


Compact PLUS units
Compact and chassis units

SIMOVERT MASTERDRIVES Vector Control

Compact PLUS, Compact and Chassis Units

General technical data

Converters, inverters, AFE inverters, rectifier units, rectifier/regenerative units and braking units

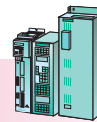
Cooling type	Forced ventilation with integral fan	
<u>Air-cooled</u> Permissible ambient and cooling-medium temperature during operation	+32 °F (0 °C) to +104 °F (+40 °C) (reduction curves for +104 °F (+40 °C) < T < +122 °F (+50 °C), see page 6/3)	
<u>Water-cooled</u>		
● Cooling water inlet temperature	+41 °F (+5 °C) to 100.4 °F (+38 °C)	
● Permissible ambient temperature during operation	+32 °F (0 °C) to +104 °F (+40 °C)	
Permissible ambient temperature during storage and transport	−13 °F (−25 °C) to +158 °F (+70 °C)	
Installation altitude	≤ 3282 ft (1000 m) above sea level (100 % load capability) > 3282 ft (1000 m) to 13126 ft (4000 m) above sea level (for reduction curves, see Section 6)	
Humidity rating	Relative humidity ≤ 85 %, moisture condensation not permissible	
Climatic category	Class 3K3 to EN 60 721-3-3	
Environmental class	Class 3C2 to EN 60 721-3-3	
Insulation	Pollution degree 2 to DIN VDE 0110-1 (HD 625. 1 S1: 1996), moisture condensation not permissible	
Overvoltage category	Category III to DIN VDE 0110-1 (HD 625. 1 S1: 1996)	
Degree of protection	To EN 60 529: Compact PLUS units: IP20; chassis units: IP00 (IP20 optional)	
Protection class	Class I to EN 61 140	
Shock protection	To DIN VDE 0106 Part 100 and BGV A2 (previously VBG 4)	
Radio-interference suppression	To EMC product standard EN 61 800-3 for variable-speed drives	
● Standard	No radio-interference suppression	
● Options	Class B1 or Class A1 to EN 61 800-3	
Additional information	The units are motor-side ground-fault protected, short-circuit-proof and may be operated under no-load conditions.	
Paint finish	For indoor installation	
Mechanical specifications	To EN 60 068-2-6	
● during operation	10 Hz to 58 Hz constant deflection 0.003 in (0.075 mm) 58 Hz to 500 Hz constant acceleration 32 ft/s ² (9.8 m/s ²) (1 g)	
● during transport	5 Hz to 9 Hz constant deflection 0.14 in (3.5 mm) 9 Hz to 500 Hz constant acceleration 32 ft/s ² (9.8 m/s ²) (1 g)	
Approvals according to UL/CSA¹⁾	UL File No.	CSA File No.
● Converters and inverters	E 145 153	LR 21927
● Rectifier units and rectifier/regenerative units ²⁾	E 145 153	LR 21927
● Braking units and braking load resistors ²⁾	E 145 153	LR 21927
● Braking resistors for Compact PLUS units	E 233 422	210040 (Certificate 1185101)
● dv/dt- and sinusoidal filter ²⁾	E 145 153	LR 21927
● Radio-interference suppression filter type 6SE70 ... ²⁾	E 145 153	LR 21927
● Line commutating and output reactors (iron)	E 103 902	
● 3NE1 series fuses are 	E 167 357	

1) UL and CSA approval is not valid for units and system components 3 AC 660 V – 690 V and 890 V – 930 V DC.

2) UL and CSA approval only in combination with SIMOVERT MASTERDRIVES converters or inverters.

SIMOVERT MASTERDRIVES Vector Control

Compact PLUS, Compact and Chassis Units



Braking units and braking resistors

Compact PLUS units Compact and chassis units

Technical characteristics

Pulse Resistor Braking

DC link braking units used in combination with braking resistors can decrease the deceleration time and increase the braking power. When a motor is occasionally generating power (i.e. when stopping) this energy is fed back to the DC link. On a non-regenerative drive the DC link voltage can become excessively high (DC link over-voltage fault) due to the inertia or ramp times. Through the use of pulse resistor braking this excess energy is dissipated through the braking unit and across the resistor in the form of heat.

Braking Units

The braking unit is connected to the converter or common DC bus in parallel to the DC link. The braking units consist of an IGBT that is switched (pulsed) on at predetermined DC link voltage levels to dissipate energy across the braking resistor. The appropriate resistor must always be connected to the braking unit. Braking energy can not be converted without one.

