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Catalog KT 10.1 • 2004



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SITOP Power supplies

sitop

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Stromversorgungen SITOP power, LOGO!Power, SIDAC-S [1] PD 20

Order No.:
E86060-K2802-A101-A1



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SITOP

Power supplies
SITOP power
LOGO!Power

Catalog KT 10.1 · 2004



Supersedes:
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The products contained in this catalog also appear in CD-ROM catalog CA 01
Order No.:
E86060-D4001-A110-C3-7600

Please contact your local Siemens representative.

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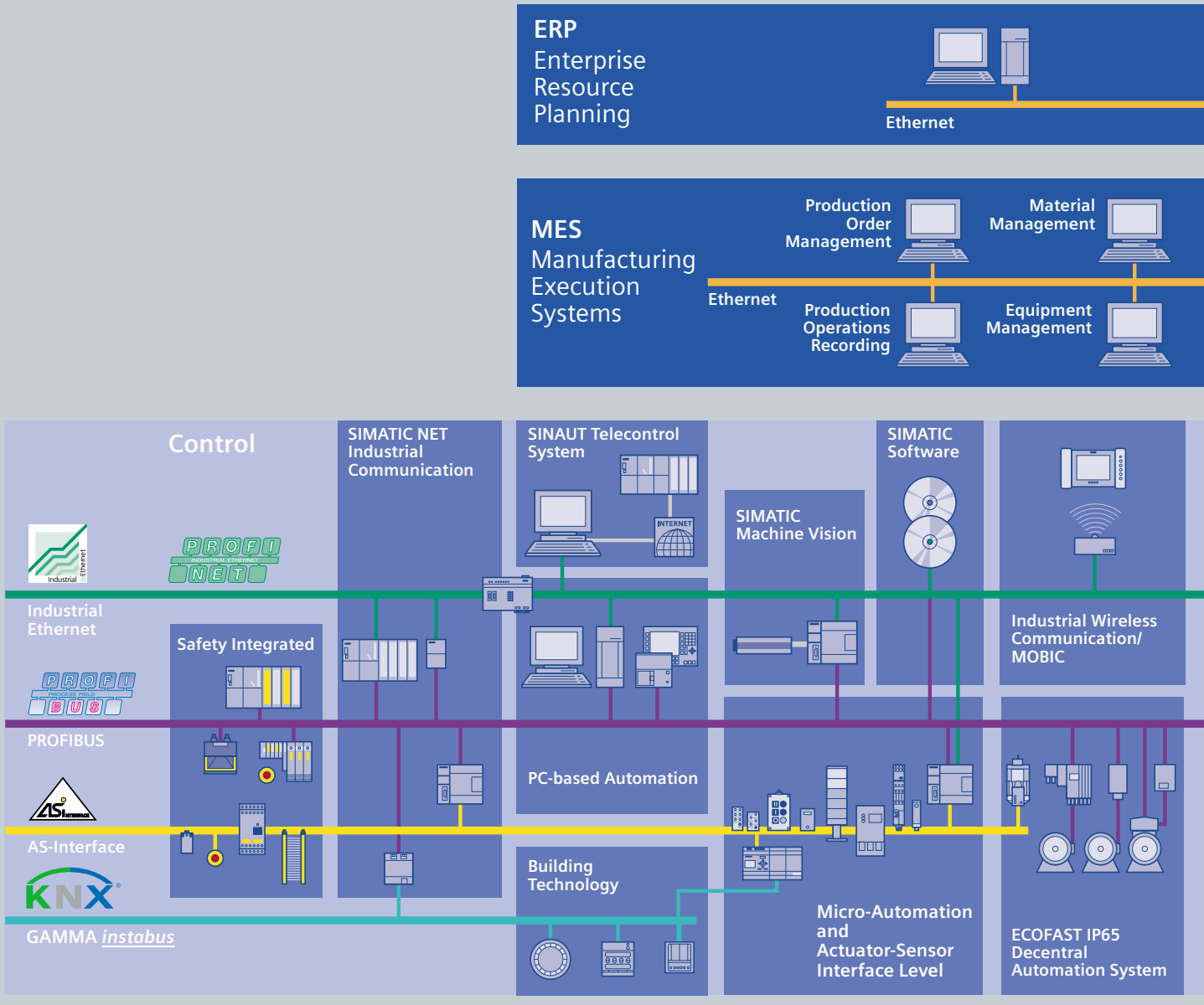




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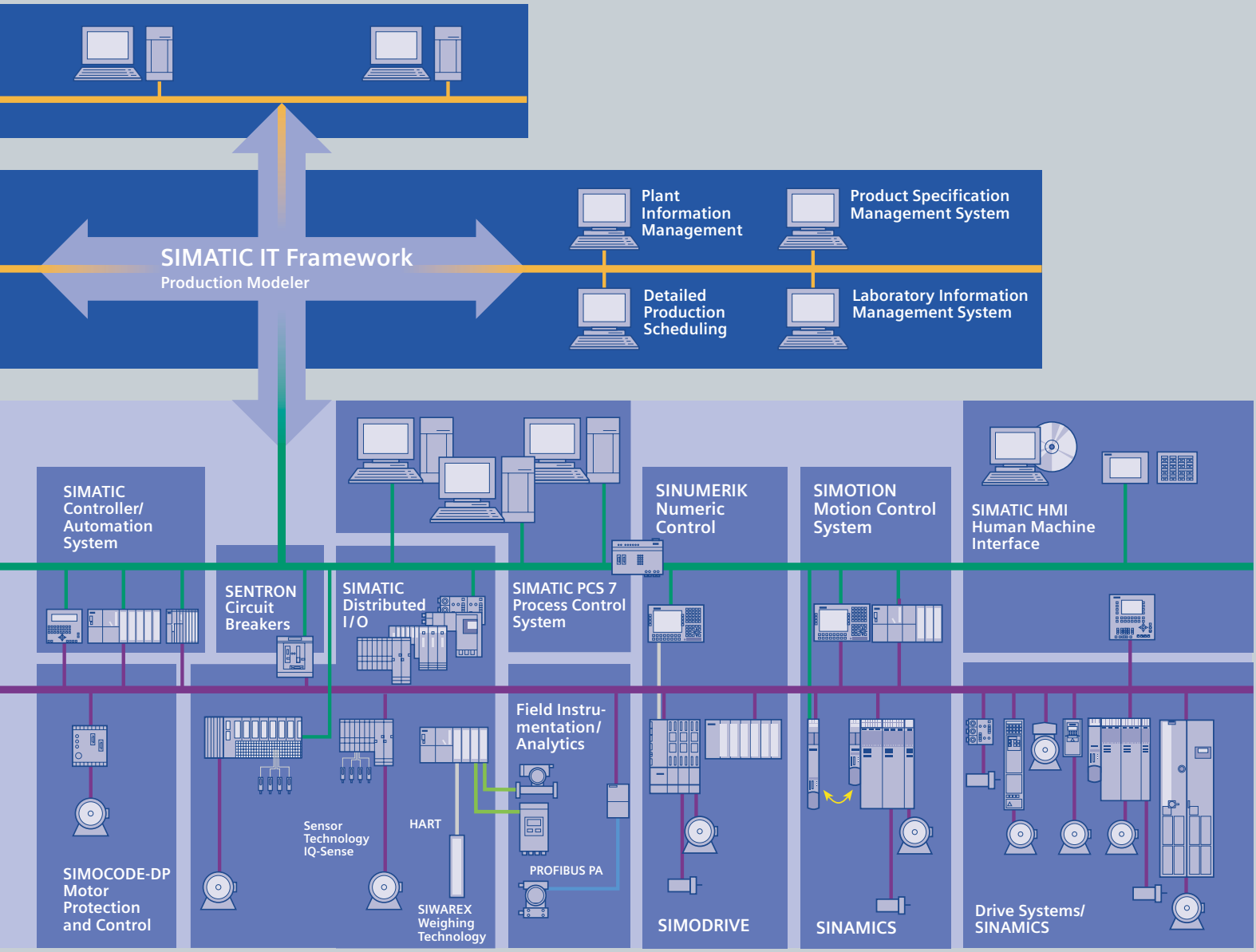
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Overview of product families

SITOP modular

The innovative SITOP modular power supplies feature a completely new concept. The highlight is the modular design comprising a basic unit which can be supplemented by add-on modules with further functions. The modularity has no competition with respect to flexibility, simple handling and price/performance ratio.

The basic units

Compact and rugged basic units for 1-, 2- or 3-phase connection and with output currents from 5 A to 40 A are the basis of the stabilized 24 V supply. The 5 A and 10 A power supply units are unique, and can be connected to almost any network throughout the world thanks to their ultra-wide input range. Each basic unit can be fitted on a DIN rail and already has a comprehensive scope of functions.

- 5 A and 10 A devices with ultra-wide input range for 1- and 2-phase operation
- 20 A and 40 A devices for 1- or 3-phase operation
- Adjustable output voltage up to 28.8 V for compensation of voltage drops
- 3 LEDs for detailed signalling of the operating status
- Power boost up to three times the rated current
- Selectable short-circuit response: constant current or latching shutdown
- Selectable output characteristic for parallel operation



The add-on modules

The functionality of the basic units can be expanded using add-on modules. The power supply is optimally integrated into the overall system using the signalling module. Immediate response to various operating statuses is possible and potential damage can be avoided. The buffer module provides effective protection against brief power failures which could lead to a plant standstill, loss of data or even machine damage if the 24 V side is not buffered. A redundancy module can also be used to provide redundant power supply. Thus the 24 V supply is guaranteed even in the worst case when a faulty power supply unit would affect the unit connected in parallel.

The SITOP select diagnosis module

The diagnosis module is the optimum expansion for all 24 V power supplies in order to divide and monitor the load current among several branch circuits. An overload or short-circuit in a feeder is reliably detected and selectively switched-off. Total failures of plants can be prevented because the 24 V supply for the other loads is maintained. Detailed signalling permits fast fault locating, and thus the minimizing of downtimes.



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SITOP DC UPS

The DC UPS modules provide optimum protection against longer power failures. DC UPS modules and battery modules expand SITOP power supply units with 24 V output voltage into uninterruptible power supplies with a rated output current up to 40 A. The transition from power supply mode to buffered mode is absolutely interruption-free. The DC UPS modules are provided as standard with all required protection and monitoring functions, thus providing high availability. The integral battery management function guarantees a long service life for the maintenance-free battery modules. Status messages concerning the operational readiness, battery status and battery lines are signaled by LEDs and floating contacts. The compact 6 A and 15 A DC UPS modules can also communicate via an interface, thus permitting simple integration into PC-based systems.

Tried and tested

The SITOP range of power supply units has proven its reliability for many years already. The units offer graded performances with output currents from 2 A to 20 A and from 10 A to 40 A for single-phase and three-phase incoming supplies respectively. Thanks to the simple handling and numerous certifications, the 24 V power supply units are also suitable for export-oriented use in all standard automation engineering applications. And should it be the case that the power supply conditions are unreliable in a global application, the proven SITOP power supplies can of course also be combined with the DC UPS modules.

The facets

The SITOP power supply units also cover individual power supply requirements - whether standard industrial applications, extreme ambient conditions, or unusual output voltages. The SITOP variants include some true all-rounders:

SITOP power 0.5: the mini devices with a width of only 22.5 mm are the narrowest in the SITOP family and are therefore particularly suitable for supplying low-voltage switchgear.

SITOP power flexi: unlimited variety thanks to a variable output. The innovative circuit concept permits flexible setting of the output voltage between 3 V and 52 V. Special voltages can therefore also be covered by a standard device.

SITOP power dual: the electronics supply for the switchgear cabinet. The DIN rail device is industry-compatible and has two 15 V outputs. For example, for electronic loads to be supplied with ±15 V.

SITOP power 24 V/2.5 A, 4 A and 10 A: the devices with universal input can be connected to 1-phase AC voltage networks as well as to DC voltage networks.

SITOP power 24 V/20 A: the 2-phase primary switched-mode regulator with 20 A rated output current is predestined for industrial networks with high AC voltages. The special wide-range input allows connection to 3-phase networks with rated voltages between 500 V and 600 V.

SITOP power AS-Interface: 2 primary switched-mode regulators are available especially for powering the actuator/sensor interface: a 2.4 A version with 24 V DC input and IP65 degree of protection, and a 7 A version with wide-range input for AC and DC voltages.



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Overview of product families

SIMATIC design

SITOP in SIMATIC design

The SITOP power supply units were developed with a design based on the SIMATIC automation systems. However, their special features mean that they can also be optimally used in many other applications.

S7-200 design: 24 V/3.5 A. The flat power supply unit with the design of the micro PLC is also particularly suitable for applications with a small overall height and a small switchgear cabinet depth.

S7-300 design: 24 V/2 A, 5 A and 10 A. Designed as series-connected power supply units for the S7-300 CPUs, they can be simply snapped onto the S7 rail and connected to the CPU by means of a connecting comb. The 2 A and 5 A devices are also available as outdoor versions which are unaffected even by temperatures from -25 °C to +70 °C or increased shock and vibration load.

ET 200B design: 24 V/5 A and 10 A. The devices with a flat design are particularly suitable when only limited mounting depths are available. They find sufficient space even in covered machine racks or pivoted frames.

ET 200X design: 24 V/10 A. The 10 A power supply unit with IP65 degree of protection is suitable for the most rugged industrial applications. Permitting any mounting position, the power supply unit for distributed I/Os can handle ambient temperatures from -25 °C to +55 °C.



LOGO!Power

The mini power supply units are available in two performance classes for output voltages of 5 V, 12 V and 15 V, and in three performance classes for 24 V. Their flat, cascaded profile even permits installation in small distribution boards. The primary switched-mode regulators have been completely innovated and now require even less space for mounting, but with increased functionality. For example, the new function "Constant current in event of overload" even permits the connection of difficult loads. Wide-range input, wide temperature range and many certifications mean that the LOGO! power supply is a universal device for use in numerous applications.

LOGO!Power



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In order to assist you in finding the right stabilized power supply for each application as quickly as possible, we have assembled the following table as an overview listing all power supplies contained in this catalog sorted according to input voltage, output voltage and output current.

Selection guide

Input voltage			*Alternating voltage*			*Direct voltage*		
Output voltage	**Output current**	**Order No.**	120 to 230 V AC	500 to 600 V two-phase AC	400 to 500 V three-phase AC	24 V DC	24 to 220 V DC	120 to 230 V DC
5 V DC	**3 A**	**6EP1 311-1SH02**	page 13/2					
	6.3 A	**6EP1 311-1SH12**	page 13/2					
12 V DC	**1.9 A**	**6EP1 321-1SH02**	page 13/4					
	4.5 A	**6EP1 322-1SH02**	page 13/4					
15 V DC	**1.9 A**	**6EP1 351-1SH02**	page 13/6					
	4 A	**6EP1 352-1SH02**	page 13/6					
	2x3.5 A	**6EP1 353-0AA00**	page 10/2					
24 V DC	**0.375 A**	**6EP1 731-2BA00**					page 2/2	
	0.5 A	**6EP1 331-2BA10**	page 2/2					
	1.3 A	**6EP1 331-1SH02**	page 13/8					
	2 A	**6EP1 331-2BA00**	page 2/2					
		6EP1 331-1SL11	page 2/3					
		6ES7 307-1BA00-0AA0	page 2/3					
		6ES7 305-1BA80-0AA0					page 2/3	
		6EP1 732-0AA00					page 2/3	
	2.5 A	**6EP1 332-1SH12**	page 3/2					page 3/2
		6EP1 332-1SH42	page 13/8					
	3.5 A	**6EP1 332-1SH31**	page 3/2					
	4 A	**6EP1 332-1SH22**	page 3/2					page 3/2
		6EP1 332-1SH51	page 13/8					
	5 A	**6EP1 333-2BA00**	page 4/2					
		6EP1 333-2AA00	page 4/2					
		6ES7 307-1EA80-0AA0	page 4/3					
		6ES7 307-1EA00-0AA0	page 4/3					
		6EP1 333-1AL12	page 4/3					
		6EP1 333-1SL11	page 4/3					
		6EP1 333-3BA00	page 4/2		page 7/2			
	10 A	**6EP1 334-2BA00**	page 5/2					
		6EP1 334-2AA00	page 5/2					
		6EP1 334-2CA00	page 5/3					
		6ES7 307-1KA01-0AA0	page 5/3					
		6EP1 334-1SL12	page 5/3					
		6EP1 334-1AL12	page 5/3					
		6EP1 334-1SH01	page 5/3					
		6EP1 434-2BA00			page 7/6			
		6EP1 334-3BA00	page 5/2		page 7/2			
	20 A	**6EP1 336-3BA00**	page 6/2					
		6EP1 336-2BA00	page 6/3					
		6EP1 536-2AA00		page 6/3				
		6EP1 436-2BA00			page 7/6			
		6EP1 436-3BA00			page 7/3			
	30 A	**6EP1 437-2BA00**			page 7/7			
	40 A	**6EP1 337-3BA00**	page 6/2					
		6EP1 437-3BA00			page 7/3			
		6EP1 437-2BA10			page 7/7			

Continued on page 1/10.

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Selection guide

Selection guide (continued)

Input voltage			*Alternating voltage*			*Direct voltage*		
Output voltage	**Output current**	**Order No.**	120 to 230 V AC	500 to 600 V two-phase AC	400 to 500 V three-phase AC	24 V DC	24 to 220 V DC	120 to 230 V DC
24 V DC UPS	**6 A**	**6EP1 931-2DC21**				page 9/7		
		6EP1 931-2DC31				page 9/7		
		6EP1 931-2DC41				page 9/7		
	15 A	**6EP1 931-2EC21**				page 9/9		
		6EP1 931-2EC31				page 9/9		
		6EP1 931-2EC41				page 9/9		
	40 A	**6EP1 931-2FC01**				page 9/13		
	1.2 Ah	**6EP1 935-6MC01**				page 9/14		
	2.5 Ah	**6EP1 935-6MD31**				page 9/15		
	3.2 Ah	**6EP1 935-6MD11**				page 9/16		
	7 Ah	**6EP1 935-6ME21**				page 9/17		
	12 Ah	**6EP1 935-6MF01**				page 9/18		
48 V DC	**20 A**	**6EP1 457-3BA00**			page 10/2			
3-52 V DC	**10 A/120 W**	**6EP1 353-2BA00**	page 10/2					
30 V DC	**2.4 A**	**6EP1 632-1AL01**				page 11/2		
AS-Interface	**7 A**	**6EP1 354-1AL01**	page 11/2					
SITOP power 24 V, Additional components								
Signalling module		**6EP1 961-3BA10**				page 8/2		
Buffer module	**40 A**	**6EP1 961-3BA00**				page 8/2		
Redundancy module	**20 A**	**6EP1 961-3BA20**				page 8/2		
Diagnosis module	**4x10 A**	**6EP1 961-2BA00**				page 8/4		

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SITOP power · Standard 24 V
Single-phase

2



Output currents up to 2 A

2/2 The smallest
2/2 The proven type
2/3 The DC/DC converter
2/3 The S7-300 type
2/3 The outdoor variant



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Single-phase

2

Output currents up to 2 A

Overview

The smallest



The proven type



Application

The optimum power supply units for automation solutions in the lower performance range; with wide-range input for AC or DC voltages; thanks to their compact and narrow design, they are particularly suitable for solutions where limited space is available and in conjunction with low-voltage switchgear.

The tried and tested power supply unit with selectable input voltage range for supplying all standard applications in automation engineering.

Technical specifications

Power supply, type	**0.5 A**	**0.375 A**	**2 A**
Order No.	**6EP1 331-2BA10**	**6EP1 731-2BA00**	**6EP1 331-2BA00**
Input			
Rated voltage $V_{in\ rated}$	Single-phase AC **120 to 230 V AC** wide-range input	DC voltage **48 to 220 V DC** wide-range input	Single-phase AC **120/230 V AC** Settable using wire jumper
Voltage range	93 to 264 V AC	30 to 264 V DC (30 to 187 V AC)	93 to 132 V/187 to 264 V AC
Overvoltage strength	2.3 x $V_{in\ rated}$, 1.3 ms	-	2.3 x $V_{in\ rated}$, 1.3 ms
Mains buffering at $I_{out\ rated}$	> 10 ms at V_{in} = 230 V	> 10 ms at V_{in} = 220 V	> 10 ms at V_{in} = 93/187 V
Rated line frequency; range	50/60 Hz, 47 to 63 Hz	-	50/60 Hz; 47 to 63 Hz
Rated current $I_{in\ rated}$	0.22 to 0.13 A	0.03 to 0.06 A	0.9/0.6 A
Inrush current limitation (+25 °C)	< 23 A, typ. 1 ms	< 35 A, typ. 3 ms	< 14 A, typ. 3 ms
I^2t	0.3 A^2s	1.2 A^2s	< 0.3 A^2s
Integrated line-side fuse	T 2 A/250 V (not accessible)	F 4 A/250 V (not accessible)	T 1.6 A/250 V (not accessible)
Recommended circuit-breaker (IEC 898) in mains supply line	From 3 A, Characteristic C	From 6 A, Characteristic C, DC-suitable	From 3 A, Characteristic C
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**	**24 V DC**	**24 V DC**
Total tolerance	± 3 %	± 3 %	± 3 %
• Stat. mains compensation	Approx. ± 0.2 %	Approx. ± 0.1 %	Approx. 0.1 %
• Stat. load compensation	Approx. ± 0.7 %	Approx. ± 0.1 %	Approx. 0.8 %
Residual ripple (clock frequency: approx. 50 kHz)	< 150 mV_{pp} (typ. 50 mV_{pp})	< 150 mV_{pp} (typ. 50 mV_{pp})	< 150 mV_{pp}
Spikes (bandwidth: 20 MHz)	< 240 mV_{pp} (typ. 150 mV_{pp})	< 240 mV_{pp} (typ. 50 mV_{pp})	< 240 mV_{pp}
Setting range	-	-	22.8 to 26.4 V
Status display	Green LED for 24 V O.K.	Green LED for 24 V O.K.	Green LED for 24 V O.K.
Power ON/OFF behavior	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)
Starting delay/voltage rise	< 1.5 s/typ. 20 ms	< 2.5 s/typ. 90 ms	< 3 s/typ. 80 ms
Rated current $I_{out\ rated}$	**0.5 A**	**0.375 A**	**2 A**
Current range			
• Up to +45 °C	0 to 0.5 A	0 to 0.375 A	0 to 2 A
• Up to +60 °C	0 to 0.5 A (up to +70 °C)	0 to 0.375 A	0 to 2 A
Dyn. V/I with			
• Starting on short circuit	Approx. 0.6 A constant current		
• Short-circuit in operation	Approx. 0.6 A constant current	typ. 2.7 A for 200 ms	typ. 7 A for 300 ms
Parallel connection for increased output	Not permissible	Not permissible	Yes, 2

Continued on page 2/4.

