



Powering Business Worldwide

EMR-3000 - MOTOR RELAY

Installation, Operation and Maintenance



Software-Version: 3.0.c

IM02602005E

Revision: J

English

EMR-3000 Functional Overview

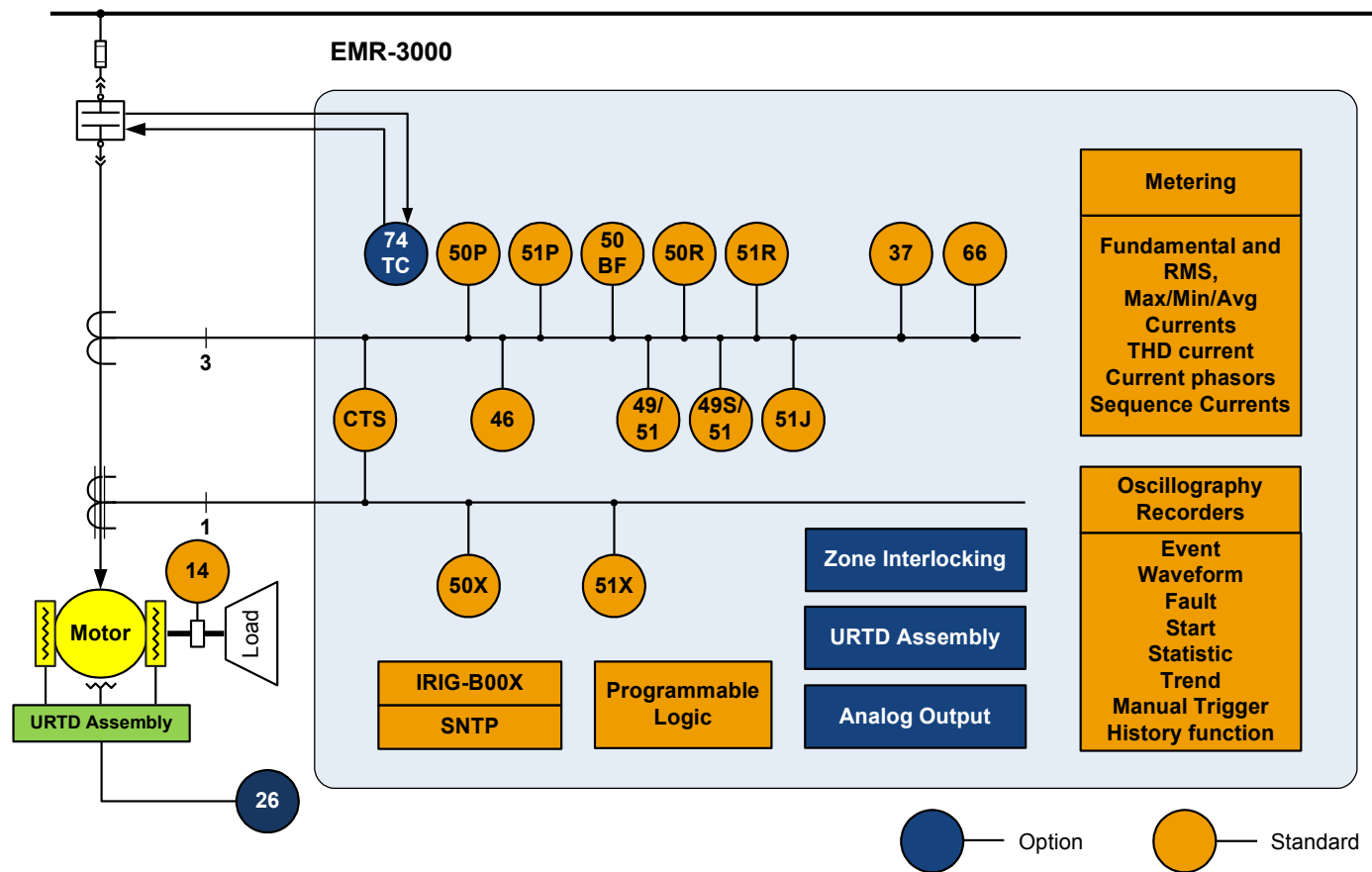


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This manual applies to devices (version):

Version 3.0.c

Build: 32897

Comments on the Manual

This manual gives a general explanation of the tasks of device planning, parameter setting, installation, commissioning, operation, and maintenance of the Eaton devices.

The manual serves as reference document for:

- Engineers in the protection field;
- Commissioning engineers;
- Personnel dealing with the setting, testing, and maintenance of protection and control devices; and
- Well trained personnel involved in electrical installations and power stations.

All functions concerning the type code will be defined. Should there be a description of any functions, parameters, or inputs/outputs that do not apply to the device in use, please ignore that information.

All details and references are explained to the best of our knowledge and are based on our experience and observations.

This manual describes the full featured versions of the devices, including all options.

All technical information and data included in this manual reflect their state at the time this document was issued. Eaton Corporation reserves the right to carry out technical modifications in line with further development without changing this manual and without previous notice. Therefore no claim can be brought based on the information and descriptions included in this manual.

Text, graphics, and formulas do not always apply to the actual delivery scope. The drawings and graphics are not true to scale. Eaton Corporation does not accept any liability for damage and operational failures caused by operating errors or disregarding the directions of this manual.

No part of this manual is allowed to be reproduced or passed on to others in any form, unless Eaton Corporation has issued advanced approval in writing.

This user manual is part of the delivery scope when purchasing the device. In case the device is passed on (sold) to a third party, the manual has to be passed on as well.

Any repair work carried out on the device requires skilled and competent personnel with verifiable knowledge and experienced with local safety regulations and have the necessary experience with working on electronic protection devices and power installations.

IMPORTANT DEFINITIONS

The symbol/word combinations detailed below are designed to call the user's attention to issues that could affect user safety and well being as well as the operating life of the device.

 **DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.

 **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.

 **CAUTION** indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

 **CAUTION** indicates practices not related to personal injury.

 **NOTICE** is used to address information and practices not related to personal injury.

 **WARNING** FOLLOW INSTRUCTIONS

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment. Practice all plant and safety instructions and precautions. Failure to follow the instructions can cause personal injury and/or property damage.



PROPER USE

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (1) constitute "misuse" and/or "negligence" within the meaning of the product warranty, thereby excluding warranty coverage for any resulting damage; and (2) invalidate product certifications or listings.

The programmable devices subject to this manual are designed for protection and also control of power installations and operational devices that are fed by voltage sources with a fixed frequency, i.e. fixed at 50 or 60 Hertz. They are not intended for use with Variable Frequency Drives. The devices are further designed for installation in low voltage (LV) compartments of medium voltage (MV) switchgear panels or in de-centralized protection panels. The programming and settings have to meet all requirements of the protection concept (of the equipment that is to be protected). The User must ensure that the device will properly recognize and manage (e.g.: switch off the circuit breaker) on the basis of User selected programming and settings all operational conditions (failures). Before starting any operation and after any modification of the programming/settings, make a documented proof that the programming and settings meet the requirements of the protection concept.

The Self-Supervision Contact (Life-Contact) has to be wired with the substation automation system in order to supervise and monitor the state of health of the programmable protective device. It is very important that an alarm annunciation is driven from the programmable protective device self-supervision contact (Life-Contact) that requires immediate attention when tripped. The alarm indicates that the protective device is no longer protecting the circuit and the system should be serviced.

Typical applications for this product family/device line are for example:

- Feeder protection;
- Mains protection;
- Transformer protection and
- Machine protection.

This device is not designed for any usage beyond these applications. This applies also to the use as a partly completed machinery. The manufacturer cannot be held liable for any resulting damage. The User alone bears the risk if this device is used for any application for which it was not designed. As to the appropriate use of the device: the technical data specified by Eaton Corporation has to be met.

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If the User's publication is not found on the web site, please contact Eaton Customer Support to get the latest copy.

CAUTION**ELECTROSTATIC DISCHARGE AWARENESS**

All electronic equipment is sensitive to electrostatic discharge, some components more than others. To protect these components from electrostatic damage, the User must take special precautions to minimize or eliminate electrostatic discharges.

Follow these precautions when working with or near the device.

1. Before performing maintenance on the electronic device, discharge the static electricity on your body to ground by touching and holding a grounded metal object (pipes, cabinets, equipment, etc.).
2. Avoid the build-up of static electricity on your body by not wearing clothing made of synthetic materials. Wear cotton or cotton-blend materials as much as possible because these do not store static electric charges as much as synthetics.
3. Keep plastic, vinyl, and Styrofoam materials (such as plastic or Styrofoam cups, cup holders, cigarette packages, cellophane wrappers, vinyl books or folders, plastic bottles, and plastic ash trays) away from the device, the modules, and the work area as much as possible.
4. Do not remove any printed circuit board (PCB) from the device cabinet unless absolutely necessary. If you must remove the PCB from the device cabinet, follow these precautions:
 - Do not touch any part of the PCB except the edges.
 - Do not touch the electrical conductors, the connectors, or the components with conductive devices or with your hands.
 - When replacing a PCB, keep the new PCB in the plastic, anti-static protective bag it comes in until you are ready to install the PCB. Immediately after removing the old PCB from the device cabinet, place it in the anti-static protective bag.

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What Is Included with the Device

The device package includes all connection terminals, except communication connectors, but does not include the fastening material. Please check the package for completeness upon delivery.

Device Package Contents:

- 1 – Protective Relay;
- 1 – Mount (Standard or Projection);
- 1 – Quick Start Guide; and
- 2 – CDs
 - Disk 1 - Contains the User's Manual, Modbus Register Maps, Profibus Register Maps and GSD file, IEC 61850 Communication Documentation, Wiring Diagrams, and Device Model (Template) for Off-line Parameter Setting;
 - Disk 2 - Contains PowerPort-E and Quality Manager software applications.

NOTICE

Disk1 contains the device templates. The device templates **MUST BE** installed to allow PowerPort-E to configure a device off-line.

Please make sure the product label, wiring diagram, type code, and materials and description pertain to this device. If you have any doubts, please contact Eaton Corporation's Customer Service Department.

Storage

The devices must not be stored outdoors. If stored, it must be stored in an area with temperature and humidity control (see the Technical Data section contained in this manual).

Important Information

⚠ WARNING

In line with the customer's requirement, the devices are combined in a modular way (in compliance with the order code). The terminal assignment of the device can be found on the top of the device (wiring diagram). In addition, it can be found within the Appendix of this manual (see Wiring Diagrams).

Device

EMR-3000

Device Planning

Planning of a device means to reduce the functional range to a degree that suits the protection task to be fulfilled (i.e.: the device shows only those functions needed or desired). If the User, for example, deactivates the voltage protection function, all parameter branches related to this function will not appear in the parameter. All corresponding events, signals, etc. will also be deactivated. Due to this change, the parameter trees become very transparent.

Planning also involves adjustment of all basic system data (frequency, etc.).

WARNING

It **MUST** be taken into account that by deactivating, for instance, protective functions, the User also changes the functionality of the device. If the User cancels the directional feature of the over-current protections, then the device no longer trips in a directional way but merely in a non-directional way.

The manufacturer does not accept liability for any personal or material damage as a result of incorrect planning.

Contact your Eaton Customer Service representative for more information.

WARNING

Beware of the inadvertent deactivating of protective functions/modules.

If the User is deactivating modules within the device planning, all parameters of those modules will be set on default.

If the User is activating one of these modules, again, all parameters of those reactivated modules will be set on default.

NOTICE

If the protective device is equipped with Zone Interlocking, overcurrent and earth current elements are needed to trigger the Zone Interlocking function. Therefore, some overcurrent and earth current elements cannot be deactivated if the device is equipped with Zone Interlocking.

Device Configuration Parameters of the Device

<i>Parameter</i>	<i>Description</i>	<i>Options</i>	<i>Default</i>	<i>Menu path</i>
Hardware Variant 1 	Optional Hardware Extension	»A« 4 Digital Inputs 4 Relay Outputs Analog Output IRIG-B, »B« 4 Digital Inputs 4 Relay Outputs Zone Interlocking IRIG-B	4 Digital Inputs 4 Relay Outputs Analog Output IRIG-B	[EMR-3000]
Hardware Variant 2 	Optional Hardware Extension	»0« Phase Current 5A/1A, Ground Current 5A/1A, »1« Phase Current 5A/1A, Sensitive Ground Current 5A/1A	Phase Current 5A/1A, Ground Current 5A/1A	[EMR-3000]

Parameter	Description	Options	Default	Menu path
Communication 	Communication	»A« Without, »B« RS 485: Modbus RTU DNP RTU, »C« Ethernet: Modbus TCP DNP UDP, TCP, »D« Fiber Optics: Profibus-DP, »E« D-SUB: Profibus-DP, »F« Fiber Optics: Modbus RTU DNP RTU, »G« RS 485/D-SUB: Modbus RTU DNP RTU, »H« Ethernet: IEC61850 Modbus TCP DNP UDP, TCP, »I« RS 485 and Ethernet: Modbus TCP, RTU DNP UDP, TCP, RTU, »K« Ethernet/Fiber Optics: IEC61850 Modbus TCP DNP UDP, TCP, »L« Ethernet/Fiber Optics: Modbus TCP DNP UDP, TCP, »T« RS 485 and Ethernet: Communication Test	»A« Without	[EMR-3000]
Printed Circuit Board 	Printed Circuit Board	»A« Standard, »B« Conformal Coating	»A« Standard	[EMR-3000]

There are two mounts available for the EMR-3000-2: a Standard Mount and a Projection Mount. To order the EMR-3000-2 with a Standard Mount, append the device code with a zero (0). To order the EMR-3000-2 with a Projection Mount, append the device code with a one (1). Refer to the table for details of the available device options.

A retrofit kit for Eaton IQ cutouts is available (Style No. 66D2217G01 – Catalog No. ER-IQEDRKIT). This kit is required when replacing an IQ-1000 or MP-3000 with the EMR-3000-2.

Ordering Information

Sample Catalog Number

The catalog number identification chart defines the electrical characteristics and operation features included in the EMR-3000-2. For example, if the catalog number were EMR-3000-2A0BA1, the device would have the following:

EMR-3000-2

- (A)** - 4 Digital Inputs, 4 Output Relays, 1 4-20 mA Analog Output, URTD Interface
 - (0)** - 5A/1A phase and ground CTs, Power Supply Range: 19-300 Vdc, 40-250 Vac
 - (B)** - Modbus-RTU (RS-485)
 - (A)** - Without Conformal Coating
-
- (0) Standard Mount
 - (1) Projection Panel Mount

EMR-3000-2 Eaton Distribution Relay Removable Terminals					
EMR-3000-2	A	0	B	A	1
Choose from the following options.					
Hardware Option 1					
4 DI, 4 Outputs, Removable Terminals, 1 4-20mA Analog Output, URTD interface, IRIG-B, Small Display	A				
4 DI, 4 Outputs, Removable Terminals, Zone Interlocking, URTD interface, IRIG-B, Small Display	B				
Hardware Option 2					
Phase Current 5A/1A, Ground Current 5A/1A, Power Supply Range: 19-300 Vdc, 40-250 Vac.		0 (Zero)			
Phase Current 5A/1A, Sensitive Ground Current 0.5A/0.1A, Power Supply Range: 19-300 Vdc, 40-250 Vac.*		1			
Communication Options					
No communication protocol			A		
Modbus-RTU (RS-485) + DNP3.0 (interface with terminals)			B		
Modbus TCP + DNP3.0 TCP/UDP (Ethernet 100MB / RJ45)			C		
Profibus-DP (Fibre optic interface, ST connector)			D		
Profibus-DP (RS485 / D-SUB interface)			E		
Modbus RTU + DNP3.0 RTU (Fiber optic interface, ST connector)			F		
Modbus RTU + DNP3.0 RTU (RS485 / D-SUB interface)			G		
IEC 61850 + Modbus TCP + DNP3.0 TCP/UDP (Ethernet 100MB, RJ45)			H		
Modbus RTU + DNP3.0 RTU (RS485 / terminals) + Modbus TCP + DNP3.0 TCP/UDP (Ethernet 100MB, RJ45)			I		
IEC 61850 + Modbus TCP + DNP3.0 TCP/UDP (Fiber optic interface, LC connector, 100MB)			K		
Modbus TCP + DNP3.0 TCP/UDP (Fiber optic interface, LC connector, 100MB)			L		
Conformal Coating Options					
None				A	
Conformal Coated Circuit Boards				B	
Mounting Options					
Standard Mount					0 (Zero)
Projection Panel Mount					1

Installation and Wiring

Three-Side-View and Panel Cutout

NOTICE

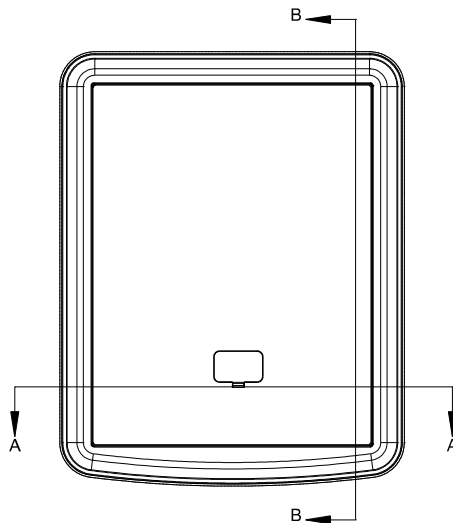
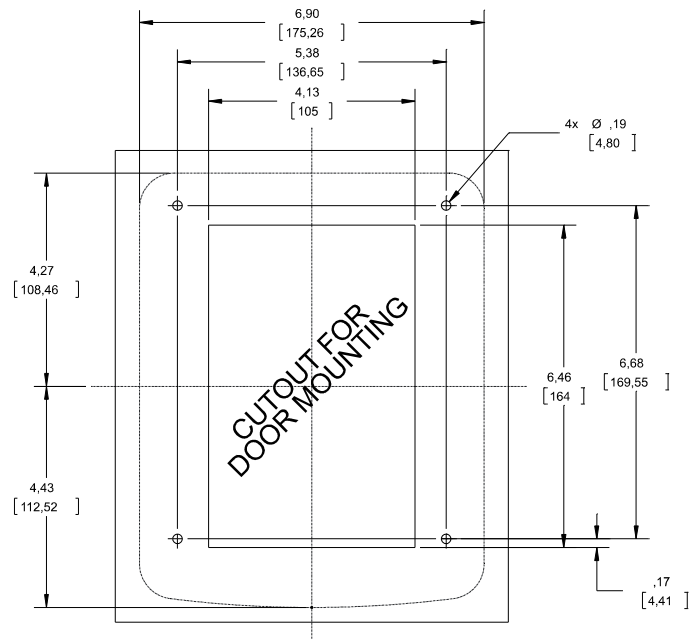
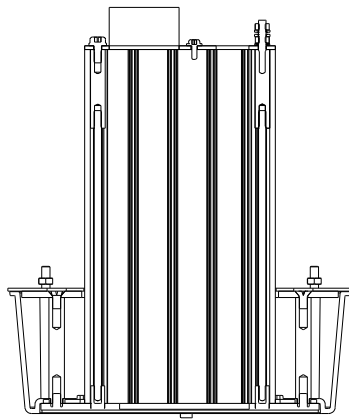
Depending on the connection method of the Communication system used, the needed space (depth) differs. If, for instance, a D-Sub-Plug is used, it has to be added to the depth dimension.

! WARNING

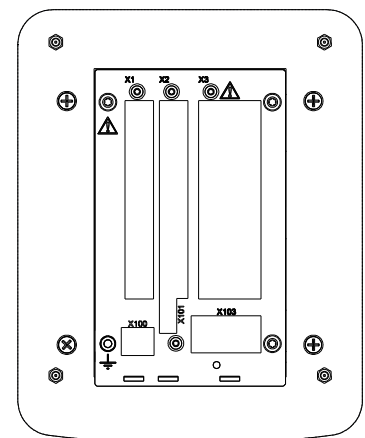
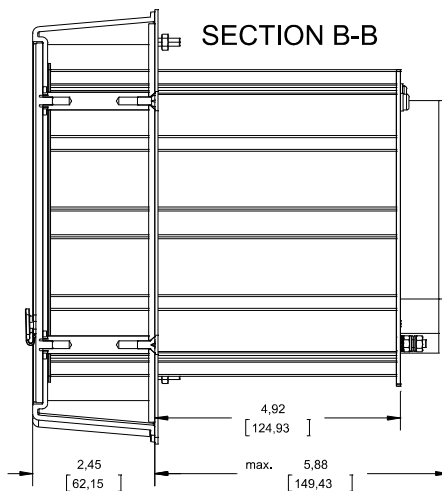
Even when the auxiliary voltage is switched-off, unsafe voltages remain at the device connections.

PROJECTION PANEL MOUNT

SECTION A-A



SECTION B-B



! WARNING

The housing must be carefully grounded. Connect a ground cable (protective earth, 4 to 6 mm² [AWG 11–9], tightening torque 1.7 Nm [15 lb-in]) to the housing, using the screw that is marked with the ground symbol (at the rear side of the device).

Moreover, the power supply card needs a separate ground connection (functional earth, min. 2.5 mm² [$\leq$ AWG 13], tightening torque 0,56 – 0,79 Nm [5–7 lb-in]). See the “Terminal Marking” diagram in Section “DI-4 X – Power Supply Card with Digital Inputs” to check for the correct terminal.

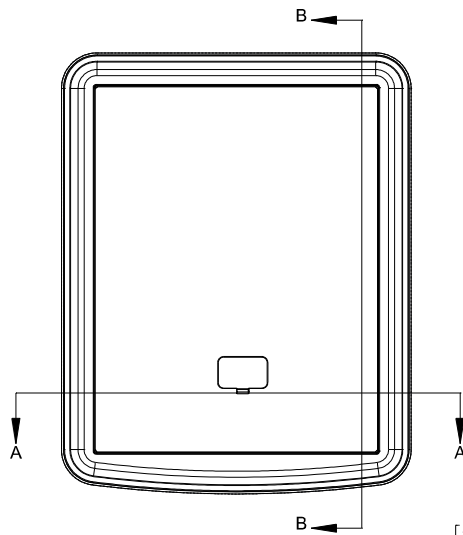
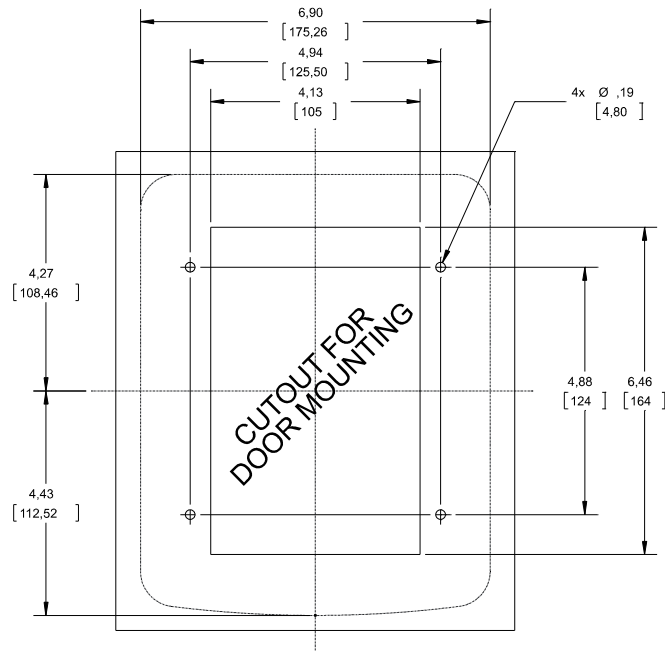
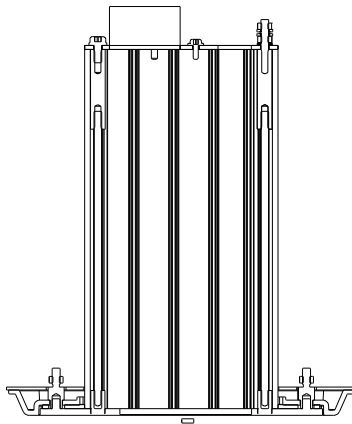
All grounding connections (i. e. protective and functional earth) must be low-inductance, i. e. as short as possible, and national standards – if applicable – must be followed.

! CAUTION

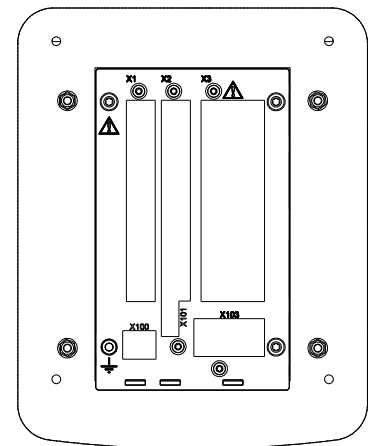
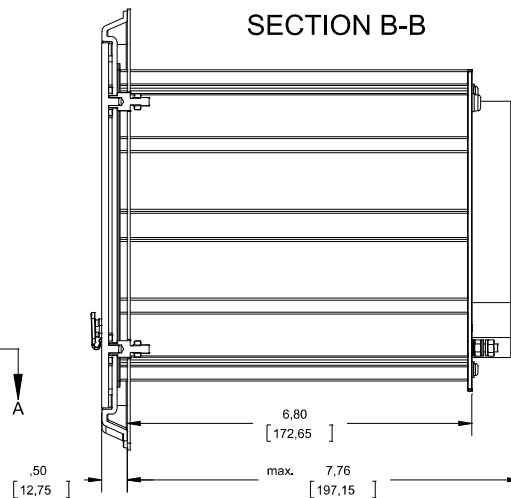
DO NOT over-tighten the mounting nuts of the relay (0.164 X32). Check the torque by means of a torque wrench (1.7 Nm [15 lb-in]). Over-tightening the mounting nuts could cause personal injury or damage the relay.

STANDARD PANEL MOUNT

SECTION A-A



SECTION B-B



Outline Standard Mount - Door Cut-out

WARNING

The housing must be carefully grounded. Connect a ground cable (protective earth, 4 to 6 mm² [AWG 11–9], tightening torque 1.7 Nm [15 lb-in]) to the housing, using the screw that is marked with the ground symbol (at the rear side of the device).

Moreover, the power supply card needs a separate ground connection (functional earth, min. 2.5 mm² [≤ AWG 13], tightening torque 0,56 – 0,79 Nm [5–7 lb-in]). See the “Terminal Marking” diagram in Section “DI-4 X – Power Supply Card with Digital Inputs” to check for the correct terminal.

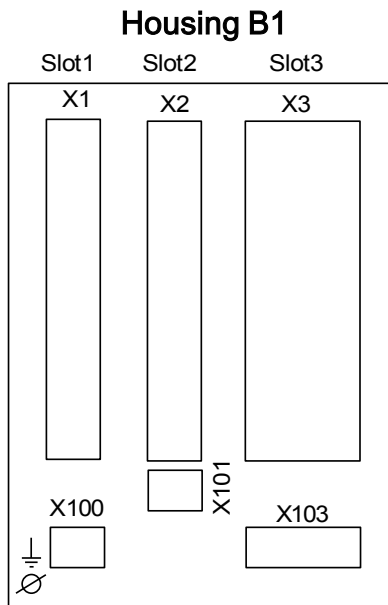
All grounding connections (i. e. protective and functional earth) must be low-inductance, i. e. as short as possible, and national standards – if applicable – must be followed.

Overview of Slots - Assembly Groups

! WARNING

In line with the customers' requirement, the devices are combined in a modular way (in compliance with the order code). In each of the slots, an assembly/group may be integrated. In the following diagram, the terminal assignment of the individual assembly/groups are shown. The exact installation/placement of the individual modules can be determined from the connection diagram attached to the top of your device.

Overview of Slots



Schematic Diagram

! WARNING

The housing must be carefully grounded. Connect a ground cable (protective earth, 4 to 6 mm² [AWG 11–9], tightening torque 1.7 Nm [15 lb-in]) to the housing, using the screw that is marked with the ground symbol (at the rear side of the device).

Moreover, the power supply card needs a separate ground connection (functional earth, min. 2.5 mm² [$\leq$ AWG 13], tightening torque 0,56 – 0,79 Nm [5–7 lb-in]). See the “Terminal Marking” diagram in Section “DI-4 X – Power Supply Card with Digital Inputs” to check for the correct terminal.

All grounding connections (i. e. protective and functional earth) must be low-inductance, i. e. as short as possible, and national standards – if applicable – must be followed.

Grounding

WARNING

The housing must be carefully grounded. Connect a ground cable (protective earth, 4 to 6 mm² [AWG 11–9], tightening torque 1.7 Nm [15 lb·in]) to the housing, using the screw that is marked with the ground symbol (at the rear side of the device).

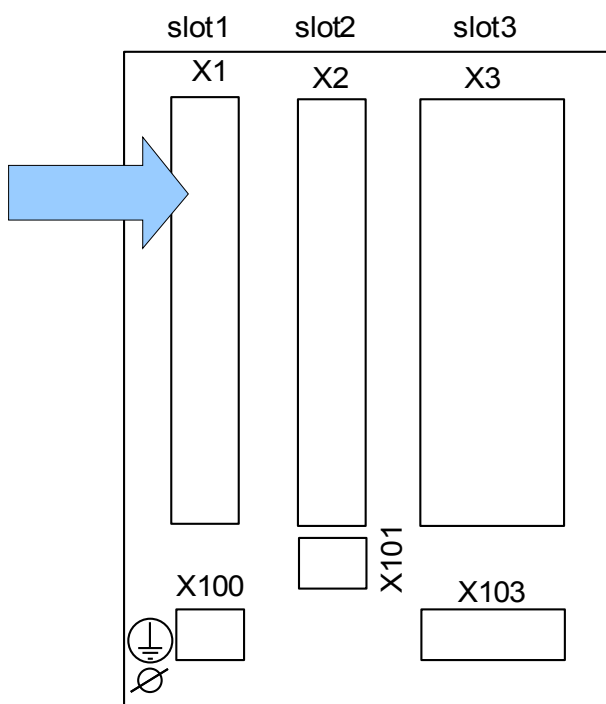
Moreover, the power supply card needs a separate ground connection (functional earth, min. 2.5 mm² [$\leq$ AWG 13], tightening torque 0,56 – 0,79 Nm [5–7 lb·in]). See the “Terminal Marking” diagram in Section “DI-4 X – Power Supply Card with Digital Inputs” to check for the correct terminal.

All grounding connections (i. e. protective and functional earth) must be low-inductance, i. e. as short as possible, and national standards – if applicable – must be followed.

CAUTION

The devices are very sensitive to electrostatic discharges.

Slot X1: Power Supply Card with Digital Inputs



Rear side of the device (Slots)

The type of power supply card and the number of digital inputs on it used in this slot is dependent on the ordered device type. The different variants have a different scope of functions.

Available assembly groups in this slot:

- **(DI4-X1):** This assembly group comprises a wide-range power supply unit; and four (4) digital inputs (grouped).

NOTICE

The available combinations can be gathered from the ordering code.

DI-4 X - Power Supply and Digital Inputs

WARNING

In addition to the grounding of the housing (protective earth, see Chapter “Installation and Wiring”) there must be an additional ground cable connected to the power supply card (functional earth, min. 2.5 mm² [$\leq$ AWG 13], tightening torque 0,56 – 0,79 Nm [5–7 lb·in]).

Connect this ground cable to terminal No. 1, see the “Terminal Marking” diagram below.

All grounding connections (i. e. protective and functional earth) must be low-inductance, i. e. as short as possible, and national standards – if applicable – must be followed.

This assembly group comprises:

- A wide-range power supply unit; and
- Four (4) digital inputs, grouped.
- Connector for the functional earth

Auxiliary Voltage Supply

- The auxiliary voltage inputs (wide-range power supply unit) are non-polarized. The device could be provided with AC or DC voltage.

Digital Inputs

CAUTION

For each digital input group, the related voltage input range has to be parameterized. Wrong switching thresholds can result in malfunctions/wrong signal transfer times.

The digital inputs are provided with different switching thresholds (can be parameterized) (two AC and five DC input ranges). The following switching levels can be defined:

- 24 Vdc;
- 48 Vdc
- 60 Vdc;
- 110/120 Vac/dc; and
- 230/240 Vac/dc.

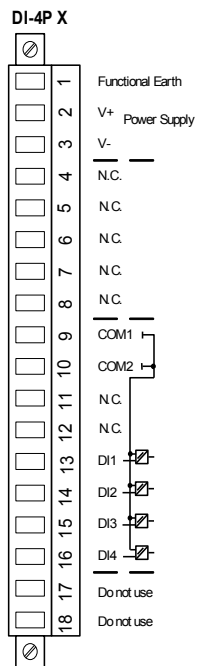
If a voltage >80% of the set switching threshold is applied at the digital input, the state change is recognized (logically “1”). If the voltage is below 40% of the set switching threshold, the device detects logically “0”.

CAUTION

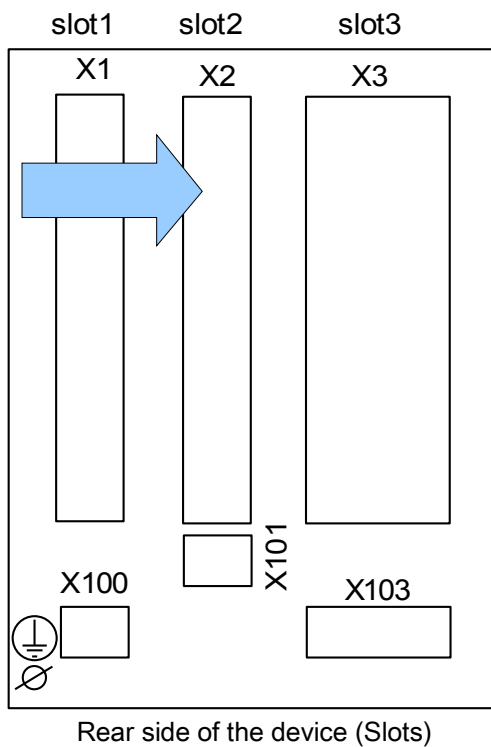
When using DC supply, the negative potential has to be connected to the common terminal (COM1, COM2, COM3 - please see the terminal marking).

Terminal Marking

X?.	
1	(E) Functional Earth
2	V+ Power Supply
3	V-
4	N.C.
5	N.C.
6	N.C.
7	N.C.
8	N.C.
9	COM1
10	COM2
11	N.C.
12	N.C.
13	DI1
14	DI2
15	DI3
16	DI4
17	Do not use
18	Do not use

Pin Assignment

Slot X2: Relay Output Card with Analog Output



The type of card in this slot is dependent on the ordered device type. The different variants have a different scope of functions.

Available assembly groups in this slot:

- **(OR-3AI X2):** Assembly Group with 2 Normally Open (Form A), 1 Changeover (Form C), SC , Analog Output IRIG-B

NOTICE

The available combinations can be gathered from the ordering code.

RO-4A X - Relay Outputs and System Contact

The Relay Outputs are potential-free contacts. In the Assignment/Relay Outputs section, the assignment of the Relay Outputs is specified. The changeable signals are listed in the Assignment List section.



Make sure that the tightening torque is 5-7 In-lb [0.56-0.79 Nm].

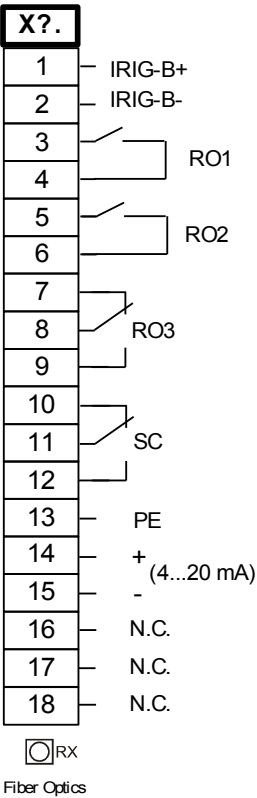
CAUTION

**Please carefully consider the current carrying capacity of the Relay Outputs.
Please refer to the Technical Data.**

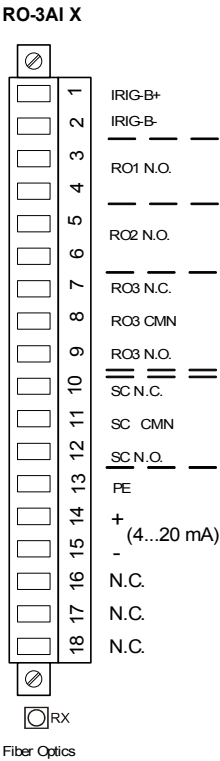
The *System-OK contact (SC relay)* cannot be configured. The system contact is a Form “C” contact that picks up when the device is free from internal faults. While the device is booting up, the *System OK relay (SC)* remains dropped-off (unenergized). As soon as the system is properly started (and protection is active), the System Contact picks up and the assigned LED is activated accordingly (please refer to the Self Supervision chapter).

For details on the Analogue Output please refer to the Technical Data.

Terminal Marking



Pin Assignment



RO-3ZI X - Relay Outputs, IRIG-B00X, Zone Interlock and SC

The Relay Outputs are potential-free contacts. In the Assignment/Relay Outputs section, the assignment of the Relay Outputs is specified. The changeable signals are listed in the Assignment List section.



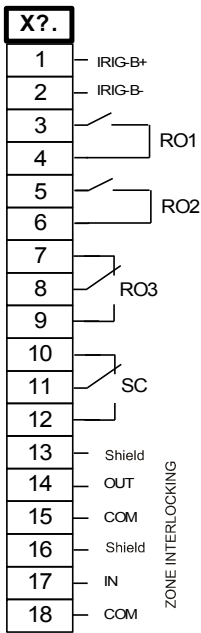
Make sure that the tightening torque is 5-7 In-lb [0.56-0.79 Nm].

CAUTION

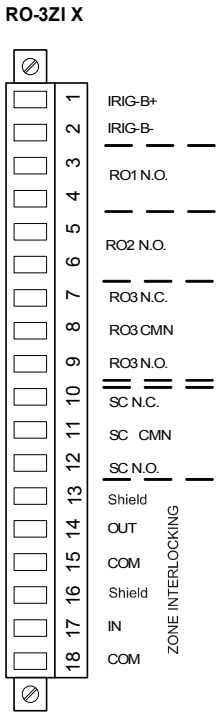
**Please carefully consider the current carrying capacity of the Relay Outputs.
Please refer to the Technical Data.**

The *System-OK contact (SC relay)* cannot be configured. The system contact is a Form “C” contact that picks up when the device is free from internal faults. While the device is booting up, the *System OK relay (SC)* remains dropped-off (unenergized). As soon as the system is properly started (and protection is active), the System Contact picks up and the assigned LED is activated accordingly (please refer to the Self Supervision chapter).

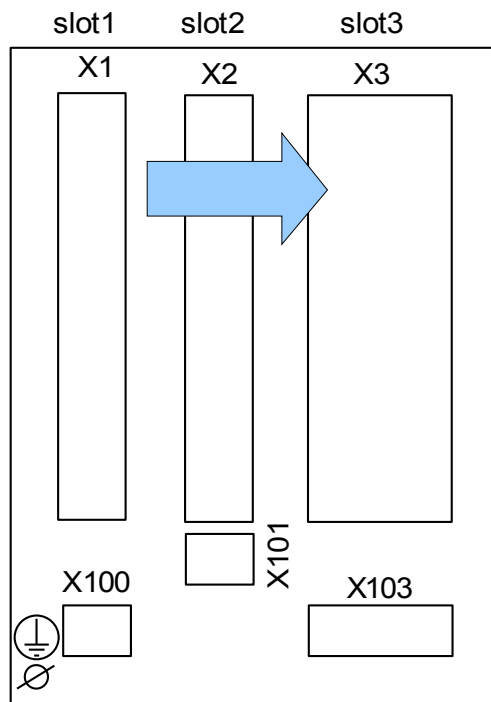
Terminal Marking



Pin Assignment



Slot X3: Current Transformer Measuring Inputs



Rear side of the device (Slots)

Available assembly groups in this slot:

- **(TI-4 X3):** Standard ground current measuring card.
- **(TIS-4 X3):** Sensitive Ground current measuring card. The Technical data of the sensitive ground measuring input deviate are different to the Technical Data of the phase current measuring inputs. Please refer to the Technical Data.

TI X- Standard Phase and Ground Current Measuring Input Card

A current measuring card is provided with four (4) current measuring inputs: three for measuring the phase currents and one for measuring of the ground current.

Each of the current measuring inputs has a measuring input for 1 A and 5 A.

The input for ground current measuring either can be connected to a zero sequence current transformer or, alternatively, it is possible to connect the summation current path of the phase current transformer to this input (residual connection).



DANGER Current transformers have to be earth grounded on their secondary side.



DANGER Interrupting the secondary circuits of current transformers causes hazardous voltages.

The secondary side of the current transformers have to be short circuited before the current circuit to the device is opened.



DANGER The current measuring inputs may exclusively be connected to current measuring transformers (with galvanic separation).



- Do not mix the inputs (1 A/5 A).
- Make sure the transformer ratios and the power of the CTs are correctly rated. If the rating of the CTs is not correct (overrated), then the normal operational conditions may not be recognized. The pickup value of the measuring unit amounts to approximately 3% of the rated current of the device. Also, the CTs need a current greater than approximately 3% of the rated current to ensure sufficient accuracy.

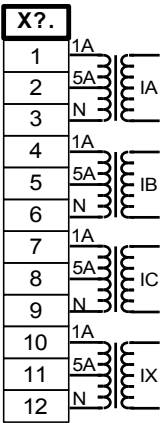
Example: For a 600 A CT (primary current), any currents below 18 A cannot be detected.

- Overloading can result in destruction of the measuring inputs or faulty signals. Overloading means that, in case of a short circuit, the current carrying capacity of the measuring inputs could be exceeded.

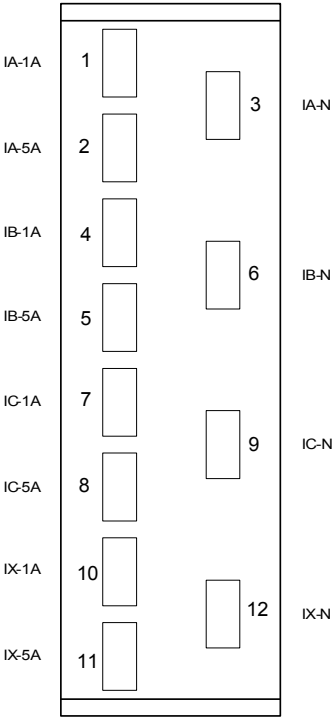


WARNING Make sure that the tightening torque is 17.7 In-lb [2 Nm].

Terminal Markings



Pin Assignment



TIS X – Phase and Sensitive Ground Current Measuring Card

The sensitive ground current measuring card is provided with four (4) current measuring inputs: three for measuring the phase currents and one for measuring of the sensitive ground current (The sensitive Ground current Input has different technical data. Please refer to chapter Technical Data.).

The input for ground current measuring either can be connected to a zero sequence current transformer or, alternatively, it is possible to connect the summation current path of the phase current transformer to this input (residual connection).



Current transformers have to be earth grounded on their secondary side.



Interrupting the secondary circuits of current transformers causes hazardous voltages.

The secondary side of the current transformers have to be short circuited before the current circuit to the device is opened.



The current measuring inputs may exclusively be connected to current measuring transformers (with galvanic separation).

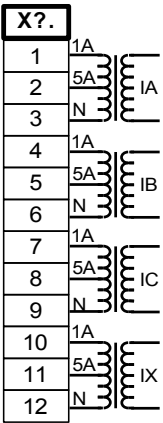


Make sure that the tightening torque is 17.7 In-lb [2 Nm].

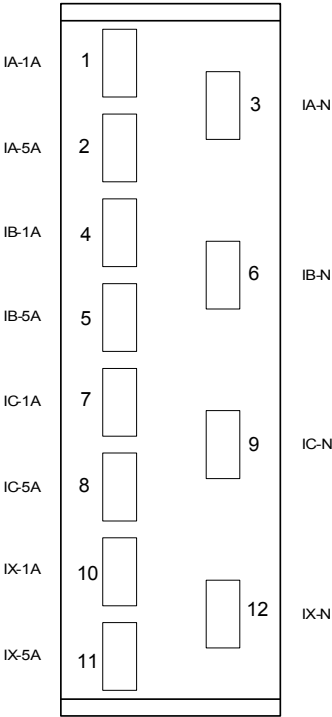


- Do not interchange the inputs (1 A/5 A)
- Make sure the transformation ratios and the power of the CTs are correctly rated. If the rating of the CTs is not right (overrated), then the normal operational conditions may not be recognized. The pickup value of the measuring unit amounts approx. 3% of the rated current of the device. Also the CTs need a current greater than approx 3% of the rated current to ensure sufficient accuracy. Example: For a 600 A CT (primary current) any currents below 18 A cannot be detected any more.
- Overloading can result in destruction of the measuring inputs or faulty signals. Overloading means that in case of a short-circuit the current-carrying capacity of the measuring inputs could be exceeded.

Terminal Markings



Pin Assignment



Common CT Wiring Configurations

Check the installation direction.



It is imperative that the secondary sides of measuring transformers be grounded.



The current measuring inputs may exclusively be connected to current measuring transformers (with galvanic separation).



CT secondary circuits must always be low-burdened or short-circuited during operation.

NOTICE

For current and voltage sensing function external wired and appropriate current and voltage transformer shall be used, based on the required input measurement ratings. Those devices provide the necessary insulation functionality.

All current measuring inputs can be provided with 1 A or 5 A nominal. Make sure that the wiring is correct.

Sensitive Ground Current Measurement

The proper use of sensitive current measuring inputs is the measurement of small currents like they could occur in isolated and high resistance grounded networks.

Due to the sensitiveness of these measuring inputs don't use them for the measurement of ground short circuit currents like they occur in solidly earthed networks.

If a sensitive measuring input should be used for the measurement of ground short circuit currents, it has to be ensured, that the measuring currents are transformed by a matching transformer according to the technical data of the protective device.

CT Connection Options

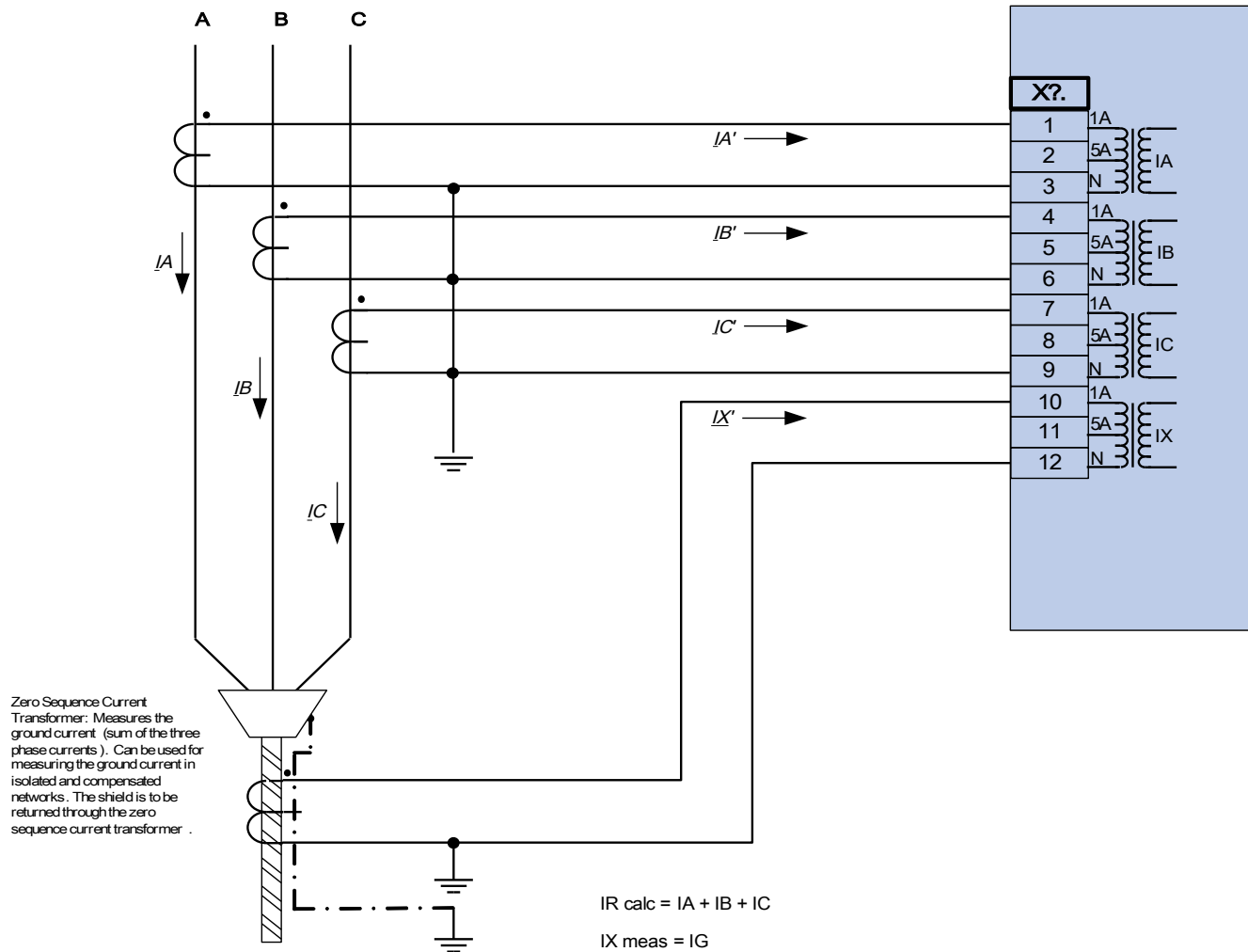
The current transformers may be connected in several ways, and the specified configuration affects the way system measurements are made and results computed. The computation of the residual current I_R , is dependent on the system configuration setting for the CT connection. The configurations resulting from the setting options are shown as well as the calculated I_R residual current.

X?	
1	1A
2	5A
3	N
4	1A
5	5A
6	N
7	1A
8	5A
9	N
10	1A
11	5A
12	N

IR calc = $I_A + I_B + I_C = I_G$

www.eaton.com 39

3-phase, 3-wire IG Measured

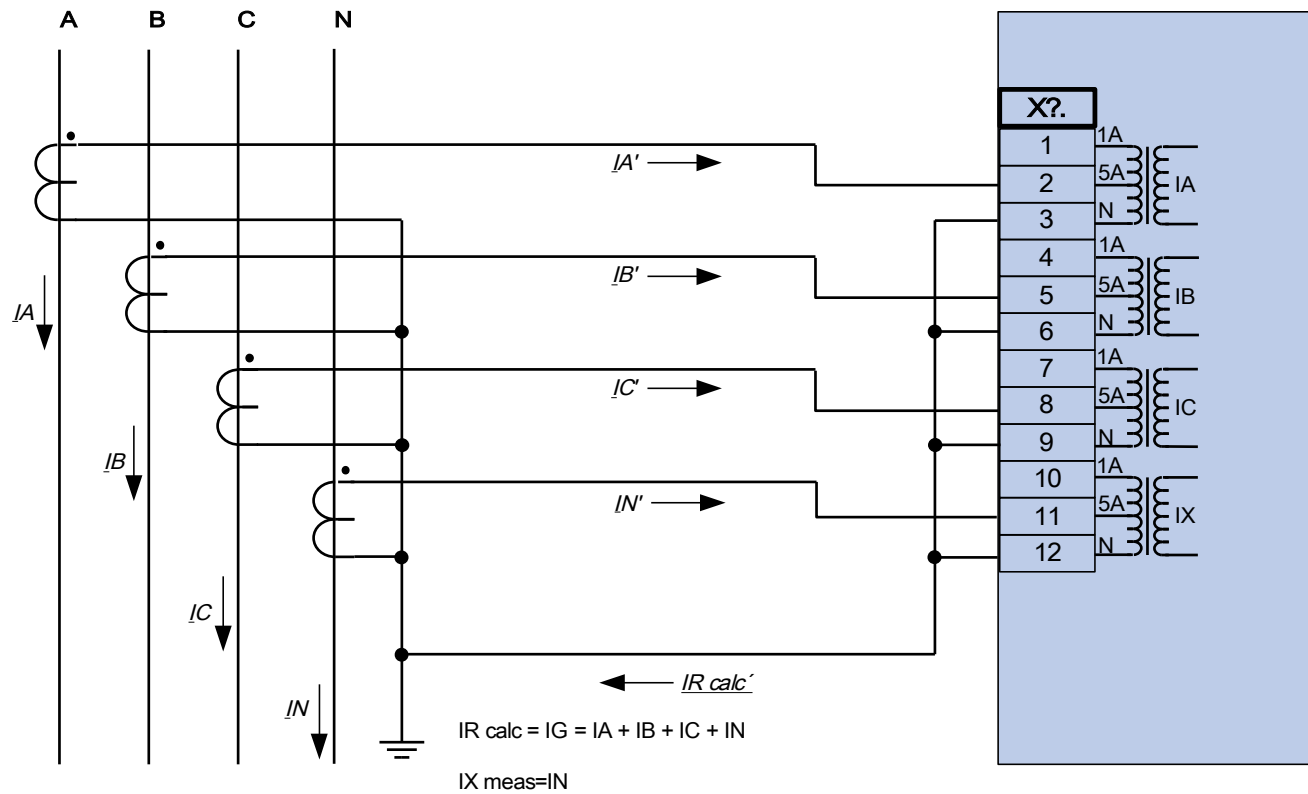


Three-phase Current Measurement; $I_{nom \text{ Secondary}} = 1 \text{ A}$.
 Ground Current Measuring via Zero Sequence CT; $I_{Gnom \text{ Secondary}} = 1 \text{ A}$.

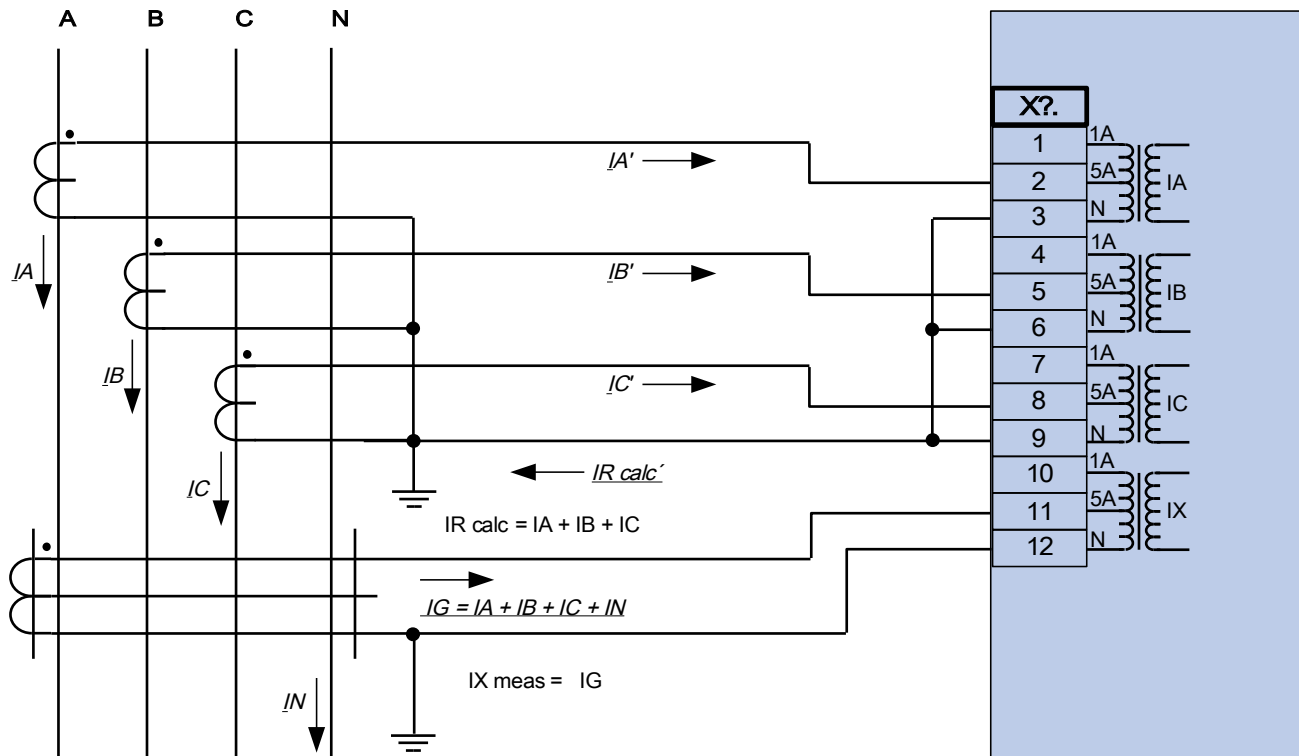


Warning!

The shielding at the dismantled end of the line has to be put through the zero sequence current transformer and has to be grounded at the cable side.

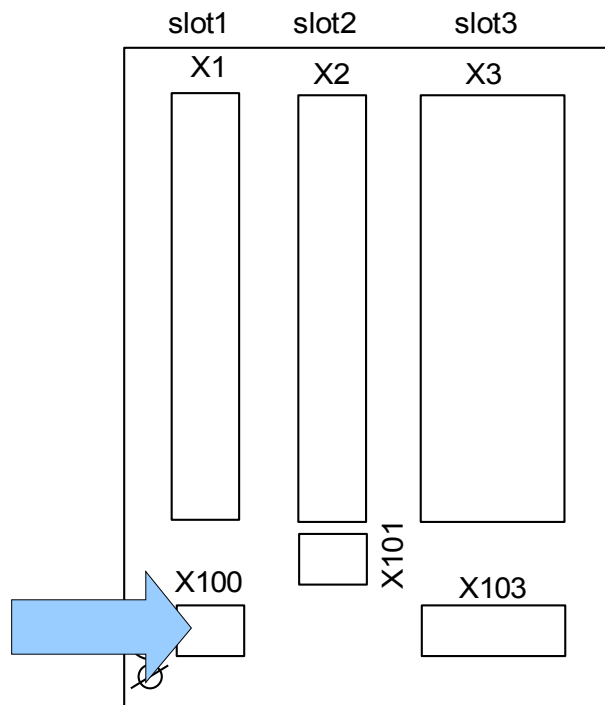
4-wire system, 4th CT on Neutral**4-wire system, 4th CT on Neutral; I_N secondary = 5 A.**

4-wire System Ground Current CT Involving Neutral



4-wire system with ground current CT (Toroidal) involving Neutral; In secondary = 5 A.

Slot X100: Ethernet Interface



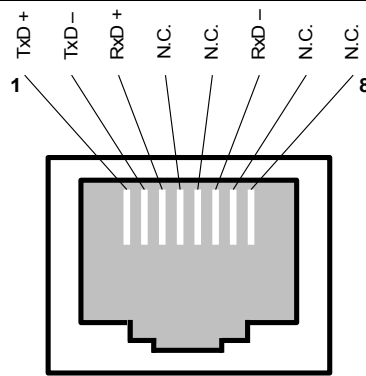
Rear side of the device (Slots)

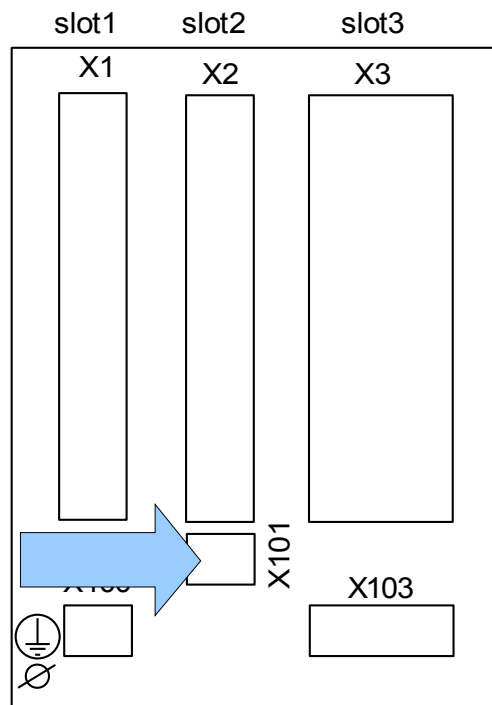
An Ethernet interface may be available depending on the device type ordered.

NOTICE

The available combinations can be gathered from the ordering code.

Ethernet - RJ45

Terminal Marking

Slot X101: URTD

Rear side of the device (Slots)

Depending on the device code, this slot can be equipped with an URTD interface.

NOTICE

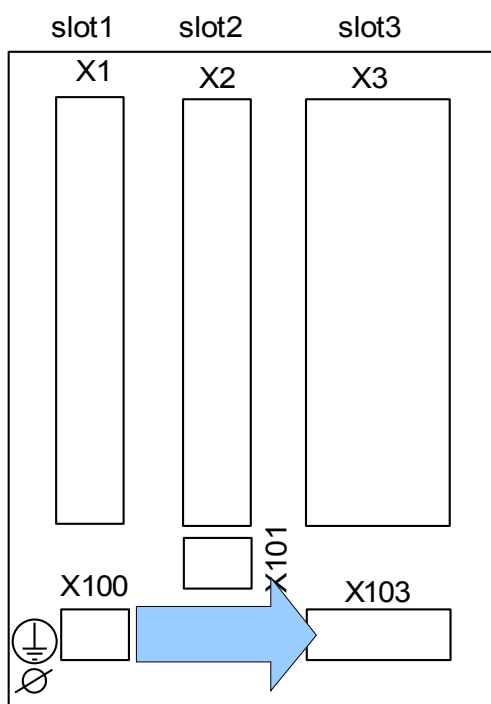
The available combinations can be gathered from the ordering code.

Interface for the URTD Module

The Universal Resistance-Temperature Detector (URTD) module has to be connected to the protective device at the special fiber optic interface (1 optical slave).

Terminal Marking	
Interface for the External URTD Module	Interface Ext. URTD Module
	

Slot X103: Data Communication



Rear side of the device (Slots)

The data communication interface in the **X103** slot is dependent on the ordered device type. The scope of functions is dependent on the type of data communication interface.

Available assembly groups in this slot:

- RS485 Terminals for Modbus and IEC
- Fiber Optics Interface for Ethernet*

*=ask for availability

NOTICE

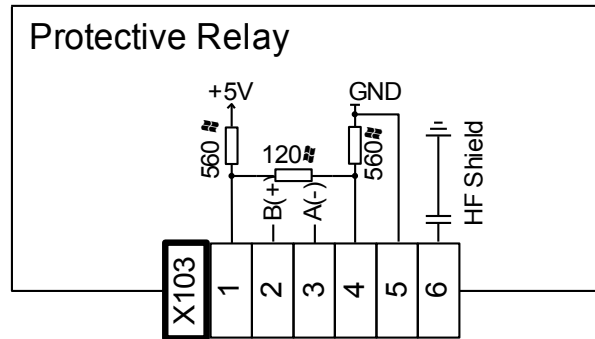
The available combinations can be gathered from the ordering code.

RS485 - Modbus® RTU

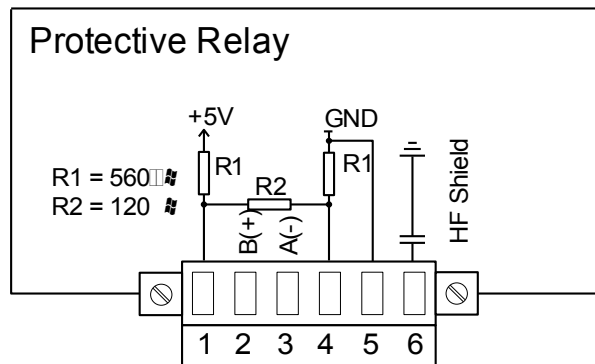


WARNING Make sure that the tightening torque is 2-4 In-lb [0.22-0.45 Nm].

Terminal Marking



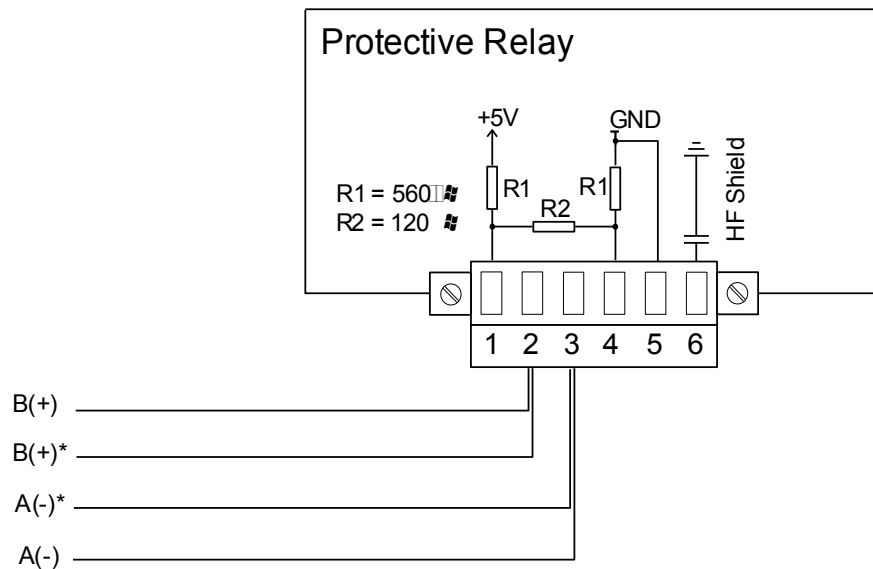
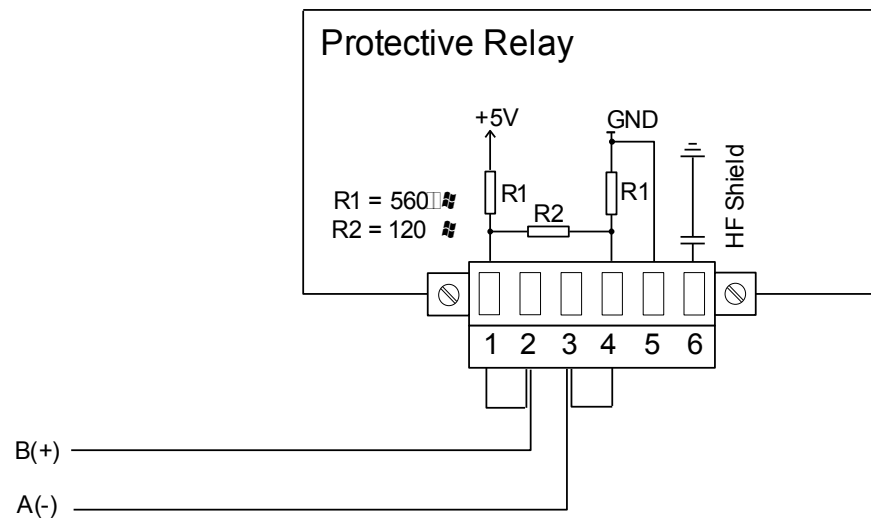
Pin Assignment



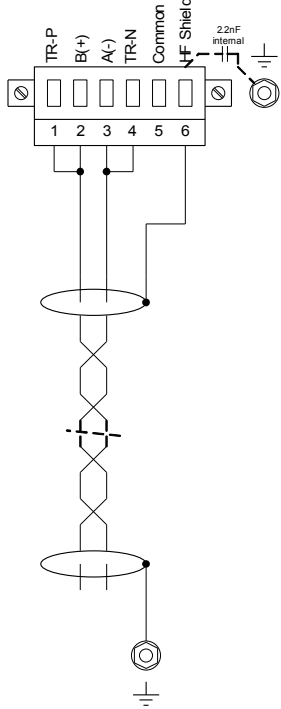
NOTICE

The Modbus® connection cable must be shielded. The shielding has to be fixed at the screw that is marked with the ground symbol at the rear side of the device.

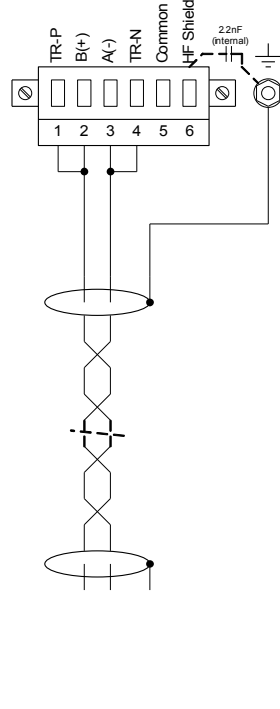
The communication is Half Duplex.

Wiring Example: Device in the Middle of the Bus*Wiring Example: Device at the End of the BUS (Using the Integrated Terminal Resistor)*

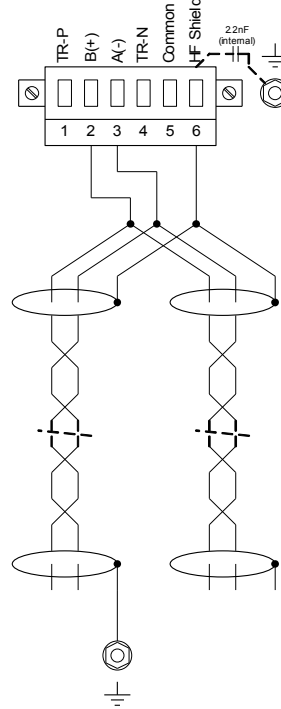
Shielding Options (2-wire + Shield)



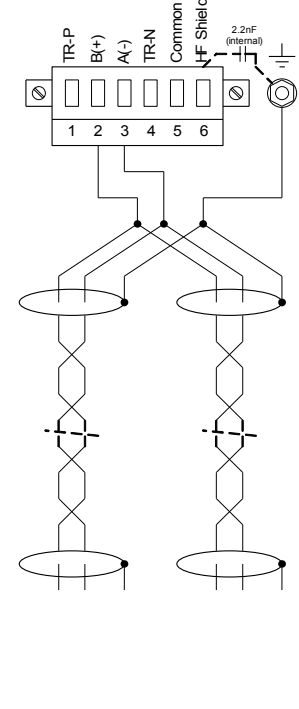
Shield at bus master side
connected to earth termination
resistors used



Shield at bus device side
connected to earth termination
resistors used

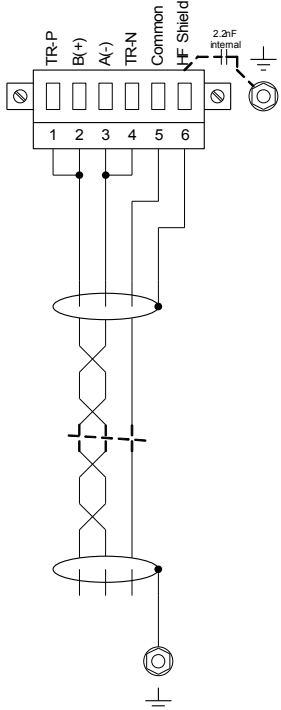


Shield at bus master side
connected to earth termination
resistors not used

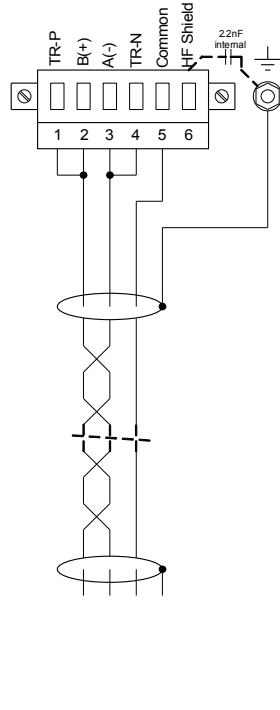


Shield at bus device side
connected to earth termination
resistors not used

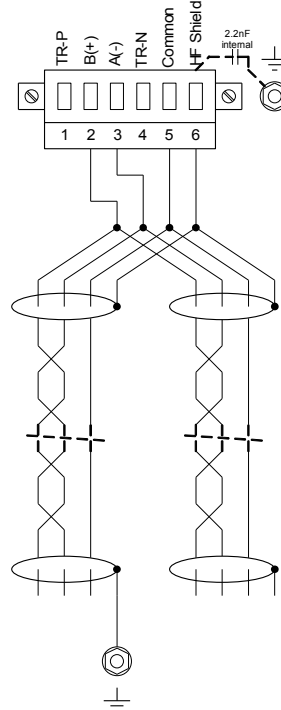
Shielding Options (3-wire + Shield)



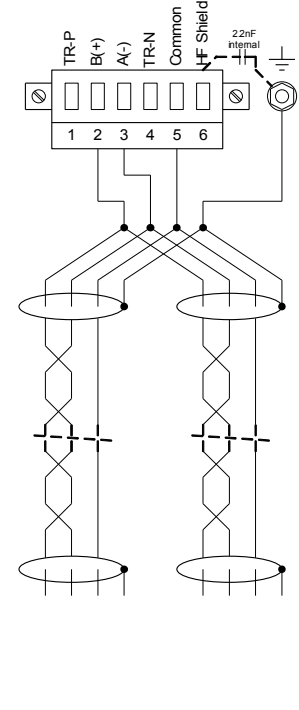
Shield at bus master side
connected to earth termination
resistors used



Shield at bus device side
connected to earth termination
resistors used



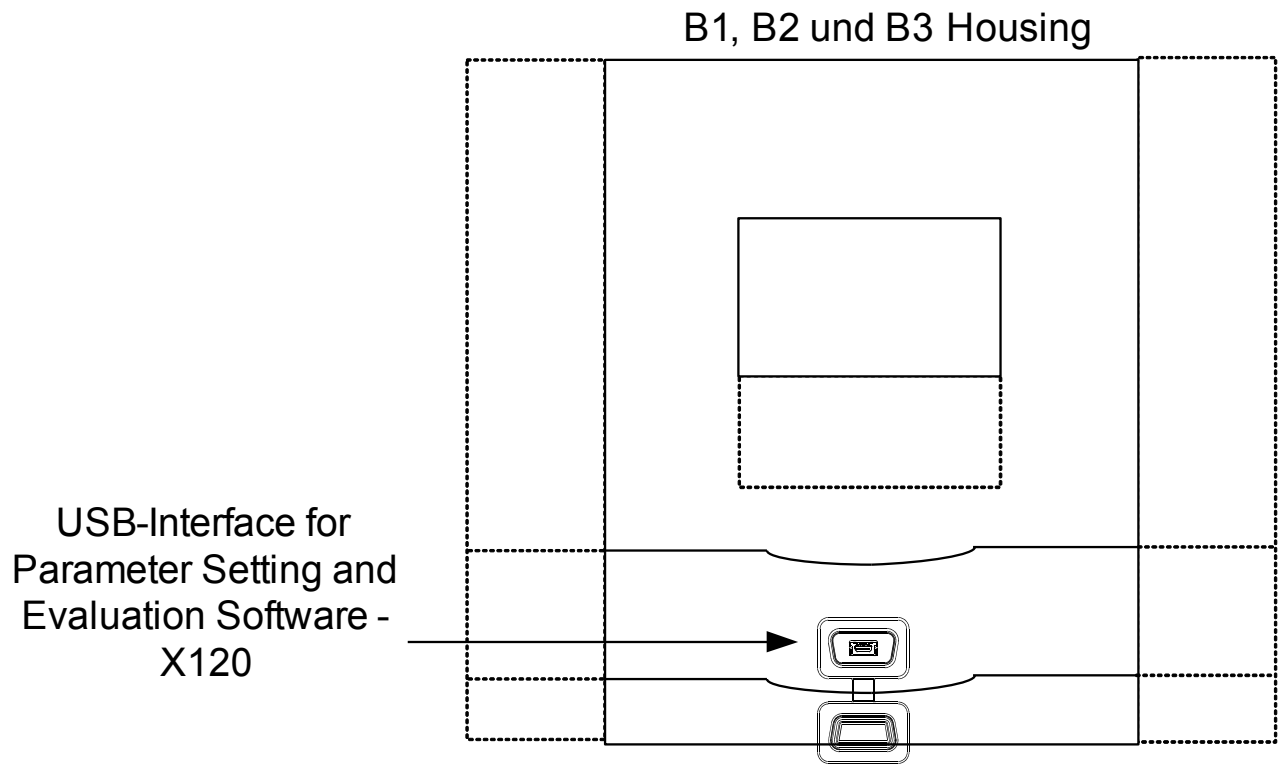
Shield at bus master side
connected to earth termination
resistors not used



Shield at bus device side
connected to earth termination
resistors not used

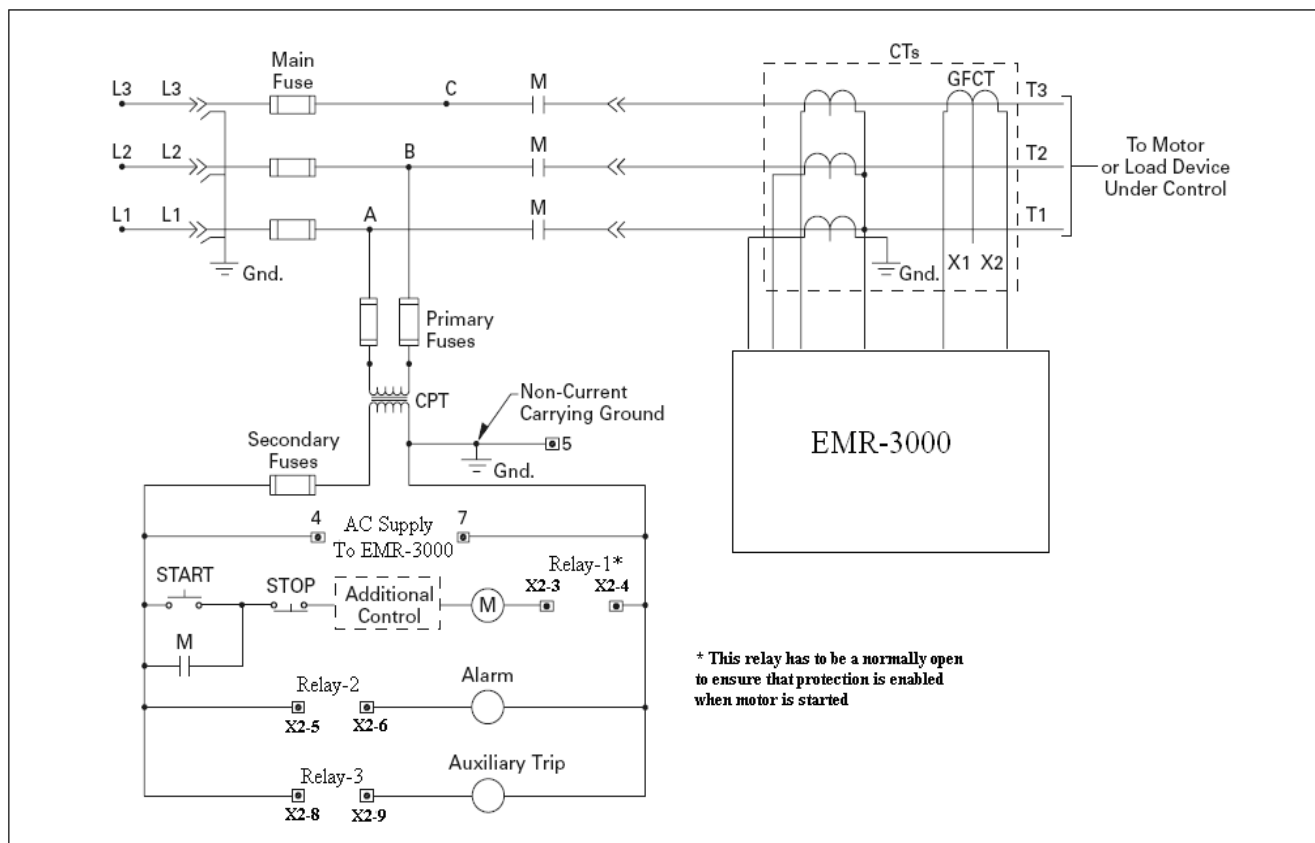
Slot X120 - PC Interface

- USB (Mini-B)



Control Wiring Diagram

Typical CT Circuits and Motor Control Wiring for the EMR-3000.



[illegible]

Typical Schematic for Feeder Breaker

The diagram illustrates a complex motor control circuit. Key components include:

- Power Supply:** A transformer (T1, T2, T3) stepping down from 4160 Vac 60Hz.
- Protection:** Main Fuse, ISW (Interlocking Switching), and L1, L2, L3 terminals.
- Control Components:** CPT 750VA 1 PLUG 120V, SF2 1 AMP, and three COIL CONTROLLER units (MA, RA, SA).
- Motor:** MOTOR, connected via X1-X14 terminal block.
- Discrete Inverter:** DISCRETE IN INC. SEQ. unit.
- Grounding:** Multiple ground connections throughout the circuit.

Legend:

- M9, M8, M7, M6, M5, M4, M3, M2, M1, M0
- Rb, Ra, R5, R6, R7, R8, R9
- X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, X11, X12, X13, X14
- S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S24, S25, S26, S27, S28, S29, S30, S31, S32, S33, S34, S35, S36, S37, S38, S39, S40, S41, S42, S43, S44, S45, S46, S47, S48, S49, S50, S51, S52, S53, S54, S55, S56, S57, S58, S59, S60, S61, S62, S63, S64, S65, S66, S67, S68, S69, S70, S71, S72, S73, S74, S75, S76, S77, S78, S79, S80, S81, S82, S83, S84, S85, S86, S87, S88, S89, S90, S91, S92, S93, S94, S95, S96, S97, S98, S99, S100

54

Input, Output and LED Settings

Digital Input Configuration

The State of the Digital Inputs can be checked within menu:

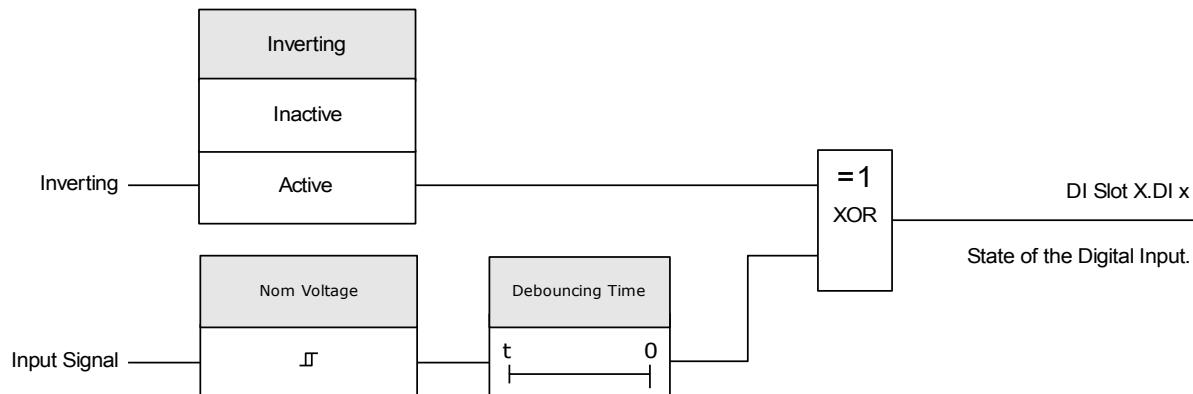
[Operations/Status Display/Name of the assembly group (e.g. DI-8X)]

The Digital Inputs can be configured within menu:

[Device Para/Digital Inputs/Name of the assembly group (e.g. DI-8X)/Group X]

Set the following parameters for each of the digital inputs:

- »Nominal voltage«;
- »Debouncing time«: A state change will only be adopted by the digital input after the debouncing time has expired; and
- »Inverting« (where necessary).



CAUTION

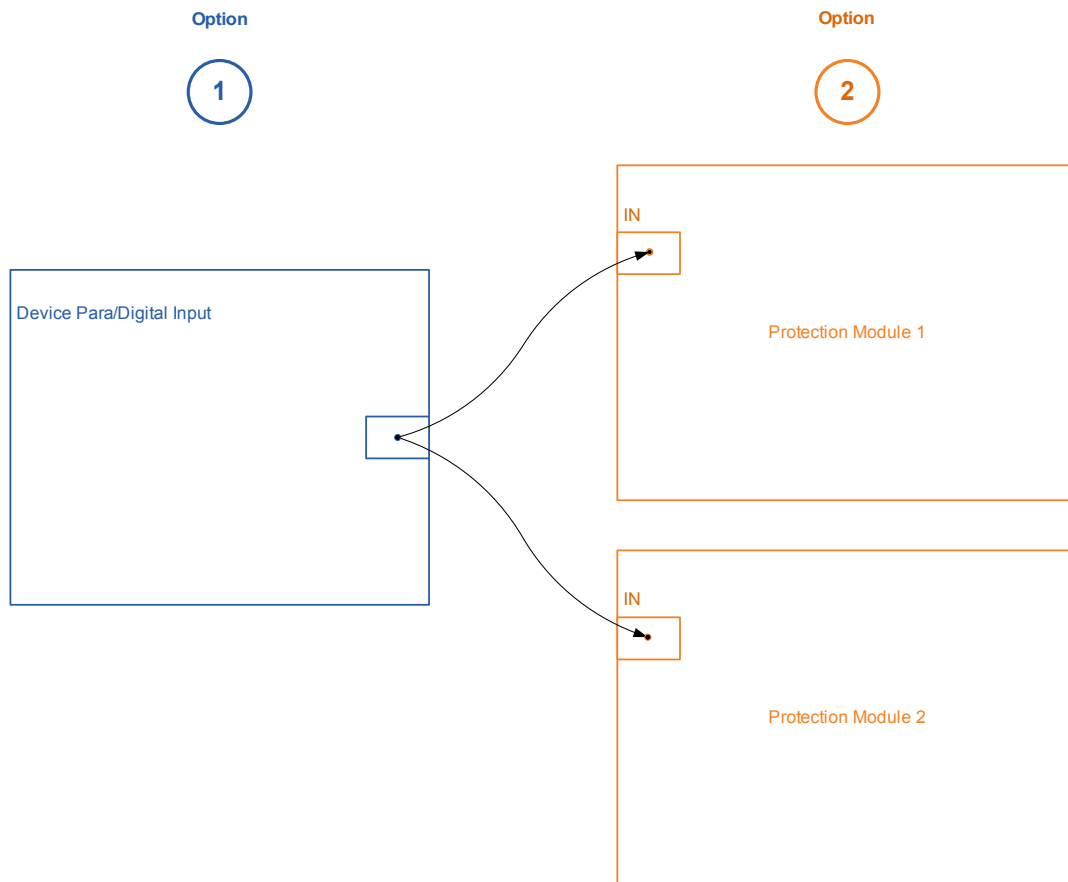
The debouncing time will be started each time the state of the input signal alternates.

CAUTION

In addition to the debouncing time that can be set via software, there is always a hardware debouncing time (approx 12 ms) that cannot be turned off.

Assignment of Digital Inputs

There are two options available in order to determine where a Digital Input should be assigned to.



Option 1 – Assigning a Digital Input onto one or multiple modules.

Adding an assignment:

Within menu [Device Parameter\Digital Inputs] Digital Inputs can be assigned onto one or multiple targets. Call up the Digital Input (Arrow right on the DI). Click on the Softkey »Parameter Setting/Wrench«. Click on »Add« and assign a target. Assign where required additional targets.

Deleting an assignment:

Select as described above a Digital Input that should be edited at the HMI. Call up the assignments of the Digital Input (Arrow-right on the DI) and select the assignment that should be removed/deleted (Please note, this has to be marked with the cursor). The assignment can now be deleted at the HMI by means of the Softkey »Parameter setting« and selection of »remove«. Confirm the parameter setting update.

Option 2 – Connecting a Module Input with a Digital Input

Call a module. Within this module assign a Digital Input onto a module input. Example: A protection module should be blocked depending on the state of a Digital Input.. For this assign onto the blocking input within the Global Parameters the Digital Input (e.g. Ex Blo 1).

Checking the Assignments of a Digital Input

In order to check the targets that a Digital Input is assigned to please proceed as follows:

Call up menu [Device Parameter\Digital Inputs].

Navigate to the Digital Input that should be checked.

At the HMI:

A multiple assignment, that means if a Digital Input is used more than once (if it is assigned to multiple targets), this will be indicated by an "..." behind a Digital Input. Call up this Digital Input by Softkey »Arrow right« in order to see the list of targets of this Digital Input.

DI-4P X Settings

Name of the Assembly group:

DI Slot X1

Device Parameters of the Digital Inputs on DI-4P X

Parameter	Description	Setting range	Default	Menu path
 Nom Voltage	Nominal voltage of the digital inputs	24 V dc, 48 V dc, 60 V dc, 110/120 V dc, 230/240 V dc, 110/120 V ac, 230/240 V ac	110/120 V ac	[Device Para /Digital Inputs /DI Slot X1]
 Inverting 1	Inverting the input signals.	Inactive, Active	Inactive	[Device Para /Digital Inputs /DI Slot X1]
 Debouncing Time 1	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	No Debouncing Time, 20 ms, 50 ms, 100 ms	No Debouncing Time	[Device Para /Digital Inputs /DI Slot X1]
 Inverting 2	Inverting the input signals.	Inactive, Active	Inactive	[Device Para /Digital Inputs /DI Slot X1]
 Debouncing Time 2	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	No Debouncing Time, 20 ms, 50 ms, 100 ms	No Debouncing Time	[Device Para /Digital Inputs /DI Slot X1]
 Inverting 3	Inverting the input signals.	Inactive, Active	Inactive	[Device Para /Digital Inputs /DI Slot X1]

Parameter	Description	Setting range	Default	Menu path
Debouncing Time 3 	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	No Debouncing Time, 20 ms, 50 ms, 100 ms	No Debouncing Time	[Device Para /Digital Inputs /DI Slot X1]
Inverting 4 	Inverting the input signals.	Inactive, Active	Inactive	[Device Para /Digital Inputs /DI Slot X1]
Debouncing Time 4 	A change of the state of a digital input will only be recognized after the debouncing time has expired (become effective). Thus, transient signals will not be misinterpreted.	No Debouncing Time, 20 ms, 50 ms, 100 ms	No Debouncing Time	[Device Para /Digital Inputs /DI Slot X1]

Digital Inputs Output Signals on DI-4P X

<i>Signal</i>	<i>Description</i>
DI 1	Signal: Digital Input
DI 2	Signal: Digital Input
DI 3	Signal: Digital Input
DI 4	Signal: Digital Input

Wired Inputs (Aliases)

Available Elements:

Wired Inputs

The module WiredInputs allows to alias Digital Inputs. By means of the menu [Device Para/WiredInputs] the user can assign specific functions on digital inputs.

Alias Example: The 52a contact will be assigned/connected to Digital input1 (DI1). Once the 52a is aliased (linked) on the DI1, the signal »WiredInput.52A« can be used instead of the DI1 signal for further processing within the protective relay. That means, from now on any state changes of the Digital Input1 will be represented by the »WiredInput.52A« signal.

Global Protection Parameter of the Wired Inputs Wired

Parameter	Description	Setting range	Default	Menu path
 Bkr Trouble	Breaker Trouble	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
 MainCont	Main Contactor	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
 StartCont	Starting Contactor	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
 RunCont	Running Contactor (inc sequence)	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
 Start	Start	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
 Stop	Stop	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
 ExtPer1	External Permissive1	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
 ExtPer2	External Permissive2	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
 ExtTrip1	External Trip1	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
 ExtTrip2	External Trip2	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Forward 	Forward	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
Reverse 	Reverse	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
GrpSetSelect 	Group Setting Select	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
Jog Forward 	JogFow	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
Jog reverse 	JogRev	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
speed1 	Speed1	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]
Local 	Local (Remote)	1..n, Dig Inputs	.-	[Device Para /Wired Inputs]

States of the Inputs of the Wired Inputs Module

Name	Description	Assignment via
Bkr Trouble-I	Breaker Trouble	[Device Para /Wired Inputs]
MainCont-I	State of the module input: Main Contactor	[Device Para /Wired Inputs]
StartCont-I	State of the module input: Starting Contactor	[Device Para /Wired Inputs]
RunCont-I	State of the module input: Running Contactor (inc sequence)	[Device Para /Wired Inputs]
Start-I	State of the module input: Start	[Device Para /Wired Inputs]
Stop-I	State of the module input: Stop	[Device Para /Wired Inputs]
ExtPer1-I	State of the module input: External Permissive1	[Device Para /Wired Inputs]
ExtPer2-I	State of the module input: External Permissive2	[Device Para /Wired Inputs]
ExtTrip1-I	State of the module input: External Trip1	[Device Para /Wired Inputs]
ExtTrip-I2	State of the module input: External Trip2	[Device Para /Wired Inputs]
Forward-I	State of the module input: Forward	[Device Para /Wired Inputs]
Reverse-I	State of the module input: Reverse	[Device Para /Wired Inputs]
GrpSetSelect-I	State of the module input: Group Setting Select	[Device Para /Wired Inputs]
Jog Forward-I	State of the module input: JogFow	[Device Para /Wired Inputs]
Jog reverse-I	State of the module input: JogRev	[Device Para /Wired Inputs]
speed1-I	State of the module input: Speed1	[Device Para /Wired Inputs]
Local-I	State of the module input: Local (Remote)	[Device Para /Wired Inputs]

Relay Output Configuration

The State of the Relay Outputs can be checked within menu:

[Operations/Status Display/Name of the assembly group (e.g. RO-XX)]

The Relay Outputs can be configured within menu:

[Device Para/Relay Outputs/Name of the assembly group (e.g. RO-XX)]

Set the following parameters for each of the relay output contacts.

- Up to seven (7) signals from the »assignment list« (OR-connected).

The states of the module outputs and the signals (e.g. states of protective functions) can be assigned to the relay output contacts. The relay output contacts are “dry-type” contacts.

- Each of the assigned signals can be inverted.

- By the Operating Mode it can be determined whether the relay output works in *Normally »De-Energized«* or *»Normally Energized«* principle.

- Each relay output contact can be set as *»Latched«* (Latched = active or inactive). A latched relay output contact will return to it's latched position after a loss of power to the protective device. A latched relay output contact will keep it's position as long as it has not been reset and as long as the power supply feeds the protective relay. In the case of a loss of power to the protective device, the relays will return to the latched position once the power is restored to the protective device (latched = relay output contacts have a memory). A latched state of a relay output contact always needs to be reset after a power loss even if the assignments are taken away (if the assignments are reprogrammed).

- Latched = inactive«*:

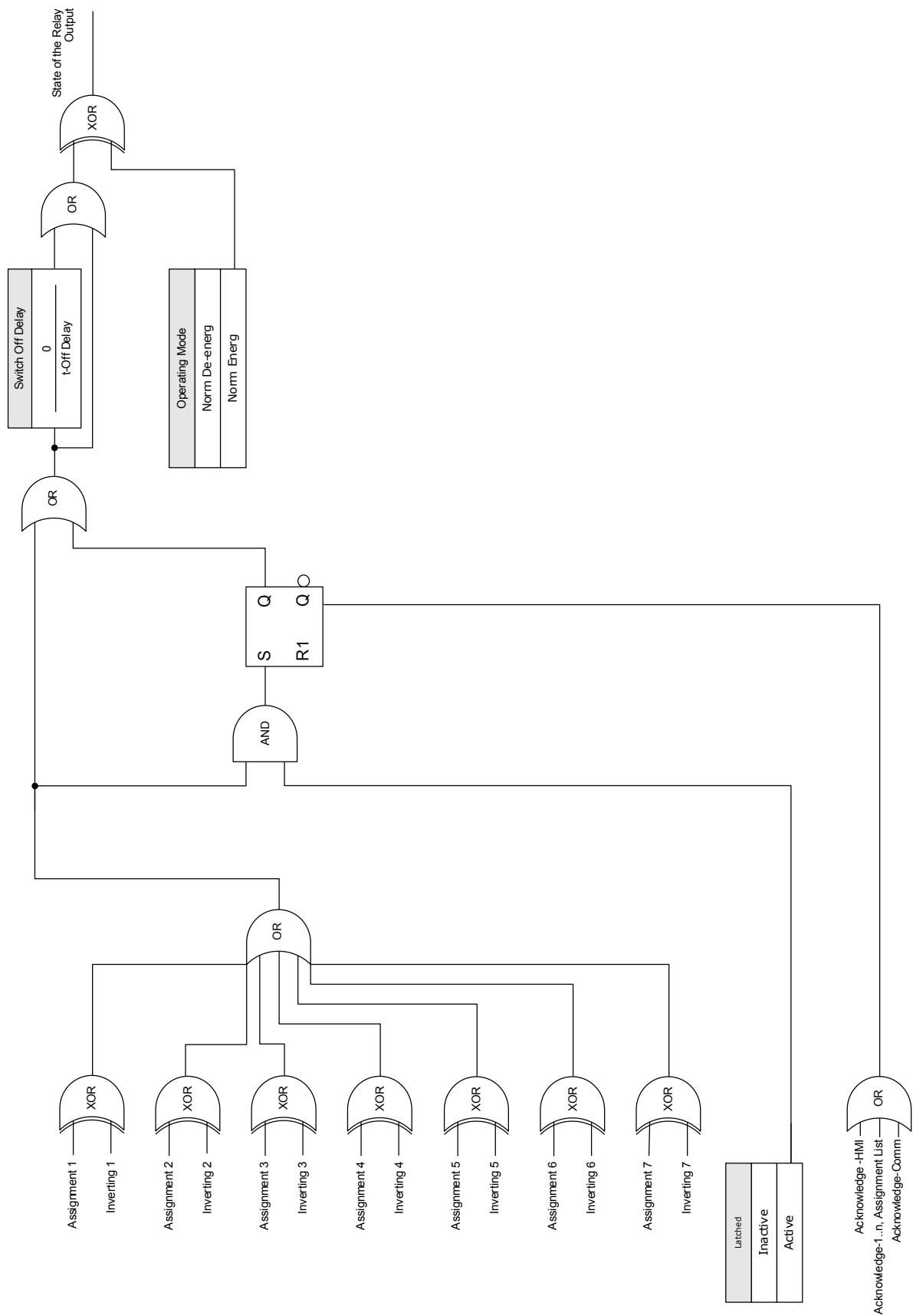
If the latching function is *»inactive«*, the relay output and, respectively, the relay output contact will adopt the state of those pickups that were assigned.

- »Latched = active«*:

If the latching function is *»active«*, the state of the relay output and, respectively, the relay output contact that was set by the pickups will be stored (they have a memory that needs to be reset).

The relay output contact can only be acknowledged after reset of those signals that had initiated the setting of the relay and after expiration of the *»t-OFF delay«*.

- At signal changes, the minimal latching time (*»t-OFF delay«*) ensures that the relay will be maintained as picked-up or released for at least this period.



CAUTION

If the relay output contacts are configured as »Latched=*active*«, they will keep their position even if there is a power outage within the power supply of the protective device.

If the relay output contacts are configured as »Latched=*active*«, they will also retain their position even if they are reprogrammed in another way. This also applies if the relay output contacts are set to »Latched is set to *inactive*«. Resetting a relay output contact that has latched a signal will always require an acknowledgement.

NOTICE

The »*System OK Relay*« (watchdog) cannot be configured.

Acknowledgment Options

Relay output contacts can be acknowledged:

- Via the push-button »Ack/Rst« at the operating panel;
- If »*Latched is active*«, each relay output contact can be acknowledged by a signal (for example: It could be reset by the state of a digital input);
- Via the module »Ex Acknowledge« where all relay output contacts can be acknowledged at once if the signal for external acknowledgment that was selected from the »Assignment list« becomes true (e.g.: the state of a digital input); and
- Via Communication (Comm), all relay output contacts can be acknowledged at once.

⚠ WARNING

Relay output contacts can be set by force or disarmed (for commissioning support, please refer to the "Service/Disarming the Relay Output Contacts" and "Service/Forcing the Relay Output Contacts" sections).

RO-3 X Settings

RO-3AI X2

Direct Commands of RO-3 X

Parameter	Description	Setting range	Default	Menu path
 DISARMED	This is the second step, after the "DISARMED Ctrl" has been activated, that is required to DISARM the relay outputs. This will DISARM those relay outputs that are currently not latched and that are not timing out. CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: Zone Interlocking and Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance. Only available if: DISARMED Ctrl = Active	Inactive, Active	Inactive	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /DISARMED /RO-3AI X2]
 Force all Outs	By means of this function the normal Relay Output State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state. Forcing all relay outputs of an entire assembly group has precedence to forcing a single relay output.	Normal, De-Energized, Energized	Normal	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-3AI X2]
 Force RO1	By means of this function the normal Relay Output State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-3AI X2]
 Force RO2	By means of this function the normal Relay Output State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-3AI X2]

Parameter	Description	Setting range	Default	Menu path
Force RO3 	By means of this function the normal Relay Output State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-3AI X2]

Device Parameters of RO-3 X

Parameter	Description	Setting range	Default	Menu path
Operating Mode 	Operating Mode	Norm De-energ, Norm Energ	Norm Energ	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
t-Off Delay 	Switch Off Delay	0.00 - 300.00s	0.2s	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Latched 	Defines whether the Relay Output will be latched when it picks up.	Inactive, Active	Active	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Acknowledgment 	Acknowledgment Signal - An acknowledgment signal (that acknowledges the corresponding Relay Output) can be assigned to each Relay Output. The acknowledgement-signal is only effective if the parameter "Latched" is set to active. Only available if: Latched = Active	1..n, Assignment List	-.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Assignment 1 	Assignment	1..n, Assignment List	Bkr.TripCmd	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Inverting 1 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Assignment 2 	Assignment	1..n, Assignment List	MStart.Blo	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Inverting 2 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]

Parameter	Description	Setting range	Default	Menu path
Assignment 3 	Assignment	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Assignment 4 	Assignment	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Assignment 5 	Assignment	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Assignment 6 	Assignment	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Inverting 6 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Assignment 7 	Assignment	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]

Parameter	Description	Setting range	Default	Menu path
Inverting 7 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Operating Mode 	Operating Mode	Norm De-energy, Norm Energ	Norm De- energ	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
t-Off Delay 	Switch Off Delay	0.00 - 300.00s	0.2s	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Latched 	Defines whether the Relay Output will be latched when it picks up.	Inactive, Active	Active	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Acknowledgment 	Acknowledgment Signal - An acknowledgment signal (that acknowledges the corresponding Relay Output) can be assigned to each Relay Output. The acknowledgement-signal is only effective if the parameter "Latched" is set to active. Only available if: Latched = Active	1..n, Assignment List	-.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Assignment 1 	Assignment	1..n, Assignment List	MStart.SPHBlockAlarm	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Inverting 1 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Assignment 2 	Assignment	1..n, Assignment List	46[2].Trip	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]

Parameter	Description	Setting range	Default	Menu path
Inverting 2 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Assignment 3 	Assignment	1..n, Assignment List	49.Alarm Timeout	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Assignment 4 	Assignment	1..n, Assignment List	RTD.Alarm	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Assignment 5 	Assignment	1..n, Assignment List	Logic.LE1.Gat e Out	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Assignment 6 	Assignment	1..n, Assignment List	-.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Inverting 6 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]

Parameter	Description	Setting range	Default	Menu path
Assignment 7 	Assignment	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Inverting 7 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Operating Mode 	Operating Mode	Norm De-energ, Norm Energ	Norm De-energ	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
t-Off Delay 	Switch Off Delay	0.00 - 300.00s	0.2s	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Latched 	Defines whether the Relay Output will be latched when it picks up.	Inactive, Active	Active	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Acknowledgment 	Acknowledgment Signal - An acknowledgment signal (that acknowledges the corresponding Relay Output) can be assigned to each Relay Output. The acknowledgement-signal is only effective if the parameter "Latched" is set to active. Only available if: Latched = Active	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Assignment 1 	Assignment	1..n, Assignment List	Bkr.TripCmd	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Inverting 1 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]

Parameter	Description	Setting range	Default	Menu path
Assignment 2 	Assignment	1..n, Assignment List	MStart.Blo	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Inverting 2 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Assignment 3 	Assignment	1..n, Assignment List	MStart.TripPhaseReverse	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Assignment 6 	Assignment	1..n, Assignment List	-.-	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]

Parameter	Description	Setting range	Default	Menu path
Inverting 6 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Assignment 7 	Assignment	1..n, Assignment List	--	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Inverting 7 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
DISARMED Ctrl 	Enables and disables the disarming of the relay outputs. This is the first step of a two step process, to inhibit the operation or the relay outputs. Please refer to "DISARMED" for the second step.	Inactive, Active	Inactive	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /DISARMED /RO-3AI X2]
Disarm Mode 	CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: Zone Interlocking and Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance.	Permanent, Timeout	Permanent	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /DISARMED /RO-3AI X2]
t-Timeout DISARM 	The relays will be armed again after expiring of this time. Only available if: Mode = Timeout DISARM	0.00 - 300.00s	0.03s	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /DISARMED /RO-3AI X2]

Parameter	Description	Setting range	Default	Menu path
Force Mode 	By means of this function the normal Relay Output States can be overwritten (forced) in case that the Relay Output is not in a disarmed state. The relays can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Permanent, Timeout	Permanent	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-3AI X2]
t-Timeout Force 	The Output State will be set by force for the duration of this time. That means, for the duration of this time, the Relay Output does not show the state of the signals that are assigned on it. Only available if: Mode = Timeout DISARM	0.00 - 300.00s	0.03s	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-3AI X2]

Input States of RO-3 X

Name	Description	Assignment via
RO1.1	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
RO1.2	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
RO1.3	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
RO1.4	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
RO1.5	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
RO1.6	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
RO1.7	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]
Ack signal RO 1	Module Input State: Acknowledgment signal for the Relay Output. If latching is set to active, the Relay Output can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Relay Outputs /RO-3AI X2 /RO 1]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
RO2.1	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
RO2.2	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
RO2.3	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
RO2.4	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
RO2.5	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
RO2.6	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
RO2.7	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
Ack signal RO 2	Module Input State: Acknowledgment signal for the Relay Output. If latching is set to active, the Relay Output can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Relay Outputs /RO-3AI X2 /RO 2]
RO3.1	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
RO3.2	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
RO3.3	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
RO3.4	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
RO3.5	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
RO3.6	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
RO3.7	Module Input State: Assignment	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]
Ack signal RO 3	Module Input State: Acknowledgment signal for the Relay Output. If latching is set to active, the Relay Output can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Relay Outputs /RO-3AI X2 /RO 3]

Signals of RO-3 X

<i>Signal</i>	<i>Description</i>
RO 1	Signal: Relay Output
RO 2	Signal: Relay Output
RO 3	Signal: Relay Output
DISARMED!	Signal: CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: Zone Interlocking and Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance
Outs forced	Signal: The State of at least one Relay Output has been set by force. That means that the state of at least one Relay is forced and hence does not show the state of the assigned signals.

RO-3ZI X Settings

RO-ZI X2

Direct Commands of RO-3ZI X

Parameter	Description	Setting range	Default	Menu path
 DISARMED	This is the second step, after the "DISARMED Ctrl" has been activated, that is required to DISARM the relay outputs. This will DISARM those relay outputs that are currently not latched and that are not timing out. CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: Zone Interlocking and Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance. Only available if: DISARMED Ctrl = Active	Inactive, Active	Inactive	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /DISARMED /RO-ZI X2]
 Force all Outs	By means of this function the normal Relay Output State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state. Forcing all relay outputs of an entire assembly group has precedence to forcing a single relay output.	Normal, De-Energized, Energized	Normal	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-ZI X2]
 Force ZI RO	Signal: Forced Zone Interlocking OUT	Normal, De-Energized, Energized	Normal	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-ZI X2]
 Force RO1	By means of this function the normal Relay Output State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-ZI X2]

Parameter	Description	Setting range	Default	Menu path
Force RO2 	By means of this function the normal Relay Output State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-ZI X2]
Force RO3 	By means of this function the normal Relay Output State can be overwritten (forced). The relay can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Normal, De-Energized, Energized	Normal	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-ZI X2]

Global Protection Parameters of RO-3ZI X

Parameter	Description	Setting range	Default	Menu path
 Operating Mode	Operating Mode	Norm De-energy, Norm Energy	Norm Energy	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
 t-Off Delay	Switch Off Delay	0.00 - 300.00s	0.2s	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
 Latched	Defines whether the Relay Output will be latched when it picks up.	Inactive, Active	Active	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
 Acknowledgment	Acknowledgment Signal - An acknowledgment signal (that acknowledges the corresponding Relay Output) can be assigned to each Relay Output. The acknowledgement-signal is only effective if the parameter "Latched" is set to active. Only available if: Latched = Active	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
 Assignment 1	Assignment	1..n, Assignment List	Bkr.TripCmd	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
 Inverting 1	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
 Assignment 2	Assignment	1..n, Assignment List	MStart.Blo	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
 Inverting 2	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]

Parameter	Description	Setting range	Default	Menu path
Assignment 3 	Assignment	1..n, Assignment List	MStart.TripPhaseReverse	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
Assignment 4 	Assignment	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
Assignment 5 	Assignment	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
Assignment 6 	Assignment	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
Inverting 6 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
Assignment 7 	Assignment	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]

Parameter	Description	Setting range	Default	Menu path
Inverting 7 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
Operating Mode 	Operating Mode	Norm De-energy, Norm Energ	Norm De- energ	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
t-Off Delay 	Switch Off Delay	0.00 - 300.00s	0.2s	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Latched 	Defines whether the Relay Output will be latched when it picks up.	Inactive, Active	Active	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Acknowledgment 	Acknowledgment Signal - An acknowledgment signal (that acknowledges the corresponding Relay Output) can be assigned to each Relay Output. The acknowledgement-signal is only effective if the parameter "Latched" is set to active. Only available if: Latched = Active	1..n, Assignment List	-.-	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Assignment 1 	Assignment	1..n, Assignment List	MStart.SPHBlockAlarm	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Inverting 1 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Assignment 2 	Assignment	1..n, Assignment List	46[2].Trip	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]

Parameter	Description	Setting range	Default	Menu path
Inverting 2 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Assignment 3 	Assignment	1..n, Assignment List	49.Alarm Timeout	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Assignment 4 	Assignment	1..n, Assignment List	RTD.Alarm	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Assignment 5 	Assignment	1..n, Assignment List	Logic.LE1.Gat e Out	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Assignment 6 	Assignment	1..n, Assignment List	-.-	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Inverting 6 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]

Parameter	Description	Setting range	Default	Menu path
Assignment 7 	Assignment	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Inverting 7 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Operating Mode 	Operating Mode	Norm De-energ, Norm Energ	Norm De-energ	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
t-Off Delay 	Switch Off Delay	0.00 - 300.00s	0.2s	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Latched 	Defines whether the Relay Output will be latched when it picks up.	Inactive, Active	Active	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Acknowledgment 	Acknowledgment Signal - An acknowledgment signal (that acknowledges the corresponding Relay Output) can be assigned to each Relay Output. The acknowledgement-signal is only effective if the parameter "Latched" is set to active. Only available if: Latched = Active	1..n, Assignment List	.-	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Assignment 1 	Assignment	1..n, Assignment List	Bkr.TripCmd	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Inverting 1 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]

Parameter	Description	Setting range	Default	Menu path
Assignment 2 	Assignment	1..n, Assignment List	MStart.Blo	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Inverting 2 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Assignment 3 	Assignment	1..n, Assignment List	MStart.TripPhaseReverse	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Assignment 6 	Assignment	1..n, Assignment List	-.-	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]

Parameter	Description	Setting range	Default	Menu path
Inverting 6 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Assignment 7 	Assignment	1..n, Assignment List	--	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Inverting 7 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
DISARMED Ctrl 	Enables and disables the disarming of the relay outputs. This is the first step of a two step process, to inhibit the operation or the relay outputs. Please refer to "DISARMED" for the second step.	Inactive, Active	Inactive	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /DISARMED /RO-ZI X2]
Disarm Mode 	CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: Zone Interlocking and Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance.	Permanent, Timeout	Permanent	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /DISARMED /RO-ZI X2]
t-Timeout DISARM 	The relays will be armed again after expiring of this time. Only available if: Mode = Timeout DISARM	0.00 - 300.00s	0.03s	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /DISARMED /RO-ZI X2]

Parameter	Description	Setting range	Default	Menu path
Force Mode 	By means of this function the normal Relay Output States can be overwritten (forced) in case that the Relay Output is not in a disarmed state. The relays can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Permanent, Timeout	Permanent	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-ZI X2]
t-Timeout Force 	The Output State will be set by force for the duration of this time. That means, for the duration of this time, the Relay Output does not show the state of the signals that are assigned on it. Only available if: Mode = Timeout DISARM	0.00 - 300.00s	0.03s	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Force RO /RO-ZI X2]

Input States of RO-3ZI X

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
RO1.1	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
RO1.2	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
RO1.3	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
RO1.4	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
RO1.5	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
RO1.6	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
RO1.7	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]
Ack signal RO 1	Module Input State: Acknowledgment signal for the Relay Output. If latching is set to active, the Relay Output can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Relay Outputs /RO-ZI X2 /RO 1]

Name	Description	Assignment via
RO2.1	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
RO2.2	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
RO2.3	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
RO2.4	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
RO2.5	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
RO2.6	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
RO2.7	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
Ack signal RO 2	Module Input State: Acknowledgment signal for the Relay Output. If latching is set to active, the Relay Output can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Relay Outputs /RO-ZI X2 /RO 2]
RO3.1	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
RO3.2	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
RO3.3	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
RO3.4	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
RO3.5	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
RO3.6	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
RO3.7	Module Input State: Assignment	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]
Ack signal RO 3	Module Input State: Acknowledgment signal for the Relay Output. If latching is set to active, the Relay Output can only be acknowledged if those signals that initiated the setting are fallen back and the hold time is expired.	[Device Para /Relay Outputs /RO-ZI X2 /RO 3]

Signals of RO-3ZI X

<i>Signal</i>	<i>Description</i>
ZI OUT	Signal: Zone Interlocking OUT
RO 1	Signal: Relay Output
RO 2	Signal: Relay Output
RO 3	Signal: Relay Output
DISARMED!	Signal: CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: Zone Interlocking and Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance
Outs forced	Signal: The State of at least one Relay Output has been set by force. That means that the state of at least one Relay is forced and hence does not show the state of the assigned signals.

LED Configuration

The LEDs can be configured within menu:

[Device Para/LEDs/Group X]

CAUTION

Attention must be paid to ensure that there are no overlapping functions due to double or multiple LED assignment of colors and flashing codes.

CAUTION

If LEDs are configured as »Latched=*active*«, they will keep (return to) their blink code and color even if there is a power outage within the power supply of the protective device.

If the LEDs are configured as »Latched=*active*«, they will also retain their blink code and color even if the LEDs are reprogrammed in another way. This also applies if the LEDs are set to »Latched = *inactive*«. Resetting a LED that has latched a signal will always require an acknowledgement.

NOTICE

This chapter contains information on the LEDs that are placed on the left hand side of the display (Group A).

If your device is also equipped with LEDs on the right hand side of the display (Group B), the analog information in this chapter is valid. The only difference between "Group A" and "Group B" is within the menu paths.

Via the »INFO« push-button, it is always possible to display the current pickups and alarm texts that are assigned to an LED. Please refer to the *Navigation* section for a description of the »INFO« push-button functionality.

Set the following parameters for each LED.

- »*Latching (self holding function)*«: If »Latching« is set to »Active«, the state that is set by the pickups will be stored until it is reset. If »Latching« is set to »Inactive«, the LED always adopts the state of those pickups that were assigned.
- »*Acknowledgement*«: Signal that will reset the LED.
- »*LED active color*«: LED lights up in this color when at least one of the allocated functions is valid (red, red-flashing, green, green flashing, off).
- »*LED inactive color*«: LED lights up in this color when none of the allocated functions is valid (red, red-flashing, green, green flashing, off).
- »*Assignment 1...n*«: Apart from the *LED for System OK (Operational)*, each LED can be assigned up to five functions (e.g. pickups) out of the »Assignment list«.
- »*Inverting an Assignment 1...n*«: This will invert the input signal.

Acknowledgment Options

LEDs can be acknowledged by:

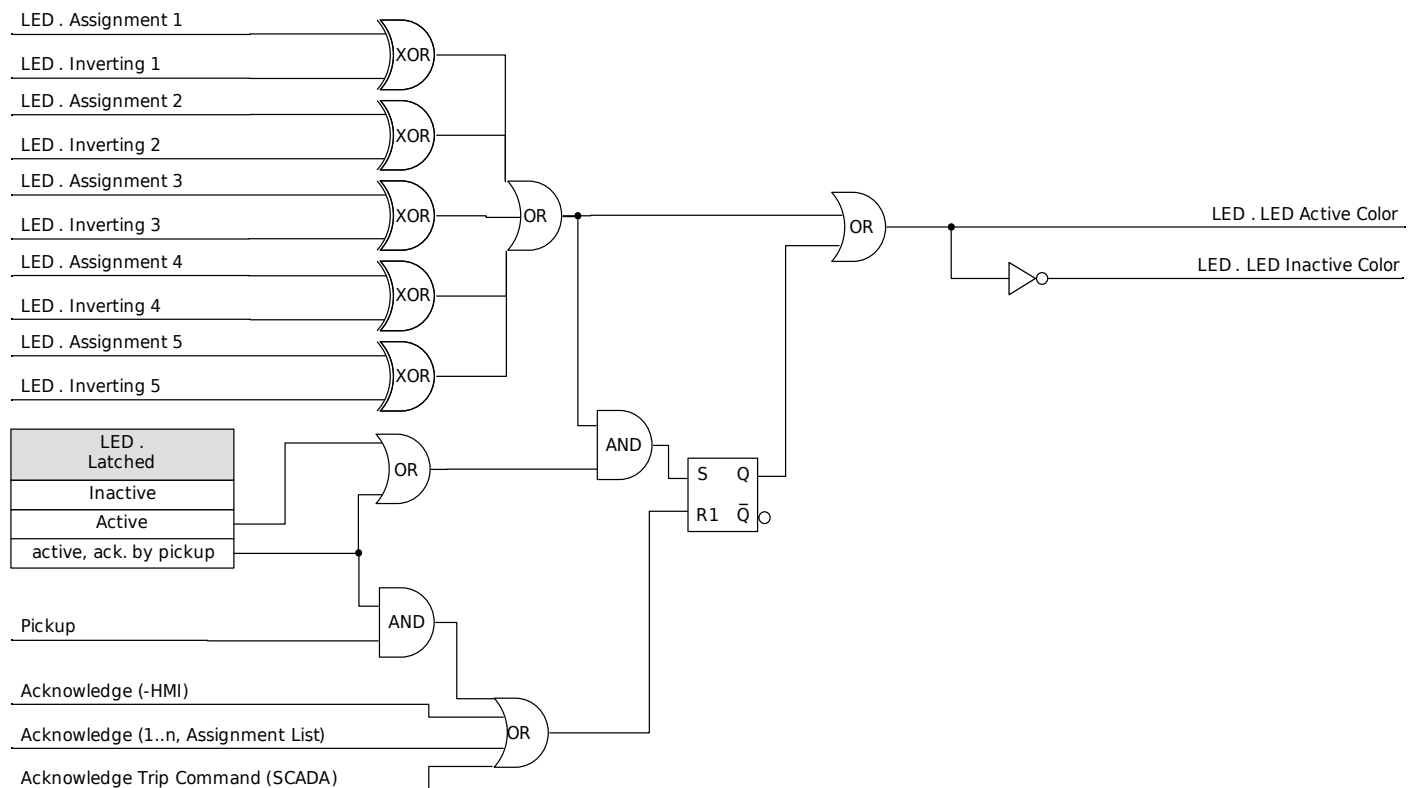
- The push-button »Ack/Rst« at the operating panel;
- A signal from the »LED Reset list« (e.g. digital inputs or communication signals) (If »Latched = active«);
- The »Ex Acknowledge« module - all LEDs can be acknowledged at once, if the signal for external acknowledgment becomes true (e.g.: the state of a digital input); and
- Communication (Comm) - all LEDs can be acknowledged at once.
- Automatically in case of a pickup from a protection function.
The automatic acknowledgment must be activated by setting:
[Device Para / LEDs / LEDs group A / LED 1...n] »Latched« = "active, ack. by pickup"

See also Chapter "Resets" for more information about acknowledgments.

LEDs

LED_E01

LED = LEDs group A, ...



The »System OK (Operational) « LED

This LED flashes green while the device is booting. After booting is complete, the LED for *System OK (Operational)* lights up in green signaling that the protection (function) is »*activated*«. Please refer to chapter "Self-Supervision" and to the external document "*Troubleshooting Guide*" to find out further information on blink codes of the *System OK LED*

The Operational LED (System OK) cannot be configured.

LED Settings

LEDs group A

Device Parameters of the LEDs

Parameter	Description	Setting range	Default	Menu path
Latched 	Defines whether the LED will be latched when it picks up.	Inactive, Active	Active	[Device Para /LEDs /LED 1]
Ack signal 	Acknowledgment signal for the LED. If latching is set to active the LED can only be acknowledged if all signals that initiated the setting of the LED are no longer present. Dependency Only available if: Latched = Active	1..n, Assignment List	.-	[Device Para /LEDs /LED 1]
LED Active Color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	Green, Red, Red flash, Green flash, -	Red	[Device Para /LEDs /LED 1]
LED Inactive Color 	The LED lights up in this color if the state of the OR-assignment of the signals is false.	Green, Red, Red flash, Green flash, -	-	[Device Para /LEDs /LED 1]
Assignment 1 	Assignment	1..n, Assignment List	Bkr.TripCmd	[Device Para /LEDs /LED 1]
Inverting 1 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 1]
Assignment 2 	Assignment	1..n, Assignment List	.-	[Device Para /LEDs /LED 1]
Inverting 2 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 1]

Parameter	Description	Setting range	Default	Menu path
Assignment 3 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 1]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 1]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 1]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 1]
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 1]
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 1]
Latched 	Defines whether the LED will be latched when it picks up.	Inactive, Active	Active	[Device Para /LEDs /LED 2]
Ack signal 	Acknowledgment signal for the LED. If latching is set to active the LED can only be acknowledged if all signals that initiated the setting of the LED are no longer present. Only available if: Latched = Active	1..n, Assignment List	-.-	[Device Para /LEDs /LED 2]
LED Active Color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	Green, Red, Red flash, Green flash, -	Red	[Device Para /LEDs /LED 2]

Parameter	Description	Setting range	Default	Menu path
LED Inactive Color 	The LED lights up in this color if the state of the OR-assignment of the signals is false.	Green, Red, Red flash, Green flash, -	-	[Device Para /LEDs /LED 2]
Assignment 1 	Assignment	1..n, Assignment List	MStart.SPHBlockAlarm	[Device Para /LEDs /LED 2]
Inverting 1 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 2]
Assignment 2 	Assignment	1..n, Assignment List	46[2].Trip	[Device Para /LEDs /LED 2]
Inverting 2 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 2]
Assignment 3 	Assignment	1..n, Assignment List	49.Alarm Timeout	[Device Para /LEDs /LED 2]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 2]
Assignment 4 	Assignment	1..n, Assignment List	RTD.Alarm	[Device Para /LEDs /LED 2]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 2]
Assignment 5 	Assignment	1..n, Assignment List	Logic.LE1.Gate Out	[Device Para /LEDs /LED 2]

Parameter	Description	Setting range	Default	Menu path
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 2]
Latched 	Defines whether the LED will be latched when it picks up.	Inactive, Active	Active	[Device Para /LEDs /LED 3]
Ack signal 	Acknowledgment signal for the LED. If latching is set to active the LED can only be acknowledged if all signals that initiated the setting of the LED are no longer present. Only available if: Latched = Active	1..n, Assignment List	-,-	[Device Para /LEDs /LED 3]
LED Active Color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	Green, Red, Red flash, Green flash, -	Red	[Device Para /LEDs /LED 3]
LED Inactive Color 	The LED lights up in this color if the state of the OR-assignment of the signals is false.	Green, Red, Red flash, Green flash, -	-	[Device Para /LEDs /LED 3]
Assignment 1 	Assignment	1..n, Assignment List	49.Trip	[Device Para /LEDs /LED 3]
Inverting 1 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 3]
Assignment 2 	Assignment	1..n, Assignment List	-,-	[Device Para /LEDs /LED 3]
Inverting 2 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 3]

Parameter	Description	Setting range	Default	Menu path
Assignment 3 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 3]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 3]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 3]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 3]
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 3]
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 3]
Latched 	Defines whether the LED will be latched when it picks up.	Inactive, Active	Active	[Device Para /LEDs /LED 4]
Ack signal 	Acknowledgment signal for the LED. If latching is set to active the LED can only be acknowledged if all signals that initiated the setting of the LED are no longer present. Only available if: Latched = Active	1..n, Assignment List	-.-	[Device Para /LEDs /LED 4]
LED Active Color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	Green, Red, Red flash, Green flash, -	Red	[Device Para /LEDs /LED 4]

Parameter	Description	Setting range	Default	Menu path
LED Inactive Color 	The LED lights up in this color if the state of the OR-assignment of the signals is false.	Green, Red, Red flash, Green flash, -	-	[Device Para /LEDs /LED 4]
Assignment 1 	Assignment	1..n, Assignment List	46[1].Trip	[Device Para /LEDs /LED 4]
Inverting 1 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 4]
Assignment 2 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 4]
Inverting 2 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 4]
Assignment 3 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 4]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 4]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 4]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 4]
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 4]

Parameter	Description	Setting range	Default	Menu path
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 4]
Latched 	Defines whether the LED will be latched when it picks up.	Inactive, Active	Inactive	[Device Para /LEDs /LED 5]
Ack signal 	Acknowledgment signal for the LED. If latching is set to active the LED can only be acknowledged if all signals that initiated the setting of the LED are no longer present. Only available if: Latched = Active	1..n, Assignment List	-,-	[Device Para /LEDs /LED 5]
LED Active Color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	Green, Red, Red flash, Green flash, -	Red flash	[Device Para /LEDs /LED 5]
LED Inactive Color 	The LED lights up in this color if the state of the OR-assignment of the signals is false.	Green, Red, Red flash, Green flash, -	-	[Device Para /LEDs /LED 5]
Assignment 1 	Assignment	1..n, Assignment List	MStart.Start	[Device Para /LEDs /LED 5]
Inverting 1 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 5]
Assignment 2 	Assignment	1..n, Assignment List	-,-	[Device Para /LEDs /LED 5]
Inverting 2 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 5]

Parameter	Description	Setting range	Default	Menu path
Assignment 3 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 5]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 5]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 5]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 5]
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 5]
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 5]
Latched 	Defines whether the LED will be latched when it picks up.	Inactive, Active	Inactive	[Device Para /LEDs /LED 6]
Ack signal 	Acknowledgment signal for the LED. If latching is set to active the LED can only be acknowledged if all signals that initiated the setting of the LED are no longer present. Only available if: Latched = Active	1..n, Assignment List	-.-	[Device Para /LEDs /LED 6]
LED Active Color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	Green, Red, Red flash, Green flash, -	Red	[Device Para /LEDs /LED 6]

Parameter	Description	Setting range	Default	Menu path
LED Inactive Color 	The LED lights up in this color if the state of the OR-assignment of the signals is false.	Green, Red, Red flash, Green flash, -	-	[Device Para /LEDs /LED 6]
Assignment 1 	Assignment	1..n, Assignment List	MStart.Run	[Device Para /LEDs /LED 6]
Inverting 1 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 6]
Assignment 2 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 6]
Inverting 2 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 6]
Assignment 3 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 6]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 6]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 6]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 6]
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 6]

Parameter	Description	Setting range	Default	Menu path
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 6]
Latched 	Defines whether the LED will be latched when it picks up.	Inactive, Active	Inactive	[Device Para /LEDs /LED 7]
Ack signal 	Acknowledgment signal for the LED. If latching is set to active the LED can only be acknowledged if all signals that initiated the setting of the LED are no longer present. Only available if: Latched = Active	1..n, Assignment List	-,-	[Device Para /LEDs /LED 7]
LED Active Color 	The LED lights up in this color if the state of the OR-assignment of the signals is true.	Green, Red, Red flash, Green flash, -	Green	[Device Para /LEDs /LED 7]
LED Inactive Color 	The LED lights up in this color if the state of the OR-assignment of the signals is false.	Green, Red, Red flash, Green flash, -	-	[Device Para /LEDs /LED 7]
Assignment 1 	Assignment	1..n, Assignment List	MStart.Stop	[Device Para /LEDs /LED 7]
Inverting 1 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 7]
Assignment 2 	Assignment	1..n, Assignment List	-,-	[Device Para /LEDs /LED 7]
Inverting 2 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 7]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Assignment 3 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 7]
Inverting 3 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 7]
Assignment 4 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 7]
Inverting 4 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 7]
Assignment 5 	Assignment	1..n, Assignment List	-.-	[Device Para /LEDs /LED 7]
Inverting 5 	Inverting of the state of the assigned signal.	Inactive, Active	Inactive	[Device Para /LEDs /LED 7]

LED Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
LED1.1	Module Input State: LED	[Device Para /LEDs /LED 1]
LED1.2	Module Input State: LED	[Device Para /LEDs /LED 1]
LED1.3	Module Input State: LED	[Device Para /LEDs /LED 1]
LED1.4	Module Input State: LED	[Device Para /LEDs /LED 1]
LED1.5	Module Input State: LED	[Device Para /LEDs /LED 1]
Acknow Sig 1	Module Input State: Acknowledgment Signal (only for automatic acknowledgment).	[Device Para /LEDs /LED 1]
LED2.1	Module Input State: LED	[Device Para /LEDs /LED 2]
LED2.2	Module Input State: LED	[Device Para /LEDs /LED 2]
LED2.3	Module Input State: LED	[Device Para /LEDs /LED 2]
LED2.4	Module Input State: LED	[Device Para /LEDs /LED 2]
LED2.5	Module Input State: LED	[Device Para /LEDs /LED 2]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Acknow Sig 2	Module Input State: Acknowledgment Signal (only for automatic acknowledgment).	[Device Para /LEDs /LED 2]
LED3.1	Module Input State: LED	[Device Para /LEDs /LED 3]
LED3.2	Module Input State: LED	[Device Para /LEDs /LED 3]
LED3.3	Module Input State: LED	[Device Para /LEDs /LED 3]
LED3.4	Module Input State: LED	[Device Para /LEDs /LED 3]
LED3.5	Module Input State: LED	[Device Para /LEDs /LED 3]
Acknow Sig 3	Module Input State: Acknowledgment Signal (only for automatic acknowledgment).	[Device Para /LEDs /LED 3]
LED4.1	Module Input State: LED	[Device Para /LEDs /LED 4]
LED4.2	Module Input State: LED	[Device Para /LEDs /LED 4]
LED4.3	Module Input State: LED	[Device Para /LEDs /LED 4]
LED4.4	Module Input State: LED	[Device Para /LEDs /LED 4]
LED4.5	Module Input State: LED	[Device Para /LEDs /LED 4]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Acknow Sig 4	Module Input State: Acknowledgment Signal (only for automatic acknowledgment).	[Device Para /LEDs /LED 4]
LED5.1	Module Input State: LED	[Device Para /LEDs /LED 5]
LED5.2	Module Input State: LED	[Device Para /LEDs /LED 5]
LED5.3	Module Input State: LED	[Device Para /LEDs /LED 5]
LED5.4	Module Input State: LED	[Device Para /LEDs /LED 5]
LED5.5	Module Input State: LED	[Device Para /LEDs /LED 5]
Acknow Sig 5	Module Input State: Acknowledgment Signal (only for automatic acknowledgment).	[Device Para /LEDs /LED 5]
LED6.1	Module Input State: LED	[Device Para /LEDs /LED 6]
LED6.2	Module Input State: LED	[Device Para /LEDs /LED 6]
LED6.3	Module Input State: LED	[Device Para /LEDs /LED 6]
LED6.4	Module Input State: LED	[Device Para /LEDs /LED 6]
LED6.5	Module Input State: LED	[Device Para /LEDs /LED 6]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Acknow Sig 6	Module Input State: Acknowledgment Signal (only for automatic acknowledgment).	[Device Para /LEDs /LED 6]
LED7.1	Module Input State: LED	[Device Para /LEDs /LED 7]
LED7.2	Module Input State: LED	[Device Para /LEDs /LED 7]
LED7.3	Module Input State: LED	[Device Para /LEDs /LED 7]
LED7.4	Module Input State: LED	[Device Para /LEDs /LED 7]
LED7.5	Module Input State: LED	[Device Para /LEDs /LED 7]
Acknow Sig 7	Module Input State: Acknowledgment Signal (only for automatic acknowledgment).	[Device Para /LEDs /LED 7]

Analog Outputs

Available Elements:

AnOut[1]

The E-Series relays can be programmed to output for two different ranges of either 0- 20mA or 4- 20 mA.

