SIEMENS

SIWAREX® FTC

| Device Manual | Status 05.2008 |

Warning and Safety Terms

This manual contains notices that are for your personal safety and to prevent damage to devices or surroundings. These notices are indicated by a warning triangle and are presented as follows depending on the degree of danger:

Danger
means, that death, severe injury or considerable material damage may **result**, if the respective safety measures are not taken.

Warning
Means that death, severe injury or serious material damage **can** result if the corresponding safety precautions are not followed carefully.

Caution
Means that material damage or minor injuries can result if the corresponding safety precautions are not followed carefully.

Caution
Means that material damage can result if the corresponding safety precautions are not followed carefully.

Attention
Refers to important information on the product, handling of a product or a corresponding segment of the documentation to which special attention should be given.

Qualified Personnel

Commissioning and operation of a device may only be performed by **qualified personnel**. Qualified personnel as indicated in the safety information in this manual are people that have the authorization to install, ground and label devices, systems and power circuits.
Intended Utilization

Warning
The device may only be utilized for the applications described in the catalog and the technical description and only in conjunction with external devices and components that are approved or recommended by Siemens.
Fault-free and safe operation of the product depend on proper transport, proper storage, assembly, installation, operation and maintenance.

Brand names / Trademarks

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SIWAREX FTC

Module for loss-in-weight scale, bulk flow measurement device and force measurement

Device Manual

Revision 05/2008

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1 Preface

1.1 Purpose of Manual

This manual contains all information required to set up and operate the SIWAREX FTC.

1.2 Basic Knowledge Required

To understand this manual, a general knowledge of SIMATIC automation technology is required. Weighing technology is also beneficial.

1.3 Scope of Manual

This manual applies to the SIWAREX FTC module:

Type	Name	Order number	From product revision (Version)	
			HW	**FW**
SIWAREX FTC	SIWAREX **Flexible Technology Continuous** Weighing	7MH4900-3AA01	**V1.0.0**	**V.3.1.4**

Table 1-1   Validity of this manual

Note

This manual contains the description of all modules that are valid at the time of publication.

We reserve the right to supply new modules or newer versions of modules with product information containing current information about the module.

PREFACE

The layout of this manual is based on activities that must be performed as part of configuration, commissioning, operation and service / maintenance.

Chapter	Description of Content
1 Preface	Notes on using this manual
2 Scope of Delivery	Description of the scope of delivery for SIWAREX FTC.
3 Preface	Overview of -Structure - Functionality - System integration of SIWAREX FTC.
4 Hardware Configuration and Assembly	Description - of individual hardware components - of structure and installation - of connections - of preparations for operation.
5 Weighing Functions and Parameters	Description of all weighing parameters and corresponding functions. The operating mode-specific parameters are indicated accordingly.
6 Commands	Description of commands that can be executed by SIWAREX FTC.
7 Messages and Diagnosis	Description of error messages with notes on problem solutions
8 Programming in SIMATIC STEP 7	Description of data exchange with the SIMATIC CPU. This chapter is only meant for users who wish to write their own application software.
9 Commissioning with a PC – SIWATOOL FTC_L	Description - Software installation - Software functions
10 Firmware-Update with SIWATOOL FTC_L	Description of software functions
11 Verifiable (calibrated)	Description of conditions for calibration as a non automatic scale

12 Accessories	Ordering information for optional components such as:
	   - Digital remote displays
	   - Micro Memory Card
	   - Exi-Interface

13 Technical Data	Technical Data
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Table 1-2   Overview of Chapter

1.4 Further Support

Do you still have questions concerning the use of the SIWAREX FTC?
Then please contact your Siemens representative in the office or business location that is responsible for your area or technical support for SIWAREX
Tel.: +49 (0)721 595 2811.

Updated information on SIWAREX weighing technology can be found on the Internet Site.

http://www.siemens.de/siwarex

2 Scope of Delivery

2.1 Scope of Delivery

A bus connector for the SIMATIC-bus, the conformity details from the manufacturer and a sheet of additional, current product information belong to the SIWAREX FTC scope of delivery.

Configuration packages are required for planning projects with the SIWAREX FTC and these can be ordered separately:

- the SIWAREX FTC project configuration package for SIMATIC S7 for loss-in-weight scales and flow meter

or

- the SIWAREX FTC project configuration package for SIAMTIC PCS7 (currently only available for belt scales)

The configuration package for SIMATIC S7 is made up of the following components:

- Commissioning program SIWATOOL FTC_L for Windows

- Set-up for installation of the module in the SIMATIC Manager hardware catalogue

- Device manuals in several languages

- SIWAREX FTC versions of "Getting started" for loss-in-weight scale and bulk flow measurement device.

Introductory application software SIWAREX FTC „Getting started" is very helpful during the first steps in programming. The current version can be obtained free-of-charge via the Internet (http://www.siemens.de/siwarex).

The configuration package for SIMATIC PCS7 is made up of the following components:

- Commissioning program SIWATOOL FTC_L for Windows

- Set-up for installation of the module in the SIMATIC Manager hardware catalogue

- Device manuals in several languages

- Set-up for PCS7 Library (only configuration package for PCS7 for belt scale)

The required or optional accessories are compiled in chapter *12 Accessories*.

3 Product Overview

3.1   General

SIWAREX FTC (**F**lexible **T**echnology **C**ontinuous Weighing) is a versatile and flexible weighing module.

The function module (FM) SIWAREX FTC is integrated in SIMATIC and uses all features of the modern automation system such as integrated communication, diagnostics system and project configuration tools to its advantage.

The scale functionality of the SIWAREX FTC utilizes the following modes of operation:

- NSW/Non automatic weighing instrument in accordance with OIML R-76

- Force measurement

- Belt scale

- Bulk flow measurement device

- Loss-in-weight scale.

The functionality of the individual modes of operation without belt scale is described in chapter 5. A separate manual is available for the "Belt scale" operating mode.

3.2   Advantages and Benefits

SIWAREX FTC is characterized by a few clear advantages:

o   Uniform structure and universal communication through the integration in the SIMATIC S7 and SIMATIC PCS7

o   Standardized configuration with SIMATC

o   Direct application in the SIMATIC automation system

o   Application in the decentralized system concept through connection to PROFIBUS-DP via ET 200M

o   Weight measurement or force measurement to resolutions of 16 million parts

o   Characteristic curve linearisation

o   High accuracy 3 x 6000d, legal-for-trade OIML R76 (0,5 μV pro e)

o   High sample rate of 10 ms

o   PID controller with extensive setting options (Loss-in-weight scale)

o   Integrated filter functions

o   Parameterizable function for inputs and outputs

o   Flexible adaptation to different requirements with SIMATIC

o   Simple parameter definition with the SIWATOOL FTC program through the RS 232 interface

o   Exchange of module possible without readjusting the scales

o   Scale progress logging – extensive optimization capabilities

o   Intrinsically safe load cell supply for Ex-Zone 1 (optional)

o   Application in Ex-Zone 2.

o   Extensive monitoring and diagnostics functions

3.3   Application Range

SIWAREX FTC is the optimal solution wherever weighing technology requires high speed and accuracy. Because of the high resolution (3 x 6000 d, legal-for-trade or 16 million parts internally), scales can be built to work accurately over broad areas. SIWAREX FTC can be used for creating container scales, platform scales, force measurement devices, belt scales, loss-in-weight scales and bulk flow measurement devices.

3.4   Structure

SIWAREX FTC is a function module (FM) of the SIMATIC S7-300 and can be read directly on the SIMATIC S7-300 or ET 200M bus. Installation / cabling efforts for the 80 mm wide module is simplified with the profile rail assembly (snap-in technology).

Connection with the load cells is done using 40-pin standard front terminal strips, the power supply is through a 2-pin plug and the serial interface is through a 9-pin D-type plug connector.

Operation of the SIWAREX FTC in SIMATIC guarantees complete integration of weighing technology in the automation system.

3.5   Function

The primary task of the SIWAREX FTC is highly accurate measurement of the current weight and exact determination of the material quantity.

There are different weighing or measurement procedures, for which the SIWAREX FTC can be optimally configured by defining parameters.

The following operating modes can be defined:

-   Non Automatic Weighing Instrument – in accordance with OIML R-76 – Non Automatic Weighing Instrument

-   Force measurement

-   Belt scale (separate manual)

-   Loss-in-weight scale

- Bulk flow measurement device

SIWAREX FTC monitors and controls a number of functions during the weighing procedures. The optimized system internal data exchange enables a direct evaluation of weighing signals and states in the PLC program.

The weighing procedure influence on the PLC enables a flexible adaptation to the system characteristics.

SIWAREX FTC is already adjusted in-house. Therefore, the scale can be adjusted to theoretical settings without using any adjustment weights and modules can be exchanged without readjusting the scale.

The SIWAREX FTC has two serial interfaces. The RS 485 interface is used for connecting digital remote displays (for operation as a non-automatic weighing instrument) or force compensation load cells WM, WMH from the Mettler Toledo company. A PC can be connected to the RS 232 interface for setting SIWAREX FTC parameters.

The SIWAREX FTC weigh module can also be used in explosion hazard areas (Zone 2). An optional Ex interface SIWAREX IS provides load cells with an intrinsically safe power supply for applications in zone 1.

3.6 System Integration in SIMATIC

SIWAREX FTC is completely integrated in the SIMATIC S7 and SIMATIC PCS7. The user is absolutely free to configure his automation solution including the weighing application as desired. The optimum solution can be created for small, medium and large systems by selectively combining the SIMATIC components. The configuration package and the SIWAREX FTC "Getting started" example applications can be used for developing customer-specific or industry-specific solutions quickly and efficiently. The following figure shows a typical setup for a medium sized system.

For project planning with SIMATIC PCS 7 (currently only for belt scales), the completed function block FB SIWA for the automation system and the graphic blocks for the operator station are used.
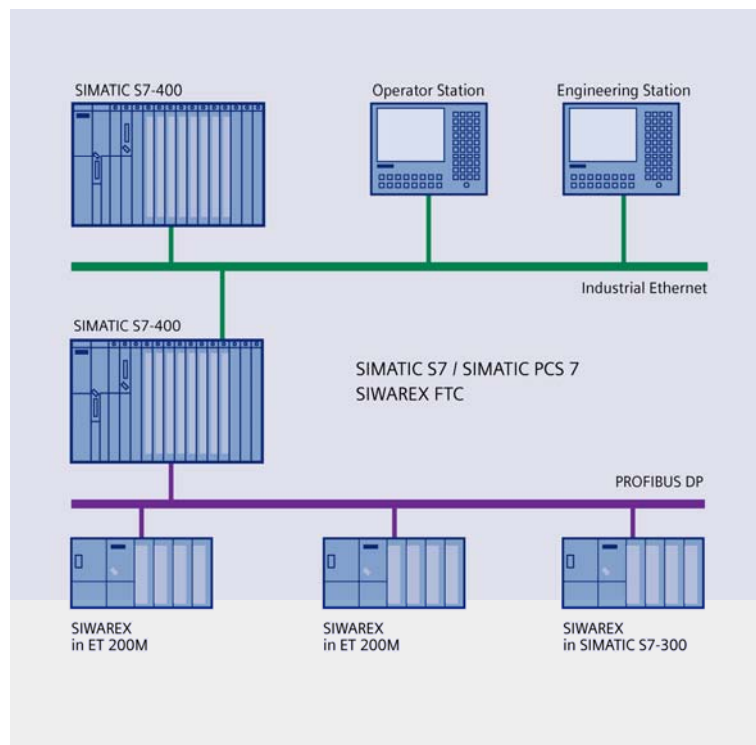
Figure 3-1   Configuration of SIMATIC S7/PCS7 with SIWAREX FTC

3.7   Commissioning and Service with SIWATOOL FTC_L

For commissioning and for service, there is a special program - SIWATOOL FTC_L for loss-in-weight scales or bulk flow measurement devices for Windows operating systems.

The program enables commissioning of the scale without having to understand automation technology. During a service procedures, you can analyze the processes in the scale and test them with the help of a PC. Reading the diagnostics buffer from the SIWAREX FTC is very helpful in analyzing events.

Besides complete access to all parameters, memory or print-outs of the weighing file, the program can create weighing curves as well.

SIWATOOL FTC_L can also be used for reading the contents of the records from the calibratable scale memory.

The following figure shows the structure of the individual program windows.
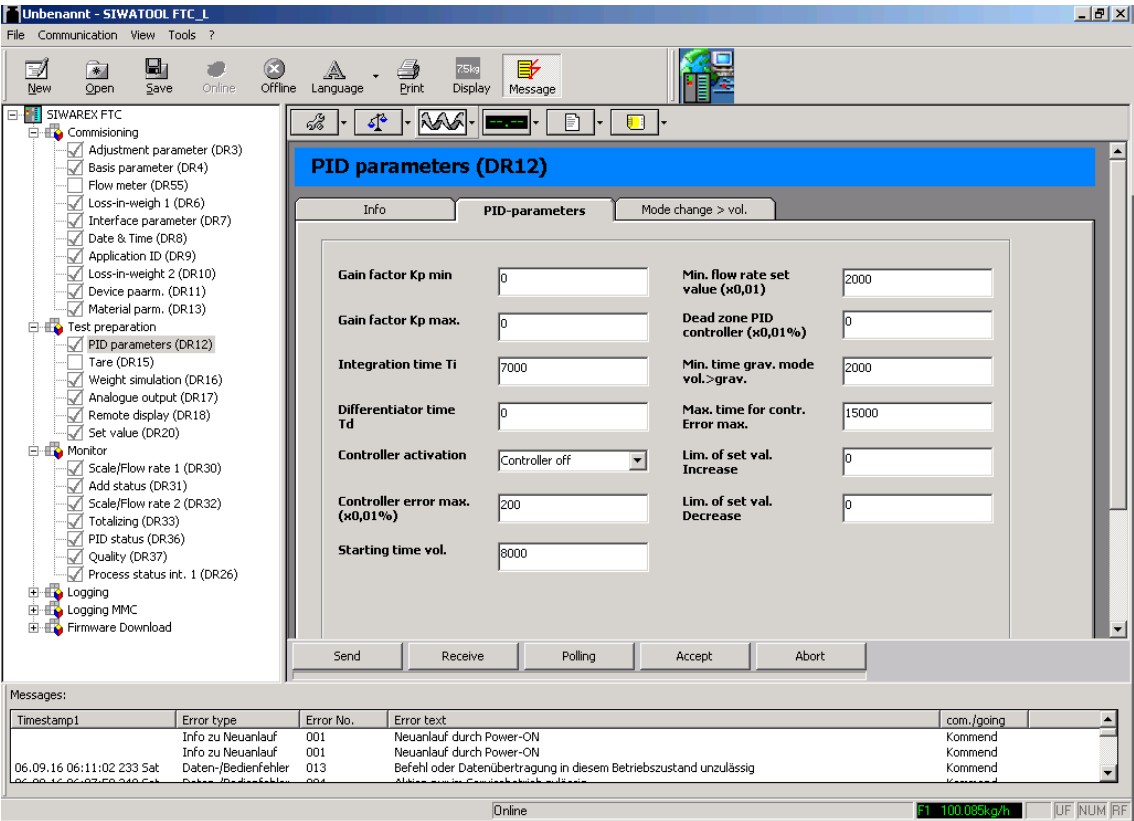
Figure 3-2   SIWATOOL FTC_L Overview

SIWATOOL FTC_L does not only support the user in entering parameters. It is very useful to analyze the diagnostic buffer, the contents of which can be saved along with the parameters after reading from the module.

A trace mode exists in the SIWAREX FTC module for optimizing weighing progress. The recorded data can be displayed in a curve diagram using MS Excel. These records can then be used to e.g. analyze and optimize the material flow for a shift.

3.8   Firmware Download with SIWATOOL FTC_L

Another feature of the SIWATOOL FTC_L program helps in loading a new version of firmware onto the SIWAREX FTC, on-site. It allows upgrades or function expansions for the firmware at any time and from anywhere.

3.9 Reading the Stored Weighing Logs with SIWATOOL FTC_L

The weighing logs are stored on an MMC (Micro Memory Card) that can be inserted into the SIWAREX FTC. If a person disagrees with the results of a certain weighing procedure, the weighing data for that weighing procedure can be reconstructed from the MMC memory.

4 Hardware Configuration and Assembly

⚠️

Warning Notes

This chapter contains information required for hardware planning, assembly and preparations for operation.

The technical safety information is to be strictly adhered to.

⚠️

Warning

Unqualified intervention in the device/system or not adhering to the warning notices can result in serious injury or damage to equipment. Only qualified personnel are permitted to access the operational components of this device / system.

⚠️

Warning

The unit has been developed, manufactured, tested and documented in accordance with the corresponding safety standards. The device itself will not cause any danger to equipment or personal health under normal circumstances.

⚠️

Danger

Commissioning is not permitted until it is guaranteed that the machine in which these components are to be integrated meets with the guidelines in 89/392/EWG.

4.1 Configuring the Hardware in SIMATIC

SIWAREX FTC is a function module (FM) in the SIMATIC S7 300 automation system. It can be installed in any position designated for function modules.

Utilization with the SIMATIC S7 300 is possible in central operation, in an expansion device or decentralized in the ET 200M system.

Operation with the SIMATIC S7 400 is only possible decentralized in the ET 200M system. In this case, the active back-plane bus can be used.

In estimating the maximum number of SIWAREX FTC's that can be integrated within one system, the following information may be helpful.

Total width	Current requirements (5V) from SIMATIC back-plane bus	RAM requirements in SIMATIC CPU
n x 80 mm	n x 50 mA	4100 Bytes + n x 1500 Bytes

Table 4-1   Requirements for n SIWAREX FTC modules

Max. amount in central operation – 8 SIWAREX FTC

Max. amount with multi-line expansion – 8 SIWAREX FTC per line

Max. amount in system ET 200M – 7 SIWAREX FTC per station

Selecting the suitable SIMATIC CPU, the SIMATIC HMI (Human Machine Interface) and the communication modules does not only depend on SIWAREX FTC requirements but also on the overall job that the automation system has to perform.

4.2 Structure to EMC Guidelines

SIWAREX FTC is a highly accurate measuring device that has to dependably measure the slightest signal. Proper assembly and wiring are therefore absolutely essential for fault-free operation.

4.2.1 Definition: EMC

EMC (Electromagnetic Compatibility) describes the ability of an electrical device to function without faults in a defined electromagnetic environment without being influenced by its surroundings and without negatively influencing the surroundings.

4.2.2 Introduction

Although SIWAREX FTC was developed for use in industrial environments and meets high EMC specifications, you should carry out EMC planning before installing your controller to determine and take into account any possible interference sources.

4.2.3   Possible Effects of Interference

Electromagnetic interference can influence the automation system and the SIWAREX FTC in various ways:

- Electromagnetic fields that have a direct influence on the system

- Interference that infiltrates the environment through bus signals (PROFIBUS DP etc.)

- Interference through process cabling (e.g. measurement lines)

- Interference infiltrating the system through the power supply and/or protective ground

Interference can impair the fault-free functioning of the SIWAREX CF.

4.2.4   Coupling Mechanisms

Depending on the means of distribution (conductive or non-conductive bound) and the distance between the interference source and the device, interference can be introduced into the automation system through four different coupling mechanisms.

Galvanic coupling

Capacitive coupling

Inductive coupling

Radiation coupling

4.2.5   Five Basic Rules for Guaranteeing EMC

If you follow these five basic rules, EMC can be guaranteed in most cases!

Rule 1: Large surface area grounding connection

Ensure that while installing the automation devices, a well-made large surface area ground connection is made between the inactive metal components (see following sections).

Connect all inactive metal components and low-impedance components with ground (broad cross-section).

Use screwed connections on painted or anodized metal surfaces either with special contact washers or remove the insulated protective surface at the contact points.

Do not use aluminum components for ground connections if at all possible. Aluminum oxidizes easily and is therefore less suitable for grounding connections.

Find a central location for connections between the grounding point and the ground wiring system.

Rule 2: Proper wiring

Separate the cabling into groups (high-voltage lines, power supply lines, signal lines, ground wiring, data lines etc.).

Run the high-voltage lines and ground wiring or data cables in separate channels or bundles.

Run measurement lines as close to grounding surfaces as possible (e.g. support beams, metal rails, cabinet panels).

Rule 3: Fixed cable shielding

Ensure that the cable shielding is connected properly.

Use shielded data lines only. The shielding must be fastened to ground using a large surface area on both ends.

The shielding of measurement lines must be fastened to ground on both ends.

Run cable shielding directly under the SIWAREX FTC on the shielding channeling. The shielding is to be run to the connection terminal.

The connection between the shielding rail / ground rail and the cabinet /housing must be low impedance.

Use metallic or metal-plated connector housings for the shielded data lines.

Rule 4: Special EMC measures

All inductivity that is to be controlled should be connected with suppressors.

Use interference suppressed fluorescent lighting or incandescent lamps for illuminating cabinets or housings in the immediate vicinity of your controller.

Rule 5: Uniform reference potential

Create a uniform reference potential and ground all electrical operational elements.

If potential differences arise or can be expected between components of your system, install adequately dimensioned potential equalizing lines. For applications in areas with a risk of explosion, potential equalization is mandatory.

4.3 Assembly on the Profile Rail

When assembling the SIMATIC components and the SIWAREX FTC, the assembly regulations must be completely fulfilled for the SIMATIC S7.

SIWAREX FTC is assembled in the following steps:

1. Check for whether the SIMATIC bus connector is connected to the left of the SIWAREX FTC in the module group.

2. Connect the SIMATIC bus connector for the following module group in the SIWAREX if necessary.

3. Install the shielding strip under SIWAREX.

4. Hang the SIWAREX FTC in its place.

5. Fasten the SIWAREX FTC with 2 screws in the lower area of the module.

6. Label the SIWAREX FTC corresponding with your identification system.

4.4   Connection and Wiring

4.4.1   Connection Areas for SIWAREX FTC

The following connection areas are found on the front:

-   Screw-in connector for 24 V power supply

-   40 pin connector for load cell connection, digital input and output, RS 485, analogue output, counter input

-   9 pin D-sub socket for RS 232 to PC or printer connection
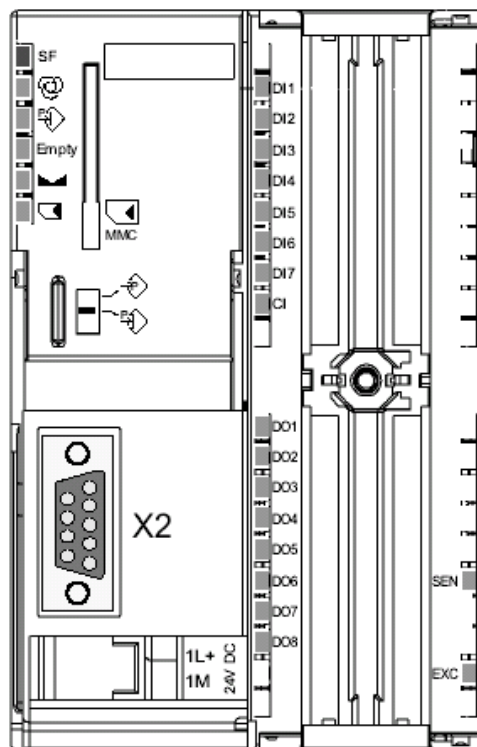
Figure 4-1   SIWAREX FTC front view

4.4.2 Shielding Connection

Special attention must be given to the shield strip for the shielded lines.
The interference resistance of the system can only be guaranteed if the properly constructed.

A cable is shielded to decrease the affects of magnetic, electrical and electromagnetic interference on this line. Interference on cable shielding is routed to ground through shielding rails that are conductively connected with the housing. To ensure that this interference does not become a source of interference, a low impedance connection to ground is especially important.

Use only lines with mesh-shielding. The shielding should provide at least 80% coverage.

For fastening the meshed shielding, use only metal cable clamps. The clamps must cover as much shielding as possible and ensure a good contact.

Shield clamps must be ordered separately from the grounding elements. The area covered by the shielding clamp is to be chosen corresponding with the cable diameter.

Approximately 1.5 cm of the cable insulation must be exposed in the area of the cable to be fastened to the shielding clamp. The exposed shielding is then pressed firmly against the grounding element with the shielding clamp.

The following figure shows the assembly of the shield clamps.
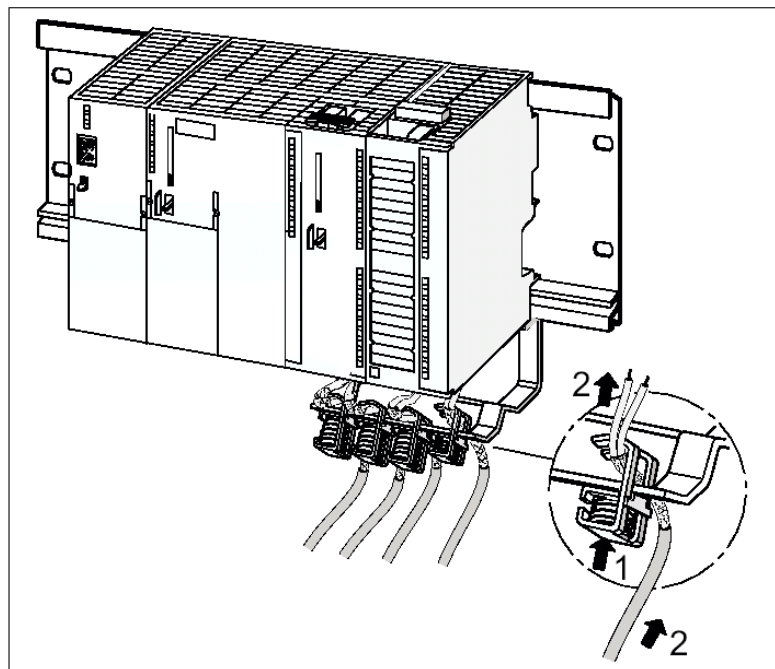
Figure 4-2   Shield clamp assembly

The shielding should be pressed against the shielding rail by the shielding clamp.

4.4.3 Connection of 24 V Power Supply

The 24 V supply voltage is connected with a screw connector. The connection is found in the lower area of the module groups next to the D-sub connector for RS 232.

Note

In the S7 300 or ET200M system, the SIMATIC CPU or IM 153 and SIWAREX FTC must be connected to the same 24 V supply.

Termination Clamp	Signal	Comment
1L+	24 V DC 1L+	Power supply +
1M	24 V DC 1M	Power supply M

Table 4-2   Power supply connection

4.4.4 Connections to Front Terminal

The SIMATIC construction guidelines apply for connecting the 40 pin connector.

Flexible cables with a cross-section of 0.25 to 1.5 mm^2 can be used. Remove the insulation from the cable for 6 mm and install wire end sleeves.

4.4.5 Load Cell Connection

Sensors equipped with strain gauges and that meet the following conditions can be connected to the SIWAREX FTC:

- Characteristic value 1.... 4 mV/V

- Supply voltage of 10.2 V is permitted

The connection is made to the 40 pin front connector. The connection should be made using the cable described in chapter *Accessories*.

Termination Clamp	Signal	Comment
X1.34	AGND	Analogue ground (is normally not connected, on where required, e.g. with additional load cell power requirement)
X1.35	SEN+	Sensor line +
X1.36	SEN-	Sensor line -

Termination Clamp	Signal	Comment
X1.37	SIG+	Measurement line +
X1.38	SIG-	Measurement line -
X1.39	EXC+	Load cell supply voltage +
X1.40	EXC-	Load cell supply voltage -

Table 4-3   Load cell connections

The following rules are to be followed when connecting load cells (WZ).

Using a junction box is required if more than one LC is connected (the LC must be connected parallel to one-another).

If the distance from the LC to the SIWAREX FTC is greater than the existing length of the LC connection cable, then the extension box EB is to be used.

2. The cable shielding is normally run on the cable guide supports of the junction box.

In case of the danger of potential equalization currents on the cable shielding, a potential equalization conductor is to be run parallel to the load cell cable or the shield clamp is to be used in the junction box to the shield strip. Using the potential equalization conductor is the preferred method of dealing with EMC (Electromagnetic Compatibility).

3. Twisted pair cable is required for the indicated wiring:

-   Sensor lines (+) and (-)

-   Measurement voltage lines (+) and (-)

-   Supply voltage lines (+) and (-)

4. The shielding is to be attached to the shielding strip on the SIWAREX FTC.

The two figures below show the load cell connection using 4-wire and 6-wire systems.
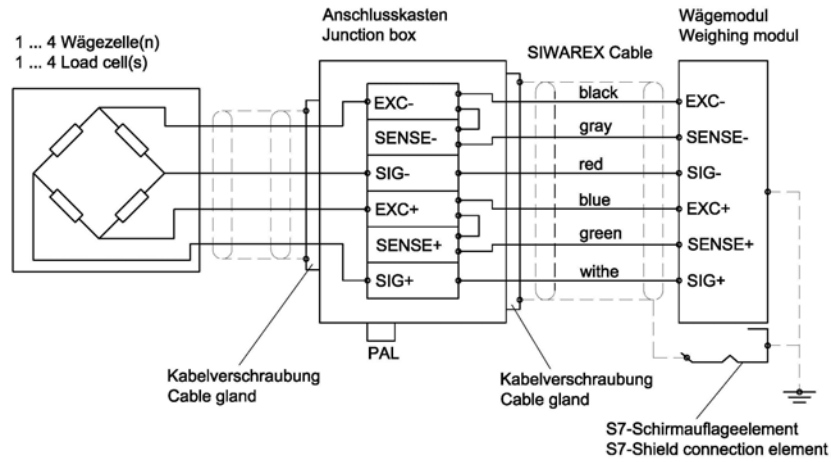
Figure 4-3   Load cell connection in 4-wire system
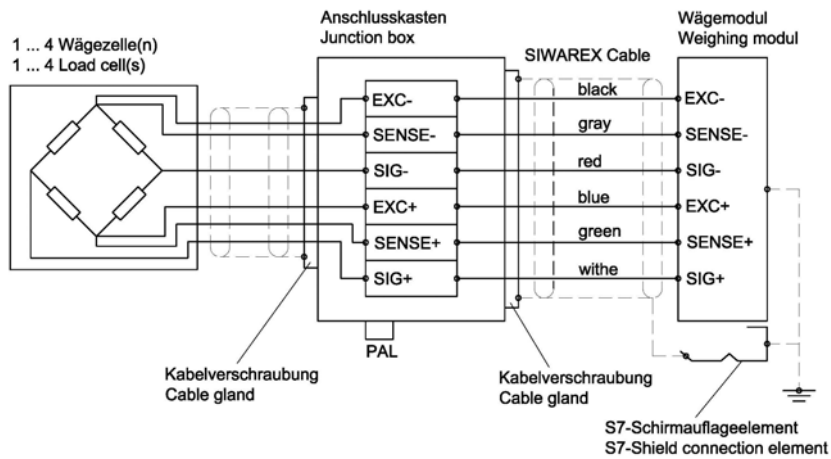
Figure 4-4   Load cell connection in 6-wire system

4.4.6   Digital Inputs

SIWAREX FTC has 7 digital inputs. These inputs are potentially isolated from the module group. They have a common reference point (M).

The functionality of each input can be defined with parameters.

DI status is indicated with and LED on the front of the SIWAREX FTC.

⚠ Warning

The inputs may only be activated if your functional allocation is known and the activation will not cause any harm.

Termination Clamp	Signal	Comment
X1.1	DI 1	Parameter definable function
X1.2	DI 2	Parameter definable function
X1.3	DI 3	Parameter definable function
X1.4	DI 4	Parameter definable function
X1.5	DI 5	Parameter definable function
1.6	DI 6	Parameter definable function
X1.7	DI 7	Parameter definable function
X1.8	2M	Reference ground for digital inputs

Table 4-4   Digital input connections
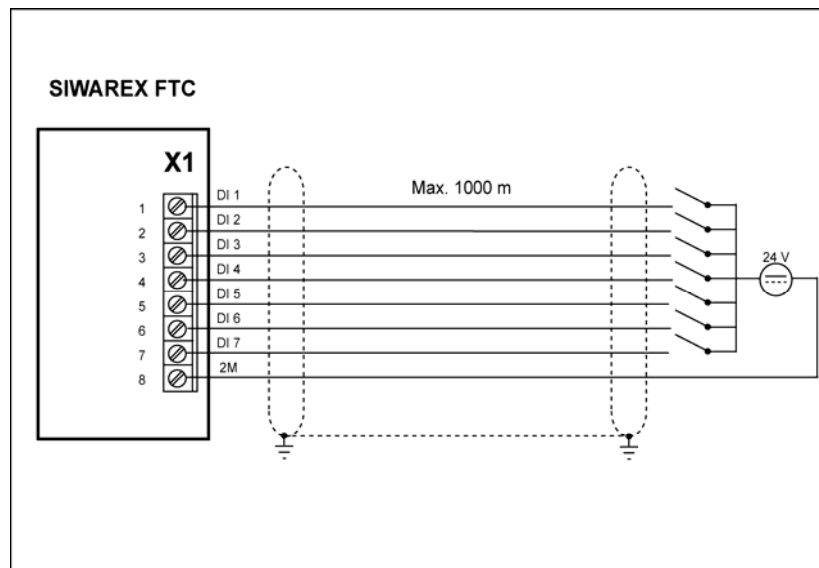
Figure 4-5   Digital inputs

4.4.7   Counter Input

The counter input serves for connecting a pulse encoder which is required when using a belt scale in continuous operation. Twisted pair wiring should be used for the connections.

Termination Clamp	Signal	Comment
X1.9	CI+	Counter input +
X1.10	CI-	Counter input -

Table 4-5   Pulse encoder connection
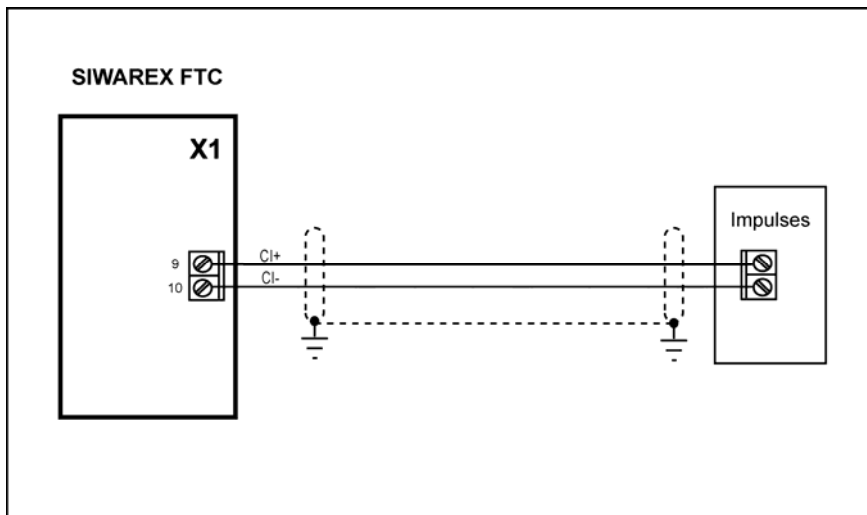
Figure 4-6   Counter input

4.4.8   Digital Outputs

The SIWAREX FTC has eight potential isolated outputs (DO) with a nominal voltage of + 24 V and an output current of maximum 0.5 A per output (max. total current 2 A).

These outputs are potentially isolated from the module group. The outputs share common potential. They have a common ground and a secure 24 V supply. They are short-circuit and overload protected.

DO status is indicated with and LED on the front of the SIWAREX FTC.

When connecting inductive consumers, the digital output that is used must be equipped with a free-wheeling diode.

!\ Warning

The outputs may only be activated if their functional allocation is known and the activation will not cause any harm.