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The DC/DC converter	The S7-300 type	The outdoor variant
		
The DC/DC converter for supply from battery and DC networks, with a wide input voltage range from 38 V to 121 V DC.	The proven power supply in the SIMATIC S7-300 design; alternatively with PS-CPU connecting comb and for snap-mounting on S7 busbar (Order No. 6ES7307-1BA00-0AA0) or without PS-CPU connecting comb for snap-mounting on DIN rail EN 500022-35x15 via mounting adapter (Order No. 6EP1 331-1SL11).	The power supply unit for extreme environmental conditions with SIMATIC S7-300 design, can be snapped onto S7 rail; with PS-CPU connecting comb.

2 A	**2 A**	**2 A**	**2 A**
6EP1 732-0AA00	**6ES7307-1BA00-0AA0**	**6EP1 331-1SL11**	**6ES7 305-1BA80-0AA0** [1]
DC voltage **48 to 110 V DC** wide-range input 38 to 121 V DC	Single-phase AC **120/230 V AC** Settable via selector switch on device 85 to 132 V/170 to 264 V AC	Single-phase AC **120/230 V AC** Settable via selector switch on device 85 to 132 V/170 to 264 V AC	DC voltage **24 to 110 V DC** wide-range input 16.8 to 138 V DC
	2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms	154 V; 0.1 s
> 5 ms at V_{in} = 48 V - 1.2 to 0.5 A < 33 A	> 20 ms at V_{in} = 93/187 V 50/60 Hz, 47 to 63 Hz 0.9/0.6 A < 20 A, < 3 ms	> 20 ms at V_{in} = 93/187 V 50/60 Hz, 47 to 63 Hz 0.9/0.6 A < 20 A, < 3 ms	> 10 ms at $V_{in\ rated}$ - 2.7 to 0.6 A (4 to 0.9 A) < 20 A, < 10 ms
T 2.5 A (not accessible) 10 to 25 A, Characteristic B, or 6 to 25 A, Characteristic C, DC-suitable	< 1.0 A^2s T 1.6 A/250 V (not accessible) 3 A, Characteristic C	< 1.0 A^2s T 1.6 A/250 V (not accessible) 3 A, Characteristic C	< 5 A^2s T 6.3 A/250 V (not accessible) From 10 A, Characteristic C, DC-suitable
Stabilized, floating direct voltage **24 V DC** ± 1 % Approx. 0.1 % Approx. 0.4 %	Stabilized, floating direct voltage **24 V DC** ± 3 % Approx. 0.1 % Approx. 0.2 %	Stabilized, floating direct voltage **24 V DC** ± 3 % Approx. 0.1 % Approx. 0.2 %	Stabilized, floating direct voltage **24 V DC** ± 3 % Approx. 0.2 % Approx. 0.4 %
< 100 mV_{pp} < 300 mV_{pp} - Green LED for 24 V O.K. Overshoots of V_{out} when switching on max. 25 V	< 150 mV_{pp} (typ. < 20 mV_{pp}) < 240 mV_{pp} (typ. < 150 mV_{pp}) - Green LED for 24 V O.K. No overshoot of V_{out} (soft start)	< 150 mV_{pp} (typ. < 20 mV_{pp}) < 240 mV_{pp} (typ. < 150 mV_{pp}) - Green LED for 24 V O.K. No overshoot of V_{out} (soft start)	< 150 mV_{pp} (typ. < 30 mV_{pp}) < 240 mV_{pp} (typ. < 150 mV_{pp}) - Green LED for 24 V O.K. No overshoot of V_{out} (soft start)
< 3 s/typ. 30 ms **2 A** 0 to 2 A 0 to 2 A (up to +70 °C)	< 3 s/typ. 60 ms **2 A** 0 to 2 A 0 to 2 A	< 3 s/typ. 60 ms **2 A** 0 to 2 A 0 to 2 A	< 3 s (typ. 7 ms)/typ. 5 ms **2 A (3 A at V_{in} > 24 V)** 0 to 2 A (3 A) 0 to 2 A (3 A)
Yes, 2	typ. 10 A for 90 ms typ. 10 A for 90 ms Not permissible	typ. 10 A for 90 ms typ. 10 A for 90 ms Not permissible	typ. 9 A for 270 ms typ. 9 A for 270 ms Yes, 2

Continued on page 2/5.

1) SIPLUS module 6AG1 307-1BA80-2AA0 for enhanced temperature range -25 to +60 °C and use under medium load (e.g. chlorine/sulfur atmosphere). Conformity with EN 50155 available soon (electrical equipment on track vehicles).

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Single-phase

Output currents up to 2 A

Power supply, type	0.5 A	0.375 A	2 A
Order No.	**6EP1 331-2BA10**	**6EP1 731-2BA00**	**6EP1 331-2BA00**
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 74 %	Approx. 66 %	Approx. 82 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 4.2 W	Approx. 4.6 W	Approx. 11 W
Control			
Dyn. mains compensation ($V_{in\ rated}$ ± 15 %)	Approx. ± 0.3 % V_{out}	Approx. ± 0.3 % V_{out}	Approx. ± 0.3 % V_{out}
Dyn. load compensation (I_{out}: 50/100/50 %)	± 0.7 % V_{out}	± 0.4 % V_{out}	± 2 % V_{out}
Settling time			
• Load step from 50 to 100 %	typ. 1.5 ms	typ. 2 ms	typ. 0.5 ms
• Load step from 100 to 50 %	typ. 1.5 ms	typ. 2 ms	typ. 0.5 ms
Protection and monitoring			
Output overvoltage protection	Yes, acc. to EN 60950	Yes, acc. to EN 60950	Yes, acc. to EN 60950
Current limitation	0.55 to 0.65 A	0.41 to 0.49 A	typ. 2.2 to 2.6 A
Short-circuit protection	Stabilized current characteristic down to 0 V	Electronic shutdown, automatic restart	Electronic shutdown, automatic restart
RMS sustained short-circuit current	< 0.65 A	< 0.9 A	< 4 A
Overload/short-circuit indicator	-	-	-
Safety			
Galvanic isolation primary/secondary	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178	Yes, SELV output voltage V_{out} acc. to EN 60950
Protective class	Class I	Class I	Class I
Discharge current	< 3.5 mA	< 3.5 mA	< 3.5 mA (typ. 0.17 mA)
TÜV test	Yes	Yes	Yes; CB scheme
CE marking	Yes	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2 No. 14-95), File E143289; cURus recognized (UL 60950, CSA 22.2 No. 60950), File E151273	Yes, cULus listed (UL 508, CSA 22.2 No. 14-95), File E143289; cURus recognized (UL 60950, CSA 22.2 No. 60950), File E151273	Yes, UL listed (UL 508) File E143289, CSA (CSA 22.2 No. 14-95)
FM approval	-	-	-
Appr. for use in marine vessels	-	-	-
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Interference emission	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Line harmonics limitation	Not applicable	Not applicable	Not applicable
Interference immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating specifications			
Ambient temperature range	-20 to +70 °C with natural convection	-20 to +70 °C with natural convection, derating above 60 °C	0 to +60 °C with natural convection
Transportation and storage temperature range	-40 to +70 °C	-40 to +70 °C	-25 to +85 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications			
Connections			
• Mains input L, N, PE (DC input: L+1, M1, PE)	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded
• Output L+	1 screw-type terminal for 0.5 to 2.5 mm^2	1 screw-type terminal for 0.5 to 2.5 mm^2	1 screw-type terminal for 0.5 to 2.5 mm^2
• Output M	2 screw-type terminals for 0.5 to 2.5 mm^2	2 screw-type terminals for 0.5 to 2.5 mm^2	2 screw-type terminals for 0.5 to 2.5 mm^2
Dimensions (W x H x D) in mm	22.5 x 80 x 91	22.5 x 80 x 91	50 x 125 x 125
Weight approx.	0.11 kg	0.14 kg	0.38 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5
Accessories	-	-	-

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2 A	2 A	2 A	2 A
6EP1 732-0AA00	**6ES7307-1BA00-0AA0**	**6EP1 331-1SL11**	**6ES7 305-1BA80-0AA0**
Approx. 84 % Approx. 9 W	Approx. 83 % Approx. 10 W	Approx. 83 % Approx. 10 W	Approx. 75 % Approx. 16 W (24 W)
± 0.3 % V_{out} ± 0.8 % V_{out}	± 0.3 % V_{out} ± 0.8 % V_{out}	± 0.3 % V_{out} ± 0.8 % V_{out}	± 0.3 % V_{out} ± 2.5 % V_{out}
< 5 ms (typ. 2.5 ms) < 5 ms (typ. 2.5 ms)	< 5 ms (typ. 2.5 ms) < 5 ms (typ. 2.5 ms)	< 5 ms (typ. 2.5 ms) < 5 ms (typ. 2.5 ms)	< 5 ms (typ. 2.5 ms) < 5 ms (typ. 2.5 ms)
Yes, suppressor diode at output typ. 2.1 to 3 A	Additional control loop, shut-down at approx. 30 V, automatic restart 2.2 to 2.6 A	Additional control loop, shut-down at approx. 30 V, automatic restart 2.2 to 2.6 A	Additional control loop, shut-down at approx. 30 V, automatic restart 3.3 to 3.9 A
Electronic shutdown, automatic restart < 2 A -	Electronic shutdown, automatic restart < 4 A -	Electronic shutdown, automatic restart < 4 A -	Electronic shutdown, automatic restart < 2 A -
Yes, SELV output voltage V_{out} acc. to EN 60950 Class I < 3.5 mA (typ. 0.7 mA)	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178 Class I < 3.5 mA (typ. 0.7 mA)	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178 Class I < 3.5 mA (typ. 0.7 mA)	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178, clearance and creepage distances > 5 mm Class I < 3.5 mA (typ. 0.7 mA)
- Yes Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E179336	Yes Yes Yes, UL listed (UL 508), File E143289, CSA (CSA 22.2 No. 14-95)	Yes Yes Yes, UL listed (UL 508), File E143289, CSA (CSA 22.2 No. 14-95)	Yes Yes Yes, UL listed (UL 508), File E143289, CSA (CSA 22.2 No. 14-95)
- - IP20	Yes, Class I Div. 2 Group A, B, C, D T4 in the S7-300 system IP20	Yes, Class I Div. 2 Group A, B, C, D T4 in the S7-300 system IP20	- Yes, GL, LRS IP20
EN 55022 Class B Not applicable EN 61000-6-2	EN 55022 Class B Not applicable EN 61000-6-2	EN 55022 Class B Not applicable EN 61000-6-2	EN 55011 Class A Not applicable EN 61000-6-2
0 to +70 °C with natural convection	0 to +60 °C with natural convection	0 to +60 °C with natural convection	-25 to +70 °C with natural convection
-40 to +70 °C Climatic class 3K3 acc. to EN 60721, no condensation	-40 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation	-40 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation	-40 to +85 °C Climatic class 3K5 acc. to EN 60721, brief condensation permissible
One screw-type terminal each for 2 x 0.5 to 2.5/1.5 mm^2 single-core/finely stranded 1 screw-type terminal for 2 x 0.5 to 2.5 mm^2 1 screw-type terminal for 2 x 0.5 to 2.5 mm^2	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 2 screw-type terminals for 0.5 to 2.5 mm^2 2 screw-type terminals for 0.5 to 2.5 mm^2	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 2 screw-type terminals for 0.5 to 2.5 mm^2 2 screw-type terminals for 0.5 to 2.5 mm^2	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 3 screw-type terminals for 0.5 to 2.5 mm^2 3 screw-type terminals for 0.5 to 2.5 mm^2
80 x 135 x 120 0.5 kg Snap-mounting on DIN rail EN 50022-35x15	50 x 125 x 120 0.42 kg Snap-mounting on S7 rail	50 x 125 x 135 0.42 kg Snap-mounting on DIN rail EN 50022-35x15	80 x 125 x 120 0.75 kg Snap-mounting on S7 rail
-	Mounting adapter for DIN rail and PS-CPU connecting comb	Mounting adapter for DIN rail and PS-CPU connecting comb	Mounting adapter for DIN rail and PS-CPU connecting comb

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2

Notes

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SITOP power · Standard 24 V
Single-phase

3



Output currents 2.5 to 4 A

3/2 The universal types

3/2 The S7-200 type



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Single-phase

Output currents 2.5 to 4 A

Overview

The universal types



The S7-200 type



Application

The universal power supply units for all supply networks, with a wide-range input from 93 V to 264 V AC and 110 V to 350 V DC for supply from all typical networks.

Power supply unit whose design and functionality are optimally matched to the SIMATIC S7-200 micro PLC; flat design, particularly suitable for low control cabinet depths.

Technical specifications

Power supply, type	**2.5 A**	**4 A**	**3.5 A**
Order No.	**6EP1 332-1SH12**	**6EP1 332-1SH22**	**6EP1 332-1SH31**
Input	Single-phase AC or DC	Single-phase AC or DC	Single-phase AC
Rated voltage $V_{in\ rated}$	**120 to 230 V AC**	**120 to 230 V AC**	**120/230 V AC**
	wide-range input	wide-range input	Settable using wire jumper
Voltage range	93 to 264 V AC or 110 to 350 V DC	93 to 264 V AC or 110 to 350 V DC	93 to 132 V/187 to 264 V AC
Overvoltage strength	2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms
Mains buffering at $I_{out\ rated}$	> 20 ms at V_{in} = 120 V, > 80 ms (typ. 100 ms) at V_{in} = 187 V	> 20 ms at V_{in} = 120 V, > 80 ms (typ. 100 ms) at V_{in} = 187 V	> 20 ms at V_{in} = 187 V
Rated line frequency; range	0/50/60 Hz, 47 to 63 Hz	0/50/60 Hz, 47 to 63 Hz	50/60 Hz, 47 to 63 Hz
Rated current $I_{in\ rated}$	1.3 to 0.7 A	1.8 to 1.1 A	1.65/0.95 A
Inrush current limitation (+25 °C)	< 33 A, < 3 ms (V_{in} = 230 V)	< 33 A, < 3 ms (V_{in} = 230 V)	< 33 A, < 3 ms (V_{in} = 230 V)
I^2t	< 3.5 A^2s	< 3.5 A^2s	< 1.0 A^2s
Integrated line-side fuse	T 3.15 A (not accessible)	T 3.15 A (not accessible)	T 2.5 A/250 V (not accessible)
Recommended circuit-breaker (IEC 898) in mains supply line	Two-pole circuit-breaker from 10 A, Characteristic C or from 6 A, Characteristic D	Two-pole circuit-breaker from 10 A, Characteristic C or from 6 A, Characteristic D	Two-pole circuit-breaker from 10 A, Characteristic C or from 6 A, Characteristic D
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**	**24 V DC**	**24 V DC**
Total tolerance	± 1 %	± 1 %	± 5 % (typ. ± 2 %)
• Stat. mains compensation	Approx. ± 0.1 %	Approx. ± 0.1 %	Approx. ± 0.1 %
• Stat. load compensation	Approx. ± 0.2 %	Approx. ± 0.2 %	Approx. ± 0.2 %
Residual ripple (clock frequency: approx. 50 kHz)	< 50 mV_{pp} (typ. 40 mV_{pp})	< 50 mV_{pp} (typ. 40 mV_{pp})	< 150 mV_{pp} (typ. 30 mV_{pp})
Spikes (bandwidth: 20 MHz)	< 100 mV_{pp} (typ. 40 mV_{pp})	< 100 mV_{pp} (typ. 40 mV_{pp})	< 240 mV_{pp} (typ. 110 mV_{pp})
Setting range	-	-	-
Status display	Green LED for 24 V O.K.	Green LED for 24 V O.K.	-
Power ON/OFF behavior	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)
Starting delay/voltage rise	< 0.6 s/typ. 20 ms	< 0.6 s/typ. 20 ms	< 1 s/typ. 80 ms
Rated current $I_{out\ rated}$	**2.5 A**	**4 A**	**3.5 A**
Current range			
• Up to +45 °C	0 to 2.5 A	0 to 4 A	0 to 3.5 A
• Up to +60 °C	0 to 2.5 A	0 to 2.5 A	0 to 3.5 A
Dyn. V/I with			
• Starting on short circuit	Approx. 2.8 A constant current	Approx. 4.4 A constant current	typ. 5 A for 100 ms
• Short-circuit in operation	Approx. 2.8 A constant current	Approx. 4.4 A constant current	typ. 5 A for 100 ms
Parallel connection for increased output	Yes, up to 10	Yes, up to 10	Yes, up to 5

Continued on page 3/3.

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Output currents 2.5 to 4 A

Power supply, type	2.5 A	4 A	3.5 A
Order No.	**6EP1 332-1SH12**	**6EP1 332-1SH22**	**6EP1 332-1SH31**
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 85 %	Approx. 85 %	Approx. 84 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 11 W	Approx. 17 W	Approx. 16 W
Control			
Dyn. mains compensation, typ. ($V_{in\ rated}$ ±15 %)	± 0.3 % V_{out}	± 0.3 % V_{out}	± 0.3 % V_{out}
Dyn. load compensation (I_{out}: 50/100/50 %)	typ. ± 0.5 % V_{out}	typ. ± 0.5 % V_{out}	< ± 10 % V_{out} (typ. ± 3 % V_{out})
Settling time			
• Load step from 50 to 100 %	< 2 ms (typ. 1 ms)	< 2 ms (typ. 1 ms)	< 5 ms
• Load step from 100 to 50 %	< 2 ms (typ. 1 ms)	< 2 ms (typ. 1 ms)	< 5 ms
Protection and monitoring			
Output overvoltage protection			
Current limitation	2.8 A	4.4 A	3.8 A
Short-circuit protection	Stabilized current characteristic down to 0 V	Stabilized current characteristic down to 0 V	Stabilized current characteristic to typ. 14 V, electronic shut-down below that, automatic restart
RMS sustained short-circuit current	< 3 A	< 5 A	< 4 A
Overload/short-circuit indicator	-	-	-
Safety			
Galvanic isolation primary/secondary	Yes, SELV output voltage V_{out} acc. to EN 60950	Yes, SELV output voltage V_{out} acc. to EN 60950	Yes, SELV output voltage V_{out} acc. to EN 60950
Protective class	Class I	Class I	Class I
Discharge current	< 3.5 mA	< 3.5 mA	< 3.5 mA
TÜV test	Yes	Yes	Yes
CE marking	Yes	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E143289	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E143289	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E143289
FM approval	-	-	-
Appr. for use in marine vessels	-	-	-
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Interference emission	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Line harmonics limitation	Not applicable	-	EN 61000-3-2
Interference immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating specifications			
Ambient temperature range	0 to +60 °C with natural convection	0 to +50 °C with natural convection	0 to +60 °C with natural convection
Transportation and storage temperature range	-25 to +85 °C	-25 to +85 °C	-25 to +85 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications			
Connections			
• Mains input L, N, PE	One screw-type terminal each for 2 x 0.5 to 1.5 mm^2 finely stranded, 2 x 0.5 to 2.5 mm^2 single-core	One screw-type terminal each for 2 x 0.5 to 1.5 mm^2 finely stranded, 2 x 0.5 to 2.5 mm^2 single-core	One screw-type terminal each for 0.5 to 1 mm^2 finely stranded, 0.5 to 1.5 mm^2 single-core
• Output L+	1 screw-type terminal for 2 x 0.5 to 2.5 mm^2	1 screw-type terminal for 2 x 0.5 to 2.5 mm^2	1 screw-type terminal for 0.5 to 1 mm^2
• Output M	1 screw-type terminal for 2 x 0.5 to 2.5 mm^2	1 screw-type terminal for 2 x 0.5 to 2.5 mm^2	2 screw-type terminals for 0.5 to 1 mm^2
Dimensions (W x H x D) in mm	80 x 135 x 120	80 x 135 x 120	160 x 80 x 62
Weight approx.	0.5 kg	0.5 kg	0.5 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15, wall mounting	Snap-mounting on DIN rail EN 50022-35x15, wall mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5, wall mounting
Accessories	-	-	Mounting bracket

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SITOP power · Standard 24 V
Single-phase and two-phase

4



Output current 5 A

4/2 SITOP modular
4/2 The proven types
4/3 The S7-300 type
4/3 The outdoor variant
4/3 The flat design



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Single-phase and two-phase

Output current 5 A

Overview

SITOP modular



The proven types



Application

The modular power supply unit with single-phase and two-phase wide-range inputs for global use in many different fields of application; expansion of functions possible using add-on modules.

The tried and tested power supply unit with selectable input voltage range for supplying all standard applications in automation engineering; 6EP1333-2AA00 without limitation of input current harmonics.

Technical specifications

Power supply, type	**5 A**	**5 A**	**5 A**
Order No.	**6EP1 333-3BA00**	**6EP1 333-2BA00**	**6EP1 333-2AA00**
Input	Single and two-phase AC	Single-phase AC	Single-phase AC
Rated voltage $V_{in\ rated}$	**120/230 to 500 V AC** Settable via selector switch on device	**120/230 V AC** Settable using wire jumper	**120/230 V AC** Settable using wire jumper
Voltage range	85 to 132 V/176 to 550 V AC	93 to 132 V/187 to 264 V AC	93 to 132 V/187 to 264 V AC
Overvoltage strength	1300 V_{peak}, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms
Mains buffering at $I_{out\ rated}$	> 25 ms at V_{in} = 120/230 V	> 10 ms at V_{in} = 93/187 V	> 20 ms at V_{in} = 93/187 V
Rated line frequency; range	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz
Rated current $I_{in\ rated}$	2.2 /1.2 to 0.61 A	2.2/0.9 A	2.2/1.3 A
Inrush current limitation (+25 °C)	< 35 A	< 32 A, typ. 3 ms	< 32 A, typ. 3 ms
I^2t	< 1.7 A^2s	< 0.8 A^2s	< 0.8 A^2s
Integrated line-side fuse	T 3, 15 A (not accessible)	T 3.15 A/250 V (not accessible)	T 3.15 A/250 V (not accessible)
Recommended circuit-breaker (IEC 898) in mains supply line	From 6 A (10 A) Characteristic C (B); with two-phase operation: circuit-breaker with two-pole connection or motor circuit-breaker 3RV1021-1EA10	From 6 A, Characteristic C	From 6 A, Characteristic C
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**	**24 V DC**	**24 V DC**
Total tolerance	± 3 %	± 3 %	± 3 %
• Stat. mains compensation	Approx. 0.1 %	Approx. 0.1 %	Approx. 0.1 %
• Stat. load compensation	Approx. 0.1 %	Approx. 0.2 %	Approx. 0.2 %
Residual ripple (clock frequency: approx. 50 kHz)	< 50 mV_{pp} (typ. 10 mV_{pp})	< 150 mV_{pp}	< 150 mV_{pp}
Spikes (bandwidth: 20 MHz)	< 200 mV_{pp} (typ. 20 mV_{pp})	< 240 mV_{pp}	< 240 mV_{pp}
Setting range	24 to 28.8 V (max. 120 W)	22.8 to 26.4 V	22.8 to 26.4 V
Status display	Green LED for 24 V O.K.	Green LED for 24 V O.K.	Green LED for 24 V O.K.
Power ON/OFF behavior	Overshoot of V_{out} approx. 3 %	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)
Starting delay/voltage rise	< 1 s/< 50 ms	< 3 s/typ. 80 ms	< 3 s/typ. 80 ms
Rated current $I_{out\ rated}$	**5 A**	**5 A**	**5 A**
Current range			
• Up to +45 °C	0 to 5 A	0 to 5 A	0 to 5 A
• Up to +60 °C	0 to 5 A	0 to 5 A	0 to 5 A
Dyn. V/I with			
• Starting on short circuit	Approx. 5.5 A constant current		
• Short-circuit in operation	typ. 15 A for 25 ms	typ. 20 A for 350 ms	typ. 20 A for 350 ms
Parallel connection for increased output	Yes, 2 (selectable current characteristic)	Yes, 2	Yes, 2

Continued on page 4/4.