These outputs can be configured by the User to represent the status of User programmed parameters that are available from the relay. The User will find the configuration menu for this feature under the [Device Para/ Analog Outputs] menu option. Here the User can define to which parameter the output will correlate. As with any parameter, a password is required to configure this feature.

To program this feature, the User will select the Analog Outputs option under the main menu item “Device PARA”. Then select the wrench icon which will allow the assignment of the output to a parameter monitored by the relay.

The available signals, that can be assigned onto the analog outputs are shown in the “List of Analog Outputs”.

Once the assignment has been made, the User can select the expected range of the parameter that will correlate to the analog output. The User will be required to enter a “Range min”, and “Range max”. The “Range min” will determine the value at which e.g. 4 mA will be transmitted by the relay. Likewise, the “Range max” value will determine the value that will result in the transmission of a 20 mA output.

Global Protection Parameters of the Analog Outputs

Parameter	Description	Setting range	Default	Menu path
 Assignment	Assignment	1..n, AnalogOutputList	-.-	[Device Para /Analog Outputs /AnOut[1]]
 Range	Adjustable range	0...20mA, 4...20mA	0...20mA	[Device Para /Analog Outputs /AnOut[1]]
 Range max	Adjustable range maximum.	-999999.00 - 999999.00°C	1.00°C	[Device Para /Analog Outputs /AnOut[1]]
 Range min	Adjustable range minimum.	-999999.00 - 999999.00°C	0.00°C	[Device Para /Analog Outputs /AnOut[1]]
 Force Mode	For commissioning purposes or for maintenance, Analog Outputs can be set by force. By means of this function the normal Analog Outputs can be overwritten (forced).	Permanent, Timeout	Permanent	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Analog Outputs /AnOut[1]]
 t-Timeout Force	The Analog Output Value will be set by force for the duration of this time. That means for the duration of this time the Analog Output does not show the value of the signals that are assigned on it. Only available if: Force Mode = Active	0.00 - 300.00s	0.03s	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Analog Outputs /AnOut[1]]

Direct Commands of the Analog Outputs

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Analog Outputs /AnOut[1]]
Force Value 	By means of this function the Analog Output Value can be overwritten (forced).	0.00 - 100.00%	0%	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /Analog Outputs /AnOut[1]]

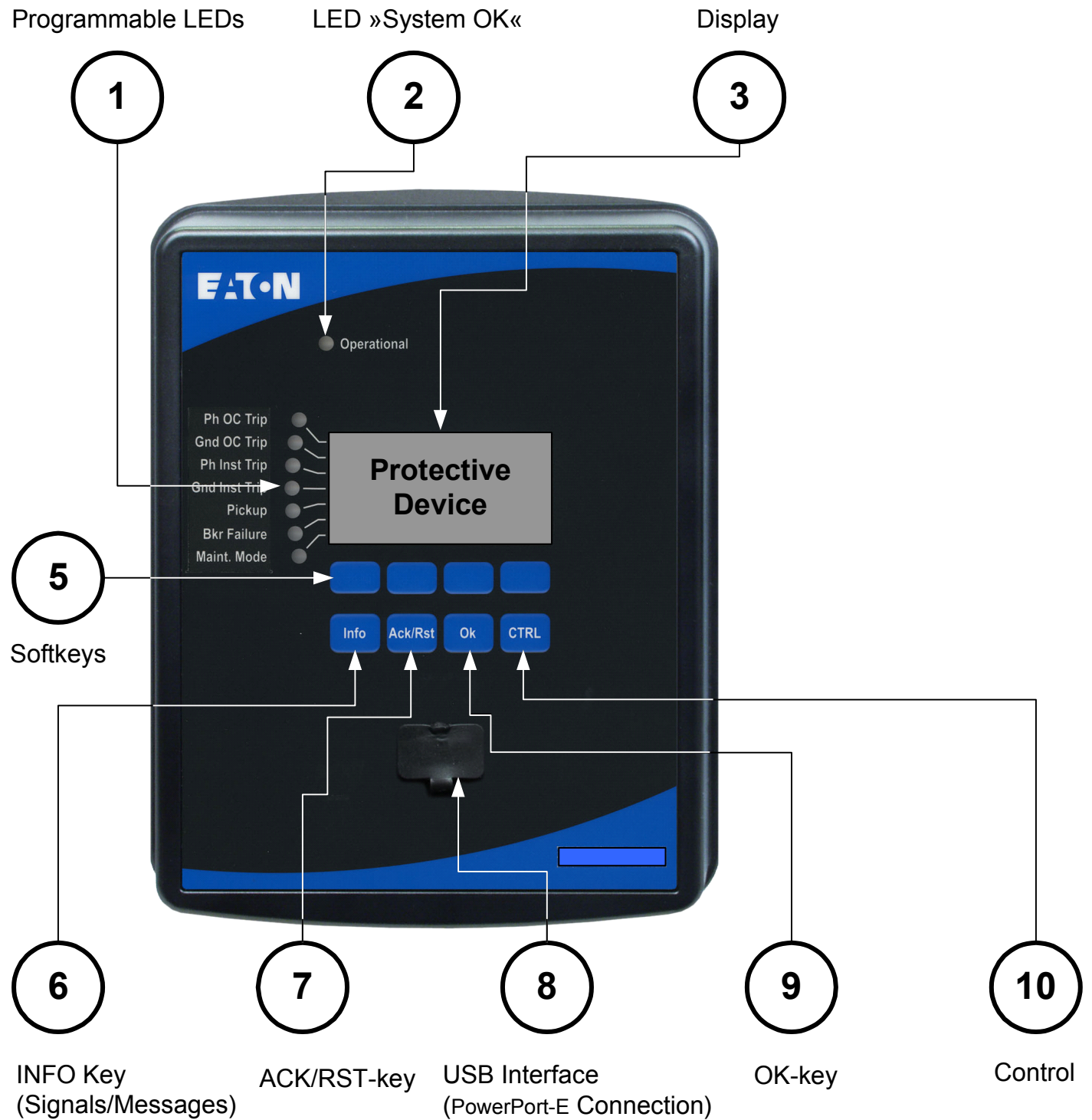
Signals of the Analog Outputs

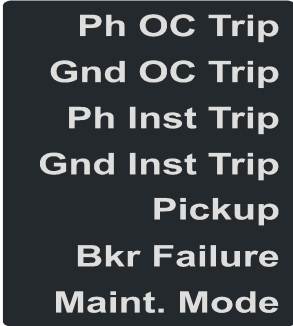
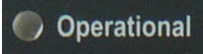
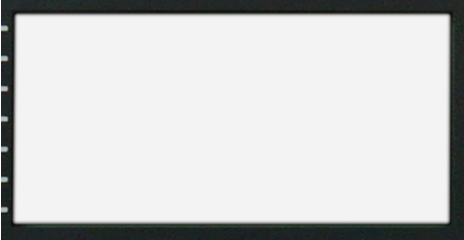
<i>Signal</i>	<i>Description</i>
Force Mode	For commissioning purposes or for maintenance, Analog Outputs can be set by force. By means of this function the normal Analog Outputs can be overwritten (forced).

List of the Analog Outputs

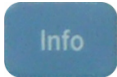
Name	Description
.-	No assignment
CT.IA RMS	Measured value: Phase current (RMS)
CT.IB RMS	Measured value: Phase current (RMS)
CT.IC RMS	Measured value: Phase current (RMS)
CT.IX meas RMS	Measured value (measured): IX (RMS)
CT.IR calc RMS	Measured value (calculated): IR (RMS)
CT.IA THD	Measured Value (Calculated): IA Total Harmonic Current
CT.IB THD	Measured Value (Calculated): IB Total Harmonic Current
CT.IC THD	Measured Value (Calculated): IC Total Harmonic Current
MStart.IA FLA	Measured value: Phase current multiples of FLA
MStart.IB FLA	Measured value: Phase current multiples of FLA
MStart.IC FLA	Measured value: Phase current multiples of FLA
MStart.I3 PFLA avg	Average RMS current of all 3 phases as multiples of FLA
MStart.I3P Fla Demand	RMS current of all 3 phases calculated in a fixed demand window as multiples of FLA
49.I2T Used	Thermal capacity used.
49.I2T Remained	Thermal capacity remained.
URTD.WD1	Winding 1
URTD.WD2	Winding 2
URTD.WD3	Winding 3
URTD.WD4	Winding 4
URTD.WD5	Winding 5
URTD.WD6	Winding 6
URTD.MB1	Motor Bearing 1
URTD.MB2	Motor Bearing 2
URTD.LB1	Load Bearing 1
URTD.LB2	Load Bearing 2
URTD.Aux1	Auxiliary1
URTD.Aux2	Auxiliary2
URTD.RTD Max	Maximum temperature of all channels.
RTD.Hottest WD	Hottest motor winding temperature in degrees C.
RTD.Hottest MB	Hottest motor bearing temperature in degrees C. Resettable with "Sys Res OperationsCr" or "All".

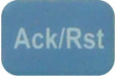
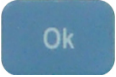
Front Panel



Item	Graphic	Name	Description
1	 (Example for an insert)	LEDs Group A	Basically there are 7 programmable LEDs provided for user to configure, the choice for each programmable LED can be any signal from the global assignment list, which includes all internal operation states of each function activated. Based on the application need, up to 7 (but not necessary) programmable LEDs can be activated. By properly configuring some or all 7 LEDs, user will be able to view the relay overall operation and some critical information immediately and intuitively without digging into any menu.
2		LED »System OK«	Should the LED »System OK« flash red during operation, contact the Service Department immediately.
3		Display	Via the display, the User can view operational data and edit the parameters.

Item	Graphic	Name	Description
5		Softkeys	The function of the »SOFTKEYS« are contextual. On the bottom line of the display, the present function is displayed/symbolized. Possible functions are: ■ Navigation; ■ Parameter decrement/increment; ■ Scrolling up/down a menu page; ■ Moving to a digit; and ■ Change into the parameter setting mode »Wrench Symbol«.

Item	Graphic	Name	Description
6		INFO Key (Signals/Messages)	Looking through the present LED assignment. The Direct Select key can be activated at any time. If the INFO key is actuated again, the User will leave the LED menu. Here only the first assignments of the LEDs will be shown. Every three seconds the »SOFTKEYs« will be shown (flashing). <i>Displaying the Multiple Assignments</i> If the INFO key is pressed, only the first assignments of any LED is shown. Every three seconds the »SOFTKEYs« will be shown (flashing). If there is more than one signal assigned to an LED (indicated by three dots), the User can check the state of the multiple assignments by proceeding as follows. In order to show all (multiple) assignments, select an LED by means of the »SOFTKEYs« »up« and »down« Via the »Softkey« »right«, call up a sub-menu of this LED that gives the User detailed information on the state of all signals assigned to this LED. An arrow symbol points to the LED whose assignments are currently displayed. Via the »SOFTKEYs« »up« and »down«, the User can call up the next / previous LED. In order to leave the LED menu, press the »SOFTKEY« »left« multiple times.

Item	Graphic	Name	Description
7		»ACK/RST- Key«	To abort changes and to acknowledge messages as well as resetting counters. In order to reset, press the Softkey »Wrench« and enter the password. The User can exit the reset menu by pressing the Softkey »Arrow-left«
8		USB Interface (PowerPort-E Connection)	Connection to the software PowerPort-E is done via the USB interface.
9		»OK Key«	When using the »OK« key, parameter changes are temporarily stored. If the »OK« key is pressed again, those changes are stored indefinitely.
10		»CTRL Key«	Access to the Control menu (not available in all devices)

Basic Menu Control

The graphic user interface is equivalent to a hierarchical structured menu tree. For access to the individual sub-menus, the »SOFTKEYS«/Navigation Keys are used. The function of the »SOFTKEYS« can be found as symbol in the footer of the display.

<i>Softkey</i>	<i>Description</i>
	■ Via »SOFTKEY« »Up«, the User will be taken to the prior menu point/one parameter up by scrolling upwards.
	■ Via »SOFTKEY« »Left«, the User will be taken one step back.
	■ Via »SOFTKEY« »Down«, the User will be taken to the next menu point/one parameter down by scrolling downwards.
	■ Via »SOFTKEY« »Right«, the User will be taken to a sub-menu.
	■ Via »SOFTKEY« »Top of List«, the User will be taken directly to the top of a list.
	■ Via »SOFTKEY« »Bottom of List«, the User will be taken directly to the end of a list.
	■ Via »SOFTKEY« »+«, the related digit will be incremented. (Continuous pressure -> fast).
	■ Via »SOFTKEY« »-«, the related digit will be decremented. (Continuous pressure -> fast)
	■ Via »SOFTKEY« »Left«, the User will be taken one digit to the left.
	■ Via »SOFTKEY« »Right«, the User will be taken one digit to the right.
	■ Via »SOFTKEY« »Parameter Setting«, the User will call up the parameter setting mode.
	■ Via »SOFTKEY« »Delete«, data will be deleted.
	■ Fast forward scrolling is possible via »SOFTKEY« »Fast forward«
	■ Fast backward scrolling is possible via »SOFTKEY« »Fast backward«

In order to return to the main menu, just keep pressing the Softkey »Arrow-Left« until you arrive at the »Main Menu«.

PowerPort-E

PowerPort-E is a parameter setting and evaluation software. Please see separate manual (MN026001EN).

- Menu-controlled parameter setting incl. validity checks
- Offline configuration of all relay types
- Reading and evaluating of statistical data and measuring values
- Setting into operation assistance
- Display of the device status
- Fault analysis via event- and fault and waveform recorder

Quality Manager

Quality Manager is an E-Series waveform and event viewing software. It is installed automatically with *PowerPort-E*. It can also be used as a standard COMTRADE file viewer.

- Open and review downloaded waveforms
- Customize waveform channel layout and views including channel overlapping and zooming
- Analyze sample by sample data points and line up the displayed analog waveform channels along with the recorded internal relay logic
- Save window setups (snapshots) and print for reporting
- Open industry standard COMTRADE files from other intelligent electronic devices
- Convert downloaded waveform files to COMTRADE file format using "Export" feature

Measuring Values

Read Out Measured Values

In the »Operation/Measured Values« menu, both measured and calculated values can be viewed. The measured values are ordered by »Standard values« and »Special values« (depending on the type of device).

Measurement Display

Menu [Operation\General Settings] offers options to change the display of measured values within the HMI and PowerPort-E.

Scaling of Measured values

By means of the parameter »Scaling« the user can determine how measured values are to be displayed within the HMI and *PowerPort-E*:

- Per Unit quantities
- Primary quantities
- Secondary quantities

Power Units (applies only for devices with power measurement)

By means of the parameter »Power Units« the User can determine how measured values are to be displayed within the HMI and *PowerPort-E*:

- Power Auto Scaling
- kW, kVAr or kVA
- MW, MVar or MVA
- GW, GVar or GVA

Energy Units (applies only for devices with energy measurement)

By means of the parameter »*Energy Units*« the User can determine how measured values are to be displayed within the HMI and *PowerPort-E*:

- Energy Auto Scaling
- kWh, kVAh or kVAh
- MWh, MVAh or MVAh
- GWh, GVAh or GVAh

In case of an overflow of the counter, the counter will start counting again at zero. A corresponding signal will indicate the counter overflow.

Counter overflow at:

■ Energy Auto Scaling	Depends on the settings for the current and voltage transformers
■ kWh, kVAh or kVAh	999,999.99
■ MWh, MVAh or MVAh	999,999.99
■ GWh, GVAh or GVAh	999,999.99

Temperature Unit (applies only for devices with temperature measurement)

By means of the parameter »*Temperature Unit*« the User can determine how measured values are to be displayed within the HMI and *PowerPort-E*:

- ° Celsius
- ° Fahrenheit

Current - Measured Values

CT

If the device is not equipped with an voltage measuring card the first measuring input on the first current measuring card (slot with the lowest number) will be used as the reference angle ($\gg I_A \ll$).

Value	Description	Menu path
IA Fund.	Measured value: Phase current (Fundamental)	[Operation /Measured Values /Current Fund.]
IB Fund.	Measured value: Phase current (Fundamental)	[Operation /Measured Values /Current Fund.]
IC Fund.	Measured value: Phase current (Fundamental)	[Operation /Measured Values /Current Fund.]
IX meas Fund.	Measured value (measured): IX (Fundamental)	[Operation /Measured Values /Current Fund.]
IR calc Fund.	Measured value (calculated): IR (Fundamental)	[Operation /Measured Values /Current Fund.]
I0 Fund.	Measured value (calculated): Zero current (Fundamental)	[Operation /Measured Values /Current Fund.]
I1 Fund.	Measured value (calculated): Positive phase sequence current (Fundamental)	[Operation /Measured Values /Current Fund.]
I2 Fund.	Measured value (calculated): Unbalanced load current (Fundamental)	[Operation /Measured Values /Current Fund.]
Angle IA	Measured Value (Calculated): Angle of Phasor IA	[Operation /Measured Values /Current Fund.]
Angle IB	Measured Value (Calculated): Angle of Phasor IB	[Operation /Measured Values /Current Fund.]

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Angle IC	Measured Value (Calculated): Angle of Phasor IC	[Operation /Measured Values /Current Fund.]
Angle IX meas	Measured Value (Calculated): Angle of Phasor IX meas	[Operation /Measured Values /Current Fund.]
Angle IR calc	Measured Value (Calculated): Angle of Phasor IR calc	[Operation /Measured Values /Current Fund.]
Angle I0	Measured Value (calculated): Angle of Zero Sequence System	[Operation /Measured Values /Current Fund.]
Angle I1	Measured Value (calculated): Angle of Positive Sequence System	[Operation /Measured Values /Current Fund.]
Angle I2	Measured value (calculated): Angle of Negative Sequence System	[Operation /Measured Values /Current Fund.]
IA RMS	Measured value: Phase current (RMS)	[Operation /Measured Values /Current RMS]
IB RMS	Measured value: Phase current (RMS)	[Operation /Measured Values /Current RMS]
IC RMS	Measured value: Phase current (RMS)	[Operation /Measured Values /Current RMS]
IX meas RMS	Measured value (measured): IX (RMS)	[Operation /Measured Values /Current RMS]
IR calc RMS	Measured value (calculated): IR (RMS)	[Operation /Measured Values /Current RMS]

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
%IA THD	Measured Value (Calculated): IA Total Harmonic Distortion	[Operation /Measured Values /Current RMS]
%IB THD	Measured Value (Calculated): IB Total Harmonic Distortion	[Operation /Measured Values /Current RMS]
%IC THD	Measured Value (Calculated): IC Total Harmonic Distortion	[Operation /Measured Values /Current RMS]
IA THD	Measured Value (Calculated): IA Total Harmonic Current	[Operation /Measured Values /Current RMS]
IB THD	Measured Value (Calculated): IB Total Harmonic Current	[Operation /Measured Values /Current RMS]
IC THD	Measured Value (Calculated): IC Total Harmonic Current	[Operation /Measured Values /Current RMS]
%(I2/I1)	Measured value (calculated): I2/I1, phase sequence will be taken into account automatically.	[Operation /Measured Values /Current Fund.]

Statistics

Statistics

In menu »*Operation/Statistics*« the min., max. and mean values of the measured and calculated measured quantities can be found.

Configuration of the Minimum and Maximum Values

The calculation of the minimum and maximum values will be started:

- When a Reset signal becomes active (Min/Max)
- When the device is restarted
- After configuration

<i>Minimum and Maximum Values (Peak Values/Pointers)</i>		
	Time interval for the calculation of the minimum and maximum values	Reset
Configuration Options Where to configure? Within menu [Device Para\ Statistics\ Min/Max]	The minimum and maximum values will be reset with the rising edge of the corresponding reset signal.	Res Min Res Max (e.g. via digital Inputs). These signals will reset the minimum and maximum pointers.
<i>Display of Minimum Values</i>	Where? Within menu [Operation\Statistics\Min]	
<i>Display of Maximum Values</i>	Where? Within menu [Operation\Statistics\Max]	

Configuration of the Average Value Calculation

Configuration of the Current Based Average Value Calculation*

*=Availability depends on the ordered device code.

<i>Current based Average Values and Peak Values</i>			
	Time period for the calculation of the average and peak values	Start options	Reset of the average and peak values
Configuration Options Where to configure? In [Device Para\ Statistics\ Demand\ Current Demand]	sliding: (sliding: average calculation based on sliding period) fixed: (fixed: Average calculation is reset by the end of the period, that means with the next starting period)	duration: (fixed or sliding period) Start Fct: (The average values are calculated based on the time period between two rising edges of this signal)	Res Fc (e.g. via Digital Input in order to reset the average values in advance (before the next rising edge of the start signal). This applies to option »Start FC« only.
<i>Trip (command) option to limit the average current demand:</i> Yes	Please refer to chapter »System Alarms«		
<i>View average values and peak values</i>	Where? Within menu [Operation\Statistics\Demand]		

Configuration of the Voltage Based Average Value Calculation*

*=Availability depends on the ordered device code.

<i>Voltage based Average Values</i>			
	Time period for the calculation of the average values	Start options	Reset of the average and peak values
Configuration Options Where to configure? In [Device Para\ Statistics\ Umit]	sliding: (sliding: average calculation based on sliding period) fixed: (fixed: Average calculation is reset by the end of the period, that means with the next starting period)	duration: (fixed or sliding period) Start Fct: (The average values are calculated based on the time period between two rising edges of this signal)	Res Fc (e.g. via Digital Input in order to reset the average values in advance (before the next rising edge of the start signal). This applies to option »Start FC« only.
<i>View average values</i>	Where? Within menu [Operation\Statistics\Vavg]		

Configuration of the Power Based Average Value Calculation*

*=Availability depends on the ordered device code.

<i>Power based Average Values (Demand) and Peak Values</i>			
	Time period for the calculation of the average and peak values	Start options	Reset of the average and peak values
Configuration Options Where to configure? In [Device Para\ Statistics\ Bezugsmanagm\ Power Demand]	sliding: (sliding: average calculation based on sliding period) fixed: (fixed: Average calculation is reset by the end of the period, that means with the next starting period)	duration: (fixed or sliding period) Start Fct: (The average values are calculated based on the time period between two rising edges of this signal)	Res Fc (e.g. via Digital Input in order to reset the average values in advance (before the next rising edge of the start signal). This applies to option »Start FC« only.
<i>Trip (command) option to limit the average power demand: Yes</i>	Please refer to chapter »System Alarms«		
<i>View average values and peak values</i>	Where? Within menu [Operation\Statistics\Demand]		

Direct Commands

Parameter	Description	Setting range	Default	Menu path
ResFc all 	Resetting of all Statistic values (Current Demand, Power Demand, Min, Max)	Inactive, Active	Inactive	[Operation /Reset /Flags]
ResFc I Demand 	Resetting of Statistics - Current Demand (avg, peak avg)	Inactive, Active	Inactive	[Operation /Reset /Flags]
ResFc Min 	Resetting of all Minimum values	Inactive, Active	Inactive	[Operation /Reset /Flags]
ResFc Max 	Resetting of all Maximum values	Inactive, Active	Inactive	[Operation /Reset /Flags]

Global Protection Parameters of the Statistics Module

Parameter	Description	Setting range	Default	Menu path
ResFc Max 	Resetting of all Maximum values	1..n, Assignment List	.-	[Device Para /Statistics /Min / Max]
ResFc Min 	Resetting of all Minimum values	1..n, Assignment List	.-	[Device Para /Statistics /Min / Max]
Start I Demand via: 	Start Current demand by:	Duration, StartFct	Duration	[Device Para /Statistics /Demand /Current Demand]
Start I Demand Fc 	Start of the calculation, if the assigned signal becomes true. Only available if: Start I Demand via: = StartFct	1..n, Assignment List	.-	[Device Para /Statistics /Demand /Current Demand]

Parameter	Description	Setting range	Default	Menu path
ResFc I Demand 	Resetting of Statistics - Current Demand (avg, peak avg)	1..n, Assignment List	-.-	[Device Para /Statistics /Demand /Current Demand]
Duration I Demand 	Recording time Only available if: Start I Demand via: = Duration	2 s, 5 s, 10 s, 15 s, 30 s, 1 min, 5 min, 10 min, 15 min, 30 min, 1 h, 2 h, 6 h, 12 h, 1 d, 2 d, 5 d, 7 d, 10 d, 30 d	15 s	[Device Para /Statistics /Demand /Current Demand]
Window I Demand 	Window configuration	Sliding, Fixed	Fixed	[Device Para /Statistics /Demand /Current Demand]

States of the Inputs of the Statistics Module

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
StartFc I Demand-I	State of the module input: Start of Statistics of the Current Demand (Update the displayed Demand)	[Device Para /Statistics /Demand /Current Demand]
ResFc I Demand-I	State of the module input: Resetting of Statistics - Current Demand (avg, peak avg)	[Device Para /Statistics /Demand /Current Demand]
ResFc Max-I	State of the module input: Resetting of all Maximum values	[Device Para /Statistics /Min / Max]
ResFc Min-I	State of the module input: Resetting of all Minimum values	[Device Para /Statistics /Min / Max]

Signals of the Statistics Module

<i>Signal</i>	<i>Description</i>
ResFc all	Signal: Resetting of all Statistic values (Current Demand, Power Demand, Min, Max)
ResFc I Demand	Signal: Resetting of Statistics - Current Demand (avg, peak avg)
ResFc Max	Signal: Resetting of all Maximum values
ResFc Min	Signal: Resetting of all Minimum values

Counters of the Module Statistics

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Res Cr I Demand	Number of resets since last booting. The timestamp shows date and time of the last reset.	[Operation /Statistics /Demand /Current Demand]
Res Cr Min values	Number of resets since last booting. The timestamp shows date and time of the last reset.	[Operation /Statistics /Min /CT]
Res Cr Max values	Number of resets since last booting. The timestamp shows date and time of the last reset.	[Operation /Statistics /Max /URTD]

Current - Statistic Values

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
I1 max Fund.	Maximum value positive phase sequence current (Fundamental)	[Operation /Statistics /Max /CT]
I1 min Fund.	Minimum value positive phase sequence current (Fundamental)	[Operation /Statistics /Min /CT]
I2 max Fund.	Maximum value unbalanced load current (Fundamental)	[Operation /Statistics /Max /CT]
I2 min Fund.	Minimum value unbalanced load current (Fundamental)	[Operation /Statistics /Min /CT]
IA max RMS	IA maximum value (RMS)	[Operation /Statistics /Max /CT]
IA avg RMS	IA average value (RMS)	[Operation /Statistics /Demand /Current Demand]
IA min RMS	IA minimum value (RMS)	[Operation /Statistics /Min /CT]
IB max RMS	IB maximum value (RMS)	[Operation /Statistics /Max /CT]

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
IB avg RMS	IB average value (RMS)	[Operation /Statistics /Demand /Current Demand]
IB min RMS	IB minimum value (RMS)	[Operation /Statistics /Min /CT]
IC max RMS	IC maximum value (RMS)	[Operation /Statistics /Max /CT]
IC avg RMS	IC average value (RMS)	[Operation /Statistics /Demand /Current Demand]
IC min RMS	IC minimum value (RMS)	[Operation /Statistics /Min /CT]
IX meas max RMS	Measured value: IX maximum value (RMS)	[Operation /Statistics /Max /CT]
IX meas min RMS	Measured value: IX minimum value (RMS)	[Operation /Statistics /Min /CT]
IR calc max RMS	Measured value (calculated): IR maximum value (RMS)	[Operation /Statistics /Max /CT]
IR calc min RMS	Measured value (calculated): IR minimum value (RMS)	[Operation /Statistics /Min /CT]

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
%(I2/I1) max	Measured value (calculated): I2/I1 maximum value, phase sequence will be taken into account automatically	[Operation /Statistics /Max /CT]
%(I2/I1) min	Measured value (calculated): I2/I1 minimum value, phase sequence will be taken into account automatically	[Operation /Statistics /Min /CT]
IA Peak demand	IA Peak value, RMS value	[Operation /Statistics /Demand /Current Demand]
IB Peak demand	IB Peak value, RMS value	[Operation /Statistics /Demand /Current Demand]
IC Peak demand	IC Peak value, RMS value	[Operation /Statistics /Demand /Current Demand]

System Alarms

Available Elements:

SysA

Within the System Alarms menu [SysA] the User can configure:

- General Settings (activate/inactivate the Demand Management, optional assign a signal, that will block the Demand Management);
- Demand Management (Current); and
- THD Protection.

Please note, that all thresholds are to be set as primary values.

Demand Management

Demand is the average of system current over a time interval (window). Demand management supports the User to keep energy demand below target values bound by contract (with the energy supplier). If the contractual target values are exceeded, extra charges are to be paid to the energy supplier.

Therefore, demand management helps the User detect and avoid averaged peak loads that are taken into account for the billing. In order to reduce the demand charge respective to demand rate, peak loads, if possible, should be diversified. That means, if possible, avoiding large loads at the same time. In order to assist the User in analyzing the demand, demand management might inform the User by an alarm. The User might also use demand alarms and assign them on relays in order to perform load shedding (where applicable).

Demand management comprises:

-
- Current Demand.

Configuring the Demand

Configuring the demand is a two step procedure. Proceed as follows.

Step1. Configure the general settings within the [Device Para/Statistics/Demand] menu:

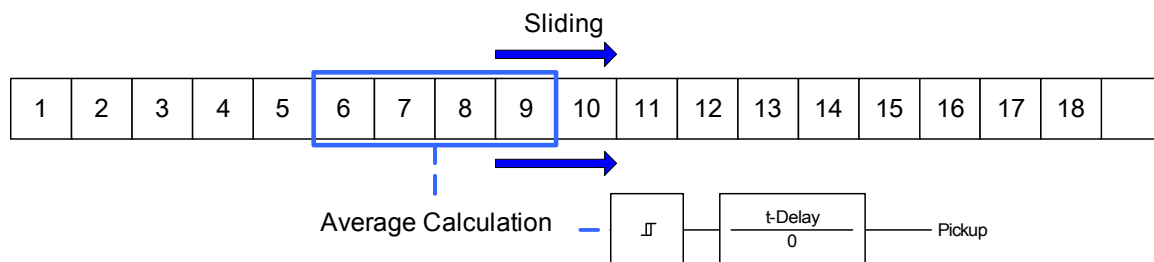
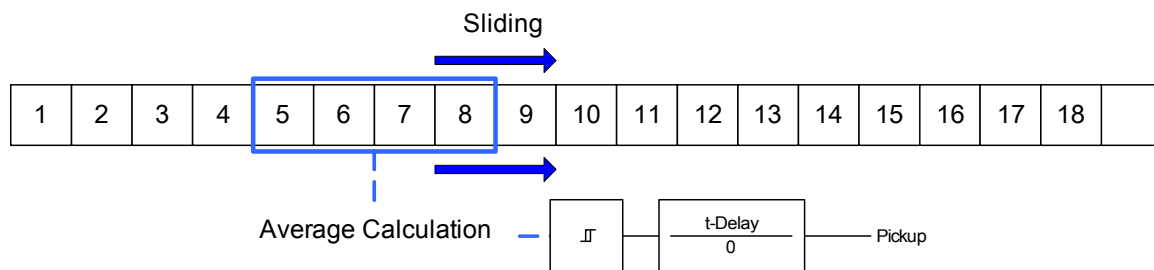
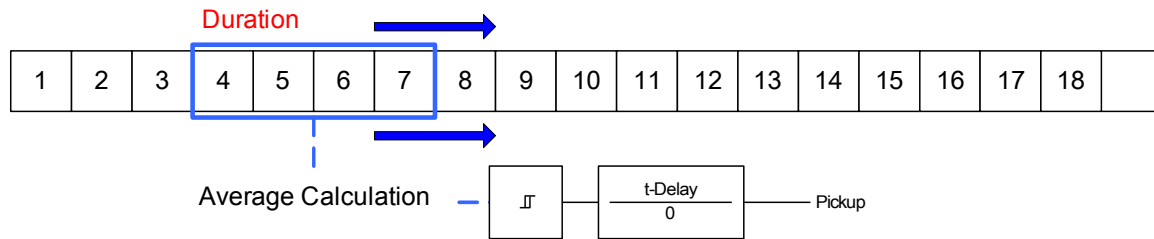
- Set the trigger source to »*Duration*«.
- Select a time base for the »*window*«.
- Determine if the window is »*fixed*« or »*sliding*«.

The interval time (window) can be set to fixed or sliding.

Example for a fixed window: If the range is set for 15 minutes, the protective device calculates the average current or power over the past 15 minutes and updates the value every 15 minutes.

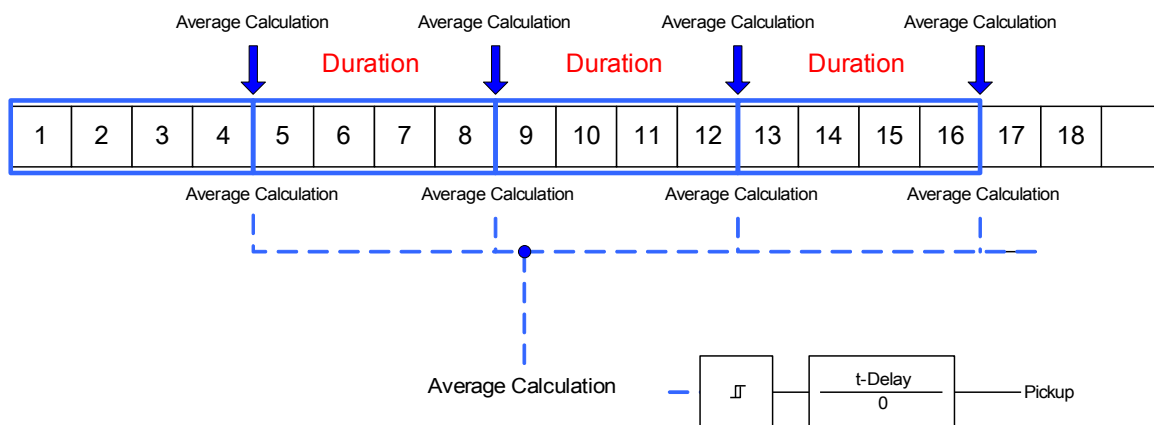
Example for a sliding window: If the sliding window is selected and the interval is set to 15 minutes, the protective device calculates and updates the average current or power continuously, for the past 15 minutes (the newest measuring value replaces the oldest measuring value continuously).

Window configuration = Sliding



.....

Window configuration = Fixed



Step 2. In addition, the Demand specific settings have to be configured in the [SysA] menu:

- Determine if the demand should generate an alarm or if it should run in the silent mode (Alarm active/inactive);
- Set the threshold; and
- Where applicable, set a delay time for the alarm.

Peak Demand

The protective device also saves the peak demand values for current and power. The quantities represent the largest demand value since the demand values were last reset. Peak demands for current and system power are date and time stamped.

Within the [Operation/Demand] menu, the current Demand and Peak demand values can be seen.

Min. and Max. Values.

Within the Operation menu the minimum (min.) and maximum (max.) values can be seen.

Minimum values since last reset: The minimum values are continuously compared to the last minimum value for that measuring value. If the new value is less than the last minimum, the value is updated. Within the [Device Para/Statistics] menu, a reset signal can be assigned.

Maximum values since last reset: The maximum values are continuously compared to the last maximum value for that measuring value. If the new value is greater than the last maximum, the value is updated. Within the [Device Para/Statistics] menu, a reset signal can be assigned.

THD Protection

In order to supervise power quality, the protective device can monitor the current THDs.

Within the [SysA/THD] menu:

- Determine if an alarm is to be issued or not (Alarm active/inactive);
- Set the threshold; and
- Where applicable, set a delay time for the alarm.

Device Planning Parameters of the Demand Management

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Do not use, Use	Use	[Device Planning]

Signals of the Demand Management (States of the Outputs)

Signal	Description
Active	Signal: Active
ExBlo	Signal: External Blocking
Alm Current Demd	Signal: Alarm Current demand value
Alarm I THD	Signal: Alarm Total Harmonic Distortion Current
Trip Current Demand	Signal: Trip Current demand value
Trip I THD	Signal: Trip Total Harmonic Distortion Current

Global Protection Parameter of the Demand Management

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[SysA /General Settings]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	1..n, Assignment List	.-	[SysA /General Settings]
Alarm 	Alarm	Inactive, Active	Inactive	[SysA /Demand /Current Demand]
Threshold 	Threshold (to be entered as primary value)	10 - 500000A	500A	[SysA /Demand /Current Demand]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
t-Delay 	Tripping Delay	0 - 60min	0min	[SysA /Demand /Current Demand]
Alarm 	Alarm	Inactive, Active	Inactive	[SysA /THD /I THD]
Threshold 	Threshold (to be entered as primary value)	1 - 500000A	500A	[SysA /THD /I THD]
t-Delay 	Tripping Delay	0 - 3600s	0s	[SysA /THD /I THD]

States of the Inputs of the Demand Management

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo-I	Module Input State: External Blocking	[SysA /General Settings]

Resets

Collective Acknowledgments for Latched Signals:

Collective Acknowledgments					
	<i>LEDs</i>	<i>Relay Outputs</i>	<i>SCADA</i>	<i>Pending Trip Command</i>	<i>LEDs+ Relay Outputs+ SCADA+ Pending Trip Command</i>
Via PowerPort-E or at the panel all... can be acknowledged. At the panel, the [Operation\ Acknowledge] menu can directly be accessed via the »Ack/Rst« key.	All LEDs at once: Where? [Operation / Acknowledge]	All Relay Outputs at once: Where? [Operation / Acknowledge]	All SCADA signals at once: Where? [Operation / Acknowledge]	All pending trip commands at once: Where? [Operation / Acknowledge]	All at once: Where? [Operation / Acknowledge]
External Acknowledgment*: Via a signal from the assignment list (e.g.: a digital Input) all... can be acknowledged.	All LEDs at once: Where? Within the menu [Device Para / Acknowledge]	All Relay Outputs at once: Where? Within the menu [Device Para / Acknowledge]	All SCADA signals at once: Where? Within the menu [Device Para / Acknowledge]	All Pending Trip commands at once: Where? Within the menu [Device Para / Acknowledge]	All at once: Where? Within the menu [Device Para / Acknowledge]
Automatic Acknowledgment: Via a new alarm from any protection function	All LEDs at once, automatically in case of a protection pickup.				

*The External Acknowledgement might be disabled if parameter »Ex Acknowledgement« is set to »inactive« within menu [Device Para / Acknowledge]. This blocks also the acknowledgement via Communication (e.g. Modbus).

** If the automatic acknowledgment is active all LEDs get acknowledged with a protection pickup.

The automatic acknowledgment must be activated by setting:

[Device Para / LEDs / LEDs group A / LED 1...n] »Latched« = "active, ack. by pickup"

Options for Individual Acknowledgments for Latched Signals:

Individual Acknowledgment			
	LEDs	Relay Output	Pending Trip Command
Via a signal from the assignment list (e.g.: a digital Input), a <i>single</i> ... can be acknowledged.	Single LED: Where? Within the Configuration menu of this single LED.	Relay Output: Where? Within the Configuration menu of this single Relay Output.	Pending Trip Command. Where? Within the module <u>BkrManager</u>

NOTICE

If the User is within the parameter setting mode, the User cannot acknowledge.

NOTICE

In case of a fault during parameter setting via the operating panel, the User must first leave the parameter mode by pressing either the push-buttons »Ack/Rst« or »OK« before accessing the »Acknowledgements« menu via the push-button.

Manual Acknowledgment

It is possible to acknowledge LEDs, SCADA, Relay Outputs and / or a pending trip command by pressing the »Ack/Rst« at the panel.

There are two principles available how the »Ack/Rst« key shall react when being pressed:

- **(1.) *With intermediate selection step:*** After the »Ack/Rst« key has been pressed, you select the items to be acknowledged (LEDs, SCADA, Relay Outputs, trip command, or all of these) via the Softkeys. After this, you press the Softkey with the »Wrench-Symbol«.
- **(2.) *Immediate acknowledge:*** After it has been configured which items shall be assigned to the »Ack via »Ack/Rst« key«, these are acknowledged by simply pressing the »Ack/Rst« key (for ca. 1 second).

The setting parameter [Device Para / Acknowledge] »Ack via »Ack/Rst« key« decides about which principle described above shall be available when the »Ack/Rst« key is pressed:

- “Nothing” – Pressing the »Ack/Rst« key works as described with “principle (1.)“, i. e. you explicitly select the items to be acknowledged.
- “Ack LEDs” – Pressing the »Ack/Rst« key (for approx. 1 second) acknowledges all LEDs immediately (only the password will be asked for, see below).
- “Ack LEDs” – Pressing the »Ack/Rst« key (for approx. 1 second) acknowledges all LEDs and all Relay Outputs immediately (only the password will be asked for, see below).
- “Ack Everything” – Pressing the »Ack/Rst« key (for approx. 1 second) acknowledges all (above) mentioned items immediately (only the password will be asked for, see below).

The three immediate types of acknowledgments according to “principle (2.)“ can be recognized from the fact that it always includes an LED test, i. e. all LEDs flash in red color for a second, then flash in green color for a second.

NOTICE

Independent of which acknowledgment type you have set, note that you are asked to enter the password.

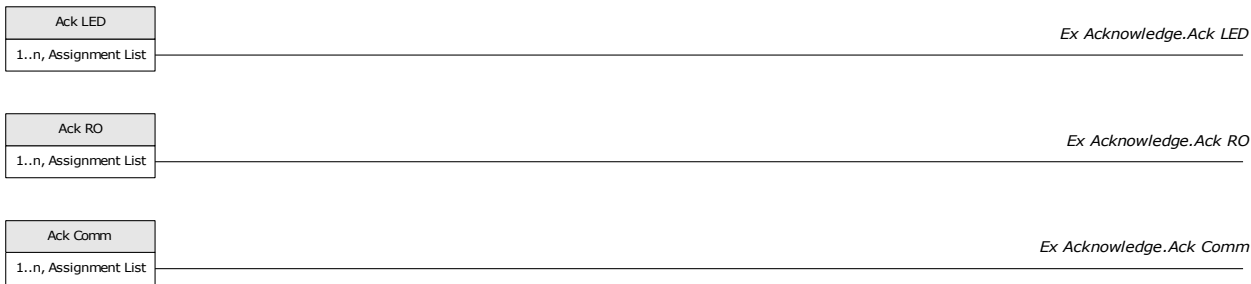
If there is the need to be able to acknowledge without entering any password set an empty password for the level »Prot-Lv1«. For general information about passwords and security-related considerations, see the “Security” chapter.



External Acknowledgments

Within the [Device Para\Ex Acknowledge] menu, the User can assign a signal (e.g.: the state of a digital input) from the assignment list that:

- Acknowledges all (acknowledgeable) LEDs at once;
- Acknowledges all (acknowledgeable) Output Relays at once; or
- Acknowledges all (acknowledgeable) Communication (Scada) signals at once.



Manual Resets

In the »*Operation/Reset*« menu, the User can:

- Reset counters;
- Delete records (e.g.: waveform records); and
- Reset special things (like statistics, thermal replica, etc.).

NOTICE

The description of the reset commands can be found within the corresponding modules.

Status Display

In the status display within the »Operation« menu, the present state of all signals can be viewed. This means the User is able to see if the individual signals are active or inactive at that moment. The User can see all signals sorted by protective elements/modules.

State of the Module Input / Signal Is...	Is Shown at the Panel as...
false / »0«	
true / »1«	

Operating Panel (HMI)

HMI

Special Parameters of the Panel

The »Device Parameter/HMI« menu is used to define the contrast of the display, the maximum admissible edit time, and the menu language (after expiration, all unsaved parameter changes will be rejected).

Direct Commands of the Panel

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Contrast 	Contrast	0 - 100%	50%	[Device Para /HMI]

Global Protection Parameters of the Panel

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
t-max Edit/Access 	If no other key(s) is pressed at the panel, after expiration of this time, all cached (changed) parameters are cancelled. The device access will be locked by falling back into Read-only level Lv0.	20 - 3600s	180s	[Device Para /HMI]
Display Off 	The display back light will be turned off when this timer has expired.	20 - 3600s	180s	[Device Para /HMI]

Recorders

Waveform Recorder

Waveform rec

- Disturbance records can be downloaded (read out) by means of the parameter setting and evaluation software PowerPort-E.
- The disturbance records can be viewed and analyzed within *Quality manager* (will be installed with *PowerPort-E*).
- Waveform records can be converted into the COMTRADE file format by means of *Quality manager*.

The waveform recorder works with 32 samples per cycle. It can be started by any of eight start events (selection from the »Assignment list« / OR-Logic).

The waveform record contains the measuring values including the pre-trigger time. By means of PowerPort-E/*Quality Manager* (option), the oscillographic curves of the analog (current, voltage) and digital channels/traces can be shown and evaluated in a graphical form.

The waveform recorder has a storage capacity of 120 s (duration). The amount of records depends on the size of each record.

The waveform recorder can be configured in the »*Device Parameter/Recorder/Waveform rec*« menu.

Determine the max. recording time to register a disturbance event. This can be set via the parameter »*Max file size*«, the maximum value is 15 s (including pre-trigger and post-trigger time). The pre-trigger and post-trigger times of the disturbance recorder are set (via parameters »*Pre-trigger time*« and »*Post-trigger time*«) in percent of the »*Max file size*« value.

To trigger the waveform recorder, up to eight signals can be selected from the »Assignment list«. The trigger events are OR-linked. If a waveform record has been written, a new waveform record cannot be triggered until all trigger signals that have triggered the previous waveform record are gone.

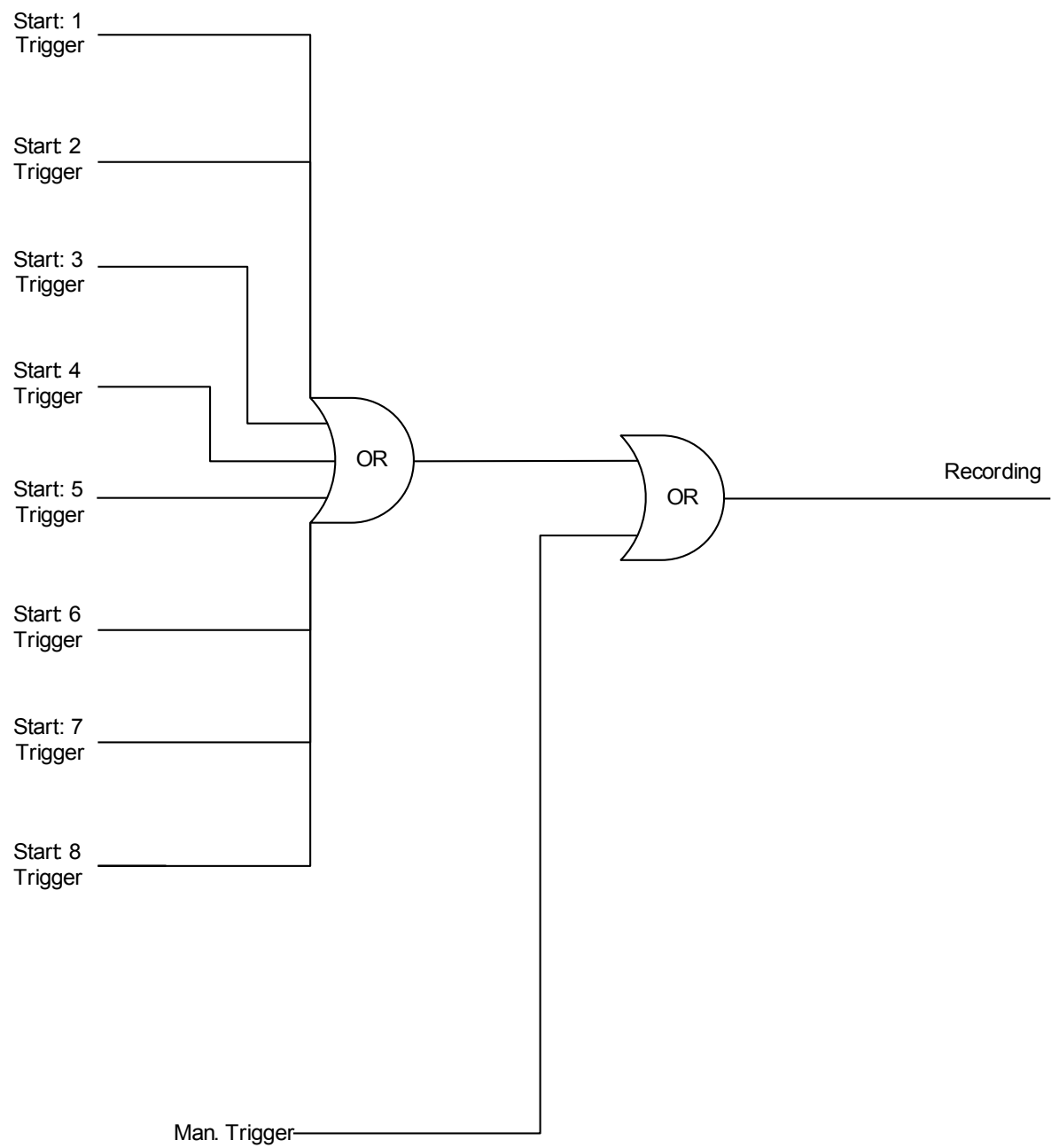
Recording is only done for the time the assigned event exists (event controlled), plus the time for the pre- and post-trigger, but not longer than the »*Max file size*« value.

NOTICE

It can obviously happen that – depending on the actual duration of the trigger signal and the settings – that the disturbance event does not get recorded completely. The only way to mitigate this risk (besides setting a smaller »*Pre-trigger time*«) is to configure a larger »*Max file size*«. This, however, has the obvious consequence that a smaller number of events can be held in memory.

In the same way it can happen that no more post-trigger time is left. Note that the recording always gets stopped after the configured »*Max file size*« has elapsed.

The parameter »*Auto overwriting*« defines how the device will react if the storage capacity has already been used up. In case »*Auto overwriting*« is »*Active*«, the oldest recorded waveform will be overwritten. If the parameter is set to »*Inactive*«, recording of the waveform events will be stopped until the storage location is manually released.



Start 1 = Prot.Pickup

Start 2 = -.-

Start 3 = -.-

Start 4 = -.-

Start 5 = -.-

Start 6 = -.-

Start 7 = -.-

Start 8 = -.-

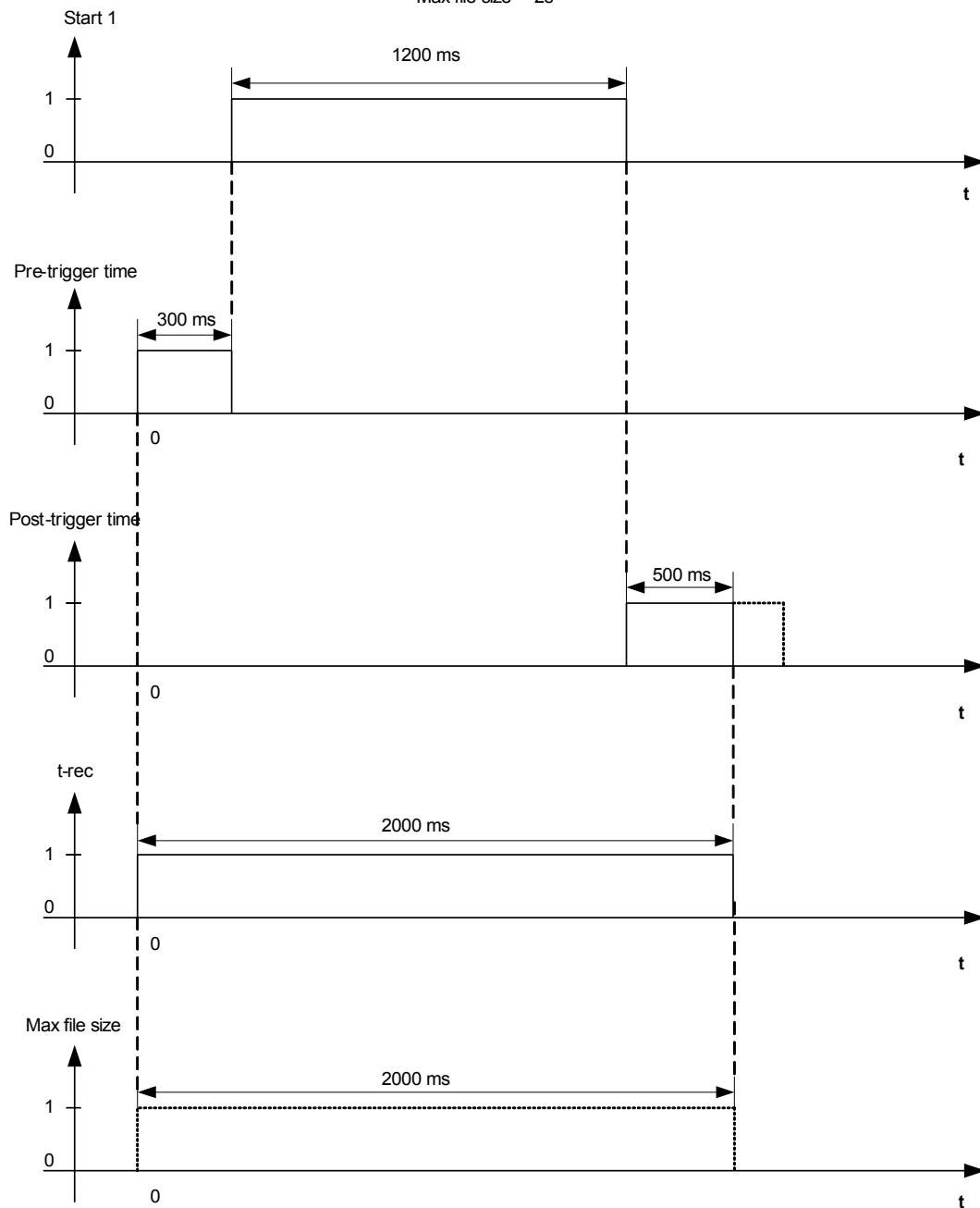
Auto overwriting = Active

Post-trigger time = 25%

Pre-trigger time = 15%

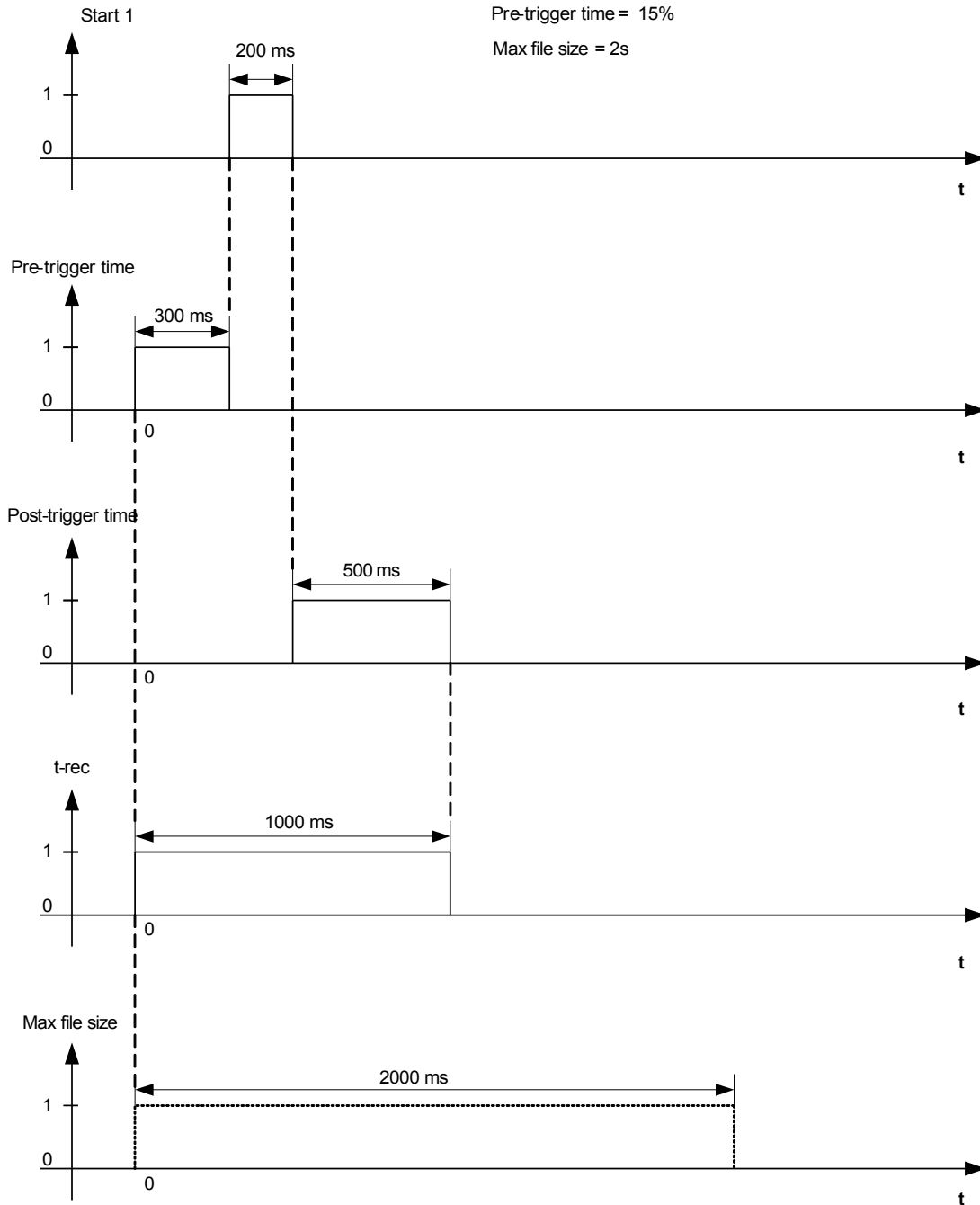
Max file size = 2s

t-rec = Max file size



Start 1 = Prot.Trip
 Start 2 = -.-
 Start 3 = -.-
 Start 4 = -.-
 Start 5 = -.-
 Start 6 = -.-
 Start 7 = -.-
 Start 8 = -.-
 Auto overwriting = Active
 Post-trigger time = 25%
 Pre-trigger time = 15%
 Max file size = 2s

t-rec < Max file size



Read Out of Waveform Records

Within the »Operation/Waveform rec« menu, the user can detect the accumulated waveform records.

NOTICE

Within the »Operation/Recorders/Man Trigger« menu, the user can trigger the waveform recorder manually.

Deleting Waveform Records

Within the »Operation/Waveform rec« menu, the user can:

- Delete waveform records;
- Choose the waveform record that is to be deleted via »SOFTKEY« »up« and »SOFTKEY« »down«;
- Call up the detailed view of the waveform record via »SOFTKEY« »right«;
- Confirm by pressing »SOFTKEY« »delete«;
- Enter the User password followed by pressing the »OK« key;
- Choose whether only the current or all waveform records should be deleted; and
- Confirm by pressing »SOFTKEY« »OK«.

Direct Commands of the Waveform Recorder Module

Parameter	Description	Setting range	Default	Menu path
Man. Trigger 	Manual Trigger	False, True	False	[Operation /Recorders /Man. Trigger]
Res all rec 	Reset all records	Inactive, Active	Inactive	[Operation /Reset /Flags]

Global Protection Parameters of the Waveform Recorder Module

Parameter	Description	Setting range	Default	Menu path
Start: 1 	Start recording if the assigned signal is true.	1..n, Assignment List	Prot.Pickup	[Device Para /Recorders /Waveform rec]
Start: 2 	Start recording if the assigned signal is true.	1..n, Assignment List	Prot.Trip	[Device Para /Recorders /Waveform rec]
Start: 3 	Start recording if the assigned signal is true.	1..n, Assignment List	-.-	[Device Para /Recorders /Waveform rec]
Start: 4 	Start recording if the assigned signal is true.	1..n, Assignment List	-.-	[Device Para /Recorders /Waveform rec]
Start: 5 	Start recording if the assigned signal is true.	1..n, Assignment List	-.-	[Device Para /Recorders /Waveform rec]
Start: 6 	Start recording if the assigned signal is true.	1..n, Assignment List	-.-	[Device Para /Recorders /Waveform rec]
Start: 7 	Start recording if the assigned signal is true.	1..n, Assignment List	-.-	[Device Para /Recorders /Waveform rec]

Parameter	Description	Setting range	Default	Menu path
Start: 8 	Start recording if the assigned signal is true.	1..n, Assignment List	-.-	[Device Para /Recorders /Waveform rec]
Auto overwriting 	If there is no more free memory capacity left, the oldest file will be overwritten.	Inactive, Active	Active	[Device Para /Recorders /Waveform rec]
Post-trigger time 	The post trigger time is settable up to a maximum of 50% of the Maximum file size setting. The post-trigger will be the remaining time of the "Max file size" but at maximum "Post-trigger time"	0 - 50%	20%	[Device Para /Recorders /Waveform rec]
Pre-trigger time 	The pre trigger time is settable up to a maximum of 50% of the Maximum file size setting.	0 - 50%	20%	[Device Para /Recorders /Waveform rec]
Max file size 	The maximum storage capacity per record is 10 seconds, including pre-trigger and post-trigger time. The waveform recorder has a total storage capacity of 120 seconds.	0.1 - 10.0s	2s	[Device Para /Recorders /Waveform rec]

Waveform Recorder Module Input States

Name	Description	Assignment via
Start1-I	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Waveform rec]
Start2-I	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Waveform rec]
Start3-I	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Waveform rec]
Start4-I	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Waveform rec]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Start5-l	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Waveform rec]
Start6-l	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Waveform rec]
Start7-l	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Waveform rec]
Start8-l	State of the module input:: Trigger event / start recording if:	[Device Para /Recorders /Waveform rec]

Waveform Recorder Module Signals

<i>Signal</i>	<i>Description</i>
Recording	Signal: Recording
Memory full	Signal: Memory Full
Clear fail	Signal: Clear Failure in Memory
Res all rec	Signal: All records deleted
Res record	Signal: Delete Record
Man. Trigger	Signal: Manual Trigger

Special Parameters of the Waveform Recorder

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
Rec state	Recording state	Ready	Ready, Recording, Writing file, Trigger Blo	[Operation /Status Display /Recorders /Waveform rec]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
Error code	Error code	OK	OK, Write err, Clear fail, Calculation err, File not found, Auto overwriting off	[Operation /Status Display /Recorders /Waveform rec]

Fault Recorder

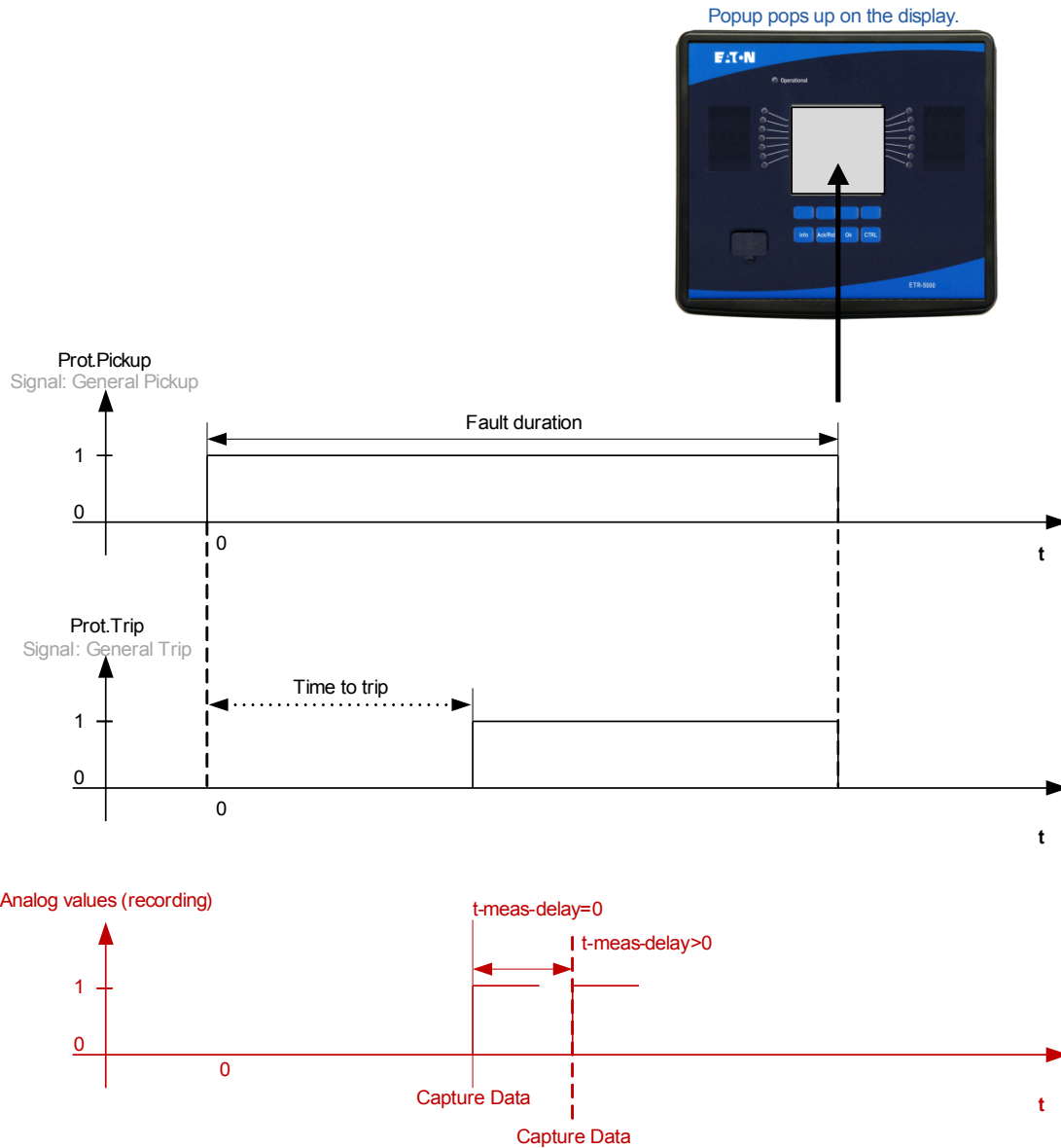
Fault rec

Purpose of the Fault recorder

The *Fault Recorder* provides compressed information about faults (e.g. Trip Causes). The compressed information can be read out also at the HMI. This might be helpful for fast fault analysis already at the HMI. After a fault, a popup window will be sent onto the display in order to draw the users attention to the fault. The *Fault Recorder* will provide information on the causes of the fault. A detailed fault analysis (in oscillographic form) can be done means of the Waveform Recorder. The reference between the Fault Records and the corresponding Waveform (Disturbance) Records are the »*Fault Number*« and the »*Grid Fault Number*«.

Definitions

- Time to Trip:** Time between *First Alarm* (Prot.Pickup) and *First Trip* (Prot.Trip) decision
- Fault Duration:** Time period from the rising edge of the General Pickup (»PROT.PICKUP«) signal up to the falling edge of the General Pickup Signal. Please note that General Pickup is an or-connection (disjunction) of all Pickup signals. General Trip is an OR-connection of all Trips.



Behavior of the Fault Recorder

Who triggers the Fault Recorder?

The *Fault Recorder* will be triggered by the rising edge of the »PROT.PICKUP« (General Pickup) signal. Please note that »PROT.PICKUP« (General Pickup) is an or-connection of all Pickup signals. The first Pickup will trigger the Fault recorder.

At which point of time will the fault measurements be captured?

The fault measurements will be captured (written) when the trip decision is taken. The point in time, when the measurements are captured (after a trip) can be delayed optionally by the parameter »*t-meas-delay*«. This might be reasonable in order to achieve more reliable measuring values (e.g. in order to avoid measuring disturbances caused by significant DC-components).

Modes

In case of a fault record should be written even if an general alarm has not lead to a trip, the parameter »*Record-Mode*« is to be set to »*Alarms and Pickups*« .

Set parameter »*Record-Mode*« to »*Trips only*«, if an Alarm that is not followed by a trip decision should not lead to a trip.

When does the overlay (popup) appears on the display of the HMI?

A popup will appear on the HMI display, when the General Pickup (Prot.Pickup) disappears.

NOTICE

No time to trip will be shown if the pickup signal that triggers the fault recorder is issued by another protection module than the trip signal. This might happen if more than one protection module is involved into a fault.

NOTICE

Please note: The parameter settings (thresholds etc.) that are shown in a fault record are not part of the fault record itself. They are always read out from the current device setting. If parameters settings that are shown in a fault record could have been updated, they will be indicated with an asterisk symbol within the fault record.

To prevent this please proceed as follows:

Save any fault record that should be archived to your local network/hard disk before doing any parameter change. Delete all the fault records in your fault recorder afterwards.

Memory

The last stored fault record is saved (fail-safe) within the *Fault Recorder* (the others are saved within a memory that depends on the auxiliary power of the protective relay). If there is no more memory free, the oldest record will be overwritten (FIFO). Up to 20 records can be stored.

How to close the overlay/popup?

By using Softkey »OK«.

How to find out fast, if a fault has lead to a trip or not?

Faults that lead to a trip will be indicated by a flash icon  (right side) within the overview menu of the fault recorder.

Which fault record pops up?

The newest fault.

Content of a Fault Record

A fault record comprises information about:

Date/Time	Date and Time of the Fault			
FaultNr	The number of the fault will be incremented with each fault (General Alarm or »PROT.PICKUP«)			
Grid Fault No.	This counter will be incremented by each General Pickup (Exception AR: this applies only to devices that offer auto reclosing).			
Active Set	The active parameter set			
Time to trip	The time between pickup and trip. Please note: No time to trip will be shown if the first pickup and the first trip are issued by different protection modules.			
Pickup	Name of the module that picked up first.			
Trip	Name of the module that tripped first. The information that will be displayed depends on which protection module has tripped. That means e.g. that the thresholds are shown. In case that the trip was initiated by the MotorStart (applies to motor protection relays) protection module, additional information will be displayed.			
Adaptive Set	In case that adaptive sets are used, the number of the active set will be displayed.			
Fault type	In case of overcurrent trips, the fault type will be evaluated based on the energized phases.			
	Pickup Phase A	Pickup Phase B	Pickup Phase C	Fault Type
	x			AG
		x		BG
			x	CG
	x	x		AB
		x	x	BC
	x		x	AC
	x	x	x	ABC
Direction	In case that a direction has been detected, the evaluated direction will be displayed (this applies to directional phase and ground overcurrent relays only).			
Measured Values	Various measuring values at the time of tripping (or delayed depending on parameter setting) will be displayed.			

How to set up the Fault Recorder

The »*Record-Mode*« will determine if trips only cause a fault record or if also Alarms without a consecutively trip should cause a fault record. This parameter is to be set within menu [Device Para\Recorders\Fault rec]

How to navigate within the Fault Recorder

<i>Navigation within the Fault recorder</i>	Softkey
Back to overview.	
Next (upper) item within this fault record.	
Previous fault record.	
Next (lower) item within this fault record.	

How to read Out the Fault Recorder

In order to read out a fault record there are two options available:

- Option 1: A Fault has popped up on the HMI (because an trip or pickup has occurred).
- Option 2: Call up manually the Fault recorder menu.

Option 1 (in case a fault record pops up on the display (overlay):

- Analyze the fault record by using Softkeys Arrow Up and Arrow Down.
- Or close the Popup by using Softkey OK

Option 2 :

- Call up the main menu;
- Call up the sub-menu »Operation/Recorders/Fault rec.«;
- Select a fault record; and
- Analyze the fault record by using Softkeys Arrow Up and Arrow Down.

How to Test the Fault Recorder

After generating an General Alarm Signal a fault record should be written.

Direct Commands of the Fault Recorder Module

Parameter	Description	Setting range	Default	Menu path
Res all rec 	Reset all records	Inactive, Active	Inactive	[Operation /Reset /Flags]

Global Protection Parameters of the Fault Recorder Module

Parameter	Description	Setting range	Default	Menu path
Record-Mode 	Recorder Mode (Set the behaviour of the recorder)	Pickups and Trips, Trips only	Trips only	[Device Para /Recorders /Fault rec]
t-meas-delay 	After the Trip, the measurement will be delayed for this time.	0 - 60ms	0ms	[Device Para /Recorders /Fault rec]

Fault Recorder Module Signals

Signal	Description
Res record	Signal: Delete Record

Event Recorder

Event rec

The event recorder can register up to 300 events and the last 50 (minimum) saved events are stored in non-volatile memory, and therefore retained when power is lost to the unit. The following information is provided for any of the events.

Events are logged as follows:

<i>Record No.</i>	<i>Fault No.</i>	<i>No of grid faults</i>	<i>Date of Record</i>	<i>Module Name</i>	<i>State</i>
Sequential Number	Number of the ongoing fault. This counter will be incremented by each General Pickup (Prot.Pickup).	A grid fault No. can have several Fault Nos. This counter will be incremented by each General Pickup. (Exception AR: this applies only to devices that offer auto reclosing).	Time stamp	What has changed?	Changed Value

There are three different classes of events.

•Alternation of binary states are shown as:

- 0->1 if the signal changes physically from »0« to »1«.
- 1->0 if the signal changes physically from »1« to »0«.

•Counters increment is shown as:

- Old Counter state -> New Counter state (e.g.: 3->4)

•Alternation of multiple states are shown as:

- Old state -> New state (e.g.: 0->2)

Read Out the Event Recorder

- Call up the »*main menu*«.
- Call up the sub-menu »*Operation/Recorders/Event rec*«.
- Select an event.

Direct Commands of the Event Recorder Module

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Res all rec 	Reset all records	Inactive, Active	Inactive	[Operation /Reset /Flags]

Event Recorder Module Signals

<i>Signal</i>	<i>Description</i>
Res all rec	Signal: All records deleted

Trend Recorder

Available Elements:

Trend rec

Configuring the Trend Recorder

The Trend Recorder is to be configured within [Device Para/Recorders/Trend Recorder] menu.

The User has to set the time interval. This defines the distance between two measuring points.

The User can select up to ten values that will be recorded.

Global Protection Parameters of the Trend Recorder

Parameter	Description	Setting range	Default	Menu path
Resolution 	Resolution (recording frequency)	60 min, 30 min, 15 min, 10 min, 5 min	15 min	[Device Para /Recorders /Trend rec]
Observed Value1 	Observed Value1	1..n, TrendRecList	CT.IA RMS	[Device Para /Recorders /Trend rec]
Observed Value2 	Observed Value2	1..n, TrendRecList	CT.IB RMS	[Device Para /Recorders /Trend rec]
Observed Value3 	Observed Value3	1..n, TrendRecList	CT.IC RMS	[Device Para /Recorders /Trend rec]
Observed Value4 	Observed Value4	1..n, TrendRecList	CT.IX meas RMS	[Device Para /Recorders /Trend rec]
Observed Value5 	Observed Value5	1..n, TrendRecList	CT.%(I2/I1)	[Device Para /Recorders /Trend rec]
Observed Value6 	Observed Value6	1..n, TrendRecList	49.I2T Used	[Device Para /Recorders /Trend rec]
Observed Value7 	Observed Value7	1..n, TrendRecList	RTD.Hottest WD	[Device Para /Recorders /Trend rec]

Parameter	Description	Setting range	Default	Menu path
Observed Value8 	Observed Value8	1..n, TrendRecList	RTD.Hottest MB	[Device Para /Recorders /Trend rec]
Observed Value9 	Observed Value9	1..n, TrendRecList	RTD.Hottest LB	[Device Para /Recorders /Trend rec]
Observed Value10 	Observed Value10	1..n, TrendRecList	RTD.Hottest Aux	[Device Para /Recorders /Trend rec]

Trend Recorder Module Signals (Output States)

Signal	Description
Hand Reset	Hand Reset

Direct Commands of the Trend Recorder

Parameter	Description	Setting range	Default	Menu path
Reset 	Delete all entries	Inactive, Active	Inactive	[Operation /Reset /Flags]

Counter Values of the Trend Recorder

Value	Description	Default	Size	Menu path
Max avail Entries	Maximum available entries in the current configuration	0	0 - 9999999999	[Operation /Count and RevData /Trend rec]

Global Values of the Trend Recorder

Name	Description
.-.	No assignment
CT.IA Fund.	Measured value: Phase current (Fundamental)
CT.IB Fund.	Measured value: Phase current (Fundamental)
CT.IC Fund.	Measured value: Phase current (Fundamental)
CT.IX meas Fund.	Measured value (measured): IX (Fundamental)
CT.IR calc Fund.	Measured value (calculated): IR (Fundamental)
CT.IA RMS	Measured value: Phase current (RMS)
CT.IB RMS	Measured value: Phase current (RMS)
CT.IC RMS	Measured value: Phase current (RMS)
CT.IX meas RMS	Measured value (measured): IX (RMS)
CT.IR calc RMS	Measured value (calculated): IR (RMS)
CT.I0 Fund.	Measured value (calculated): Zero current (Fundamental)
CT.I1 Fund.	Measured value (calculated): Positive phase sequence current (Fundamental)
CT.I2 Fund.	Measured value (calculated): Unbalanced load current (Fundamental)
CT.%(I2/I1)	Measured value (calculated): I2/I1, phase sequence will be taken into account automatically.

Name	Description
CT.%(I2/I1) max	Measured value (calculated): I2/I1 maximum value, phase sequence will be taken into account automatically
CT.IA avg RMS	IA average value (RMS)
CT.IB avg RMS	IB average value (RMS)
CT.IC avg RMS	IC average value (RMS)
MStart.IA FLA	Measured value: Phase current multiples of FLA
MStart.IB FLA	Measured value: Phase current multiples of FLA
MStart.IC FLA	Measured value: Phase current multiples of FLA
MStart.I3 PFLA avg	Average RMS current of all 3 phases as multiples of FLA
49.I2T Used	Thermal capacity used.
URTD.WD1	Winding 1
URTD.WD1 max	Winding1 Maximum Value
URTD.WD2	Winding 2
URTD.WD2 max	Winding2 Maximum Value
URTD.WD3	Winding 3
URTD.WD3 max	Winding3 Maximum Value
URTD.WD4	Winding 4
URTD.WD4 max	Winding4 Maximum Value
URTD.WD5	Winding 5
URTD.WD5 max	Winding5 Maximum Value
URTD.WD6	Winding 6
URTD.WD6 max	Winding6 Maximum Value
URTD.MB1	Motor Bearing 1
URTD.MB1 max	Motor Bearing1 Maximum Value
URTD.MB2	Motor Bearing 2
URTD.MB2 max	Motor Bearing2 Maximum Value
URTD.LB1	Load Bearing 1
URTD.LB1 max	Load Bearing1 Maximum Value
URTD.LB2	Load Bearing 2
URTD.LB2 max	Load Bearing2 Maximum Value
URTD.Aux1	Auxiliary1
URTD.Aux1 max	Auxiliary1 Maximum Value
URTD.Aux2	Auxiliary2
URTD.Aux2 max	Auxiliary2 Maximum Value
URTD.RTD Max	Maximum temperature of all channels.
RTD.Hottest WD	Hottest motor winding temperature in degrees C.
RTD.Hottest MB	Hottest motor bearing temperature in degrees C. Resettable with "Sys Res OperationsCr" or "All".

<i>Name</i>	<i>Description</i>
RTD.Hottest LB	Hottest load bearing temperature in degrees C. Resettable with "Sys Res OperationsCr" or "All".
RTD.Hottest Aux	Hottest Auxiliary temperature in degrees C. Resettable with "Sys Res OperationsCr" or "All".

Motor Start Recorder

Available Elements:

Start rec

The Motor Start Recorder logs information during a motor start-up. These records are stored in a fail-safe manner and the capacity allows for recording up to 5 start-ups. After 5 start-ups, every following start-up overwrites the recording of the oldest one („First in First out“ principle).

- *IL1 max RMS, IL2 max RMS, IL3 max RMS* Every recording consists of a summary of information and recorded analog trends. However, the exact set of data is dependent on the ordered device variant. The summary data can be accessed using PowerPort-E or via the front panel interface of the relay. This feature provides information recorded at the time of each start of the motor such as:
 - Date of the motor start event
 - Record number
 - *IL1 max RMS, IL2 max RMS, IL3 max RMS, IG max RMS* – Maximum RMS phase current of the respective phase
 - *Unbalance max* – Maximum current unbalance during the motor start-up
 - *I avg* – Average current of all three phases at the time of the start-to-run transition
 - *Speed* – The motor nominal speed (1 or 2)
 - Time (duration) values:
 - *tS-tI* – The time that elapses from the start until the current value drops below the set start-up threshold
 - *tS-tR* – The time that elapses from the start until the motor is running, or – in case of an incomplete start sequence – until the trip command
 - *I2T Used* – Thermal capacity used, specified as percentage of the maximum thermal capacity
 - *Start success* – This is set to 1 if the motor start has been successful (and equals 0 otherwise).

PowerPort-E allows for storing the summary information as text files, or have them printed out.

The analog trends can be viewed using the *Quality Manager* software. Examples for recorded analog trends are:

- Phase current values
- Current unbalance
- Thermal capacity
- Temperatures (in case an RTD box is fitted)

Managing Start Records

The start recorder data can be downloaded by means of *PowerPort-E* from the device.

- Start *PowerPort-E* if this has not been done already.
 - If the data has not been downloaded from the device yet, select the menu item “Receive Start Recorder” in the “Device” menu.
 - Within the navigation tree, double-click the “Operation” icon.
 - Go to the [Operation / Recorders] menu. Here the user will find the “Start Rec” menu item.
 - By selecting “Start Rec”, the Start Recorder Window will appear
-
-  To access data that has been stored in the device using *PowerPort E*, the User must select the “Receive Start Recorder” button in the upper left hand corner of the “Start Rec” window. When clicked, the *PowerPort-E* software will retrieve the highlighted record from the device.
 -  After selecting one of the max. 5 recordings a summary of the Start Recorder data can be retrieved (for the selected recording) by clicking the “Receive Summary Data” button in the upper left hand corner of the “Start Rec” window.
 -  A list of all currently available Start Records is viewable by selecting the “Refresh Start Recorder” button on the start recorder.
 -  It is possible to delete individual records that are stored on the protective device. First, select “Receive Start Recorder”, and then select the record to be deleted by clicking on the record number, followed by the selection of the “Delete Start Record” button in the upper left hand corner of the “Start Rec” window.
 -  To permanently remove all start records within a device's start recorder, select the “Delete All Start Records” button also located in the upper left hand corner of the “Start Rec” window. This will remove all previously stored start records within the device to which the user is presently connected.
 -  Open a Start Record file from a local storage device. Please note that it is possible to compare an archived Start Record against archived Parameter settings that are also stored on a local device. Read the “Caution” information below (page 184).

When using *PowerPort-E* to view the Start Recorder data, the Start Recorder features can also be found by right clicking anywhere within the “Start Rec” window.

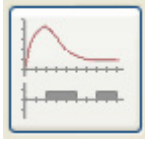
NOTICE

The “Print” button takes the user to the printing dialogue, where it is possible to export the summary into a text file. This is done the following way:

- Retrieve the data in the “Start Rec” window, as described above.
- Click on the button „Receive Summary Data“.
- Click on the “Print” button.
- Click on the button “Export to file”.
- Enter a valid file name.
- Select the file path.
- Click on the “Save” button.

Displaying Start Records

When a Start Record is called up, a window with the following options pops up.



View motor start data graphically in the *Quality Manager* software. In the *Quality Manager* software the user can view the RMS value of the phase currents, thermal capacity used, and temperatures measured by the URTD module if a URTD is installed and attached to the relay.



View motor start data overlaid with the Motor Protection Curves (Starting Profile Plot versus Protection limits). The user can view the average current recorded during the motor start versus protection elements such as 50P, or the Thermal Model. The user has the option to alter the displayed setting groups.

Please note that protective elements, that are not projected within the device planning, won't be visible.

The Starting Profile Plot offers two User Scenarios:

1. Adapting the protection settings to the recorded start curve. The User will see the impact of parameter changes in the Profile Plot. By means of this he can decide if the relay settings match the protection requirements.
2. Analyzing a Start Record. Since a Start Record does not include the relay settings, the User has to ensure, that backups of the relay settings are available that were valid at the time of recording.



Please Note that the Starting Profile Plot shows the recorded average current versus the current relay settings. The relay settings itself are not part of a Start Record.

Adaptive parameters and their impacts wont be visible within the Starting Profile.

Blockings wont be visible within the Starting Profile.

Please make sure to save the setting files together with this record to guarantee the graph represents the conditions of when this event occurred.

Global Protection Parameters of the Motor Start Recorder

Parameter	Description	Setting range	Default	Menu path
Resolution 	Resolution (recording frequency)	50ms, 100ms, 1s	50ms	[Device Para /Recorders /Start rec]

Motor Start Recorder Module Signals (Output States)

Signal	Description
Storing	Signal: Data are saved

Direct Commands of the Motor Start Recorder Module

Parameter	Description	Setting range	Default	Menu path
Res StartRec 	Delete all start recorder records	Inactive, Active	Inactive	[Operation /Reset /Flags]
Res StatisticRec 	Delete all statistic recorder records (start trending)	Inactive, Active	Inactive	[Operation /Reset /Flags]

Statistic Recorder

The Statistic Recorder shows motor specific statistical data on a monthly base.

The Statistic Recorder can record up to 24 monthly reports. The reports are power fail safe stored.

In order to view information from the Statistic Recorder, the User has to select [Operation/Recorder/Statisticrec] from the menu tree.

By double clicking on the »Date of Record« statistics information can be viewed such as the number of starts, the number of successful starts, the average start time, the »*average I²T*« value during any start, and the average of all maximum currents value seen during each start.

History Function

The History function, accessible under the Operations menu, can be utilized as a counter or log of specific occurrences monitored by the device. The types of occurrence that can be recorded include:

- Operations (OperationsCr);
- Alarms (AlarmCr);
- Trips (TripCr); and
- Totals (TotalCr).

To View and/or Reset History Records at the Device

1. Press the softkey under Menu in the display to access the “Operation” menu.
2. Press the right arrow softkey to access the Operation functions.
3. Use the softkeys under the up and down arrows to select “History” then press the softkey under the right arrow to access the History functions.
4. Scroll to the type of occurrence to be viewed or reset then press the right arrow softkey
5. Scroll to the counter to be viewed or reset then press the right arrow softkey to access the counter. The recorded data for the selected counter will be shown in the display. If the counter is not to be reset, use the softkeys to return to the main menu.
6. To reset the counter, press the “Ack/Rst” softkey then press the softkey under the “Wrench” icon.
7. Using the softkeys, enter the password then press the “OK” softkey.
8. Press the softkey under “Yes” to reset the counter. Once the counter has been reset, use the softkeys to return to the main menu.

Time Synchronization

TimeZones

The device gives the User the ability to synchronize the device with a central time generator. This provides the following advantages:

- The time does not drift from the reference time. A continuously accumulating deviation of the reference time thereby will be balanced. Also refer to the Specifications (Tolerances Real Time Clock) section.
- All time synchronized devices operate with the same time. Therefore, logged events of the individual devices can be compared exactly and be evaluated (single events of the event recorder, waveform records).

The device's time can be synchronized via the following protocols:

- IRIG-B;
- SNTP;
- Communication protocol Modbus (RTU or TCP);
- Communication protocol DNP3.

These protocols use different hardware interfaces and are different in accuracy. Further information can be found in the Specifications section.

<i>Used Protocol</i>	<i>Hardware-Interface</i>	<i>Recommended Application</i>
Without time synchronization	---	Not recommended.
IRIG-B	IRIG-B Terminal	Recommend, if interface available.
SNTP	RJ45 (Ethernet)	Recommend alternative to IRIG-B, especially when using IEC 61850 or Modbus TCP.
Modbus RTU	RS485, D-SUB or Fiber Optic	Recommend when using Modbus RTU communication protocol and when no IRIG-B real time clock is available.
Modbus TCP	RJ45 (Ethernet)	Limited recommendation when Modbus TCP communication protocol is used and when no IRIG-B real time clock or an SNTP server is available.
DNP3	RS485 or RJ45 (Ethernet)	Limited recommendation when using the DNP3 communication protocol and no IRIG-B real time clock or an SNTP server is available

Accuracy of Time Synchronization

The accuracy of the device's synchronized system time depends on different factors:

- Accuracy of the connected time generator;
- Synchronization protocol that is used; and
- At Modbus TCP, SNTP and DNP3 TCP/UDP: Network load and data package transmission times

NOTICE

Please consider the accuracy of the time generator used. Deviations of the time generator's time causes the same deviations on the device's system time.

Selection of Timezone and Synchronization Protocol

The protection relay masters both UTC and local time. This means that the device can be synchronized with UTC time while using local time for user display.

Time Synchronization with UTC time (recommended):

Time synchronization is usually done using UTC time. This means for example that an IRIG-B time generator is sending UTC time information to the protection relay. This is the recommended use case, since here a continuous time synchronization can be ensured. There are no “leaps in time” through change of Daylight Savings Time.

To achieve that the device shows the current local time, the timezone and the change to Daylight Savings Time can be configured.

Please carry out the following setting steps under [Device Para/ Time]:

1. Select your local timezone in the timezone menu.
2. There also configure the switching of daylight savings time.
3. Select the used time synchronization protocol in the TimeSync menu (e.g. “IRIG-B”).
4. Set the parameters of the synchronization protocol (refer to the according chapter).

Time Synchronization with local time:

Should the time synchronization however be done using local time, then please leave the timezone to »UTC+0 London« and do not use switching of daylight saving time.

NOTICE

The synchronization of the relay's system time is exclusively done by the synchronization protocol selected in the menu [Device Para/ Time/ TimeSync/ Used Protocol].

Without Time Synchronization:

To achieve that the device shows the current local time, the timezone and the change to Daylight Savings Time can be configured.

Please carry out the following setting steps under [Device Para/ Time]:

1. Select your local timezone in the timezone menu.
2. There also configure the switching of daylight savings time.
3. Select »manual« as your used protocol in the TimeSync menu.
4. Set date and time.

Global Protection Parameters of the Time Synchronization

Parameter	Description	Setting range	Default	Menu path
 DST offset	Difference to wintertime	-180 - 180min	60min	[Device Para /Time /Timezone]
 DST manual	Manual setting of the Daylight Saving Time	Inactive, Active	Active	[Device Para /Time /Timezone]
 Summertime	Daylight Saving Time Only available if: DST manual = Active	Inactive, Active	Inactive	[Device Para /Time /Timezone]
 Summertime m	Month of clock change summertime Only available if: DST manual = Inactive	January, February, March, April, May, June, July, August, September, October, November, December	March	[Device Para /Time /Timezone]
 Summertime d	Day of clock change summertime Only available if: DST manual = Inactive	Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, General day	Sunday	[Device Para /Time /Timezone]
 Summertime w	Place of selected day in month (for clock change summertime) Only available if: DST manual = Inactive	First, Second, Third, Fourth, Last	Last	[Device Para /Time /Timezone]

Parameter	Description	Setting range	Default	Menu path
Summertime h 	Hour of clock change summertime Only available if: DST manual = Inactive	0 - 23h	2h	[Device Para /Time /Timezone]
Summertime min 	Minute of clock change summertime Only available if: DST manual = Inactive	0 - 59min	0min	[Device Para /Time /Timezone]
Wintertime m 	Month of clock change wintertime Only available if: DST manual = Inactive	January, February, March, April, May, June, July, August, September, October, November, December	October	[Device Para /Time /Timezone]
Wintertime d 	Day of clock change wintertime Only available if: DST manual = Inactive	Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, General day	Sunday	[Device Para /Time /Timezone]
Wintertime w 	Place of selected day in month (for clock change wintertime) Only available if: DST manual = Inactive	First, Second, Third, Fourth, Last	Last	[Device Para /Time /Timezone]
Wintertime h 	Hour of clock change wintertime Only available if: DST manual = Inactive	0 - 23h	3h	[Device Para /Time /Timezone]

Parameter	Description	Setting range	Default	Menu path
Wintertime min 	Minute of clock change wintertime Only available if: DST manual = Inactive	0 - 59min	0min	[Device Para /Time /Timezone]

Parameter	Description	Setting range	Default	Menu path
Time Zones 	Time Zones	UTC+14 Kiritimati, UTC+13 Rawaki, UTC+12.75 Chatham Island, UTC+12 Wellington, UTC+11.5 Kingston, UTC+11 Port Vila, UTC+10.5 Lord Howe Island, UTC+10 Sydney, UTC+9.5 Adelaide, UTC+9 Tokyo, UTC+8 Hong Kong, UTC+7 Bangkok, UTC+6.5 Rangoon, UTC+6 Colombo, UTC+5.75 Kathmandu, UTC+5.5 New Delhi, UTC+5 Islamabad, UTC+4.5 Kabul, UTC+4 Abu Dhabi, UTC+3.5 Tehran, UTC+3 Moscow, UTC+2 Athens, UTC+1 Berlin, UTC+0 London, UTC-1 Azores,	UTC+0 London	[Device Para /Time /Timezone]

Parameter	Description	Setting range	Default	Menu path
TimeSync 	Time synchronization	-, IRIG-B, SNTP, Modbus, DNP	-	[Device Para /Time /TimeSync /TimeSync]

Signals (Output States) of the Time Synchronization

\$(AppStateOutTemplate:TimeZone_appStateOut)

SNTP

SNTP

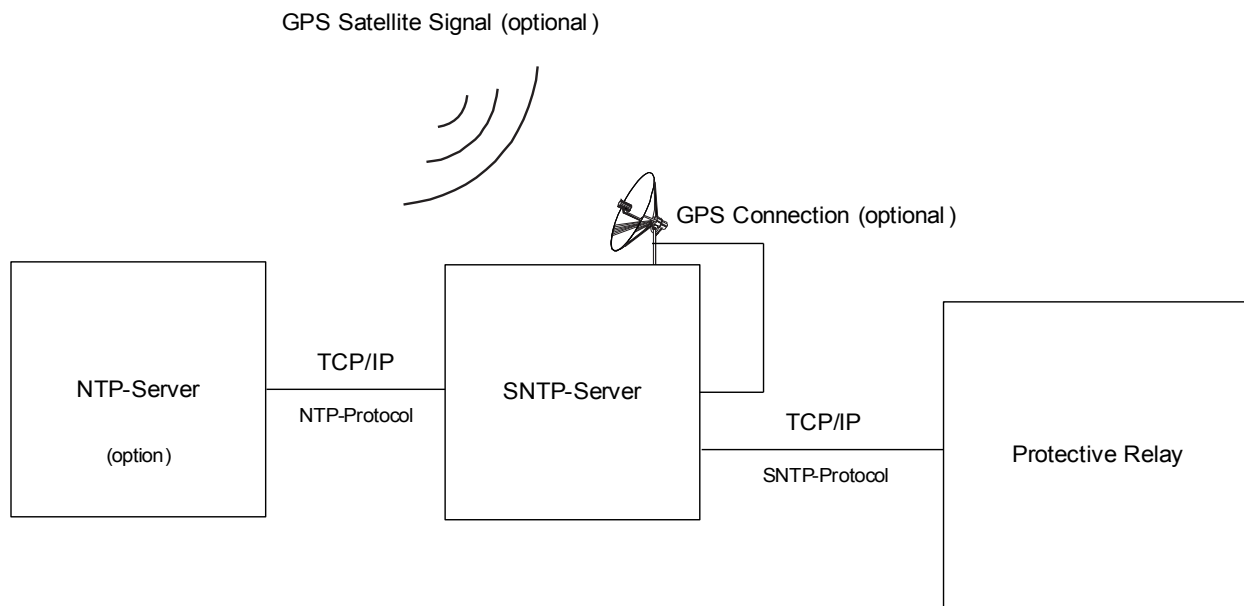
NOTICE

Important pre-condition: The device needs to have access to an SNTP server via the connected network. This server preferably should be installed locally.

Principle – General Use

SNTP is a standard protocol for time synchronization via a network. At minimum, one SNTP server has to be integrated into the network. The device can be configured for one or two connected SNTP servers.

The device's system time will be synchronized by the connected SNTP server 1 to 4 times per minute. In turn, the SNTP server synchronizes its time via NTP with other NTP servers. This is the normal case. Alternatively it can receive its time via GPS, radio controlled clock, or the like.



Accuracy

The accuracy of the SNTP server used and the accuracy of its reference clock influences the accuracy of the protection relay's clock.

With each transmitted time information, the SNTP server sends information about its accuracy:

- **Stratum:** The stratum gives information on how close the SNTP server within the cluster is to other NTP servers that are connected to an atomic clock. (If the server's "stratum" has been set manually, it is not an indication of its quality or reliability.)
- **Precision:** This is the accuracy, the SNTP server provides the system time.

Also the performance (traffic and data package transmission time) of the connected network has an influence on the accuracy of the time synchronization. A locally installed SNTP server with an accuracy of $\leq 200 \mu\text{sec}$ is recommended. If this cannot be provided, the connected server's accuracy can be checked in the [Operation/Status Display/Time Sync.] menu:

- The server quality gives information about the accuracy of the used server. The quality should be GOOD or SUFFICIENT. A server with BAD quality should not be used because this could cause fluctuations of the time synchronization
- The network quality gives information about the network's load and data package transmission time. The quality should be GOOD or SUFFICIENT. A network with BAD quality should not be used because this could cause fluctuations during time synchronization

Using two SNTP Servers

When configuring two SNTP servers, the device always synchronizes to server 1 by default.

If server 1 fails, the device automatically switches to server 2.

When (after a failure) server 1 recovers, the device switches back to server 1.

SNTP Commissioning

Activate the SNTP time synchronization by means of the [Device Para/ Time/ TimeSync] menu:

- Select »*SNTP*« in the time synchronization menu.
- Set the IP address of the first server in the SNTP menu.
- Set the IP address of the second server, if available.
- Set all configured servers to "active".

Fault Analysis

If there is no SNTP signal for more than 120 seconds., the SNTP status changes from “active” to “inactive” and an entry in the Event Recorder will be set.

The SNTP functionality can be checked in the [Operation/Status Display/Time Sync./Sntp] menu.

If the SNTP status is not “active”, please proceed as follows:

- Check if the wiring is correct (Ethernet-cable connected).
- Check if a valid IP address is set in the device (Device Para/TCP/IP).
- Check if the IP address of the SNTP server is set in the device (Device Para/ Time/ TimeSync/ SNTP).
- Check if SNTP is used for time synchronization (Device Para/ Time/ TimeSync/ TimeSync).
- Check if the Ethernet connection is active (Device Para/TCP/IP/Link = Up?).
- Check if the SNTP server as well as the protection device answers to a Ping.
- Check if the SNTP server is up and working.

Device Planning Parameters of the SNTP

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Do not use, Use	Do not use	[Device Planning]

Direct Commands of the SNTP

Parameter	Description	Setting range	Default	Menu path
Res Counter 	Reset all Counters.	Inactive, Active	Inactive	[Operation /Reset /Counter]

Global Protection Parameters of the SNTP

Parameter	Description	Setting range	Default	Menu path
Server1 	Server 1	Inactive, Active	Inactive	[Device Para /Time /TimeSync /SNTP]
IP Byte1 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]
IP Byte2 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]
IP Byte3 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]
IP Byte4 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]

Parameter	Description	Setting range	Default	Menu path
Server2 	Server 2	Inactive, Active	Inactive	[Device Para /Time /TimeSync /SNTP]
IP Byte1 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]
IP Byte2 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]
IP Byte3 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]
IP Byte4 	IP1.IP2.IP3.IP4	0 - 255	0	[Device Para /Time /TimeSync /SNTP]

Signals of the SNTP

Signal	Description
SNTP active	Signal: If there is no valid SNTP signal for 120 sec, SNTP is regarded as inactive.

SNTP Counters

Value	Description	Default	Size	Menu path
NoOfSyncs	Total Number of Synchronizations.	0	0 - 9999999999	[Operation /Count and RevData /TimeSync /SNTP]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NoOfConnectLost	Total Number of lost SNTP Connections (no sync for 120 sec).	0	0 - 9999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfSmallSyncs	Service counter: Total Number of very small Time Corrections.	0	0 - 9999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfNormSyncs	Service counter: Total Number of normal Time Corrections.	0	0 - 9999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfBigSyncs	Service counter: Total Number of big Time Corrections.	0	0 - 9999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfFiltSyncs	Service counter: Total Number of filtered Time Corrections.	0	0 - 9999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfSlowTrans	Service counter: Total Number of slow Transfers.	0	0 - 9999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfHighOffs	Service counter: Total Number of high Offsets.	0	0 - 9999999999	[Operation /Count and RevData /TimeSync /SNTP]
NoOfIntTimeouts	Service counter: Total Number of internal timeouts.	0	0 - 9999999999	[Operation /Count and RevData /TimeSync /SNTP]
StratumServer1	Stratum of Server 1	0	0 - 9999999999	[Operation /Status Display /TimeSync /SNTP]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
StratumServer2	Stratum of Server 2	0	0 - 9999999999	[Operation /Status Display /TimeSync /SNTP]

SNTP Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
Used Server	Which Server is used for SNTP synchronization.	None	Server1, Server2 , None	[Operation /Status Display /TimeSync /SNTP]
PrecServer1	Precision of Server 1	0ms	0 - 1000.00000 ms	[Operation /Status Display /TimeSync /SNTP]
PrecServer2	Precision of Server 2	0ms	0 - 1000.00000 ms	[Operation /Status Display /TimeSync /SNTP]
ServerQlty	Quality of Server used for Synchronization (GOOD, SUFFICIENT, BAD)	-	GOOD, SUFFICIENT, BAD, -	[Operation /Status Display /TimeSync /SNTP]
NetConn	Quality of Network Connection (GOOD, SUFFICIENT, BAD).	-	GOOD, SUFFICIENT, BAD, -	[Operation /Status Display /TimeSync /SNTP]

IRIG-B00X

IRIG-B

NOTICE

Requirement: An IRIG-B00X time code generator is needed. IRIG-B004 and higher will support/transmit the “year information”.

If you are using an IRIG time code that does not support the “year information” (IRIG-B000, IRIG-B001, IRIG-B002, IRIG-B003), you have to set the “year” manually within the device. In these cases the correct year information is a precondition for a properly working IRIG-B.

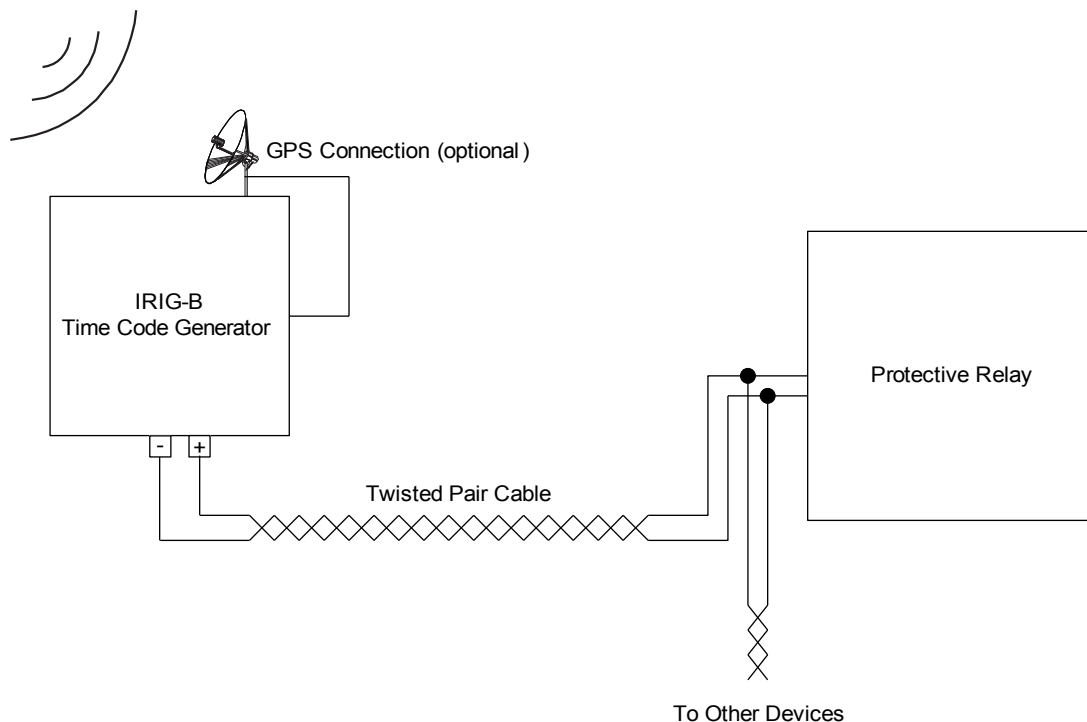
Principle - General Use

The IRIG-B standard is the most used standard to synchronize the time of protection devices in medium voltage applications. The protection device supports IRIG-B according to the IRIG STANDARD 200-04.

This means that all time synchronization formats IRIG-B00X (IRIG-B000 / B001 / B002 / B003 / B004 / B005 / B006 / B007) are supported. It is recommended to use IRIG-B004 and higher which also transmits the “year information”.

The system time of the protection device is being synchronized with the connected IRIG-B code generator once a second. The accuracy of the used IRIG-B code generator can be increased by connecting a GPS-receiver to it.

GPS Satellite Signal (optional)



The location of the IRIG-B interface depends to the device type. Please refer to the wiring diagram supplied with the protective device.

IRIG-B Commissioning

Activate the IRIG-B synchronization within menu [Device Para/ Time/ TimeSync]:

- Select »IRIG-B« in the time synchronization menu.
- Set the time synchronization in the IRIG-B menu to »Active«.
- Select the IRIG-B type (choose B000 through B007).

Fault Analysis

If the device does not receive any IRIG-B time code for more than 60 s, the IRIG-B status switches from »active« to »inactive« and there is created an entry within the Event Recorder.

Check the IRIG-B functionality through the menu [Operation/ Status display/ TimeSync/ IRIG-B]:

Should the IRIG-B status not be reported as being »active«, please proceed as follows:

- To begin with check the IRIG-B wiring.
- Check, if the correct IRIG-B00X type is configured.

IRIG-B Control Commands

In addition to the date and time information, the IRIG-B code offers the option to transmit up to 18 control commands that can be processed by the protective device. They have to be set and issued by the IRIG-B code generator.

The protective device offers up to 18 IRIG-B assignment options for those control commands in order to carry out the assigned action. If there is a control command assigned to an action, this action is being triggered as soon as the control command is transmitted as being true. As an example there can be triggered the start of statistics or the street lighting can be switched on through a relay.

NOTICE

IRIG-B control commands are not recorded by Event and Disturbance Recorders.

If it is required to have a control signal recorded the best way is to use a Logic (1 gate) equation, because the Programmable Logic always gets recorded.

Device Planning Parameters of the IRIG-B00X

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Do not use, Use	Do not use	[Device Planning]

Direct Commands of the IRIG-B00X

Parameter	Description	Setting range	Default	Menu path
Res IRIG-B Cr 	Resetting of the Diagnosis Counters: IRIG-B	Inactive, Active	Inactive	[Operation /Reset /Counter]

Global Protection Parameters of the IRIG-B00X

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Device Para /Time /TimeSync /IRIG-B]
IRIG-B00X 	Determination of the Type: IRIG-B00X. IRIG-B types differ in types of included "Coded Expressions" (year, control-functions, straight-binary-seconds).	IRIGB-000, IRIGB-001, IRIGB-002, IRIGB-003, IRIGB-004, IRIGB-005, IRIGB-006, IRIGB-007	IRIGB-000	[Device Para /Time /TimeSync /IRIG-B]

Signals of the IRIG-B00X (Output States)

Signal	Description
IRIG-B active	Signal: If there is no valid IRIG-B signal for 60 sec, IRIG-B is regarded as inactive.
High-Low Invert	Signal: The High and Low signals of the IRIG-B are inverted. This does NOT mean that the wiring is faulty. If the wiring is faulty no IRIG-B signal will be detected.

<i>Signal</i>	<i>Description</i>
Control Signal1	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal2	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal3	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal4	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal5	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal6	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal7	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal8	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal9	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal10	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal11	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal12	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal13	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal14	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal15	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).

<i>Signal</i>	<i>Description</i>
Control Signal16	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal17	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
Control Signal18	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).

IRIG-B00X Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NoOfFramesOK	Total number valid Frames.	0	0 - 65535	[Operation /Count and RevData /TimeSync /IRIG-B]
NoOfFrameErrors	Total Number of Frame Errors. Physically corrupted Frame.	0	0 - 65535	[Operation /Count and RevData /TimeSync /IRIG-B]
Edges	Edges: Total number of rising and falling edges. This signal indicates if a signal is available at the IRIG-B input.	0	0 - 65535	[Operation /Count and RevData /TimeSync /IRIG-B]

Device Parameters

Sys

Date and Time

In the »*Device parameters/Date/Time*« menu, the User can set the date and time.

NOTICE

The User cannot set time and date manually (manual changes will be ignored), if the clock of the protective device is synchronized automatically (e.g. via IRIG-B or SNTP).

Version

Within the »*Device parameters/Version*« menu, the User can obtain information on the software and hardware versions.

TCP/IP Settings

WARNING

Warning: Mixing up IP Addresses

(In case there is more than one protective device within the TCP/IP network or establishing an unintentional wrong connection to a protective device based on a wrong entered IP address.

Transferring parameters into the wrong protective device might lead to death, personal injury, or damage of electrical equipment.

In order to prevent faulty connections, the User **MUST** document and maintain a list with the IP addresses of any switchboard/protective devices.

The User **MUST** double check the IP addresses of the connection that is to be established. That means, the User **MUST** first read out the IP address at the HMI of the device (within menu [Device para/TCP IP]) then compare the IP address with the list. If the addresses are identical, establish the connection. If they are not, **DO NOT** establish the connection.

Within »Device Para / TCP/IP/TCP/IP Config« menu, the TCP/IP settings have to be set.

The first-time setting of the TCP/IP Parameters can be done at the panel (HMI) only.

NOTICE

Establishing a connection via TCP/IP to the device is only possible if the device is equipped with an Ethernet interface (RJ45).

Contact your IT administrator in order to establish the network connection.

Set the TCP/IP Parameters:

Call up »Device parameter/TCP/IP/TCP/IP Config« at the HMI (panel) and set the following parameters:

- TCP/IP address;
- Subnetmask; and
- Gateway.

Direct Commands of the System Module

Parameter	Description	Setting range	Default	Menu path
Ack RO LED Comm TCmd 	Reset the Relay Outputs, LEDs, Communication, and the Trip Command.	Inactive, Active	Inactive	[Operation /Reset /Flags]
Ack LED 	All acknowledgeable LEDs will be acknowledged.	Inactive, Active	Inactive	[Operation /Reset /Flags]
Ack RO 	All acknowledgeable Relay Outputs will be acknowledged.	Inactive, Active	Inactive	[Operation /Reset /Flags]
Ack Comm 	Communication will be acknowledged.	Inactive, Active	Inactive	[Operation /Reset /Flags]
Res OperationsCr 	Reset all counters in history group operations	Inactive, Active	Inactive	[Operation /Reset /History]
Res AlarmCr 	Reset all counters in history group alarms	Inactive, Active	Inactive	[Operation /Reset /History]
Res TripCmdCr 	Reset all counters in history group trips	Inactive, Active	Inactive	[Operation /Reset /History]
Res TotalCr 	Reset all counters in history group total	Inactive, Active	Inactive	[Operation /Reset /History]
Res All 	Reset of all Counters	Inactive, Active	Inactive	[Operation /Reset /History]
Reboot 	Rebooting the device.	No, Yes	No	[Service /General]

Parameter	Description	Setting range	Default	Menu path
MaintMode Manually 	Arc Flash Reduction Maintenance Switch Mode: Manual Activation of the Arc Flash Reduction Mode Only available if: Maint Mode = Activation Manually	Maint Mode inactive, Activation via Comm, Activation via DI, Inactive, Active	Inactive	[Service /MaintMode Manually]
Program Mode Bypass 	Short-period bypass of the Program Mode.	Inactive, Active	Inactive	[System Para]

CAUTION

CAUTION: Manually rebooting the device will release the Supervision Contact.

Global Protection Parameters of the System

Parameter	Description	Setting range	Default	Menu path
PSet-Switch 	Switching Parameter Set	PS1, PS2, PS3, PS4, PSS via Inp fct, PSS via Comm	PSS via Inp fct	[Protection Para /PSet-Switch]
PS1: Activated by 	This Setting Group will be the active one if: The Parameter Setting Group Switch is set to "Switch via Input" and the other three input functions are inactive at the same time. In case there is more than one input function active, no Parameter Setting Group Switch will be executed. In case all input functions are inactive, the device will keep working with the Setting Group that was activated lastly. Only available if: PSet-Switch = PSS via Inp fct	1..n, PSS	Sys.Maint Mode Inactive	[Protection Para /PSet-Switch]
PS2: Activated by 	This Setting Group will be the active one if: The Parameter Setting Group Switch is set to "Switch via Input" and the other three input functions are inactive at the same time. In case there is more than one input function active, no Parameter Setting Group Switch will be executed. In case all input functions are inactive, the device will keep working with the Setting Group that was activated lastly. Only available if: PSet-Switch = PSS via Inp fct	1..n, PSS	Sys.Maint Mode Active	[Protection Para /PSet-Switch]
PS3: Activated by 	This Setting Group will be the active one if: The Parameter Setting Group Switch is set to "Switch via Input" and the other three input functions are inactive at the same time. In case there is more than one input function active, no Parameter Setting Group Switch will be executed. In case all input functions are inactive, the device will keep working with the Setting Group that was activated lastly. Only available if: PSet-Switch = PSS via Inp fct	1..n, PSS	.-	[Protection Para /PSet-Switch]

Parameter	Description	Setting range	Default	Menu path
PS4: Activated by 	This Setting Group will be the active one if: The Parameter Setting Group Switch is set to "Switch via Input" and the other three input functions are inactive at the same time. In case there is more than one input function active, no Parameter Setting Group Switch will be executed. In case all input functions are inactive, the device will keep working with the Setting Group that was activated lastly. Only available if: PSet-Switch = PSS via Inp fct	1..n, PSS	.-	[Protection Para /PSet-Switch]
Remote Reset 	Enables or disables the option to acknowledge from external/remote via signals (assignments) and Communication.	Inactive, Active	Active	[Device Para /Ex Acknowledge]
Ack LED 	All acknowledgeable LEDs will be acknowledged if the state of the assigned signal becomes true. Only available if: Remote Reset = Active	1..n, Assignment List	.-	[Device Para /Ex Acknowledge]
Ack RO 	All acknowledgeable Relay Outputs will be acknowledged if the state of the assigned signal becomes true. Only available if: Remote Reset = Active	1..n, Assignment List	.-	[Device Para /Ex Acknowledge]
Ack Comm 	Communication will be acknowledged if the state of the assigned signal becomes true. Only available if: Remote Reset = Active	1..n, Assignment List	.-	[Device Para /Ex Acknowledge]
Scaling 	Display of the measured values as primary, secondary, or per unit values	Per unit values, Primary values, Secondary values	Primary values	[Operation /General Settings]
Maint Mode 	Activation Mode of the Arc Flash Reduction. Switching into another mode is only possible when no Activation Signal is active (pending).	Inactive, Activation Manually, Activation via Comm, Activation via DI	Inactive	[Service /Maint Mode]
Maint Mode Activated by 	Activation Signal for the Arc Flash Reduction Maintenance Switch Only available if: Maint Mode Activated by = Activation via DI	1..n, Dig Inputs	DI Slot X1.DI 3	[Service /Maint Mode]

Parameter	Description	Setting range	Default	Menu path
Program Mode 	Program Mode	Either Motor Stopped or Running, Motor Stop	Either Motor Stopped or Running	[System Para]

System Module Input States

Name	Description	Assignment via
Ack LED-I	Module Input State: LEDs Acknowledgment by Digital Input.	[Device Para /Ex Acknowledge]
Ack RO-I	Module Input State: Acknowledgment of the Relay Outputs.	[Device Para /Ex Acknowledge]
Ack Comm-I	Module Input State: Acknowledge Communication via Digital Input. The replica that Communication has received from the device is to be reset.	[Device Para /Ex Acknowledge]
PS1-I	State of the module input, respectively of the signal, that should activate this Parameter Setting Group.	[Protection Para /PSet-Switch]
PS2-I	State of the module input, respectively of the signal, that should activate this Parameter Setting Group.	[Protection Para /PSet-Switch]
PS3-I	State of the module input, respectively of the signal, that should activate this Parameter Setting Group.	[Protection Para /PSet-Switch]
PS4-I	State of the module input, respectively of the signal, that should activate this Parameter Setting Group.	[Protection Para /PSet-Switch]
Maint Mode-I	Module Input State: Arc Flash Reduction Maintenance Switch	[Service /Maint Mode]

System Module Signals

Signal	Description
Reboot	Signal: Rebooting the device: 1=Restart initiated by power supply; 2=Restart initiated by the User; 3=Set on defaults (Super Reset); 4=Restart by the debugger; 5=Restart because of configuration change; 6=General failure; 7=Restart initiated by System Abort (host side); 8=Restart initiated by watchdog timeout (host side); 9=Restart initiated by System Abort (dsp side); 10=Restart initiated by watchdog timeout (dsp side); 11=Power supply failure (short term interruption) or power supply voltage too low; 12=illegal memory access.
Act Set	Signal: Active Parameter Set
PS 1	Signal: Parameter Set 1
PS 2	Signal: Parameter Set 2
PS 3	Signal: Parameter Set 3
PS 4	Signal: Parameter Set 4
PSS manual	Signal: Manual switch over of a Parameter Set
PSS via Comm	Signal: Parameter Set Switch via Scada. Write into this output byte the integer of the parameter set that should become active (e.g. 4 => Switch onto parameter set 4).

<i>Signal</i>	<i>Description</i>
PSS via Inp fct	Signal: Parameter Set Switch via Input Function
Min. 1 param changed	Signal: At least one parameter has been changed
Program Mode Bypass	Signal: Short-period bypass of the Program Mode.
Maint Mode Active	Signal: Arc Flash Reduction Maintenance Active
Maint Mode Inactive	Signal: Arc Flash Reduction Maintenance Inactive
MaintMode Manually	Signal: Arc Flash Reduction Maintenance Manual Mode
Maint Mode Comm	Signal: Arc Flash Reduction Maintenance Comm Mode
Maint Mode DI	Signal: Arc Flash Reduction Maintenance Digital Input Mode
Param to be saved	Number of parameters to be saved. 0 means that all parameter changes are overtaken.
Ack LED	Signal: LEDs Acknowledgment
Ack RO	Signal: Acknowledgment of the Relay Outputs
Ack Counter	Signal: Reset of all Counters
Ack Comm	Signal: Acknowledge Communication
Ack TripCmd	Signal: Reset Trip Command
Ack LED-HMI	Signal: LEDs Acknowledgment :HMI
Ack RO-HMI	Signal: Acknowledgment of the Relay Outputs :HMI
Ack Counter-HMI	Signal: Reset of all Counters :HMI
Ack Comm-HMI	Signal: Acknowledge Communication :HMI
Ack TripCmd-HMI	Signal: Reset Trip Command :HMI
Ack LED-Comm	Signal: LEDs Acknowledgment :Communication
Ack RO-Comm	Signal: Acknowledgment of the Relay Outputs :Communication
Ack Counter-Comm	Signal: Reset of all Counters :Communication
Ack Comm-Comm	Signal: Acknowledge Communication :Communication
Ack TripCmd-Comm	Signal: Reset Trip Command :Communication

Special Values of the System Module

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Build	Build	[Device Para /Version]
Version	Version	[Device Para /Version]
Operating hours Cr	Operating hours counter of the protective device	[Operation /Count and RevData /Sys]
Hours Counter	Resettable device operation hours counter	[Operation /History /TotalCr]

Communication Protocols

Module: SCADA

Comm

Device Planning Parameters of the Serial SCADA Interface

Parameter	Description	Options	Default	Menu path
Protocol 	CAUTION! Changing the protocol will cause a restart of the device	Do not use, Modbus RTU, Modbus TCP, DNP RTU, DNP TCP, DNP UDP, IEC61850, Profibus	Do not use	[Device Planning]

Signals (Output States) of the SCADA Interface

Signal	Description
Comm connected	At least one Communication system is connected to the device.
Comm not connected	No Communication system is connected to the device.

TCP/IP Parameter

Tcplp

Global TCP/IP Parameters

Parameter	Description	Setting range	Default	Menu path
Keep Alive Time 	Keep Alive Time is the duration between two keep alive transmissions in idle condition	1 - 7200s	720s	[Device Para /TCP/IP /Advanced Settings]
Keep Alive Interval 	Keep Alive Interval is the duration between two successive keep alive retransmissions, if the acknowledgement to the previous keepalive transmission was not received.	1 - 60s	15s	[Device Para /TCP/IP /Advanced Settings]

Parameter	Description	Setting range	Default	Menu path
 Keep Alive Retry	Keep alive retry is the number of retransmissions to be carried out before declaring that the remote end is not available.	3 - 3	3	[Device Para /TCP/IP /Advanced Settings]

Modbus®

Modbus

Modbus® Protocol Configuration

The time-controlled Modbus® protocol is based on the master-slave working principle. This means that the substation control and protection system sends an inquiry or instruction to a certain device (slave address) that will then be answered or carried out accordingly. If the inquiry/instruction cannot be answered/carried out (e.g.: because of an invalid slave address), a failure message is returned to the master.

The master (substation control and protection system) can query information from the device, such as:

- Type of unit version;
- Measuring values/statistical measured values;
- Switch operating position (in preparation);
- State of device;
- Time and date;
- State of the device's digital inputs; and
- Protection-/state pickups.

The master (control system) can give commands/instructions to the device, such as:

- Control of switchgear (where applicable, i.e.: each according to the applied device version);
- Change-over of parameter set;
- Reset and acknowledgment of pickups/signals;
- Adjustment of the date and time; and
- Control of pickup relays.

For detailed information on data point lists and error handling, please refer to the Modbus® documentation.

To allow configuration of the devices for Modbus® connection, some default values of the control system must be available.

Modbus RTU

Part 1: Configuration of the Devices

Call up »*Device parameter/Modbus*« and set the following communication parameters:

- Slave address, to allow clear identification of the device; and
- Baud rate.

Also, select the RS485 interface-related parameters such as:

- Number of data bits;
- One of the following supported communication variants:
 - Number of data bits,
 - Even,
 - Odd,
 - Parity or no parity, or
 - Number of stop bits;
- »*t-timeout*«: communication errors are only identified after expiration of a supervision time »*t-timeout*«; and
- Response time (defining the period within which an inquiry from the master has to be answered).

Part 2: Hardware Connection

- For hardware connection to the control system, there is an RS485 interface at the rear side of the device (RS485, fiber optic or terminals).
- Connect the bus and the device (wiring).
- Up to 32 devices can be connected to the bus (point to point connection/spurs).
- Connect a terminating resistor to the bus.

Error Handling - Hardware Errors

Information on physical communication errors, such as:

- Baud rate error and
- Parity error;

can be obtained from the event recorder.

Error Handling – Errors on Protocol Level

If, for example, an invalid memory address is inquired, error codes will be returned by the device that need to be interpreted.

Modbus TCP

NOTICE

Establishing a connection via TCP/IP to the device is only possible if the device is equipped with an Ethernet Interface (RJ45).

Contact your IT administrator in order to establish the network connection.

Part 1: Setting the TCP/IP Parameters

Call up »*Device parameter/TCP/IP*« at the HMI (panel) and set the following parameters:

- TCP/IP address;
- Subnetmask; and
- Gateway.

Part 2: Configuration of the Devices

Call up »*Device parameter/Modbus*« and set the following communication parameters.

- Setting a unit identifier is only necessary if a TCP network should be coupled to a RTU network.
- If a different port than the default port 502 should be used, please proceed as follows:
 - Choose "Private" within the TCP-Port-Configuration.
 - Set the port number.
- Set the maximum acceptable time out for "no communication". If this time has expired without any communication, the device concludes a failure has occurred within the master system.
- Allow or disallow the blocking of SCADA commands.

Part 3: Hardware Connection

- There is a RJ45 interface at the rear side of the device for the hardware connection to the control system.
- Establish the connection to the device by means of a proper Ethernet cable.