Termination Clamp	Signal	Comment
X1.11	DO 1	Parameter definable function
X1.12	DO 2	Parameter definable function
X1.13	DO 3	Parameter definable function
X1.14	DO 4	Parameter definable function
X1.15	DO 5	Parameter definable function
X1.16	DO 6	Parameter definable function
X1.17	DO 7	Parameter definable function
X1.18	DO 8	Parameter definable function
X1.19	3L+	24 V for digital outputs
X1.20	3M	Ground for digital outputs

Table 4-6   Digital output connections
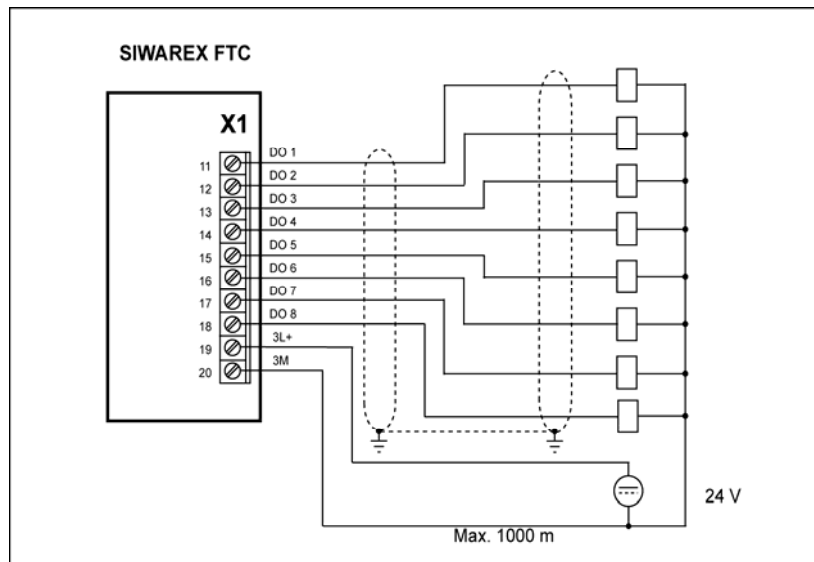
Figure 4-7   Digital outputs

4.4.9   Analog output

Termination Clamp	Signal	Comment
X1.29	IOUT+	Analogue output +
X1.30	IOUT-	Analogue output -

Table 4-7   Analog output connection
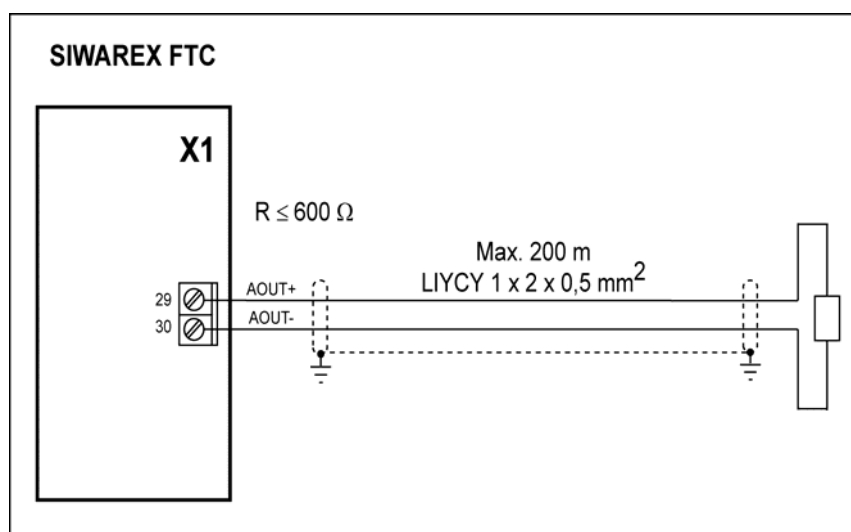
Figure 4-8   Analog output

4.4.10   Interface RS 485 for Mettler Toledo type WM or WMH

Digital sensors from the Mettler Toledo company of type WM or WMH can be connected to Siwarex. The following interface parameters (data record 3 and 7) are to be set:

(DR3) Device selection: Digital load cell Mettler Toledo

(DR7) Baudrate: 38400

(DR7) Character parity: even

(DR7) Data bits: 7

(DR7) Stop bits: 1

Termination Clamp	Signal	Comment
X1.21	485a	Input Ta
X1.22	485b	Input Tb
X1.23	485a	Output Ta
X1.24	485a	Output Tb
X1.25	RTa	Termination resistor RTa
X1.26	RTb	Termination resistor RTb
X1.11	DO 1	Send Start instruction (sir)
X1.12	DO 2	Send Stop instruction (si)

Table 4-8   RS 485 Connections
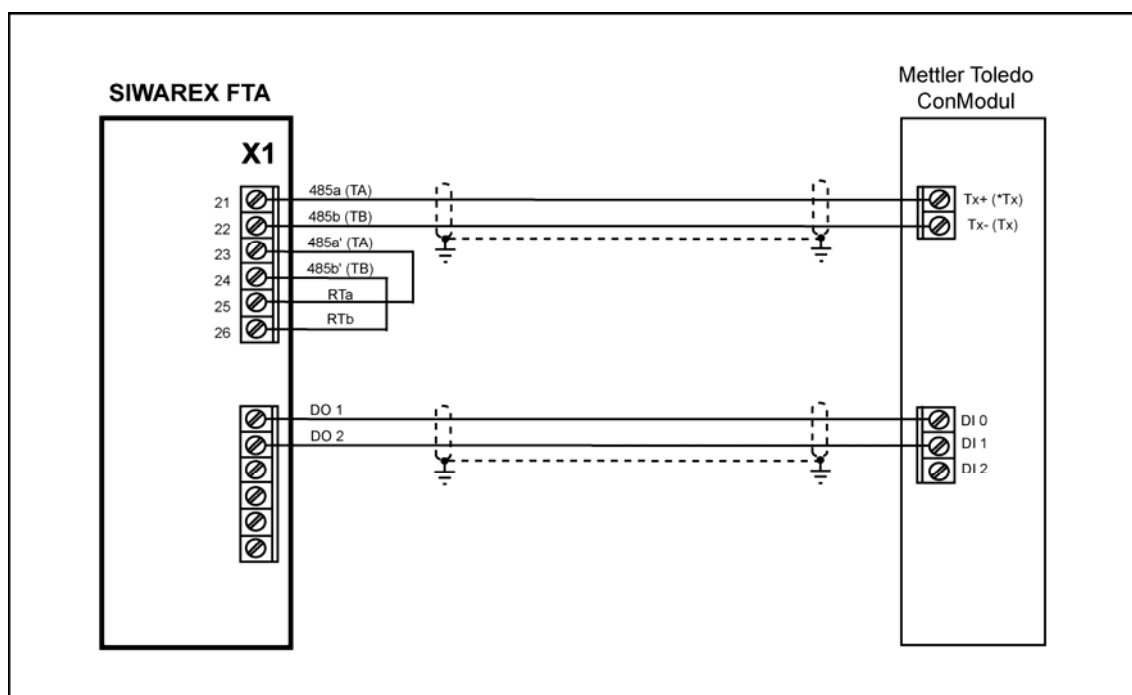
Image 4-9   Connecting Mettler Toledo type WM or WMH to RS 485

Connecting METTLER TOLEDO type WM or WMH some additional parameters must be set.

4.4.11 RS 485 Interface

Termination Clamp	Signal	Comment
X1.21	485a	Input Ta
X1.22	485b	Input Tb
X1.23	485a	Output Ta
X1.24	485a	Output Tb
X1.25	RTa	Termination resistor RTa
X1.26	RTb	Termination resistor RTb

Table 4-9   RS 485 connection
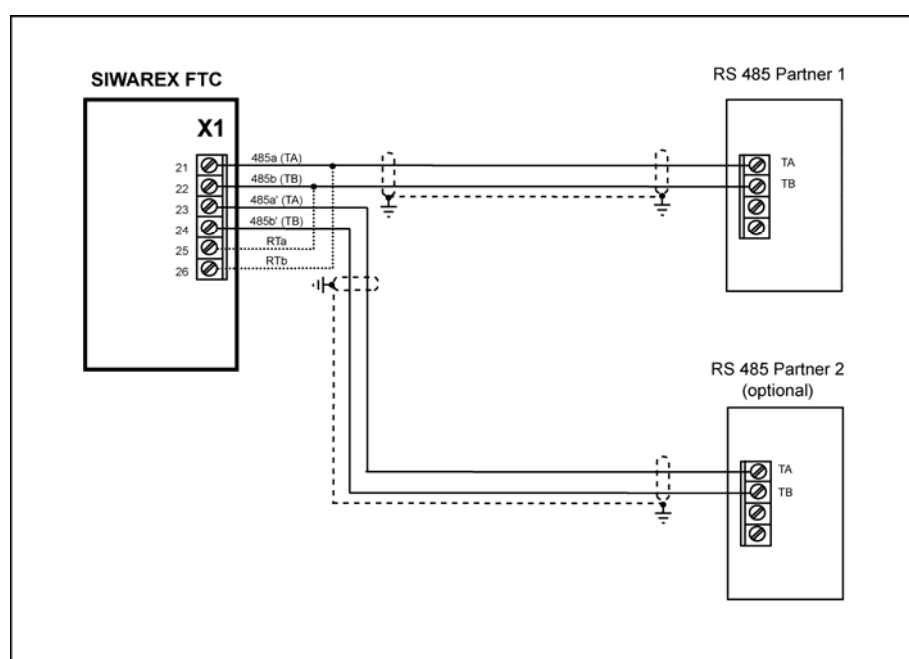
Figure 4-10   RS 485 connection

4.4.12 Connecting the Remote Display from Siebert

One or more Siebert Type S102 displays can be connected to the RS485 interface. The displays can only be used for displaying weights in "Non automatic weighing instrument" operating mode.

When connecting a single display, ensure that the RTa and RTb bridges are wired. When installing the S102 for operation, the same parameters that have been set by the SIWATOOL FTC for RS 485 are to be defined.
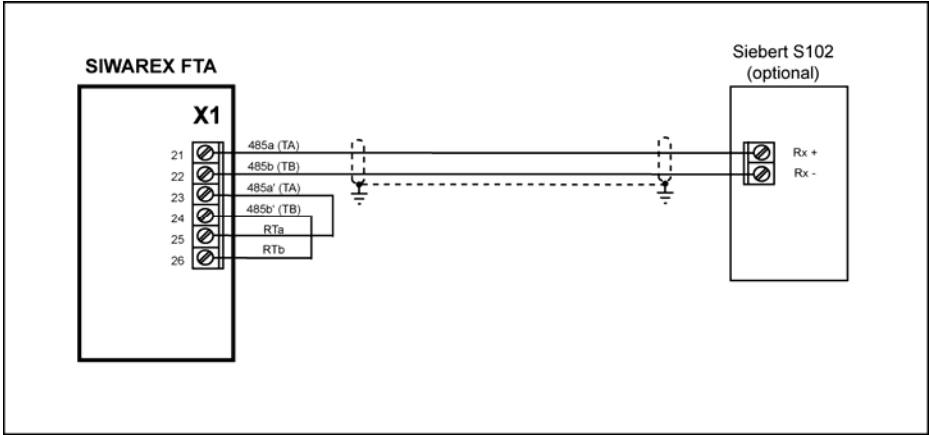
Figure 4-11   Connecting the S102 display

4.4.13 Connecting the PC for SIWATOOL FTC

Table   RS 232 Interface

Termination Clamp	Signal	Comment
X2	9 pin D-type	RS 232 Interface

Table 4-10   Connecting the PC

Ready-made cables are available for connecting the PC (see *Accessories*)
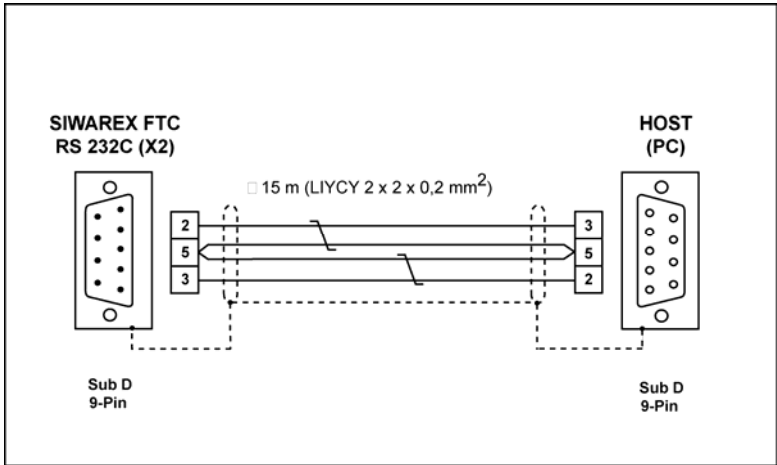
Figure 4-12   Connecting the PC

4.4.14 LED Display Elements

Label	LED color	LED	Description
SF	Red	LED 1 upper left	System Fault Hardware fault
	Green	LED 2	Continuous operation active (flashing)
	Green	LED 3	Write protect for calibration data activated
	Green	LED 4	Scale in empty range
	Green	LED 5	Scale at stand-still
	Green	LED 6	Micro Memory Card is operation ready
EXC	Green	LED 7	Load cell supply
SEN	Green	LED 8	Supply voltage feedback from load cells

Table 4-11   Display Elements (LED)

4.4.15 Using the Micro Memory Card

Only a SIMATIC Micro Memory Card can be used for saving the calibratable records or for recording weighing states. Approximately 16 MB of data can be stored with the MMC described in chapter *Accessories*.

Warning notice

After formatting the MMC with SIWAREX FTC, it can no longer be used in the SIMATIC-CPU! Therefore, the MMC should be labeled correspondingly.

4.5 Preparing for Operation

Introduction

After assembling the module group and making all connections, the next part of the commissioning process is to perform a partial functionality check on the SIWAREX FTC and all connected components.
The individual steps for partial testing are to be performed in the following sequence:

Visual check

Check all previously performed steps for proper execution, i.e.:
- Is there any external damage to the module group?
- Are the modules situated in the proper positions?
- Are all fastening screws properly tightened?
- Are all connecting cables properly connected and fastened tightly?
- Is the frontal connection made properly?
- Is the shielding properly attached to the shielding conductor for all corresponding cables?
- Is the profile rail connected to the ground conductor?
- Have all tools, materials or components that do not belong to the S7 or SIWAREX FTC been removed from the profile rail and the module group?

24 V to SIWAREX FTC connection

Turn on power supply on.
Proper initialization of the SIWAREX FTC in the SIMATIC can only be guaranteed if:
- the S7-CPU (with decentralized connection with IM 153-1) and the SIWAREX FTC are switched on at the same time
  or
- the SIWAREX FTC first.

LED checks on the SIWAREX FTC

After applying the 24V supply voltage and a short initialization phase (internal tests are indicated by LED running sequence), the SIWAREX FTC goes into operating status. The following LEDs must have the status that is indicated below if the unit is running correctly:

LED (EXC) --> ON status
LED (SEN) --> ON status
LED (SF)   --> OFF status

4.6   Application in Ex-Zones

⚠ Danger

D A N G E R   E X P L O S I O N

Exists when the installation and setup regulations are not adhered to.

⚠ For using the SIWAREX FTC in areas with a risk of explosion, the important information in the "SIMATIC Automation Systems - Basics of Explosion protection (Doc.No. A5E00206200)" must be observed!

Below you will find important information on the installation of the SIWAREX FTC in a hazardous area.

SIWAREX FTC may only be used under the conditions, which are specified in the appropriate certificates.

The SIWAREX FTC can be used in Ex zone 2 (acc. to IEC/CENELEC, directive 94/9/EG).

In the following you find some details about the certificates ATEX (Europe) and UL (USA, Canada).

Certificate: ATEX:

Type Examination Certificate Number: ATEX Nr. KEMA 08ATEX0002 X

⚠ It is important that the related safety instructions are followed.

These you can find on the internet under
http://support.automation.siemens.com/WW/view/en/29443327

Certificate: c-UL-us haz. loc.

UL file number. USA: NRAG.E239877

UL file number Canada: NRAG7.E239877

Note to c-UL-us haz.loc:

Warning – Explosion Hazard – Do not disconnect while circuit is live unless area is known to be non-hazardous.

Warning – Explosion Hazard – Substitution of components may impair suitability for Class I, Division 2.

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only.

Connection from load cells to SIWAREX FTC:

The SIWAREX FTC can be connected with load cells in zone 1 or zone 2.

For a connection of load cells in zone 2 it is sufficient, that the load cells also have an approval for zone 2 and all associated directives as well as the installation instructions are respected.

For a connection of load cells in zone 1, load cells with the adequate approvals are needed and appropriate provisions according to the guidelines must ensure explosion protected operation. For example SIWAREX R load cells can be connected intrinsically safe via the Ex-Interface SIWAREX IS. The instructions for the Ex-Interface, the load cells and the ATEX as well as the c-UL-CSA directives have to be respected.

Installation and Maintenance:

Required connection and installation work must be performed by qualified personnel.

Repairs can only be carried out at the production location.

5 Weighing Functions and Parameters

5.1   General

The SIWAREX FTC can be used as a Non Automatic Weighing Instrument, for force measurement, belt scale, loss-in-weight scale or as bulk flow measurement device. The operating mode is set once when commissioning the scale in the adjustment data area (data record 3).

The selected operating mode and the defined parameters are very important to the behavior of the SIWAREX FTC in the process.
The parameters are set with default values from the manufacturer. Using the command "Load default values", the parameters defined in the factory are set again.
The default operating mode is "Belt scale". If you want to run the scale in another operating mode (e.g. loss-in-weight scale), you have to set the operating mode during commissioning (e.g. to "Loss-in-weight scale").
The default parameters are defined so that the scale is immediately ready for each operating mode. Not all parameters must be re-entered for each operating mode.
By changing a parameter, the behavior of the scale is changed respectively.
The advantage of this solution is that you can define how many of the default values should be retained and how much the behavior of the scale has to be adapted for the application.

All parameters are split into data records (DR) **.** The data records are organized according to process steps (tasks) that you have to perform during the commissioning phase or during the process itself.
An overview of data records is provided in the following table.

DR No.	Content / Structure	Comment	Cross-reference
3	Adjustment parameter	All operating modes	*5.2*
4	Basic parameter	All operating modes	*5.4*
5	Belt scale	Belt scale (separate manual)	*5.5*
55	Bulk flow measurement device	Bulk flow measurement device	*5.6*
6	Differential scale 1	Loss-in-weight scale	*5.7*
7	Interface parameters	All operating modes	*5.8*
8	Date / Time	All operating modes	*5.9*
9	Application ID	All operating modes	*5.10*
10	Differential scale 2	Loss-in-weight scale	*5.11*

DR No.	Content / Structure	Comment	Cross-reference
11	Device characteristic curve	Loss-in-weight scale	*5.12*
12	PID controller parameter	Loss-in-weight scale	*5.13*
13	Material characteristic curve	Loss-in-weight scale	*5.14*
14	Current tilt angle	Only belt scale (separate manual)	
15	Tare input	NAWI, Force, Belt scale	*5.15*
16	Weight simulation value	All operating modes	*5.16*
17	Ext. analog default value	All operating modes	*5.17*
18	Ext. display default value	All operating modes	*5.18*
20	Target_flow_value	Loss-in-weight scale	*5.19*
21	Parameter for batch operation	Belt scale (separate manual)	
26	Internal state	All operating modes	
30	Process state 1	NAWI, Force measurement, Belt scale	*5.20*
31	Process state 2	All operating modes	*5.21*
32	Process value differential scale	Loss-in-weight scale, bulk flow measurement device	*5.22*
33	Totals	Belt scale, loss-in-weight scale, bulk flow measurement device	*5.23*
34	ASCII weight value	All operating modes	*5.24*
35	Cryptodata	All operating modes	*5.25*
36	Process values PID-controller	Loss-in-weight scale	*5.26*
37	Quality	Loss-in-weight scale	*5.27*
40	Log text 1	All operating modes	*5.28*
41	Log text 2	All operating modes	*5.28*
42	Log text 3	All operating modes	*5.28*
43	Log text 4	All operating modes	*5.28*
44	Last log data	All operating modes	*5.29*
45	String	All operating modes	*5.30*
46	Log ID for requirements through S7 interface	All operating modes	*5.31*
47	Log output to S7 interface	All operating modes	*5.32*
120	MMC-trace data	All operating modes	*5.33*
121	RAM-trace data	All operating modes	*5.33*
122	MMC-log data	All operating modes	*5.35*
123	MMC/RAM-Trace-/Log- process values	All operating modes	*5.34*

Table 5-1   Data record overview

In the following parameter description, you will find a description of the weighing functions that are influenced by that parameter.
The parameters of a data record are shown in a table to start with.
This is then followed by the exact parameter description for the parameters of that data record. After the receipt of new parameters, SIWAREX FTC performs a

plausibility test corresponding with the defined operating mode. If there is a parameter error then the data record will not be accepted (stored) by the SIWAREX FTC and a "synchronous" message is generated (see chapter *7 Messages and Diagnosis*).

5.2   DR3 Adjustment Parameters

The adjustment parameters must be checked for each new scale and must be changed where necessary and most important, the operating mode must be defined during commissioning.

The scale is basically defined using the adjustment parameter and by performing the adjustment. Adjusting the scale can be done using adjustment weights (see *5.2.1*) or theoretically (see *5.3*). In verifiable operation as a non-automatic weighing machine, the data of the DR3 cannot be changed after calibration.

Procedures:

o   Check all parameters and change if necessary

o   Switch on service operation (command).

o   Send the DR3 to the scale

o   Perform scale adjustment

o   Receive DR3 from the scale

o   Switch off service operation

Name	Type	Address	Default	Range of Values / Meaning	Reference
(6) Adjustment					
Adjustment digits for Adjustment zero 0	DINT	DBD000	1398101	0 to: 2^{24} Other definitions not permitted.	*5.2.1*
Adjustment digits for Adjustment weight 1	DINT	DBD004	15379113	0 to: 2^{24} Other definitions not permitted.	*5.2.1*
Adjustment digits for adjustment weight 2	DINT	DBD008	0	0 to: 2^{24} Other definitions not permitted.	*5.2.1*
Adjustment digits for Adjustment weight 3	DINT	DBD012	0	0 to: 2^{24} Other definitions not permitted.	*5.2.1*
Adjustment digits for Adjustment weight 4	DINT	DBD016	0	0 to: 2^{24} Other definitions not permitted.	*5.2.1*
Adjustment weight 1 (Flow rate with bulk flow measurement device)	REAL	DBD020	50	> 0 Other definitions not permitted.	*5.2.1*
adjustment weight 2 (Flow rate with bulk flow measurement device)	REAL	DBD024	0	≥ 0 Other definitions not permitted.	*5.2.1*
Adjustment weight 3 (Flow rate with bulk flow measurement device)	REAL	DBD028	0	≥ 0 Other definitions not permitted.	*5.2.1*
Adjustment weight 4 (Flow rate with bulk flow measurement device)	REAL	DBD032	0	≥ 0 Other definitions not permitted.	*5.2.1*

Name	Type	Address	Default	Range of Values / Meaning	Reference
Characteristic value range	BYTE	DBB036	2	1: Characteristic value to 1mV/V 2: Characteristic value to 2mV/V 4: Characteristic value to 4mV/V 101: Characteristic value +/- 1mV/V (force measurement, bi-directional) 102: Characteristic value +/- 2mV/V (force measurement, bi-directional) 104: Characteristic value +/- 4mV/V (force measurement, bi-directional) Other definitions not permitted.	*5.2.2*
(5) Filter					
Filter sequence	BYTE	DBB037	0	Bit 0 : 0: Average value filter before digital filter 1: Digital filter before average value filter Bits 1 to 7 not set	*5.2.3*
Type of low pass filters	BYTE	DBB038	0	0: critically damped 1: Bessel filter 2: Butterworth filter Other definitions not permitted.	*5.2.4*
Limit Frequency	BYTE	DBB039	4	0: No filter 1: fg = 20Hz 2: fg = 10Hz 3: fg = 5Hz 4: fg = 2Hz 5: fg = 1Hz 6: fg = 0.5Hz 7: fg = 0.2Hz 8: fg = 0.1Hz 9: fg = 0.05Hz Other definitions not permitted.	*5.2.5*
Depth of average value filter	INT	DBW040	10	[0 ... 250] x 10 ms 0: Average value filter deactivated Other definitions not permitted.	*5.2.6*
(1) Adjustment parameter I			0		
Scale Name	STRING [10]	DBB042	„SIWAREX XX"		*5.2.7*
Number of weight ranges	BYTE	DBB056	1	1 Range 2 Ranges 3 Ranges Other definitions not permitted.	*5.2.8*
Scale type	BYTE	DBB057	0	Bit 0:: 0: Multi-range scale 1: Multi-resolution scale	*5.2.9*
Activate zero setting upon start-up			0	Bit 1: 0: Switch-on zero setting device switched off; 1: Switch-on zero setting device switched on	*5.2.10*
Activated zero setting at start-up, if scale is tared			0	Bit 2: 0: Switch-on zero setting, not when tare ≠ 0 1: Switch-on zero setting performed with tare ≠ 0	*5.2.11*
Automatic zero adjustment			0	Bit 3: 0: Zero tracking device switched off; 1: Zero tracking device switched on Bit 4 - 7 not set	*5.2.12*
(2) Calibration parameter II					
Minimum weight for Weighing range 1	REAL	DBD058	1		*5.2.13*

Name	Type	Address	Default	Range of Values / Meaning	Reference
Maximum weight for weighing range 1	REAL	DBD062	100		*5.2.14*
Numeral step for weighing range 1	REAL	DBD066	0,02	Number step weighing range 1 ($1*10^k$, $2*10^k$, $5*10^k$, $k \in N_{0)}$) Other definitions not permitted.	*5.2.15*
Minimum weight for Weighing range 2	REAL	DBD070	0		*5.2.16*
Maximum weight for weighing range 2	REAL	DBD074	0		*5.2.17*
Numeral step for weighing range 2	REAL	DBD078	0	Number step WB2 ($1*10^k$, $2*10^k$, $5*10^k$, $k \in N_{0)}$) Other definitions not permitted.	*5.2.18*
Minimum weight for Weighing range 3	REAL	DBD082	0		*5.2.19*
Maximum weight for weighing range 3	REAL	DBD086	0		*5.2.20*
Numeral step for weighing range 3	REAL	DBD090	0	Numeral step WB3 ($1*10^k$, $2*10^k$, $5*10^k$, $k \in N_{0)}$) Other definitions not permitted.	*5.2.21*
(3) Calibration parameter III					
Standstill Time	TIME	DBD094	1000	ms	*5.2.22*
Standstill Range	REAL	DBD098	0,02	Standstill range in weight unit	*5.2.23*
Wait time for standstill	TIME	DBD102	2000	If there is no standstill, the weighing command is immediately rejected with an operating error at setting 0 and otherwise the wait time is waited through. If no standstill has occurred after the wait time has elapsed, an error message is generated and the command is aborted. For weighing commands (zero setting, taring in operation as non-automatic weighing instrument) that are activated by an operator, a setting in the 2000 ms range is a good idea.	*5.2.24*
Max. negative weight for zero setting when switching on	BYTE	DBB106	10	Neg. Range of the switch-on zero setting device [in % of WB_{max}] (Entry from Pos- + Neg. Zero setting value may not exceed 20% for country code „OIML") Deactivated for loss-in-weight scale.	*5.2.25*
Max. positive weight for zero setting when switching on	BYTE	DBB107	10	Pos. range for switch-on zero setting device [in % of WB_{max}] (Entry from Pos- + Neg. Zero setting value may not exceed 20% for country code „OIML") Deactivated for loss-in-weight scale.	*5.2.26*
Maximum negative weight for zero setting	BYTE	DBB108	1	Neg. Range of zero setting device [in % of WB_{max}] (Entry from Pos- + Neg. Zero setting value may not exceed 4% for country code „OIML")	*5.2.27*
Maximum positive weight for zero setting	BYTE	DBB109	3	Neg. Range of zero setting device [in % of WB_{max}] (Entry from Pos- + Neg. Zero setting value may not exceed 4% for country code „OIML")	*5.2.28*
Tare max. weight T-	BYTE	DBB110	100	Subtractive tare device range [in % of WB_{max} with multi-range scale] [in % of WB_1 with multi-resolution scale] (Entry may not exceed 100% with country code "OIML")	*5.2.29*

Name	Type	Address	Default	Range of Values / Meaning	Reference
Operating mode	BYTE	DBB111	0	Operating mode: 0 NAWI filling procedure 1 NAWI emptying procedure 2 Force measurement 3 Belt scale 4 Loss-in-weight scale 5 Bulk flow measurement device	*5.2.30*
Reserve_3_110	BYTE	DBB112	0	Reserved	
Load cell type	BYTE	DBB109	0	0: analog load cell 1: METTLER TOLEDO type WM or WMH 2...255 analog load cell	*5.2.37*
Timeout digital LC	WORD	DBW110	240	Timeout in ms for receiving the cyclic weight value of the digital load cell	*5.2.38*
Regulations	STRING [4]	DBB116	"----"	"OIML" : = Regulation code OIML "----": = No regulation code	*5.2.39*
Weight unit	STRING [4]	DBB122	kg	Weight unit	*5.2.40*
Weight unit large	STRING [4]	DBB128	t	Large weight unit	*5.2.41*
Length unit	STRING [2]	DBD134	m	Length units (belt scale only)	*5.2.42*
U Factor	REAL	DBD138	1000	Conversion factor weight unit > Large weight unit	*5.2.43*
Determination time 3	TIME	DBD140	10000	Adjustment or zero setting time for dynamic zero setting, taring or adjusting 0... max. 900 000 ms (belt scale only)	*5.2.44*
		144			

Table 5-2   DR3 Allocation

5.2.1   DR3 - Adjustment Digits 0, 1, 2, 3, 4, for the Zero Point and Adjustment Weights 1, 2, 3, 4

The analog measurement value coming from the load cells is converted into a digital value with an analog-digital converter. A weight value is then calculated from this digital value. All functions of the SIWAREX FTC then uses this weight value for executing their task.

To calculate the weight value from the digital value, the characteristic curve of the measurement system must be determined. In the simplest case, the characteristic curve is defined by points 0 and 1. The first operating point (point 0) is always determined by the empty scale alone with its own construction weight. The weight of its own construction, the scale load cells deliver a measurement voltage to the SIWAREX FTC. After the analog-digital conversion of the measurement voltage, the digital value (adjustment digit 0) is assigned the zero point (zero weight).

For determining the average value of the adjustment point for the belt scale (zero point, adjustment weight) over a predefined period of time, the determination time must be defined. This time entry is not applicable for other operating modes.

If the scale is loaded with a known calibration weight (e.g. with 50 % of the measurement range), then the second operation point can be determined. The new digital value from the analog-digital converter is now assigned the calibration weight.

The characteristic curve can be further adjusted using a maximum of three other points that must lie above point 1.

Ensure that the difference between two adjustment weights is at least 5% of the measurement range.

The adjustment consists of the following steps:

Define adjustment weights and other parameters of the DR 3 data record.

Send DR 3 to the scale

With an empty scale, give the command "Valid adjustment weight = 0"

Load the scale with the defined calibration weight

Give the command "Valid adjustment weight = 1"

Receive DR 3 from the scale

Save the data to a data carrier

The adjustment sequence for the increasing adjustment weights must be retained.

Example:

Zero point = 0.0 kg (always)	produces 5 800 000 digits
Adjustment weight 1 = 100 kg	produces 10 100 000 digits

This defines the characteristic curve (0 is entered as the weight value for further adjustment weights) and the scale can now perform the calculations for the weight values over the entire measurement range.

Note:

Since the maximum value for adjustment digits is 15 379 113 and the value for completely empty load cells (without the weight of the construction itself) is 1 398 101 the plausibility of the characteristic curve can be roughly estimated to determine load deviations for example.

The illustration shows the relationship between the adjustment digits and the adjustment weight of the scale.
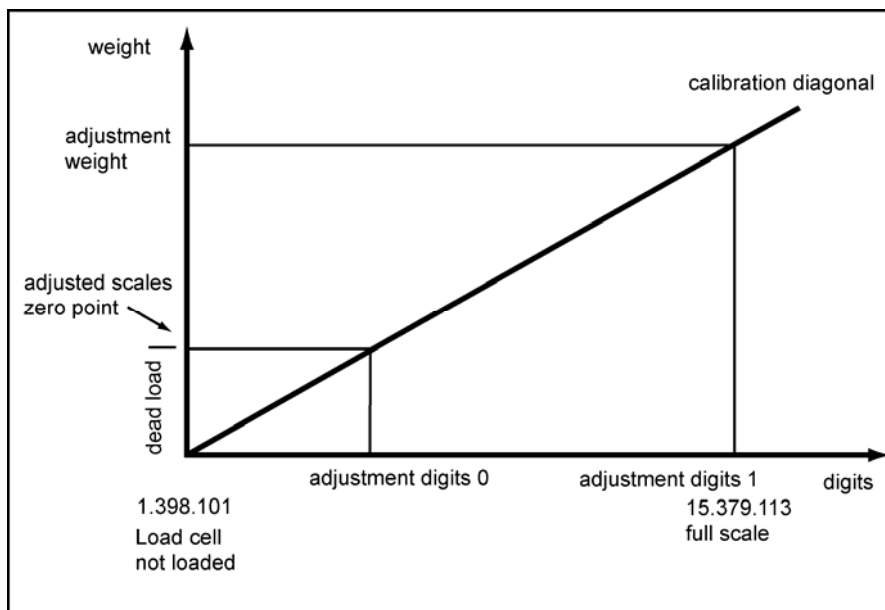
FIGURE 5-1   Adjustment Digits and Weight Value

If the adjustment weights and adjustment digits of a SIWAREX FTC are known then the adjustment procedure does not need to be performed. They are simply sent to the SIWAREX FTC in the DR3 data record and the scale is immediately operational (after official calibration of the scale, it is no longer possible to send DR3).

The SIWATOOL FTC program supports you in quickly performing and adjustment.

Option 1:

After commissioning and after adjustment, all data records for the scale are read from SIWAREX FTC and are stored as a scale file ScaleX.FTL.

Identical scales can now be put into operation immediately. Connect the PC to the new scale and activate the "Send all data records" function. This also transfers the adjustment weights and the adjustment digits - the characteristic curve is defined immediately. Of course, the same applies for exchanging a SIWAREX FTC.

Option 2:

Use the SIWATOOL FTC „Theoretical adjustment" function and determine the characteristic curve of the scale from the technical data of the load cells alone. The case assumes proper construction of the scale (see *5.3*).

Note

Normally, defining two operating points is sufficient to determine the characteristic curve for the scale. Other operation points must only be defined on non-linear systems - New digital values (adjustment digits 2, 3, 4) are assigned with other calibration weights (e.g. 70%, 80%, 100% of the measurement range).
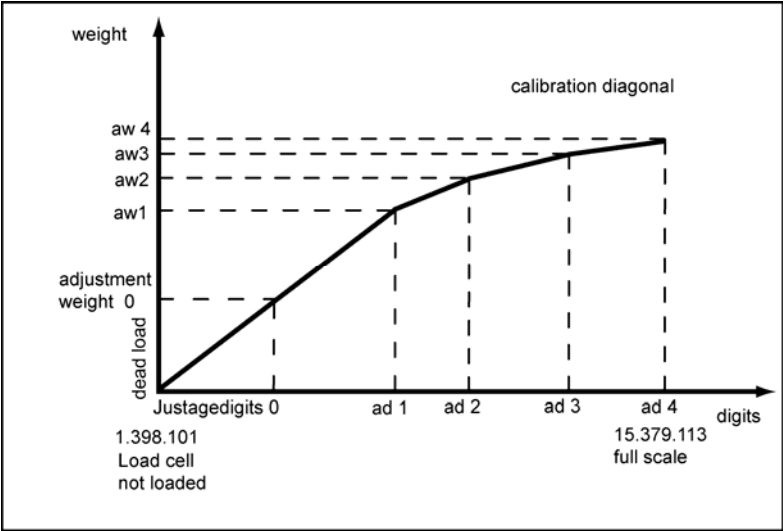
FIGURE 5-2   Linearization of the scale characteristic curve

The characteristic curve is converted for bi-directional operation in "Force measurement" operating mode. The following image shows the relationship between effective force and the adjustment digits.
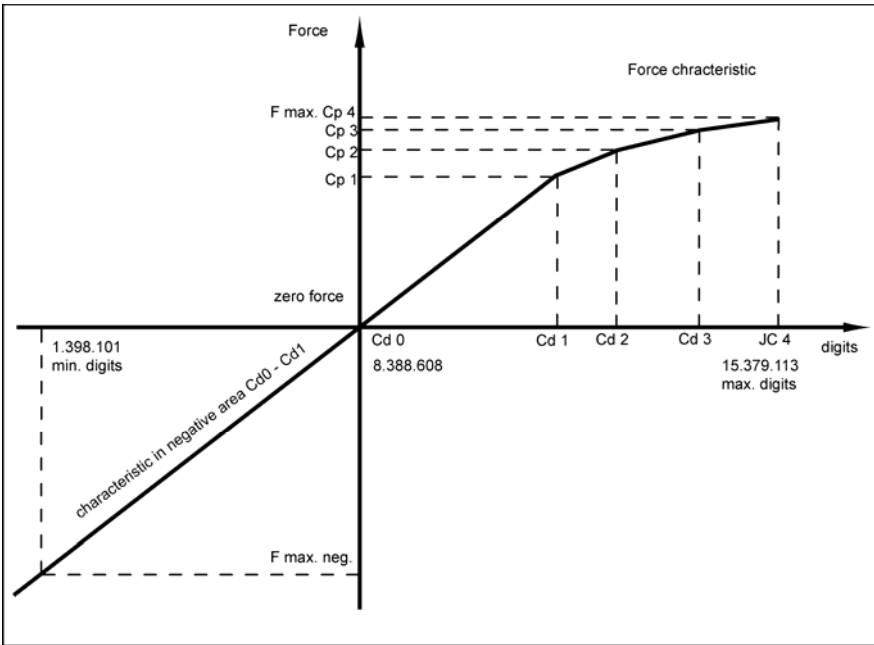
FIGURE 5-3   Adjustment Digits and Force

5.2.2 DR3 - Characteristic Value Range

Depending on the characteristic value of the connected load cells, the value 1 mV/V, 2 mV/V or 4 mV/V must be selected. Since the SIWAREX FTC supplies the load cells with approximately 10 V, the measuring input is redefined according to the expected measurement voltage (max. 10 mV, max. 20 mV or max. 40 mV).

For example, if the characteristic value of the connected load cells is 2.85 mV/V then the next higher characteristic value must normally be set, i.e. 4 mV/V.

For bi-directional force measurement, the characteristic value range should be defined as +/-.

5.2.3 DR3 – Filter Sequence for the Signal Filter

Changing the filter sequence can be an advantage in some cases. Normally, the signal is first filtered by the average value filter.

5.2.4 DR3 - Type of Low-Pass Filters

For the suppression of interference to the weight display, 3 types of filters have been prepared for selection (critically damped, Bessel filter, Butterworth filter). The selection is performed empirically. The following images show the step response of the three filters (fg = 2 Hz).