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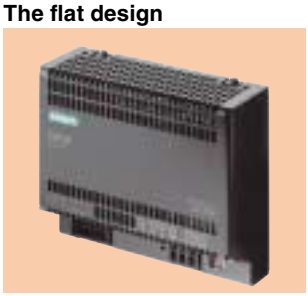
The S7-300 type



The outdoor variant



The flat design



The proven power supply in the SIMATIC S7-300 design; alternatively with PS-CPU connecting comb for snap-mounting on S7 busbar (Order No. 6ES7307-1EA00-0AA0) or without PS-CPU connecting comb for snap-mounting on DIN rail EN 500022-35x15 via mounting adapter (Order No. 6EP1 333-1SL11).

The power supply unit for extreme environmental conditions with SIMATIC S7-300 design, can be snapped onto S7 rail; with PS-CPU connecting comb.

The flat design which is of great advantage where only low mounting depths are available, e.g. for use with distributed I/O, in machine benches or alcoves; design matched to SIMATIC ET 200B.

5 A	**5 A**	**5 A**	**5 A**
6ES7 307-1EA00-0AA0	**6EP1 333-1SL11**	**6ES7 307-1EA80-0AA0** [1]	**6EP1 333-1AL12**
Single-phase AC **120/230 V AC** Settable via selector switch on device 85 to 132 V/170 to 264 V AC	Single-phase AC **120/230 V AC** Settable via selector switch on device 85 to 132 V/170 to 264 V AC	Single-phase AC **120/230 V AC** Settable via selector switch on device 93 to 132 V/187 to 264 V AC	Single-phase AC **120/230 V AC** Settable via selector switch on device 85 to 132 V/170 to 264 V AC
2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms
> 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 to 63 Hz 2.1/1.3 A < 45 A, < 3 ms	> 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 to 63 Hz 2.1/1.3 A < 45 A, < 3 ms	> 20 ms at V_{in} = 93/187 V 50/60 Hz, 47 to 63 Hz 2.1/1.2 A < 45 A, < 3 ms	> 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 to 63 Hz 2.2/1.2 A < 32 A, < 3 ms
< 1.2 A^2s F 4 A/250 V (not accessible) From 6 A, Characteristic C	< 1.2 A^2s F 4 A/250 V (not accessible) From 6 A, Characteristic C	< 1.8 A^2s (typ. 1.2 A^2s) T 3.15 A/250 V (not accessible) From 10 A, Characteristic C or from 6 A, Characteristic D	< 0.8 A^2s T 3.15 A/250 V (not accessible) From 6 A, Characteristic C
Stabilized, floating direct voltage **24 V DC** ± 3 % Approx. 0.1 % Approx. 0.2 %	Stabilized, floating direct voltage **24 V DC** ± 3 % Approx. 0.1 % Approx. 0.2 %	Stabilized, floating direct voltage **24 V DC** ± 3 % Approx. ± 0.2 % Approx. ± 0.4 %	Stabilized, floating direct voltage **24 V DC** ± 1 % Approx. 0.1 % Approx. 0.5 %
< 150 mV_{pp} (typ. 40 mV_{pp}) < 240 mV_{pp} (typ. 90 mV_{pp})	< 150 mV_{pp} (typ. 40 mV_{pp}) < 240 mV_{pp} (typ. 90 mV_{pp})	< 150 mV_{pp} (typ. 40 mV_{pp}) < 240 mV_{pp} (typ. 90 mV_{pp})	< 150 mV_{pp} (typ. 40 mV_{pp}) < 240 mV_{pp} (typ. 100 mV_{pp})
- Green LED for 24 V O.K. No overshoot of V_{out} (soft start)	- Green LED for 24 V O.K. No overshoot of V_{out} (soft start)	- Green LED for 24 V O.K. No overshoot of V_{out} (soft start)	22 to 29 V Green LED for 24 V O.K. No overshoot of V_{out} (soft start)
< 2 s/typ. 60 ms **5 A**	< 2 s/typ. 60 ms **5 A**	< 3 s/typ. 100 ms **5 A**	< 2 s/typ. 40 ms **5 A**
0 to 5 A 0 to 5 A	0 to 5 A 0 to 5 A	0 to 5 A 0 to 5 A	0 to 5 A 0 to 5 A
typ. 20 A for 75 ms typ. 20 A for 75 ms Not permissible	typ. 20 A for 75 ms typ. 20 A for 75 ms Not permissible	typ. 20 A for 180 ms typ. 20 A for 80 ms Not permissible	typ. 20 A for 500 ms typ. 20 A for 500 ms Yes, 2

Continued on page 4/5.

1) SIPLUS module 6AG1 307-1EA80-2AA0 for enhanced temperature range -25 to +60 °C and use under medium load (e.g. chlorine/sulfur atmosphere). Conformity with EN 50155 available soon (electrical equipment on track vehicles).

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Single-phase and two-phase

Output current 5 A

Power supply, type	5 A	5 A	5 A
Order No.	**6EP1 333-3BA00**	**6EP1 333-2BA00**	**6EP1 333-2AA00**
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 87 %	Approx. 87 %	Approx. 87 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 18 W	Approx. 18 W	Approx. 18 W
Control			
Dyn. mains compensation ($V_{in\ rated}$ ±15 %)	Approx. 0.1%	Approx. ± 0.3 % V_{out}	Approx. ± 0.3 % V_{out}
Dyn. load compensation (I_{out}: 50/100/50 %)	Approx. +3 % V_{out}	± 2.5 % V_{out}	± 2.5 % V_{out}
Settling time			
• Load step from 50 to 100 %	< 5 ms (typ. 2 ms)	typ. 0.2 ms	typ. 0.2 ms
• Load step from 100 to 50 %	< 5 ms (typ. 2 ms)	typ. 0.2 ms	typ. 0.2 ms
Protection and monitoring			
Output overvoltage protection	< 35 V	Yes, acc. to EN 60950	Yes, acc. to EN 60950
Current limitation	typ. 5.5 A	typ. 5.5 to 6.5 A	typ. 5.5 to 6.5 A
Short-circuit protection	Choice of stabilized current characteristic approx. 5.5 A or latching shutdown	Electronic shutdown, automatic restart	Electronic shutdown, automatic restart
RMS sustained short-circuit current	Approx. 5.5 A	< 17 A	< 17 A
Overload/short-circuit indicator	Yellow LED for "overload", red LED for "latching shutdown"	-	-
Safety			
Galvanic isolation primary/secondary	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178	Yes, SELV output voltage V_{out} acc. to EN 60950	Yes, SELV output voltage V_{out} acc. to EN 60950
Protective class	Class I	Class I	Class I
Discharge current	< 3.5 mA (typ. 0.25 mA)	< 3.5 mA (typ. 0.4 mA)	< 3.5 mA (typ. 0.4 mA)
TÜV test	Yes	Yes; CB scheme	Yes; CB scheme
CE marking	Yes	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E197259	Yes, UL listed (UL 508) File E143289, CSA (CSA 22.2 No. 14-95)	Yes, UL listed (UL 508) File E143289, CSA (CSA 22.2 No. 14-95)
FM approval	-	-	-
Appr. for use in marine vessels	-	-	-
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Interference emission	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Line harmonics limitation	EN 61000-3-2	EN 61000-3-2	-
Interference immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating specifications			
Ambient temperature range	0 to +60 °C with natural convection	0 to +60 °C with natural convection	0 to +60 °C with natural convection
Transportation and storage temperature range	-25 to +85 °C	-25 to +85 °C	-25 to +85 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications			
Connections			
• Mains input L, N, PE	One screw-type terminal each for 0.2 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded
• Output L+	2 screw-type terminals for 0.2 to 2.5 mm^2	1 screw-type terminal for 0.5 to 2.5 mm^2	1 screw-type terminal for 0.5 to 2.5 mm^2
• Output M	2 screw-type terminals for 0.2 to 2.5 mm^2	2 screw-type terminals for 0.5 to 2.5 mm^2	2 screw-type terminals for 0.5 to 2.5 mm^2
Dimensions (W x H x D) in mm	70 x 125 x 125	75 x 125 x 125	75 x 125 x 125
Weight approx.	1.2 kg	0.75 kg	0.57 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5
Accessories	Buffer module (6EP1961-3BA00) Signalling module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)	-	-

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Output current 5 A

5 A	5 A	5 A	5 A
6ES7 307-1EA00-0AA0	**6EP1 333-1SL11**	**6ES7 307-1EA80-0AA0**	**6EP1 333-1AL12**
Approx. 87 % Approx. 18 W	Approx. 87 % Approx. 18 W	Approx. 84 % Approx. 23 W	Approx. 88 % Approx. 17 W
± 0.3 % V_{out} ± 2.5 % V_{out}	± 0.3 % V_{out} ± 2.5 % V_{out}	± 0.3 % V_{out} ± 3 % V_{out}	± 0.3 % V_{out} ± 0.5 % V_{out}
typ. 0.1 ms typ. 0.1 ms	typ. 0.1 ms typ. 0.1 ms	< 5 ms (typ. 0.2 ms) < 5 ms (typ. 0.2 ms)	< 5 ms (typ. 0.1 ms) < 5 ms (typ. 0.1 ms)
Additional control loop, shut-down at approx. 30 V, automatic restart 5.5 to 6.5 A	Additional control loop, shut-down at approx. 30 V, automatic restart 5.5 to 6.5 A	Additional control loop, shut-down at approx. 30 V, automatic restart 5.5 to 6.5 A	Additional control loop, shut-down at approx. 33 V, automatic restart 5.5 to 6.5 A
Electronic shutdown, automatic restart < 9 A -	Electronic shutdown, automatic restart < 9 A -	Electronic shutdown, automatic restart < 5 A -	Electronic shutdown, automatic restart < 5 A -
Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178 Class I < 3.5 mA (typ. 0.3 mA)	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178 Class I < 3.5 mA (typ. 0.3 mA)	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178, clearance and creepage distances > 8 mm Class I < 3.5 mA (typ. 0.3 mA)	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178 Class I < 3.5 mA (typ. 0.26 mA)
Yes Yes Yes, UL listed (UL 508) File E143289, CSA (CSA 22.2 No. 14-95)	Yes Yes Yes, UL listed (UL 508) File E143289, CSA (CSA 22.2 No. 14-95)	Yes Yes Yes, UL listed (UL 508) File E143289, CSA (CSA 22.2 No. 14-95)	Yes Yes Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E197259
Yes, Class I Div. 2 Group A, B, C, D, T 4 in the S7-300 system IP20	Yes, Class I Div. 2 Group A, B, C, D, T 4 in the S7-300 system IP20	- Yes, GL, LRS IP20	- - IP20
EN 55022 Class B EN 61000-3-2 EN 61000-6-2	EN 55022 Class B EN 61000-3-2 EN 61000-6-2	EN 55011 Class A - EN 61000-6-2	EN 55022 Class B - EN 61000-6-2
0 to +60 °C with natural convection -40 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation	0 to +60 °C with natural convection -40 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation	-40 to +70 °C with natural convection -40 to +85 °C Climatic class 3K5 acc. to EN 60721, brief condensation permissible	0 to +60 °C with natural convection -25 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation
One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 3 screw-type terminals for 0.5 to 2.5 mm^2 3 screw-type terminals for 0.5 to 2.5 mm^2	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 3 screw-type terminals for 0.5 to 2.5 mm^2 3 screw-type terminals for 0.5 to 2.5 mm^2	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 3 screw-type terminals for 0.5 to 2.5 mm^2 3 screw-type terminals for 0.5 to 2.5 mm^2	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 3 screw-type terminals for 0.5 to 2.5 mm^2 3 screw-type terminals for 0.5 to 2.5 mm^2
80 x 125 x 120 0.74 kg Snap-mounting on S7 rail	80 x 125 x 135 0.74 kg Snap-mounting on DIN rail EN 50022-35x15	80 x 125 x 120 0.57 kg Snap-mounting on S7 rail	160 x 130 x 60 0.6 kg Snap-mounting on DIN rail EN 50022-35x15/7.5
Mounting adapter for DIN rail and connecting comb	Mounting adapter for DIN rail and connecting comb	Mounting adapter for DIN rail and connecting comb	Mounting bracket

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Notes

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SITOP power · Standard 24 V
Single-phase and two-phase

5



Output current 10 A

5/2 SITOP modular
5/2 The proven types
5/3 The IP65 version
5/3 The S7-300 type
5/3 The flat design
5/3 The universal type



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Single-phase and two-phase

Output current 10 A

Overview

	SITOP modular	The proven types
		

Application

The modular power supply unit with single-phase and two-phase wide-range inputs for global use in many different fields of application; expansion of functions possible using add-on modules.

The tried and tested power supply unit with selectable input voltage range for supplying all standard applications in automation engineering; 6EP1334-2AA00 without limitation of input current harmonics.

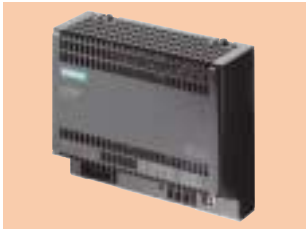
Technical specifications

Power supply, type	10 A	10 A	10 A
Order No.	**6EP1 334-3BA00**	**6EP1 334-2BA00**	**6EP1 334-2AA00**
Input	Single and two-phase AC	Single-phase AC	Single-phase AC
Rated voltage $V_{in\ rated}$	**120/230 to 500 V AC**	**120/230 V AC**	**120/230 V AC**
	Settable via selector switch on device	Settable using wire jumper	Settable using wire jumper
Voltage range	85 to 132/176 to 550 V AC	85 to 132/187 to 264 V AC	85 to 132/187 to 264 V AC
Overvoltage strength	1300 V_{peak}, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3ms	2.3 x $V_{in\ rated}$, 1.3 ms
Mains buffering at $I_{out\ rated}$	> 25 ms at V_{in} = 120/230 V	> 10 ms at V_{in} = 93/187 V	> 20 ms at V_{in} = 93/187 V
Rated line frequency; range	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz
Rated current $I_{in\ rated}$	4.4 /2.4 to 1.1 A	5.5/2.1 A	5.5/3.2 A
Inrush current limitation (+25 °C)	< 35 A	< 65 A, typ. 3 ms	< 65 A, typ. 3 ms
I^2t	< 4.0 A^2s	< 3.3 A^2s	< 3.3 A^2s
Integrated line-side fuse	T 6.3 A (not accessible)	T 6.3 A/250 V (not accessible)	T 6.3 A/250 V (not accessible)
Recommended circuit-breaker (IEC 898) in mains supply line	From 6 A (10 A) Characteristic C (B); with two-phase operation: circuit-breaker with two-pole connection or motor circuit-breaker 3RV1021-1EA10	From 10 A, Characteristic C	From 10 A, Characteristic C
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**	**24 V DC**	**24 V DC**
Total tolerance	± 3 %	± 3 %	± 3 %
• Stat. mains compensation	Approx. 0.1 %	Approx. 0.2 %	Approx. 0.2 %
• Stat. load compensation	Approx. 0.1 %	Approx. 1 %	Approx. 1 %
Residual ripple (clock frequency: approx. 50 kHz)	< 50 mV_{pp} (typ. 10 mV_{pp})	< 150 mV_{pp}	< 150 mV_{pp}
Spikes (bandwidth: 20 MHz)	< 200 mV_{pp} (typ. 20 mV_{pp})	< 240 mV_{pp}	< 240 mV_{pp}
Setting range	24 to 28.8 V (max. 240 W)	22.8 to 28.8 V	22.8 to 28.8 V
Status display	Green LED for 24 V O.K.	Green LED for 24 V O.K.	Green LED for 24 V O.K.
Power ON/OFF behavior	Overshoot of V_{out} approx. 3%	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)
Starting delay/voltage rise	< 1 s/< 50 ms	< 3 s/typ. 80 ms	< 3 s/typ. 80 ms
Rated current $I_{out\ rated}$	**10 A**	**10 A**	**10 A**
Current range			
• Up to +45 °C	0 to 10 A	0 to 12 A	0 to 12 A
• Up to +60 °C	0 to 10 A	0 to 10 A	0 to 10 A
Dyn. V/I with			
• Starting on short circuit	Approx. 12 A constant current		
• Short-circuit in operation	typ. 30 A for 25 ms	typ. 38 A for 200 ms	typ. 38 A for 200 ms
Parallel connection for increased output	Yes, 2 (selectable current characteristic)	Yes, 2	Yes, 2

Continued on page 5/4.

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Output current 10 A

The IP65 version	The S7-300 type	The flat design	The universal type
			
Power supply unit with IP65 degree of protection, design and functionality optimally matched to ET 200X distributed I/O devices. When using without ET 200X, the connector seal accessory is required.	The proven power supply in the SIMATIC S7-300 design; alternatively with PS-CPU connecting comb for snap-mounting on S7 busbar or without connecting comb for snap-mounting on DIN rail EN 500022-35x15 via mounting adapter.	The flat design which is of great advantage where only low mounting depths are available, e.g. for use with distributed I/O, in machine benches or alcoves; design matched to SIMATIC ET 200B.	The universal power supply unit for all supply networks, with a wide-range input from 93 V to 264 V AC and 110 V to 350 V DC for supply from all typical networks.
10 A	**10 A**	**10 A**	**10 A**
6EP1 334-2CA00	**6ES7 307-1KA01-0AA0 / 6EP1334-1SL12**	**6EP1 334-1AL12**	**6EP1 334-1SH01**
Single-phase AC **120/230 V AC** Settable using wire jumper 93 to 132/187 to 264 V AC	Single-phase AC **120/230 V AC** Settable via selector switch on device 85 to 132/170 to 264 V AC	Single-phase AC **120/230 V AC** Settable via selector switch on device 85 to 132/170 to 264 V AC	Single-phase AC **120 to 230 V AC** wide-range input 93 to 264 V AC or 110 to 350 V DC
2.3 x $V_{in\ rated}$, 1.3ms	2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms
> 20 ms at V_{in} = 93/187 V 50/60 Hz, 47 to 63 Hz 4.3/2.6 A < 65 A, typ. 3 ms	> 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 to 63 Hz 4.1/1.8 A < 55 A, < 3 ms	> 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 to 63 Hz 4/2.5 A < 65 A, < 3 ms	> 20 ms at V_{in} = 93/187 V 0/50/60 Hz; 47 to 63 Hz 2.5 to 1.3 A < 20 A, < 3 ms
< 2.5 A^2s T 6.3 A/250 V (not accessible) From 16 A, Characteristic C	< 3.3 A^2s T 6.3 A/250 V (not accessible) From 10 A, Characteristic C	< 3.3 A^2s T 6.3 A/250 V (not accessible) From 10 A, Characteristic C	< 1.5 A^2s T 6.3 A (not accessible) From 16 A, Characteristic C
Stabilized, floating direct voltage **24 V DC** ± 3 % Approx. 0.2 % Approx. 1 %	Stabilized, floating direct voltage **24 V DC** ± 3 % Approx. 0.1 % Approx. 0.5 %	Stabilized, floating direct voltage **24 V DC** ± 1 % Approx. 0.1 % Approx. 0.5 %	Stabilized, floating direct voltage **24 V DC** ± 1 % < ± 0.1 % < ± 0.2 %
< 150 mV_{pp} < 240 mV_{pp}	< 150 mV_{pp} (typ. 40 mV_{pp}) < 240 mV_{pp} (typ. 100 mV_{pp})	< 150 mV_{pp} (typ. 50 mV_{pp}) < 240 mV_{pp} (typ. 200 mV_{pp})	< 100 mV_{pp} < 100 mV_{pp}
22.8 to 25.2 V Green LED for 24 V O.K. No overshoot of V_{out} (soft start)	- Green LED for 24 V O.K. No overshoot of V_{out} (soft start)	22 to 29 V Green LED for 24 V O.K. No overshoot of V_{out} (soft start)	- Green LED for 24 V O.K. No overshoot of V_{out} (soft start)
< 3 s/typ. 80 ms **10 A**	< 1.5 s/typ. 80 ms **10 A**	< 2 s/typ. 40 ms **10 A**	< 3 s/typ. 100 ms **10 A**
0 to 10 A (up to +40 °C) 0 to 8 A (up to +55 °C)	0 to 10 A 0 to 10 A	0 to 10 A 0 to 10 A	0 to 10 A 0 to 10 A
typ. 38 A for 200 ms Yes, 2	typ. 35 A for 80 ms typ. 35 A for 150 ms Not permissible	typ. 35 A for 700 ms typ. 35 A for 700 ms Yes, 2	Approx. 11 A constant current Approx. 11 A constant current Yes, 2

Continued on page 5/5.