Direct Commands of the Modbus®

Parameter	Description	Setting range	Default	Menu path
Res Diagn Cr 	All Modbus Diagnosis Counters will be reset.	Inactive, Active	Inactive	[Operation /Reset /Counter]

Global Protection Parameters of the Modbus®

Parameter	Description	Setting range	Default	Menu path
Slave ID 	Device address (Slave ID) within the bus system. Each device address has to be unique within a bus system.	1 - 247	1	[Device Para /Modbus / Communication]
Unit ID 	The Unit Identifier is used for routing. This parameter is to be set, if a Modbus RTU and a Modbus TCP network should be coupled.	1 - 255	255	[Device Para /Modbus / Communication]
TCP Port Config 	TCP Port Configuration. This parameter is to be set only if the default Modbus TCP Port should not be used.	Default, Private	Default	[Device Para /Modbus / Communication]
Port 	Port number And Only available if: TCP Port Config = Private	502 - 65535	502	[Device Para /Modbus / Communication]
t-timeout 	Within this time the answer has to be received by the Communication system, otherwise the request will be disregarded. In that case, the Communication system detects a communication failure and the Communication System has to send a new request.	0.01 - 10.00s	1s	[Device Para /Modbus / Communication]

Parameter	Description	Setting range	Default	Menu path
Baud rate 	Baud rate	1200, 2400, 4800, 9600, 19200, 38400	19200	[Device Para /Modbus / Communication]
Physical Settings 	Digit 1: Number of bits. Digit 2: E=even parity, O=odd parity, N=no parity. Digit 3: Number of stop bits. More information on the parity: It is possible that the last data bit is followed by a parity bit which is used for recognition of communication errors. The parity bit ensures that with even parity ("EVEN") always an even number of bits with valence "1" or with odd parity ("ODD") an odd number of "1" valence bits are transmitted. But it is also possible to transmit no parity bits (here the setting is "Parity = None"). More information on the stop-bits: The end of a data byte is terminated by the stop-bits.	8E1, 8O1, 8N1, 8N2	8E1	[Device Para /Modbus / Communication]
t-call 	If there is no request message sent from Communication to the device after expiry of this time, the device concludes a communication failure within the Communication system.	1 - 3600s	10s	[Device Para /Modbus / Communication]
Comm CmdBlo 	Activating (allowing)/ Deactivating (disallowing) the blocking of the Communication Commands	Inactive, Active	Inactive	[Device Para /Modbus / Communication]
Disable Latching 	Disable Latching: If this parameter is active (true), none of the Modbus states will be latched. That means that trip signals wont be latched by Modbus.	Inactive, Active	Inactive	[Device Para /Modbus / Communication]

Parameter	Description	Setting range	Default	Menu path
 AllowGap	If this parameter is active (True), the User can request a set of modbus register without getting an exception, because of invalid address in the requested array. The invalid addresses have a special value 0xFAFA, but the User is responsible for ignoring invalid addresses. Attention: This special value can be valid, if address is valid.	Inactive, Active	Active	[Device Para /Modbus / Communication]
 Optical rest position	Optical rest position	Light off, Light on	Light on	[Device Para /Modbus / Communication]
 Config Bin Inp1	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	SSV.System Error	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp1	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp2	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	Prot.Pickup	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp2	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp3	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	Prot.Trip	[Device Para /Modbus /Configb Registers /States]

Parameter	Description	Setting range	Default	Menu path
Latched Config Bin Inp3 	Latched Configurable Binary Input	Inactive, Active	Active	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp4 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp4 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp5 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp5 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp6 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp6 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]

Parameter	Description	Setting range	Default	Menu path
 Config Bin Inp7	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp7	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp8	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp8	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp9	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	Bkr.Pos OPEN	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp9	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp10	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	Bkr.Pos CLOSE	[Device Para /Modbus /Configb Registers /States]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Latched Config Bin Inp10 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp11 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	BF.Pickup	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp11 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp12 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	BF.Trip	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp12 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp13 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	BF.Lockout	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp13 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]

Parameter	Description	Setting range	Default	Menu path
 Config Bin Inp14	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp14	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp15	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp15	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp16	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	-.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp16	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp17	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	Sgen.Running	[Device Para /Modbus /Configb Registers /States]

Parameter	Description	Setting range	Default	Menu path
Latched Config Bin Inp17 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp18 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	Sys.Maint Mode Active	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp18 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp19 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	MStart.Stop	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp19 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp20 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	MStart.Start	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp20 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
 Config Bin Inp21	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	MStart.Run	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp21	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp22	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp22	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp23	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp23	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp24	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]

Parameter	Description	Setting range	Default	Menu path
Latched Config Bin Inp24 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp25 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp25 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp26 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp26 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp27 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp27 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]

Parameter	Description	Setting range	Default	Menu path
 Config Bin Inp28	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp28	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp29	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp29	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp30	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
 Latched Config Bin Inp30	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
 Config Bin Inp31	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]

Parameter	Description	Setting range	Default	Menu path
Latched Config Bin Inp31 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp32 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Modbus /Configb Registers /States]
Latched Config Bin Inp32 	Latched Configurable Binary Input	Inactive, Active	Inactive	[Device Para /Modbus /Configb Registers /States]
Mapped Meas 1 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 2 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 3 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 4 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]

Parameter	Description	Setting range	Default	Menu path
 Mapped Meas 5	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
 Mapped Meas 6	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
 Mapped Meas 7	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
 Mapped Meas 8	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
 Mapped Meas 9	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
 Mapped Meas 10	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]

Parameter	Description	Setting range	Default	Menu path
Mapped Meas 11 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 12 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 13 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 14 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 15 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]
Mapped Meas 16 	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	1..n, TrendRecList	.-	[Device Para /Modbus /Configb Registers /Measured Values]

States of the Module Inputs of the MODBUS® Protocol

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Config Bin Inp1-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp2-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp3-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp4-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp5-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp6-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp7-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp8-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Config Bin Inp9-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp10-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp11-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp12-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp13-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp14-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp15-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp16-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp17-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Config Bin Inp18-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp19-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp20-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp21-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp22-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp23-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp24-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp25-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp26-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Config Bin Inp27-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp28-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp29-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp30-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp31-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]
Config Bin Inp32-I	State of the module input: Config Bin Inp	[Device Para /Modbus /Configb Registers /States]

Values of the MODBUS® Protocol

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Mapped Meas 1	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 2	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Mapped Meas 3	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 4	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 5	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 6	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 7	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 8	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 9	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 10	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 11	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 12	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 13	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Mapped Meas 14	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 15	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]
Mapped Meas 16	Mapped Measured Values. They can be used to provide measured values to the Modbus Master.	[Operation /Count and RevData /Modbus]

Counters of the MODBUS® Protocol

<i>Parameter</i>	<i>Description</i>
Device Type	Device Type: Eaton: EDR-3000 - 2 EDR-5000 - 3 EMR-3000 - 4 EMR-4000 - 5 EMR-5000 - 6 ETR-4000 - 8 ETR-5000 - 9 EGR-5000 - 12
Comm Version	Modbus Communication version. This version number changes if something becomes incompatible between different Modbus releases.

Modbus® Module Signals (Output States)

NOTICE

Some signals (that are active for a short time only) have to be acknowledged separately (e.g.: trip signals) by the communication system.

<i>Signal</i>	<i>Description</i>
Transmission	Signal: Communication Active
Comm Cmd 1	Communication Command
Comm Cmd 2	Communication Command
Comm Cmd 3	Communication Command
Comm Cmd 4	Communication Command
Comm Cmd 5	Communication Command

<i>Signal</i>	<i>Description</i>
Comm Cmd 6	Communication Command
Comm Cmd 7	Communication Command
Comm Cmd 8	Communication Command
Comm Cmd 9	Communication Command
Comm Cmd 10	Communication Command
Comm Cmd 11	Communication Command
Comm Cmd 12	Communication Command
Comm Cmd 13	Communication Command
Comm Cmd 14	Communication Command
Comm Cmd 15	Communication Command
Comm Cmd 16	Communication Command

Modbus® Module Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NoOfRequestsTotal	Total number of requests. Includes requests for other slaves.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfRequestsForMe	Total Number of requests for this slave.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfResponse	Total number of requests having been responded.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfResponseTimeOverruns	Total number of requests with exceeded response time. Physically corrupted Frame.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfOverrunErrors	Total Number of Overrun Failures. Physically corrupted Frame.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfParityErrors	Total number of parity errors. Physically corrupted Frame.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NoOfFrameErrors	Total Number of Frame Errors. Physically corrupted Frame.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfBreaks	Number of detected communication aborts	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfQueryInvalid	Total Number of Request errors. Request could not be interpreted	0	0 - 9999999999	[Operation /Count and RevData /Modbus]
NoOfInternalError	Total Number of Internal errors while interpreting the request.	0	0 - 9999999999	[Operation /Count and RevData /Modbus]

Profibus

Profibus

Part 1: Configuration of the Devices

Call up »*Device parameter/Profibus*« and set the following communication parameter:

- Slave-address, to allow clear identification of the device.

In addition to that the Master has to be provided with the GSD-file. The GSD-file can be taken from the Product-CD.

Part 2: Hardware Connection

- For hardware connection to the control system, there is optional an D-SUB interface at the rear side of the device.
- Connect bus and device (wiring).
- Up to 123 slaves can be connected.
- Terminate the Bus by means of an Terminate Resistor.

Error Handling

Information on physical communication errors, such as:

- Baudrate Error

This can be obtained from the event recorder or the status display.

Error Handling – Status LED at the rear side

The Profibus D-SUB interface at the rear side of the device is equipped with an status LED.

- Baud Search -> red flashing
- Baud Found -> green flashing
- Data Exchange -> green
- No Profibus/Unplugged, not connected -> red

Direct Commands of the Profibus

Parameter	Description	Setting range	Default	Menu path
Reset Comds 	All Profibus Commands will be reset.	Inactive, Active	Inactive	[Operation /Reset /Counter]

Global Protection Parameters of the Profibus

Parameter	Description	Setting range	Default	Menu path
Config Bin Inp 1 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 1 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 2 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 2 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 3 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 3 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 4 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]

Parameter	Description	Setting range	Default	Menu path
Latched 4 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 5 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 5 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 6 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 6 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 7 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 7 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 8 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 8 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 9 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]

Parameter	Description	Setting range	Default	Menu path
Latched 9 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 10 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 10 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 11 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 11 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 12 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 12 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 13 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 13 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]

Parameter	Description	Setting range	Default	Menu path
Config Bin Inp 14 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 14 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 15 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 15 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 16 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 1-16]
Latched 16 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 1-16]
Config Bin Inp 17 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 17 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 18 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]

Parameter	Description	Setting range	Default	Menu path
Latched 18 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 19 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 19 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 20 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 20 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 21 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 21 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 22 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 22 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]

Parameter	Description	Setting range	Default	Menu path
Config Bin Inp 23 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 23 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 24 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 24 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 25 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 25 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 26 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 26 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 27 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]

Parameter	Description	Setting range	Default	Menu path
Latched 27 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 28 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 28 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 29 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 29 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 30 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 30 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Config Bin Inp 31 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 31 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]

Parameter	Description	Setting range	Default	Menu path
Config Bin Inp 32 	Virtual Digital Input. This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	-,-	[Device Para /Profibus /Config Bin Inp 17-32]
Latched 32 	Defines whether the Input is latched. Only available if: Latched = Active	Inactive, Active	Inactive	[Device Para /Profibus /Config Bin Inp 17-32]
Slave ID 	Device address (Slave ID) within the bus system. Each device address has to be unique within a bus system.	2 - 125	2	[Device Para /Profibus /Bus parameters]

Inputs of the Profibus

Name	Description	Assignment via
Assignment 1-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 2-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 3-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 4-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 5-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 6-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 7-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Assignment 8-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 9-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 10-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 11-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 12-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 13-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 14-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 15-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 16-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 1-16]
Assignment 17-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 18-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 19-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
Assignment 20-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 21-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 22-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 23-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 24-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 25-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 26-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 27-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 28-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 29-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 30-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]
Assignment 31-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]

Name	Description	Assignment via
Assignment 32-I	Module input state: Comm Assignment	[Device Para /Profibus /Config Bin Inp 17-32]

Profibus Signals (Output States)

Signal	Description
Data OK	Data within the input field are OK (Yes=1)
SubModul Err	Assignable Signal, Failure in Sub-Module, Communication Failure.
Connection active	Connection active
Comm Cmd 1	Communication Command
Comm Cmd 2	Communication Command
Comm Cmd 3	Communication Command
Comm Cmd 4	Communication Command
Comm Cmd 5	Communication Command
Comm Cmd 6	Communication Command
Comm Cmd 7	Communication Command
Comm Cmd 8	Communication Command
Comm Cmd 9	Communication Command
Comm Cmd 10	Communication Command
Comm Cmd 11	Communication Command
Comm Cmd 12	Communication Command
Comm Cmd 13	Communication Command
Comm Cmd 14	Communication Command
Comm Cmd 15	Communication Command
Comm Cmd 16	Communication Command

Profibus Values

Value	Description	Default	Size	Menu path
Fr Sync Err	Frames, that were sent from the master to the slave are faulty.	1	1 - 99999999	[Operation /Count and RevData /Profibus]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
crcErrors	Number of CRC errors that the ss manager has recognized in received response frames from ss (each error caused a subsystem reset)	1	1 - 99999999	[Operation /Count and RevData /Profibus]
frLossErrors	Number of frame loss errors that the ss manager recognized in received response frames from ss (each error caused a subsystem reset)	1	1 - 99999999	[Operation /Count and RevData /Profibus]
ssCrcErrors	Number of CRC errors that the subsystem has recognized in received trigger frames from host	1	1 - 99999999	[Operation /Count and RevData /Profibus]
ssResets	Number of subsystem resets/restarts from ss manager	1	1 - 99999999	[Operation /Count and RevData /Profibus]
Master ID	Device address (Master ID) within the bus system. Each device address has to be unique within a bus system.	1	1 - 125	[Operation /Status Display /Profibus /State]
HO Id PSub	Handoff Id of PbSub	0	0 - 999999999	[Operation /Status Display /Profibus /State]
t-WatchDog	The Profibus Chip detects a communication issue if this timer is expired without any communication (Parametrizing telegram).	0	0 - 999999999	[Operation /Status Display /Profibus /State]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
Slave State	Communication State between slave and master.	Baud Search	Baud Search, Baud Found, PRM OK, PRM REQ, PRM Fault, CFG Fault, Clear Data, Data exchange	[Operation /Status Display /Profibus /State]
Baud rate	The baud rate that has been detected lastly, will still be shown after a connection issue.	-.-	12 Mb/s, 6 Mb/s, 3 Mb/s, 1.5 Mb/s, 0.5 Mb/s, 187500 baud, 93750 baud, 45450 baud, 19200 baud, 9600 baud, -.-	[Operation /Status Display /Profibus /State]
PNO Id	PNO Identification Number. GSD Identification Number.	0C50h	0C50h	[Operation /Status Display /Profibus /State]

IEC 61850

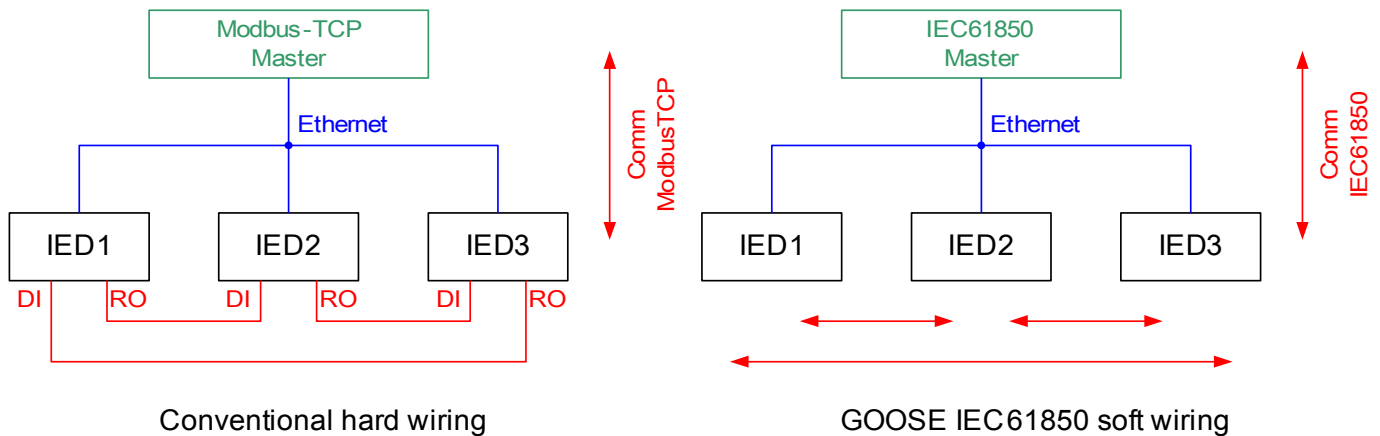
IEC61850

Introduction

To understand the functioning and mode of operation of a substation in an IEC 61850 automation environment, it is useful to compare the commissioning steps with those of a conventional substation in a Modbus TCP environment. In a conventional substation, the individual Intelligent Electronic Devices (IEDs) communicate in a vertical direction with the higher level control center via Communication. The horizontal communication is exclusively realized by wiring relay outputs (RO) and digital inputs (DI) together.

In an IEC 61850 environment, communication between the IEDs takes place digitally (via Ethernet) by a service called Generic Object Oriented Substation Event (GOOSE). By means of this service, information about events is submitted between each IED. Therefore each IED has to know about the functional capability of all other connected IEDs.

Each IEC 61850 capable device includes a description of its own functionality and communications skills (IED Capability Description, *.ICD). By means of a Substation Configuration Tool to describe the structure of the substation, assignment of the devices to the primary technique, etc., virtual wiring of the IEDs between each other and with other switch gear of the substation can be achieved. A description of the substation configuration will be generated in the form of a *.SCD file. Finally, this file has to be submitted to each device. Now the IEDs are able to communicate with each other, react to interlockings, and operate switch gear.



Commissioning steps for a conventional substation with modbus TCP environment:

- Parameter setting of the IEDs;
- Ethernet installation;
- TCP/IP settings for the IEDs; and
- Wiring according to wiring scheme.

Commissioning steps for a substation with IEC 61850 environment:

1. Parameter setting of the IEDs
Ethernet installation
TCP/IP settings for the IEDs
2. IEC 61850 configuration (software wiring)
 - a) Exporting an ICD file from each device
 - b) Configuration of the substation
(generating a SCD file)
 - c) Transmit SCD file to each device.

Generation/Export of a Device Specific ICD File

Each Eaton IEC 61850 capable device includes a description of its own functionality and communications skills in the form of an IED Capability Description (*.ICD) file. This file can be exported as follows and be used for the configuration of the substation.

NOTICE

- A change of the devices parameters has an influence on the content of the ICD file.

1. Connect the device with your PC/Notebook.
2. Start PowerPort E.
3. Click on »*Receive data from Device*« in the »*Device*« menu.
4. Click on »*IEC 61850*« in the »*Device Para*« menu.
5. Click on the ICD icon in the IEC 61850 window.
6. Select a drive and file name for the ICD file and click "save".
7. Repeat the steps 1 to 6 for all connected devices in this IEC 61850 environment.

Generation/Export of a SCD file

Each device can create an export it's own functionality and communications skills in form of a *.SCD file.

1. Connect the device with your PC/Notebook.
2. Start Power-Port-E.
3. Click on »*Receive data from Device*« in the menu »*Device*«.
4. Click on »*IEC61850*« in the menu »*Device Para*«.
5. Click on the SCD icon in the IEC61850 window.
6. Select a drive and file name for the SCD file and click "save".
7. Repeat the steps 1 to 6 for all connected devices in this IEC61850 environment.

Generation of a Substation Configuration Description (SCD) File

The substation configuration (i. e. connection of all logical nodes of protection and control devices) as well as switch gear usually is done with a "Substation Configuration Tool". Therefore the ICD files of all connected IEDs in the IEC 61850 environment have to be available. The result of the station wide "software wiring" can be exported in the form of a Station Configuration Description (SCD) file.

Suitable Substation Configuration Tools (SCT) are available by the following Companies:

H&S, Hard- & Software Technologie GmbH & Co. KG, Dortmund (Germany) (www.hstech.de).

Applied Systems Engineering Inc. (www.ase-systems.com)

Kalki Communication Technologies Limited (www.kalkitech.com)

Import of the *.SCD File into the Device

When the substation configuration is completed, the *.SCD file has to be transmitted to all connected devices. This has to be done as follows:

1. Connect the device with your PC/notebook.
2. Start PowerPort E.
3. Click on »*Receive data from Device*« in the »*Device*« menu.
4. Click on »*IEC 61850*« in the »*Device Para*« menu.
5. Switch the parameter »*IEC 61850 Communication*« to »*OFF*« and submit the changed parameter set into the device.
6. Click on the IEC icon in the IEC 61850 window.
7. Select the folder where the *.SCD file is stored. Select the *.SCD file and click "Open".
8. A password is requested. Enter the same password, which you use for parameter setting of the device.
9. Following Step 5, again switch on the IEC Communication and submit the changed parameter set into the device.
10. Repeat Steps 1 through 9 for all devices connected to this IEC 61850 environment.
11. If no error message occurs, the configuration has been completed successfully.



- When changing the substation configuration, usually a new *.SCD file has to be generated. This *.SCD file must be transmitted to all devices by means of PowerPort E. If the file is not transmitted to all devices, IEC 61850 malfunctions will be the result.
- If the parameters of the devices are changed after the completion of the substation configuration, changes in the corresponding *.ICD file may result. This, in turn, may make an update of the *.SCD file necessary.

IEC 61850 Virtual Outputs

In addition to the standardized logical node status information, up to 32 free configurable status information items can be assigned to the 32 Virtual Outputs. This can be done in the [Device Para/IEC61850] menu.

Direct Commands of the IEC 61850

Parameter	Description	Setting range	Default	Menu path
ResetStatistic 	Reset of all IEC61850 diagnostic counters	Inactive, Active	Inactive	[Operation /Reset /Counter]

Global Protection Parameters of the IEC 61850

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Device Para /IEC61850]
Deadb integr time 	Deadband integration time.	0 - 300	0	[Device Para /IEC61850]

Global Parameters of the IEC 61850

Parameter	Description	Setting range	Default	Menu path
VirtualOutput1 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput2 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput3 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput4 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]

Parameter	Description	Setting range	Default	Menu path
VirtualOutput5 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput6 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput7 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput8 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput9 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput10 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput11 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput12 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput13 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput14 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]

Parameter	Description	Setting range	Default	Menu path
VirtualOutput15 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput16 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput17 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput18 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput19 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput20 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput21 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput22 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput23 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput24 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]

Parameter	Description	Setting range	Default	Menu path
VirtualOutput25 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput26 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput27 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput28 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput29 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput30 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput31 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]
VirtualOutput32 	Virtual Output. This signal can be assigned or visualized via the SCD file to other devices within the IEC61850 substation.	1..n, Assignment List	.-	[Device Para /IEC61850]

States of the Inputs of the IEC 61850

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
VirtOut1-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut2-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut3-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut4-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut5-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut6-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut7-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut8-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut9-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut10-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut11-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut12-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut13-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut14-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut15-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut16-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut17-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
VirtOut18-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut19-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut20-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut21-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut22-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut23-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut24-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut25-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut26-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut27-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut28-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut29-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut30-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut31-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]
VirtOut32-I	Module input state: Binary state of the Virtual Output (GGIO)	[Device Para /IEC61850]

IEC 61850 Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
MMS Client connected	At least one MMS client is connected to the device
All Goose Subscriber active	All Goose subscriber in the device are working
VirtInp1	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp2	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp3	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp4	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp5	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp6	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp7	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp8	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp9	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp10	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp11	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp12	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp13	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp14	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp15	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp16	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp17	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp18	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp19	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp20	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp21	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp22	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp23	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp24	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp25	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp26	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp27	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp28	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp29	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp30	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp31	Signal: Virtual Input (IEC61850 GGIO Ind)
VirtInp32	Signal: Virtual Input (IEC61850 GGIO Ind)
Quality of GGIO In1	Self-Supervision of the GGIO Input

<i>Signal</i>	<i>Description</i>
Quality of GGIO In2	Self-Supervision of the GGIO Input
Quality of GGIO In3	Self-Supervision of the GGIO Input
Quality of GGIO In4	Self-Supervision of the GGIO Input
Quality of GGIO In5	Self-Supervision of the GGIO Input
Quality of GGIO In6	Self-Supervision of the GGIO Input
Quality of GGIO In7	Self-Supervision of the GGIO Input
Quality of GGIO In8	Self-Supervision of the GGIO Input
Quality of GGIO In9	Self-Supervision of the GGIO Input
Quality of GGIO In10	Self-Supervision of the GGIO Input
Quality of GGIO In11	Self-Supervision of the GGIO Input
Quality of GGIO In12	Self-Supervision of the GGIO Input
Quality of GGIO In13	Self-Supervision of the GGIO Input
Quality of GGIO In14	Self-Supervision of the GGIO Input
Quality of GGIO In15	Self-Supervision of the GGIO Input
Quality of GGIO In16	Self-Supervision of the GGIO Input
Quality of GGIO In17	Self-Supervision of the GGIO Input
Quality of GGIO In18	Self-Supervision of the GGIO Input
Quality of GGIO In19	Self-Supervision of the GGIO Input
Quality of GGIO In20	Self-Supervision of the GGIO Input
Quality of GGIO In21	Self-Supervision of the GGIO Input
Quality of GGIO In22	Self-Supervision of the GGIO Input
Quality of GGIO In23	Self-Supervision of the GGIO Input
Quality of GGIO In24	Self-Supervision of the GGIO Input
Quality of GGIO In25	Self-Supervision of the GGIO Input
Quality of GGIO In26	Self-Supervision of the GGIO Input
Quality of GGIO In27	Self-Supervision of the GGIO Input
Quality of GGIO In28	Self-Supervision of the GGIO Input
Quality of GGIO In29	Self-Supervision of the GGIO Input
Quality of GGIO In30	Self-Supervision of the GGIO Input
Quality of GGIO In31	Self-Supervision of the GGIO Input
Quality of GGIO In32	Self-Supervision of the GGIO Input
SPCSO1	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO2	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO3	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).

<i>Signal</i>	<i>Description</i>
SPCSO4	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO5	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO6	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO7	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO8	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO9	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO10	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO11	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO12	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO13	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO14	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO15	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO16	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO17	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO18	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO19	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO20	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO21	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO22	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO23	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO24	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO25	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).

<i>Signal</i>	<i>Description</i>
SPCSO26	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO27	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO28	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO29	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO30	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO31	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
SPCSO32	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).

IEC 61850 Module Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NoOfGooseRxAll	Total number of received GOOSE messages including messages for other devices (subscribed and not subscribed messages).	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfGooseRxSubscribed	Total Number of subscribed GOOSE messages including messages with incorrect content.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfGooseRxCorrect	Total Number of subscribed and correctly received GOOSE messages.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfGooseRxNew	Number of subscribed and correctly received GOOSE messages with new content.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfGooseTxAll	Total Number of GOOSE messages that have been published by this device.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfGooseTxNew	Total Number of new GOOSE messages (modified content) that have been published by this device.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfServerRequestsAll	Total number of MMS Server requests including incorrect requests.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfDataReadAll	Total Number of values read from this device including incorrect requests.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfDataReadCorrect	Total Number of correctly read values from this device.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NoOfDataWritten All	Total Number of values written by this device including incorrect ones.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfDataWritten Correct	Total Number of correctly written values by this device.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
NoOfDataChange Notification	Number of detected changes within the datasets that are published with GOOSE messages.	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]
No of Client Connections	Number of active MMS client connections	0	0 - 9999999999	[Operation /Count and RevData /IEC61850]

Values of the IEC 61850

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
GoosePublisherState	State of the GOOSE Publisher (on or off)	Off	Off, On, Error	[Operation /Status Display /IEC61850 /State]
GooseSubscriberState	State of the GOOSE Subscriber (on or off)	Off	Off, On, Error	[Operation /Status Display /IEC61850 /State]
MmsServerState	State of MMS Server (on or off)	Off	Off, On, Error	[Operation /Status Display /IEC61850 /State]

DNP3

DNP

DNP (Distributed Network Protocol) is for data and information exchange between SCADA (Master) and IEDs (Intelligent Electronic Devices). The DNP protocol has been developed in first releases for serial communication. Due to further development of the DNP protocol, it offers now also TCP and UDP communication options via Ethernet.

DNP Device Planning

Depending on the hardware of the protective device up to three DNP communication options are available within the Device Planning.

Call up the device planning menu.

Select (depending on device code) the appropriate SCADA Protocol.

- DNP3 RTU (via serial Port)
- DNP3 TCP (via Ethernet)
- DNP3 UDP (via Ethernet)

DNP Protocol General Settings

NOTICE

Please note that unsolicited reporting is not available for serial communication, if more than one slave is connected to the serial communication (collisions). Do not use in these cases unsolicited reporting for DNP RTU.

Unsolicited reporting is available also for serial communication, if each slave is connected via a separated connection to the Master-System. That means, the master is equipped with a separate serial interface for each slave (multi serial cards).

Call up menu [Device Para/DNP3/Communication].

The Communication (General Settings) Settings have to be set according to the needs of the Communication Master – System.

Self Addressing is available for DNP-TCP. That means that the Master and Slave id are auto-detected.

Point Mapping

NOTICE

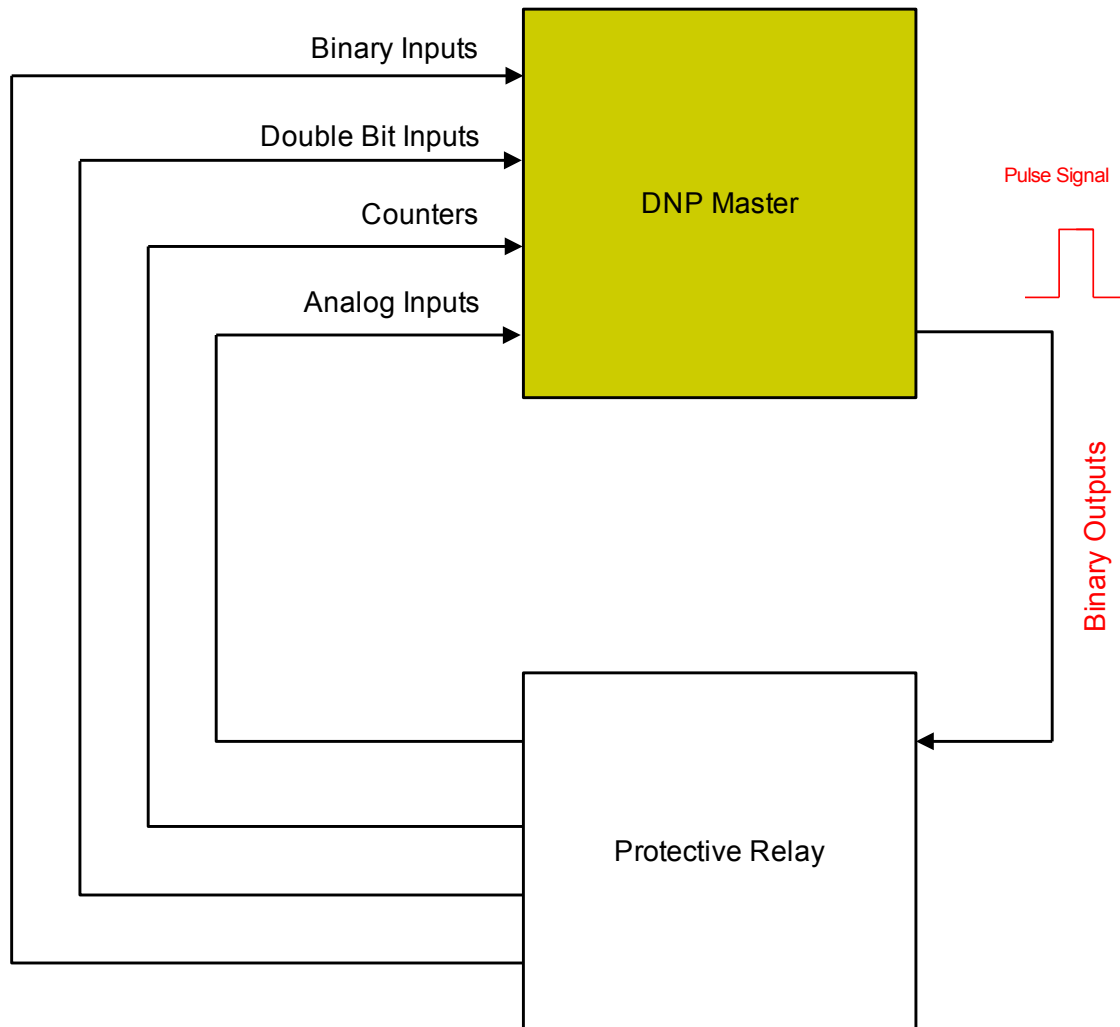
Please take into account that the designations of inputs and outputs are set from the Masters perspective. This way of choosing the designations is due to a definition in the DNP standard. That means for example that Binary Inputs that can be set within the Device Parameters of the DNP protocol are the “Binary Inputs” of the Master.

Call up menu [Device Para/DNP3/Point Map]. Once the general settings of the DNP protocol are done, the point mapping is to be done as a next step.

- Binary Inputs (States to be send to the master)
- Double Bit Inputs (Breaker states to be send to the master)
- Counters (Counters to be send to the master)
- Analog Inputs (e.g. measured values to be send to the master). Please take into account that floating values have to be transmitted as integers. That means they have to be scaled (multiplied) with a scaling factor in order to bring them into the integer format.

Use Binary outputs in order to control e.g. LEDs or Relays within the protective device (via Logic).

Point Mapping



Please try to avoid gaps that will slow down the performance of the DNP communication. That means do not leave unused inputs / outputs in between used inputs / outputs (e.g. Do not use Binary Output 1 and 3 when 2 is unused).

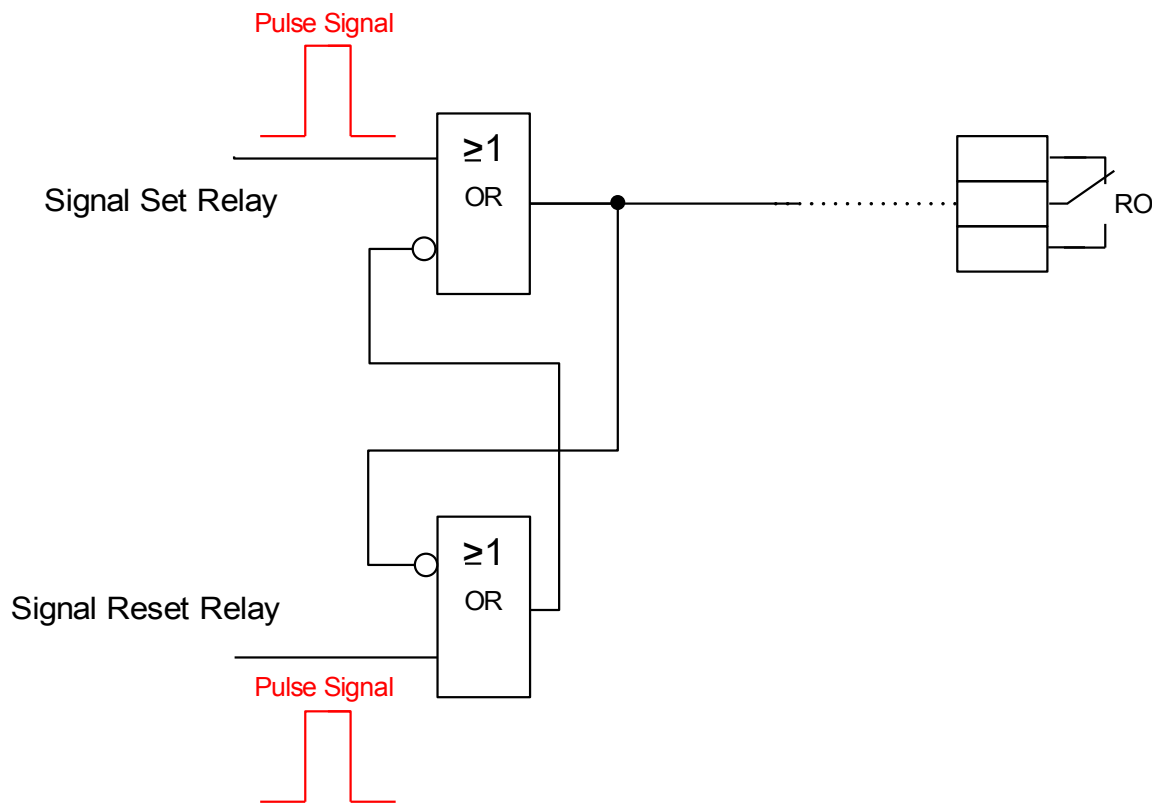
Application Example Setting a Relay:

Binary Output signals of the DNP cannot directly be used in order to switch relays because the DNP Binary Outputs are pulse signals (by DNP definition, not steady state). Steady states can be created by means of Logic functions. The Logic Functions can be assigned onto the Relay Inputs.

Please note: You can use a Set/Reset element (Flip Flop) from Logics.

Logic

Assign Logic Functions onto Relay Inputs



Direct Commands of the DNP

Parameter	Description	Setting range	Default	Menu path
Res all Diag Cr	Reset all diagnosis counters	Inactive, Active	Inactive	[Operation /Reset /Counter]



Parameter	Description	Setting range	Default	Menu path
Slave Id 	SlaveId defines the DNP3 address of this device (Outstation)	0 - 65519	1	[Device Para /DNP / Communication]
Master Id 	MasterId defines the DNP3 address of master (SCADA)	0 - 65519	65500	[Device Para /DNP / Communication]

Global Protection Parameters of the DNP

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Device Para /DNP / Communication]
IP Port Number 	Port Number of the IP address	0 - 65535	20000	[Device Para /DNP / Communication]
Baud rate 	Baud rate for communication	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	19200	[Device Para /DNP / Communication]
Frame Layout 	Frame Layout	8E1, 8O1, 8N1, 8N2	8E1	[Device Para /DNP / Communication]

Parameter	Description	Setting range	Default	Menu path
Optical rest position 	Optical rest position	Light off, Light on	Light on	[Device Para /DNP / Communication]
SelfAddress 	Support of self (automatic) addresses	Inactive, Active	Inactive	[Device Para /DNP / Communication]
DataLink confirm 	Enables or disables the data layer confirmation (ack).	Never, Always, On_Large	Never	[Device Para /DNP / Communication]
t-DataLink confirm 	Data layer confirmation timeout	0.1 - 10.0s	1s	[Device Para /DNP / Communication]
DataLink num retries 	Number of repetition of data link packet sending after failing	0 - 255	3	[Device Para /DNP / Communication]
Direction Bit 	Enables Direction Bit functionality. The Direction Bit is 0 for SlaveStation and 1 for MasterStation	Inactive, Active	Inactive	[Device Para /DNP / Communication]
Max Frame Size 	This value is used to limit the net Frame Size	64 - 255	255	[Device Para /DNP / Communication]
Test Link Period 	This value specifies the time period when to send a Test Link-Frame	0.0 - 120.0s	0s	[Device Para /DNP / Communication]

Parameter	Description	Setting range	Default	Menu path
AppLink confirm 	Determines if the device will request that the Application Layer response be confirmed or not	Never, Always, Event	Always	[Device Para /DNP / Communication]
t-AppLink confirm 	Application layer response timeout	0.1 - 10.0s	5s	[Device Para /DNP / Communication]
AppLink num retries 	The number of times the device will retransmit an Application Layer fragment	0 - 255	0	[Device Para /DNP / Communication]
Unsol Reporting 	Enables supports unsolicited reporting. This is only for Network connections available. For serial connection this setting is fix set to inactive	Inactive, Active	Inactive	[Device Para /DNP / Communication]
Unsol Reporting Timeout 	Set the amount of time that the outstation will wait for an Application Layer confirmation back from the master indicating that the master received the unsolicited response message.	1.0 - 60.0s	10s	[Device Para /DNP / Communication]
Unsol Reporting Retry 	Set the number of retries that an outstation transmits in each unsolicited response series if it does not receive confirmation back from the master.	0 - 255	2	[Device Para /DNP / Communication]
TestSeqNo 	Test if sequence number of request is incremented. If it is not correctly incremented the request will be ignored. It is recommended to have it inactive but some older DNP implementations need it activated.	Inactive, Active	Inactive	[Device Para /DNP / Communication]
TestSBO 	It enables a stricter comparing of SBO and operate command. For older DNP versions it is recommended to deactivated it.	Inactive, Active	Active	[Device Para /DNP / Communication]

Parameter	Description	Setting range	Default	Menu path
 Timeout SBO	DNP Outputs can be controlled in a two stage procedure (SBO: Select Before Operate). These outputs are to be selected first by a select command. After this the bit is reserved for this operate request. When this timer is expired, the bit will be released.	1.0 - 60.0s	30s	[Device Para /DNP / Communication]
 ColdRestart	Enables support for Cold Restart function.	Inactive, Active	Inactive	[Device Para /DNP / Communication]
 Deadb integr time	Deadband integration time.	0 - 300	1	[Device Para /DNP / Communication]
 BinaryInput 0	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
 BinaryInput 1	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
 BinaryInput 2	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
 BinaryInput 3	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
 BinaryInput 4	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]

Parameter	Description	Setting range	Default	Menu path
BinaryInput 5 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 6 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 7 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 8 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 9 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 10 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 11 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 12 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 13 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]

Parameter	Description	Setting range	Default	Menu path
BinaryInput 14 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 15 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 16 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 17 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 18 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 19 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 20 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 21 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 22 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]

Parameter	Description	Setting range	Default	Menu path
BinaryInput 23 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 24 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 25 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 26 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 27 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 28 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 29 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 30 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 31 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]

Parameter	Description	Setting range	Default	Menu path
BinaryInput 32 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 33 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 34 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 35 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 36 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 37 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 38 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 39 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 40 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]

Parameter	Description	Setting range	Default	Menu path
BinaryInput 41 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 42 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 43 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 44 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 45 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 46 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 47 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 48 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 49 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]

Parameter	Description	Setting range	Default	Menu path
BinaryInput 50 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 51 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 52 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 53 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 54 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 55 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 56 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 57 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 58 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]

Parameter	Description	Setting range	Default	Menu path
BinaryInput 59 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 60 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 61 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 62 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput 63 	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Binary Inputs]
DoubleBitInput 0 	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Double Bit Inputs]
DoubleBitInput 1 	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Double Bit Inputs]
DoubleBitInput 2 	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Double Bit Inputs]

Parameter	Description	Setting range	Default	Menu path
DoubleBitInput 3 	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Double Bit Inputs]
DoubleBitInput 4 	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Double Bit Inputs]
DoubleBitInput 5 	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	1..n, Assignment List	.-	[Device Para /DNP /Point map /Double Bit Inputs]
BinaryCounter 0 	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	.-	[Device Para /DNP /Point map /BinaryCounter]
BinaryCounter 1 	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	.-	[Device Para /DNP /Point map /BinaryCounter]
BinaryCounter 2 	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	.-	[Device Para /DNP /Point map /BinaryCounter]
BinaryCounter 3 	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	.-	[Device Para /DNP /Point map /BinaryCounter]
BinaryCounter 4 	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	.-	[Device Para /DNP /Point map /BinaryCounter]

Parameter	Description	Setting range	Default	Menu path
BinaryCounter 5 	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	.-	[Device Para /DNP /Point map /BinaryCounter]
BinaryCounter 6 	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	.-	[Device Para /DNP /Point map /BinaryCounter]
BinaryCounter 7 	Counter can be used to report counter values to the DNP master.	1..n, Assignment List	.-	[Device Para /DNP /Point map /BinaryCounter]
Analog value 0 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 0 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 0 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 1 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 1 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 1 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 2 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 2 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 2 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 3 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 3 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 3 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 4 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 4 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 4 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 5 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
 Scale Factor 5	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
 Dead Band 5	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
 Analog value 6	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
 Scale Factor 6	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
 Dead Band 6	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
 Analog value 7	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 7 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 7 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 8 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 8 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 8 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 9 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 9 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 9 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 10 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 10 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 10 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 11 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 11 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 11 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 12 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 12 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 12 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 13 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 13 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 13 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 14 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 14 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 14 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 15 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 15 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 15 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 16 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 16 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 16 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 17 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 17 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 17 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 18 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 18 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 18 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 19 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 19 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 19 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 20 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 20 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 20 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 21 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 21 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 21 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 22 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 22 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 22 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 23 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 23 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 23 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 24 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 24 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 24 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 25 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 25 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 25 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 26 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 26 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 26 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 27 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 27 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 27 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 28 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 28 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 28 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 29 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 29 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 29 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 30 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]
Scale Factor 30 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 30 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]
Analog value 31 	Analog value can be used to report values to the master (DNP)	1..n, TrendRecList	.-	[Device Para /DNP /Point map /Analog Input]

Parameter	Description	Setting range	Default	Menu path
Scale Factor 31 	The scale factor is used to convert the measured value in an integer format	0.001, 0.01, 0.1, 1, 10, 100, 1000, 10000, 100000, 1000000	1	[Device Para /DNP /Point map /Analog Input]
Dead Band 31 	If a change of measured value is greater than the deadband value it will be reported to the master.	0.01 - 100.00%	1%	[Device Para /DNP /Point map /Analog Input]

Inputs of the DNP

Name	Description	Assignment via
BinaryInput0-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput1-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput2-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput3-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
BinaryInput4-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput5-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput6-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput7-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput8-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput9-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput10-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput11-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput12-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
BinaryInput13-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput14-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput15-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput16-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput17-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput18-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput19-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput20-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput21-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
BinaryInput22-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput23-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput24-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput25-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput26-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput27-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput28-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput29-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput30-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
BinaryInput31-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput32-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput33-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput34-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput35-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput36-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput37-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput38-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput39-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
BinaryInput40-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput41-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput42-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput43-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput44-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput45-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput46-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput47-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput48-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
BinaryInput49-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput50-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput51-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput52-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput53-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput54-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput55-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput56-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput57-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
BinaryInput58-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput59-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput60-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput61-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput62-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
BinaryInput63-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.	[Device Para /DNP /Point map /Binary Inputs]
DoubleBitInput0-I	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	[Device Para /DNP /Point map /Double Bit Inputs]
DoubleBitInput1-I	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	[Device Para /DNP /Point map /Double Bit Inputs]
DoubleBitInput2-I	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	[Device Para /DNP /Point map /Double Bit Inputs]

Name	Description	Assignment via
DoubleBitInput3-I	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	[Device Para /DNP /Point map /Double Bit Inputs]
DoubleBitInput4-I	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	[Device Para /DNP /Point map /Double Bit Inputs]
DoubleBitInput5-I	Double Bit Digital Input (DNP). This corresponds to a double bit binary output of the protective device.	[Device Para /DNP /Point map /Double Bit Inputs]

Options of the DNP

Name	Description
.-	No assignment
Prot.FaultNo	Waveform No.
Prot.No of GridFaults	Number of grid faults: A grid fault, e.g. a short circuit, might cause several faults with trip and autoreclosing, each fault being identified by an increased fault number. In this case, the grid fault number remains the same.
Bkr.TripCmd Cr	Counter: Total number of trips of the switchgear (breaker, load break switch...). Resettable with Total or All.
MStart.StartPerHour	StartPerHour
MStart.SPH Release	In case that the Motor is blocked by a SPH blocking, this timer needs to be expired before the blocking is released and the next motor start is permitted. The next Motor Start will increment the SPH counter again.
MStart.ColdStartPermit	Number of cold starts remaining
MStart.OCNT	Motor Operation count since last reset. Resettable with "Sys Res Operations Cr" or "All".
MStart.RunTime	Motor Operation time since last reset. Resettable with "Sys. Res Operations Cr" or "All".
MStart.nEmrgOvr	Number of emergency overrides since last reset. Resettable with "Sys. Res Operations Cr" or "All".
MStart.TRunTime	Motor Operation (Motor run time) time since last reset. Resettable with "Sys. Res TotalCr" or "All".
MStart.TOCS	Total Motor Operation count since last reset. Resettable with "Sys. Res TotalCr" or "All".
MStart.nTRNTrips	Number of transition trips since last reset. Resettable with "Sys. Res TripCr" or "All".
MStart.nRevTrips	Number of reverse spinning trips since last reset. Resettable with "Sys. Res TripCr" or "All".
MStart.nZSWTrips	Number of zero speed switch trips since last reset. Resettable with "Sys. Res TripCr" or "All".

<i>Name</i>	<i>Description</i>
MStart.nISQT	Number of incomplete sequence trips since last reset. Resettable with "Sys. Res TripCr" or "All".
MStart.nSPHBlocks	Number of start per hour blocks since last reset. Resettable with "Sys. Res Operations Cr" or "All".
MStart.nTBSBlocks	Number of time between start blocks since last reset. Resettable with "Sys. Res Operations Cr" or "All".
Sys.Operating hours Cr	Operating hours counter of the protective device
Sys.Hours Counter	Resettable device operation hours counter

Selectable Switchgears of the DNP

<i>Name</i>	<i>Description</i>
.-	No assignment
Bkr.State	Signal: Breaker Position (0 = Indeterminate, 1 = OPEN, 2 = CLOSE, 3 = Disturbed)

DNP Signals (Output States)

NOTICE

Some signals (that are for a short time active only) have to be acknowledged separately (e.g. Trip signals) by the Communication System.

Signal	Description
busy	This message is set if the protocol is started. It will be reset if the protocol is shut down.
ready	The message will be set if the protocol is successfully started and ready for data exchange.
active	The communication with the Master (Scada) is active.
BinaryOutput0	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput1	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput2	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput3	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput4	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput5	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput6	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput7	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput8	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput9	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput10	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput11	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput12	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput13	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput14	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput15	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.

<i>Signal</i>	<i>Description</i>
BinaryOutput16	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput17	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput18	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput19	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput20	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput21	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput22	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput23	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput24	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput25	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput26	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput27	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput28	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput29	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput30	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
BinaryOutput31	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.

DNP Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
NReceived	Diagnostic counter: Number of received characters	0	0 - 9999999999	[Operation /Count and RevData /DNP]
NSent	Diagnostic counter: Number of sent characters	0	0 - 9999999999	[Operation /Count and RevData /DNP]
NBadFramings	Diagnostic counter: Number of bad framings. A large number indicates a disturbed serial connection.	0	0 - 9999999999	[Operation /Count and RevData /DNP]
NBadParities	Diagnostic counter: Number of parity errors. A large number indicates a disturbed serial connection.	0	0 - 9999999999	[Operation /Count and RevData /DNP]
NBreakSignals	Diagnostic counter: Number of break signals. A large number indicates a disturbed serial connection.	0	0 - 9999999999	[Operation /Count and RevData /DNP]
NBadChecksum	Diagnostic counter: Number of frames received with bad checksum.	0	0 - 9999999999	[Operation /Count and RevData /DNP]

Parameters

Parameter setting and planning can be done:

- Directly at the device; or
- By way of the *PowerPort-E* software application.

Parameter Definitions

Device Parameters

By modifying the Device Parameters, the User may (depending on the type of device):

- Configure digital inputs, Assign LEDs;
- Configure Relay Outputs;
- Assign acknowledgment signals;
- Configure statistics;
- Configure general Protocol Settings;
- Adapt HMI settings;
- Configure recorders (reports);
- Set date and time;
- Change passwords; and/or
- Check the version (build) of the device.

System Parameters

System Parameters comprise the essential, basic settings of your switchboard such as rated frequency and transformer ratios.

Protection Parameters



Please note that by deactivating, for example protective functions, the User also changes the functionality of the device.

The manufacturer does not accept liability for any personal or material damage as a result of incorrect planning.

Contact your Eaton Customer Service representative for more information.

The protection parameters include the following protection parameter trees.

- Global Protection Parameters »*Global Prot Para*«: Here the User can find all protection parameters that are universally valid. That means they are valid independent of the protection parameter sets.
- Setting Group Parameters »*Set1..4*«: The protection parameters that the User set within a parameter set are only valid if the parameter set selected is switched to active.

Device Planning Parameters

- **Improving the Usability (Clarity):** All protection modules that are currently unused can be hidden (switched to invisible) through Device Planning. In the Device Planning menu, the User can adapt the scope of functionality of the protective device exactly as needed. The User can improve the usability by hiding all modules that are not currently needed.
- **Adapting the device to the application:** For those modules that are needed, determine how they should be set up (e.g.: directional, non-directional, <, >...).

Direct Commands

Direct Commands are part of the “Device Parameter tree” but **NOT** part of the parameter file. They will be executed directly (e.g.: Resetting of a Counter).

State of the Module Inputs

Module Inputs are part of the “Device Parameter tree”. The State of the Module Input is context-dependent.

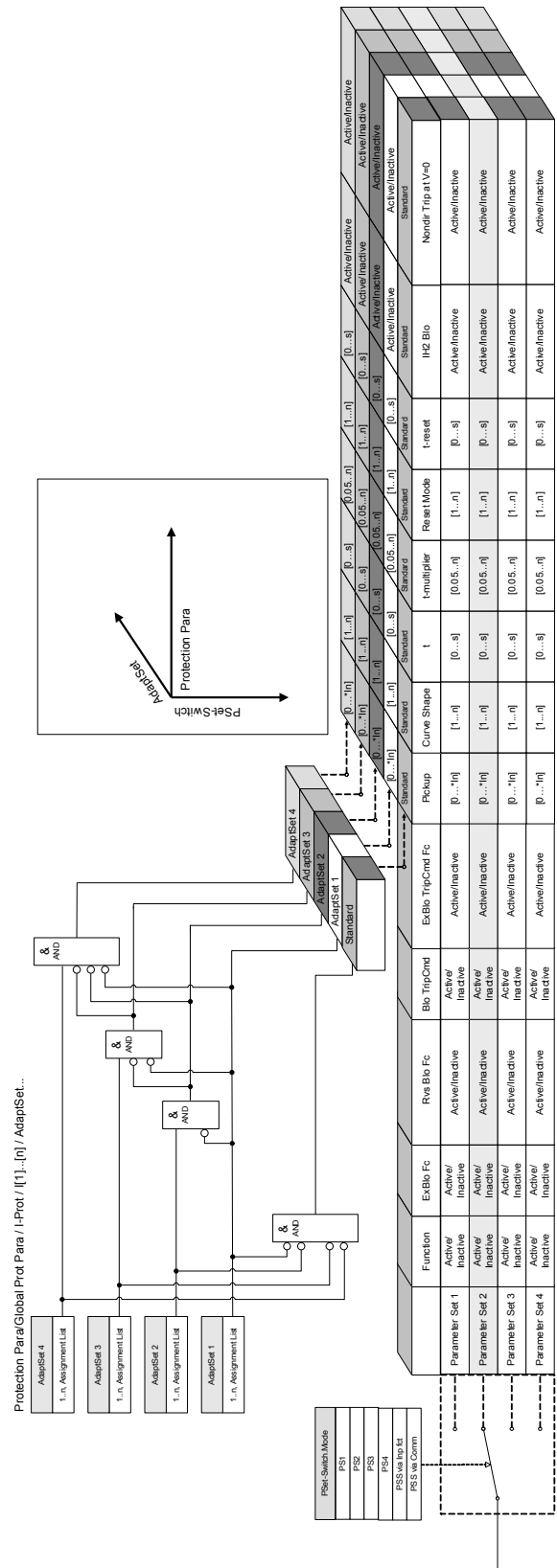
By means of the Module Inputs, information can be passed to and acted upon by the modules. The User can assign signals to **Module Inputs**. The state of the signals that are assigned to an input can be viewed from the Status Display. Module Inputs can be identified by an “-I” at the end of the name.

Signals

Signals are part of the “Device Parameter tree”. The state of the signal is context-dependent.

- **Signals** represent the state of the installation/equipment (e.g.: position indicators of the breaker).
- **Signals** are assessments of the state of the grid and the equipment (System OK, Transformer failure detected, ...).
- **Signals** represent decisions that are taken by the device (e.g.: Trip Command) based on the User parameter settings.

Adaptive Parameter Sets



Adaptive Parameter Sets are part of the “Device Parameter tree”.

By means of **Adaptive Parameter Sets**, the User can temporarily modify single parameters within the Parameter Setting groups.

NOTICE

Adaptive Parameters drop-out automatically if the acknowledged signal that has activated them has dropped-out. Please take into account that Adaptive Set 1 is dominant to Adaptive Set 2. Adaptive Set 2 is dominant to Adaptive Set 3. Adaptive Set 3 is dominant to Adaptive Set 4.

NOTICE

In order to increase the usability (clarity), Adaptive Parameter Sets become visible if a corresponding activation signal has been assigned (PowerPort-E V. 1.2 and higher).

Example: In order to use Adaptive Parameters within Protective Element I [1], please proceed as follows.

- Assign within the Global Parameter tree, within Protective Element I[1], an activation signal for Adaptive Parameter Set 1.
- Adaptive Parameter Set 1 becomes now visible within the Protection Parameter Sets for element I[1].

By means of additional activation signals, further Adaptive Parameter Sets can be used.

The functionality of the IED (relay) can be enhanced / adapted, by means of **Adaptive Parameters** in order to meet the requirements of modified states of the grid or the power supply system respectively, to manage unpredictable events.

Moreover, the adaptive parameter can also be used to realize various special protective functions or to expand the existing function modules in a simple way, without costly redesign the existing hardware or software platform.

The **Adaptive Parameter** feature allows, besides a standard parameter set, one of the four parameter sets labeled from 1 to 4, to be used, for example, in a time overcurrent element under the control of the configurable Set Control Logic. The dynamic switch-over of the adaptive parameter set is only active for a particular element when its adaptive set control logic is configured and only as long as the activation signal is true.

For some protection elements, such as time overcurrent and instantaneous overcurrent (50P, 51P, 50G, 51G, ...), besides the “default” setting there exists another four “alternative” settings for pickup value, curve type, time dial, and reset mode set values that can dynamically be switched-over by means of the configurable adaptive setting control logic in the single set parameter.

If the **Adaptive Parameter** feature is not used, the adaptive set control logic will not be selected (assigned). The protective elements work, in this case, just like a normal protection using the “Default” settings. If one of the **Adaptive Set** Control logic is assigned to a logic function, the protective element will be “switched-over” to the corresponding adaptive settings if the assigned logic function is asserted and will drop-out to the “Default” setting if the assigned signal that has activated the **Adaptive Set** has dropped-out.

Adaptive Parameter Set Activation Signals

Name	Description
.-	No assignment
Exp[1].Alarm	Signal: Alarm
Exp[2].Alarm	Signal: Alarm
Exp[3].Alarm	Signal: Alarm
Exp[4].Alarm	Signal: Alarm
CTS.Pickup	Signal: Pickup Current Transformer Measuring Circuit Supervision
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
Modbus.Comm Cmd 1	Communication Command
Modbus.Comm Cmd 2	Communication Command
Modbus.Comm Cmd 3	Communication Command
Modbus.Comm Cmd 4	Communication Command
Modbus.Comm Cmd 5	Communication Command
Modbus.Comm Cmd 6	Communication Command
Modbus.Comm Cmd 7	Communication Command
Modbus.Comm Cmd 8	Communication Command
Modbus.Comm Cmd 9	Communication Command
Modbus.Comm Cmd 10	Communication Command
Modbus.Comm Cmd 11	Communication Command
Modbus.Comm Cmd 12	Communication Command
Modbus.Comm Cmd 13	Communication Command
Modbus.Comm Cmd 14	Communication Command
Modbus.Comm Cmd 15	Communication Command
Modbus.Comm Cmd 16	Communication Command
IEC61850.VirtInp1	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp2	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp3	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp4	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp5	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp6	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp7	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp8	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp9	Signal: Virtual Input (IEC61850 GGIO Ind)

<i>Name</i>	<i>Description</i>
IEC61850.VirtInp10	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp11	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp12	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp13	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp14	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp15	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp16	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp17	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp18	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp19	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp20	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp21	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp22	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp23	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp24	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp25	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp26	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp27	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp28	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp29	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp30	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp31	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp32	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.SPCSO1	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO2	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO3	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO4	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO5	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO6	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO7	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO8	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).

<i>Name</i>	<i>Description</i>
IEC61850.SPCSO9	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO10	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO11	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO12	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO13	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO14	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO15	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO16	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
Profibus.Comm Cmd 1	Communication Command
Profibus.Comm Cmd 2	Communication Command
Profibus.Comm Cmd 3	Communication Command
Profibus.Comm Cmd 4	Communication Command
Profibus.Comm Cmd 5	Communication Command
Profibus.Comm Cmd 6	Communication Command
Profibus.Comm Cmd 7	Communication Command
Profibus.Comm Cmd 8	Communication Command
Profibus.Comm Cmd 9	Communication Command
Profibus.Comm Cmd 10	Communication Command
Profibus.Comm Cmd 11	Communication Command
Profibus.Comm Cmd 12	Communication Command
Profibus.Comm Cmd 13	Communication Command
Profibus.Comm Cmd 14	Communication Command
Profibus.Comm Cmd 15	Communication Command
Profibus.Comm Cmd 16	Communication Command
Logic.LE1.Gate Out	Signal: Output of the logic gate
Logic.LE1.Timer Out	Signal: Timer Output
Logic.LE1.Out	Signal: Latched Output (Q)
Logic.LE1.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE2.Gate Out	Signal: Output of the logic gate
Logic.LE2.Timer Out	Signal: Timer Output
Logic.LE2.Out	Signal: Latched Output (Q)
Logic.LE2.Out inverted	Signal: Negated Latched Output (Q NOT)

<i>Name</i>	<i>Description</i>
Logic.LE3.Gate Out	Signal: Output of the logic gate
Logic.LE3.Timer Out	Signal: Timer Output
Logic.LE3.Out	Signal: Latched Output (Q)
Logic.LE3.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE4.Gate Out	Signal: Output of the logic gate
Logic.LE4.Timer Out	Signal: Timer Output
Logic.LE4.Out	Signal: Latched Output (Q)
Logic.LE4.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE5.Gate Out	Signal: Output of the logic gate
Logic.LE5.Timer Out	Signal: Timer Output
Logic.LE5.Out	Signal: Latched Output (Q)
Logic.LE5.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE6.Gate Out	Signal: Output of the logic gate
Logic.LE6.Timer Out	Signal: Timer Output
Logic.LE6.Out	Signal: Latched Output (Q)
Logic.LE6.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE7.Gate Out	Signal: Output of the logic gate
Logic.LE7.Timer Out	Signal: Timer Output
Logic.LE7.Out	Signal: Latched Output (Q)
Logic.LE7.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE8.Gate Out	Signal: Output of the logic gate
Logic.LE8.Timer Out	Signal: Timer Output
Logic.LE8.Out	Signal: Latched Output (Q)
Logic.LE8.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE9.Gate Out	Signal: Output of the logic gate
Logic.LE9.Timer Out	Signal: Timer Output
Logic.LE9.Out	Signal: Latched Output (Q)
Logic.LE9.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE10.Gate Out	Signal: Output of the logic gate
Logic.LE10.Timer Out	Signal: Timer Output
Logic.LE10.Out	Signal: Latched Output (Q)
Logic.LE10.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE11.Gate Out	Signal: Output of the logic gate
Logic.LE11.Timer Out	Signal: Timer Output
Logic.LE11.Out	Signal: Latched Output (Q)
Logic.LE11.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE12.Gate Out	Signal: Output of the logic gate

<i>Name</i>	<i>Description</i>
Logic.LE12.Timer Out	Signal: Timer Output
Logic.LE12.Out	Signal: Latched Output (Q)
Logic.LE12.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE13.Gate Out	Signal: Output of the logic gate
Logic.LE13.Timer Out	Signal: Timer Output
Logic.LE13.Out	Signal: Latched Output (Q)
Logic.LE13.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE14.Gate Out	Signal: Output of the logic gate
Logic.LE14.Timer Out	Signal: Timer Output
Logic.LE14.Out	Signal: Latched Output (Q)
Logic.LE14.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE15.Gate Out	Signal: Output of the logic gate
Logic.LE15.Timer Out	Signal: Timer Output
Logic.LE15.Out	Signal: Latched Output (Q)
Logic.LE15.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE16.Gate Out	Signal: Output of the logic gate
Logic.LE16.Timer Out	Signal: Timer Output
Logic.LE16.Out	Signal: Latched Output (Q)
Logic.LE16.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE17.Gate Out	Signal: Output of the logic gate
Logic.LE17.Timer Out	Signal: Timer Output
Logic.LE17.Out	Signal: Latched Output (Q)
Logic.LE17.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE18.Gate Out	Signal: Output of the logic gate
Logic.LE18.Timer Out	Signal: Timer Output
Logic.LE18.Out	Signal: Latched Output (Q)
Logic.LE18.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE19.Gate Out	Signal: Output of the logic gate
Logic.LE19.Timer Out	Signal: Timer Output
Logic.LE19.Out	Signal: Latched Output (Q)
Logic.LE19.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE20.Gate Out	Signal: Output of the logic gate
Logic.LE20.Timer Out	Signal: Timer Output
Logic.LE20.Out	Signal: Latched Output (Q)
Logic.LE20.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE21.Gate Out	Signal: Output of the logic gate
Logic.LE21.Timer Out	Signal: Timer Output

<i>Name</i>	<i>Description</i>
Logic.LE21.Out	Signal: Latched Output (Q)
Logic.LE21.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE22.Gate Out	Signal: Output of the logic gate
Logic.LE22.Timer Out	Signal: Timer Output
Logic.LE22.Out	Signal: Latched Output (Q)
Logic.LE22.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE23.Gate Out	Signal: Output of the logic gate
Logic.LE23.Timer Out	Signal: Timer Output
Logic.LE23.Out	Signal: Latched Output (Q)
Logic.LE23.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE24.Gate Out	Signal: Output of the logic gate
Logic.LE24.Timer Out	Signal: Timer Output
Logic.LE24.Out	Signal: Latched Output (Q)
Logic.LE24.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE25.Gate Out	Signal: Output of the logic gate
Logic.LE25.Timer Out	Signal: Timer Output
Logic.LE25.Out	Signal: Latched Output (Q)
Logic.LE25.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE26.Gate Out	Signal: Output of the logic gate
Logic.LE26.Timer Out	Signal: Timer Output
Logic.LE26.Out	Signal: Latched Output (Q)
Logic.LE26.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE27.Gate Out	Signal: Output of the logic gate
Logic.LE27.Timer Out	Signal: Timer Output
Logic.LE27.Out	Signal: Latched Output (Q)
Logic.LE27.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE28.Gate Out	Signal: Output of the logic gate
Logic.LE28.Timer Out	Signal: Timer Output
Logic.LE28.Out	Signal: Latched Output (Q)
Logic.LE28.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE29.Gate Out	Signal: Output of the logic gate
Logic.LE29.Timer Out	Signal: Timer Output
Logic.LE29.Out	Signal: Latched Output (Q)
Logic.LE29.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE30.Gate Out	Signal: Output of the logic gate
Logic.LE30.Timer Out	Signal: Timer Output
Logic.LE30.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logic.LE30.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE31.Gate Out	Signal: Output of the logic gate
Logic.LE31.Timer Out	Signal: Timer Output
Logic.LE31.Out	Signal: Latched Output (Q)
Logic.LE31.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE32.Gate Out	Signal: Output of the logic gate
Logic.LE32.Timer Out	Signal: Timer Output
Logic.LE32.Out	Signal: Latched Output (Q)
Logic.LE32.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE33.Gate Out	Signal: Output of the logic gate
Logic.LE33.Timer Out	Signal: Timer Output
Logic.LE33.Out	Signal: Latched Output (Q)
Logic.LE33.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE34.Gate Out	Signal: Output of the logic gate
Logic.LE34.Timer Out	Signal: Timer Output
Logic.LE34.Out	Signal: Latched Output (Q)
Logic.LE34.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE35.Gate Out	Signal: Output of the logic gate
Logic.LE35.Timer Out	Signal: Timer Output
Logic.LE35.Out	Signal: Latched Output (Q)
Logic.LE35.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE36.Gate Out	Signal: Output of the logic gate
Logic.LE36.Timer Out	Signal: Timer Output
Logic.LE36.Out	Signal: Latched Output (Q)
Logic.LE36.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE37.Gate Out	Signal: Output of the logic gate
Logic.LE37.Timer Out	Signal: Timer Output
Logic.LE37.Out	Signal: Latched Output (Q)
Logic.LE37.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE38.Gate Out	Signal: Output of the logic gate
Logic.LE38.Timer Out	Signal: Timer Output
Logic.LE38.Out	Signal: Latched Output (Q)
Logic.LE38.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE39.Gate Out	Signal: Output of the logic gate
Logic.LE39.Timer Out	Signal: Timer Output
Logic.LE39.Out	Signal: Latched Output (Q)
Logic.LE39.Out inverted	Signal: Negated Latched Output (Q NOT)

<i>Name</i>	<i>Description</i>
Logic.LE40.Gate Out	Signal: Output of the logic gate
Logic.LE40.Timer Out	Signal: Timer Output
Logic.LE40.Out	Signal: Latched Output (Q)
Logic.LE40.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE41.Gate Out	Signal: Output of the logic gate
Logic.LE41.Timer Out	Signal: Timer Output
Logic.LE41.Out	Signal: Latched Output (Q)
Logic.LE41.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE42.Gate Out	Signal: Output of the logic gate
Logic.LE42.Timer Out	Signal: Timer Output
Logic.LE42.Out	Signal: Latched Output (Q)
Logic.LE42.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE43.Gate Out	Signal: Output of the logic gate
Logic.LE43.Timer Out	Signal: Timer Output
Logic.LE43.Out	Signal: Latched Output (Q)
Logic.LE43.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE44.Gate Out	Signal: Output of the logic gate
Logic.LE44.Timer Out	Signal: Timer Output
Logic.LE44.Out	Signal: Latched Output (Q)
Logic.LE44.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE45.Gate Out	Signal: Output of the logic gate
Logic.LE45.Timer Out	Signal: Timer Output
Logic.LE45.Out	Signal: Latched Output (Q)
Logic.LE45.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE46.Gate Out	Signal: Output of the logic gate
Logic.LE46.Timer Out	Signal: Timer Output
Logic.LE46.Out	Signal: Latched Output (Q)
Logic.LE46.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE47.Gate Out	Signal: Output of the logic gate
Logic.LE47.Timer Out	Signal: Timer Output
Logic.LE47.Out	Signal: Latched Output (Q)
Logic.LE47.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE48.Gate Out	Signal: Output of the logic gate
Logic.LE48.Timer Out	Signal: Timer Output
Logic.LE48.Out	Signal: Latched Output (Q)
Logic.LE48.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE49.Gate Out	Signal: Output of the logic gate

<i>Name</i>	<i>Description</i>
Logic.LE49.Timer Out	Signal: Timer Output
Logic.LE49.Out	Signal: Latched Output (Q)
Logic.LE49.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE50.Gate Out	Signal: Output of the logic gate
Logic.LE50.Timer Out	Signal: Timer Output
Logic.LE50.Out	Signal: Latched Output (Q)
Logic.LE50.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE51.Gate Out	Signal: Output of the logic gate
Logic.LE51.Timer Out	Signal: Timer Output
Logic.LE51.Out	Signal: Latched Output (Q)
Logic.LE51.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE52.Gate Out	Signal: Output of the logic gate
Logic.LE52.Timer Out	Signal: Timer Output
Logic.LE52.Out	Signal: Latched Output (Q)
Logic.LE52.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE53.Gate Out	Signal: Output of the logic gate
Logic.LE53.Timer Out	Signal: Timer Output
Logic.LE53.Out	Signal: Latched Output (Q)
Logic.LE53.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE54.Gate Out	Signal: Output of the logic gate
Logic.LE54.Timer Out	Signal: Timer Output
Logic.LE54.Out	Signal: Latched Output (Q)
Logic.LE54.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE55.Gate Out	Signal: Output of the logic gate
Logic.LE55.Timer Out	Signal: Timer Output
Logic.LE55.Out	Signal: Latched Output (Q)
Logic.LE55.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE56.Gate Out	Signal: Output of the logic gate
Logic.LE56.Timer Out	Signal: Timer Output
Logic.LE56.Out	Signal: Latched Output (Q)
Logic.LE56.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE57.Gate Out	Signal: Output of the logic gate
Logic.LE57.Timer Out	Signal: Timer Output
Logic.LE57.Out	Signal: Latched Output (Q)
Logic.LE57.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE58.Gate Out	Signal: Output of the logic gate
Logic.LE58.Timer Out	Signal: Timer Output

<i>Name</i>	<i>Description</i>
Logic.LE58.Out	Signal: Latched Output (Q)
Logic.LE58.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE59.Gate Out	Signal: Output of the logic gate
Logic.LE59.Timer Out	Signal: Timer Output
Logic.LE59.Out	Signal: Latched Output (Q)
Logic.LE59.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE60.Gate Out	Signal: Output of the logic gate
Logic.LE60.Timer Out	Signal: Timer Output
Logic.LE60.Out	Signal: Latched Output (Q)
Logic.LE60.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE61.Gate Out	Signal: Output of the logic gate
Logic.LE61.Timer Out	Signal: Timer Output
Logic.LE61.Out	Signal: Latched Output (Q)
Logic.LE61.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE62.Gate Out	Signal: Output of the logic gate
Logic.LE62.Timer Out	Signal: Timer Output
Logic.LE62.Out	Signal: Latched Output (Q)
Logic.LE62.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE63.Gate Out	Signal: Output of the logic gate
Logic.LE63.Timer Out	Signal: Timer Output
Logic.LE63.Out	Signal: Latched Output (Q)
Logic.LE63.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE64.Gate Out	Signal: Output of the logic gate
Logic.LE64.Timer Out	Signal: Timer Output
Logic.LE64.Out	Signal: Latched Output (Q)
Logic.LE64.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE65.Gate Out	Signal: Output of the logic gate
Logic.LE65.Timer Out	Signal: Timer Output
Logic.LE65.Out	Signal: Latched Output (Q)
Logic.LE65.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE66.Gate Out	Signal: Output of the logic gate
Logic.LE66.Timer Out	Signal: Timer Output
Logic.LE66.Out	Signal: Latched Output (Q)
Logic.LE66.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE67.Gate Out	Signal: Output of the logic gate
Logic.LE67.Timer Out	Signal: Timer Output
Logic.LE67.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logic.LE67.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE68.Gate Out	Signal: Output of the logic gate
Logic.LE68.Timer Out	Signal: Timer Output
Logic.LE68.Out	Signal: Latched Output (Q)
Logic.LE68.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE69.Gate Out	Signal: Output of the logic gate
Logic.LE69.Timer Out	Signal: Timer Output
Logic.LE69.Out	Signal: Latched Output (Q)
Logic.LE69.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE70.Gate Out	Signal: Output of the logic gate
Logic.LE70.Timer Out	Signal: Timer Output
Logic.LE70.Out	Signal: Latched Output (Q)
Logic.LE70.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE71.Gate Out	Signal: Output of the logic gate
Logic.LE71.Timer Out	Signal: Timer Output
Logic.LE71.Out	Signal: Latched Output (Q)
Logic.LE71.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE72.Gate Out	Signal: Output of the logic gate
Logic.LE72.Timer Out	Signal: Timer Output
Logic.LE72.Out	Signal: Latched Output (Q)
Logic.LE72.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE73.Gate Out	Signal: Output of the logic gate
Logic.LE73.Timer Out	Signal: Timer Output
Logic.LE73.Out	Signal: Latched Output (Q)
Logic.LE73.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE74.Gate Out	Signal: Output of the logic gate
Logic.LE74.Timer Out	Signal: Timer Output
Logic.LE74.Out	Signal: Latched Output (Q)
Logic.LE74.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE75.Gate Out	Signal: Output of the logic gate
Logic.LE75.Timer Out	Signal: Timer Output
Logic.LE75.Out	Signal: Latched Output (Q)
Logic.LE75.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE76.Gate Out	Signal: Output of the logic gate
Logic.LE76.Timer Out	Signal: Timer Output
Logic.LE76.Out	Signal: Latched Output (Q)
Logic.LE76.Out inverted	Signal: Negated Latched Output (Q NOT)

<i>Name</i>	<i>Description</i>
Logic.LE77.Gate Out	Signal: Output of the logic gate
Logic.LE77.Timer Out	Signal: Timer Output
Logic.LE77.Out	Signal: Latched Output (Q)
Logic.LE77.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE78.Gate Out	Signal: Output of the logic gate
Logic.LE78.Timer Out	Signal: Timer Output
Logic.LE78.Out	Signal: Latched Output (Q)
Logic.LE78.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE79.Gate Out	Signal: Output of the logic gate
Logic.LE79.Timer Out	Signal: Timer Output
Logic.LE79.Out	Signal: Latched Output (Q)
Logic.LE79.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE80.Gate Out	Signal: Output of the logic gate
Logic.LE80.Timer Out	Signal: Timer Output
Logic.LE80.Out	Signal: Latched Output (Q)
Logic.LE80.Out inverted	Signal: Negated Latched Output (Q NOT)
Sys.Maint Mode Active	Signal: Arc Flash Reduction Maintenance Active
Sys.Maint Mode Inactive	Signal: Arc Flash Reduction Maintenance Inactive

Adaptive Parameters via HMI

NOTICE

The use of Adaptive Parameters via the HMI (panel) differs a bit to the use via PowerPort-E.

Adaptive Parameters can be also used via the HMI (instead of using the recommended *PowerPort-E*). The principle method of using them via the HMI is as follows.

1. Assign an activation signal for an Adaptive Parameter Set within the Global Parameters » *Global Para*« for a protective element (available for current functions only).
2. Call up this protective element within a Setting Group.
3. Go to the parameter that should be modified adaptively and call it up for editing (arrow-right-key).
4. Choose the corresponding Adaptive Set.
5. Set the modified parameter for the selected Adaptive Set.

Application Example

The tripping time »*t*« for the 50[1] element of »*Parameter Set 1*« should be desensitized (reduced) in case Digital Input 2 becomes active.

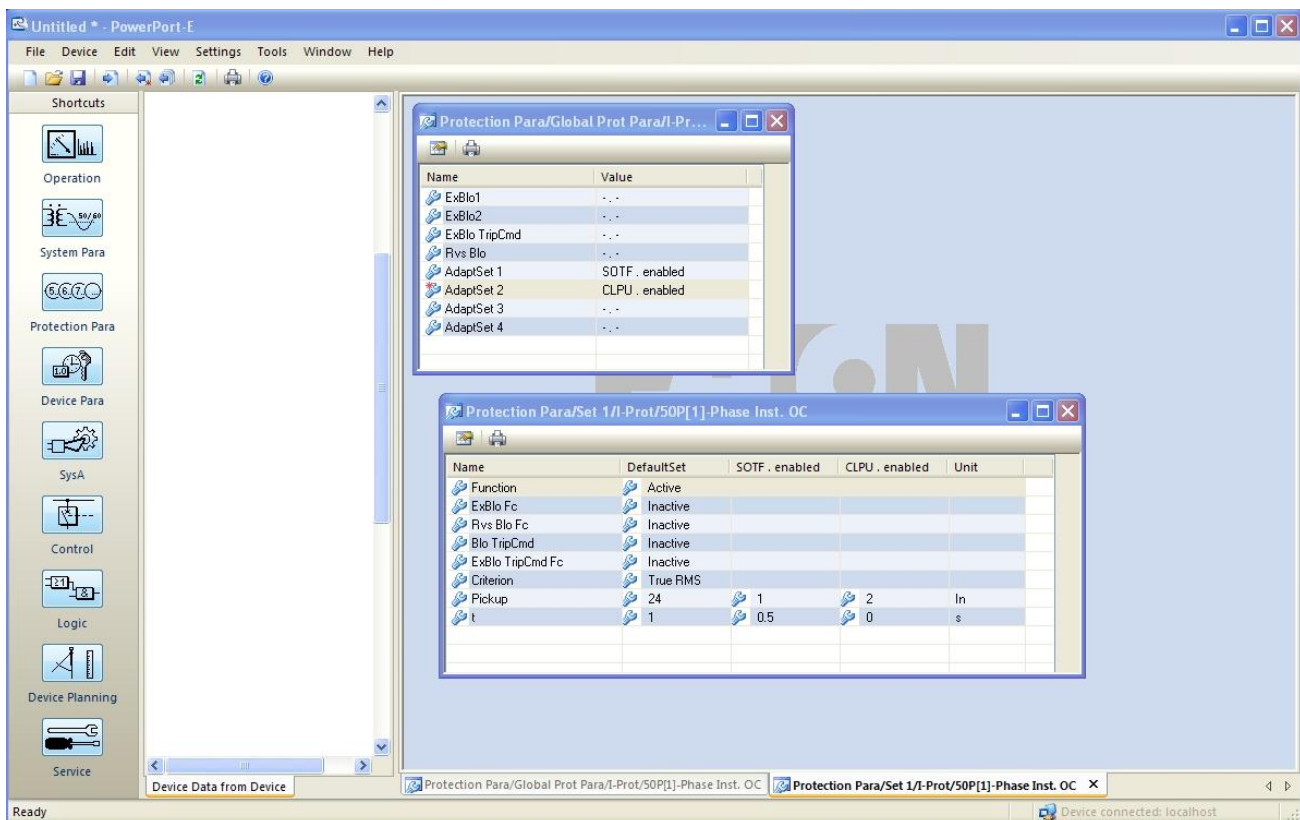
1. Call up the menu [Protection Para/Global Protection Para/I-Prot/50[1]/AdaptSet1] and assign Digital Input 2 as activation signal.
2. Call up the 50[1] element within the menu [Protection Para/Set[1]/I-Port/50[1].
3. Go to the tripping time parameter »*t*« by means of the softkey (arrow-down) and call up the submenu by means of the softkey (arrow-right).
4. Call up the corresponding parameter set (Adaptive Set 1 in this example).
5. Set the reduced tripping time for »*AdaptSet 1*«.

Check and confirm that the functionality is in compliance with your protection plan via a commissioning test.

Application Example

During a “Switch-OnTo-Fault” condition, the User is usually requested to make the embedded protective function tripping of the faulted line faster, instantaneous, or sometimes non-directional.

Such a “Switch-OnTo-Fault” application can easily be realized using the **Adaptive Parameter** features mentioned previously. The standard time overcurrent protection element (e.g.: 51P) should trip instantaneously in case of SOTF condition,. If the SOTF logic function »SOTF ENABLED« is detecting a manual breaker close condition, the relay switches to **Adaptive Set 1** if the signal »SOTF.ENABLED« is assigned to **Adaptive Set 1**. The corresponding **Adaptive Set 1** will become active and than » $t = 0$ « sec.



The screen shot above shows the adaptive setting configurations following applications based on only one simple overcurrent protection element:

1. Standard Set: Default settings;
2. Adaptive Set 1: SOTF application (Switch-OnTo-Fault);
3. Adaptive Set 2: CLPU application (Cold Load Pickup);

Application Examples

- The output signal of the Switch OnTo Fault module can be used to activate an **Adaptive Parameter Set** that sensitizes the overcurrent protection.
- The output signal of the Cold Load Pickup module can be used to activate an **Adaptive Parameter Set** that desensitizes the overcurrent protection.
- By means of **Adaptive Parameter Sets**, an Adaptive Auto Reclosure can be realized. After a reclosure attempt, the tripping thresholds or tripping curves of the overcurrent protection can be adapted.
- Depending on undervoltage, the overcurrent protection can be modified (voltage controlled). This applies to devices that offer voltage protection only.
- The ground overcurrent protection can be modified by the residual voltage. This applies to devices that offer voltage protection only.
- Dynamic and automatic adaption of the ground current settings in order to adapt the settings to different loads (single-phase load diversity).

NOTICE

Adaptive Parameter Sets are only available for devices with current protection modules.

Parameter Setting at the HMI

Every parameter belongs to an access area. Editing and changing of a parameter requires a sufficient access authorization.

The User can obtain the required access authorizations by unlocking access areas in advance of parameter changes or context-dependent. In the following sections both options will be explained.

Option 1: Direct Authorization for an Access Area

Call up menu [Device Para\Access level].

Select the required access level respectively navigate to the required access authorization (level). Enter the required password. If the correct password has been entered, the required access authorization will be obtained. In order to do the parameter changes please proceed as follows:

- Move to the parameter you want to change by using the Softkeys. If the parameter is selected, the lower right corner of the display should show a »Wrench« symbol.



This symbol indicates, that the parameter is unlocked and can be edited, because the required access authorization is available. Confirm the Softkey »Wrench«, in order to edit the parameter. Change the parameter.

Now you can:

- save the change you made and have them adopted by the system or:
- change additional parameters and save finally all the altered parameters and have them adopted by the system.

To save parameter changes immediately,

- press the »OK« key for saving changed parameters directly and to have them adopted by the device. Confirm the parameter changes by pressing the »Yes« Softkey or dismiss by pressing »No«.

To change additional parameters and save afterwards,

- move to other parameters and change them

NOTICE

A star symbol in front of the changed parameters indicates that the modifications have only been saved temporarily, they are not yet finally stored and adopted by the device.

In order to make things easier to follow, especially where complex parameter changes are involved, on every superior/higher-ranking menu level the intended change of the parameter is indicated by the star symbol (star trace). This makes it possible to control or follow up from the main menu level at any time where parameter changes have been made and have not been saved finally.

In addition to the star trace to the temporary saved parameter changes, a general parameter changing symbol is faded-in at the left corner of the display, and so it is possible from each point of the menu tree to see that there are parameter changes still not adopted by the device.

Press the »OK« key to initiate the final storage of all parameter changes. Confirm the parameter changes by pressing the »Yes« softkey or dismiss by pressing Softkey »No«.

NOTICE

If the display shows a Key Symbol instead of a Wrench-Symbol, this will indicate, that the required access authorization is not available.



In order to edit this parameter, a password is required, that provides the required authorization.

NOTICE

Plausibility check: In order to prevent obvious wrong settings the device monitors constantly all temporary saved parameter changes. If the device detects an implausibility, this is indicated by a question mark in front of the respective parameter.

In order to make things easier to follow up, especially where complex parameter changes are involved, on every superior/higher-ranking menu level, above the temporarily saved parameters an invalidity is indicated by the question mark (plausibility trace). This makes it possible to control or follow from the main menu level at any time where implausibilities are intended to be saved.

In addition to the question mark trace to the temporary saved implausible parameter changes a general implausibility symbol/question mark is faded-in at the left corner of the display, and so it is possible to see from each point of the menu tree that implausibilities have been detected by the device.

A star/parameter change indication is always overwritten by the question mark/implausibility symbol.

If a device detects an implausibility, it rejects saving and adopting of the parameters.

Option 2: Context-dependent Access Authorization

Navigate to the parameter, that is to be changed. If the parameter is selected, the lower right corner of the display shows a »Key«-Symbol.



This symbol indicates, that the device is still within the »Read Only Lv0«-Level, or that the current level does not provide sufficient access rights to allow editing of this parameter.

Press this Softkey and enter the password¹⁾ that provides access to this parameter.

Please change the parameter settings.

¹⁾ This page provides also information, which password/access authorization is required to do changes on this parameter.

Now you can:

- save the change you made and have them adopted by the system or:
- change additional parameters and save finally all the altered parameters and have them adopted by the system.

To save parameter changes immediately,

- press the »OK« key for saving changed parameters directly and to have them adopted by the device. Confirm the parameter changes by pressing the »Yes« Softkey or dismiss by pressing »No«.

To change additional parameters and save afterwards,

- move to other parameters and change them

NOTICE

A star symbol in front of the changed parameters indicates that the modifications have only been saved temporary, they are not yet finally stored and adopted by the device.

In order to make things easier to follow up, especially where complex parameter changes are involved, on every superior/higher-ranking menu level the intended change of the parameter is indicated by the star symbol (star trace). This makes it possible to control or follow from the main menu level at any time where parameter changes have been made and have not been saved finally.

In addition to the star trace to the temporary saved parameter changes, a general parameter changing symbol is faded-in at the left corner of the display, and so it is possible from each point of the menu tree to see that there are parameter changes still not adopted by the device.

Press the »OK« key to initiate the final storage of all parameter changes. Confirm the parameter changes by pressing the »Yes« Softkey or dismiss by pressing Softkey »No«.

NOTICE

Plausibility check: In order to prevent obvious wrong settings the device monitors constantly all temporary saved parameter changes. If the device detects an implausibility, this is indicated by a question mark in front of the respective parameter.

In order to make things easier to follow up, especially where complex parameter changes are involved, on every superior/higher-ranking menu level, above the temporary saved parameters an invalidity is indicated by the question mark (plausibility trace). This makes it possible to control or follow from the main menu level at any time where implausibilities are intended to be saved.

In addition to the question mark trace to the temporary saved implausible parameter changes a general implausibility symbol/question mark is faded-in at the left corner of the display, and so it is possible to see from each point of the menu tree that implausibilities have been detected by the device.

A star/parameter change indication is always overwritten by the question mark/implausibility symbol.

If a device detects an implausibility, it rejects saving and adopting of the parameters.

Setting Groups

Within the »Protection Para/P-Set Switch« menu, the User has the following possibilities:

- To manually set one of the four setting groups active;
- To assign a signal to each setting group that sets this group to active; and
- Scada switches the setting groups.

NOTICE

Switching over to another (already configured) setting group is done very quickly (usually within a time of approx. 10 ms).

Option	Setting Group Switch
Manual Selection	Switch over, if another setting group is chosen manually within the menu »Protection Para/P-Set Switch«
Via Input Function (e.g. Digital Input)	Switch over not until the request is clear. That means, if there is more or less than one request signal active, no switch over will be executed. Example:: • DI3 is assigned onto Parameter set 1. DI3 is active "1". • DI4 is assigned onto Parameter set 2. DI4 is inactive "0". Now the device should switch from parameter set 1 to parameter set 2. Therefore at first DI3 has to become inactive "0". Than DI4 has to be active "1". If DI4 becomes again inactive "0", parameter set 2 will remain active "1" as long as there is no clear request (e.g. DI3 becomes active "1", all the other assignments are inactive "0")
Via Scada	Switch over if there is a clear SCADA request. Otherwise no switch over will be executed.

NOTICE

Setting group switch: Whenever another setting group gets activated, all memory-related values (e.g. timers) are reset for all protection functions.

Configuration change: Whenever changes are made to the settings of protection parameters (device planning, global parameters or setting group parameters for more than one setting group) all protection functionality is completely deactivated for a short time. This means that all protection modules are inactive for some time, so that they can be restarted with the new settings. This way it is made sure that all protection behavior is consistent with respect to the new settings.

An *exception* from this is a configuration change that is restricted to settings from only one setting group. In this case all protection functions are only reset (exactly as for a setting group switch, see above).

Signals that can be used for PSS

Name	Description
.-	No assignment
CTS.Pickup	Signal: Pickup Current Transformer Measuring Circuit Supervision
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
Logic.LE1.Gate Out	Signal: Output of the logic gate
Logic.LE1.Timer Out	Signal: Timer Output
Logic.LE1.Out	Signal: Latched Output (Q)
Logic.LE1.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE2.Gate Out	Signal: Output of the logic gate
Logic.LE2.Timer Out	Signal: Timer Output
Logic.LE2.Out	Signal: Latched Output (Q)
Logic.LE2.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE3.Gate Out	Signal: Output of the logic gate
Logic.LE3.Timer Out	Signal: Timer Output
Logic.LE3.Out	Signal: Latched Output (Q)
Logic.LE3.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE4.Gate Out	Signal: Output of the logic gate
Logic.LE4.Timer Out	Signal: Timer Output
Logic.LE4.Out	Signal: Latched Output (Q)
Logic.LE4.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE5.Gate Out	Signal: Output of the logic gate
Logic.LE5.Timer Out	Signal: Timer Output
Logic.LE5.Out	Signal: Latched Output (Q)
Logic.LE5.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE6.Gate Out	Signal: Output of the logic gate
Logic.LE6.Timer Out	Signal: Timer Output
Logic.LE6.Out	Signal: Latched Output (Q)
Logic.LE6.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE7.Gate Out	Signal: Output of the logic gate
Logic.LE7.Timer Out	Signal: Timer Output
Logic.LE7.Out	Signal: Latched Output (Q)
Logic.LE7.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE8.Gate Out	Signal: Output of the logic gate

<i>Name</i>	<i>Description</i>
Logic.LE8.Timer Out	Signal: Timer Output
Logic.LE8.Out	Signal: Latched Output (Q)
Logic.LE8.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE9.Gate Out	Signal: Output of the logic gate
Logic.LE9.Timer Out	Signal: Timer Output
Logic.LE9.Out	Signal: Latched Output (Q)
Logic.LE9.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE10.Gate Out	Signal: Output of the logic gate
Logic.LE10.Timer Out	Signal: Timer Output
Logic.LE10.Out	Signal: Latched Output (Q)
Logic.LE10.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE11.Gate Out	Signal: Output of the logic gate
Logic.LE11.Timer Out	Signal: Timer Output
Logic.LE11.Out	Signal: Latched Output (Q)
Logic.LE11.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE12.Gate Out	Signal: Output of the logic gate
Logic.LE12.Timer Out	Signal: Timer Output
Logic.LE12.Out	Signal: Latched Output (Q)
Logic.LE12.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE13.Gate Out	Signal: Output of the logic gate
Logic.LE13.Timer Out	Signal: Timer Output
Logic.LE13.Out	Signal: Latched Output (Q)
Logic.LE13.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE14.Gate Out	Signal: Output of the logic gate
Logic.LE14.Timer Out	Signal: Timer Output
Logic.LE14.Out	Signal: Latched Output (Q)
Logic.LE14.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE15.Gate Out	Signal: Output of the logic gate
Logic.LE15.Timer Out	Signal: Timer Output
Logic.LE15.Out	Signal: Latched Output (Q)
Logic.LE15.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE16.Gate Out	Signal: Output of the logic gate
Logic.LE16.Timer Out	Signal: Timer Output
Logic.LE16.Out	Signal: Latched Output (Q)
Logic.LE16.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE17.Gate Out	Signal: Output of the logic gate
Logic.LE17.Timer Out	Signal: Timer Output

<i>Name</i>	<i>Description</i>
Logic.LE17.Out	Signal: Latched Output (Q)
Logic.LE17.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE18.Gate Out	Signal: Output of the logic gate
Logic.LE18.Timer Out	Signal: Timer Output
Logic.LE18.Out	Signal: Latched Output (Q)
Logic.LE18.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE19.Gate Out	Signal: Output of the logic gate
Logic.LE19.Timer Out	Signal: Timer Output
Logic.LE19.Out	Signal: Latched Output (Q)
Logic.LE19.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE20.Gate Out	Signal: Output of the logic gate
Logic.LE20.Timer Out	Signal: Timer Output
Logic.LE20.Out	Signal: Latched Output (Q)
Logic.LE20.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE21.Gate Out	Signal: Output of the logic gate
Logic.LE21.Timer Out	Signal: Timer Output
Logic.LE21.Out	Signal: Latched Output (Q)
Logic.LE21.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE22.Gate Out	Signal: Output of the logic gate
Logic.LE22.Timer Out	Signal: Timer Output
Logic.LE22.Out	Signal: Latched Output (Q)
Logic.LE22.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE23.Gate Out	Signal: Output of the logic gate
Logic.LE23.Timer Out	Signal: Timer Output
Logic.LE23.Out	Signal: Latched Output (Q)
Logic.LE23.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE24.Gate Out	Signal: Output of the logic gate
Logic.LE24.Timer Out	Signal: Timer Output
Logic.LE24.Out	Signal: Latched Output (Q)
Logic.LE24.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE25.Gate Out	Signal: Output of the logic gate
Logic.LE25.Timer Out	Signal: Timer Output
Logic.LE25.Out	Signal: Latched Output (Q)
Logic.LE25.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE26.Gate Out	Signal: Output of the logic gate
Logic.LE26.Timer Out	Signal: Timer Output
Logic.LE26.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logic.LE26.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE27.Gate Out	Signal: Output of the logic gate
Logic.LE27.Timer Out	Signal: Timer Output
Logic.LE27.Out	Signal: Latched Output (Q)
Logic.LE27.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE28.Gate Out	Signal: Output of the logic gate
Logic.LE28.Timer Out	Signal: Timer Output
Logic.LE28.Out	Signal: Latched Output (Q)
Logic.LE28.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE29.Gate Out	Signal: Output of the logic gate
Logic.LE29.Timer Out	Signal: Timer Output
Logic.LE29.Out	Signal: Latched Output (Q)
Logic.LE29.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE30.Gate Out	Signal: Output of the logic gate
Logic.LE30.Timer Out	Signal: Timer Output
Logic.LE30.Out	Signal: Latched Output (Q)
Logic.LE30.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE31.Gate Out	Signal: Output of the logic gate
Logic.LE31.Timer Out	Signal: Timer Output
Logic.LE31.Out	Signal: Latched Output (Q)
Logic.LE31.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE32.Gate Out	Signal: Output of the logic gate
Logic.LE32.Timer Out	Signal: Timer Output
Logic.LE32.Out	Signal: Latched Output (Q)
Logic.LE32.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE33.Gate Out	Signal: Output of the logic gate
Logic.LE33.Timer Out	Signal: Timer Output
Logic.LE33.Out	Signal: Latched Output (Q)
Logic.LE33.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE34.Gate Out	Signal: Output of the logic gate
Logic.LE34.Timer Out	Signal: Timer Output
Logic.LE34.Out	Signal: Latched Output (Q)
Logic.LE34.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE35.Gate Out	Signal: Output of the logic gate
Logic.LE35.Timer Out	Signal: Timer Output
Logic.LE35.Out	Signal: Latched Output (Q)
Logic.LE35.Out inverted	Signal: Negated Latched Output (Q NOT)

<i>Name</i>	<i>Description</i>
Logic.LE36.Gate Out	Signal: Output of the logic gate
Logic.LE36.Timer Out	Signal: Timer Output
Logic.LE36.Out	Signal: Latched Output (Q)
Logic.LE36.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE37.Gate Out	Signal: Output of the logic gate
Logic.LE37.Timer Out	Signal: Timer Output
Logic.LE37.Out	Signal: Latched Output (Q)
Logic.LE37.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE38.Gate Out	Signal: Output of the logic gate
Logic.LE38.Timer Out	Signal: Timer Output
Logic.LE38.Out	Signal: Latched Output (Q)
Logic.LE38.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE39.Gate Out	Signal: Output of the logic gate
Logic.LE39.Timer Out	Signal: Timer Output
Logic.LE39.Out	Signal: Latched Output (Q)
Logic.LE39.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE40.Gate Out	Signal: Output of the logic gate
Logic.LE40.Timer Out	Signal: Timer Output
Logic.LE40.Out	Signal: Latched Output (Q)
Logic.LE40.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE41.Gate Out	Signal: Output of the logic gate
Logic.LE41.Timer Out	Signal: Timer Output
Logic.LE41.Out	Signal: Latched Output (Q)
Logic.LE41.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE42.Gate Out	Signal: Output of the logic gate
Logic.LE42.Timer Out	Signal: Timer Output
Logic.LE42.Out	Signal: Latched Output (Q)
Logic.LE42.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE43.Gate Out	Signal: Output of the logic gate
Logic.LE43.Timer Out	Signal: Timer Output
Logic.LE43.Out	Signal: Latched Output (Q)
Logic.LE43.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE44.Gate Out	Signal: Output of the logic gate
Logic.LE44.Timer Out	Signal: Timer Output
Logic.LE44.Out	Signal: Latched Output (Q)
Logic.LE44.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE45.Gate Out	Signal: Output of the logic gate

<i>Name</i>	<i>Description</i>
Logic.LE45.Timer Out	Signal: Timer Output
Logic.LE45.Out	Signal: Latched Output (Q)
Logic.LE45.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE46.Gate Out	Signal: Output of the logic gate
Logic.LE46.Timer Out	Signal: Timer Output
Logic.LE46.Out	Signal: Latched Output (Q)
Logic.LE46.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE47.Gate Out	Signal: Output of the logic gate
Logic.LE47.Timer Out	Signal: Timer Output
Logic.LE47.Out	Signal: Latched Output (Q)
Logic.LE47.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE48.Gate Out	Signal: Output of the logic gate
Logic.LE48.Timer Out	Signal: Timer Output
Logic.LE48.Out	Signal: Latched Output (Q)
Logic.LE48.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE49.Gate Out	Signal: Output of the logic gate
Logic.LE49.Timer Out	Signal: Timer Output
Logic.LE49.Out	Signal: Latched Output (Q)
Logic.LE49.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE50.Gate Out	Signal: Output of the logic gate
Logic.LE50.Timer Out	Signal: Timer Output
Logic.LE50.Out	Signal: Latched Output (Q)
Logic.LE50.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE51.Gate Out	Signal: Output of the logic gate
Logic.LE51.Timer Out	Signal: Timer Output
Logic.LE51.Out	Signal: Latched Output (Q)
Logic.LE51.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE52.Gate Out	Signal: Output of the logic gate
Logic.LE52.Timer Out	Signal: Timer Output
Logic.LE52.Out	Signal: Latched Output (Q)
Logic.LE52.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE53.Gate Out	Signal: Output of the logic gate
Logic.LE53.Timer Out	Signal: Timer Output
Logic.LE53.Out	Signal: Latched Output (Q)
Logic.LE53.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE54.Gate Out	Signal: Output of the logic gate
Logic.LE54.Timer Out	Signal: Timer Output

<i>Name</i>	<i>Description</i>
Logic.LE54.Out	Signal: Latched Output (Q)
Logic.LE54.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE55.Gate Out	Signal: Output of the logic gate
Logic.LE55.Timer Out	Signal: Timer Output
Logic.LE55.Out	Signal: Latched Output (Q)
Logic.LE55.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE56.Gate Out	Signal: Output of the logic gate
Logic.LE56.Timer Out	Signal: Timer Output
Logic.LE56.Out	Signal: Latched Output (Q)
Logic.LE56.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE57.Gate Out	Signal: Output of the logic gate
Logic.LE57.Timer Out	Signal: Timer Output
Logic.LE57.Out	Signal: Latched Output (Q)
Logic.LE57.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE58.Gate Out	Signal: Output of the logic gate
Logic.LE58.Timer Out	Signal: Timer Output
Logic.LE58.Out	Signal: Latched Output (Q)
Logic.LE58.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE59.Gate Out	Signal: Output of the logic gate
Logic.LE59.Timer Out	Signal: Timer Output
Logic.LE59.Out	Signal: Latched Output (Q)
Logic.LE59.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE60.Gate Out	Signal: Output of the logic gate
Logic.LE60.Timer Out	Signal: Timer Output
Logic.LE60.Out	Signal: Latched Output (Q)
Logic.LE60.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE61.Gate Out	Signal: Output of the logic gate
Logic.LE61.Timer Out	Signal: Timer Output
Logic.LE61.Out	Signal: Latched Output (Q)
Logic.LE61.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE62.Gate Out	Signal: Output of the logic gate
Logic.LE62.Timer Out	Signal: Timer Output
Logic.LE62.Out	Signal: Latched Output (Q)
Logic.LE62.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE63.Gate Out	Signal: Output of the logic gate
Logic.LE63.Timer Out	Signal: Timer Output
Logic.LE63.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logic.LE63.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE64.Gate Out	Signal: Output of the logic gate
Logic.LE64.Timer Out	Signal: Timer Output
Logic.LE64.Out	Signal: Latched Output (Q)
Logic.LE64.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE65.Gate Out	Signal: Output of the logic gate
Logic.LE65.Timer Out	Signal: Timer Output
Logic.LE65.Out	Signal: Latched Output (Q)
Logic.LE65.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE66.Gate Out	Signal: Output of the logic gate
Logic.LE66.Timer Out	Signal: Timer Output
Logic.LE66.Out	Signal: Latched Output (Q)
Logic.LE66.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE67.Gate Out	Signal: Output of the logic gate
Logic.LE67.Timer Out	Signal: Timer Output
Logic.LE67.Out	Signal: Latched Output (Q)
Logic.LE67.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE68.Gate Out	Signal: Output of the logic gate
Logic.LE68.Timer Out	Signal: Timer Output
Logic.LE68.Out	Signal: Latched Output (Q)
Logic.LE68.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE69.Gate Out	Signal: Output of the logic gate
Logic.LE69.Timer Out	Signal: Timer Output
Logic.LE69.Out	Signal: Latched Output (Q)
Logic.LE69.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE70.Gate Out	Signal: Output of the logic gate
Logic.LE70.Timer Out	Signal: Timer Output
Logic.LE70.Out	Signal: Latched Output (Q)
Logic.LE70.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE71.Gate Out	Signal: Output of the logic gate
Logic.LE71.Timer Out	Signal: Timer Output
Logic.LE71.Out	Signal: Latched Output (Q)
Logic.LE71.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE72.Gate Out	Signal: Output of the logic gate
Logic.LE72.Timer Out	Signal: Timer Output
Logic.LE72.Out	Signal: Latched Output (Q)
Logic.LE72.Out inverted	Signal: Negated Latched Output (Q NOT)

<i>Name</i>	<i>Description</i>
Logic.LE73.Gate Out	Signal: Output of the logic gate
Logic.LE73.Timer Out	Signal: Timer Output
Logic.LE73.Out	Signal: Latched Output (Q)
Logic.LE73.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE74.Gate Out	Signal: Output of the logic gate
Logic.LE74.Timer Out	Signal: Timer Output
Logic.LE74.Out	Signal: Latched Output (Q)
Logic.LE74.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE75.Gate Out	Signal: Output of the logic gate
Logic.LE75.Timer Out	Signal: Timer Output
Logic.LE75.Out	Signal: Latched Output (Q)
Logic.LE75.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE76.Gate Out	Signal: Output of the logic gate
Logic.LE76.Timer Out	Signal: Timer Output
Logic.LE76.Out	Signal: Latched Output (Q)
Logic.LE76.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE77.Gate Out	Signal: Output of the logic gate
Logic.LE77.Timer Out	Signal: Timer Output
Logic.LE77.Out	Signal: Latched Output (Q)
Logic.LE77.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE78.Gate Out	Signal: Output of the logic gate
Logic.LE78.Timer Out	Signal: Timer Output
Logic.LE78.Out	Signal: Latched Output (Q)
Logic.LE78.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE79.Gate Out	Signal: Output of the logic gate
Logic.LE79.Timer Out	Signal: Timer Output
Logic.LE79.Out	Signal: Latched Output (Q)
Logic.LE79.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE80.Gate Out	Signal: Output of the logic gate
Logic.LE80.Timer Out	Signal: Timer Output
Logic.LE80.Out	Signal: Latched Output (Q)
Logic.LE80.Out inverted	Signal: Negated Latched Output (Q NOT)
Sys.Maint Mode Active	Signal: Arc Flash Reduction Maintenance Active
Sys.Maint Mode Inactive	Signal: Arc Flash Reduction Maintenance Inactive

Program Mode

By means of the Program Mode, parameter settings can be locked against any changes as long as one or all of the breaker(s) are in the »CLOSED« position. The Program Mode can be activated within the [System Para/General Settings/Program Mode Bypass] menu.

- »Both Bkr Open« - Parameter changes require all breakers to be in the »OPEN« state.
- »Either Bkr Open or Close« - Parameter changes do not require the breaker to be in the »OPEN« state.

Unlike, if the Program Mode is used for Motor Protection devices, the user has the following options:

- »Motor Stop« - Lock parameter changes, if the motor is not in the »STOP« state.
This ensures, that parameter changes can only be done while the motor stands still (zero speed).
- »Either Motor Stopped or Running« - Parameter changes do not require the motor to be in the »Motor stop« state.

Bypass of the Program Mode

The program mode can be bypassed by means of the Direct Control Parameter »Program Mode Bypass«. The protective device will fall back into the program mode either:

- Directly after a parameter change has been saved, else
- 10 minutes after the bypass has been activated.

System Parameters

System Para

Within the system parameters, the User can set all parameters that are relevant for the primary side and the mains operational method like frequency, primary and secondary values, and the star point treatment.

General System Parameters

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Phase Sequence 	Phase Sequence direction	ABC, ACB	ABC	[System Para]
f 	Nominal frequency	50Hz, 60Hz	60Hz	[System Para]

System Parameters – Current Related

Parameter	Description	Setting range	Default	Menu path
CT con 	Current transformer connection	3-wire, 4th CT IN, 4th CT IG	3-wire	[System Para]
CT pri 	Nominal current of the primary side of the current transformers.	1 - 50000A	10A	[System Para]
CT sec 	Nominal current of the secondary side of the current transformers.	1A, 5A	5A	[System Para]
CT dir 	Protection functions with directional feature can only work properly if the connection of the current transformers is free of wiring errors. If all current transformers are connected to the device with an incorrect polarity, the wiring error can be compensated by this parameter. This parameter turns the current vectors by 180 degrees.	0°, 180°	0°	[System Para]
XCT pri 	This parameter defines the primary nominal current of the connected ground current transformer. If the ground current is measured via the Residual connection, the primary value of the phase current transformer must be entered here.	1 - 50000A	50A	[System Para]
XCT sec 	This parameter defines the secondary nominal current of the connected ground current transformer. If the ground current is done via the Residual connection, the primary value of the phase current transformer must be entered here.	1A, 5A	5A	[System Para]

Parameter	Description	Setting range	Default	Menu path
XCT dir 	Ground fault protection with directional feature depends also on the correct wiring of the ground current transformer. An incorrect polarity/wiring can be corrected by means of the settings "0°" or "180°". The operator has the possibility of turning the current vector by "180°" (change of sign) without modification of the wiring. This means, that - in terms of figures - the determined current indicator was turned by "180°" by the device.	0°, 180°	0°	[System Para]

Blocking

The device provides a function for temporary blocking of the complete protection functionality or of single protections.



Make absolutely sure that no illogical or even life-threatening blockings are allocated.

Make sure not to carelessly deactivate protection functions that have to be available according to the protection concept.

Permanent Blocking

Switching "On" or "Off" the Complete Protection Functionality

In the *»Protection«* module, the complete protection of the device can be switched "On" or "Off". Set the Function parameter to *»Active«* or *»Inactive«* in the *»Prot«* module.



Protection is activated only if in the *»Prot«* module the parameter *Function* is = *»Active«* (i.e.: with *»Function«* = *»Inactive«*, no protection function are operating). If *»Function«* = *»Inactive«*, then the device cannot protect any components.

Switching Modules "On" or "Off"

Each of the modules can be switched "On" or "Off" (permanently). This is achieved when the *»Function«* parameter is set to *»Active«* or *»Inactive«* in the respective module.

Activating or Deactivating the Tripping Command of a Protection Permanently

In each of the protections, the tripping command to the breaker can be permanently blocked. For this purpose, the *»TripCmd Blo«* parameter has to be set to *»Active«*.

Temporary Blocking

To Block the Complete Protection of the Device Temporarily by a Signal

In the *»Prot«* module, the complete protection of the device can be blocked temporarily by a signal. On the condition that a module-external blocking is permitted (*»ExBlo Fc=active«*). In addition to this, a related blocking signal from the *»Assignment list«* must have been assigned. For the time the allocated blocking signal is active, the module is blocked.



If the *»Prot«* module is blocked, the complete protection function does not work. As long as the blocking signal is active, the device cannot protect any components.

To Block a Complete Protection Module Temporarily by an Active Assignment

- In order to establish a temporary blockage of a protection module, the parameter »ExBlo Fc« of the module has to be set to »Active«. This gives the permission: »This module can be blocked«.
- Within the general protection parameters, a signal has to be additionally chosen from the »Assignment list«. The blocking only becomes active when the assigned signal is active.

To Block the Tripping Command of a Protection Element Temporarily by an Active Assignment

The tripping command of any of the protection modules can be blocked from an external signal. In this case, external does not only mean from outside the device, but also from outside the module. Not only real external signals are permitted to be used as blocking signals (for example: the state of a digital input), but the User can also choose any other signal from the »Assignment list«.

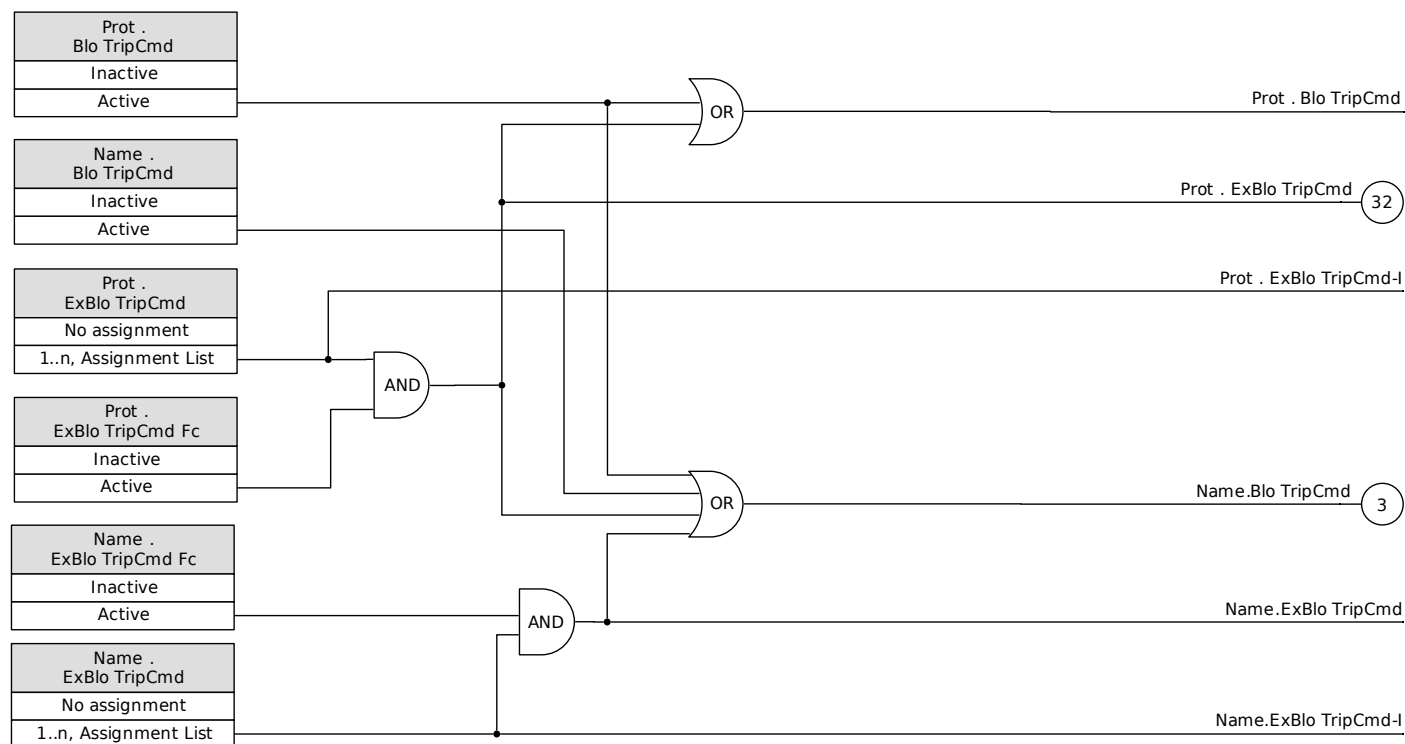
- In order to establish a temporary blockage of a protection element, the parameter »ExBlo TripCmd Fc« of the module has to be set to »Active«. This gives the permission: »The tripping command of this element can be blocked«.
- Within the general protection parameters, an additional signal has to be chosen and assigned to the »ExBlo« parameter from the »Assignment list«. If the selected signal is activated, the temporary blockage becomes effective.

To Activate or Deactivate the Tripping Command of a Protection Module

Trip Blockings

GeneralProt_E02

Name = All Modules That Are Blockable



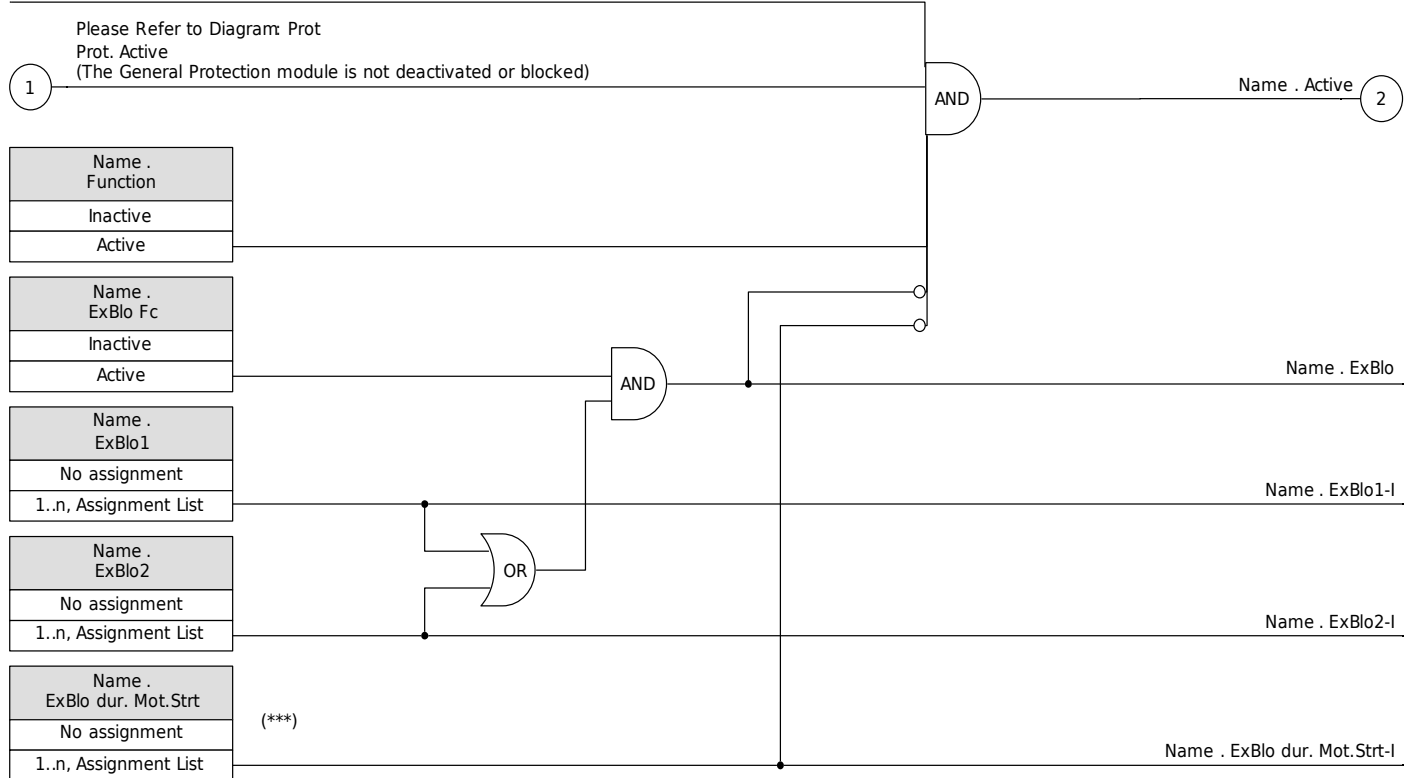
Activate, Deactivate Respectively to Block Temporary Protection Functions

Blockings

GeneralProt_E05

Name = All Modules That Are Blockable

Frequency is within the nominal frequency range. (*) (**)



(*) All protective elements will be blocked that are using fundamental or harmonics measured values, if the frequency leaves the nominal frequency range. Protective elements that are using RMS values will remain active.

(**) This applies to devices that offer wide frequency range measurement only.

(***) Applies only to protective elements that are blocked during motor start.

Current protective functions cannot only be blocked permanently («*Function = Inactive*») or temporarily by any blocking signal from the »Assignment list«, but also by »*Reverse Interlocking*«.

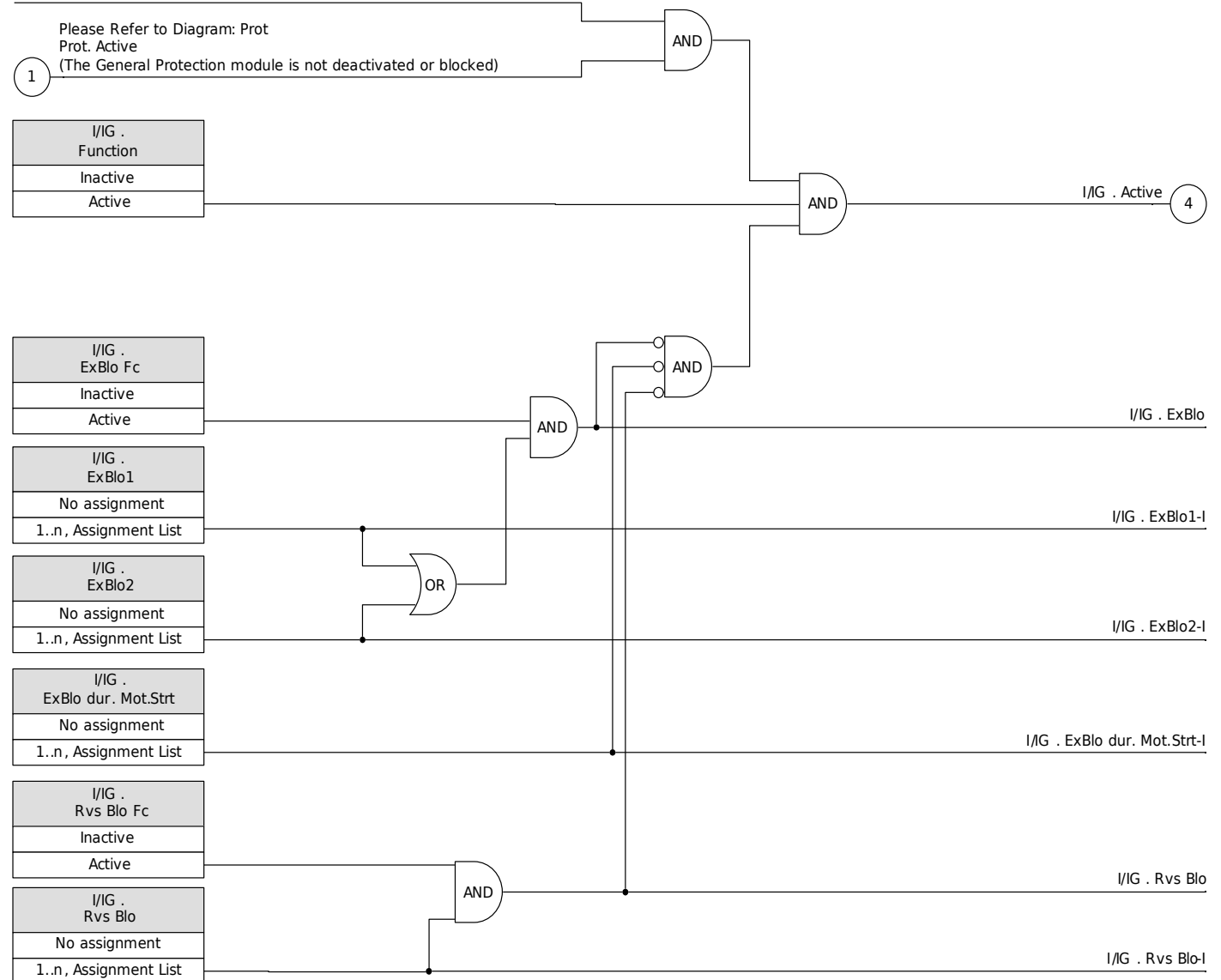
All other protection functions can be activated, deactivated, or blocked in the same manner.

Blockings (**)

Pdoc_E04

I/G = I[1]...[n], IG[1]...[n]

Frequency is within the nominal frequency range. (*)(**)



(*) All protective elements will be blocked that are using fundamental or harmonics measured values, if the frequency leaves the nominal frequency range. Protective elements that are using RMS values will remain active.

(**) This applies to devices that offer wide frequency range measurement only.

Protection (Prot) Module

Prot

The »Protection« module serves as the outer frame for all other protection modules (i.e.: they are all enclosed by the »Protection« Module).



In the case where the »Protection« module is blocked, the complete protective function of the device is disabled.

Module Prot Blocked - Protection Inactive:

If the master »Protection« module is allowed to be temporarily blocked and the allocated blocking signals are active, then all protection functions will be disabled. In such a case, the protective function is »Inactive«.

Protection Active:

If the master »Protection« module was activated and a blockade for this module was not activated respectively, the assigned blocking signals are inactive at that moment, then the »Protection« is »Active«.

How to Block All Protective and Supervisory Functions

In order to block all protective and supervisory functions, call up the menu [Protection/Para/Global Prot Para/Prot]:

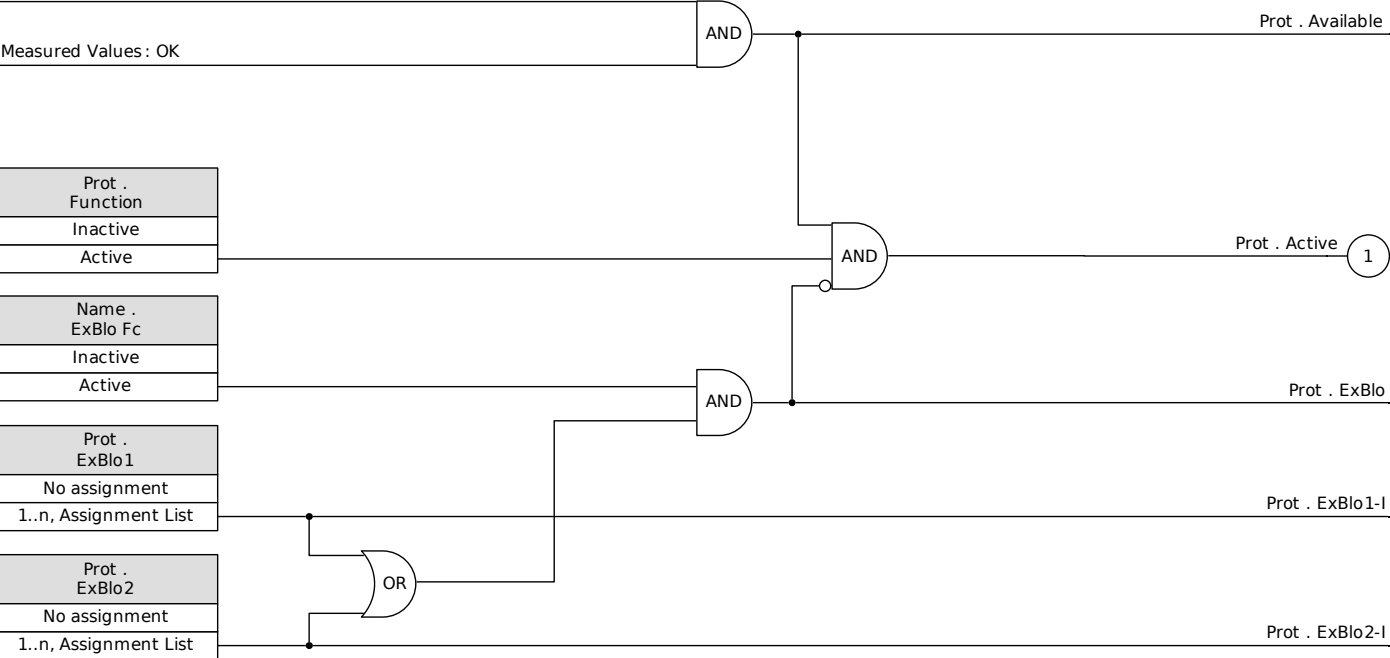
- Set the parameter »ExBlo Fc = active«;
- Choose an assignment for »ExBlo1«; and
- Optionally choose an assignment for »ExBlo2«.

If the signal becomes true, then all protective and supervisory functions will be blocked as long as one of these signals are true.

Prot - Active

GeneralProt_E01

At the moment, no parameter is being changed (except parameter set parameters).



Each protection element generates its own pickup and trip signals, which are automatically passed onto the »Prot« module where the phase based and general (collective) pickup and trip signals are generated. The »Prot« module serves as a top level and a common place to group all pickups and trips from each individual protection element.

For instance, »PROT.PICKUP PHASE A« is the phase A pickup signal OR-ed from all protection elements; »PROT.TRIP PHASE A« is the phase A trip signal OR-ed from all protection elements; »PROT.PICKUP« is the collective pickup signal OR-ed from all protection elements; Prot.Trip is the collective Trip signal OR-ed from all protection elements, and etc. The Tripping commands of the protection elements have to be fed to the »Bkr Manager« module for further trip request processing.

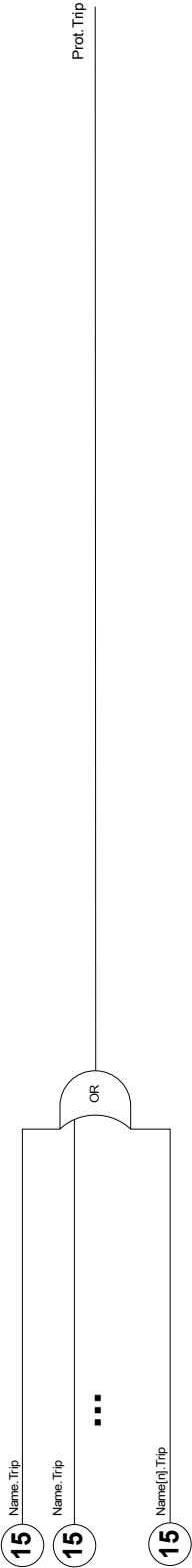


The tripping commands are executed by the »Bkr Manager« module. Tripping commands have to be assigned to a breaker. The Breaker Manager will issue the trip command to the breaker.

If a protection element is activated and respectively decides to trip, two pickup signals will be created.

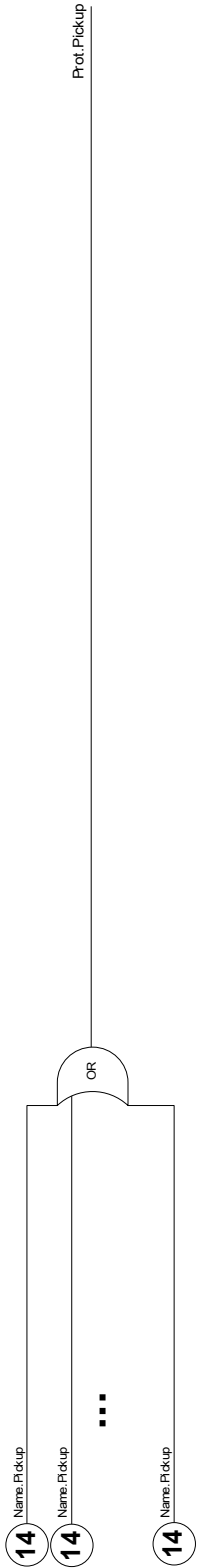
1. The module or the protection element issues an pickup/alarm (e.g.: »50P[1].PICKUP« or »50P[1].TRIP«).
2. The master »Prot« module collects/summarizes the signals and issues a pickup/alarm or a trip signal »PROT.PICKUP« »PROT.TRIP«.

Prot. Trip
Name = Each trip of an active, trip authorized protection module will lead to a general trip.