For the suppression of the interferences in average values, separate filters are activated in the parameters for the respective operating mode.
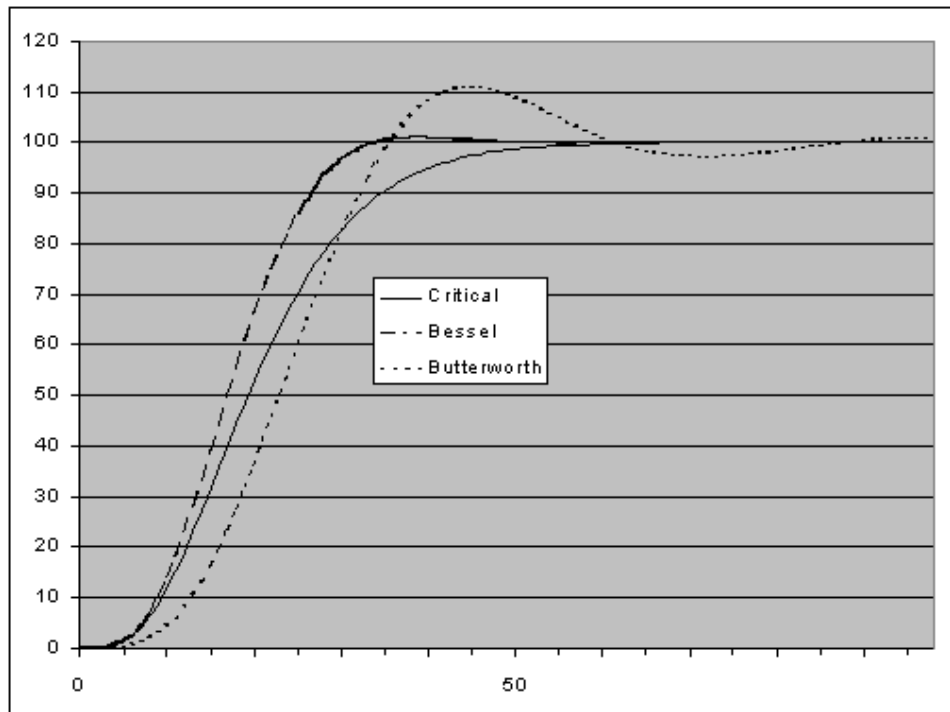
FIGURE 5-4   Step responses of the digital low-pass filter

5.2.5 DR3 - Limit Frequency

Defining the limit frequency is critically important for suppressing interference. The "speed" of the scale's reaction to the change in the measured value is determined by specifying the limit frequency.

A value of e.g. 2 Hz leads to a relatively quick scale reaction to a weight change, a value of e.g. 0.5 Hz makes the scale "sluggish".

5.2.6 DR3 - Depth of Average Value Filters

The average value filter is used to settle the weight value against interference. The weight value is based on the average of the n weight values that the SIWAREX FTC calculates every 10 msec, e.g. if n=10, 10 values are used for calculating the average value. Every 10 ms, the oldest value drops out of the calculation and the newest is considered in the calculation.

5.2.7 DR3 - Scale Name

The name consists of a maximum of 10 characters and can be freely selected.

Note

The scale name can no longer be changed after official calibration.

5.2.8 DR3 - Number of Weight Ranges

SIWAREX FTC can be defined as a scale with one, two or three different measurement ranges. Depending on the construction type certification, the numeral step can be defined separately for every range. Normally, only one measuring range is used in the force measurement and continuous weighing (belt scale, bulk flow measurement device) operating modes.

5.2.9 DR3 - Scale Type

If the number of ranges is greater than one then the scale type can be defined as a multi-range scale or a multi-resolution scale.

Information on the function of a multi-range- or multi-resolution-scale can be found in EN 45 501.

Note

If only one range is defined then this entry is meaningless.

5.2.10 DR3 - Activate Zero Setting upon Switching On

The scale can be set to zero automatically by switching the supply voltage on. On verifiable scales, a weight value of +/- 10% of the max. measurement range can be set to zero on start-up.

Attention

In non-verifiable operation (no OIML restrictions), a full scale can also be set to zero after activating this function. Limiting the effectiveness is possible by entering the max. and min. weight however. See Max. Min. weight for zero setting upon switch-on. In operating modes "Belt scale" and "Loss-in-weight scale", this function cannot be activated.

5.2.11 DR3 - Activated Zero Setting upon Switch On, If Scale Tared

The scale can be set to zero automatically by switching the supply voltage on. If the function above is activated, there is still the question of whether zero setting at start-up should be run if the tare weight is unequal to zero.

If yes, the tare weight is also deleted with the zero setting and if no, no zero setting is performed on the scale.

5.2.12 DR3 - Automatic Zero Adjustment

Zero setting the scale can be performed with the "Zero setting" instruction if required. The automatic zero adjustment sets the scale to zero without an instruction if it slowly drifts away from the zero point. Slow drifting is presumed if the conditions of standard EN45501 have been met. This function is executed as a dynamic zero setting function in the "Belt scale" operating mode.

This function has no effect in the "Loss-in-weight scale" operating mode.

Attention

In non-verifiable operation (no OIML restrictions), after activating this function, the scale can indicate zero after a slow drift over time if it is full. When using this function, overloading the scale must be prevented with suitable measures.

5.2.13 DR3 - Minimum Weight for Weighing Range 1

The current weight value can be used for verifiable recording (with the numeral step for measurement range 1) only above the minimum weight. The minimum weight is defined by an adjustment or a calibration. The minimum weight depends on the number and type of load cells used.

The value can be set to 0 on non-calibrating scales.

5.2.14 DR3 - Maximum Weight for Weighing Range 1

The current weight can be used for calibrating purposes (with the numeral step for measurement range 1) only under the maximum weight. The maximum weight is defined during adjustment. The maximum weight depends on the number and type of load cells used and the required weight range.

5.2.15 DR3 - Minimum Weight for Weighing Range 1

The numeral step for weighing range 1 can be defined corresponding with standard EN 45501 (0.0001 to 50).

5.2.16 DR 3 - Minimum Weight for Weighing Range 2

The current weight value can be used for verifiable recording (with the numeral step for measurement range 2) only above the minimum weight. The minimum weight is defined by an adjustment or a calibration. The minimum weight depends on the number and type of load cells used. The value can be set to 0 on non-calibrating scales.

Note

If only one weighing range is defined (such as e.g. for the belt scale or loss-in-weight scale), then this definition is meaningless.

5.2.17 DR 3 - Maximum Weight for Weighing Range 2

The current weight can be used for calibrating purposes (with the numeral step for measurement range 2) only under the maximum weight. The maximum weight is defined during adjustment.

The maximum weight depends on the number and type of load cells used.

Note

If only one weighing range is defined then this entry is meaningless.

5.2.18 DR 3 - Minimum Weight for Weighing Range 2

The numeral step for weighing range 2 can be defined corresponding with standard EN 45501 (0.0001 to 50).

If only one weighing range is defined then this entry is meaningless.

5.2.19 DR 3 - Minimum Weight for Weighing Range 3

The current weight value can be used for verifiable recording (with the numeral step for measurement range 3) only above the minimum weight. The minimum weight is defined by an adjustment or a calibration. The minimum weight depends on the number and type of load cells used.

The value can be set to 0 on non-calibrating scales.

Note

If only one or two weighing ranges are defined then this entry is meaningless.

5.2.20 DR 3 - Maximum Weight for Weighing Range 3

The current weight can be used for calibrating purposes (with the numeral step for measurement range 3) only under the maximum weight. The maximum weight is defined during adjustment.

The maximum weight depends on the number and type of load cells used.

Note

If only one or two weighing ranges are defined then this entry is meaningless.

5.2.21 DR 3 - Numeral Step for Weighing Range 3

The numeral step for weighing range 1 can be defined corresponding with standard EN 45501 (0.0001 to 50).

Note

If only one or two weighing ranges are defined then this entry is meaningless.

5.2.22 DR 3 - Standstill Time

Standstill monitoring is used to identify when the scale is at a stable equilibrium.

Scale standstill is determined if the weight value changes by less than a defined deviation range (standstill value) within a defined time (standstill time). Standstill is used in static operation of the scale (Command: Zero setting, Taring, Output log).

5.2.23 DR 3 - Standstill Range

Standstill monitoring is used to identify when the scale is at a stable equilibrium.

Scale standstill is determined if the weight value changes by less than a defined deviation range (standstill value) within a defined time (standstill time). Standstill is used in static operation of the scale (Command: Zero setting, Taring, Output log).

The figure below illustrates the functioning of the standstill monitoring feature.
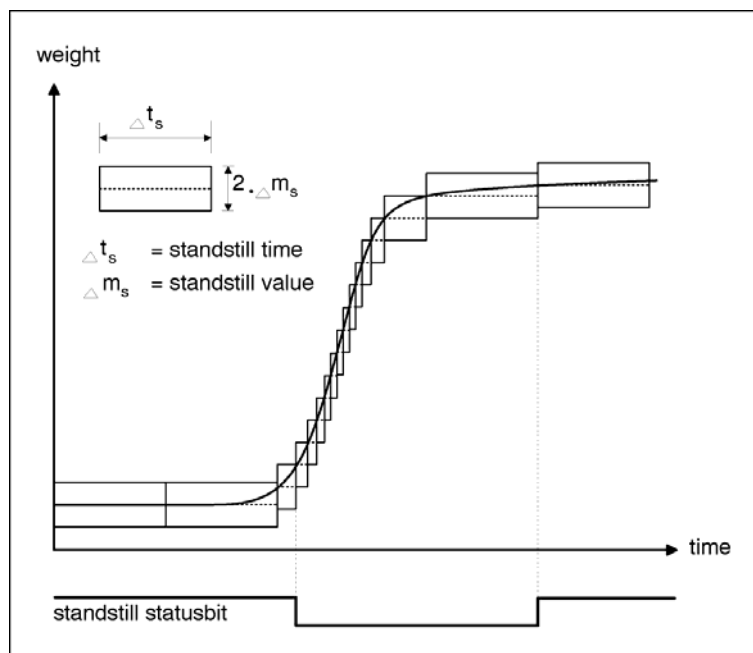
FIGURE 5-5   Standstill Monitoring

5.2.24 DR 3 - Waiting Time for Standstill

To prevent having to cancel a weighing instruction (only taring, printing and zero setting in static operation) immediately when the stable weight of the scale is not defined, the waiting time is given as standstill. If the scale instruction tare, output

log or zero setting was not possible after this time has elapsed then the corresponding technology message generated.

5.2.25   DR 3 - Maximum Negative Weight for Zero Setting upon Switch On

Zero setting means that an automatic zero setting is performed for the scale when the supply voltage is switched on.

If zero setting upon switching on the supply voltage has been activated, then the definition will limit the affect of the function. The reference point for the effectiveness of the limitation is not the current weight, it is the weight that was displayed by the scale without a previous zero setting. In operating modes "Belt scale" and "Loss-in-weight scale", this function is not effective.

5.2.26   DR 3 - Maximum Positive Weight for Zero Setting upon Switch On

Zero setting means that an automatic zero setting is performed for the scale when the supply voltage is switched on.

If zero setting upon switching on the supply voltage has been activated, then the definition will limit the affect of the function. The reference point for the effectiveness of the limitation is not the current weight, it is the weight that was displayed by the scale without a previous zero setting. In operating modes "Belt scale" and "Loss-in-weight scale", this function is not effective.

5.2.27   DR 3 - Maximum Negative Weight for Zero Setting

The current gross weight of the scale is defined as zero for zero setting.

For zero setting, the specification can be used to limit the effect of the function. The reference point for the affect of the limitation is not the current gross weight. It is the weight that the scale would show without a previous zero setting.

For scales in calibrating operation, the limit between the negative and positive weight for zero setting is 4% of the maximum weighing range.

5.2.28   DR 3 - Maximum Positive Weight for Zero Setting

For zero setting, the specification can be used to limit the effect of the function. The reference point for the effectiveness of the limitation is not the current weight, it is the weight that was displayed by the scale without a previous zero setting.

For scales in calibrating operation, the limit between the negative and positive weight for zero setting is 4% of the maximum weighing range.

5.2.29   DR 3 - Tare max. Weight T-

SIWAREX FTC accepts every weight value which is less than %-record of the maximum weighing range with multi-range scales or weighing range 1 with a multi-resolution scale.

On scales in verifiable application, the value is limited to 100% of the maximum weighing range.

5.2.30   DR 3 – Operating Mode

This parameter can be used to select the suitable weighing program. One of these weighing operating modes applies depending on the task description.

Defining the operating mode is done during the initial commissioning of the module by sending the adjustment data record DR 3 with the newly defined operating mode.

Data records or individual parameters, which have no effect in a certain operating mode, will be accepted in the SIWAREX FTC module.

The following operating modes can be defined:

- 0 - non-automatic weighing instrument (OIML R 76) for fill scales
- 0 - non-automatic weighing instrument (OIML R 76) for emptying scales
- 2 - Force measurement (bi-directional)
- 3 – Belt scale (Default value, Description in separate manual)
- 4 - Loss-in-weight scale
- 5 - Bulk flow measurement device

5.2.31 DR 3 - Weighing Operating Mode: NAWI Filling Procedure

Non-automatic weighing instrument (NAWI) - according to OIML R-76 - only accepts the service and adjustment instructions and weighing instructions "zero setting" and "taring". The net weight increases with increasing load on the scale.

5.2.32 DR 3 - Operating Mode: NAWI Emptying Procedure

Non-automatic weighing instrument (NAWI) - according to OIML R-76 - only accepts the service and adjustment instructions and weighing instructions "zero setting" and "taring". The net weight increases with decreasing load on the scale.

5.2.33 DR 3 - Operating Mode: Force Measurement

This operating mode is not legal-for-trade. The scope of functionality is similar, but with operating mode "non-automatic weighing instrument filling procedure". The difference is in the ability to use the measuring range in the positive and negative direction.

5.2.34 DR 3 - Operating Mode: Belt Scale

In operating mode Belt scale, the parameters from the DR 5 are also evaluated. The scope of functionality is designed for operation with a belt scale. The belt scale is described in a separate manual.

5.2.35 DR 3 - Operating Mode: Loss-in-weight Scale

In operating mode Loss-in-weight scale, the adjustment parameters from data records DR 6, DR 10, DR 11, DR 12 and DR 13 are also evaluated. The scope of functionality is designed for operation with a loss-in-weight scale.

5.2.36 DR 3 - Operating Mode: Bulk Flow Measurement Device

In operating mode Bulk flow measurement device, the adjustment parameters from the DR 55 are also evaluated. The scope of functionality is designed for operation with a bulk flow measurement device.

5.2.37 DR 3 - Load cell type

Analog load cells (strain gauge full bridge sensor) as well as sensorsfrom the Mettler Toledo type WM or WMH can be connected to the SIWAREX FTC. This information defines which interface that the signal comes from:

- via the connection with strain gauge analog load cells

- via RS 485 with sensors type WM or WMH

After selecting the sensors METTLER TOLEDO Type WM or WMH, settings must be made in data record DR 7 for the RS485 interface (see *4.4.10*)

In data record 3, the adjustment digits and adjustment weight must be defined:

o Adjustment digits for zero point = 8388608

o Adjustment digits 1 = 13388608

o Adjustment digits 2, 3, 4 = 0

o Adjustment weight 1 = 5000000/ digital value per weight unit e.g. if 10000d/kg was sent from the sensor 5000000/10000=500

o Adjustment digits 2, 3, 4 = 0

The application-dependent sensor parameters are set using the tools for defining parameters for the WM or WMH sensors.

The following settings (with instructions) must be made for communication with SIWAREX FTC:

- RS422 interface settings:

  o PROT_2   (Basic protocol)

  o COM_1_8_0_0   (Interface RS422, 38400 baud, 7 Bits, even parity, 1 stop bit)

- Setting the digital inputs:

  o DIN1_SIR_0_1 (Input 1 for the SIR instruction, positive edge, output via RS422)

  o DIN1_SI_0_1 (Input 1 for the SIR instruction, positive edge, output via RS422)

5.2.38 DR 3 – Monitoring time for the digital load cells

The receipt of the cyclic weight telegrams from the load cell type types WM, WMH is monitored. If no telegram is received for the defined time period (in ms), SIWAREX FTC indicates an operational fault No. 24 – Digital load cell not ready. A status bit also provides (Status NAWI, Bit 29) the information on whether the digital load cell is ready. If the status bit is not set, the

weight values are not evaluated because no plausible weight values have been received.

5.2.39 DR 3 - Regulations

Scales in calibrating operation are subject to certain restrictions. The "OIML" entry activates these restrictions. To deactivate them, it is necessary to enter "----". The entry „OIML" only makes sense if the scale is to be verifiable as a non-automatic weighing instrument.

5.2.40 DR 3 - Weight Unit

A 4-position character sequence can be defined as the unit of measurement, e.g.: g, kg, lbs

5.2.41 DR 3 – Large Weight Unit

A 4 character string can be defined as the unit of measurement e.g.: t.

The relationship between the mass unit of measurement and the measured unit of measurement is determined with a factor e.g. 1,000. The large weight unit is advantageous when defining quantities that refer to a longer period of time, e.g. belt quantities per hour.

5.2.42 DR 3 - Length Unit (belt scale only)

The length unit is used for defining the belt length. Calculating the belt load refers to this definition.

The parameter only has an effect in the operating mode "Belt scale".

5.2.43 DR 3 - Conversion Factor

The conversion factor indicates the relationship between the weight unit and the large weight unit. The factor can be defined as required.

Example:

Weight unit: kg

Large weight unit: t

Conversion factor 1000,0

5.2.44 DR 3 – Determination Time (belt scale only)

With a static scale (determination time = 0), the operation points are determined immediately after activating the instruction during the adjustment. Zero setting is also executed immediately when defining a stable weight.

A determination time can also be defined for this instruction for the belt scale. The scale runs the determination of the operation point during the defined determination time as an average value of all measurements and the average value is output after the determination time has elapsed.

The determination time applies for the following instructions: zero point valid, adjustment weight 1...4 valid, zero setting, taring.

Example:

If the determination time is set to 10 000 ms, a new weight is determined e.g. every 10 ms with the "Zero setting" instruction. After 10 seconds have elapsed, the average value of all measurements will be defined as a new adjustment point.

5.3 Theoretical Adjustment – Adjustment Without Adjustment Weights

If performing the adjustment is not possible using adjustment weights, the scale can also be put back into operation without adjustment weights, if the mechanical structure of the scale is correct and the measuring logs are available for the individual load cells. Execution is handled with the help of SIWATOOL FTC_L (not in operating mode "Force measurement") during the processing of the adjustment parameters. We call the procedure "theoretical adjustment".

First, the characteristic value range (1mV/V, 2mV/V or 4mV/V) must be defined in the "Adjustment" tab of the data record for the adjustment data. Then, switch to the "Theoretical adjustment" tab.

To execute the theoretical adjustment, the rated load for all load cells is defined first, e.g. 3 load cells with 1,000 kg each result in a rated load of 3,000 kg. The adjustment zero offset (unit µV), and the characteristic value (unit mV/V) is then entered for each individual load cell. These values are taken from the respective load cell measurement log. The characteristic value is normally entered with up to 5 decimal places, e.g. 2.01201.

Adjustment zero offset for each load cell is defined as follows:

Adjustment zero offset (µV) = Adjustment zero offset measurement value (µV/V) x Weigh module supply voltage (V)

Example:

Load cells - Supply voltage (EXC) = 10 V

Adjustment zero offset = 1.2 µV/V (from Load cells - measurement log)

Entry: Adjustment zero offset = 1.2 µV/V x 10 V = 12 µV

After entering the data for each load cell, the adjustment digits are calculated and the result is displayed by actuating the button "Calculate adjustment digits". Then, the calculated adjustment digits can be integrated into the data record with adjustment data (DR 3) by actuating button "Accept calculation". The data record is then sent to the weigh module with the new adjustment data.

Depending on the mechanics of the device, a completely empty scale may indicate a value that deviates from the adjustment zero slightly. In this case, the instruction "Characteristic curve shift" can be executed.

5.4 DR 4 Basis Parameter

The basis parameters define other features of a scale, which are responsible for the basic behavior. The parameters must be checked and sometimes have to be changed. DR 4 is not subject to write protection in calibrating operation.

Procedures:

o Check all parameters and change if necessary

o Send the DR 4 to the scale

Name	Type	Address	Default	Range of Values / Meaning	Reference
Reserve_4_0	BYTE	DBB000	0	Reserved	
Reserve_4_1	BYTE	DBB001	0	Reserved	
Reserve_4_2	WORD	DBW002	0	Reserved	
Monitoring time for recording	TIME	DBD004	2000	Time within which, a recording task must be ended (msec)	*5.4.1*
Device for log output	BYTE	DBB008	1	Bit 0 : 0 = Log output to RS232 interface 1 = Log output to MMC Bits 1 to 7 not used	*5.4.2*
Reserve_4_9	BYTE	DBB009	0	Reserved	
Basis weight for limit value 1 Basis weight for limit value 2 Basis weight for the empty range	BYTE	DBB010	0 0	Bit 0 : 0 = Basis for limit value 1 is the gross weight 1 = Basis for limit value 1 is the net weight Bit1 : 0 = Basis for limit value 2 is the gross weight 1 = Basis for limit value 2 is the net weight Bit 3 : 0 = Basis for the empty range is the gross weight 1 = Basis for the empty range is the net weight Bits 4 to 7 not used	*5.4.3* *5.4.4* *5.4.5*
Reserve_4_11	BYTE	DBB011	0	Reserved	
Empty range	REAL	DBD012	1	For filling procedures, this depends on parameters, for emptying procedures relative to gross. With the loss-in-weight scale: Limit value for ending the emptying run.	*5.4.6*
Switch-on weight Limit value 1	REAL	DBD016	1	Switch-on weight Limit value 1	*5.4.7*
Cut-off weight Limit value 1	REAL	DBD020	1,1	Cut-off weight Limit value 1	*5.4.8*
Switch-on weight Limit value 2	REAL	DBD024	50	Switch-on weight Limit value 2	*5.4.9*
Cut-off weight Limit value 2	REAL	DBD028	49	Cut-off weight Limit value 2	*5.4.10*
Switch-on weight Limit value 3	REAL	DBD032	99	Limit value 3 corresponds with overfill limit	*5.4.11*
Cut-off weight Limit value 3	REAL	DBD036	98	Cut-off weight limit value 3	*5.4.12*
		40			

Table 5-3   Allocation of DR 4

5.4.1   DR 4 - Monitoring Time for Logging

If logging of the weighing results is generated by an instruction or automatically, SIWAREX FTC monitors whether the procedure has been completed within the predefined time. If not, an error is generated.

5.4.2   DR 4 - Device for the Log Output

Logs can be output to a connected printer or to the Micro Memory Card (MMC). The contents of the log are defined in data records DR 40 to DR 43.

5.4.3   DR 4 - Basis Weight for Limit Value 1

The limit values can be defined in relation to the gross weight or the net weight of the scale.

5.4.4   DR 4 - Basis Weight for Limit Value 2

The limit values can be defined in relation to the gross weight or the net weight of the scale.

5.4.5   DR 4 - Basis Weight for Monitoring the Empty Range

The limit value for the monitoring of the empty range can be defined in relation to the gross weight or the net weight of the scale.

5.4.6   DR 4 - Empty Range

The value for the empty range is a limit value, that when exceeded indicates the "empty" status to the SIWAREX FTC which gives this out as status information.

In operating mode Loss-in-weight scale, emptying in automatic mode is ended if the value drops below the limit value.

5.4.7   DR 4 - Switch-on Weight Limit Value 1

Switch-on and shut-off weights can be defined separately for a limit value. In this way, a minimum value monitor and a maximum value monitor can be realized by hysteresis. A maximum value monitor is realized with the following specification:

Switch on value > Switch off value

A minimum value monitor is realized with the following specification:

Switch on value < Switch off value

The following image shows the functionality of limit values 1, 2, 3
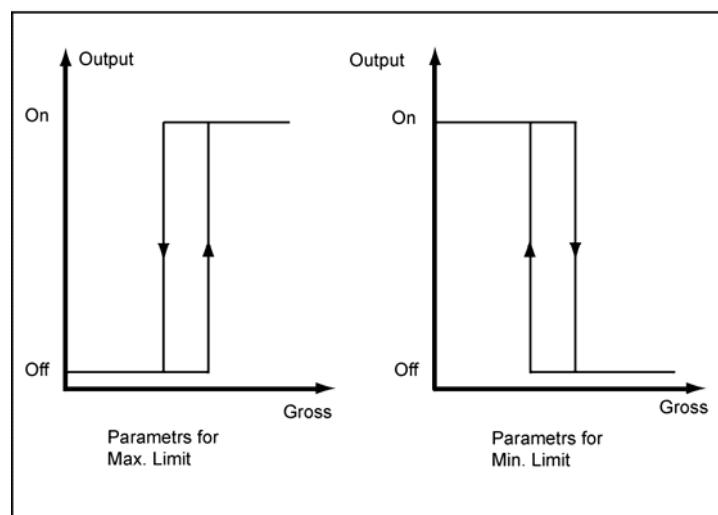
FIGURE 5-6   Defining limit value parameter

5.4.8   DR 4 - Cut-off Weight Limit Value 1

See: Switch On Weight, Limit Value 1

5.4.9   DR 4 - Switch-on Weight Limit Value 2

See: Switch On Weight, Limit Value 1

5.4.10   DR 4 - Cut-off Weight Limit Value 2

See: Switch On Weight, Limit Value 1

5.4.11   DR 4 - Switch-on Weight Limit Value 3

The switch-on and cut-off weight can be defined separately for the limit value.
With limit value 3, only the maximum weight monitor can be used. The basis weight
for the limit value 3 is always the gross weight.

5.4.12   DR 4 - Cut-off Weight Limit Value 3

When the limit value is undercut, the status information "limit value 3) is reset.

5.5   DR 5 Belt Scale Parameter (Description in separate manual)

5.6   DR 55 Bulk Flow Measurement Device Parameters

The parameters in this data record are only relevant in operating mode "Bulk flow
measurement device". The parameters must be checked and changed if necessary.

Procedures:

o   Check all parameters and change if necessary

o   Send the DR 55 to the scale

Name	Type	Address	Default	Range of Values / Meaning	Reference
Reserve_55_0	REAL	DBD000	0	Reserved	
Reserve _55_4	TIME	DBD004	0	Reserved	
Reserve_55_8	REAL	DBD008	0	Reserved	
Reserve_55_12	REAL	DBD012	0	Reserved	
Reserve_55_16	INT	DBW016	0	Reserved	
Reserve_55_18	INT	DBW018	0	Reserved	
Reserve_55_20	TIME	DBD020	0	Reserved	
Reserve_55_24	TIME	DBD024	0	Reserved	
Reserve_55_28	INT	DBD028	0	Reserved	
Reserve_55_30	INT	DBD030	0	Reserved	
Nominal flow	REAL	DBD032	50	Nominal flow in WU/h (Weight unit per hour)	*5.6.1*
Reserve_55_30	REAL	DBD036	0	Reserved	*5.6.2*
Flow rate correction factor	REAL	DBD040	1	Correction factor for calculating flow rate Value range 0.5 ... 2	

Name	Type	Address	Default	Range of Values / Meaning	Reference
Minimum flow rate	INT	DBW044	200	Limit value for minimum flow rate in % of the nominal flow rate. With 0 – no monitoring.	*5.6.3*
Maximum flow rate	INT	DBW046	1250	Limit value for maximum flow rate in % of the nominal flow rate. With 0 – no monitoring	*5.6.4*
Reserve_55_48	REAL	DBW048	0	Reserved	
Max. flow rate for zero setting	INT	DBW052	10	Maximum flow rate with zero setting in % of the nominal flow rate.	*5.6.5*
Minimum flow rate for totalizing	INT	DBW054	0	Minimum flow rate in % of the nominal flow rate for performing the totalizing	*5.6.6*
Delay time for monitoring the flow rate at the start	TIME	DBD056	1 sec	Delay time after switching on the feed until the monitoring of the flow rate is actuated.	*5.6.7*
Delay time for monitoring the flow rate in operation	TIME	DBD060	1 sec	Delay time in continuous operation until monitoring the flow rate is actuated.	*5.6.8*
Totalizing numeral step in WU	REAL	DBD064	0,1	Numeral step (‚Totalizing value') f. the distribution memory (Group 1) 1...4 in weight unit WU	*5.6.9*
Totalizing numeral step in LWU	REAL	DBD068	0,1	Numeral step (‚Totalizing value') f. the distribution memory (Group 2) 5...8 in large weight unit LWU	*5.6.10*
Quantity per pulse 1	REAL	DBD072	0	Indicates, after which quantity increase for group 1 that a pulse should be output (when an external totalizing counter is connected)	*5.6.11*
Pulse duration 1 f. Digital output	TIME	DBD076	0	Pulse duration 1 for outputting the required quantity to a digital output (when an external totalizing counter is connected 1) (50 ....1000ms)	*5.6.12*
Minimum pause duration 1 for digital output	TIME	DBD080	0	Minimum pause duration 1 for output of the required quantity to digital output (when an external totalizing counter is connected) 50 ....1000ms	*5.6.13*
Quantity per pulse 2	REAL	DBD084	0	Indicates, after which quantity increase that a pulse should be output. (when an external totalizing counter is connected 2)	*5.6.14*
Pulse duration 2 f. Digital output	TIME	DBD088	0	Pulse duration group 2 for the output of the required quantities to a digital output (when a totalizing counter is connected) 50 ....1000ms	*5.6.15*
Minimum pause duration 2 for digital output	TIME	DBD092	0	Minimum pause duration group 2 for output of the required quantity to a digital output (when a totalizing counter is connected) 50 ....1000ms	*5.6.16*
Overload-Undercut-Inhibition time	TIME	DBD096	0	Time delay for the error messages which are caused by overloading or undercutting the measuring range	*5.6.17*
Reserve_5_100	INT	DBW100	0	Reserved	
		102			

Table 5-4   Allocation of DR 55

5.6.1   DR 55 - Nominal Flow rate

Nominal flow rate in WU (Weight units) / h is defined by the user.

It corresponds with the flow rate (100%), for which the bulk flow measurement device is designed.

5.6.2 DR 55 – Flow rate Correction Factor

A material test can be performed to compare the actual required material quantity with the total calculated by SIWAREX FTC. The correction factor can be used to influence the material quantity calculation for slight deviations.

The following formula applies for the correction factor:

Output flow rate = measured flow rate x correction factor

5.6.3 DR 55 – Minimum Flow

Minimum flow rate is a limit value in 0.1 % of the nominal flow rate. The entry of the number e.g. 800 corresponds with 80.0 %. After this value has been undercut, SIWAREX FTC sets a status bit.

5.6.4 DR 55 - Maximum Flow rate

Maximum flow rate is a limit value in 0.1 % of the nominal flow rate. The entry of the number e.g. 1020 corresponds with 102.0 %. After this value has been exceeded, SIWAREX FTC sets a status bit.

5.6.5 DR 55 – Maximum Flow rate for Zero Setting

Maximum flow rate for zero adjustment is a limit value in 0.1 % of the nominal flow rate. Entering the number e.g. 20 corresponds with 2.0 %. After this value has been undercut, SIWAREX FTC will not execute or cancel the zero setting instruction.

5.6.6 DR 55 – Minimum Flow rate for Totalizing

Minimum flow rate is a limit value in 0.1 % of the nominal flow rate for executing the totalizing. The entry of the number, e.g. 8 corresponds with 0.8 %. After exceeding this value, the totalizing is possible.

5.6.7 DR 55 – Time for Monitoring the Flow rate After the Start-up

After switching on the feed, under-cutting the minimum flow rate is only indicated after this time has elapsed.

5.6.8 DR 55 – Delay Time for Activating the Monitoring of the Flow rate in Continuous Operation

After under-cutting the minimum flow rate, the respective message or status bit is only output after this time has elapsed.

5.6.9 DR 55 – Numeral Step for Totals 1...4

The totalizing memory 1...4 is run with the weight unit indicated in data record 3. The user can define the smallest step for creating a total with the numeral step.

E.g. weight unit 1 kg, numeral step for creating the total is 5 kg.

5.6.10 DR 55 - Numeral Step for Totals 4...5

Distribution memory 4...8 is run with large weight unit indicated in data record 3. The user can define the smallest step for creating a total with the numeral step.

E.g. Weight unit 1 kg, numeral step for totalizing is 1 t.

5.6.11 DR 55 – Material Quantity per Pulse 1

The material quantity per pulse 1 indicates, after which quantity increase of distribution memory 1.....4 1 should output a pulse through the defined digital output.

5.6.12 DR 55 – Pulse Duration 1 for the Digital Output

For the external quantity counter, the pulse duration (ms) can be defined so that the device can recognize the pulse for sure. The pulse duration is not permitted to be selected so long that stopping the minimum pause duration will make the next pulse late.

5.6.13 DR 55 – Pause Duration 1 for the Digital Output

For the external quantity counter, the pulse duration (ms) can be defined so that the device can recognize the pulse for sure. The pulse duration is not permitted to be selected so long that stopping the minimum pause duration will make the next pulse late.

5.6.14 DR 55 – Material Quantity per Pulse 2

The material quantity per pulse 2 indicates, after which quantity increase of distribution memory 1.....4 1 should output a pulse through the defined digital output.

5.6.15 DR 55 – Pulse Duration 2 for the Digital Output

For the external quantity counter, the pulse duration (ms) can be defined so that the device can recognize the pulse for sure. The pulse duration is not permitted to be selected so long that stopping the minimum pause duration will make the next pulse late.

5.6.16 DR 55 – Minimum Pause Duration 2 for the Digital Output

For the external quantity counter, the pulse duration (ms) can be defined so that the device can recognize the pulse for sure. The pulse duration is not permitted to be selected so long that stopping the minimum pause duration will make the next pulse late.

5.6.17 DR 55 – Over and Under-load Inhibition Time

When undercutting or exceeding the measurement range, a fault is indicated. For the defined inhibition time, the fault message is suppressed. If the status remains for a longer period of time, the fault message is output.

5.7 DR 6 Loss-in-weight Scale I

5.7.1 Introduction to the Functionality of the Loss-in-weight Scale

The loss-in-weight scale detects the current weight of the container, calculates and regulates the flow rate according to the defined setpoint.

The dosing container filled with the product and the dosing organ are weighed completely and the product flow rate leaves the dosing organ. The weighing electronics measure the entire dosing station in fixed time intervals. The weight reduction is calculated per time unit from the difference in weight between two measurement values under consideration of the time difference. The following controller uses the determined flow rate and compares it with the set flow rate (gravimetric phase). If there are deviations, the set signals are output to the dosing organ to achieve the desired product discharge.

In a fixed application, various interference effects the system such as e.g. vibration or shaking, which produces incorrect measurements in the weighing procedure. Therefore, filters exist for suppressing the interference.

In addition, problem situations must be handled, such as e.g. refilling the weighing container. The supply of product for the dosing station is continually reduced. If the minimum weight is achieved, the weighing container must be filled again. During refilling, the product continues to be taken by the dosing organ. Since regulating the flow rate during this time is not possible, the material discharge is volumetric (no flow rate measurement).

A loss-in-weight scale, which is a component of an automation system, as is the SIWAREX FTC module, offers many opportunities to optimize processing in combination with the automation components.

Directly embedding the weighing electronics in the automation system and the therefore optimal cooperation with the central processing unit enables functions to be defined with parameters and activated based on the requirements from the control program. The high measuring technology resolution, real-time signal processing, determination and filtering of signals in the weighing electronics achieves highly precise dosing.

For correct flow rate calculations, the weight signal must be filtered. SIWAREX can filter the weight value for displaying the fill status (filter specifications in DR 3) and for formation of the flow rate value (filter specifications in DR 10) separately. For each task, there is an average value filter and a low-pass filter.
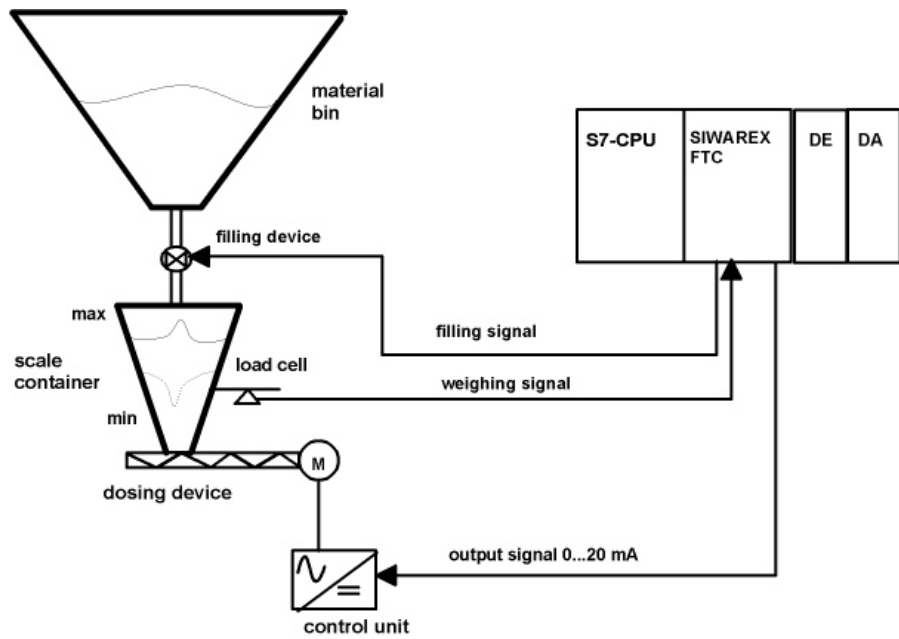
FIGURE 5-7   Basic structure of the loss-in-weight scale

The following figure shows weighing progress in continuous operation.
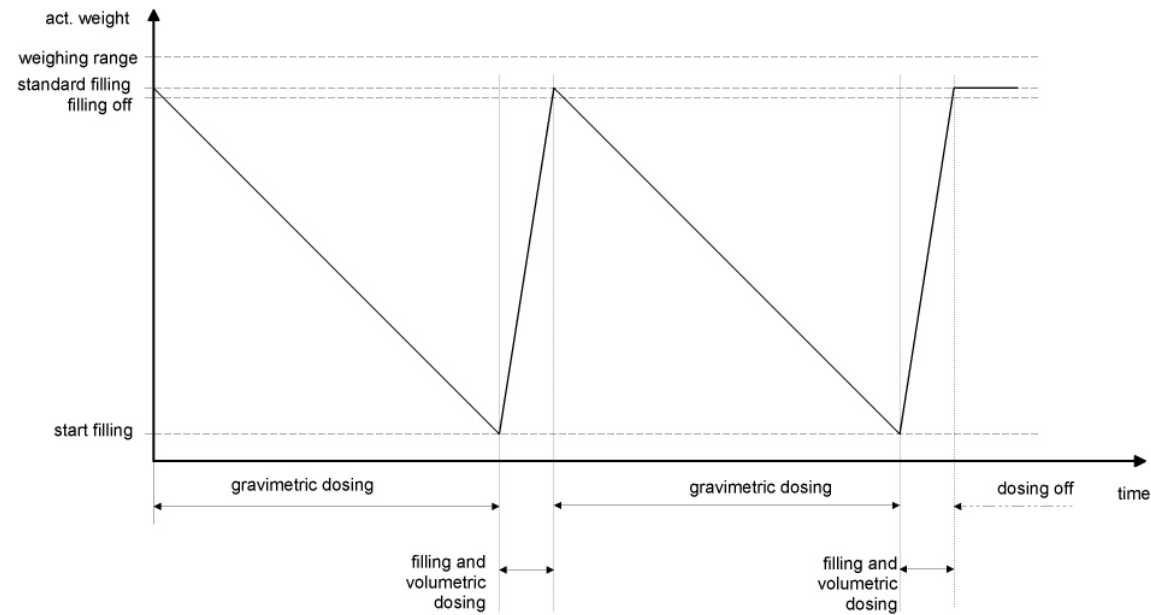
FIGURE 5-8   Weighing progress of the loss-in-weight scale

The following figure shows the limit values that exist with the SIWAREX FTC in combination with filling the supply container.