The braking unit operates autonomously of the converter or inverters. The braking unit electronics are supplied from the DC link voltage. Braking units can be connected in parallel to increase braking power, however each braking unit requires its own braking resistor.

Compact PLUS chopper

The Compact PLUS converters and rectifier units have an integrated braking chopper. Only an external braking resistor is required to dissipate the braking energy during generative operation.

Applications in which braking energy occurs only occasionally, e.g. emergency stop, can be implemented with compact braking resistors that are specially matched to Compact PLUS units. These compactly dimensioned braking resistors can absorb high levels of braking power for a short time.

More information

regarding dimensioning of the braking units and braking resistors can be found in Section 6, Engineering Information.



Fig. 3/12
Braking unit and braking resistor for compact and chassis units

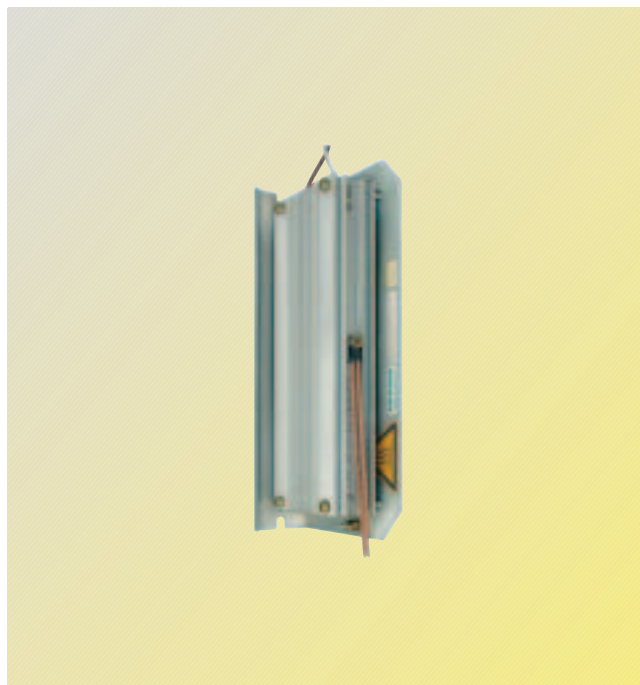
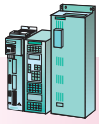


Fig. 3/13
Braking resistor for Compact PLUS units



Compact PLUS units
Compact and chassis units

SIMOVERT MASTERDRIVES Vector Control Compact PLUS, Compact and Chassis Units

Braking units and braking resistors

Technical data

Rated voltage	280 V DC -15 % to 340 V DC +10 %	510 V DC -15 % to 650 V DC +10 %	675 V DC -15 % to 810 V DC +10 %	890 V DC -15 % to 930 V DC +15 %
DC link voltage				
Thresholds				
Upper threshold 1	NA	774 V	967 V	1158 V
Lower threshold 2	NA	673 V	841 V	1070 V
Load class II to EN 60 146-1-1				
Rated power P_{20}	P_{20} power at the upper threshold: The duration is a function of the internal or external resistor			
Continuous power P_{DB}	Continuous power at the upper threshold: The value is dependent on the internal and external resistor			
Short-time power P_3	$1.5 \times P_{20}$ power at the upper threshold: The duration is a function of the internal and external resistor			
Cycle time	90 s			
Overload duration	20 s (22 % of the cycle time)			

Braking units cannot be ordered with options.

Note: At the time of this publication the size S and A braking units ending in order number ...-2DA0 were scheduled to be superseded. The newer type units have smaller envelope dimensions and do not contain an internal braking resistor. If a newer type unit is to replace a superseded braking unit which was only operating with the internal braking resistor, an appropriate Compact PLUS braking resistor can be used.

When a superseded unit is being replaced and signals are connected to control terminal X38, then the control terminal strip must be re-wired. Ensure the ground X38/Pin 2 is connected to the ground on the receiver so the signal level of the electronic switch is detected.