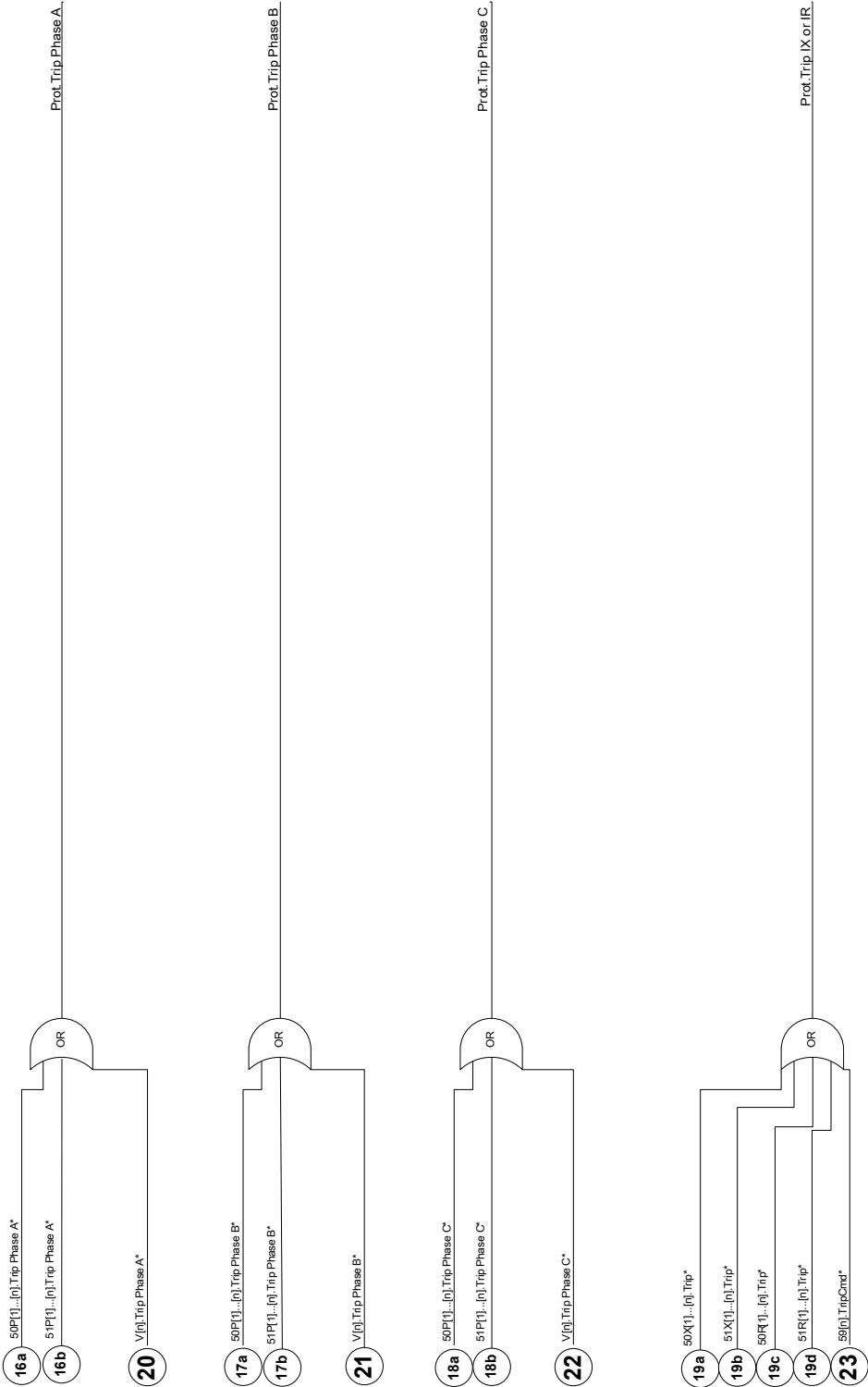
Prot. Pickup

Name = Each pickup of a module (except from supervision modules but including BF) will lead to a general pickup (collective pickup).



Prot. Trip

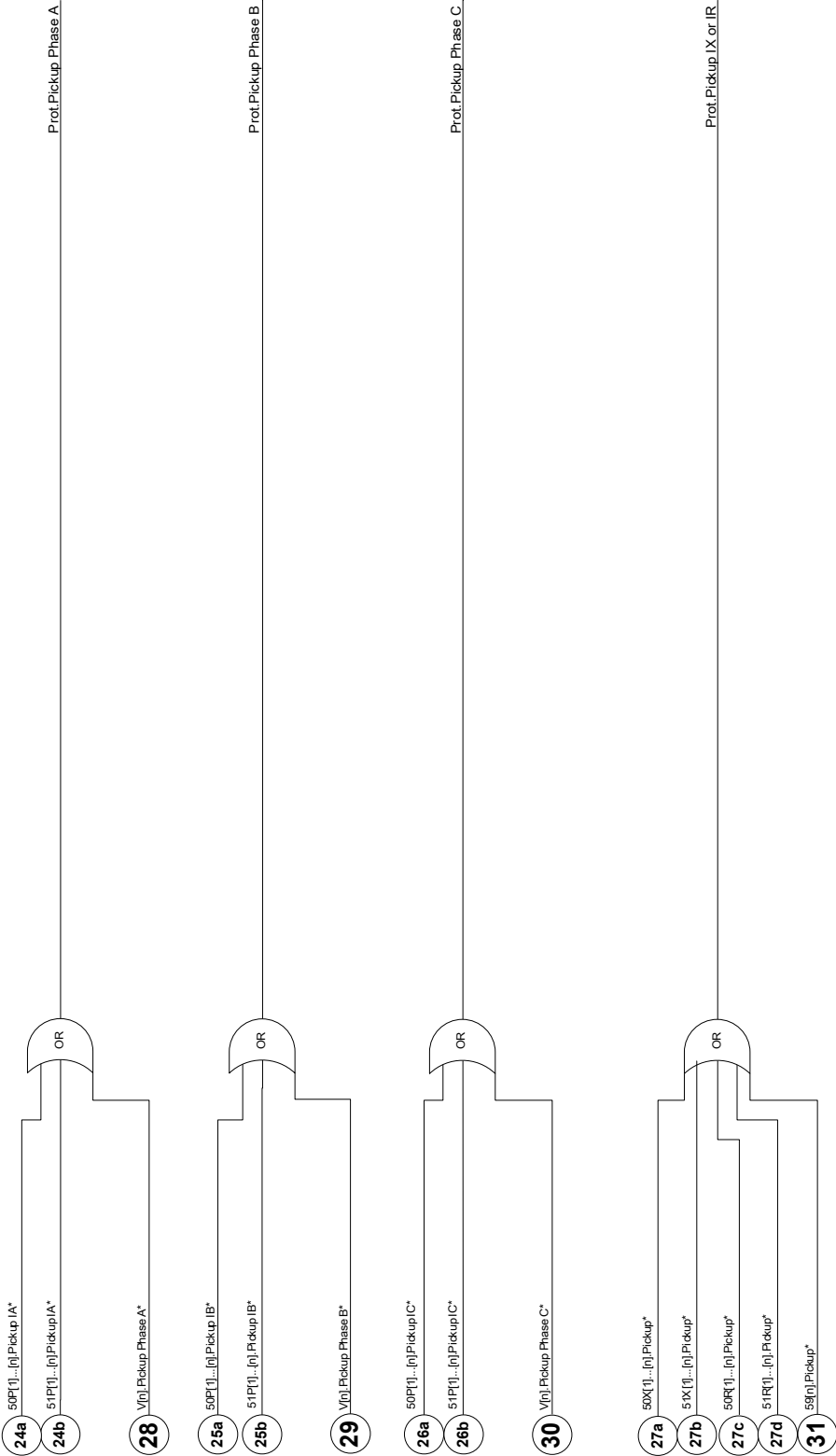
Each phase selective trip of a trip authorized module (I, IG, V, VX depending on the device type) will lead to a phase selective general trip.



*=Depending on the type of device

Prot.Pickup

Each phase selective pickup of a module (I, IG, V, VX depending on the device type) will lead to a phase selective general pickup (collective pickup).



*=Depending on the type of device

Direct Commands of the Protection Module

Parameter	Description	Setting range	Default	Menu path
Res FaultNo a GridFaultNo 	Resetting of fault number and grid fault number.	Inactive, Active	Inactive	[Operation /Reset /Counter]

Global Protection Parameters of the Protection Module

Parameter	Description	Setting range	Default	Menu path
ExBlo Fc 	Activate (allow) the external blocking of the global protection functionality of the device.	Inactive, Active	Inactive	[Protection Para /Global Prot Para /Prot]
ExBlo1 	If external blocking of this module is activated (allowed), the global protection functionality of the device will be blocked if the state of the assigned signal becomes true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /Prot]
ExBlo2 	If external blocking of this module is activated (allowed), the global protection functionality of the device will be blocked if the state of the assigned signal becomes true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /Prot]

Protection Module Input States

Name	Description	Assignment via
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /Prot]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /Prot]

Protection Module Signals (Output States)

Signal	Description
Available	Signal: Protection is available.

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Pickup Phase A	Signal: General Pickup Phase A
Pickup Phase B	Signal: General Pickup Phase B
Pickup Phase C	Signal: General Pickup Phase C
Pickup IX or IR	Signal: General Pickup - Ground Fault
Pickup	Signal: General Pickup
Trip Phase A	Signal: General Trip Phase A
Trip Phase B	Signal: General Trip Phase B
Trip Phase C	Signal: General Trip Phase C
Trip IX or IR	Signal: General Trip Ground Fault
Trip	Signal: General Trip
Res FaultNo a GridFaultNo	Signal: Resetting of fault number and grid fault number.

Values of the Protection Module

<i>Parameter</i>	<i>Description</i>
FaultNo	Waveform No.
No of GridFaults	Number of grid faults: A grid fault, e.g. a short circuit, might cause several faults with trip and autoreclosing, each fault being identified by an increased fault number. In this case, the grid fault number remains the same.
Trip	First trip cause which is the same as listed in fault record: See SCADA doc for code (section Cause of Trip). See manual (section Fault Recorder) for more information.

Switchgear/Breaker – Manager

Bkr



WARNING Misconfiguration of switchgear could result in death or serious injury. This e. g. is the case when opening a disconnecter under load or when switching a ground connector to live parts of a system.

Beside protection functions, protective relays more and more will take care about controlling switchgear, like breakers, load break switches, disconnectors and ground connectors.

A correct configuration of all switchgear is an indispensable precondition for the proper functioning of the protective device. This also is the case, when the switchgear are not controlled, but supervised only.

Single Line Diagram

The user can create and modify Single Lines (pages) by means of the *Page Editor*.

The Single Lines (Control Pages) have to be loaded into the protective device by means of *Smart view*.

For details on the creation, modification and upload of Single Lines (Control Pages) please refer to the manual "page_editor_eaton_en.pdf" or contact the technical support. The manual can be accessed via the *Page Editors* help menu.

The single line diagram includes the graphical description of the breaker and its designation (name) as well as its features (short circuit proof or not ...). For displaying in the devices software, the switchgears' designations (e. g. QA1, QA2, instead of SG[x]) will be taken from the single line diagram (configuration file).

The configuration file includes the single line diagram and the breaker properties. The breaker properties and single line diagram are coupled via the configuration file.

Switchgear Configuration

Wiring

At first the switchgear positioning indicators have to be connected to the digital inputs of the protection device.

One of the position indicators (either the »Aux CLOSE« or the »Aux OPEN«) contact has to be connected necessarily. It is recommended also to connect the »Aux OPEN« contact.

Thereafter the command outputs (relay outputs) have to be connected with the switchgear.

NOTICE

Please observe the following option: In the general settings of a breaker, the CLOSE/OPEN commands of a protection element can be issued to the same output relays, where the other control commands are issued.

If the commands are issued to different relays output relays the amount of wiring increases.

Assignment of Position Indications

The position indication is needed by the device to get (evaluate) the information about the current status /position of the breaker. The switchgear position indications are shown in the devices display. Each position change of a switchgear results in a change of the corresponding switchgear symbol.

NOTICE

For the detection of a switchgear's position always two separate Aux contacts are recommended! If only one Aux contact is used, no intermediate or disturbed positions can be detected.

A (reduced) transition supervision (time between issue of the command and position feedback indication of the switchgear) is also possible by one Aux contact.

In the menu [Control/Bkr/Bkr [x]] the assignments for the position indications have to be set.

*Detection of switchgear position with two Aux contacts – **Aux CLOSE and Aux OPEN (recommended!)***

For detection of their positions switchgear are provided with Aux contacts (Aux CLOSE and Aux OPEN). It is

recommended to use both contacts to detect intermediate and disturbed positions too.

The protection device continuously supervises the status of the inputs »Aux CLOSE-I« and »Aux OPEN-I«.

These signals are validated based on the supervision timers »*t-Move CLOSE*« and »*t-Move OPEN*« validation functions. As a result, the switchgear position will be detected by the following signals:

- Pos CLOSE
- Pos OPEN
- Pos Indeterm
- Pos Disturb.
- Pos (State=0,1,..2 or 3)

Supervision of the CLOSE command

When an CLOSE command is initiated, the »*t-Move CLOSE*« timer will be started. While the timer is running, the »POS INDETERM« State will become true. If the command is executed and properly fed back from the switchgear before the timer has run down, »POS CLOSE« will become true. Otherwise, if the timer has expired »POS DISTURB« will become true.

Supervision of the OPEN command

When an OPEN command is initiated, the »*t-Move OPEN*« timer will be started. While the timer is running, the »POS INDETERM« State will become true. If the command is executed and properly fed back before the timer has run down, »POS OPEN« will become true. Otherwise, if the timer has expired »POS DISTURB« will become true.

The following table shows how switchgear positions are validated:

<i>States of the Digital Inputs</i>		<i>Validated Breaker Positions</i>				
<i>Aux CLOSE-I</i>	<i>Aux OPEN-I</i>	<i>POS CLOSE</i>	<i>POS OPEN</i>	<i>POS Indeterm</i>	<i>POS Disturb</i>	<i>POS State</i>
0	0	0	0	1 (while a Moving timer is running)	0 (while a Moving timer is running)	0 Intermediate
1	1	0	0	1 (while a Moving timer is running)	0 (while a Moving timer is running)	0 Intermediate
0	1	0	1	0	0	1 OPEN
1	0	1	0	0	0	2 CLOSE
0	0	0	0	0 (Moving timer elapsed)	1 (Moving timer elapsed)	3 Disturbed
1	1	0	0	0 (Moving timer elapsed)	1 (Moving timer elapsed)	3 Disturbed

Single Position Indication **Aux CLOSE or Aux OPEN**

If the single pole indication is used, the »SI SINGLECONTACTIND« will become true.

The moving time supervision works only in one direction. If the Aux OPEN signal is connected to the device, only the “OPEN command” can be supervised and if the Aux CLOSE signal is connected to the device, only the “CLOSE command” can be supervised.

Single Position Indication – **Aux CLOSE**

If only the Aux CLOSE signal is used for the Status Indication of an “CLOSE command”, the switch command will also start the moving time, the position indication indicates an INTERMEDIATE position during this time interval. When the switchgear reaches the end position indicated by the signals Pos CLOSE and CES succesf before the moving time has elapsed the signal Pos Indeterm disappears.

If the moving time elapsed before the switchgear has reached the end position, the switching operation was not successful and the Position Indication will change to POS Disturb and the signal Pos Indeterm disappears. After the moving time has elapsed, the Dwell time will be started (if set). During this time interval the Position Indication will also indicate an INTERMEDIATE state. When the Dwell time elapses the Position Indication will change to Pos CLOSE.

The following table shows how breaker positions are validated based on **Aux CLOSE**:

States of the Digital Input		Validated Breaker Positions				
<i>Aux CLOSE-I</i>	<i>Aux OPEN-I</i>	<i>POS CLOSE</i>	<i>POS OPEN</i>	<i>POS Indeterm</i>	<i>POS Disturb</i>	<i>POS State</i>
0	Not wired	0	0	1 (while t-Move CLOSE is running)	0 (while t-Move CLOSE is running)	0 Intermediate
0	Not wired	0	1	0	0	1 OPEN
1	Not wired	1	0	0	0	2 CLOSE

If there is no digital input assigned to the »Aux CLOSE« contact, the position indication will have the value 3 (disturbed).

Single Position Indication – **Aux OPEN**

If only the Aux OPEN signal is used for the monitoring of the “OPEN command”, the switch command will start the moving timer. The Position Indication will indicate an INTERMEDIATE position. When the switchgear reaches its end position before the moving timer elapses, »CES succesf« will be indicated. At the same time the signal »Pos Indeterm« disappears.

If the moving time elapsed before the switchgear has reached the OPEN position, the switching operation was not successful and the Position Indication will change to »Pos Disturb« and the signal »Pos Indeterm« disappears. When the moving timer has elapsed, the dwell timer will be started (if configured). During this timer elapses »Pos Disturb« will be indicated. When the dwell time has elapsed, the OPEN position of the switchgear will be indicated by the »Pos OPEN« signal.

The following table shows how breaker positions are validated based on **Aux OPEN**:

States of the Digital Input		Validated Breaker Positions				
Aux CLOSE-I	Aux OPEN-I	POS CLOSE	POS OPEN	POS Indeterm	POS Disturb	POS State
Not wired	0	0	0	1 (while t-Move OPEN is running)	0 (while t-Move OPEN is running)	0 Intermediate
Not wired	1	0	1	0	0	1 OPEN
Not wired	0	1	0	0	0	2 CLOSE

If there is no digital input assigned to the »Aux OPEN« contact, the position indication will have the value 3 (disturbed).

Setting of Supervision Times

In the menu [Control/SG/SG[x]/General Settings] the supervision times of the individual switchgear have to be set. Dependent on the type of switchgear it can be necessary to set further parameters, like dwell time.

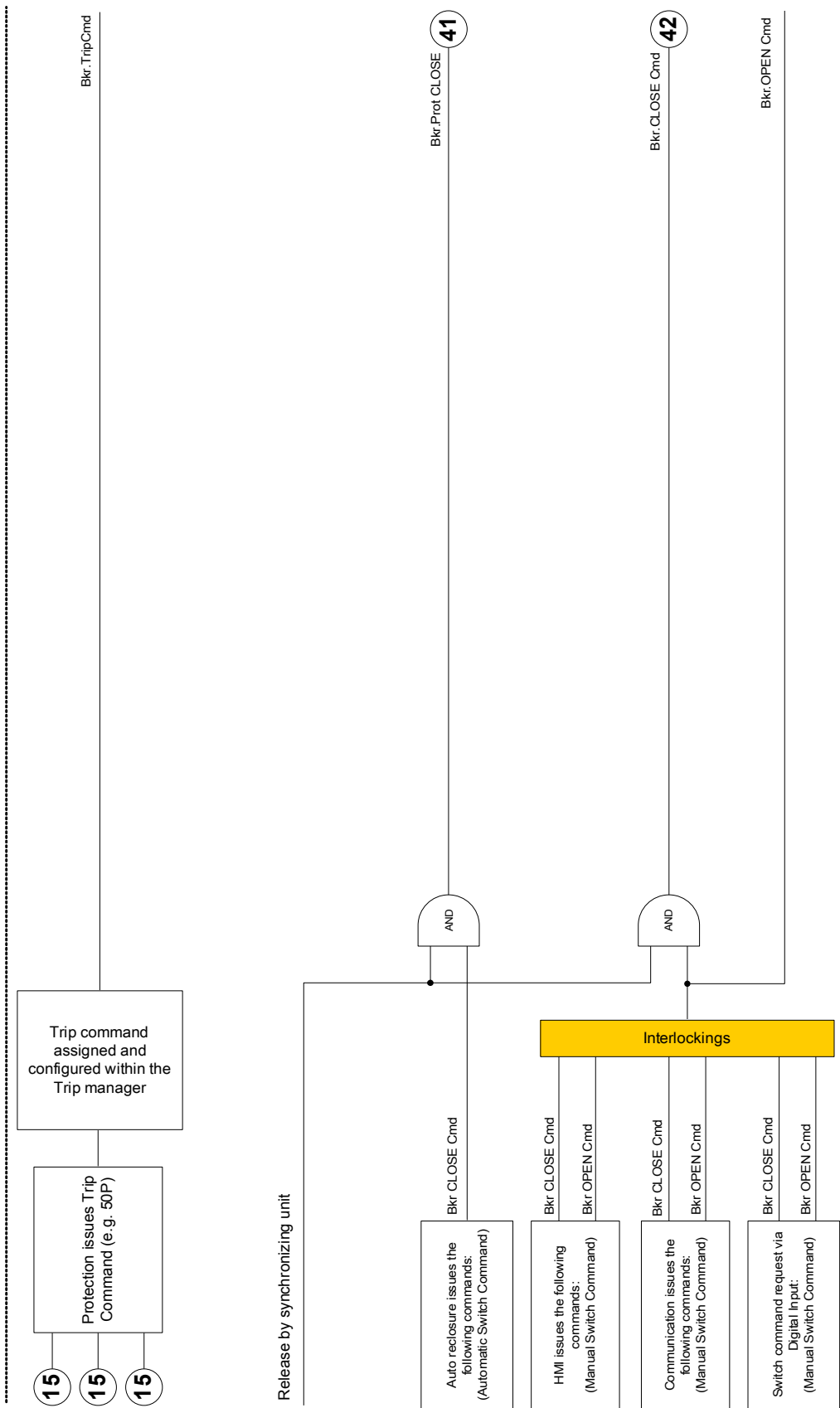
Interlockings

To avoid faulty operations, interlockings have to be provided. This can be realized mechanically or electrically.

For a controllable switchgear up to three interlockings can be assigned in both switching directions (CLOSE/OPEN). These interlockings prevent switching in the corresponding direction.

The protection OPEN command and the reclosing command of the AR module are always executed without interlockings. For the case, that a protection OPEN command must not be issued, this must be blocked separately.

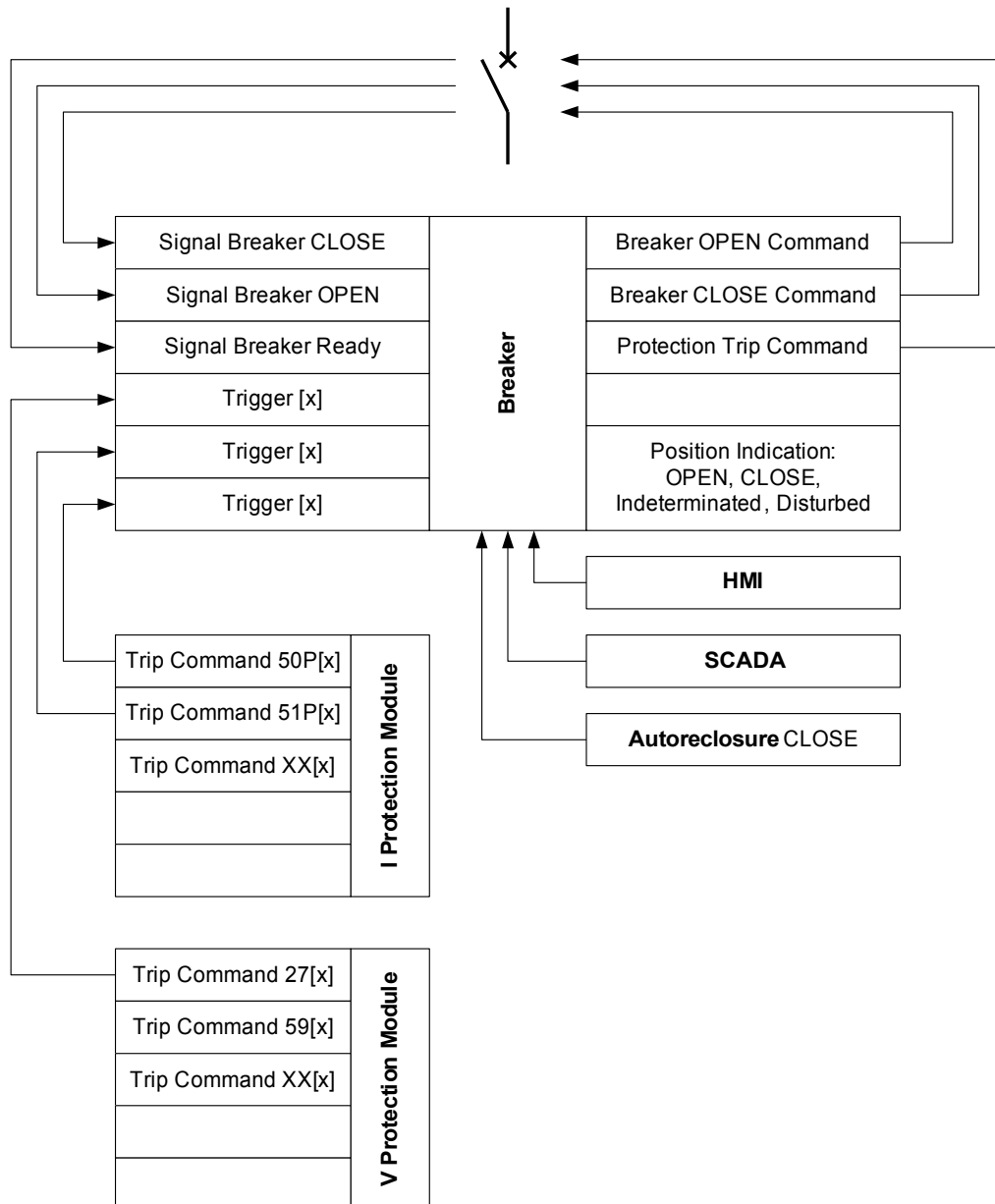
Further interlockings can be realized by means of the Logic module.



Trip Manager – Assignment of commands

The trip commands of the protection elements have to be assigned to those switchgear, that are make/break capable (Breaker). For every make/break capable switchgear a Trip Manager is provided.

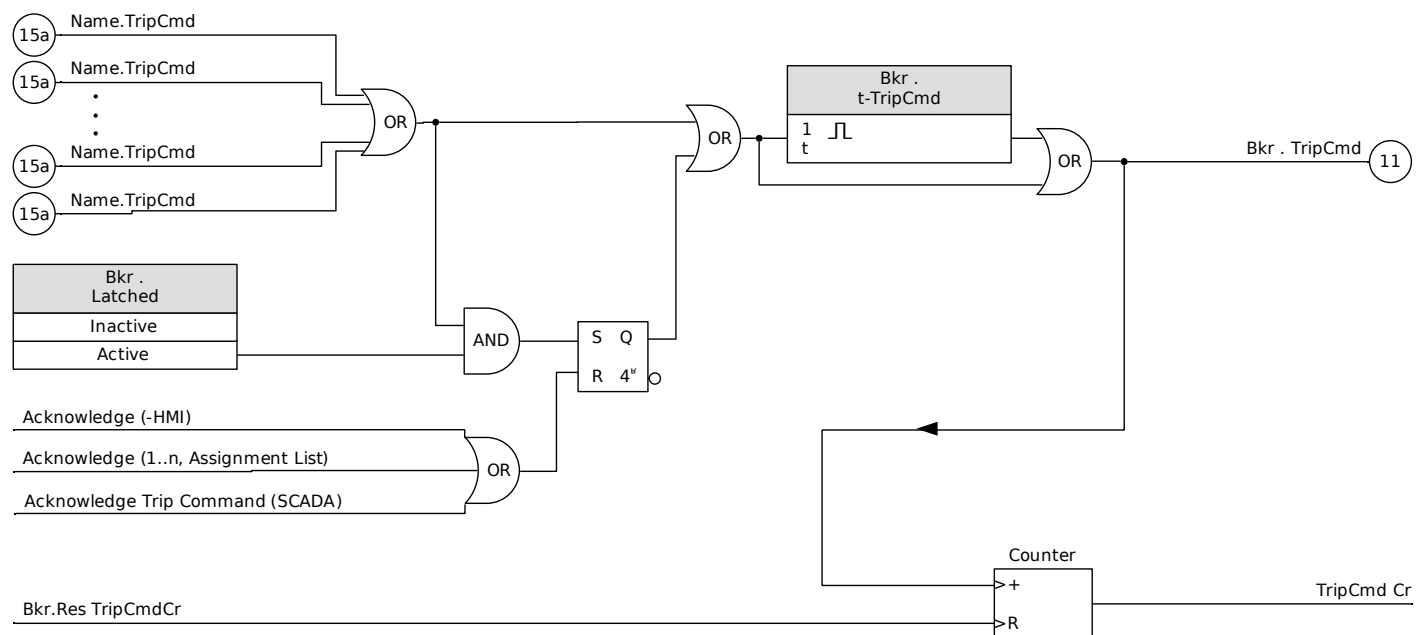
In the Trip Manager all tripping commands are combined by an “OR” logic. The actual tripping command to the switchgear is exclusively given by the Trip Manager. This means, that only tripping commands which are assigned in the Trip Manager lead to an operation of the switchgear. In addition to that, the User can set the minimum hold time of the tripping command within this module and define whether the tripping command is latched or not.



Bkr . Trip Bkr

Switchgear_E01

Name =Each trip of an active, trip authorized protection module will lead to a general trip.



Ex CLOSE/OPEN

If the switchgear should be opened or closed by an external signal, the User can assign one signal that will trigger the CLOSE and one signal that will trigger the OPEN command (e.g. digital inputs or output signals of the Logics). An OPEN command has priority. CLOSE commands are slope oriented, OPEN commands are level oriented.

Synchronized Switching*

*=availability depends on ordered device type

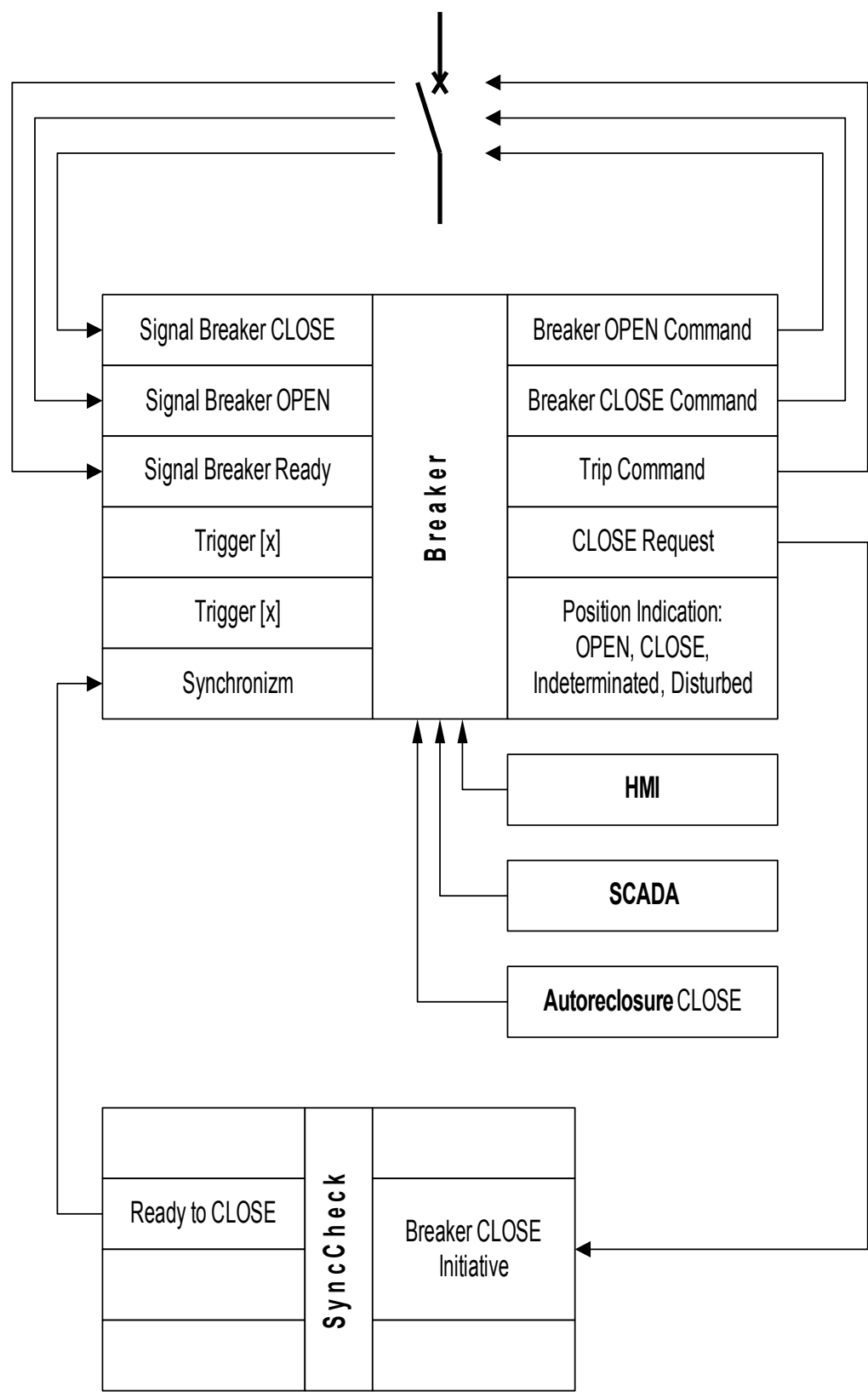
Before a switchgear may connect two mains sections, synchronism of these sections must be assured.

In the menu [Synchronous Switching] the parameter »Synchronism« defines which signal indicates synchronism.

If the synchronism condition shall be evaluated by the internal Synch-Check module the signal »*Sync. Ready to Close*« (release by synch-check module) has to be assigned. Alternatively a digital input or a logic output can be assigned.

In the synchronization mode "Generator-to-System" additionally the synchronism request has to be assigned in the menu [Protection Para\Global Prot Para\Sync].

If a synchronism signal is assigned, the switching command will only be executed, when the synchronism signal will become true within the maximum supervision time »*t-MaxSyncSuperv*«. This supervision time will be started with the issued CLOSE command. If no synchronism signal has been assigned, the synchronism release is permanently.



Switching Authority

For the Switching Authority [Control\General Settings], the following general settings are possible:

NONE:	No control function;
LOCAL:	Control only via push buttons at the panel;
REMOTE:	Control only via SCADA, digital inputs, or internal signals; and
LOCAL&REMOTE:	Control via push buttons, SCADA, digital inputs, or internal signals.

Non Interlocked Switching

For test purposes, during commissioning and temporarily operations, interlockings can be disabled.



WARNING: Non interlocked Switching can lead to serious injuries or death!

For non interlocked switching the menü [Control\General Settings] provides the following options:

- Non interlocked switching for one single command
- Permanent
- Non interlocked switching for a certain time
- Non interlocked switching, activated by an assigned signal

The set time for non interlocked switching applies also for the “single Operation” mode.

Manual Manipulation of the Switchgear Position

In case of faulty position indication contacts (Aux contacts) or broken wires, the position indication resulted from the assigned signals can be manipulated (overwritten) manually, to keep the ability to switch the affected switchgear. A manipulated switchgear position will be indicated on the display by an exclamation mark “!” beside the switchgear symbol.



WARNING: Manipulation of the Switchgear Position can lead to serious injuries or death!

Double Operation Locking

All control commands to any switchgear in a bay have to be processed sequentially. During a running control command no other command will be handled.

Switch Direction Control

Switching commands are validated before execution. When the switchgear is already in the desired position, the switch command will not be issued again. An opened breaker cannot be opened again. This also applies for switching command at the HMI or via SCADA.

Anti Pumping

By pressing the CLOSE command softkey only a single switching CLOSE impulse will be issued independent, how long the softkey is actuated. The switchgear will close only once per close command.

Direct Commands of the Control

Parameter	Description	Setting range	Default	Menu path
Res Bwear Sl Breaker 	Resetting the slow breaker alarm	Inactive, Active	Inactive	[Operation /Reset /Counter]
Ack TripCmd 	Acknowledge Trip Command	Inactive, Active	Inactive	[Operation /Reset /Flags]

Global Protection Parameters of the Control

Parameter	Description	Setting range	Default	Menu path
CinBkr-52a 	The breaker is in CLOSE-position if the state of the assigned signal is true (52a).	1..n, Dig Inputs	.-	[Control /Bkr /Pos Indicatr Wirng]
CinBkr-52b 	The breaker is in OPEN-position if the state of the assigned signal is true (52b).	1..n, Dig Inputs	.-	[Control /Bkr /Pos Indicatr Wirng]
Ready 	Breaker is ready for operation if the state of the assigned signal is true. This digital input can be used by some protective elements (if they are available within the device) like Auto Reclosure (AR), e.g. as a trigger signal.	1..n, Dig Inputs	.-	[Control /Bkr /Pos Indicatr Wirng]
Interl CLOSE1 	Interlocking of the CLOSE command	1..n, Assignment List	Wired Inputs.Bkr Trouble-I	[Control /Bkr /Interlockings]
Interl CLOSE2 	Interlocking of the CLOSE command	1..n, Assignment List	MStart.Blo	[Control /Bkr /Interlockings]
Interl CLOSE3 	Interlocking of the CLOSE command	1..n, Assignment List	.-	[Control /Bkr /Interlockings]

Parameter	Description	Setting range	Default	Menu path
Interl OPEN1 	Interlocking of the OPEN command	1..n, Assignment List	.-	[Control /Bkr /Interlockings]
Interl OPEN2 	Interlocking of the OPEN command	1..n, Assignment List	.-	[Control /Bkr /Interlockings]
Interl OPEN3 	Interlocking of the OPEN command	1..n, Assignment List	.-	[Control /Bkr /Interlockings]
SC CLOSE 	Switching CLOSE Command, e.g. the state of the Logics or the state of the digital input	1..n, DI- LogicList	.-	[Control /Bkr /Ex OPEN/CLOSE Cmd]
SC OPEN 	Switching OPEN Command, e.g. the state of the Logics or the state of the digital input	1..n, DI- LogicList	.-	[Control /Bkr /Ex OPEN/CLOSE Cmd]
t-TripCmd 	Minimum hold time of the OPEN-command (Breaker, load break switch)	0 - 300.00s	0.2s	[Control /Bkr /Trip Manager]
Latched 	Defines whether the Relay Output will be Latched when it picks up.	Inactive, Active	Inactive	[Control /Bkr /Trip Manager]
Ack TripCmd 	Ack TripCmd	1..n, Assignment List	.-	[Control /Bkr /Trip Manager]
Trigger1 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	50P[1].TripCmd	[Control /Bkr /Trip Manager]
Trigger2 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	50P[2].TripCmd	[Control /Bkr /Trip Manager]

Parameter	Description	Setting range	Default	Menu path
Trigger3 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	51P[1].TripCmd	[Control /Bkr /Trip Manager]
Trigger4 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	51P[2].TripCmd	[Control /Bkr /Trip Manager]
Trigger5 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	51P[3].TripCmd	[Control /Bkr /Trip Manager]
Trigger6 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	50X[1].TripCmd	[Control /Bkr /Trip Manager]
Trigger7 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	50X[2].TripCmd	[Control /Bkr /Trip Manager]
Trigger8 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	51X[1].TripCmd	[Control /Bkr /Trip Manager]
Trigger9 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	51X[2].TripCmd	[Control /Bkr /Trip Manager]
Trigger10 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	50R[1].TripCmd	[Control /Bkr /Trip Manager]
Trigger11 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	50R[2].TripCmd	[Control /Bkr /Trip Manager]
Trigger12 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	51R[1].TripCmd	[Control /Bkr /Trip Manager]
Trigger13 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	51R[2].TripCmd	[Control /Bkr /Trip Manager]

Parameter	Description	Setting range	Default	Menu path
Trigger14 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	46[1].TripCmd	[Control /Bkr /Trip Manager]
Trigger15 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	46[2].TripCmd	[Control /Bkr /Trip Manager]
Trigger16 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	MStart.TripCmd	[Control /Bkr /Trip Manager]
Trigger17 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	49.TripCmd	[Control /Bkr /Trip Manager]
Trigger18 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	37[1].TripCmd	[Control /Bkr /Trip Manager]
Trigger19 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	37[2].TripCmd	[Control /Bkr /Trip Manager]
Trigger20 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	50J[1].TripCmd	[Control /Bkr /Trip Manager]
Trigger21 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	50J[2].TripCmd	[Control /Bkr /Trip Manager]
Trigger22 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	RTD.TripCmd	[Control /Bkr /Trip Manager]
Trigger23 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	-.-	[Control /Bkr /Trip Manager]
Trigger24 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	-.-	[Control /Bkr /Trip Manager]

Parameter	Description	Setting range	Default	Menu path
Trigger25 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	.-	[Control /Bkr /Trip Manager]
Trigger26 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	.-	[Control /Bkr /Trip Manager]
Trigger27 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	.-	[Control /Bkr /Trip Manager]
Trigger28 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	.-	[Control /Bkr /Trip Manager]
Trigger29 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	.-	[Control /Bkr /Trip Manager]
Trigger30 	Open Command to the Breaker if the state of the assigned signal becomes true.	1..n, Trip Cmds	.-	[Control /Bkr /Trip Manager]
t-Move CLOSE 	Time to move to the CLOSE Position	0.01 - 100.00s	0.1s	[Control /Bkr /General Settings]
t-Move OPEN 	Time to move to the OPEN Position	0.01 - 100.00s	0.1s	[Control /Bkr /General Settings]

Switchgear/Breaker Input States

Name	Description	Assignment via
CinBkr-52a-I	Module Input State: Feed-back signal of the Bkr (52a)	[Control /Bkr /Pos Indicators Wirng]

Name	Description	Assignment via
CinBkr-52b-I	Module Input State: Feed-back signal of the Bkr. (52b)	[Control /Bkr /Pos Indicatr's Wirng]
Ready-I	Module Input State: Breaker Ready	[Control /Bkr /Pos Indicatr's Wirng]
Ack TripCmd-I	State of the module input: Acknowledgment Signal (only for automatic acknowledgment). Module input signal	[Control /Bkr /Trip Manager]
Interl CLOSE1-I	State of the module input: Interlocking of the CLOSE command	[Control /Bkr /Interlockings]
Interl CLOSE2-I	State of the module input: Interlocking of the CLOSE command	[Control /Bkr /Interlockings]
Interl CLOSE3-I	State of the module input: Interlocking of the CLOSE command	[Control /Bkr /Interlockings]
Interl OPEN1-I	State of the module input: Interlocking of the OPEN command	[Control /Bkr /Interlockings]
Interl OPEN2-I	State of the module input: Interlocking of the OPEN command	[Control /Bkr /Interlockings]
Interl OPEN3-I	State of the module input: Interlocking of the OPEN command	[Control /Bkr /Interlockings]
SC CLOSE-I	State of the module input: Switching CLOSE Command, e.g. the state of the Logics or the state of the digital input	[Control /Bkr /Ex OPEN/CLOSE Cmd]
SC OPEN-I	State of the module input: Switching OPEN Command, e.g. the state of the Logics or the state of the digital input	[Control /Bkr /Ex OPEN/CLOSE Cmd]

Switchgear/Breaker Signals (Outputs States)

Signal	Description
SI SingleContactInd	Signal: The Position of the Switchgear is detected by one auxiliary contact (pole) only. Thus indeterminate and disturbed Positions cannot be detected.
Pos not CLOSE	Signal: Pos not CLOSE
Pos CLOSE	Signal: Breaker is in CLOSE-Position
Pos OPEN	Signal: Breaker is in OPEN-Position
Pos Indeterm	Signal: Breaker is in Indeterminate Position
Pos Disturb	Signal: Breaker Disturbed - Undefined Breaker Position. The feed-back signals (Position Indicators) contradict themselves. After expiring of a supervision timer this signal becomes true.
State	Signal: Breaker Position (0 = Indeterminate, 1 = OPEN, 2 = CLOSE, 3 = Disturbed)
Ready	Signal: Breaker is ready for operation.
Interl CLOSE	Signal: One or more IL_Close inputs are active.
Interl OPEN	Signal: One or more IL_Open inputs are active.
CES succesf	Signal: Command Execution Supervision: Switching command executed successfully.
CES Disturbed	Signal: Command Execution Supervision: Switching Command unsuccessful. Switchgear in disturbed position.
CES Fail TripCmd	Signal: Command Execution Supervision: Command execution failed because trip command is pending.
CES SwitchgDir	Signal: Command Execution Supervision respectively Switching Direction Control: This signal becomes true, if a switch command is issued even though the switchgear is already in the requested position. Example: A switchgear that is already OPEN should be switched OPEN again (doubly). The same applies to CLOSE commands.
CES CLOSE d OPEN	Signal: Command Execution Supervision: CLOSE Command during a pending OPEN Command.
CES SG not ready	Signal: Command Execution Supervision: Switchgear not ready
CES Field Interl	Signal: Command Execution Supervision: Switching Command not executed because of field interlocking.
CES SG removed	Signal: Command Execution Supervision: Switching Command unsuccessful, Switchgear removed.
TripCmd	Signal: Trip Command
Ack TripCmd	Signal: Acknowledge Trip Command
Bwear Slow Breaker	Signal: Slow Breaker Alarm
Res Bwear SI Breaker	Signal: Resetting the slow breaker alarm
CLOSE Cmd	Signal: CLOSE command issued to the switchgear. Depending on the setting the signal may include the CLOSE command of the Prot module.
OPEN Cmd	Signal: OPEN command issued to the switchgear. Depending on the setting the signal may include the OPEN command of the Prot module.
CLOSE Cmd manual	Signal: CLOSE Cmd manual

<i>Signal</i>	<i>Description</i>
OPEN Cmd manual	Signal: OPEN Cmd manual

Optional External Switching Signals

NOTICE

The following list of signals can be used as signals for external switching.

<i>Name</i>	<i>Description</i>
-.-	No assignment
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
Logic.LE1.Gate Out	Signal: Output of the logic gate
Logic.LE1.Timer Out	Signal: Timer Output
Logic.LE1.Out	Signal: Latched Output (Q)
Logic.LE1.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE2.Gate Out	Signal: Output of the logic gate
Logic.LE2.Timer Out	Signal: Timer Output
Logic.LE2.Out	Signal: Latched Output (Q)
Logic.LE2.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE3.Gate Out	Signal: Output of the logic gate
Logic.LE3.Timer Out	Signal: Timer Output
Logic.LE3.Out	Signal: Latched Output (Q)
Logic.LE3.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE4.Gate Out	Signal: Output of the logic gate
Logic.LE4.Timer Out	Signal: Timer Output
Logic.LE4.Out	Signal: Latched Output (Q)
Logic.LE4.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE5.Gate Out	Signal: Output of the logic gate
Logic.LE5.Timer Out	Signal: Timer Output
Logic.LE5.Out	Signal: Latched Output (Q)
Logic.LE5.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE6.Gate Out	Signal: Output of the logic gate
Logic.LE6.Timer Out	Signal: Timer Output
Logic.LE6.Out	Signal: Latched Output (Q)
Logic.LE6.Out inverted	Signal: Negated Latched Output (Q NOT)

<i>Name</i>	<i>Description</i>
Logic.LE7.Gate Out	Signal: Output of the logic gate
Logic.LE7.Timer Out	Signal: Timer Output
Logic.LE7.Out	Signal: Latched Output (Q)
Logic.LE7.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE8.Gate Out	Signal: Output of the logic gate
Logic.LE8.Timer Out	Signal: Timer Output
Logic.LE8.Out	Signal: Latched Output (Q)
Logic.LE8.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE9.Gate Out	Signal: Output of the logic gate
Logic.LE9.Timer Out	Signal: Timer Output
Logic.LE9.Out	Signal: Latched Output (Q)
Logic.LE9.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE10.Gate Out	Signal: Output of the logic gate
Logic.LE10.Timer Out	Signal: Timer Output
Logic.LE10.Out	Signal: Latched Output (Q)
Logic.LE10.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE11.Gate Out	Signal: Output of the logic gate
Logic.LE11.Timer Out	Signal: Timer Output
Logic.LE11.Out	Signal: Latched Output (Q)
Logic.LE11.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE12.Gate Out	Signal: Output of the logic gate
Logic.LE12.Timer Out	Signal: Timer Output
Logic.LE12.Out	Signal: Latched Output (Q)
Logic.LE12.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE13.Gate Out	Signal: Output of the logic gate
Logic.LE13.Timer Out	Signal: Timer Output
Logic.LE13.Out	Signal: Latched Output (Q)
Logic.LE13.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE14.Gate Out	Signal: Output of the logic gate
Logic.LE14.Timer Out	Signal: Timer Output
Logic.LE14.Out	Signal: Latched Output (Q)
Logic.LE14.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE15.Gate Out	Signal: Output of the logic gate
Logic.LE15.Timer Out	Signal: Timer Output
Logic.LE15.Out	Signal: Latched Output (Q)
Logic.LE15.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE16.Gate Out	Signal: Output of the logic gate

<i>Name</i>	<i>Description</i>
Logic.LE16.Timer Out	Signal: Timer Output
Logic.LE16.Out	Signal: Latched Output (Q)
Logic.LE16.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE17.Gate Out	Signal: Output of the logic gate
Logic.LE17.Timer Out	Signal: Timer Output
Logic.LE17.Out	Signal: Latched Output (Q)
Logic.LE17.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE18.Gate Out	Signal: Output of the logic gate
Logic.LE18.Timer Out	Signal: Timer Output
Logic.LE18.Out	Signal: Latched Output (Q)
Logic.LE18.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE19.Gate Out	Signal: Output of the logic gate
Logic.LE19.Timer Out	Signal: Timer Output
Logic.LE19.Out	Signal: Latched Output (Q)
Logic.LE19.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE20.Gate Out	Signal: Output of the logic gate
Logic.LE20.Timer Out	Signal: Timer Output
Logic.LE20.Out	Signal: Latched Output (Q)
Logic.LE20.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE21.Gate Out	Signal: Output of the logic gate
Logic.LE21.Timer Out	Signal: Timer Output
Logic.LE21.Out	Signal: Latched Output (Q)
Logic.LE21.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE22.Gate Out	Signal: Output of the logic gate
Logic.LE22.Timer Out	Signal: Timer Output
Logic.LE22.Out	Signal: Latched Output (Q)
Logic.LE22.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE23.Gate Out	Signal: Output of the logic gate
Logic.LE23.Timer Out	Signal: Timer Output
Logic.LE23.Out	Signal: Latched Output (Q)
Logic.LE23.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE24.Gate Out	Signal: Output of the logic gate
Logic.LE24.Timer Out	Signal: Timer Output
Logic.LE24.Out	Signal: Latched Output (Q)
Logic.LE24.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE25.Gate Out	Signal: Output of the logic gate
Logic.LE25.Timer Out	Signal: Timer Output

<i>Name</i>	<i>Description</i>
Logic.LE25.Out	Signal: Latched Output (Q)
Logic.LE25.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE26.Gate Out	Signal: Output of the logic gate
Logic.LE26.Timer Out	Signal: Timer Output
Logic.LE26.Out	Signal: Latched Output (Q)
Logic.LE26.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE27.Gate Out	Signal: Output of the logic gate
Logic.LE27.Timer Out	Signal: Timer Output
Logic.LE27.Out	Signal: Latched Output (Q)
Logic.LE27.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE28.Gate Out	Signal: Output of the logic gate
Logic.LE28.Timer Out	Signal: Timer Output
Logic.LE28.Out	Signal: Latched Output (Q)
Logic.LE28.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE29.Gate Out	Signal: Output of the logic gate
Logic.LE29.Timer Out	Signal: Timer Output
Logic.LE29.Out	Signal: Latched Output (Q)
Logic.LE29.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE30.Gate Out	Signal: Output of the logic gate
Logic.LE30.Timer Out	Signal: Timer Output
Logic.LE30.Out	Signal: Latched Output (Q)
Logic.LE30.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE31.Gate Out	Signal: Output of the logic gate
Logic.LE31.Timer Out	Signal: Timer Output
Logic.LE31.Out	Signal: Latched Output (Q)
Logic.LE31.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE32.Gate Out	Signal: Output of the logic gate
Logic.LE32.Timer Out	Signal: Timer Output
Logic.LE32.Out	Signal: Latched Output (Q)
Logic.LE32.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE33.Gate Out	Signal: Output of the logic gate
Logic.LE33.Timer Out	Signal: Timer Output
Logic.LE33.Out	Signal: Latched Output (Q)
Logic.LE33.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE34.Gate Out	Signal: Output of the logic gate
Logic.LE34.Timer Out	Signal: Timer Output
Logic.LE34.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logic.LE34.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE35.Gate Out	Signal: Output of the logic gate
Logic.LE35.Timer Out	Signal: Timer Output
Logic.LE35.Out	Signal: Latched Output (Q)
Logic.LE35.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE36.Gate Out	Signal: Output of the logic gate
Logic.LE36.Timer Out	Signal: Timer Output
Logic.LE36.Out	Signal: Latched Output (Q)
Logic.LE36.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE37.Gate Out	Signal: Output of the logic gate
Logic.LE37.Timer Out	Signal: Timer Output
Logic.LE37.Out	Signal: Latched Output (Q)
Logic.LE37.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE38.Gate Out	Signal: Output of the logic gate
Logic.LE38.Timer Out	Signal: Timer Output
Logic.LE38.Out	Signal: Latched Output (Q)
Logic.LE38.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE39.Gate Out	Signal: Output of the logic gate
Logic.LE39.Timer Out	Signal: Timer Output
Logic.LE39.Out	Signal: Latched Output (Q)
Logic.LE39.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE40.Gate Out	Signal: Output of the logic gate
Logic.LE40.Timer Out	Signal: Timer Output
Logic.LE40.Out	Signal: Latched Output (Q)
Logic.LE40.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE41.Gate Out	Signal: Output of the logic gate
Logic.LE41.Timer Out	Signal: Timer Output
Logic.LE41.Out	Signal: Latched Output (Q)
Logic.LE41.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE42.Gate Out	Signal: Output of the logic gate
Logic.LE42.Timer Out	Signal: Timer Output
Logic.LE42.Out	Signal: Latched Output (Q)
Logic.LE42.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE43.Gate Out	Signal: Output of the logic gate
Logic.LE43.Timer Out	Signal: Timer Output
Logic.LE43.Out	Signal: Latched Output (Q)
Logic.LE43.Out inverted	Signal: Negated Latched Output (Q NOT)

<i>Name</i>	<i>Description</i>
Logic.LE44.Gate Out	Signal: Output of the logic gate
Logic.LE44.Timer Out	Signal: Timer Output
Logic.LE44.Out	Signal: Latched Output (Q)
Logic.LE44.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE45.Gate Out	Signal: Output of the logic gate
Logic.LE45.Timer Out	Signal: Timer Output
Logic.LE45.Out	Signal: Latched Output (Q)
Logic.LE45.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE46.Gate Out	Signal: Output of the logic gate
Logic.LE46.Timer Out	Signal: Timer Output
Logic.LE46.Out	Signal: Latched Output (Q)
Logic.LE46.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE47.Gate Out	Signal: Output of the logic gate
Logic.LE47.Timer Out	Signal: Timer Output
Logic.LE47.Out	Signal: Latched Output (Q)
Logic.LE47.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE48.Gate Out	Signal: Output of the logic gate
Logic.LE48.Timer Out	Signal: Timer Output
Logic.LE48.Out	Signal: Latched Output (Q)
Logic.LE48.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE49.Gate Out	Signal: Output of the logic gate
Logic.LE49.Timer Out	Signal: Timer Output
Logic.LE49.Out	Signal: Latched Output (Q)
Logic.LE49.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE50.Gate Out	Signal: Output of the logic gate
Logic.LE50.Timer Out	Signal: Timer Output
Logic.LE50.Out	Signal: Latched Output (Q)
Logic.LE50.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE51.Gate Out	Signal: Output of the logic gate
Logic.LE51.Timer Out	Signal: Timer Output
Logic.LE51.Out	Signal: Latched Output (Q)
Logic.LE51.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE52.Gate Out	Signal: Output of the logic gate
Logic.LE52.Timer Out	Signal: Timer Output
Logic.LE52.Out	Signal: Latched Output (Q)
Logic.LE52.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE53.Gate Out	Signal: Output of the logic gate

<i>Name</i>	<i>Description</i>
Logic.LE53.Timer Out	Signal: Timer Output
Logic.LE53.Out	Signal: Latched Output (Q)
Logic.LE53.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE54.Gate Out	Signal: Output of the logic gate
Logic.LE54.Timer Out	Signal: Timer Output
Logic.LE54.Out	Signal: Latched Output (Q)
Logic.LE54.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE55.Gate Out	Signal: Output of the logic gate
Logic.LE55.Timer Out	Signal: Timer Output
Logic.LE55.Out	Signal: Latched Output (Q)
Logic.LE55.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE56.Gate Out	Signal: Output of the logic gate
Logic.LE56.Timer Out	Signal: Timer Output
Logic.LE56.Out	Signal: Latched Output (Q)
Logic.LE56.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE57.Gate Out	Signal: Output of the logic gate
Logic.LE57.Timer Out	Signal: Timer Output
Logic.LE57.Out	Signal: Latched Output (Q)
Logic.LE57.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE58.Gate Out	Signal: Output of the logic gate
Logic.LE58.Timer Out	Signal: Timer Output
Logic.LE58.Out	Signal: Latched Output (Q)
Logic.LE58.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE59.Gate Out	Signal: Output of the logic gate
Logic.LE59.Timer Out	Signal: Timer Output
Logic.LE59.Out	Signal: Latched Output (Q)
Logic.LE59.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE60.Gate Out	Signal: Output of the logic gate
Logic.LE60.Timer Out	Signal: Timer Output
Logic.LE60.Out	Signal: Latched Output (Q)
Logic.LE60.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE61.Gate Out	Signal: Output of the logic gate
Logic.LE61.Timer Out	Signal: Timer Output
Logic.LE61.Out	Signal: Latched Output (Q)
Logic.LE61.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE62.Gate Out	Signal: Output of the logic gate
Logic.LE62.Timer Out	Signal: Timer Output

<i>Name</i>	<i>Description</i>
Logic.LE62.Out	Signal: Latched Output (Q)
Logic.LE62.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE63.Gate Out	Signal: Output of the logic gate
Logic.LE63.Timer Out	Signal: Timer Output
Logic.LE63.Out	Signal: Latched Output (Q)
Logic.LE63.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE64.Gate Out	Signal: Output of the logic gate
Logic.LE64.Timer Out	Signal: Timer Output
Logic.LE64.Out	Signal: Latched Output (Q)
Logic.LE64.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE65.Gate Out	Signal: Output of the logic gate
Logic.LE65.Timer Out	Signal: Timer Output
Logic.LE65.Out	Signal: Latched Output (Q)
Logic.LE65.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE66.Gate Out	Signal: Output of the logic gate
Logic.LE66.Timer Out	Signal: Timer Output
Logic.LE66.Out	Signal: Latched Output (Q)
Logic.LE66.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE67.Gate Out	Signal: Output of the logic gate
Logic.LE67.Timer Out	Signal: Timer Output
Logic.LE67.Out	Signal: Latched Output (Q)
Logic.LE67.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE68.Gate Out	Signal: Output of the logic gate
Logic.LE68.Timer Out	Signal: Timer Output
Logic.LE68.Out	Signal: Latched Output (Q)
Logic.LE68.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE69.Gate Out	Signal: Output of the logic gate
Logic.LE69.Timer Out	Signal: Timer Output
Logic.LE69.Out	Signal: Latched Output (Q)
Logic.LE69.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE70.Gate Out	Signal: Output of the logic gate
Logic.LE70.Timer Out	Signal: Timer Output
Logic.LE70.Out	Signal: Latched Output (Q)
Logic.LE70.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE71.Gate Out	Signal: Output of the logic gate
Logic.LE71.Timer Out	Signal: Timer Output
Logic.LE71.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logic.LE71.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE72.Gate Out	Signal: Output of the logic gate
Logic.LE72.Timer Out	Signal: Timer Output
Logic.LE72.Out	Signal: Latched Output (Q)
Logic.LE72.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE73.Gate Out	Signal: Output of the logic gate
Logic.LE73.Timer Out	Signal: Timer Output
Logic.LE73.Out	Signal: Latched Output (Q)
Logic.LE73.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE74.Gate Out	Signal: Output of the logic gate
Logic.LE74.Timer Out	Signal: Timer Output
Logic.LE74.Out	Signal: Latched Output (Q)
Logic.LE74.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE75.Gate Out	Signal: Output of the logic gate
Logic.LE75.Timer Out	Signal: Timer Output
Logic.LE75.Out	Signal: Latched Output (Q)
Logic.LE75.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE76.Gate Out	Signal: Output of the logic gate
Logic.LE76.Timer Out	Signal: Timer Output
Logic.LE76.Out	Signal: Latched Output (Q)
Logic.LE76.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE77.Gate Out	Signal: Output of the logic gate
Logic.LE77.Timer Out	Signal: Timer Output
Logic.LE77.Out	Signal: Latched Output (Q)
Logic.LE77.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE78.Gate Out	Signal: Output of the logic gate
Logic.LE78.Timer Out	Signal: Timer Output
Logic.LE78.Out	Signal: Latched Output (Q)
Logic.LE78.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE79.Gate Out	Signal: Output of the logic gate
Logic.LE79.Timer Out	Signal: Timer Output
Logic.LE79.Out	Signal: Latched Output (Q)
Logic.LE79.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE80.Gate Out	Signal: Output of the logic gate
Logic.LE80.Timer Out	Signal: Timer Output
Logic.LE80.Out	Signal: Latched Output (Q)
Logic.LE80.Out inverted	Signal: Negated Latched Output (Q NOT)

Switchgear Wear

Switchgear Wear Features

The sum of the accumulated interrupted currents.

A »SGwear Slow Switchgear« might indicate malfunction at an early stage.

The protective relay will calculate the »SG OPEN Capacity« continuously. 100% means, that switchgear maintenance is mandatory now.

The protective relay will make a alarm decision based on the curve that the user provides.

The relay will monitor the frequency of CLOSE/OPEN cycles. The User can set thresholds for the maximum allowed sum of interrupt currents and the maximum allowed sum of interrupt currents per hour. By means of this alarm, excessive switchgear operations can be detected at an early stage.

Slow Switchgear Alarm

An increase of the close or opening time of the switchgear is an indication for the maintenance need. If the measured time exceeds the time »*t-Move OPEN*« or »*t-Move CLOSE*«, the signal »SGwear Slow Switchgear« will be activated.

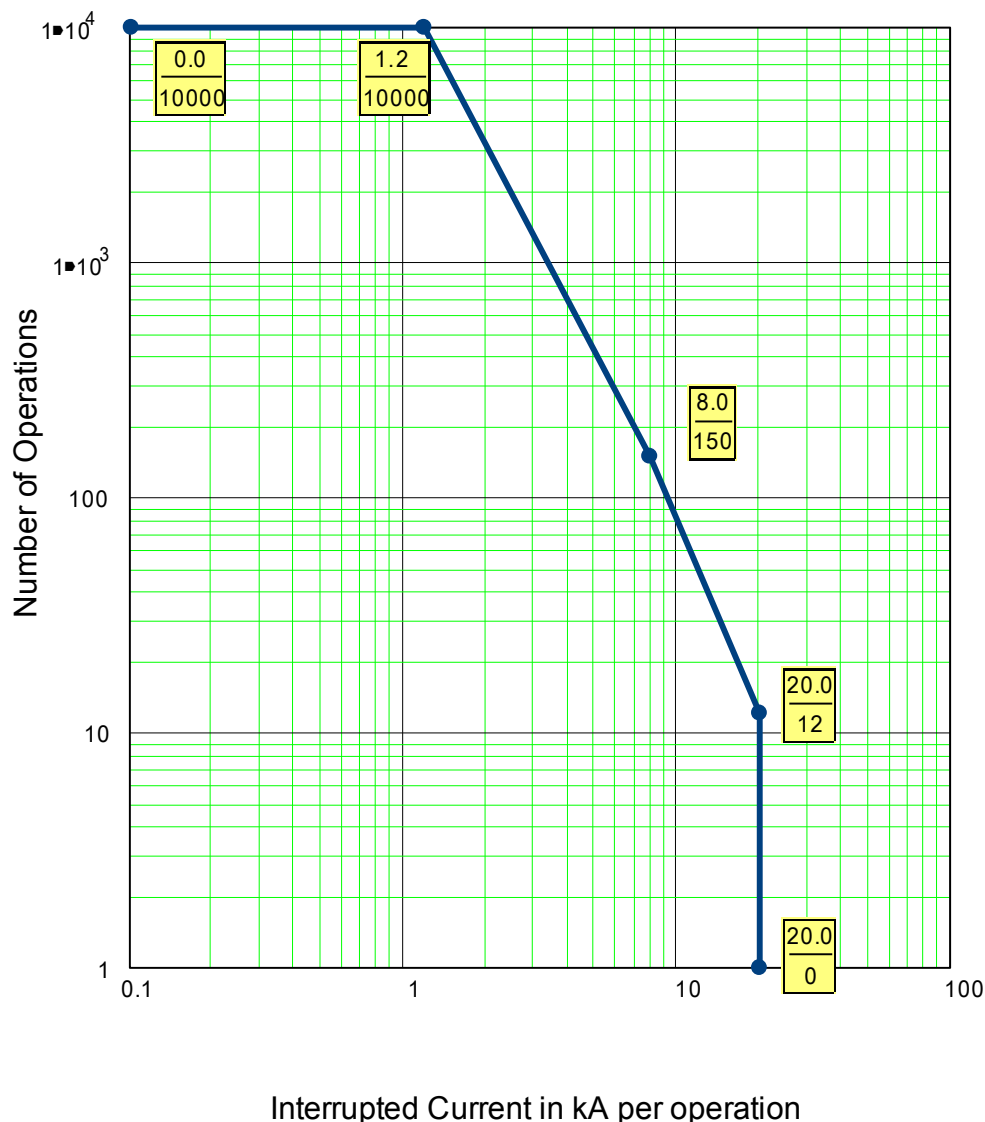
Switchgear Wear Curve

In order to keep the switchgear in good working condition, the switchgear needs to be monitored. The switchgear health (operation life) depends above all on:

- The number of CLOSE/OPEN cycles.
- The amplitudes of the interrupting currents.
- The frequency that the switchgear operates (Operations per hour).

The user has to maintain the switchgear accordingly to the maintenance schedule that is to be provided by the manufacturer (switchgear operation statistics). By means of up to ten points that the user can replicate the switchgear wear curve within menu [Control/SG/SG[x]/SGW] . Each point has two settings: the interrupt current in kilo amperes and the allowed operation counts. No matter how many points are used, the operation counts the last point as zero. The protective relay will interpolate the allowed operations based on the switchgear wear curve. When the interrupted current is greater than the interrupt current at the last point, the protective relay will assume zero operation counts.

Breaker Maintenance Curve for a typical 25kV Breaker



Global Protection Parameters of the Breaker Wear Module

Parameter	Description	Setting range	Default	Menu path
Operations Alarm 	Service Alarm, too many Operations	1 - 100000	9999	[Control /Bkr /Bwear]
Isum Intr Alarm 	Alarm, the Sum (Limit) of interrupting currents has been exceeded.	0.00 - 2000.00kA	100.00kA	[Control /Bkr /Bwear]
Isum Intr ph Alm 	Alarm, the per hour Sum (Limit) of interrupting currents has been exceeded.	0.00 - 2000.00kA	100.00kA	[Control /Bkr /Bwear]
Bwear Curve Fc 	The Breaker Wear Curve defines the maximum allowed CLOSE/OPEN cycles depending on the brake currents. If the breaker maintenance curve is exceeded, an alarm will be issued. The breaker maintenance curve is to be taken from the technical data sheet of the breaker manufacturer. By means of the available points this curve is to be replicated.	Inactive, Active	Inactive	[Control /Bkr /Bwear]
WearLevel Alarm 	Breaker Wear curve Alarm Only available if:Bwear Curve Fc = Active	0.00 - 100.00%	80.00%	[Control /Bkr /Bwear]
WearLevel Lockout 	Breaker Wear Curve Lockout Level Only available if:Bwear Curve Fc = Active	0.00 - 100.00%	95.00%	[Control /Bkr /Bwear]
Current1 	Interrupted Current Level #1 Only available if:Bwear Curve Fc = Active	0.00 - 2000.00kA	0.1kA	[Control /Bkr /Bwear]
Count1 	Open Counts Allowed #1 Only available if:Bwear Curve Fc = Active	1 - 32000	10000	[Control /Bkr /Bwear]

Parameter	Description	Setting range	Default	Menu path
Current2 	Interrupted Current Level #2 Only available if:Bwear Curve Fc = Active	0.00 - 2000.00kA	1.00kA	[Control /Bkr /Bwear]
Count2 	Open Counts Allowed #2 Only available if:Bwear Curve Fc = Active	1 - 32000	10000	[Control /Bkr /Bwear]
Current3 	Interrupted Current Level #3 Only available if:Bwear Curve Fc = Active	0.00 - 2000.00kA	1.15kA	[Control /Bkr /Bwear]
Count3 	Open Counts Allowed #3 Only available if:Bwear Curve Fc = Active	1 - 32000	10000	[Control /Bkr /Bwear]
Current4 	Interrupted Current Level #4 Only available if:Bwear Curve Fc = Active	0.00 - 2000.00kA	3.00kA	[Control /Bkr /Bwear]
Count4 	Open Counts Allowed #4 Only available if:Bwear Curve Fc = Active	1 - 32000	1900	[Control /Bkr /Bwear]
Current5 	Interrupted Current Level #5 Only available if:Bwear Curve Fc = Active	0.00 - 2000.00kA	5.00kA	[Control /Bkr /Bwear]
Count5 	Open Counts Allowed #5 Only available if:Bwear Curve Fc = Active	1 - 32000	850	[Control /Bkr /Bwear]
Current6 	Interrupted Current Level #6 Only available if:Bwear Curve Fc = Active	0.00 - 2000.00kA	6.00kA	[Control /Bkr /Bwear]
Count6 	Open Counts Allowed #6 Only available if:Bwear Curve Fc = Active	1 - 32000	500	[Control /Bkr /Bwear]
Current7 	Interrupted Current Level #7 Only available if:Bwear Curve Fc = Active	0.00 - 2000.00kA	13.00kA	[Control /Bkr /Bwear]

Parameter	Description	Setting range	Default	Menu path
Count7 	Open Counts Allowed #7 Only available if:Bwear Curve Fc = Active	1 - 32000	110	[Control /Bkr /Bwear]
Current8 	Interrupted Current Level #8 Only available if:Bwear Curve Fc = Active	0.00 - 2000.00kA	16.00kA	[Control /Bkr /Bwear]
Count8 	Open Counts Allowed #8 Only available if:Bwear Curve Fc = Active	1 - 32000	75	[Control /Bkr /Bwear]
Current9 	Interrupted Current Level #9 Only available if:Bwear Curve Fc = Active	0.00 - 2000.00kA	20.00kA	[Control /Bkr /Bwear]
Count9 	Open Counts Allowed #9 Only available if:Bwear Curve Fc = Active	1 - 32000	45	[Control /Bkr /Bwear]
Current10 	Interrupted Current Level #10 Only available if:Bwear Curve Fc = Active	0.00 - 2000.00kA	25.00kA	[Control /Bkr /Bwear]
Count10 	Open Counts Allowed #10 Only available if:Bwear Curve Fc = Active	1 - 32000	30	[Control /Bkr /Bwear]

Breaker Wear Signals (Output States)

Signal	Description
Operations Alarm	Signal: Service Alarm, too many Operations
Isum Intr trip: IA	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded: IA
Isum Intr trip: IB	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded: IB
Isum Intr trip: IC	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded: IC
Isum Intr trip	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded in at least one phase.
Res TripCmdCr	Signal: Resetting of the Counter: total number of trip commands

<i>Signal</i>	<i>Description</i>
Res Isum trip	Signal: Reset summation of the tripping currents
WearLevel Alarm	Signal: Breaker Wear curve Alarm
WearLevel Lockout	Signal: Breaker Wear Curve Lockout Level
Res Bwear Curve	Signal: Reset of the Breaker Wear maintenance curve.
Isum Intr ph Alm	Signal: Alarm, the per hour Sum (Limit) of interrupting currents has been exceeded.
Res Isum Intr ph Alm	Signal: Reset of the Alarm, "the per hour Sum (Limit) of interrupting currents has been exceeded".

Breaker Wear Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
TripCmd Cr	Counter: Total number of trips of the switchgear (breaker, load break switch...). Resettable with Total or All.	0	0 - 200000	[Operation /Count and RevData /Control /Bkr]

Breaker Wear Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
Isum trip IA	Summation of the tripping currents phase	0.00A	0.00 - 1000.00A	[Operation /Count and RevData /Control /Bkr]
Isum trip IB	Summation of the tripping currents phase	0.00A	0.00 - 1000.00A	[Operation /Count and RevData /Control /Bkr]
Isum trip IC	Summation of the tripping currents phase	0.00A	0.00 - 1000.00A	[Operation /Count and RevData /Control /Bkr]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
Isum Intr per hour	Sum per hour of interrupting currents.	0.00kA	0.00 - 1000.00kA	[Operation /Count and RevData /Control /Bkr]
Bkr OPEN capacity	CB OPEN capacity. 100% means, that the breaker is to be maintained.	0.0%	0.0 - 100.0%	[Operation /Count and RevData /Control /Bkr]

Direct Commands of the Breaker Wear Module

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Res TripCmdCr 	Resetting of the Counter: total number of trip commands	Inactive, Active	Inactive	[Operation /Reset /Counter]
Res Isum trip 	Reset summation of the tripping currents	Inactive, Active	Inactive	[Operation /Reset /Counter]
Res Isum Intr per hour 	Sum per hour of interrupting currents.	Inactive, Active	Inactive	[Operation /Reset /Counter]
Res Bkr OPEN capacity 	Resetting of the CB OPEN capacity. 100% means, that the breaker is to be maintained.	Inactive, Active	Inactive	[Operation /Reset /Counter]

Control Parameters

Direct commands of the Control Module

Parameter	Description	Setting range	Default	Menu path
Switching Authority 	Switching Authority	None, Local, Remote, Local and Remote	Local	[Control /General Settings]

Signals of the Control Module

Signal	Description
Local	Switching Authority: Local
Remote	Switching Authority: Remote
SG Indeterm	Minimum one Switchgear is moving (Position cannot be determined).
SG Disturb	Minimum one Switchgear is disturbed.

Counters of the Control Module

Parameter	Description
CES SAuthority	Command Execution Supervision: Switching Command not executed. No switching authority.
CES DoubleOperating	Command Execution Supervision: A second switch command is in conflict with a pending one.
No. of rej. Com	No. of rej. Com because Locked by ParaSystem

Synchronization inputs

Assignable Trip Commands (Trip Manager)

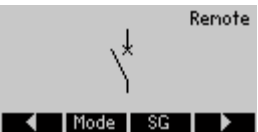
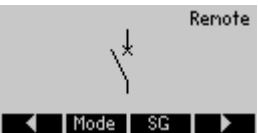
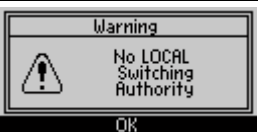
Name	Description
-.-	No assignment
MStart.TripCmd	Signal: Trip Command
50P[1].TripCmd	Signal: Trip Command

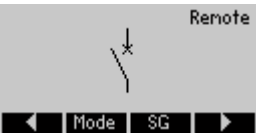
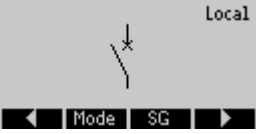
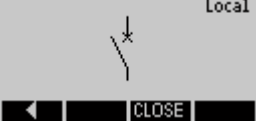
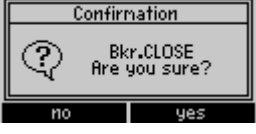
<i>Name</i>	<i>Description</i>
50P[2].TripCmd	Signal: Trip Command
50P[3].TripCmd	Signal: Trip Command
51P[1].TripCmd	Signal: Trip Command
51P[2].TripCmd	Signal: Trip Command
51P[3].TripCmd	Signal: Trip Command
50X[1].TripCmd	Signal: Trip Command
50X[2].TripCmd	Signal: Trip Command
51X[1].TripCmd	Signal: Trip Command
51X[2].TripCmd	Signal: Trip Command
50R[1].TripCmd	Signal: Trip Command
50R[2].TripCmd	Signal: Trip Command
51R[1].TripCmd	Signal: Trip Command
51R[2].TripCmd	Signal: Trip Command
49.TripCmd	Signal: Trip Command
50J[1].TripCmd	Signal: Trip Command
50J[2].TripCmd	Signal: Trip Command
37[1].TripCmd	Signal: Trip Command
37[2].TripCmd	Signal: Trip Command
37[3].TripCmd	Signal: Trip Command
46[1].TripCmd	Signal: Trip Command
46[2].TripCmd	Signal: Trip Command
ZI.TripCmd	Signal: Zone Interlocking Trip Command
ExP[1].TripCmd	Signal: Trip Command
ExP[2].TripCmd	Signal: Trip Command
ExP[3].TripCmd	Signal: Trip Command
ExP[4].TripCmd	Signal: Trip Command
Ex87.TripCmd	Signal: Trip Command
Remote Trip.TripCmd	Signal: Trip Command
RTD.TripCmd	Signal: Trip Command

Control - Example: Switching of a Breaker

Ctrl

The following example shows how to switch a breaker via the HMI at the device.

	Change into the menu »Control« by pushing the »right arrow« softkey.
	Change to the control page by pushing the »right arrow« softkey.
	Information only: On the control page the current switchgear positions is displayed. By means of the softkey »Mode« it can be switched to the menu »General Settings«. In this menu switching authority and interlockings can be set. By means of the softkey »SG« it can be switched to the menu »SG«. In this menu specific settings for the switch gear can be done. This page can be directly called up via the key "CTRL" at the front panel.
	To execute a switching operation, change into the switching menu by pushing the right arrow softkey button.
	Executing a switching command via the devices HMI is only possible when the switching authority is set to »Local«. If no switching authority is given, this has to be set first to »Local« or »Local and Remote«. With the softkey »OK« it can be switched back to the single line diagram page.

	Pushing the softkey »Mode« leads to the menu »General Settings«.
	In this menu the switching authority can be changed.
	Select between »Local« or »Local and Remote«.
	Now it is possible to execute switching commands at the HMI.
	Push the »right arrow« softkey to get to the control page.
	The breaker is opened, therefore it can be closed only. After pushing the softkey »CLOSE« a confirmation window appears.
	When you are sure to proceed with the switching operation, press the softkey »YES«.

	The switching command will be given to the breaker. The display shows the intermediate position of the switchgear.
	It will be shown on the display when the switchgear reaches the new end position. Further possible switching operations (OPEN) will be displayed by softkeys.
	Notice: For the case, the switchgear does not reach the new end position within the set supervision time the following Warning appears on the display.

Protective Elements

IOC Function

Elements:
IOC Function

Functional Description

The instantaneous overcurrent function (IOC) or 50P[x] is intended to protect in the event of a high-current fault. The example IOC setting used in the Motor Protection Curve (see the Motor Protection Curve Examples in the Ultimate Trip Current Section) is 12 times (1,200%) of FLA. In general, the instantaneous IOC should be at least 1.5 times LRC, well above the locked rotor current normally seen at the moment of a start.

IOC should trip fast and therefore no run or pickup delay is provided. A start delay is set at a minimum of two cycles (0.03 sec.), or more if needed to block IOC tripping on magnetizing inrush when the motor is first energized. An additional IOC time delay setting is set at a default of zero seconds.

IOC Trip Level

The IOC sets the instantaneous overcurrent trip limit in percentage of the FLA above at which the relay trips. This trip type can be set to Inactive to deactivate this protective device element. For currents clearly above the setting, the IOC function picks up in two power cycles or less. *The IOC setting must be below $(1,130 * PCT / FLA)$ or 1,600%, whichever is less.*

IOC Start Delay (IOCSD)

This setting sets the number of power cycles after a start is recognized until the IOC trip and alarm functions are enabled. Use this delay to inhibit IOC tripping on a current peak caused by magnetic inrush when the motor is first energized (usually two to three cycles).

Load Shedding

Available elements:

MLS

Functional Description

In some applications, the protective device can forestall a JAM alarm or trip, or a thermal trip, by sending a signal to the process to reduce loading. The load shedding function, if enabled, closes or opens a relay contact to shed process load when the motor load current goes above the Load Shed Drop threshold, for a time exceeding the Drop Delay t . This could, for example, be connected to stop flow of material into the driven process until the load current drops below the Load Shed Dropout threshold, for the time determined by the Drop Delay t .

Set the load shed pickup current comfortably below the JAM trip level. It may be useful to set it below the Ultimate Trip Current, particularly if RTDs are not used.

The load shed function provides a contact output signal that the User connects to the process equipment, to reduce loading on the motor if it becomes too large. For example, the contact might be used to temporarily stop the flow of heavy materials onto a conveyor driven by the protected motor. In this way, the protective device tries to alleviate an overload before it reaches an outright thermal protective trip. When the load is reduced, the contact returns to the normal state and the process can resume loading of the motor.

The load shed function, which is active only during the RUN state of the motor, is configured with settings “MLS - Mechanical Load Shedding”, under each of the the Setting groups (Set 1 for example).

Device Planning Parameters of the Load Shedding

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Do not use, Use	Use	[Device Planning]

Global Protection Parameters of the Load Shedding

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /MLS]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /MLS]

Setting Group Parameters of the Load Shedding

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /MLS]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /MLS]
Pickup Threshold 	Load shedding pickup current as multiplier of FLA	0.50 - 1.50FLA	0.90FLA	[Protection Para /<1..4> /MLS]
t-Pickup Delay 	Trip delay time	0.0 - 5.0s	1.0s	[Protection Para /<1..4> /MLS]
Dropout Threshold 	Load shedding dropout as multiplier of FLA (Hysteresis)	0.50 - 1.50FLA	0.50FLA	[Protection Para /<1..4> /MLS]
t-Drop Delay 	Dropout delay time	0.0 - 5.0s	1.0s	[Protection Para /<1..4> /MLS]

Load Shedding Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /MLS]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /MLS]

Load Shedding Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Pickup	Signal: Pickup
Trip	Signal: Trip

JAM

Elements

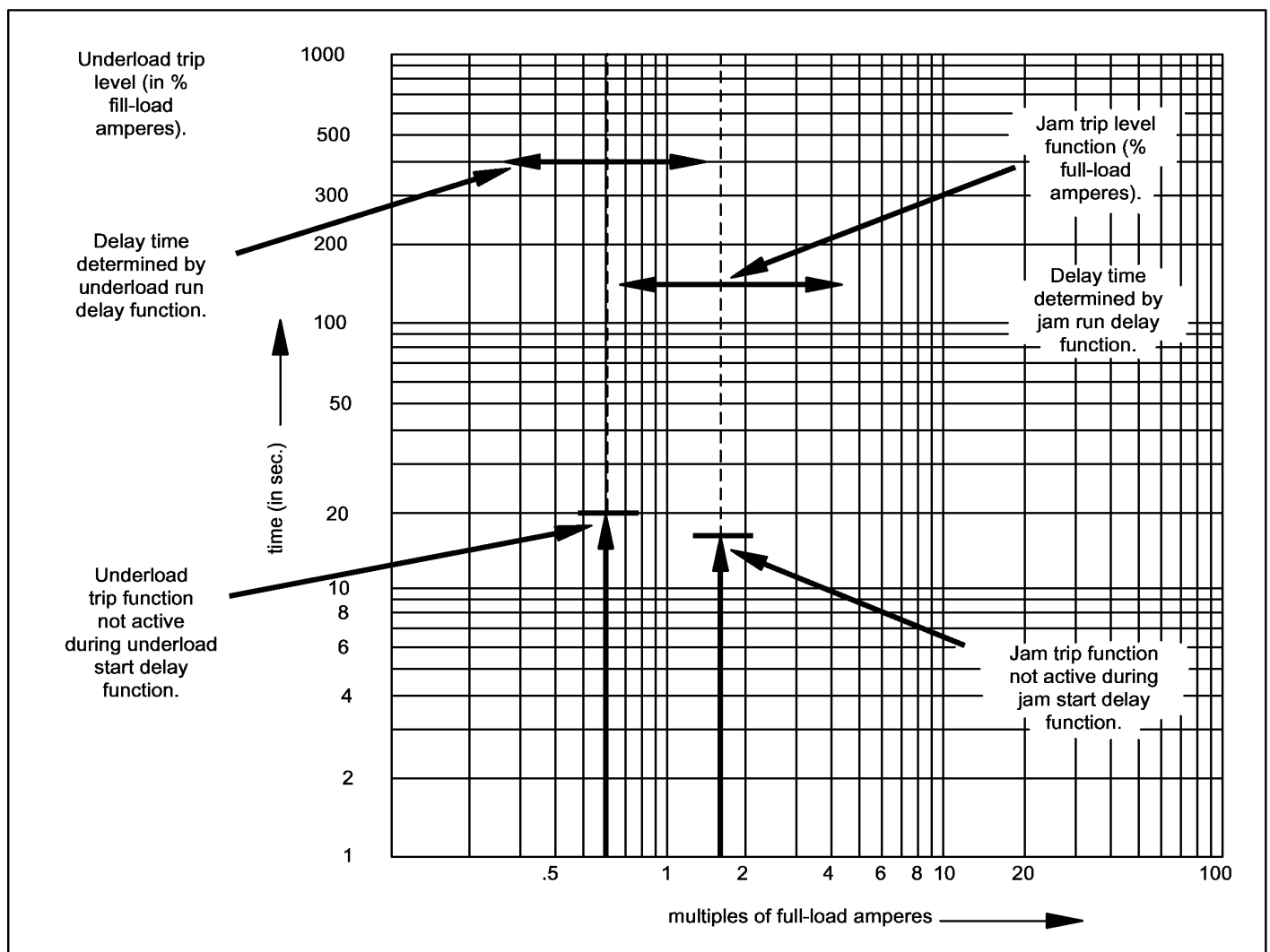
50J[1] ,50J[2]

Functional Description

When the motor is running, a current increase above normal load may be an indication of a malfunction in the load. JAM protection recognizes mechanical problems, such as broken drive gears.

Refer to the JAM protection limit (the right vertical line in the “Underload and JAM Trip Function” curve example). In this curve example, the JAM trip is set at 150% of FLA.

Underload and JAM Trip Function



The protective device can be configured for a JAM alarm and/or a JAM trip. There are two JAM elements:

- JAM1 50J[1]; and
- JAM2 50J[2].

They are located under the >>Protection Parma<< menu, under each setting group (Set 1 for example). It is suggested

to use 50J[1] for JAM trip, and 50J[2] for JAM alarm. Each can be disabled by entering the JAM setting menu and then selecting "Inactive". It can also be blocked by various blocking elements set by the User under the >>Global Prot Para / JAM<< menu. In the "Underload and JAM Trip Function" curve, the Trip settings are represented by two vertical lines, both well above the normal load current. This curve also applies to JAM setting configured as an alarm. Be sure to set the alarm level **below** the trip level.

Both trips and alarms are held off by the JAM Start Delay located under the >>Global Prot Para / Motor-start Start Delay Timers<<. Use the start delay to block tripping and alarming until the motor current drops to continuous load level. Use run delays to avoid nuisance alarms or trips for load transients.

To configure this function for operation under an alarm condition, the User must assign the functions pickup [(50J[1].Pickup) for example] to an output relay, under >>Device Parm / Relay Outs<< that the User has identified as the Alarm relay output. Likewise, to illuminate an LED under a functions alarm condition, LED2 must be assigned the functions pickup. Several elements are configured as such at the factory for convenience.

Device Planning Parameters for JAM Protection

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Do not use, Use	Use	[Device Planning]

Global Protection Parameters for JAM Protection

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /JAM-Prot /50][1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /JAM-Prot /50][1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /JAM-Prot /50][1]]

Setting Group Parameters for JAM Protection

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /JAM-Prot /50J[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /JAM-Prot /50J[1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	50J[1]: Inactive 50J[2]: Active	[Protection Para /<1..4> /JAM-Prot /50J[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /JAM-Prot /50J[1]]
Pickup 	JAM pickup based on a multiplier of FLA	1.00 - 12.00FLA	50J[1]: 10FLA 50J[2]: 10.00FLA	[Protection Para /<1..4> /JAM-Prot /50J[1]]
t 	Tripping delay	0.0 - 1200.0s	2.0s	[Protection Para /<1..4> /JAM-Prot /50J[1]]

JAM Protection Module Input States

Name	Description	Assignment via
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /JAM-Prot /50J[1]]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /JAM-Prot /50J[1]]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /JAM-Prot /50J[1]]

JAM Protection Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Pickup	Signal: Pickup
Trip	Signal: Trip
TripCmd	Signal: Trip Command

JAM Protection Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nPickups	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /PickupCr]
nTripCmds	Number of trip commands since last reset.	0	0 - 9999999999	[Operation /History /TripCmdCr]

Commissioning Test Description

Set the JAM Start delay timer to one second. Set the JAM function to “Active” and Threshold to “2 X FLA”. Set the JAM “Delay T” to one second. Apply current of “2 X FLA” setting for one second. The relay should not trip. Apply the same current for 3 seconds. The unit should trip in 2 to 3 seconds.

Locked Rotor Protection

Functional Description

The Locked-rotor protection function is an integral part of the thermal model and is used to protect the motor in the event that the motor fails to start or accelerate after being energized. The heating in the motor during this period of time can be significantly higher than the heating at rated current, ranging from 10 to 50 times the normal rated heating. The time that a motor can remain at a standstill after being energized varies with the applied voltage and has an I²T limit.

When determining the heat in the motor during this period of time, both the negative and positive sequence currents are used in the equation that approximates the heat generated in a locked rotor condition. The heat can be approximated by the equation:

$$I^2_H = I_1^2 + K I_2^2$$

where :

- I_1 = the per unit stator positive sequence current;
- K = weighting factor for the value of I_2 resulting from the disproportionate heating caused by the negative sequence current component due to skin effect in the rotor bar; and
- I_2 = per unit stator negative sequence current.

Settings for the LRC (Locked Rotor Current) can be found under the System Parameters. The LRC value is a multiplier of the Full Load amps (FLA) setting and ranges from 300 to 1200 % of FLA.

The value of $K = 6.01$ should be used to mimic the thermal model of Eaton's MP3000 and MP4000 motor relays.

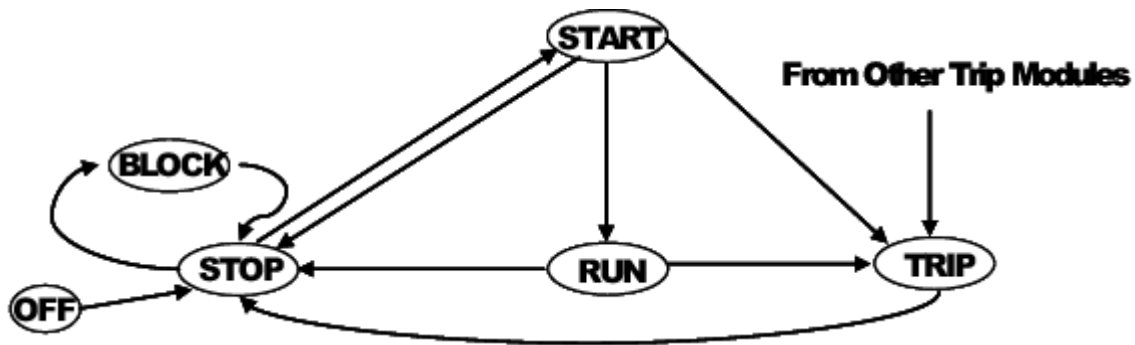
Motor Starting and Control Module

Available elements:

MStart

General – Principle Use

The motor start control logic is the core control and protective function for a protective device. The logic includes the motor operation state monitoring, motor state transition control, starts limit monitoring, state transition trip, and emergency override.



Motor Cycle Monitoring

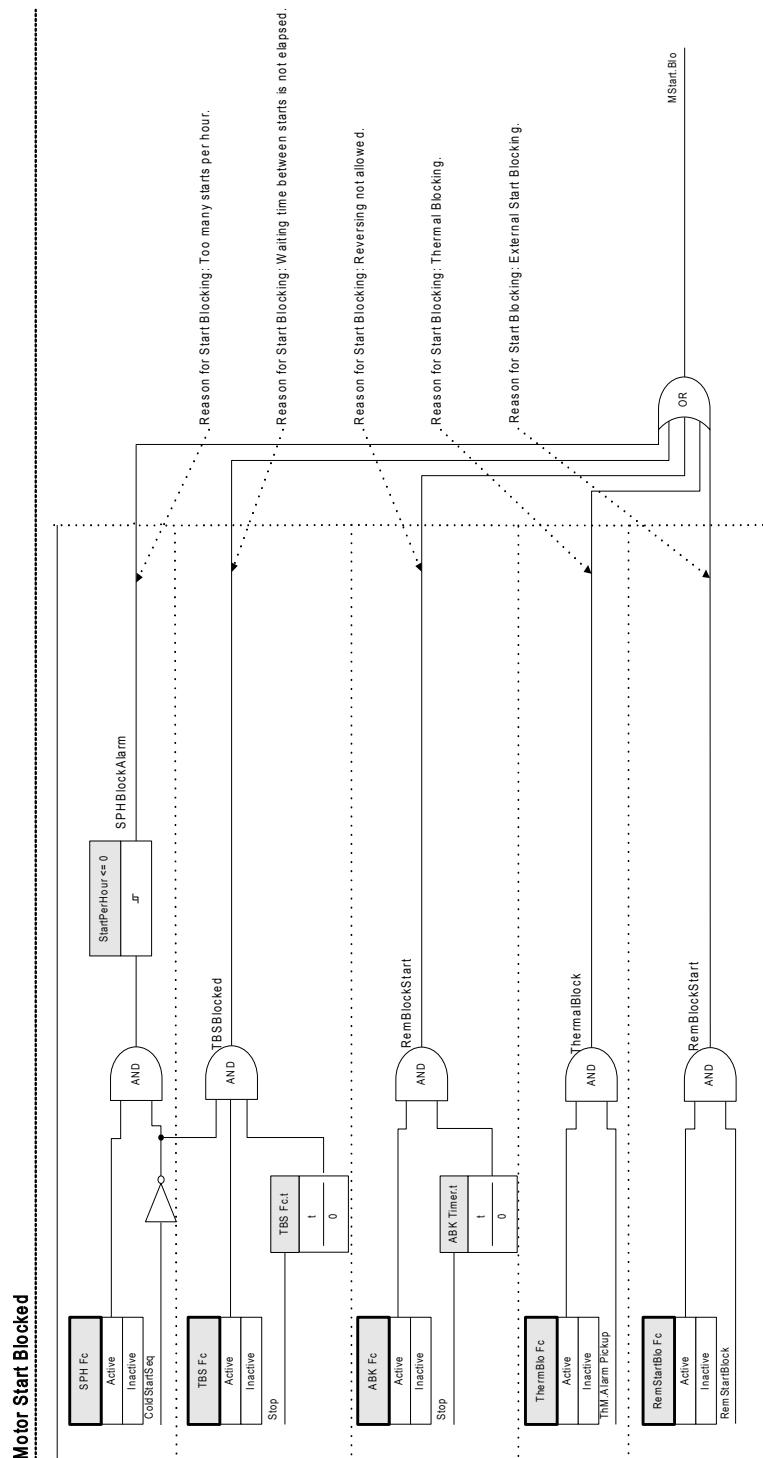
The basic motor operation states can be classified as four states that include:

1. Start cycle;
2. Run cycle;
3. Stop cycle; and
4. Trip state.

Under normal conditions, the motor operations should go through stop, start, run, and stop cycles that are referred to as a complete operation sequence; while under certain abnormal conditions, the motor could go from start to stop, or start to trip, or run to trip. If other protection trips occur at either the start or run cycle, the motor will be forced to go to trip mode. After motor currents are terminated, the motor will go into the stop cycle. A motor start is blocked by the hidden state “Block” as shown in the motor start diagram, if any of the following conditions are noted - motor starts limit, starting frequency, thermal and mechanical constraints. The User may choose to use the blocked state to block the motor from starting or use it as an alarm or indication.

Motor Start Blocked

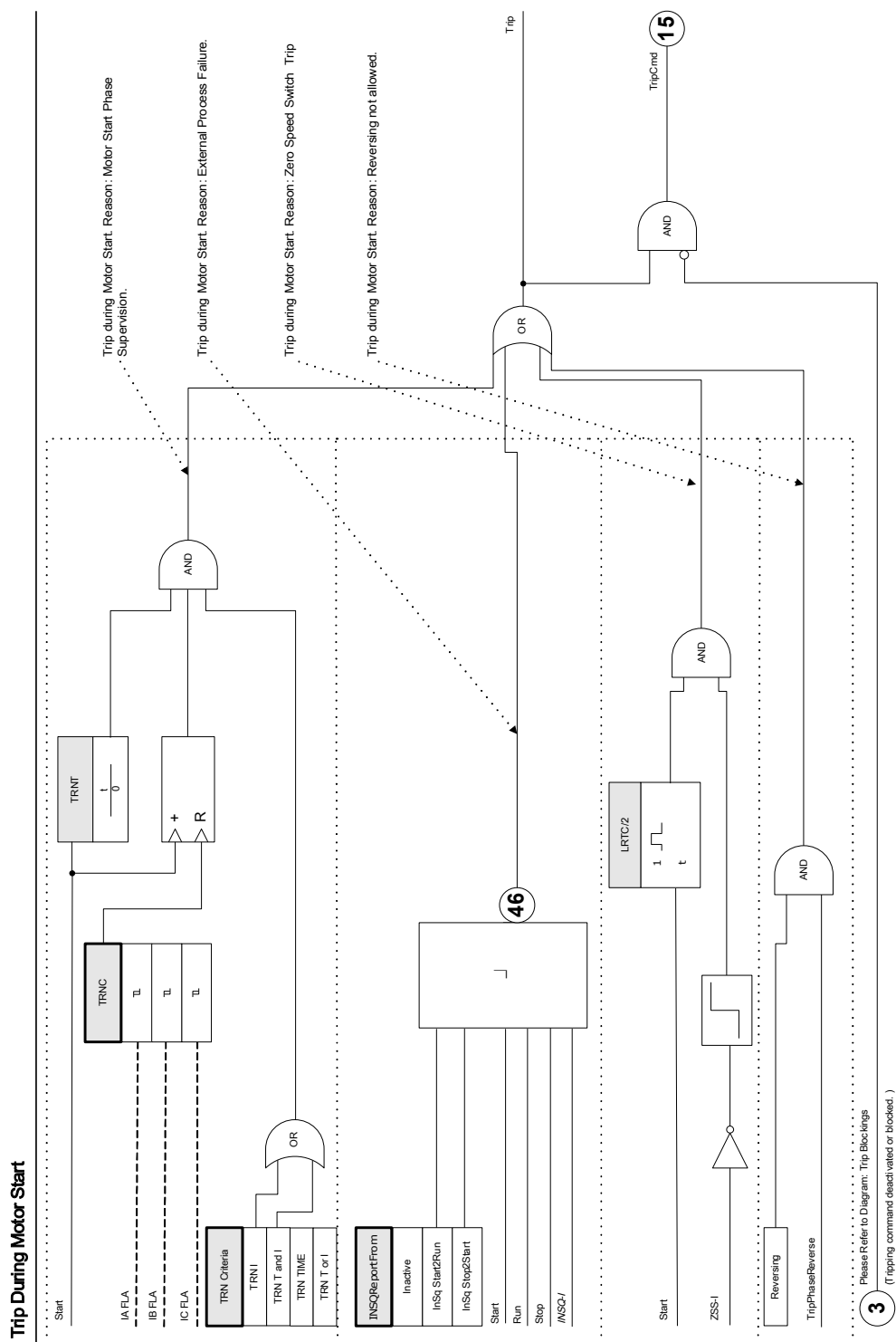
A Motor Start can be blocked by certain events, if any of the following conditions are noted - motor starts limit, starting frequency, thermal and mechanical constraints. The User may choose to use the states to block the motor from starting or use it as an alarm or indication.



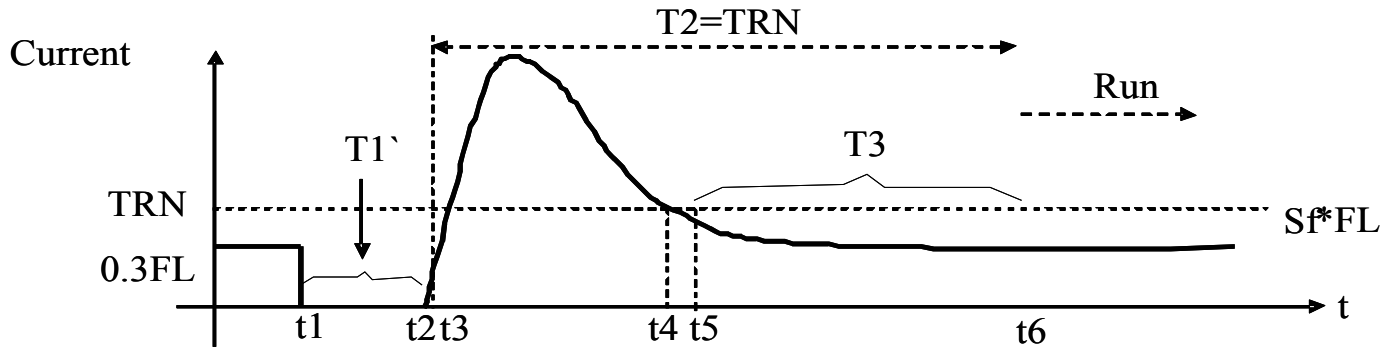
Motor Start / Transition Trips

The Motor will be tripped during the start phase, in case that:

- The Start Control detects an unsuccessful Start. (Please see section Start Control Module)
- There is an Incomplete Start Sequence. The device detects via an digital input, that the external process is not properly started.
- If a reverse direction is detected but reversing is not allowed.
- If case of a Zero Speed Switch trip.



Motor State Transition



T1: Stop Cycle

t4 - t3: Start Cycle if TRNC is select

t6 - t3: Start Cycle if TRNT is select

Start Control Module

The Start Control Module drawing shows an example of how the protective device reacts to a normal operating-cycle current profile. Initially, the motor is stopped and the current is zero. As long as the protective device is not in a trip state, it permits contactor energization by closing its trip contact in series with the contactor. The contactor is energized by the operator or process control system through a normal two-wire or three-wire motor control scheme, external to the protective device. The protective device declares a motor start when it senses a motor current that exceeds 30% of the FLA setting. Meanwhile, the transition timer (TRNT) begins to run. The protective device also monitors the large starting current, noting when the current falls below the transition level TRNC.

Start to Run transition is based on the setting TRN Criteria, which has four transition behaviors for the User to select:

- TRN T - Transition to RUN after time setting TRNT only. Current is ignored.
- TRN I - Transition when starting current drops below the setting only. If the time set in TRNT expires before the current transition, the motor trips.
- TRN T or I - Transition on time or current, whichever comes first.
- TRN T and I - Transition on time and current. Both must occur, and the current must drop below the setting before the time delay expires. If the timer expires before the current falls below the set transition level, the motor trips.

If there is no transition trip, the protective device relay declares a successful transition to RUN cycle and the corresponding transition flag(s) (current or time, or both, depending on the settings and motor current) is set. The transition flag(s) is the part of the global output list, which can be assigned to any module input or relay output. If it is assigned to a relay output, it can control a reduced-voltage starter, switching to full running voltage.

Even if the transition control output contact is not used, the transition function can provide clear indications of the actual state of the motor (START versus RUN) on the front panel display and via data communications. A good way to do this is to use the settings of TRN Criteria = TRN T or I and TRNC = 130% of FLA. Modify the latter, if needed, to lie at a transition value between the starting current and post-start maximum load current. Set the transition timer well beyond the normal start time to avoid a transition trip.

Start Delays

When the protective device declares a START, all start timers of the enabled functions begin to time. Each of these timers blocks the respective function until the set delay expires. These start timers are affected by transitions - they run for the set time, which may be less than or greater than the time of transition. These start delay timers include:

- IOC (Instantaneous overcurrent start delay);
- GOC (Ground fault start delay);
- UnderLoad (Underload trip and alarm start delay);
- IUnbalance (Current unbalance trip and alarm start delay);
- JAM (Jam trip and alarm start delay); and
- Generic1 to Generic5 (Generic start delay).

Note that the generic start delays are not tied to anything, and they can be used to block anything at the User's choice.

Eaton E-Series Motor Relays that have the ability to measure Voltage also have the following additional start delay timers:

- VUnbalance (Voltage Unbalance start delay) - **
- UnderVoltage - **
- OverVoltage - **
- Power
- Power Factor
- Frequency - **

** - If the time delay for these timers is set to zero, these timers will not wait for the protective device to declare a START. The protective function will be active immediately.

Start Limits

Because motor starting consumes a considerable amount of thermal energy compared to its normal load conditions, the number of starts in a given time period must be monitored and controlled. The protective device has three functions that contribute to the start limits monitoring. These are:

- TBS (Time between Starts);
- SPH (Starts per Hour); and
- NOCS (Number of Cold Starts).

Most motors can tolerate some number of consecutive cold starts before the time between starts is enforced. The protective device treats a start as the first in a sequence of cold starts if the motor has been stopped for at least the time period that is the greatest of one hour and TBS. Subsequent starts are treated as additional cold starts in the same sequence, only if they run no more than ten minutes, until the set number of cold starts is reached. Once the motor is in the cold starting sequence, it will ignore TBS and SPH limits. The cold start sequence will be terminated if the motor has run for more than ten minutes for a cold start before it exhausts NOCS, then starts after this are subject to time and count limits imposed by TBS and SPH. If the motor reaches the NOCS limit in a cold start sequence, NOCS block flag will be set and TBS will start to time. When TBS reaches its limit while the NOCS block flag is still set, the cold start sequence will be terminated and the NOCS block will be released. Meanwhile, the SPH will start to count at the last start in the complete cold start sequence.

Stop Cycle

The run cycle continues until the motor current level falls below the Stop Current Threshold setting current on all three phases. Then a stop is declared. The start limits (also referred as Jogging start limits) and the anti-backspin time delay (ABS) are checked. If blocking conditions exist, the protective device can be configured to block a motor from starting. Remaining jogging block times are displayed and counted down, indicating how long to wait. If there are no such starting block conditions in effect, the protective device is ready for a new start.

Anti-Backspin Delay Time (ABS)

ABS sets the time in seconds before a motor restart is permitted after a trip or stop condition. This function can be set to OFF.

This function is used with a motor driving a pump working into a head, or any other load that tends to spin in a reverse direction (backspin) when the motor is de-energized. It blocks starting during the time when the motor might be rotating in reverse following a trip. Also, this function may be used simply to set idle time (time between stop and start) before a restart is permitted.

External Start Blocking

A motor can be blocked through a digital input. If this feature is enabled, the User must make sure that both the Motor Start and Digital Input modules are configured properly.

Thermal Block

Besides the previously mentioned start monitoring and controlling means, the motor can be blocked if the thermal capacity used exceeds the alarm level. It is the User's choice to turn on or off this feature and set an appropriate alarm level in the thermal model module.

Blocked Condition

Note that the protective device has two types of blocking outputs: individual block and a general block. The individual blocking functions are as follows:

- Number of cold starts block;
- Time between starts block;
- Starts per hour block;
- Anti-Backspin block;
- Thermal block (from thermal model); and
- External starting block

When any of Anti-Backspin, thermal, and external blocks are on, the general blocked flag will be set. The TBS and SPH can turn on the general blocked flag only if the motor is not in a cold start sequence; NOCS block can not cause the general blocked flag to be set.

Forced Starting

It is recommended that the User wires the general blocked output to the motor trip circuit for preventing the motor from starting under these blocked conditions. If the User chooses not to do this for their applications, a Forced Starting flag will be set when the motor is started with the blocked conditions. This flag can only be reset manually through PowerPort-E or from the front panel.

Trips and Trip Bypass

If any of the motor protective functions operate while the motor starts or runs, the protective device can open its trip contact if so configured. It may also open its trip contact after a stop is recognized if any jogging function time limit is blocking the next start. In either case, the protective device expects that the contactor has opened in response and that no current flows.

If the protective device senses noticeable current for more than about a second whenever it is tripped, it sets a Trip Bypass flag. This means that the relay blocking of the contactor has been circumvented by the User to start the motor. If the current fails to stop when the protective device trips a running motor, it may be because of a User trip bypass or because of a stuck contactor.

Consider the possibility of backup protection for a contactor opening failure. Configure one of the output relays to pick up for a trip bypass. Connect the contact to trip an upstream breaker. This protects the motor from damage in case of a stuck contactor (at the cost of interrupting other loads connected to the same breaker).

Zero Speed Switch (ZSS ON or OFF)

ZSS enables the function that verifies if the motor begins to physically spin after a start. It requires a zero-speed switch on the motor, which is closed at rest and opens as the rotor reaches (5%-10%) its normal speed. Connect the zero-speed switch contact to one of the protective device Discrete Inputs. If the contact fails to open within LRT/2 (one-half of locked-rotor time) after a start, the relay trips with a zero-speed switch trip message.

This protection is always useful, but is essential if the Long Acceleration Time (LAT) function setting is used.

With ZSS being enabled and being mapped to one of the digital inputs, the protective device checks the ZSS input status at the very moment it sees a start - it wants to sense the initially closed zero-speed switch, which opens shortly thereafter as the motor spins. If it fails to find the closed contact, it trips immediately. Check the wiring and contact for problems.

Long Acceleration Time (LAT)

When the LAT function is enabled, the LAT timer is used to set a time interval during which the motor is permitted to accelerate a high-inertia load, which is longer than the locked-rotor time. This function can be (and usually should be) set to OFF. If the thermal-model accumulator bucket fills to 100% during the long acceleration time, it is limited to that value and the thermal trip is held off until the LAT timer expires. By then, the thermal bucket level must have decreased (thermal model cooled) below 100% or the motor trips.

The LAT function should be used but not limited only on motors with a zero-speed switch (a normally-closed contact that opens when the motor actually begins to spin). Connect the zero-speed switch contact to one of the protective device Discrete Inputs. The Zero-Speed Switch function must be enabled (ZSS ON). The protective device requires the zero-speed switch to open within LRT/2 (one-half of locked-rotor time) after a start, or the motor is tripped by the ZSS function. This protects a completely stalled motor from being damaged when the LAT timer blocks the locked-rotor thermal trip.

CAUTION

The long acceleration time (LAT) function can block the critical LRC-LRT rotor thermal protection during a start and destroy the motor. Turn LAT OFF unless absolutely needed and the motor's suitability for this starting duty has been confirmed. Use only with zero speed switch function ZSS ON and switch input connected to protect a stalled motor.

The User can temporarily defeat the I²t thermal protection limit after a start by setting a Long Acceleration Time delay. This can be a dangerous setting that blocks thermal tripping and holds the bucket at a 100% level if the load takes a long time to reach running speed. An example is a motor spinning a large centrifuge. In using LAT, the User can take advantage of the partial cooling from airflow produced by the motor spinning at below-normal speed, as compared to unfanned heating of a locked rotor. The motor must be rated for this severe starting duty. Also, the User must ensure that the motor actually has begun to spin well before the locked-rotor time has expired. This is accomplished by connecting a zero-speed switch to a Discrete Input and turning on ZSS function. The zero-speed switch is a contact that is closed when the motor is at rest, and opens as the motor begins to spin, usually at 5-10% of running speed. If ZSS is set to ON and the protective device relay does not sense the contact open in one-half the locked-rotor time setting, it trips the motor.

⚠ WARNING

Turn OFF LAT unless the application specifically demands it. Use a zero speed switch with LAT. Using an LAT setting greater than locked rotor time without a zero speed switch temporarily defeats thermal protection and damages the motor if the rotor actually is locked.

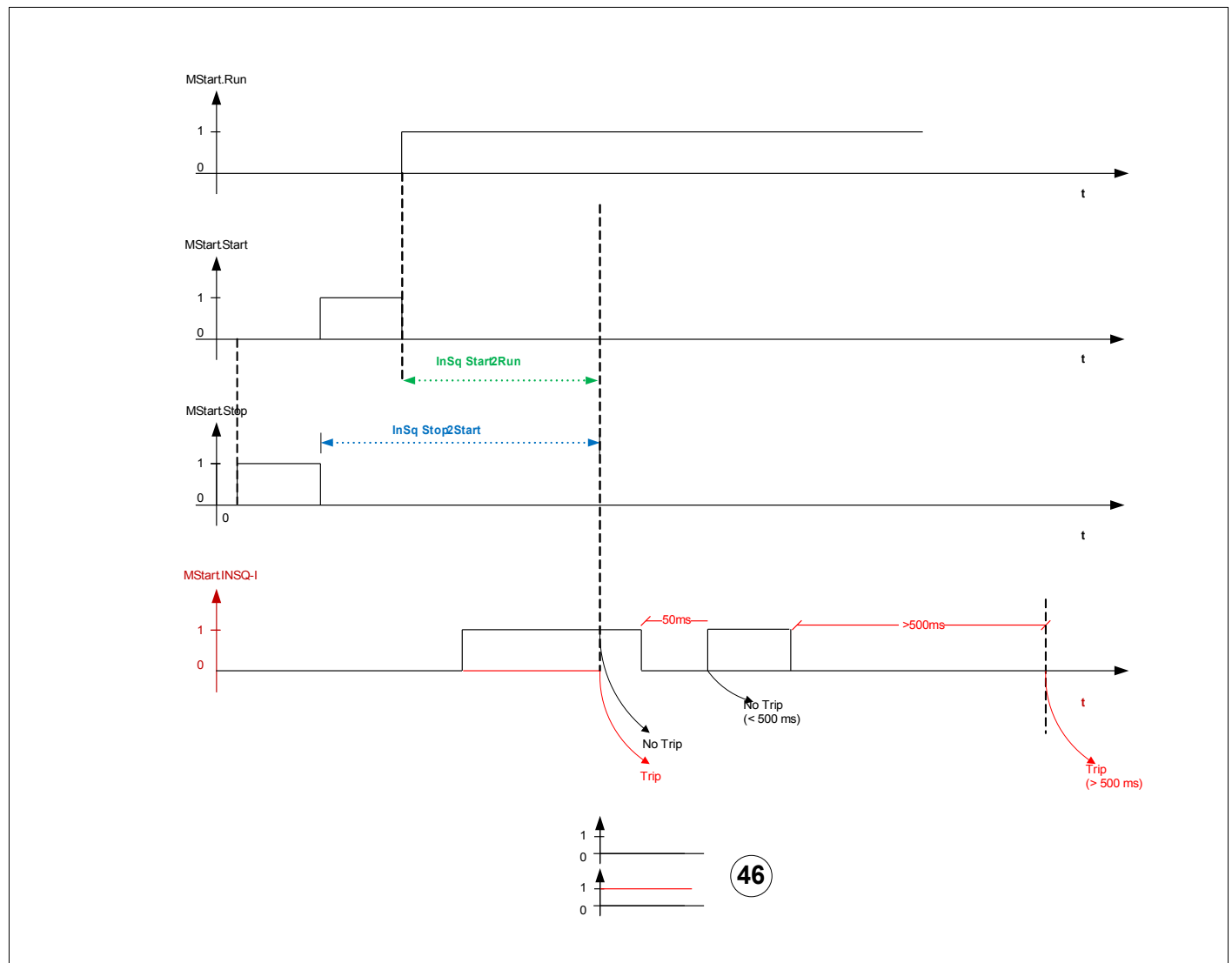
If LAT is used, check the settings of transition time TRNT and jam start delay to be sure they are coordinated with the prolonged starting cycle.

Incomplete Sequence Report Back Time (INSQ)

The incomplete sequence function requires an input from the report back contact from the process that the motor is running. Shortly after the motor starts, the report back contact provides an indication that the process has started to operate as expected. If the process does not start up correctly, the contact does not close within the expected time. If a problem develops later on, the report back contact opens. In either case, the open contact state indicates that the motor should be tripped.

To use this function, set a time limit for report back here and define the start of report back timing. Connect the report back contact to one of the protective device Discrete Inputs. If this input is not energized before the set time expires, the relay will trip on an “Incomplete Sequence”.

Note that the input must be energized continuously after the time delay has expired to hold off this trip. Otherwise, if the incomplete sequence report back contact changes state for a period greater than 0.5 seconds, the relay will trip on an incomplete sequence. This delay allows for any momentary transient switching that may occur in the process report back contact, such as that which can occur in an open transition reduced voltage start.



Emergency Override

If enabled, an emergency override can be executed by pushing the Emrg Override button behind the front panel security door. In any case, an emergency override can be performed by a remote contact connected to any one of the discrete inputs programmed as EMG OVR, or via front panel under Operations\Reset menu. The as-shipped setting is disabled.

Emergency override allows a panic restart of a tripped motor without completely disabling protection. When the override request is received, the thermal-model accumulator bucket is drained to its initial level of 40°C (104°F). Jogging limit counters and timing, including anti-backspin timing, are reset. Cold starts are fully restored.

The motor protection is now in the state it would be in if the motor had been standing for a long time prior to the moment of the override. This allows an immediate restart of the motor. The override can also delay an impending thermal trip of a running motor. The emergency override action is counted in the history record, and noted with its time tag in the logbook record.

CAUTION

The emergency override function clears and restarts all protective functions of the protective device. Using this function can damage the motor. Use it only for true emergencies, when it is known what caused the trip. Override permits the risk of motor damage to avoid an even more dangerous process situation caused by the tripping of the motor.

Starting Profile Plot versus Protection Limits

By means of PowerPort-E the user can call up the average current of the last five starting cycles and plot it against the protection limits of the phase overcurrent elements that are working based on definite time tripping curves.

In order to plot the motor-start curve against the protection limits, the User has to proceed as follows:

The protective device records the average current and voltage versus time for the last four starting cycles. This information is available via the communications port. The PowerNet host plots the motor current versus the motor cold-start protection curve, as shown in

Global Protection Parameters of the Motor Start Module

Parameter	Description	Setting range	Default	Menu path
Reversing 	Reversing or non reversing starter. This option will affect the sequence current calculations.	Inactive, Active	Inactive	[System Para]
FLA 	Full load current (amperes). Set to maximum stator continuous RMS current primary (actual motor winding) amperes in each phase. Use motor nameplate or manufacturers data. Note that the ratio FLA/CT prim must lie between 0.25 and 1.5 in order to have reliable motor protection.	10 - 6000A	10A	[System Para]
LRC 	Set to the locked-rotor current (the current the motor draws when stalled), in times of FLA. Use motor nameplate or manufacturers data.	3.00 - 12.00FLA	3.00FLA	[System Para]
LRTC 	Specifies how long a locked-rotor or stall condition can be maintained before the motor is damaged, in seconds, for a cold start. Use motor nameplate or manufacturers data.	1 - 120s	1s	[System Para]
UTC 	Ultimate trip threshold. Sets the current level above which a trip will eventually occur when no RTD stator temperature data is available, in multiple of FLA. For normal use, set UTC to the service factor times 100%. The service factor is found on the motor nameplate or in manufacturers data.	0.85 - 1.50	0.85	[System Para]
STPC 	Stop current threshold, in multiple of FLA, if the actual current is below the threshold for at least 300 milliseconds. If a stop state occurs, the jogging functions Starts per Hour Allowed (SPH), Time Between Starts (TBS) and Anti-Backspin (ABK) are enforced. All phases of the current must be below this level before a stop will be declared.	0.02 - 0.20FLA	0.02FLA	[System Para]

Parameter	Description	Setting range	Default	Menu path
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /MStart /Start Control]
RemStartBlo Fc 	RemStartBlo Fc	Inactive, Active	Inactive	[Protection Para /Global Prot Para /MStart /Start Control]
ThermBlo Fc 	ThermBlo Fc	Inactive, Active	Inactive	[Protection Para /Global Prot Para /MStart /Start Control]
TRN Criteria 	Start transition criterion	TRN I, TRN TIME, TRN T and I, TRN T or I	TRN T and I	[Protection Para /Global Prot Para /MStart /Start Control]
TRNT 	Motor start transition time limit Only available if: TRN Criteria = TRN T and I Or TRN Criteria = TRN TIME	0 - 1200s	10s	[Protection Para /Global Prot Para /MStart /Start Control]
TRNC 	Motor start transitions current level in FLA% Only available if: TRN Criteria = TRN T and I Or TRN Criteria = TRN I	0.10 - 3.00FLA	1.30FLA	[Protection Para /Global Prot Para /MStart /Start Control]
NOCS 	Number of cold starts limit	1 - 5	1	[Protection Para /Global Prot Para /MStart /Start Control]

Parameter	Description	Setting range	Default	Menu path
TBS Fc 	Time Between Starts on/off	Inactive, Active	Inactive	[Protection Para /Global Prot Para /MStart /Start Control]
TBS Timer 	Time Between Starts Limit Only available if: TBS Fc = Active	1 - 240min	60min	[Protection Para /Global Prot Para /MStart /Start Control]
SPH Fc 	Starts Per Hour	Inactive, Active	Inactive	[Protection Para /Global Prot Para /MStart /Start Control]
SPH 	SPH Only available if: SPH Fc = Active	1 - 10	1	[Protection Para /Global Prot Para /MStart /Start Control]
INSQReportFrom 	INcomplete SeQuence report time starting point	Inactive, InSq Start2Run, InSq Stop2Start	Inactive	[Protection Para /Global Prot Para /MStart /Start Control]
INSQReportTime 	INSQ Report back time Only available if: INSQReportFrom = Active	1 - 240s	1s	[Protection Para /Global Prot Para /MStart /Start Control]
LAT Fc 	Long Time Acceleration Timer	Inactive, Active	Inactive	[Protection Para /Global Prot Para /MStart /Start Control]

Parameter	Description	Setting range	Default	Menu path
 LAT Timer	Large motors with a high inertia may experience starting currents that exceed the locked rotor current and time. The protective relay has logic and provisions for a zero speed switch input to differentiate between a stall and start condition. If the motor is spinning then the relay will not trip on the normal locked rotor time allowing the motor to start. Only available if: LAT Fc = Active	1 - 1200s	1200s	[Protection Para /Global Prot Para /MStart /Start Control]
 ABK Fc	For certain applications, such as pumping a fluid up a pipe, the motor may be driven backward for a period of time after it stops. The protective relay provides an anti-backspin timer to prevent starting the motor while it is spinning in the reverse direction. The timer begins counting from the moment a stop is declared by the relay.	Inactive, Active	Inactive	[Protection Para /Global Prot Para /MStart /Start Control]
 ABK Timer	For certain applications, such as pumping a fluid up a pipe, the motor may be driven backward for a period of time after it stops. The protective relay provides an anti-backspin timer to prevent starting the motor while it is spinning in the reverse direction. The timer begins counting from the moment a stop is declared by the relay. Only available if: ABK Fc = Active	1 - 3600s	3600s	[Protection Para /Global Prot Para /MStart /Start Control]
 ZSS	Zero Speed Switch	Inactive, Active	Inactive	[Protection Para /Global Prot Para /MStart /Start Control]
 EmgOvr	Emergency override options. Signal has to be active in order to release the thermal capacity of the motor. Please notice that by doing this you run the risk of damaging the motor. "EMGOVR" has to be set to "DI" or "UI" for this input to take effect.	Inactive, DI, UI, DI or UI	Inactive	[Protection Para /Global Prot Para /MStart /Start Control]
 RemStartBlock	Remote Motor Start Blocking Only available if: RemStartBlo Fc = Active	1..n, Dig Inputs	-.-	[Protection Para /Global Prot Para /MStart /Motor Inputs]

Parameter	Description	Setting range	Default	Menu path
EmgOvr 	Emergency Override. Signal has to be active in order to release the thermal capacity of the motor. Please notice that by doing this you run the risk of damaging the motor. "EMGOVR" has to be set to "DI" or "DI or UI" for this input to take effect	1..n, Dig Inputs	.-	[Protection Para /Global Prot Para /MStart /Motor Inputs]
INSQ 	INcomplete SeQuence Only available if: INSQReportFrom = Active	1..n, Dig Inputs	.-	[Protection Para /Global Prot Para /MStart /Motor Inputs]
ZSS 	Zero Speed Switch Only available if: ZSS = Active	1..n, Dig Inputs	.-	[Protection Para /Global Prot Para /MStart /Motor Inputs]
STPC Blo 	With this setting a Digital Input keeps the Motor in the RUN mode, even when the motor current drops below STPC (motor stop current).	1..n, Dig Inputs	.-	[Protection Para /Global Prot Para /MStart /Motor Inputs]
t-Blo-IOC 	Phase Instantaneous Overcurrent Start Delay. 50P[x] elements are blocked for the time programmed under this parameter, while the motor is starting.	0.03 - 1.00s	0.05s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-GOC 	Ground Instantaneous Overcurrent Start Delay. 50X[x], 50R[x] and 50G[x] elements are blocked for the time programmed under this parameter, while the motor is starting	0.03 - 1.00s	0.08s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-UnderLoad 	Underload Start Delay. 37[x] elements are blocked for the time programmed under this parameter, while the motor is starting	0 - 1200s	60s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]

Parameter	Description	Setting range	Default	Menu path
t-Blo-IUnbalance 	Current Unbalance Start Delay. 46[x] elements are blocked for the time programmed under this parameter, while the motor is starting	0.03 - 1200.00s	10.00s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-JAM 	Jam Start Delay. 50[x] elements are blocked for the time programmed under this parameter, while the motor is starting	0.03 - 1200.00s	60.00s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-Generic1 	t-Blo-Generic1	0 - 1200s	0s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-Generic2 	t-Blo-Generic2	0 - 1200s	0s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-Generic3 	t-Blo-Generic3	0 - 1200s	0s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]
t-Blo-Generic4 	t-Blo-Generic4	0 - 1200s	0s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]

Parameter	Description	Setting range	Default	Menu path
t-Blo-Generic5 	t-Blo-Generic5	0 - 1200s	0s	[Protection Para /Global Prot Para /MStart /Start Delay Timer]

Global Protection Parameters of the Motor Start Module

Parameter	Description	Setting range	Default	Menu path
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /MStart /Start Control]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /MStart /Start Control]

Motor Start Module Input States

Name	Description	Assignment via
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /MStart /Start Control]
RemStartBlock-I	State of the module input: Remote Motor Start Blocking	[Protection Para /Global Prot Para /MStart /Motor Inputs]
EmgOvr-I	State of the module input: Emergency Override. Signal has to be active in order to release the thermal capacity of the motor. Please notice that by doing this you run the risk of damaging the motor. "EMGOVR" has to be set to "DI" or "DI or UI" for this input to take effect	[Protection Para /Global Prot Para /MStart /Motor Inputs]
INSQ-I	State of the module input: INcomplete SeQuence	[Protection Para /Global Prot Para /MStart /Motor Inputs]
ZSS-I	State of the module input: Zero Speed Switch	[Protection Para /Global Prot Para /MStart /Motor Inputs]
STPC Blo-I	State of the module input: With this setting a Digital Input keeps the Motor in the RUN mode, even when the motor current drops below STPC (motor stop current).	[Protection Para /Global Prot Para /MStart /Motor Inputs]

Motor Start Module Signals (Output States)

Signal	Description
Active	Signal: Active
Blo TripCmd	Signal: Trip Command blocked
Trip	Signal: Trip
TripCmd	Signal: Trip Command
Start	Signal: Motor is in start mode
Run	Signal: Motor is in run mode
Stop	Signal: Motor is in stop mode
Blo	Signal: Motor is blocked for starting or transition to Run mode
NOCSBlocked	Signal: Motor is prohibited to start due to number of cold start limits
SPHBlocked	Signal: Motor is prohibited to start due to starts per hour limits
SPHBlockAlarm	Signal: Motor is prohibited to start due to starts per hour limits, would come active in the next stop
TBSBlocked	Signal: Motor is prohibited to start due to time between starts limits
ThermalBlock	Signal: Thermal block
RemBlockStart	Signal: Motor is prohibited to start due to external blocking through digital input DI
TransitionTrip	Signal: Start transition fail trip
ZSSTrip	Signal: Zero speed trip (possible locked rotor)
INSQSP2STFaill	Signal: Fail to transit from stop to start based on reported back time
INSQSt2RunFail	Signal: Fail to transit from start to run based on reported back time
LATBlock	Signal: Long acceleration timer enforced
ColdStartSeq	Signal: Motor cold start sequence flag
ForcedStart	Signal: Motor being forced to start
TripPhaseReverse	Signal: Relay tripped because of phase reverse detection
EmergOverrideDI	Signal: Emergency override start blocking through digital input DI
EmergOverrideUI	Signal: Emergency override start blocking through front panel
ABKActive	Signal: Anti-backspin is active. For certain applications, such as pumping a fluid up a pipe, the motor may be driven backward for a period of time after it stops. The anti-backspin timer prevents starting the motor while it is spinning in the reverse direction.
GOCStartBlock	Signal: Ground Instantaneous Overcurrent Start Delay. GOC (Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
IOCStartBlock	Signal: Phase Instantaneous Overcurrent Start Delay. IOC (Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
ULoadStartBlock	Signal: Underload Start Delay. Underload(Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter

<i>Signal</i>	<i>Description</i>
JamStartBlock	Signal: JAM Start Delay. JAM(Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
UnbalStartBlock	Signal: Motor start block current unbalance signal
Blo-Generic1	Generic Start Delay. This value can be used to block any protective element.1
Blo-Generic2	Generic Start Delay. This value can be used to block any protective element.2
Blo-Generic3	Generic Start Delay. This value can be used to block any protective element.3
Blo-Generic4	Generic Start Delay. This value can be used to block any protective element.4
Blo-Generic5	Generic Start Delay. This value can be used to block any protective element.5
I_Transit	Signal: Current transition signal
T_Transit	Signal: Time transition signal
MotorStopBlo	Signal: Motor stop block other protection functions
RFD_IA_Normal	Signal: System IA RotaryFieldDetection Normal
RFD_IA_Reverse	Signal: System IA RotaryFieldDetection Reverse

Direct Commands of the Motor Start Module

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
EmergOverHMI 	Emergency override through front display Only available if: EmgOvr = Active	Inactive, Active	Inactive	[Operation /Reset /EmgOvr]
RstForcedStart 	Reset Forced Start flag	Inactive, Active	Inactive	[Operation /Reset /Flags]

Motor Start Module Counter Values

Value	Description	Default	Size	Menu path
WaitTimeStarts	Wait time between starts remained	0s	0 - 9999999999s	[Operation /Measured Values /Motor Values]
ColdStartPermit	Number of cold starts remaining	0	0 - 9999999999	[Operation /Measured Values /Motor Values]
StartPerHour	StartPerHour	0	0 - 9999999999	[Operation /Measured Values /Motor Values]
SPH Release	In case that the Motor is blocked by a SPH blocking, this timer needs to be expired before the blocking is released and the next motor start is permitted. The next Motor Start will increment the SPH counter again.	0min	0 - 9999999999 min	[Operation /Measured Values /Motor Values]
AntiBackSpin	Anti-BackspinTimer	0s	0 - 9999999999s	[Operation /Measured Values /Motor Values]
IA FLA	Measured value: Phase current multiples of FLA	0FLA	0 - 1000FLA	[Operation /Measured Values /Current RMS]
IB FLA	Measured value: Phase current multiples of FLA	0FLA	0 - 1000FLA	[Operation /Measured Values /Current RMS]
IC FLA	Measured value: Phase current multiples of FLA	0FLA	0 - 1000FLA	[Operation /Measured Values /Current RMS]
I3 PFLA avg	Average RMS current of all 3 phases as multiples of FLA	0FLA	0 - 1000FLA	[Operation /Measured Values /Current RMS]
OCNT	Motor Operation count since last reset. Resettable with "Sys Res Operations Cr" or "All".	0	0 - 65535	[Operation /History /OperationsCr]

Value	Description	Default	Size	Menu path
HighestStartI	Highest starting phase current. The time stamp indicates the point in time when the maximum current has occurred. Resettable with "Sys. Res Operations Cr" or "All".	0A	0 - 99999999A	[Operation /History /OperationsCr]
HighestRunI	Highest running phase current. The time stamp indicates the point in time when the maximum current has occurred. Resettable with "Sys. Res Operations Cr" or "All".	0A	0 - 9999999A	[Operation /History /OperationsCr]
nEmrgOvr	Number of emergency overrides since last reset. Resettable with "Sys. Res Operations Cr" or "All".	0	0 - 65535	[Operation /History /OperationsCr]
nISQT	Number of incomplete sequence trips since last reset. Resettable with "Sys. Res TripCr" or "All".	0	0 - 65535	[Operation /History /TripCmdCr]
nSPHBlocks	Number of start per hour blocks since last reset. Resettable with "Sys. Res Operations Cr" or "All".	0	0 - 65535	[Operation /History /TripCmdCr]
nTBSBlocks	Number of time between start blocks since last reset. Resettable with "Sys. Res Operations Cr" or "All".	0	0 - 65535	[Operation /History /TripCmdCr]
nTRNTrips	Number of transition trips since last reset. Resettable with "Sys. Res TripCr" or "All".	0	0 - 65535	[Operation /History /TripCmdCr]
nZSWTrips	Number of zero speed switch trips since last reset. Resettable with "Sys. Res TripCr" or "All".	0	0 - 65535	[Operation /History /TripCmdCr]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nRevTrips	Number of reverse spinning trips since last reset. Resettable with "Sys. Res TripCr" or "All".	0	0 - 65535	[Operation /History /TripCmdCr]
TOCS	Total Motor Operation count since last reset. Resettable with "Sys. Res TotalCr" or "All".	0	0 - 65535	[Operation /History /TotalCr]

Motor Start Module Values

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
I3 PRMS avg	Average RMS current of all 3 phases	[Operation /Measured Values /Current RMS]
RunTime	Motor Operation time since last reset. Resettable with "Sys. Res Operations Cr" or "All".	[Operation /History /OperationsCr]
Highest%I2/I1	Highest %I2/I1 value since last reset. The time stamp indicates the point in time when the maximum unbalanced load has occurred. Resettable with "Sys. Res Operations Cr" or "All".	[Operation /History /OperationsCr]
TRunTime	Motor Operation (Motor run time) time since last reset. Resettable with "Sys. Res TotalCr" or "All".	[Operation /History /TotalCr]

Motor Start Module Statistics

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
IA max FLA	IA maximum value multiples of FLA	[Operation /Statistics /Max /CT]
IA avg FLA	IA average value multiples of FLA	[Operation /Statistics /Demand /Current Demand]
IA min FLA	IA minimum value multiples of FLA	[Operation /Statistics /Min /CT]
IB max FLA	IB maximum value multiples of FLA	[Operation /Statistics /Max /CT]

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
IB avg FLA	IB average value multiples of FLA	[Operation /Statistics /Demand /Current Demand]
IB min FLA	IB minimum value multiples of FLA	[Operation /Statistics /Min /CT]
IC max FLA	IC maximum value multiples of FLA	[Operation /Statistics /Max /CT]
IC avg FLA	IC average value multiples of FLA	[Operation /Statistics /Demand /Current Demand]
IC min FLA	IC minimum value multiples of FLA	[Operation /Statistics /Min /CT]
I3P Fla Demand	RMS current of all 3 phases calculated in a fixed demand window as multiples of FLA	[Operation /Statistics /Demand /Current Demand]

Ground Fault Protection

Elements:

Ground Fault Protection

Functional Description

This CT has a large primary window through which all three-phase conductors can pass. The most common ground fault CTs have a ratio of 50:5 or 50:1.