Filling level parameter

- Weighing range DS3
- Standard filling weight DS6 — 100%
- Filling off DS6 — 98%
- Filling start DS6 — 10%
- Empty DS4 — 2%
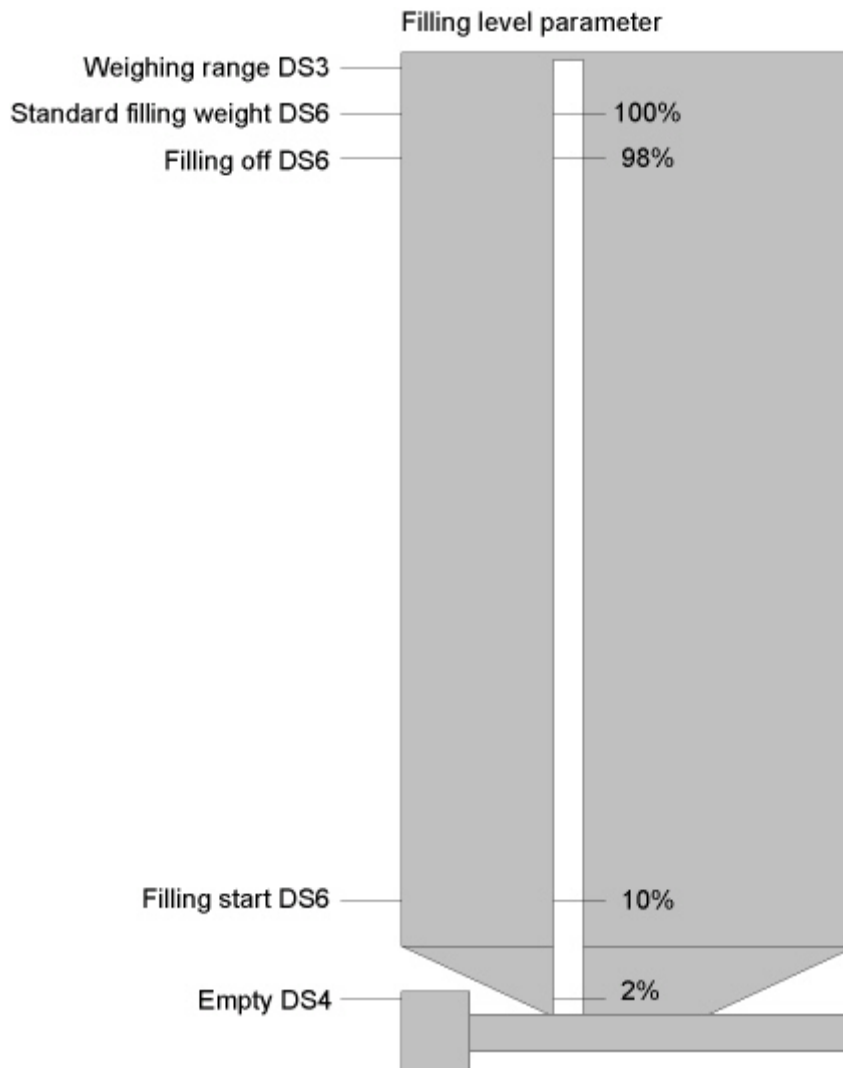
FIGURE 5-9   Fill quantities of a loss-in-weight scale

SIWAREX FTC recognized automatic mode and manual mode in operating mode "Loss-in-weight scale".

Normally, manual mode is used for tests or commissioning and service.
All functions are switched on and off with the individual instructions. This allows all functions to be tested.

In automatic mode, the functions are linked for continuous operation, e.g. refilling switches on automatically, if the respective limit value has been undercut.
This switches automatically into volumetric mode.

The following drawings show the function blocks and the operating status transitions in the operating mode loss-in-weight scale.

Status diagram for differential scale

Automatic mode (gravimetric / volumetric)

Manual mode (volumetric)

Fault

From all states (besides 8)

156

Filling **5**

150

151

Fill and dosing **6**

154

155 or full

162

Dosing **7**

163

Emptying . **7a**

154

155 or full

156

150

151

Idle **0**

Fault 9

2

1

Service mode **8**

Filling (volumetr. dosing) **1**

155 **161**

154

157, 158

157, 158

161

151, 156 or status empty, if emptying)

Dosing **158**

Dosing volumetr. **3**

Dosing gravimetr. **2**

*)

157, 159

Instructions:
150: Dosing (Man./vol.) on
151: Dosing off

154: Filling on
155: Filling off
156: Dosing & filling off
157: Dosing (auto/vol.) on
158: Dosing (auto/grav.) on
159: Dosing (auto/vol./jerk-free) on

161: Emptying (autom.) on
162: Emptying (Man.) on
163: Emptying off

1: Service operation on
2: Service operation off

- - - - - ▶ = Branch depending on fill level

*) Switching can be done automatically Start-up, flow rate fault or fill-level-dependent

N = Status number

Empty: switched off after undercutting the empty value

Fehler! Verweisquelle konnte nicht gefunden werden.

FIGURE 5-10   Status diagram of the loss-in-weight scale

Setpoint
value

Setpoint
handling

Measuring time t_z

Gravimetric

Volumetric

Input
signal

Weight value
Average Value
Filter
Low-pass filter
DS 10

Flow rate calculation
(every t_z ms), when
starting or with new
setpoint, every 250 ms

Control
deviation
(every t_z ms)

PID
controller

Material
characteri
stic curve

Device
characteri
stic curve

Flow rate values,
Create totals 1…8

Variable

Weight value
Average Value
Filter
Low Pass Filter
DS 3

Refill controller,
Fill status display,
Scale status

FIGURE 5-11   Function blocks of the loss-in-weight scale

The following parameters mainly determine the measuring behavior of the loss-in-weight scale. Other parameters in DR 10 form the filtering of the flow rate values and describe monitoring limit values.

Procedures:

o Check all parameters and change if necessary

o Send the DR 6 to the scale

Name	Type	Address	Default	Range of Values / Meaning	Reference
Time unit for flow rate definition	STRING [2]	DBB000	"h "	Time unit for defining the flow rate. Permitted entries "s" or "h"	*5.7.2*
Nominal filling weight	REAL	DBD004	100	Nominal filling weight of the weighing container.	*5.7.3*
Nominal flow rate in WU/s or WU/h	REAL	DBD008	100	Nominal flow rate in weight units / s or /h corresponding with the definition of the time unit.	*5.7.4*
Measuring time flow rate	TIME	DBD012	2000	Measuring time for the calculation of the flow rate (must be $\geq$ 100ms). Max 60 Sec. (rounded to 10ms internally). The PID controller works in the same cycle	*5.7.5*
Flow rate correction factor	REAL	DBD016	1	Correction factor for Calculating the flow rate Value range 0.5 ... 2.	*5.7.6*
Flow rate min	INT	DBW020	2000	Limit value for minimum flow rate in 0.01 % of the nominal flow rate	*5.7.7*
Flow rate max	INT	DBW022	12500	Limit value for maximum flow rate in 0.01 % of the nominal flow rate	*5.7.8*
Reserved	REAL	DBD024	0	Reserved	
Start filling 0.01	INT	DBW028	3000	Min. limit value to start / activate the refilling in 0.01 % of the nominal filling weight.	*5.7.9*
End filling 0.01 %	INT	DBW030	8000	Max. limit value to switching the refilling off in 0.01 % of the nominal filling weight.	*5.7.10*
Settling time after filling	TIME	DBD032	3000	Delay time after switching filling off until switching to gravimetric operation.	*5.7.11*
Filling time	TIME	DBD036	0	If the filling time is unequal to 0, filling is performed for the defined time.	*5.7.12*
Monitoring time for filling	TIME	DBD040	0	After the max. filling time has elapsed, a check is performed to detect whether filling is ended. If necessary, a status bit and a technology fault NNN are output (no malfunction stop). Monitoring is effective while filling according to weight values. 0: Monitoring switched off	*5.7.13*
Inhibition time	TIME	DBD044	1000	Inhibition time for the fault message when the measurement range is exceeded. No message occurs during the inhibition time.	*5.7.14*
Reserved	REAL	DBD048	0	Reserved	
Measuring period for quality	TIME	DBD052	0	Time for a measurement interval (0 or >=100 ms)	*5.7.15*
Number of measuring periods	INT	DBW056	0	Number of measuring periods for the calculation of statistic values.	*5.7.16*
Reserved	INT	DBD058	0	Reserved	
Totalizing numeral step in WU	REAL	DBD060	0,1	Numeral step (,Totalizing value') f. the distribution memory (Group 1) 1...4 in weight unit WU	*5.7.17*
Totalizing numeral step in LWU	REAL	DBD064	0,1	Numeral step (,Totalizing value') f. the distribution memory (Group 2) 5...8 in large weight unit LWU	*5.7.18*
Reserved	REAL	DBD068		Reserved	
		72			

Table 5-5   Allocation of DR 6

5.7.2 DR 6 – Time Unit for flow rate

The definitions for flow rate can be made in units "s" (per second) or "h " (per hour). This definition is effective for all flow rate entries.

5.7.3 DR 6 - Nominal Filling Weight

The nominal filling weight amounts to the quantity of material that should be in the container after refilling is complete.

5.7.4 DR 6 - Nominal flow rate

Nominal flow rate in WU (weight units) /s or in WU (weight units) /h is defined by the user. This corresponds with the flow rate (100.00 %), for which the loss-in-weight scale is designed.

5.7.5 DR 6 – Measurement Time

The flow rate is calculated and output with the defined update time. This time definition also defines the controller cycle time of the PID controller.

5.7.6 DR 6 – Correction Factor for the flow rate Calculation

A material test can be performed to compare the actual required material quantity with the total calculated by SIWAREX FTC. The correction factor can be used to influence the total quantity calculation for slight deviations.

The following formula applies for the correction factor:

Output flow rate = measured flow rate x correction factor

5.7.7 DR 6 – Minimum flow rate

Minimum flow rate is a limit value in 0.01 % of the nominal flow rate. Entering the number e.g. 800 corresponds with 8.00 %. After this value has been undercut, SIWAREX FTC sets a status bit.

5.7.8 DR 6 - Maximum flow rate

Maximum flow rate is a limit value in 0.01 % of the nominal flow rate. Entering the number e.g. 10020 corresponds with 100.20 %. After this value has been exceeded, SIWAREX FTC sets a status bit.

5.7.9 DR 6 – Limit Value for Starting Filling

If the limit value is undercut (in 0,01 % of the nominal filling quantity), the refilling procedure is started in automatic operation. During refilling, the scale continues to work in volumetric mode.

5.7.10 DR 6 – Limit Value for Ending the Filling

If the limit value is exceeded (in 0,01 % of the nominal filling quantity), the refilling procedure is ended in automatic operation. When the settling time has elapsed, the scale switches to gravimetric operation.

5.7.11   DR 6 – Settling Time

After switching the refilling off, the settling time is started. After this time has elapsed, the switch from volumetric mode to gravimetric mode is made.

5.7.12   DR 6 – Refill Time

Refilling can be controlled by time as well. If the defined time =0 then refilling is done after the defined limit values for refilling. If the definition is > 0 (ms) then the refilling is done for the defined time.

5.7.13   DR 6 – Monitoring Time for Filling

Refilling can be monitored for a defined time. If the defined time =0 then there is no monitoring. If the definition is > 0 (ms) then the time is started when filling begins. If the filling is not yet ended when the defined time has elapsed, a technology message occurs. Filling is not stopped however.

5.7.14   DR 6 – Inhibition Time

The inhibition time (ms) is used for suppressing the message caused by exceeding the measuring range. The message is suppressed for the duration of the inhibit time. During the inhibit time, volumetric mode is switched to automatically.

5.7.15   DR 6 – Measuring Time for Dosing Consistency

To evaluate the dosing consistency, a measurement interval must be selected. See 5.27.

5.7.16   DR 6 – Number of Measurements for Dosing Consistency

The determined dosing consistency for the defined time is calculated for the calculation and output of the dosing consistency as an average value of the individual n measuring periods.

5.7.17   DR 6 – Numeral Step for Totals 1...4

The totalizing memory 1...4 is run with the weight unit indicated in data record 3. The user can define the smallest step for creating a total with the numeral step.

E.g. weight unit 1 kg, numeral step for creating the total is 5 kg.

5.7.18   DR 6 - Numeral Step for Totals 4...5

Distribution memory 4...8 is run with large weight unit indicated in data record 3. The user can define the smallest step for creating a total with the numeral step.

E.g. Weight unit 1 kg, numeral step for totalizing is 1 t.

5.8   DR 7 Interfaces

The parameters that define the behavior of the SIWAREX FTC on the interfaces
are defined in DR 7. If an interface is not used the default values can be left alone.

o   Change parameter if required.

o   Send the DR 7 to the scale

Name	Type	Address	Default	Range of Values / Meaning	Reference
S7-Interface		0			
Reserved	BYTE	DBB000	0		
Source for the weight simulation	BYTE	DBB001	0	0: Weight simulation inactive 1: Weight simulation value from SIMATIC 2: Weight simulation value from RS232 Other definitions not permitted.	*5.8.1*
Decade used for rounding the decimal places of the process values (REAL-weight values)	BYTE	DBB002	3	0: rounding to 0 decimal places 1: rounding to 1 decimal place 2: rounding to 2 decimal places 3: rounding to 3 decimal places 4: rounding to 4 decimal places 5: rounding to 5 decimal places 6: rounding to 6 decimal places	*5.8.2*
Reserved	BYTE	DBB003	0	Reserved	
Force service operation	BYTE	DBB004	0	Bit 0 : 0: Outputs in service operation Forced control impossible 1: Outputs in service operation Forced control is possible Bit 1 - 7 not used	*5.8.3*
Process value 1 for fast output to the SIMATIC CPU	BYTE	DBB005	2	Various process values are available for selection after listing.	*5.8.4*
Process value 2 for fast output to the SIMATIC CPU	BYTE	DBB006	30	Various process values are available for selection after listing.	*5.8.5*
Reserve 2	BYTE	DBB007	0	Reserve 2	
S7-Alarm					
Definition of the process alarm 0	WORD	DBW008	0	Value 0 - No process alarm generation Value range 1 – 0FFh Number of the technical error Value range 100h – 13Fh 100h+ 0...1Fh Bit-No. NAWI-status bit - coming 100h+ 20h...3Fh Bit-No. Conti status flag-coming Value range 200h – 23Fh 200h+ 0...1Fh Bit-No. NAWI status bit - going 200h+ 20h...3Fh Bit-Nr. Conti status bit-going	*5.8.6*

Name	Type	Address	Default	Range of Values / Meaning	Reference
Definition of the process alarm 1	WORD	DBW010	0	Value 0 - No process alarm generation Value range 1 – 0FFh Number of the technical error Value range 100h – 13Fh 100h+ 0...1Fh Bit-No. NAWI-status bit - coming 100h+ 20h...3Fh Bit-No. Conti status bit-coming Value range 200h – 23Fh 200h+ 0...1Fh Bit-No. NAWI status bit - going 200h+ 20h...3Fh Bit-Nr. Conti status bit-going	*5.8.6*
Definition of the process alarm 2	WORD	DBW012	0	Value 0 - No process alarm generation Value range 1 – 0FFh Number of the technical error Value range 100h – 13Fh 100h+ 0...1Fh Bit-No. NAWI-status bit - coming 100h+ 20h...3Fh Bit-No. Conti status bit-coming Value range 200h – 23Fh 200h+ 0...1Fh Bit-No. NAWI status bit - going 200h+ 20h...3Fh Bit-Nr. Conti status bit-going	*5.8.6*
Definition of the process alarm 3	WORD	DBW014	0	Value 0 - No process alarm generation Value range 1 – 0FFh Number of the technical error Value range 100h – 13Fh 100h+ 0...1Fh Bit-No. NAWI-status bit - coming 100h+ 20h...3Fh Bit-No. Conti status bit-coming Value range 200h – 23Fh 200h+ 0...1Fh Bit-No. NAWI status bit - going 200h+ 20h...3Fh Bit-Nr. Conti status bit-going	*5.8.6*
Definition of the process alarm 4	WORD	DBW016	0	Value 0 - No process alarm generation Value range 1 – 0FFh Number of the technical error Value range 100h – 13Fh 100h+ 0...1Fh Bit-No. NAWI-status bit - coming 100h+ 20h...3Fh Bit-No. Conti status bit-coming Value range 200h – 23Fh 200h+ 0...1Fh Bit-No. NAWI status bit - going 200h+ 20h...3Fh Bit-Nr. Conti status bit-going	*5.8.6*
Definition of the process alarm 5	WORD	DBW018	0	Value 0 - No process alarm generation Value range 1 – 0FFh Number of the technical error Value range 100h – 13Fh 100h+ 0...1Fh Bit-No. NAWI-status bit - coming 100h+ 20h...3Fh Bit-No. Conti status bit-coming Value range 200h – 23Fh 200h+ 0...1Fh Bit-No. NAWI status bit - going 200h+ 20h...3Fh Bit-Nr. Conti status bit-going	*5.8.6*

Name	Type	Address	Default	Range of Values / Meaning	Reference
Definition of the process alarm 6	WORD	DBW020	0	Value 0 - No process alarm generation Value range 1 – 0FFh Number of the technical error Value range 100h – 13Fh 100h+ 0...1Fh Bit-No. NAWI-status bit - coming 100h+ 20h...3Fh Bit-No. Conti status bit-coming Value range 200h – 23Fh 200h+ 0...1Fh Bit-No. NAWI status bit - going 200h+ 20h...3Fh Bit-Nr. Conti status bit-going	*5.8.6*
Definition of the process alarm 7	WORD	DBW022	0	Value 0 - No process alarm generation Value range 1 – 0FFh Number of the technical error Value range 100h – 13Fh 100h+ 0...1Fh Bit-No. NAWI-status bit - coming 100h+ 20h...3Fh Bit-No. Conti status bit-coming Value range 200h – 23Fh 200h+ 0...1Fh Bit-No. NAWI status bit - going 200h+ 20h...3Fh Bit-Nr. Conti status bit-going	*5.8.6*
S7 - FB Life bit monitoring time	TIME	DBD024	0	0 = S7- Life bit monitor switched off 1 to n = Monitoring time [msec]	*5.8.7*
Analog output			0		
Weight for zero point (0 or 4 mA)	REAL	DBD028	0	Value output with the 0 or 4 mA	*5.8.8*
Reference for end value (20 mA)	REAL	DBD032	0	Value output with the 20 mA.	*5.8.9*
Replacement value for the analogue output at OD	REAL	DBD036	0	Replacement value which is output with an active OD signal if the parameters are defined respectively	*5.8.10*
Source for the analog output	BYTE	DBB040	0	0 = Control signals-SIMATIC 1 = ext. default value through DR 17 2 = Gross 3 = Net 4 = Belt speed 5 = Flow rate 1 6 = Belt load Other definitions not allowed 7 = Actuation signal PID controller	*5.8.11*
Current range for the analogue output	BYTE	DBB041	0	Bit 0: 0: 0 .. 20mA 1: 4 .. 20mA Bit 1 – 7 unused	*5.8.12*
RS232			0		
RS232-printer baud rate	BYTE	DBB042	3	0 = 1200 Bit/sec. 1 = 2400 Bit/sec. 2 = 4800 Bit/s 3 = 9600 Bit/s Other definitions not permitted.	*5.8.13*

Name	Type	Address	Default	Range of Values / Meaning	Reference
RS232- XON/XOFF for printer	BYTE	DBB043	1	Bit 0: 0: XON/XOFF transmission control OFF 1: XON/XOFF transmission control ON	*5.8.14*
RS232- RTS/CTS for printer			0	Bit 1: 0: CTS/RTS transmission control OFF 1: CTS/RTS transmission control ON	
			0	Bit 2: reserved, must always be 0 Bit 3 – 7 unused	
RS485		0			
Log selection	BYTE	DBB044	0	0: no protocol 1: SIEBERT- Protocol S11 2: ASCII protocol 3: SIEBERT- Protocol S102 (6-position)	*5.8.15*
Decimal place for the remote display	BYTE	DBB045	0	0 to 4 Other definitions not permitted.	*5.8.16*
RS485-Baudrate	BYTE	DBB046	3	0 = 1200 Bit/sec. 1 = 2400 Bit/sec. 2 = 4800 Bit/s 3 = 9600 Bit/s 4 = 19200 Bit/s Other definitions not permitted.	*5.8.17*
RS485-character parity	BYTE	DBB047	0	Bit 0: 0: even 1: odd	*5.8.18*
RS485- Data bits			1	Bit 1: 0: 7 data bits 1: 8 data bits	
RS485-Stop-Bits			0	Bit 2: 0: 1 stop bit 1: 2 stop bit Bit 3 – 7 not used	
Digital outputs		0			
Definition of digital output 1	BYTE	DBB048	0FFh	Value range 00h – 3Fh 0...1Fh Bit-No. NAWI status flag 20h...3Fh Bit-No. Conti status flag 41h....Pulse output Integration Distribution mem.1 42h... Pulse output Integration Distribution mem.5 FFh output always inactive	*5.8.19*
Definition of the digital output 2	BYTE	DBB049	0FFh	Value range 00h – 3Fh 0...1Fh Bit-No. NAWI status flag 20h...3Fh Bit-No. Conti status flag FFh output always inactive	*5.8.19*
Definition of the digital output 3	BYTE	DBB050	0FFh	Value range 00h – 3Fh 0...1Fh Bit-No. NAWI status flag 20h...3Fh Bit-No. Conti status flag FFh output always inactive	*5.8.19*
Definition of the digital output 4	BYTE	DBB051	0FFh	Value range 00h – 3Fh 0...1Fh Bit-No. NAWI status flag 20h...3Fh Bit-No. Conti status flag FFh output always inactive	*5.8.19*

Name	Type	Address	Default	Range of Values / Meaning	Reference
Definition of the digital output 5	BYTE	DBB052	0FFh	Value range 00h – 3Fh 0...1Fh Bit-No. NAWI status flag 20h...3Fh Bit-No. Conti status flag FFh output always inactive	*5.8.19*
Definition of the digital output 6	BYTE	DBB053	0FFh	Value range 00h – 3Fh 0...1Fh Bit-No. NAWI status flag 20h...3Fh Bit-No. Conti status flag FFh output always inactive	*5.8.19*
Definition of the digital output 7	BYTE	DBB054	0FFh	Value range 00h – 3Fh 0...1Fh Bit-No. NAWI status flag 20h...3Fh Bit-No. Conti status flag FFh output always inactive	*5.8.19*
Definition of the digital output 8	BYTE	DBB055	0FFh	Value range 00h – 3Fh 0...1Fh Bit-No. NAWI status flag 20h...3Fh Bit-No. Conti status flag FFh output always inactive	*5.8.19*
Level definition for digital outputs 1....8	BYTE	DBB056	0	Bit 0: DO1 -> 0 = high active: 1 = low active .... Bit 7: DO8 -> 0 = high active: 1 = low active	*5.8.20*
Replacement values for digital outputs 1 .... 8 upon fault or OD signal	BYTE	DBB057	0	Bit 0: Replacement value digital output 1 .... Bit 7: Replacement value digital output 8	*5.8.21*
Activate - Digital output replacement values for operational faults	BYTE	DBB058	0	Bit 0: 0: Replacement value output for operating error deactivated 1: Replacement value for operating error activated Bit 1 - 7 not used	*5.8.22*
Reserve 3	BYTE	DBB059	0	Reserve 3	
Digital inputs		0			
Definition of digital input 1	BYTE	DBB060	0	0 = No command 1- 254 = Command code	*5.8.23*
Definition of the digital input 2	BYTE	DBB061	0	0 = No command 1- 254 = Command code	*5.8.23*
Definition of the digital input 3	BYTE	DBB062	0	0 = No command 1- 254 = Command code	*5.8.23*
Definition of the digital input 4	BYTE	DBB063	0	0 = No command 1- 254 = Command code	*5.8.23*
Definition of the digital input 5	BYTE	DBB064	0	0 = No command 1- 254 = Command code	*5.8.23*
Definition of the digital input 6	BYTE	DBB065	0	0 = No command 1- 254 = Command code	*5.8.23*
Definition of the digital input 7	BYTE	DBB066	0	0 = No command 1- 254 = Command code	*5.8.23*
Level definition for digital inputs 1...7	BYTE	DBB067	0	Bit 0: Digital input 1 -> 0 = high active: 1 = low active .... Bit 6: Digital input 7 -> 0 = high active: 1 = low active Bit 7: Not used	*5.8.24*
Reserved	TIME	DBD068	0	Reserved	

Name	Type	Address	Default	Range of Values / Meaning	Reference
Reserve 4	DWORD	DBB072	0	Reserve 4	
MMC Parameter		0			
Log overflow	BYTE	DBB076	1	Bit 0: 0: with full memory, the logging procedure is stopped 1: with full memory, the oldest entries are overwritten	*5.8.25*
Trace overflow			1	Bit 1: 0: No overwriting of trace data is possible 1: the oldest trace data is overwritten with full card	
Memory for trace			0	Bit 2: 0: Trace data is stored in RAM 1: Trace data is stored in the MMC Bit 3 – 7 not used	
Memory segment for trace function	BYTE	DBB077	50	Up to 100% but the total for trace function and log may not exceed 100%	*5.8.26*
Memory segment for logs	BYTE	DBB078	50	Up to 100% but the total for trace function and log may not exceed 100%	*5.8.27*
Trace function Recording cycle	BYTE	DBB079	1	1...n x 10 msec	*5.8.28*
		80			

Table 5-6   Allocation of DR 7

5.8.1 DR 7 - Source for the Weight Simulation

Instead of the actual weight determination, a weight simulation can be activated for test purposes. The simulated weight value can be defined through the SIMATIC interface or through the RS232 interface (SIWATOOL FTC). The weight simulation makes commissioning the scale much easier in certain situations.

5.8.2 DR 7 - Decade for Rounding the Decimal Places for the Process Values

This parameter can be used to define to how many decimal places that the (weight) process values should be rounded. This entry decouples the display of weight values which trigger the restrictions of the calibration requirements from the values that are used in the control software.

5.8.3 DR 7 - Force in Service Operation

After activating this function, the digital outputs can be forced independent of their parameter definitions. Force control is only possible in service operation and only with the SIMATIC interface.

⚠

Warning notice

Before using this function, you must ensure that the system will not reach any hazardous status caused by the forced control of the digital outputs of the SIWAREX FTC.

5.8.4 DR 7 - Process Value 1 for Fast Output to the SIMATIC CPU

The current process values can be read as data packages (data records) in the SIMATIC CPU using function block FB43. Transferring a large data record can last for several CPU cycles and puts a load on system performance.

If a process value should be transferred very quickly to the SIMATIC CPU immediately after its origination in the SIWAREX FTC, the peripheral interface of the SIWAREX FTC exists. The data is read by the FB43 cyclically and provided for the user as an output variable. In the belt scale operating mode, normally the current belt load (selection code 45) is of some importance. Selection is from the list See: *Table 5-29   Process values for allocating* log fields*.*

5.8.5 DR 7 - Process Value 2 for Fast Output to the SIMATIC CPU

Process value 2 can be defined just the same as process value 1 (see above). Normally the current Conti status (selection code 30) is of interest in the loss-in-weight scale operating mode.

5.8.6 DR 7 - Definition of the Process Alarms 0, 1, 2, 3, 4, 5, 6, 7

The process alarms can be defined with this parameter. The module group can generate process alarms in the SIMATIC CPU. The control program can react immediately to an event this way. Defining a process alarm is explained with the example of process alarm 0. The explanation also applies to process alarms 1 to 7.

If parameter value 0 is defined for process alarm 0 then no process alarms are generated.

By entering a value unequal to zero, a process alarm is allocated according to the following procedures:

Value range 1 to 255

Number of the technology message. If the defined technology error occurs then process alarm 0 is generated.

Value range 256 to 319

Number of the bit from the NAWI- or Conti status (see DR 30). If the defined status occurs then process alarm 0 is generated.

256+ 0... 31 Bit-No. NAWI status bit coming

288+ 0... 31 Bit-No. Conti status bit coming

Value range 512 to 575

Number of the bit from the NAWI- or Conti status (see DR 30). If the defined status goes then process alarm 0 is generated.

512+ 0... 31 Bit-No. NAWI status bit going

544+ 0... 31 Bit-No. Conti status bit going

5.8.7 DR 7 - S7-FB-Life Bit Monitoring Time

The SIWAREX FTC can determine whether the FB is maintaining the communication with the SIMATIC CPU by monitoring the life bit. If the FB does not respond, an operating error is output after the defined time has elapsed. Monitoring is active in RUN status of the SIMATIC_CPU.

5.8.8 DR 7 – Input Value for the Adjustment Zero (0 or 4 mA)

A weight for the range start can be defined when defining the range parameters for the analogue output.

5.8.9 DR 7 - Input Value for the End Value (20 mA)

When defining the parameters for the range for the analog output, a weight can be defined for the range end.

5.8.10 DR 7 - Replacement Value for the Analog Output with OD

A weight can be defined for the analogue output, for which a corresponding signal is output if the OD signal (Output Disable) exists.

Normally this corresponds with the SIMATIC CPU status - STOP.

5.8.11 DR 7 - Source for the Analog Output

The source for the analogue output can be defined with this parameter. The weight values from the defined source are output as current signals corresponding with the parameter definitions for start and end ranges.

The following sources are available:

0 - Control value form the SIMATIC (FB)

1 - Default value from the DR 17

2 - Gross weight

3 - Net weight

4 - Belt speed

5 - Flow rate 1

6 - Belt load

7 - Actuation signal from PID controller

5.8.12 DR 7 - Current Range for the Analog Output

The analog output can be operated with a current range 0... 20 mA or 4... 20 mA.

5.8.13   DR 7 - RS232 Printer Baudrate

If a printer is connected to the RS232 interface, the following baud rates can be defined.

1200 Bit/sec

2400 Bit/sec

4800 Bit/sec

9600 bps

5.8.14   DR 7 - RS232 Transmission Control for Printer

The transfer control parameters for the RS232 interfaces can be defined as follows:

XON/XOFF (for printer protocol only)

    0: XON/XOFF transmission control OFF

    1: XON/XOFF transmission control ON

RTS/CTS (for printer protocol only)

    0: CTS/RTS transmission control OFF

    1: CTS/RTS transmission control ON

5.8.15   DR 7 – Protocol Selection for RS 485

The following protocols can be set for the RS485 interface
- 0: No protocol
    1: SIEBERT- Protocol S11
    2: ASCII protocol
    3: SIEBERT- Protocol S102 (6-position)

5.8.16   DR 7 - Decimal Place for the Remote Display

If a display from the Siebert company is connected to the RS 485 interface,
the decimal place for the display of non-verifiable process values can be defined.

5.8.17   DR 7 – RS 485 Baudrate

The following protocols can be set for the RS485 interface:

0 = 1200 Bit/sec.

1 = 2400 Bit/sec.

2 = 4800 Bit/s

3 = 9600 Bit/s

4 = 19200 Bit/s

5.8.18 DR 7 - RS485 Character Frame

Parity:

0: even

1: odd

Number of data bits

0: 7 data bits

1: 8 data bits

Number of stop bits:

0: 1 Stop bit

1: 2 Stop bits

5.8.19 DR 7 - Definition of the Digital Outputs 1, 2, 3, 4, 5, 6, 7, 8

The definition of the digital outputs can be defined with this parameter. Assigning a bit from the pool of status bits for the scale causes the output to be active (active can be signal level 0 or 1 - see below) if the bit is set.

When assigning a number between 0 and 63, the digital output is assigned to a status bit of the scale and when assigning a number > 63, the output remains inactive.

0... 31 Bit-No. NAWI status flag

31 + 0... 31 Bit-No. Conti status flag

253   Start MW transmission digital LC

254   Stop MW transmission digital LC

255   Output always inactive

Other values not allowed

5.8.20 DR 7 - Level Definition for Digital Outputs 1 to 8

After assigning the definitions for digital outputs to a status bit, the signal that the output should have when it is active can be determined.

E.g. Digital output 1 (DO1) is determined with bit 0:

If bit 0 is 0 then DO1 is high active and if bit 0 is 1 then DO1 is low active,

If bit 1 is 0 then DO2 is high active and if bit 1 is 1 then DO2 is low active,

etc.

5.8.21 DR 7 - Replacement Values for DO 1 to 8 with Fault or Output Disable

Normally, the outputs are reset with a SIMATIC CPU STOP. This behavior corresponds with the default setting.

If it makes sense to set an output with a SIMATIC CPU STOP, you can define it with this parameter.

E.g. Digital output 1 (DO1) is determined with bit 0:

If bit 0 is 0 then DO1 is also 0 with OD signal.

If bit 0 is 1 then DO1 is 1 with OD signal.

The digital output 1 (DO2) is determined with bit 1:

If bit 1 is 0 then DO2 is also 0 with OD signal.

If bit 1 is 1 then DO2 is 1 with OD signal.

etc.

Warning notice

If an output is to be set with the SIMATIC CPU STOP then you must ensure that it does not lead to a hazardous situation.

5.8.22 DR 7 - Replacement Values for Digital Outputs with Operating Error

Normally, the outputs are reset when there is a module group fault (operating error). This behavior corresponds with the default setting.

If it makes sense to set an output with a fault, you can define it with this parameter.

E.g. Digital output 1 (DO1) is determined with bit 0:

If bit 0 is 0 then DO1 is also 0 with fault.

If bit 0 is 1 then DO1 is 1 with fault.

The digital output 1 (DO2) is determined with bit 1:

If bit 1 is 0 then DO2 is also 0 with fault.

If bit 1 is 1 then DO2 is 1 with fault.

etc.

Warning

If an output is to be set with the fault (operating error) then you must ensure that it does not lead to a hazardous situation.

5.8.23 DR 7 - Definition of Digital Inputs 0, 1, 2, 3, 4, 5, 6, 7

The definition of the digital inputs can be defined with this parameter. This can happen by allocating an instruction.

Commands:

If the signal 1 appears at the defined input then the assigned command is executed. To allocate and instruction to an input, its instruction number (1 to 255) must be entered (see Command List). By entering 0, the input is assigned as unused.

5.8.24 DR 7 - Level Definition for Digital Inputs 1 to 7

After assigning the definition for digital inputs to a command or a step-on condition, you can define which signal that the should be interpreted as active on the input.

E.g. Digital input 1 (DI1) is determined with bit 0:

If bit 0 is 0 then DI1 is high active and if bit 0 is 1 then DI1 is low active,

If bit 1 is 0 then DI2 is high active and if bit 1 is 1 then DI2 is low active,

etc.

5.8.25 DR 7 - MMC Log Overflow, MMC Trace Overflow, Target Memory for Trace Function

Bit 0 is used for defining how the logging should be performed in the verifiable MMC memory when the memory is full.

0: with full memory, the logging procedure is stopped

1: with full memory, the oldest entries are overwritten

Bit 1 is used for defining how the logging of trace data should continue if memory is full.

0: No overwriting of trace data is possible with full MMC memory

1: The oldest trace data is overwritten with full MMC memory

The trace function is described in *5.8.28*

Bit 2 defines which memory is used for recording the trace data.

0: Trace data is stored in RAM

1: Trace data is stored in the MMC

The trace function is described in *5.8.28*

5.8.26 DR 7 - Memory Segment for Trace Function

The MMC memory can be used for recording the trace data and for recording the verifiable scale logs.

The percentage of MMC memory that is available for the trace function is defined with this parameter.

Up to 100% is permitted in this definition but the total for trace function and verifiable log may not exceed 100%

The trace function is described in *5.8.28*

5.8.27 DR 7 - Memory Segment for Log

The MMC memory can be used for recording the trace data and for recording the verifiable scale logs.

The percentage of MMC memory that is available for the verifiable logs is defined with this parameter.

Up to 100% is permitted in this definition but the total for trace function and verifiable log may not exceed 100%

The trace function is described in *5.8.28*

5.8.28 DR 7 - Trace Function Recording Cycle

Every n-th measurement (n x 10 msec) is recorded. When recording to RAM, $n \geq 1$ is possible and when recording to MMC, $n \geq 5$ is possible.

The recording can be started with the "Start Recording" 70 command and stopped with "End recording" 71 command.

A recording element has a length of 64 bytes and contains several measurement values and status bits (*see Table 5-34   Combination of recording* elements).

The values that are recorded can be read with the SIWATOOL FTC and can then be exported into MS EXCEL.

If the trace function is defined as recording into cyclic memory then it can be used to construct a status recorder. The command for starting the recording can come from the SIMATIC control program and the command for stopping can also come from the control program, e.g. if you want to record and save the progress of a procedure.

5.9   DR 8 Date / Time

SIWAREX FTC has its own hardware clock. The actual date and time can be read through DR 8. The date and time can be set on the module group using this data record if required.

Procedures:

o   Setting the date and time.

o   Send the DR 8 to the scale

Name	Type	Address	Default	Range of Values / Meaning	Reference
Date / Time					
Date / Time	DATE_AND_TIME, DT	DBD000	01.01.01 00:00:00 000 Mo	Date&Time in SIMATIC-Format	
		4			

Table 5-7   Allocation of DR 8

5.10 DR 9 Info on Module

No entries can be made in DR 9. The data record uses the information on the inner life of the module.