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Single-phase and two-phase

Output current 10 A

Power supply, type	10 A	10 A	10 A
Order No.	**6EP1 334-3BA00**	**6EP1 334-2BA00**	**6EP1 334-2AA00**
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 87 %	Approx. 89 %	Approx. 89 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 36 W	Approx. 30 W	Approx. 30 W
Control			
Dyn. mains compensation ($V_{in\ rated}$ ± 15 %)	Approx. 0.1 %	Approx. ± 0.3 % V_{out}	Approx. ± 0.3 % V_{out}
Dyn. load compensation (I_{out}: 50/100/50 %)	Approx. +3 % V_{out}	± 5 % V_{out}	± 5 % V_{out}
Settling time			
• Load step from 50 to 100 %	< 5 ms (typ. 2 ms)	typ. 0.2 ms	typ. 0.2 ms
• Load step from 100 to 50 %	< 5 ms (typ. 2 ms)	typ. 0.2 ms	typ. 0.2 ms
Protection and monitoring			
Output overvoltage protection	< 35 V	Yes, acc. to EN 60950	Yes, acc. to EN 60950
Current limitation	typ. 12 A	typ. 13 to 15 A	typ. 13 to 15 A
Short-circuit protection	Choice of stabilized current characteristic approx. 12 A or latching shutdown	Electronic shutdown, automatic restart	Electronic shutdown, automatic restart
RMS sustained short-circuit current	Approx. 12 A	< 21 A	< 21 A
Overload/short-circuit indicator	Yellow LED for "overload", red LED for "latching shutdown"	-	-
Safety			
Galvanic isolation primary/secondary	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178	Yes, SELV output voltage V_{out} acc. to EN 60950	Yes, SELV output voltage V_{out} acc. to EN 60950
Protective class	Class I	Class I	Class I
Discharge current	< 3.5 mA (typ. 0.32 mA)	< 3.5 mA (typ. 0.4 mA)	< 3.5 mA (typ. 0.4 mA)
TÜV test	Yes	Yes; CB scheme	Yes; CB scheme
CE marking	Yes	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91) File E197259	Yes, UL listed (UL 508) File E143289, CSA (CSA 22.2 No. 14-95)	Yes, UL listed (UL 508) File E143289, CSA (CSA 22.2 No. 14-95)
FM approval	-	-	-
Appr. for use in marine vessels	-	-	-
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Interference emission	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Line harmonics limitation	EN 61000-3-2	EN 61000-3-2	-
Interference immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating specifications			
Ambient temperature range	0 to +60 °C with natural convection	0 to +60 °C with natural convection	0 to +60 °C with natural convection
Transportation and storage temperature range	-25 to +85 °C	-25 to +85 °C	-25 to +85 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications			
Connections			
• Mains input L, N, PE	One screw-type terminal each for 0.2 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded
• Output L+	2 screw-type terminals for 0.2 to 2.5 mm^2	1 screw-type terminal for 0.5 to 2.5 mm^2	1 screw-type terminal for 0.5 to 2.5 mm^2
• Output M	2 screw-type terminals for 0.2 to 2.5 mm^2	2 screw-type terminals for 0.5 to 2.5 mm^2	2 screw-type terminals for 0.5 to 2.5 mm^2
Dimensions (W x H x D) in mm	90 x 125 x 125	100 x 125 x 135	100 x 125 x 135
Weight approx.	1.4 kg	1.08 kg	0.78 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5
Accessories	Buffer module (6EP1961-3BA00) Signalling module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)	-	-

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Output current 10 A

10 A 6EP1 334-2CA00	10 A 6ES7 307-1KA01-0AA0 / 6EP1334-1SL12	10 A 6EP1 334-1AL12	10 A 6EP1 334-1SH01
Approx. 87 % Approx. 36 W	Approx. 87 % Approx. 34 W	Approx. 89 % Approx. 30 W	Approx. 85 % Approx. 42 W
± 0.3 % V_{out} ± 5 % V_{out}	± 0.3 % V_{out} ± 2.5 % V_{out}	± 0.3 % V_{out} ± 0.6 % V_{out}	± 0.3 % V_{out} ± 1.5 % V_{out}
typ. 0.2 ms typ. 0.2 ms	< 5 ms < 5 ms	< 5 ms (typ. 0.1 ms) < 5 ms (typ. 0.2 ms)	< 20 ms (typ. 10 ms) < 20 ms (typ. 10 ms)
Yes, acc. to EN 60950 typ. 9 to 11 A	Additional control loop, shut-down at approx. 30 V, automatic restart 11 to 12 A	Additional control loop, shut-down at approx. 33 V, automatic restart 11 to 13 A	Yes, acc. to EN 60950 11 to 13 A
Choice of automatic restart or latching shutdown < 21 A Red LED for overtemperature switch-off	Electronic shutdown, automatic restart < 10 A -	Electronic shutdown, automatic restart < 10 A -	Stabilized current characteristic down to 0 V < 14 A -
Yes, SELV output voltage V_{out} acc. to EN 60950 Class I < 3.5 mA (typ. 0.9 mA)	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178 Class I < 3.5 mA (typ. 0.5 mA)	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178 Class I < 3.5 mA (typ. 0.27 mA)	Yes, SELV output voltage V_{out} acc. to EN 60950 Class I < 3.5 mA
Yes Yes Yes, UL listed (UL 508) File E143289, CSA (CSA 22.2 No. 14-95)	Yes Yes Yes, UL listed (UL 508) File E143289, CSA (CSA 22.2 No. 14-95)	Yes Yes Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E197259	Yes Yes Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E143289
- - IP65	Yes, Class I Div. 2, A, B, C, D, T4 in the S7-300 system IP20	- - IP20	- - IP20
EN 55011 Class A - EN 61000-6-2	EN 55022 Class B EN 61000-3-2 EN 61000-6-2	EN 55022 Class B - EN 61000-6-2	EN 55022 Class B EN 61000-3-2 EN 61000-6-2
-25 to +55 °C (power derating above +40 °C)	0 to +60 °C with natural convection	0 to +60 °C with natural convection	0 to +60 °C with natural convection
-40 to +70 °C Climatic class 3K3 acc. to EN 60721, no condensation	-40 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation	-25 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation	-25 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation
Screw-type terminals 0.5 to 2.5 mm^2 (PG11 screwed gland) Screw terminals, or connection via expansion interface on the backplane bus of the ET 200X Screw terminals, or connection via expansion interface on the backplane bus of the ET 200X	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 4 screw-type terminals for 0.5 to 2.5 mm^2 4 screw-type terminals for 0.5 to 2.5 mm^2	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 3 screw-type terminals for 0.5 to 2.5 mm^2 3 screw-type terminals for 0.5 to 2.5 mm^2	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 3 screw-type terminals for 0.5 to 2.5 mm^2 3 screw-type terminals for 0.5 to 2.5 mm^2
140 x 270 x 126 1.7 kg Wall mounting, any mounting position	120 x 125 x 120 [1] 120 x 125 x 135 [2] 1.1 kg Snap-mounting on S7 rail [1] Snap-mounting on DIN rail EN 50022-35x15 [2]	160 x 130 x 60 0.72 kg Snap-mounting on DIN rail EN 50022-35x15/7.5	200 x 125 x 135 1.8 kg Snap-mounting on DIN rail EN 50022-35x15 or on S7 rail
IP65 connector seal	Mounting adapter for DIN rail and PS-CPU connecting comb	Mounting bracket	-

1) Order No. 6ES7307-1KA01-0AA0.
2) Order No. 6EP1334-1SL12.

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SITOP power · Standard 24 V
Single-phase and two-phase

6



Output currents 20 A and 40 A
6/2 SITOP modular
6/3 The proven type
6/3 The two-phase version



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Single-phase and two-phase

Output currents 20 A and 40 A

Overview

	SITOP modular	SITOP modular
		

Application

The modular power supply units with single-phase and two-phase inputs for global use in many different fields of application; expansion of functions possible using add-on modules.

Technical specifications

Power supply, type	20 A	40 A
Order No.	**6EP1 336-3BA00**	**6EP1 337-3BA00**
Input	Single/two-phase AC	Single/two-phase AC
Rated voltage $V_{in\ rated}$	**120/230 V AC**	**120/230 V AC**
	Settable using wire jumper on device	Settable using wire jumper on device
Voltage range	85 to 132/176 to 264 V	85 to 132/176 to 264 V
Overvoltage strength	2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms
Mains buffering at $I_{out\ rated}$	> 20 ms at V_{in} = 230 V	> 20 ms at V_{in} = 230 V
Rated line frequency; range	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz
Rated current $I_{in\ rated}$	7.7/3.5 A	15/8 A
Inrush current limitation (+25 °C)	< 60 A	< 125 A
I^2t	< 9.9 A^2s	< 26 A^2s
Integrated line-side fuse	Yes	Yes
Recommended circuit-breaker (IEC 898) in mains supply line	10 A Char. C (2-pole coupled with 2-phase operation) or motor circuit-breaker 3RV1421-...	20 A Char. C (2-pole coupled with 2-phase operation) or motor circuit-breaker 3RV1421-...
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**	**24 V DC**
Total tolerance	± 3 %	± 3 %
• Stat. mains compensation	Approx. 0.1 %	Approx. 0.1 %
• Stat. load compensation	Approx. 0.1 %	Approx. 0.1 %
Residual ripple (clock frequency: approx. 50 kHz)	< 100 mV_{pp} (typ. 30 mV_{pp})	< 100 mV_{pp} (typ. 60 mV_{pp})
Spikes (bandwidth: 20 MHz)	< 200 mV_{pp} (typ. 60 mV_{pp})	< 200 mV_{pp} (typ. 120 mV_{pp})
Setting range	24 to 28.8 V (max. 480 W)	24 to 28.8 V (max. 960 W)
Status display	Green LED for 24 V O.K.	Green LED for 24 V O.K.
Power ON/OFF behavior	Overshoot of V_{out} approx. 3 %	Overshoot of V_{out} approx. 3 %
Starting delay/voltage rise	< 0.1 s/< 50 ms	< 0.1 s/< 50 ms
Rated current $I_{out\ rated}$	**20 A**	**40 A**
Current range		
• Up to +45 °C	0 to 20 A	0 to 40 A [1]
• Up to +60 °C	0 to 20 A	0 to 40 A [1]
Dyn. V/I with		
• Starting on short circuit	Approx. 23 A constant current	Approx. 46 A constant current
• Short-circuit in operation	typ. 60 A for 25 ms	typ. 120 A for 25 ms
Parallel connection for increased output	Yes, 2 (selectable current characteristic)	Yes, 2 (selectable current characteristic)

Continued on page 6/4.

1) Derating in 120 V operation necessary.

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The proven type	The two-phase version
	
The tried and tested power supply unit with selectable input voltage range for supplying all standard applications in automation engineering.	The power supply unit with 2-phase wide-range input for widely changing power supply networks (> 550 V) as well as industrial networks in Canada and the USA.
20 A	**20 A**
6EP1 336-2BA00	**6EP1 536-2AA00**
Single-phase AC **120/230 V AC** Settable using wire jumper 93 to 132/187 to 264 V AC	Two-phase AC **500 to 600 V 2 AC** wide-range input 420 to 682 V 2 AC
2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms
> 10 ms at V_{in} = 93/187 V 50/60 Hz, 47 to 63 Hz 8.0/3.3 A < 81 A	6/30 ms at V_{in} = 420/600 V 50/60 Hz; 47 to 63 Hz 1.82 A (at 420 V) typ. 25 A
< 8 A^2s T 10 A (not accessible) Circuit-breaker from 16 A Characteristic C	< 1.0 A^2s none Required: 2-pole coupled circuit-breaker Char. C max. 10 A or motor circuit-breaker 3RV1021-1DA10, setting 3 A
Stabilized, floating direct voltage **24 V DC** ± 3 %	Stabilized, floating direct voltage **24 V DC** ± 3 %
< 150 mV_{pp} < 240 mV_{pp} 22.8 to 26.4 V [1] Green LED for 24 V O.K. No overshoot of V_{out} (soft start)	< 150 mV_{pp} < 240 mV_{pp} 22.8 to 28.8 V [2] Green LED for 24 V O.K. Small overshoot of V_{out} (< 2 V for max. 500 ms)
< 3 s/typ. 80 ms **20 A** 0 to 20 A 0 to 20 A (55 °C)	- **20 A** 0 to 20 A 0 to 20 A
Approx. 20 A constant current Approx. 20 A constant current Yes, 2 [1]	Approx. 25 A constant current Approx. 28 A constant current Yes, 2 [2]

Continued on page 6/5.

1) Only permissible with ambient temperature from 0 to 45 °C.
2) Only permissible with ambient temperature from 0 to 50 °C.

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Single-phase and two-phase

Output currents 20 A and 40 A

Power supply, type	20 A	40 A
Order No.	**6EP1 336-3BA00**	**6EP1 337-3BA00**
Efficiency		
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 89 %	Approx. 88 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 59 W	Approx. 131 W
Control		
Dyn. mains compensation ($V_{in\ rated}$ ± 15 %)	< 1 % V_{out}	< 1 % V_{out}
Dyn. load compensation (I_{out}: 50/100/50 %)	Approx. ± 2 % V_{out}	Approx. ± 2 % V_{out}
Settling time		
• Load step from 50 to 100 %	< 5 ms (typ. 2 ms)	< 5 ms (typ. 2 ms)
• Load step from 100 to 50 %	< 5 ms (typ. 2 ms)	< 5 ms (typ. 2 ms)
Protection and monitoring		
Output overvoltage protection	< 35 V	< 35 V
Current limitation	typ. 23 A	typ. 46 A
Short-circuit protection	Choice of stabilized current characteristic approx. 23 A or latching shutdown	Choice of stabilized current characteristic approx. 46 A or latching shutdown
RMS sustained short-circuit current	Approx. 23 A	Approx. 46 A
Overload/short-circuit indicator	Yellow LED for "overload", red LED for "latching shutdown"	Yellow LED for "overload", red LED for "latching shutdown"
Safety		
Galvanic isolation primary/secondary	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178
Protective class	Class I	Class I
Discharge current	< 3.5 mA (typ. 0.4 mA)	< 3.5 mA (typ. 0.4 mA)
TÜV test	Yes	Yes
CE marking	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E197259	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E197259
FM approval	-	-
Appr. for use in marine vessels	-	-
Degree of protection (EN 60529)	IP20	IP20
EMC		
Interference emission	EN 55022 Class B	EN 55022 Class B
Line harmonics limitation	EN 61000-3-2	-
Interference immunity	EN 61000-6-2	EN 61000-6-2
Operating specifications		
Ambient temperature range	0 to +60 °C with natural convection	0 to +60 °C with natural convection
Transportation and storage temperature range	-25 to +85 °C	-25 to +85 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications		
Connections		
• Mains input L, N, PE	One screw-type terminal each for 0.2 to 4 mm^2 single-core/finely stranded	One screw-type terminal each for 0.2 to 4 mm^2 single-core/finely stranded
• Output L+	2 screw-type terminals for 0.5 to 4 mm^2	2 screw-type terminals for 0.5 to 10 mm^2
• Output M	2 screw-type terminals for 0.5 to 4 mm^2	2 screw-type terminals for 0.5 to 10 mm^2
Dimensions (W x H x D) in mm	160 x 125 x 125	240 x 125 x 125
Weight approx.	2.2 kg	2.9 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5
Accessories	Buffer module (6EP1961-3BA00) Signalling module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)	Buffer module (6EP1961-3BA00) Signalling module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)

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20 A	20 A
6EP1 336-2BA00	6EP1 536-2AA00
Approx. 87 % Approx. 72 W	Approx. 89 % Approx. 60 W
Approx. ± 0.3 % V_{out} ± 1 % V_{out}	< 1 % V_{out} -4 %, +2 % V_{out}
V_{out} not outside tolerance V_{out} not outside tolerance	< 3 ms < 3 ms
Yes, acc. to EN 60950 typ. 22 A	Yes, acc. to EN 60950 typ. 21 to 26 A
Stabilized current characteristic down to 0 V < 22 A -	Stabilized current characteristic approx. 28 A Approx. 28 A -
Yes, SELV output voltage V_{out} acc. to EN 60950 Class I < 3.5 mA	Yes, SELV output voltage V_{out} acc. to EN 60950 Class I < 0.78 mA (550 V/60 Hz)
Yes Yes Yes, UL listed (UL 508) File E143289, CSA (CSA 22.2 No. 14-95)	Yes Yes Yes, UL listed (UL 508) File E143289, CSA (CSA 22.2 No. 14-95)
- - IP20	- - IP20
EN 55022 Class B EN 61000-3-2 EN 61000-6-2	EN 55011 Class A - EN 61000-6-2
0 to +55 °C with natural convection -25 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation	0 to +60 °C with natural convection -25 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation
One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 1 screw-type terminal for 0.33 to 10 mm^2 2 screw-type terminals for 0.33 to 10 mm^2	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 1 screw-type terminal for 0.33 to 10 mm^2 2 screw-type terminals for 0.33 to 10 mm^2
280 x 125 x 92 2.4 kg Snap-mounting on DIN rail EN 50022-35x15/7.5 Mounting bracket 90° (6EP1971-2BA00)	280 x 180 x 92 3.3 kg Snap-mounting on DIN rail EN 50022-35x15/7.5 Mounting bracket 90° (6EP1971-2BA00)

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Notes

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SITOP power · Standard 24 V
Three-phase

7



Output currents 5 A to 40 A

7/2 SITOP modular
7/2 ■ 5 A and 10 A
7/3 ■ 20 A and 40 A
7/6 The proven types
7/6 ■ 10 A and 20 A
7/7 ■ 30 A and 40 A



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Three-phase

Output currents 5 A to 40 A

Overview

SITOP modular	SITOP modular
	

Application

The modular power supply units with wide-range input for two-phase connection to three-phase power supply networks; for global use in many different fields of application; expansion of functions possible using add-on modules.

Technical specifications

Power supply, type	5 A	10 A
Order No.	**6EP1 333-3BA00**	**6EP1 334-3BA00**
Input	Two-phase AC	Two-phase AC
Rated voltage $V_{in\ rated}$	**120/230 to 500 V AC**	**120/230 to 500 V AC**
	Settable via selector switch on device	Settable via selector switch on device
Voltage range	85 to 132/176 to 550 V AC	85 to 132/176 to 550 V AC
Overvoltage strength	1300 V_{peak}, 1.3 ms	1300 V_{peak}, 1.3 ms
Mains buffering at $I_{out\ rated}$	> 25 ms at V_{in} = 120/230 V	> 25 ms at V_{in} = 120/230 V
Rated line frequency; range	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz
Rated current $I_{in\ rated}$	2.2/1.2 to 0.61 A	4.4/2.4 to 1.1 A
Inrush current limitation (+25 °C)	< 35 A	< 35 A
I^2t	< 1.7 A^2s	< 4.0 A^2s
Integrated line-side fuse	T 3, 15 A	T 6.3 A
Required fuse protection in mains supply line	Circuit-breaker 6 A (10 A) Characteristic C (B), 2-pole coupled, or motor circuit-breaker 3RV1021-...	Circuit-breaker 6 A (10 A) Characteristic C (B), 2-pole coupled, or motor circuit-breaker 3RV1021-...
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**	**24 V DC**
Total tolerance	± 3 %	± 3 %
• Stat. mains compensation	Approx. 0.1 %	Approx. 0.1 %
• Stat. load compensation	Approx. 0.1 %	Approx. 0.1 %
Residual ripple (clock frequency: approx. 50 kHz)	< 50 mV_{pp} (typ. 10 mV_{pp})	< 50 mV_{pp} (typ. 10 mV_{pp})
Spikes (bandwidth: 20 MHz)	< 200 mV_{pp} (typ. 20 mV_{pp})	< 200 mV_{pp} (typ. 20 mV_{pp})
Setting range	24 to 28.8 V (max. 120 W)	24 to 28.8 V (max. 240 W)
Status display	Green LED for 24 V O.K.	Green LED for 24 V O.K.
Power ON/OFF behavior	Overshoot of V_{out} approx. 3 %	Overshoot of V_{out} approx. 3 %
Starting delay/voltage rise	< 1 s/< 50 ms	< 1 s/< 50 ms
Rated current $I_{out\ rated}$	**5 A**	**10 A**
Current range		
• Up to +45 °C	0 to 5 A	0 to 10 A
• Up to +60 °C	0 to 5 A	0 to 10 A
Dyn. V/I with		
• Starting on short circuit	Approx. 5.5 A constant current	Approx. 12 A constant current
• Short-circuit in operation	typ. 15 A for 25 ms	typ. 30 A for 25 ms
Parallel connection for increased output	Yes, 2 (selectable current characteristic)	Yes, 2 (selectable current characteristic)

Continued on page 7/4.

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SITOP modular



SITOP modular



The modular power supply units with three-phase wide-range input for global use in many different fields of application; expansion of functions possible using add-on modules.

20 A	**40 A**
6EP1 436-3BA00	**6EP1 437-3BA00**
Three-phase AC **400 to 500 V 3 AC** wide-range input 320 to 550 V (startup from V_{in} > 340)	Three-phase AC **400 to 500 V 3 AC** wide-range input 320 to 550 V (startup from V_{in} > 340)
2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms
> 6 ms at V_{in} = 400 V 50/60 Hz; 47 to 63 Hz 1.1 A (V_{in} = 400 V) < 35 A	> 6 ms at V_{in} = 400 V 50/60 Hz; 47 to 63 Hz 2.2 A (V_{in} = 400 V) < 70 A
< 0.7 A^2s None 3-pole coupled circuit-breaker 6 to 16 A Char. C or motor circuit-breaker 3RV1021-1DA10, setting 3 A	< 2.8 A^2s None 3-pole coupled circuit-breaker 10 to 16 A Char. C or motor circuit-breaker 3RV1021-1DA10, setting 3 A
Stabilized, floating direct voltage **24 V DC** ± 3 % Approx. ± 0.1 % Approx. ± 0.2 %	Stabilized, floating direct voltage **24 V DC** ± 3 % Approx. ± 0.1 % Approx. ± 0.2 %
< 100 mV_{pp} < 200 mV_{pp} 24 to 28.8 V (max. 480 W) Green LED for 24 V O.K. No overshoot of V_{out} (soft start)	< 100 mV_{pp} < 200 mV_{pp} 24 to 28.8 V (max. 960 W) Green LED for 24 V O.K. No overshoot of V_{out} (soft start)
< 2.5 s/< 500 ms **20 A** 0 to 20 A 0 to 20 A	< 2.5 s/< 500 ms **40 A** 0 to 40 A 0 to 40 A
Approx. 23 A constant current typ. 60 A for 25 ms Yes, 2 (selectable current characteristic)	Approx. 46 A constant current typ. 120 A for 25 ms Yes, 2 (selectable current characteristic)

Continued on page 7/5.