The protective device is recognized to UL 1053, Ground Fault Protective Device standard. This may eliminate the need for a separate ground fault protector in many applications that formerly required one.

Note that the ground fault current settings 50R[x] and 50X [x] are based on the ground CT rated **primary current (In)**, not on FLA or the phase CT ratio. For example, a pick-up setting of 0.10 gives a trip or alarm for an actual ground leakage current of 5 A on the primary side of the sensor with a 50:5 CT.

This function is only useful for a grounded power system. The ground return is normally made from the neutral of the secondary wire winding of the supply power transformer. Resistance grounding is acceptable as long as the resulting fault current is at a level the protective device can be set to detect.

The ground CT, which provides sensitive protection for high-resistance ground faults, may saturate for a robust heavy-current ground fault in a solidly-grounded system. Minimize the saturation problem by minimizing the burden. Use the shortest and heaviest leads possible between the ground CT and the relay. The relay itself has very low burden, usually much lower than the connecting wiring. Calculate the current magnitude that saturates the ground CT. Consider the CT secondary voltage capability and the total burden of the CT secondary winding itself, the connecting wires, and the relay. Make sure this saturation current is well above the minimum sensitivity of the *phase* IOC function and/or the motor fuses.

A residual connection – the wired summation of the phase CT circuits through the ground CT input – requires a much higher ground fault time setting to avoid false tripping. Thus, sensitivity is not nearly as good as with a separate flux-canceling CT.

If the relay is installed where a residual connection is used, XCT should be set to the same value as CT Pri. The User must then set the ground fault trip level at a high value to avoid nuisance tripping from CT ratio errors, third harmonic and certain higher harmonics, or other measurement errors producing false residual currents. Monitor the metered ground current during various loading conditions to ensure a good margin between these error currents and the ground fault trip current setting 50R [x]. Also, watch out for phase CTs that saturate during motor starting. The saturation produces a large residual current and a ground fault trip. This may be a problem if the CTs have a low voltage capability (e.g.: C5 or C10), have long wiring runs, or are otherwise heavily burdened.

Thermal Model

Available Elements:

49

General – Principle Use

Thermal Protection and Alarm

This protective device provides a thermal model that is similar to Eaton's MP-3000 motor relay to approximate the thermal capacity used. The thermal model can work with or without the URTD. The RTD-based direct temperature trips and alarms are independent of the thermal model. Without the URTD, meaning the URTD is not connected to the protective device or it is connected but not configured for the thermal protection trips, the thermal model protection will be solely based on the following settings:

- 1.Full Load Ampere (FLA);
- 2.Locked Rotor Current (LRC);
- 3.Maximum Allowable Stall Time (Tc);
- 4.UTC (Ultimate Trip Current) or Service Factor (SF);
- 5.Cooling Time Constant;
- 6.Thermal Model Trip Threshold if enabled;
- 7.Trip Delay;
- 8.Thermal Model Alarm Threshold if enabled; and
- 9.Alarm Delay.

The first four settings (1-4) dictate the maximum allowable thermal limit curve of the protected equipment, and the last four settings (6-9) define the thermal trip and alarm curves relative to the thermal limit curve. Setting 5 is used for cooling or damping.

Mathematically, the thermal limit curve can be expressed as the following:

$$Trip\ Time = \frac{I_{LR}^2 * T_{LR}}{I_{ef}^2} \quad \text{when} \quad I_{ef} > SF * FLA$$

If the direct stator temperature measurements are available, the thermal replica model will be modified to include the heat loss between stator and rotor. As a result, the motor will be able to run longer under overload conditions. The heat loss serves as a cooling. At some point, the cooling effect will cancel the heat increment so that the thermal capacity used will reach some steady-state level that may be below the trip or alarm limit. This equivalently raises the service factor and shifts the trip curve right.

If the thermal capacity used is held at a level that is below the trip threshold, the thermal model will not trip. To prevent the protected equipment from overheating, the direct temperature trip function must be enabled. Keep in mind that in order for the stator temperature to be effective in the thermal replica model, the following conditions must be met:

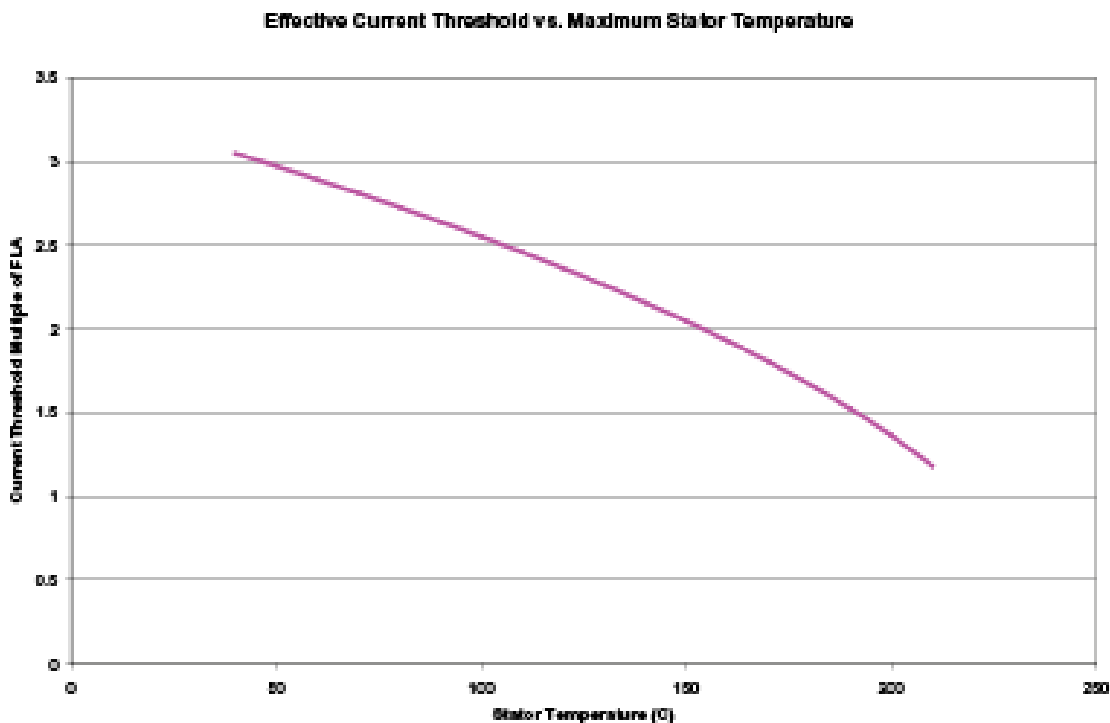
- Some RTD channels must be configured to measure the winding temperatures; and
- These RTD channels must be enabled for trip.

In addition, at least one of these winding temperatures must be valid.

Knowing the maximum steady stator temperature qS ($^{\circ}C$), the thermal capacity used can be estimated by the following formula.

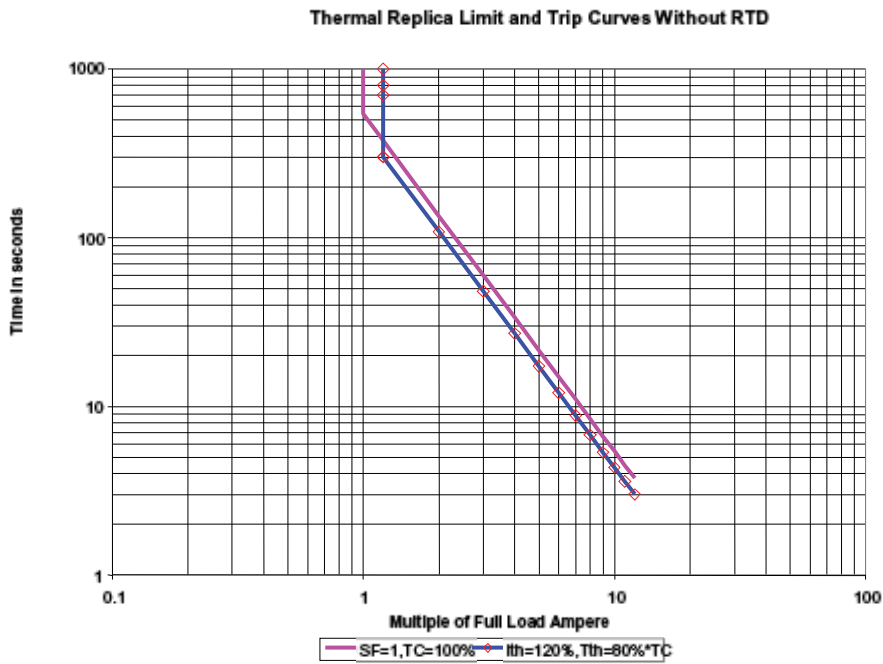
$$TC_{Used} \% = \left(\frac{0_S}{240} + \frac{I_{ef}^2 * 50}{I_{LR}^2 * T_{LR}} \right) \quad \text{when} \quad I_{ef} > ITH * FLA$$

Take for example, ILR = 6FLA, TLR = 15, and thermal trip level of 100%. The relationship between the effective current threshold and the stator temperature can be seen in the Stator Temperature Effect on Current Threshold Curve.

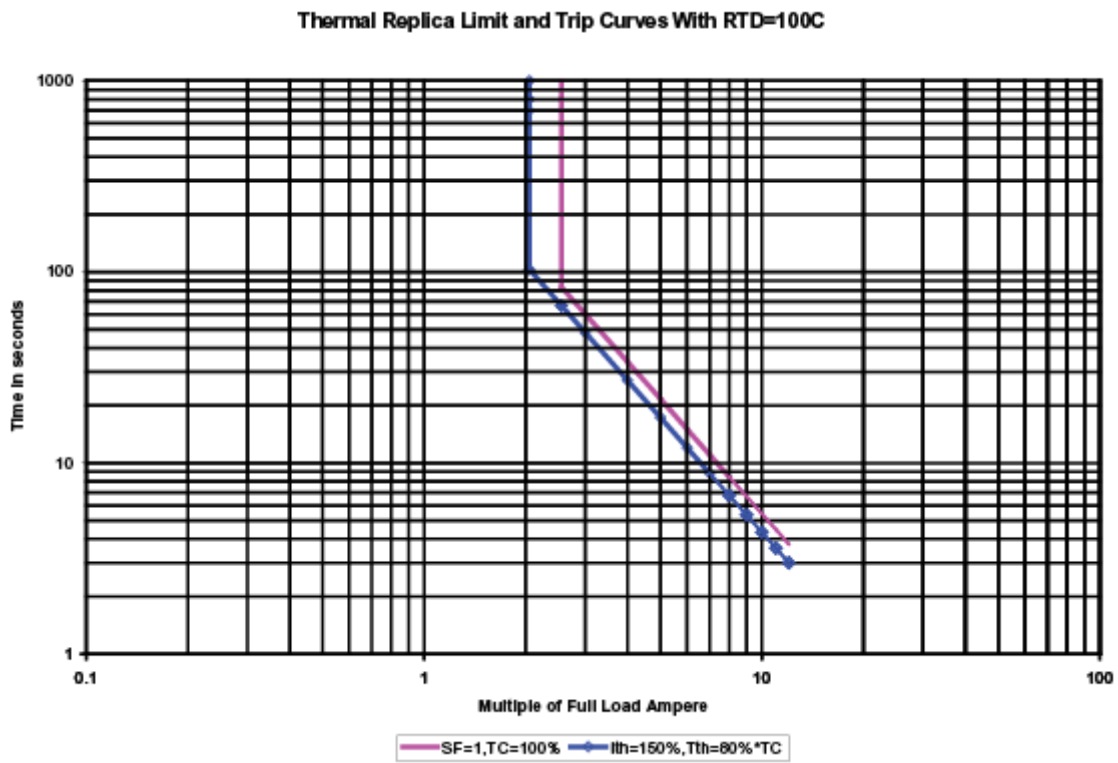


Stator Temperature Effect on Current Threshold Curve

From the graph, it is seen that the lower the stator temperature, the higher the effective current threshold. Without stator temperature, given the current threshold of 1.0 FLA and 2.0 FLA of the stator phase current, the thermal model will use the full thermal capacity in 139.54 seconds. However, if the stator temperature is known as $100^{\circ}C$ ($212^{\circ}F$), the effective ultimate trip current threshold is raised to 2.55 FLA and the thermal capacity used will reach a steady state of 77.5%. As a result, the thermal model will never trip under this condition. From this example, it can be seen that the stator RTD could keep the motor running under overload condition. In this case, the appropriate direct stator temperature trip function must be enabled.



Thermal Replica Model Limit and Trip Curves without RTD



Thermal Replica Model Limit and Trip Curves with RTD

In the Thermal Replica Model Trip Curves with and without RTD, the unmarked lines are the thermal limit curves and the marked lines are the trip curves. From the curve without RTD, it can be seen that one can change the thermal current threshold to shift the upper portion of the trip curve right to allow the motor to run at a higher overload condition than is specified with the service factor. From the curve with RTD, it can be seen that the stator RTD pushes the effective thermal current threshold to 2.55 FLA on the thermal limit curve (unmarked line). The marked line is the trip curve with 80% thermal capacity trip threshold, so actual effective thermal current threshold for the trip curve is about 2.05 FLA. Although in this case, the thermal current threshold is set to 1.50 FLA, it is effectively raised to a higher level with the stator RTD. Keep in mind that thermal limit and trip curves shown are based on the example above. They will vary with other sets of the settings.

NOTICE

The thermal model of the motor protection devices uses the hottest winding "WD" RTD value

Global Protection Parameters of the Thermal Model

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /49]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /49]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /49]
Use RTD values 	Take RTD values into account for the calculation of the Thermal Model.	Inactive, Active	Inactive	[Protection Para /Global Prot Para /49]
K2 	This value represents the negative sequence current weighting factor of the motor. The User can mimic the behavior of the MP-3000 if this value is left to "6.01"	0.10 - 10.00	6.01	[Protection Para /Global Prot Para /49]
τ -cool 	Cooling time constant	5 - 240	60	[Protection Para /Global Prot Para /49]

Setting Group Parameters of the Thermal Model

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Active	[Protection Para /<1..4> /49]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /49]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /49]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /49]
Trip Function 	Turn on or off the trip function	Inactive, Active	Active	[Protection Para /<1..4> /49]
Trip Threshold 	Trip threshold at which the thermal model will trip, based on percentage of thermal capacity used. This value should typically always be set at 0.99 Only available if: Trip Function = Active	0.60 - 0.99	0.99	[Protection Para /<1..4> /49]
Trip Delay 	Thermal capacity used trip delay Only available if: Trip Function = Active	0.0 - 3600.0s	0.0s	[Protection Para /<1..4> /49]
Alarm Function 	Turn on or off the alarm function	Inactive, Active	Active	[Protection Para /<1..4> /49]

Parameter	Description	Setting range	Default	Menu path
Alarm Threshold 	Alarm threshold at which the thermal model will trip, based on percentage of thermal capacity used Only available if: Alarm Function = Active	0.60 - 0.99	0.70	[Protection Para /<1..4> /49]
Alarm Delay 	Thermal capacity used alarm delay Only available if: Alarm Function = Active	1 - 360min	1min	[Protection Para /<1..4> /49]

Thermal Model Module Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1	Module Input State: External Blocking	[Protection Para /Global Prot Para /49]
ExBlo2	Module Input State: External Blocking	[Protection Para /Global Prot Para /49]
ExBlo TripCmd	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /49]

Thermal Model Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
Alarm Pickup	Signal: Alarm Pickup
Alarm Timeout	Signal: Alarm Timeout
RTD effective	RTD effective
Load above SF	Load above Service Factor
Active	Signal: Active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Pickup	Signal: Pickup
Trip	Signal: Trip
TripCmd	Signal: Trip Command

Direct Commands of the Thermal Model Module

Parameter	Description	Setting range	Default	Menu path
Res I2T Used 	Reset thermal capacity used.	Inactive, Active	Inactive	[Operation /Reset /Flags]

Thermal Model Module Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
I2T Used	Thermal capacity used.	0%	0 - 1000%	[Operation /Measured Values /Thermal Capacity]
I2T Remained	Thermal capacity remained.	0%	0 - 1000%	[Operation /Measured Values /Thermal Capacity]
nTripCmds	Number of trip commands since last reset.	0	0 - 65535	[Operation /History /TripCmdCr]
nAlarms	nAlarms	0	0 - 65535	[Operation /History /PickupCr]

Ultimate Trip Current

Elements:

Ultimate Trip Current

Functional Description

The Ultimate Trip Current (UTC) sets the current level at which a trip eventually occurs and is settable to a value as a percentage of Full Load Amps (FLA). This value represents the vertical line on the upper portion of the non-RTD as shown in the protection trip curve labeled Motor Protection Curve Example 2 (with out RTD). The ultimate trip current setting in this example is at 1 times the FLA.

Note that in systems where an RTD is used the UTC pick-up point is biased by the measured temperature. This is shown in the example trip curve labeled Motor Protection Curve Example 3 (with RTD) where you will see a shift in the UTC value to 2 times the FLA

For normal use, set UTC to the *service factor* times 100%. The available range is 85% to 150%. The service factor is found on the motor nameplate or in the manufacturer's data. Note that the relay does not trip at the moment the current goes above UTC during motor running. Instead, it models the gradual stator heating for currents above UTC, and trips only after some time has passed. The trip time depends on a variety of setting and operating factors, including the motor nameplate data contained in other setting values.

Use a conservative value. In this case, a lower value of UTC than that dictated by the service factor if the motor ambient temperatures may rise above 40°C (104°F) and the optional URTD Module is not used. Also, consider lowering the UTC value if the motor is suitably rated, yet additional safety is critical for the application.



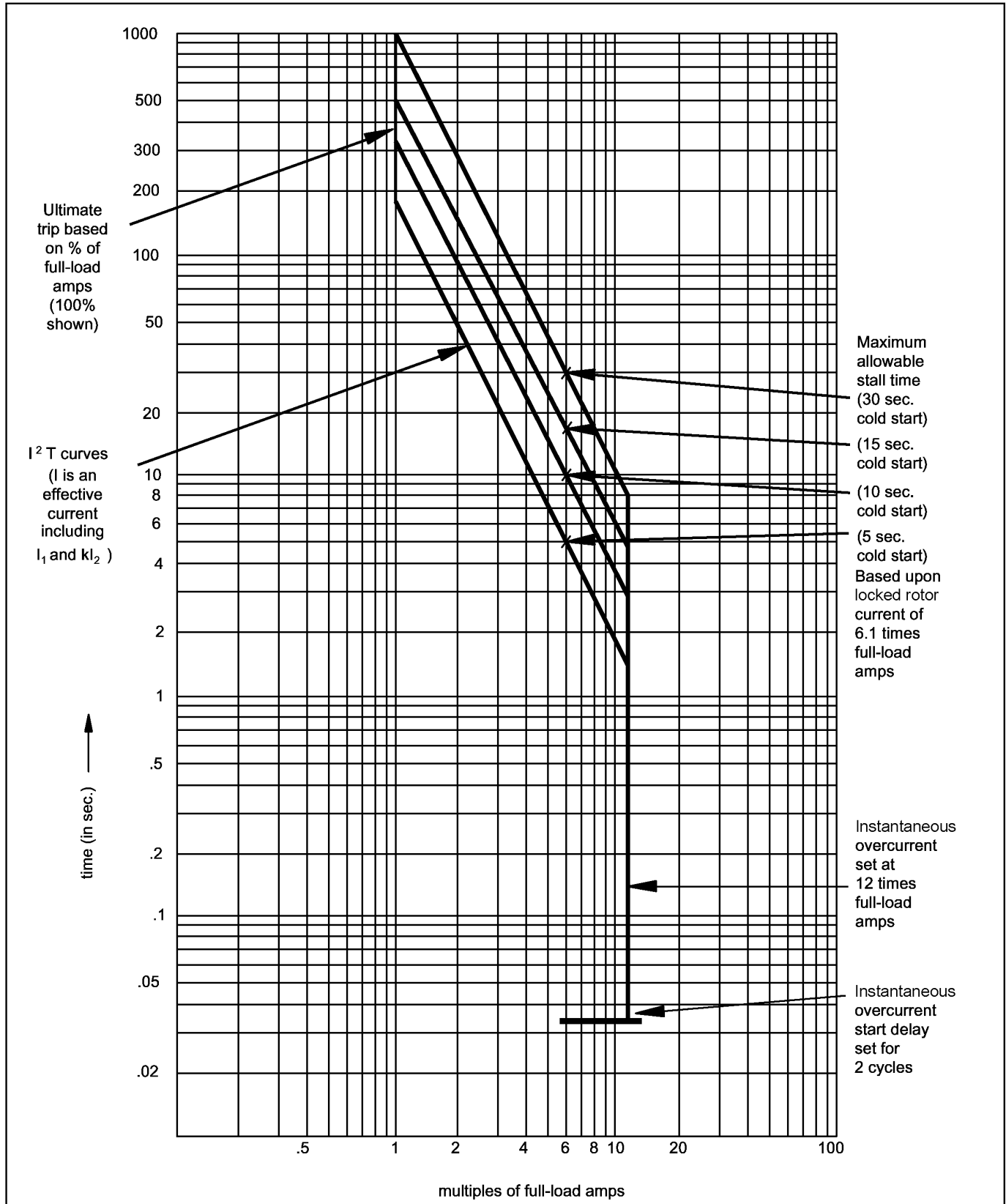
If UTC is set above 100% times the service factor, motor damage could result.

If stator RTDs are not used and there is the possibility that the ambient may rise above 40°C (104°F), the ultimate trip current should be set below the value indicated by the nameplate service factor to avoid stator insulation damage or loss of motor life.

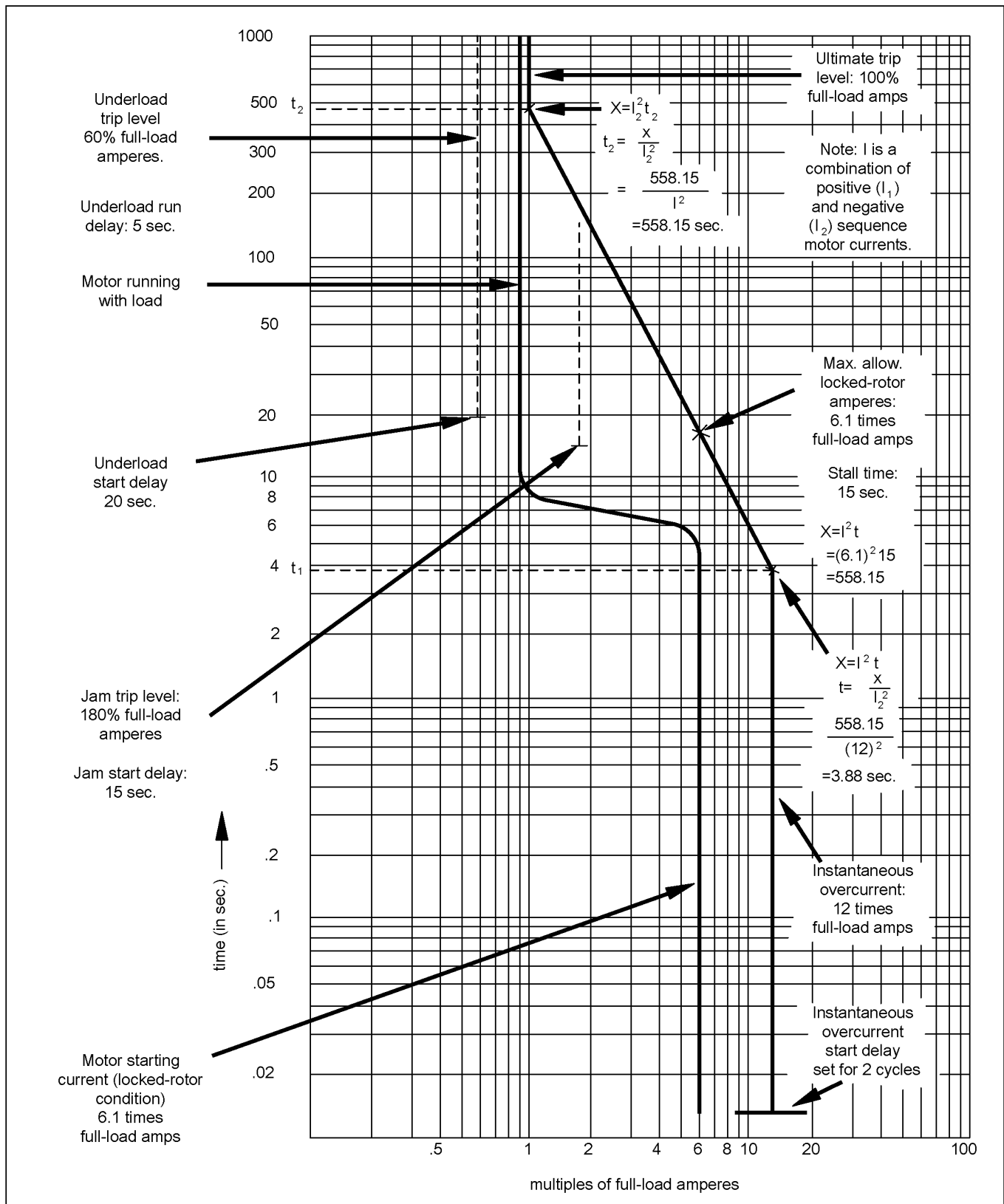
If stator temperature measurements are available, the algorithm may keep from tripping, even if the effective current is above the ultimate trip current setting, depending on stator temperature reports. It is still important to set a correct ultimate trip current so that the motor is well protected. If the RTDs, the module, or its communications to the relay fail, the algorithm falls back to use of UTC. Also, note that if all RTD channels are set to OFF, the algorithm reverts to the non- RTD calculation, which is based strictly on UTC.

Motor Protection Curves

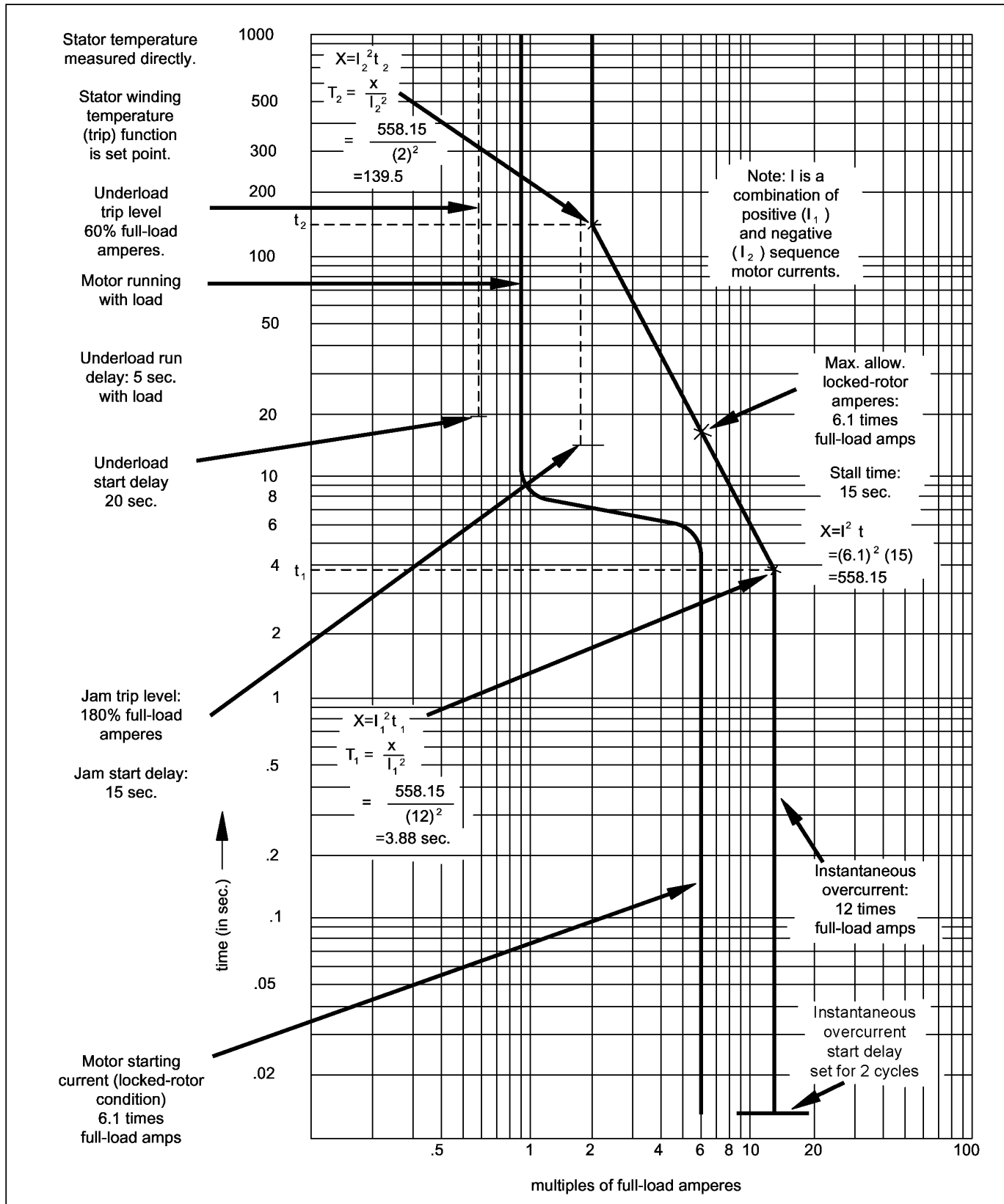
Motor Protection Curve (Example 1)



Motor Protection Curve (Example 2 - without RTDs)



Motor Protection Curve (Example 3 - with RTDs)



Underload Module

Elements

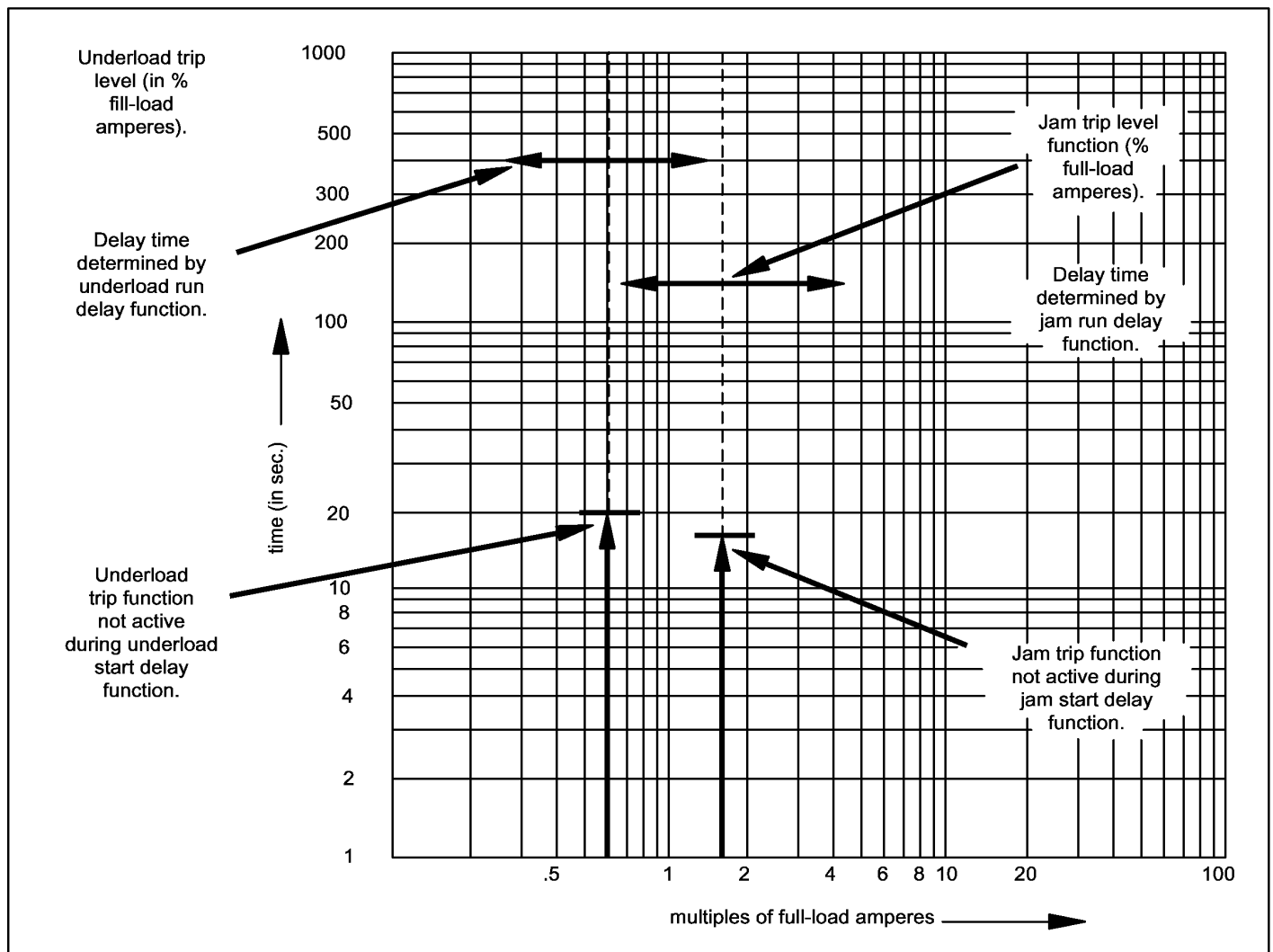
37[1] .37[2] .37[3]

Functional Description

When the motor is running, a current reduction might indicate a malfunction in the load. Underload protection recognizes mechanical problems, such as a blocked flow or loss of back pressure in a pump, or a broken drive belt or drive shaft.

Refer to the underload protection limit - the left vertical line in the Underload and Jam Trip Function example. In the example, the underload trip is set at 60% of FLA. The protective device can be configured for underload alarm and underload trip. Each can be disabled by entering the >>Underload Setting<< menu and then selecting "Inactive".

Underload and JAM Trip Function



These would be represented by two such vertical lines, both below the normal load current. Be sure to set the alarm level **above** the trip level. Both trips and alarms are held off by the start delay. Each has its own run or pickup delay.

Use the start delay to block tripping until the load stabilizes after a start. Use run delays to avoid nuisance alarms or trips for load transients.

To configure this function for operation under an alarm condition, the User must assign the functions pickup (for example 50J[1].Pickup) to an output relay, under >>Device Parm / Relay Outs<< that the User has identified as the Alarm relay output. Likewise, to illuminate an LED under a functions alarm condition, LED 2 must be assigned the functions pickup. Several elements are configure as such at the factory for convenience.

Device Planning Parameters of the Underload Module

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Do not use, Use	37[1]: Use 37[2]: Use 37[3]: Do not use	[Device Planning]

Global Protection Parameters of the Underload Module

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Underload-Prot /37[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Underload-Prot /37[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Underload-Prot /37[1]]

Setting Group Parameters of the Underload Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Underload-Prot /37[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Underload-Prot /37[1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	37[1]: Inactive 37[2]: Active 37[3]: Inactive	[Protection Para /<1..4> /Underload-Prot /37[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Underload-Prot /37[1]]
Underload 	Underload Pickup based on a multiplier of FLA	0.05 - 0.90FLA	0.50FLA	[Protection Para /<1..4> /Underload-Prot /37[1]]
Phases 	Indicates if one, two of three or all phases are required for operation	any one, all	any one	[Protection Para /<1..4> /Underload-Prot /37[1]]
t 	Tripping delay	0.4 - 1200.0s	10.0s	[Protection Para /<1..4> /Underload-Prot /37[1]]

Parameter	Description	Setting range	Default	Menu path
CTS Blo 	Measuring Circuit Supervision Current	Inactive, Active	Inactive	[Protection Para /<1..4> /Underload-Prot /37[1]]

Underload Module Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /Underload-Prot /37[1]]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /Underload-Prot /37[1]]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /Underload-Prot /37[1]]

Underload Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Pickup	Signal: Pickup
Trip	Signal: Trip
TripCmd	Signal: Trip Command

Underload Module Counter Values

Value	Description	Default	Size	Menu path
nPickups	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /PickupCr]
nTripCmds	Number of trip commands since last reset.	0	0 - 9999999999	[Operation /History /TripCmdCr]

50P - DEFT Overcurrent Protection

Elements

50P[1] 50P[2] 50P[3]



WARNING

If using inrush blockings, the tripping delay of the current protection functions must be at least 30 ms or more in order to prevent faulty trippings (applies only to devices which are equipped with Inrush protection).

NOTICE

All overcurrent protective elements are identically structured.

For each element the following characteristic is available:

- DEFT (definite time).

Explanation

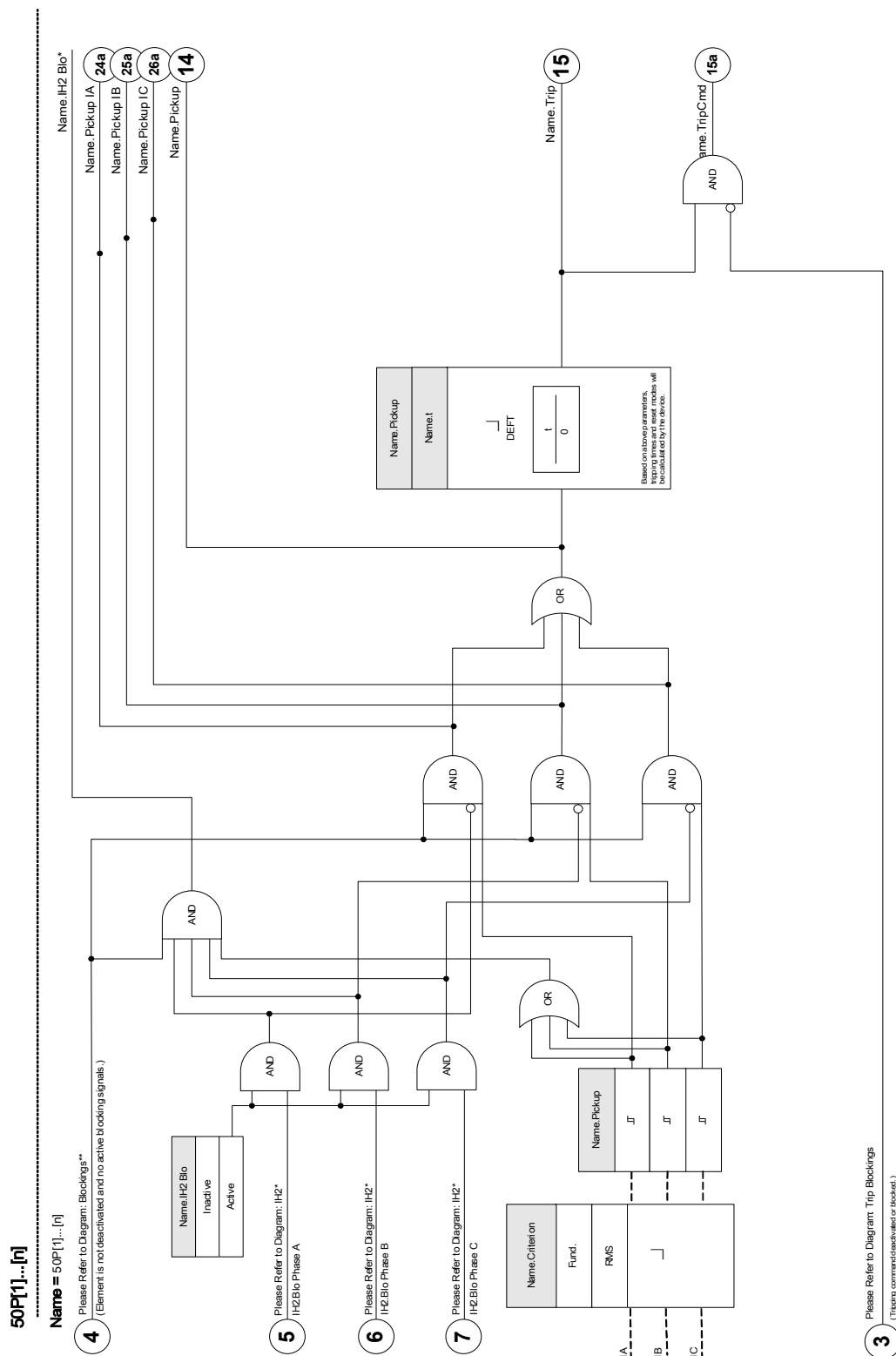
t = Tripping delay

I = Fault current

Pickup = If the pickup value is exceeded, the module/element starts to time out to trip .

This element offers a criterion setting. The criterion setting tells if the threshold is based on the fundamental (Phasor) or RMS.

For Tripping curves, please refer to “Instantaneous Current Curves (Phase)” located in the Appendix.



*=Applies only to devices that offer Inrush Protection

Device Planning Parameters of the 50P Module

Parameter	Description	Options	Default	Menu path
Mode 	Mode	50P[1]: Non-directional 50P[2]: Non-directional 50P[3]: Do not use, Non-directional	Non-directional	[Device Planning]

Global Protection Parameters of the 50P Module

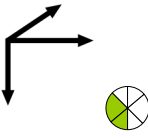
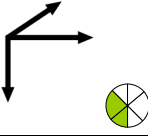
Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /50P[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /50P[1]]

Parameter	Description	Setting range	Default	Menu path
ExBlo3 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	-.-, MStart.GOCStart Block, MStart.IOCStart Block, MStart.ULoadSt artBlock, MStart.JamStart Block, MStart.UnbalSta rtBlock, MStart.Blo- Generic1, MStart.Blo- Generic2, MStart.Blo- Generic3, MStart.Blo- Generic4, MStart.Blo- Generic5	MStart.IOCSta rtBlock	[Protection Para /Global Prot Para /I-Prot /50P[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /I-Prot /50P[1]]
Rvs Blo 	Reverse Blocking, if Reverse Blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	-.-	[Protection Para /Global Prot Para /I-Prot /50P[1]]
AdaptSet 1 	Assignment Adaptive Parameter 1	AdaptSet	-.-	[Protection Para /Global Prot Para /I-Prot /50P[1]]
AdaptSet 2 	Assignment Adaptive Parameter 2	AdaptSet	-.-	[Protection Para /Global Prot Para /I-Prot /50P[1]]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
AdaptSet 3 	Assignment Adaptive Parameter 3	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /50P[1]]
AdaptSet 4 	Assignment Adaptive Parameter 4	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /50P[1]]

Setting Group Parameters of the 50P Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	50P[1]: Active 50P[2]: Active 50P[3]: Inactive	[Protection Para /<1..4> /I-Prot /50P[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /50P[1]]
Rvs Blo Fc 	Activate (allow) or inactivate (disallow) reverse blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/element are blocked that are parameterized "Rvs Blo Fc = active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /50P[1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	50P[1]: Inactive 50P[2]: Active 50P[3]: Inactive	[Protection Para /<1..4> /I-Prot /50P[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /50P[1]]
Criterion 	Measuring method: fundamental or rms or 3rd harmonic (only generator protection relays)	Fundamental, True RMS	True RMS	[Protection Para /<1..4> /I-Prot /50P[1]]

Parameter	Description	Setting range	Default	Menu path
Pickup 	If the pickup value is exceeded, the module/element starts to time out to trip. Only available if: Characteristic = DEFT Or Characteristic = INV Minimum of the setting range If: VRestrict = Active Minimum of the setting range If: VRestrict = Inactive	0.02 - 40.00In	50P[1]: 2In 50P[2]: 2.5In 50P[3]: 3.0In	[Protection Para /<1..4> /I-Prot /50P[1]]
t 	Tripping delay Only available if: Characteristic = DEFT	0.00 - 300.00s	50P[1]: 0s 50P[2]: 0.25s 50P[3]: 0.25s	[Protection Para /<1..4> /I-Prot /50P[1]]

50P Module Input States

Name	Description	Assignment via
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /I-Prot /50P[1]]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /I-Prot /50P[1]]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /I-Prot /50P[1]]
Rvs Blo-I	Module Input State: Reverse Blocking	[Protection Para /Global Prot Para /I-Prot /50P[1]]
AdaptSet1-I	Module Input State: Adaptive Parameter1	[Protection Para /Global Prot Para /I-Prot /50P[1]]
AdaptSet2-I	Module Input State: Adaptive Parameter2	[Protection Para /Global Prot Para /I-Prot /50P[1]]
AdaptSet3-I	Module Input State: Adaptive Parameter3	[Protection Para /Global Prot Para /I-Prot /50P[1]]
AdaptSet4-I	Module Input State: Adaptive Parameter4	[Protection Para /Global Prot Para /I-Prot /50P[1]]

50P Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Rvs Blo	Signal: Reverse Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Pickup IA	Signal: Pickup IA
Pickup IB	Signal: Pickup IB
Pickup IC	Signal: Pickup IC
Pickup	Signal: Pickup
Trip	Signal: Trip
TripCmd	Signal: Trip Command
Active AdaptSet	Active Adaptive Parameter
DefaultSet	Signal: Default Parameter Set
AdaptSet 1	Signal: Adaptive Parameter 1
AdaptSet 2	Signal: Adaptive Parameter 2
AdaptSet 3	Signal: Adaptive Parameter 3
AdaptSet 4	Signal: Adaptive Parameter 4

50P Module Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nPickups	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /PickupCr]
nTripCmds	Number of trip commands since last reset.	0	0 - 9999999999	[Operation /History /TripCmdCr]

Commissioning: Overcurrent Protection, Non-directional [ANSI 50P]

Object to be tested:

- Signals to be measured for each current protection element: the threshold values, total tripping time (recommended), or alternatively tripping delays and the drop-out ratios; each time 3 x single-phase and 1 x three-phase.

NOTICE

Eaton recommends measuring the total tripping time instead of the tripping delay. The tripping delay should be specified by the User. The total tripping time is measured at the position signaling contact of the breaker (not at the relay output contacts!).

Total tripping time = tripping delay (please refer to the tolerances of the protection elements)
+ breaker operating time (about 50 ms)

Please take the breaker operating times from the technical data specified in the relevant documentation provided by the breaker manufacturer.

Necessary means:

- Current source;
- Current meters; and
- Timer.

Procedures:

Testing the threshold values (3 x single-phase and 1 x three-phase)

For each test performed, feed a current that is about 3-5% above the threshold value for activation/tripping. Then check the threshold values.

Testing the total tripping delay (recommendation)

Measure the total tripping times at the auxiliary contacts of the breaker (breaker tripping).

Testing the tripping delay (measuring at the relay output contact)

Measure the tripping times at the relay output contact.

Testing the drop-out ratio

Reduce the current to 97% below the trip value and check the drop-out ratio.

Successful test result

The measured total tripping delays or individual tripping delays, threshold values, and drop-out ratios correspond with those values specified in the adjustment list. Permissible deviations/tolerances can be found in the Technical Data section.

51P - INV Overcurrent-Protection

Elements

51P[1] 51P[2] 51P[3]



WARNING If using inrush blockings, the tripping delay of the current protection functions must be at least 30 ms or more in order to prevent faulty trippings (applies only to devices which are equipped with Inrush protection).

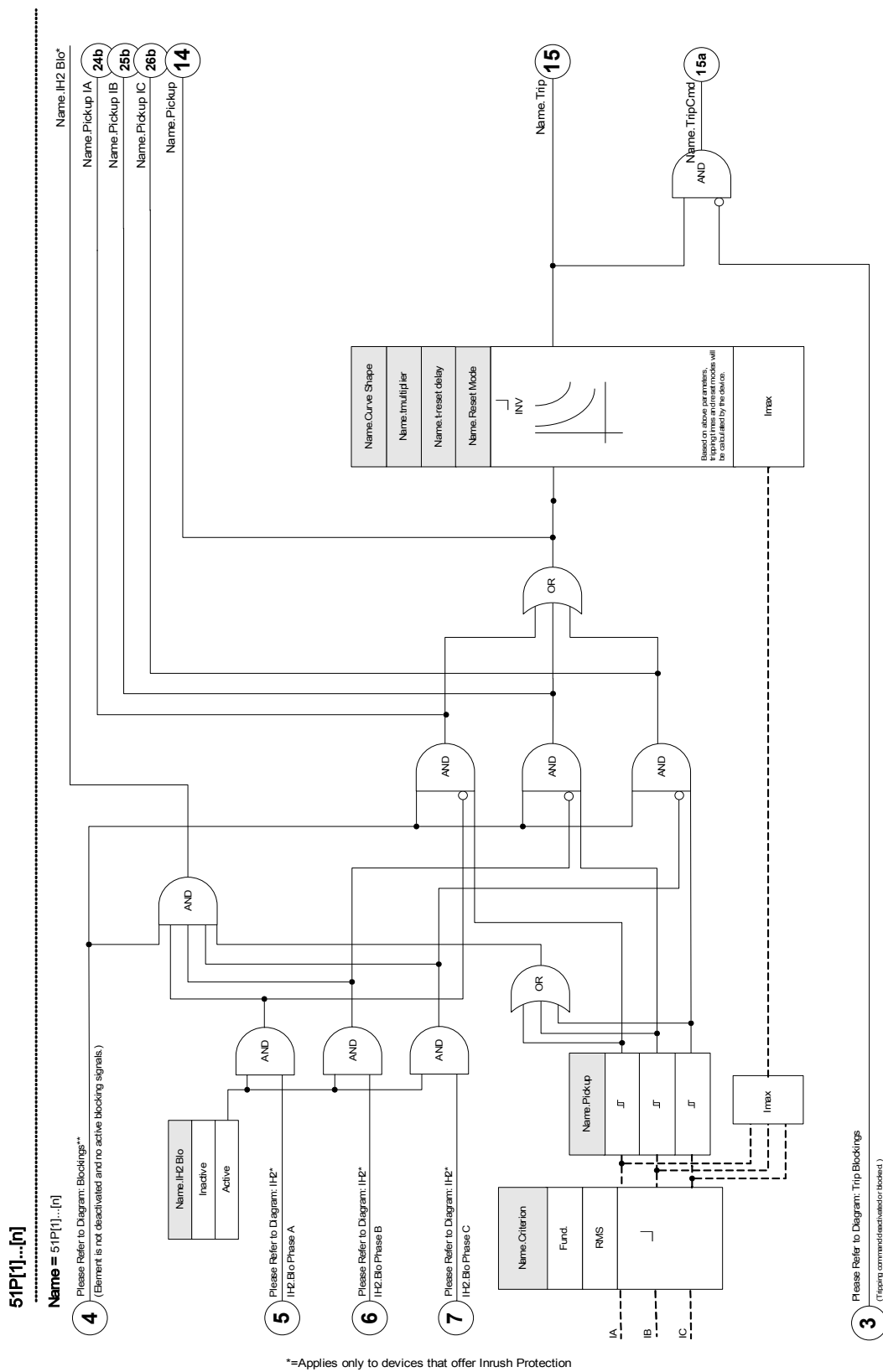


NOTICE All overcurrent protective elements are identically structured.

For each element, the following characteristics are available:

- NINV (IEC/XInv);
- VINV (IEC/XInv);
- LINV (IEC/XInv);
- EINV (IEC/XInv);
- MINV (ANSI/XInv);
- VINV (ANSI/XInv);
- EINV (ANSI/XInv);
- Thermal Flat;
- Therm Flat IT;
- Therm Flat I2T; and
- Therm Flat I4T.

For tripping curves please refer to “Time Current Curves (PHASE)” located in the Appendix.



Device Planning Parameters of the 51P Module

Parameter	Description	Options	Default	Menu path
Mode 	Mode	51P[1]: Non-directional 51P[2]: Do not use, Non-directional 51P[3]: Do not use, Non-directional	Non-directional	[Device Planning]

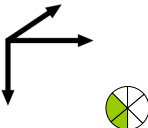
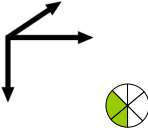
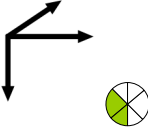
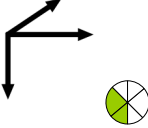
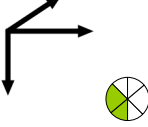
Global Protection Parameters of the 51P Module

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /51P[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /51P[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /51P[1]]
Rvs Blo 	Reverse Blocking, if Reverse Blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /51P[1]]
AdaptSet 1 	Assignment Adaptive Parameter 1	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /51P[1]]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
AdaptSet 2 	Assignment Adaptive Parameter 2	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /51P[1]]
AdaptSet 3 	Assignment Adaptive Parameter 3	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /51P[1]]
AdaptSet 4 	Assignment Adaptive Parameter 4	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /51P[1]]

Setting Group Parameters of the 51P Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	51P[1]: Active 51P[2]: Active 51P[3]: Inactive	[Protection Para /<1..4> /I-Prot /51P[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /51P[1]]
Rvs Blo Fc 	Activate (allow) or inactivate (disallow) reverse blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/element are blocked that are parameterized "Rvs Blo Fc = active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /51P[1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	51P[1]: Inactive 51P[2]: Active 51P[3]: Inactive	[Protection Para /<1..4> /I-Prot /51P[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /51P[1]]
Criterion 	Measuring method: fundamental or rms or 3rd harmonic (only generator protection relays)	Fundamental, True RMS	True RMS	[Protection Para /<1..4> /I-Prot /51P[1]]

Parameter	Description	Setting range	Default	Menu path
Pickup 	If the pickup value is exceeded, the module/element starts to time out to trip. Minimum of the setting range If: VRestrict = Active Minimum of the setting range If: VRestrict = Inactive	0.02 - 40.00In	1.00In	[Protection Para /<1..4> /I-Prot /51P[1]]
Curve Shape 	Characteristic	IEC NINV, IEC VINV, IEC EINV, IEC LINV, ANSI MINV, ANSI VINV, ANSI EINV, Therm Flat, IT, I2T, I4T	ANSI MINV	[Protection Para /<1..4> /I-Prot /51P[1]]
t-multiplier 	Time multiplier/tripping characteristic factor. The setting range depends on the selected tripping curve.	0.02 - 20.00	51P[1]: 1 51P[2]: 2 51P[3]: 3	[Protection Para /<1..4> /I-Prot /51P[1]]
Reset Mode 	Reset Mode	Instantaneous, t-delay, Calculated	Calculated	[Protection Para /<1..4> /I-Prot /51P[1]]
t-reset 	Reset time for intermittent phase failures (INV characteristics only) Available if: Reset Mode = t-delay	0.00 - 60.00s	0s	[Protection Para /<1..4> /I-Prot /51P[1]]

51P Module Input States

Name	Description	Assignment via
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /I-Prot /51P[1]]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /I-Prot /51P[1]]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /I-Prot /51P[1]]
Rvs Blo-I	Module Input State: Reverse Blocking	[Protection Para /Global Prot Para /I-Prot /51P[1]]
AdaptSet1-I	Module Input State: Adaptive Parameter1	[Protection Para /Global Prot Para /I-Prot /51P[1]]
AdaptSet2-I	Module Input State: Adaptive Parameter2	[Protection Para /Global Prot Para /I-Prot /51P[1]]
AdaptSet3-I	Module Input State: Adaptive Parameter3	[Protection Para /Global Prot Para /I-Prot /51P[1]]
AdaptSet4-I	Module Input State: Adaptive Parameter4	[Protection Para /Global Prot Para /I-Prot /51P[1]]

51P Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Rvs Blo	Signal: Reverse Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Pickup IA	Signal: Pickup IA
Pickup IB	Signal: Pickup IB
Pickup IC	Signal: Pickup IC
Pickup	Signal: Pickup
Trip	Signal: Trip
TripCmd	Signal: Trip Command
Active AdaptSet	Active Adaptive Parameter
DefaultSet	Signal: Default Parameter Set
AdaptSet 1	Signal: Adaptive Parameter 1
AdaptSet 2	Signal: Adaptive Parameter 2
AdaptSet 3	Signal: Adaptive Parameter 3
AdaptSet 4	Signal: Adaptive Parameter 4

51P Module Module Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nPickups	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /PickupCr]
nTripCmds	Number of trip commands since last reset.	0	0 - 9999999999	[Operation /History /TripCmdCr]

Commissioning: Overcurrent Protection, Non-directional [ANSI 51P]

Object to be tested

- Signals to be measured for each current protection element: the threshold values, total tripping time (recommended), or alternatively tripping delays and the drop-out ratios; each time 3 x single-phase and 1 x three-phase.

NOTICE

Eaton recommends measuring the total tripping time instead of the tripping delay. The tripping delay should be specified by the User. The total tripping time is measured at the position signaling contact of the breaker (not at the relay output contacts!).

Total tripping time = tripping delay (please refer to the tolerances of the protection stages)
+ breaker operating time (about 50 ms)

Please take the breaker operating times from the technical data specified in the relevant documentation provided by the breaker manufacturer.

Necessary means:

- Current source;
- Current meters; and
- Timer.

Procedure:

Testing the threshold values (3 x single-phase and 1 x three-phase)

For each test performed, feed a current that is about 3-5% above the threshold value for activation/tripping. Then check the threshold values.

Testing the total tripping delay (recommendation)

Measure the total tripping times at the auxiliary contacts of the breaker (breaker tripping).

Testing the tripping delay (measuring at the relay output contact)

Measure the tripping times at the relay output contact.

Testing the drop-out ratio

Reduce the current to 97% below the trip value and check the drop-out ratio.

Successful test result

The measured total tripping delays or individual tripping delays, threshold values, and drop-out ratios correspond with those values specified in the adjustment list. Permissible deviations/tolerances can be found in the Technical Data section.

50X DEFT Measured Ground Fault Protection

Elements

50X[1], 50X[2]



WARNING

If using inrush blockings, the tripping delay of the ground current protection functions must be at least 30 ms or more in order to prevent faulty trippings.



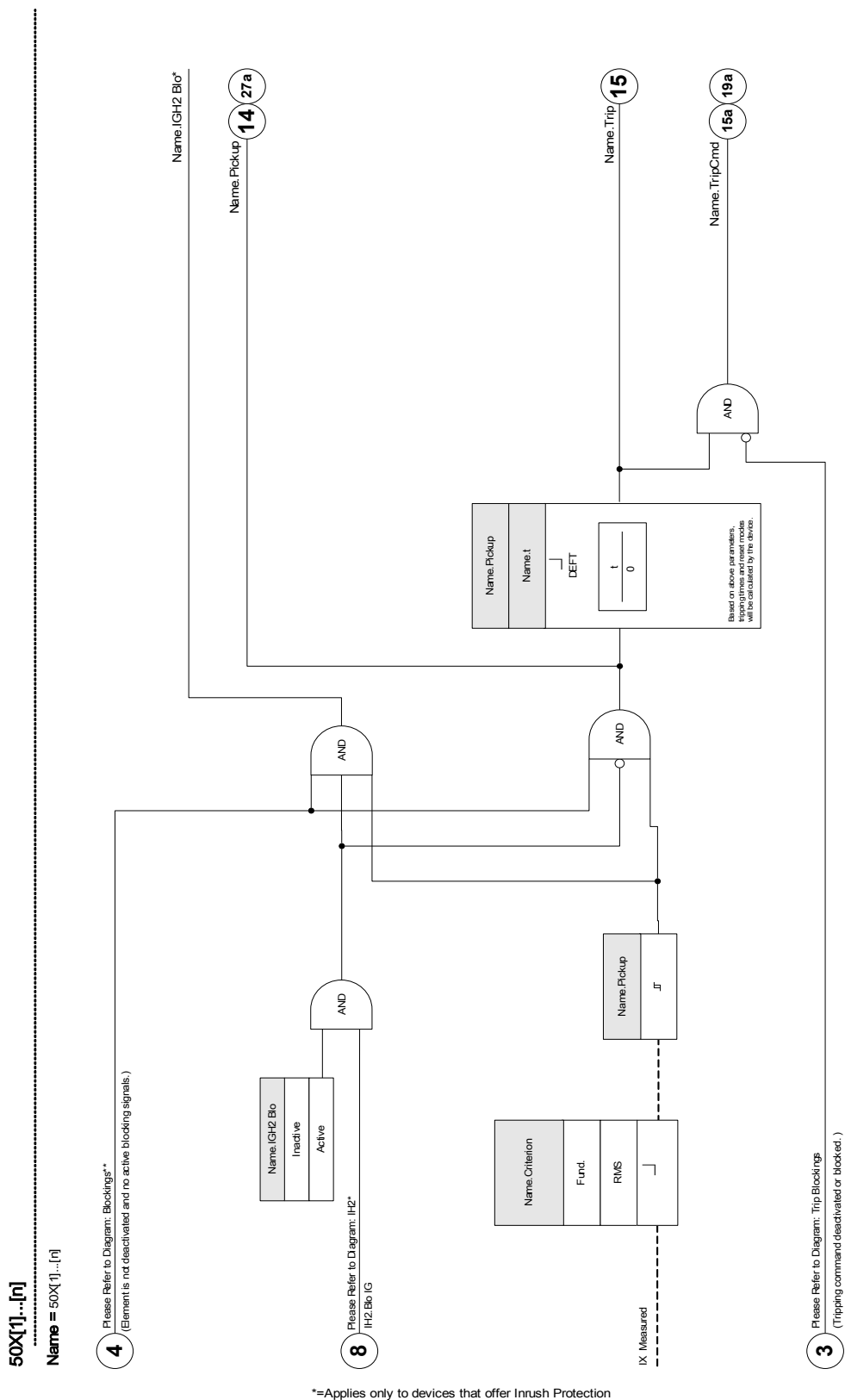
All ground current elements are identically structured.

For each element the following characteristics are available:

- DEFT (definite time).

For tripping curves please refer to “Instantaneous Current Curves (Ground Current Measured)” located in the Appendix.

The ground current can be measured either directly via a zero sequence transformer or detected by a residual connection. The ground current can alternatively be calculated from the phase currents. However, this is only possible if the current transformers are Wye-connected.



Device Planning Parameters of the 50X Ground Fault Protection

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Non-directional	Non-directional	[Device Planning]

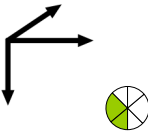
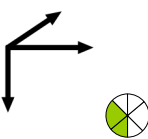
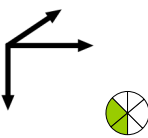
Global Protection Parameters of the 50X Ground Fault Protection

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /50X[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /50X[1]]
ExBlo3 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	.-, MStart.GOCStart Block, MStart.IOCStart Block, MStart.ULoadSt artBlock, MStart.JamStart Block, MStart.UnbalSta rtBlock, MStart.Blo- Generic1, MStart.Blo- Generic2, MStart.Blo- Generic3, MStart.Blo- Generic4, MStart.Blo- Generic5	MStart.GOCSt artBlock	[Protection Para /Global Prot Para /I-Prot /50X[1]]

Parameter	Description	Setting range	Default	Menu path
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /50X[1]]
Rvs Blo 	Reverse Blocking, if Reverse Blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /50X[1]]
AdaptSet 1 	Assignment Adaptive Parameter 1	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /50X[1]]
AdaptSet 2 	Assignment Adaptive Parameter 2	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /50X[1]]
AdaptSet 3 	Assignment Adaptive Parameter 3	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /50X[1]]
AdaptSet 4 	Assignment Adaptive Parameter 4	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /50X[1]]

Setting Group Parameters of the 50X Ground Fault Protection

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Active	[Protection Para /<1..4> /I-Prot /50X[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /50X[1]]
Rvs Blo Fc 	Activate (allow) or inactivate (disallow) reverse blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/element are blocked that are parameterized "Rvs Blo Fc = active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /50X[1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	50X[1]: Inactive 50X[2]: Active	[Protection Para /<1..4> /I-Prot /50X[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /50X[1]]
Criterion 	Measuring method: fundamental or rms or 3rd harmonic (only generator protection relays)	Fundamental, True RMS	True RMS	[Protection Para /<1..4> /I-Prot /50X[1]]

Parameter	Description	Setting range	Default	Menu path
Pickup 	If the pickup value is exceeded, the module/element will be started.	0.02 - 20.00In	50X[1]: 1In 50X[2]: 2In	[Protection Para /<1..4> /I-Prot /50X[1]]
Pickup (sensitive) 	If the pickup value is exceeded, the module/element will be started.	0.002 - 2.000In	0.02In	[Protection Para /<1..4> /I-Prot /50X[1]]
t 	Tripping delay Only available if: Characteristic = DEFT	0.00 - 300.00s	0.5s	[Protection Para /<1..4> /I-Prot /50X[1]]

50X Ground Fault Protection Input States

Name	Description	Assignment via
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /I-Prot /50X[1]]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /I-Prot /50X[1]]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /I-Prot /50X[1]]
Rvs Blo-I	Module Input State: Reverse Blocking	[Protection Para /Global Prot Para /I-Prot /50X[1]]
AdaptSet1-I	Module Input State: Adaptive Parameter1	[Protection Para /Global Prot Para /I-Prot /50X[1]]
AdaptSet2-I	Module Input State: Adaptive Parameter2	[Protection Para /Global Prot Para /I-Prot /50X[1]]
AdaptSet3-I	Module Input State: Adaptive Parameter3	[Protection Para /Global Prot Para /I-Prot /50X[1]]
AdaptSet4-I	Module Input State: Adaptive Parameter4	[Protection Para /Global Prot Para /I-Prot /50X[1]]

50X Ground Fault Protection Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Rvs Blo	Signal: Reverse Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Pickup	Signal: Pickup IX or IR
Trip	Signal: Trip
TripCmd	Signal: Trip Command
Active AdaptSet	Active Adaptive Parameter
DefaultSet	Signal: Default Parameter Set
AdaptSet 1	Signal: Adaptive Parameter 1
AdaptSet 2	Signal: Adaptive Parameter 2
AdaptSet 3	Signal: Adaptive Parameter 3
AdaptSet 4	Signal: Adaptive Parameter 4

50X Ground Fault Protection Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nPickups	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /PickupCr]
nTripCmds	Number of trip commands since last reset.	0	0 - 9999999999	[Operation /History /TripCmdCr]

Commissioning: Ground Fault Protection – Non-directional [ANSI 50X]

Please test the non-directional ground overcurrent analog to the non-directional phase overcurrent protection.

51X INV Measured Ground Fault Protection

Elements

51X[1], 51X[2]

NOTICE

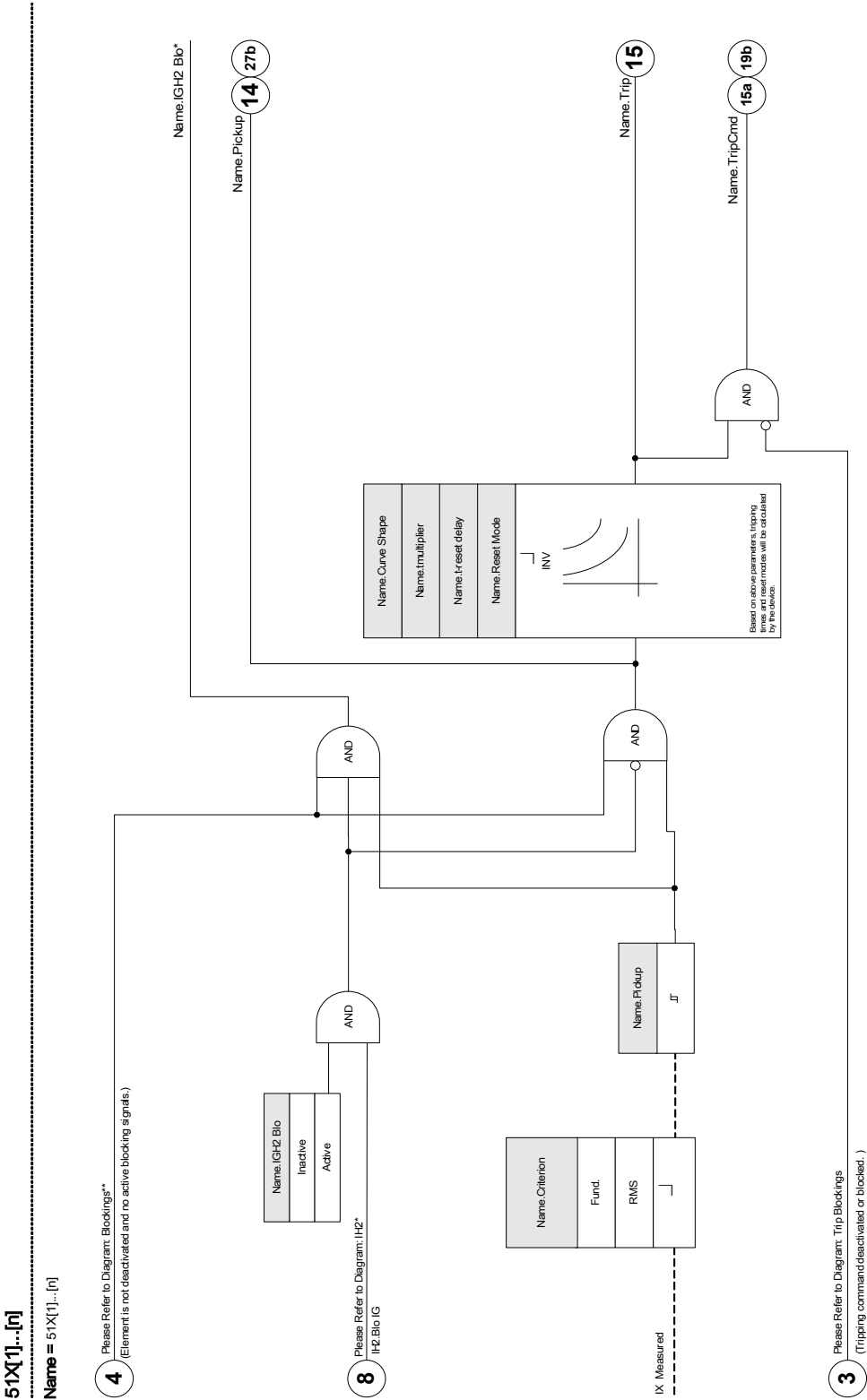
All ground current elements are identically structured.

For each element the following characteristics are available:

- NINV (IEC/XInv);
- VINV (IEC/XInv);
- LINV (IEC/XInv);
- EINV (IEC/XInv);
- MINV (ANSI/XInv);
- VINV (ANSI/XInv);
- EINV (ANSI/XInv);
- Thermal Flat;
- IT;
- I2T; and
- I4T.

For tripping curves please refer to “Time Current Curves (Ground Current)” located in the Appendix.

The ground current can be measured either directly via a zero sequence transformer or detected by a residual connection. The ground current can alternatively be calculated from the phase currents. However, this is only possible if the current transformers are Wye-connected.



*=Applies only to devices that offer Inrush Protection

Device Planning Parameters of the 51X Ground Fault Protection

Parameter	Description	Options	Default	Menu path
Mode 	Mode	51X[1]: Non-directional 51X[2]: Do not use, Non-directional	Non-directional	[Device Planning]

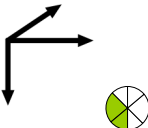
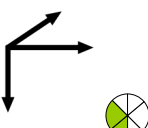
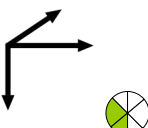
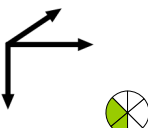
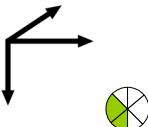
Global Protection Parameters of the 51X Ground Fault Protection

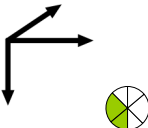
Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /51X[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /51X[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /51X[1]]
Rvs Blo 	Reverse Blocking, if Reverse Blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /51X[1]]
AdaptSet 1 	Assignment Adaptive Parameter 1	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /51X[1]]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
AdaptSet 2 	Assignment Adaptive Parameter 2	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /51X[1]]
AdaptSet 3 	Assignment Adaptive Parameter 3	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /51X[1]]
AdaptSet 4 	Assignment Adaptive Parameter 4	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /51X[1]]

Setting Group Parameters of the 51X Ground Fault Protection

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Active	[Protection Para /<1..4> /I-Prot /51X[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /51X[1]]
Rvs Blo Fc 	Activate (allow) or inactivate (disallow) reverse blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/element are blocked that are parameterized "Rvs Blo Fc = active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /51X[1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	51X[1]: Inactive 51X[2]: Active	[Protection Para /<1..4> /I-Prot /51X[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /51X[1]]
Criterion 	Measuring method: fundamental or rms or 3rd harmonic (only generator protection relays)	Fundamental, True RMS	True RMS	[Protection Para /<1..4> /I-Prot /51X[1]]

Parameter	Description	Setting range	Default	Menu path
Pickup 	If the pickup value is exceeded, the module/element will be started.	0.02 - 20.00In	0.5In	[Protection Para /<1..4> /I-Prot /51X[1]]
Pickup (sensitive) 	If the pickup value is exceeded, the module/element will be started.	0.002 - 2.000In	0.02In	[Protection Para /<1..4> /I-Prot /51X[1]]
Curve Shape 	Characteristic	IEC NINV, IEC VINV, IEC EINV, IEC LINV, ANSI MINV, ANSI VINV, ANSI EINV, Therm Flat, IT, I2T, I4T	ANSI MINV	[Protection Para /<1..4> /I-Prot /51X[1]]
t-multiplier 	Time multiplier/tripping characteristic factor. The setting range depends on the selected tripping curve.	0.02 - 20.00	51X[1]: 1 51X[2]: 2	[Protection Para /<1..4> /I-Prot /51X[1]]
Reset Mode 	Reset Mode	Instantaneous, t-delay, Calculated	Calculated	[Protection Para /<1..4> /I-Prot /51X[1]]

Parameter	Description	Setting range	Default	Menu path
t-reset 	Reset time for intermittent phase failures (INV characteristics only) Only available if:Reset Mode = t-delay	0.00 - 60.00s	0.00s	[Protection Para /<1..4> /I-Prot /51X[1]]

51X Ground Fault Protection Input States

Name	Description	Assignment via
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /I-Prot /51X[1]]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /I-Prot /51X[1]]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /I-Prot /51X[1]]
Rvs Blo-I	Module Input State: Reverse Blocking	[Protection Para /Global Prot Para /I-Prot /51X[1]]
AdaptSet1-I	Module Input State: Adaptive Parameter1	[Protection Para /Global Prot Para /I-Prot /51X[1]]
AdaptSet2-I	Module Input State: Adaptive Parameter2	[Protection Para /Global Prot Para /I-Prot /51X[1]]
AdaptSet3-I	Module Input State: Adaptive Parameter3	[Protection Para /Global Prot Para /I-Prot /51X[1]]
AdaptSet4-I	Module Input State: Adaptive Parameter4	[Protection Para /Global Prot Para /I-Prot /51X[1]]

51X Ground Fault Protection Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Rvs Blo	Signal: Reverse Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Pickup	Signal: Pickup IX or IR
Trip	Signal: Trip
TripCmd	Signal: Trip Command
Active AdaptSet	Active Adaptive Parameter
DefaultSet	Signal: Default Parameter Set
AdaptSet 1	Signal: Adaptive Parameter 1
AdaptSet 2	Signal: Adaptive Parameter 2
AdaptSet 3	Signal: Adaptive Parameter 3
AdaptSet 4	Signal: Adaptive Parameter 4

51X Ground Fault Protection Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nPickups	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /PickupCr]
nTripCmds	Number of trip commands since last reset.	0	0 - 9999999999	[Operation /History /TripCmdCr]

Commissioning: Ground Fault Protection – Non-directional [ANSI 51X]

Please test the non-directional ground overcurrent analog to the non-directional phase overcurrent protection.

50R DEFT Calculated Ground Fault Protection Module

Elements

50R[1].50R[2]



WARNING If using inrush blockings, the tripping delay of the ground current protection functions must be at least 30 ms or more in order to prevent faulty trippings.

NOTICE

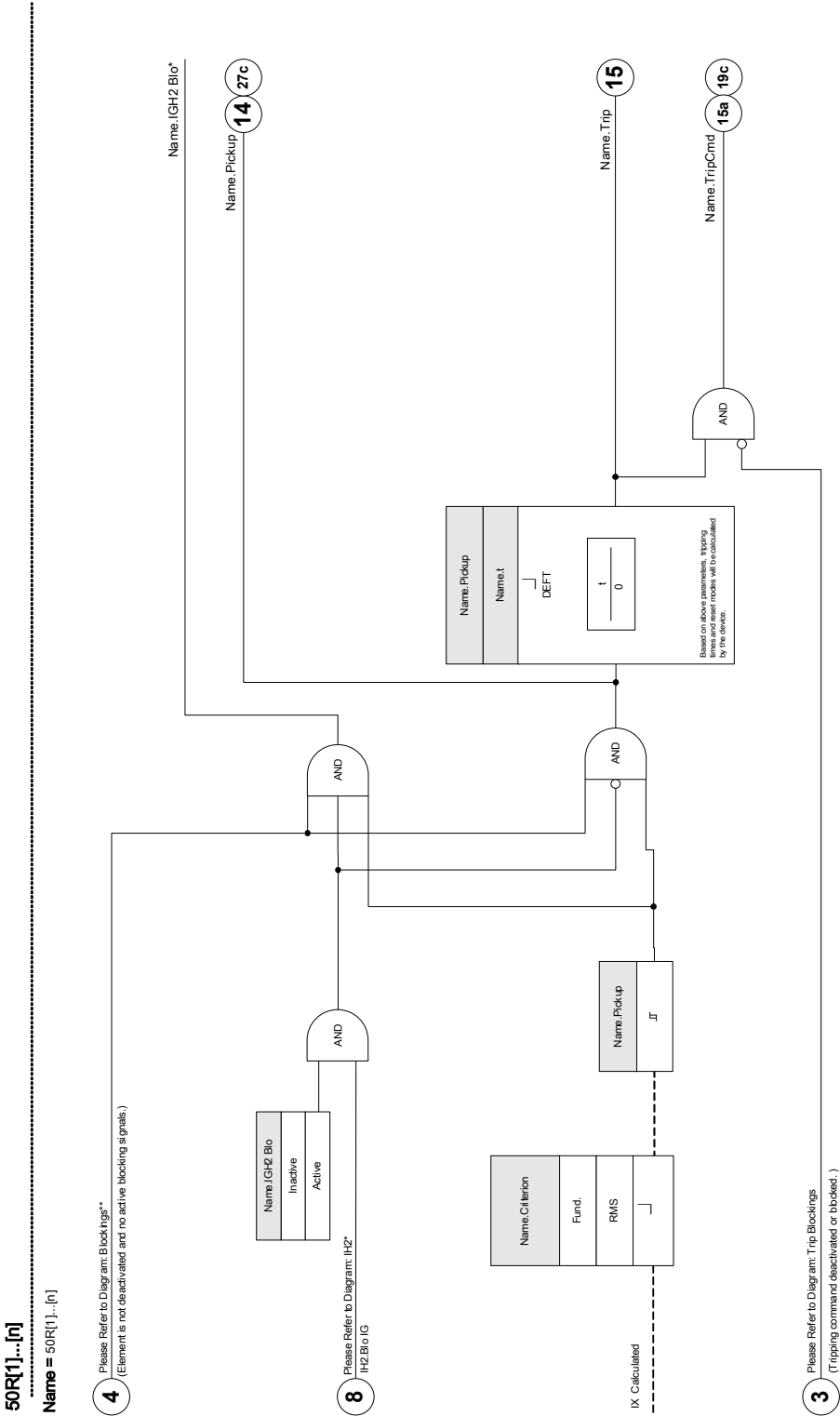
All ground current elements are identically structured.

For each element, the following characteristics are available:

- DEFT (definite time).

For tripping curves please refer to “Instantaneous Current Curves (Ground Current Calculated)” located in the Appendix.

The ground current can be measured either directly via a zero sequence transformer or detected by a residual connection. The ground current can alternatively be calculated from the phase currents. However, this is only possible if the current transformers are Wye-connected.



*=Applies only to devices that offer Inrush Protection

Device Planning Parameters of the 50R Ground Fault Protection

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Non-directional	Non-directional	[Device Planning]

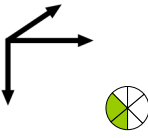
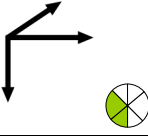
Global Protection Parameters of the 50R Ground Fault Protection

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /50R[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /50R[1]]
ExBlo3 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	.-, MStart.GOCStart Block, MStart.IOCStart Block, MStart.ULoadSt artBlock, MStart.JamStart Block, MStart.UnbalSta rtBlock, MStart.Blo- Generic1, MStart.Blo- Generic2, MStart.Blo- Generic3, MStart.Blo- Generic4, MStart.Blo- Generic5	MStart.GOCSt artBlock	[Protection Para /Global Prot Para /I-Prot /50R[1]]

Parameter	Description	Setting range	Default	Menu path
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /50R[1]]
Rvs Blo 	Reverse Blocking, if Reverse Blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /50R[1]]
AdaptSet 1 	Assignment Adaptive Parameter 1	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /50R[1]]
AdaptSet 2 	Assignment Adaptive Parameter 2	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /50R[1]]
AdaptSet 3 	Assignment Adaptive Parameter 3	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /50R[1]]
AdaptSet 4 	Assignment Adaptive Parameter 4	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /50R[1]]

Setting Group Parameters of the 50R Ground Fault Protection

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Active	[Protection Para /<1..4> /I-Prot /50R[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /50R[1]]
Rvs Blo Fc 	Activate (allow) or inactivate (disallow) reverse blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/element are blocked that are parameterized "Rvs Blo Fc = active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /50R[1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	50R[1]: Inactive 50R[2]: Active	[Protection Para /<1..4> /I-Prot /50R[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /50R[1]]
Criterion 	Measuring method: fundamental or rms or 3rd harmonic (only generator protection relays)	Fundamental, True RMS	True RMS	[Protection Para /<1..4> /I-Prot /50R[1]]

Parameter	Description	Setting range	Default	Menu path
Pickup 	If the pickup value is exceeded, the module/element will be started.	0.02 - 20.00In	50R[1]: 1In 50R[2]: 2In	[Protection Para /<1..4> /I-Prot /50R[1]]
t 	Tripping delay Only available if: Characteristic = DEFT	0.00 - 300.00s	0.5s	[Protection Para /<1..4> /I-Prot /50R[1]]

50R Ground Fault Protection Input States

Name	Description	Assignment via
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /I-Prot /50R[1]]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /I-Prot /50R[1]]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /I-Prot /50R[1]]
Rvs Blo-I	Module Input State: Reverse Blocking	[Protection Para /Global Prot Para /I-Prot /50R[1]]
AdaptSet1-I	Module Input State: Adaptive Parameter1	[Protection Para /Global Prot Para /I-Prot /50R[1]]
AdaptSet2-I	Module Input State: Adaptive Parameter2	[Protection Para /Global Prot Para /I-Prot /50R[1]]
AdaptSet3-I	Module Input State: Adaptive Parameter3	[Protection Para /Global Prot Para /I-Prot /50R[1]]
AdaptSet4-I	Module Input State: Adaptive Parameter4	[Protection Para /Global Prot Para /I-Prot /50R[1]]

50R Ground Fault Protection Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Rvs Blo	Signal: Reverse Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Pickup	Signal: Pickup IX or IR
Trip	Signal: Trip
TripCmd	Signal: Trip Command
Active AdaptSet	Active Adaptive Parameter
DefaultSet	Signal: Default Parameter Set
AdaptSet 1	Signal: Adaptive Parameter 1
AdaptSet 2	Signal: Adaptive Parameter 2
AdaptSet 3	Signal: Adaptive Parameter 3
AdaptSet 4	Signal: Adaptive Parameter 4

50R Ground Fault Protection Module Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nPickups	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /PickupCr]
nTripCmds	Number of trip commands since last reset.	0	0 - 9999999999	[Operation /History /TripCmdCr]

Commissioning: Ground Fault Protection – Non-directional [ANSI 50R]

Please test the non-directional ground overcurrent using the procedure for non-directional phase overcurrent protection.

51R INV Calculated Ground Fault Protection

Elements

51R[1], 51R[2]

NOTICE

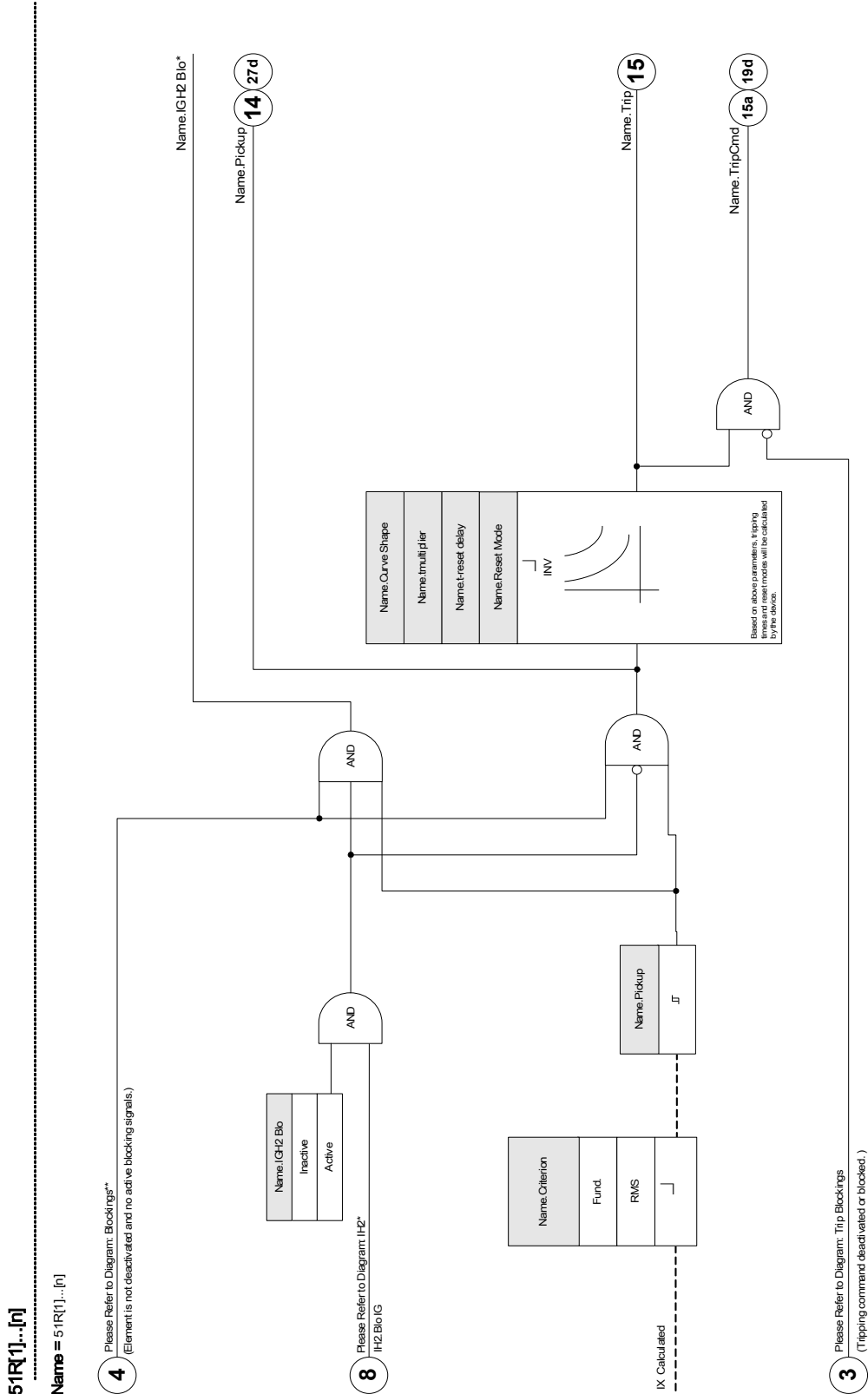
All ground current elements are identically structured.

For each element the following characteristics are available:

- NINV (IEC/XInv);
- VINV (IEC/XInv);
- LINV (IEC/XInv);
- EINV (IEC/XInv);
- MINV (ANSI/XInv);
- VINV (ANSI/XInv);
- EINV (ANSI/XInv);
- Thermal Flat;
- IT;
- I2T; and
- I4T.

For tripping curves please refer to “Time Current Curves (Ground Current)” located in the Appendix.

The ground current can be measured either directly via a zero sequence transformer or detected by a residual connection. The ground current can alternatively be calculated from the phase currents. However, this is only possible if the current transformers are Wye-connected.



*=Applies only to devices that offer Inrush Protection

Device Planning Parameters of the 51R Ground Fault Protection

Parameter	Description	Options	Default	Menu path
Mode 	Mode	51R[1]: Non-directional 51R[2]: Do not use, Non-directional	Non-directional	[Device Planning]

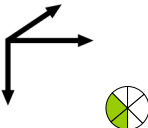
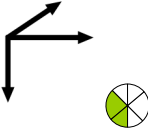
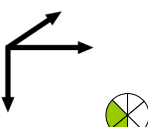
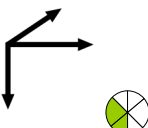
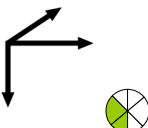
Global Protection Parameters of the 51R Ground Fault Protection

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /51R[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /51R[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /51R[1]]
Rvs Blo 	Reverse Blocking, if Reverse Blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /I-Prot /51R[1]]
AdaptSet 1 	Assignment Adaptive Parameter 1	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /51R[1]]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
AdaptSet 2 	Assignment Adaptive Parameter 2	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /51R[1]]
AdaptSet 3 	Assignment Adaptive Parameter 3	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /51R[1]]
AdaptSet 4 	Assignment Adaptive Parameter 4	AdaptSet	.-	[Protection Para /Global Prot Para /I-Prot /51R[1]]

Setting Group Parameters of the 51R Ground Fault Protection

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Active	[Protection Para /<1..4> /I-Prot /51R[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /51R[1]]
Rvs Blo Fc 	Activate (allow) or inactivate (disallow) reverse blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/element are blocked that are parameterized "Rvs Blo Fc = active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /51R[1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	51R[1]: Inactive 51R[2]: Active	[Protection Para /<1..4> /I-Prot /51R[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /I-Prot /51R[1]]
Criterion 	Measuring method: fundamental or rms or 3rd harmonic (only generator protection relays)	Fundamental, True RMS	True RMS	[Protection Para /<1..4> /I-Prot /51R[1]]

Parameter	Description	Setting range	Default	Menu path
Pickup 	If the pickup value is exceeded, the module/element will be started.	0.02 - 20.00In	51R[1]: 0.1In 51R[2]: 0.5In	[Protection Para /<1..4> /I-Prot /51R[1]]
Curve Shape 	Characteristic	IEC NINV, IEC VINV, IEC EINV, IEC LINV, ANSI MINV, ANSI VINV, ANSI EINV, Therm Flat, IT, I2T, I4T	ANSI MINV	[Protection Para /<1..4> /I-Prot /51R[1]]
t-multiplier 	Time multiplier/tripping characteristic factor. The setting range depends on the selected tripping curve.	0.02 - 20.00	51R[1]: 1 51R[2]: 2	[Protection Para /<1..4> /I-Prot /51R[1]]
Reset Mode 	Reset Mode	Instantaneous, t-delay, Calculated	Calculated	[Protection Para /<1..4> /I-Prot /51R[1]]
t-reset 	Reset time for intermittent phase failures (INV characteristics only) Only available if: Reset Mode = t-delay	0.00 - 60.00s	0.00s	[Protection Para /<1..4> /I-Prot /51R[1]]

51R Ground Fault Protection Input States

Name	Description	Assignment via
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /I-Prot /51R[1]]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /I-Prot /51R[1]]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /I-Prot /51R[1]]
Rvs Blo-I	Module Input State: Reverse Blocking	[Protection Para /Global Prot Para /I-Prot /51R[1]]
AdaptSet1-I	Module Input State: Adaptive Parameter1	[Protection Para /Global Prot Para /I-Prot /51R[1]]
AdaptSet2-I	Module Input State: Adaptive Parameter2	[Protection Para /Global Prot Para /I-Prot /51R[1]]
AdaptSet3-I	Module Input State: Adaptive Parameter3	[Protection Para /Global Prot Para /I-Prot /51R[1]]
AdaptSet4-I	Module Input State: Adaptive Parameter4	[Protection Para /Global Prot Para /I-Prot /51R[1]]

51R Ground Fault Protection Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Rvs Blo	Signal: Reverse Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Pickup	Signal: Pickup IX or IR
Trip	Signal: Trip
TripCmd	Signal: Trip Command
Active AdaptSet	Active Adaptive Parameter
DefaultSet	Signal: Default Parameter Set
AdaptSet 1	Signal: Adaptive Parameter 1
AdaptSet 2	Signal: Adaptive Parameter 2
AdaptSet 3	Signal: Adaptive Parameter 3
AdaptSet 4	Signal: Adaptive Parameter 4

51R Ground Fault Protection Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nPickups	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /PickupCr]
nTripCmds	Number of trip commands since last reset.	0	0 - 9999999999	[Operation /History /TripCmdCr]

Commissioning: Ground Fault Protection – Non-directional [ANSI 51R]

Please test the non-directional ground overcurrent analog to the non-directional phase overcurrent protection.

ZI - Zone Interlocking

Elements

ZI

Principle – General Use

The purpose of zone interlocking is to speed up tripping for some faults without sacrificing the coordination of the system and interjecting nuisance trips into the system. Zone interlocking devices can communicate across distribution zones to determine whether or not a device sees a fault condition.

Zone interlocking is a communication scheme used with breakers and protective relays to improve the level of protection in a power distribution system. This is achieved through communication between the downstream and upstream devices in a power system. The zones are classified by their location downstream of the main circuit protective device which is generally defined as Zone 1.

By definition, a selectively coordinated system is one where by adjusting the trip unit pickup and time delay settings, the breaker closest to the fault trips first. The upstream breaker serves two functions: (1) back-up protection to the downstream breaker and (2) protection of the conductors between the upstream and downstream breakers.

For faults which occur on the conductors between the upstream and downstream breakers, it is ideal for the upstream breaker to trip with no time delay. This is the feature provided by Zone Selective Interlocking.

The zone interlocking information can be transferred to or received from other compatible zone interlocking devices by means of suitable communication cables. The single zone interlock terminal block, with its 3-wire scheme, can be used for either phase zone interlocking, ground zone interlocking, or a combination of the two. If phase and ground zone interlocking are combined, the potential consequences must be understood before implementation.



WARNING

Systems containing multiple sources, or where the direction of power flow varies, require special considerations, or may not be suitable for this feature.

NOTICE

The breaker failure pickup signal »BF.PICKUP« is implicitly connected to zone interlocking, so that NO zone interlock output signal can be sent to the upstream device if a breaker failure on a downstream device is detected.

Description of the Functions and Features

- Configurable protection functions to initiate the zone interlocking OUTPUT signal (start functions).
- Remove zone interlocking OUTPUT signal immediately after detection of a breaker failure.
- Reset time (about ten cycles - settable) to interrupt OUTPUT signal for durable trip signal.

- Small trip delay (about three cycles – settable) to wait for downstream devices interlocking signals.
- Zone interlocking trip signal only possible by absence of zone interlocking INPUT signals.
- Configurable zone interlocking trip functions (protective functions serve as zone interlocking trip functions).
- Zone interlocking trip function pickup and tripping characteristic adaption using adaptive settings controlled by the zone interlocking input signals.

Device Planning Parameters of the Zone Interlocking

Parameter	Description	Options	Default	Menu path
Mode	Mode	Use	Use	[Device Planning]
				

Global Protection Parameters of the Zone Interlocking

In the global parameter menu for zone interlocking, two external blocking inputs (» *Ex Block1/Ex Block2*«), as with other protection modules, can be assigned to the input of the zone interlocking function so that the zone interlock function can be blocked by an assigned function.

Via an external input signal, the zone interlocking can also be blocked if the parameter » *ExtBlockTripCMD*« is assigned.

NOTICE

Breaker Failure Pickup flag BF.Pickup is implicitly connected to zone interlocking, so that NO zone interlock output signal can be sent to the upstream device if a breaker failure on downstream device is detected.

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /ZI]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /ZI]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /ZI]

Setting Group Parameters of the Zone Interlocking

The zone interlocking Setting Group Parameters consists of three groups of setting to configure the zone interlocking module to adapt to various application philosophies accordingly:

- General: This group comprises the settings used to control the general usage of the zone interlocking module.
- OUTPUT: What should be assigned to the Zone Out?
 - Phase,
 - Ground, or
- - Both.

The OUTPUT group comprises the settings to configure the zone interlocking output logic. If the zone interlocking application is used to a downstream device, the settings in OUTPUT group should be programmed accordingly. If the zone interlocking application is only used for an upstream device (main breaker or Zone 1), the setting ZoneInterlockOut within the OUTPUT group should be disabled.

- TRIP: Activate the Zone Trip.

The TRIP group comprises the settings used to configure the zone interlocking TRIP logic. If the zone interlocking application is applied to an upstream device, (main breaker or Zone 1), the settings in the TRIP group should be programmed accordingly. If the zone interlocking application is only used for a downstream device (feeder breaker or Zone 2), the setting ZoneInterlockTrip in TRIP group should be disabled.

Setting the above mentioned setting groups accordingly the zone interlocking module can be configured as:

- Downstream device application (using only OUTPUT logic);,
- Upstream device application (using only TRIP logic); or
- Midstream device application (using both OUTPUT and TRIP logics together).

The following menu and tables show the detailed information about the settings.

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/stage. The elements, that are associated with Zone Interlocking depend on the protective device. Transformer relays: ZI[1]: 50P[1], 50P[2], 51P[1], 50X[1], 51X[1], 50R[1], 51R[1] ZI[2]: 50P[3], 50P[4], 51P[3], 50X[2], 51X[2], 50R[2], 51R[2] All other Protective Devices: ZI: 50P[1], 50P[2], 51P[1], 50X[1], 50X[2], 51X[1], 50R[1], 50R[2], 51R[1]	Inactive, Active	Inactive	[Protection Para /<1..4> /ZI /General Settings]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /ZI /General Settings]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /ZI /General Settings]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /ZI /General Settings]
ZI OUT Fc 	Zone Interlocking Out activate (allow) / inactivate (disallow)	Inactive, Active	Active	[Protection Para /<1..4> /ZI /Zone Out]
Fault Type 	Fault Type	Phase, Ground, Both	Both	[Protection Para /<1..4> /ZI /Zone Out]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Trip 	Signal: Zone Interlocking Trip	Inactive, Active	Active	[Protection Para /<1..4> /ZI /Zone Trip]
Fault Type 	Fault Type	Phase, Ground, Both	Both	[Protection Para /<1..4> /ZI /Zone Trip]

Zone Interlocking Output Logic [X2]

The following current protective function elements serve as the Phase Zone Interlock OUTPUT start functions:

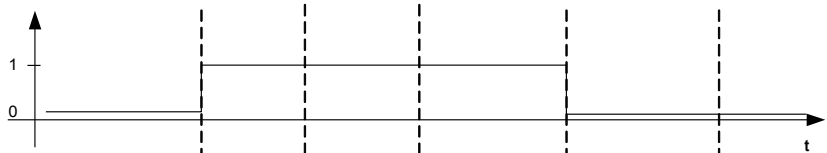
- 51P[1];
- 50P[1]; and
- 50P[2].

The following current protective function serves as the Ground Zone Interlock OUTPUT start functions:

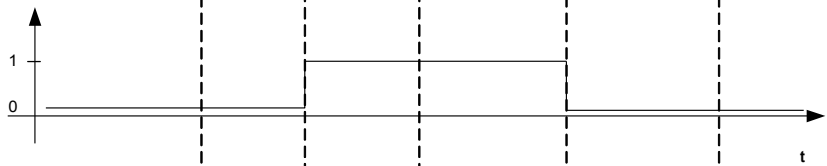
- 51X[1];
- 50X[1];
- 50X[2];
- 51R[1];
- 50R[1] and
- 50R[2].

Zone Interlocking OUTPUT Logic Timing

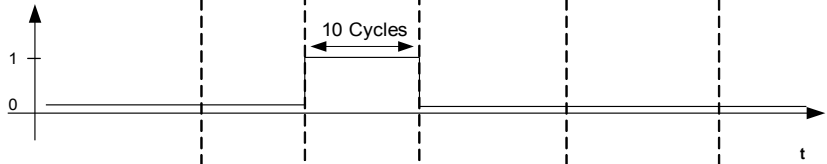
51P[1].Pickup



51P[1].Trip



Reset Timer



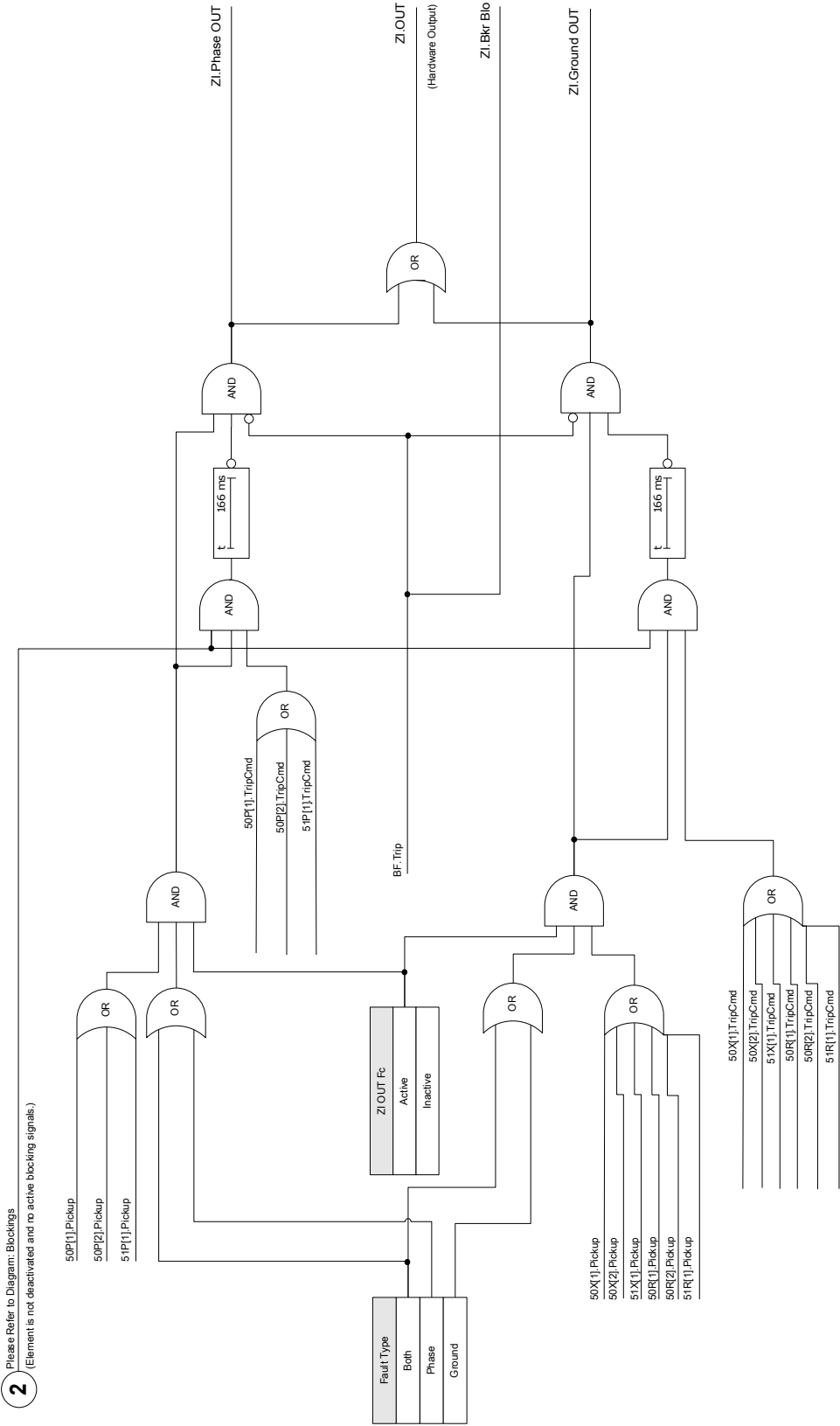
ZI.Bkr Blo



ZI.OUT



ZI Zone Out



Zone Interlocking Trip Logic [X2]

The following overcurrent protection elements trigger Phase Zone-Interlock trip functions:

- $1.5 * 51P[1]$;
- $50P[1]$; and
- $50P[2]$.

The following overcurrent protection elements trigger Ground Zone Interlock trip functions:

- $51X[1]$;
- $50X[1]$;
- $50X[2]$;
- $51R[1]$;
- $50R[1]$, and
- $50R[2]$.

Zone Interlocking TRIP Logic Timing

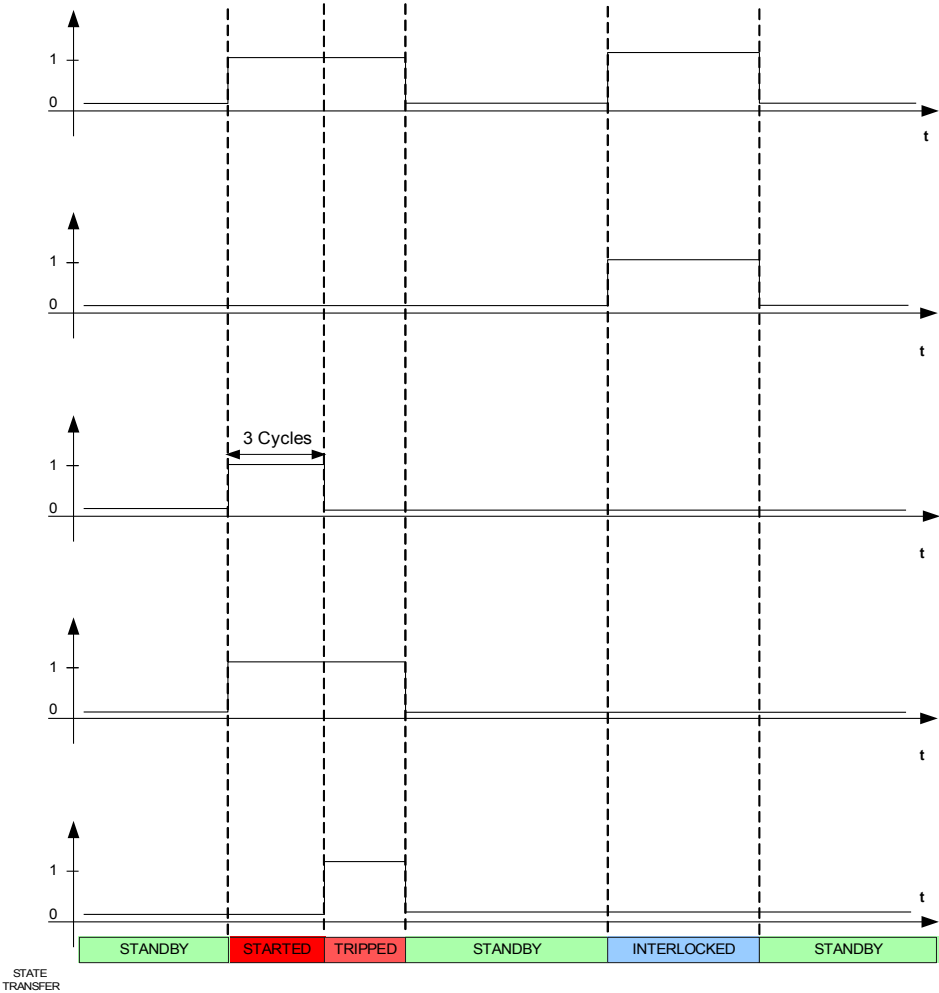
51P[1].Pickup

ZI.IN

Trip delay time

ZI.Pickup

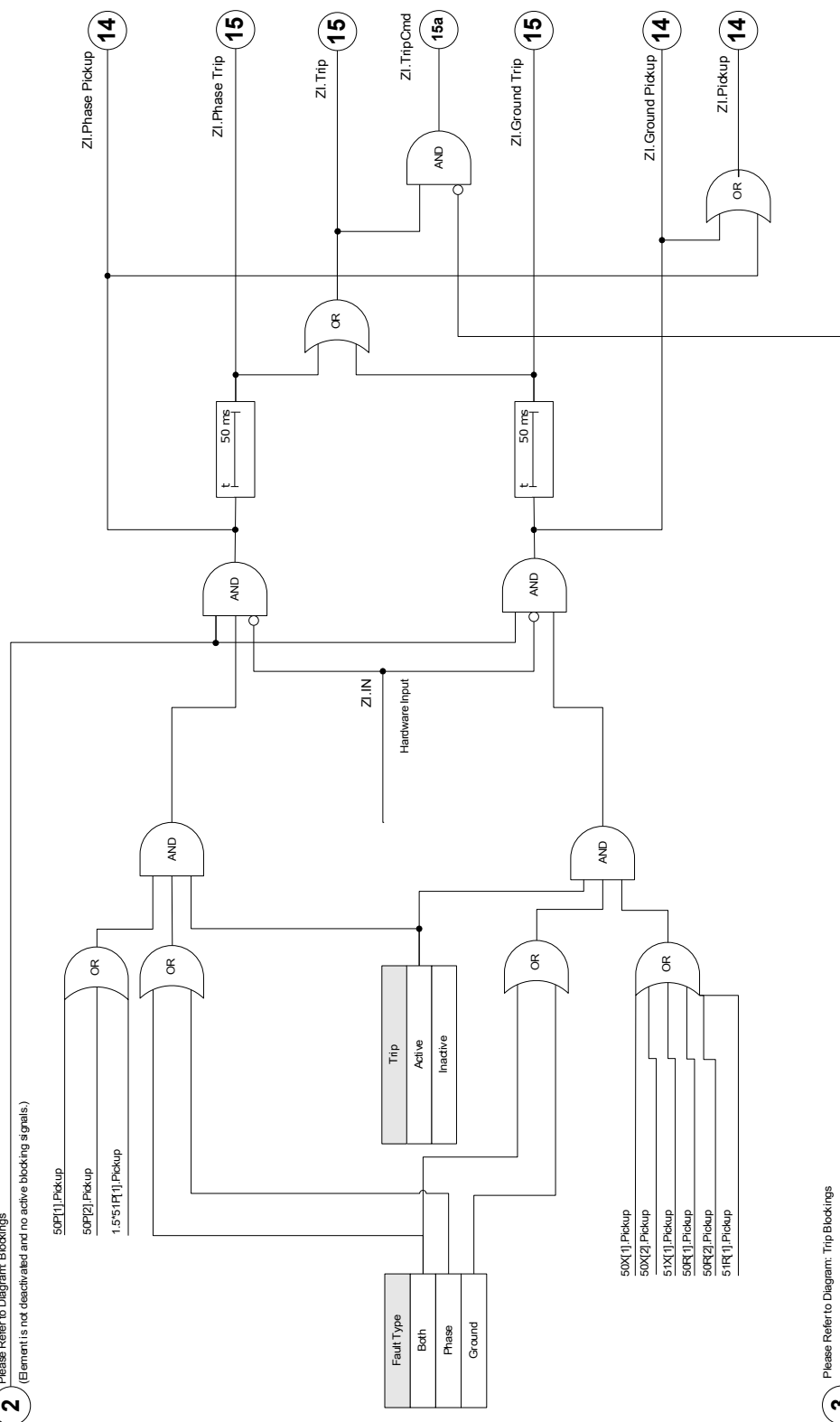
ZI.Trip



Z1.Zone Trip

Please Refer to Diagram: Blockings

(Element is not deactivated and no active blocking signals.)



Please Refer to Diagram: Trip Blockings

(Tripping command deactivated or blocked.)

Zone Interlocking Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /ZI]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /ZI]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /ZI]

Zone Interlocking Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Bkr Blo	Signal: Blocked by Breaker Failure
Phase Pickup	Signal: Zone Interlocking Phase Pickup
Phase Trip	Signal: Zone Interlocking Phase Trip
Ground Pickup	Signal: Zone Interlocking Ground Pickup
Ground Trip	Signal: Zone Interlocking Ground Trip
Pickup	Signal: Pickup Zone Interlocking
Trip	Signal: Zone Interlocking Trip
TripCmd	Signal: Zone Interlocking Trip Command
Phase OUT	Signal: Zone Interlocking Phase OUT
Ground OUT	Signal: Zone Interlocking Ground OUT
OUT	Signal: Zone Interlocking OUT
IN	Signal: Zone Interlocking IN

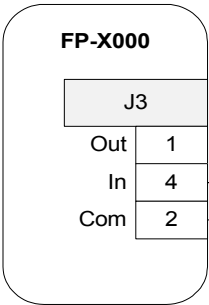
Zone Interlocking Wiring

NOTICE

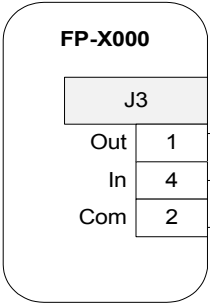
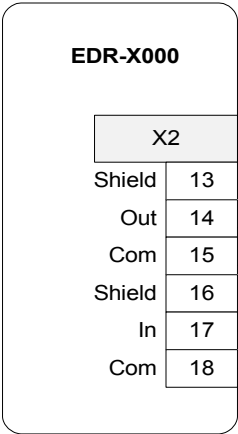
The ZI Outputs are for use with connection to electronic inputs only.

The zone interlocking connection between relays is done by means of a twisted shielded cable. Downstream zone interlock outputs may be paralleled from up to ten devices (FP-5000 or DT-3000 or a combination of both) for connection to upstream zone interlocked relays.

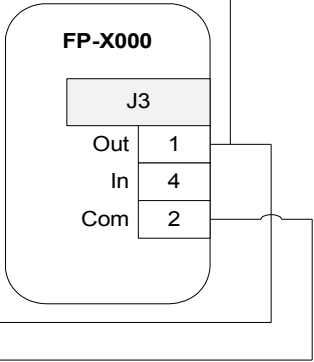
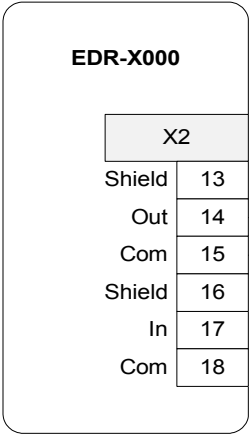
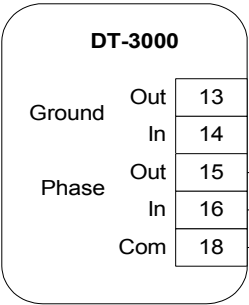
Zone 1



Zone 2



Zone 3

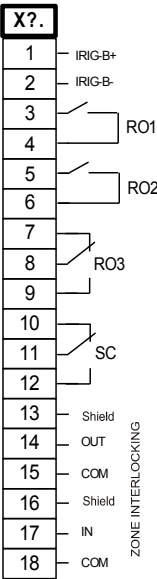


Hardware Terminals for Zone Interlocking

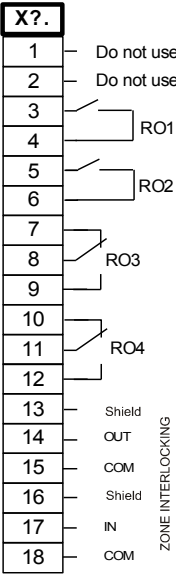
By means of the zone interlocking terminals, the device can be connected to other Eaton protective devices such as an FP5000, DT3000, etc.

As an upstream device, the terminals - Phase/Ground IN should be connected to the OUT terminals of up to ten downstream device(s) by means of a dedicated cable wired in parallel. As a downstream device, the terminals - Phase/Ground OUT should be connected to the IN terminals of an upstream device by means of a dedicated cable.

Terminal Marking X2 for Device: EDR-3000



Terminal Marking X2 for Device: EDR-4000, EDR-5000, EMR-4000, EMR-5000, EGR-4000 and EGR-5000



46 - Current Unbalance Protection

Elements:

46[1], 46[2]

This is the 46 device Current Unbalance setting, which works similar to the 47 device Voltage Unbalance setting. The positive and negative sequence currents are calculated from the 3-phase currents. The Threshold setting defines a minimum operating current magnitude of either I1 or I2 for the 46 function to operate, which ensures that the relay has a solid basis for initiating a current unbalance trip. The » $\%(I2/I1)$ « setting is the unbalance trip pickup setting. It is defined by the ratio of negative sequence current to positive sequence current – » $\%(I2/I1)$ « for ABC rotation, and » $\%(I1/I2)$ « for ACB rotation. The device will automatically select the correct ratio based on the Phase Sequence setting in the System Configuration group described above.

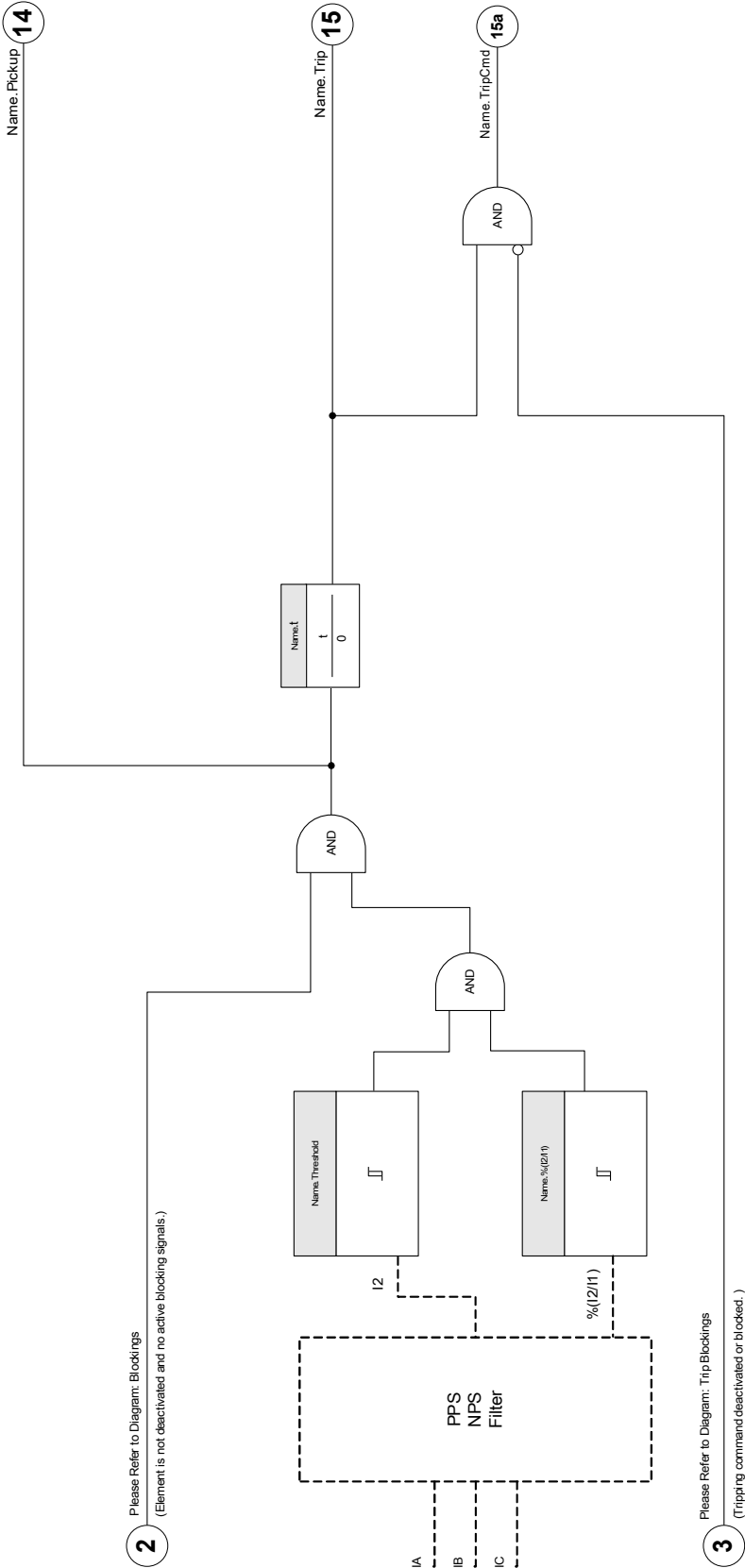
This function requires positive or negative sequence current magnitude above the threshold setting and the percentage current unbalance above the » $\%(I2/I1)$ « setting before allowing a current unbalance trip. Therefore, both the threshold and percent settings must be met for the specified delay time setting before the relay initiates a trip for current unbalance.

NOTICE

All 46 Current Unbalance are identically structured.

46[1]..[n]

Name = 46[1]..[n]



Device Planning Parameters of the Current Unbalance Module

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Do not use, Use	Use	[Device Planning]

Global Protection Parameters of the Current Unbalance Module

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Unbalance-Prot /46[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Unbalance-Prot /46[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Unbalance-Prot /46[1]]

Setting Group Parameters of the Current Unbalance Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Unbalance-Prot /46[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Unbalance-Prot /46[1]]

Parameter	Description	Setting range	Default	Menu path
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	46[1]: Inactive 46[2]: Active	[Protection Para /<1..4> /Unbalance-Prot /46[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Unbalance-Prot /46[1]]
Threshold 	The Threshold setting defines a minimum operating current magnitude of I ₂ for the 46 function to operate, which ensures that the relay has a solid basis for initiating a current unbalance trip. This is a supervisory function and not a trip level. Only available if: Device Planning: 51Q.Mode = 46	0.01 - 4.00In	0.3In	[Protection Para /<1..4> /Unbalance-Prot /46[1]]
%(I ₂ /I ₁) 	The %(I ₂ /I ₁) setting is the unbalance trip pickup setting. It is defined by the ratio of negative sequence current to positive sequence current (% Unbalance=I ₂ /I ₁). Phase sequence will be taken into account automatically. Only available if: %(I ₂ /I ₁) = Use	2 - 40%	46[1]: 40% 46[2]: 20%	[Protection Para /<1..4> /Unbalance-Prot /46[1]]
t 	Tripping delay Only available if: Characteristic = DEFT	0.00 - 300.00s	46[1]: 2s 46[2]: 10s	[Protection Para /<1..4> /Unbalance-Prot /46[1]]

Current Unbalance Module Input States

Name	Description	Assignment via
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /Unbalance-Prot /46[1]]

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /Unbalance-Prot /46[1]]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /Unbalance-Prot /46[1]]

Current Unbalance Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Pickup	Signal: Pickup Negative Sequence
Trip	Signal: Trip
TripCmd	Signal: Trip Command

Current Unbalance Module Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nPickups	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /PickupCr]
nTripCmds	Number of trip commands since last reset.	0	0 - 9999999999	[Operation /History /TripCmdCr]

Commissioning: Current Unbalance Module

Object to be tested:

Test of the unbalanced load protection function.

Necessary means:

- Three-phase current source with adjustable current unbalance; and
- Timer.

Procedure:

Check the phase sequence:

- Ensure that the phase sequence is the same as that set in the field parameters.
- Feed-in a three-phase nominal current.
- Change to the »Measuring Values« menu.
- Check the measuring value for the unbalanced current »I2 Fund.«. The measuring value displayed for »I2 Fund.« should be zero (within the physical measuring accuracy).

NOTICE

If the displayed magnitude for I2 Fund. is the same as that for the balanced nominal currents fed to the relay, it implies that the phase sequence of the currents seen by the relay is reversed.

Now turn-off phase A.

- Again check the measuring value of the unbalanced current »I2 Fund.« in the »Measuring Values« menu. The measuring value of the unbalanced current »I2 Fund.« should now be 33%.
- Turn-on phase A, but turn-off phase B.
- Once again check the measuring value of the unbalanced current I2 Fund. in the »Measuring Values« menu. The measuring value of the asymmetrical current »I2 Fund.« should be again 33%.
- Turn-on phase B, but turn-off phase C.
- Again check the measuring value of unbalanced current »I2 Fund.« in the »Measuring Values« menu. The measuring value of the unbalanced current »I2 Fund.« should still be 33%.

Testing the trip delay:

Apply a balanced three-phase current system (nominal currents).

- Switch off IA (the threshold value »Threshold« for »I2 Fund.« must be below 33%).
- Measure the tripping time.

The present current unbalance »I2 Fund.« corresponds with 1/3 of the existing phase current displayed.

Testing the threshold values

- Configure minimum » $\%(I2/I1)$ « setting (2%) and an arbitrary threshold value » *Threshold* « (I2 Fund.).
- For testing the threshold value, a current has to be fed to phase A which is lower than three times the adjusted threshold value » *Threshold* « (I2 Fund.).
- Feeding only phase A results in » $\%(I2/I1) = 100\%$ «, so the first condition » $\%(I2/I1) \geq 2\%$ « is always fulfilled.
- Now increase the phase A current until the relay is activated.