Name	Type	Address	Default	Range of Values / Meaning	Reference
Info on module					
CRC Checksum	DWORD	DBW000	0	-	
Length of firmware in bytes	DWORD	DBW004	0	-	
Product Info	STRING [26]	DBB008	0	Siemens AG Serial number of the module	
Module name	STRING [10]	DBB036	SIWAREX XX		
Application	STRING [4][8]	DBB048	„CONT" „NAWI" „xxxx" „xxxx" „xxxx" „xxxx" „xxxx" „xxxx"	Application identification	
File name	STRING [20]	DBB082	0		
Version recognition	BYTE [4]	DBB104	0	Byte 0 (ASCII) <u>Before delivery approval</u> B = Laboratory status P = Pilot R = Release S = Special status <u>After delivery approval</u> V = Version K = Correction status	
Function status				Byte 1 function status xx (important function changes or technical changes for the calibration 0 ... 99)	
Data structure version				Byte 2 Version DR structure yy (indicates changes in the data record structure) 0 ... 99	
Correction status				Byte 3 correction status zz (small changes or error clean-up) 0 ... 99	
Creation date	STRING [10]	DBB108	0		
Creation time	STRING [8]	DBB120	0		

Name	Type	Address	Default	Range of Values / Meaning	Reference
Boot loader version	WORD	DBW130	0		
Scale type	STRING [4]	DBB132	„CONT„ or „NAWI"		
Reserved	WORD	DBW138	0	Reserved	
		140			

Table 5-8   Allocation of DR 9

5.10.1 DR 9 - Info on Module

The information on the SIWAREX FTC module is for the purpose of identifying the module in the manufacturer's plant (e.g. for repairs). This information has no influence on user operation.

5.11 DR 10 Loss-in-weight Scale II

In DR 10, the parameters are defined for filtering and monitoring the flow rate value.

- Change the parameter if necessary.

- Send DR 10 to the scale

Name	Type	Address	Default	Range of Values / Meaning	Reference
Low-pass limit frequency	BYTE	DBB000	6	Flow rate measurement Critically damped low-pass filter 0: No filter 1: fg = 20Hz 2: fg = 10Hz 3: fg = 5Hz 4: fg = 2Hz 5: fg = 1Hz 6: fg = 0.5Hz 7: fg = 0.2Hz 8: fg = 0.1Hz 9: fg = 0.05Hz	*5.11.1*
Reserve_12_2	BYTE	DBB001	0	Reserved	
Reserve_12_4	WORD	DBW002	0	Reserved	
Filter depth - Average value filter	INT	DBW004	10	Flow rate measurement Filter depth - Average value filter [0 .. 500] 0, 1: Average value filter deactivated >1: Filter depth	*5.11.2*
Reserved	INT	DBW006	0	Reserved	
Flow rate min. in 0.01 % related to setpoint	INT	DBW008	9500	0: no monitoring > 0 Minimum flow rate in % from setpoint If the value is undercut, a status message is output (Conti-Status flags). Also not effective in controlled operation, the setpoint from DR 20 creates a criteria.	*5.11.3*

Name	Type	Address	Default	Range of Values / Meaning	Reference
Flow rate min. in 0.01 % related to setpoint	INT	DBW010	10500	0: no monitoring > 100: Maximum flow rate in 0.01 % of the setpoint If the value is exceeded, a status message is output (Conti-Status flags). Also not effective in controlled operation, the setpoint from DR 20 creates a criteria.	*5.11.4*
Limit value for max. flow rate change	INT	DBW012	0	Limit value for monitoring the maximum change in flow rate in 0.01 % of the nominal flow rate per second 0: Monitoring switched off	*5.11.5*
Reserved	INT	DBW014	0	Reserved	
Min. vol. time	TIME	DBW016	5000	Minimum time for the volumetric operation after automatic shut-off in volumetric operation because of flow rate faults 0: No minimum time >100: Minimum time	*5.11.6*
Reserve_10_20		DBW020	0	Reserved	
Reserve_10_22	INT	DBW022	0	Reserved	
		24			

Table 5-9   Allocation of DR 10

5.11.1   DR 10 - Flow rate Measurement - Limit Frequency of the Low-pass Filter

Defining the limit frequency is critically important for suppressing interference. The "speed" of the flow rate calculation reaction to the change in the measured value is determined by specifying the limit frequency.

A value of e.g. 2 Hz leads to a relatively quick flow rate calculation reaction to a weight change, a value of e.g. 0.5 Hz makes the scale "sluggish".

5.11.2   DR 10 – Flow rate Measurement – Average Value Filter Depth

The average value filter is used to settle the weight value against interference. The weight value is based on the average of the n weight values that the SIWAREX FTC calculates every 10 msec, e.g. if n=10, 10 values are used for calculating the average value. Every 10 ms, the oldest value drops out of the calculation and the newest is considered in the calculation.

5.11.3   DR 10 – Flow rate min. in Relation to Setpoint

The definition determines the lower tolerance band for the flow rate value in relation to the setpoint. Undercutting the value can be used (see DR 12 – PID parameters) for switching to volumetric operation. The definition is done in 0.01 %.

5.11.4   DR 10 – Flow rate max. in Relation to Setpoint

The definition determines the upper tolerance band for the flow rate value in relation to the setpoint. Exceeding the value can be used (see also DR 12 – PID parameters) for switching to volumetric operation. The definition is done in 0.01 %.

5.11.5 DR 10 – Max. Flow rate Change

The definition determines the limit value for the maximum change in flow rate. The definition is done in 0.01 % of the nominal flow rate per second. Exceeding the value can be used (see also DR 12 – PID parameters) for switching to volumetric operation.

5.11.6 DR 10 – Min. time Volumetric

The definition of the minimum time for the volumetric operation after automatic shut-off in volumetric operation because of flow rate faults If the fault no longer exists before this time has elapsed, the volumetric operation is retained for this minimum time.

The definition is made in ms.

5.12 DR 11 Device Characteristic Curve for the Loss-in-weight Scale

The characteristic curve of the dosing device is stored in DR 11. The characteristic curve describes the dependency of the flow rate on the actuating signal. Ideally, it is assumed that the current fill status is constant in the dosing container (e.g. fill quantity at approx. 100%). The characteristic curve should be recorded one time during commissioning.

Determining the characteristic curve is done similar to the scale adjustment. First the actuating signals, for which the flow rate is to be determined, are defined. Acceptance for the operating point is done for the actuating signal with an instruction or the current flow rate can be entered directly in the data record. At least one operating point must be defined. If necessary, the characteristic curve can be determined for different materials and stored in the controller. When materials are switched, the respective DR 11 is sent to the scale. As actuating signal, a value that normally corresponds with the control current of the analog output is entered. The analog output is initialized in DR 7:

Initial value 0 corresponds with current 0 mA

End value 20.000 corresponds with end current of 20 mA

The actuating signal can also be output via Profibus (SIMATIC) to a connected drive.

Name	Type	Address	Default	Range of Values / Meaning	Reference
Minimum actuating signal	REAL	DBD000	0	Minimum actuating signal (normally output current) for the operation of the dosing device (0…20.000mA). Definitions greater than 0 and less than the defined limit value are raised to the minimum actuating signal.	*5.12.1*
Raise limit	REAL	DBD004	0	Raise limit for actuating signal per second.	*5.12.2*
Drop limit	REAL	DBD008	0	Drop limit for actuating signal per second.	*5.12.3*
Operating point 1 actuating signal	REAL	DBD012	20,000	Output actuating signal e (normally current 0...20,000)	*5.12.4*
Operating point 1 Flowrate	REAL	DBD016	100	Achieved flow rate	*5.12.5*
Operating point 2 actuating signal	REAL	DBD020	0	Output actuating signal (normally current 0...20,000)	*5.12.6*

Name	Type	Address	Default	Range of Values / Meaning	Reference
Operating point 2 Flowrate	REAL	DBD024	0	Achieved flow rate	*5.12.7*
Operating point 3 actuating signal	REAL	DBD028	0	Output actuating signal (normally current 0...20,000)	*5.12.8*
Operating point 3 Flowrate	REAL	DBD032	0	Achieved flow rate	*5.12.9*
Operating point 4 actuating signal	REAL	DBD036	0	Output actuating signal (normally current 0...20,000)	*5.12.10*
Operating point 4 Flowrate	REAL	DBD040	0	Achieved flow rate	*5.12.11*
		44			

Table 5-10 Allocation of DR 11

5.12.1 DR 11 – Minimum Actuation signal

The minimum actuation signal is defined with this parameter (of nominal). If a smaller value (less than 0) than the minimum value results from the actuation signal calculation then the minimum value is output.

5.12.2 DR 11 – Raise Limit for the Actuation signal

Too great an increase in the actuation signal is prevented with this parameter. The definition is done in manipulated value change per second.

5.12.3 DR 11 – Drop Limit for the Actuation signal

Too great a decrease in the actuation signal is prevented with this parameter. The definition is done in manipulated value change per second.

5.12.4 DR 11 – Operating Point 1 Actuation signal

The setpoint can be defined with the setpoint definition. The respective flow rate is then measured in volumetric operation and fixed with command 171.

5.12.5 DR 11 – Operating Point 1 Flow rate

The flow rate value stored for the actuation signal.

5.12.6 DR 11 – Operating Point 2 Actuation signal

The setpoint can be defined with the setpoint definition. The respective flow rate is then measured in volumetric operation and fixed with command 172.

5.12.7 DR 11 – Operating Point 2 Flow rate

The flow rate value stored for the actuation signal.

5.12.8 DR 11 – Operating Point 3 Actuation signal

The setpoint can be defined with the setpoint definition. The respective flow rate is then measured in volumetric operation and fixed with command 173.

5.12.9 DR 11 – Operating Point 3 Flow rate

The flow rate value stored for the actuation signal.

5.12.10 DR 11 – Operating Point 4 Actuation signal

The setpoint can be defined with the setpoint definition. The respective flow rate is then measured in volumetric operation and fixed with command 174.

5.12.11 DR 11 – Operating Point 4 Flow rate

The flow rate value stored for the actuation signal.

5.13 DR 12 PID Controller Parameter for Loss-in-weight Scale

Te controller parameters for the PID controller are compiled in DR 12. Setting the controller parameter is decisive for the quality of the dosing. In the first step, the integration time Ti and the amplification factor Kp min. and Kp max. (Kp min. can also be the same as Kp max.) must be defined. For verifying the controller results, the trace function that is integrated in SIWAREX FTC can be used. In this case, all of the most important data is recorded in the defined time-interval and can then be read. In the second step, the control parameters can be adjusted depending on the achieved dosing results.

Procedures:

o   Setting controller parameters

o   Send DR 12 to the SIWAREX FTC

o   Evaluating dosing results

o   Testing other controller settings.

Name	Type	Address	Default	Range of Values / Meaning	Reference
Proportional action factor Kp min.	INT	DBW000	30	Proportional action factor Kp (controller amplification) with two decimal place, e.g. 30 means 0,3 (effective with control deviation =0)	*5.13.1*
Proportional action factor Kp max.	INT	DBW002	110	Proportional action factor Kp (controller amplification) with two decimal place, e.g. 110 means 1,10 (effective with max. control deviation)	*5.13.2*
Integration time Ti	TIME	DBD004	7000	Integration time, determines the behavior of the Integrator (if 0, then I-part is switched off)	*5.13.3*
Differentiation time Tv	TIME	DBD008	0	Differentiation time, determines the behavior of the differentiator (if 0, the D-part is switched off). In the loss-in-weight scale, the D-part of the controller is always 0.	*5.13.4*
Controller activation	BYTE	DBB012	1	0 = Controller off, 1 = Activate control Other values not permitted	*5.13.5*
Reserved	BYTE	DBB013	0	Reserved	
Max. control difference	INT	DBW014	400	Control difference, with which the maximum proportional action factor will be effective	*5.13.6*

Name	Type	Address	Default	Range of Values / Meaning	Reference
Start-up time	TIME	DBD016	10000	The start-up time in volumetric operation until switching into controlled operation.	*5.13.7*
Minimum setpoint	INT	DBW020	2000	Minimum setpoint in 0.01 % of the nominal flow rate. Setpoints under the limit value are not accepted.	*5.13.8*
Dead zone PID controller	INT	DBW022	0	Symmetrical dead zone in control difference for the controller in 0.01 % of the nominal flow rate. No readjusting control is done within the dead zone.	*5.13.9*
Min. time gravimetric	TIME	DBD024	1000	Minimum time for gravimetr. operation ("Tolerated time"), is started after switching to gravimetr. operation. As long as this time is running, no switch to volumetr. operation is made because of the flow rate monitoring.	*5.13.10*
Max. time control difference	TIME	DBD028	10000	Maximum time for violating the limit value for the max. control difference. 0=Monitoring switched off. Upon activation: Status bit and technology message.	*5.13.11*
Setpoint Raise limit	INT	DBW032	0	Setpoint raise limit Definition in 0.01 % of the nominal flow rate per second 0: Limitation switched off	*5.13.12*
Setpoint Drop limit	INT	DBW034	0	Setpoint drop limit Definition in 0.01 % of the nominal flow rate per second 0: Limitation switched off	*5.13.13*
Volumetric upon flow rate fault	BYTE	DBB036	Bit 2 =1 Bit 3 =1	*Switch to volumetric operation upon* *Bit 0* : Undercut flow rate min. (DR 6) *Bit 1* : Exceeded flow rate max. (DR 6) *Bit 2* : Undercut flow rate min. (Set) *Bit 3* : Exceeded flow rate max. (Set) *Bit 4* : Exceeded max. flow rate change speed *Bit 5 – 7 unused* Switch back to gravimetric operation depends on the cause of the fault disappearing. If more faults occur, the volumetric operation continues as long as a fault exists.	*5.13.14*
Jerk-free switching	BYTE	DBB37	0	Jerk-free switch to volumetric operation: *When switching to volumetric operation* *Bit 0* : 0 = Switch gravim -> volum. should be done smoothly 1 = switch by characteristic curve when undercutting the flow rate min. (DR 6) *Bit 1* : 0 = Switch gravim -> volum. should be done smoothly 1 = switch by characteristic curve when undercutting the flow rate max. (DR 6) *Bit 2* : 0 = Switch gravim -> volum. should be done smoothly 1 = switch by characteristic curve when undercutting the flow rate min. (Set) *Bit 3* : 0 = Switch gravim -> volum. should be done smoothly 1 = switch by characteristic curve when undercutting the flow rate max. (Set)	*5.13.15*

Name	Type	Address	Default	Range of Values / Meaning	Reference
				Bit 4 : 0 = Switch gravim -> volum. should be done smoothly 1 = switch by characteristic curve when exceeding the max. change speed of the flow rate *Bit 5 – 7 unused* Switch back to gravimetric operation depends on the cause of the fault disappearing. If more faults occur, the volumetric operation continues as long as a fault exists.	
Reserved	INT	DBW038	0	Reserved	
Monitoring time for the volumetric operation	TIME	DBD040	15000	Monitoring time for the duration of volumetric operation. If no switch has been made back to gravimetric operation within this time, a status bit and a technology message are output. The monitoring also works when switching into volumetric operation because of a command. The monitoring does not work during refilling.	*5.13.16*

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Table 5-11 Allocation of DR 12

5.13.1 DR 12 – Proportional Action Factor Kp min.

The proportional action factor can be reset during operation depending on the control difference. With a control difference of 0, the defined Kp min. is effective and increases linearly to Kp max. when achieving the max. control deviation. The definition Kp min. = Kp max. is permitted.

5.13.2 DR 12 – Proportional Action Factor Kp max.

The proportional action factor can be reset during operation depending on the control difference. With a control difference of 0, the defined Kp min. is effective and increases linearly to Kp max. when achieving the max. control deviation.

5.13.3 DR 12 – Integration Time Ti

Integration time, determines the behavior of the Integrator (if 0, then I-part is switched off). The definition is made in ms.

5.13.4 DR 12 – Differentiation Time Td

Differentiation time, determines the behavior of the differentiator (if 0, the D-part is switched off). In the loss-in-weight scale, the D-part of the controller is always 0.

5.13.5 DR 12 – Controller Activation

The PID controller cannot be switched off. In this case, SIWAREX FTC functions as a differential scale with active flow rate measurement.

5.13.6   DR 12 – Maximum Control Difference

The max. control difference is a limit value in =,01 % of set value, by which the maximum proportional action factor Kp max is effective. If the limit value is violated, the monitoring time "Time Control difference max." is also started. If the control difference remains greater than the limit value after this monitoring time is elapsed, a technology message and the respective status information is output.

5.13.7   DR 12 – Start-up Time

The start-up time (ms) determines the duration of volumetric mode until switching to gravimetric mode in automatic operation.

5.13.8   DR 12 – Minimum Setpoint

Minimum setpoint in 0.01 % of the nominal flow rate. Setpoints under the limit value are not accepted, to prevent an incorrect setpoint definition.

5.13.9   DR 12 – Dead Zone for the PID Controller

Symmetrical dead zone in control difference for the controller in 0.01 % of the nominal flow rate. No readjusting control occurs within the dead zone, i.e. the actuation signal is not readjusted.

5.13.10 DR 12 – Minimum Time for after switching from vol. to gravimetric

Minimum time for gravimetric operation, is started after switching from volumetric to gravimetric mode. As long as the time is running, no switch is made to volumetric mode because of flow rate monitoring.

5.13.11 DR 12 – Max. Time for max. Control Deviation

Maximum time for exceeding the limit value for the max. control difference. After this time has elapsed, a status information and a technology message are created.

With definition =0, the monitoring is switched off.

5.13.12 DR 12 – Raise Limit for the Setpoint

When making the setpoint definition, a check is performed to ensure that the setpoint is not raised too high. If the increase in the setpoint is too great, a ramp function is activated, which limits the increase to the defined value. The definition is done in 0.01 % of the nominal flow rate per second.

With definition =0, the monitoring is switched off.

5.13.13 DR 12 – Drop Limit for the Setpoint

When making the setpoint definition, a check is performed to ensure that the setpoint is not decreased too much. If the decrease in the setpoint is too great, a ramp function is activated, which limits the decrease to the defined value. The definition is done in 0.01 % of the nominal flow rate per second.

With definition =0, the monitoring is switched off.

5.13.14 DR 12 – Switching to Volumetric Operation upon Flow rate Fault

Switching into volumetric operation can be defined for activation of various limit values:

Undercut flow rate min. (DR 6)

Exceeding though-put max. (DR 6)

Undercutting flow rate min. (in relation to the setpoint)

Exceeding the flow rate max. (in relation to the setpoint)

Exceeding the max. flow rate change speed

Switching to volumetric mode can be done according to the material characteristic curve or jerk-free. Jerk-free means that the current actuation signal will not be influenced by the controller.

Switching back into gravimetric mode is done if the respective limit value is no longer exceeded.

If more faults occur, the volumetric operation continues as long as a fault still exists.

5.13.15 DR 12 – Jerk-free Switching to Volumetric Mode

If switching to volumetric operation is defined for a certain flow rate fault, defining whether the switch to volumetric operation is done according to a material characteristic curve (a small change in the actuation signal is possible for switching) or jerk-free is possible. The jerk-free switching means fixing the current actuation signal, corrected in cases with influence on the material characteristic curve.

5.13.16 DR 12 – Monitoring Time for Volumetric Mode

Monitoring time for the duration of volumetric operation. If no switch has been made back to gravimetric operation within this time, a status bit and a technology message are output. The monitoring does not work during refilling.

The monitoring also works when switching into volumetric operation because of a command. With definition =0, the monitoring is switched off.

5.14 DR 13 Material Characteristic Curve

The characteristic curve of the dosing device was stored in DR 11.
The characteristic curve describes the dependency of the flow rate on the actuating signal. Ideally, it is assumed that the current weight is constant in the dosing container (e.g. fill quantity approx. 100 %).

The second characteristic curve - the material characteristic curve - in DR 13 describes the influence of the current fill quantity on the actuation signal.

Determining the characteristic curve can be done in volumetric or gravimetric mode. A command can be activated at the respective fill level to calculate the correction factor. The characteristic curve should be determined with the typical setpoint. The individual points on the characteristic curve can be corrected again so that the characteristic curve corresponds with the current material characteristics.

If necessary, the characteristic curve can be determined for different materials and stored in the controller. When switching materials, the DR 13 is sent to the scale.

Name	Type	Address	Default	Range of Values / Meaning	Reference
Reserved	REAL	DBD000	0	Reserved	
Factor 10 % Fill quantity	INT	DBW004	10400	Fill quantity factor at 10 % fill quantity. Definition in 0.0001.	*5.14.1*
Factor 30 % Fill quantity	INT	DBW006	10300	Fill quantity factor at 30 % fill quantity. Definition in 0.0001.	*5.14.1*
Factor 50 % Fill quantity	INT	DBW008	10200	Fill quantity factor at 50 % fill quantity. Definition in 0.0001.	*5.14.1*
Factor 70 % Fill quantity	INT	DBW010	10100	Fill quantity factor at 70 % fill quantity. Definition in 0.01.	*5.14.1*
Factor 90 % Fill quantity	INT	DBW012	10000	Fill quantity factor at 90 % fill quantity. Definition in 0.0001.	*5.14.1*
Reserved	INT	DBW014	0	Reserved	

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Table 5-12   Allocation of DR 13

5.14.1 DR 13 – Factor for 10 % (30 %, 50 %, 70 %, 90 %) Fill Quantity

The factor is determined by activating the respective command. By reading DR 13 from the SIWAREX FTC, the current factors can be viewed. The determination is permitted within the range of +/- 10 %, otherwise the command is rejected.
The definition is done in 0.0001, e.g. 10232 means a factor of 1.0232.

5.15 DR 15 Tare Entry

DR 15 is used for external specification of the tare weight.

Procedures:

o   Enter tare weight

o   Send the DR 15 to the scale

o   Activate the command "Accept tare entry (24)"

Name	Type	Address	Default	Range of Values / Meaning	Reference
Tare entry					
Tare entry	REAL	DBD000	0	External tare entry (Preset Tare).	*5.15.1*

4

Table 5-13   Allocation of DR 15

5.15.1 DR 15 - Tare Entry

DR 15 is used for external specification of the tare weight. Once specified with DR 15, the tare value is not yet activated. The transfer to tare memory of the SIWAREX FTC is then performed with instruction „Accept tare entry"
(see command code *24*).

5.16 DR 16 Weight simulation entry

If the DR 16 was defined as the source for the weight simulation (see DR 7 *Source for the weight* simulation), defining a weight value through DR 16 will deactivate the measurement input of the SIWAREX FTC and the defined value is "simulated" as the weight value.

Procedures:

o Check in DR 7, whether DR 16 has been defined as the source for the weight simulation

o Enter a value to be simulated

o Send the DR 16 to the scale

Name	Type	Address	Default	Range of Values / Meaning	Reference
Simulation					
Weight simulation entry	REAL	DBD000	0	Default value for weight simulation (is used instead of the gross weight e.g. for test)	*5.16.1*
		4			

Table 5-14   Allocation of DR 16

5.16.1 DR 16 - Weight Simulation Definition

If the DR 16 was defined as the source for the weight simulation (see DR 7 *Source for the weight* simulation), defining a weight value through DR 16 will deactivate the measurement input of the SIWAREX FTC and the defined value is "simulated" as the weight value. This way, plant components (including filter settings) can be tested even though the scale is not set up yet.

5.17 DR 17 Analog Output Control

If DR 17 has been defined as the source for the analogue output (see DR 7 *Source for the analog* output) then sending a weight value will output a corresponding output stream on the analogue output.

Procedures:

o Check in DR 7, whether DR 17 was defined as the source for the analog output.

o Check the parameter definitions of the analog output (see DR 7 *Weight for zero point* and following parameters).

o Enter a value in DR 17

o Send DR 17 to the scale

Name	Type	Address	Default	Range of Values / Meaning	Reference
Analog output					
Ext. definition for analog output	REAL	DBD000	0	Analogue output control with a default value.	*5.17.1*
		4			

Table 5-15   Allocation of DR 17

5.17.1 DR 17 - Ext. Definition for Analog Output

If the DR 17 has been defined as the source for controlling the analogue output (see DR 7 *DR 7 - Source for the*) then the analogue output is controlled with the defined value with a definition of a weight value on DR 17. This way, the analogue output can be set continuously from the SIMATIC control program.

5.18 DR 18 Control Display for Non-automatic Weighing Instrument

A value can be preset using DR 18 and this value can be displayed on the external display. This way, the external display (Siebert) can be used for displaying any value that is calculated in SIMATIC. The display can only be used in operating mode "Non-automatic weighing instrument".

Procedures:

o   Enter a value in DR 18

o   Send the DR 18 to the scale

Name	Type	Address	Default	Range of Values / Meaning	Reference
Display					
Ext. definition for remote display	REAL	DBD000	0	Remote display control (Siebert S102) with a default value	
		4			

Table 5-16   Allocation of DR 18

5.19 DR 20 Flow rate Setpoint

The definition of a setpoint has an effect in manual operation as well as in automatic operation. A new setpoint can be defined during operation. In addition, the length of time that volumetric mode should run with a setpoint change can also be defined.

Procedures:

o   Defining set weight, possibly correcting vol. time

o   Send DR 20 to the scale

Name	Type	Address	Default	Range of Values / Meaning	Reference
Setpoint value	REAL	DBD000	0	Set value in WU/s or WU/h. The current setpoint definition must be greater than the min. setpoint and must not be greater than 1.5 times the nominal feed rate.	*5.19.1*
Setpoint in 0.01 %	INT	DBW004	5000	Setpoint in % of the nominal flow rate. The current setpoint definition must be greater than the min. setpoint and must not be greater than 1.5 times the nominal feed rate.	*5.19.2*

Name	Type	Address	Default	Range of Values / Meaning	Reference
Setpoint additional parameters	BYTE	DBB006	1	The definition =0 means that the new setpoint should be leveled out gravimetrically. The definition =1 means that the new setpoint should be started by switching into volumetric mode.	5.19.3
Reserved	BYTE	DBB007	0		
Time for volumetric	TIME	DBD008	10000	The duration of the volumetric start-up can also be determined with the setpoint definition.	5.19.4
		12			

Table 5-17   Allocation of DR 20

5.19.1 DR 20 – Flow rate Setpoint

Set value in WU/s or WU/h. The current setpoint definition must be greater than the min. setpoint and must not be greater than 1.5 times the nominal feed rate. The definition is only accepted if the second setpoint definition is pre-defined in % with 0.

5.19.2 DR 20 – Flow rate Setpoint in %

Setpoint in 0.01 % of the nominal flow rate. The current setpoint definition must be greater than the min. setpoint and must not be greater than 1.5 times the nominal feed rate. The definition is only accepted if the second definition of the set value in WU/s or WU/h% is pre-defined with 0.

5.19.3 DR 20 – Additional Parameter Volumetric/Gravimetric

Whether the switch to volumetric operation should be done can be defined with the take-over of the setpoint during operation. The definition =0 means that the new setpoint should be leveled out gravimetrically. The definition =1 means that the new setpoint should be started by switching into volumetric mode. In the following parameter, the volumetric time can be defined depending on the setpoint size.

5.19.4 DR 20 – Time Volumetric

If the switch to volumetric operation is defined in the acceptance of the new setpoint, the duration for volumetric operation can be defined. The definition is made in ms.

5.20 DR 30 Process Status 1 (NAWI, Force measurement, Belt scale)

The process values and the expanded process values can be used to monitor the current states and data in the non-automatic weighing instrument. Observing the selected data is very helpful in test operation for optimizing parameters. The status can also be monitored if the SIWAREX FTC is controlled by the SIMATIC CPU.

The NAWI- and Conti-status flags are simultaneously updated in DR 32 as well - process status loss-in-weight scale.

Name	Type	Address	Range of Values / Meaning	Reference
NAWI status flags	DINT	DBD000	Status bits (see below)	*5.20.1*
Conti-Status flags	DINT	DBD004	Status bits (see below)	*5.20.2*
Gross process value	REAL	DBD008	Gross weight	*5.20.3*
Net process value	REAL	DBD012	Net weight	*5.20.4*
Tare process value	REAL	DBD016	Tare weight	*5.20.5*
G/N weight	REAL	DBD020	Verifiable B/N weight value for display and logging purposes (Basis for DR ASCII weight value)	*5.20.6*
B/N weight_x10	REAL	DBD024	Verifiable B/N weight value with 10 fold resolution (Basis for DR ASCII weight value)	*5.20.7*
Tare weight	REAL	DBD028	Verifiable tare weight value for display and logging purposes	
Belt speed	REAL	DBD032	Current speed [LU/s]	
Belt speed in %	INT	DBW036	Belt speed in % related to the nominal speed	
Belt load in %	INT	DBW038	Belt load in relation with the nominal belt load	
Nominal belt load	REAL	DBD040	Nominal belt load [WU/LU] calculated from nominal flowrate and nominal speed	
Belt load	REAL	DBD044	Current belt load [WU/LU]	
Flowrate 1	REAL	DBD048	Flowrate 1 [WU./s]	*5.20.8*
Flowrate 2	REAL	DBD052	Flowrate 2 [WU/h]	*5.20.9*
Flowrate 3	REAL	DBD056	Flowrate 3 [LWU/h]	*5.20.10*
Flowrate in %	INT	DBW060	In reference to the nominal flowrate	*5.20.11*
Operating hours counter	INT	DBW062	(is not reset, begins after overflow at 0)	*5.20.12*
Pulse counter value	DINT	DBD064	Pulse counter value in reference to the set measuring time	

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Table 5-18   Allocation of DR 30

5.20.1 DR 30 - NAWI Status Bits

Bit No.	Name	Range of Values / Meaning	Reference
0	WR1	Weight within weighing range 1	
1	WR2	Weight is in weighing range 2	
2	WR3	Weight is in weighing range 3	
3	Limit 1	Limit value 1 activated	
4	Limit 2	Limit value 2 activated	
5	Limit 3	Limit value 3 activated	
6	Tared (NET)	Set if the scale is tared	
7	Preset Tare	Set if the scale was tared with tare input	
8	Max+9e	Set if maximum load is exceeded by 9 e	
9	¼d zero	Set if the weight does not exceed ¼ d	
10	Waiting for stand-still	Set if the scale waits for a stand-still after the weighing start.	
11	Standstill	Standstill exists	
12	Scale adjusted	Set if the scale is adjusted (calibrated)	
13	Error on DI	Set if a command could not be executed on a digital input	
14	Simulation active	Set if the weight simulation has been activated	
15	Service operation active	Set if service operation has been activated	
16	Printing log	The log is being printed.	
17	RS232-Print not possible	The log cannot be printed.	
18	MMC inserted	The MMC is in position	
19	MMC ready	The MMC is formatted and ready for recording	

Bit No.	Name	Range of Values / Meaning	Reference
20	MMC-trace ready	The MMC is ready for the trace function	
21	MMC-log ready	The MMC is ready for logging	
22	Trace active	The trace function is activated	
23	Reserved	Reserved	
24	Reserved	Reserved	
25	Empty message	Scale in empty range	
26	Calibration data protection	The switch for protecting the calibration data is switched on	
27	Reserved	Reserved	
28	Reserved	Reserved	
29	Reserved	Reserved	
30	Standalone operation activated	1, if standalone operation has been activated	
31	Operating error	At least one operating error (fault) exists	

Table 5-19   DR 30 - NAWI status bits

5.20.2 DR 30 - Conti-Status Flags

Bit No.	Name	Range of Values / Meaning	Reference
0	Belt control status	0: Belt control OFF 1: Belt control ON	
1	Totalizing status	1: Recording and totalizing of the dosing quantity is active 0: Dosing quantity will not be recorded	
2	Min. belt loading exceeded	Belt loading min has been exceeded (is returned with a delay in cases)	
3	Belt loading max. exceeded	Belt max has been exceeded (is indicated with a delay in cases)	
4	Min. belt speed exceeded	Min. belt speed exceeded (returned with a delay in cases)	
5	Max. belt speed exceeded	Max. belt speed exceeded (is indicated with a delay in cases)	
6	Min. pulse undercut	1 = Pulse encoder generates less than 2 pulses / second 0 = Pulse encoder generates a minimum of 2 pulses / second	
7	Min. belt load exceeded for totalizing	1= Min. belt load exceeded for totalizing, the totalizing can be performed	
8	Scale in dynamic zero setting range	=1, if the scale is in the dynamic zero setting range	
9	Dynamic adjustment or zero setting procedure is running	=1, if dynamic adjustment or zero setting procedure is running	
10	Dyn. zero setting aborted	1: If dynamic zero setting could not be completed or was ended early because of leaving the zero setting range	
11	Volumetric operation	Volumetric operation in automatic mode.	
12	Filling	Filling activated.	
13	> max. flow rate +/-	Change speed of flow rate too great	
14	> min. flow rate	Minimum flow rate achieved	
15	> max. flow rate	Maximum flow rate exceeded (in relation to the nominal flow rate or setpoint)	
16	Pulse 1 external	Pulses f. external summator 1	
17	Pulse 2 external	Pulses f. External summator 2	
18	Gravimetric operation	Gravimetric mode in automatic operation.	
19	Emptying activated	The command for emptying was activated. Scale will not refill, the container will empty until the limit value "Empty range" from DR 4.	
20	Max. control difference	Maximum control difference exists.	
21	Reserved	Reserved	
22	Max. filling time	The maximum filling time has been achieved.	
23	Max. time max. control difference	The maximum control difference is at the max. defined monitoring time.	
24	Max. vol. time	The volumetric mode is active longer than the defined max. monitoring time.	
25	Reserved	Reserved	

Bit No.	Name	Range of Values / Meaning	Reference
26	Status change	Status change running. The information is set with the following events: - Start-up in volumetric operation - Setpoint change in volumetric operation - Switch to grav. operation. For the time of the monitoring delay (DR 12) - defined switch to volumetr. operation upon flow rate fault	
27	Reserved	Reserved	
28	Dosing active	Switch on material discharge organ	
29	Loading active	Loading (belt scale) is activated.	
30	Loading complete	Loading (belt scale) is complete.	
31	Reserved	Reserved	

Table 5-20   DR 30 - Conti-Status flags

5.20.3 DR 30 - Gross Process Value

The current gross weight value. Dimension: Weight Unit [WU].

5.20.4 DR 30 - Net Process Value

The current net weight value. Dimension: Weight Unit [WU].

5.20.5 DR 30 - Tare Process Value

The current tare weight value. Dimension: Weight Unit [WU].

5.20.6 DR 30 - G/N Weight

The momentary weight value which will be used for the main display. Dimension: Weight Unit [WU].

5.20.7 DR 30 - G/N Weight_x10

The momentary weight value in increased resolution which will be used for the main display. Dimension: Weight Unit [WU].

5.20.8 DR 30 – Flowrate 1

The current flowrate 1 is output in the dimension Weight unit / sec [WU/s].

5.20.9 DR 30 – Flowrate 2

The current flowrate 2 is output in the dimension Weight unit/h [WU/h].

5.20.10 DR 30 – Flowrate 3

The current flowrate 3 is output in the dimension Large Weight Unit / h [LWU/h].

5.20.11 DR 30 – Flowrate in % of the Nominal Flowrate

The current flowrate is output in % of the nominal flowrate.

5.20.12 DR 30 – Operating Hours Counter

The operating hours counter records the number of hours that the SIWAREX FTC is supplied with 24V voltage.

5.21 DR 31 Process Status 2 (all operating modes)

The user or the service technician can retrieve information on the current status of the scale in the expanded process values.

Name	Type	Address	Range of Values / Meaning	Reference
Unfiltered digital value	DINT	DBD000	Unfiltered digital value from ADU	*5.21.1*
Filtered digital value	DINT	DBD004	Filtered digital value from filter level 1 for NAWI-Fct.	*5.21.2*
Reserve33_1	DINT	DBD008	Reserved	
Operating error	DWORD	DBD012	Error word Operating error (for test dept., Bit-No. = Error code –1)	*5.21.3*
curr. Date/Time	DATE_AND_TIME	DBD016	curr. Date/Time	*5.21.4*
Current temperature	INT	DBW024	Current inner-temperature of the module [0.1°C]. If no temperature value is available: -100.0°C.	*5.21.5*
DE status	BYTE	DBB026	Current status of the digital inputs (without pulse input)	*5.21.6*
Reserve_31_27	BYTE	DBB027	Reserve 1	
Impedance reference value	INT	DBW028	Impedance reference value [0.1Ω]	*5.21.7*
Impedance value	INT	DBW030	Impedance actual value [0.1Ω]	*5.21.8*

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Table 5-21   Allocation of DR 32

5.21.1 DR 31 – Unfiltered Digital Value

The current number of digits from the AD converter is output without being filtered.

5.21.2 DR 31 – Unfiltered Digital Value

The current number of digits from the AD converter is output after the filtering.

5.21.3 DR 31 – Operating Error

The current existing operating errors (fault) are output as double word.

5.21.4 DR 31 – Date Time

The current date and time from the internal clock of the SIWAREX FTC.

5.21.5 DR 31 – Max. Temperature

The maximum occurring module temperature (slave pointer).

5.21.6 DR 31 – Status of Digital Inputs

The current signal level on the digital inputs 1...6. The status of the input for the pulse counter is not indicated.

5.21.7 DR 31 - Impedance Reference Value

The total resistance of the load cell(s) which is measured upon commissioning. Measurement is initiated with an instruction.

5.21.8 DR 31 – Impedance Actual Value

Current measures total resistance of the load cell(s). Measurement is initiated with an instruction.

5.22 DR 32 Process Status of Loss-in-weight Scale

The user or the service technician can retrieve information on the current status of the scale in the expanded process values.