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Three-phase

Output currents 5 A to 40 A

Power supply, type	5 A	10 A
Order No.	**6EP1 333-3BA00**	**6EP1 334-3BA00**
Efficiency		
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 87 %	Approx. 87 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 18 W	Approx. 36 W
Control		
Dyn. mains compensation ($V_{in\ rated}$ ± 15 %)	Approx. 0.1 %	Approx. 0.1 %
Dyn. load compensation (I_{out}: 50/100/50 %)	Approx. +3 % V_{out}	Approx. +3% V_{out}
Settling time		
• Load step from 50 to 100 %	< 5 ms (typ. 2 ms)	< 5 ms (typ. 2 ms)
• Load step from 100 to 50 %	< 5 ms (typ. 2 ms)	< 5 ms (typ. 2 ms)
Protection and monitoring		
Output overvoltage protection	< 35 V	< 35 V
Current limitation	typ. 5.5 A	typ. 12 A
Short-circuit protection	Choice of stabilized current characteristic approx. 5.5 A or latching shutdown	Choice of stabilized current characteristic approx. 12 A or latching shutdown
RMS sustained short-circuit current	Approx. 5.5 A	Approx. 12 A
Overload/short-circuit indicator	Yellow LED for "overload", red LED for "latching shutdown"	Yellow LED for "overload", red LED for "latching shutdown"
Safety		
Galvanic isolation primary/secondary	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178
Protective class	Class I	Class I
Discharge current	< 3.5 mA (typ. 0.25 mA)	< 3.5 mA (typ. 0.32 mA)
TÜV test	Yes	Yes
CE marking	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E197259	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E197259
FM approval	-	-
Appr. for use in marine vessels	-	-
Degree of protection (EN 60529)	IP20	IP20
EMC		
Interference emission	EN 55022 Class B	EN 55022 Class B
Line harmonics limitation	EN 61000-3-2	EN 61000-3-2
Interference immunity	EN 61000-6-2	EN 61000-6-2
Operating specifications		
Ambient temperature range	0 to +60 °C with natural convection	0 to +60 °C with natural convection
Transportation and storage temperature range	-25 to +85 °C	-25 to +85 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications		
Connections		
• Mains input L1, L2, L3, PE	One screw-type terminal each for 0.2 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.2 to 2.5 mm^2 single-core/finely stranded
• Output L+	2 screw-type terminals for 0.2 to 2.5 mm^2	2 screw-type terminals for 0.2 to 2.5 mm^2
• Output M	2 screw-type terminals for 0.2 to 2.5 mm^2	2 screw-type terminals for 0.2 to 2.5 mm^2
Dimensions (W x H x D) in mm	70 x 125 x 125	90 x 125 x 125
Weight approx.	1.2 kg	1.4 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5
Accessories	Buffer module (6EP1961-3BA00) Signalling module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)	Buffer module (6EP1961-3BA00) Signalling module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)

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20 A	40 A
6EP1 436-3BA00	**6EP1 437-3BA00**
Approx. 90 % Approx. 53 W	Approx. 90 % Approx. 106 W
< 1 % V_{out}	< 1 % V_{out}
Approx. ± 2 % V_{out}	Approx. ± 2 % V_{out}
< 10 ms (typ. 4 ms) < 10 ms (typ. 4 ms)	< 10 ms (typ. 4 ms) < 10 ms (typ. 4 ms)
< 35 V typ. 23 A	< 35 V typ. 46 A
Choice of stabilized current characteristic approx. 23 A or latching shutdown Approx. 23 A Yellow LED for "overload", red LED for "latching shutdown"	Choice of stabilized current characteristic approx. 46 A or latching shutdown Approx. 46 A Yellow LED for "overload", red LED for "latching shutdown"
Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178 Class I < 3.5 mA	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178 Class I < 3.5 mA
Yes Yes Yes, UL listed (UL 508) File E197259, CSA (CSA 22.2 No. 14-95)	Yes Yes Yes, UL listed (UL 508) File E197259, CSA (CSA 22.2 No. 14-95)
- - IP20	- - IP20
EN 55022 Class B EN 61000-3-2 EN 61000-6-2	EN 55022 Class B EN 61000-3-2 EN 61000-6-2
0 to +60 °C with natural convection	0 to +60 °C with natural convection
-25 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation	-25 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation
One screw-type terminal each for 0.2 to 4 mm^2 single-core/finely stranded 2 screw-type terminals for 0.33 to 4 mm^2 2 screw-type terminals for 0.33 to 4 mm^2	One screw-type terminal each for 0.2 to 4 mm^2 single-core/finely stranded 2 screw-type terminals for 0.33 to 10 mm^2 2 screw-type terminals for 0.33 to 10 mm^2
160 x 125 x 125 2 kg Snap-mounting on DIN rail EN 50022-35x15/7.5	240 x 125 x 125 3.2 kg Snap-mounting on DIN rail EN 50022-35x15/7.5
Buffer module (6EP1961-3BA00) Signalling module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)	Buffer module (6EP1961-3BA00) Signalling module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)

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Three-phase

Output currents 10 A to 40 A

Overview

The proven types



Application

The tried and tested power supply units with three-phase wide-range input for supplying all standard applications in automation engineering.

Technical specifications

Power supply, type	**10 A**	**20 A**
Order No.	**6EP1 434-2BA00**	**6EP1 436-2BA00**
Input	Three-phase AC	Three-phase AC
Rated voltage $V_{in\ rated}$	**400 to 500 V 3 AC**	**400 to 500 V 3 AC**
	wide-range input	wide-range input
Voltage range	360 to 550 V 3 AC (340 to 360 V for max. 2 s or at max. 0.9 x $I_{out\ rated}$)	360 to 550 V 3 AC (340 to 360 V for max. 2 s or at max. 0.9 x $I_{out\ rated}$)
Overvoltage strength	2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms
Mains buffering at $I_{out\ rated}$	> 6 ms at V_{in} = 360 V	> 3 ms at V_{in} = 360 V
Rated line frequency; range	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz
Rated current $I_{in\ rated}$	0.65 A (at 400 V)	1.2 A (at 400 V)
Inrush current limitation (+25 °C)	< 25 A	< 25 A
I^2t	< 1.0 A^2s	< 1.0 A^2s
Integrated line-side fuse	none	none
Required fuse protection in mains supply line	3-pole coupled circuit-breaker Char. C up to 25 A (recommendation: 6 A) or motor circuit-breaker 3RV1021-1DA10, setting 3 A	3-pole coupled circuit-breaker Char. C up to 25 A (recommendation: 6 A) or motor circuit-breaker 3RV1021-1DA10, setting 3 A
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**	**24 V DC**
Total tolerance	± 3 %	± 3 %
• Stat. mains compensation		
• Stat. load compensation		
Residual ripple (clock frequency: approx. 50 kHz)	< 150 mV_{pp} (typ. 60 mV_{pp})	< 150 mV_{pp} (typ. 60 mV_{pp})
Spikes (bandwidth: 20 MHz)	< 240 mV_{pp} (typ. 120 mV_{pp})	< 240 mV_{pp} (typ. 120 mV_{pp})
Setting range	22.8 to 26.4 V [1]	22.8 to 26.4 V [1]
Status display	Green LED for 24 V O.K.	Green LED for 24 V O.K.
Power ON/OFF behavior	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)
Starting delay/voltage rise	< 3 s/typ. 40 ms	< 3 s/typ. 40 ms
Rated current $I_{out\ rated}$	**10 A**	**20 A**
Current range		
• Up to +45 °C	0 to 10 A	0 to 20 A
• Up to +55 °C	0 to 10 A	0 to 20 A
Dyn. V/I with		
• Starting on short circuit	Constant current approx. 18 A	Constant current approx. 30 A
• Short-circuit in operation	Constant current approx. 18 A	Constant current approx. 30 A
Parallel connection for increased output	Yes, 2 [1]	Yes, 2 [1]

Continued on page 7/8.

1) Only permissible with ambient temperature from 0 °C to 45 °C.

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The proven types



The tried and tested power supply units with three-phase wide-range input for supplying all standard applications in automation engineering.

30 A	**40 A**
6EP1 437-2BA00	**6EP1 437-2BA10**
Three-phase AC **400 to 500 V 3 AC** wide-range input 360 to 550 V 3 AC (340 to 360 V for max. 2 s or at max. 0.9 x $I_{out\ rated}$)	Three-phase AC **400 to 500 V 3 AC** wide-range input 360 to 550 V 3 AC (340 to 360 V for max. 2 s or at max. 0.9 x $I_{out\ rated}$)
2.3 x $V_{in\ rated}$, 1.3 ms	2.3 x $V_{in\ rated}$, 1.3 ms
> 4.5 ms at V_{in} = 360 V 50/60 Hz; 47 to 63 Hz 1.4 A (at 400 V) < 25 A	> 3 ms at V_{in} = 360 V 50/60 Hz; 47 to 63 Hz 1.9 A (at 400 V) < 25 A
< 1.0 A^2s none 3-pole coupled circuit-breaker Char. C up to 25 A (recommendation: 6 A) or motor circuit-breaker 3RV1021-1DA10, setting 3 A	< 1.0 A^2s none 3-pole coupled circuit-breaker Char. C up to 25 A (recommendation: 6 A) or motor circuit-breaker 3RV1021-1DA10, setting 3 A
Stabilized, floating direct voltage **24 V DC** ± 3 %	Stabilized, floating direct voltage **24 V DC** ± 3 %
< 150 mV_{pp} (typ. 50 mV_{pp}) < 240 mV_{pp} (typ. 200 mV_{pp}) 22.8 to 26.4 V [1] Green LED for 24 V O.K. Small overshoot of V_{out} (< 2 V for max. 500 ms)	< 150 mV_{pp} (typ. 50 mV_{pp}) < 240 mV_{pp} (typ. 200 mV_{pp}) 22.8 to 26.4 V [1] Green LED for 24 V O.K. Small overshoot of V_{out} (< 2 V for max. 500 ms)
< 3 ms/typ. 40 ms **30 A**	< 3 ms/typ. 40 ms **40 A**
0 to 30 A 0 to 30 A	0 to 40 A 0 to 40 A
Approx. 60 A for 600 ms Approx. 60 A for 600 ms Yes, 2 [1]	Approx. 70 A for 600 ms Approx. 70 A for 600 ms Yes, 2 [1]

Continued on page 7/9.

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Three-phase

Output currents 10 A to 40 A

Power supply, type	10 A	20 A
Order No.	**6EP1 434-2BA00**	**6EP1 436-2BA00**
Efficiency		
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 89 %	Approx. 89 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 30 W	Approx. 59 W
Control		
Dyn. mains compensation ($V_{in\ rated}$ ± 15 %)	< 1 % V_{out}	< 1 % V_{out}
Dyn. load compensation (I_{out}: 50/100/50 %)	± 2 % V_{out}	± 2 % V_{out}
Settling time		
• Load step from 50 to 100 %	< 2 ms	< 2 ms
• Load step from 100 to 50 %	< 2 ms	< 2 ms
Protection and monitoring		
Output overvoltage protection	Yes, acc. to EN 60950	Yes, acc. to EN 60950
Current limitation	typ. 10.5 to 13 A	typ. 21 to 26 A
Short-circuit protection	Stabilized current characteristic down to 0 V	Stabilized current characteristic down to 0 V
RMS sustained short-circuit current	< 20 A	< 30 A
Overload/short-circuit indicator	-	-
Safety		
Galvanic isolation primary/secondary	Yes, SELV output voltage V_{out} acc. to EN 60950	Yes, SELV output voltage V_{out} acc. to EN 60950
Protective class	Class I	Class I
Discharge current	< 0.35 mA (550 V/60 Hz)	< 0.35 mA (550 V/60 Hz)
TÜV test	Yes; CB scheme	Yes; CB scheme
CE marking	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E143289	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E143289
FM approval	-	-
Appr. for use in marine vessels	-	-
Degree of protection (EN 60529)	IP20	IP20
EMC		
Interference emission	EN 55022 Class B	EN 55022 Class B
Line harmonics limitation	EN 61000-3-2	EN 61000-3-2
Interference immunity	EN 61000-6-2	EN 61000-6-2
Operating specifications		
Ambient temperature range	0 to +55 °C with natural convection	0 to +55 °C with natural convection
Transportation and storage temperature range	-25 to +85 °C	-25 to +85 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications		
Connections		
• Mains input L1, L2, L3, PE	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded
• Output L+	1 screw-type terminal for 0.33 to 10 mm^2	1 screw-type terminal for 0.33 to 10 mm^2
• Output M	2 screw-type terminals for 0.33 to 10 mm^2	2 screw-type terminals for 0.33 to 10 mm^2
Dimensions (W x H x D) in mm	280 x 125 x 92	280 x 125 x 92
Weight approx.	2 kg	2 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5
Accessories	Mounting bracket 90° (6EP1971-2BA00)	Mounting bracket 90° (6EP1971-2BA00)

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30 A	40 A
6EP1 437-2BA00	**6EP1 437-2BA10**
Approx. 90 % Approx. 80 W	Approx. 90 % Approx. 107 W
< 1 % V_{out} -4 %, +2 % V_{out}	< 1 % V_{out} -4 %, +2 % V_{out}
< 3 ms < 3 ms	< 3 ms < 3 ms
Yes, acc. to EN 60950 typ. 31.5 to 39 A	Yes, acc. to EN 60950 typ. 42 to 52 A
Electronic shutdown, automatic restart < 48 A -	Electronic shutdown, automatic restart < 62 A -
Yes, SELV output voltage V_{out} acc. to EN 60950 Class I < 0.78 mA (550 V/60 Hz)	Yes, SELV output voltage V_{out} acc. to EN 60950 Class I < 0.78 mA (550 V/60 Hz)
Yes; CB scheme Yes Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E143289	Yes; CB scheme Yes Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E143289
- - IP20	- - IP20
EN 55022 Class B EN 61000-3-2 EN 61000-6-2	EN 55022 Class B EN 61000-3-2 EN 61000-6-2
0 to +55 °C with natural convection -25 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation	0 to +55 °C with natural convection -25 to +85 °C Climatic class 3K3 acc. to EN 60721, no condensation
One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 1 screw-type terminal for 0.33 to 10 mm^2 2 screw-type terminals for 0.33 to 10 mm^2	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded 1 screw-type terminal for 0.33 to 10 mm^2 2 screw-type terminals for 0.33 to 10 mm^2
280 x 180 x 92 3.6 kg Snap-mounting on DIN rail EN 50022-35x15/7.5	280 x 180 x 92 3.6 kg Snap-mounting on DIN rail EN 50022-35x15/7.5
Mounting bracket 90° (6EP1971-2BA00)	Mounting bracket 90° (6EP1971-2BA00)

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Notes

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SITOP power · Standard 24 V
Additional components

8



8/2 SITOP modular signalling module
8/2 SITOP modular buffer module
8/2 SITOP modular redundancy module
8/4 SITOP select diagnosis module
8/6 Mounting bracket 90°
8/7 Mounting adapter for S7 rail and PS-CPU connecting comb
8/7 IP65 connector seals
8/7 Circular input connectors and AS-Interface coupling module PG



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Additional components

Overview

	SITOP modular signalling module	SITOP modular buffer module	SITOP modular redundancy module
			

Application

SITOP modular signalling module	SITOP modular buffer module	SITOP modular redundancy module
Using the signalling module in combination with a stabilized SITOP modular power supply unit, signals can be provided on the operating status of the power supply unit, and remote switching ON/OFF of the unit is possible; automatic contacting with the power supply unit.	With brief interruptions in the power supply, the buffer module in combination with a stabilized SITOP modular power supply unit can buffer the load current without an interruption. The buffer module is wired in parallel with the output of the power supply unit.	The redundancy module serves to decouple two stabilized SITOP modular power supplies in parallel mode. If one power supply fails, the 24 V is safely retained.

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Technical specifications

Order No.	6EP1 961-3BA10	6EP1 961-3BA00	6EP1 961-3BA20
Input/output		Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated input voltage $V_{in\ rated}$	-	**24 V DC**	**24 V DC**
Input voltage range	-	24 to 28.8 V DC	24 to 28.8 V DC
Control input	Non-isolated input for remote ON/OFF switching of the power supply unit	-	-
Rated output voltage $V_{out\ rated}$	-	V_{in} – approx. 1 V	V_{in} – approx. 0.5 V
Rated current $I_{out\ rated}$	-	40 A	20 A (maximum total current 40 A)
Mains buffering	-	100 ms at 40 A up to 800 ms at 5 A load current	-
Buffer time, max.	-	3 s	-
Parallel connection for increased output	-	Yes, 2	-
Protection and monitoring			
Static current limitation	-	typ. 40 A	-
Short-circuit protection	-	Electronic	-
Displays/messages			
Status display	-	Green LED for supply voltage > 20.5 V	Green LED for "Power supply 1 and Power supply 2 OK"
Signals	Floating relay contacts (changeover contacts, rating 6 A/240 V AC) for "Output voltage OK" and "Power supply availability OK"	-	Floating relay contact (changeover contact, rating 6 A/240 V AC) for "Power supply 1 and Power supply 2 OK", switching threshold adjustable from 20 to 25 V

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Technical specifications (continued)

Order No.	6EP1 961-3BA10	6EP1 961-3BA00	6EP1 961-3BA20
Safety			
Galvanic isolation	Yes, SELV acc. to EN 60950 (relay contacts)	Yes, SELV acc. to EN 60950	Yes, SELV acc. to EN 60950 (relay contact)
Protective class	Class I	Class I	Class I
TÜV test	Yes	Yes	Yes
CE marking	Yes	Yes	Yes
UL/cUL (CSA) approval	Yes, UL listed (UL 508) File E197259, CSA (CSA 22.2 No. 14-95)	Yes, UL listed (UL 508) File E197259, CSA (CSA 22.2 No. 14-95)	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91)
FM approval	-	-	-
Appr. for use in marine vessels	-	-	-
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Interference emission	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Interference immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating specifications			
Ambient temperature range	0 to +60 °C with natural convection	0 to +60 °C with natural convection	0 to +60 °C with natural convection
Transportation and storage temperature range	-25 to +85 °C	-25 to +85 °C	-25 to +85 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications			
Connections	Screw-type terminals for 0.14 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for + and - for 0.5 to 10 mm^2 single-core/finely stranded	Input, output and ground: one screw-type terminal each for 0.33 to 10 mm^2, single-core/finely stranded; relay contact: one screw-type terminal each for 0.5 to 2.5 mm^2, single-core/finely stranded
Dimensions (W x H x D) in mm	26 x 125 x 116	70 x 125 x 125	70 x 125 x 125
Weight approx.	0.15 kg	1.2 kg	1.0 kg
Mounting	Can be directly snapped onto the side of the basic unit	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5

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Additional components

Overview

SITOP select



Application

The diagnosis module is used together with 24 V power supply units to divide the load current between several branch circuits and to monitor the individual currents. Faults in the individual circuits resulting from an overload or short-circuit are detected and switched off selectively, and other load current paths therefore remain unaffected by the fault. This results in rapid fault diagnostics, and downtimes are minimized.

Technical specifications

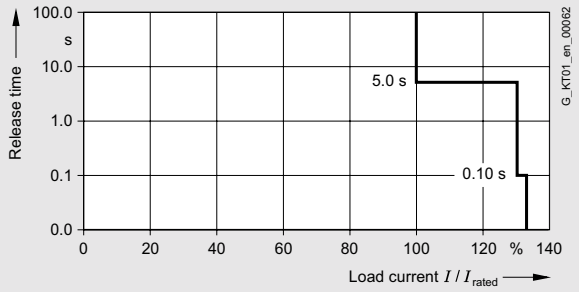
Type	**Module 4 x 10 A**
Order No.	**6EP1 961-2BA00**
Input	**DC voltage**
Rated voltage $V_{in\ rated}$	24 V DC
Voltage range	22 to 30 V
Overvoltage strength	35 V; 100 ms
Output	**DC voltage**
Rated voltage $V_{out\ rated}$	**V_{out} - 0.5 V**
Total tolerance/ residual ripple	Corresponding to the input voltage
Number of output channels	4
Rated current $I_{out\ rated}$ up to +60 °C	**10 A per channel**
Setting range	2 to 10 A per channel
Parallel connection of several channels	Not permissible
Efficiency	
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 97 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 30 W
Switch-off characteristic per channel	
Overcurrent	I_{out} = 1.0 to 1.3 x set value, switch-off after approx. 5 s
Current limitation	I_{out} = 1.35 x set value, switch-off after approx. 50 to 100 ms
Immediate switch-off	I_{out} > set value and V_{in} < 20 V
Reset	Using keys on module
Protection and monitoring	
Line protection	Electronic; additionally possible via accessible FK2 blade-type fuse (equipped when delivered with 15 A fuse) per channel
Status displays	Two-color LED per channel, green for output switched through, red for output switched off
Signaling contact	Common signal contact (NO contact)
Safety	
Protective class	Class III
Degree of protection (EN 60529)	IP20
TÜV test	Yes
CE marking	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E197259; cURus recognized (UL 60950, CSA 22.2 No. 60950), File E151273
EMC	
Interference emission	EN 55022 Class B
Interference immunity	EN 61000-6-2
Operating specifications	
Ambient temperature range	0 to +60 °C with natural convection
Transportation and storage temperature range	-25 to +85 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation

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Technical specifications (continued)

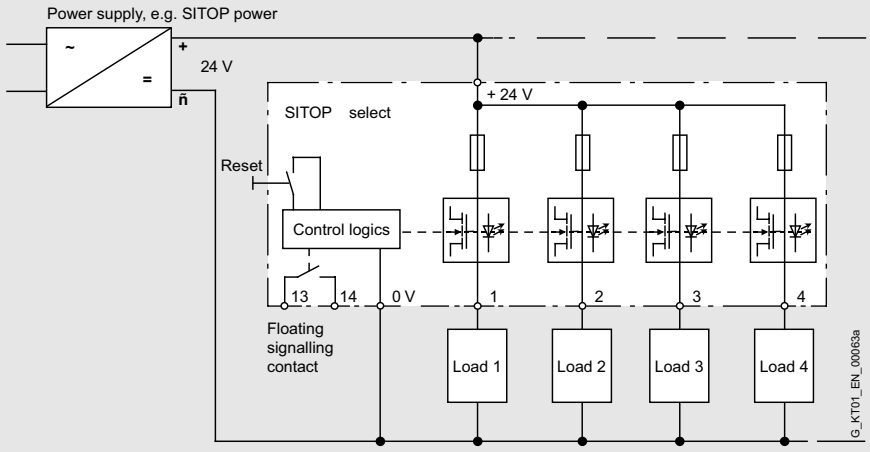
Type	Module 4 x 10 A
Order No.	**6EP1 961-2BA00**
Mechanical specifications	
Connections	
• Input +24	2 screw-type terminals for 0.33 to 10 mm^2
• Input 0 V	2 screw-type terminals for 0.22 to 4 mm^2
• Outputs 1 to 4	1 screw-type terminal per channel for 0.22 to 4 mm^2
• Signalling contact	2 screw-type terminals for 0.22 to 4 mm^2
Dimensions (W x H x D) in mm	72 x 90 x 90
Weight	0.4 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5

Characteristic curves



Switch-off characteristic

Schematics



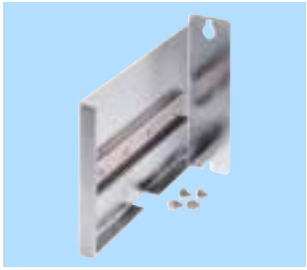
Basic circuit

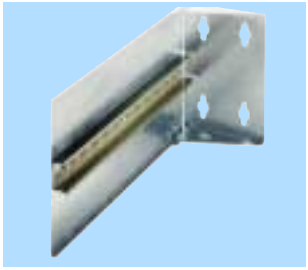
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Additional components

Overview

Mounting bracket





Application

Combination of a SITOP power supply unit with a 90° mounting bracket results in a minimum surface requirement on the rear panel of the switchgear cabinet (the width of the power supply unit becomes the depth, the depth becomes the width). The mounting bracket is suitable for switchgear cabinets with a depth of 240 mm or 320 mm or more.