Testing the dropout ratio of the threshold values

Having tripped the relay in the previous test, now decrease the phase A current. The dropout ratio must not be higher than 0.97 times the threshold value.

Testing $\%(I2/I1)$

- Configure minimum threshold value » *Threshold* « (I2 Fund.) ($0.01 \times I_n$) and set » $\%(I2/I1)$ « greater or equal to 10%.
- Apply a balanced three-phase current system (nominal currents). The measuring value of » $\%(I2/I1)$ « should be 0%.
- Now increase the phase A current. With this configuration, the threshold value » *Threshold* « (I2 Fund.) should be reached before the value » $\%(I2/I1)$ « reaches the set » $\%(I2/I1)$ « ratio threshold.
- Continue increasing the phase 1 current until the relay is activated.

Testing the dropout ratio of $\%(I2/I1)$

Having tripped the relay in the previous test, now decrease the phase A current. The dropout of » $\%(I2/I1)$ « has to be 1% below the » $\%(I2/I1)$ « setting.

Successful test result:

The measured trip delays, threshold values, and dropout ratios are within the permitted deviations/tolerances, specified under Technical Data.

RT - Remote Trip

Available elements:

Remote Trip

NOTICE

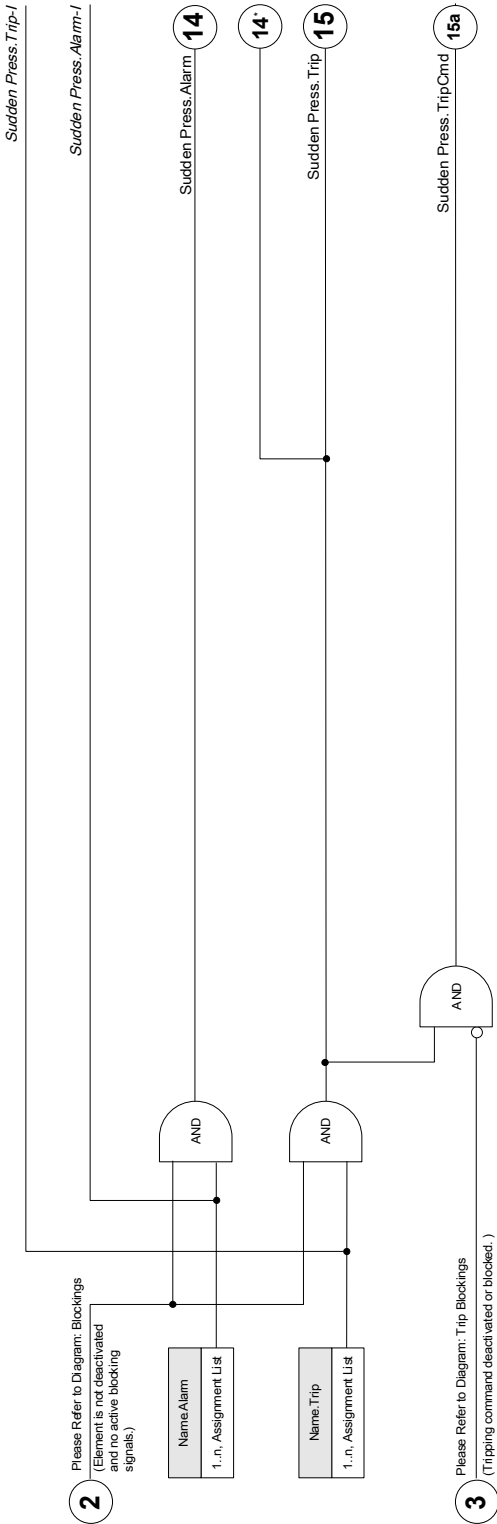
All elements of the *Remote Trip* are identically structured.

By means of these elements, the protective device can detect and execute pickups and trips that are issued by other external devices. This can be helpful, for logging purposes, if the other device is not equipped with an event or waveform recorder. This might also be helpful if the other device has no communication (SCADA) interface.

Remote Trip

Name = Remote Trip

*= If no signal is assigned to the pickup input



Device Planning Parameters of the Remote Trip Module

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Do not use, Use	Use	[Device Planning]

Global Protection Parameters of the Remote Trip Module

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Remote Trip]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Remote Trip]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Remote Trip]
Alarm 	Assignment for External Alarm	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Remote Trip]
Trip 	External trip of the Bkr. if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Remote Trip]

Setting Group Parameters of the Remote Trip Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Remote Trip]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Remote Trip]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Remote Trip]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Remote Trip]

Remote Trip Module Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /Remote Trip]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /Remote Trip]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /Remote Trip]
Alarm-I	Module Input State: Alarm	[Protection Para /Global Prot Para /Remote Trip]
Trip-I	Module Input State: Trip	[Protection Para /Global Prot Para /Remote Trip]

Remote Trip Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm	Signal: Alarm
Trip	Signal: Trip
TripCmd	Signal: Trip Command

Values of the Remote Trip Module

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nPickups	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /PickupCr]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nTripCmds	Number of trip commands since last reset.	0	0 - 9999999999	[Operation /History /TripCmdCr]

Commissioning: Remote Trip

Object to be tested:

Test of the External Protection Module.

Necessary means:

Dependent on the application.

Procedure:

Simulate the functionality of the External Protection (pickup, trip, and blockings) by (de-)energizing the digital inputs.

Successful test result:

All external pickups, external trips, and external blockings are correctly recognized and processed by the device.

ExP - External Protection

Available elements:

ExP[1] . ExP[2] . ExP[3] . ExP[4]

NOTICE

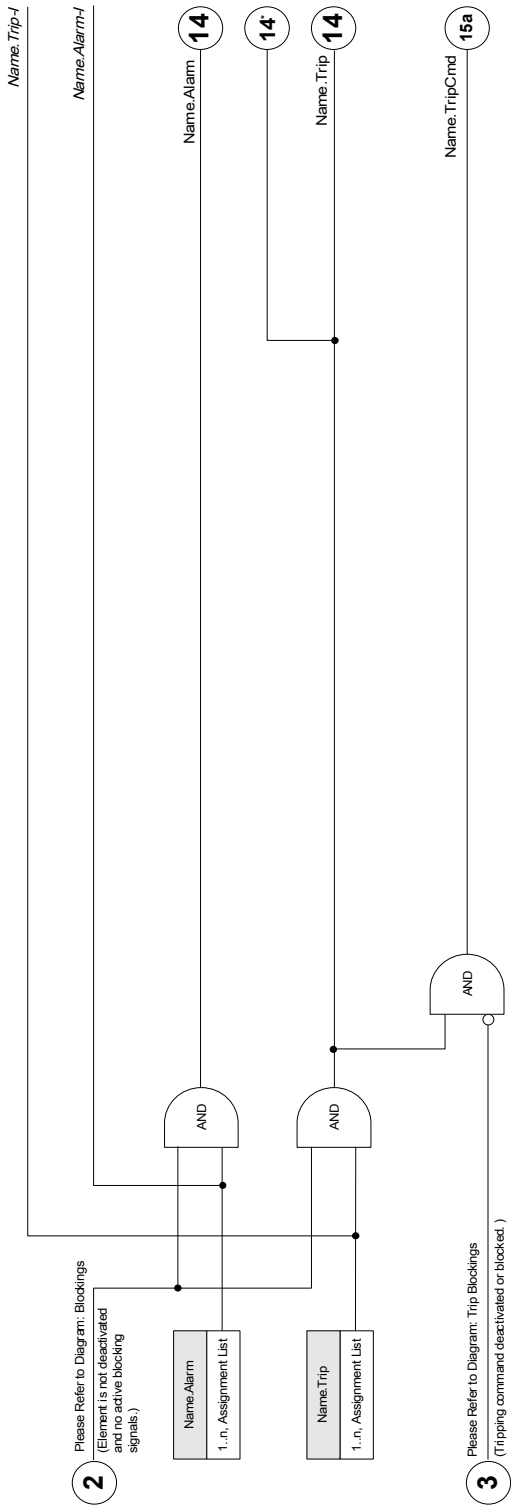
All elements of the external protection ExP[1]...[4] are identically structured.

By means of these elements, the protective device can detect and execute pickups and trips that are issued by other external devices. This can be helpful, for logging purposes, if the other device is not equipped with an event or waveform recorder. This might also be helpful if the other device has no communication (SCADA) interface.

Exp[1]..[n]

Name = Exp[1]..[n]

*=if no signal is assigned to the pickup input



Device Planning Parameters of the External Protection Module

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Do not use, Use	Do not use	[Device Planning]

Global Protection Parameters of the External Protection Module

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Exp /Exp[1]]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Exp /Exp[1]]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Exp /Exp[1]]
Alarm 	Assignment for External Alarm	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Exp /Exp[1]]
Trip 	External trip of the Bkr. if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Exp /Exp[1]]

Setting Group Parameters of the External Protection Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Exp /Exp[1]]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Exp /Exp[1]]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Exp /Exp[1]]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Exp /Exp[1]]

External Protection Module Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /ExP /ExP[1]]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /ExP /ExP[1]]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /ExP /ExP[1]]
Alarm-I	Module Input State: Alarm	[Protection Para /Global Prot Para /ExP /ExP[1]]
Trip-I	Module Input State: Trip	[Protection Para /Global Prot Para /ExP /ExP[1]]

External Protection Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm	Signal: Alarm
Trip	Signal: Trip
TripCmd	Signal: Trip Command

Counter Values of the External Protection

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nPickups	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /PickupCr]
nTripCmds	Number of trip commands since last reset.	0	0 - 9999999999	[Operation /History /TripCmdCr]

Commissioning: External Protection

Object to be tested:

Test of the External Protection Module.

Necessary means:

Dependent on the application.

Procedure:

Simulate the functionality of the External Protection (pickup, trip, and blockings) by (de-)energizing the digital inputs.

Successful test result:

All external pickups, external trips, and external blockings are correctly recognized and processed by the device.

Ex87 - External Differential Protection

Available elements:

Ex87

NOTICE

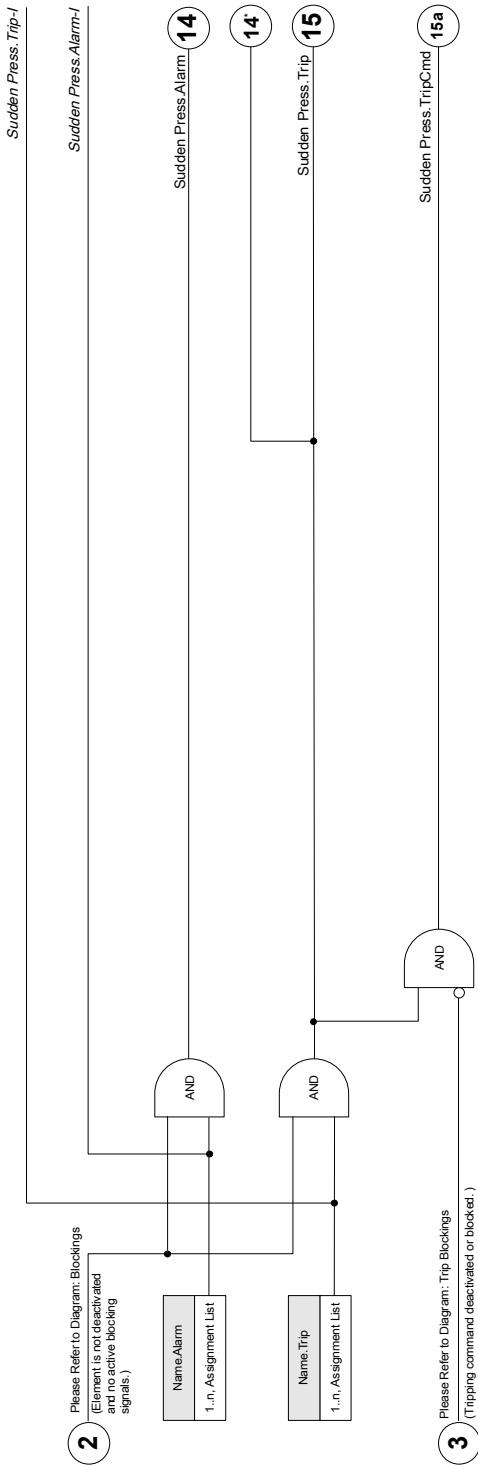
All elements of the external differential protection are identically structured.

By means of these elements, the protective device can detect and execute pickups and trips that are issued by other external devices. This can be helpful, for logging purposes, if the other device is not equipped with an event or waveform recorder. This might also be helpful if the other device has no communication (SCADA) interface.

Ex87

Name = Ex87

*=If no signal is assigned to the pickup input



Device Planning Parameters of the External Differential Protection

Parameter	Description	Options	Default	Menu path
Mode	Mode	Do not use, Use	Use	[Device Planning]
				

Global Protection Parameters of the External Differential Protection

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Ex87]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Ex87]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Ex87]
Alarm 	Assignment for External Alarm	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Ex87]
Trip 	External trip of the Bkr. if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Ex87]

Setting Group Parameters of the External Differential Protection Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Ex87]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Ex87]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Ex87]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Ex87]

External Differential Protection Module Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /Ex87]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /Ex87]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /Ex87]
Alarm-I	Module Input State: Alarm	[Protection Para /Global Prot Para /Ex87]
Trip-I	Module Input State: Trip	[Protection Para /Global Prot Para /Ex87]

External Differential Protection Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm	Signal: Alarm
Trip	Signal: Trip
TripCmd	Signal: Trip Command

Values of the External Differential

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nPickups	Number of alarms since last reset.	0	0 - 9999999999	[Operation /History /PickupCr]
nTripCmds	Number of trip commands since last reset.	0	0 - 9999999999	[Operation /History /TripCmdCr]

Commissioning: External Differential Protection

Object to be tested:

Test of the External Protection Module.

Necessary means:

Dependent on the application.

Procedure:

Simulate the functionality of the External Differential Protection (pickup, trip, and blockings) by (de-)energizing the digital inputs.

Successful test result:

All external pickups, external trips, and external blockings are correctly recognized and processed by the device.

RTD Protection Module [26]

Elements:

RTD

General – Principle Use

NOTICE

The Resistance-based Temperature Detector (RTD) Protection Module uses temperature data that are provided by Eaton's Universal Resistance-based Temperature Detector (URTD) module (please refer to the URTD Module section) or Eaton's Universal Resistance-based Temperature Detector II (URTDII) module (please refer to the URTDII Module section).

NOTICE

If voting trip is required, please map the output used for tripping purposes: "RTD. Voting Trip Grp 1" or "RTD. Voting Trip Grp 2".

The protective device provides tripping and alarming functions based on the direct temperature measurements read from Eaton's (URTD) device that has 11 temperature sensor channels or Eaton's (URTDII) device that has 11 or 12 temperature sensor channels. Each channel will have one trip function without an intended delay and one alarm function with a delay.

- The "trip" function has only a threshold setting.
- Each individual »Alarm Function« will have a threshold setting range, and can be individually enabled or disabled. Since the temperature cannot change instantaneously (which is a way that temperature differs from current), the "delay" is essentially built in to the function due to the fact that the temperature will take some time to increase from room temperature to the "trip threshold" level.
- The dropout ratio for both trip and alarm is 0.99.
- The temperature rise is limited by the RTD driver.
- The entire function can be turned off or on, or individual channels can be turned off or on.

Voting

Additionally, RTD voting schemes are available and User programmable. The Voting feature must be activated and configured within the following menu, [Protection Para\Set[x]\Temp-Prot/ RTD\Vote[x]]. Here, the setting »*Function*« has to be set to »*Active*«.

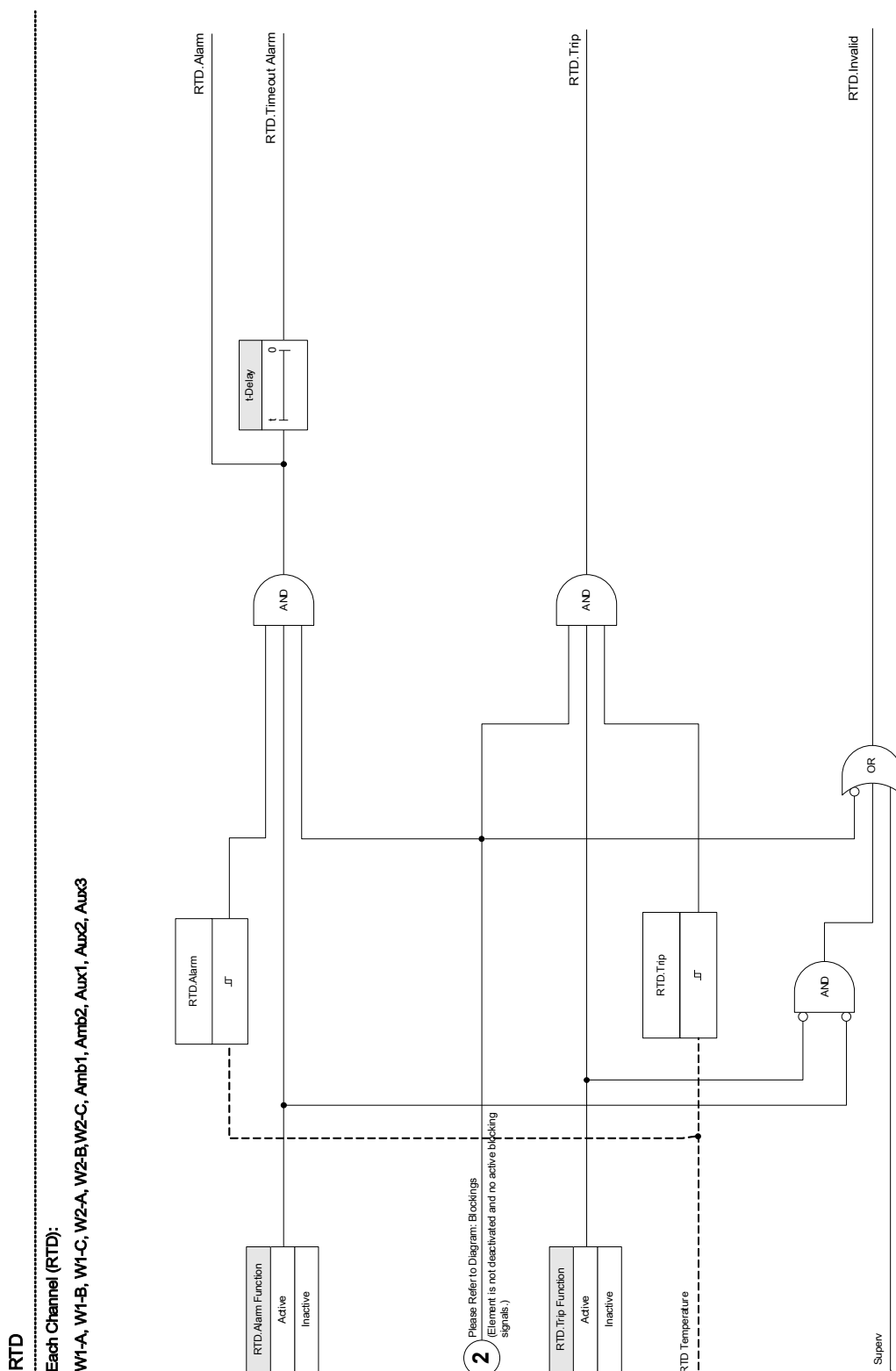
Once activated, the number of channels that will be used by the voting feature is selected. This is set by way of the parameter »*Voting[x]*«. This parameter defines how many of the selected channels must be over its threshold level in order to get a voting trip. Each individual channel must be selected or deselected by setting to either »*Yes*« or »*No*«. When selecting »*Yes*«, the channel will be used in the voting process. Note that in order to be selected, each channel must also be active and the RTD module itself has to be active.

If for example, Vote[x] is set to »*3*«, and all channels are set to »*Yes*«, and if any three of the selected channels exceed their individual threshold settings, a Vote trip will occur.

Please note that the voting trip will be issued as a RTD trip only, if the parameter »*TripCmd Selection*« is set to »*Voting trip*« within the Global Protection Parameters of the RTD module. The Trip has to be assigned then within the trip manager to the Breaker.

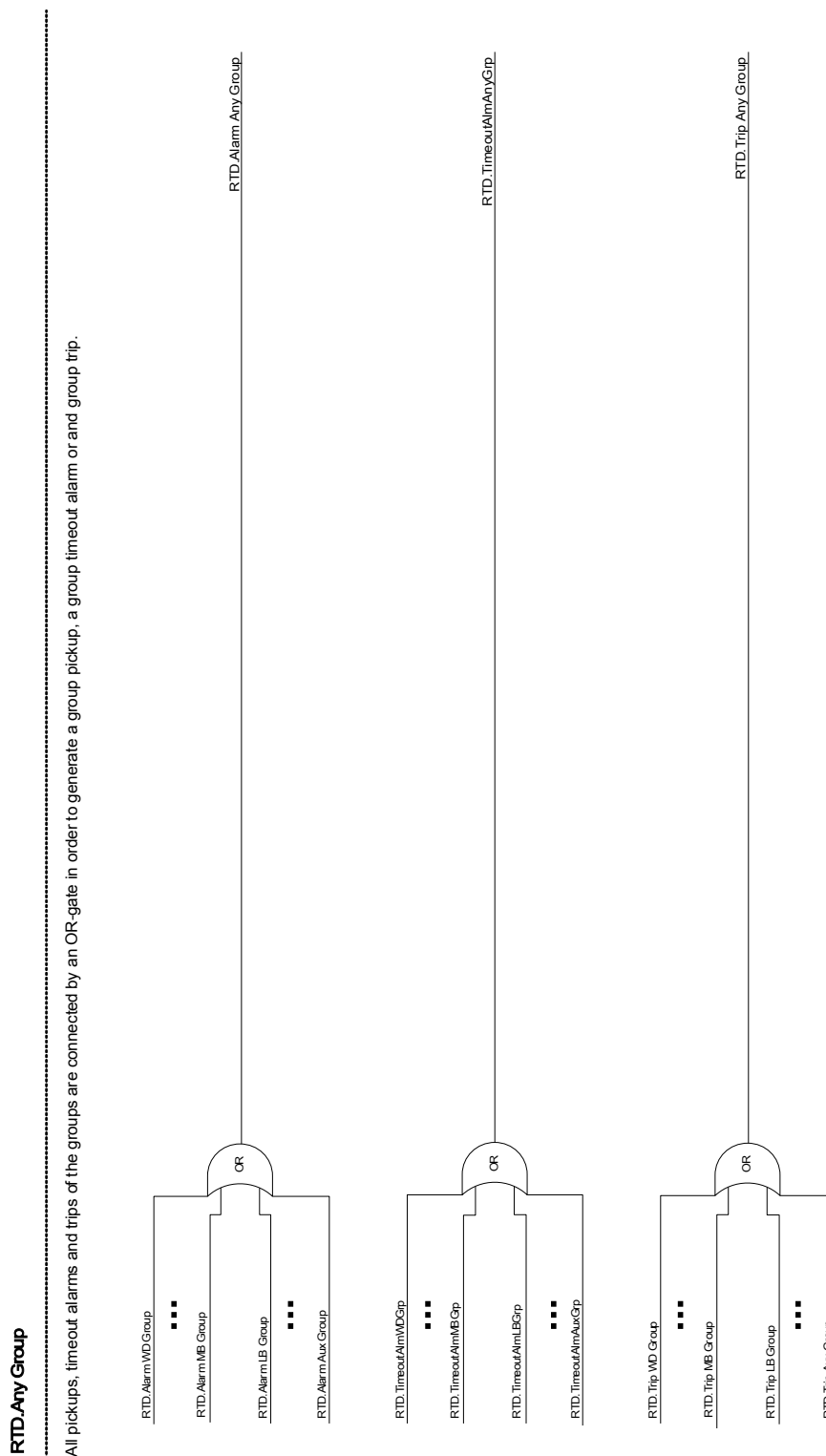
Alarm, Timeout Alarm and Trip Principle for each RTD Sensor

The following diagram shows the general working principle (delayed alarm, undelayed trip) of each of the RTD sensors.



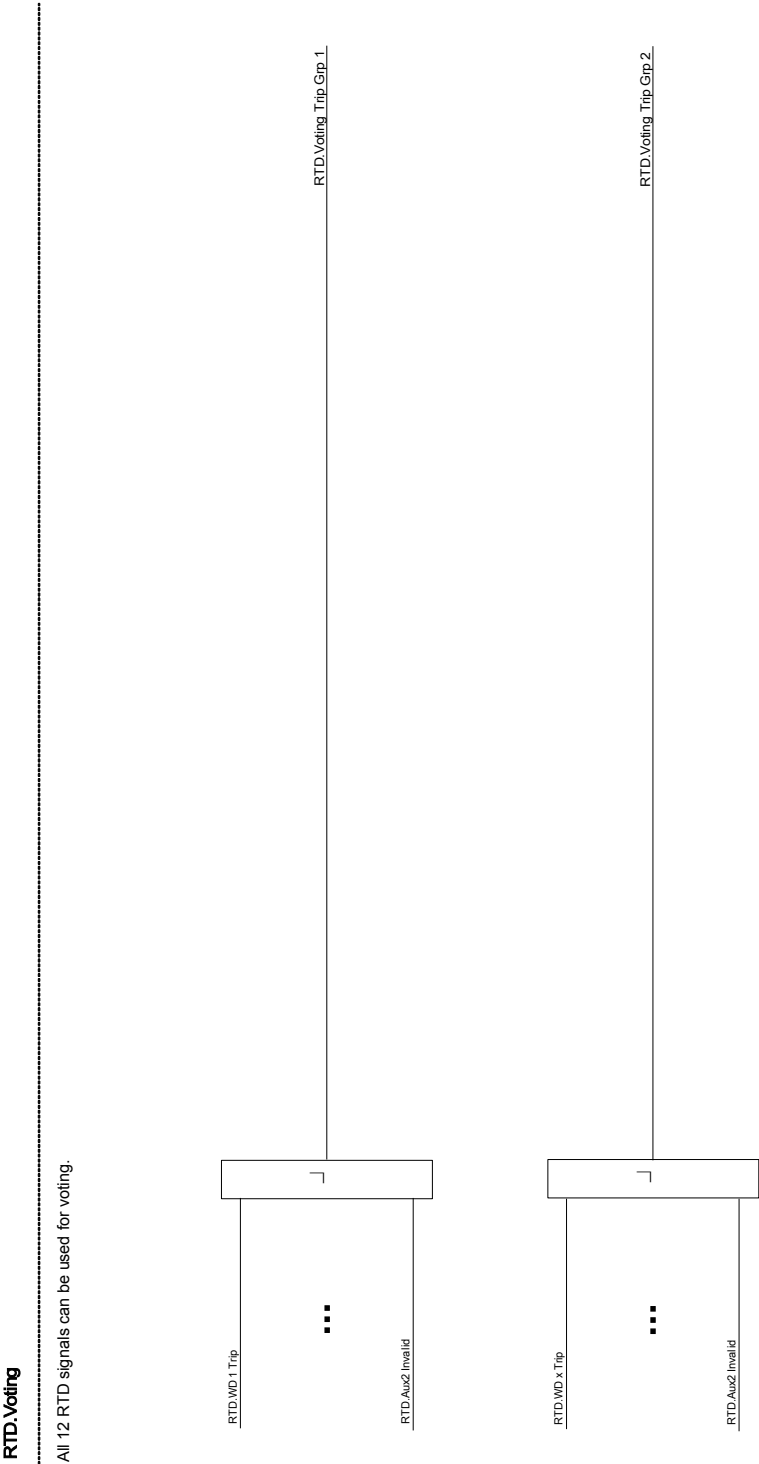
Collective Alarm, Timeout Alarm and Trip Signals

The RTD sensors are assigned to four groups (depending on the ordered device). These four groups are OR-connected to the "AnyGroup". The AnyGroup generates an alarm, an timeout alarm and a trip signal if any of the sensors mounted into this issues the corresponding signal.



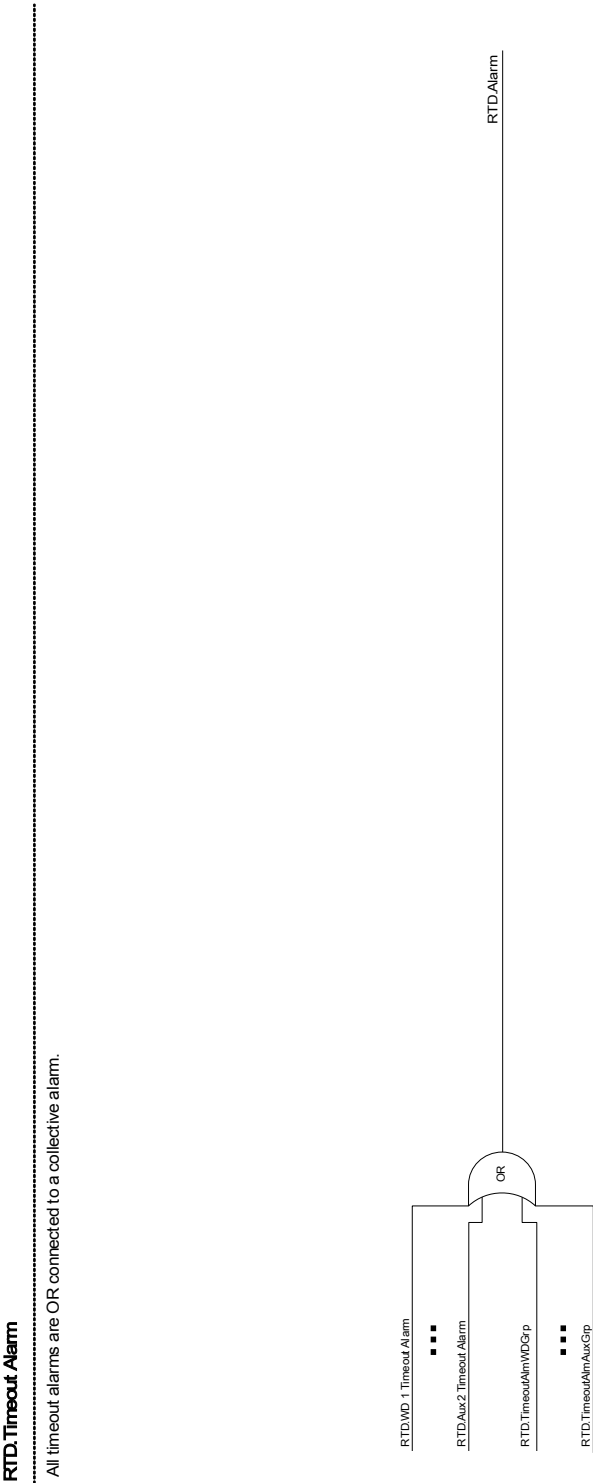
Trips of the Voting Groups

In order to use voting groups the user has to determine the sensors that should belong to a voting group and how many of them have to trip in order to generate a voting trip of the corresponding group.



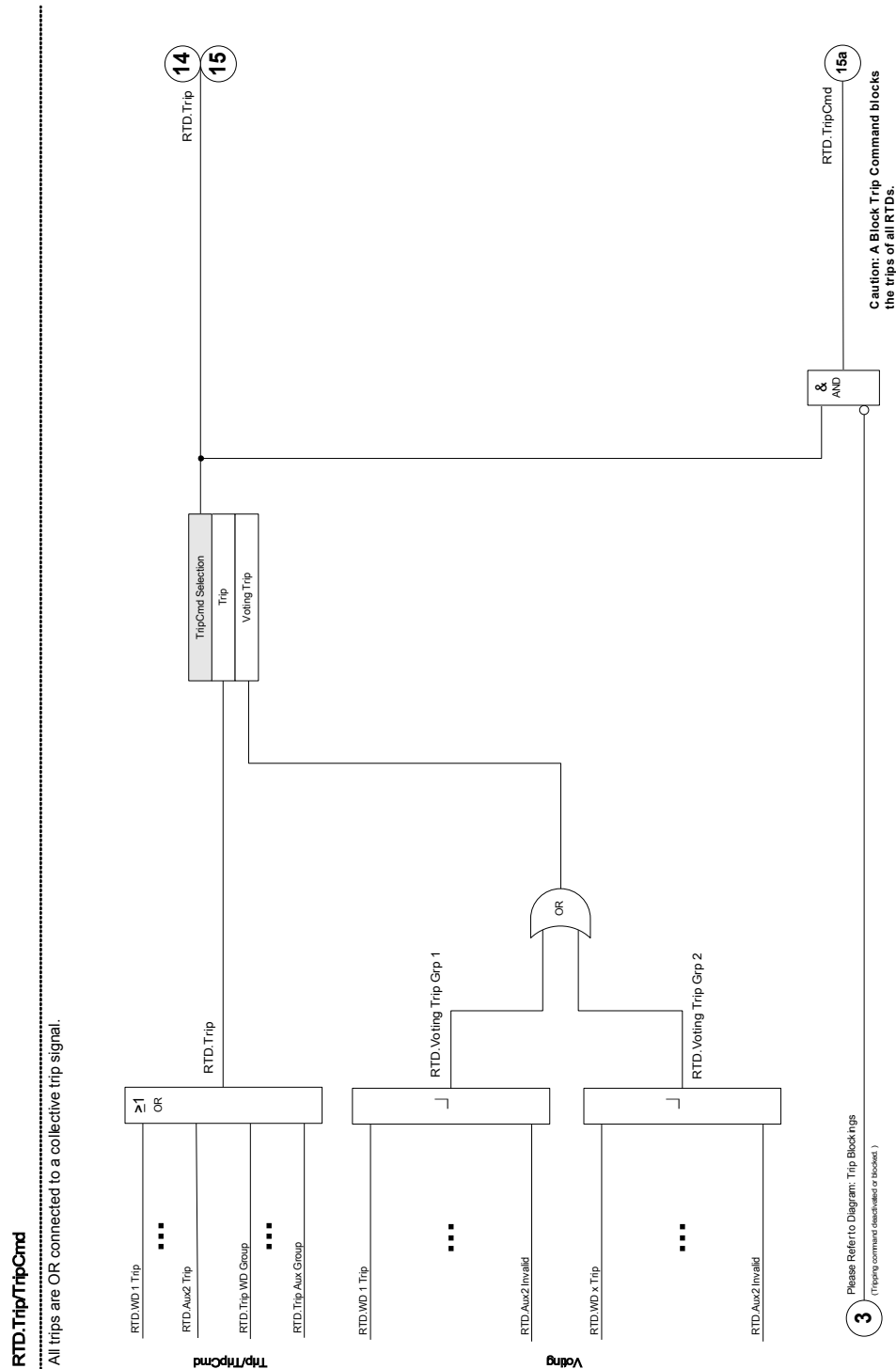
Collective Timeout Alarm Signal

All RTD sensor timeout alarms and all group timeouts are OR-connected.



Collective Trip Signal

By means of the trip command selection »*TripCmdSelection*« the user determines if the RTD element should use for the final trip signal the OR-connected default RTD trips or if the RTD element should use the OR-connected voting trips.



Device Planning Parameters of the RTD Temperature Protection Module

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Do not use, Use	Use	[Device Planning]

Global Protection Parameters of the RTD Temperature Protection Module

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Temp-Prot /RTD]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Temp-Prot /RTD]
ExBlo TripCmd 	External blocking of the Trip Command of the module/the element, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Temp-Prot /RTD]
TripCmd Selection 	This parameter determines if the final trip of the RTD module is issued by the default way or by the voting groups.	Trip, Voting Trip	Trip	[Protection Para /Global Prot Para /Temp-Prot /RTD]

Setting Group Parameters of the RTD Temperature Protection Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /General Settings]

Parameter	Description	Setting range	Default	Menu path
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /General Settings]
Blo TripCmd 	Permanent blocking of the Trip Command of the module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /General Settings]
ExBlo TripCmd Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo TripCmd Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /General Settings]
WD 1 Alarm Function 	Winding 1 Alarm Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /WD 1]
WD 1 Trip Function 	Winding 1 Trip Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /WD 1]
WD 1 Alarm 	Winding 1 Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD 1]

Parameter	Description	Setting range	Default	Menu path
WD 1 t-Delay 	Winding 1 If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /WD 1]
WD 1 Trip 	Winding 1 Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD 1]
WD 2 Alarm Function 	Winding 2 Alarm Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /WD 2]
WD 2 Trip Function 	Winding 2 Trip Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /WD 2]
WD 2 Alarm 	Winding 2 Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD 2]
WD 2 t-Delay 	Winding 2 If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /WD 2]
WD 2 Trip 	Winding 2 Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD 2]

Parameter	Description	Setting range	Default	Menu path
WD 3 Alarm Function 	Winding 3 Alarm Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /WD 3]
WD 3 Trip Function 	Winding 3 Trip Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /WD 3]
WD 3 Alarm 	Winding 3 Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD 3]
WD 3 t-Delay 	Winding 3 If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /WD 3]
WD 3 Trip 	Winding 3 Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD 3]
WD 4 Alarm Function 	Winding 4 Alarm Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /WD 4]
WD 4 Trip Function 	Winding 4 Trip Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /WD 4]

Parameter	Description	Setting range	Default	Menu path
WD 4 Alarm 	Winding 4 Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD 4]
WD 4 t-Delay 	Winding 4 If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /WD 4]
WD 4 Trip 	Winding 4 Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD 4]
WD 5 Alarm Function 	Winding 5 Alarm Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /WD 5]
WD 5 Trip Function 	Winding 5 Trip Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /WD 5]
WD 5 Alarm 	Winding 5 Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD 5]
WD 5 t-Delay 	Winding 5 If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /WD 5]

Parameter	Description	Setting range	Default	Menu path
WD 5 Trip 	Winding 5 Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD 5]
WD 6 Alarm Function 	Winding 6 Alarm Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /WD 6]
WD 6 Trip Function 	Winding 6 Trip Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /WD 6]
WD 6 Alarm 	Winding 6 Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD 6]
WD 6 t-Delay 	Winding 6 If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /WD 6]
WD 6 Trip 	Winding 6 Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD 6]
MB 1 Alarm Function 	Motor Bearing 1 Alarm Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /MB 1]

Parameter	Description	Setting range	Default	Menu path
MB 1 Trip Function 	Motor Bearing 1 Trip Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /MB 1]
MB 1 Alarm 	Motor Bearing 1 Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /MB 1]
MB 1 t-Delay 	Motor Bearing 1 If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /MB 1]
MB 1 Trip 	Motor Bearing 1 Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /MB 1]
MB 2 Alarm Function 	Motor Bearing 2 Alarm Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /MB 2]
MB 2 Trip Function 	Motor Bearing 2 Trip Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /MB 2]
MB 2 Alarm 	Motor Bearing 2 Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /MB 2]

Parameter	Description	Setting range	Default	Menu path
MB 2 t-Delay 	Motor Bearing 2 If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /MB 2]
MB 2 Trip 	Motor Bearing 2 Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /MB 2]
LB 1 Alarm Function 	Load Bearing 1 Alarm Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /LB 1]
LB 1 Trip Function 	Load Bearing 1 Trip Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /LB 1]
LB 1 Alarm 	Load Bearing 1 Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /LB 1]
LB 1 t-Delay 	Load Bearing 1 If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /LB 1]
LB 1 Trip 	Load Bearing 1 Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /LB 1]

Parameter	Description	Setting range	Default	Menu path
LB 2 Alarm Function 	Load Bearing 2 Alarm Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /LB 2]
LB 2 Trip Function 	Load Bearing 2 Trip Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /LB 2]
LB 2 Alarm 	Load Bearing 2 Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /LB 2]
LB 2 t-Delay 	Load Bearing 2 If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /LB 2]
LB 2 Trip 	Load Bearing 2 Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /LB 2]
Aux1 Alarm Function 	Auxiliary 1 Alarm Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /Aux1]
Aux1 Trip Function 	Auxiliary 1 Trip Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /Aux1]

Parameter	Description	Setting range	Default	Menu path
Aux1 Alarm 	Auxiliary 1 Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function1 = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /Aux1]
Aux1 t-Delay 	Auxiliary 1 If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function1 = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /Aux1]
Aux1 Trip 	Auxiliary 1 Threshold for Temperature Trip Only available if: Device Planning: Trip Function2 = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /Aux1]
Aux2 Alarm Function 	Auxiliary 2 Alarm Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /Aux2]
Aux2 Trip Function 	Auxiliary 2 Trip Function	Inactive, Active	Active	[Protection Para /<1..4> /Temp-Prot /RTD /Aux2]
Aux2 Alarm 	Auxiliary 2 Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function2 = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /Aux2]
Aux2 t-Delay 	Auxiliary 2 If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function2 = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /Aux2]

Parameter	Description	Setting range	Default	Menu path
Aux2 Trip 	Auxiliary 2 Threshold for Temperature Trip Only available if: Device Planning: Trip Function2 = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /Aux2]
WD Alarm Function 	Winding Alarm Function	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /WD Group]
WD Trip Function 	Winding Trip Function	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /WD Group]
WD Alarm 	Winding Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD Group]
WD t-Delay 	Winding If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /WD Group]
WD Trip 	Winding Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /WD Group]
MB Alarm Function 	Motor Bearing Alarm Function	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /MB Group]

Parameter	Description	Setting range	Default	Menu path
MB Trip Function 	Motor Bearing Trip Function	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /MB Group]
MB Alarm 	Motor Bearing Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /MB Group]
MB t-Delay 	Motor Bearing If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /MB Group]
MB Trip 	Motor Bearing Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /MB Group]
LB Alarm Function 	Load Bearing Alarm Function	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /LB Group]
LB Trip Function 	Load Bearing Trip Function	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /LB Group]
LB Alarm 	Load Bearing Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /LB Group]

Parameter	Description	Setting range	Default	Menu path
LB t-Delay 	Load Bearing If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /LB Group]
LB Trip 	Load Bearing Threshold for Temperature Trip Only available if: Device Planning: Trip Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /LB Group]
Aux Alarm Function 	Auxiliary Alarm Function	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /Aux Group]
Aux Trip Function 	Auxiliary Trip Function	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /Aux Group]
Aux Alarm 	Auxiliary Threshold for Temperature Alarm Only available if: Device Planning: Alarm Function = Use	0 - 200°C	80°C	[Protection Para /<1..4> /Temp-Prot /RTD /Aux Group]
Aux t-Delay 	Auxiliary If this time is expired a Temperature Alarm will be generated. Only available if: Device Planning: Alarm Function = Use	0 - 360min	1min	[Protection Para /<1..4> /Temp-Prot /RTD /Aux Group]
Aux Trip 	Auxiliary Threshold for Temperature Trip Only available if: Device Planning: Aux = Use	0 - 200°C	100°C	[Protection Para /<1..4> /Temp-Prot /RTD /Aux Group]

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
Voting 1 	Voting: This parameter defines how many of the selected channels must be over its threshold level for getting a voting trip	1 - 12	1	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
WD 1 	Winding 1	No, Yes	Yes	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
WD 2 	Winding 2	No, Yes	Yes	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
WD 3 	Winding 3	No, Yes	Yes	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
WD 4 	Winding 4	No, Yes	Yes	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
WD 5 	Winding 5	No, Yes	Yes	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]

Parameter	Description	Setting range	Default	Menu path
WD 6 	Winding 6	No, Yes	Yes	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
MB 1 	Motor Bearing 1	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
MB 2 	Motor Bearing 2	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
LB 1 	Load Bearing 1	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
LB 2 	Load Bearing 2	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
Aux1 	Auxiliary1	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]
Aux2 	Auxiliary2	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting1]

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
Voting 2 	Voting: This parameter defines how many of the selected channels must be over its threshold level for getting a voting trip	1 - 12	1	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
WD 1 	Winding 1	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
WD 2 	Winding 2	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
WD 3 	Winding 3	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
WD 4 	Winding 4	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
WD 5 	Winding 5	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]

Parameter	Description	Setting range	Default	Menu path
WD 6 	Winding 6	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
MB 1 	Motor Bearing 1	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
MB 2 	Motor Bearing 2	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
LB 1 	Load Bearing 1	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
LB 2 	Load Bearing 2	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
Aux1 	Auxiliary1	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]
Aux2 	Auxiliary2	No, Yes	No	[Protection Para /<1..4> /Temp-Prot /RTD /Voting2]

RTD Temperature Protection Module Input States

Name	Description	Assignment via
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /Temp-Prot /RTD]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /Temp-Prot /RTD]
ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command	[Protection Para /Global Prot Para /Temp-Prot /RTD]

RTD Temperature Protection Module Signals (Output States)

Signal	Description
Active	Signal: Active
ExBlo	Signal: External Blocking
Blo TripCmd	Signal: Trip Command blocked
ExBlo TripCmd	Signal: External Blocking of the Trip Command
Alarm	Alarm RTD Temperature Protection
Trip	Signal: Trip
TripCmd	Signal: Trip Command
WD 1 Trip	Winding 1 Signal: Trip
WD 1 Alarm	Winding 1 Alarm RTD Temperature Protection
WD 1 Timeout Alarm	Winding 1 Timeout Alarm
WD 1 Invalid	Winding 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
WD 2 Trip	Winding 2 Signal: Trip
WD 2 Alarm	Winding 2 Alarm RTD Temperature Protection
WD 2 Timeout Alarm	Winding 2 Timeout Alarm
WD 2 Invalid	Winding 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
WD 3 Trip	Winding 3 Signal: Trip
WD 3 Alarm	Winding 3 Alarm RTD Temperature Protection
WD 3 Timeout Alarm	Winding 3 Timeout Alarm

<i>Signal</i>	<i>Description</i>
WD 3 Invalid	Winding 3 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
WD 4 Trip	Winding 4 Signal: Trip
WD 4 Alarm	Winding 4 Alarm RTD Temperature Protection
WD 4 Timeout Alarm	Winding 4 Timeout Alarm
WD 4 Invalid	Winding 4 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
WD 5 Trip	Winding 5 Signal: Trip
WD 5 Alarm	Winding 5 Alarm RTD Temperature Protection
WD 5 Timeout Alarm	Winding 5 Timeout Alarm
WD 5 Invalid	Winding 5 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
WD 6 Trip	Winding 6 Signal: Trip
WD 6 Alarm	Winding 6 Alarm RTD Temperature Protection
WD 6 Timeout Alarm	Winding 6 Timeout Alarm
WD 6 Invalid	Winding 6 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
MB 1 Trip	Motor Bearing 1 Signal: Trip
MB 1 Alarm	Motor Bearing 1 Alarm RTD Temperature Protection
MB 1 Timeout Alarm	Motor Bearing 1 Timeout Alarm
MB 1 Invalid	Motor Bearing 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
MB 2 Trip	Motor Bearing 2 Signal: Trip
MB 2 Alarm	Motor Bearing 2 Alarm RTD Temperature Protection
MB 2 Timeout Alarm	Motor Bearing 2 Timeout Alarm
MB 2 Invalid	Motor Bearing 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
LB 1 Trip	Load Bearing 1 Signal: Trip
LB 1 Alarm	Load Bearing 1 Alarm RTD Temperature Protection
LB 1 Timeout Alarm	Load Bearing 1 Timeout Alarm
LB 1 Invalid	Load Bearing 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
LB 2 Trip	Load Bearing 2 Signal: Trip
LB 2 Alarm	Load Bearing 2 Alarm RTD Temperature Protection
LB 2 Timeout Alarm	Load Bearing 2 Timeout Alarm
LB 2 Invalid	Load Bearing 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Aux1 Trip	Auxiliary 1 Signal: Trip
Aux1 Alarm	Auxiliary 1 Alarm RTD Temperature Protection
Aux1 Timeout Alarm	Auxiliary 1 Timeout Alarm

<i>Signal</i>	<i>Description</i>
Aux1 Invalid	Auxiliary 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Aux2 Trip	Auxiliary 2 Signal: Trip
Aux2 Alarm	Auxiliary 2 Alarm RTD Temperature Protection
Aux2 Timeout Alarm	Auxiliary 2 Timeout Alarm
Aux2 Invalid	Auxiliary 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Trip WD Group	Trip all Windings
Alarm WD Group	Alarm all Windings
TimeoutAlmWDGrp	Timeout Alarm all Windings
WD Group Invalid	Winding Group Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Trip MB Group	Trip all Motor Bearings
Alarm MB Group	Alarm all Motor Bearings
TimeoutAlmMBGrp	Timeout Alarm all Motor Bearings
MB Group Invalid	Motor Bearing Group Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Trip LB Group	Trip all Load Bearings
Alarm LB Group	Alarm all Load Bearings
TimeoutAlmLBGrp	Timeout Alarm all Load Bearings
LB Group Invalid	Load Bearing Group Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
Trip Any Group	Trip Any Group
Alarm Any Group	Alarm Any Group
TimeoutAlmAnyGrp	Timeout Alarm Any Group
Voting Trip Grp 1	Voting Trip Group 1
Voting Trip Grp 2	Voting Trip Group 2
Timeout Alarm	Alarm timeout expired
Trip Aux Group	Trip Auxiliary Group
Alarm Aux Group	Alarm Auxiliary Group
TimeoutAlmAuxGrp	Timeout Alarm Auxiliary Group
AuxGrpInvalid	Invalid Auxiliary Group

RTD Temperature Protection Module Counter Values

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
Hottest WD	Hottest motor winding temperature in degrees C.	0°C	0 - 200°C	[Operation /Measured Values /URTD]
Hottest MB	Hottest motor bearing temperature in degrees C. Resettable with "Sys Res OperationsCr" or "All".	0°C	0 - 200°C	[Operation /Measured Values /URTD]
Hottest LB	Hottest load bearing temperature in degrees C. Resettable with "Sys Res OperationsCr" or "All".	0°C	0 - 200°C	[Operation /Measured Values /URTD]
Hottest Aux	Hottest Auxiliary temperature in degrees C. Resettable with "Sys Res OperationsCr" or "All".	0°C	0 - 200°C	[Operation /Measured Values /URTD]
HighestWdTemp	Highest motor winding temperature in degrees. Resettable with "Sys Res OperationsCr" or "All".	0°C	0 - 250°C	[Operation /History /OperationsCr]
HighestMbTemp	Highest motor bearing temperature in degrees. Resettable with "Sys Res OperationsCr" or "All".	0°C	0 - 250°C	[Operation /History /OperationsCr]
HighestLbTemp	Highest load bearing temperature in degrees. Resettable with "Sys Res OperationsCr" or "All".	0°C	0 - 250°C	[Operation /History /OperationsCr]
HighestAuxTemp	Highest Auxiliary temperature in degrees. Resettable with "Sys Res OperationsCr" or "All".	0°C	0 - 250°C	[Operation /History /OperationsCr]
nWdAlarms	Number of winding temperature alarms since last reset. Resettable with "Sys Res Alarm" or "All".	0	0 - 65535	[Operation /History /PickupCr]

<i>Value</i>	<i>Description</i>	<i>Default</i>	<i>Size</i>	<i>Menu path</i>
nMbAlarms	Number of motor bearing temperature alarms since last reset. Resettable with "Sys Res Alarm" or "All".	0	0 - 65535	[Operation /History /PickupCr]
nLbAlarms	Number of load bearing temperature alarms since last reset. Resettable with "Sys Res Alarm" or "All".	0	0 - 65535	[Operation /History /PickupCr]
nAuxAlarms	Number of auxiliary temperature alarms since last reset. Resettable with "Sys Res Alarm" or "All".	0	0 - 65535	[Operation /History /PickupCr]
nWdTrips	Number of winding temperature trips since last reset. Resettable with "Sys Res TripCr" or "All".	0	0 - 65535	[Operation /History /TripCmdCr]
nMbTrips	Number of motor bearing temperature trips since last reset. Resettable with "Sys Res TripCr" or "All".	0	0 - 65535	[Operation /History /TripCmdCr]
nLbTrips	Number of load bearing temperature trips since last reset. Resettable with "Sys Res TripCr" or "All".	0	0 - 65535	[Operation /History /TripCmdCr]
nAuxTrips	Number of auxiliary temperature trips since last reset. Resettable with "Sys Res TripCr" or "All".	0	0 - 65535	[Operation /History /TripCmdCr]
nChannelFails	Number of RTD channel failures.	0	0 - 65535	[Operation /History /PickupCr]

URTDII Module Interface

URTD

Principle – General Use

The optional Universal Resistance-based Temperature Detector II (URTDII) Module provides temperature data to the protective device up to 12 RTDs embedded in the motor, generator, transformer, or cable connector and driven equipment (see Eaton I.L. IL02602013E). The temperature data will be shown as measured values and statistics in the Operating Data menu. In addition, each channel will be monitored. The measured data provided by the URTDII Module can also be used for temperature protection (please refer to the Temperature Protection section).

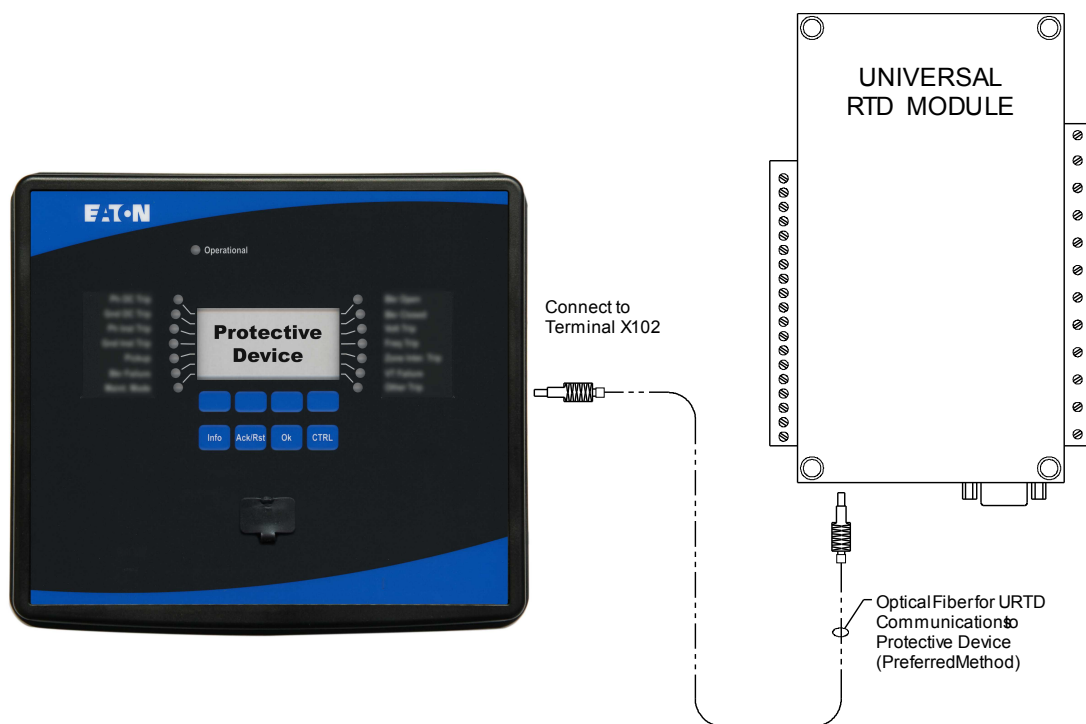
The URTDII conveys multiplexed temperature data back to the relay via a single optical fiber. The URTDII may be mounted remotely from the protective device. The fiber optic connector is located on the **X102** terminal of the protective device.

Consider the benefit of mounting the URTDII module away from the protective device and as close to the protected equipment as possible. The big bundle of RTD wires to the protected equipment becomes much shorter. The URTDII may be placed up to 400 ft (121.9 m) from the protective device with the optical fiber connection. Note that the URTDII will require a power supply connection at its remote location.

Connect a suitable source to the power terminals J10A-1 and J10A-2 on the URTDII module. Connect any of the Shield terminals to a non-current-carrying safety ground. It is recommended to have a ground connection on both sides of the unit.

<u>Style</u>	<u>Power Supply</u>
URTDII-01	48-240VAC 48-250VDC
URTDII-02	24-48VDC

URTDII Module Fiber Optic Connection to the Protective Device



The figure above shows the fiber optic connections between the URTDII Module and the protective device. The protective device supports the optical fiber connection. The following table lists the fiber optic order options.

Fiber Optic Order Options.

Cutler-Hammer Agilent Technologies

Length	Catalog Number	Number
3.3 ft (1 m)	MPFO-1	HBFR-ELS001 or HBFRRLS001
16.4 ft (5 m)	MPFO-5	HBFR-ELS005 or HBFRRLS005
32.8 ft (10 m)	MPFO-10	HBFR-ELS010 or HBFRRLS010
82.0 ft (25 m)	MPFO-25	HBFR-ELS025
164.0 ft (50 m)	MPFO-50	HBFR-ELS050
246.1 ft (75 m)	MPFO-75	HBFR-ELS075
249.3 ft (76 m)	MPFO-76	HBFR-ELS076
328.1 ft (100 m)	MPFO-100	HBFR-ELS100
393.7 ft (120 m)	MPFO-120	HBFR-ELS120
Uncut Fiber	HBFR-EUS (Length)	

The optical fiber is the only method of transmitting temperature data from the URTDII Module to the protective device.

Preassembled plastic optical fibers with connectors can be ordered from Eaton, or from any distributor of Agilent

Technologies® optical fiber products. In addition, these same distributors offer long rolls of cable with connectors that can be installed in the field. Some distributors will make custom lengths to order.

NOTICE

Force is 11 pounds (50 Newtons).

Surplus length of a pre-cut fiber does not cause a problems. Simply coil and tie the excess fiber at a convenient point. Avoid high tie pressure. Bending radius of the fiber should be greater than 2 in. (50.8 mm).

The fiber termination at the URTDII simply snaps into or out of the connector. To connect the fiber termination at the protective device, push the plug of the fiber optic onto the device interface then turn it until it “snaps”.

CAUTION

The protective device as well as the URTDII have various power supply options. Make certain that the power supply is acceptable for both units before connecting the same power supply to both devices.

Wiring RTDs to the URTDII Module

RTD Control	URTDII Connection Name	Terminals	Transformer Temperature Monitoring Point
RTD1: Alarm Functional Trip Functional W1-A Alarm W1-A t-Delay W1-A Trip	MW1	J2-1, J2-2	W1-A – Transformer Winding 1, Phase A RTD Temperature.
RTD2: Alarm Functional Trip Functional W1-B Alarm W1-B t-Delay W1-B Trip	MW2	J2-5, J2-6	W1-B - Transformer Winding 1, Phase B RTD Temperature.
RTD3: Alarm Functional Trip Functional W1-C Alarm W1-C t-Delay W1-C Trip	MW3	J2-8, J2-9	W1-C - Transformer Winding 1, Phase C RTD Temperature.
RTD4: Alarm Functional Trip Functional W2-A Alarm W2-A t-Delay W2-A Trip	MW4	J2-12, J2-13	W2-A - Transformer Winding 2, Phase A RTD Temperature.
RTD5: Alarm Functional Trip Functional W2-B Alarm W2-B t-Delay W2-B Trip	MW5	J2-15, J2-16	W2-B - Transformer Winding 2, Phase B RTD Temperature.
RTD6: Alarm Functional Trip Functional W2-C Alarm W2-C t-Delay W2-C Trip	MW6	J2-19, J2-20	W2-C - Transformer Winding 2, Phase C RTD Temperature.
RTD7: Alarm Functional Trip Functional Amb1 Alarm Amb1 t-Delay Amb1 Trip	MB1	J10B-19, J10B-20	AMB1 - Transformer Ambient RTD Temperature (1).

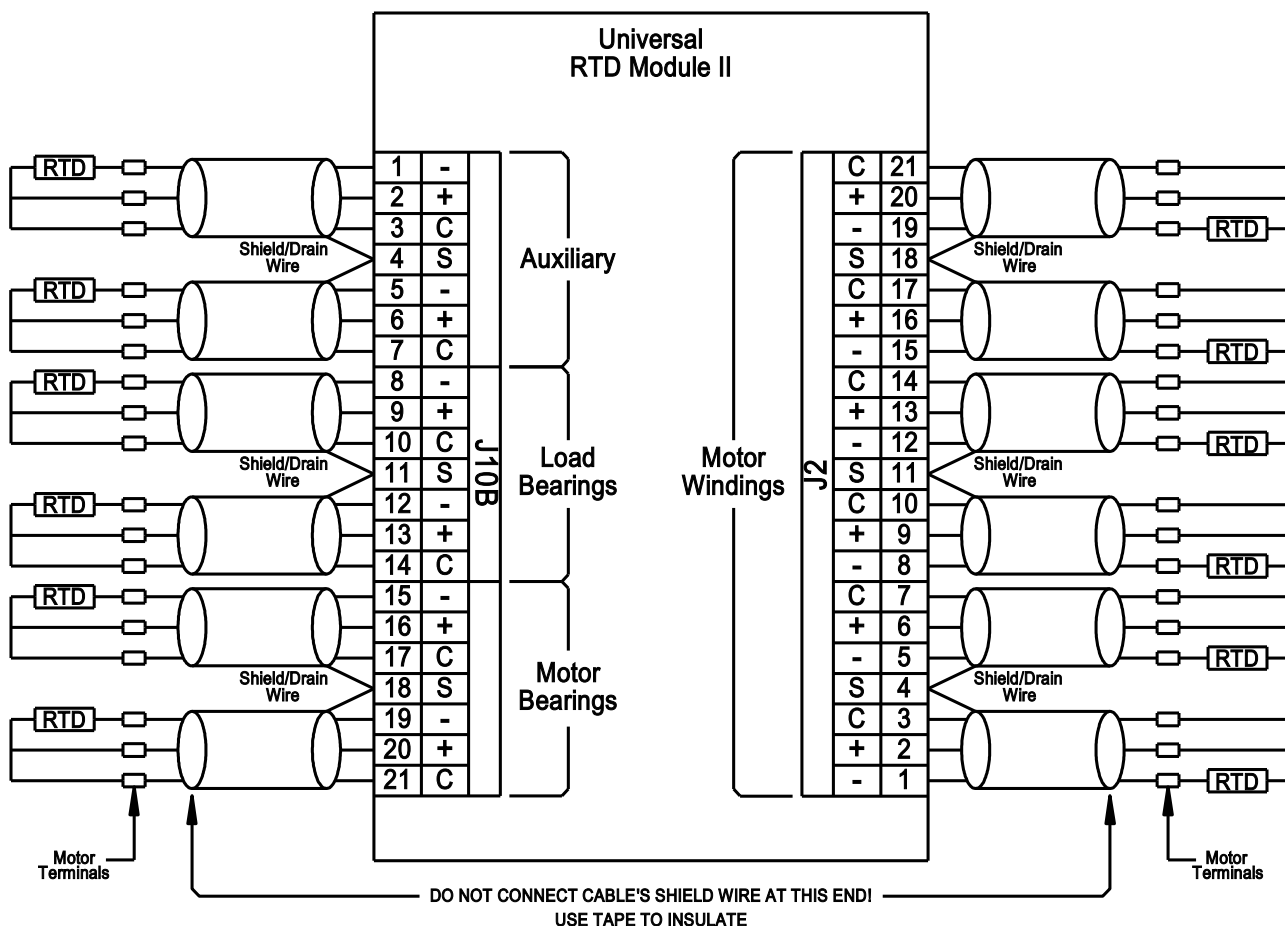
RTD Control	URTDII Connection Name	Terminals	Transformer Temperature Monitoring Point
RTD8: Alarm Functional Trip Functional Amb2 Alarm Amb2 t-Delay Amb2 Trip	MB2	J10B-15, J10B-16	AMB2 - Transformer Ambient RTD Temperature (2).
RTD9: Alarm Functional Trip Functional Aux1 Alarm Aux1 t-Delay Aux1 Trip	LB1	J10B-12, J10B-13	AUX1 – User Defined RTD Temperature.
RTD10: Alarm Functional Trip Functional Aux2 Alarm Aux2 t-Delay Aux2 Trip	LB2	J10B-8, J10B-9	AUX2 – User Defined RTD Temperature.
RTD11: Alarm Functional Trip Functional Aux3 Alarm Aux3 t-Delay Aux3 Trip	AUX1	J10B-5, J10B-6	AUX3 – User Defined RTD Temperature.
RTD12: Alarm Functional Trip Functional Aux4 Alarm Aux4 t-Delay Aux4 Trip	AUX2	J10B-1, J10B-2	AUX4 – User Defined RTD Temperature.

NOTICE

Consult the URTDII Module Instruction Leaflet (I.L. IL02602013E) for complete instructions.

Three URTD terminals are provided for each RTD input.

The three terminals for any unused RTD input channel should be wired together. For example, if MW5 and MW6 are unused, MW5 terminals J2-15, J2-16, and J2-17 should be wired together and MW6 terminals J2-19, J2-20, J2-21 should be separately wired together.



See the figure above for wiring of RTDs to the URTD inputs. Use #18 AWG, three-conductor shielded cable. Note the connection rules in the figure. When making connections to a two-lead RTD, connect two of the cable conductors to one of the RTD leads as shown. Make this connection as close to the transformer as possible. Connect the third cable conductor to the remaining RTD lead.

Connect the shield / drain wire to the Shield terminal as shown in the figure. The RTD cable shield should be connected only at the URTD end, and insulated at the RTD end. The RTD's themselves must not be grounded at the object to be protected.

Remember to set the URTDII module DIP switches according to the types of RTDs in each of the channels (see I.L. IL02602013E).

Direct Commands of the URTD Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]
Force WD1 	Force Winding 1	0 - 392	0	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]
Force WD2 	Force Winding 2	0 - 392	0	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]
Force WD3 	Force Winding 3	0 - 392	0	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]
Force WD4 	Force Winding 4	0 - 392	0	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]
Force WD5 	Force Winding 5	0 - 392	0	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]

Parameter	Description	Setting range	Default	Menu path
Force WD6 	Force Winding 6	0 - 392	0	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]
Force MB1 	Force Motor Bearing 1	0 - 392	0	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]
Force MB2 	Force Motor Bearing 2	0 - 392	0	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]
Force LB1 	Force Load Bearing 1	0 - 392	0	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]
Force LB2 	Force Load Bearing 2	0 - 392	0	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]
Force Aux1 	Force Auxiliary1	0 - 392	0	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]

Parameter	Description	Setting range	Default	Menu path
Force Aux2 	Force Auxiliary2	0 - 392	0	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]

Global Protection Parameters of the URTD Module

Parameter	Description	Setting range	Default	Menu path
 Force Mode	By means of this function the normal Relay Output States can be overwritten (forced) in case that the Relay Output is not in a disarmed state. The relays can be set from normal operation (relay works according to the assigned signals) to "force energized" or "force de-energized" state.	Permanent, Timeout	Permanent	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]
 t-Timeout Force	The Output State will be set by force for the duration of this time. That means, for the duration of this time, the Relay Output does not show the state of the signals that are assigned on it. Only available if: Mode = Timeout DISARM	0.00 - 300.00s	0.03s	[Service /Test Mode (Prot inhibit) /WARNING! Cont? /URTD]
 Temperature Unit	Temperature Unit	Celsius, Fahrenheit	Celsius	[System Para]

URTD Signals (Output States)

<i>Signal</i>	<i>Description</i>
WD1 Superv	Signal: Supervision Channel WD1
WD2 Superv	Signal: Supervision Channel WD2
WD3 Superv	Signal: Supervision Channel WD3
WD4 Superv	Signal: Supervision Channel WD4
WD5 Superv	Signal: Supervision Channel WD5
WD6 Superv	Signal: Supervision Channel WD6
MB1 Superv	Signal: Supervision Channel MB1
MB2 Superv	Signal: Supervision Channel MB2
LB1 Superv	Signal: Supervision Channel LB1
LB2 Superv	Signal: Supervision Channel LB2
Aux1 Superv	Signal: Supervision Channel Aux1
Aux2 Superv	Signal: Supervision Channel Aux2
Superv	Signal: URTD Supervision Channel
active	Signal: URTD active
Outs forced	Signal: The State of at least one Relay Output has been set by force. That means that the state of at least one Relay is forced and hence does not show the state of the assigned signals.

URTD Module Statistics

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
WD1 max	Winding1 Maximum Value	[Operation /Statistics /Max /URTD]
WD2 max	Winding2 Maximum Value	[Operation /Statistics /Max /URTD]
WD3 max	Winding3 Maximum Value	[Operation /Statistics /Max /URTD]
WD4 max	Winding4 Maximum Value	[Operation /Statistics /Max /URTD]
WD5 max	Winding5 Maximum Value	[Operation /Statistics /Max /URTD]
WD6 max	Winding6 Maximum Value	[Operation /Statistics /Max /URTD]
MB1 max	Motor Bearing1 Maximum Value	[Operation /Statistics /Max /URTD]
MB2 max	Motor Bearing2 Maximum Value	[Operation /Statistics /Max /URTD]

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
LB1 max	Load Bearing1 Maximum Value	[Operation /Statistics /Max /URTD]
LB2 max	Load Bearing2 Maximum Value	[Operation /Statistics /Max /URTD]
Aux1 max	Auxiliary1 Maximum Value	[Operation /Statistics /Max /URTD]
Aux2 max	Auxiliary2 Maximum Value	[Operation /Statistics /Max /URTD]

URTD Measured Values

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
WD1	Winding 1	[Operation /Measured Values /URTD]
WD2	Winding 2	[Operation /Measured Values /URTD]
WD3	Winding 3	[Operation /Measured Values /URTD]
WD4	Winding 4	[Operation /Measured Values /URTD]
WD5	Winding 5	[Operation /Measured Values /URTD]
WD6	Winding 6	[Operation /Measured Values /URTD]
MB1	Motor Bearing 1	[Operation /Measured Values /URTD]
MB2	Motor Bearing 2	[Operation /Measured Values /URTD]
LB1	Load Bearing 1	[Operation /Measured Values /URTD]
LB2	Load Bearing 2	[Operation /Measured Values /URTD]
Aux1	Auxiliary1	[Operation /Measured Values /URTD]

<i>Value</i>	<i>Description</i>	<i>Menu path</i>
Aux2	Auxiliary2	[Operation /Measured Values /URTD]
RTD Max	Maximum temperature of all channels.	[Operation /Measured Values /URTD]

Supervision

BF- Breaker Failure [50BF*/62BF]

*=only available in protective relays that offer current measurement.

Available elements:

BF

Principle – General Use

The breaker failure (BF) protection is used to provide backup protection in the event that a breaker fails to operate properly during fault clearing. This signal is to be used to trip the upstream breaker (e.g. infeed of a busbar) either via an output relay or via Communication. Depending on the ordered device and type there are different/multiple schemes available to detect a breaker failure.

Start/Trigger of the BF Timer

A supervision timer »*t-BF*« will be started, once the BF module is triggered. Even if the Trigger signal drops again, this timer will continue to run. If the timer runs down/elapses (is not stopped), the module will issue a trip afterwards. This trip signal is to be used to trip the upstream breaker (backup).

Stopping the BF

The timer will be stopped if the opening of the breaker is detected. Depending on the supervision scheme the timer will be stopped if the current falls below the current threshold or if the position signals indicate the open position of the breaker or a combination of both. The BF module will remain within the state rejected until the trigger signal drops (falls back).

Detecting a Breaker Failure

Depending on the supervision scheme, the Breaker Failure signal (Trip) will be set if either:

- the current doesn't fall below the threshold or
- the position signals indicate that the breaker is in the closed position or
- both.

Reject state of the BF-module

The BF module will switch into the rejected state if the Breaker failure triggers are still active while the open position of the breaker has been detected successfully.

Readiness for Operation

The BF module will switch back into the Stand-by if the trigger signals drop (fall back).

Locking

A locking signal will be issued simultaneously with the BF-Signal (Trip). The locking signal is permanent. This signal has to be acknowledged at the HMI.

NOTICE**Note on devices that offer Wide Frequency Range measurement:**

The supervision scheme 50BF will be blocked as soon as the frequency differs more than 5% from the nominal frequency. As long as the frequency differs more than 5% from the nominal frequency the supervision scheme “50BF and CB Pos” will work according to the “CB Pos” scheme.

Supervision Schemes

Up to three supervision schemes are available depending on the ordered device type and variant in order to detect a Breaker Failure.

*50BF**

A supervision timer will be started as soon as the BF-module is triggered by a trip signal. A Breaker Failure will be detected and a signal will be issued if the measured current does not fall below a set threshold while this timer runs down.

This supervision scheme is available within protective relays that offer current measurement.

CB Pos

A supervision timer will be started as soon as the BF module is triggered by a trip signal. A Breaker Failure will be detected and a signal will be issued if the evaluation of the position indicators of the Breaker does not indicate that the breaker has been switched off successfully while this timer runs down.

This supervision scheme is available within all protective relays. This scheme is recommended if Breaker Failures have to be detected while there is no or not much load flow (small currents). This might e.g. be the case if overvoltage or overfrequency is supervised for a Gen-Set that is running in Stand-by.

*50 BF and CB Pos**

A supervision timer will be started as soon as the BF module is triggered by a trip signal. A Breaker Failure will be detected and a signal will be issued if the measured current does not fall below a set threshold and if simultaneously the evaluation of the position indicators of the Breaker does not indicate that the breaker has been switched off successfully while this timer runs down.

This scheme is recommended if Breaker Failures have to be double checked. This scheme will issue a trip command to the upstream breaker even if position indicators indicate misleadingly (faulty) that the breaker has been opened or if the current measurement indicates misleadingly (faulty) that the breaker is now in the open position.

*=only available in protective relays that offer current measurement.

Trigger Modes

There are three trigger modes for the BF module available. In addition to that, there are three assignable trigger inputs available that might trigger the BF module even if they are not assigned within the breaker manager onto the breaker that is to be monitored.

- All Trips*: All trip signals that are assigned to this breaker (within the trip manager) will start the BF module (please refer also to section "Trigger signals of the Breaker Failure").

- Current Trips*: All current trips that are assigned to this breaker (within the trip manager) will start the BF module (please refer also to section "Trigger signals of the Breaker Failure").

- External Trips*: All external trips that are assigned to this breaker (within the trip manager) will start the BF module (please refer also to section "Trigger signals of the Breaker Failure").

- In addition, the User can also select *none* (e.g.: if the User intends to use one of the three additional assignable trigger inputs).

NOTICE

Those trips can exclusively start the breaker failures that are assigned within the trip manager to the breaker that is to be supervised. In contrast to that the additional three triggers 1-3 will trigger the BF module even if they are not assigned onto the breaker within the corresponding breaker manager.

NOTICE

Select the winding side (Breaker, Winding) from which the measured currents should be taken in case this protective device provides more than one current measurement card.

NOTICE

This Notice applies to protective devices that offer control functionality only! This protective element requires, that a switchgear (Breaker) is assigned to it. It is allowed only to assign switchgears (Breaker) to this protective element, whose measuring transformers provide measuring data to the protective device.

Breaker Failure Lockout

The signal of the Breaker Failure is latched. This signal can be used to block the breaker against a switching on attempt.

Tabular Summary

	Supervision Schemes		
	Where? Within [Protection Para\Global Prot Para\Supervision\BF]		
	CB Pos²⁾	50BF³⁾	CBPos und 50BF⁴⁾
<i>Which breaker is to be monitored?</i> Where to select? Within [Protection Para\Global Prot Para\Supervision\BF]	Selection of the breaker that is to be monitored. (In case that more than one breaker is available)	Selection of the breaker that is to be monitored. (In case that more than one breaker is available)	Selection of the breaker that is to be monitored. (In case that more than one breaker is available)
<i>Trigger Modi</i> (Who starts the BF-timer ?) Where to set? Within [Protection Para\Global Prot Para\Supervision\BF]	All Trips ⁵⁾ or All Current Trips ⁵⁾ or External Trips ⁵⁾ ...and the breaker is in the closed position and the BF module is within the stand-by state.	All Trips ⁵⁾ or All Current Trips ⁵⁾ or External Trips ⁵⁾ ...and the BF module is within the stand-by state.	All Trips ⁵⁾ or All Current Trips ⁵⁾ or External Trips ⁵⁾ ...and the breaker is in the closed position and the BF module is within the stand-by state.
<i>Who stops the BF-Timer?</i> Once the timer has been stopped the BF module will switch into the state "Rejected". The module will switch back into the state "Stand-by" if the trigger signals are dropped.	Position indicators indicate that the switchgear (breaker) is in the open position.	Current is fallen below the $I < \text{threshold}^{1)}$.	Position indicators indicate that the switchgear (breaker) is in the open position and current is fallen below the $I < \text{threshold}^{1)}$.
<i>A Breaker Failure will be detected</i> ...and a trip signal to the upstream breaker will be issued?	When the BF-Timer has run down (elapsed).	When the BF-Timer has run down (elapsed).	When the BF-Timer has run down (elapsed).
<i>When does the trip signal to the upstream breaker drops (falls back)?</i>	If the position indicators indicate that the switchgear (breaker) is in the open position and if the trigger signals are dropped (fallen back)	If the current is fallen below the $I < \text{and}$ if the trigger signals are dropped (fallen back)	If the position indicators indicate that the switchgear (breaker) is in the open position and if the current is fallen below the $I < \text{and}$ if the trigger signals are dropped (fallen back)

¹⁾ It is recommended to set the $I <$ threshold to a value that is slightly below the fault current that is expectable. By means of that it is possible to shorten the BF supervision timer and hence reduce thermal and mechanical damage of the electrical equipment in case of a Breaker Failure. The lower the threshold, the longer the time that is needed to detect, that the breaker is in the open position, especially if there are transients/harmonics.

Note: Tripping delay of the BF module = Minimum delay time (tripping time) of the backup protection!

2), 3), 4)

Available in all devices with the
corresponding software

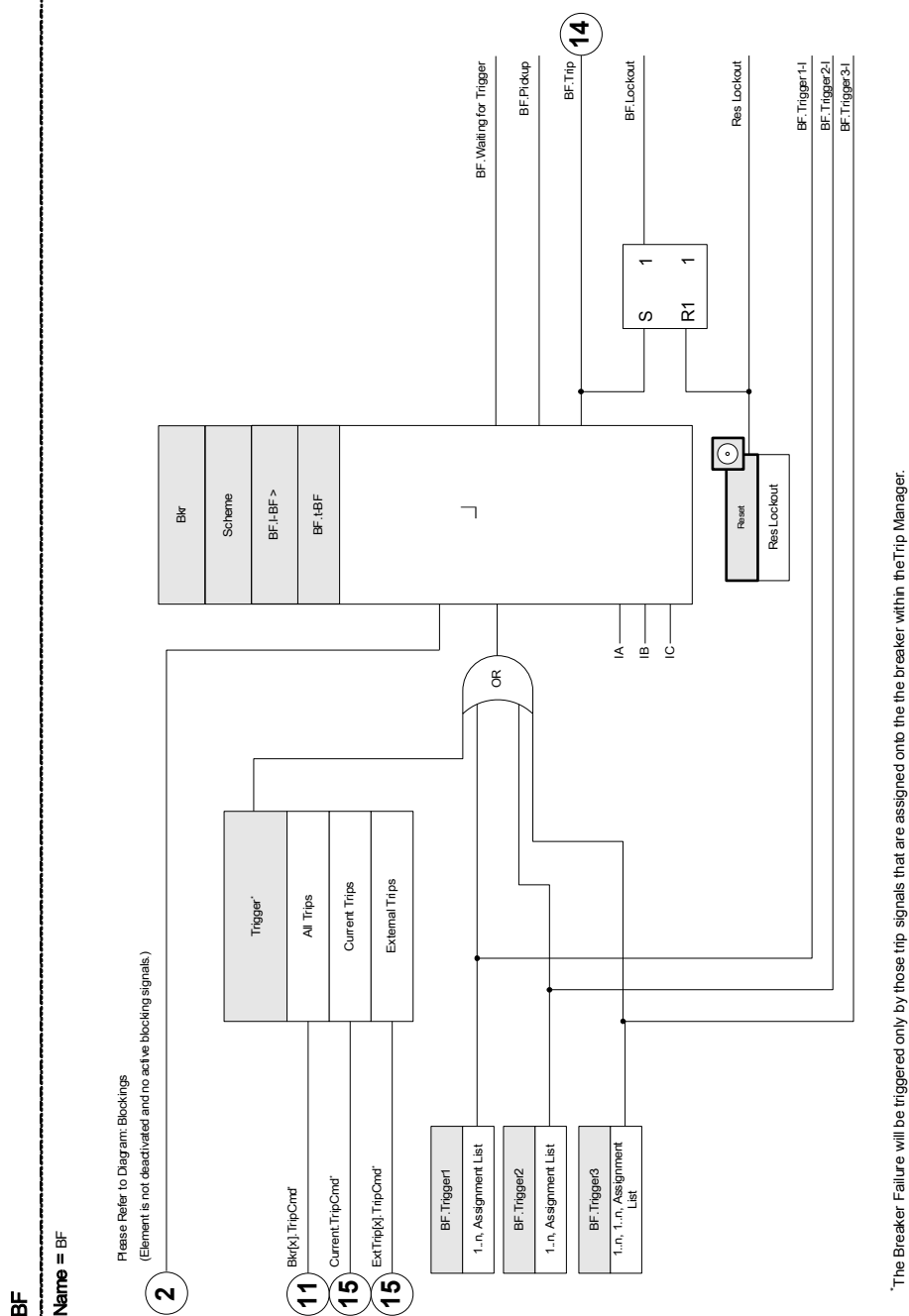
Available in all devices that offer
current measurement

Available in all devices that offer
current measurement

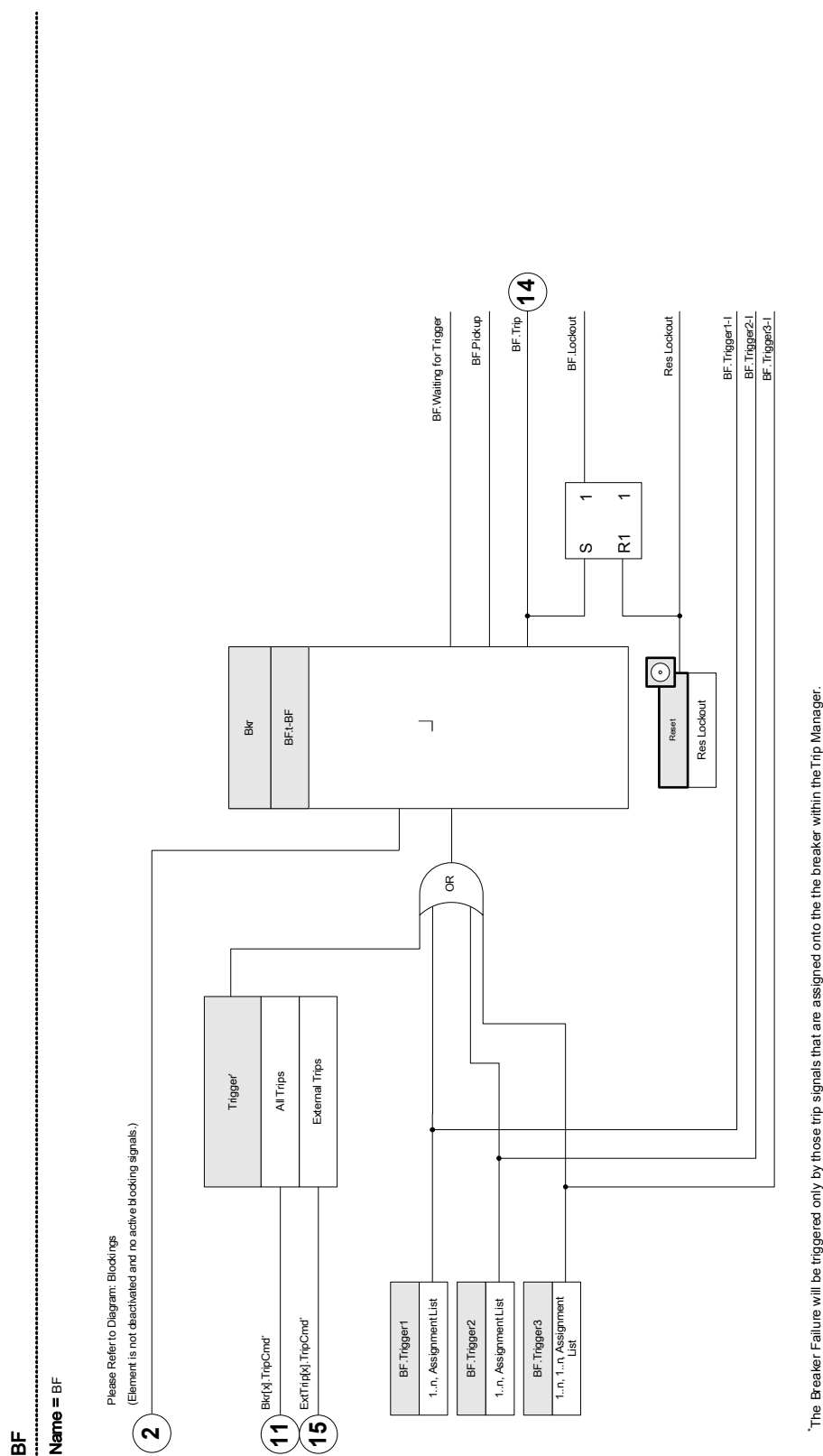
5)

Only if the signals are assigned onto the breaker within the breaker manager.

Breaker Failure Protection for devices that offer current measurement



Breaker Failure Protection for devices that offer voltage measurement only



Device Planning Parameters of the BF

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Use	Use	[Device Planning]

Global Protection Parameters of the BF

Parameter	Description	Setting range	Default	Menu path
Scheme 	Scheme	50BF, CB Pos, 50BF and CB Pos	50BF	[Protection Para /Global Prot Para /Supervision /BF]
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Supervision /BF]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Supervision /BF]
Trigger 	Determining the trigger mode for the Breaker Failure.	- . -, All Trips, ExP Fc, Current Trips	All Trips	[Protection Para /Global Prot Para /Supervision /BF]
Trigger1 	Trigger that will start the BF	Trigger	.-	[Protection Para /Global Prot Para /Supervision /BF]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Trigger2 	Trigger that will start the BF	Trigger	.-	[Protection Para /Global Prot Para /Supervision /BF]
Trigger3 	Trigger that will start the BF	Trigger	.-	[Protection Para /Global Prot Para /Supervision /BF]

Direct Commands of the BF

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
Res Lockout 	Reset Lockout	Inactive, Active	Inactive	[Operation /Reset /Flags]

Setting Group Parameters of the BF

NOTICE

In order to prevent a faulty activation of the BF Module, the pickup (alarm) time must be greater than the sum of:

- Operating time of the protective relay
- +The close-open time of the breaker (please refer to the technical data of the manufacturer of the breaker);
- +Drop off time (current- or position indicators)
- +Security margin.

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Supervision /BF]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Supervision /BF]
I-BF > 	Breaker Failure Alarm will be initiated if this threshold is still exceeded after the timer has expired (50 BF). Only available if: Scheme50BF = Or Scheme = 50BF and CB Pos	0.02 - 4.00In	0.02In	[Protection Para /<1..4> /Supervision /BF]
t-BF 	If the delay time is expired, an BF alarm is given out.	0.00 - 10.00s	0.20s	[Protection Para /<1..4> /Supervision /BF]

BF Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /Supervision /BF]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /Supervision /BF]
Trigger1-I	Module Input: Trigger that will start the BF	[Protection Para /Global Prot Para /Supervision /BF]
Trigger2-I	Module Input: Trigger that will start the BF	[Protection Para /Global Prot Para /Supervision /BF]
Trigger3-I	Module Input: Trigger that will start the BF	[Protection Para /Global Prot Para /Supervision /BF]

BF Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Waiting for Trigger	Waiting for Trigger
Pickup	Signal: BF-Module Started (Pickup)
Trip	Signal: Breaker Failure Trip
Lockout	Signal: Lockout
Res Lockout	Signal: Reset Lockout

Trigger signals of the Breaker Failure

*These trips will start the **BF** module if »All trips« have been selected as the trigger event.*

Name	Description
.-.	No assignment
MStart.TripCmd	Signal: Trip Command
50P[1].TripCmd	Signal: Trip Command
50P[2].TripCmd	Signal: Trip Command
50P[3].TripCmd	Signal: Trip Command
51P[1].TripCmd	Signal: Trip Command
51P[2].TripCmd	Signal: Trip Command
51P[3].TripCmd	Signal: Trip Command
50X[1].TripCmd	Signal: Trip Command
50X[2].TripCmd	Signal: Trip Command
51X[1].TripCmd	Signal: Trip Command
51X[2].TripCmd	Signal: Trip Command
50R[1].TripCmd	Signal: Trip Command
50R[2].TripCmd	Signal: Trip Command
51R[1].TripCmd	Signal: Trip Command
51R[2].TripCmd	Signal: Trip Command
49.TripCmd	Signal: Trip Command
50J[1].TripCmd	Signal: Trip Command
50J[2].TripCmd	Signal: Trip Command
37[1].TripCmd	Signal: Trip Command
37[2].TripCmd	Signal: Trip Command
37[3].TripCmd	Signal: Trip Command
46[1].TripCmd	Signal: Trip Command
46[2].TripCmd	Signal: Trip Command
ZI.TripCmd	Signal: Zone Interlocking Trip Command
ExP[1].TripCmd	Signal: Trip Command
ExP[2].TripCmd	Signal: Trip Command
ExP[3].TripCmd	Signal: Trip Command
ExP[4].TripCmd	Signal: Trip Command
Ex87.TripCmd	Signal: Trip Command
Remote Trip.TripCmd	Signal: Trip Command
RTD.TripCmd	Signal: Trip Command
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input

<i>Name</i>	<i>Description</i>
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
Logic.LE1.Gate Out	Signal: Output of the logic gate
Logic.LE1.Timer Out	Signal: Timer Output
Logic.LE1.Out	Signal: Latched Output (Q)
Logic.LE1.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE2.Gate Out	Signal: Output of the logic gate
Logic.LE2.Timer Out	Signal: Timer Output
Logic.LE2.Out	Signal: Latched Output (Q)
Logic.LE2.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE3.Gate Out	Signal: Output of the logic gate
Logic.LE3.Timer Out	Signal: Timer Output
Logic.LE3.Out	Signal: Latched Output (Q)
Logic.LE3.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE4.Gate Out	Signal: Output of the logic gate
Logic.LE4.Timer Out	Signal: Timer Output
Logic.LE4.Out	Signal: Latched Output (Q)
Logic.LE4.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE5.Gate Out	Signal: Output of the logic gate
Logic.LE5.Timer Out	Signal: Timer Output
Logic.LE5.Out	Signal: Latched Output (Q)
Logic.LE5.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE6.Gate Out	Signal: Output of the logic gate
Logic.LE6.Timer Out	Signal: Timer Output
Logic.LE6.Out	Signal: Latched Output (Q)
Logic.LE6.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE7.Gate Out	Signal: Output of the logic gate
Logic.LE7.Timer Out	Signal: Timer Output
Logic.LE7.Out	Signal: Latched Output (Q)
Logic.LE7.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE8.Gate Out	Signal: Output of the logic gate
Logic.LE8.Timer Out	Signal: Timer Output
Logic.LE8.Out	Signal: Latched Output (Q)
Logic.LE8.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE9.Gate Out	Signal: Output of the logic gate
Logic.LE9.Timer Out	Signal: Timer Output
Logic.LE9.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logic.LE9.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE10.Gate Out	Signal: Output of the logic gate
Logic.LE10.Timer Out	Signal: Timer Output
Logic.LE10.Out	Signal: Latched Output (Q)
Logic.LE10.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE11.Gate Out	Signal: Output of the logic gate
Logic.LE11.Timer Out	Signal: Timer Output
Logic.LE11.Out	Signal: Latched Output (Q)
Logic.LE11.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE12.Gate Out	Signal: Output of the logic gate
Logic.LE12.Timer Out	Signal: Timer Output
Logic.LE12.Out	Signal: Latched Output (Q)
Logic.LE12.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE13.Gate Out	Signal: Output of the logic gate
Logic.LE13.Timer Out	Signal: Timer Output
Logic.LE13.Out	Signal: Latched Output (Q)
Logic.LE13.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE14.Gate Out	Signal: Output of the logic gate
Logic.LE14.Timer Out	Signal: Timer Output
Logic.LE14.Out	Signal: Latched Output (Q)
Logic.LE14.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE15.Gate Out	Signal: Output of the logic gate
Logic.LE15.Timer Out	Signal: Timer Output
Logic.LE15.Out	Signal: Latched Output (Q)
Logic.LE15.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE16.Gate Out	Signal: Output of the logic gate
Logic.LE16.Timer Out	Signal: Timer Output
Logic.LE16.Out	Signal: Latched Output (Q)
Logic.LE16.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE17.Gate Out	Signal: Output of the logic gate
Logic.LE17.Timer Out	Signal: Timer Output
Logic.LE17.Out	Signal: Latched Output (Q)
Logic.LE17.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE18.Gate Out	Signal: Output of the logic gate
Logic.LE18.Timer Out	Signal: Timer Output
Logic.LE18.Out	Signal: Latched Output (Q)
Logic.LE18.Out inverted	Signal: Negated Latched Output (Q NOT)

<i>Name</i>	<i>Description</i>
Logic.LE19.Gate Out	Signal: Output of the logic gate
Logic.LE19.Timer Out	Signal: Timer Output
Logic.LE19.Out	Signal: Latched Output (Q)
Logic.LE19.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE20.Gate Out	Signal: Output of the logic gate
Logic.LE20.Timer Out	Signal: Timer Output
Logic.LE20.Out	Signal: Latched Output (Q)
Logic.LE20.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE21.Gate Out	Signal: Output of the logic gate
Logic.LE21.Timer Out	Signal: Timer Output
Logic.LE21.Out	Signal: Latched Output (Q)
Logic.LE21.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE22.Gate Out	Signal: Output of the logic gate
Logic.LE22.Timer Out	Signal: Timer Output
Logic.LE22.Out	Signal: Latched Output (Q)
Logic.LE22.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE23.Gate Out	Signal: Output of the logic gate
Logic.LE23.Timer Out	Signal: Timer Output
Logic.LE23.Out	Signal: Latched Output (Q)
Logic.LE23.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE24.Gate Out	Signal: Output of the logic gate
Logic.LE24.Timer Out	Signal: Timer Output
Logic.LE24.Out	Signal: Latched Output (Q)
Logic.LE24.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE25.Gate Out	Signal: Output of the logic gate
Logic.LE25.Timer Out	Signal: Timer Output
Logic.LE25.Out	Signal: Latched Output (Q)
Logic.LE25.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE26.Gate Out	Signal: Output of the logic gate
Logic.LE26.Timer Out	Signal: Timer Output
Logic.LE26.Out	Signal: Latched Output (Q)
Logic.LE26.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE27.Gate Out	Signal: Output of the logic gate
Logic.LE27.Timer Out	Signal: Timer Output
Logic.LE27.Out	Signal: Latched Output (Q)
Logic.LE27.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE28.Gate Out	Signal: Output of the logic gate

<i>Name</i>	<i>Description</i>
Logic.LE28.Timer Out	Signal: Timer Output
Logic.LE28.Out	Signal: Latched Output (Q)
Logic.LE28.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE29.Gate Out	Signal: Output of the logic gate
Logic.LE29.Timer Out	Signal: Timer Output
Logic.LE29.Out	Signal: Latched Output (Q)
Logic.LE29.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE30.Gate Out	Signal: Output of the logic gate
Logic.LE30.Timer Out	Signal: Timer Output
Logic.LE30.Out	Signal: Latched Output (Q)
Logic.LE30.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE31.Gate Out	Signal: Output of the logic gate
Logic.LE31.Timer Out	Signal: Timer Output
Logic.LE31.Out	Signal: Latched Output (Q)
Logic.LE31.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE32.Gate Out	Signal: Output of the logic gate
Logic.LE32.Timer Out	Signal: Timer Output
Logic.LE32.Out	Signal: Latched Output (Q)
Logic.LE32.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE33.Gate Out	Signal: Output of the logic gate
Logic.LE33.Timer Out	Signal: Timer Output
Logic.LE33.Out	Signal: Latched Output (Q)
Logic.LE33.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE34.Gate Out	Signal: Output of the logic gate
Logic.LE34.Timer Out	Signal: Timer Output
Logic.LE34.Out	Signal: Latched Output (Q)
Logic.LE34.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE35.Gate Out	Signal: Output of the logic gate
Logic.LE35.Timer Out	Signal: Timer Output
Logic.LE35.Out	Signal: Latched Output (Q)
Logic.LE35.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE36.Gate Out	Signal: Output of the logic gate
Logic.LE36.Timer Out	Signal: Timer Output
Logic.LE36.Out	Signal: Latched Output (Q)
Logic.LE36.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE37.Gate Out	Signal: Output of the logic gate
Logic.LE37.Timer Out	Signal: Timer Output

<i>Name</i>	<i>Description</i>
Logic.LE37.Out	Signal: Latched Output (Q)
Logic.LE37.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE38.Gate Out	Signal: Output of the logic gate
Logic.LE38.Timer Out	Signal: Timer Output
Logic.LE38.Out	Signal: Latched Output (Q)
Logic.LE38.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE39.Gate Out	Signal: Output of the logic gate
Logic.LE39.Timer Out	Signal: Timer Output
Logic.LE39.Out	Signal: Latched Output (Q)
Logic.LE39.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE40.Gate Out	Signal: Output of the logic gate
Logic.LE40.Timer Out	Signal: Timer Output
Logic.LE40.Out	Signal: Latched Output (Q)
Logic.LE40.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE41.Gate Out	Signal: Output of the logic gate
Logic.LE41.Timer Out	Signal: Timer Output
Logic.LE41.Out	Signal: Latched Output (Q)
Logic.LE41.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE42.Gate Out	Signal: Output of the logic gate
Logic.LE42.Timer Out	Signal: Timer Output
Logic.LE42.Out	Signal: Latched Output (Q)
Logic.LE42.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE43.Gate Out	Signal: Output of the logic gate
Logic.LE43.Timer Out	Signal: Timer Output
Logic.LE43.Out	Signal: Latched Output (Q)
Logic.LE43.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE44.Gate Out	Signal: Output of the logic gate
Logic.LE44.Timer Out	Signal: Timer Output
Logic.LE44.Out	Signal: Latched Output (Q)
Logic.LE44.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE45.Gate Out	Signal: Output of the logic gate
Logic.LE45.Timer Out	Signal: Timer Output
Logic.LE45.Out	Signal: Latched Output (Q)
Logic.LE45.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE46.Gate Out	Signal: Output of the logic gate
Logic.LE46.Timer Out	Signal: Timer Output
Logic.LE46.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logic.LE46.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE47.Gate Out	Signal: Output of the logic gate
Logic.LE47.Timer Out	Signal: Timer Output
Logic.LE47.Out	Signal: Latched Output (Q)
Logic.LE47.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE48.Gate Out	Signal: Output of the logic gate
Logic.LE48.Timer Out	Signal: Timer Output
Logic.LE48.Out	Signal: Latched Output (Q)
Logic.LE48.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE49.Gate Out	Signal: Output of the logic gate
Logic.LE49.Timer Out	Signal: Timer Output
Logic.LE49.Out	Signal: Latched Output (Q)
Logic.LE49.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE50.Gate Out	Signal: Output of the logic gate
Logic.LE50.Timer Out	Signal: Timer Output
Logic.LE50.Out	Signal: Latched Output (Q)
Logic.LE50.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE51.Gate Out	Signal: Output of the logic gate
Logic.LE51.Timer Out	Signal: Timer Output
Logic.LE51.Out	Signal: Latched Output (Q)
Logic.LE51.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE52.Gate Out	Signal: Output of the logic gate
Logic.LE52.Timer Out	Signal: Timer Output
Logic.LE52.Out	Signal: Latched Output (Q)
Logic.LE52.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE53.Gate Out	Signal: Output of the logic gate
Logic.LE53.Timer Out	Signal: Timer Output
Logic.LE53.Out	Signal: Latched Output (Q)
Logic.LE53.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE54.Gate Out	Signal: Output of the logic gate
Logic.LE54.Timer Out	Signal: Timer Output
Logic.LE54.Out	Signal: Latched Output (Q)
Logic.LE54.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE55.Gate Out	Signal: Output of the logic gate
Logic.LE55.Timer Out	Signal: Timer Output
Logic.LE55.Out	Signal: Latched Output (Q)
Logic.LE55.Out inverted	Signal: Negated Latched Output (Q NOT)

<i>Name</i>	<i>Description</i>
Logic.LE56.Gate Out	Signal: Output of the logic gate
Logic.LE56.Timer Out	Signal: Timer Output
Logic.LE56.Out	Signal: Latched Output (Q)
Logic.LE56.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE57.Gate Out	Signal: Output of the logic gate
Logic.LE57.Timer Out	Signal: Timer Output
Logic.LE57.Out	Signal: Latched Output (Q)
Logic.LE57.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE58.Gate Out	Signal: Output of the logic gate
Logic.LE58.Timer Out	Signal: Timer Output
Logic.LE58.Out	Signal: Latched Output (Q)
Logic.LE58.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE59.Gate Out	Signal: Output of the logic gate
Logic.LE59.Timer Out	Signal: Timer Output
Logic.LE59.Out	Signal: Latched Output (Q)
Logic.LE59.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE60.Gate Out	Signal: Output of the logic gate
Logic.LE60.Timer Out	Signal: Timer Output
Logic.LE60.Out	Signal: Latched Output (Q)
Logic.LE60.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE61.Gate Out	Signal: Output of the logic gate
Logic.LE61.Timer Out	Signal: Timer Output
Logic.LE61.Out	Signal: Latched Output (Q)
Logic.LE61.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE62.Gate Out	Signal: Output of the logic gate
Logic.LE62.Timer Out	Signal: Timer Output
Logic.LE62.Out	Signal: Latched Output (Q)
Logic.LE62.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE63.Gate Out	Signal: Output of the logic gate
Logic.LE63.Timer Out	Signal: Timer Output
Logic.LE63.Out	Signal: Latched Output (Q)
Logic.LE63.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE64.Gate Out	Signal: Output of the logic gate
Logic.LE64.Timer Out	Signal: Timer Output
Logic.LE64.Out	Signal: Latched Output (Q)
Logic.LE64.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE65.Gate Out	Signal: Output of the logic gate

<i>Name</i>	<i>Description</i>
Logic.LE65.Timer Out	Signal: Timer Output
Logic.LE65.Out	Signal: Latched Output (Q)
Logic.LE65.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE66.Gate Out	Signal: Output of the logic gate
Logic.LE66.Timer Out	Signal: Timer Output
Logic.LE66.Out	Signal: Latched Output (Q)
Logic.LE66.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE67.Gate Out	Signal: Output of the logic gate
Logic.LE67.Timer Out	Signal: Timer Output
Logic.LE67.Out	Signal: Latched Output (Q)
Logic.LE67.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE68.Gate Out	Signal: Output of the logic gate
Logic.LE68.Timer Out	Signal: Timer Output
Logic.LE68.Out	Signal: Latched Output (Q)
Logic.LE68.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE69.Gate Out	Signal: Output of the logic gate
Logic.LE69.Timer Out	Signal: Timer Output
Logic.LE69.Out	Signal: Latched Output (Q)
Logic.LE69.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE70.Gate Out	Signal: Output of the logic gate
Logic.LE70.Timer Out	Signal: Timer Output
Logic.LE70.Out	Signal: Latched Output (Q)
Logic.LE70.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE71.Gate Out	Signal: Output of the logic gate
Logic.LE71.Timer Out	Signal: Timer Output
Logic.LE71.Out	Signal: Latched Output (Q)
Logic.LE71.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE72.Gate Out	Signal: Output of the logic gate
Logic.LE72.Timer Out	Signal: Timer Output
Logic.LE72.Out	Signal: Latched Output (Q)
Logic.LE72.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE73.Gate Out	Signal: Output of the logic gate
Logic.LE73.Timer Out	Signal: Timer Output
Logic.LE73.Out	Signal: Latched Output (Q)
Logic.LE73.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE74.Gate Out	Signal: Output of the logic gate
Logic.LE74.Timer Out	Signal: Timer Output

Name	Description
Logic.LE74.Out	Signal: Latched Output (Q)
Logic.LE74.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE75.Gate Out	Signal: Output of the logic gate
Logic.LE75.Timer Out	Signal: Timer Output
Logic.LE75.Out	Signal: Latched Output (Q)
Logic.LE75.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE76.Gate Out	Signal: Output of the logic gate
Logic.LE76.Timer Out	Signal: Timer Output
Logic.LE76.Out	Signal: Latched Output (Q)
Logic.LE76.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE77.Gate Out	Signal: Output of the logic gate
Logic.LE77.Timer Out	Signal: Timer Output
Logic.LE77.Out	Signal: Latched Output (Q)
Logic.LE77.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE78.Gate Out	Signal: Output of the logic gate
Logic.LE78.Timer Out	Signal: Timer Output
Logic.LE78.Out	Signal: Latched Output (Q)
Logic.LE78.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE79.Gate Out	Signal: Output of the logic gate
Logic.LE79.Timer Out	Signal: Timer Output
Logic.LE79.Out	Signal: Latched Output (Q)
Logic.LE79.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE80.Gate Out	Signal: Output of the logic gate
Logic.LE80.Timer Out	Signal: Timer Output
Logic.LE80.Out	Signal: Latched Output (Q)
Logic.LE80.Out inverted	Signal: Negated Latched Output (Q NOT)

These trips will start the BF module if »All current« functions have been selected as the trigger event.

Name	Description
-.-	No assignment
50P[1].TripCmd	Signal: Trip Command
50P[2].TripCmd	Signal: Trip Command
50P[3].TripCmd	Signal: Trip Command
51P[1].TripCmd	Signal: Trip Command

<i>Name</i>	<i>Description</i>
51P[2].TripCmd	Signal: Trip Command
51P[3].TripCmd	Signal: Trip Command
50X[1].TripCmd	Signal: Trip Command
50X[2].TripCmd	Signal: Trip Command
51X[1].TripCmd	Signal: Trip Command
51X[2].TripCmd	Signal: Trip Command
50R[1].TripCmd	Signal: Trip Command
50R[2].TripCmd	Signal: Trip Command
51R[1].TripCmd	Signal: Trip Command
51R[2].TripCmd	Signal: Trip Command
49.TripCmd	Signal: Trip Command
50J[1].TripCmd	Signal: Trip Command
50J[2].TripCmd	Signal: Trip Command
37[1].TripCmd	Signal: Trip Command
37[2].TripCmd	Signal: Trip Command
37[3].TripCmd	Signal: Trip Command
46[1].TripCmd	Signal: Trip Command
46[2].TripCmd	Signal: Trip Command
ZI.TripCmd	Signal: Zone Interlocking Trip Command

These trips will start the BF module if »External trips« have been selected as the trigger event.

Name	Description
-.-	No assignment
ExP[1].TripCmd	Signal: Trip Command
ExP[2].TripCmd	Signal: Trip Command
ExP[3].TripCmd	Signal: Trip Command
ExP[4].TripCmd	Signal: Trip Command

Commissioning Example: Supervision Scheme 50BF

Object to Be Tested:

Test of the Breaker Failure protection (Supervision Scheme 50BF).

Necessary Means:

- Current source;
- Ammeter; and
- Timer.

NOTICE

When testing, the applied test current must always be higher than the tripping threshold »I-BF«. If the test current falls below the threshold while the breaker is in the “Off” position, no pickup will be generated.

Procedure (Single-Phase):

For testing the tripping time of the BF protection, a test current has to be higher than the threshold value of one of the current protection modules that are assigned to trigger the BF protection. The BF trip delay can be measured from the time when one of the triggering inputs becomes active to the time when the BF protection trip is asserted.

To avoid wiring errors, checked to make sure the breaker in the upstream system switches off.

The time, measured by the timer, should be in line with the specified tolerances.

Successful Test Result:

The actual times measured comply with the setpoint times. The breaker in the higher-level section switches off.

! WARNING

Re-connect the control cable to the breaker!

CTS - Current Transformer Supervision

CTS

Most functions of metering, protection, and control in the relay rely on correct current measurements. It is important to make sure the CT connections and their operations are correct. The failures (including CT secondary wire broken, insulation broken down, broken wiring between CT and relay, and mismatched polarities) will cause the incorrect current measurements. The other CT errors (due to the magnetizing current that is proportional to the primary current, CT saturation, and measuring circuit and quantization error) can also cause inaccurate current measurements.

The CTS utilizes the Kirchhoff's current law to detect a CT failure and can differentiate the wiring errors from the measurement errors by adding biases to offset the measurement related errors. The biases include two terms, one of which is related to the static error that accounts for CT magnetizing characteristic differences and current measurement circuit calibration errors and other is the dynamic error that is proportional to the measured maximum current due to CT transformation characteristics. The CTs are assumed to be used in the wye-grounded winding sides. Under normal conditions, the mismatch between the calculated and the measured zero sequence current should be less than the bias value. However, if there is a CT wiring error, such relationship will not hold true. If the mismatch exceeds the bias for a specified time, an pickup (alarm) will be generated.

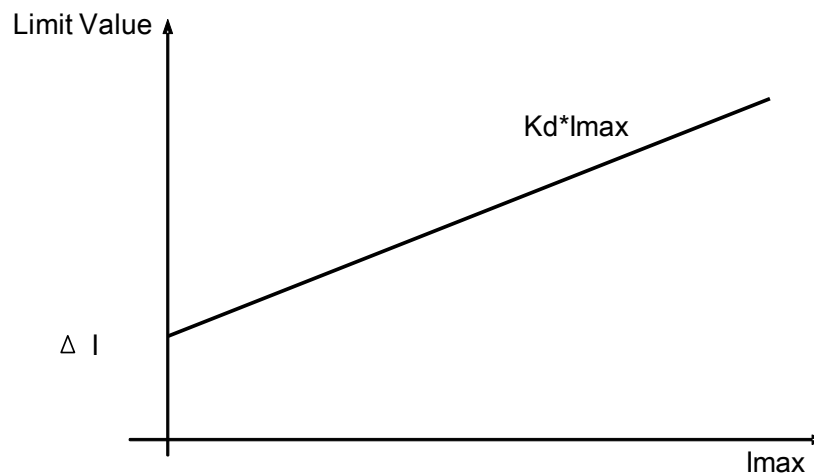
The operating principle can be expressed in terms of CT secondary currents as follow:

$$(\vec{I_L1} + \vec{I_L2} + \vec{I_L3}) + KI \cdot \vec{I_G} = 3 \cdot \vec{I_0} + KI \cdot \vec{I_G} \geq \Delta I + Kd \cdot I_{max}$$

KI is the ratio of the ground CT ratio over the phase CT ratio, and it is automatically calculated from the rated system parameters.

- ΔI = The static error, a minimum mismatch allowed between the calculated and measured zero sequence current.
- Kd = The dynamic error factor, a restrain slope that defines a percentage error generated by a high current.
- I_{max} = maximum phase current.
- Total bias value = $\Delta I + Kd \times I_{max}$.

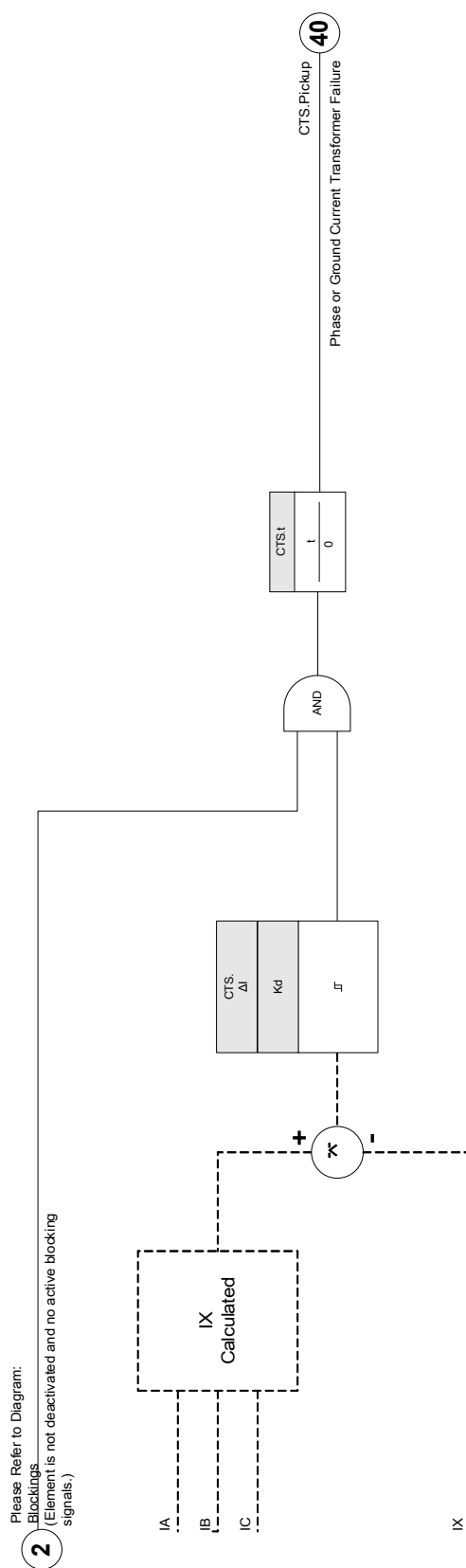
The current transformer supervision operation can be graphically represented as follows.



CAUTION

If the current is measured in two phases only (for example only I_A/I_B) or if there is no separate ground current measuring (e.g.: normally via a zero sequence CT), the supervision function should be deactivated.

CTS



Device Planning Parameters of the Current Transformer Supervision

Parameter	Description	Options	Default	Menu path
Mode 	Mode	Do not use, Use	Do not use	[Device Planning]

Global Protection Parameter of the Current Transformer Supervision

Parameter	Description	Setting range	Default	Menu path
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Supervision /CTS]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Supervision /CTS]

Setting Group Parameters of the Current Transformer Supervision

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Supervision /CTS]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Supervision /CTS]
ΔI 	In order to prevent faulty tripping of phase selective protection functions that use the current as tripping criterion. If the difference of the measured ground current and the calculated value I_0 is higher than the pick up value ΔI , an pickup event is generated after expiring of the excitation time. In such a case, a fuse failure, a broken wire or a faulty measuring circuit can be assumed.	0.10 - 1.00In	0.50In	[Protection Para /<1..4> /Supervision /CTS]
Pickup delay 	Pickup delay	0.1 - 9999.0s	1.0s	[Protection Para /<1..4> /Supervision /CTS]
Kd 	Dynamic correction factor for the evaluation of the difference between calculated and measured ground current. This correction factor allows transformer faults, caused by higher currents, to be compensated.	0.00 - 0.99	0.00	[Protection Para /<1..4> /Supervision /CTS]

Current Transformer Supervision Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /Supervision /CTS]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /Supervision /CTS]

Current Transformer Supervision Signals (Outputs States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Pickup	Signal: Pickup Current Transformer Measuring Circuit Supervision

Commissioning: Current Transformer Failure Supervision

NOTICE

Preconditions:

- 1.Measurement of all three-phase currents (are applied to the measuring inputs of the device).
- 2.The ground current is detected via a zero sequence transformer (not in residual connection).

Object to Be Tested:

Check of the CT Supervision (by comparing the calculated with the measured ground current).

Necessary Means:

Three-phase current source.

Procedure, Part 1:

- Set the limiting value of the CTs to » $\Delta I = 0.1 \cdot I_n$ «.
- Feed a three-phase, symmetrical current system (approx. nominal current) to the secondary side.
- Disconnect the current of one phase from one of the measuring inputs (the symmetrical feeding at the secondary side has to be maintained).
- Make sure that the »CTS.PICKUP« signal is generated.

Successful Test Result, Part 1:

The »CTS.PICKUP« signal is generated.

Procedure, Part 2:

- Feed a three-phase, symmetrical current system (approx. nominal current) to the secondary side.
- Feed a current that is higher than the threshold value for the measuring circuit supervision to the ground current measuring input.
- Make sure that the »CTS.PICKUP« signal is generated.

Successful Test Result, Part 2:

The »CTS.PICKUP« signal is generated.

74TC - Trip Circuit Monitoring

TCM

The trip circuit monitoring is used for monitoring if the trip circuit is ready for opening operations. The monitoring can be fulfilled by two ways. The first assumes only 52a is used in the trip circuit. The second assumes that, in addition to 52a, 52b is also used for the circuit monitoring. Two options either 52a only (or breaker closed) or both (52a and 52b) are provided for the User to select based on use of the breaker status in the trip circuit. With 52a only in the trip circuit, the monitoring is only effective when the breaker is closed while if both 52a and 52b are used, the trip circuit will be monitored all time as long as the control power is on.

The trip circuit continuity is monitored through the digital inputs DI1 and DI2, and the breaker status 52a or 52b or both must be monitored through the other digital inputs. Note that the digital inputs used for this purpose must be configured properly based on the trip circuit control voltage and also that the de-bouncing times must be set to minimum. If the trip circuit is detected broken, an alarm will be issued with a specified delay, which must be greater than a period from the time when a trip contact is closed to the time when the breaker status is clearly recognized by the relay.

NOTICE

Slot 1 has two digital inputs, each of which has a separate root (contact separation) for the trip circuit supervision.

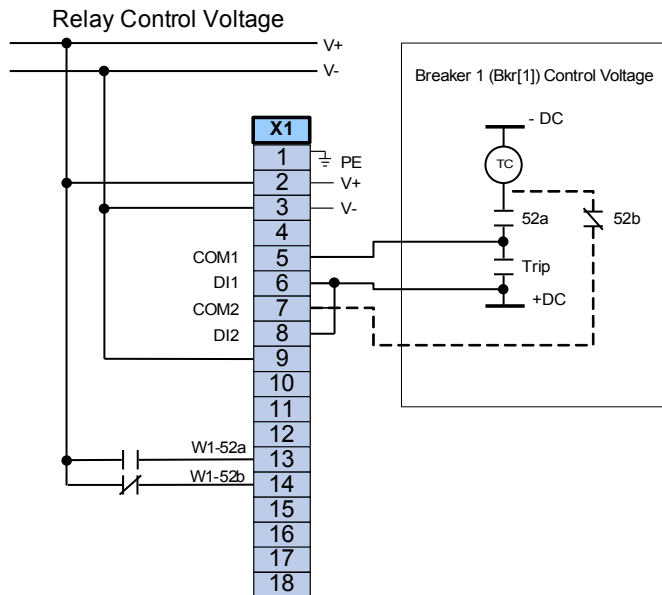
In this case, the trip circuit supply voltage serves also as supply voltage for the digital inputs and so the supply voltage failure of a trip circuit can be detected directly.

In order to identify a conductor failure in the trip circuit on the supply line or in the trip coil, the off-coil has to be looped-in to the supervision circuit.

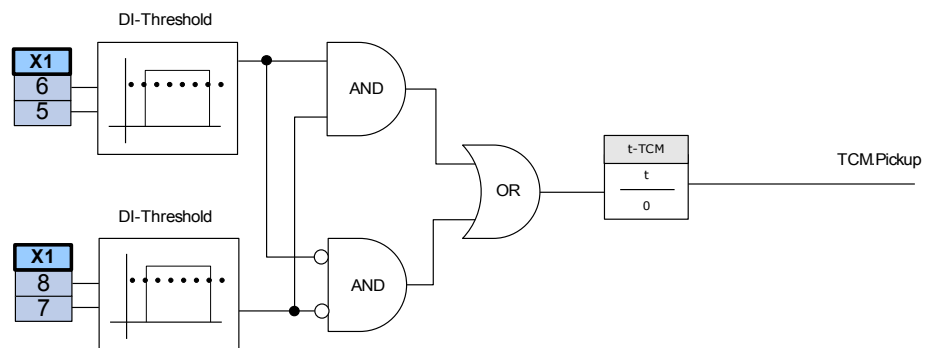
The time delay is to be set in a way that switching actions cannot cause false trips in this module.

One Breaker Application Examples

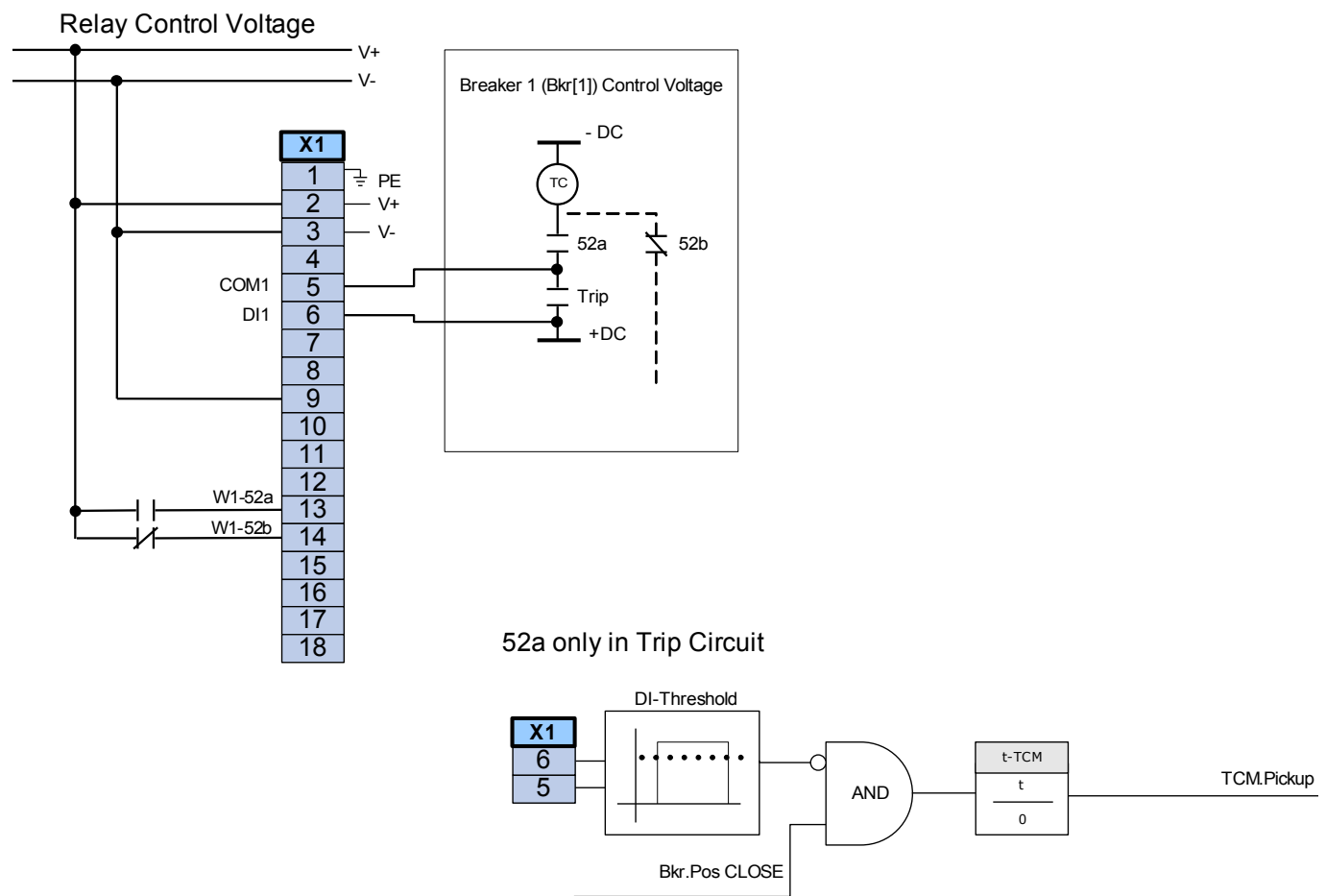
Trip Circuit Monitoring for one Breaker: Auxiliary Contacts (52a and 52b) in trip circuit.



52a and 52b in Trip Circuit



Trip Circuit Monitoring for One Breaker: Auxiliary Contacts (52a Only) in Trip Circuit.



Device Planning Parameters of the Trip Circuit Monitoring Module

Parameter	Description	Options	Default	Menu path
Mode	Mode	Do not use, Use	Use	[Device Planning]
				

Global Protection Parameters of the Trip Circuit Monitoring Module

Parameter	Description	Setting range	Default	Menu path
Mode 	Select if trip circuit is going to be monitored when the breaker is closed or when the breaker is either open or close.	Closed	Closed	[Protection Para /Global Prot Para /Supervision /TCM]
Input 1 	Select the input configured to monitor the trip coil when the breaker is closed.	1..n, Dig Inputs	DI Slot X1.DI 1	[Protection Para /Global Prot Para /Supervision /TCM]
ExBlo1 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Supervision /TCM]
ExBlo2 	External blocking of the module, if blocking is activated (allowed) within a parameter set and if the state of the assigned signal is true.	1..n, Assignment List	.-	[Protection Para /Global Prot Para /Supervision /TCM]

Setting Group Parameters of the Trip Circuit Monitoring Module

Parameter	Description	Setting range	Default	Menu path
Function 	Permanent activation or deactivation of module/element.	Inactive, Active	Inactive	[Protection Para /<1..4> /Supervision /TCM]
ExBlo Fc 	Activate (allow) or inactivate (disallow) blocking of the module/element. This parameter is only effective if a signal is assigned to the corresponding global protection parameter. If the signal becomes true, those modules/elements are blocked that are parameterized "ExBlo Fc=active".	Inactive, Active	Inactive	[Protection Para /<1..4> /Supervision /TCM]
t-TCM 	Tripping delay time of the Trip Circuit Supervision	0.10 - 10.00s	0.2s	[Protection Para /<1..4> /Supervision /TCM]

Trip Circuit Monitoring Module Input States

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
CinBkr-52a-I	Module Input State: Feed-back signal of the Bkr (52a)	[Protection Para /Global Prot Para /Supervision /TCM]
CinBkr-52b-I	Module Input State: Feed-back signal of the Bkr. (52b)	[]
ExBlo1-I	Module Input State: External Blocking1	[Protection Para /Global Prot Para /Supervision /TCM]
ExBlo2-I	Module Input State: External Blocking2	[Protection Para /Global Prot Para /Supervision /TCM]

Trip Circuit Monitoring Module Signals (Output States)

<i>Signal</i>	<i>Description</i>
Active	Signal: Active
ExBlo	Signal: External Blocking
Pickup	Signal: Pickup Trip Circuit Supervision
Not Possible	Not possible because no state indicator assigned to the breaker.

Commissioning: Trip Circuit Monitoring for Breakers

NOTICE

For breakers that trip by means of little energy (e.g.: via an optocoupler), it has to be ensured that the current applied by the digital inputs will not cause false tripping of the breaker.

Object to Be Tested:

Test of the trip circuit monitoring (with 52a and 52b contact).

Procedure, Part 1:

Simulate failure of the control voltage in the power circuits.

Successful Test Result, Part 1:

After expiration of »*t-TCM*« the trip circuit supervision, *TCM* of the device should signal a pickup.

Procedure, Part 2:

Simulate a broken cable in the breaker control circuit.

Successful Test Result, Part 2:

After expiration of »*t-TCM*«, the trip circuit supervision *TCM* of the device should signal a pickup.

Self Supervision

SSV

The protection devices are supervised by various check routines during normal operation and during the start-up phase on faulty operation.

The protection devices are carrying out various self supervision tests.

<i>Self Supervision within the devices</i>		
Supervision of...	Supervised by...	Action on detected issue...
Start phase	The duration (permitted time) of the boot phase is monitored.	The device will be rebooted. => The device will be taken out of service after three unsuccessful start attempts.
Supervision of the duration of a protection cycle (Software cycle)	The maximum permitted time for a protection cycle is monitored by a timing analysis.	The self-supervision contact will be deenergized if the permitted time for a protection cycle is exceeded (first threshold). The protection device will be rebooted, if the protection cycle exceeds the second threshold.
Monitoring of the communication between Main and Digital Signal Processor (DSP)	The cyclic measured value processing of the DSP is monitored by the main processor.	The device will be rebooted, if a failure is detected. The self-supervision contact will be deenergized.
Analog-Digital-Converter	The DSP does a plausibility check on the digitalized data.	Protection will be blocked, if a failure is detected, in order to prevent faulty tripping.
Supervision of data consistency after an outage of the power supply. (e.g. outage of the power supply while changing the parameter settings).	An internal logic detects fragmentary saved data after an outage of the power supply.	If the new data is incomplete or corrupt, it will be deleted during the reboot phase of the device. The device will continue to work with the last valid data set.
Data consistency in general	Generation of check-sums.	The device will be taken out of service in case that inconsistent data is detected that is not caused by an outage of the power supply. (fatal internal error).

<i>Self Supervision within the devices</i>		
Parameter Setting (Device)	Protecting the parameter setting by plausibility checks.	Implausibilities within the parameter configuration can be detected by means of plausibility checks. Detected implausibilities are highlighted by a question mark symbol. Please refer to chapter parameter setting for detailed information.
Quality of the power supply	A hardware circuit ensures that the device can only be used, if the power supply is in the range specified by the technical data.	If the supply voltage is too low, the device will not start up or it will be set out of service respectively.
Sags of the supply voltage	Short-term sags of the supply voltage are detected and can be bridged in most of the cases by means of the integrated buffer within the power supply hardware. This buffer also allows the termination of ongoing data writing procedures.	The module for the supervision of the system utilization will detect repetitive short-term sags of the supply voltage.
Internal data of the device (memory load, internal resources, ...)	An internal module monitors the system utilization.	The module for the supervision of the system utilization initiates in case of a fatal error a reboot of the device. In case of minor faults the system led will flash alternating red and green (please refer to the <i>Troubleshooting Guide</i>). The issue will be recorded as a system message.
Battery	The battery is monitored continuously. Notice: The battery serves as buffering of the clock (real time clock). There's no impact on the functionality of the device if the battery breaks down, except for the buffering of the clock while the unit is in de-energized condition.	If the battery is low the System LED will flash alternating red and green (please refer to the <i>Troubleshooting Guide</i>).
Status of the device communication (SCADA)	The projected and activated SCADA module supervises its connection to the master communication system.	You can check if there is active communication with the master system within menu <Operation/ Status display/ Communication>. In order to monitor this state you can assign this status onto an LED and/or an output relay. For details on the status of the GOOSE communication please refer to chapter IEC61850.