Superseded units	Newer type S units
Order No.	Order No.
6SE7021-6CS87-2DA0	6SE7021-6CS87-2DA1
6SE7023-2CA87-2DA0	6SE7023-2CS87-2DA1
6SE7026-3CA87-2DA0	6SE7026-3CS87-2DA1
6SE7018-0ES87-2DA0	6SE7018-0ES87-2DA1
6SE7021-6ES87-2DA0	6SE7021-6ES87-2DA1
6SE7023-2EA87-2DA0	6SE7023-2ES87-2DA1
6SE7028-0EA87-2DA0	6SE7028-0ES87-2DA1
6SE7016-4FS87-2DA0	6SE7016-4FS87-2DA1
6SE7021-3FS87-2DA0	6SE7021-3FS87-2DA1
6SE7026-4FA87-2DA0	6SE7026-4FS87-2DA1

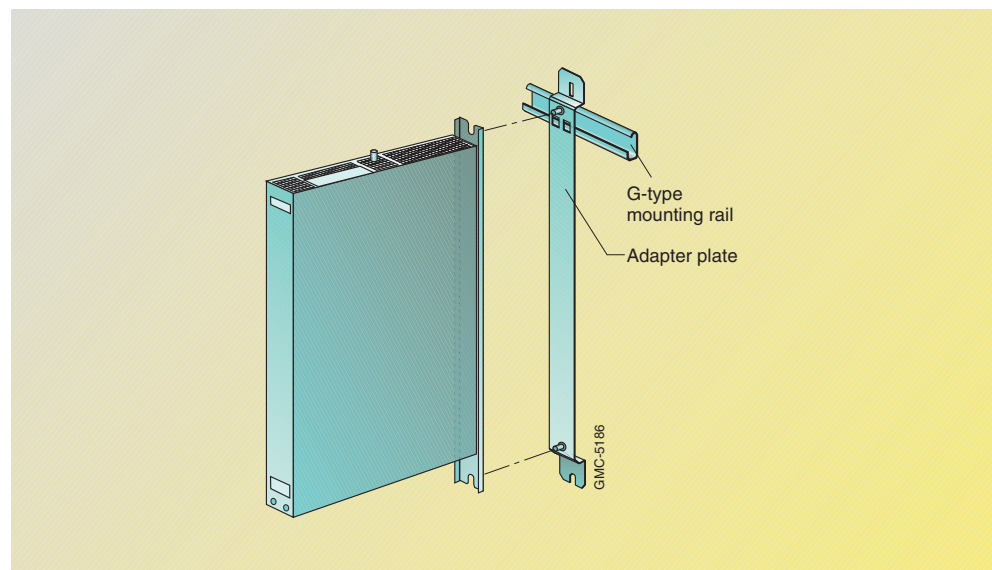


Fig. 3/14
Adapter plate 6SX7010-0KC01 is required for mounting on G-Type rail for size S newer type braking units

SIMOVERT MASTERDRIVES Vector Control

Compact PLUS, Compact and Chassis Units



Braking units and braking resistors

Compact PLUS units Compact and chassis units

Selection and ordering data

Braking resistors for Compact PLUS units

Braking power ¹⁾					Braking resistor
P_{20}	P_3	P_{DB}	Resistance	Cycle time T	
kW	kW	kW	Ω	s	Order No.
2 ³⁾	3	0.15	200	3200	6SE7013-2ES87-2DC0
4 ³⁾	6	0.3 ⁴⁾	100	6400	6SE7016-3ES87-2DC0
5	7.5	1.25	80	90	6SE7018-0ES87-2DC0
10	15	2.5	40	90	6SE7021-6ES87-2DC0
12 ³⁾	18	0.9 ⁵⁾	33.3	6400	6SE7022-0ES87-2DC0
20	30	5	20	90	6SE7023-2ES87-2DC0
50	75	12.5	8	90	6SE7028-0ES87-2DC0
100	150	25	4	90	6SE7031-6ES87-2DC0

Braking units and braking resistors for compact and chassis units

Braking power ¹⁾			Braking unit	Dimensions		Weight		Braking resistor, external	Resist- ance ²⁾
P_{20}	P_3	P_{DB}		W x H x D					
kW	kW	kW	Order No.	in	(mm)	lb	(kg)	Order No.	Ω

DC link voltage 280 V to 310 V DC

5	7.5	1.25	6SE7021-6CS87-2DA1	1.8 x 14.2 x 9.7	(45 x 360 x 247)	6.6	(3)	6SE7021-6CS87-2DC0	20
10	15	2.5	6SE7023-2CS87-2DA1	1.8 x 14.2 x 9.7	(45 x 360 x 247)	7.3	(3.3)	6SE7023-2CS87-2DC0	10
20	30	5	6SE7026-3CS87-2DA1	1.8 x 14.2 x 9.7	(45 x 360 x 247)	9.0	(4.1)	6SE7026-3CS87-3DC0	5