Technical specifications

Mounting bracket	**For depth 240 mm**	**For depth 320 mm**
Order No.	**6EP1 971-1AA01**	**6EP1 971-2BA00**
Dimensions (W x H x D) in mm	50 x 159 x 236	100 x 150 x 320
Sheet plate thickness	2 mm	1.5 mm
Connected mounting rail	DIN rail EN 50022-35x7.5	DIN rail EN 50022-35x15
Weight approx.	0.9 kg	0.9 kg
Mounting	Can be screwed on level surface (keyhole mounting with M5 screws, drill hole distance 147.5 mm height)	Can be screwed on level surface (keyhole mounting with M6 screws, drill hole distance 90 mm height, 50 mm to the side)
Supplied accessories	Two M5 combi screws and two M5 self-tapping screws	Four M6 combi screws
Suitable for	SITOP 24 V/3.5 A (6EP1 332-1SH31) SITOP 24 V/5 A (6EP1 333-1AL12) SITOP 24 V/10 A (6EP1 334-1AL12) SITOP DC UPS module 40 A (6EP1 931-2FC01)	SITOP 24 V/10 A (6EP1 434-2BA00) SITOP 24 V/20 A (6EP1 336-2BA00, 6EP1 335-3BA00, 6EP1 436-2BA00, 6EP1 436-3BA00, 6EP1 457-3BA00, 6EP1 536-2AA00) SITOP 24 V/30 A (6EP1 437-2BA00) SITOP 24 V/40 A (6EP1 437-2BA10, 6EP1 337-3BA00, 6EP1 437-3BA00)

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Mounting adapter for S7 rail and PS-CPU connecting comb

The single-phase SITOP power supply units 24 V/2 A (6ES7 307-1BA00-0AA0, 6ES7 305-1BA80-0AA0), 24 V/5 A (6ES7 307-1EA00-0AA0, 6ES7 307-1EA80-0AA0) and 24 V/10 A (6ES7 307-1KA01-0AA0) are special mechanical versions for SIMATIC S7-300.

They can be mounted on an S7 rail, and the connection to the new CPUs or the compact CPUs of the S7-300 can be established without problem using a supplied connecting comb.

Power supply units of same design without connecting comb, but with a supplied mounting adapter for DIN rail EN 50022-35x15, are available with the Order Nos. 6EP1 331-1SL11 (24 V/2 A), 6EP1 333-1SL11 (24 V/5 A) and 6EP1 334-1SL12 (24 V/10 A).

A connecting comb for older CPUs with product phase-out since 2003 as well as the mounting adapter are available as individual accessories.

Selection and Ordering Data

PS-CPU connecting comb (spare part for CPUs 313, 314, 315, 315/316/318-2 DP, IM153)	**6ES7 390-7BA00-0AA0**
Mounting adapter for DIN rail EN 50022-35x15	**6ES7 390-6BA00-0AA0**

IP65 connector seals

The single-phase SITOP power supply unit 24 V/10 A in IP65 degree of protection (6EP1 334-2CA00) has a design and functionality which are optimally adapted to the ET 200X distributed I/O system.

Thanks to integral plug-in connectors, it can be flush-mounted with the modules without any special wiring overhead.

If the power supply unit is operated outside the ET 200X system as a stand-alone power supply unit in IP65 degree of protection, connector seals are required to seal the integral plug-in connectors.

Selection and Ordering Data

IP65 connector seal for power supply unit 6EP1 334-2CA00	**6EP1 971-2CA00**

Circular input connectors and AS interface coupling module PG

A 6-pole circular connector with socket inset is required for the ASi power supply 30 V/2.4 A in IP65 degree of protection (6EP1 632-1AL01) for connection of the input side.

The connection of the ASi power supply to the ASi network is made using the coupling module PG.

Selection and Ordering Data

6-pole circular input connector with socket inset	**6ES5 760-2CA11**
AS interface coupling module PG	**3RG9 220-0AA00**

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Notes

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SITOP power · Standard 24 V Uninterruptible power supplies

9



DC UPS

9/2 Overview
9/2 DC UPS software
9/3 DC UPS module 6 A and 15 A
9/11 DC UPS module 40 A
9/14 Battery module 1.2 Ah
9/15 Battery module 2.5 Ah
9/16 Battery module 3.2 Ah
9/17 Battery module 7 Ah
9/18 Battery module 12 Ah



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DC UPS

Overview

By combining a DC UPS module with at least one 24 V battery module and a SITOP power supply unit, longer power failures can be bridged without any interruption.

This combination is used, for example, in machine tool manufacture, in the textile industry, with all types of production lines and filling systems, and in conjunction with 24 V industrial PCs. The negative effects which frequently result from power failures can thus be prevented.

For nonstop use in the event of power failures, Siemens offers the uninterruptible power supplies
- DC UPS 6 A
- DC UPS 15 A
- DC UPS 40 A

as well as the battery modules
- 1.2 Ah
- 3.2 Ah
- 7 Ah
- 12 Ah
- 2.5 Ah (high-temperature battery).

Selection table for battery modules with power failure buffer times

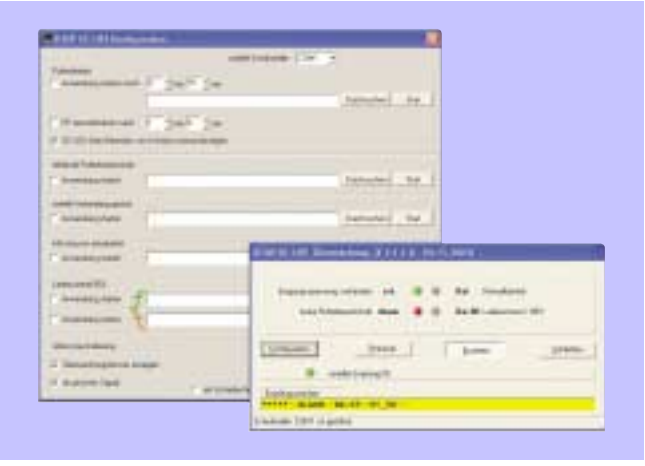
Load current	Battery module 1.2 Ah (6EP1935-6MC01)	Battery module 3.2 Ah (6EP1935-6MD11)	Battery module 7 Ah (6EP1935-6ME21)	Battery module 12 Ah (6EP1935-6MF01)	Battery module 2.5 Ah (6EP1935-6MD31)
1 A	30 min	2.5 h	6 h	10 h	2 h
2 A	11 min	45 min	2.5 h	4 h	45 min
4 A	2 min	20 min	45 min	2.5 h	20 min
6 A	1 min	10 min	30 min	1 h	13 min
8 A	-	4 min	20 min	40 min	9 min
10 A	-	1.5 min	15 min	30 min	7 min
12 A	-	1 min	10 min	25 min	5.5 min
14 A	-	50 s	8 min	20 min	4.5 min
16 A	-	40 s	6 min	15 min	4 min
20 A	-	-	2 min	11 min	-

Note:
- The power failure buffer times are based on the discharge period of the completely charged battery module down to a battery voltage of 21 V; ambient temperature 25 °C.
- With the DC UPS 40 A module, high electronically limited peak currents (120 A for approx. 12 ms, up to 40 A for several minutes depending on the battery capacity) are automatically delivered in the event of increased load current requirements (e.g. when switching on incandescent lamps, contactors with DC autotransformer winding, DC motors, DC/DC converters, electronic modules with high input capacitance). To achieve this, at least two battery modules of 7 Ah or more must be connected in parallel.
- Following a power failure, the battery module is automatically disconnected from the loads electronically and rapidly recharged at 0.2/0.4 A (DC UPS 6 A module), at 0.35/0.7 A (DC UPS 15 A module) or at 2 A (DC UPS 40 A module) (V/I characteristic with 27 V or 27.3 V end-of-charge voltage).

DC UPS software

The DC UPS 6 A and 15 A modules are optionally available with a serial interface or USB interface. All relevant messages concerning the status of the DC UPS can then be sent to a PC (e.g. SIMATIC PC). The SITOP DC UPS software, with which the signals sent from the DC UPS module can be processed further on the PC, is very easy to use. In monitoring mode, the statuses of the DC UPS module are visualized on the PC. The safe shutdown in the event of a power failure and the automatic restart of the PC are supported. It is also possible to freely define the responses to the various operating states of the DC UPS module, permitting extremely flexible incorporation into many different applications.

The software executes under the WinNT 4.0, Win2000 and WinXP operating systems. It is available as freeware on the SITOP Internet site for free downloading.



Monitoring and configuration windows of the SITOP UPS software

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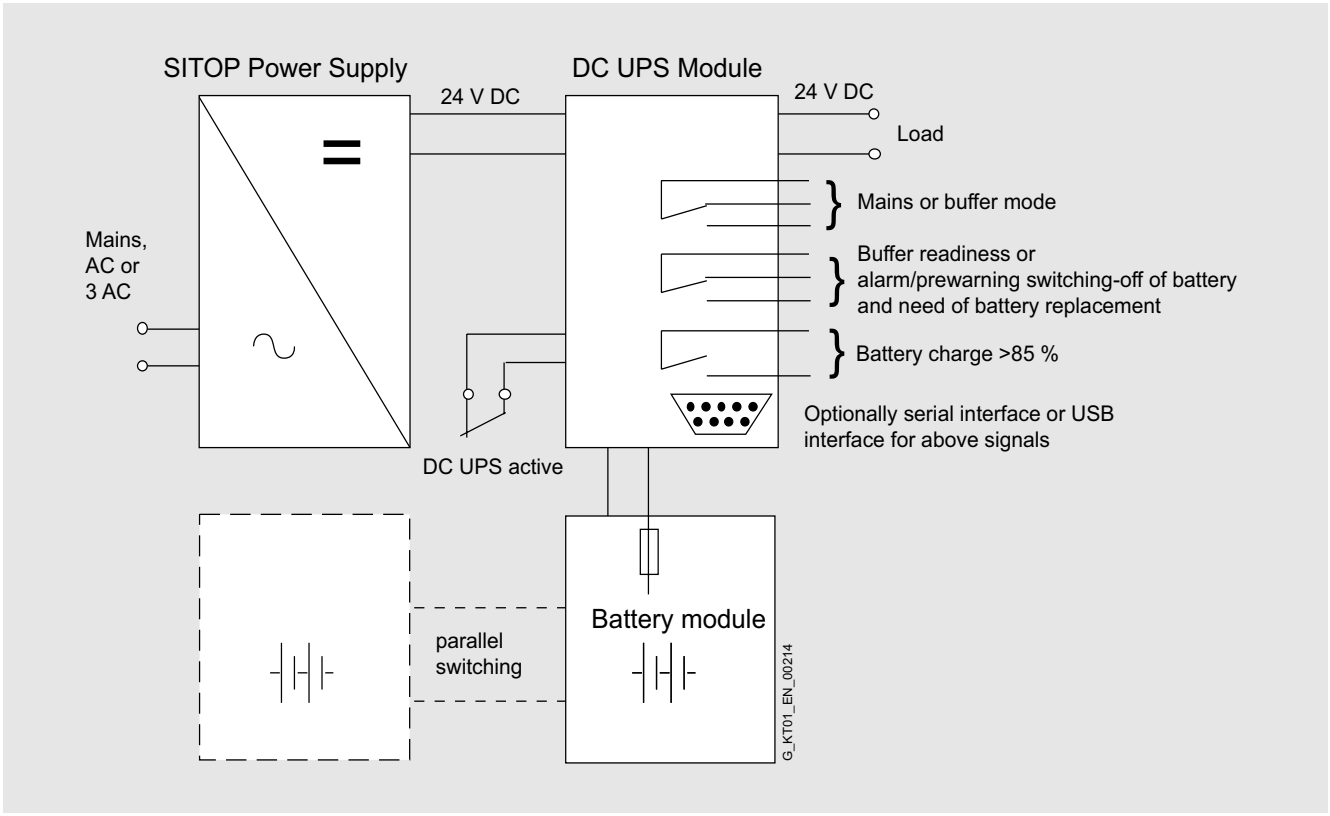
DC UPS module 6 A and 15 A

Overview

- Compact design, only 50 mm wide
- Simple DIN rail mounting
- Absolutely interruption-free buffering of power failures through immediately electronic connection of the batteries as soon as the DC UPS input voltage drops below the value set using DIP switches
- High safety and availability through monitoring of operational readiness, battery supply line, battery aging (message "Battery replacement necessary") and battery charge (message "Battery charge >85%")
- Support of automatic restart of industrial PCs through selectable switch-off response
- Optionally with serial or USB interface.
  SW tool as download at
  http://www.siemens.de/sitop
  executes under WinNT4.0, Win2000 and WinXP.

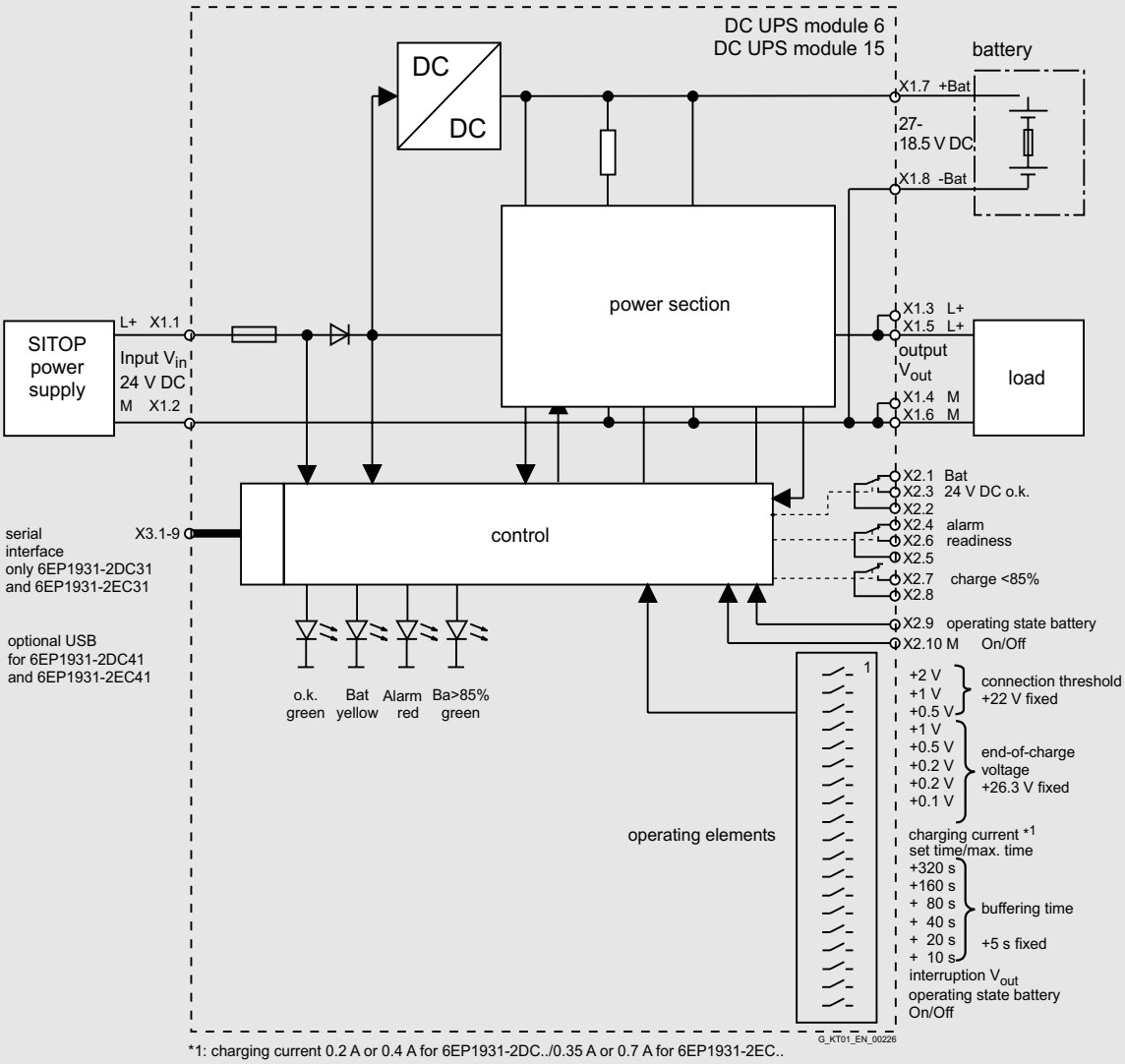


Integration



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DC UPS module 6 A and 15 A



*1: charging current 0.2 A or 0.4 A for 6EP1931-2DC../0.35 A or 0.7 A for 6EP1931-2EC..

9

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Function

The following timing diagrams show the characteristic of the input and output voltages at the terminals of the DC UPS module as well as the signal characteristic of the signals (relays) and the remote signal (interface) as examples.

"Long" power failure with DC UPS without serial or USB interface (Fig. 9/1)

Power recovery only following expiry of buffer time tp (t3 after t4):

If the input voltage at the DC UPS module fails (time t1), the battery "Bat" immediately takes over the DC supply, and the output voltage V_{out} is therefore retained completely without interruption.

The floating changeover contact "OK/Bat" switches to its deenergized position "Bat".

At the time t1, the buffer time tp set on the DIP switches is started automatically.

The fact that the DIP switch is set to "Interruption output V_{out}" has no effect in this example because the input voltage returns at time t3 only after the set buffer time (time t4) has expired.

"Short" power failure with DC UPS without serial or USB interface (Fig. 9/2)

Power recovery prior to expiry of buffer time tp (t3 before t4):

If the input voltage at the DC UPS module fails (time t1), the battery "Bat" immediately takes over the DC supply, and the output voltage V_{out} is therefore retained completely without interruption.

The floating changeover contact "OK/Bat" switches to its deenergized position "Bat".

At the time t1, the buffer time tp set on the DIP switches is started automatically.

With the selected DIP switch position "Interruption output V_{out}", the output voltage V_{out} is automatically interrupted for 5 seconds following expiry of the set buffer time tp (time t4).

The battery has already been disconnected because the input voltage has returned at the time t3.

If the DIP switch is not set to "Interruption output V_{out}", there is no interruption in this example because the input voltage has already returned at time t3 prior to expiry of the set buffer time (time t4).

Buffer time (time t4) automatically interrupted for 5 s, and battery disconnected from the output at the same time which had not yet been disconnected because the input voltage was missing.

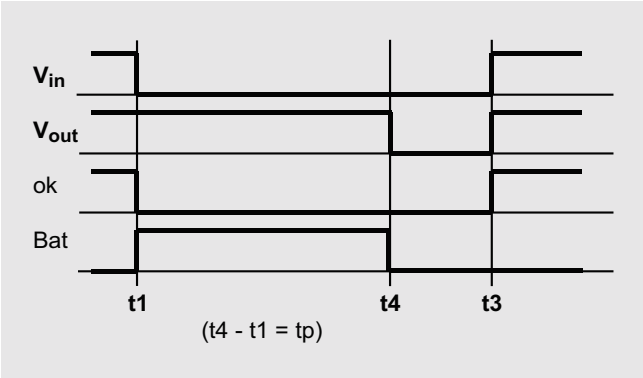


Fig. 9/1 "Long power failure"

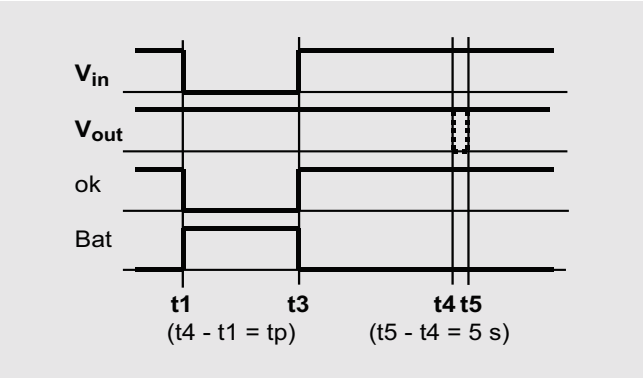


Fig. 9/2 "Short power failure"

DC UPS without serial or USB interface (6EP1931-2DC21/ -2EC21)

DIP switch settings on device: buffer time tp (from 5 to 635 s with bottom row No. 2 to 7)/ /t = following setting (with bottom row No. 1 to left)/ ⋮ = with setting interruption V_{out} (with bottom row No. 8 to left)

Legend:

V_{in}:	input voltage at terminals X1.1 – X1.2
V_{out}:	output voltage at terminals X1.3 – X1.4 and X1.5 - X1.6
ok:	Signal for input voltage V_{in} OK or above the set battery connection threshold
Bat:	Signal for battery mode (batteries connected to the output, batteries supply the load)
Remote:	Signal for remote timer start with signal level = 0 at pin 7 of the 9-pin serial interface (pin 7 is normally the positive power supply of the interface)
t1:	Input voltage V_{in} missing or falls below the set connection threshold
t2:	Buffer time set on the DIP switches is started by a remote timer start (signal level = 0)
t3:	Input voltage V_{in} is above the set connection threshold
t4:	End of set buffer time (output is switched off and/or battery disconnected)
t5:	Output is connected again 5 sec. after switch-off
tp:	Buffer time set on the DIP switches (bottom row No. 2 to 7)

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Function (continued)

"Long" power failure with DC UPS with serial or USB interface (Fig. 9/3)

Power recovery only following expiry of buffer time tp (t3 after t4):

If the input voltage at the DC UPS module fails (time t1), the battery "Bat" immediately takes over the DC supply, and the output voltage V_{out} is therefore retained completely without interruption.

The floating changeover contact "OK/Bat" switches to its deenergized position "Bat".

At the user-selectable time t2, the buffer time tp set on the DIP switches is started by means of the signal "Remote timer start" (signal level = 0 at pin 7 of the 9-pin serial interface).

The fact that the DIP switch is set to "Interruption output V_{out}" has no effect in this example because the input voltage returns at time t3 after the set buffer time (time t4) has expired.

Note: Without a remote signal level = 0 with the set duration t = max., there is no interruption in the output voltage here because the set buffer time is not started (or only interrupted if the exhaustive discharge protection disconnects the battery and the input voltage has not returned by then).

"Short" power failure with DC UPS with serial or USB interface (Fig. 9/4)

Power recovery prior to expiry of buffer time tp (t3 before t4):

If the input voltage at the DC UPS module fails (time t1), the battery "Bat" immediately takes over the DC supply, and the output voltage V_{out} is therefore retained completely without interruption.

The floating changeover contact "OK/Bat" switches to its deenergized position "Bat".

At the user-selectable time t2, the buffer time tp set on the DIP switches is started by means of the signal "Remote timer start" (signal level = 0 at pin 7 of the 9-pin serial interface following previous signal timing according to Instruction Manual).

With the selected DIP switch position "Interruption output V_{out}", the output voltage V_{out} is automatically interrupted for 5 seconds following expiry of the set buffer time tp (time t4).

The battery has already been disconnected because the input voltage has returned at the time t3.

The output voltage interruption of V_{out} for 5 s permits an automatic restart for many industrial PCs, even if the mains voltage (or the input voltage V_{in} on the DC UPS module) returns during shutting-down of the PC, as in this example.