Device Start (Reboot)

The device starts up if:

- it is connected to the supply voltage,
- the User initiates (intentionally) a restart of the device,
- the device is set back to factory defaults,
- the internal self-supervision of the device detects a fatal error.

The reason for a device start/reboot is shown numerically within menu <Operation/ Status display/ Sys/ Restart> (please refer to the table below). The reason will also be logged within the event recorder (Event: Sys.Restart).

The table below explains the numbers indicating the reason of the restart.

<i>Device Start-up Codes</i>	
1.	Normal Start-up Start-up after clean disconnection of the supply voltage.
2.	Reboot by the Operator Device reboot triggered by the operator via HMI or Smart view.
3.	Reboot by means of Super Reset Automatic reboot when setting the device back to factory defaults.
4.	-- (outdated)
5.	-- (outdated)
6.	Unknown Error Source Reboot due to unknown error source.
7.	Forced Reboot (initiated by the main processor) The main processor identified invalid conditions or data.
8.	Exceeded Time Limit of the Protection Cycle Unexpected interruption of the Protection Cycle.
9.	Forced Reboot (initiated by the digital signal processor) The digital signal processor identified invalid conditions or data.
10.	Exceeded Time Limit of the Measured Value Processing Unexpected interruption of the cyclic measured value processing.
11.	Sags of the Supply Voltage Reboot after short-term sag or outage of the supply voltage.
12.	Illegal Memory Access Reboot after illegal memory access.

Internal Messages

The menu [Operation / Self Supervision / Messages] gives access to the list of internal messages. In particular, it is recommended to check these in case of some problem directly related to the device.

All messages that can potentially appear here are described in detail in a separate document, the "E-Series

Troubleshooting Guide".

Device taken out of Service “Device Stopped”

The protection device will be taken out of service, if there is an undefined state that cannot be escaped after three reboots.

In this state the system LED will be illuminated red or red flashing. The display will show the message “Device Stopped” followed by a 6-digit error code, e.g. E01487.

In addition to the recorders, messages and display information that can be accessed by the user, there may exist additional error information accessible by the Service Staff. These offer further failure analysis and diagnosis opportunities to the Service Staff.

NOTICE

In such a case please contact the Eaton Service Staff and provide them the error code.

For further information on trouble shooting please refer to the separately provided “Trouble Shooting Guide”.

Direct Commands of the Self Supervision

Parameter	Description	Setting range	Default	Menu path
Ack System LED 	Ack System LED (red/green flashing LED)	False, True	False	[Operation /Reset /Flags]

Signals (Output States) of the Self Supervision

Signal	Description
System Error	Signal: Device Failure
SelfSuperVision Contact	Signal: SelfSuperVision Contact

Values of the Self Supervision

Value	Description	Menu path
Last Failure	Last Failure	[Operation /Self Supervision /System Error]

Counter Values of the Self Supervision

Value	Description	Menu path
Resets by Device	Resets initiated by the device	[Operation /Self Supervision /System Error]
Cr No of free sockets	Counter for network diagnosis. Number of free sockets.	[Operation /Self Supervision /System State]

Programmable Logic

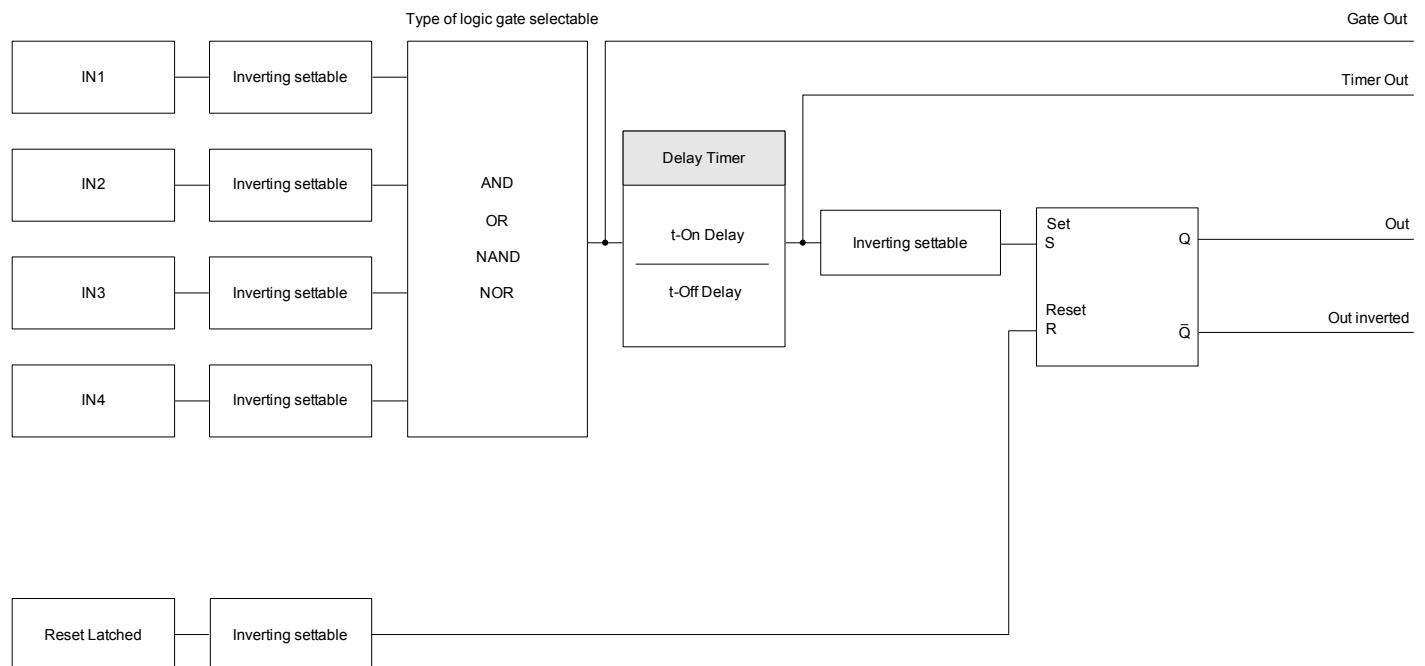
Available Elements (Equations):
Logic

General Description

The protective device includes programmable logic equations for programming inputs, outputs, blocking of protective functions, and custom logic functions in the relay.

The logic provides control of the output relays based on the state of the inputs that can be chosen from the assignment list (protective function pickups, protective function states, breaker states, system alarms, and module inputs). The User can use the output signals of a logic equation as inputs in higher equations (e.g.: the output signal of logic equation 10 might be used as an input of logic equation 11).

Principle Overview.



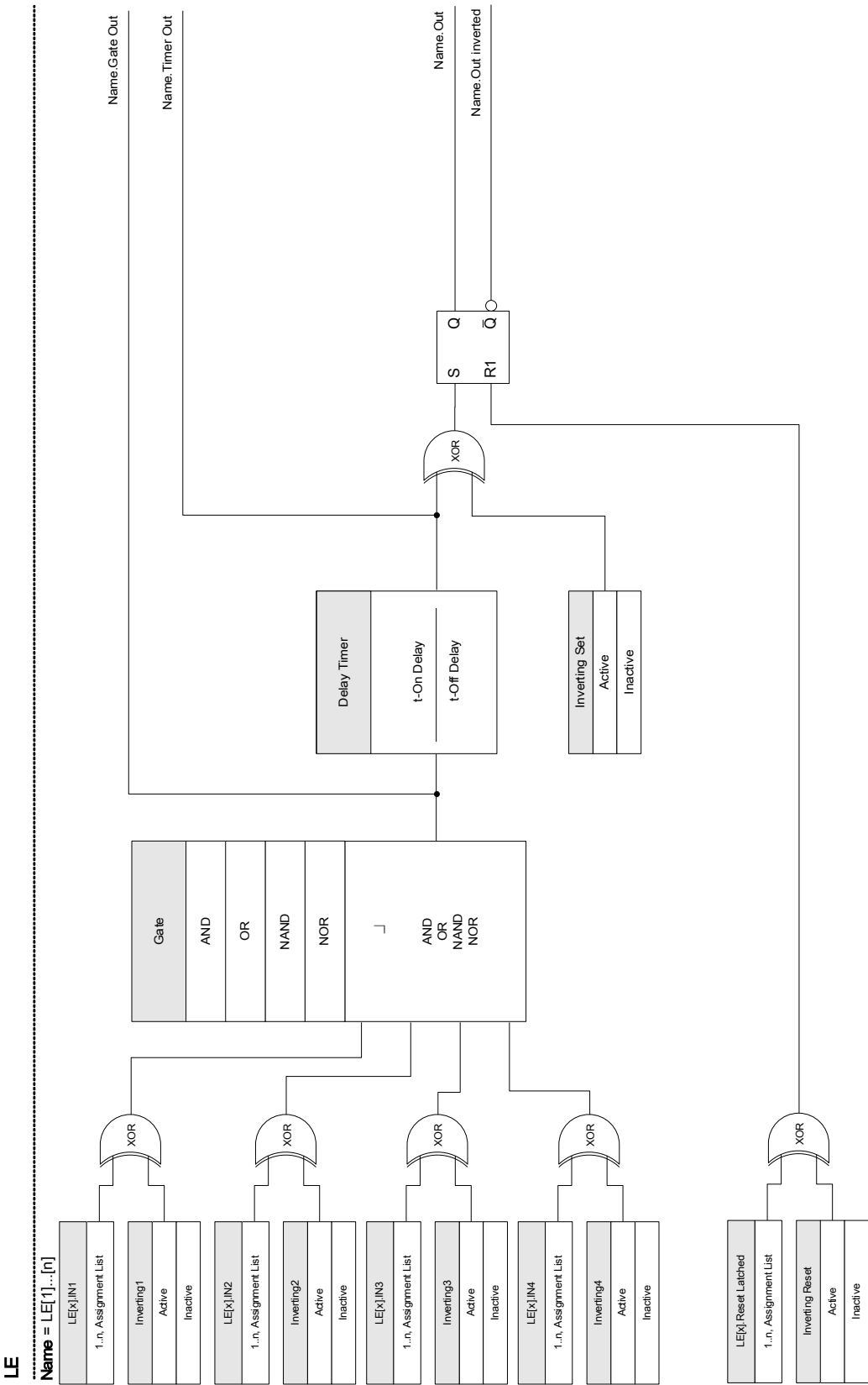
If no signal is assigned to a logic gate (All inputs are "0"), then the output of the gate will be set as follows:

- "0" for an AND gate
- "1" for a NAND gate
- "0" for an OR gate
- "1" for a NOR gate

If at least one input signal is assigned to a gate all not assigned inputs are set to:

- "1" for AND / NAND gates
- "0" for an OR / NOR gates

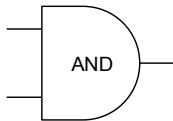
Detailed Overview – Overall Logic Diagram.



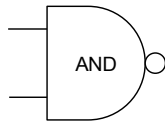
Available Gates (Operators)

Within the Logic Equation, the following Gates can be used.

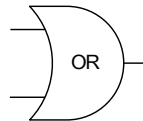
Gate



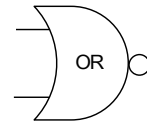
AND



NAND



OR



NOR

Input Signals

The User can assign up to four Input signals (from the assignment list) to the inputs of the gate.

As an option, each of the four input signals can be inverted (negated).

Timer Gate (On Delay and Off Delay)

The output of the gate can be delayed. The User has the option to set an On and an Off delay.

Latching

The timer issues two signals: an unlatched and a latched signal. The latched output can optionally be inverted.

In order to reset the latched signal, the User has to assign a reset signal from the assignment list. Optionally, the reset signal can also be inverted.

If no »Reset Latched« signal is assigned, then the »LATCH OUT « signal will be identical with the »TIMER OUT « signal.

Cascading Logical Outputs

The device will evaluate output states of the logic equations starting from “Logic Equation 1” up to the logic equation with the highest number. This evaluation cycle will be continuously repeated.

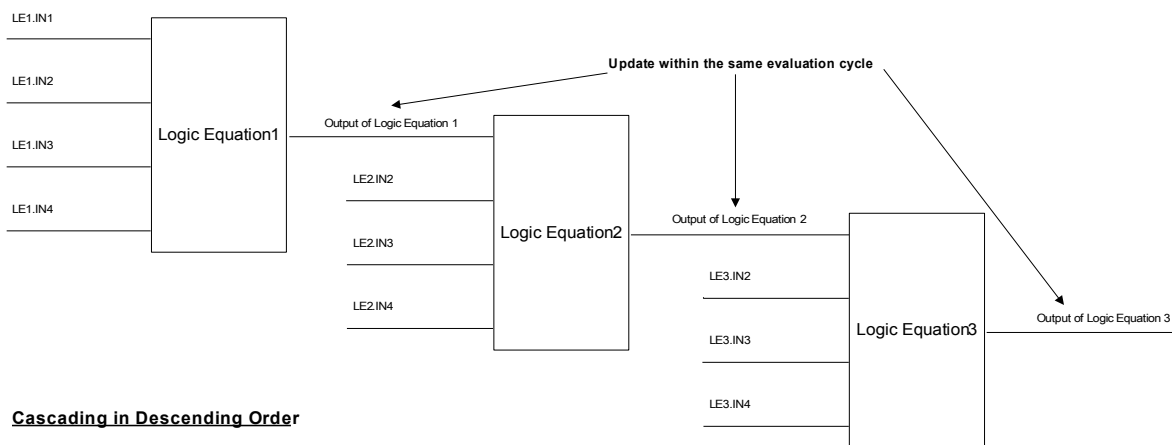
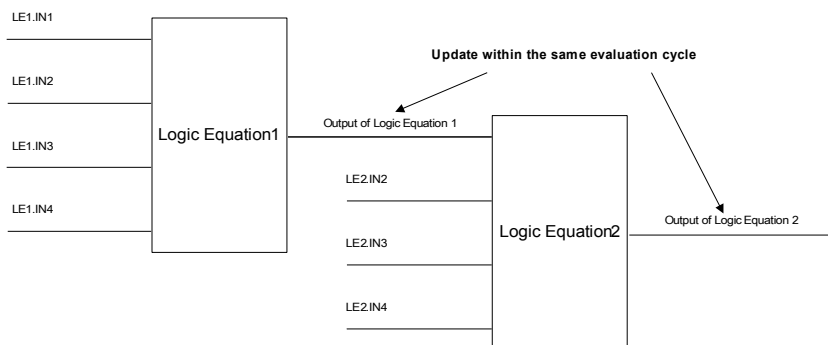
Cascading Logic Equations in an ascending sequence.

Cascading in an ascending sequence means that the User utilizes the output signal of “Logic Equation n ” as input of “Logic Equation $n+1$ ”. If the state of “Logic Equation n ” changes, the state of the output of “Logic Equation $n+1$ ” will be updated within the same cycle.

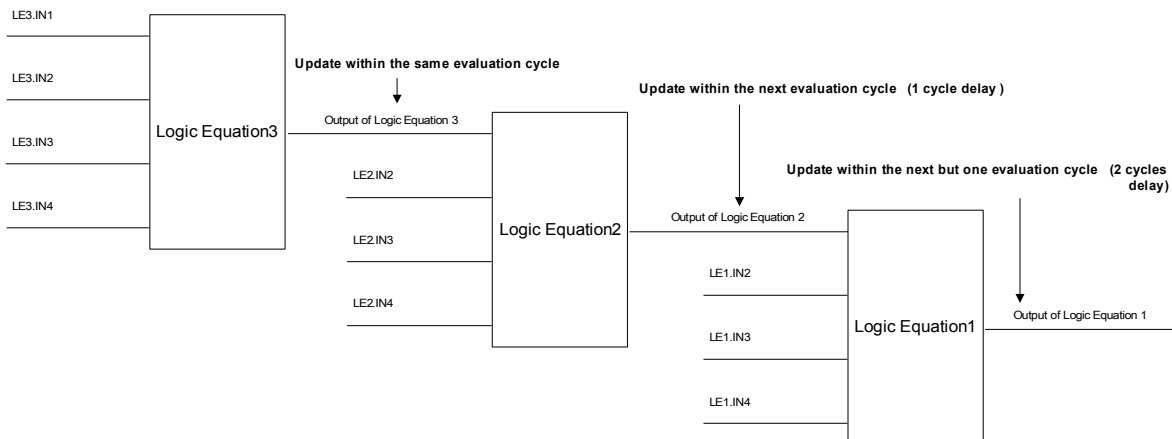
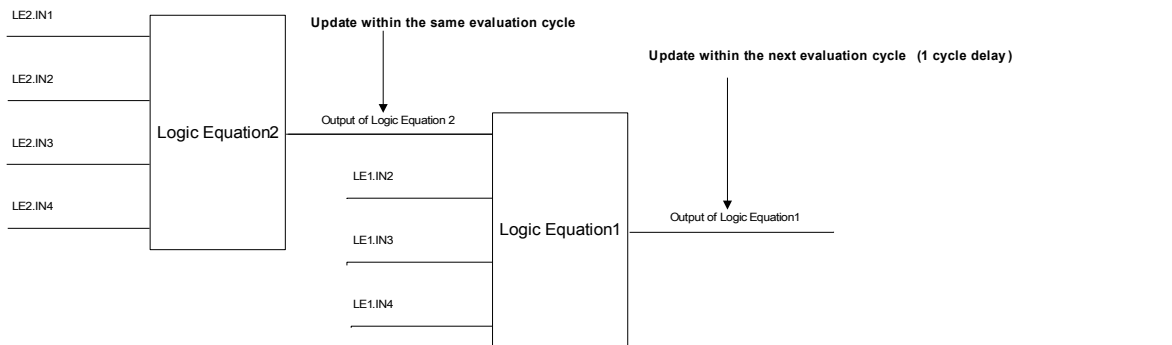
Cascading Logic Equations in a descending sequence.

Cascading in a descending sequence means that the User utilizes the output signal of “Logic Equation $n+1$ ” as input of “Logic Equation n ”. If the output of “Logic Equation $n+1$ ” changes, this change of the feed back signal at the input of “Logic Equation n ” will be delayed for one cycle.

Cascading in Ascending Order



Cascading in Descending Order



Programmable Logic at the Panel



WARNING improper use of logic equations might result in personal injury or damage the electrical equipment.

Do not use logic equations unless the User can ensure the safe functionality.

How to configure a logic equation?

- Within the Device Planning, set the number of required Logic Equations.
- Call up the [Logic] menu.
- Select a Logic Equation that is to be set.
- Set the Input Signals (where necessary, invert them).
- If required, configure the timer (» *On delay*« and » *Off delay*«).
- If the latched output signal is used, assign a reset signal to the reset input.
- Within the »status display«, the User can check the status of the logical inputs and outputs of the logic equation.

In case the logic equations should be cascaded, the User has to be aware of timing delays (cycles) in case of descending sequences (Please refer to the Cascading Logical Outputs section).

By means of the Status Display [Operation/Status Display], the logical states can be verified.

Device Planning Parameters of the Programmable Logic

<i>Parameter</i>	<i>Description</i>	<i>Options</i>	<i>Default</i>	<i>Menu path</i>
No of Equations: 	Number of required Logic Equations:	0, 5, 10, 20, 40, 80	20	[Device Planning]

Global Protection Parameter of the Programmable Logic

Parameter	Description	Setting range	Default	Menu path
LE1.Gate 	Logic gate	AND, OR, NAND, NOR	OR	[Logic /LE 1]
LE1.IN1 	Assignment of the Input Signal	1..n, Assignment List	Logic.LE2.Gate Out	[Logic /LE 1]
LE1.Inverting1 	Inverting the input signals. Only available if an input signal has been assigned.	Inactive, Active	Inactive	[Logic /LE 1]
LE1.IN2 	Assignment of the Input Signal	1..n, Assignment List	Logic.LE3.Gate Out	[Logic /LE 1]
LE1.Inverting2 	Inverting the input signals. Only available if an input signal has been assigned.	Inactive, Active	Inactive	[Logic /LE 1]
LE1.IN3 	Assignment of the Input Signal	1..n, Assignment List	-.-	[Logic /LE 1]
LE1.Inverting3 	Inverting the input signals. Only available if an input signal has been assigned.	Inactive, Active	Inactive	[Logic /LE 1]
LE1.IN4 	Assignment of the Input Signal	1..n, Assignment List	-.-	[Logic /LE 1]
LE1.Inverting4 	Inverting the input signals. Only available if an input signal has been assigned.	Inactive, Active	Inactive	[Logic /LE 1]
LE1.t-On Delay 	Switch On Delay	0.00 - 36000.00s	0.00s	[Logic /LE 1]

<i>Parameter</i>	<i>Description</i>	<i>Setting range</i>	<i>Default</i>	<i>Menu path</i>
LE1.t-Off Delay 	Switch Off Delay	0.00 - 36000.00s	0.00s	[Logic /LE 1]
LE1.Reset Latched 	Reset Signal for the Latching	1..n, Assignment List	-.-	[Logic /LE 1]
LE1.Inverting Reset 	Inverting Reset Signal for the Latching	Inactive, Active	Inactive	[Logic /LE 1]
LE1.Inverting Set 	Inverting the Setting Signal for the Latching	Inactive, Active	Inactive	[Logic /LE 1]

Programmable Logic Inputs

<i>Name</i>	<i>Description</i>	<i>Assignment via</i>
LE1.Gate In1-I	State of the module input: Assignment of the Input Signal	[Logic /LE 1]
LE1.Gate In2-I	State of the module input: Assignment of the Input Signal	[Logic /LE 1]
LE1.Gate In3-I	State of the module input: Assignment of the Input Signal	[Logic /LE 1]
LE1.Gate In4-I	State of the module input: Assignment of the Input Signal	[Logic /LE 1]
LE1.Reset Latch-I	State of the module input: Reset Signal for the Latching	[Logic /LE 1]

Programmable Logic Outputs

<i>Signal</i>	<i>Description</i>
LE1.Gate Out	Signal: Output of the logic gate
LE1.Timer Out	Signal: Timer Output
LE1.Out	Signal: Latched Output (Q)
LE1.Out inverted	Signal: Negated Latched Output (Q NOT)

Commissioning

Before starting work on an open switchboard, it is required that the switchboard is de-energized and the following five safety regulations have been met.

DANGER

Safety precautions:

- Disconnect the power supply;
- Secure against reconnection;
- Verify that the equipment is de-energized;
- Connect to ground and short-circuit all phases; and
- Cover or safeguard all live adjacent parts.

DANGER

The secondary circuit of a current transformer must never be opened during operation. The prevailing high voltages can cause severe injury or death.

WARNING

Even when the auxiliary voltage is switched off, it is likely that there are still hazardous voltages at the component connections.

All locally applicable national and international installation and safety regulations for working at electrical power installations **MUST** always to be followed.

WARNING

Prior to the initial voltage connection, the following must be guaranteed:

- Correct grounding of the device;
- That all signal circuits are tested;
- That all control circuits are tested;
- Transformer wiring is checked;
- Correct rating of the CTs;
- Correct burden of the CTs;
- That the operational conditions are in line with the Technical Data;
- Correct rating of the transformer protection;
- Function of the transformer fuses;
- Correct wiring of all digital inputs;
- Polarity and capacity of the supply voltage; and
- Correct wiring of the analog inputs and outputs.
- *For line differential protection:* Correct fiber optics connection for a reliable Protection Communication

NOTICE

The permissible deviations of measuring values and device adjustment are dependent on the Technical Data/Tolerances.

Commissioning/Protection Test

WARNING

Commissioning/protection test must be carried out by authorized and qualified personnel. Before the device is put into operation, the related documentation **MUST** be read and understood.

WARNING

With any test of the protection functions, the following has to be checked:

- Is activation/tripping saved in the event recorder?
- Is tripping saved in the fault recorder?
- Is tripping saved in the waveform recorder?
- Are all signals/messages correctly generated?
- Do all generally configured blocking functions work properly?
- Do all temporarily configured (via DI) blocking functions work properly?
- To enable checks on all LEDs and relay functions, these have to be provided with the relevant pickup (alarm) and tripping functions of the respective protection functions/elements. This **MUST** be tested in practical operation.

WARNING

Check of all temporary blockings (via digital inputs).

- In order to avoid malfunctions, all blockings related to tripping/non-tripping of protection function **MUST** be tested. The test can be very complex and should therefore be performed by the same personnel who set up the protection concept.

CAUTION

Check all general trip blockings. All general trip blockings **MUST** be tested.

NOTICE

Prior to the initial operation of the protection device, all tripping times and values shown in the adjustment list **MUST** be confirmed by a secondary test.

NOTICE

Any description of functions, parameters, inputs, or outputs that does not match the device in hand can be ignored.

Decommissioning – Removing the Plug from the Relay

WARNING

Dismounting the relay will lead to a loss of the protection functionality. Ensure that there is a back-up protection. If you are not aware of the consequences of decommissioning the device – STOP! DO NOT start.

WARNING

Inform SCADA before you start.

Switch-off the power supply.

Ensure that the cabinet is de-energized and that there are no voltages that could lead to injury of personnel.

Disconnect the terminals at the rear-side of the device. DO NOT pull any cable – pull on the plug! If it is stuck, use a screw driver.

Fasten the cables and terminals in the cabinet by means of cable clips to ensure that no accidental electrical connections are caused.

Hold the device at the front-side while removing the mounting nuts.

Remove the device carefully from the cabinet.

In case no other device is to be mounted or replaced, cover/close the cut-out in the front-door.

Close the cabinet.

Service and Commissioning Support

Within the service menu, various functions support maintenance and commissioning of the device.

General

Within the [Service/General] menu, the User can initiate a reboot of the device.

Maintenance Mode

Principle – General Use

NOTICE

The Maintenance Mode can be used to reduce arc flash levels. Refer to Std. NFPA70E.

! DANGER

DO NOT attempt to install or perform maintenance on equipment while it is energized. Severe personal injury or death can result from contact with energized equipment. Verify that no voltage is present before opening doors of the switchboard.

! DANGER

If maintenance will be performed on a device, special protective clothing and equipment MUST BE USED and all industry standard procedures MUST BE FOLLOWED. Failure to do so can result in severe personal injury or death.

The Maintenance Mode can improve safety by providing a simple and reliable method to reduce fault clearing time and lower incident energy levels at energized panels. The Maintenance Mode allows the User to switch to more sensitive settings via the HMI/panel, Communication, or via a Digital Input while maintenance work is being performed at an energized panel or device. The more sensitive settings provide greater security for maintenance personnel and helps reduce the possibility of injury.

The status of the Maintenance Mode (active/inactive) is stored power fail-safe.

NOTICE

Manual activation is only possible via the HMI/panel (not via PowerPort-E).

The Maintenance Mode can be activated:

- Manually (only at the HMI/panel);
- Via communication; or
- Via a digital input.

NOTICE

Changing to another mode is only possible if there is no active Activation Signal (e.g.: if the device is in the “Via Digital Input Mode” and while the assigned Digital Input is “true”, the User cannot switch to the “Manual Mode”).

Before Use



The sensitivity settings for the Maintenance Mode have to be calculated and programmed into the device (according to Std. NFPA70E). They are not part of the device by default.

When the Maintenance Mode is enabled and fault current causes its operation, the fault clearing time of the associated breaker has to be very fast. Calculate the sensitivity setting on the basis of **Std. NFPA70E**.

Program those sensitivity settings either into a setting group or into Adaptive Parameters.

How to Use the Maintenance Mode

Calculate the sensitivity setting on the basis of **Std. NFPA70E**. Program those sensitivity settings either into a setting group or into Adaptive Parameters.

The Maintenance Mode offers two output signals: “Maint Mode activated” and “Maint Mode not activated”.

The »Maint Mode.ACTIVATED« signal should be used to:

- Switch to another setting group (in case the sensitivity settings are saved within this setting group);
- Activate “Adaptive Parameters” (in case the sensitivity settings are saved within these adaptive parameters); and/or
- Block or activate dedicated functions.

Please see the Adaptive Parameters section for more details.

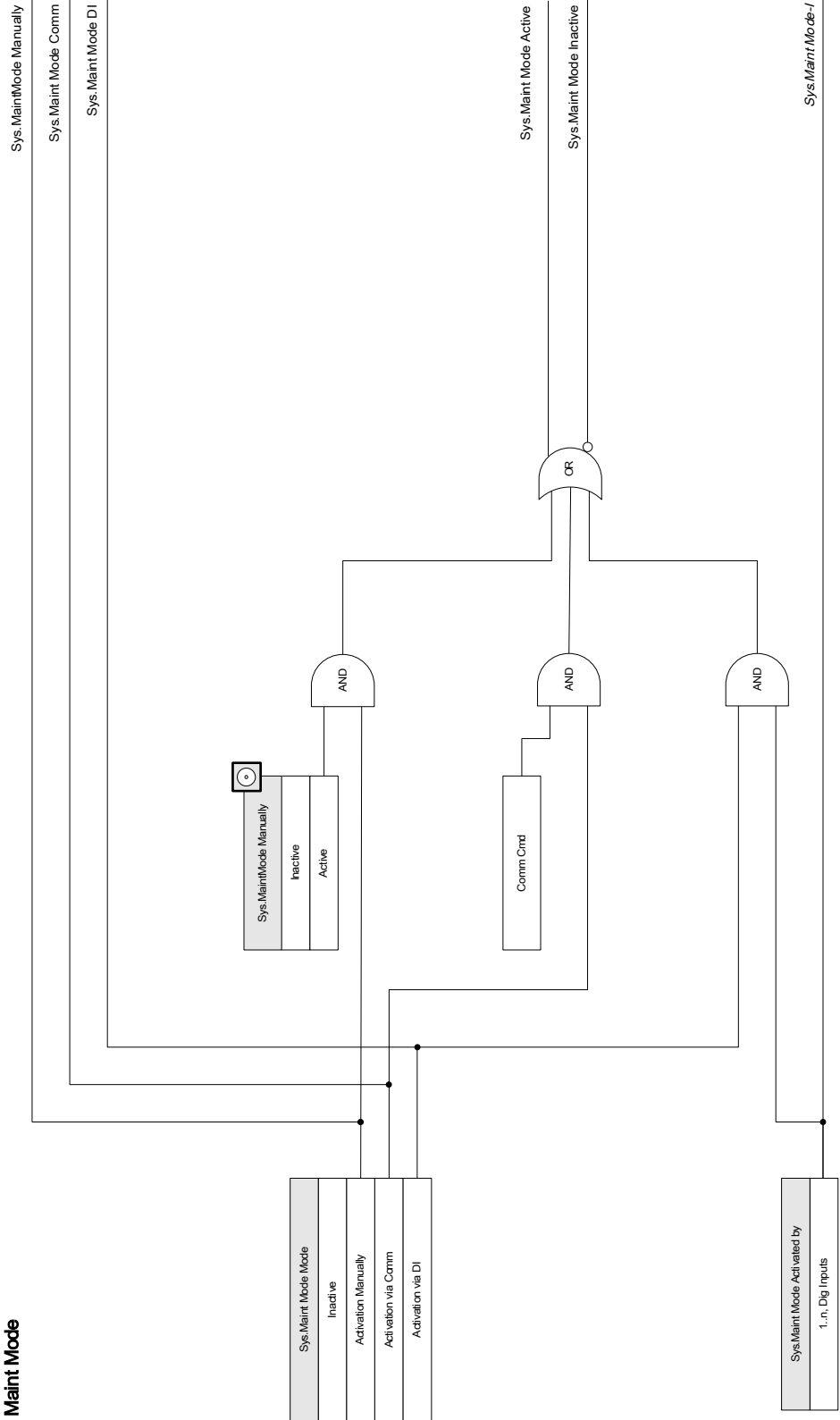
The »Maint Mode.NOT ACTIVATED« signal should be used to:

- Switch back to the standard setting group when Maintenance Mode should not be used.

For fast access, the Maintenance Mode can be accessed by means of the »Softkey« Maint on the start screen (root) of the device.

Sys

Maint Mode



Forcing the Relay Output Contacts

NOTICE

The parameters, their defaults, and setting ranges have to be taken from Relay Output Contacts section.

Principle – General Use

! DANGER

The User **MUST ENSURE** that the relay output contacts operate normally after maintenance is completed. If the relay output contacts do not operate normally, the protective device **WILL NOT** provide protection.

For commissioning purposes or for maintenance, relay output contacts can be set by force.

Within this mode [Service/Test Mode (Prot inhibit)/WARNING! Cont?/Force RO], relay output contacts can be set by force:

- Permanent; or
- Via timeout.

If they are set with a timeout, they will keep their “Force Position” only as long as this timer runs. If the timer expires, the relay will operate normally. If they are set as Permanent, they will keep the “Force Position” continuously.

There are two options available:

- Forcing a single relay »*Force Rox*«; and
- Forcing an entire group of relay output contacts »*Force all Outs*«.

Forcing an entire group takes precedence over forcing a single relay output contact!

NOTICE

A relay output contact **WILL NOT follow a force command** as long as it is disarmed at the same time.

NOTICE

A relay output contact **WILL follow a force command:**

- If it is not disarmed; and
- If the Direct Command is applied to the relay(s).

Keep in mind, that forcing all relay output contacts (of the same assembly group) takes precedence over the force command of a single relay output contact.

Disarming the Relay Output Contacts

NOTICE

The parameters, their defaults, and setting ranges have to be taken from the Relay Output Contacts section.

Principle – General Use

Within this mode [Service/Test Mode (Prot inhibit)/WARNING! Cont?/DISARMED], entire groups of relay output contacts can be disabled. By means of this test mode, contact outputs switching actions of the relay output contacts are prevented. If the relay output contacts are disarmed, maintenance actions can be carried out without the risk of taking entire processes off-line.

! DANGER

The User **MUST ENSURE** that the relay output contacts are **ARMED AGAIN** after maintenance is complete. If they are not armed, the protective device **WILL NOT** provide protection.

NOTICE

Zone Interlocking Output and the Supervision Contact cannot be disarmed.

Within this mode [Service/Test Mode (Prot inhibit)/WARNING! Cont?/DISARMED] entire groups of relay output contacts can be disarmed:

- Permanent; or
- Via timeout.

If they are set with a timeout, they will keep their “Disarm Position” only as long as this timer runs. If the timer expires, the relay output contacts will operate normally. If they are set Permanent, they will keep the “Disarm State” continuously.

NOTICE

A relay output contact **WILL NOT be disarmed as long as:**

- A relay output contact **WILL NOT** be disarmed if it is latched (and not yet reset).
- A relay output contact **WILL NOT** be disarmed as long as a running t-OFF-delay timer is not yet expired (hold time of a relay output contact).
- If the Disarm Control is not set to active.
- If the Direct Command is not applied.

NOTICE

A relay output contact WILL be disarmed if it is not latched and:

- If there is no running t-OFF-delay timer (hold time of a relay output contact);
and
- If the DISARM Control is set to active; and
- If the Direct Command Disarm is applied.

Forcing RTDs*

* = Availability depends on ordered device.

NOTICE

The parameters, their defaults, and setting ranges have to be taken from RTD/UTRD section.

Principle – General Use

! DANGER

The User **MUST ENSURE** that the RTDs operate normally after maintenance is completed. If the RTDs do not operate normally, the protective device **WILL NOT** provide protection.

For commissioning purposes or for maintenance, RTD temperatures can be set by force.

Within this mode [Service/Test Mode (Prot inhibit)/WARNING! Cont?/URTD], RTD temperatures can be set by force:

- Permanent; or
- Via timeout.

If they are set with a timeout, they will keep their “Forced Temperature” only as long as this timer runs. If the timer expires, the RTD will operate normally. If they are set as »*Permanent*«, they will keep the “Forced Temperature” continuously. This menu will show the measured values of the RTDs until the User activates the force mode by calling up the »*Function*«. As soon as the force mode is activated, the shown values will be frozen as long as this mode is active. Now the User can force RTD values. As soon as the force mode is deactivated, measured values will again be shown.

Forcing Analog Outputs*

* = Availability depends on ordered device.

NOTICE

The parameters, their defaults, and setting ranges have to be taken from Analog Output section.

Principle – General Use

! DANGER

The User **MUST ENSURE** that the Analog Outputs operate normally after maintenance is completed. **Do not use this mode if forced Analog Outputs cause issues in external processes.**

For commissioning purposes or for maintenance, Analog Outputs can be set by force.

Within this mode [Service/Test Mode (Prot inhibit)/WARNING! Cont?/Analog Outputs], Analog Outputs can be set by force:

- Permanent; or
- Via timeout.

If they are set with a timeout, they will keep their “Forced Value” only as long as this timer runs. If the timer expires, the Analog Output will operate normally. If they are set as »*Permanent*«, they will keep the “Forced Value” continuously. This menu will show the current value that is assigned to the Analog Output until the User activates the force mode by calling up the »*Function*«. As soon as the force mode is activated, the shown values will be frozen as long as this mode is active. Now the User can force Analog Output values. As soon as the force mode is deactivated, measured values will again be shown.

Forcing Analog Inputs*

* = Availability depends on ordered device.

NOTICE

The parameters, their defaults, and setting ranges have to be taken from Analog Inputs section.

Principle – General Use

! DANGER

The User **MUST ENSURE** that the Analog Inputs operate normally after maintenance is completed.

For commissioning purposes or for maintenance, Analog Inputs can be set by force.

Within this mode [Service/Test Mode (Prot inhibit)/WARNING! Cont?/Analog Inputs], Analog Inputs can be set by force:

- Permanent; or
- Via timeout.

If they are set with a timeout, they will keep their “Forced Value” only as long as this timer runs. If the timer expires, the Analog Input will operate normally. If they are set as »*Permanent*«, they will keep the “Forced Value” continuously. This menu will show the current value that is fed to the Analog Input until the User activates the force mode by calling up the »*Function*«. As soon as the force mode is activated, the shown value will be frozen as long as this mode is active. Now the User can force the Analog Input value. As soon as the force mode is deactivated, measured value will be shown again.

Technical Data

NOTICE

Use Copper conductors only, 75°C (167°F).
Conductor size AWG 14 [2.5 mm].

Climatic Environmental Conditions

Storage Temperature:	-30°C to +70°C (-22°F to 158°F)
Operating Temperature:	-20°C to +60°C (-4°F to 140°F)
Permissible Humidity at Ann. Average:	<75% rel. (on 56d up to 95% rel.)
Permissible Installation Altitude:	<2,000 m (6,561.67 ft) above sea level If 4,000 m (13,123.35 ft) altitude applies, a changed classification of the operating and test voltages may be necessary.

Degree of Protection EN 60529

HMI Front Panel with Seal:	IP54
Rear Side Terminals:	IP20

Routine Test

Insulation Test Acc. to IEC60255-5:	All tests to be carried out against ground and other input and output circuits.
Aux. Voltage Supply, Digital Inputs, Current Measuring Inputs, Signal Relay Outputs:	2.5 kV (eff.) / 50 Hz
Voltage Measuring Inputs:	3.0 kV (eff.) / 50 Hz
All Wire-Bound Communication Interfaces:	1.5 kV DC

Housing

Housing B1: Height/ Width	183 mm (7.205 in.) / 141.5 mm (5.571 in.)
Housing Depth (Incl. Terminals):	208 mm (8.189 in.)
Material, Housing:	Aluminum extruded section
Material, Front Panel:	Aluminum / foil front
Mounting Position:	Horizontal ($\pm 45^\circ$ around the X-axis must be permitted)
Weight:	approx. 2.4 kg (5.291 lb)

Current and Ground Current Measurement

Plug-in Connector with Integrated Short-Circuiter (Conventional Current Inputs)

Phase and Ground Current Inputs:

Nominal Currents:	1 A / 5 A
Max. Measuring Range:	Up to 40 x I_n (phase currents) Up to 25 x I_n (ground current standard)
Capacity:	4 x I_n /continuously
Overcurrent Proof:	30 x I_n / 10 s 100 x I_n / 1 s 250 x I_n / 10 ms (1 half-wave)
Power Consumption:	Phase current inputs At $I_n = 1\text{ A}$ $S = 25\text{ mVA}$ At $I_n = 5\text{ A}$ $S = 90\text{ mVA}$ Ground current input At $I_n = 1\text{ A}$ $S = 25\text{ mVA}$ At $I_n = 5\text{ A}$ $S = 90\text{ mVA}$

Sensitive Ground Current Inputs:

Nominal Currents:	1 A / 5 A with 50:0.025 core balance CT
Max. Measuring Range:	Up to 2.5 x I_n
Capacity:	2 x I_n /continuously
Overcurrent Proof:	10 x I_n / 10 s 25 x I_n / 1 s 100 x I_n / 10 ms (1 half-wave)
Power Consumption:	At 1 A $S = 550\text{ mVA}$ At 0.1 A $S = 7\text{ mVA}$ At 5 A $S = 870\text{ mVA}$ At 0.5 A $S = 10\text{ mVA}$
Frequency Range:	50 Hz / 60 Hz $\pm 10\%$
Terminals:	Screw-type terminals with integrated short-circuiters (contacts)

Phase and Ground Current**Inputs:**

Screws M4, captive type acc. to VDEW

Connection Cross Sections: 1 x or 2 x 2.5 mm² (2 x AWG 14) with wire end ferrule
1 x or 2 x 4.0 mm² (2 x AWG 12) with ring cable sleeve or cable sleeve
1 x or 2 x 6 mm² (2 x AWG 10) with ring cable sleeve or cable sleeve

The current measuring board's terminal blocks may be used as with 2 (double) conductors AWG 10,12,14 otherwise with single conductors only.

Voltage Supply

Aux. Voltage:	24 - 270 Vdc / 48 - 230 Vac (-20/+10%) $\approx$
Buffer Time in Case of Supply Failure:	$\geq$ 50 ms at minimal aux. voltage Interrupted communication is permitted.
Max. Permissible Making Current:	18 A peak value for $\leq$ 0.25 ms 12 A peak value for $\leq$ 1 ms

The voltage supply must be protected by a fuse of:

- 2,5 A time-lag miniature fuse 5 x 20 mm (approx. 1/5 x 0.8 in.) according to IEC 60127
- 3,5 A time-lag miniature fuse 6,3 x 32 mm (approx. 1/4 x 1 1/4 in.) according to UL 248-14

Power Consumption

Power Supply Range:	Power consumption in Idle Mode	Max. Power Consumption
24 - 270 Vdc:	Approx. 7 W	Approx. 10 W
48 - 230 Vac	Approx. 7 W / 13 VA	Approx. 10W /17 VA
(For Frequencies of 50-60 Hz):		

Display

Display Type:	LCD with LED background illumination
Resolution - Graphics Display:	128 x 64 pixel

LED - Type:	Two colored: red / green
Number of LEDs, Housing B2:	8

Front Interface USB

Type:	Mini B

Real Time Clock

Running Reserve of the Real Time
Clock: 1 year min.

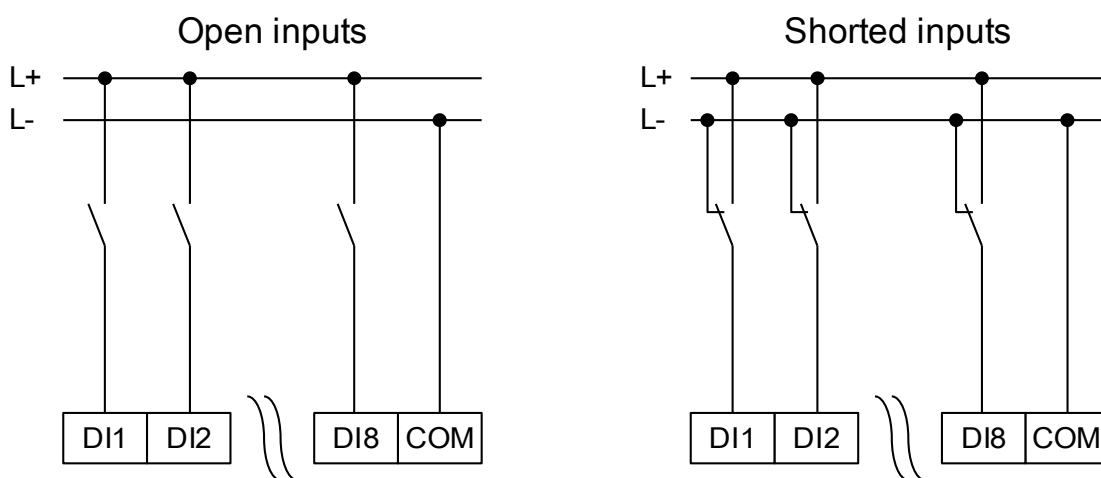
Digital Inputs

Max. Input Voltage: 300 Vdc / 259 Vac

Input Current: DC <4 mA
AC <16 mA

Reaction Time: <20 ms

Fallback Time:
Shorted inputs <30 ms
Open inputs <90 ms



(Safe State of the Digital Inputs)

Switching Thresholds: $U_n = 24 \text{ Vdc}, 48 \text{ Vdc}, 60 \text{ Vdc}, 110 \text{ Vac / dc}, 230 \text{ Vac / dc}$

$U_n = 24 \text{ Vdc}$

Switching Threshold 1 ON: Min. 19.2 Vdc

Switching Threshold 1 OFF: Max. 9.6 Vdc

$U_n = 48 \text{ V} / 60 \text{ Vdc}$

Switching Threshold 2 ON: Min. 42.6 Vdc

Switching Threshold 2 OFF: Max. 21.3 Vdc

$U_n = 110 / 120 \text{ Vac / dc}$

Switching Threshold 3 ON: Min. 88.0 Vdc / 88.0 Vac

Switching Threshold 3 OFF: Max. 44.0 Vdc / 44.0 Vac

$U_n = 230 / 240 \text{ Vac / dc}$

Switching Threshold 4 ON: Min. 184 Vdc / 184 Vac

Switching Threshold 4 OFF: Max. 92 Vdc / 92 Vac

Terminals: Screw-type terminal

Relay Outputs

Continuous Current:	5 A ac / dc
Max. Make Current	25 A ac / 25 A dc for 4 s 48W (VA) at L/R = 40ms 30 A / 230Vac according to ANSI IEEE Std C37.90-2005 30 A / 250Vdc according to ANSI IEEE Std C37.90-2005
Max. Breaking Current:	5 A ac up to 240 V ac 4 A ac at 230V and $\cos \phi = 0,4$ 5 A dc up to 30 V (resistive) 0.3 A dc at 250 V (resistive) 0,1 A dc at 220 V and L/R = 40ms
Max. Switching Voltage:	250 V ac / 250 V dc
Switching Capacity:	3,000 VA
Operating time: (*)	typ. 7 ms
Reset time: (*)	typ. 3 ms
Contact Type:	Form C or normally open contact
Terminals:	Screw-type terminals

(*) The operating and reset times are the pure hardware-related switching times (coil – making/breaking contact), i. e. without the time that it takes the software to calculate the decisions.

Time Synchronization IRIG-B00X

Nominal input voltage:

5 V

Connection:

Screw-type terminals (twisted pair)

Zone Interlocking

Only for Zone Interlock Tripping Outputs (Zone Interlock, semiconductor output): 5 Vdc, <2mA for connection to electronic inputs only.

Zone Out:	
Output voltage (High)	4.75 to 5.25 Vdc
Output voltage (Low)	0.0 to +0.5 Vdc
Zone In:	
Nominal input voltage	+5 Vdc
Max. input voltage	+5.5 Vdc
Switching threshold ON	min. 4.0 Vdc
Switching threshold OFF	max. 1.5 Vdc
Galvanic isolation	2.5 kV ac (to ground and other IO)
Connection:	Screw-type terminals (twisted pair)

RS485*

Connection:	6 screw-clamping terminals RM 3.5 mm (138 MIL) (terminating resistors internal)

*availability depends on device

CAUTION

The RS485 interface is realized via terminals. The communication cable has to be shielded. The shielding has to be fixed at the screw that is marked with the ground symbol (rear side of the device).

Fiber Optic Module with ST connector*

Connector:	ST Port
Compatible Fiber:	50/125 µm, 62,5/125 µm, 100/140 µm and 200 µm HCS
Wavelength	820 nm
Minimum Optical Input Power:	-24,0 dBm
Minimum Optical Output Power:	-19.8 dBm with 50/125 µm fiber -16,0 dBm with 62,5/125 µm fiber -12,5 dBm with 100/145 µm fiber -8,5 dBm with 200 µm HCS fiber
Maximum Link Length:	approx. 2.7 km (depending on link attenuation)

*availability depends on device

Please note: The transmission speed of the optical interfaces is limited to 3 MBaud for Profibus.

Fiber Optic Module with LC Connector for Long-distance Protection Communication**

Connector:	LC Port
Compatible Fiber:	9 µm single mode
Wavelength:	1310 nm
Minimum Optical Input Power:	-31.0 dBm
Minimum Optical Output Power:	-15.0 dBm
Maximum Link Length:	approx. 20 km (depending on link attenuation)

** only for Line Differential Protection

Optical Ethernet module with LC connector*

Connector:	LC-Port
Compatible Fiber:	50/125 µm and 62,5/125 µm
Wavelength:	1300 nm
Minimum Optical Input Power:	-30,0 dBm
Minimum Optical Output Power:	-22.5 dBm with 50/125 µm fiber -19,0 dBm with 62,5/125 µm fiber
Maximum Link Length:	approx. 2 km (depending on link attenuation)

*availability depends on device

URTD-Interface*

Connector:	Versatile Link
Compatible Fiber:	1 mm
Wavelength:	660 nm
Minimum Optical Input Power:	-39,0 dBm

*availability depends on device

Analog Output

Shielded cable for the analog output is recommended. The terminal of the HF shield should be used, when connecting the shield to ground on both sides of the cable is not possible. On one side of the cable the shield has to be directly connected to ground. In case of the use of unshielded twisted pair cables, the length must not exceed 10 m.

Range:	0-20 mA
Max. load resistance:	1 k Ω
Accuracy	0.5% of the nominal value 20 mA
Influence of temperature to accuracy	<1% (within the range of 0°C to +60°C (+32°F to +140°F))
Test voltage of output against other electrical groups	2.5 kV
Test voltage of output against ground	1.0 kV

Boot Phase

After switching on the power supply, the protection will be available in approximately 16 seconds. After approximately 40 seconds, the boot phase is completed (HMI and Communication initialized).

Standards

Approvals

- UL-listed file: E154862

Design Standards

Generic Standard	EN 61000-6-2 , 2005 EN 61000-6-3 , 2006
Product Standard	EC 60255-1; 2009 IEC 60255-27, 2013 EN 50178, 1998 UL 508 (Industrial Control Equipment), 2005 CSA C22.2 No. 14-95 (Industrial Control Equipment), 1995 ANSI C37.90, 2005

High Voltage Tests (IEC 60255-1)

High Frequency Interference Test

IEC 60255-22-1	Within one circuit	1 kV/2 s
IEEE C37.90.1		
IEC 61000-4-18	Circuit to ground	2.5 kV/2 s
class 3	Circuit to circuit	2.5 kV/2 s

Insulation Voltage Test

IEC 60255-27 (10.5.3.2)	All circuits to other circuits and exposed conductive parts	2.5 kV (eff.)/50Hz, 1 min.
IEC 60255-5		
EN 50178	Except interfaces	1.5 kV DC, 1 min.
	Voltage measuring input	3 kV (eff.)/50 Hz, 1 min.

Impulse Voltage Test

IEC 60255-27 (10.5.3.1)		5 kV/0.5J, 1.2/50 μ s
IEC 60255-5		

Insulation resistance test

IEC 60255-27 (10.5.3.3)	Within one circuit	500V DC , 5s
EN 50178		
	Circuit to circuit	500V DC , 5s

EMC Immunity Tests

Fast Transient Disturbance Immunity Test (Burst)

IEC 60255-22-4	Power supply, mains inputs	±4 kV, 2.5 kHz
IEC 61000-4-4	Other in- and outputs	±2 kV, 5 kHz (coupling network) ±4 kV, 2.5 kHz (coupling clamp)
ANSI C37.90.1		
class 4		

Surge Immunity Test (Surge)

IEC 60255-22-5	Within one circuit	2 kV
IEC 61000-4-5	Circuit to ground	4 kV
class 4		
class 3	Communication cables to ground	2 kV

Electrical Discharge Immunity Test (ESD)

IEC 60255-22-2	Air discharge	8 kV
IEC 61000-4-2 class 3	Contact discharge	6 kV

Radiated Radio Frequency Electromagnetic Field Immunity Test

IEC 60255-22-3	26 MHz – 80 MHz	10 V/m
IEC 61000-4-3	80 MHz – 1 GHz	35 V/m
	1 GHz – 3 GHz	10 V/m

Immunity to Conducted Disturbances Induced by Radio Frequency Fields

IEC 61000-4-6 class 3	150kHz - 80MHz	10 V

Power Frequency Magnetic Field Immunity Test

IEC 61000-4-8	continuous	30 A/m
class 4	3 sec	300 A/m

EMC Emission Tests*Radio Interference Suppression Test*

IEC/CISPR22	150kHz - 30MHz	Limit value class B
IEC60255-26		
DIN EN 55022		

Radio Interference Radiation Test

IEC/CISPR22	30MHz - 1GHz	Limit value class B
IEC60255-25		
DIN EN 55022		

Environmental Tests

Classification:

IEC 60068-1	Climatic Classification	20/060/56
IEC 60721-3-1	Classification of ambient conditions (Storage)	1K5/1B1/1C1L/1S1/1M2 but min. -30°C (-22°F)
IEC 60721-3-2	Classification of ambient conditions (Transportation)	2K2/2B1/2C1/2S1/2M2 but min. -30°C (-22°F)
IEC 60721-3-3	Classification of ambient conditions (Stationary use at weather protected locations)	3K6/3B1/3C1/3S1/3M2 but min. -20°C (-4°F) /max 60°C (140°F)

Test Ad: Cold

IEC 60068-2-1	Temperature Test duration	-20°C (-4°F) 16 h

Test Bd: Dry Heat

IEC 60068-2-2	Temperature Relative humidity Test duration	60°C (140°F) <50% 72 h

Test Cab: Damp Heat (Steady State)

IEC 60255 (6.12.3.6)	Temperature	60°C (140°F)
IEC 60068-2-78	Relative humidity Test duration	95% 56 days

Test Db: Damp Heat (Cyclic)

IEC 60068-2-30	Temperature Relative humidity Cycles (12 + 12-hour)	60°C (140°F) 95% 2

Test Nb: Temperature Change

IEC 60255 (6.12.3.5)	Temperature	60°C/-20°C
IEC 60068-2-14	cycle	5
	test duration	1°C/5min

Test BD: Dry Heat Transport and storage test

IEC 60255 (6.12.3.3)	Temperature	70°C
IEC 60068-2-2	test duration	16 h

Test AB: Cold Transport and storage test

IEC 60255-1 (6.12.3.4)	Temperature	-30°C
IEC 60068-2-1	test duration	16 h

Mechanical Tests

Test Fc: Vibration Response Test

IEC 60068-2-6	(10 Hz – 59 Hz)	0.0014 in. (0.035 mm)
IEC 60255-21-1	Displacement	
class 1	(59Hz – 150Hz)	0.5 gn
	Acceleration	
	Number of cycles in each axis	1

Test Fc: Vibration Endurance Test

IEC 60068-2-6	(10 Hz – 150 Hz)	1.0 gn
IEC 60255-21-1	Acceleration	
class 1	Number of cycles in each axis	20

Test Ea: Shock Test

IEC 60068-2-27	Shock response test	5 gn, 11 ms, 3 impulses in each direction
IEC 60255-21-2		
class 1	Shock resistance test	15 gn, 11 ms, 3 impulses in each direction

Test Eb: Shock Endurance Test

IEC 60068-2-29	Shock endurance test	10 gn, 16 ms, 1,000 impulses in each direction
IEC 60255-21-2		
class 1		

Test Fe: Earthquake Test

IEC 60068-3-3	Single axis earthquake vibration test	1 – 9 Hz horizontal: 0,295 in. (7.5 mm)
IEC 60255-21-3		1 – 9 Hz vertical : 0,137 in. (3.5 mm)
		1 sweep per axis
class 2		9 – 35 Hz horizontal: 2 gn,
		9 – 35 Hz vertical : 1 gn,
		1 sweep per axis

Specifications

Specifications of the Real Time Clock

Resolution:	1 ms
Tolerance:	<1 minute / month (+20°C [68°F]) <±1ms if synchronized via IRIG-B

Time Synchronization Tolerances

The different protocols for time synchronization vary in their accuracy:

<i>Used Protocol</i>	<i>Time drift over one month</i>	<i>Deviation to time generator</i>
Without time synchronization	<1 min (+20°C)	Time drifts
IRIG-B	Dependent on the time drift of the time generator	<±1 ms
SNTP	Dependent on the time drift of the time generator	<±1 ms
Modbus TCP	Dependent on the time drift of the time generator	Dependent on the network load
Modbus RTU	Dependent on the time drift of the time generator	<±1 ms
DNP3	Dependent on the time drift of the time generator	<±1 ms

Specifications of the Measured Value Acquisition

Phase and Ground Current Measuring

Frequency Range:	50 Hz / 60 Hz $\pm$ 10%
Accuracy:	Class 0.5
Amplitude Error if $I < I_n$:	$\pm 0.5\%$ of the rated current ^{*3)}
Amplitude Error if $I > I_n$:	$\pm 0.5\%$ of the measured current ^{*3)}
Amplitude Error if $I > 2 I_n$:	$\pm 1.0\%$ of the measured current ^{*3)}
Harmonics:	Up to 20% 3rd harmonic $\pm 2\%$ Up to 20% 5th harmonic $\pm 2\%$
Frequency Influence:	$< \pm 2\%$ / Hz in the range of ± 5 Hz of the configured nominal frequency
Temperature Influence:	$< \pm 1\%$ within the range of 0°C to +60°C (+32°F to +140°F)

*3) For earth current sensitive the precision does not depend on the nominal value but is referenced to 100 mA (with $I_n = 1$ A) respectively. 500 mA (with $I_n = 5$ A)

Protection Elements Accuracy

NOTICE

The tripping delay relates to the time between alarm and trip.
The accuracy of the operating time relates to the time between fault entry and the time when the protection element is picked-up.

Reference conditions for all Protection Elements: sine wave, at rated frequency, total harmonic distortion < 1%
Measuring criterion: Fundamental

Overcurrent Protection Elements: 50P[x]	Accuracy
Pickup	$\pm 1.5\%$ of the setting value or 1% In.
Dropout Ratio	97% or 0.5% In
t	DEFT $\pm 1\%$ or ± 10 ms
Operating Time At testing current ≥ 2 times pickup value	<36ms
Disengaging Time	<55 ms

Overcurrent Protection Elements: 51P[x]	Accuracy
Pickup	$\pm 1.5\%$ of the setting value or 1% In.
Dropout Ratio	97% or 0.5% x In
Operating Time At testing current ≥ 2 times pickup value	<36 ms
Disengaging Time	<55 ms
t-Multiplier	$\pm 5\%$ (according to selected curve)
Reset Mode	$\pm 5\%$ (according to selected curve)
t-reset (Reset Mode = t-delay)	$\pm 1\%$ or ± 10 ms

Ground Current Elements: 50X[x] / 50R[x]	Accuracy ^{*3)}
Pickup (measured ground current)	$\pm 1.5\%$ of the setting value or 1% In
Pickup (calculated ground current)	$\pm 2.0\%$ of the setting value or 1.5% In
Dropout Ratio	97% or 0.5% In
t	DEFT $\pm 1\%$ or ± 10 ms
Operating Time Starting from IE higher than 1.2 x IE>	<45 ms
Disengaging Time	<55 ms
t-reset (Reset Mode = t-delay)	$\pm 1\%$ or ± 10 ms

Ground Current Elements: 51X[x] / 51R[x]	Accuracy ^{*3)}
Pickup (measured ground current)	$\pm 1.5\%$ of the setting value or 1% In
Pickup (calculated ground current)	$\pm 2.0\%$ of the setting value or 1.5% In
Dropout Ratio	97% or 0.5% In
Operating Time Starting from IE higher than 1.1 x IE>	<45 ms
Disengaging Time	<55 ms
t-Multiplier	$\pm 5\%$ (according to selected curve)
Reset Mode	$\pm 5\%$ (according to selected curve)
t-reset (Reset Mode = t-delay)	$\pm 1\%$ or ± 10 ms

*3) For earth current sensitive the precision does not depend on the nominal value but is referenced to 100 mA (with $I_n = 1$ A) respectively 500 mA (with $I_n = 5$ A)

Motor Protection: 66 [x]	Accuracy
Stop Declaration	<50 ms
Time period current must drop below STPC	$\pm 1.5\%$ of the setting value or 1% I_n
Anti Backspin Blocking time to allow for back spin.	± 1 sec.
TBS Timer Time between repeated starts.	± 1 sec.
Reset Starts Per Hour Reset starts per hours timer from oldest start event.	± 1 min.

Overcurrent Protection Elements: 49 Thermal Model	Accuracy
Trip Threshold	$\pm 2\%$
Trip Delay	$\pm 1\%$ or ± 10 ms
Alarm Threshold	$\pm 2\%$
Alarm Delay	$\pm 1\%$ or ± 10 ms

Jam-Stall Protection: 50J	Accuracy
Pickup	$\pm 1.5\%$ of the setting value or 1% I_n
Dropout Ratio	97% or 0.5% I_n
t	DEFT $\pm 1\%$ or ± 10 ms
Operating Time Starting from I higher than 1.1 x I>	<35 ms
Disengaging Time	<45 ms

Under Load Protection: 37[x]	Accuracy
Threshold	$\pm 1.5\%$ of the setting value or 1% I_n
Dropout Ratio	103% or 0.5% x I_n
t	DEFT $\pm 1\%$ or ± 10 ms
Operating Time Starting from I lower than 0.9 x setting value	<50 ms
Disengaging Time	<50 ms

Mechanical Load Shedding: MLS	Accuracy
Pickup Threshold	±1.5% of the setting value or 1% In
Pickup Delay	DEFT ±1% or ±10 ms
Dropout Threshold	±1.5% of the setting value or 1% In
Dropout Delay	DEFT ±1% or ±10 ms

Start Delay Timers	Accuracy
Start Delay (common timers)	±1% or ±10 ms
Operating Times	
for IOC, GOC, JAM	<35 ms
for Underload, Generic 1-5	<60 ms

Temperature Protection Elements: 49/38 [x] RTD Trip w /URTD	Accuracy
Trip Threshold	±1°C (1.8°F)
Alarm Threshold	±1°C (1.8°F)
t-delay Alarm	DEFT ±1% or ±10 ms
Reset Hysteresis	-2°C (-3.6°F) of threshold ±1°C (1.8°F)

Current unbalance: 46[x]	Accuracy ^{*1)}
Threshold	±2% of the setting value or 1% In
%(I2/I1)	±1%
t	DEFT ±1% or ±10 ms
Operating Time	<70 ms
Disengaging Time	<50 ms

*1) Negative-sequence current I2 must be $\geq 0.01 \times I_n$, I1 must be $\geq 0.1 \times I_n$.

Breaker Failure Protection: 50BF	Accuracy
I-BF>	±1.5% of the setting value or 1% In
t-BF	±1% or ±10 ms
Operating Time	<40 ms
Starting from I Higher than 1.3 x I-BF>	
Disengaging Time	<40 ms

Trip Circuit Monitoring: TCM	Accuracy
t-TCM	±1% or ±10 ms

<i>Current Transformer Supervision: CTS</i>	<i>Accuracy</i>
ΔI	$\pm 2\%$ of the setting value or 1.5% In
Dropout Ratio	94%
Pickup delay	$\pm 1\%$ or ± 10 ms

Appendix

The following terms, abbreviations, and acronyms are used in this manual. Please refer to this section for their meanings / definitions.

A	Ampere(s), Amp(s)
AC	Alternating current
A/D	Analog to digital
Ack.	Acknowledge
AMP	Ampere(s), Amp(s)
AND	Logical gate (The output becomes true if all Input signals are true.)
ANG	Angle
ANSI	American National Standards Institute
AR	Automatic reclosure
AUX	Auxiliary
AVG, avg	Average
AWG	American wire gauge
BF	Breaker failure
BFI	Breaker failure initiate
BKR, bkr	Breaker
Blo	Blocking(s)
°C	Degrees Celsius
calc	Calculated
CB	Circuit breaker
CD	Compact disk
Char	Curve shape
CHK	Check
CHNL	Channel
Cmd.	Command
CMND	Command
CMN	Common input
COM	Common input
Comm	Communication

COMP	Compensated, comparison
CONN	Connection
CONT	Continuous, contact
CPU	Central processing unit
Cr.	Counter(s)
CRT, CRNT	Current
CSA	Canadian Standards Association
CT	Control transformer
Ctrl.	Control
CTS	Current transformer supervision
d	Day
D/A	Digital to analog
D-Sub-Plug	Communication interface
DC, dc	Direct current
DEFT	Definite time characteristic (Tripping time does not depend on the height of the current.)
DFLT	Default
DGNST	Diagnostics
DI	Digital Input
Diagn.	Diagnosis
Diagn Cr	Diagnosis counter(s)
DIFF	Differential
DIN	Deutsche Industrie Norm
DIR, dir	Directional
DMD	Demand
DPO	Dropout
DSP	Digital signal processor
dt	Rate of change
EINV	Extremely inverse tripping characteristic
EMC	Electromagnetic compatibility
EN	Europäische Norm
err. / Err.	Error
EVTcon	Parameter determines if the residual voltage is measured or calculated.

Ex	External
ExBlo	External blocking(s)
ExP	External protection
EXT	Extension, external
°F	Degrees Fahrenheit
F	Field
Fc	Function (Enable or disable functionality = allow or disallow.)
FIFO	First in first out
FIFO Principal	First in first out
FLA	Full load current
FO	Fiber optic
FTP	File transfer protocol
fund	Fundamental (ground wave)
FWD	Forward
G, g	Generator
gn	Acceleration of the earth in vertical direction (9.81 m/s ²)
GND	Ground
GPS	Global positioning system
h	Hour
HARM	Harmonic / harmonics
HMI	Human machine interface (Front of the protective relay)
HTL	Manufacturer internal product designation
HTTP	Hyper text transfer protocol
Hz	Hertz
I	Fault current
I	Current
I0	Zero current (symmetrical components), Zero sequence current
I1	Positive sequence current (symmetrical components)
I2	Negative sequence current (symmetrical components)
IA	Phase A current
IAB	Phase A minus B current
IB	Phase B current
IBC	Phase B minus C current

I-BF	Tripping threshold
IC	Phase C current
IC's	Manufacturer internal product designation
ICA	Phase C minus A current
ID	Identification
IEC	International Electrotechnical Commission
IED	Intelligent electronic device
IEEE	Institute of Electrical and Electronics Engineers
IG	Ground current (not residual)
IG	Fault current
Igd	Differential ground current
IGnom	Nominal ground current
IH1	Fundamental harmonic (1 st harmonic)
IH2	2 nd harmonic
IINV	Inverse
in.	Inch
incl.	Include, including
Info.	Information
Interl.	Interlocking
INV	Inverse characteristic (The tripping time will be calculated depending on the height of the current)
I/O	Input / output
IOC	Instantaneous overcurrent
IOV	Instantaneous overvoltage
IR	Calculated ground current
IRIG	Input for time synchronization (Clock), Inter-range instrumentation group
ISO	International Standards Organization
IT	Thermal Characteristic
I2T	Thermal Characteristic
I4T	Thermal Characteristic
IUV	Instantaneous undervoltage
IX	4 th measuring input of the current measuring assembly group (either ground or neutral current)
J	Joule

kA	Kiloampere
kg	Kilogram
kHz	Kilohertz
kV	Kilovolt(s)
kVdc or kVDC	Kilovolt(s) direct current
L1	Phase A
L2	Phase B
L3	Phase C
I/In	Ratio of current to nominal current.
LED	Light emitting diode
lb-in	Pound-inch
LINV	Long time inverse tripping characteristic
LV	Low voltage
m	Meter
M	Machine
mA	Milliampere(s), Milliamp(s)
MAG	Magnitude
MAN, man.	Manual / manually
MAX, max.	Maximum
meas	Measured
MIN, min.	Minimum
min.	Minute
MINV	Moderately Inverse Tripping Characteristic
MK	Manufacturer Internal Product Designation Code
mm	Millimeter
MMU	Memory mapping unit
MRT	Minimum response time
ms	Milli-second(s)
MTA	Maximum torque angle
MTR	Motor
MV	Medium voltage
mVA	Milli volt amperes (Power)

MVA	Mega volt-ampere (total 3-phase)
MVA A	Mega volt-ampere (phase A)
MVA B	Mega volt-ampere (phase B)
MVA C	Mega volt-ampere (phase C)
MVAR	Mega Var (total 3-phase)
MVAR A	Mega Var (phase A)
MVAR B	Mega Var (phase B)
MVAR C	Mega Var (phase C)
MVARH	Mega Var-Hour
MW	Megawatt(s) (total 3-phase)
MW A	Megawatt(s) (phase A)
MW B	Megawatt(s) (phase B)
MW C	Megawatt(s) (phase C)
MWH	Megawatt-Hour(s)
N	Neutral
N/A, n/a	Not applicable
N.C.	Not connected
NEG	Negative
NINV	Normal inverse tripping characteristic
Nm	Newton-meter
No	Number
N.O.	Normal open (Contact)
NOM, Nom.	Nominal
NT	Manufacturer internal product designation code
O	Over
OC, O/C	Overcurrent
O/P, Op, OUT	Output
OV	Overvoltage
OVERFREQ	Overfrequency
OVL	Overload
P	Phase
Para.	Parameter
PC	Personal computer
PCB	Printed circuit board

PE	Protected Earth
p.u.	per unit (per-unit system)
PF	Power factor (total 3-phase)
PF A	Power factor (phase A)
PF B	Power factor (phase B)
PF C	Power factor (phase C)
Ph	Phase
POS	Positive
PRESS	Pressure
PRI, pri	Primary
PROT, Prot	Protection Module (Master Module), protection
PS1	Parameter set 1
PS2	Parameter set 2
PS3	Parameter set 3
PS4	Parameter set 4
PSet	Parameter set
PSS	Parameter set switch (Switching from one parameter set to another)
pu	Per unit
PWM	Pulse width modulated
PWR	Power
R	Reset
rec.	Record
REF	Reference
rel	Relative
REM	Remote
res	Reset
ResetFct	Reset function
REV	Reverse
RevData	Review data
RMS	Root mean square
RO	Relay Output
RO1	1 st Relay Output
RO2	2 nd Relay Output

RO3	3 rd Relay Output
Rst	Reset
RTD	Resistance-temperature detector
RX (Rx)	Receive, receiver
s	Second
S	Sensitive
SAT	CT saturation
SC	Supervision Contact (Synonyms: Life-Contact, Watchdog, State of Health Contact)
Sca	SCADA
SCADA	Communication module, supervisory control and data acquisition
sec	Second(s)
SEC, sec	Secondary
SENS	Sensitive
SEQ	Sequence
Sig.	Signal
SNTP	Simple network time protocol
SRC	Source
StartFct	Start function
STATS	Statistics
Sum	Summation
SUPERV	Supervision
SW	Software
SYNC	Sync-check, Synchrocheck
SYNCHCHK	Sync-check, Synchrocheck
Sys.	System
t or t.	Time
t	Tripping delay
T	Time, transformer
Tcmd	Trip command
TCP	Transmission control protocol
TCP/IP	Communication protocol
TEMP, temp	Temperature
THD	Total harmonic distortion

TI	Manufacturer internal product designation code
TOC	Time overcurrent
TOV	Time overvoltage
TRANS	Transient
TripCmd	Trip command
TX (Tx)	Transmit, transmitter
txt	Text
UC	Undercurrent
UL	Underwriters Laboratories
UMZ	DEFT (definite time tripping characteristic)
URTD	Universal resistance-temperature detector
USB	Universal serial bus
V	Volts
V0	Zero sequence voltage
V1	Positive sequence voltage
V2	Negative sequence voltage
VA	Phase A voltage
VAB	Phase A to B voltage
Vac / V ac	Volts alternating current
VAG	Phase A to ground voltage
VARH	Var-hour voltage
VB	Phase B voltage
VBA	Phase B to A voltage
VBG	Phase B to ground voltage
VC	Phase C voltage
VCA	Phase C to A voltage
VCG	Phase C to ground voltage
Vdc / V dc	Volts direct current
VDE	Verband Deutscher Elektrotechnik
VDEW	Verband der Elektrizitätswirtschaft
VE	Residual voltage
V/Hz	Volts per Hertz
VINV	Very inverse tripping characteristic

VT	Voltage transformer
VTs	Voltage transformer supervision
W	Watt(s)
WDC	Watch dog contact (supervision contact)
WDG	Winding
WH	Watthour
www	World wide web
X	Reactance
XCT	4 th current measuring input (ground or neutral current)
XInv	Inverse characteristic
Z	Impedance, zone

Instantaneous Current Curves (Phase)

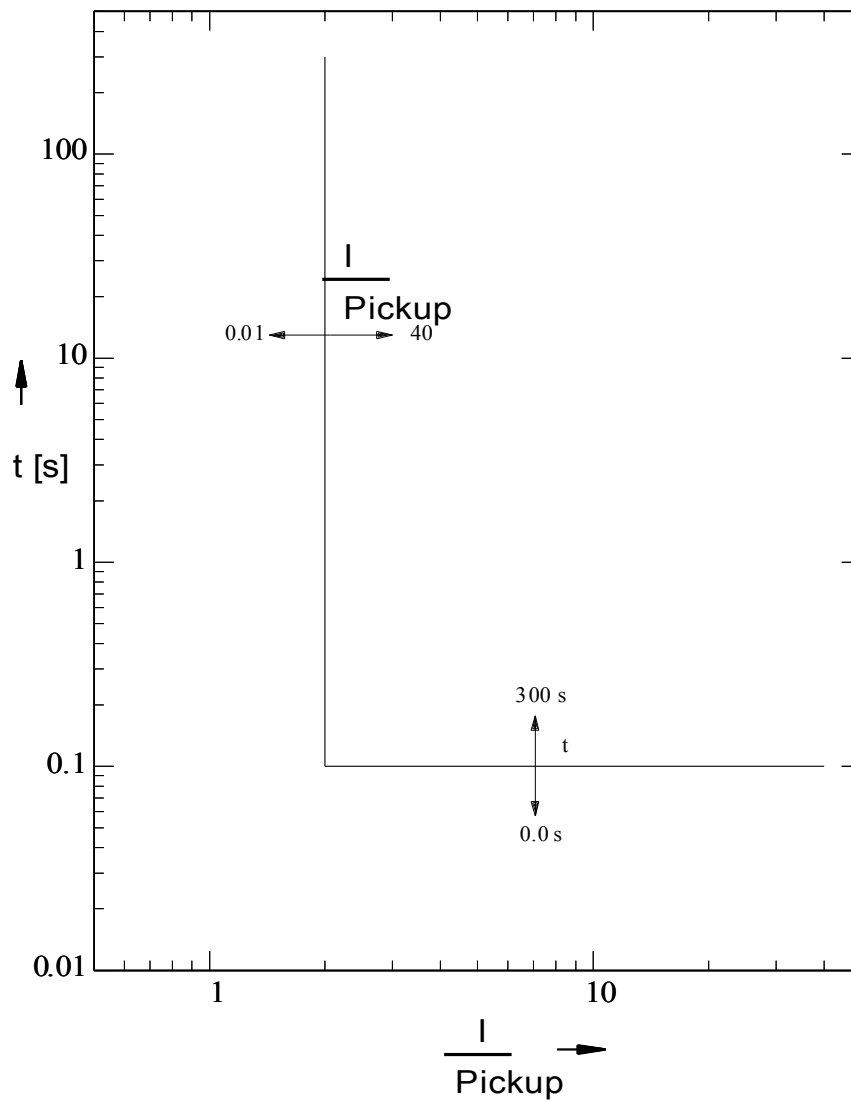
Explanation:

t = Tripping delay

I = Fault current

Pickup = If the pickup value is exceeded, the module/element starts to time out to trip .

DEFT



Time Current Curves (Phase)

The following characteristics are available:

- NINV (IEC/AMZ) – *IEC Normal Inverse*
- VINV (IEC/AMZ) – *IEC Very Inverse*
- LINV (IEC/AMZ) – *IEC Long Time Inverse*
- EINV (IEC/AMZ) – *IEC Extremely Inverse*
- MINV (ANSI/AMZ) – *ANSI Moderately Inverse*
- VINV (ANSI/AMZ) – *ANSI Very Inverse*
- EINV (ANSI/AMZ) – *ANSI Extremely Inverse*
- ABB RI – *Special Inverse*
- Thermal Flat
- IT
- I2T
- I4T

Explanation:

t = Tripping delay

t-multiplier = Time multiplier/tripping characteristic factor . The setting range depends on the selected tripping curve.

I = Fault current

Pickup = If the pickup value is exceeded, the module/element starts to time out to trip .

IEC Normal Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = IEC NINV

Reset

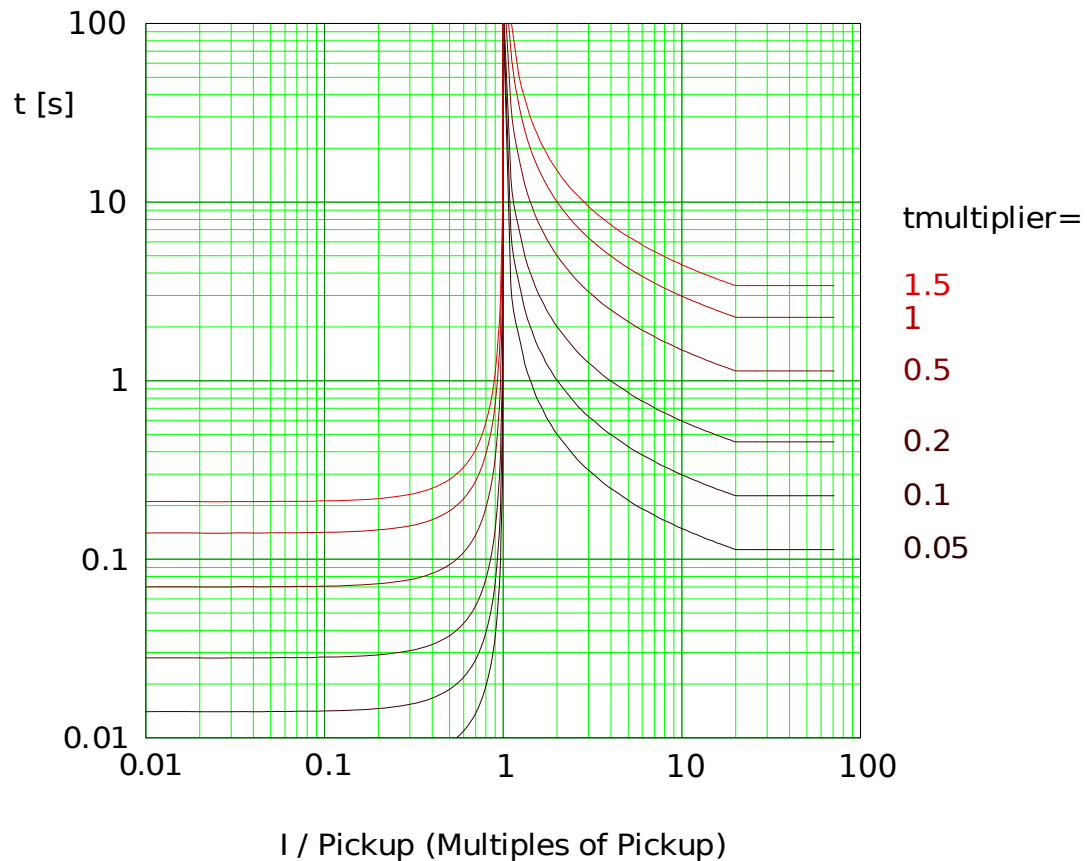
$$t = \frac{0.14}{1 - \left(\frac{I}{Pickup} \right)^2} \cdot t_{multiplier}$$

If: $\frac{I}{Pickup} < 1$

Trip

$$t = \frac{0.14}{\left(\frac{I}{Pickup} \right)^{0.02} - 1} \cdot t_{multiplier}$$

If: $1 < \frac{I}{Pickup} \leq 20$



IEC Very Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = IEC VINV

Reset

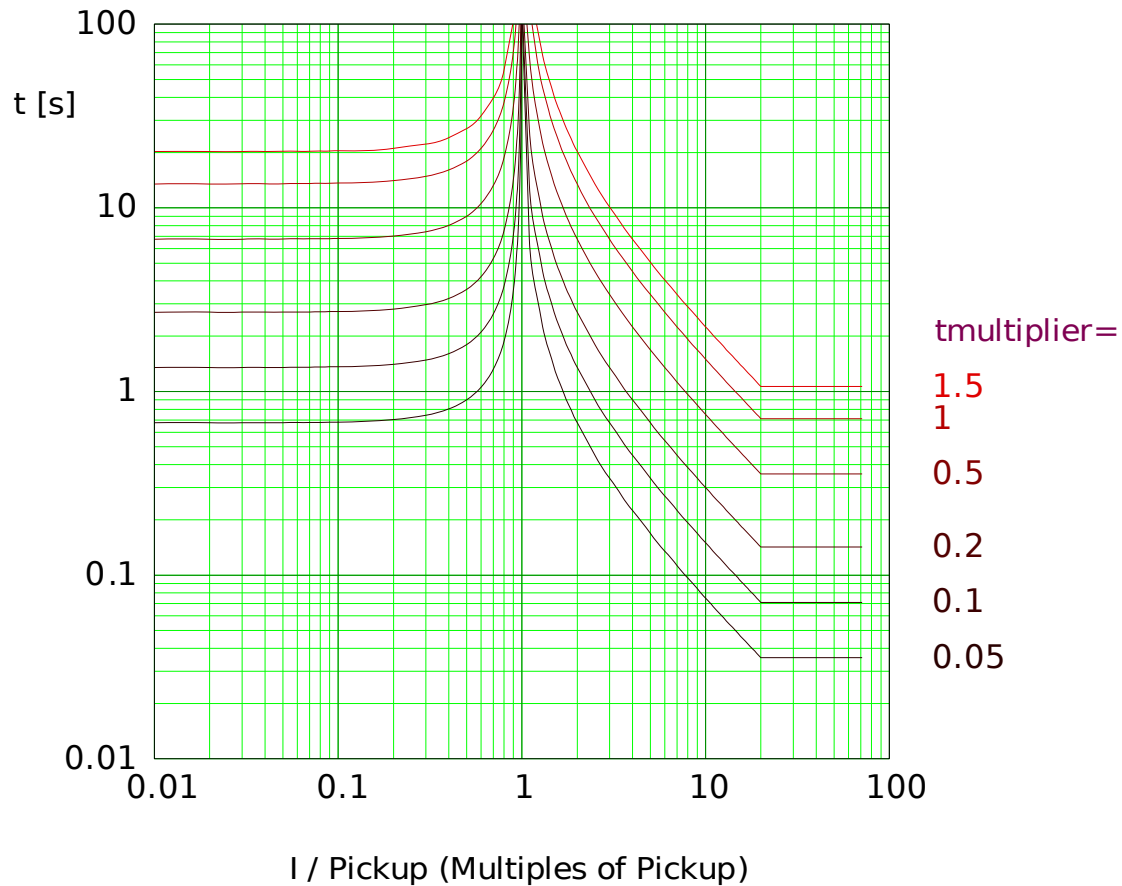
$$t = \frac{13.5}{1 - \left(\frac{I}{Pickup} \right)^2} \cdot t_{multiplier}$$

$$\text{If: } \frac{I}{Pickup} < 1$$

Trip

$$t = \frac{13.5}{\frac{I}{Pickup} - 1} \cdot t_{multiplier}$$

$$\text{If: } 1 < \frac{I}{Pickup} \leq 20$$



Pdloc_Z02

IEC Extremely Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = IEC EINV

Reset

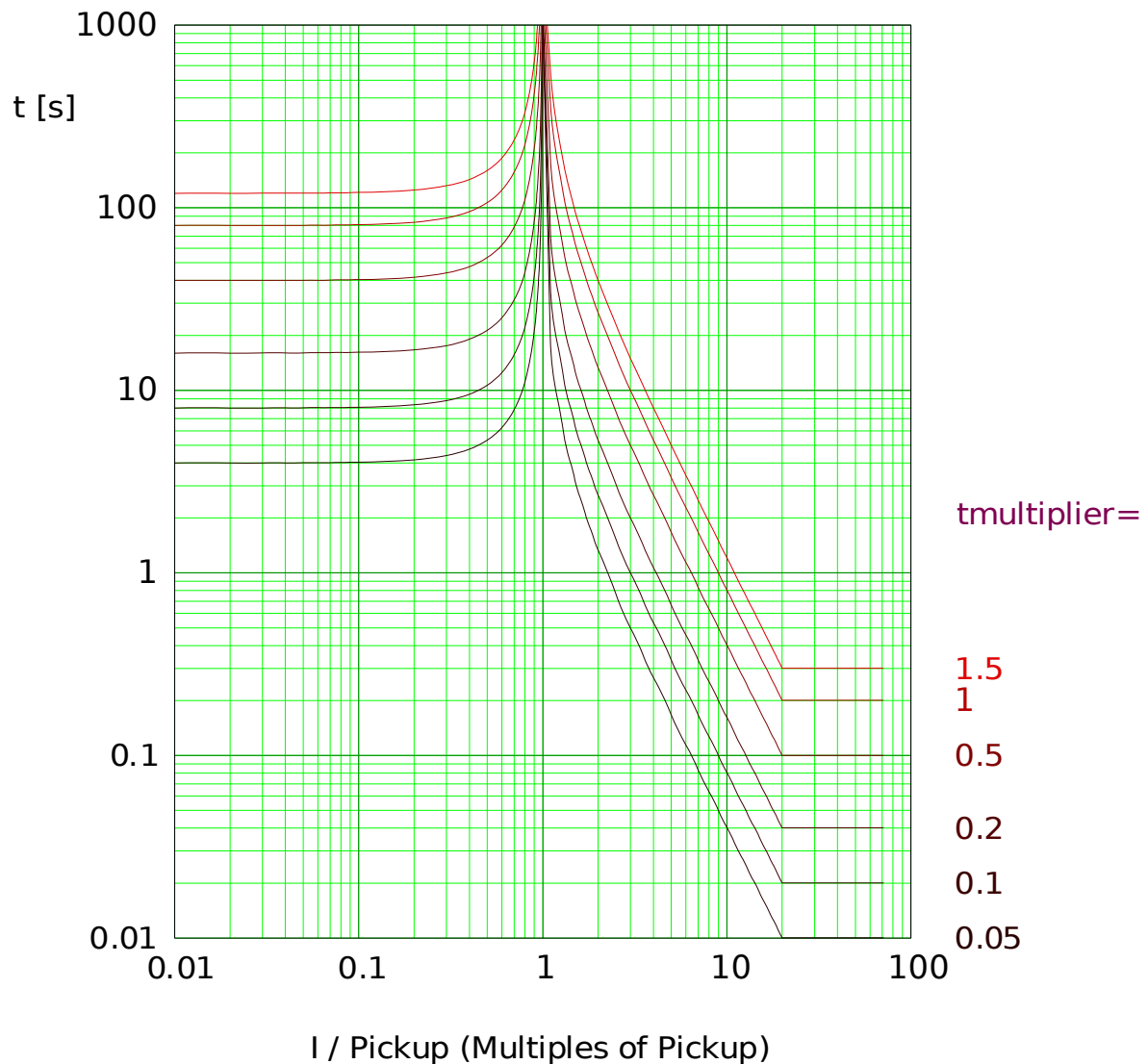
$$t = \frac{80}{1 - \left(\frac{I}{Pickup} \right)^2} \cdot t_{multiplier}$$

If: $\frac{I}{Pickup} < 1$

Trip

$$t = \frac{80}{\left(\frac{I}{Pickup} \right)^2 - 1} \cdot t_{multiplier}$$

If: $1 < \frac{I}{Pickup} \leq 20$



IEC Long Time Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = IEC LINV

Reset

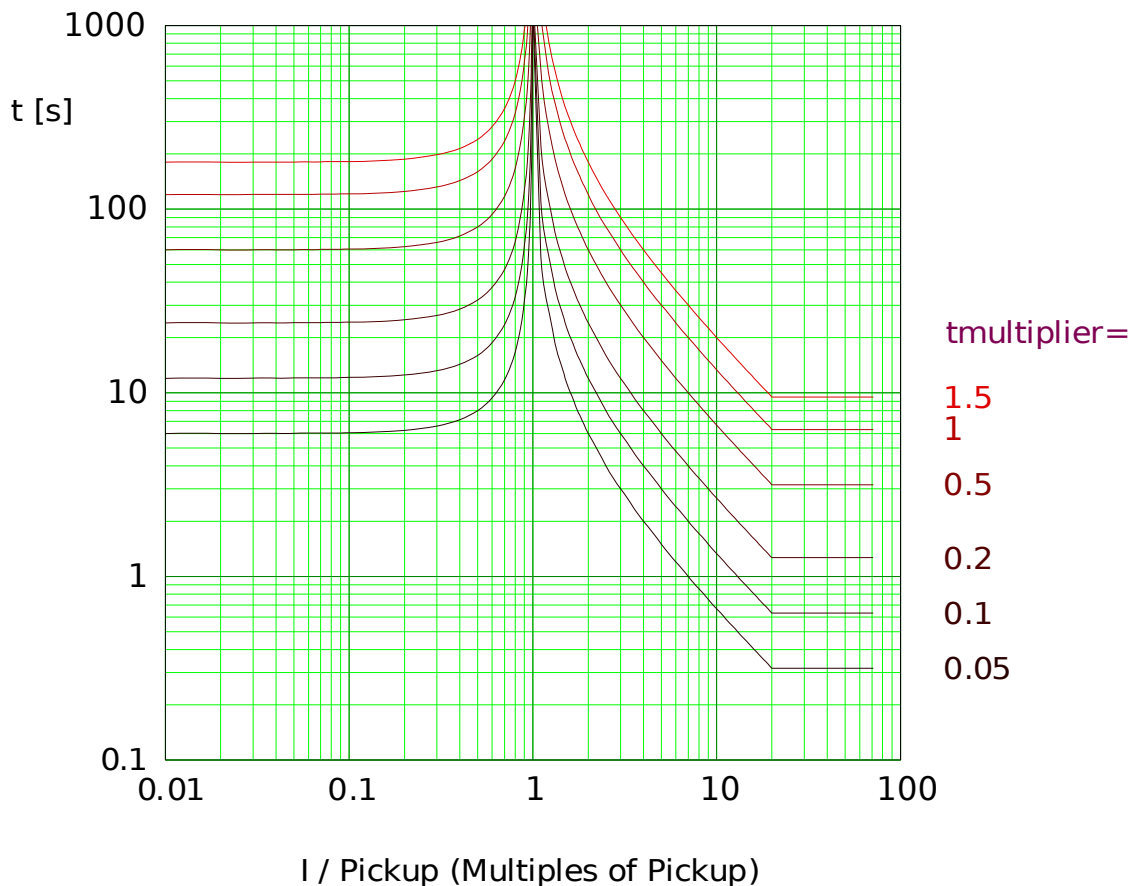
$$t = \frac{120}{1 - \left(\frac{I}{Pickup}\right)^2} \cdot tmultiplier$$

$$\text{If: } \frac{I}{Pickup} < 1$$

Trip

$$t = \frac{120}{\frac{I}{Pickup} - 1} \cdot tmultiplier$$

$$\text{If: } 1 < \frac{I}{Pickup} \leq 20$$



ANSI Moderately Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = ANSI MINV

Reset

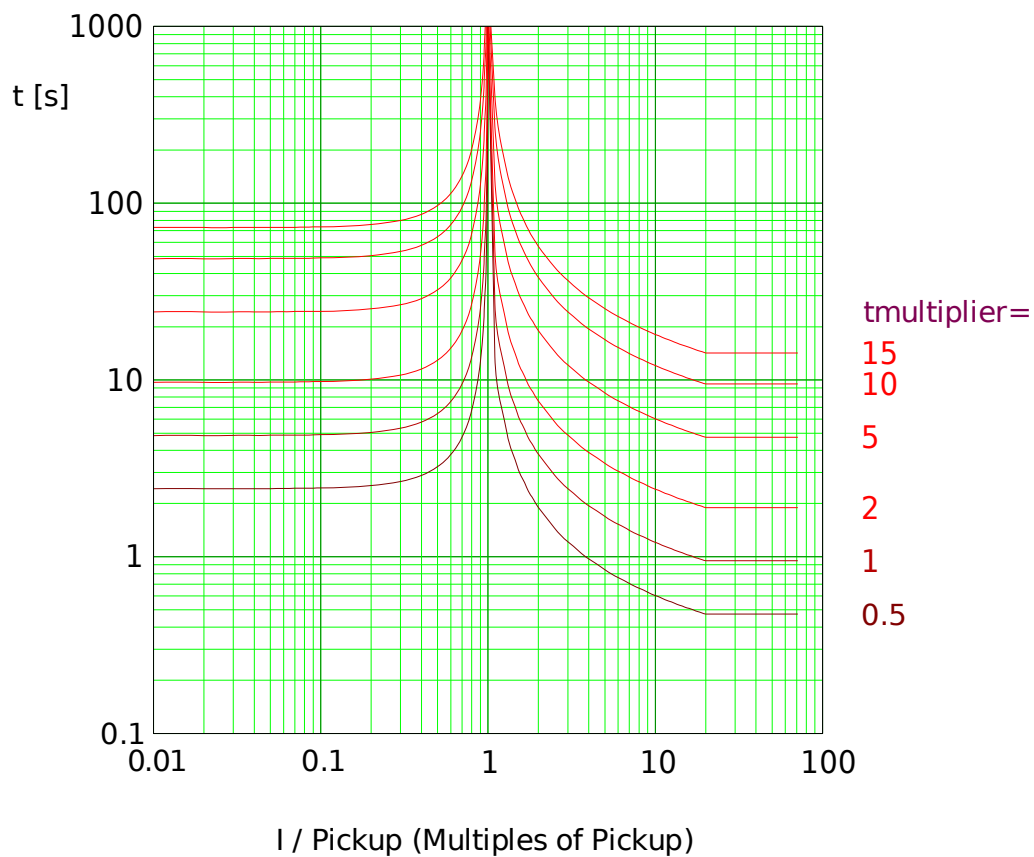
$$t = \frac{4.85}{1 - \left(\frac{I}{Pickup} \right)^2} \cdot t_{multiplier}$$

If: $\frac{I}{Pickup} < 1$

Trip

$$t = \left(\frac{0.0515}{\left(\frac{I}{Pickup} \right)^{0.02} - 1} + 0.1140 \right) \cdot t_{multiplier}$$

If: $1 < \frac{I}{Pickup} \leq 20$



ANSI Very Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = ANSI VINV

Reset

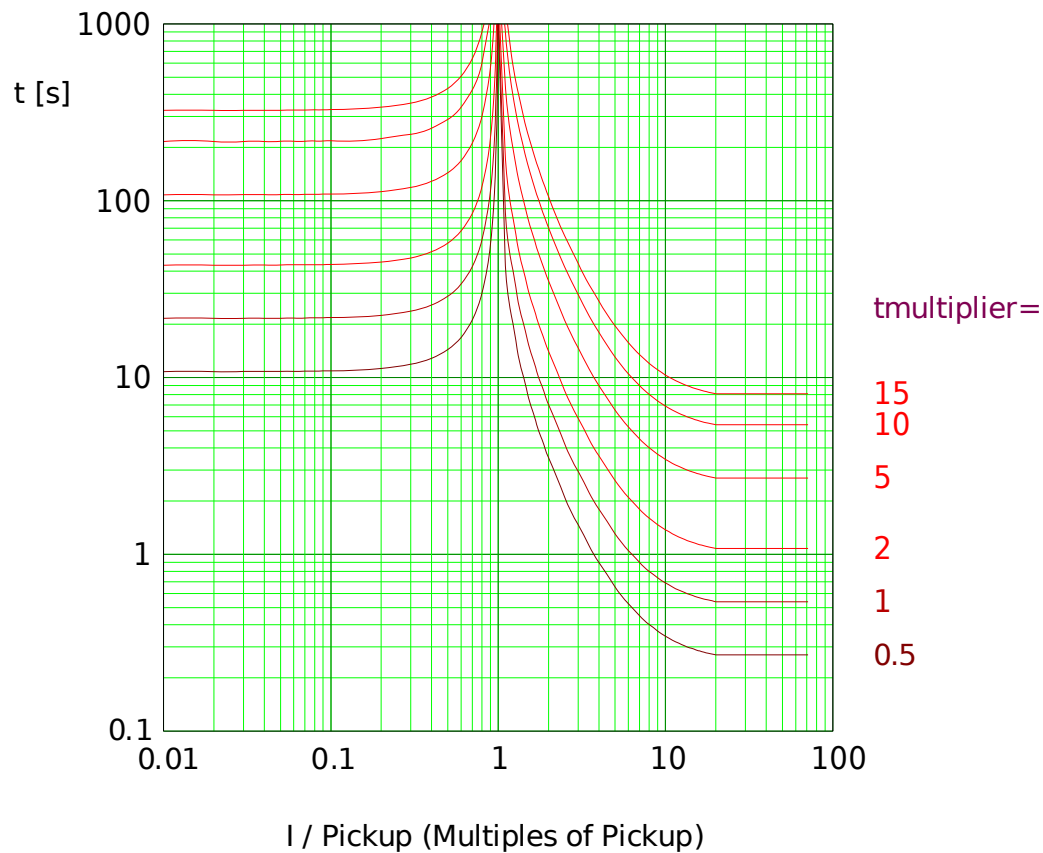
$$t = \frac{21.6}{1 - \left(\frac{I}{Pickup} \right)^2} \cdot t_{multiplier}$$

If: $\frac{I}{Pickup} < 1$

Trip

$$t = \left(\frac{19.61}{\left(\frac{I}{Pickup} \right)^2 - 1} + 0.491 \right) \cdot t_{multiplier}$$

If: $1 < \frac{I}{Pickup} \leq 20$



Pdoc_Z06

ANSI Extremely Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = ANSI EINV

Reset

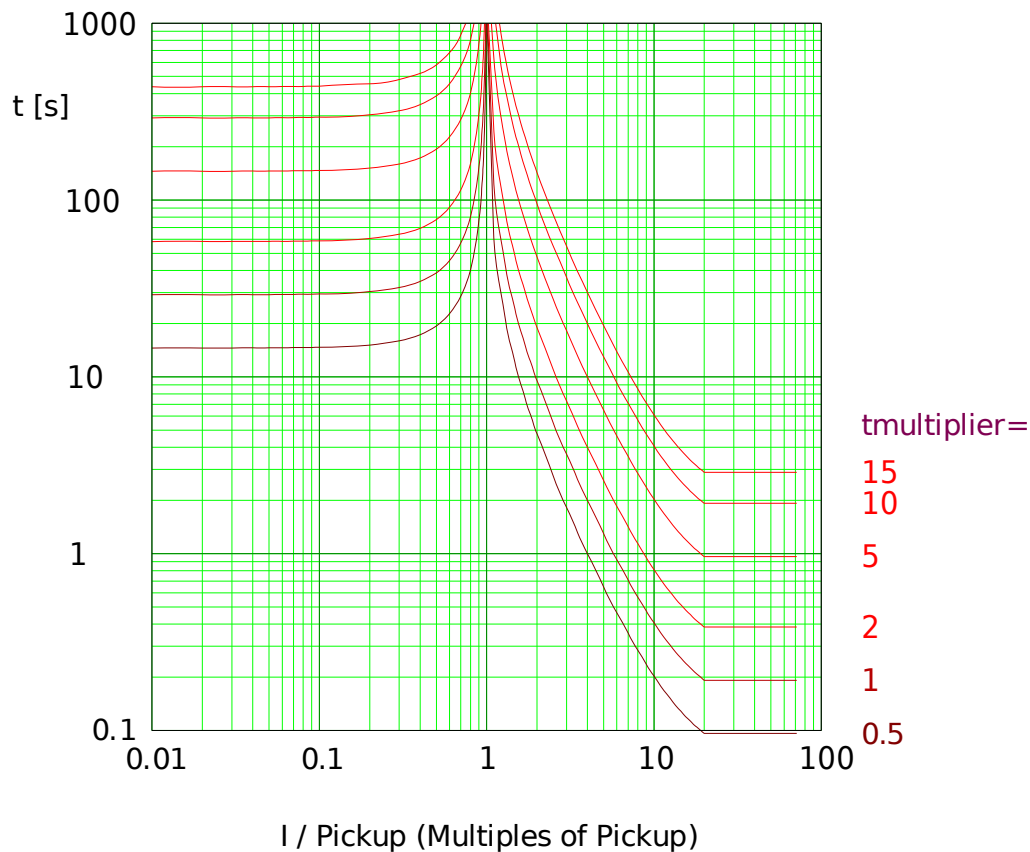
$$t = \frac{29.1}{1 - \left(\frac{I}{Pickup} \right)^2} \cdot tmultiplier$$

If: $\frac{I}{Pickup} < 1$

Trip

$$t = \left(\frac{28.2}{\left(\frac{I}{Pickup} \right)^2 - 1} + 0.1217 \right) \cdot tmultiplier$$

If: $1 < \frac{I}{Pickup} \leq 20$



PdDoc_Z07

Special Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = RINV

Reset

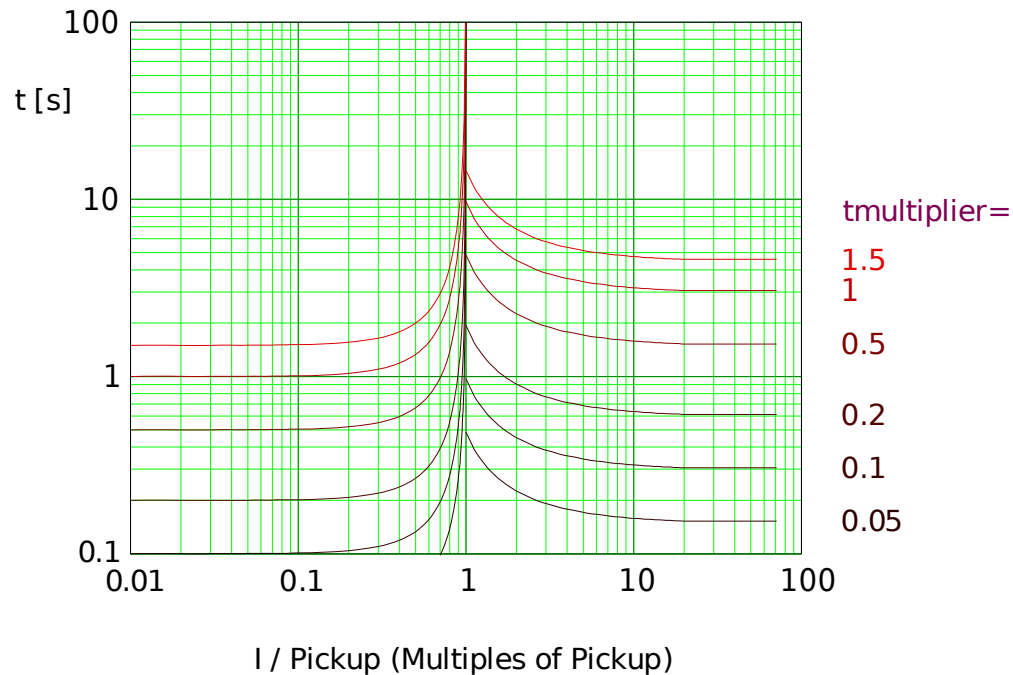
$$t = \frac{1.0}{1 - \left(\frac{I}{Pickup} \right)^2} \cdot t_{multiplier}$$

If: $\frac{I}{Pickup} < 1$

Trip

$$t = \frac{1.0}{0.339 - 0.236 \cdot \left(\frac{I}{Pickup} \right)^{-1}} \cdot t_{multiplier}$$

If: $1 < \frac{I}{Pickup} \leq 20$



Pdoc_Z12

Thermal Flat Curve

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

»**Curve Shape**« = Therm Flat

Reset

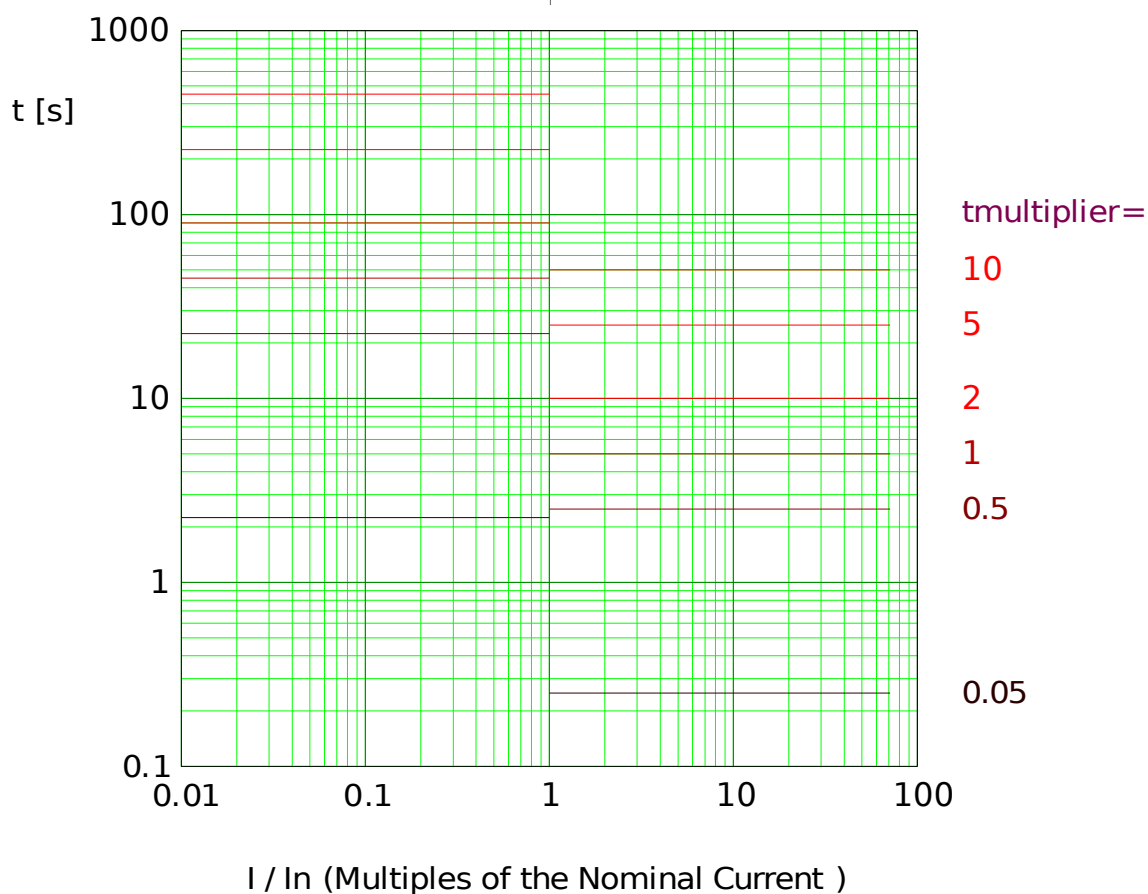
$$t = (5 \cdot 3^2) \cdot t_{multiplier}$$

$$\text{If: } \frac{I}{I_n} < 1$$

Trip

$$t = (5 \cdot 3^0) \cdot t_{multiplier}$$

$$\text{If: } 1 < \frac{I}{I_n}$$



Pd0c_Z08

Thermal Curve IT

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

»**Curve Shape**« = IT

Reset

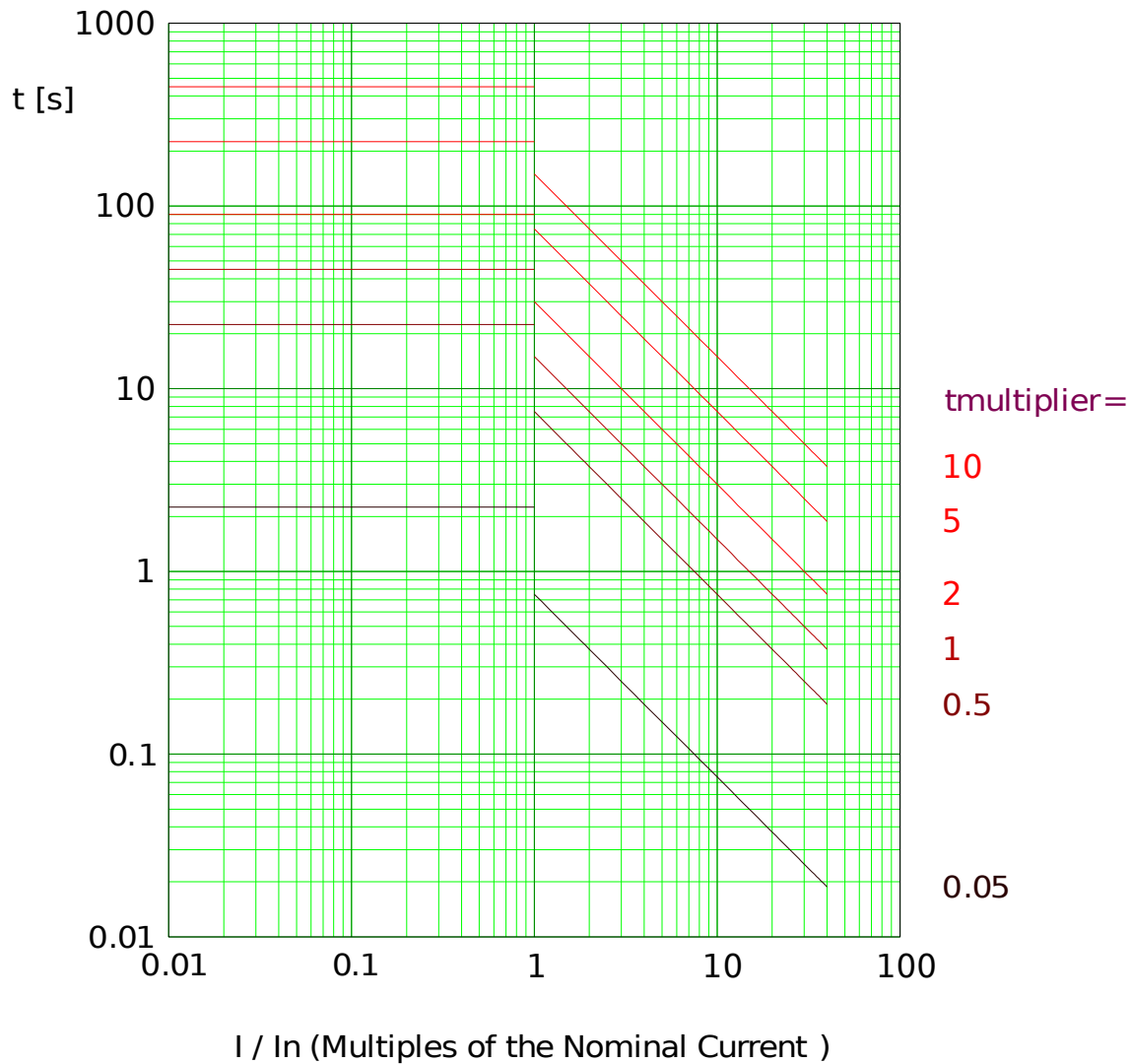
$$t = (5 \cdot 3^2) \cdot t_{\text{multiplier}}$$

If: $\frac{I}{I_n} < 1$

Trip

$$t = \frac{5 \cdot 3^1}{\left(\frac{I}{I_n}\right)^1} \cdot t_{\text{multiplier}}$$

If: $1 < \frac{I}{I_n}$



Thermal Curve I2T

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

»**Curve Shape**« = I2T

Reset

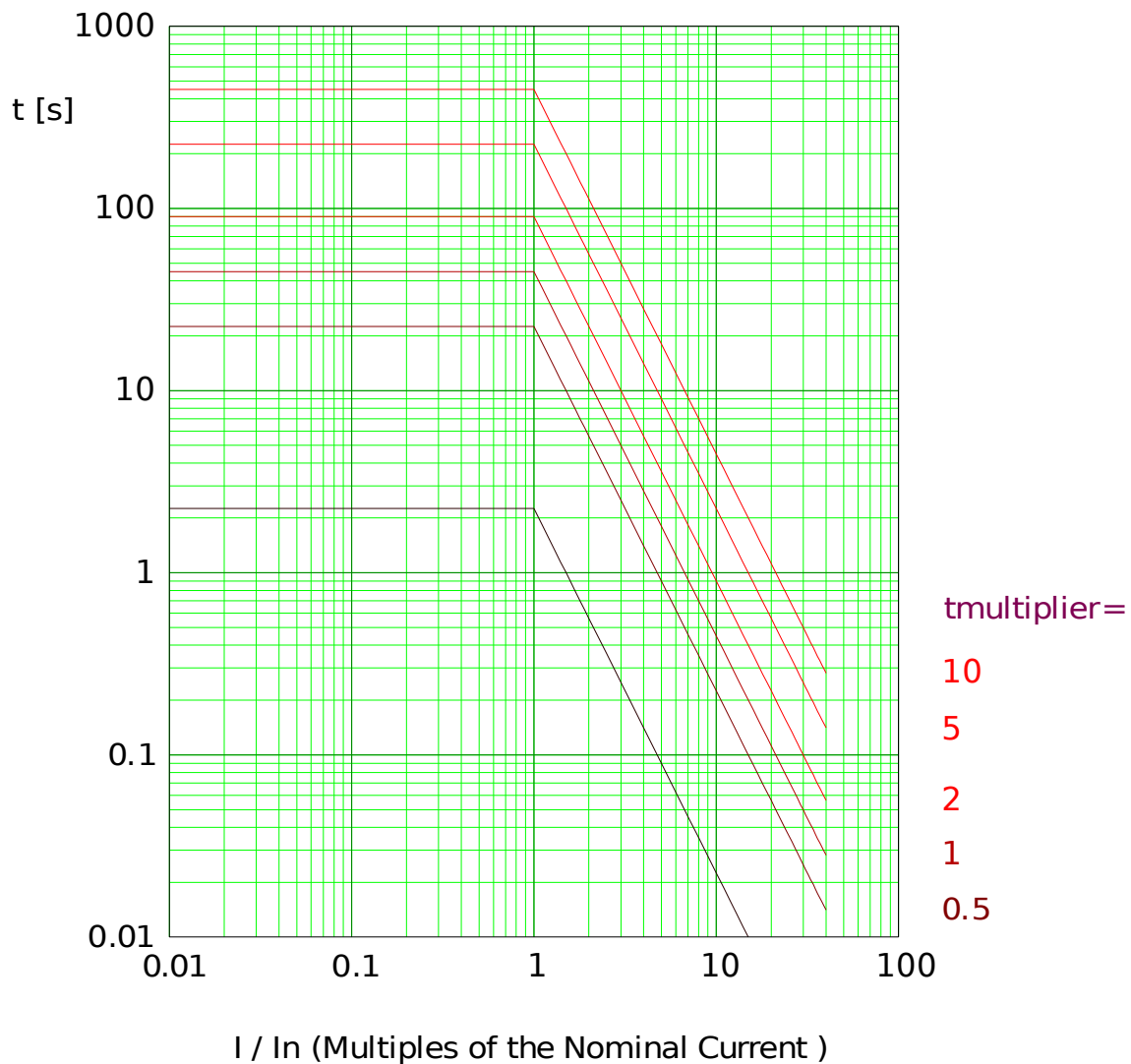
$$t = (5 \cdot 3^2) \cdot t_{\text{multiplier}}$$

$$\text{If: } \frac{I}{I_n} < 1$$

Trip

$$t = \frac{5 \cdot 3^2}{\left(\frac{I}{I_n}\right)^2} \cdot t_{\text{multiplier}}$$

$$\text{If: } 1 < \frac{I}{I_n}$$



Thermal Curve I4T

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

»**Curve Shape**« = I4T

Reset

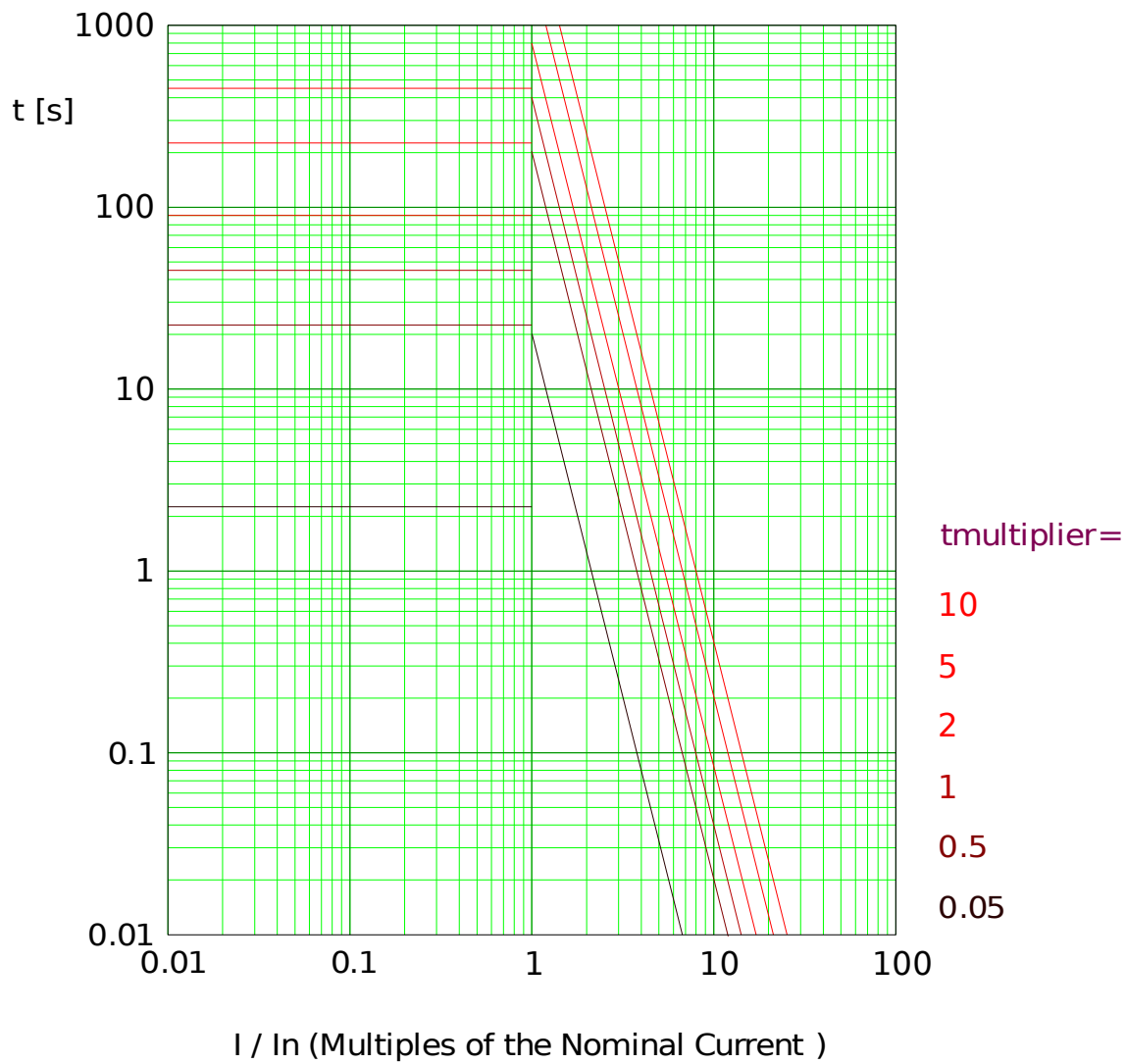
$$t = (5 \cdot 3^2) \cdot t_{\text{multiplier}}$$

$$\text{If: } \frac{I}{I_n} < 1$$

Trip

$$t = \frac{5 \cdot 3^4}{\left(\frac{I}{I_n}\right)^4} \cdot t_{\text{multiplier}}$$

$$\text{If: } 1 < \frac{I}{I_n}$$



Instantaneous Current Curves (Ground Current Calculated)

The following characteristics is available:

- DEFT (definite time).

Explanation:

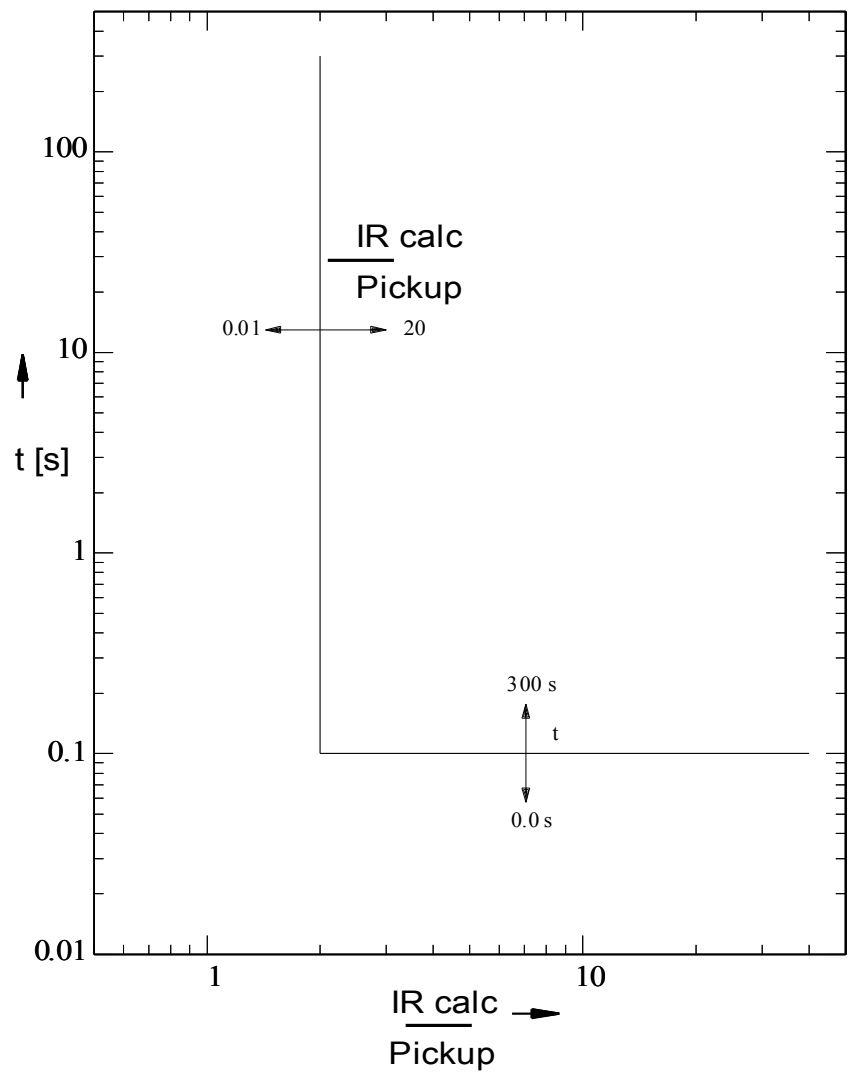
t = Tripping delay

IG = Fault current

Pickup = If the pickup value is exceeded, the module/element starts to time out to trip .

The ground current can be measured either directly via a zero sequence transformer or detected by a residual connection. The ground current can alternatively be calculated from the phase currents; but this is only possible if the current transformers are Wye-connected.

DEFT



Instantaneous Current Curves (Ground Current Measured)

The following characteristics is available:

- DEFT (definite time).

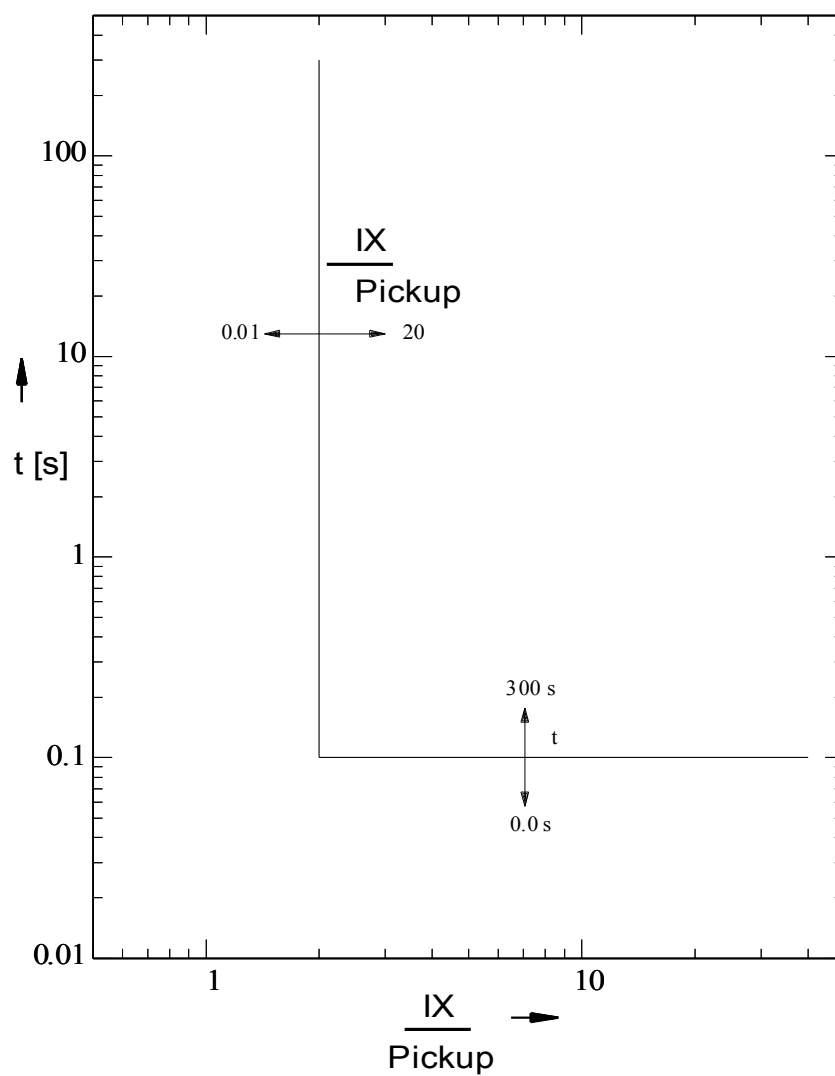
Explanation:

t = Tripping delay

I_X = Fault current

Pickup = If the pickup value is exceeded, the module/element starts to time out to trip .

The ground current can be measured either directly via a zero sequence transformer or detected by a residual connection. The ground current can alternatively be calculated from the phase currents; but this is only possible if the current transformers are Wye-connected.

DEFT

Time Current Curves (Ground Current)

The following characteristics are available:

- NINV (IEC/AMZ) – *IEC Normal Inverse*
- VINV (IEC/AMZ) – *IEC Very Inverse*
- LINV (IEC/AMZ) – *IEC Long Time Inverse*
- EINV (IEC/AMZ) – *IEC Extremely Inverse*
- MINV (ANSI/AMZ) – *ANSI Moderately Inverse*
- VINV (ANSI/AMZ) – *ANSI Very Inverse*
- EINV (ANSI/AMZ) – *ANSI Extremely Inverse*
- ABB RI – *Special Inverse*
- Thermal Flat
- IT
- I2T
- I4T

Explanation:

t = Tripping delay

t -multiplier = Time multiplier/tripping characteristic factor. The setting range depends on the selected tripping curve.
 I_G = Fault current

Pickup = If the pickup value is exceeded, the module/element starts to time out to trip .

The ground current can be measured either directly via a zero sequence transformer or detected by a residual connection. The ground current can alternatively be calculated from the phase currents; but this is only possible if the current transformers are Wye-connected.