Name	Type	Address	Range of Values / Meaning	Reference
NAWI status flags	DINT	DBD000	Status bits (see DR 30)	*5.20.1*
Conti-Status flags	DINT	DBD004	Status bits (see DR 30)	*5.20.2*
Gross process value	REAL	DBD008	Gross weight	*5.22.2*
Net process value	REAL	DBD012	Net weight	*5.22.3*
Tare process value	REAL	DBD016	Tare weight	*5.22.4*
Flow rate 1	REAL	DBD020	Flow rate 1 in WU/s or in WU/h, as currently measures, also values, which are causes by faults.	*5.22.5*
Flow rate 2	REAL	DBD024	Flow rate 2 in WU/s or in WU/h, as currently measured. If switching to volumetric operation because of faults, the last valid value before the fault is frozen.	*5.22.6*
Flow rate 3	REAL	DBD028	Flow rate 3 2 in WU/s or in WU/h, as currently measured. If switching to volumetric operation because of faults, the last valid value before the fault is frozen. In addition, the value is switched immediately to zero when the dosing is switched off.	*5.22.7*
Flow rate in %	INT	DBW032	Current flow rate in 0.01 % in relation to nominal flowrate.	*5.22.8*
Operating hours counter	INT	DBW034	(is not reset, begins at 0 after overflow).	*5.22.9*
Reserved	REAL	DBD036	Reserved	

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Table 5-22   Allocation of DR 32

5.22.1 DR 32 NAWI and Conti Status Flags

The meaning of the status flags is described in DR 30.

5.22.2 DR 32 - Gross Process Value

The current gross weight value. Dimension: Weight Unit [WU].

5.22.3 DR 32 - Net Process Value

The current net weight value. Dimension: Weight Unit [WU].

5.22.4 DR 32 - Tare Process Value

The current tare weight value. Dimension: Weight Unit [WU].

5.22.5 DR 32 – Flow rate 1

The current flow rate, which is continually measured. Values that are a result of a flow rate fault are also output.

5.22.6 DR 32 – Flow rate 2

The current flow rate, which is continually measured. Values, which result from a flow rate fault, are replaced with the last flow rate value before the switch to volumetric operation.

5.22.7 DR 32 – Flow rate 3

The current flow rate, which is continually measured. Values, which result from a flow rate fault, are replaced with the last flow rate value before the switch to volumetric operation. In addition, the flow rate value is switched immediately to zero when the dosing is switched off.

5.22.8 DR 32 – Flow rate in % of the Nominal Flowrate

The current flow rate (derived from flow rate 3) output in 0.01 % of the nominal flowrate.

5.22.9 DR 32 – Operating Hours Counter

The operating hours counter records the number of hours that the SIWAREX FTC is supplied with 24V voltage.

5.23 DR 33 Distribution Memory

Totalizing is performed at the same time for every distribution memory location. The user can delete a certain location at any time which defines the totalizing period.

Name	Type	Address	Range of Values / Meaning	Reference
Distribution memory 1	REAL	DBD000	For saving the total quantity related to WU and rounded to the numeral step	*5.23.1*
Distribution memory 2	REAL	DBD004	For saving the total quantity and rounded to the numeral step WU;	*5.23.2*
Distribution memory 3	REAL	DBD008	For saving the total quantity rounded to the numeral step WU	*5.23.3*
Distribution memory 4	REAL	DBD012	For saving the total quantity and rounded to the numeral step WU;	*5.23.4*
Distribution memory 5	REAL	DBD016	For saving the total quantity and rounded to the numeral step LWU	*5.23.5*
Distribution memory 6	REAL	DBD020	For saving the total quantity and rounded to	*5.23.6*

Name	Type	Address	Range of Values / Meaning	Reference
			the numeral step LWU;	
Distribution memory 7	REAL	DBD024	For saving the total quantity and rounded to the numeral step LWU	*5.23.7*
Distribution memory 8	REAL	DBD028	For saving the total quantity and rounded to the numeral step LWU;	*5.21.8*
		32		

Table 5-23   Allocation of DR 33

5.23.1 DR 33 – Distribution Memory 1

Content of distribution memory. Dimension in weight units [WU]. Can be reset with instruction „Delete distribution memory 1" or „Log and delete distribution memory 1".

5.23.2 DR 33 – Distribution Memory 2

Content of distribution memory. Dimension in weight units [WU]. Can be reset with the instruction „Delete distribution memory 2" or „Log and delete distribution memory 2".

5.23.3 DR 33 – Distribution Memory 3

Content of distribution memory. Dimension in weight units [WU]. Can be reset with the instruction „Delete distribution memory 3" or „Log and delete distribution memory 3".

5.23.4 DR 33 – Distribution Memory 4

Content of distribution memory. Dimension in weight units [WU]. Can be reset with the instruction „Delete distribution memory 4" or „Log and delete distribution memory 4".

5.23.5 DR 33 – Distribution Memory 5

Content of distribution memory. Dimension in Large weight unit [LWU]. Can be reset with instruction „Delete distribution memory 5" or „Log and delete distribution memory 5".

5.23.6 DR 33 – Distribution Memory 6

Content of distribution memory. Dimension in Large weight unit [LWU]. Can be reset with instruction „Delete distribution memory 6" or „Log and delete distribution memory 6".

5.23.7 DR 33 – Distribution Memory 7

Content of distribution memory. Dimension in Large weight unit [LWU]. Can be reset with instruction „Delete distribution memory 7" or „Log and delete distribution memory 7".

5.23.8 DR 33 – Distribution Memory 8

Content of distribution memory. Dimension in Large weight unit [LWU]. Can be reset with instruction „Delete distribution memory 8" or „Log and delete distribution memory 8".

5.24 DR 34 ASCII Display Value

The ASCII weight value corresponds with the value on the main display of the scale.

The data record is displayed in a separate window in SIWATOOL FTC by activating function "Actual value".

Name	Type	Address	Default	Range of Values / Meaning	Reference
Current weight in ASCII format	STRING[16]	DBB000	-	Current weight in ASCII format as output on the display	
		18			

Table 5-24   Allocation of DR 34

SIWAREX FTC controls the content of DR 34 via instructions 25, 26, 128...142, 181… 192.

5.25 DR 35 Encoded Information for Verifiable Display

The content of the DR 35 corresponds with the DR 34, but is encoded. The verifiable display is generated on the SIMATIC OP/TP from the contents of DR 35.

Name	Type	Address	Default	Range of Values / Meaning	Reference
Coded data fro verifiable weight display	Hex	DBD000		Content is not made public	
		0			

Table 5-25   Allocation of DR 35

5.26 DR 36 Process Status of PID Controller

The current status and data of the controller can be monitored using the process values of the PID controller and the process values for loss-in-weight scales. Observing the selected data is very helpful in test operation for optimizing parameters. The status can also be monitored if the SIWAREX FTC is controlled by the SIMATIC CPU.

Name	Type	Address	Range of Values / Meaning	Reference
Current setpoint	REAL	DBD000	The currently defined setpoint in WU/s or in WU/h.	*5.26.1*
Effective setpoint	REAL	DBD004	The currently defined and active setpoint in WU/s or in WU/h, limited if necessary by the defined ramp function (setpoint limitation).	*5.26.2*
Current flow rate 1	REAL	DBD008	The current flow rate value in WU/s or WU/h.	*5.26.3*
Current control difference	REAL	DBD012	Current control difference affecting the control input.	*5.26.4*

Name	Type	Address	Range of Values / Meaning	Reference
Current actuation signal (Current)	REAL	DBD016	Current current value to be output in mA.	*5.26.5*
Current setpoint in 0.01 %	INT	DBW020	The current defined setpoint in 0.01 % of the nominal flow rate.	*5.26.6*
Effective setpoint in 0.01 %	INT	DBW022	The currently defined and active setpoint in 0.01 % of the nominal flow rate, limited if necessary by the defined ramp function (setpoint limitation).	*5.26.7*
Current flow rate 1 in 0.01 %	INT	DBW024	The current flow rate value in 0.01 % of the nominal flow rate.	*5.26.8*
Current control difference in 0.01 %	INT	DBW026	Current control difference affecting the controller input in 0.01 % of the setpoint.	*5.26.9*
Current actuation signal from the controller in 0.01 %	INT	DBW028	Current actuation signal from the controller in 0.01 % of the nominal flow rate.	*5.26.10*
Current manipulated value according to the material characteristic curve in 0.01 %	INT	DBW030	Current actuation signal from the controller in 0.01 % of the nominal flow rate corrected by the material characteristic curve.	*5.26.11*
Current difference between volumetr. and gravimetr. Actuation signal in % x 100	INT	DBW032	Current difference between the actuation signal according to the material characteristic curve in gravimetric operation and the theoretical actuation signal according to the material characteristic curve in volumetric operation in relation to the setpoint.	*5.26.12*
Current filling status in % of the nominal filling quantity	INT	DBW034	Current filling quantity in 0.01 % of the nominal filling quantity.	*5.26.13*
Actuation signal	REAL	DBD036	Actuation signal for controlling dosing devices through a bus connection. Output of 10000 corresponds with 100.00 % of the setting range.	*5.26.14*
		40		

Table 5-26   Allocation of DR 36

5.26.1 DR 36 – Flow rate Setpoint

The currently defined setpoint in WU/s or in WU/h. By reading the setpoint in DR 36, the setpoint definition, which is made through DR 20, can be checked.

5.26.2 DR 36 – Effective Flow rate Setpoint

The currently defined and active setpoint in WU/s or in WU/h, limited if necessary by the defined ramp function (setpoint limitation). The setpoint raising limit can be defined in DR 6. The effective setpoint is used for creating the control difference.

5.26.3 DR 36 – Flow rate 1

The current flow rate value in WU/s or WU/h. This value corresponds with the current measurement, with a flow rate fault, the determined value is still output.

5.26.4 DR 36 – Control Difference

Current control difference affecting the control input. The output is done in WU/s or in WU/h.

5.26.5 DR 36 – Output Current

Current value to be output in mA. The calculated value that is passed on to the digital/analog converter. Whether the current actually flows is not monitored.

5.26.6 DR 36 – Flow rate Setpoint in 0.01 %

The current defined setpoint in 0.01 % of the nominal flow rate. By reading the setpoint in DR 36, the setpoint definition, which is made through DR 20, can be checked.

5.26.7 DR 36 – Effective Flow rate Setpoint in 0.01 %

The currently defined and active setpoint in 0.01 % of the nominal flow rate, limited if necessary by the defined ramp function (setpoint limitation). The setpoint raising limit can be defined in DR 6. The effective setpoint is used for creating the control difference.

5.26.8 DR 36 – Flow rate in 0.01 %

The current flow rate value in 0.01 % of the nominal flow rate. To create the flow rate value, flow rate 3 is used (treated).

5.26.9 DR 36 – Control Difference in 0.01 %

Current control difference affecting the controller input in 0.01 % of the setpoint.

The value provides current information concerning which percentage deviation from the setpoint exists.

5.26.10 DR 36 – Actuation signal from Controller in 0.01 %

Current actuation signal from the controller in 0.01 % of the nominal flow rate. The actuation signal which has not yet been corrected with the material characteristic curve.

5.26.11 DR 36 – Actuation signal According to Material Characteristic Curve in 0.01 %

Current actuation signal from the controller in 0.01 % of the nominal flow rate corrected by the material characteristic curve. This value is then passed onto the dosing device via the device characteristic curve.

5.26.12 DR 36 – Actuation signal Difference Grav./Vol. in 0.01 %

Current difference between the setpoint according to the material characteristic curve in gravimetric operation (controller active) and the theoretical actuation signal according to the material characteristic curve in volumetric operation in 0.01 % in relation to the setpoint. This value provides information indicating by which

difference the actuation signal would change with a switch (fault-related), if the switch is not defined as jerk-free.

By reading this value, the necessity for updating the material characteristic curve can be estimated.

5.26.13 DR 36 – Filling level in 0.01 %

Current filling level in 0.01 % of the nominal filling quantity. This display is helpful in creating the material characteristic curve.

5.26.14 DR 36 – Actuation signal

Actuation signal for controlling dosing devices through a bus connection. Output of 10000 corresponds with 100.00 % of the setting range.

The amount of current that is output through the analog output is a theoretical value when controlling the dosing device via the bus.

5.27 DR 37 Dosing Consistency

Corresponding with the definition of parameters in DR 6, the current quality data can be checked in DR 37.

Name	Type	Address	Range of Values / Meaning	Reference
Average weight change	REAL	DBD000	Average value of the weight reduction in time interval of the measurement time.	*5.27.1*
Average flow rate	REAL	DBD004	Average value of the flow rate measured in the defined number of measuring periods.	*5.27.1*
Dosing consistency	REAL	DBD008	Definition concerning dosing quality.	*5.27.1*
Reserved	REAL	DBD012		
Reserved	INT	DBW016		
Reserved	INT	DBW018		
		20		

Table 5-27　　　　Allocation of DR 37

5.27.1 DR 37 – Average Weight Change, average flow rate, dosing constancy

Average value of the weight reduction in time interval of the measurement time, measured in the defined number of measuring periods.

Average value of the flow rate values, measured in the defined number of measuring periods.

Definition concerning dosing quality. The value is calculated as a quotient of the nominal deviation in relation to the average value of the flow rate.

AW = 1/n * Total(dW);

$$AF = AW/T ; \quad [WU/s] \text{ or}$$

$$AF = 3600 * AW/T ; \quad [WU/h]$$

$$DC = \frac{100}{AW} \sqrt{\frac{1}{n-1} * \sum_{1}^{n} (dW_i - AW)^2}$$

n:	amount of measuring periods
T:	measuring period (s)
AF:	average flow rate
AW:	average weight reduction (WU)
dW:	weight reduction (in one measuring period).
WU:	weight unit
DC:	dosing constancy

5.28 DR 40 to 43 Log Text 1 to 4

The logs can be defined in data records DR 40 to DR 43. A log text can either be printed automatically or on command or it can be saved in the verifiable MMC memory.

Log text entries 1 to 4 are composed of fixed segments such as title and label and of variable fields.

The variable fields can contain various values from the SIWAREX FTC.

In addition, 4 designation variables can be defined in addition to the process variables. These designations are 4*16 bytes long and can be specified at any time by the SIMATIC CPU. DR 40 to 43 cannot be defined through the SIMATIC CPU.

Name	Type	Address	Default	Range of Values / Meaning	Reference
Log text 1					
Log text 1	STRING[160]	DBB000	LF,'FF0C',SP,'FF0D', SP,'FF0F',SP,SP,'FF 05',CR,EOT; (Prot.-ID, Date, Time, Weight)	Place holder for field functions „0FFh,Index" (indicated here with *f*xx). Unused characters are initialized with 0 (for process values, see below)	
		162			

Table 5-28   Allocation of DR 40

Index (with log output 0xFF,nn)	Value	S7	Log field	Field length [Byte] (for log field only)	Field layout (example) (for log field only)
NAWI fields (nn)					
0	NAWI status flags	j	n	-	-
1	Grossweight_Process	j	j	14	•12345.678•kg•
2	Netweight_Process	j	j	14	•12345.678•kg•
3	Tareweight_Process	j	j	14	•12345.678•kg•
4	B/N weight verifiable	j	j	18	<N1•12345.678•kg•> <B1•-12345.67•kg•>
5	B/N Weight_x10	j	n	-	-
6	Tare weight (verifiable / calibratable)	j	j	18	<PT•12345.678•kg•>
7	Pulse counter value	j	j	10	1234567890
8	Temperature	j	n	5	21.5
9	Operating error	j	n	-	-
10	Unfiltered raw value	j	n	-	-
11	Filtered raw value 1	j	n	-	-
12	Log ID	n	j	16	<No•1234567890•>
13	Date (dd.mm.yy)	n	j	8	27.12.02
14	Date (yy-mm-dd)	n	j	8	02-12-27
15	Time	n	j	8	13:05:00
16	String 1	n	j	16	Milk powder •••••
17	String 2	n	j	16	Bread crumbs••••
18	String 3	n	j	16	Sugar•••••••••••
19	String 4	n	j	16	Wheat flour••••••
20					
21	Description	n	j	10	<Differential_dosing_scale1>
22					
23					
24					
25					
26					
27					
28					
29					
Conti-Fields (nn)					
30	Conti-Status flags	j	n	-	
31	Distribution memory 1	j	j	16	S1•12345678.9•kg
32	Distribution memory 2	j	j	16	S2•12345.6789•kg
33	Distribution memory 3	j	j	16	S3•12345.6789•kg
34	Distribution memory 4	j	j	16	S4•12345.6789•kg
35	Distribution memory 5	j	j	16	S5•12345.6789•kg
36	Distribution memory 6	j	j	16	S6•12345.6789•kg
37	Distribution memory 7	j	j	16	S7•12345.6789•kg
38	Distribution memory 8	j	j	16	S8•12345.6789•kg
39	Flow rate 1	j	j	16	F1•1234567.8kg/s
40	Flow rate 2	j	j	16	F2•1234567.8kg/h
41	Flow rate 3	j	j	16	F3•1234567.8•t/h
42	Belt speed	j	j	16	BS•1234567.8•m/s
43	Belt load	j	j	16	BB 1234567.8kg/m
44	Flow in %	j	j	16	FS•123•%••••••••
45	Belt load in %	j	j	16	BB•123•%••••••••
46	Belt speed in %	j	j	16	BS•123•%••••••••
47	Current setpoint	j	j	18	SP•1234567.8kg/s
48	Effective setpoint	j	j	18	SW•1234567.8kg/s
49	Current control difference	j	j	18	DI•1234567.8kg/s
50	Act. Control difference in %	j	j	10	D•123,00•%
51	Act. Difference vol/grav in %	j	j	10	K•123,00•%

52	Fill level in %	j	j	10	W•123,00•%
53	Actuation signal according to controller in %	j	j	18	C•123,00•%
54	Actuation signal according to Mat-KL in %	j	j	10	M•123,00•%
55	Actuation signal in %	j	j	10	Y•123,00•%
56	Average weight change	n	j	10	AW•12345678.90•kg•
57	Average flow rate	n	j	10	AF•1234567.89•kg/s
58	Dosing consistency	n	j	10	DC•1234567.89•••••
59					
60					

Table 5-29   Process values for allocating log fields

5.29 DR 44 Last Log

The log data is stored up until the next logging procedure in DR 44. If necessary, the content can be output again.

Name	Type	Address	Default	Range of Values / Meaning	Reference
Last log					
MMC-ID	BYTE[5]	DBB000	0	1 byte manufacturer's ID + 4 bytes serial number; with log output to RS232 interface always 0	*5.29.1*
Reserve 1	BYTE	DBB005	0	Reserve 1	
Reserve 2	WORD	DBB006	0	Reserve 2	
Log ID	DINT	DBD008	0	ID for stored log text	*5.29.2*
Last log data	STRING[160]	DBB012	STRING[160] = 0H	Log text for last logging procedure	*5.29.3*
		174			

Table 5-30   Allocation of DR 44

5.29.1   DR 44 - MMC-ID

Identification of the MMC card.

5.29.2   DR 44 - Log ID

The log ID is a unique log number that can be used to identify the log. The number is incremented with every logging procedure.

5.29.3   DR 44 - Last Log Data

The last output log data can be read up until the next logging procedure.

5.30 DR 45 String

The string is test that can be inserted as variables in the log. The content of the string can be defined through SIWATOOL or from control program of the SIMATIC CPU.

Name	Type	Address	Default	Range of Values / Meaning	Reference
String					
String 1	STRING[16]	DBB000	"String 1 "	16 string 1	
String 2	STRING[16]	DBB018	„String 2 „	16 String 2	
String 3	STRING[16]	DBB036	„String 3 „	16 String 3	
String 4	STRING[16]	DBB054	„String 4 „	16 String 4	
		72			

Table 5-31   Allocation of DR 45

5.31 DR 46 Parameter for Reading MMC Logs in SIMATIC

Scale logs can be saved on the MMC card. If necessary, a verifiable (legal) log can be read and its contents can be checked using the SIWATOOL FTC program.

Data records DR 46/DR 47 can be used to read any log in SIMATIC S7 (not verifiable and only to be used as operational display). The user enters the desired log ID in DR 46 and then sends DR 46 to the SIWAREX FTC. A short time later, the log is prepared for reading (Status bit „MMC data ready S7). If the user now requests the DR 47 with the log, the log with the desired ID is read in DR 47.

The last log can also be read through DR 47. 1 must be entered in BYTE 4 of DR 46. In this case, the predefined log ID is ignored.

Procedures:

o   Define ID number and enter in DR 46

o   Send the DR 46 to the scale

o   Wait for status bit "MMC data ready S7"

o   Read DR 47

o   Display or check content of log.

Name	Type	Address	Default	Range of Values / Meaning	Reference
Index					
ID number for reading	DINT	DBD000	0	The definition ensures that the log with the ID number is read when reading the DR 47. If the request of the last data record (byte 0) is activated, the ID number is ignored.	
Request for the last data record	BYTE	DBB004	0	With the definition = 1, the last log is read through data record DR 47.	
Reserved	BYTE	DBB005	0	Reserve.	
		6			

Table 5-32 Allocation of DR 46

5.32 DR 47 Requested Log

The log data is prepared in DR 47.

Name	Type	Address	Default	Range of Values / Meaning	Reference
MMC-ID	BYTE[5]	DBB000	0	1 byte manufacturer's ID + 4 bytes serial number; with log output to RS232 interface always 0	
Reserve 1	BYTE	DBB005	0	Reserve 1	
Reserve 2	WORD	DBB006	0	Reserve 2	
Log ID	DINT	DBD008	0	ID for stored log text	
Log data 1	STRING[40]	DBB012	STRING[40] = 0H	Log text Part 1	
Log data 2	STRING[40]	DBB054	STRING[40] = 0H	Log text Part 2	
Log data 3	STRING[40]	DBB096	STRING[40] = 0H	Log text Part 3	
Log data 4	STRING[40]	DBB0138	STRING[40] = 0H	Log text Part 4	
		180			

Table 5-33   Allocation of DR 47

5.32.1 DR 47 - MMC-ID

Identification of the MMC card.

5.32.2 DR 47 - Log ID

The log ID is a unique log number that can be used to identify the log. The number is incremented with every logging procedure.

5.32.3 DR 47 - Log Data

The log data consists of 4 strings.

5.33 DR 120/121 Trace - Data Logging

The trace function is used for logging measurement values and current states of the scale in RAM memory of the SIWAREX FTC or in the MMC card.

When logging to RAM, SIWATOOL FTC reads the trace elements with data record 120 and when logging to the MMC it is done through data record 121.

The recording is started with the instruction "Start the recording" *70* and can be ended with instruction "End current recording" *71*.

By defining parameters in data record DR 7 *MMC Parameter* the trace function can be defined. The data record cannot be read through the SIMATIC CPU.

Name	Type	Length bytes	Range of Values / Meaning	Reference
Timestamp1	DATE&TIME	8		
Conti- Status flag	DINT	4	Status bit	
NAWI status flags	DINT	4	Status bit	
Unfiltered raw value	DINT	4	Unfiltered digit value from ADC	

Name	Type	Length bytes	Range of Values / Meaning	Reference
Filtered raw value	DINT	4	Filtered digit value	
Net_Process	REAL	4	Net weight	
Belt load	REAL	4	Current belt load WU/m	
Pulse counter value	DINT	4	Pulse counter value with reference to the measurement time	
Flowrate 1	REAL	4	Flowrate [Weight/Time unit]	
Belt speed m/sec	REAL	4	Belt speed	
Digital input states	BYTE	1	Status of the DE	
Reserved	BYTE	1	Reserved	
Current actuation signal from controller in % *100	INT	2	Current actuation signal from controller in % *100	
Setpoint value	REAL	4	Setpoint value	
Effective setpoint	REAL	4	Effective setpoint	
Actuation signal according to material characteristic curve	REAL	4	Actuation signal according to material characteristic curve	
Actuation signal according to device characteristic curve	INT	2	Actuation signal according to device characteristic curve	
Reserved	INT	2	Reserved	
		64		

Table 5-34   Combination of recording elements

The evaluation of the collected data can be handled using SIWATOOL FTC and MS Excel. All of the logged elements that have been recorded are stored in the Excel table and can be read in a graph over time.

The progress of the weighing procedure can be analyzed and optimized.

In the event of sporadic events in the system, the recording can be activated as circulating memory and can be ended with a condition in the SIMATIC control program at any time. The subsequent evaluation can help to explain a sporadic event in the system. A simultaneous evaluation of the message buffer, in which the last 100 events are stored (evaluation with SIWATOOL FTC) offers a good basis for an analysis or remote analysis.

An element requires 46 bytes. If the recording is run e.g. once per 50 msec, it means memory requirements of 920 bytes per second.

In the simplest case, the RAM memory (approx. 2 MB) of the SIWAREX FTC can be used for the recording.

5.34 DR 123 Data Content MMC

By reading the DR 122, SIWATOOL FTC can be used to determine which data is stored on the Micro Memory Card. Based on this information, the user can read targeted records and logs.

Name	Type	Length	Range of Values / Meaning	Reference
Log ID	DINT	4	*Depending on the log output RS232 / MMC, this ID is shown as follows* RS232 The ID is incremented with every log output (not with repeat") and is stored and managed in RAM memory. This number is only reset with default values. MMC The ID is incremented with every log output (not with repeat") and is stored and managed in MMC memory. This number can only be reset by deleting or formatting the card.	
MMC ID	BYTE[5]	5	1 byte manufacturer ID and 4 bytes serial number	
Reserve 1	BYTE	1	Reserve 1	
Reserve 2	INT	2	Reserve 2	
MMC memory capacity	DINT	4	MMC - total memory capacity in bytes	
Available MMC capacity for log data	DINT	4	Capacity of the MMC for log data [Bytes]	
Available capacity for trace data	DINT	4	Display depending on the defined trace target RAM or MMC in the interface parameters [Bytes]	
Oldest MMC-Log-ID	DINT	4	Oldest element	
Youngest MMC-Log-ID	DINT	4	Youngest element	
Oldest MMC-Trace- ID	DINT	4	Oldest element	
Youngest MMC-Trace-ID	DINT	4	Youngest element	
Oldest RAM-Trace- ID	DINT	4	Oldest element	
Youngest RAM-Trace-ID	DINT	4	Youngest element	
		48		

Table 5-35   Overview of MMC data

5.35 DR 122 Log Data MMC

By reading the DR 122, SIWATOOL FTC can be used to determine which log data is stored on the MMC.

A log can then be read for a defined log ID.

Name	Type	Length	Range of Values / Meaning	Reference
MMC-ID	BYTE[5]	5	1 byte manufacturer ID + 4 bytes serial number	
Reserve 1	BYTE	1	Reserve 1	
Length	INT	2	[n] Number of valid data bytes in the log text; if 0, the requested log number does not exist	
Log ID	DINT	4	ID for stored log text	
Log text	BYTE[n]	174	Log text 1|2|3|4	
Block check character	INT	2	CRC16 (MMC-ID + Log ID + Log text[n])	
		188		

Table 5-36   MMC log

6 Commands

6.1 Command Groups

The SIWAREX command are divided into groups. The combining of the commands into a group is done according to their functionalities.

Every command has a unique number. A command can be sent via various interfaces (SIMATIC, SIWATOOL FTC, digital input).

Every time that a command is sent to SIWAREX FTC, a check must be made for whether the command has been executed correctly. The data and operating errors (synchronous errors) that are generated provide information on why the command could not be executed.

The **Service and adjustment commands group** is used during the commissioning of the scale. As long as the scale is not adjusted, it can only be used in service operation. Switching to service operation is indicated in the status bits.

The group of **scale commands NAWI (non automatic weighing instrument)** contains all instructions that concern the handling of a static scale. Normally, commands that have anything to do with the operation of the SIWAREX FTC as a non-automatic weighing instrument (e.g. zero setting, taring).

The group of **display commands** contain all commands that are used for switching the content of the main display.

The extensive group of **scale commands for the loss-in-weight scale** is used for controlling the loss-in-weight scale. The basic behavior of the SIWAREX FTC is defined one time by defining parameters.

The group of **log commands** contains commands that control the log output to a printer or the verifiable storage of the logs.

Use of the Micro Memory Card MMC is controlled with commands from the command group **Micro Memory commands**.

After receiving a command, SIWAREX FTC checks for whether the command can be executed. If the check results are negative, the user is informed of the cause by an output of a "synchronous" message (see chapter *7 Messages and Diagnosis*).

Note

If the module is in operating status „Hardware fault" or operating fault, then only the instructions (8) LOAD   DEFAULT VALUES, (1) SERVICE_ON, (2) SERVICE_OFF and (9) ACK_ERROR, (150, 156) DOSING (FILLING) STOP are accepted, all other instructions are rejected with a data-/operating error

6.2 Command List

Code	Command explanation	Comment
	Service and adjustment commands	
1	**Switch on service operation** The SIWAREX must be switched to service operation to perform the adjustment. A non-adjusted scale cannot get out of service operation.	No totalizing
2	**Switch off service operation** After the adjustment, service operation can be switched off. Only then can the scale accept weighing commands.	Service operation
3	**Adjustment command zero point valid** The beginning of the characteristic curve - zero point of the scale - is defined with the momentary dead-load.	Service operation
4	**Adjustment command Adjustment weight 1 valid** The first adjustment weight is assigned with the momentary weight.	Service operation
5	**Adjustment command Adjustment weight 2 valid** The second adjustment weight is assigned with the momentary weight.	Service operation
6	**Adjustment instruction Adjustment weight 3 valid** The third adjustment weight is assigned with the momentary weight.	Service operation
7	**Adjustment instruction Adjustment weight 4 valid** The fourth adjustment weight is assigned with the momentary weight.	Service operation
8	**Predefine all data records with default values** All parameters are set to the status that was assigned originally by the manufacturer.	Service operation
9	**Acknowledge error** Operating errors and fatal system errors that have led to a reboot are acknowledged. The damaged operating status is aborted if no other operating errors exist.	always

Code	Command explanation	Comment
10	**Run impedance check** The resistance of the load cells is measured and compared with the stored impedance reference value.	Not in totalizing
11	**Determine impedance reference value** The resistance of the load cells is determined and stored as a reference value for future impedance checks.	Not in totalizing
12	**Activate stand-alone operation** The SIWAREX is switched over to stand-alone operation.	Service operation
13	**Deactivate stand-alone operation** The SIWAREX is switched to operation in SIMATIC.	Service operation
	Scale commands	
21	**Scale zero setting** The current weight is set to zero. In calibratable operation ("OIML"), only possible with restrictions (-1%, +3%). The tare is deleted at the same time.	
22	**Tare** The current weight is set to zero and the weight display is designated as "Net" and "Tare" at the same time.	
23	**Delete tare** The tare is deleted. The current weight is displayed and designations of "Net" are changed to "Gross", the designation "Tare" or "Preset-Tare" is reset.	
24	**Accept defined tare** The defined tare is accepted as tare and at the same time, "Preset tare" is designated together with the weight display.	
25	**Switch on increased resolution** Activate output / display of the verifiable weight value with increased resolution for 5 seconds.	
26	**Display tare weight** Activate output / display of the tare value for 5 seconds.	
27	**End dynamic zero setting/adjustment** Dynamic zero setting is ended and the new zero value is accepted.	

Code	Command explanation	Comment
28	**Abort dynamic zero setting/adjustment** Dynamic zero setting is aborted and the new zero value is not accepted.	
	Log commands	
31	**Output log text 1** Log output with text layout 1.	
32	**Output log text 2** Output the log with text layout 2	
33	**Output log text 3** Output the log with text layout 3	
34	**Output log text 4** Output the log with text layout 4	
35	**Repeat last logging procedure** The last log output is repeated.	
40-41	**Reserved**	
40	**Reserved**	
41	**Reserved**	
	Micro Memory Commands	
70	**Start the Recording** The recording (trace function) should start	
71	**End running recording** The activated recording (trace function) is ended.	
72	**Delete logs in MMC** The logs stored in the Micro Memory Card are deleted.	Service operation
73	**Delete log in MMC (Trace)** The recorded data (trace function) stored in the Micro Memory Card are deleted.	
74	**Delete log in RAM (Trace)** The stored data (trace function) in the RAM memory are deleted.	

Code	Command explanation	Comment
75	**Format MMC** The Micro Memory Card parameters are defined corresponding with the definitions in the module data. All of the stored content in the MMC is deleted.	Service operation
76	**Delete all MMC data (log data, measurement data, …)** The data stored in the Micro Memory Card are deleted.	Service operation
	Scale commands	
100	**Switch belt on** Used for switching the belt belt on (The belt control bit is set in CONTI status)	
101	**Switch belt off** Used for switching the transport belt off (The belt control bit is deleted in CONTI status) and if necessary, the running totalizing procedure is stopped, the discharge organ is switched off at the same time.	
102	**Switch on totalizing** This is used for starting the totalization using the flowrate in the 8 distribution memory locations (is only used if the belt control is switched on)	
103	**Switch off totalizing/Switch off loading** This is used for stopping the totalizing, the flowrate continues to be measured and there is no integration into the distribution memory. Loading operation is ended.	
104	**Switch on dosing (belt scale)** Activate discharge organ (is only used if the belt control is switched on)	
105	**Switch off dosing (belt scale)** Deactivate discharge organ	
106	**Switch belt on, switch on totalizing** The belt scale sends a signal for dosing (The belt control bit is set in the CONTI status). Totalizing is activated. The loading quantity (DR 21) must be larger than the lag. The content of distribution memory 1 must be less than the loading quantity - lag. The distribution memory is not deleted at the start.	

Code	Command explanation	Comment
107	**Switch the belt on, switch totalizing on, switch dosing on** Material loading is started corresponding with the total quantity definition, totalizing is switched on and belt control is switched on. The content of distribution memory 1 must be less than the loading quantity - lag. If necessary, delete the content of the distribution memory 1 in advance. The loading quantity (DR 21) must be larger than the lag.	
110	**Delete all distribution memory** Deletes all 8 distribution memory locations.	
111	**Log and delete distribution memory 1** Deletes verifiable distribution memory 1 *This automatically includes a logging procedure. In this case, the text 1 (DR 40) is used- The deletion is only performed if the total 1 is contained in the log text.*	
112	**Delete distribution memory 1** Deletes distribution memory 1.	
113	**Log and delete distribution memory 2** Deletes distribution memory 2. *This automatically includes a logging procedure. Text 1 (DR 40) is used here. The deletion is only executed if total 2 is contained in the log text.*	
114	**Delete distribution memory 2** Deletes distribution memory 2.	
115	**Log and delete distribution memory 3** Deletes distribution memory 3. *This automatically includes a logging procedure. Text 1 (DR 40) is used here. The deletion is only executed if total 3 is contained in the log text.*	
116	**Delete distribution memory 3** Deletes distribution memory 3.	
117	**Log and delete distribution memory 4** Deletes verifiable distribution memory 4 *This automatically includes a logging procedure. Text 1 (DR 40) is used here. The deletion is only executed if total 1 is contained in the log text.*	
118	**Delete distribution memory 4** Deletes distribution memory 4.	

Code	Command explanation	Comment
119	**Log and delete distribution memory 5** Deletes verifiable distribution memory 5. *This automatically includes a logging procedure.* *Text 1 (DR 40) is used here. The deletion is only* *executed if total 1 is contained in the log text.*	
120	**Delete distribution memory 5** Deletes distribution memory 5.	
121	**Log and delete distribution memory 6** Deletes verifiable distribution memory 6 *This automatically includes a logging procedure.* *Text 1 (DR 40) is used here. The deletion is only* *executed if total 1 is contained in the log text.*	
122	**Delete distribution memory 6** Deletes distribution memory 6.	
123	**Log and delete distribution memory 7** Deletes verifiable distribution memory 1 *This automatically includes a logging procedure.* *Text 1 (DR 40) is used here. The deletion is only* *executed if total 1 is contained in the log text.*	
124	**Delete distribution memory 8** Deletes distribution memory 1.	
125	**Log and delete distribution memory 7** Deletes verifiable distribution memory 7 *This automatically includes a logging procedure.* *Text 1 (DR 40) is used here. The deletion is only* *executed if total 1 is contained in the log text.*	
126	**Delete distribution memory 8** Deletes distribution memory 8.	
127		
128	**Display distribution memory 1** Display total weight value in DR 34 (total 1 from DR 33).	
129	**Display distribution memory 2** Display total weight value in DR 34 (total 2 from DR 33).	
130	**Display distribution memory 3** Display total weight value in DR 34 (total 3 from DR 33).	