Note: Without a remote signal level = 0 with setting t = max. duration, there is no interruption in the output voltage here because the set buffer time is not started.

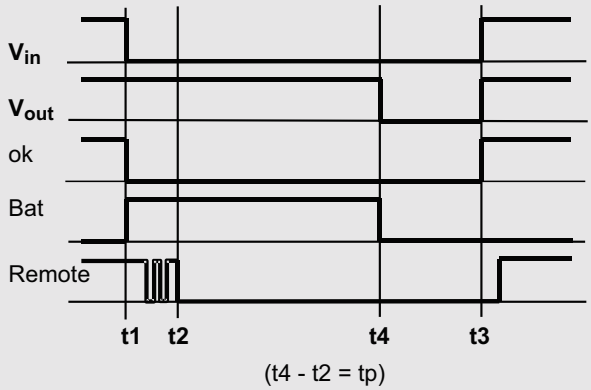


Fig. 9/3 "Long power failure"

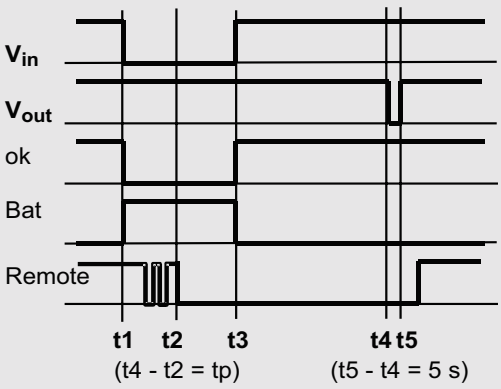


Fig. 9/4 "Short power failure"

DC UPS with serial or USB interface (6EP1931-2DC31/-2DC41/-2EC31/-2EC41)

DIP switch settings on device: buffer time tp (from 5 to 635 s with bottom row No. 2 to 7)/
/t = max. time (with bottom row No. 1 to right)/interruption V_{out} (with bottom row No. 8 to left)

Legend:

V_{in}:	input voltage at terminals X1.1 – X1.2
V_{out}:	output voltage at terminals X1.3 – X1.4 and X1.5 - X1.6
ok:	Signal for input voltage V_{in} OK or above the set battery connection threshold
Bat:	Signal for battery mode (batteries connected to the output, batteries supply the load)
Remote:	Signal for remote timer start with signal level = 0 at pin 7 of the 9-pin serial interface (pin 7 is normally the positive power supply of the interface)
t1:	Input voltage V_{in} missing or falls below the set connection threshold
t2:	Buffer time set on the DIP switches is started by a remote timer start (signal level = 0)
t3:	Input voltage V_{in} is above the set connection threshold
t4:	End of set buffer time (output is switched off and/or battery disconnected)
t5:	Output is connected again 5 sec. after switch-off
tp:	Buffer time set on the DIP switches (bottom row No. 2 to 7)

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Technical specifications

	DC UPS module 6
Order No.	**6EP1 931-2DC21** **6EP1 931-2DC31** (with serial interface) **6EP1 931-2DC41** (with USB interface)
Input L+/ M with normal mode	Stabilized direct voltage
Rated voltage $V_{in\ rated}$ [1]	**24 V DC**
Voltage range	22 to 29 V DC
Connection threshold for battery	22.5 V DC ± 0.1 V (default setting), **adjustable in range from 22 to 25.5 V DC** (in intervals of 0.5 V)
Rated current $I_{in\ rated}$	6 A + approx. 0.6 A with empty battery
Mains buffering	
Mains buffering or buffer time	dependent on connected battery and load current: • With 3.2 Ah battery module (6EP1935-6MD11) at +25 °C: approx. 10 min at 6 A; 20 min at 4 A; 45 min at 2 A • With 7 Ah battery module (6EP1935-6ME21) at +25 °C: approx. 30 min at 6 A; 45 min at 4 A; 150 min at 2 A
On/off control circuit	External floating NO contact required (load max. 15 V DC/max. 10 mA). With the control circuit open, the battery is disconnected from the output L+, and the mains buffering is therefore canceled.
Buffer time	**Adjustable** using DIP switches to maximum buffer time until forced switch-off by exhaustive discharge protection (at approx. 19 V) or to timed buffering **from 5 to 635 seconds** (in intervals of 10 s)
Output L+/ M with normal mode	
Rated voltage $V_{out\ rated}$	**24 V DC** (output voltage of SITOP power supply unit)
Voltage range	Input voltage V_{in} less approx. 0.5 V DC
Output current I_{out}	**0 to 6 A**
Dynamic current with overload	Electronic current limitation to 1.05 to 1.4 x $I_{out\ rated}$ for approx. 80 ms, then electronic switching-off of output with automatic attempts at restarting (approx. 20 s interval between the restart attempts)
Dynamic current with short-circuit	Electronic current limitation to 1.5 to 3 x $I_{out\ rated}$ for approx. 20 ms, then electronic switching-off of output with automatic attempts at restarting (approx. 20 s interval between the restart attempts)
Output L+/ M with battery mode	
Rated voltage $V_{out\ rated}$	**24 V DC** (from battery module)
Voltage range, approx.	27 to 19 V DC; 27 V at no load, 25 V at I_{out} = 0.05 x C x 1/h or 24 V at I_{out} = 1 x C x 1/h or 23 V at I_{out} = 2 x C x 1/h (C = total connected battery capacity in Ah), 19 V switch-off threshold for exhaustive discharge protection
Output current I_{out}	**0 to 6 A** (permanently reliable)
Dynamic current with overload	Electronic current limitation to 1.05 to 1.4 x $I_{out\ rated}$ for approx. 80 ms, then electronic switching-off of output with automatic attempts at restarting (approx. 20 s interval between the restart attempts)
Dynamic current with short-circuit	Electronic current limitation to 1.5 to 3 x $I_{out\ rated}$ for approx. 20 ms, then electronic switching-off of output with automatic attempts at restarting (approx. 20 s interval between the restart attempts)
Output +Bat / -Bat with normal mode	**I-V charging characteristic** (first constant current I, then constant voltage V)
End-of-charge voltage V	27.0 V DC ± 0.1 V (default setting), **adjustable in range from 26.3 to 29.3 V** (in intervals of 0.1 V)
Charging current I	Approx. 0.4 A (default setting), **adjustable to 0.2 A or 0.4 A** (charging is carried out with the on/off circuit closed or open)
Efficiency / power loss	
At $V_{out\ rated}$, $I_{out\ rated}$ approx.	95 %/7 W
With battery operation, approx.	94.5 %/8 W
Protection and monitoring	
Polarity reversal protection	Against input voltage and batteries with reversed polarity
Overload protection	Electronic current limitation to 1.05 to 1.4 x $I_{out\ rated}$ for approx. 80 ms, then electronic switching-off of output with automatic attempts at restarting (approx. 20 s interval between the restart attempts)
Short-circuit protection	Electronic current limitation to 1.5 to 3 x $I_{out\ rated}$ for approx. 20 ms, then electronic switching-off of output with automatic attempts at restarting (approx. 20 s interval between the restart attempts). Internal, non-accessible 16 A fuse
Exhaustive discharge protection	Automatic switch-off at battery voltage below approx. 19 V
Monitoring "Wire breakage, battery circuit"	Alarm signal if battery circuit is not closed or if it opens during operation (cyclic test approx. every 20 s)
Monitoring "Battery replacement necessary"	Alarm signal flashing at approx. 0.25 Hz (approx. 2 s alarm, approx. 2 s no alarm, approx. 2 s alarm etc.). Check every 4 hours if no buffer mode or switch-off has taken place within 4 hours
Monitoring "Battery charge > 85 %"	Indication whether batteries are charged to at least 85 % of the rated capacity

1) All SITOP 24 V DC power supply units are permissible without limitation.

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DC UPS module 6 A

Technical specifications (continued)

	DC UPS module 6
Order No.	**6EP1 931-2DC21** **6EP1 931-2DC31** (with serial interface) **6EP1 931-2DC41** (with USB interface)
Signalling [1]	
Normal mode	Green LED (OK) and floating changeover contact "24 V DC OK/Bat" to position "24 V DC OK" [2]
Buffer or battery mode (battery supplies load on its own, or in addition to PS in event of overload)	Yellow LED (Bat) and floating changeover contact "24 V DC OK/Bat" to position "Bat" (= de-energized position)
Alarm (buffer readiness missing or pre-warning at < 20.4 V battery voltage)	Red LED (Alarm) and floating changeover contact to position "Alarm" (= de-energized position). Causes for absence of buffer readiness during normal mode could be: Operating status Off or open on/off control circuit, battery module not connected, battery faulty or with reversed polarity (battery voltage < 18.5 V) or wire breakage between battery and UPS module. Scanning and thus updating of the signal every 20 s. Causes for absence of buffer readiness during buffer mode could be: Battery voltage has fallen below 20.4 V DC (= prewarning prior to switching-off by exhaustive discharge protection) as well as switching-off of battery because of overload, short-circuit, exhaustive discharge protection or expired buffer time. The Red LED then goes off.
"Battery replacement necessary"	Red LED (Alarm) flashes at 0.25 Hz and floating changeover contact (Alarm) switches at approx. 0.25 Hz
"Battery charge > 85 %"	Green LED (Bat > 85 %) and floating NO contact closed (de-energized position = open)
Optional interface and software	
Serial interface	Only with **6EP1 931-2DC31** Output of all signals, and receipt of signal "Remote timer start". Techn. design: PC-compatible. 8N1 send and receive, 9600 baud, 8 data bits, 1 stop bit, no parity bit. Required connection to PC: 1 : 1 continuous 9-pole SUB D extension cable (male/female), only pin 2 (RXD), pin 3 (TDX) and pin 7 (RTS) are required.
USB interface	Only with **6EP1 931-2DC41** Output of all signals, and receipt of signal "Remote timer start". Techn. design: Specification 2.0 with full speed, i.e. 2 Mbit/s. Powered by DC UPS with +5 V ("self powered"). Required connection to PC: Commercially available 4-core shielded cable, 90 Ohm, max. 5 m, USB series "A" connector to PC and USB series "B" connector to DC UPS
Software	A software tool (executes under WinNT4.0, Win 2000 and WinXP) for reading and processing the signals is available on the Internet at http://www.siemens.de/sitop as a download. Further information on the interface can also be found there.
Control signals	
On/off control signal	By opening the control circuit (or using DIP switch on device), the buffer mode is terminated, or the battery is disconnected from the output. All other functions are retained.
"Remote timer start" via serial interface or USB	Starts the mains buffering for the set buffer time
Safety	
Galvanic isolation primary/secondary	No
Protective class	Class III (ext. circuit and power supply unit: SELV voltage acc. to EN 60950 is required)
EMC	
Interference emission	RI suppression acc. to EN 55022, limit characteristic B
Interference immunity	Interference immunity acc. to EN 61000-6-2
Ambient conditions	
Ambient temperature during operation	0 to +60 °C with natural convection
Transportation and storage temperature	-40 to +70 °C
Degree of protection (EN 60529)	IP20
Humidity rating	Conditions of use acc. to EN 60721, climatic class 3K3 (relative humidity 5 % to 85 % and absolute humidity 1 g/m³ to 25 g/m³; no condensation)
Approvals	
CE	CE conformity acc. to 98/336 EEC and 73/23 EEC
UL / cUL	UL 508 / CSA C22.2, File E197259
Mechanical specifications	
Connections for 24 V DC input	2 screw-type terminals for 1 to 4 mm²/17 to 11 AWG
Connections for 24 V DC output	4 screw-type terminals for 1 to 4 mm²/17 to 11 AWG
Connections for 24 V DC battery module	2 screw-type terminals for 1 to 4 mm²/17 to 11 AWG
Connections for control circuit and signals	10 screw-type terminals for 0.5 to 2.5 mm²/20 to 13 AWG
Dimensions (W x H x D) in mm	50 x 125 x approx. 125
Required clearance	50 mm above and 50 mm below the device
Weight	Approx. 0.4 kg (with serial or USB interface: approx. 0.45 kg)
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5

1) Permissible contact rating: 60 V DC/1 A or 30 V AC/1 A.

2) "24 V DC OK" means: Voltage of power supply unit is greater than the battery connection threshold set on the DC UPS module 6.

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Technical specifications

	DC UPS module 15
Order No.	**6EP1 931-2EC21** **6EP1 931-2EC31** (with serial interface) **6EP1 931-2EC41** (with USB interface)
Input L+/ M with normal mode	Stabilized direct voltage
Rated voltage $V_{in\ rated}$ [1]	**24 V DC**
Voltage range	22 to 29 V DC
Connection threshold for battery	22.5 V DC ± 0.1 V (default setting), **adjustable in range from 22 to 25.5 V DC** (in intervals of 0.5 V)
Rated current $I_{in\ rated}$	15 A + approx. 1 A with empty battery
Mains buffering	
Mains buffering or buffer time	Dependent on connected battery and load current: • With 3.2 Ah battery module (6EP1935-6MD11) at +25 °C: approx. 45 s at 15 A; 1.5 min at 10 A; 13 min at 5 A • With 7 Ah battery module (6EP1935-6ME21) at +25 °C: approx. 7 min at 15 A; 15 min at 10 A; 38 min at 5 A
On/off control circuit	External floating NO contact required (load max. 15 V DC/max. 10 mA). With the control circuit open, the battery is disconnected from the output L+, and the mains buffering is therefore canceled.
Buffer time	**Adjustable** using DIP switches to maximum buffer time until forced switch-off by exhaustive discharge protection (at approx. 19 V) or to timed buffering **from 5 to 635 seconds** (in intervals of 10 s)
Output L+/ M with normal mode	
Rated voltage $V_{out\ rated}$	**24 V DC** (output voltage of SITOP power supply unit)
Voltage range	Input voltage V_{in} less approx. 0.5 V DC
Output current I_{out}	**0 to 15 A**
Dynamic current with overload	Electronic current limitation to 1.05 to 1.4 x $I_{out\ rated}$ for approx. 80 ms, then electronic switching-off of output with automatic attempts at restarting (approx. 20 s interval between the restart attempts)
Dynamic current with short-circuit	Electronic current limitation to 1.5 to 3 x $I_{out\ rated}$ for approx. 20 ms, then electronic switching-off of output with automatic attempts at restarting (approx. 20 s interval between the restart attempts)
Output L+/ M with battery mode	
Rated voltage $V_{out\ rated}$	**24 V DC** (from battery module)
Voltage range, approx.	27 to 19 V DC; 27 V at no load, 25 V at I_{out} = 0.05 x C x 1/h or 24 V at I_{out} = 1 x C x 1/h or 23 V at I_{out} = 2 x C x 1/h (C = total connected battery capacity in Ah), 19 V switch-off threshold for exhaustive discharge protection
Output current I_{out}	**0 to 15 A** (permanently reliable)
Dynamic current with overload	Electronic current limitation to 1.05 to 1.4 x $I_{out\ rated}$ for approx. 80 ms, then electronic switching-off of output with automatic attempt at restarting (approx. 20 s interval between the restart attempts)
Dynamic current with short-circuit	Electronic current limitation to 1.5 to 3 x $I_{out\ rated}$ for approx. 20 ms, then electronic switching-off of output with automatic attempt at restarting (approx. 20 s interval between the restart attempts)
Output +Bat / -Bat with normal mode	**I-V charging characteristic** (first constant current I, then constant voltage V)
End-of-charge voltage V	27.0 V DC ± 0.1 V (default setting), **adjustable in range from 26.3 to 29.3 V** (in intervals of 0.1 V)
Charging current I	Approx. 0.7 A (default setting), **adjustable to 0.35 A or 0.7 A** (charging is carried out with the on/off circuit closed or open)
Efficiency / power loss	
At $V_{out\ rated}$, $I_{out\ rated}$ approx.	96.2 %/14 W
With battery operation, approx.	96 %/15 W
Protection and monitoring	
Polarity reversal protection	Against input voltage and batteries with reversed polarity
Overload protection	Electronic current limitation to 1.05 to 1.4 x $I_{out\ rated}$ for approx. 80 ms, then electronic switching-off of output with automatic attempts at restarting (approx. 20 s interval between the restart attempts)
Short-circuit protection	Electronic current limitation to 1.5 to 3 x $I_{out\ rated}$ for approx. 20 ms, then electronic switching-off of output with automatic attempts at restarting (approx. 20 s interval between the restart attempts). Internal, non-accessible 16 A fuse
Exhaustive discharge protection	Automatic switch-off at battery voltage below approx. 19 V
Monitoring "Wire breakage, battery circuit"	Alarm signal if battery circuit is not closed or if it opens during operation (cyclic test approx. every 20 s)
Monitoring "Battery replacement necessary"	Alarm signal flashing at approx. 0.25 Hz (approx. 2 s alarm, approx. 2 s no alarm, approx. 2 s alarm etc.). Check every 4 hours if no buffer mode or switch-off has taken place within 4 hours
Monitoring "Battery charge > 85 %"	Signal whether batteries are charged to at least 85 % of the rated capacity

1) All SITOP 24 V DC power supply units are permissible without limitation.

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DC UPS module 15 A

Technical specifications (continued)

	DC UPS module 15
Order No.	**6EP1 931-2EC21** **6EP1 931-2EC31** (with serial interface) **6EP1 931-2EC41** (with USB interface)
Signalling [1]	
Normal mode	Green LED (OK) and floating changeover contact "24 V DC OK/Bat" to position "24 V DC OK" [2]
Buffer or battery mode (battery supplies load on its own, or in addition to PS in event of overload)	Yellow LED (Bat) and floating changeover contact "24 V DC OK/Bat" to position "Bat" (= de-energized position)
Alarm (buffer readiness missing or pre-warning at < 20.4 V battery voltage)	Red LED (Alarm) and floating changeover contact to position "Alarm" (= de-energized position). Causes for absence of buffer readiness during normal mode could be: Operating status Off or open on/off control circuit, battery module not connected, battery faulty or with reversed polarity (battery voltage < 18.5 V) or wire breakage between battery and UPS module. Scanning and thus updating of the signal every 20 s. Causes for absence of buffer readiness during buffer mode could be: Battery voltage fallen below 20.4 V DC (= prewarning prior to switching-off by exhaustive discharge protection) as well as switching-off of battery because of overload, short-circuit, exhaustive discharge protection or expired buffer time. The Red LED then goes off.
"Battery replacement necessary"	Red LED (Alarm) flashes at 0.25 Hz and floating changeover contact (Alarm) switches at approx. 0.25 Hz
"Battery charge > 85 %"	Green LED (Bat > 85 %) and floating NO contact closed (de-energized position = open)
Optional interface and software	
Serial interface	Only with **6EP1 931-2EC31** Output of all signals, and receipt of signal "Remote timer start". Techn. design: PC-compatible. 8N1 send and receive, 9600 baud, 8 data bits, 1 stop bit, no parity bit. Required connection to PC: 1 : 1 continuous 9-pole SUB D extension cable (male/female), only pin 2 (RXD), pin 3 (TDX) and pin 7 (RTS) are required.
USB interface	Only with **6EP1 931-2EC41** Output of all signals, and receipt of signal "Remote timer start". Techn. design: Specification 2.0 with full speed, i.e. 2 Mbit/s. Powered by DC UPS with +5 V ("self powered"). Required connection to PC: Commercially available 4-core shielded cable, 90 Ohm, max. 5 m, USB series "A" connector to PC and USB series "B" connector to DC UPS
Software	A software tool (executes under WinNT4.0, Win 2000 and WinXP) for reading and processing the signals is available on the Internet at http://www.siemens.de/sitop as a download. Further information on the interface can also be found there.
Control signals	
On/off control signal	By opening the control circuit (or using DIP switch on the device), buffer mode is terminated, or the battery is disconnected from the output. All other functions are retained.
"Remote timer start" via serial interface or USB	Starts the mains buffering for the set buffer time
Safety	
Galvanic isolation primary/secondary	No
Protective class	Class III (ext. circuit and power supply unit: SELV voltage acc. to EN 60950 is required)
EMC	
Interference emission	RI suppression acc. to EN 55022, limit characteristic B
Interference immunity	Interference immunity acc. to EN 61000-6-2
Ambient conditions	
Ambient temperature during operation	0 to +60 °C with natural convection
Transportation and storage temperature	-40 to +70 °C
Degree of protection (EN 60529)	IP20
Humidity rating	Conditions of use acc. to EN 60721, climatic class 3K3 (relative humidity 5 % to 85 % and absolute humidity 1 g/m³ to 25 g/m³; no condensation)
Approvals	
CE	CE conformity acc. to 98/336 EEC and 73/23 EEC
UL / cUL	UL 508 / CSA C22.2, File E197259
Mechanical specifications	
Connections for 24 V DC input	2 screw-type terminals for 1 to 4 mm²/17 to 11 AWG
Connections for 24 V DC output	4 screw-type terminals for 1 to 4 mm²/17 to 11 AWG
Connections for 24 V DC battery module	2 screw-type terminals for 1 to 4 mm²/17 to 11 AWG
Connections for control circuit and signals	10 screw-type terminals for 0.5 to 2.5 mm²/20 to 13 AWG
Dimensions (W x H x D) in mm	50 x 125 x approx. 125
Required clearance	50 mm above and 50 mm below the device
Weight	Approx. 0.4 kg (with serial or USB interface: approx. 0.45 kg)
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5

1) Permissible contact rating: 60 V DC/1 A or 30 V AC/1 A.

2) "24 V DC OK" means: Voltage of power supply unit is greater than the battery connection threshold set on the DC UPS module 15.