IEC Normal Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = IEC NINV

Reset

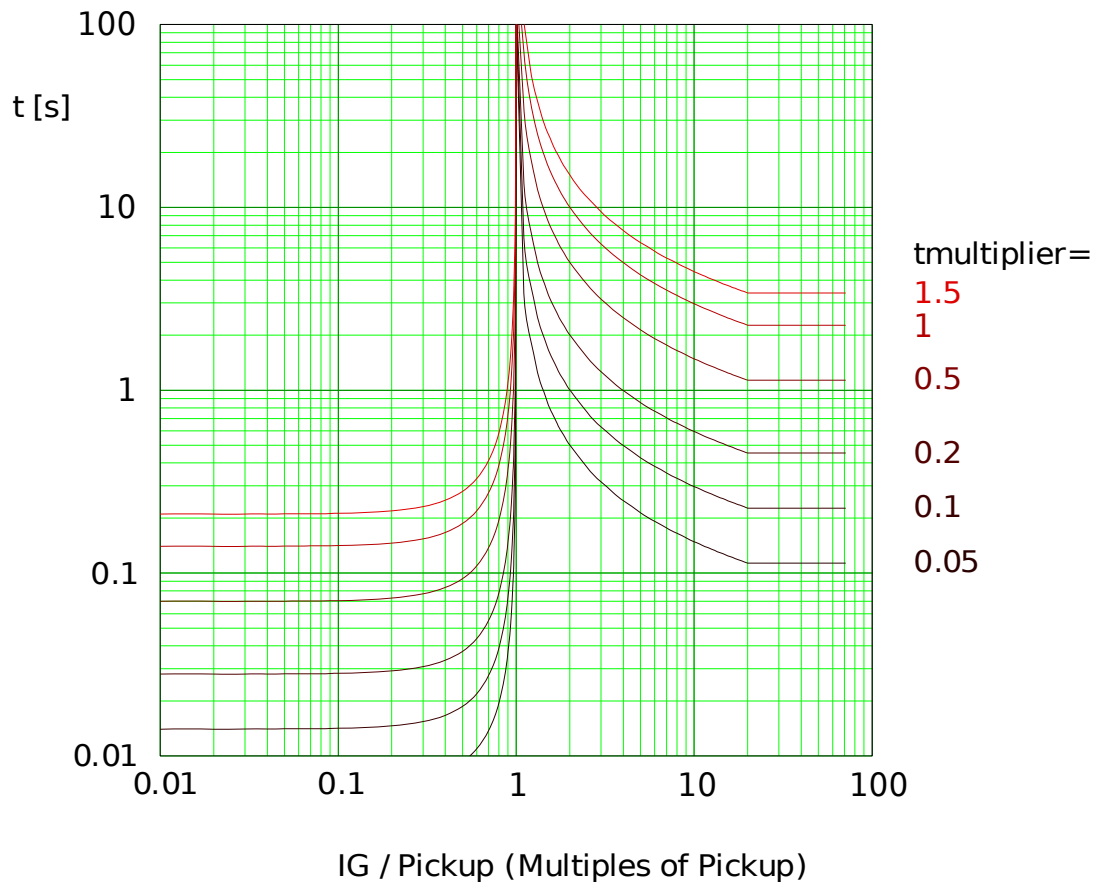
$$t = \frac{0.14}{1 - \left(\frac{IG}{Pickup} \right)^2} \cdot t_{multiplier}$$

If: $\frac{IG}{Pickup} < 1$

Trip

$$t = \frac{0.14}{\left(\frac{IG}{Pickup} \right)^{0.02} - 1} \cdot t_{multiplier}$$

If: $1 < \frac{IG}{Pickup} \leq 20$



Edoc_Z01

IEC Very Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_n$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_n$.

»Curve Shape« = IEC VINV

Reset

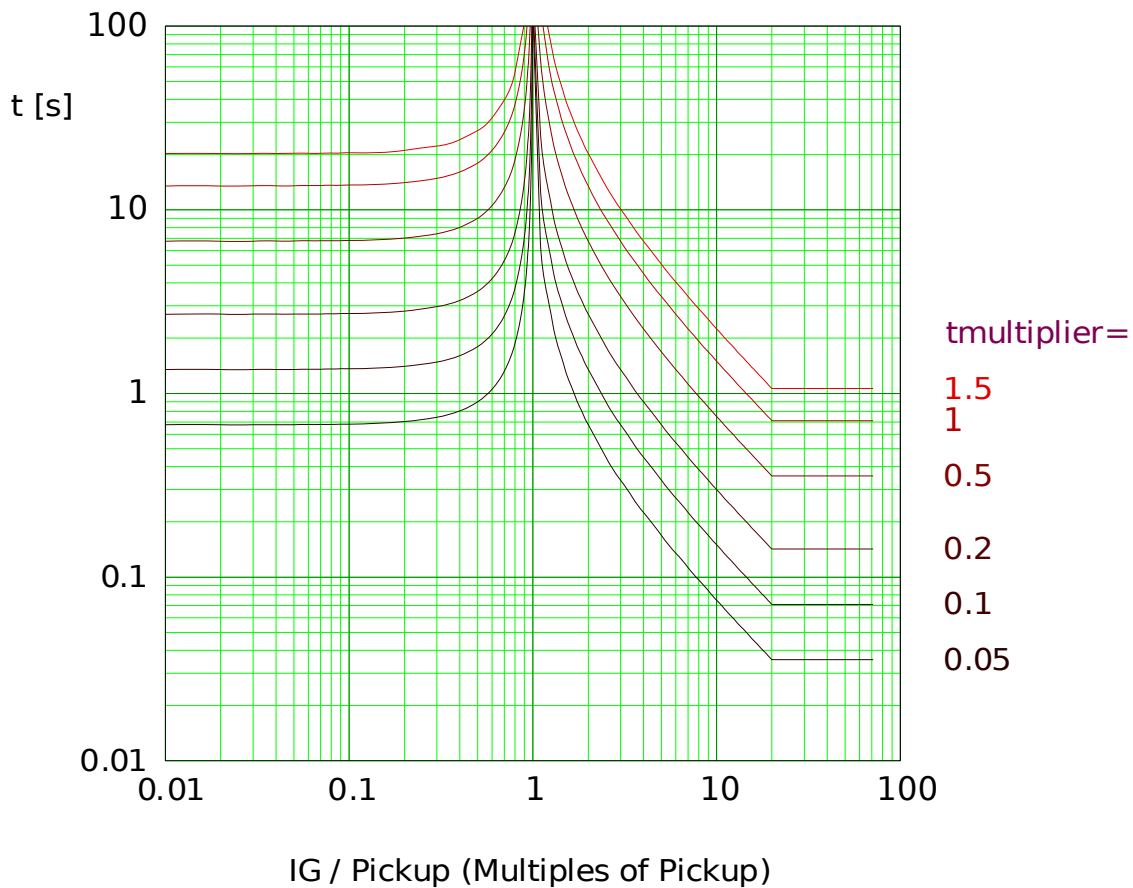
$$t = \frac{13.5}{1 - \left(\frac{IG}{Pickup} \right)^2} \cdot t_{multiplier}$$

$$\text{If: } \frac{IG}{Pickup} < 1$$

Trip

$$t = \frac{13.5}{\frac{IG}{Pickup} - 1} \cdot t_{multiplier}$$

$$\text{If: } 1 < \frac{IG}{Pickup} \leq 20$$



Edoc_Z02

IEC Extremely Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_n$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_n$.

»Curve Shape« = IEC EINV

Reset

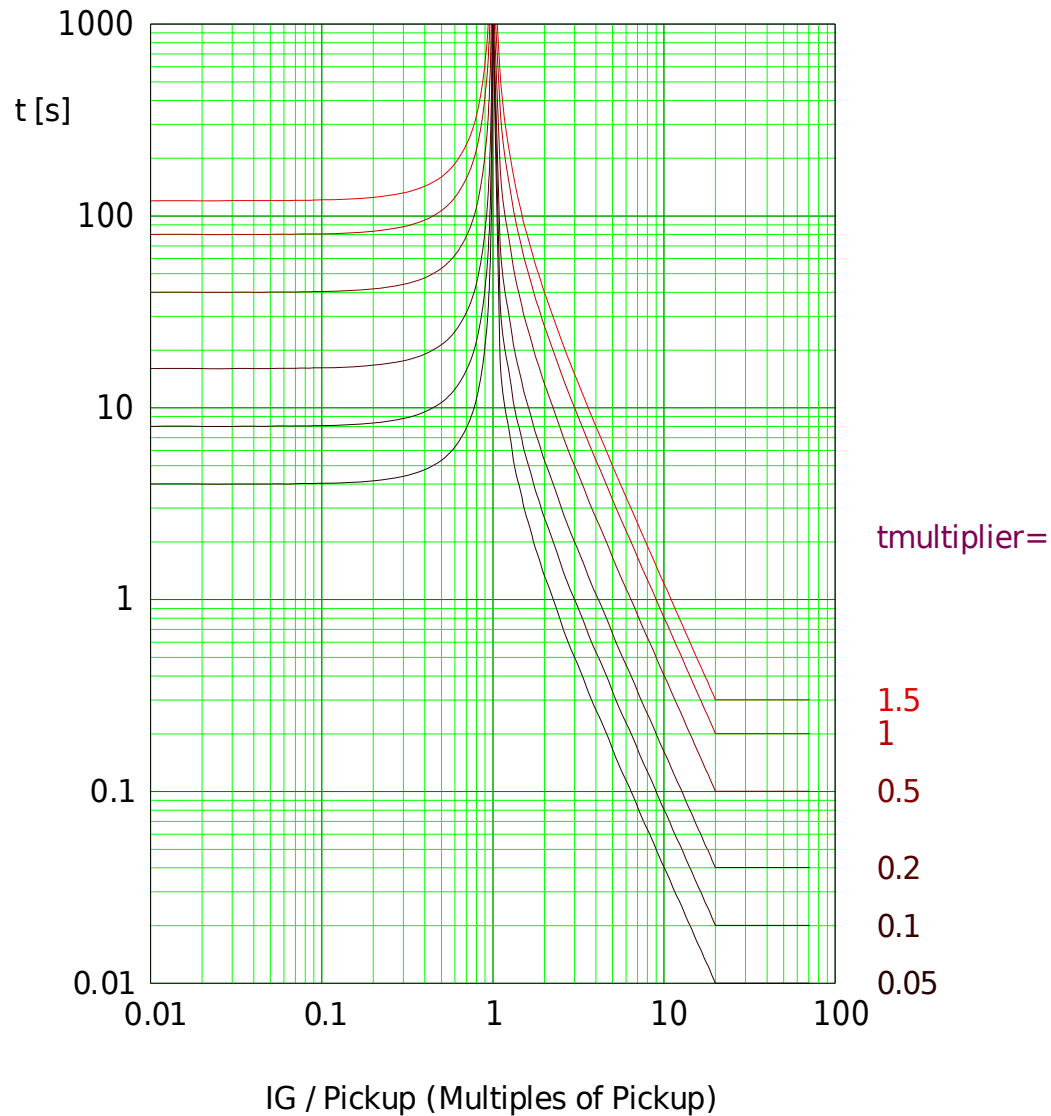
$$t = \frac{80}{1 - \left(\frac{IG}{Pickup} \right)^2} \cdot t_{multiplier}$$

$$\text{If: } \frac{IG}{Pickup} < 1$$

Trip

$$t = \frac{80}{\left(\frac{IG}{Pickup} \right)^2 - 1} \cdot t_{multiplier}$$

$$\text{If: } 1 < \frac{IG}{Pickup} \leq 20$$



IEC Long Time Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = IEC LINV

Reset

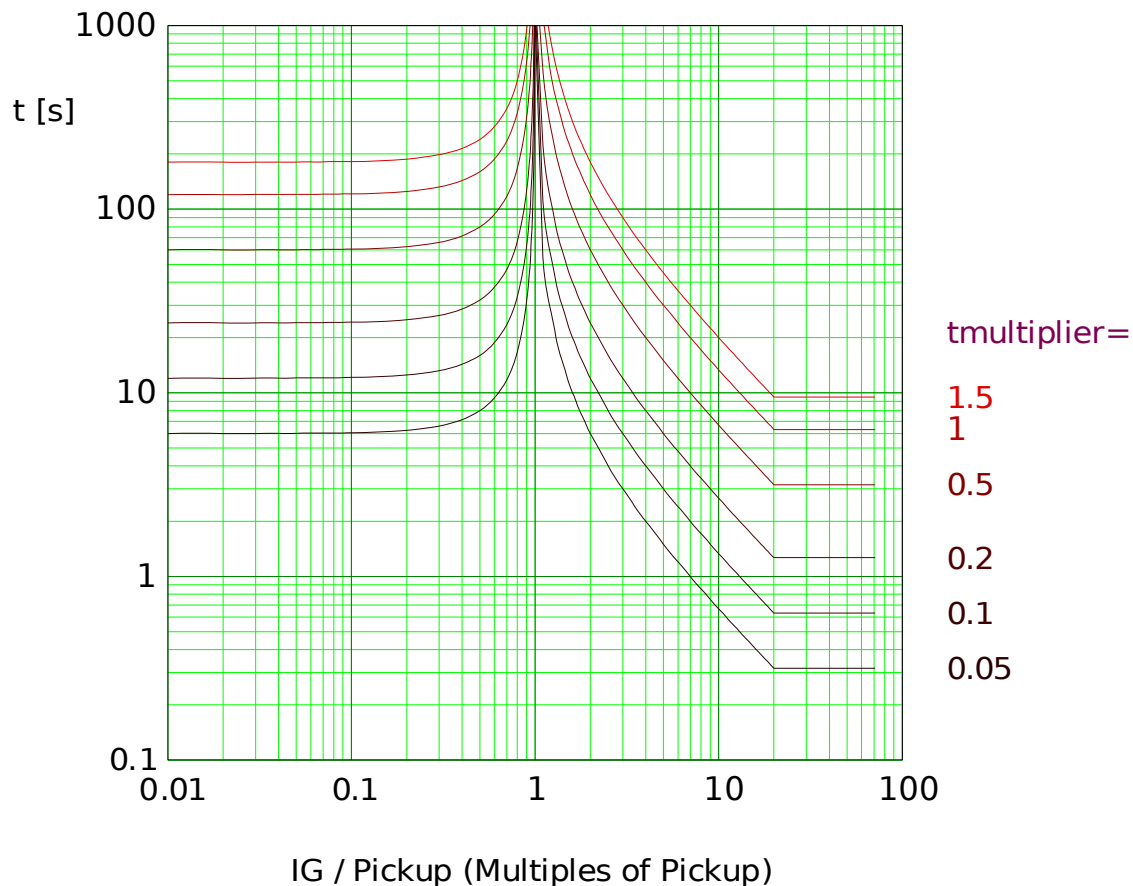
$$t = \frac{120}{1 - \left(\frac{IG}{Pickup} \right)^2} \cdot t_{multiplier}$$

$$\text{If: } \frac{IG}{Pickup} < 1$$

Trip

$$t = \frac{120}{\frac{IG}{Pickup} - 1} \cdot t_{multiplier}$$

$$\text{If: } 1 < \frac{IG}{Pickup} \leq 20$$



ANSI Moderately Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = ANSI MINV

Reset

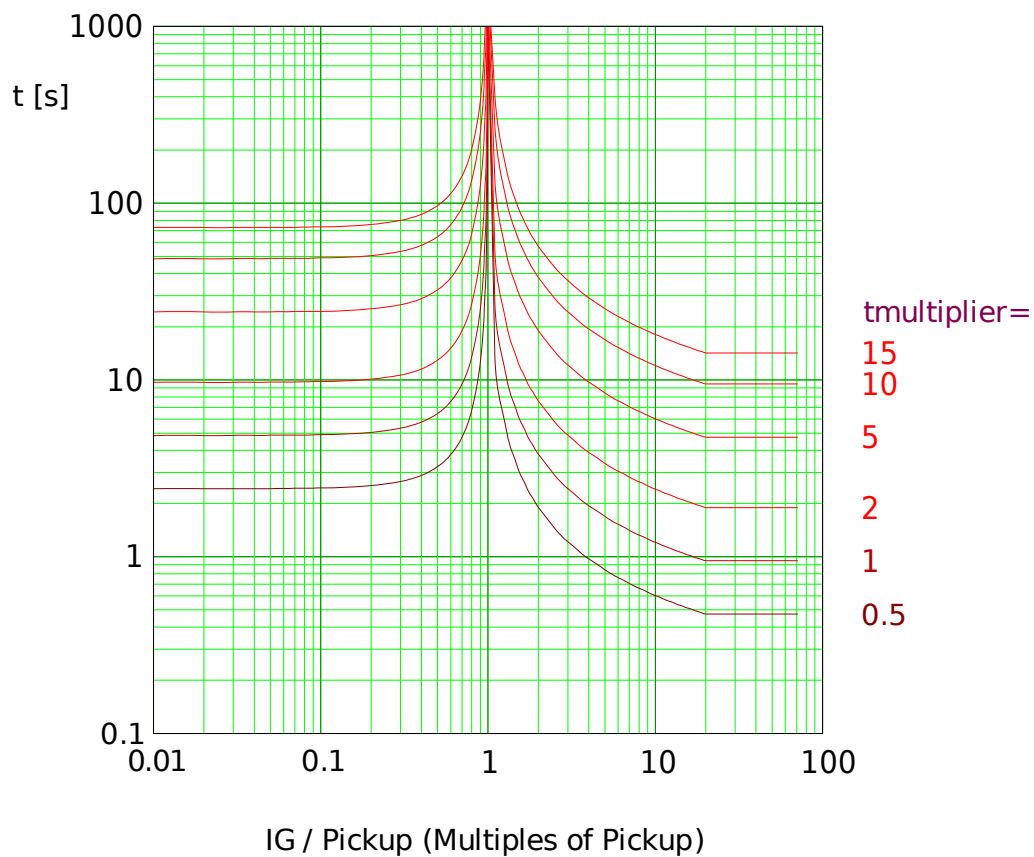
$$t = \frac{4.85}{1 - \left(\frac{IG}{Pickup} \right)^2} \cdot t_{multiplier}$$

If: $\frac{IG}{Pickup} < 1$

Trip

$$t = \left(\frac{0.0515}{\left(\frac{IG}{Pickup} \right)^{0.02} - 1} + 0.1140 \right) \cdot t_{multiplier}$$

If: $1 < \frac{IG}{Pickup} \leq 20$



Edoc_Z05

ANSI Very Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = ANSI VINV

Reset

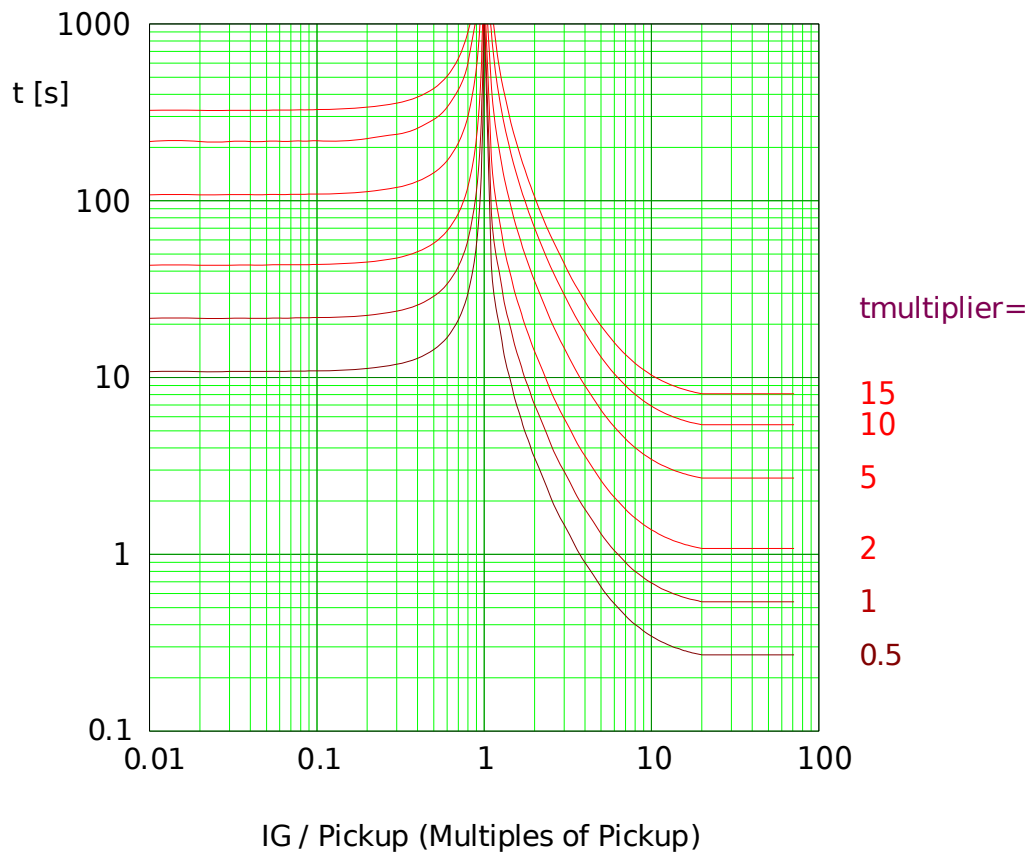
$$t = \frac{21.6}{1 - \left(\frac{IG}{Pickup} \right)^2} \cdot t_{multiplier}$$

If: $\frac{IG}{Pickup} < 1$

Trip

$$t = \left(\frac{19.61}{\left(\frac{IG}{Pickup} \right)^2 - 1} + 0.491 \right) \cdot t_{multiplier}$$

If: $1 < \frac{IG}{Pickup} \leq 20$



Edoc_Z06

ANSI Extremely Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = ANSI EINV

Reset

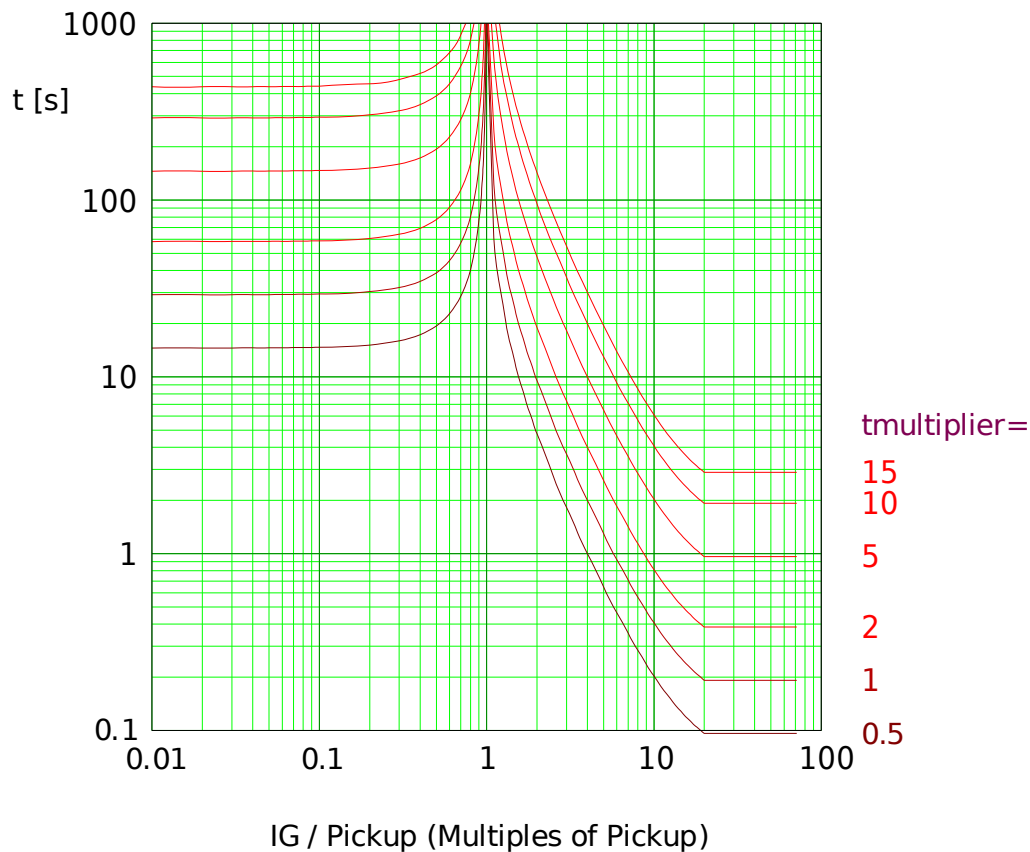
$$t = \frac{29.1}{1 - \left(\frac{IG}{Pickup} \right)^2} \cdot t_{multiplier}$$

If: $\frac{IG}{Pickup} < 1$

Trip

$$t = \left(\frac{28.2}{\left(\frac{IG}{Pickup} \right)^2 - 1} + 0.1217 \right) \cdot t_{multiplier}$$

If: $1 < \frac{IG}{Pickup} \leq 20$



Special Inverse

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

Remark: For $I > 20 \cdot I_s$, the curve stops decreasing, the t-values are kept constant at the value for $I = 20 \cdot I_s$.

»Curve Shape« = RINV

Reset

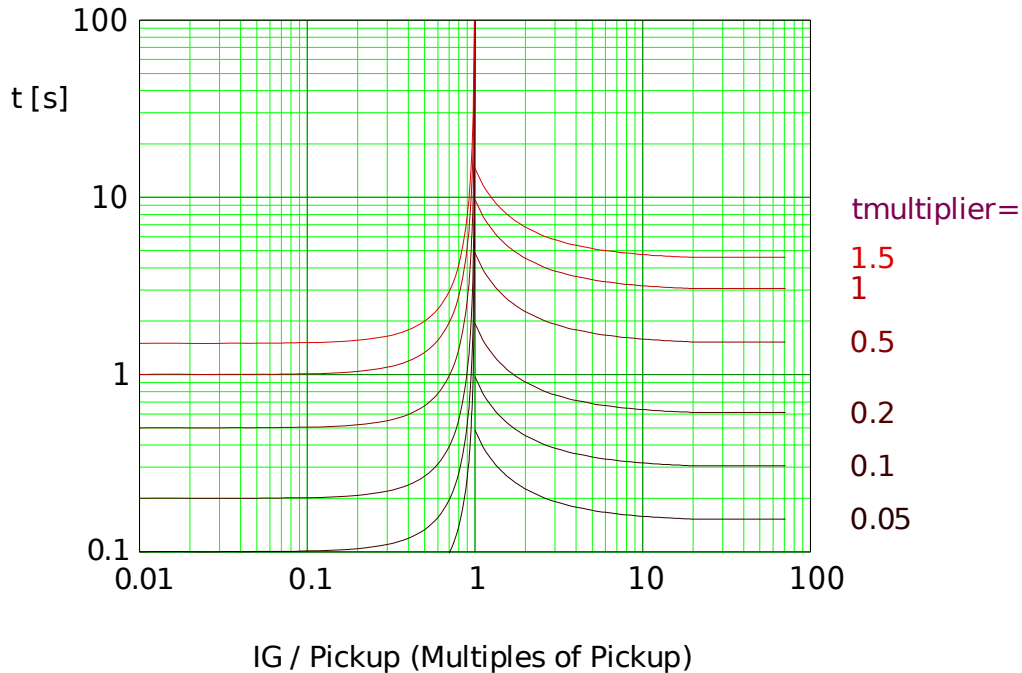
$$t = \frac{1.0}{1 - \left(\frac{IG}{Pickup} \right)^2} \cdot t_{multiplier}$$

If: $\frac{IG}{Pickup} < 1$

Trip

$$t = \frac{1.0}{0.339 - 0.236 \cdot \left(\frac{IG}{Pickup} \right)^{-1}} \cdot t_{multiplier}$$

If: $1 < \frac{IG}{Pickup} \leq 20$



Edoc_Z12

Thermal Flat Curve

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

»**Curve Shape**« = Therm Flat

Reset

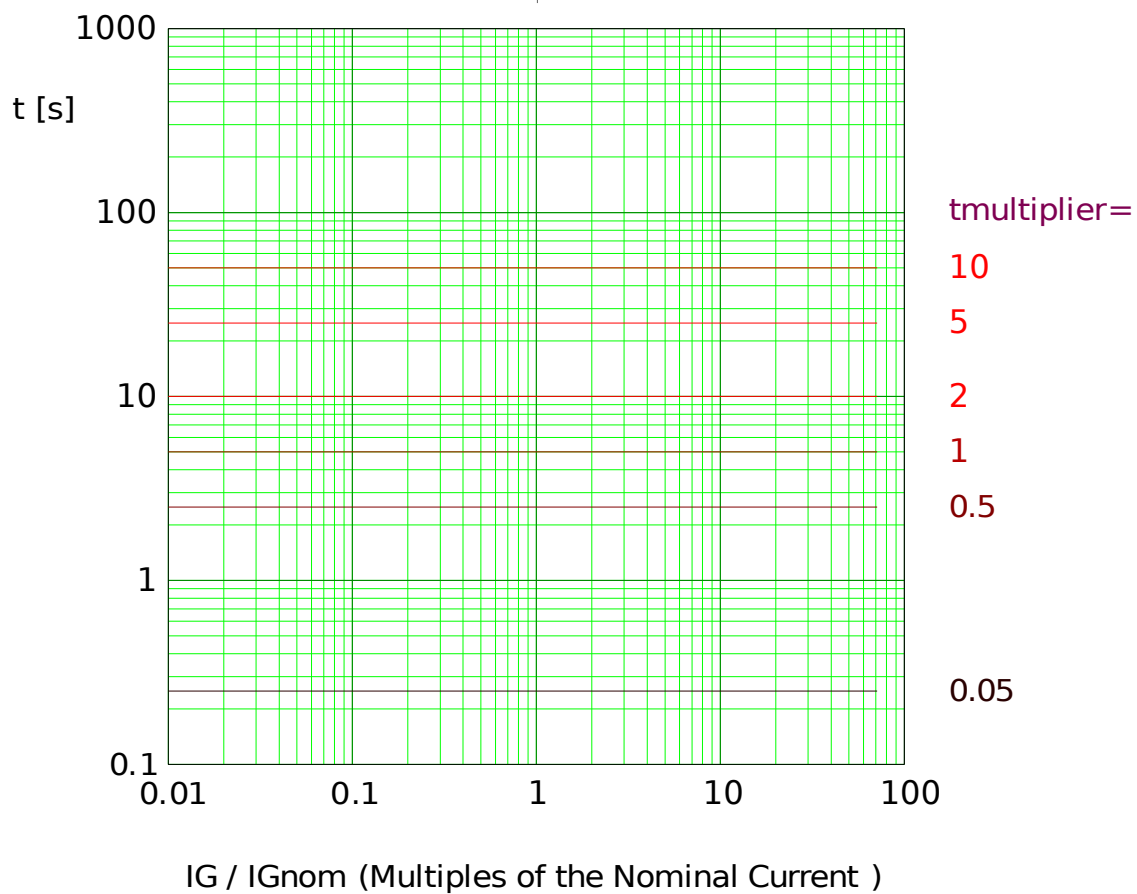
$$t = (5 \cdot 1^2) \cdot t_{\text{multiplier}}$$

$$\text{If: } \frac{IG}{IG_{\text{nom}}} < 1$$

Trip

$$t = (5 \cdot 1^0) \cdot t_{\text{multiplier}}$$

$$\text{If: } 1 < \frac{IG}{IG_{\text{nom}}}$$



Edoc_Z08

Thermal Curve IT

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

»**Curve Shape**« = IT

Reset

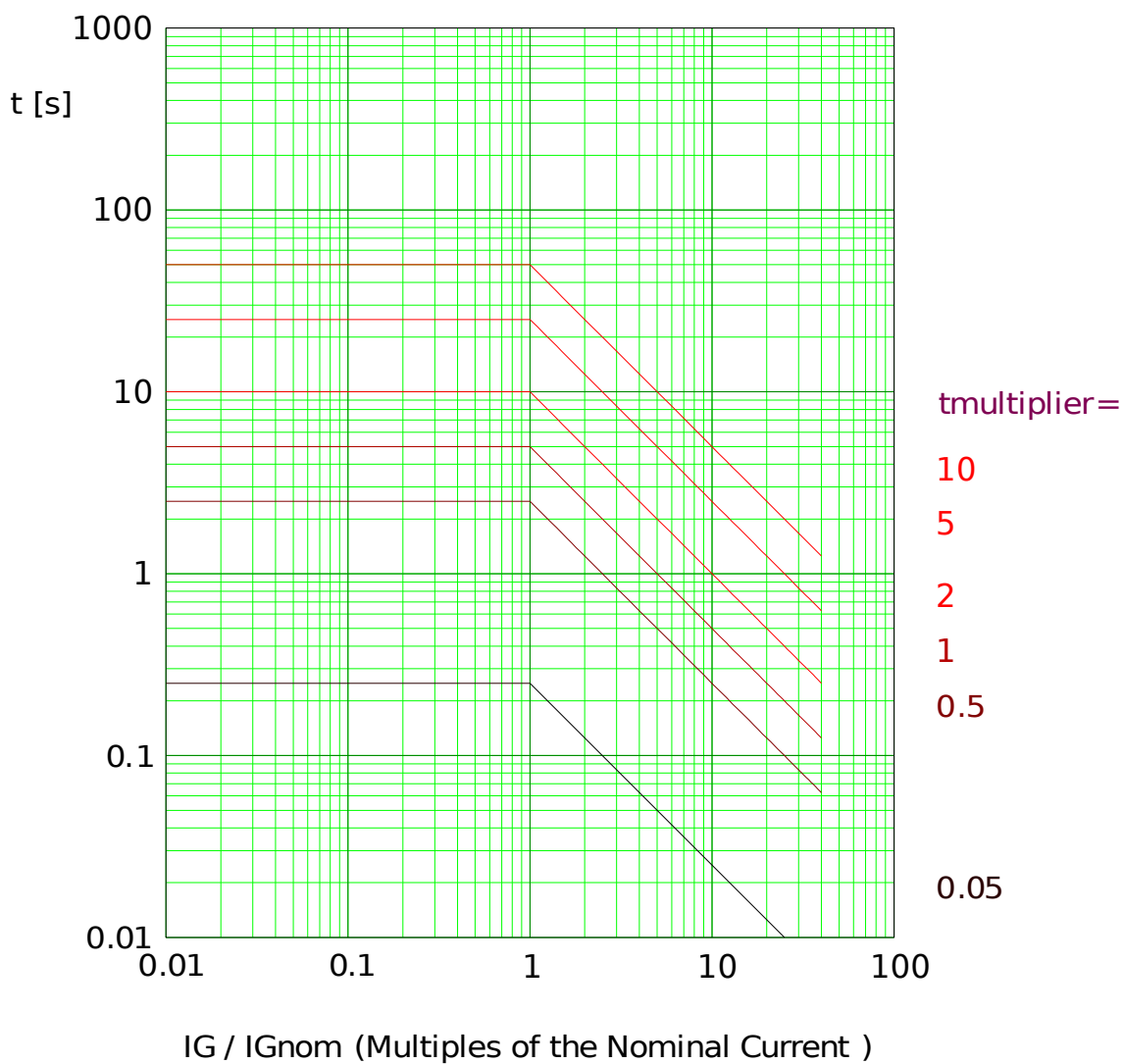
$$t = (5 \cdot 1^2) \cdot t_{multiplier}$$

If: $\frac{I_G}{I_{Gnom}} < 1$

Trip

$$t = \frac{5 \cdot 1^1}{\left(\frac{I_G}{I_{Gnom}}\right)^1} \cdot t_{multiplier}$$

If: $1 < \frac{I_G}{I_{Gnom}}$



Thermal Curve I2T

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

»**Curve Shape**« = I2T

Reset

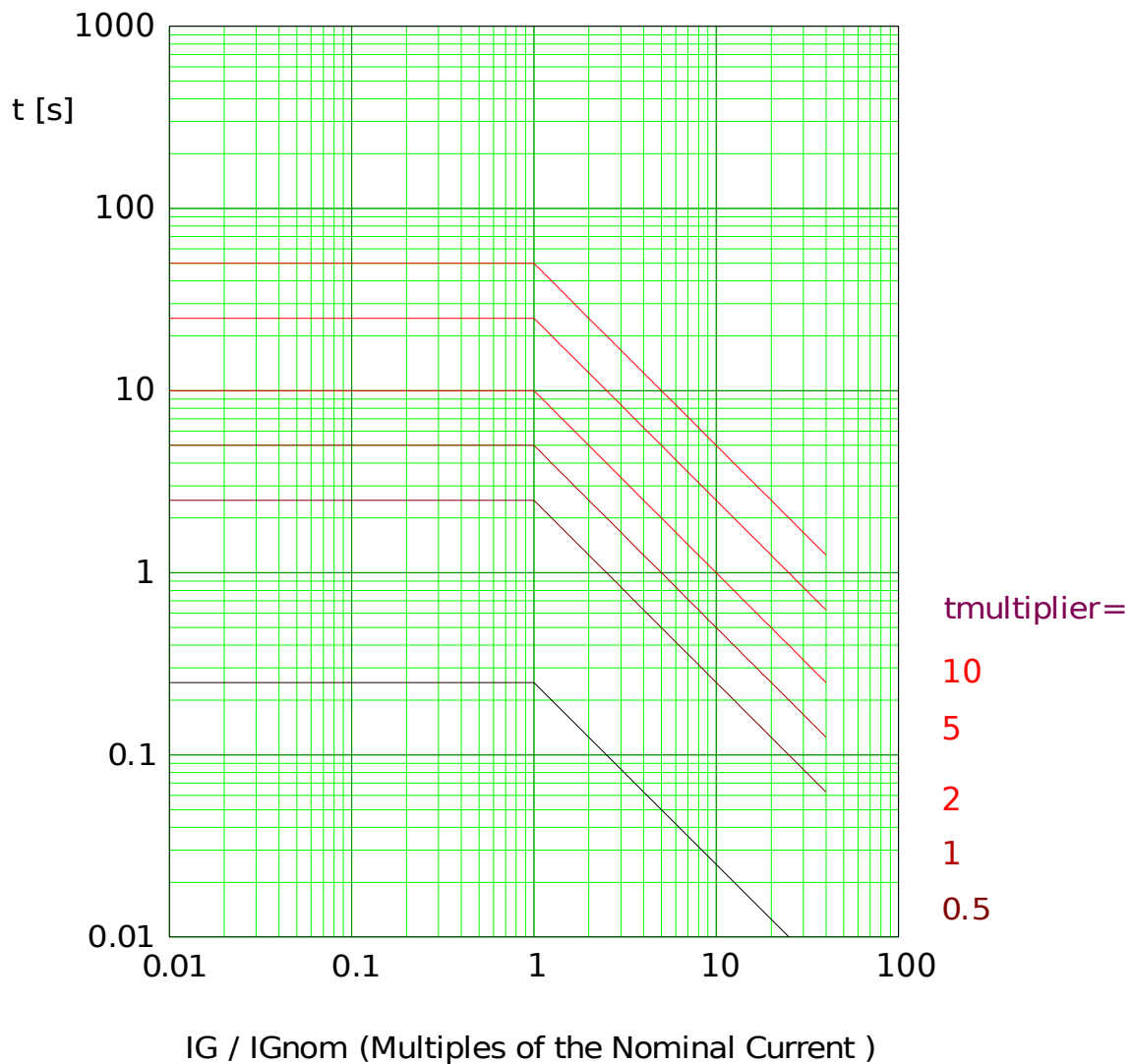
$$t = (5 \cdot 1^2) \cdot t_{\text{multiplier}}$$

If: $\frac{I_G}{I_{Gnom}} < 1$

Trip

$$t = \frac{5 \cdot 1^2}{\left(\frac{I_G}{I_{Gnom}}\right)^2} \cdot t_{\text{multiplier}}$$

If: $1 < \frac{I_G}{I_{Gnom}}$



Thermal Curve I4T

NOTICE

Various reset modes are available:
Resetting via characteristic, delayed and instantaneous.

»**Curve Shape**« = I4T

Reset

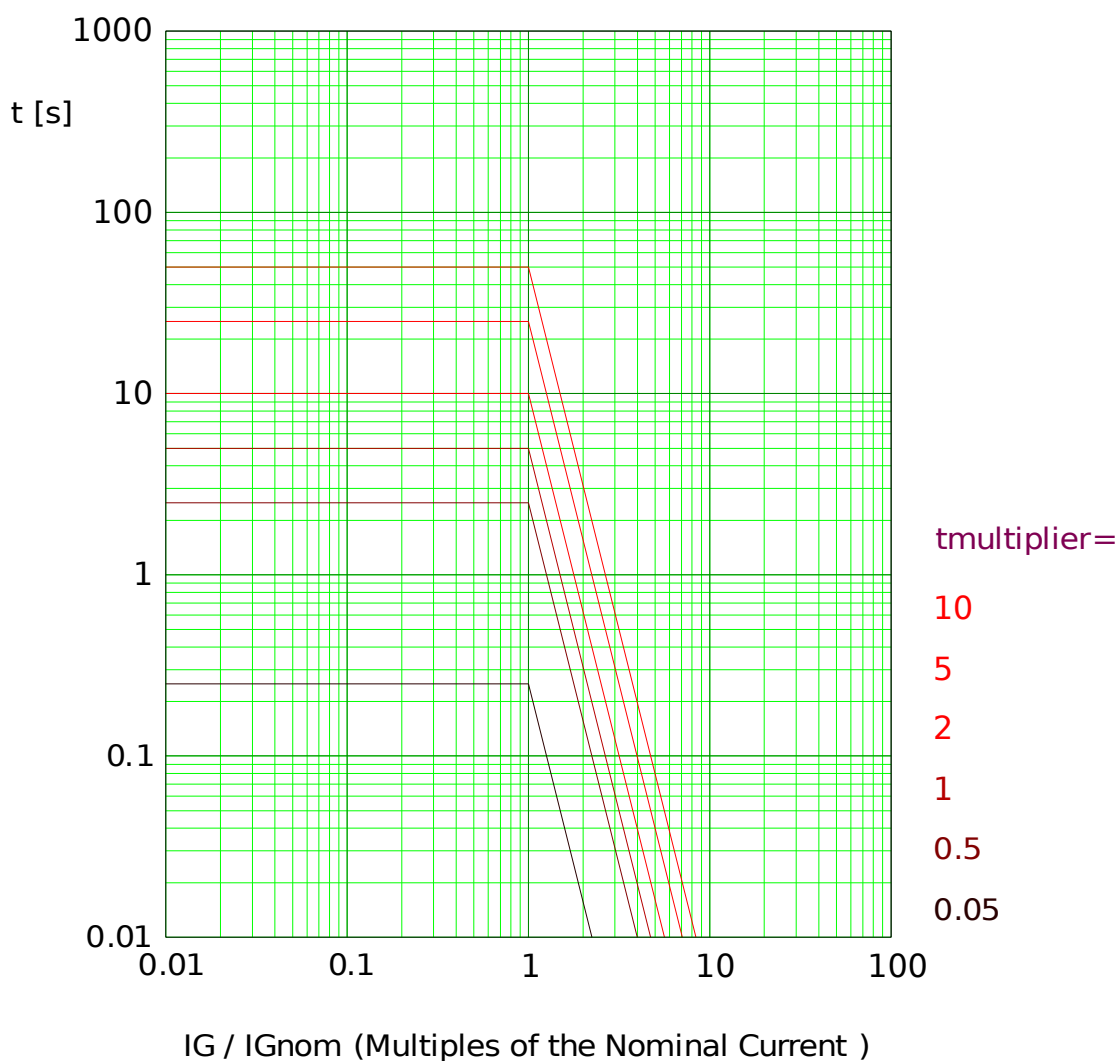
$$t = (5 \cdot 1^2) \cdot t_{multiplier}$$

Trip

$$t = \frac{5 \cdot 1^4}{\left(\frac{I_G}{I_{Gnom}}\right)^4} \cdot t_{multiplier}$$

If: $\frac{I_G}{I_{Gnom}} < 1$

If: $1 < \frac{I_G}{I_{Gnom}}$



Edoc_Z11

Assignment List

The »ASSIGNMENT LIST« below summarizes all module outputs (signals) and inputs (e.g.: states of the assignments).

Name	Description
-.-	No assignment
Prot.Available	Signal: Protection is available.
Prot.Active	Signal: Active
Prot.ExBlo	Signal: External Blocking
Prot.Pickup Phase A	Signal: General Pickup Phase A
Prot.Pickup Phase B	Signal: General Pickup Phase B
Prot.Pickup Phase C	Signal: General Pickup Phase C
Prot.Pickup IX or IR	Signal: General Pickup - Ground Fault
Prot.Pickup	Signal: General Pickup
Prot.Trip Phase A	Signal: General Trip Phase A
Prot.Trip Phase B	Signal: General Trip Phase B
Prot.Trip Phase C	Signal: General Trip Phase C
Prot.Trip IX or IR	Signal: General Trip Ground Fault
Prot.Trip	Signal: General Trip
Prot.Res FaultNo a GridFaultNo	Signal: Resetting of fault number and grid fault number.
Prot.ExBlo1-I	Module Input State: External Blocking1
Prot.ExBlo2-I	Module Input State: External Blocking2
Ctrl.Local	Switching Authority: Local
Ctrl.Remote	Switching Authority: Remote
Ctrl.SG Indeterm	Minimum one Switchgear is moving (Position cannot be determined).
Ctrl.SG Disturb	Minimum one Switchgear is disturbed.
Bkr.SI SingleContactInd	Signal: The Position of the Switchgear is detected by one auxiliary contact (pole) only. Thus indeterminate and disturbed Positions cannot be detected.
Bkr.Pos not CLOSE	Signal: Pos not CLOSE
Bkr.Pos CLOSE	Signal: Breaker is in CLOSE-Position
Bkr.Pos OPEN	Signal: Breaker is in OPEN-Position
Bkr.Pos Indeterm	Signal: Breaker is in Indeterminate Position
Bkr.Pos Disturb	Signal: Breaker Disturbed - Undefined Breaker Position. The feed-back signals (Position Indicators) contradict themselves. After expiring of a supervision timer this signal becomes true.
Bkr.Ready	Signal: Breaker is ready for operation.
Bkr.Interl CLOSE	Signal: One or more IL_Close inputs are active.
Bkr.Interl OPEN	Signal: One or more IL_Open inputs are active.
Bkr.CES succesf	Signal: Command Execution Supervision: Switching command executed successfully.

Name	Description
Bkr.CES Disturbed	Signal: Command Execution Supervision: Switching Command unsuccessful. Switchgear in disturbed position.
Bkr.CES Fail TripCmd	Signal: Command Execution Supervision: Command execution failed because trip command is pending.
Bkr.CES SwitchgDir	Signal: Command Execution Supervision respectively Switching Direction Control: This signal becomes true, if a switch command is issued even though the switchgear is already in the requested position. Example: A switchgear that is already OPEN should be switched OPEN again (doubly). The same applies to CLOSE commands.
Bkr.CES CLOSE d OPEN	Signal: Command Execution Supervision: CLOSE Command during a pending OPEN Command.
Bkr.CES SG not ready	Signal: Command Execution Supervision: Switchgear not ready
Bkr.CES Field Interl	Signal: Command Execution Supervision: Switching Command not executed because of field interlocking.
Bkr.CES SG removed	Signal: Command Execution Supervision: Switching Command unsuccessful, Switchgear removed.
Bkr.TripCmd	Signal: Trip Command
Bkr.Ack TripCmd	Signal: Acknowledge Trip Command
Bkr.Bwear Slow Breaker	Signal: Slow Breaker Alarm
Bkr.Res Bwear SI Breaker	Signal: Resetting the slow breaker alarm
Bkr.CLOSE Cmd	Signal: CLOSE command issued to the switchgear. Depending on the setting the signal may include the CLOSE command of the Prot module.
Bkr.OPEN Cmd	Signal: OPEN command issued to the switchgear. Depending on the setting the signal may include the OPEN command of the Prot module.
Bkr.CLOSE Cmd manual	Signal: CLOSE Cmd manual
Bkr.OPEN Cmd manual	Signal: OPEN Cmd manual
Bkr.CinBkr-52a-I	Module Input State: Feed-back signal of the Bkr (52a)
Bkr.CinBkr-52b-I	Module Input State: Feed-back signal of the Bkr. (52b)
Bkr.Ready-I	Module Input State: Breaker Ready
Bkr.Ack TripCmd-I	State of the module input: Acknowledgment Signal (only for automatic acknowledgment). Module input signal
Bkr.Interl CLOSE1-I	State of the module input: Interlocking of the CLOSE command
Bkr.Interl CLOSE2-I	State of the module input: Interlocking of the CLOSE command
Bkr.Interl CLOSE3-I	State of the module input: Interlocking of the CLOSE command
Bkr.Interl OPEN1-I	State of the module input: Interlocking of the OPEN command
Bkr.Interl OPEN2-I	State of the module input: Interlocking of the OPEN command
Bkr.Interl OPEN3-I	State of the module input: Interlocking of the OPEN command
Bkr.SC CLOSE-I	State of the module input: Switching CLOSE Command, e.g. the state of the Logics or the state of the digital input
Bkr.SC OPEN-I	State of the module input: Switching OPEN Command, e.g. the state of the Logics or the state of the digital input
Bkr.Operations Alarm	Signal: Service Alarm, too many Operations

Name	Description
Bkr.Isum Intr trip: IA	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded: IA
Bkr.Isum Intr trip: IB	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded: IB
Bkr.Isum Intr trip: IC	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded: IC
Bkr.Isum Intr trip	Signal: Maximum permissible Summation of the interrupting (tripping) currents exceeded in at least one phase.
Bkr.Res TripCmdCr	Signal: Resetting of the Counter: total number of trip commands
Bkr.Res Isum trip	Signal: Reset summation of the tripping currents
Bkr.WearLevel Alarm	Signal: Breaker Wear curve Alarm
Bkr.WearLevel Lockout	Signal: Breaker Wear Curve Lockout Level
Bkr.Res Bwear Curve	Signal: Reset of the Breaker Wear maintenance curve.
Bkr.Isum Intr ph Alm	Signal: Alarm, the per hour Sum (Limit) of interrupting currents has been exceeded.
Bkr.Res Isum Intr ph Alm	Signal: Reset of the Alarm, "the per hour Sum (Limit) of interrupting currents has been exceeded".
MStart.Active	Signal: Active
MStart.Blo TripCmd	Signal: Trip Command blocked
MStart.Trip	Signal: Trip
MStart.TripCmd	Signal: Trip Command
MStart.Start	Signal: Motor is in start mode
MStart.Run	Signal: Motor is in run mode
MStart.Stop	Signal: Motor is in stop mode
MStart.Blo	Signal: Motor is blocked for starting or transition to Run mode
MStart.NOCSBlocked	Signal: Motor is prohibited to start due to number of cold start limits
MStart.SPHBlocked	Signal: Motor is prohibited to start due to starts per hour limits
MStart.SPHBlockAlarm	Signal: Motor is prohibited to start due to starts per hour limits, would come active in the next stop
MStart.TBSBlocked	Signal: Motor is prohibited to start due to time between starts limits
MStart.ThermalBlock	Signal: Thermal block
MStart.RemBlockStart	Signal: Motor is prohibited to start due to external blocking through digital input DI
MStart.TransitionTrip	Signal: Start transition fail trip
MStart.ZSSTrip	Signal: Zero speed trip (possible locked rotor)
MStart.INSQSP2STFaill	Signal: Fail to transit from stop to start based on reported back time
MStart.INSQSt2RunFail	Signal: Fail to transit from start to run based on reported back time
MStart.LATBlock	Signal: Long acceleration timer enforced
MStart.ColdStartSeq	Signal: Motor cold start sequence flag
MStart.ForcedStart	Signal: Motor being forced to start
MStart.TripPhaseReverse	Signal: Relay tripped because of phase reverse detection

Name	Description
MStart.EmergOverrideDI	Signal: Emergency override start blocking through digital input DI
MStart.EmergOverrideUI	Signal: Emergency override start blocking through front panel
MStart.ABKActive	Signal: Anti-backspin is active. For certain applications, such as pumping a fluid up a pipe, the motor may be driven backward for a period of time after it stops. The anti-backspin timer prevents starting the motor while it is spinning in the reverse direction.
MStart.GOCStartBlock	Signal: Ground Instantaneous Overcurrent Start Delay. GOC (Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
MStart.IOCStartBlock	Signal: Phase Instantaneous Overcurrent Start Delay. IOC (Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
MStart.ULoadStartBlock	Signal: Underload Start Delay. Underload(Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
MStart.JamStartBlock	Signal: JAM Start Delay. JAM(Instantaneous Overcurrent) elements are blocked for the time programmed under this parameter
MStart.UnbalStartBlock	Signal: Motor start block current unbalance signal
MStart.Blo-Generic1	Generic Start Delay. This value can be used to block any protective element.1
MStart.Blo-Generic2	Generic Start Delay. This value can be used to block any protective element.2
MStart.Blo-Generic3	Generic Start Delay. This value can be used to block any protective element.3
MStart.Blo-Generic4	Generic Start Delay. This value can be used to block any protective element.4
MStart.Blo-Generic5	Generic Start Delay. This value can be used to block any protective element.5
MStart.I_Transit	Signal: Current transition signal
MStart.T_Transit	Signal: Time transition signal
MStart.MotorStopBlo	Signal: Motor stop block other protection functions
MStart.RFD_IA_Normal	Signal: System IA RotaryFieldDetection Normal
MStart.RFD_IA_Reverse	Signal: System IA RotaryFieldDetection Reverse
MStart.ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
MStart.RemStartBlock-I	State of the module input: Remote Motor Start Blocking
MStart.EmgOvr-I	State of the module input: Emergency Override. Signal has to be active in order to release the thermal capacity of the motor. Please notice that by doing this you run the risk of damaging the motor. "EMGOVR" has to be set to "DI" or "DI or UI" for this input to take effect
MStart.INSQ-I	State of the module input: INcomplete SeQuence
MStart.ZSS-I	State of the module input: Zero Speed Switch
MStart.STPC Blo-I	State of the module input: With this setting a Digital Input keeps the Motor in the RUN mode, even when the motor current drops below STPC (motor stop current).
50P[1].Active	Signal: Active
50P[1].ExBlo	Signal: External Blocking
50P[1].Rvs Blo	Signal: Reverse Blocking
50P[1].Blo TripCmd	Signal: Trip Command blocked
50P[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
50P[1].Pickup IA	Signal: Pickup IA

<i>Name</i>	<i>Description</i>
50P[1].Pickup IB	Signal: Pickup IB
50P[1].Pickup IC	Signal: Pickup IC
50P[1].Pickup	Signal: Pickup
50P[1].Trip	Signal: Trip
50P[1].TripCmd	Signal: Trip Command
50P[1].DefaultSet	Signal: Default Parameter Set
50P[1].AdaptSet 1	Signal: Adaptive Parameter 1
50P[1].AdaptSet 2	Signal: Adaptive Parameter 2
50P[1].AdaptSet 3	Signal: Adaptive Parameter 3
50P[1].AdaptSet 4	Signal: Adaptive Parameter 4
50P[1].ExBlo1-I	Module Input State: External Blocking1
50P[1].ExBlo2-I	Module Input State: External Blocking2
50P[1].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
50P[1].Rvs Blo-I	Module Input State: Reverse Blocking
50P[1].AdaptSet1-I	Module Input State: Adaptive Parameter1
50P[1].AdaptSet2-I	Module Input State: Adaptive Parameter2
50P[1].AdaptSet3-I	Module Input State: Adaptive Parameter3
50P[1].AdaptSet4-I	Module Input State: Adaptive Parameter4
50P[2].Active	Signal: Active
50P[2].ExBlo	Signal: External Blocking
50P[2].Rvs Blo	Signal: Reverse Blocking
50P[2].Blo TripCmd	Signal: Trip Command blocked
50P[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
50P[2].Pickup IA	Signal: Pickup IA
50P[2].Pickup IB	Signal: Pickup IB
50P[2].Pickup IC	Signal: Pickup IC
50P[2].Pickup	Signal: Pickup
50P[2].Trip	Signal: Trip
50P[2].TripCmd	Signal: Trip Command
50P[2].DefaultSet	Signal: Default Parameter Set
50P[2].AdaptSet 1	Signal: Adaptive Parameter 1
50P[2].AdaptSet 2	Signal: Adaptive Parameter 2
50P[2].AdaptSet 3	Signal: Adaptive Parameter 3
50P[2].AdaptSet 4	Signal: Adaptive Parameter 4
50P[2].ExBlo1-I	Module Input State: External Blocking1
50P[2].ExBlo2-I	Module Input State: External Blocking2
50P[2].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command

<i>Name</i>	<i>Description</i>
50P[2].Rvs Blo-I	Module Input State: Reverse Blocking
50P[2].AdaptSet1-I	Module Input State: Adaptive Parameter1
50P[2].AdaptSet2-I	Module Input State: Adaptive Parameter2
50P[2].AdaptSet3-I	Module Input State: Adaptive Parameter3
50P[2].AdaptSet4-I	Module Input State: Adaptive Parameter4
50P[3].Active	Signal: Active
50P[3].ExBlo	Signal: External Blocking
50P[3].Rvs Blo	Signal: Reverse Blocking
50P[3].Blo TripCmd	Signal: Trip Command blocked
50P[3].ExBlo TripCmd	Signal: External Blocking of the Trip Command
50P[3].Pickup IA	Signal: Pickup IA
50P[3].Pickup IB	Signal: Pickup IB
50P[3].Pickup IC	Signal: Pickup IC
50P[3].Pickup	Signal: Pickup
50P[3].Trip	Signal: Trip
50P[3].TripCmd	Signal: Trip Command
50P[3].DefaultSet	Signal: Default Parameter Set
50P[3].AdaptSet 1	Signal: Adaptive Parameter 1
50P[3].AdaptSet 2	Signal: Adaptive Parameter 2
50P[3].AdaptSet 3	Signal: Adaptive Parameter 3
50P[3].AdaptSet 4	Signal: Adaptive Parameter 4
50P[3].ExBlo1-I	Module Input State: External Blocking1
50P[3].ExBlo2-I	Module Input State: External Blocking2
50P[3].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
50P[3].Rvs Blo-I	Module Input State: Reverse Blocking
50P[3].AdaptSet1-I	Module Input State: Adaptive Parameter1
50P[3].AdaptSet2-I	Module Input State: Adaptive Parameter2
50P[3].AdaptSet3-I	Module Input State: Adaptive Parameter3
50P[3].AdaptSet4-I	Module Input State: Adaptive Parameter4
51P[1].Active	Signal: Active
51P[1].ExBlo	Signal: External Blocking
51P[1].Rvs Blo	Signal: Reverse Blocking
51P[1].Blo TripCmd	Signal: Trip Command blocked
51P[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
51P[1].Pickup IA	Signal: Pickup IA
51P[1].Pickup IB	Signal: Pickup IB
51P[1].Pickup IC	Signal: Pickup IC

<i>Name</i>	<i>Description</i>
51P[1].Pickup	Signal: Pickup
51P[1].Trip	Signal: Trip
51P[1].TripCmd	Signal: Trip Command
51P[1].DefaultSet	Signal: Default Parameter Set
51P[1].AdaptSet 1	Signal: Adaptive Parameter 1
51P[1].AdaptSet 2	Signal: Adaptive Parameter 2
51P[1].AdaptSet 3	Signal: Adaptive Parameter 3
51P[1].AdaptSet 4	Signal: Adaptive Parameter 4
51P[1].ExBlo1-I	Module Input State: External Blocking1
51P[1].ExBlo2-I	Module Input State: External Blocking2
51P[1].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
51P[1].Rvs Blo-I	Module Input State: Reverse Blocking
51P[1].AdaptSet1-I	Module Input State: Adaptive Parameter1
51P[1].AdaptSet2-I	Module Input State: Adaptive Parameter2
51P[1].AdaptSet3-I	Module Input State: Adaptive Parameter3
51P[1].AdaptSet4-I	Module Input State: Adaptive Parameter4
51P[2].Active	Signal: Active
51P[2].ExBlo	Signal: External Blocking
51P[2].Rvs Blo	Signal: Reverse Blocking
51P[2].Blo TripCmd	Signal: Trip Command blocked
51P[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
51P[2].Pickup IA	Signal: Pickup IA
51P[2].Pickup IB	Signal: Pickup IB
51P[2].Pickup IC	Signal: Pickup IC
51P[2].Pickup	Signal: Pickup
51P[2].Trip	Signal: Trip
51P[2].TripCmd	Signal: Trip Command
51P[2].DefaultSet	Signal: Default Parameter Set
51P[2].AdaptSet 1	Signal: Adaptive Parameter 1
51P[2].AdaptSet 2	Signal: Adaptive Parameter 2
51P[2].AdaptSet 3	Signal: Adaptive Parameter 3
51P[2].AdaptSet 4	Signal: Adaptive Parameter 4
51P[2].ExBlo1-I	Module Input State: External Blocking1
51P[2].ExBlo2-I	Module Input State: External Blocking2
51P[2].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
51P[2].Rvs Blo-I	Module Input State: Reverse Blocking
51P[2].AdaptSet1-I	Module Input State: Adaptive Parameter1

<i>Name</i>	<i>Description</i>
51P[2].AdaptSet2-I	Module Input State: Adaptive Parameter2
51P[2].AdaptSet3-I	Module Input State: Adaptive Parameter3
51P[2].AdaptSet4-I	Module Input State: Adaptive Parameter4
51P[3].Active	Signal: Active
51P[3].ExBlo	Signal: External Blocking
51P[3].Rvs Blo	Signal: Reverse Blocking
51P[3].Blo TripCmd	Signal: Trip Command blocked
51P[3].ExBlo TripCmd	Signal: External Blocking of the Trip Command
51P[3].Pickup IA	Signal: Pickup IA
51P[3].Pickup IB	Signal: Pickup IB
51P[3].Pickup IC	Signal: Pickup IC
51P[3].Pickup	Signal: Pickup
51P[3].Trip	Signal: Trip
51P[3].TripCmd	Signal: Trip Command
51P[3].DefaultSet	Signal: Default Parameter Set
51P[3].AdaptSet 1	Signal: Adaptive Parameter 1
51P[3].AdaptSet 2	Signal: Adaptive Parameter 2
51P[3].AdaptSet 3	Signal: Adaptive Parameter 3
51P[3].AdaptSet 4	Signal: Adaptive Parameter 4
51P[3].ExBlo1-I	Module Input State: External Blocking1
51P[3].ExBlo2-I	Module Input State: External Blocking2
51P[3].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
51P[3].Rvs Blo-I	Module Input State: Reverse Blocking
51P[3].AdaptSet1-I	Module Input State: Adaptive Parameter1
51P[3].AdaptSet2-I	Module Input State: Adaptive Parameter2
51P[3].AdaptSet3-I	Module Input State: Adaptive Parameter3
51P[3].AdaptSet4-I	Module Input State: Adaptive Parameter4
50X[1].Active	Signal: Active
50X[1].ExBlo	Signal: External Blocking
50X[1].Rvs Blo	Signal: Reverse Blocking
50X[1].Blo TripCmd	Signal: Trip Command blocked
50X[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
50X[1].Pickup	Signal: Pickup IX or IR
50X[1].Trip	Signal: Trip
50X[1].TripCmd	Signal: Trip Command
50X[1].DefaultSet	Signal: Default Parameter Set
50X[1].AdaptSet 1	Signal: Adaptive Parameter 1

<i>Name</i>	<i>Description</i>
50X[1].AdaptSet 2	Signal: Adaptive Parameter 2
50X[1].AdaptSet 3	Signal: Adaptive Parameter 3
50X[1].AdaptSet 4	Signal: Adaptive Parameter 4
50X[1].ExBlo1-I	Module Input State: External Blocking1
50X[1].ExBlo2-I	Module Input State: External Blocking2
50X[1].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
50X[1].Rvs Blo-I	Module Input State: Reverse Blocking
50X[1].AdaptSet1-I	Module Input State: Adaptive Parameter1
50X[1].AdaptSet2-I	Module Input State: Adaptive Parameter2
50X[1].AdaptSet3-I	Module Input State: Adaptive Parameter3
50X[1].AdaptSet4-I	Module Input State: Adaptive Parameter4
50X[2].Active	Signal: Active
50X[2].ExBlo	Signal: External Blocking
50X[2].Rvs Blo	Signal: Reverse Blocking
50X[2].Blo TripCmd	Signal: Trip Command blocked
50X[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
50X[2].Pickup	Signal: Pickup IX or IR
50X[2].Trip	Signal: Trip
50X[2].TripCmd	Signal: Trip Command
50X[2].DefaultSet	Signal: Default Parameter Set
50X[2].AdaptSet 1	Signal: Adaptive Parameter 1
50X[2].AdaptSet 2	Signal: Adaptive Parameter 2
50X[2].AdaptSet 3	Signal: Adaptive Parameter 3
50X[2].AdaptSet 4	Signal: Adaptive Parameter 4
50X[2].ExBlo1-I	Module Input State: External Blocking1
50X[2].ExBlo2-I	Module Input State: External Blocking2
50X[2].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
50X[2].Rvs Blo-I	Module Input State: Reverse Blocking
50X[2].AdaptSet1-I	Module Input State: Adaptive Parameter1
50X[2].AdaptSet2-I	Module Input State: Adaptive Parameter2
50X[2].AdaptSet3-I	Module Input State: Adaptive Parameter3
50X[2].AdaptSet4-I	Module Input State: Adaptive Parameter4
51X[1].Active	Signal: Active
51X[1].ExBlo	Signal: External Blocking
51X[1].Rvs Blo	Signal: Reverse Blocking
51X[1].Blo TripCmd	Signal: Trip Command blocked
51X[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command

<i>Name</i>	<i>Description</i>
51X[1].Pickup	Signal: Pickup IX or IR
51X[1].Trip	Signal: Trip
51X[1].TripCmd	Signal: Trip Command
51X[1].DefaultSet	Signal: Default Parameter Set
51X[1].AdaptSet 1	Signal: Adaptive Parameter 1
51X[1].AdaptSet 2	Signal: Adaptive Parameter 2
51X[1].AdaptSet 3	Signal: Adaptive Parameter 3
51X[1].AdaptSet 4	Signal: Adaptive Parameter 4
51X[1].ExBlo1-I	Module Input State: External Blocking1
51X[1].ExBlo2-I	Module Input State: External Blocking2
51X[1].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
51X[1].Rvs Blo-I	Module Input State: Reverse Blocking
51X[1].AdaptSet1-I	Module Input State: Adaptive Parameter1
51X[1].AdaptSet2-I	Module Input State: Adaptive Parameter2
51X[1].AdaptSet3-I	Module Input State: Adaptive Parameter3
51X[1].AdaptSet4-I	Module Input State: Adaptive Parameter4
51X[2].Active	Signal: Active
51X[2].ExBlo	Signal: External Blocking
51X[2].Rvs Blo	Signal: Reverse Blocking
51X[2].Blo TripCmd	Signal: Trip Command blocked
51X[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
51X[2].Pickup	Signal: Pickup IX or IR
51X[2].Trip	Signal: Trip
51X[2].TripCmd	Signal: Trip Command
51X[2].DefaultSet	Signal: Default Parameter Set
51X[2].AdaptSet 1	Signal: Adaptive Parameter 1
51X[2].AdaptSet 2	Signal: Adaptive Parameter 2
51X[2].AdaptSet 3	Signal: Adaptive Parameter 3
51X[2].AdaptSet 4	Signal: Adaptive Parameter 4
51X[2].ExBlo1-I	Module Input State: External Blocking1
51X[2].ExBlo2-I	Module Input State: External Blocking2
51X[2].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
51X[2].Rvs Blo-I	Module Input State: Reverse Blocking
51X[2].AdaptSet1-I	Module Input State: Adaptive Parameter1
51X[2].AdaptSet2-I	Module Input State: Adaptive Parameter2
51X[2].AdaptSet3-I	Module Input State: Adaptive Parameter3
51X[2].AdaptSet4-I	Module Input State: Adaptive Parameter4

<i>Name</i>	<i>Description</i>
50R[1].Active	Signal: Active
50R[1].ExBlo	Signal: External Blocking
50R[1].Rvs Blo	Signal: Reverse Blocking
50R[1].Blo TripCmd	Signal: Trip Command blocked
50R[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
50R[1].Pickup	Signal: Pickup IX or IR
50R[1].Trip	Signal: Trip
50R[1].TripCmd	Signal: Trip Command
50R[1].DefaultSet	Signal: Default Parameter Set
50R[1].AdaptSet 1	Signal: Adaptive Parameter 1
50R[1].AdaptSet 2	Signal: Adaptive Parameter 2
50R[1].AdaptSet 3	Signal: Adaptive Parameter 3
50R[1].AdaptSet 4	Signal: Adaptive Parameter 4
50R[1].ExBlo1-I	Module Input State: External Blocking1
50R[1].ExBlo2-I	Module Input State: External Blocking2
50R[1].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
50R[1].Rvs Blo-I	Module Input State: Reverse Blocking
50R[1].AdaptSet1-I	Module Input State: Adaptive Parameter1
50R[1].AdaptSet2-I	Module Input State: Adaptive Parameter2
50R[1].AdaptSet3-I	Module Input State: Adaptive Parameter3
50R[1].AdaptSet4-I	Module Input State: Adaptive Parameter4
50R[2].Active	Signal: Active
50R[2].ExBlo	Signal: External Blocking
50R[2].Rvs Blo	Signal: Reverse Blocking
50R[2].Blo TripCmd	Signal: Trip Command blocked
50R[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
50R[2].Pickup	Signal: Pickup IX or IR
50R[2].Trip	Signal: Trip
50R[2].TripCmd	Signal: Trip Command
50R[2].DefaultSet	Signal: Default Parameter Set
50R[2].AdaptSet 1	Signal: Adaptive Parameter 1
50R[2].AdaptSet 2	Signal: Adaptive Parameter 2
50R[2].AdaptSet 3	Signal: Adaptive Parameter 3
50R[2].AdaptSet 4	Signal: Adaptive Parameter 4
50R[2].ExBlo1-I	Module Input State: External Blocking1
50R[2].ExBlo2-I	Module Input State: External Blocking2
50R[2].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command

<i>Name</i>	<i>Description</i>
50R[2].Rvs Blo-I	Module Input State: Reverse Blocking
50R[2].AdaptSet1-I	Module Input State: Adaptive Parameter1
50R[2].AdaptSet2-I	Module Input State: Adaptive Parameter2
50R[2].AdaptSet3-I	Module Input State: Adaptive Parameter3
50R[2].AdaptSet4-I	Module Input State: Adaptive Parameter4
51R[1].Active	Signal: Active
51R[1].ExBlo	Signal: External Blocking
51R[1].Rvs Blo	Signal: Reverse Blocking
51R[1].Blo TripCmd	Signal: Trip Command blocked
51R[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
51R[1].Pickup	Signal: Pickup IX or IR
51R[1].Trip	Signal: Trip
51R[1].TripCmd	Signal: Trip Command
51R[1].DefaultSet	Signal: Default Parameter Set
51R[1].AdaptSet 1	Signal: Adaptive Parameter 1
51R[1].AdaptSet 2	Signal: Adaptive Parameter 2
51R[1].AdaptSet 3	Signal: Adaptive Parameter 3
51R[1].AdaptSet 4	Signal: Adaptive Parameter 4
51R[1].ExBlo1-I	Module Input State: External Blocking1
51R[1].ExBlo2-I	Module Input State: External Blocking2
51R[1].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
51R[1].Rvs Blo-I	Module Input State: Reverse Blocking
51R[1].AdaptSet1-I	Module Input State: Adaptive Parameter1
51R[1].AdaptSet2-I	Module Input State: Adaptive Parameter2
51R[1].AdaptSet3-I	Module Input State: Adaptive Parameter3
51R[1].AdaptSet4-I	Module Input State: Adaptive Parameter4
51R[2].Active	Signal: Active
51R[2].ExBlo	Signal: External Blocking
51R[2].Rvs Blo	Signal: Reverse Blocking
51R[2].Blo TripCmd	Signal: Trip Command blocked
51R[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
51R[2].Pickup	Signal: Pickup IX or IR
51R[2].Trip	Signal: Trip
51R[2].TripCmd	Signal: Trip Command
51R[2].DefaultSet	Signal: Default Parameter Set
51R[2].AdaptSet 1	Signal: Adaptive Parameter 1
51R[2].AdaptSet 2	Signal: Adaptive Parameter 2

<i>Name</i>	<i>Description</i>
51R[2].AdaptSet 3	Signal: Adaptive Parameter 3
51R[2].AdaptSet 4	Signal: Adaptive Parameter 4
51R[2].ExBlo1-I	Module Input State: External Blocking1
51R[2].ExBlo2-I	Module Input State: External Blocking2
51R[2].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
51R[2].Rvs Blo-I	Module Input State: Reverse Blocking
51R[2].AdaptSet1-I	Module Input State: Adaptive Parameter1
51R[2].AdaptSet2-I	Module Input State: Adaptive Parameter2
51R[2].AdaptSet3-I	Module Input State: Adaptive Parameter3
51R[2].AdaptSet4-I	Module Input State: Adaptive Parameter4
49.Alarm Pickup	Signal: Alarm Pickup
49.Alarm Timeout	Signal: Alarm Timeout
49.RTD effective	RTD effective
49.Load above SF	Load above Service Factor
49.Active	Signal: Active
49.ExBlo	Signal: External Blocking
49.Blo TripCmd	Signal: Trip Command blocked
49.ExBlo TripCmd	Signal: External Blocking of the Trip Command
49.Pickup	Signal: Pickup
49.Trip	Signal: Trip
49.TripCmd	Signal: Trip Command
49.ExBlo1	Module Input State: External Blocking
49.ExBlo2	Module Input State: External Blocking
49.ExBlo TripCmd	Module Input State: External Blocking of the Trip Command
50J[1].Active	Signal: Active
50J[1].ExBlo	Signal: External Blocking
50J[1].Blo TripCmd	Signal: Trip Command blocked
50J[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
50J[1].Pickup	Signal: Pickup
50J[1].Trip	Signal: Trip
50J[1].TripCmd	Signal: Trip Command
50J[1].ExBlo1-I	Module Input State: External Blocking1
50J[1].ExBlo2-I	Module Input State: External Blocking2
50J[1].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
50J[2].Active	Signal: Active
50J[2].ExBlo	Signal: External Blocking
50J[2].Blo TripCmd	Signal: Trip Command blocked

<i>Name</i>	<i>Description</i>
50J[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
50J[2].Pickup	Signal: Pickup
50J[2].Trip	Signal: Trip
50J[2].TripCmd	Signal: Trip Command
50J[2].ExBlo1-I	Module Input State: External Blocking1
50J[2].ExBlo2-I	Module Input State: External Blocking2
50J[2].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
37[1].Active	Signal: Active
37[1].ExBlo	Signal: External Blocking
37[1].Blo TripCmd	Signal: Trip Command blocked
37[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
37[1].Pickup	Signal: Pickup
37[1].Trip	Signal: Trip
37[1].TripCmd	Signal: Trip Command
37[1].ExBlo1-I	Module Input State: External Blocking1
37[1].ExBlo2-I	Module Input State: External Blocking2
37[1].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
37[2].Active	Signal: Active
37[2].ExBlo	Signal: External Blocking
37[2].Blo TripCmd	Signal: Trip Command blocked
37[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
37[2].Pickup	Signal: Pickup
37[2].Trip	Signal: Trip
37[2].TripCmd	Signal: Trip Command
37[2].ExBlo1-I	Module Input State: External Blocking1
37[2].ExBlo2-I	Module Input State: External Blocking2
37[2].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
37[3].Active	Signal: Active
37[3].ExBlo	Signal: External Blocking
37[3].Blo TripCmd	Signal: Trip Command blocked
37[3].ExBlo TripCmd	Signal: External Blocking of the Trip Command
37[3].Pickup	Signal: Pickup
37[3].Trip	Signal: Trip
37[3].TripCmd	Signal: Trip Command
37[3].ExBlo1-I	Module Input State: External Blocking1
37[3].ExBlo2-I	Module Input State: External Blocking2
37[3].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command

<i>Name</i>	<i>Description</i>
MLS.Active	Signal: Active
MLS.ExBlo	Signal: External Blocking
MLS.Pickup	Signal: Pickup
MLS.Trip	Signal: Trip
MLS.ExBlo1-I	Module Input State: External Blocking1
MLS.ExBlo2-I	Module Input State: External Blocking2
46[1].Active	Signal: Active
46[1].ExBlo	Signal: External Blocking
46[1].Blo TripCmd	Signal: Trip Command blocked
46[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
46[1].Pickup	Signal: Pickup Negative Sequence
46[1].Trip	Signal: Trip
46[1].TripCmd	Signal: Trip Command
46[1].ExBlo1-I	Module Input State: External Blocking1
46[1].ExBlo2-I	Module Input State: External Blocking2
46[1].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
46[2].Active	Signal: Active
46[2].ExBlo	Signal: External Blocking
46[2].Blo TripCmd	Signal: Trip Command blocked
46[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
46[2].Pickup	Signal: Pickup Negative Sequence
46[2].Trip	Signal: Trip
46[2].TripCmd	Signal: Trip Command
46[2].ExBlo1-I	Module Input State: External Blocking1
46[2].ExBlo2-I	Module Input State: External Blocking2
46[2].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
ZI.Active	Signal: Active
ZI.ExBlo	Signal: External Blocking
ZI.Blo TripCmd	Signal: Trip Command blocked
ZI.ExBlo TripCmd	Signal: External Blocking of the Trip Command
ZI.Bkr Blo	Signal: Blocked by Breaker Failure
ZI.Phase Pickup	Signal: Zone Interlocking Phase Pickup
ZI.Phase Trip	Signal: Zone Interlocking Phase Trip
ZI.Ground Pickup	Signal: Zone Interlocking Ground Pickup
ZI.Ground Trip	Signal: Zone Interlocking Ground Trip
ZI.Pickup	Signal: Pickup Zone Interlocking
ZI.Trip	Signal: Zone Interlocking Trip

<i>Name</i>	<i>Description</i>
ZI.TripCmd	Signal: Zone Interlocking Trip Command
ZI.Phase OUT	Signal: Zone Interlocking Phase OUT
ZI.Ground OUT	Signal: Zone Interlocking Ground OUT
ZI.OUT	Signal: Zone Interlocking OUT
ZI.IN	Signal: Zone Interlocking IN
ZI.ExBlo1-I	Module Input State: External Blocking1
ZI.ExBlo2-I	Module Input State: External Blocking2
ZI.ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
ExP[1].Active	Signal: Active
ExP[1].ExBlo	Signal: External Blocking
ExP[1].Blo TripCmd	Signal: Trip Command blocked
ExP[1].ExBlo TripCmd	Signal: External Blocking of the Trip Command
ExP[1].Alarm	Signal: Alarm
ExP[1].Trip	Signal: Trip
ExP[1].TripCmd	Signal: Trip Command
ExP[1].ExBlo1-I	Module Input State: External Blocking1
ExP[1].ExBlo2-I	Module Input State: External Blocking2
ExP[1].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
ExP[1].Alarm-I	Module Input State: Alarm
ExP[1].Trip-I	Module Input State: Trip
ExP[2].Active	Signal: Active
ExP[2].ExBlo	Signal: External Blocking
ExP[2].Blo TripCmd	Signal: Trip Command blocked
ExP[2].ExBlo TripCmd	Signal: External Blocking of the Trip Command
ExP[2].Alarm	Signal: Alarm
ExP[2].Trip	Signal: Trip
ExP[2].TripCmd	Signal: Trip Command
ExP[2].ExBlo1-I	Module Input State: External Blocking1
ExP[2].ExBlo2-I	Module Input State: External Blocking2
ExP[2].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
ExP[2].Alarm-I	Module Input State: Alarm
ExP[2].Trip-I	Module Input State: Trip
ExP[3].Active	Signal: Active
ExP[3].ExBlo	Signal: External Blocking
ExP[3].Blo TripCmd	Signal: Trip Command blocked
ExP[3].ExBlo TripCmd	Signal: External Blocking of the Trip Command
ExP[3].Alarm	Signal: Alarm

<i>Name</i>	<i>Description</i>
ExP[3].Trip	Signal: Trip
ExP[3].TripCmd	Signal: Trip Command
ExP[3].ExBlo1-I	Module Input State: External Blocking1
ExP[3].ExBlo2-I	Module Input State: External Blocking2
ExP[3].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
ExP[3].Alarm-I	Module Input State: Alarm
ExP[3].Trip-I	Module Input State: Trip
ExP[4].Active	Signal: Active
ExP[4].ExBlo	Signal: External Blocking
ExP[4].Blo TripCmd	Signal: Trip Command blocked
ExP[4].ExBlo TripCmd	Signal: External Blocking of the Trip Command
ExP[4].Alarm	Signal: Alarm
ExP[4].Trip	Signal: Trip
ExP[4].TripCmd	Signal: Trip Command
ExP[4].ExBlo1-I	Module Input State: External Blocking1
ExP[4].ExBlo2-I	Module Input State: External Blocking2
ExP[4].ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
ExP[4].Alarm-I	Module Input State: Alarm
ExP[4].Trip-I	Module Input State: Trip
Ex87.Active	Signal: Active
Ex87.ExBlo	Signal: External Blocking
Ex87.Blo TripCmd	Signal: Trip Command blocked
Ex87.ExBlo TripCmd	Signal: External Blocking of the Trip Command
Ex87.Alarm	Signal: Alarm
Ex87.Trip	Signal: Trip
Ex87.TripCmd	Signal: Trip Command
Ex87.ExBlo1-I	Module Input State: External Blocking1
Ex87.ExBlo2-I	Module Input State: External Blocking2
Ex87.ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
Ex87.Alarm-I	Module Input State: Alarm
Ex87.Trip-I	Module Input State: Trip
Remote Trip.Active	Signal: Active
Remote Trip.ExBlo	Signal: External Blocking
Remote Trip.Blo TripCmd	Signal: Trip Command blocked
Remote Trip.ExBlo TripCmd	Signal: External Blocking of the Trip Command
Remote Trip.Alarm	Signal: Alarm

Name	Description
Remote Trip.Trip	Signal: Trip
Remote Trip.TripCmd	Signal: Trip Command
Remote Trip.ExBlo1-I	Module Input State: External Blocking1
Remote Trip.ExBlo2-I	Module Input State: External Blocking2
Remote Trip.ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
Remote Trip.Alarm-I	Module Input State: Alarm
Remote Trip.Trip-I	Module Input State: Trip
URTD.WD1 Superv	Signal: Supervision Channel WD1
URTD.WD2 Superv	Signal: Supervision Channel WD2
URTD.WD3 Superv	Signal: Supervision Channel WD3
URTD.WD4 Superv	Signal: Supervision Channel WD4
URTD.WD5 Superv	Signal: Supervision Channel WD5
URTD.WD6 Superv	Signal: Supervision Channel WD6
URTD.MB1 Superv	Signal: Supervision Channel MB1
URTD.MB2 Superv	Signal: Supervision Channel MB2
URTD.LB1 Superv	Signal: Supervision Channel LB1
URTD.LB2 Superv	Signal: Supervision Channel LB2
URTD.Aux1 Superv	Signal: Supervision Channel Aux1
URTD.Aux2 Superv	Signal: Supervision Channel Aux2
URTD.Superv	Signal: URTD Supervision Channel
URTD.active	Signal: URTD active
URTD.Outs forced	Signal: The State of at least one Relay Output has been set by force. That means that the state of at least one Relay is forced and hence does not show the state of the assigned signals.
RTD.Active	Signal: Active
RTD.ExBlo	Signal: External Blocking
RTD.Blo TripCmd	Signal: Trip Command blocked
RTD.ExBlo TripCmd	Signal: External Blocking of the Trip Command
RTD.Alarm	Alarm RTD Temperature Protection
RTD.Trip	Signal: Trip
RTD.TripCmd	Signal: Trip Command
RTD.WD 1 Trip	Winding 1 Signal: Trip
RTD.WD 1 Alarm	Winding 1 Alarm RTD Temperature Protection
RTD.WD 1 Timeout Alarm	Winding 1 Timeout Alarm
RTD.WD 1 Invalid	Winding 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.WD 2 Trip	Winding 2 Signal: Trip

<i>Name</i>	<i>Description</i>
RTD.WD 2 Alarm	Winding 2 Alarm RTD Temperature Protection
RTD.WD 2 Timeout Alarm	Winding 2 Timeout Alarm
RTD.WD 2 Invalid	Winding 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.WD 3 Trip	Winding 3 Signal: Trip
RTD.WD 3 Alarm	Winding 3 Alarm RTD Temperature Protection
RTD.WD 3 Timeout Alarm	Winding 3 Timeout Alarm
RTD.WD 3 Invalid	Winding 3 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.WD 4 Trip	Winding 4 Signal: Trip
RTD.WD 4 Alarm	Winding 4 Alarm RTD Temperature Protection
RTD.WD 4 Timeout Alarm	Winding 4 Timeout Alarm
RTD.WD 4 Invalid	Winding 4 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.WD 5 Trip	Winding 5 Signal: Trip
RTD.WD 5 Alarm	Winding 5 Alarm RTD Temperature Protection
RTD.WD 5 Timeout Alarm	Winding 5 Timeout Alarm
RTD.WD 5 Invalid	Winding 5 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.WD 6 Trip	Winding 6 Signal: Trip
RTD.WD 6 Alarm	Winding 6 Alarm RTD Temperature Protection
RTD.WD 6 Timeout Alarm	Winding 6 Timeout Alarm
RTD.WD 6 Invalid	Winding 6 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.MB 1 Trip	Motor Bearing 1 Signal: Trip
RTD.MB 1 Alarm	Motor Bearing 1 Alarm RTD Temperature Protection
RTD.MB 1 Timeout Alarm	Motor Bearing 1 Timeout Alarm
RTD.MB 1 Invalid	Motor Bearing 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.MB 2 Trip	Motor Bearing 2 Signal: Trip
RTD.MB 2 Alarm	Motor Bearing 2 Alarm RTD Temperature Protection
RTD.MB 2 Timeout Alarm	Motor Bearing 2 Timeout Alarm
RTD.MB 2 Invalid	Motor Bearing 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.LB 1 Trip	Load Bearing 1 Signal: Trip
RTD.LB 1 Alarm	Load Bearing 1 Alarm RTD Temperature Protection
RTD.LB 1 Timeout Alarm	Load Bearing 1 Timeout Alarm
RTD.LB 1 Invalid	Load Bearing 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.LB 2 Trip	Load Bearing 2 Signal: Trip

<i>Name</i>	<i>Description</i>
RTD.LB 2 Alarm	Load Bearing 2 Alarm RTD Temperature Protection
RTD.LB 2 Timeout Alarm	Load Bearing 2 Timeout Alarm
RTD.LB 2 Invalid	Load Bearing 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Aux1 Trip	Auxiliary 1 Signal: Trip
RTD.Aux1 Alarm	Auxiliary 1 Alarm RTD Temperature Protection
RTD.Aux1 Timeout Alarm	Auxiliary 1 Timeout Alarm
RTD.Aux1 Invalid	Auxiliary 1 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Aux2 Trip	Auxiliary 2 Signal: Trip
RTD.Aux2 Alarm	Auxiliary 2 Alarm RTD Temperature Protection
RTD.Aux2 Timeout Alarm	Auxiliary 2 Timeout Alarm
RTD.Aux2 Invalid	Auxiliary 2 Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Trip WD Group	Trip all Windings
RTD.Alarm WD Group	Alarm all Windings
RTD.TimeoutAlmWDGrp	Timeout Alarm all Windings
RTD.WD Group Invalid	Winding Group Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Trip MB Group	Trip all Motor Bearings
RTD.Alarm MB Group	Alarm all Motor Bearings
RTD.TimeoutAlmMBGrp	Timeout Alarm all Motor Bearings
RTD.MB Group Invalid	Motor Bearing Group Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Trip LB Group	Trip all Load Bearings
RTD.Alarm LB Group	Alarm all Load Bearings
RTD.TimeoutAlmLBGrp	Timeout Alarm all Load Bearings
RTD.LB Group Invalid	Load Bearing Group Signal: Invalid Temperature Measurement Value (e.g caused by an defective or interrupted RTD Measurement)
RTD.Trip Any Group	Trip Any Group
RTD.Alarm Any Group	Alarm Any Group
RTD.TimeoutAlmAnyGrp	Timeout Alarm Any Group
RTD.Voting Trip Grp 1	Voting Trip Group 1
RTD.Voting Trip Grp 2	Voting Trip Group 2
RTD.Timeout Alarm	Alarm timeout expired
RTD.Trip Aux Group	Trip Auxiliary Group
RTD.Alarm Aux Group	Alarm Auxiliary Group
RTD.TimeoutAlmAuxGrp	Timeout Alarm Auxiliary Group
RTD.AuxGrpInvalid	Invalid Auxiliary Group

<i>Name</i>	<i>Description</i>
RTD.ExBlo1-I	Module Input State: External Blocking1
RTD.ExBlo2-I	Module Input State: External Blocking2
RTD.ExBlo TripCmd-I	Module Input State: External Blocking of the Trip Command
BF.Active	Signal: Active
BF.ExBlo	Signal: External Blocking
BF.Waiting for Trigger	Waiting for Trigger
BF.Pickup	Signal: BF-Module Started (Pickup)
BF.Trip	Signal: Breaker Failure Trip
BF.Lockout	Signal: Lockout
BF.Res Lockout	Signal: Reset Lockout
BF.ExBlo1-I	Module Input State: External Blocking1
BF.ExBlo2-I	Module Input State: External Blocking2
BF.Trigger1-I	Module Input: Trigger that will start the BF
BF.Trigger2-I	Module Input: Trigger that will start the BF
BF.Trigger3-I	Module Input: Trigger that will start the BF
TCM.Active	Signal: Active
TCM.ExBlo	Signal: External Blocking
TCM.Pickup	Signal: Pickup Trip Circuit Supervision
TCM.Not Possible	Not possible because no state indicator assigned to the breaker.
TCM.CinBkr-52a-I	Module Input State: Feed-back signal of the Bkr (52a)
TCM.CinBkr-52b-I	Module Input State: Feed-back signal of the Bkr. (52b)
TCM.ExBlo1-I	Module Input State: External Blocking1
TCM.ExBlo2-I	Module Input State: External Blocking2
CTS.Active	Signal: Active
CTS.ExBlo	Signal: External Blocking
CTS.Pickup	Signal: Pickup Current Transformer Measuring Circuit Supervision
CTS.ExBlo1-I	Module Input State: External Blocking1
CTS.ExBlo2-I	Module Input State: External Blocking2
SysA.Active	Signal: Active
SysA.ExBlo	Signal: External Blocking
SysA.Alm Current Demd	Signal: Alarm Current demand value
SysA.Alarm I THD	Signal: Alarm Total Harmonic Distortion Current
SysA.Trip Current Demand	Signal: Trip Current demand value
SysA.Trip I THD	Signal: Trip Total Harmonic Distortion Current
SysA.ExBlo-I	Module Input State: External Blocking
Wired Inputs.Bkr Trouble-I	Breaker Trouble

Name	Description
Wired Inputs.MainCont-I	State of the module input: Main Contactor
Wired Inputs.StartCont-I	State of the module input: Starting Contactor
Wired Inputs.RunCont-I	State of the module input: Running Contactor (inc sequence)
Wired Inputs.Start-I	State of the module input: Start
Wired Inputs.Stop-I	State of the module input: Stop
Wired Inputs.ExtPer1-I	State of the module input: External Permissive1
Wired Inputs.ExtPer2-I	State of the module input: External Permissive2
Wired Inputs.ExtTrip1-I	State of the module input: External Trip1
Wired Inputs.ExtTrip-I2	State of the module input: External Trip2
Wired Inputs.Forward-I	State of the module input: Forward
Wired Inputs.Reverse-I	State of the module input: Reverse
Wired Inputs.GrpSetSelect-I	State of the module input: Group Setting Select
Wired Inputs.Jog Forward-I	State of the module input: JogFow
Wired Inputs.Jog reverse-I	State of the module input: JogRev
Wired Inputs.speed1-I	State of the module input: Speed1
Wired Inputs.Local-I	State of the module input: Local (Remote)
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input
RO-3AI X2.RO 1	Signal: Relay Output
RO-3AI X2.RO 2	Signal: Relay Output
RO-3AI X2.RO 3	Signal: Relay Output
RO-3AI X2.DISARMED!	Signal: CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: Zone Interlocking and Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance
RO-3AI X2.Outs forced	Signal: The State of at least one Relay Output has been set by force. That means that the state of at least one Relay is forced and hence does not show the state of the assigned signals.
RO-ZI X2.ZI OUT	Signal: Zone Interlocking OUT
RO-ZI X2.RO 1	Signal: Relay Output
RO-ZI X2.RO 2	Signal: Relay Output
RO-ZI X2.RO 3	Signal: Relay Output
RO-ZI X2.DISARMED!	Signal: CAUTION! RELAYS DISARMED in order to safely perform maintenance while eliminating the risk of taking an entire process off-line. (Note: Zone Interlocking and Supervision Contact cannot be disarmed). YOU MUST ENSURE that the relays are ARMED AGAIN after maintenance

Name	Description
RO-ZI X2.Outs forced	Signal: The State of at least one Relay Output has been set by force. That means that the state of at least one Relay is forced and hence does not show the state of the assigned signals.
AnOut[1].Force Mode	For commissioning purposes or for maintenance, Analog Outputs can be set by force. By means of this function the normal Analog Outputs can be overwritten (forced).
Event rec.Res all rec	Signal: All records deleted
Waveform rec.Recording	Signal: Recording
Waveform rec.Memory full	Signal: Memory Full
Waveform rec.Clear fail	Signal: Clear Failure in Memory
Waveform rec.Res all rec	Signal: All records deleted
Waveform rec.Res record	Signal: Delete Record
Waveform rec.Man. Trigger	Signal: Manual Trigger
Waveform rec.Start1-I	State of the module input:: Trigger event / start recording if:
Waveform rec.Start2-I	State of the module input:: Trigger event / start recording if:
Waveform rec.Start3-I	State of the module input:: Trigger event / start recording if:
Waveform rec.Start4-I	State of the module input:: Trigger event / start recording if:
Waveform rec.Start5-I	State of the module input:: Trigger event / start recording if:
Waveform rec.Start6-I	State of the module input:: Trigger event / start recording if:
Waveform rec.Start7-I	State of the module input:: Trigger event / start recording if:
Waveform rec.Start8-I	State of the module input:: Trigger event / start recording if:
Fault rec.Res record	Signal: Delete Record
Trend rec.Hand Reset	Hand Reset
Start rec.Storing	Signal: Data are saved
SSV.System Error	Signal: Device Failure
SSV.SelfSuperVision Contact	Signal: SelfSuperVision Contact
Comm.Comm connected	At least one Communication system is connected to the device.
Comm.Comm not connected	No Communication system is connected to the device.
DNP.busy	This message is set if the protocol is started. It will be reset if the protocol is shut down.
DNP.ready	The message will be set if the protocol is successfully started and ready for data exchange.
DNP.active	The communication with the Master (Scada) is active.
DNP.BinaryOutput0	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput1	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput2	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.

<i>Name</i>	<i>Description</i>
DNP.BinaryOutput3	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput4	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput5	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput6	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput7	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput8	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput9	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput10	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput11	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput12	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput13	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput14	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput15	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput16	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput17	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput18	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput19	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput20	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput21	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput22	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput23	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput24	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.

<i>Name</i>	<i>Description</i>
DNP.BinaryOutput25	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput26	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput27	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput28	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput29	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput30	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryOutput31	Virtual Digital Output (DNP). This corresponds to a virtual binary input of the protective device.
DNP.BinaryInput0-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput1-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput2-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput3-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput4-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput5-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput6-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput7-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput8-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput9-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput10-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput11-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput12-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput13-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput14-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.

<i>Name</i>	<i>Description</i>
DNP.BinaryInput15-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput16-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput17-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput18-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput19-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput20-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput21-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput22-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput23-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput24-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput25-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput26-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput27-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput28-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput29-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput30-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput31-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput32-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput33-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput34-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput35-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput36-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.

<i>Name</i>	<i>Description</i>
DNP.BinaryInput37-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput38-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput39-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput40-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput41-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput42-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput43-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput44-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput45-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput46-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput47-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput48-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput49-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput50-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput51-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput52-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput53-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput54-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput55-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput56-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput57-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput58-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.

<i>Name</i>	<i>Description</i>
DNP.BinaryInput59-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput60-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput61-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput62-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
DNP.BinaryInput63-I	Virtual Digital Input (DNP). This corresponds to a virtual binary output of the protective device.
Modbus.Transmission	Signal: Communication Active
Modbus.Comm Cmd 1	Communication Command
Modbus.Comm Cmd 2	Communication Command
Modbus.Comm Cmd 3	Communication Command
Modbus.Comm Cmd 4	Communication Command
Modbus.Comm Cmd 5	Communication Command
Modbus.Comm Cmd 6	Communication Command
Modbus.Comm Cmd 7	Communication Command
Modbus.Comm Cmd 8	Communication Command
Modbus.Comm Cmd 9	Communication Command
Modbus.Comm Cmd 10	Communication Command
Modbus.Comm Cmd 11	Communication Command
Modbus.Comm Cmd 12	Communication Command
Modbus.Comm Cmd 13	Communication Command
Modbus.Comm Cmd 14	Communication Command
Modbus.Comm Cmd 15	Communication Command
Modbus.Comm Cmd 16	Communication Command
Modbus.Config Bin Inp1-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp2-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp3-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp4-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp5-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp6-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp7-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp8-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp9-I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp10-I	State of the module input: Config Bin Inp

Name	Description
Modbus.Config Bin Inp11- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp12- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp13- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp14- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp15- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp16- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp17- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp18- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp19- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp20- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp21- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp22- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp23- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp24- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp25- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp26- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp27- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp28- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp29- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp30- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp31- I	State of the module input: Config Bin Inp
Modbus.Config Bin Inp32- I	State of the module input: Config Bin Inp

<i>Name</i>	<i>Description</i>
IEC61850.MMS Client connected	At least one MMS client is connected to the device
IEC61850.All Goose Subscriber active	All Goose subscriber in the device are working
IEC61850.VirtInp1	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp2	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp3	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp4	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp5	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp6	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp7	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp8	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp9	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp10	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp11	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp12	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp13	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp14	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp15	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp16	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp17	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp18	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp19	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp20	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp21	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp22	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp23	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp24	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp25	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp26	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp27	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp28	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp29	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp30	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp31	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.VirtInp32	Signal: Virtual Input (IEC61850 GGIO Ind)
IEC61850.Quality of GGIO In1	Self-Supervision of the GGIO Input

<i>Name</i>	<i>Description</i>
IEC61850.Quality of GGIO In2	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In3	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In4	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In5	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In6	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In7	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In8	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In9	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In10	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In11	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In12	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In13	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In14	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In15	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In16	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In17	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In18	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In19	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In20	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In21	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In22	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In23	Self-Supervision of the GGIO Input

<i>Name</i>	<i>Description</i>
IEC61850.Quality of GGIO In24	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In25	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In26	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In27	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In28	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In29	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In30	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In31	Self-Supervision of the GGIO Input
IEC61850.Quality of GGIO In32	Self-Supervision of the GGIO Input
IEC61850.SPCSO1	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO2	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO3	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO4	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO5	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO6	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO7	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO8	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO9	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO10	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO11	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO12	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO13	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).

<i>Name</i>	<i>Description</i>
IEC61850.SPCSO14	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO15	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO16	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO17	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO18	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO19	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO20	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO21	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO22	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO23	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO24	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO25	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO26	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO27	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO28	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO29	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO30	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO31	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.SPCSO32	Status bit that can be set by clients like e.g. the Master Communication System (Single Point Controllable Status Output).
IEC61850.VirtOut1-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut2-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut3-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut4-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut5-I	Module input state: Binary state of the Virtual Output (GGIO)

<i>Name</i>	<i>Description</i>
IEC61850.VirtOut6-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut7-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut8-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut9-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut10-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut11-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut12-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut13-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut14-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut15-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut16-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut17-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut18-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut19-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut20-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut21-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut22-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut23-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut24-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut25-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut26-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut27-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut28-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut29-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut30-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut31-I	Module input state: Binary state of the Virtual Output (GGIO)
IEC61850.VirtOut32-I	Module input state: Binary state of the Virtual Output (GGIO)
Profibus.Data OK	Data within the input field are OK (Yes=1)
Profibus.SubModul Err	Assignable Signal, Failure in Sub-Module, Communication Failure.
Profibus.Connection active	Connection active
Profibus.Comm Cmd 1	Communication Command
Profibus.Comm Cmd 2	Communication Command
Profibus.Comm Cmd 3	Communication Command
Profibus.Comm Cmd 4	Communication Command
Profibus.Comm Cmd 5	Communication Command
Profibus.Comm Cmd 6	Communication Command

<i>Name</i>	<i>Description</i>
Profibus.Comm Cmd 7	Communication Command
Profibus.Comm Cmd 8	Communication Command
Profibus.Comm Cmd 9	Communication Command
Profibus.Comm Cmd 10	Communication Command
Profibus.Comm Cmd 11	Communication Command
Profibus.Comm Cmd 12	Communication Command
Profibus.Comm Cmd 13	Communication Command
Profibus.Comm Cmd 14	Communication Command
Profibus.Comm Cmd 15	Communication Command
Profibus.Comm Cmd 16	Communication Command
IRIG-B.IRIG-B active	Signal: If there is no valid IRIG-B signal for 60 sec, IRIG-B is regarded as inactive.
IRIG-B.High-Low Invert	Signal: The High and Low signals of the IRIG-B are inverted. This does NOT mean that the wiring is faulty. If the wiring is faulty no IRIG-B signal will be detected.
IRIG-B.Control Signal1	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal2	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal3	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal4	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal5	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal6	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal7	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal8	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal9	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal10	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal11	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal12	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal13	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal14	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).

Name	Description
IRIG-B.Control Signal15	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal16	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal17	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
IRIG-B.Control Signal18	Signal: IRIG-B Control Signal. The external IRIG-B generator can set these signals. They can be used for further control procedures inside the device (e.g. logic funtions).
SNTP.SNTP active	Signal: If there is no valid SNTP signal for 120 sec, SNTP is regarded as inactive.
Statistics.ResFc all	Signal: Resetting of all Statistic values (Current Demand, Power Demand, Min, Max)
Statistics.ResFc I Demand	Signal: Resetting of Statistics - Current Demand (avg, peak avg)
Statistics.ResFc Max	Signal: Resetting of all Maximum values
Statistics.ResFc Min	Signal: Resetting of all Minimum values
Statistics.StartFc I Demand-I	State of the module input: Start of Statistics of the Current Demand (Update the displayed Demand)
Logic.LE1.Gate Out	Signal: Output of the logic gate
Logic.LE1.Timer Out	Signal: Timer Output
Logic.LE1.Out	Signal: Latched Output (Q)
Logic.LE1.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE1.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE1.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE1.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE1.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE1.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE2.Gate Out	Signal: Output of the logic gate
Logic.LE2.Timer Out	Signal: Timer Output
Logic.LE2.Out	Signal: Latched Output (Q)
Logic.LE2.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE2.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE2.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE2.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE2.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE2.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE3.Gate Out	Signal: Output of the logic gate
Logic.LE3.Timer Out	Signal: Timer Output
Logic.LE3.Out	Signal: Latched Output (Q)
Logic.LE3.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE3.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE3.Gate In2-I	State of the module input: Assignment of the Input Signal

<i>Name</i>	<i>Description</i>
Logic.LE3.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE3.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE3.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE4.Gate Out	Signal: Output of the logic gate
Logic.LE4.Timer Out	Signal: Timer Output
Logic.LE4.Out	Signal: Latched Output (Q)
Logic.LE4.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE4.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE4.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE4.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE4.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE4.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE5.Gate Out	Signal: Output of the logic gate
Logic.LE5.Timer Out	Signal: Timer Output
Logic.LE5.Out	Signal: Latched Output (Q)
Logic.LE5.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE5.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE5.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE5.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE5.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE5.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE6.Gate Out	Signal: Output of the logic gate
Logic.LE6.Timer Out	Signal: Timer Output
Logic.LE6.Out	Signal: Latched Output (Q)
Logic.LE6.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE6.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE6.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE6.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE6.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE6.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE7.Gate Out	Signal: Output of the logic gate
Logic.LE7.Timer Out	Signal: Timer Output
Logic.LE7.Out	Signal: Latched Output (Q)
Logic.LE7.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE7.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE7.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE7.Gate In3-I	State of the module input: Assignment of the Input Signal

<i>Name</i>	<i>Description</i>
Logic.LE7.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE7.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE8.Gate Out	Signal: Output of the logic gate
Logic.LE8.Timer Out	Signal: Timer Output
Logic.LE8.Out	Signal: Latched Output (Q)
Logic.LE8.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE8.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE8.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE8.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE8.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE8.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE9.Gate Out	Signal: Output of the logic gate
Logic.LE9.Timer Out	Signal: Timer Output
Logic.LE9.Out	Signal: Latched Output (Q)
Logic.LE9.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE9.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE9.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE9.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE9.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE9.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE10.Gate Out	Signal: Output of the logic gate
Logic.LE10.Timer Out	Signal: Timer Output
Logic.LE10.Out	Signal: Latched Output (Q)
Logic.LE10.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE10.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE10.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE10.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE10.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE10.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE11.Gate Out	Signal: Output of the logic gate
Logic.LE11.Timer Out	Signal: Timer Output
Logic.LE11.Out	Signal: Latched Output (Q)
Logic.LE11.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE11.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE11.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE11.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE11.Gate In4-I	State of the module input: Assignment of the Input Signal

<i>Name</i>	<i>Description</i>
Logic.LE11.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE12.Gate Out	Signal: Output of the logic gate
Logic.LE12.Timer Out	Signal: Timer Output
Logic.LE12.Out	Signal: Latched Output (Q)
Logic.LE12.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE12.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE12.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE12.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE12.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE12.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE13.Gate Out	Signal: Output of the logic gate
Logic.LE13.Timer Out	Signal: Timer Output
Logic.LE13.Out	Signal: Latched Output (Q)
Logic.LE13.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE13.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE13.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE13.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE13.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE13.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE14.Gate Out	Signal: Output of the logic gate
Logic.LE14.Timer Out	Signal: Timer Output
Logic.LE14.Out	Signal: Latched Output (Q)
Logic.LE14.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE14.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE14.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE14.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE14.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE14.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE15.Gate Out	Signal: Output of the logic gate
Logic.LE15.Timer Out	Signal: Timer Output
Logic.LE15.Out	Signal: Latched Output (Q)
Logic.LE15.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE15.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE15.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE15.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE15.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE15.Reset Latch-I	State of the module input: Reset Signal for the Latching

<i>Name</i>	<i>Description</i>
Logic.LE16.Gate Out	Signal: Output of the logic gate
Logic.LE16.Timer Out	Signal: Timer Output
Logic.LE16.Out	Signal: Latched Output (Q)
Logic.LE16.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE16.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE16.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE16.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE16.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE16.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE17.Gate Out	Signal: Output of the logic gate
Logic.LE17.Timer Out	Signal: Timer Output
Logic.LE17.Out	Signal: Latched Output (Q)
Logic.LE17.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE17.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE17.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE17.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE17.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE17.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE18.Gate Out	Signal: Output of the logic gate
Logic.LE18.Timer Out	Signal: Timer Output
Logic.LE18.Out	Signal: Latched Output (Q)
Logic.LE18.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE18.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE18.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE18.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE18.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE18.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE19.Gate Out	Signal: Output of the logic gate
Logic.LE19.Timer Out	Signal: Timer Output
Logic.LE19.Out	Signal: Latched Output (Q)
Logic.LE19.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE19.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE19.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE19.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE19.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE19.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE20.Gate Out	Signal: Output of the logic gate

<i>Name</i>	<i>Description</i>
Logic.LE20.Timer Out	Signal: Timer Output
Logic.LE20.Out	Signal: Latched Output (Q)
Logic.LE20.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE20.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE20.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE20.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE20.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE20.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE21.Gate Out	Signal: Output of the logic gate
Logic.LE21.Timer Out	Signal: Timer Output
Logic.LE21.Out	Signal: Latched Output (Q)
Logic.LE21.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE21.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE21.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE21.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE21.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE21.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE22.Gate Out	Signal: Output of the logic gate
Logic.LE22.Timer Out	Signal: Timer Output
Logic.LE22.Out	Signal: Latched Output (Q)
Logic.LE22.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE22.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE22.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE22.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE22.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE22.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE23.Gate Out	Signal: Output of the logic gate
Logic.LE23.Timer Out	Signal: Timer Output
Logic.LE23.Out	Signal: Latched Output (Q)
Logic.LE23.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE23.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE23.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE23.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE23.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE23.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE24.Gate Out	Signal: Output of the logic gate
Logic.LE24.Timer Out	Signal: Timer Output

<i>Name</i>	<i>Description</i>
Logic.LE24.Out	Signal: Latched Output (Q)
Logic.LE24.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE24.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE24.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE24.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE24.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE24.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE25.Gate Out	Signal: Output of the logic gate
Logic.LE25.Timer Out	Signal: Timer Output
Logic.LE25.Out	Signal: Latched Output (Q)
Logic.LE25.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE25.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE25.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE25.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE25.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE25.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE26.Gate Out	Signal: Output of the logic gate
Logic.LE26.Timer Out	Signal: Timer Output
Logic.LE26.Out	Signal: Latched Output (Q)
Logic.LE26.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE26.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE26.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE26.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE26.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE26.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE27.Gate Out	Signal: Output of the logic gate
Logic.LE27.Timer Out	Signal: Timer Output
Logic.LE27.Out	Signal: Latched Output (Q)
Logic.LE27.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE27.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE27.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE27.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE27.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE27.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE28.Gate Out	Signal: Output of the logic gate
Logic.LE28.Timer Out	Signal: Timer Output
Logic.LE28.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logic.LE28.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE28.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE28.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE28.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE28.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE28.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE29.Gate Out	Signal: Output of the logic gate
Logic.LE29.Timer Out	Signal: Timer Output
Logic.LE29.Out	Signal: Latched Output (Q)
Logic.LE29.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE29.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE29.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE29.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE29.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE29.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE30.Gate Out	Signal: Output of the logic gate
Logic.LE30.Timer Out	Signal: Timer Output
Logic.LE30.Out	Signal: Latched Output (Q)
Logic.LE30.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE30.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE30.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE30.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE30.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE30.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE31.Gate Out	Signal: Output of the logic gate
Logic.LE31.Timer Out	Signal: Timer Output
Logic.LE31.Out	Signal: Latched Output (Q)
Logic.LE31.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE31.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE31.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE31.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE31.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE31.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE32.Gate Out	Signal: Output of the logic gate
Logic.LE32.Timer Out	Signal: Timer Output
Logic.LE32.Out	Signal: Latched Output (Q)
Logic.LE32.Out inverted	Signal: Negated Latched Output (Q NOT)

<i>Name</i>	<i>Description</i>
Logic.LE32.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE32.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE32.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE32.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE32.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE33.Gate Out	Signal: Output of the logic gate
Logic.LE33.Timer Out	Signal: Timer Output
Logic.LE33.Out	Signal: Latched Output (Q)
Logic.LE33.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE33.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE33.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE33.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE33.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE33.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE34.Gate Out	Signal: Output of the logic gate
Logic.LE34.Timer Out	Signal: Timer Output
Logic.LE34.Out	Signal: Latched Output (Q)
Logic.LE34.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE34.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE34.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE34.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE34.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE34.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE35.Gate Out	Signal: Output of the logic gate
Logic.LE35.Timer Out	Signal: Timer Output
Logic.LE35.Out	Signal: Latched Output (Q)
Logic.LE35.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE35.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE35.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE35.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE35.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE35.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE36.Gate Out	Signal: Output of the logic gate
Logic.LE36.Timer Out	Signal: Timer Output
Logic.LE36.Out	Signal: Latched Output (Q)
Logic.LE36.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE36.Gate In1-I	State of the module input: Assignment of the Input Signal

<i>Name</i>	<i>Description</i>
Logic.LE36.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE36.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE36.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE36.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE37.Gate Out	Signal: Output of the logic gate
Logic.LE37.Timer Out	Signal: Timer Output
Logic.LE37.Out	Signal: Latched Output (Q)
Logic.LE37.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE37.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE37.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE37.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE37.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE37.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE38.Gate Out	Signal: Output of the logic gate
Logic.LE38.Timer Out	Signal: Timer Output
Logic.LE38.Out	Signal: Latched Output (Q)
Logic.LE38.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE38.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE38.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE38.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE38.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE38.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE39.Gate Out	Signal: Output of the logic gate
Logic.LE39.Timer Out	Signal: Timer Output
Logic.LE39.Out	Signal: Latched Output (Q)
Logic.LE39.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE39.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE39.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE39.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE39.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE39.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE40.Gate Out	Signal: Output of the logic gate
Logic.LE40.Timer Out	Signal: Timer Output
Logic.LE40.Out	Signal: Latched Output (Q)
Logic.LE40.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE40.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE40.Gate In2-I	State of the module input: Assignment of the Input Signal

<i>Name</i>	<i>Description</i>
Logic.LE40.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE40.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE40.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE41.Gate Out	Signal: Output of the logic gate
Logic.LE41.Timer Out	Signal: Timer Output
Logic.LE41.Out	Signal: Latched Output (Q)
Logic.LE41.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE41.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE41.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE41.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE41.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE41.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE42.Gate Out	Signal: Output of the logic gate
Logic.LE42.Timer Out	Signal: Timer Output
Logic.LE42.Out	Signal: Latched Output (Q)
Logic.LE42.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE42.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE42.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE42.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE42.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE42.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE43.Gate Out	Signal: Output of the logic gate
Logic.LE43.Timer Out	Signal: Timer Output
Logic.LE43.Out	Signal: Latched Output (Q)
Logic.LE43.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE43.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE43.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE43.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE43.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE43.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE44.Gate Out	Signal: Output of the logic gate
Logic.LE44.Timer Out	Signal: Timer Output
Logic.LE44.Out	Signal: Latched Output (Q)
Logic.LE44.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE44.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE44.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE44.Gate In3-I	State of the module input: Assignment of the Input Signal

<i>Name</i>	<i>Description</i>
Logic.LE44.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE44.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE45.Gate Out	Signal: Output of the logic gate
Logic.LE45.Timer Out	Signal: Timer Output
Logic.LE45.Out	Signal: Latched Output (Q)
Logic.LE45.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE45.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE45.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE45.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE45.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE45.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE46.Gate Out	Signal: Output of the logic gate
Logic.LE46.Timer Out	Signal: Timer Output
Logic.LE46.Out	Signal: Latched Output (Q)
Logic.LE46.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE46.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE46.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE46.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE46.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE46.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE47.Gate Out	Signal: Output of the logic gate
Logic.LE47.Timer Out	Signal: Timer Output
Logic.LE47.Out	Signal: Latched Output (Q)
Logic.LE47.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE47.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE47.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE47.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE47.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE47.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE48.Gate Out	Signal: Output of the logic gate
Logic.LE48.Timer Out	Signal: Timer Output
Logic.LE48.Out	Signal: Latched Output (Q)
Logic.LE48.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE48.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE48.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE48.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE48.Gate In4-I	State of the module input: Assignment of the Input Signal

<i>Name</i>	<i>Description</i>
Logic.LE48.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE49.Gate Out	Signal: Output of the logic gate
Logic.LE49.Timer Out	Signal: Timer Output
Logic.LE49.Out	Signal: Latched Output (Q)
Logic.LE49.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE49.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE49.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE49.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE49.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE49.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE50.Gate Out	Signal: Output of the logic gate
Logic.LE50.Timer Out	Signal: Timer Output
Logic.LE50.Out	Signal: Latched Output (Q)
Logic.LE50.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE50.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE50.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE50.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE50.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE50.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE51.Gate Out	Signal: Output of the logic gate
Logic.LE51.Timer Out	Signal: Timer Output
Logic.LE51.Out	Signal: Latched Output (Q)
Logic.LE51.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE51.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE51.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE51.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE51.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE51.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE52.Gate Out	Signal: Output of the logic gate
Logic.LE52.Timer Out	Signal: Timer Output
Logic.LE52.Out	Signal: Latched Output (Q)
Logic.LE52.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE52.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE52.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE52.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE52.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE52.Reset Latch-I	State of the module input: Reset Signal for the Latching

<i>Name</i>	<i>Description</i>
Logic.LE53.Gate Out	Signal: Output of the logic gate
Logic.LE53.Timer Out	Signal: Timer Output
Logic.LE53.Out	Signal: Latched Output (Q)
Logic.LE53.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE53.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE53.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE53.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE53.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE53.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE54.Gate Out	Signal: Output of the logic gate
Logic.LE54.Timer Out	Signal: Timer Output
Logic.LE54.Out	Signal: Latched Output (Q)
Logic.LE54.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE54.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE54.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE54.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE54.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE54.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE55.Gate Out	Signal: Output of the logic gate
Logic.LE55.Timer Out	Signal: Timer Output
Logic.LE55.Out	Signal: Latched Output (Q)
Logic.LE55.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE55.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE55.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE55.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE55.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE55.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE56.Gate Out	Signal: Output of the logic gate
Logic.LE56.Timer Out	Signal: Timer Output
Logic.LE56.Out	Signal: Latched Output (Q)
Logic.LE56.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE56.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE56.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE56.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE56.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE56.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE57.Gate Out	Signal: Output of the logic gate

<i>Name</i>	<i>Description</i>
Logic.LE57.Timer Out	Signal: Timer Output
Logic.LE57.Out	Signal: Latched Output (Q)
Logic.LE57.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE57.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE57.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE57.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE57.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE57.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE58.Gate Out	Signal: Output of the logic gate
Logic.LE58.Timer Out	Signal: Timer Output
Logic.LE58.Out	Signal: Latched Output (Q)
Logic.LE58.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE58.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE58.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE58.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE58.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE58.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE59.Gate Out	Signal: Output of the logic gate
Logic.LE59.Timer Out	Signal: Timer Output
Logic.LE59.Out	Signal: Latched Output (Q)
Logic.LE59.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE59.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE59.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE59.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE59.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE59.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE60.Gate Out	Signal: Output of the logic gate
Logic.LE60.Timer Out	Signal: Timer Output
Logic.LE60.Out	Signal: Latched Output (Q)
Logic.LE60.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE60.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE60.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE60.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE60.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE60.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE61.Gate Out	Signal: Output of the logic gate
Logic.LE61.Timer Out	Signal: Timer Output

<i>Name</i>	<i>Description</i>
Logic.LE61.Out	Signal: Latched Output (Q)
Logic.LE61.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE61.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE61.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE61.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE61.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE61.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE62.Gate Out	Signal: Output of the logic gate
Logic.LE62.Timer Out	Signal: Timer Output
Logic.LE62.Out	Signal: Latched Output (Q)
Logic.LE62.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE62.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE62.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE62.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE62.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE62.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE63.Gate Out	Signal: Output of the logic gate
Logic.LE63.Timer Out	Signal: Timer Output
Logic.LE63.Out	Signal: Latched Output (Q)
Logic.LE63.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE63.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE63.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE63.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE63.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE63.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE64.Gate Out	Signal: Output of the logic gate
Logic.LE64.Timer Out	Signal: Timer Output
Logic.LE64.Out	Signal: Latched Output (Q)
Logic.LE64.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE64.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE64.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE64.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE64.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE64.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE65.Gate Out	Signal: Output of the logic gate
Logic.LE65.Timer Out	Signal: Timer Output
Logic.LE65.Out	Signal: Latched Output (Q)

<i>Name</i>	<i>Description</i>
Logic.LE65.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE65.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE65.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE65.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE65.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE65.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE66.Gate Out	Signal: Output of the logic gate
Logic.LE66.Timer Out	Signal: Timer Output
Logic.LE66.Out	Signal: Latched Output (Q)
Logic.LE66.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE66.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE66.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE66.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE66.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE66.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE67.Gate Out	Signal: Output of the logic gate
Logic.LE67.Timer Out	Signal: Timer Output
Logic.LE67.Out	Signal: Latched Output (Q)
Logic.LE67.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE67.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE67.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE67.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE67.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE67.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE68.Gate Out	Signal: Output of the logic gate
Logic.LE68.Timer Out	Signal: Timer Output
Logic.LE68.Out	Signal: Latched Output (Q)
Logic.LE68.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE68.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE68.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE68.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE68.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE68.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE69.Gate Out	Signal: Output of the logic gate
Logic.LE69.Timer Out	Signal: Timer Output
Logic.LE69.Out	Signal: Latched Output (Q)
Logic.LE69.Out inverted	Signal: Negated Latched Output (Q NOT)

<i>Name</i>	<i>Description</i>
Logic.LE69.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE69.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE69.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE69.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE69.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE70.Gate Out	Signal: Output of the logic gate
Logic.LE70.Timer Out	Signal: Timer Output
Logic.LE70.Out	Signal: Latched Output (Q)
Logic.LE70.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE70.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE70.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE70.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE70.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE70.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE71.Gate Out	Signal: Output of the logic gate
Logic.LE71.Timer Out	Signal: Timer Output
Logic.LE71.Out	Signal: Latched Output (Q)
Logic.LE71.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE71.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE71.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE71.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE71.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE71.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE72.Gate Out	Signal: Output of the logic gate
Logic.LE72.Timer Out	Signal: Timer Output
Logic.LE72.Out	Signal: Latched Output (Q)
Logic.LE72.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE72.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE72.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE72.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE72.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE72.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE73.Gate Out	Signal: Output of the logic gate
Logic.LE73.Timer Out	Signal: Timer Output
Logic.LE73.Out	Signal: Latched Output (Q)
Logic.LE73.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE73.Gate In1-I	State of the module input: Assignment of the Input Signal

<i>Name</i>	<i>Description</i>
Logic.LE73.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE73.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE73.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE73.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE74.Gate Out	Signal: Output of the logic gate
Logic.LE74.Timer Out	Signal: Timer Output
Logic.LE74.Out	Signal: Latched Output (Q)
Logic.LE74.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE74.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE74.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE74.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE74.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE74.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE75.Gate Out	Signal: Output of the logic gate
Logic.LE75.Timer Out	Signal: Timer Output
Logic.LE75.Out	Signal: Latched Output (Q)
Logic.LE75.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE75.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE75.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE75.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE75.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE75.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE76.Gate Out	Signal: Output of the logic gate
Logic.LE76.Timer Out	Signal: Timer Output
Logic.LE76.Out	Signal: Latched Output (Q)
Logic.LE76.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE76.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE76.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE76.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE76.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE76.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE77.Gate Out	Signal: Output of the logic gate
Logic.LE77.Timer Out	Signal: Timer Output
Logic.LE77.Out	Signal: Latched Output (Q)
Logic.LE77.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE77.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE77.Gate In2-I	State of the module input: Assignment of the Input Signal

<i>Name</i>	<i>Description</i>
Logic.LE77.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE77.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE77.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE78.Gate Out	Signal: Output of the logic gate
Logic.LE78.Timer Out	Signal: Timer Output
Logic.LE78.Out	Signal: Latched Output (Q)
Logic.LE78.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE78.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE78.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE78.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE78.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE78.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE79.Gate Out	Signal: Output of the logic gate
Logic.LE79.Timer Out	Signal: Timer Output
Logic.LE79.Out	Signal: Latched Output (Q)
Logic.LE79.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE79.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE79.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE79.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE79.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE79.Reset Latch-I	State of the module input: Reset Signal for the Latching
Logic.LE80.Gate Out	Signal: Output of the logic gate
Logic.LE80.Timer Out	Signal: Timer Output
Logic.LE80.Out	Signal: Latched Output (Q)
Logic.LE80.Out inverted	Signal: Negated Latched Output (Q NOT)
Logic.LE80.Gate In1-I	State of the module input: Assignment of the Input Signal
Logic.LE80.Gate In2-I	State of the module input: Assignment of the Input Signal
Logic.LE80.Gate In3-I	State of the module input: Assignment of the Input Signal
Logic.LE80.Gate In4-I	State of the module input: Assignment of the Input Signal
Logic.LE80.Reset Latch-I	State of the module input: Reset Signal for the Latching
Sgen.Running	Signal: Measuring value simulation is running
Sgen.Ex Start Simulation-I	State of the module input: External Start of Fault Simulation (Using the test parameters)
Sgen.ExBlo	Module Input State: External Blocking
Sgen.Ex ForcePost-I	State of the module input: Force Post state. Abort simulation.
Sys.PS 1	Signal: Parameter Set 1
Sys.PS 2	Signal: Parameter Set 2

Name	Description
Sys.PS 3	Signal: Parameter Set 3
Sys.PS 4	Signal: Parameter Set 4
Sys.PSS manual	Signal: Manual switch over of a Parameter Set
Sys.PSS via Comm	Signal: Parameter Set Switch via Scada. Write into this output byte the integer of the parameter set that should become active (e.g. 4 => Switch onto parameter set 4).
Sys.PSS via Inp fct	Signal: Parameter Set Switch via Input Function
Sys.Min. 1 param changed	Signal: At least one parameter has been changed
Sys.Program Mode Bypass	Signal: Short-period bypass of the Program Mode.
Sys.Maint Mode Active	Signal: Arc Flash Reduction Maintenance Active
Sys.Maint Mode Inactive	Signal: Arc Flash Reduction Maintenance Inactive
Sys.MaintMode Manually	Signal: Arc Flash Reduction Maintenance Manual Mode
Sys.Maint Mode Comm	Signal: Arc Flash Reduction Maintenance Comm Mode
Sys.Maint Mode DI	Signal: Arc Flash Reduction Maintenance Digital Input Mode
Sys.Ack LED	Signal: LEDs Acknowledgment
Sys.Ack RO	Signal: Acknowledgment of the Relay Outputs
Sys.Ack Comm	Signal: Acknowledge Communication
Sys.Ack TripCmd	Signal: Reset Trip Command
Sys.Ack LED-HMI	Signal: LEDs Acknowledgment :HMI
Sys.Ack RO-HMI	Signal: Acknowledgment of the Relay Outputs :HMI
Sys.Ack Comm-HMI	Signal: Acknowledge Communication :HMI
Sys.Ack TripCmd-HMI	Signal: Reset Trip Command :HMI
Sys.Ack LED-Comm	Signal: LEDs Acknowledgment :Communication
Sys.Ack RO-Comm	Signal: Acknowledgment of the Relay Outputs :Communication
Sys.Ack Counter-Comm	Signal: Reset of all Counters :Communication
Sys.Ack Comm-Comm	Signal: Acknowledge Communication :Communication
Sys.Ack TripCmd-Comm	Signal: Reset Trip Command :Communication
Sys.Ack LED-I	Module Input State: LEDs Acknowledgment by Digital Input.
Sys.Ack RO-I	Module Input State: Acknowledgment of the Relay Outputs.
Sys.Ack Comm-I	Module Input State: Acknowledge Communication via Digital Input. The replica that Communication has received from the device is to be reset.
Sys.PS1-I	State of the module input, respectively of the signal, that should activate this Parameter Setting Group.
Sys.PS2-I	State of the module input, respectively of the signal, that should activate this Parameter Setting Group.
Sys.PS3-I	State of the module input, respectively of the signal, that should activate this Parameter Setting Group.
Sys.PS4-I	State of the module input, respectively of the signal, that should activate this Parameter Setting Group.

<i>Name</i>	<i>Description</i>
Sys.Maint Mode-I	Module Input State: Arc Flash Reduction Maintenance Switch

List of the Digital Inputs

The following list comprises all Digital Inputs. This list is used in various Protective Elements (e.g. TCS...). The availability and the number of entries depends on the type of device.

<i>Name</i>	<i>Description</i>
-. -	No assignment
DI Slot X1.DI 1	Signal: Digital Input
DI Slot X1.DI 2	Signal: Digital Input
DI Slot X1.DI 3	Signal: Digital Input
DI Slot X1.DI 4	Signal: Digital Input

List of ANSI Codes

ANSI	Functions
14	Underspeed
21	Distance Protection
21P	Phase Distance Protection
24	Overexcitation Protection (Volts per Hertz)
25	Synchronizing or Synchronism-check via 4 th measuring channel of voltage measurement card
26	Temperature Protection
27	Undervoltage Protection
27(t)	Undervoltage (time dependent) Protection
27A	Undervoltage Protection (Auxiliar) via 4 th measuring channel of voltage measurement card
27M	Undervoltage (time dependent) Phase Protection (Main)
27N	Neutral Undervoltage via 4 th measuring channel of voltage measurement card
27TN	Third Harmonic Neutral Undervoltage via 4 th measuring channel of voltage measurement card
32	Directional Power Protection
32F	Forward Power Protection
32R	Reverse Power Protection
37	Undercurrent / Under Power
38	Temperature Protection (optional via Interface/external Box)
40	Loss of Excitation / Loss of Field
46	Unbalanced Current Protection
46G	Unbalanced Generator Current Protection
47	Unbalanced Voltage Protection
48	Incomplete Sequence (Start-up time Supervision)
49	Thermal Protection
49M	Thermal Motor Protection
49R	Thermal Rotor Protection
49S	Thermal Stator Protection
50BF	Breaker Failure
50	Overcurrent (instantaneous)
50J	Jam (locked Rotor)
50P	Phase Overcurrent (instantaneous)
50N	Neutral Overcurrent (instantaneous)
50Ns	Sensitive Neutral Overcurrent (instantaneous)
51	Overcurrent
51P	Phase Overcurrent
51N	Neutral Overcurrent
51Ns	Sensitive Neutral Overcurrent
51LR	Locked Rotor
51LRS	Locked Rotor Start (during start sequence)
51C	Voltage Controlled Overcurrent (via adaptive Parameters)
51Q	Negative Phase Sequence Overcurrent (multiple trip characteristics)
51V	Voltage Restrained Overcurrent
55	Power Factor Protection
56	Field Application Relay
59	Overvoltage Protection
59M	Phase Overvoltage Protection (Main)
59TN	Third Harmonic Neutral Overvoltage via 4 th measuring channel of voltage measurement card

ANSI	Functions
59A	Overvoltage Protection via 4th (Auxiliar) measuring channel of voltage measurement card
59N	Neutral Overvoltage Protection
60FL	Voltage Transformer Supervision
60L	Current Transformer Supervision
64R	Rotor Earth Fault Protection
64REF	Restricted Ground Fault Protection
66	Starts per h (Start Inhibit)
67	Directional Overcurrent
67N	Directional Neutral Overcurrent
67Ns	Sensitive Directional Neutral Overcurrent
68	Power Swing Blocking
74TC	Trip Circuit Supervision
78	Out of Step Tripping
78V	Vector Surge Protection
79	Auto Reclosure
81	Frequency Protection
81U	Underfrequency Protection
81O	Overfrequency Protection
81R	ROCOF (df/dt)
86	Lock Out
87	Differential Protection (Generator/Transformer/Busbar)
87GD	Ground Differential Protection
87M	Motor Differential Protection
87U	Unit Differential Protection (protected zone includes generator and step-up transformer)
87UP	Unit Phase Differential Protection (protected zone includes generator and step-up transformer)

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