DC link voltage 510 V to 650 V DC²⁾

5	7.5	1.25	6SE7018-0ES87-2DA1	1.8 x 14.2 x 9.7	(45 x 360 x 247)	6.6	(3)	6SE7018-0ES87-2DC0	80
10	15	2.5	6SE7021-6ES87-2DA1	1.8 x 14.2 x 9.7	(45 x 360 x 247)	6.8	(3.1)	6SE7021-6ES87-2DC0	40
20	30	5	6SE7023-2ES87-2DA1	1.8 x 14.2 x 9.7	(45 x 360 x 247)	7.3	(3.3)	6SE7023-2ES87-2DC0	20
50	75	12.5	6SE7028-0ES87-2DA1	1.8 x 14.2 x 9.7	(45 x 360 x 247)	9.0	(4.1)	6SE7028-0ES87-2DC0	8
100	150	25	6SE7031-6EB87-2DA0	5.3 x 16.7 x 13.8	(135 x 425 x 350)	9.7	(18)	6SE7031-6ES87-2DC0	4
170	255	42.5	6SE7032-7EB87-2DA0	5.3 x 16.7 x 13.8	(135 x 425 x 350)	39.7	(18)	6SE7032-7ES87-2DC0	2.35

DC link voltage 675 V to 810 V DC²⁾

5	7.5	1.25	6SE7016-4FS87-2DA1	1.8 x 14.2 x 9.7	(45 x 360 x 247)	6.6	(3)	6SE7016-4FS87-2DC0	124
10	15	2.5	6SE7021-3FS87-2DA1	1.8 x 14.2 x 9.7	(45 x 360 x 247)	6.8	(3.1)	6SE7021-3FS87-2DC0	62
50	75	12.5	6SE7026-4FS87-2DA1	1.8 x 14.2 x 9.7	(45 x 360 x 247)	9.0	(4.1)	6SE7026-4FS87-2DC0	12.4
100	150	25	6SE7031-3FB87-2DA0	5.3 x 16.7 x 13.8	(135 x 425 x 350)	39.7	(18)	6SE7031-3FS87-2DC0	6.2
200	300	50	6SE7032-5FB87-2DA0	5.3 x 16.7 x 13.8	(135 x 425 x 350)	39.7	(18)	6SE7032-5FS87-2DC0	3.1

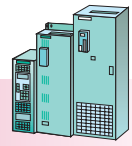
DC link voltage 890 V to 930 V DC²⁾

50	75	12.5	6SE7025-3HS87-2DA1	1.8 x 14.2 x 9.7	(45 x 360 x 247)	9.0	(4.1)	6SE7025-3HS87-2DC0	17.8
200	300	50	6SE7032-1HB87-2DA0	5.3 x 16.7 x 13.8	(135 x 425 x 350)	39.7	(18)	6SE7032-1HS87-2DC0	4.45

See Section 6 for information on paralleling braking units for additional braking capacity.

- 1) For power definition, see Section 6.
- 2) Permits the braking power for switch-on application threshold = 774 V (\cong supply voltage 3 AC 460 V)
switch-on application threshold = 967 V (\cong supply voltage 3 AC 575 V)
switch-on application threshold = 1158 V (\cong supply voltage 3 AC 690 V)

- 3) Braking resistor in type Compact PLUS for occasionally incurring braking energy, e. g. emergency stop.
- 4) CSA rating 240 W.
- 5) CSA rating 720 W.



System components

Braking units and braking resistors

The braking resistors listed in Section 3 match the braking units and allow full utilization of the braking capability.

When braking resistors and braking units are combined, it must be guaranteed that the resistance of a resistor is not less than the minimum allowed resistance, otherwise the braking unit may be damaged.

The braking units of the same or adjacent power ratings, e.g. $P_{20} = 100$ kW and 170 kW or 5 kW and 10 kW, can be connected in parallel to increase the power. Each braking unit, however, requires its own load resistor. The maximum permissible continuous braking power connected to a converter or inverter is

$$P_{DBMAX} \leq 0.6 P_{conv.}$$

$$P_{20MAX} \leq 2.4 P_{conv.}$$

Braking units are used when regenerative power occurs occasionally and for a short time, e.g. during braking of the drive (emergency stop). For braking over a longer period of time, rectifier/regenerative units or AFE units are to be used.

$$P_{20} = \text{Rated Power}$$

$$P_3 = \text{Peak Power} = 1.5 \times P_{20}$$

$$P_{DB} = 0.25 \times P_{20} = \text{Steady State power rating}$$

The following applies with respect to paralleled braking units:

$$P_{20 \text{ total}} = 0.9 \times \text{collective } P_{20} \text{ of individual units}$$

$$P_3 \text{ total} = \text{collective } P_3 \text{ of individual units}$$

$$P_{DB \text{ total}} = \text{collective } P_{DB} \text{ of individual units}$$

Note

Fuses are not required for single-motor drives (one braking unit on converter). Fuses complying with page 3/66 should be fitted on multi-motor systems with common DC bus. These fuses only provide protection in "critical situations." They do not protect the braking unit or braking resistor.