Code	Command explanation	Comment
131	**Display distribution memory 4** Display total weight value in DR 34 (total 4 from DR 33).	
132	**Display distribution memory 5** Display total weight value in DR 34 (total 5 from DR 33).	
133	**Display distribution memory 6** Display total weight value in DR 34 (total 6 from DR 33).	
134	**Display distribution memory 7** Display total weight value in DR 34 (total 7 from DR 33).	
135	**Display distribution memory 8** Display total weight value in DR 34 (total 8 from DR 33).	
136	**Display flow rate 1 in DR 34** Display flow rate 1 in DR 34 (from DR 32).	
137	**Display flow rate 2 in DR 34** Display flow rate 2 in DR 34 (from DR 32).	
138	**Display flow rate 3 in DR 34** Display flow rate 3 in DR 34 (from DR 32).	
139	**Show belt loading in DR 34** Display of the belt loading in DR 34 (from DR 31).	
140	**Show verifiable weight B/N in DR 34** Return to weight display.	
142	**Display flow rate 1 (%) in DR 34** Display the flow rate (in % of nominal flow rate) in DR 34 (from DR 32).	
143	**Display belt loading (%) in DR 34** Display of the belt loading (% of the nominal belt load) in DR 34 (from DR 31).	
144	**Display belt speed (%) in DR 34** Display of the belt speed (% of the nominal speed of the belt) in DR 34 (from DR 31).	
145		
146		
147		

Code	Command explanation	Comment
148		
149		
150	**Dosing (Man./vol.) on** Dosing is volumetric according to material characteristic curve.	
151	**Dosing off** Switch off dosing in automatic and manual operation.	
152	**Totalizing on** This is used for starting the totalization using the flow rate in the 8 distribution memory locations (is only used if the dosing is switched on).	
153	**Totalizing off** This is used for stopping the totalizing, the flow rate to be measured and there is no integration into the distribution memory.	
154	**Filling on** Filling is switched on immediately. In manual operation, there is no effect on other functions. This switches automatically into volumetric operation in automatic mode.	
155	**Filling off** Filling is switched off immediately.	
156	**Dosing & filling off** The command switches both functions off simultaneously in automatic operation and manual operation.	
157	**Dosing (auto/vol.) on** The command starts volumetric operation in automatic mode. The switch to gravimetric operation is not automatic in this case, a command must be used.	
158	**Dosing (auto/grav.) on** This command switches automatic operation on. If defined, the volumetric mode is switched on first, then the switch to gravimetric operation is done automatically.	
159	**Dosing (auto/vol.-jerk-free)** The command switches to automatic operation from gravimetric operation, whereby the actuation signal is retained. The actuation signal is then corrected according to the fill quantity.	
160	**Reserved**	

Code	Command explanation	Comment
161	**Emptying (auto) on** The command activates emptying. If the fill quantity achieves the limit value for refilling, no refilling is started but the dosing is continued in volumetric operation under the empty range is achieved (DR 4).	
162	**Emptying (Manual) on** The command activates emptying. If the fill quantity achieves the limit value for refilling, no refilling is started but the dosing is continued in volumetric operation under the empty range is achieved (DR 4).	
163	**Emptying off** The command deactivates emptying in automatic operation as well as in manual operation.	
164	**Reserved**	
170	**Reserved**	
171	**Device operating point 1 valid** This command indicates operating point 1 as being valid on the device characteristic curve. The actuation signal and the respective flow rate value is retained (in DR 11).	
172	**Device operating point 2 valid** This command indicates operating point 2 as being valid on the device characteristic curve. The actuation signal and the respective flow rate value is retained (in DR 11).	
173	**Device operating point 3 valid** This command indicates operating point 3 as being valid on the device characteristic curve. The actuation signal and the respective flow rate value is retained (in DR 11).	
174	**Device operating point 4 valid** This command indicates operating point 4 as being valid on the device characteristic curve. The actuation signal and the respective flow rate value is retained (in DR 11).	
175	**Delete quality data** The content of DR 37 is deleted with this command.	
176	**Factor 10% valid** This command determines the filling quantity factor for the material characteristic curve and stores it in DR 13.	
177	**Factor 30% valid** This command determines the filling quantity factor for the material characteristic curve and stores it in DR 13.	
178	**Factor 50% valid** This command determines the filling quantity factor for the material characteristic curve and stores it in DR 13.	

Code	Command explanation	Comment
179	**Factor 70% valid** This command determines the filling quantity factor for the material characteristic curve and stores it in DR 13.	
180	**Factor 90% valid** This command determines the filling quantity factor for the material characteristic curve and stores it in DR 13.	
181	**Display current setpoint** The command switches on the display of the setpoint in DR 34 (from DR 36).	
182	**Display effective setpoint** The command switches on the display of the effective setpoint in DR 34 (from DR 36).	
183	**Act. Display control difference** The command switches on the display of the effective setpoint in DR 34 (from DR 36).	
184	**Act. Display control difference in %** The command switches on the display of the control difference in 0.01 % of the setpoint in DR 34 (from DR 36).	
185	**Display the current actuation signal difference between volumetr. and gravimetric operation** The command switches on the display of the actuation signal difference between the current actuation signal and the actuation signal according to the material characteristic curve in 0.01 % of setpoint in DR 34 (from DR 36).	
186	**Display fill level in %** The command switches the display of the fill level in 0.01 % of the nominal fill level in DR 34 (from DR 36) on.	
187	**Display actuation signal according to controller in %** The command switches on the display of the actuation signal according to the PID controller in 0.01 % of the nominal flow rate in DR 34 (from DR 36).	
188	**Display actuation signal according to material characteristic curve in %** The command switches on the display of the actuation signal according to the material characteristic curve in 0.01 % of the nominal flow rate in DR 34 (from DR 36).	
189	**Display actuation signal in %** The command switches on the display of the actuation signal in 0.01 % steps in DR 34 (from DR 36).	
190	**Display average weight change** The command switches on the display of the average weight change in DR 34 (from DR 37).	

Code	Command explanation	Comment
191	**Display average flow rate** The command switches on the display of the average flow rate in DR 34 (from DR 37).	
192	**Display dosing consistency** The command switches on the display of the dosing consistency in DR 34 (from DR 37).	
193		
194		
195		

Table 6-1   SIWAREX FTC command list

The commands in the table above can be activated over all interfaces.

More commands can be activated on the SIMATIC S7 interface of the FB SIWA_FTC.

Command group	Description
1... 199	Commands are passed on to the module group without reading or writing from or to data records (scale, weighing, logging commands). The meanings of these commands correspond with the settings in table XX.
203... 245...399	Read a data record 3... 47. The numbers 248... 399 are reserved for expansion.
403... 445...599	Write a data record 3... 47. The numbers 448... 599 are reserved for expansion.
601... 699	Range for combined commands. The function block SIWA_FTC (FB44) can transfer several data records in sequence.
601	Read DR31, DR32, DR34
649	Read all data records (Loss-in-weight scale) in the SIWAREX FTC (DR 3, DR 4, DR 6, DR 7, DR 8, DR 9, DR 10, DR 11, DR 12, DR 13, DR 15, DR 20, DR 26, DR 31, DR 32, DR 33, DR 34, DR 35, DR 36, DR 37, DR 44, DR 45, DR 47, DR 123)
699	Write data records (Loss-in-weight scale) DR 3, DR 4, DR 6, DR 7, DR 8, DR 10, DR 11, DR 12, DR 13, DR 15, DR 20, DR 26 in the SIWAREX FTC

Table 6-2   SIWAREX FTC command groups

More information on command transfers from the control program using the SIMATIC interface can be found in chapter *8 Programming in SIMATIC STEP 7*

7 Messages and Diagnosis

7.1 Message Types

The SIWAREX FTC messages are divided into different types.

The **asynchronous** messages can be generated spontaneously at any time due to an unforeseen event. The internal and external hardware faults (operating messages) and the technology messages that can occur spontaneously during a weighing procedure.

The **synchronous** messages are always the response to user activity.

There are data errors if a plausibility error is determined in a data package that the user wants to send to the module group and the module does not accept that data package. These are operating errors if the module group in the current operating status cannot execute the given command.

The status displays are not messages in this respect. The status displays describe the status of the scale in normal operation and can be monitored or evaluated at any time.

7.2 Message Paths

The SIWAREX FTC messages are passed on to the user by various paths. During configuration, it is important to choose the right path for routing and processing the messages.

Essentially, the messages are processed for two purposes:

- For display on an operating panel
- For connection to control software to control certain reactions in a process.

The following message paths are possible:

- Message buffer output to the SIWATOOL FTC_L commissioning program
- Output through the SIWA_FTC function block to its message outputs
- Diagnostic alarms in SIMATIC CPU with OB82 evaluation
- Process alarms in the SIMATIC CPU with evaluation in the process alarm OBs.

7.3 Detection of Messages Using SIWATOOL FTC_L

A message buffer is integrated in the module and holds up to 100 entries. If the number of messages in the message buffer reaches 99 then a new message will immediately delete the oldest message. The message buffer can be read at any time with SIWATOOL FTC_L (menu point "Read all data records") and can be saved together with the scale parameters. This helps in recognizing, analyzing and solving problems in the system.

7.4 Detection of Messages Using FB SIWA_FTC

All of the messages of the SIWAREX module can be recognized and processed in the controller using the FB SIWA_FTC. Additional errors in the processing of the FB SWIA_FTC are put out through the FB_ERR output variable (see chapter *8 Programming in SIMATIC STEP 7.*)

7.5 Detection of Messages Using the Diagnostic Alarms in the SIMATIC-CPU.

Operating messages (hardware faults) are recognized in the SIMATIC CPU with diagnostic alarms. For more information see chapter *8 Programming in SIMATIC STEP 7*.

Recognizing messages with process alarms.

Process alarms enable the user to respond flexibly to technology messages or to the selected status information. For more information see chapter *8 Programming in SIMATIC STEP 7*.

7.6 Message list Data and Operating Errors

Error No.	Data and operating errors - Meaning	Explanation
1	Unknown command code	The SIWAREX does not recognize the command code or the data record in the parameterized mode or is unable to process the command or data record in the current operating state.
2	Action not permitted in service operation	Only certain commands or data entries are permitted in service operation. The last command or the last sent data cannot be accepted by the scale in service operation. The following commands are not permitted: - Start totalization - Taring (22, 24) - Output log (31 to 35) - Start/Stop Trace (70, 71) Switch to normal operation.
3	Service operation cannot be deactivated sine the assembly is not adjusted	A non-adjusted module group cannot be switched to normal operation. Fist, adjust the scale and then you can get out of service operation. A theoretical adjustment can be performed with the SIWATOOL FTC_L.
4	Action only permitted in service operation	Only certain commands or data entries are permitted in normal operation. The last command or the last sent data cannot be accepted by the scale in normal operation. Switch to service operation. The following activities can only be performed in service operation: - Load factory settings command (8) - Switch service operation off (2) - Adjustment commands (3, 4, 5, 6, 7) - Delete / Format MMC (72 to 75) - Send DR 3
5	Calibration parameter transfer with active write protect not permitted	The calibration parameters (DR 3) may only be changed if the write protect is not active (switch on the front moved to down position). First deactivate the write protection. This also applies for the internal data record DR 26. Attention! A pre-calibrated scale will lose its calibration.
6	Adjustment command with active write protect not permitted	The adjustment commands can only be executed when the write protect is inactive (switch on the front in the down position). First deactivate the write protection. Attention! A pre-calibrated scale will lose its calibration.
7	Download not possible since write protect is active	Downloading the firmware may only be done if the write protection is inactive (switch on front down). First deactivate the write protection. Attention! A pre-calibrated scale will lose its calibration.
11	Transmission of the data record or command is not permitted in continuous operation	The data record or the command is not permitted to be activated during the totalizing.

Error No.	Data and operating errors - Meaning	Explanation
12	Command cannot be executed because the previous command is not finished yet.	A new command cannot interrupt the execution of the current command. Activate the command after the current command has finished executing.
13	Command or data transfer not allowed in this operating status	A new command cannot be executed in this operating status.
16		Reserved
21	Command not allowed since the assembly is damaged the OD is active	The activated command is not allowed since the scale has a fault or SIMATIC CPU is in STOP status. Correct the error (red LED on the front must go off).
22	DI assignment not allowed	You have assigned the digital inputs incorrectly. Correct your assignments.
23	DO assignment not allowed	You have assigned the digital outputs incorrectly. Correct your assignments. The outputs may only be defined with numbers 0 to 63 and 255.
25	Time range for pulse input not allowed	The measurement time entry for the pulse input is incorrect. The permitted range lies between 100 msec and 10000 msec. Correct the entry.
29	Ext. analog default value implausible	The current value entry for the analog output lies outside of the defined (DR 7) range. Enter a smaller value.
30	Analog output replacement value implausible.	The replacement value for the analog output lies outside of the defined (DR 7) range. is too large for the analog output. Enter a smaller value.
31	Analog zero value to analogue end value implausible	The default analog zero value or analogue end value is incorrect. Change at least one of the values.
35	Baudrate not permitted for RS232	The baudrate is not permitted for the RS232 interface. Define the baud rate.
36	Process alarm assignment or process value assignment implausible	The allocation of the process alarms or process values in DR 7 is incorrect for the S7 interface. Change your assignment.
37	Baud rate not defined for RS485	The baud rate for the RS485 interface is not defined. Define the baud rate.
43	Trace task not possible since MMC full	
44	Trace task cannot be executed, since MMC is defective or non-existent	
45	Trace recording cycle too small	The recording cycle is too small in DR 7. Define a longer recording cycle (at least 5 x 10 msec. for MMC).

Error No.	Data and operating errors - Meaning	Explanation
56	Log text too long	The log text with filled in parameters is too long or the end character (EOT) is missing. Change the log text. Ensure that in place of the corresponding print field code, the respective number of characters for the field is set. The overall length of the text filled with values may not exceed 160 characters (incl. printer control characters but without the termination EOT).
57	Log text contains fields that are not permitted	Log text contains fields that are not permitted Change the log text.
58	Log text contains angle-brackets	Log text contains angle-brackets Remove the angle-brackets from the log text.
62	Logging not possible since the weight lies outside of the weighing range	Logs can only be output within the weighing range in verifiable operation (code OIML in DR 3).
63	Logging output not possible since the SIWATOOL FTC driver is active	The log can not be output because the SIWATOOL FTC_L is active on the interface. Disconnect the PC and connect the printer.
64	Logging output not possible since the printer is not ready	The log cannot be printed since the printer is not ready. Check the printer.
65	Logging output not possible since a print job is still running	The log cannot be printed since another print job is still running. Wait until the current print job is complete.
66	Logging not possible since the MMC is full	Logging is not possible since the MMC is full. Switch MMCs.
67	Logging task cannot be executed, since MMC is defective or non-existent	Logging is not possible since the MMC is defective. Switch MMCs.
68	Log output not possible since no data is available.	Repeating the last log print-out is not possible since there has been no previous print-out or the saved data is defective.
70	Logging output not possible since the log ID is not in the print text	Log output is not possible since the content of the text does not contain the log ID. Define the log ID in the text. This entry is necessary if the verifiable weight is contained in the log text in verifiable operation ((Technical regulation code OIML in DR 3).
76	Value range Adjustment digits exceeded	The definition for the adjustment digits in DR 3 is too large. Enter a smaller value. The highest permitted value is 16 777 215.
77	Regulation code not permitted	The regulation code is incorrect. Enter the proper code. The permitted entries are ---- or OIML.
78	Zero setting range > 4% or zero setting range exceeded	The zero definition range or zero setting range is too large. This is the case if you have defined a zero setting range of > 4% of the maximum weighing range, or > 20% of the zero setting range in DR 3 in verifiable operation (technical regulation code OIML in DR 3). The sum of the negative and positive values apply in this instance. Reduce the zero definition range or zero setting range.

Error No.	Data and operating errors - Meaning	Explanation
79	Number of weight ranges not allowed	The number of the weighing range is incorrect. Enter 1, 2 or 3.
81	Relationship between weighing ranges implausible	The definition for weighing ranges is incorrect in DR 3 (Max- and Min-values). On a multi-resolution scale, the Min-value of the next higher range must be equal to the Max-value of the range underneath. The Max-value must be greater than the Min-value. On a multi-range scale, the Min- as well as the Max-values must be increasing sequential ranges and the Max-value of a range must always be greater than the Min-value. Check parameter definitions.
82	Numeral step not plausible	At least one numeral step is incorrect in DR 3. The following numeral steps are permitted as numeral steps for the three weighing ranges and the distribution value: 50, 20, 10, 5, 2, 1, .., 0.5, 0.2, 0.1, 0.05, 0.02, 0.01, 0,005, 0,002, 0,001, 0.0005, 0.0002, 0.0001. The numeral step is not permitted to be to be less than one 6000th of the weighing range maximum value in verifiable operation (technical regulation code OIML in DR 3). The total numeral step may not be less than the numeral step of weighing range 1 in verifiable operation (regulation code OIML set in DR 3). The numeral step of a weighing range may not be less than the numeral step of the weighing range below it. Check parameter definitions.
83	Filter parameter implausible	The filter parameter definition in DR 3 or DR 10 is not plausible. Check the codes for the filter type (0..2) and the limit frequency (0..9).
84	Characteristic value not plausible	The characteristic value in DR 3 is incorrect. Set the parameter to a valid value (1, 2 or 4).
85	Averaging filter length not permitted	The average value filter is defined incorrectly in DR 3. Set the parameter for the depth of the average value filter to 250 at the very most.
86	Adjustment weight error	The defined adjustment weights are incorrect. The weight values must be in ascending order or 0 if not used.
87	Conversion factor error	The conversion factor from weight unit to large weight unit is implausible.
88	Adjustment zero setting time too large	The adjustment time and zero setting time is too great (0…900 s).
89		Reserved
94	Adjustment weight too low	The adjustment weight is too low in DR 3. Increase the adjustment weight interval. The measurement values between two sequential adjustment weights must be separated by a space of at least 2% of the measurement range.

Error No.	Data and operating errors - Meaning	Explanation
96	Tare T- invalid	The subtractive tare has been exceeded. This error is generated in the following cases: ▪ The gross value lies above the defined permitted tare range for the taring command. ▪ An externally defined tare value is negative. ▪ An external defined tare value is larger than the maximum value of weighing range 1 on a multi-resolution scale. ▪ An externally define tare value is larger than the maximum tare value [%] of the largest weighing range in verifiable operation (technical regulation code OIML in DR 3) with a multi-resolution scale.
97		
98	Totalizing memory already deleted	The Delete distribution memory command could not be executed since the distribution memory is already zero
99	Distribution memory could not be logged	An error has occurred while logging the totalizing memory. Check the output device. Check the additional technology errors for indications concerning the cause of the error. A technology fault is defined with the cause.
100	Weight outside zero definition range	Zero definition cannot be executed since the current zero point lies outside the zero definition range defined in DR 3 or the current gross value lies above the largest defined weighing range value. The limit value is defined in DR 5 with a loss-in-weight scale.
101	Scale command cannot be executed since not at standstill	The weighing command (Taring, Zero definition, Logging) cannot be executed since the standstill is not within the defined standstill time in DR 3.
102	Adjustment weight missing	Adjustment command cannot be executed because the respective adjustment weight is not entered in DR 3.
105	Weighing operating mode not allowed or unknown	Incorrect weighing operating mode in DR 3. Enter a correct weighing operating mode.
106	Limit values implausible	The defined limit values in DR 4 are not plausible. Limit value 3 may only be operated as a max. limit value (On ≥ Off). Correct limit value 3.
111	Parameter implausible for external distribution memory	At maximum flowrate, the pulses for the external summator can not longer be output.
112	Nominal speed implausible.	Nominal speed implausible (must be larger than 0).
113	Pulse constant implausible.	Pulse constant implausible (must be larger than 0).
114		
115	Allocation of log text No. for autom. logging not permitted	The log text number in DR 21 is incorrect. Correct the number (0..4).
116	Belt length implausible	Effective belt length implausible (must be larger than 0).

Error No.	Data and operating errors - Meaning	Explanation
119	Tilt angle implausible	Tilt angle of the belt implausible (must be larger than 0).
120		
121		
122	Current value definition is not plausible	Current value definition (actuation signal) in the device characteristic curve DR 11 is not plausible.
123	Operating point in the characteristic curve is not plausible	The definition of the operating point in the device characteristic curve or in the material characteristic curve is not plausible.
124	Reserved	Reserved
125	Flow rate setpoint not plausible.	The setpoint in DR 20 is not plausible.
143	Load amount too low (belt scale)	The defined load amount is too low. For belt scale only.
150	Command impossible since SIMATIC CPU is in STOP	Command impossible since SIMATIC CPU is in STOP
166	Date Time implausible	The date or time definition is not plausible. Correct the definition. The following are allowed: ▪ Year: 0..99 ▪ Month: 1..12 ▪ Day: 1..28/29/30/31 (depending on the month) ▪ Hour: 0..23 ▪ Minute: 0..59 ▪ Second: 0..59 ▪ Weekday: 1..7
167	Time definition implausible	The definition for a time entry is not plausible. Check the following conditions: ▪ DR 6 measuring time for the flow rate is not in permitted range ▪ DR 6 : Filling time does not match maximum filling time ▪ DR 6: Inhibit time does not match settling time ▪ DR 12: Control cycle time, Integration time or differentiation time not plausible
168	Percentage default value incorrect	The percentage default value is not plausible.
169	Negative default value not permitted	Negative default value not permitted Change the definition.
170	Number range for weighing values exceeded	The numeral range for a definition is invalid. Permitted values are -100 000 000 and lower than 100 000 000.
171	Checksum error	Checksum error in data record 26. The data was falsified or the DR versions to not match.

Error No.	Data and operating errors - Meaning	Explanation
172	Selection code unknown	There is a number for selecting a property that has no meaning contained in the parameters. The following values must be observed: DR 3: • Source for weight simulation 0..2 • Decade for rounding 0..6 • Source for analog output 0..4 DR 6: Time unit selection incorrect DR 12 Controller activation or switching flag not plausible
176	Impedance error	Impedance error is output if the impedance deviation is greater than 10% to the reference value or if an error has occurred during the measurement.
178	DR-writing not possible	The selected data record cannot be defined if the write protection is set.

Table 7-1   List of Data and Operating Errors

7.7   Message List Technology Messages

Error No.	Technology message - Meaning	Explanation
1-10	**MMC error**	
1	Card function not executable	MMC defect or non-existent. MMC check required. These errors are generated: ▪ If a trace entry should be made to the MMC, but no formatted MMC is inserted ▪ If the MMC is deleted during a logging/trace entry. ▪ If the MMC contains data errors that cannot be restored after insertion.
2	Trace recording aborted since the MMC is full	The trace recording has been aborted because there is no more memory available. If recording to the MMC has been defined, insert a new MMC. Set the recording method to cyclic memory before formatting an MCC so that the oldest data is automatically continuously overwritten. If recording to RAM is defined, read the data if desired and then delete the trace memory. Set the recording method to cyclic memory if you want to overwrite the oldest data automatically.
3	Recording aborted since the parameters have been changed	Trace recording has been aborted because the recording device parameters have been changed during the recording process.
4	logging not possible since the MMC is full	Logging to the MMC cannot be performed because the memory on the MMC is exhausted. Use a new MMC.
5	Trace overloaded	The defined cycle for the trace recording cannot be processed. There may be problems with the MMC. Use a new MMC. If the problem still occurs, decrease the recording cycle of the trace function in DR 7 or record to the RAM memory (MMC parameter in DR 7).
11-20	**Log output error**	
11	Error in log	Logging the used text is not possible because a non-defined code for a variable field has been defined. Check the log texts in DR 40, 41, 42 or 43.
12	Timeout print-out	A print-job was not completed within the monitoring time defined for logging in DR 4. Check the output device or increase the monitoring time.

Error No.	Technology message - Meaning	Explanation
13	Error Output device not ready	Logging is not possible because the defined output device was not ready. If the printer is defined as the output device, check whether the printer is connected properly and if it is ready or not. If the MMC is selected as the MMC, check for whether a formatted MMC is inserted.
14	Logging not possible since the weight lies outside of the weighing range	Logging not possible since the weight lies outside of the weighing range in verifiable application (code in DR 3 OIML)
15		Reserved
16	Logging is not possible since there is no log ID in the print text	Logging is not possible since no log ID is defined in the log string (verifiable application, code in DR 3 - OIML).
17	Logging is not possible because the printer is not ready	Logging is not possible because the printer has not indicated that it is ready. Check the printer.
18	Logging is not possible because the MMC is defective or is not inserted	Logging is not possible because the MMC is defective or it has been removed. Change or insert the MMC.
19	Logging is not possible because the SIWATOOL-driver is active	Logging is not possible because the SIWATOOL program is active on the interface. Disconnect the connection to the PC and connect a printer.
20		Reserved
21-40	**Error in weighing function**	
21	Scale command aborted, not at standstill	Taring/Zero definition or logging not possible because no standstill has been achieved within the standstill waiting time 1 defined in DR 3.
22	Zero setting not possible	The switch-on weight lies outside of the value range defined in DR 3 for zero setting with the maximum positive and negative weight.
23	Zero setting / taring not possible	Zero definition or zero setting not possible because the gross is outside the zero definition range or taring is not possible because the tare maximum load has been exceeded.
41-100	**Error in continuous operation**	
50	Weighing procedure aborted because of CPU stop	A running process has been aborted because the S7 CPU went into stop status.
70	Time for maximum control difference elapsed	The max. control difference was longer than the maximum permitted time.
71	Procedure stopped because value not in permitted measuring range	Refilling was stopped because the measuring range was exceeded

Error No.	Technology message - Meaning	Explanation
72	Maximum refilling time was exceeded	Maximum time for refilling procedure was exceeded. (Refilling is not switched off)
73	Reserved	Reserved
74	Max. vol. time exceeded	Monitoring time for switching back from volumetr. operation to gravimetr. operation has elapsed

Table 7-2   List of Technology Messages

7.8 Message List of the Operating Messages

If an error generates an operating message, the red SF LED on the front of the module is illuminated. The operating messages are generated coming and going.

Error No.	Operating messages - Meaning	Solution
	Internal module error going	
1	Reboot due to error in RAM read-write testing	The error can mean that the module is defective. This fault must be reset with the "Error Acknowledge" command. *Note: Error is deleted by acknowledging but is never set since there is no more activity when a RAM fault occurs → Watchdog, Error 2*
2	New start caused by watchdog error (mandatory acknowledgment)	The module had to be reset because of a critical error. This fault must be reset with the "Error Acknowledge" command.
3	New start caused by program error (mandatory acknowledgment)	The error can mean that the module is defective. This fault must be reset with the "Error Acknowledge" command. Contact the SIWAREX Hotline.
4	Lost process alarm	Process alarm on the S7 interface
5	Parameter error (Data loss)	Parameter error (Data loss). One or more data segments in non-volatile memory are defective. Load the defective data records e.g. with the Set default value command or transfer the affected records individually.
	External error going	
17	Limit for load cell signal exceeded or undershot	The measurement is too high. Measure the measurement voltage with a multimeter and check the load cells. Check the set characteristic value in DR 3.
18	Wire break	The connection to the load cells has been broken. Check the load cell connection.
19	ADC error	The AD converter must be reset because of a fault.
20	Timeout Life bit	The SIMATIC-CPU has not tracked the life bit within the defined time. The communication through the FB SIWA is damaged.
23	Belt speed too low	The pulse input no longer delivers pulses (less than 2 pulse/s)
24	Fault on RS485	Communication fault on the RS485 interface.

Table 7-3   List of Operating Messages –going

Error No.	Operating messages - Meaning	Solution
	Internal module error going	
129	Reboot due to error in RAM read-write testing	The error can mean that the module is defective. This fault must be reset with the "Error Acknowledge" command. *Note: Error is deleted by acknowledging but is never set since there is no more activity when a RAM fault occurs → Watchdog, Error 2*
130	New start caused by watchdog error (mandatory acknowledgment)	The module had to be reset because of a critical error. This fault must be reset with the "Error Acknowledge" command.
131	New start caused by program error (mandatory acknowledgment)	The error can mean that the module is defective. This fault must be reset with the "Error Acknowledge" command. Contact the SIWAREX Hotline.
132	Lost process alarm	Process alarm on the S7 interface
133	Parameter error (Data loss)	Parameter error (Data loss). One or more data segments in non-volatile memory are defective. Load the defective data records e.g. with the Set default value command or transfer the affected records individually.
	External error going	
145	Limit for load cell signal exceeded or undershot	The measurement is too high. Measure the measurement voltage with a multimeter and check the load cells. Check the set characteristic value in DR 3.
146	Wire break	The connection to the load cells has been broken. Check the load cell connection.
147	ADC error	The AD converter must be reset because of a fault.
148	Timeout Life bit	The SIMATIC-CPU has not tracked the life bit within the defined time. The communication through the FB SIWA is damaged.
151	Belt speed too low	The pulse input no longer delivers pulses (less than 2 pulse/s)
152	Fault on RS485	Communication fault on the RS485 interface.

Table 7-4 List of Operating Messages – coming

8 Programming in SIMATIC STEP 7

8.1 General

SIWAREX FTC was developed specifically for operation with the SIMATIC S7.
The hardware set-up is described in detail in chapter *4* Hardware Configuration.
SIWAREX FTC is projected as a function module in the SIMATIC manager.
In order for the SIWAREX FTC to be accepted into the module assembly catalogue of the SIMATIC manager, the SETUP program (SETUP_FOR_SIMATIC on the project planning package CD) must be executed.
The configuration package supplied includes a project containing the standard software (FB 43 SIWA_FTC), required for operation of the SIWAREX FTC. The program SIWAREX FTC "Getting Started" is also provided. This program shows how application software can be created.
Using the Getting Started program and creating your own supplements for various applications is recommended e.g. using the message block for SIWAREX FTC since the processing and displaying of errors exhibited by SIWAREX is performed very simply.

The future holds a separate manual for the SIWAREX FTC configuration package in PCS 7. Currently, the configuration package SIWAREX FTC for PCS 7 only contains the functionality of the belt scale.

8.2 SIWAREX FTC in HW Config.

Planning of the hardware configuration in SIMATIC Manager involves definition of the basic properties of the module:

- Peripheral address of the module

- Diagnostic alarm enable

- Process alarm enable

- Behavior for CPU stop

SIWAREX FTC requires 16 bytes in the input and output areas.

Other scale specific parameters that are also changed during the control program run-time can be defined in two different ways:

- Using the SIWATOOL FTC_L set-up software

- By defining the parameters in a scale data block and then transferring them to the SIWAREX FTC. Cyclic communication between the SIWAREX FTC module and the SIMATIC CPU is established through the FB SIWA_FTC function block (FB43).

8.3   SIWAREX FTC in the Cyclic STEP 7 – Program

SIWAREX FTC communicates with the SIMATIC CPU with the function block FB SIWA_ FTC. While programming the call, an instance data block is created for the FB SIWA_FTC. Besides the instance data block, **a scale DB is required for every SIWAREX FTC scale**, in which the scale parameters are stored. The UDT that comes with it can also be used for creating the scale DB.

The vector DB must also be loaded in the SIMATIC CPU. **A vector DB can be used by several SIWAREX FTC modules**.

Function block FB SIWA_FTC and the data block are found on the CD for the configuration package SIWAREX FTC for SIMATIC S7 in Getting started software.

```
CALL "SIWA_FTC" , DB 15 (
            ADDR                        := 256,
            DB_SCALE                    := 18,
            DB_VECTOR                   := 17,
            CMD_IN                      := "DB_SCALE".i_CMD_INPUT,
            SIM_VAL                     := "DB_SCALE".r_SIM_VALUE,
            ANA_OUT                     := "DB_SCALE".r_ANALOG_OUT_VALUE,
            DO_FORCE                    := "DB_SCALE".b_DIG_OUTPUT_FORCE,
            TRANSITION                  := "DB_SCALE".b_Reserve
            CMD_INPR                    := "DB_SCALE".bo_CMD_IN_PROGRESS,
            CMD_FOK                     := "DB_SCALE".bo_CMD_FINISHED_OK,
            CMD_ERR                     := "DB_SCALE".bo_CMD_ERR,
            CMD_ERR_C                   := "DB_SCALE".b_CMD_ERR_CODE,
            REF_COUNT                   := "DB_SCALE".b_INFO_REFRESH_COUNT,
            PROC_VAL1                   := "DB_SCALE".r_PROCESS_VALUE1,
            PROC_VAL2                   := "DB_SCALE".dw_PROCESS_VALUE2,
            SC_STATUS                   := "DB_SCALE".dw_SCALE_STATUS,
            ERR_MSG                     := "DB_SCALE".bo_ERR_MSG,
            ERR_MSG_TYPE                := "DB_SCALE".b_ERR_MSG_TYPE,
            ERR_MSG_C                   := "DB_SCALE".b_ERR_MSG_CODE,
            FB_ERR                      := "DB_SCALE".bo_FB_ERR,
            FB_ERR_C                    := "DB_SCALE".b_FB_ERR_CODE,
            START_UP                    := "DB_SCALE".bo_START_UP_IN_PROGRESS,
            CMD_EN                      := "DB_SCALE".bo_CMD_ENABLE,
            ERR_MSG_Q                   := "DB_SCALE".bo_ERR_MSG_QUIT);
```

Figure 8-1   Call parameters for FB SIWA_FTC

8.4   Call parameters for FB SIWA_FTC

The call parameters of the FB SIWA_FTC are described in the following section. As supplied, the call parameters are defined as variables in the scale DB. It is possible to define the call parameters with other variables of the same type.

While calling the FB SIWA_FTC, the number of the instance DB to be generated must be defined.

8.4.1   ADDR:= 256, Input, INT

SIWAREX FTC requires 16 bytes in the input and output range of the SIMATIC CPU for operation. The ADDR parameter must correspond wit the definition in the HW configuration.

8.4.2 DB_SCALE:= 18, Input, INT

A scale DB must be defined for every scale, in which the parameter of the SIWAREX FTC and the current actual value are found. The number of the DB can be freely selected. DB15 has been defined as the scale DB in the project planning package. In addition, the UDT15 is provided as a template for creating blocks.

8.4.3 DB_VECTOR:= 17, Input, INT

The content of the vector DB may not be modified by the user. It must be loaded one time only per SIMATIC CPU, independent of the number of SIWAREX FTC modules that are used. The number of the DB can be freely selected.

8.4.4 CMD_IN:= "DB_SCALE".i_CMD_INPUT, Input, INT

The user controls all command using this input variable, whether for transferring a data record or executing a weighing task. The commands are described in chapter *6*. The user prepares the command number using this variable and triggers the command using variable CMD_EN:= "DB_SCALE".bo_CMD_ENABLE (see chapter *8.4.22*). The FB SIWA_FTC does not delete the command number, it resets the trigger variable CMD_EN:= "DB_SCALE".bo_CMD_ENABLE after executing the command.

8.4.5 SIM_VAL:= "DB_SCALE".r_SIM_VALUE, Input, REAL

If the simulation has been enabled (see chapter *5.8.1*), the value to be simulated can be defined on this input. The value should be found in the weighing range of the weighing instrument.

8.4.6 ANA_OUT:= "DB_SCALE".r_ANALOG_OUT_VALUE, Input, REAL

If control of the analog output has been enabled (see chapter *5.8.11*), the value to be controlled can be defined on this input. The value should be found in the defined range of the weighing instrument.

8.4.7 DO_FORCE:= "DB_SCALE".b_DIG_OUTPUT_FORCE, Input, BYTE

If forced control of the digital outputs has been enabled (see chapter *5.8.3*), the value to be controlled can be defined on this input. Bit 0 corresponds with digital output 0, bit 1 corresponds with digital output 1, etc.

8.4.8 CMD_INPR:= "DB_SCALE".bo_CMD_IN_PROGRESS, Output, BOOL

The bit informs the user that a command is currently being processed.

8.4.9 CMD_INPR:= "DB_SCALE".bo_CMD_FOK, Output, BOOL

The bit informs the user that his command has been executed with no errors (Command complete without errors).

8.4.10 CMD_ERR:= "DB_SCALE".bo_CMD_ERR, Output, BOOL

This bit informs the user that a command has not been executed. The bit is set for one cycle (edge) only. The cause can be evaluated in the same cycle with variable CMD_ERR_C:= "DB_SCALE".b_CMD_ERR_CODE The number is decoded in the table "Data and Operating Errors" in chapter *7.6.* If no error code is specified, the error must be evaluated in "DB_SCALE".b_FB_ERR_CODE.

8.4.11 CMD_ERR_C:= "DB_SCALE".b_CMD_ERR_CODE, Output, BYTE

For a command that is not executed (Finished with errors), the error number is output here. The number that is output is decoded in table "Data and Operating Errors" in chapter *7.6.* The value remains in the output until the next command is triggered. The evaluation is to be performed with the set bit CMD_ERR:= "DB_SCALE".bo_CMD_ERR appears. If no error code is specified, the error must be evaluated in "DB_SCALE".b_FB_ERR_CODE.

8.4.12 REF_COUNT:= "DB_SCALE".b_INFO_REFRESH_COUNT, Output, BYTE

The current output values which are prepared as output variables of the FB SIWA_FTC are read cyclically by the FB through the peripheral range. SIWAREX FTC updates the values internally in a 10 msec rhythm. Every update is assigned a number which can be used in the SIMATIC CPU like a time stamp.

8.4.13 PROC_VAL1:= "DB_SCALE".r_PROCESS_VALUE1, Output, REAL

The selected process value is output using this variable (See chapter *5.8.4*). Normally, the belt load is output here.

8.4.14 PROC_VAL2:= "DB_SCALE".w_PROCESS_VALUE2, Output, DWORD

The selected process value is output using this variable (See chapter *5.8.5*). The status of the continuous weighing is normally output here (see chapter *5.20.2*).

8.4.15 SC_STATUS:= "DB_SCALE".dw_SCALE_STATUS, Output, DWORD

The status of the non-automatic weighing instrument NAWI (see chapter *5.20.1*) is always output through this variable.

8.4.16 ERR_MSG:= "DB_SCALE".bo_ERR_MSG, Output, BOOL

All messages that SIWAREX FTC prepares are prepared in an output buffer on the module. If a new message appears, this bit is set. The user can evaluate the meaning using variables ERR_MSG_TYPE:= "DB_SCALE".b_ERR_MSG_TYPE and ERR_MSG_C:= "DB_SCALE".b_ERR_MSG_CODE. After acknowledging the message by the user (ERR_MSG_Q:= "DB_SCALE".bo_ERR_MSG_QUIT), the bit is reset by the block.

8.4.17 ERR_MSG_TYPE:= "DB_SCALE".b_ERR_MSG_TYPE, Output, BYTE

The user is shown which message is there with variable:

Bit 0 – Operating message (Fault)

Bit 1 – Technology error

Bit 2 – Data or operating error

8.4.18 ERR_MSG_C:= "DB_SCALE".b_ERR_MSG_CODE, Output, BYTE

The user is informed of the message number with this variable (suitable for ERR_MSG_TYPE:= "DB_SCALE".b_ERR_MSG_TYPE). After the evaluation of the message, the user indicates to the FB that the message has been evaluated (with variable ERR_MSG_Q:= "DB_SCALE".bo_ERR_MSG_QUIT) and the FB SIWA_FTC is ready to output the next message if one exists.

8.4.19 FB_ERR:= "DB_SCALE".bo_FB_ERR, Output, BOOL

If an error has occurred during the processing of the function block itself, it is indicated by this variable.

⚠

Warning

If a processing error occurs for FB SIWA_FTC, we have to assume that the variables that have been output do not correspond with the actual status in the module.

8.4.20 FB_ERR_C:= "DB_SCALE".b_FB_ERR_CODE

The error number of the FB SIWA_FTC is output through this variable.