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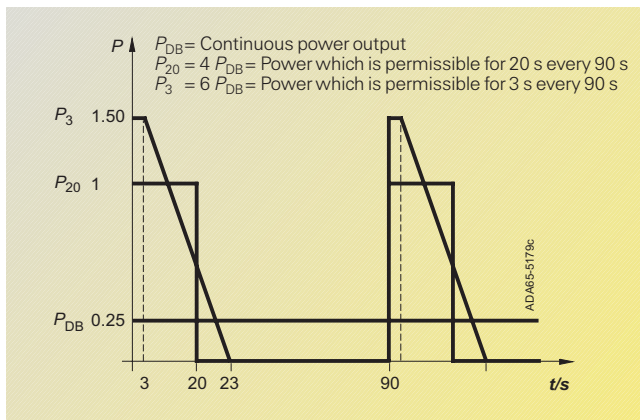


Fig. 6/51
Load diagram

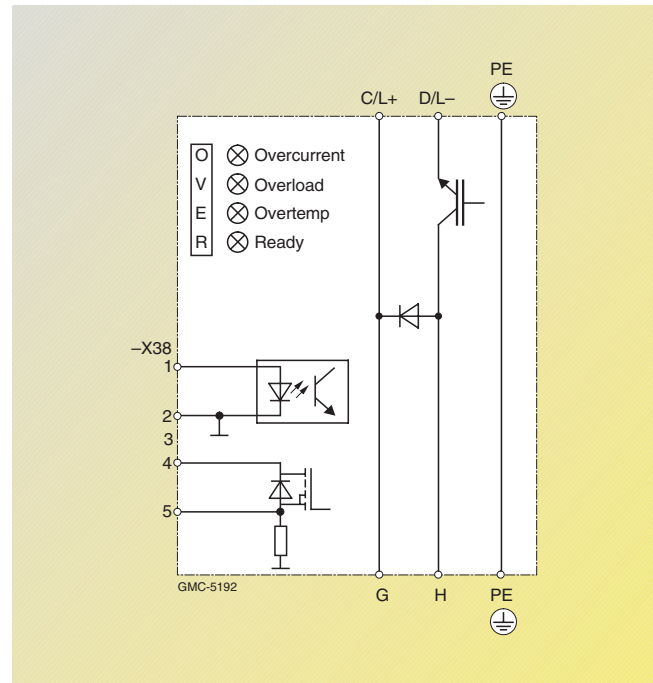


Fig. 6/52
General schematic diagram of 6SE70...S...2DA1 braking units

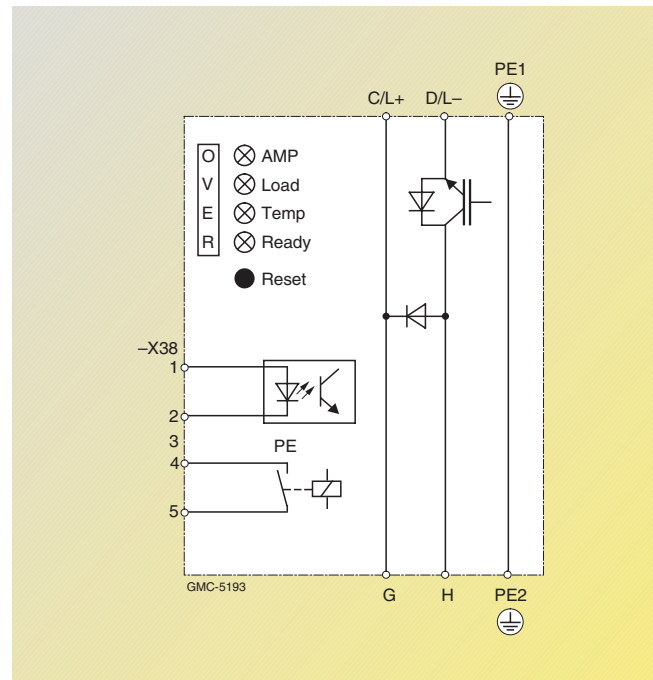


Fig. 6/53
General schematic diagram of 6SE70...B...2DA0 braking units