The following messages can be output:

Bit 0 - DB_SCALE or DB_VECTOR are missing or have incorrect lengths

Bit 1 - Error with internal call for SFC58 or SFC59, the value RET_VAL is entered in DW4 in the scale DB for one cycle

Bit 2 - Error interpreting a data record / command, specified data record or command number is incorrect.

Bit 3 - Life bit error, SIWAREX FTC not responding

Bit 4 - Unable to read peripheral data in this cycle

Bit 5 - Activated command aborted at restart

Bit 6 - Reserved

Bit 7 - Reserved

⚠

Warning

If a processing error occurs for FB SIWA_FTC, we have to assume that the variables that have been output do not correspond with the actual status in the module.

8.4.21   START_UP:= "DB_SCALE".bo_START_UP_IN_PROGRESS

Communication between the SIWAREX FTC and the FB SIWA_FTC is synchronized when the SIWAREX FTC module is restarted (normally when the SIMATIC CPU is started). The bit can be output for more than one cycle.

8.4.22   CMD_EN:= "DB_SCALE".bo_CMD_ENABLE

After entering the command number in the CMD_IN:= "DB_SCALE".i_CMD_INPUT variable, the execution of the command is triggered with this bit. To prevent the command from being triggered more than once, the bit should be created as an edge. After execution of the command, the FB SIWA_FTC resets the trigger variable CMD_EN:= "DB_SCALE".bo_CMD_ENABLE.

8.4.23   ERR_MSG_Q:= "DB_SCALE".bo_ERR_MSG_QUIT

After evaluating a message with variable ERR_MSG_C:= "DB_SCALE".b_ERR_MSG_CODE, the user acknowledges this message. FB SIWA_FTC can then output the next message.

8.5   Allocation of the Scale DB

There are variables that are available in the SIMATIC in the scales DB.
The allocation corresponds with the data record structure. The variable designation is in English.

8.6   Calibratable Weight Display on OP/TP/MP 170B, 270B, 370

For displaying the calibratable weight value, the same device that the operator uses for running the system can be used. **The calibratable display is important in operating mode "Non-automatic weighing instrument" in calibratable applications.**

The calibratable main display for one or more scales can be one of the following devices:

TP170B, OP170B

TP270, OP270, MP270B

MP370

The SIMATIC HMI device can be connected with the MPI or to PROFIBUS. The calibratable display of the weight value can be connected in any system hierarchy. The connection does not have to be sealed and future planning for operator windows are also not influenced by the calibratable weight display.

8.6.1 Functionality of the Calibratable Weight Display

The value for the calibratable weight display is generated internally by the SIWAREX FTC, it is encoded and then provided in the data record DR 35 for the user.

The DR 35 data record is read by the FB SIWA_FTC and is put in the scale DB just like every other data record in a defined address.

The content of the DR 35 can be sent via the bus connection to other SIMATIC-CPUs or it can be evaluated locally.

For the evaluation, an AddOn is used for ProTool – a special function, which is able to decode the contents of the DR 35 and display it in a special output field. This AddOn is called „Assured Output" and must be installed in addition to ProTool.

MODUL NO.   ▶◀   CRC: 36683

B   2.465 kg
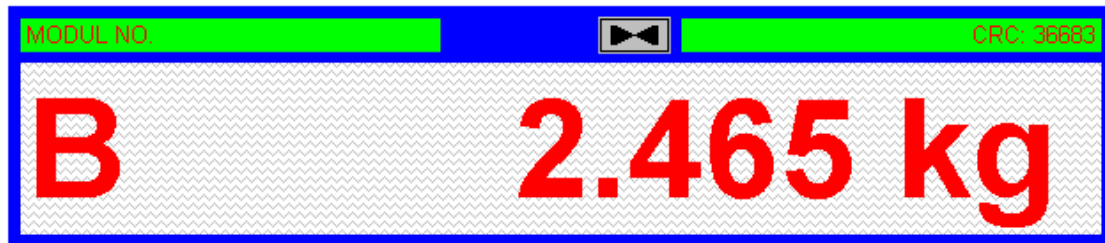
Figure 8-2   Display of the Calibratable Display in TP/OP

8.6.2 Installation and Configuration of the Calibratable Weight Display

First, the OCX for the assured output must be integrated into the setup environment of ProTool. This is possible with version 6.0 SP2 ProTool(Pro) or higher.

That program that can perform the installation can be found in the OCX_DISPLAY directory of the planning package.

If ProTool is not on drive C: or D:, the setup.bat program must be edited with an editor and written to the other drive.

After executing the setup.bat program, the Protool.ini file must be changed according to the note in setup.bat.
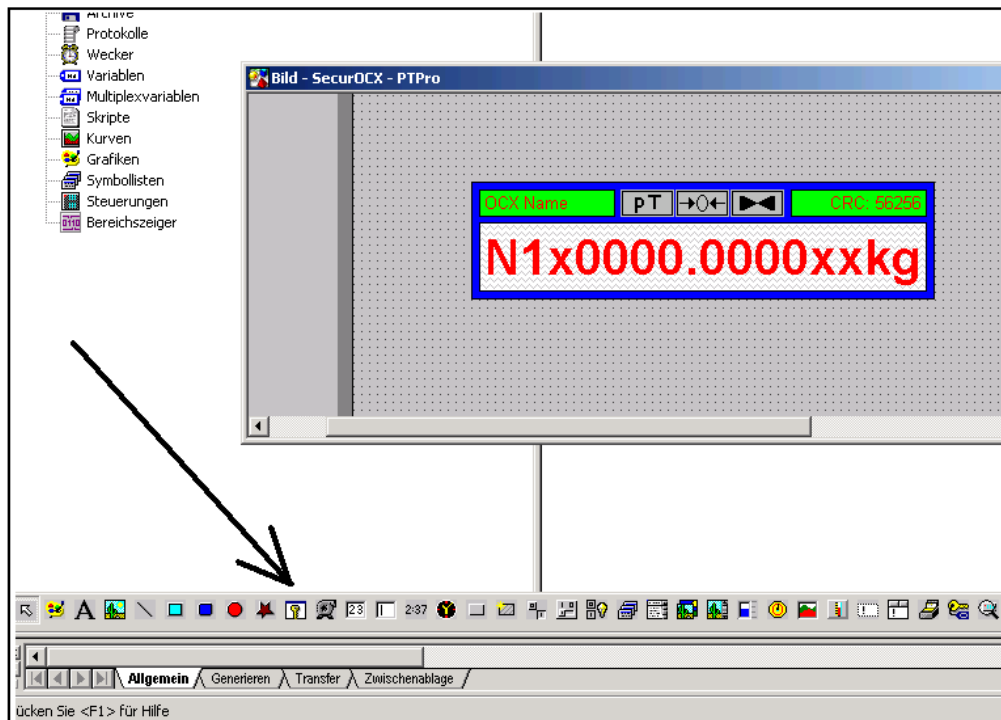
Figure 8-3   Function "Secure output" in ProTool

If ProTool is called again afterwards, a new function appears in the tool-bar (see arrow) - "Secure output", which is projected just as all other functions.

During planning, the address of the data record DR 35 must be defined.
The variable is BYTE and has a length of 32 bytes.

The refresh rate lies somewhere around 200 to 300 msec which is comfortable to the eye.

Note

After converting a project to another target device, the assured output must be deleted in the images and planned again.

Note

When loading the project to the target device, a notice can be displayed which indicates that the OCX is not certified. This notice has no influence on the functionality of the AddOn.

Figure 8-4   SIWAREX FTC OCX parameters

9 Commissioning with a PC – SIWATOOL FTC_L

9.1 General

The scale can be put into operation using the SIWATOOL FTC_L independent of the commissioning of the SIMATIC automation system.

This program is included in the configuration package supplied.
The program (catalogue SIWATOOL_FTC) must be installed in the first step. Less than 30 MB is required on the hard drive.

9.2 Windows and Functions in SIWATOOL FTC_L

The program window is constructed so that navigating through the parameter definition areas of the SIWAREX FTC is made easier. In the left-hand portion, the overview of the parameters is shown as a tree-structure. The parameter grouping corresponds with the various activities which can happen during the project planning, commissioning, tests and for service cases.
A data record in SIWAREX FTC belongs to every branch of the tree structure. Several parameters are combined in one data record. In the right-hand window, the parameters in a data record can be edited in index card format.
The first card in a box is set up as an information sheet. The user is shown which tasks can be processed with the parameters of the selected data record in this information sheet. For sending, receiving and transferring, the entire data record is always handled, not just an index card.

9.3 Offline Configuration

All scale parameters can be processed and stored without the SIWAREX FTC. This reduces the commissioning time.
The parameters for more than one scale can be prepared in the office and only have to be transferred to the SIWAREX FTC when starting the operation on-site. Data from one scale that is currently in operation can be read and used in the commissioning of another scale.

9.4 Online Operation

To switch to online operation, the PC must be connected to the SIWAREX FTC with the SIWATOOL cable (see *Accessories*). The COM interface can be set up in the communication menu.
All parameters can be changed in online operation. A message window shows the current content of the message buffer in SIWAREX FTC. The current process values can be observed in the various windows. For testing, all commands can be sent to the SIWAREX FTC.
All data can be read out and stored as a file or printed for archiving purposes.

⚠️
Warning

All data can be edited in the module in online operation. The changes are not automatically transferred to the corresponding scale data blocks. As user, you must decide whether the data comparison is required and perform it if necessary.
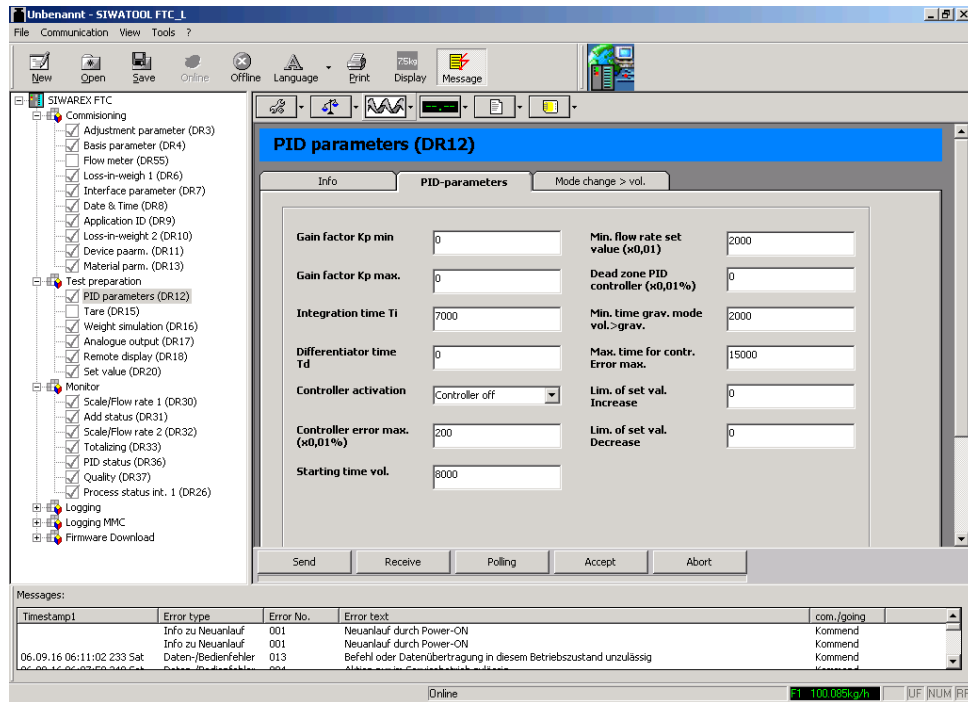
Figure 9-1   SIWATOOL FTC_L windows

9.5   Help

After clicking on a data record in the left-hand program window, the "Info" card can be selected in the right-hand program window. A description of the affect of the data record on the behavior of the scale is shown in a white area.

After selecting a card, a segment of the corresponding data record is shown in the form of input and output fields. In addition to the parameter designation, the Tool Tips can also be helpful in remembering the meanings of certain parameters (text is displayed if the mouse pointer is positioned over a field).

After clicking on menu point "Help", the "SIWAREX FTC" manual is called. Installation of Acrobat Reader is necessary to read the manual.

10 Firmware-Update with SIWATOOL FTC_L

10.1 Advantages of the Firmware Update

If you want to utilize the firmware update offer on the SIWAREX Internet Site (www.siemens.de/siwarex / Support), you can download the latest firmware versions, free of charge and then transfer them onto the modules with the SIWATOOL FTC_L program.

The firmware is found in Flash memory. If necessary, new firmware can be transferred onto the assembly.

The new firmware can slightly vary from earlier versions with small changes - this is the case if the data structure of SIWAREX FTC parameters are not changed. In this case, putting the new firmware on will not change the current data.

If the new firmware creates new data structures, new data records or changes to existing data records because of function expansion the SIWAREX FTC will define those parameters with default values after the firmware has been downloaded. Therefore, the original status of those parameters should be read using the SIWATOOL FTC (Menu: "Communication", "Receive all data records") and then saved to a file.

Loading the firmware onto the SIWAREX FTC module is performed over a few steps:

1. Switch the SIMATIC CPU to STOP.

2. Register SIWATOOL FTC_L (online)

3. Select Firmware Download

4. Select Firmware file

5. Activate the download mode with the checkmark

6. Start the transfer

This transfer can take up to several minutes.

When the transfer is complete, SIWAREX FTC performs a restart. Communication with the SIWATOOL FTC_L must be activated again.
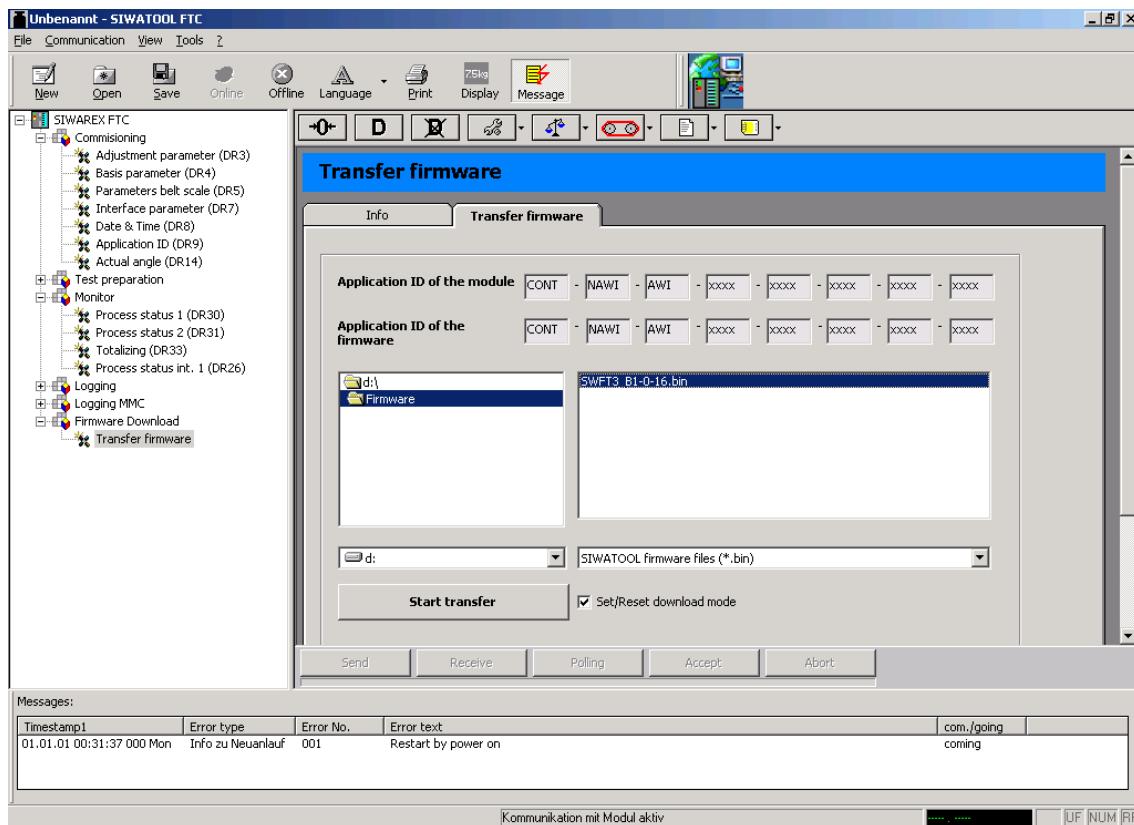
Figure 10-1　　　Downloading the Firmware with SIWATOOL FTC_L

⚠

Warning notice

SIWAREX FTC will not respond to the communication requests from the SIMATIC CPU while transferring the firmware. The CPU indicates a peripheral access error and unless a corresponding OB (Organization Block) is programmed, the CPU can go to STOP status.

In this case, loading the new firmware should simply be done with the CPU in STOP status.

11 Verifiable (calibrated) Application as a Non-automatic Weighing Instrument

11.1 General Information

⚠ **!**	**Attention** Scales subject to calibration may only be certified by a calibration expert or qualified representative.

Preparation

Prior to the actual certification by the calibration expert, the operator of the scale should make the preparations described below:

Start SIWAREX FTC
- Adjust the scale as described in the device manual
- Check all of the points corresponding with (1), (2), (3) and (4).

(1) = European Regulations ER (90/384/EWG) on non-automatic weighing instruments

(2) = European Standard EN 45 501 for non-automatic weighing instruments

Calibration sticker

The calibration sticker is found in the calibration set which is available as an accessory.

Certification of the SIWAREX FTC

The certification of the calibrated scale is done by a calibration expert from a recognized position.

SIWAREX FTC Stamp of Approval (Certification stamp)

After activating the write protection (WRP switch on the front), the calibration expert attaches the certification stamp and the calibration mark.

11.2 Calibratable Main Weight Display

The calibratable main display for SIWAREX can either be handled using the calibratable display S102 by Siebert or with certain standard SIMATIC OP/TPs (*8.6*). The conditions for use and details can be found in the construction type certification for SIWAREX FTC.

11.3 Reading the Calibratable Logs with SIWATOOL FTC_L

The weighing logs of the non-automatic weighing instrument can either be printed on a printer certified as legal-for-trade or stored in verifiable memory in the optional Micro Memory Card.

The capacity of the MMC should normally be sufficient for recording the scale logs for a period of 3 months. The MMC can be configured with SIWATOO FTC_L so that the data will overwrite older data when the memory is full. This creates a circulating buffer that conforms with the documentation of the calibration regulations.

A unique log ID is found in every weighing log that is stored. The log ID is very important because it is also printed out on the non-calibratable delivery note next to the amounts.

If anyone objects to a fixed delivery because of the delivered amount, the log ID is used to help find the log - either in a stack of paper logs or on the Micro Memory Card.

A connection has to be made to SIWAREX using SIWATOOL FTC_L for this purpose. After entering the log ID, the data to be checked is read from the MMC, which is still in the SIWAREX FTC and is continuously storing the production scale data, and this data is then displayed.
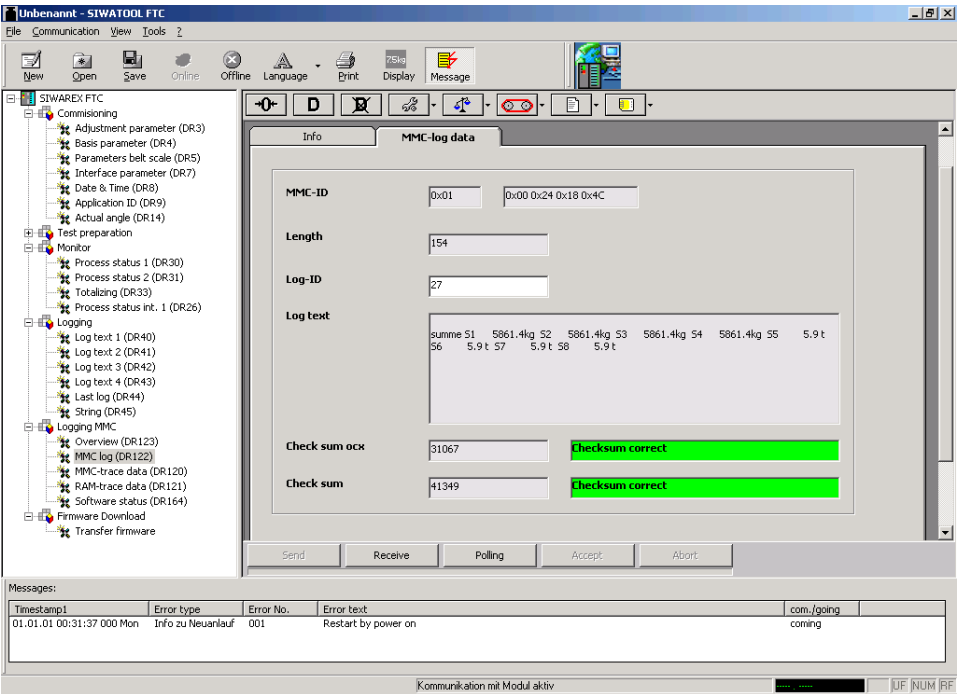
Figure 11-1   Reading the calibratable memory with SIWATOOL FTC_L

12 Accessories

There are necessary and optional accessories for the SIWAREX FTC.

The essential accessories are indicated in the following table.

Description	Order-No.
SIWAREX FTC Weighing electronics for continuous weighing for S7-300 and ET200M. EU type approval (certificate) 3 x 6000d as non-automatic weighing instrument Application areas: non-automatic weighing instrument, force measurement, belt scales, loss-in-weight scale and flow meter.	**7MH4900-3AA01**
• **SIWAREX FTC Device Manual** (The device manual is only available electronically and is available through Internet page www.siemens.de/siwarex)	
SIWAREX FTC configuration package for SIMATIC S7 for non automatic weighing scale, Force measurement, Loss-in-weight scale and flow meter on CD-ROM • SETUP for S7 integration as of Step7 V5.2 • S7- Function block, Getting started • PC parameter software SIWATOOL FTC_L • Manual on CD-ROM	**7MH4900-3AK02**
SIWAREX FTC configuration package for PCS7 V6.0 (only available for belt scales) on CD-ROM • SETUP for S7- Integration • Function block for the CFC-Plan • Face plate for WINCC • PC parameter software SIWATOOL FTC_L • Manual on CD-ROM	**7MH4900-3AK61**
SIWATOOL-connection cable from SIWAREX FTC with a serial PC interface, for 9 pin PC interfaces (RS 232)	
• **Length 2 m**	**7MH4702-8CA**
• **Length 5 m**	**7MH4702-8CB**
• **Front connector 40 pin,** with screw contacts (required for every SIWAREX assembly), alternatively with spring-clamps - see next point	**6ES7 392-1AM00-0AA00**
• **Front connector 40 pin**, with spring-clamps (required for every SIWAREX assembly), alternatively with screw contacts - see next point	**6ES7 392-1BM00-0AA00**
• **Shielding contact rail** sufficient for one SIWAREX FTC module group	**6ES7 390-5AA00-0AA0**
• **Shielding connection clamp** Content: 2 pieces (suitable for cable of diameter 4 to 13 mm) Note: One shielding connection clamp is required for each of the following: - Scale connection - RS 485 interface	**6ES7 390-5CA00-0AA0**

Description	Order-No.
- RS 232 interface	
• S7 profile rail	
- **160 mm**	**6ES7 390-1AB60-0AA0**
- **480 mm**	**6ES7 390-1AE80-0AA0**
- **530 mm**	**6ES7 390-1AF30-0AA0**
- **830 mm**	**6ES7 390-1AJ30-0AA0**
- **2000 mm**	**6ES7 390-1BC00-0AA0**
Power supply PS 307 (only required if no DC 24 V is available) AC 120/230 V; DC 24 V	
• **PS 307-1B; 2 A**	**6ES7 307-1BA00-0AA0**
• **PS 307-1E; 5 A**	**6ES7 307-1EA00-0AA0**
• **PS 307-1K; 10 A**	**6ES7 307-1KA00-0AA0**
Label strips (10 pieces, replacements)	**6ES7 392-2XX00-0AA0**
Remote display (optional)	
The digital remote display model Siebert S102 can be connected directly through an RS 485 interface to the SIWAREX FTC Siebert Industrieelektronik GmbH Postfach 1180 D-66565 Eppelborn Tel.: 06806/980-0 Fax: 06806/980-999 Internet: http://www.siebert.de For detailed information, please contact the manufacturer.	
SIWAREX JB connection and distribution box for parallel switching for load cells, optional	**7MH4710-1BA**
SIWAREX EB expansion box for extending load cell cables, optional	**7MH4710-2AA**
Micro Memory Card (SIMATIC), optional	**6ES7953-8LF11-0AA0**
Calibration set for non-automatic weighing instruments – Accessories for a calibration certification (sticker plate, calibration marks, CD with samples and information)	**7MH4900-2AY10**
Ex-Interface, Type SIWAREX IS with ATEX certification for intrinsically safe connection of load cells, including the manual	
• with short-circuit current < DC 199 mA	**7MH4710-5BA**
• with short-circuit current < DC 137 mA	**7MH4710-5CA**
Cables (optional)	
Cable Li2Y 1 x 2 x 0.75 ST + 2 x (2 x 0.34 ST) – CY for connecting a SIWAREX FTC with connection and distribution box (JB), expansion box (EB) or Ex-Interface (Ex-I) as well as between two JBs, for stationary cabling, occasional bending is possible, 10.8 mm outer diameter for Environmental temperatures –20 to +70°C	**7MH4702-8AG**
Cable Li2Y 1 x 2 x 0.75 ST + 2 x (2 x 0.34 ST) - CY, blue cover Connecting of connection and distribution box (JB) or expansion box (EB) in explosion hazard areas and Ex-Interface (Ex-I), for stationary cabling, occasional bending is possible, blue PVC insulated coating, approx. 10.8 mm outer diameter for environmental temperatures –20 to +70°C	**7MH4702-8AF**
Cable LiYCY 4 x 2 x 0.25 mm² for RS 485	**7MH4407-8BD0**

13 Technical Data

13.1 24 V Power Supply

An isolated function low voltage (in accordance with EN60204-1) is to be ensured by the system power supply.

Rated voltage	DC 24 V
Static upper / lower limits	DC 20.4 V/28.8V
Dynamic upper / lower limits	DC 18.5 V/30.2 V
Non-periodic over-voltages	DC 35 V for 500 msec with a recovery time of 50 sec.
Max. current consumption	500 mA
Typical module power loss	7.5 W

Table 13-1   Data: Power supply 24 V

13.2 Power Supply from S7 Backplane Bus

Current consumption from S7-300 back-plane bus	Typical 55 mA

Table 13-2   Data: Power supply from S7 backplane bus

13.3 Load Cell Connection

EU type certification as non-automatic weighing instrument, class III	3 x 6000 d (pi = 0.4)
Precision with Ex-i interface	3 x 6000 d (pi = 0.5)
Error limit conforming to DIN1319-1 from measurement range end value at 20 °C $\pm$10 K	Measuring range 1mV/V: ≤ 0.01 % Measuring range 2/4mV/V: ≤ 0.005 %
Refresh rate internal / external	2.5 msec/10 msec
Internal resolution	16 million parts
3 measuring ranges	0 to 1 mV/V 0 to 2 mV/V 0 to 4 mV/V
Max. distance to load cell (calibration)	1000 m (500 m)
Max. distance from load cell to Ex-i-Interface in Ex range	150/500 m for gas group IIC 1000 m for gas group IIB (see SIWAREX IS device manual)
Lowest permitted input signal for a calibration value in calibrating operation	≥ 0.5 µV/e

Load cell power Voltage Current	Typical DC 10.2 V * ≤ 184 mA
Permitted load cell resistance without Ex-i-Interface	> 56 Ω < 4010 Ω
Permitted load cell resistance with Ex-i-Interface	> 87 Ω < 4010 Ω
Monitor for sensor inputs	Typical ≥ 5 V Hysteresis 120 mV
Response time for sensor line monitor	≤ 1 s
Common mode rejection CMRR @50 Hz	Typical 120 dB
Measuring value filtering for low pass filter	0.05...20 Hz
Measured value filtering for average value filter	2...250 values
Impedance measurement for load cells	Measuring range 56 Ω...4010 Ω Precision ±5% Repeat accuracy <1 %
Isolation	500 V

* Values apply to module output

Table 13-3   Data: Load Cell Connection

13.4 Analog Output

The defined replacement value is output for active BASP-/OD signal (S7 CPU).	
Range 1	0 to 20 mA
Range 2	4 to 20 mA
Max. total error at 25 °C	< 0,5 % *
Refresh rate	10 ms
Load (incl. line resistance)	≤ 520 Ω, ≤ 30 nF
Cable length 0.5 mm^2	200 m
Temperature coefficient	max. ± 75 ppm / K
Resolution	12 Bit (4096 parts) **
Isolation	500 V

* Definitions apply with current >0.5mA
** Resolution reduced by 20 % with operations 4 to 20 mA

Table 13-4   Data: Analog Output

13.5 Digital Inputs (DI), Digital Outputs (DO)

	DI	DO
The defined value is always output on the DO for active BASP-/OD signal (S7 CPU). An inverse diode (recovery diode) is to be used on the consuming component with inductive loads on the DO.		
Number	7	8
Rated voltage	DC 24 V	
Isolation	500 V	
Voltage range for H signal	DC 15 V to 30 V	
Voltage range for L signal	DC -3 V to 5 V	
Input current (15 to 30 V)	2 to 15 mA	
Switching frequency	max. 50 Hz	max. 50 Hz

Rated current	0.5 A
Max. output current	0.6 A
max. cumulative current of all outputs	2 A
Isolation	500 V
Voltage drop on assembly	< 0.25 V
Switching delay	≤ 12 ms
Short-circuit proof	Yes[1]

[1] Pulsed output current upon short-circuit

Table 13-5   Data: Digital inputs, Digital outputs

13.6 Counter Input CI (for belt scale)

Number	1
Rated voltage	DC 24 V
Isolation conforming with IEC 1131, UL 508, CSA C22.2 NO. 142	500 V
Voltage range for H signal	DC 9 V to 30 V
Voltage range for L signal	DC -3 V to 5 V
Input current (15 to 30 V)	2 to 15 mA
Switching frequency	max. 10 kHz
Isolation	500 V

Table 13-6   Data: Counter input CI

13.7 RS 232C Interface

Baud rate	1200 to 115200 Baud
Data bits	8
Parity	Even
Stop bits	1
Max. distance	15 m
Signal level	Conforms to EIA-RS232C
Isolation	500 V

Table 13-7   Data: RS 232C interface

13.8 RS 485 Interface

Baud rate	1200 to 19200 Baud
Data bits	7 or 8
Parity	even / odd
Stop bits	1 or 2
Max. distance	1000m at 1200 Baud
Signal level	Conforms with EIA-RS485
Termination resistance	390Ω / 220Ω / 390Ω
Isolation	500 V

Table 13-8   Data: RS 485 interface

13.9 Dimension and Weight

Dimensions W x H x D	80 x 125 x130 mm
Weight	600 g

Table 13-9   Data: Dimensions and Weight

13.10   Mechanical Requirements and Data

Testing	Standards	Test values
Vibration in operation	DIN IEC 68-2-6 DIN IEC 721, Part 3-3 IEC 1131-2	Class 3M3 Testing Fc 10 ... 58 Hz: 0.075 mm movement 58 ...150 Hz: 9.8 m/s^2 10 cycles per axis 1 octave / min.
Shock in operation	DIN IEC 68-2-27 DIN IEC 721, Part 3-3 IEC 1131-2	Class 3M3 Test Ea 150 m/s^2 , Half sinus Duration: 11 ms Number: 3 per axis each in neg. and pos. direction

Table 13-10   Data: Mechanical Requirements

13.11   Electrical-, EMC- and Climatic Requirements

13.11.1 Electrical Protection and Safety Requirements

Requirement met	Standards	Comments
Safety regulations	EN60204; DIN VDE 0113; IEC 1131; UL 508; CSA C22.2 No.142; FM class I, Div.2; UL/CSA	UL-/CSA-/FM Zone 2 certification upon request
Protection class	VDE 0106 Part 1 IEC 536	Protection class I, with protective conductor
IP protection	DIN 60529 IEC 529	in S7 frame: IP20 only SIWAREX FTC: IP10
Air and creepage distances	IEC 1131 UL508	Surge category II Pollution degree 2

Requirement met	Standards	Comments
	CSA C22.2 No.142	Circuit board material IIIa Circuit track spacing 0.5 mm
Isolation test	IEC 1131-2: 1992 CSA C22.2 No.142	Rated voltage 24 V Test voltage 500 V DC
Fire and burn protection	for "Open Type Controller": IEC 1131-2: 1992; UL 508	
Material	SN 36350 (3.93)	

Table 13-11   Data: Electrical Protection and Safety Requirements

13.11.2 Electromagnetic Compatibility

Comments	Standard	Degree of severity
Burst pulses on power supply lines:	DIN EN 61000-4-4 (DIN VDE 0843 T4)	2 kV (acc. 90/384/EWG 1 kV)
Burst pulses on data and signal lines:	DIN EN 61000-4-4 (DIN VDE 0843 T4)	2 kV (acc. 90/384/EWG 0.5 kV)
Electrostatic discharge (ESD)	DIN EN 61000-4-4 (DIN VDE 0843 T2)	6 kV
Electrostatic air discharge (ESD)	DIN EN 61000-4-4 (DIN VDE 0843 T4)	8 kV
Surge on power supply lines	DIN EN 61000-4-5 (DIN VDE 0839 T10)	$\pm$ 2 kV unsym.* $\pm$ 1 kV sym.
Surge on data and signal lines :	DIN EN 61000-4-5 (DIN VDE 0839 T10)	$\pm$ 1 kV unsym.*
HF disturbance (electromagnetic fields) 10 kHz to 80 MHz	DIN EN 61000-4-3 (DIN VDE 0843 T3)	up to 3 V/m
HF disturbance (electromagnetic fields) 80 MHz to 1000 MHz	DIN EN 61000-4-3 (DIN VDE 0843 T3)	to 10 V/m (acc. 90/384/EWG 3 V/m)

Table 13-12   Data: Electromagnetic Compatibility

*   must be protected with external protection elements
**   For use in residential areas, additional measures must be taken (e.g.: Use in 8MC cabinets)

EMC   For EMC, guidelines in accordance with NAMUR NE21 Part1, as well as the European directives 90/384/EEC for non-automatic weighing instruments and 89/336/EEC concerning the emission and sensitivity of electromagnetic disturbance are taken into account.

13.12   Environmental Conditions

The SIWAREX FTC is suitable for weather protected, stationary application in SIMATIC S7-300 systems. Conditions for application conforming with IEC 1131-2.

For use in extreme operating conditions (e.g. heavy dust, acidic moisture or gasses etc.), additional measures are to be taken such as B. Encapsulation.

Climatic requirements		
Comments	Environmental conditions	Application range
Operating temperature: Vertical installation in S7-300 Horizontal installation in S7-300 Calibrating operation	-10 to +60 °C -10 to +40 °C -10 to +40 °C	The S7-300 standard module groups may not be operated under 0°C
Storage and transport temperature	-40 to +70 °C	
Relative humidity	5 to 95 %	Without condensation, corresponds to relative humidity (RH) exposure level 2 in accordance with DIN IEC 1131-2
Pollutant concentration	SO_2: < 0.5 ppm; H_2S: < 0.1 ppm;	RH < 60% no condensation

Table 13-13   Data: Climatic Requirements

13.13   Licenses

Note:
The licenses that are currently valid for SIWAREX FTC are indicated on the SIWAREX FTC rating plate.

CE	Directives: 90/384/EWG "Non-automatic weighing instrument" 89/336/EEC "Electromagnetic Compatibility" 94/9/EG "Explosion protection" (ATEX 100a) **Note**: Further information on the EC directives can be found in the product documentation accompanying every SIWAREX FTC.
c**UL**us HAZ. LOC.	Underwriters Laboratories Inc. nach UL 508 (Industrial Control Equipment) CSA C22.2 No. 142 (Process Control Equipment) UL 1604 (Hazardous Location) CSA-213 (Hazardous Location) APPROVED for use in Class I, Division 2, Group A, B, C, D T4; Class I, Zone 2, Group IIC T4
FM APPROVED	Factory Mutual Research (FM) nach Approval Standard Class Number 3611, 3600, 3810 APPROVED for use in Class I, Division 2, Group A, B, C, D T4; Class I, Zone 2, Group IIC T4
Ex	Explosion protection according to EN 60079-15: 2005 (Electrical apparatus for potentially explosive atmospheres; Type of protection "n") Class II 3 G EEx nA II T4 For using the SIWAREX FTC in areas with a risk of explosion, the important information in the "SIMATIC Automation Systems - Basics of Explosion protection (Doc.No. A5E00206200)" must be observed!

14 Index

15 Abbreviations

ADC	Analog-Digital-Converter
ASCII	American Standard Code for Information Interchange
B	Gross weight
O&O	Operating and Observing
CPU	Central processing unit
DO	Digital output
DB	Data block
DI	Digital input
FC	STEP7 function call
FB	Function block (S7)
FM	Function module (for S7-300)
HMI	Human machine interface (SIMATIC Operator Panel)
HW	Hardware
MMC	Micro-Memory-Card / Multi-Media-Card
MPI	Multi-Point-Interface
NAWI	Non-automatic weighing instrument
NSW	Non-automatic weighing instrument
OD	Output Disable (S7)
OIML	Organization Internationale de Metrologie Legale
OM	Object manager for STEP 7 objects
OP	Operator Panel (SIMATIC)
P-BUS	Peripherals bus (S7)
PC	Personal Computer
pT	Preset tare (predefined tare weight with manual taring)
PTB	Physikalisch Technische Bundesanstalt (certification authority for calibration of scales)
RAM	Random Access Memory
S7-300	Siemens Automation System for the mid-performance-range
S7-400	Siemens Automation System for the high-level performance range
SFC	System Function Call (S7)
STEP 7	Programming device software for SIMATIC S7
T	Tare weight
TIA	Totally Integrated Automation
TP	Touch Panel (SIMATIC)
UDT	Universal Data Table (S7)
WRP	Write Protection
LC	Load cell(s)