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DC UPS module 40 A

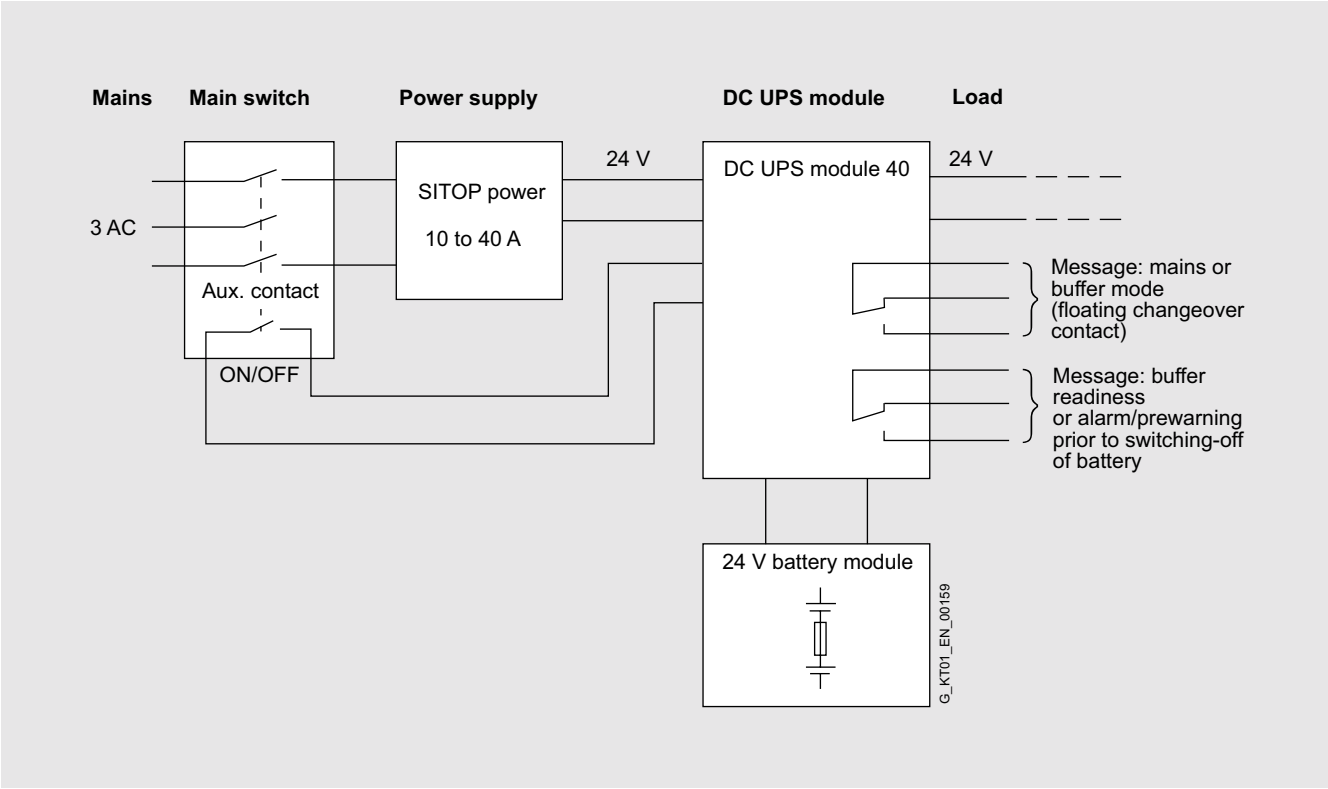
Overview

- Mounting depth only approx. 65 mm
- Rated output power 480 W with one battery module, 960 W with two battery modules
- Extremely high efficiency of approx. 99% as result of patented circuit concept
- Immediate electronic connection of battery as soon as the consumer voltage or the voltage present between the L+/M terminals of the DC UPS module falls below a value of 22.5 V DC. The consumer voltage only drops to 22 V DC for a maximum of 1 ms.
- High electronically limited peak currents (120 A for approx. 12 ms, up to 40 A for several minutes depending on the battery capacity) are automatically delivered in the event of increased load current requirements (e.g. when switching on incandescent lamps, contactors with DC autotransformer winding, DC motors, DC/DC converters, electronic modules with high input capacitance). To achieve this, at least two battery modules of 7 Ah or more must be connected in parallel.
- Following a power failure, the battery module is automatically disconnected from the consumers electronically and rapidly recharged with a constant current of 2 A (V/I characteristic with 27.3 V end-of-charge voltage).



- Signalling
  - Green LED/yellow LED and floating changeover contact for mains/battery mode
  - Red LED and floating changeover contact for buffer readiness (LED off)/ alarm (LED on)

Integration

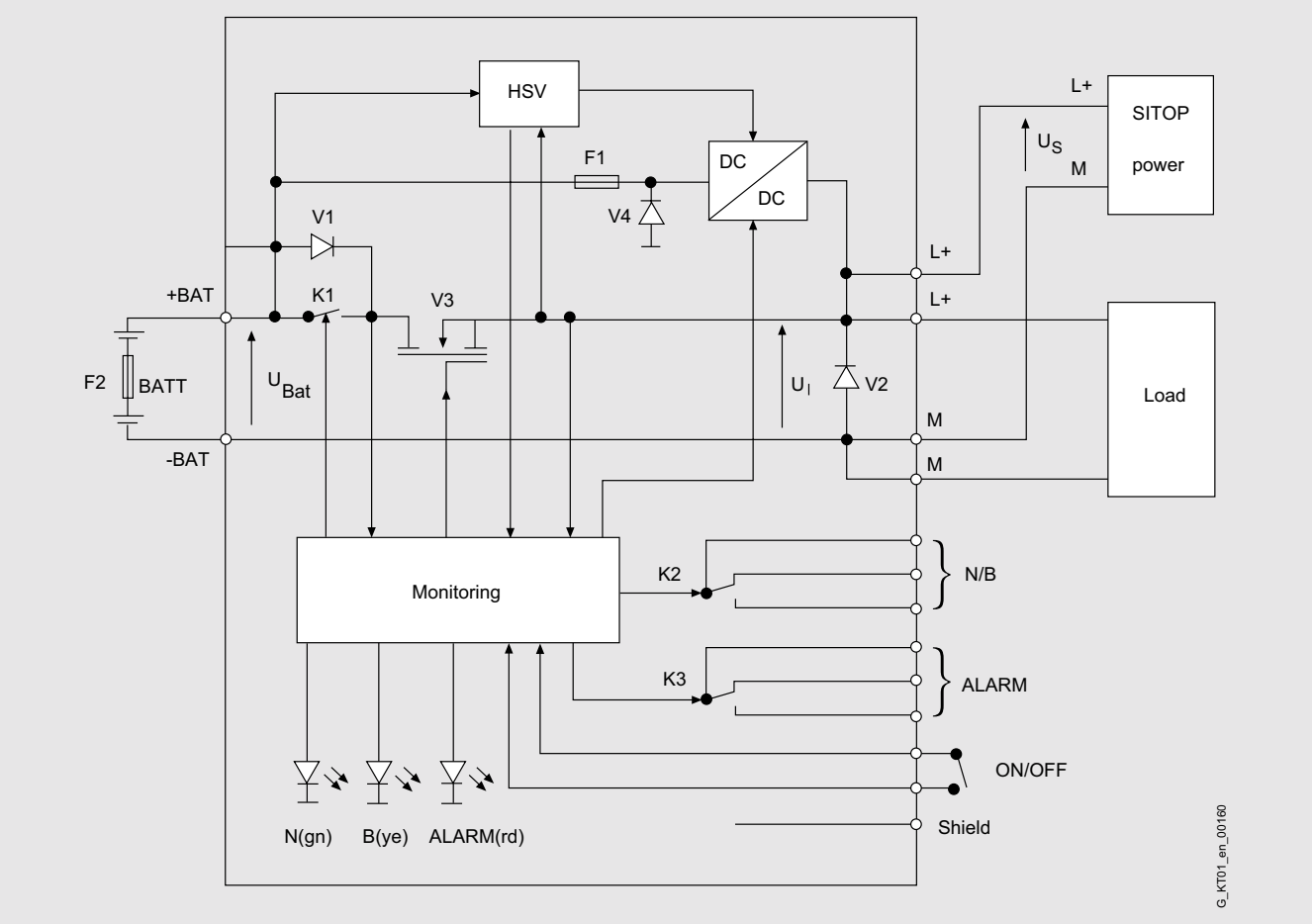


Block diagram: Configuration of uninterruptible SITOP power supply 40 A

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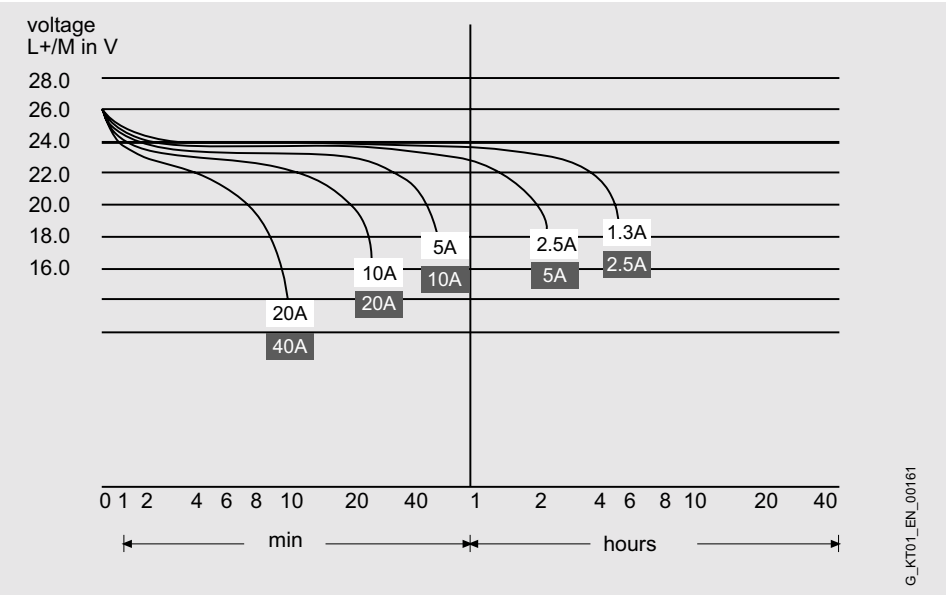
DC UPS module 40 A

Integration (continued)



Block diagram

Characteristic curves



Voltage characteristic between the terminals L+/M of the DC UPS module with connection of

1 battery module 24 V/7 Ah depending on duration and load current.

Parameters: Load current 20 A/ 10 A/5 A/2.5 A/1.3 A;

2 battery modules 24 V/7 Ah

Parameters: Load current 40 A/ 20 A/10 A/5 A/2.5 A

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Technical specifications

	DC UPS module 40 6EP1 931-2FC01
Order No.	
Input L+/ M with normal mode	Stabilized direct voltage
Rated voltage $V_{in\ rated}$ [1]	**24 V DC**
Voltage range	23.5 to 26 V DC
Overvoltage strength	VDE 0160 A1 (April 1989), limit curve B2 (2 x V_{rated}, 0.4 ms)
Connection threshold for battery	Approx. 22.5 V
Mains buffering at $I_{out\ rated}$	Dependent on connected battery, see discharge characteristic of battery module
Rated current $I_{in\ rated}$	40 A
On/off control circuit	External floating NO contact required (load max. 12 V DC/max. 5 mA). With the control circuit open, the battery is disconnected from the output L+, and the mains buffering is therefore canceled.
Output L+/ M with normal mode	
Rated voltage $V_{out\ rated}$	**24 V DC** (output voltage of SITOP power supply unit)
Voltage range	Input voltage less approx. 0.1 V
Output current I_{out} with discharged/ charged battery	**0 to 37 A** (max. 3 A required for battery charging)/**0 to 40 A**
Output L+/ M with battery mode	
Rated voltage $V_{out\ rated}$	**24 V DC** (from battery module)
Voltage range, approx.	27 to 18.5 V DC; 27 V at no load, 25 V at I_{out} = 0.05 x C x 1/h or 24 V at I_{out} = 1 x C x 1/h or 23 V at I_{out} = 2 x C x 1/h (C = total connected battery capacity in Ah), 18.5 V switch-off threshold for exhaustive discharge protection
Output current I_{out} with a battery module of 7 Ah or more	0 to 25 A
Output current I_{out} with two battery modules of 7 Ah or more	0 to 40 A
Dyn. V/I with short-circuit	Typ. 120 A for approx. 12 ms (with two battery modules of 7 Ah or more)
Output +Bat/-Bat with normal mode	**I-V charging characteristic** (first constant current I, then constant voltage V)
End-of-charge voltage	27.3 V ± 0.3 V
Charging current	**0 to 2.5 A** (typ. 2 A); charging is carried out with the on/off circuit closed or open
Efficiency/power loss	
at $V_{out\ rated}$, $I_{out\ rated}$ and fully charged battery	Approx. 99 %/approx. 7 W
With battery operation	Approx. 97 %/approx. 30 W
Protection and monitoring	
Exhaustive discharge protection	Automatic switch-off at battery voltage < 18.5 V
Short-circuit protection	Temperature monitoring of circuit-breaker, electronic switch-off with automatic restart
Monitoring "Wire breakage, battery circuit"	Alarm signal flashing at approx. 1/3 Hz if battery circuit is not closed or if it opens during operation (cyclic test every 20 s)
Signalling	
On/off (battery switch-off)	External NO contact (load 12 V DC/5 mA)
Normal mode	Green LED + N/B signal (floating changeover contact N/B in position N) [2]
Buffer or battery mode (battery supplies load on its own, or in addition to PS in event of overload)	Yellow LED + N/B signal (floating changeover contact N/B in position N) [2]
Alarm (buffer readiness missing or pre-warning at < 20.4 V battery voltage)	Red LED + alarm signal (floating changeover contact for alarm) [2]
Safety	
Galvanic isolation primary/secondary	No
Protective class	Class III (ext. circuit and power supply unit: SELV voltage acc. to EN 60950 is required)
TÜV test/CE marking	Yes/yes
UL/cUL (CSA) approval [3]	Yes, UL/cUL recognized (UL 1950), File E172952
Degree of protection (EN 60529)	IP20
EMC	
Interference emission	EN 55022 Class B
Interference immunity	EN 61000-6-2
Ambient conditions	
Ambient temperature range in operation	0 to +60 °C with natural convection
Transportation and storage temperature range	-25 to +85 °C
Humidity rating	H acc. to DIN 40040: relative humidity up to 75 % as mean value, 95 % on 30 days/year, no condensation
Mechanical specifications	
Input connections [4] L+, M	2 screw-type terminals for 0.5 to 10 mm^2 single-core/finely stranded
Output connections [4] L+, M	2 screw-type terminals for 0.5 to 10 mm^2 single-core/finely stranded
Battery connections +/-	2 screw-type terminals for 0.5 to 10 mm^2 single-core/finely stranded
Signals On/Off, N/B, alarm, shield connections	9 screw-type terminals for 0.5 to 2,5 mm^2 single-core/finely stranded
Dimensions (W x H x D) in mm, approx.	220 x 130 x 65
Approx. weight	1.2 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x7.5 or on SITOP power 90° mounting bracket

1) Reliable power supplies are the single-phase SITOP power 10 A and 20 A and the three-phase SITOP power 10 A to 40 A if their output voltage is set between 25 V and 25.5 V DC. The single-phase SITOP power supply units 2 A to 10 A with Order Nos. 6EP13..-1... are not reliable.

2) Permissible contact rating: 60 V DC/1 A or 30 V AC/1 A.

3) Approval only in combination with battery module 7 Ah (6EP1935-6ME01).

4) Both L+ and M connections are electrically connected within the device, and a differentiation of the input/output connections on the device is therefore unnecessary.

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Battery module 1.2 Ah

Overview



- Battery module for DC UPS module 6 A
- Contains two maintenance-free, sealed lead-acid batteries from the same batch fitted in a holder and connected in series
- Completely prewired with battery fuse holder and terminals
- Low self-discharge rate of approx. 3 % per month (at +20 °C)

Technical specifications

	Battery module 1.2 Ah
Order No.	**6EP1 935-6MC01**
Battery type, charging current/ charging voltage	**Maintenance-free lead-acid batteries** [1]
Recommended end-of-charge voltage (standby use)	
• For +25 °C battery temperature	27.0 V DC
• For other battery temperatures	27.8 V for +10 °C; 27.3 V for +20 °C; 26.8 V for +30 °C; 26.7 V for +35 °C; 26.6 V for +40 °C
Recommended charging current	Max. 0.3 A
Protection	
Short-circuit protection	Battery fuse 15 A/32 V (FK2 flat fuse + holder)
Battery protection	Valve control
Safety	
Protective class	Class III
UL/cUL (CSA) approval	UL/cUL recognized (UL1778, CSA 22.2 No. 107.1-95), File E219627
Degree of protection (EN 60529)	IP00
Operating specifications	
Ambient temperature range	+5 to +40 °C
Transportation and storage temperature range	-20 to +50 °C
Self-discharge rate	Approx. 3 % per month at a battery temperature of 20 °C (increased value at higher temperature)
Service life	
The service life of the chemical lead-acid batteries (reduction to 50 % of original capacity) depends on the battery temperature as follows:	
At +20 °C	Approx. 4 years
At +25 °C	Approx. 3.5 years
At +30 °C	Approx. 3 years
At +35 °C	Approx. 2.5 years
At +40 °C	Approx. 2 years
At +45 °C	Approx. 1.5 years
At +50 °C	Approx. 1 year
Mechanical specifications	
Connection	1 terminal each for 0.08 to 2.5 mm^2 for + BAT and - BAT
Supplied accessories	Accessory pack with FK2 fuse 15 A
Dimensions (W x H x D) in mm	Approx. 96 x 106 x 108
Weight	Approx. 2 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5 or keyhole mounting for hanging in M4 screws

1) For storage, installation and operation of the lead-acid batteries, the appropriate DIN/VDE regulations or the country-specific directives (e.g. VDE 0510 Part 2/EN 50272-2) must be observed. The battery location must be sufficiently ventilated, potential ignition sources must be at least 50 cm away.

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Battery module 2.5 Ah

Overview



- High-temperature battery for DC UPS module 6 A and 15 A
- Contains two maintenance-free, sealed chemical lead-acid batteries from the same batch fitted in a holder and connected in series
- Completely prewired with battery fuse holder and terminals
- Low self-discharge rate of approx. 3 % per month (at +20 °C)

Technical specifications

	Battery module 2.5 Ah
Order No.	**6EP1 935-6MD31**
Battery type, charging current/ charging voltage	**Maintenance-free chemical lead-acid batteries** [1]
Recommended end-of-charge voltage (standby use)	
• For +25 °C battery temperature	27.7 V DC
• For other battery temperatures	29.0 V for -10 °C; 28.6 V for 0 °C; 28.3 V for +10 °C; 27.9 V for +20 °C; 27.5 V for +30 °C; 27.2 V for +40 °C; 26.8 V for +50 °C; 26.4 V for +60 °C
Recommended charging current	Max. 5 A
Protection	
Short-circuit protection	Battery fuse 15 A/32 V (FK2 flat fuse + holder)
Battery protection	Valve control
Safety	
Protective class	Class III
UL/cUL (CSA) approval	UL/cUL recognized (UL1778, CSA 22.2 No. 107.1-95), File E219627
Degree of protection (EN 60529)	IP00
Operating specifications	
Ambient temperature range	-40 to +60 °C with natural convection
Transportation and storage temperature range	-40 to +60 °C
Self-discharge rate	Approx. 3 % per month at a battery temperature of 20 °C (increased value at higher temperature)
Service life	
The service life of the chemical lead-acid batteries (reduction to 80 % of original capacity) depends on the battery temperature as follows:	
At +15 °C	Approx. 19 years
At +20 °C	Approx. 13 years
At +25 °C	Approx. 9 years
At +30 °C	Approx. 7 years
At +35 °C	Approx. 5 years
At +40 °C	Approx. 3 years
At +45 °C	Approx. 2 years
At +50 °C	Approx. 1.5 years
At +60 °C	Approx. 1 year
Mechanical specifications	
Connection	1 terminal each for 0.08 to 2.5 mm^2 for + BAT and - BAT
Supplied accessories	Accessory pack with FK2 fuse 15 A
Dimensions (W x H x D) in mm	Approx. 265 x 151 x 91
Weight	Approx. 3.8 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5 or keyhole mounting for hanging in M4 screws

1) For storage, installation and operation of the lead-acid batteries, the appropriate DIN/VDE regulations or the country-specific directives (e.g. VDE 0510 Part 2/EN 50272-2) must be observed. The battery location must be sufficiently ventilated, potential ignition sources must be at least 50 cm away.

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Battery module 3.2 Ah

Overview



- Battery module for DC UPS module 6 A and 15 A
- Contains two maintenance-free, sealed lead-acid batteries from the same batch fitted in a holder and connected in series
- Includes battery fuse holder and terminals
- Low self-discharge rate of approx. 3 % per month (at +20 °C)

Technical specifications

	Battery module 3.2 Ah
Order No.	**6EP1 935-6MD11**
Battery type, charging current/ charging voltage	**Maintenance-free, sealed lead-acid batteries** [1]
Recommended end-of-charge voltage (standby use)	
• For +25 °C battery temperature	27.0 V DC
• For other battery temperatures	27.8 V for +10 °C; 27.3 V for +20 °C; 26.8 V for +30 °C; 26.7 V for +35 °C; 26.6 V for +40 °C
Recommended charging current	Max. 0.8 A
Protection	
Short-circuit protection	Battery fuse 15 A/32 V (FK2 flat fuse + holder)
Battery protection	Valve control
Safety	
Protective class	Class III
UL/cUL (CSA) approval	UL/cUL recognized (UL1778, CSA 22.2 No. 107.1-95), File E219627
Degree of protection (EN 60529)	IP00
Operating specifications	
Ambient temperature range	+5 to +40 °C with natural convection
Transportation and storage temperature range	-20 to +50 °C
Self-discharge rate	Approx. 3 % per month at a battery temperature of 20 °C (increased value at higher temperature)
Service life	
The service life of the chemical lead-acid batteries (reduction to 50 % of original capacity) depends on the battery temperature as follows:	
At +20 °C	Approx. 4 years
At +25 °C	Approx. 3.5 years
At +30 °C	Approx. 3 years
At +35 °C	Approx. 2.5 years
At +40 °C	Approx. 2 years
At +45 °C	Approx. 1.5 years
At +50 °C	Approx. 1 year
Mechanical specifications	
Connection	1 terminal each for 0.08 to 2.5 mm^2 for + BAT and - BAT
Supplied accessories	Accessory pack with FK2 fuse 15 A
Dimensions (W x H x D) in mm	Approx. 190 x 151 x approx. 82
Weight	Approx. 3.2 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5 or keyhole mounting for hanging in M4 screws

1) For storage, installation and operation of the lead-acid batteries, the appropriate DIN/VDE regulations or the country-specific directives (e.g. VDE 0510 Part 2/EN 50272-2) must be observed. The battery location must be sufficiently ventilated, potential ignition sources must be at least 50 cm away.

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Battery module 7 Ah

Overview



- Battery for DC UPS module 6 A and 15 A and DC UPS module 40 A
- Contains two maintenance-free, sealed lead-acid batteries from the same batch fitted in a holder and connected in series
- Completely prewired with battery fuse holder and terminals
- Accessory pack with FK2 spare fuses 15 A and 20 A
- Low self-discharge rate of approx. 3 % per month (at +20 °C)

Technical specifications

	Battery module 7 Ah
Order No.	**6EP1 935-6ME21**
Battery type, charging current/ charging voltage	**Maintenance-free, sealed lead-acid batteries** [1]
Recommended end-of-charge voltage (standby use)	
• For +25 °C battery temperature	27.0 V DC
• For other battery temperatures	27.8 V for +10 °C; 27.3 V for +20 °C; 26.8 V for +30 °C; 26.7 V for +35 °C; 26.6 V for +40 °C
Recommended charging current	Max. 1.75 A
Protection	
Short-circuit protection	Battery fuse 15 A/32 V (FK2 flat fuse + holder)
Battery protection	Valve control
Safety	
Protective class	Class III
UL/cUL (CSA) approval	UL/cUL recognized (UL1778, CSA 22.2 No. 107.1-95), File E219627
Degree of protection (EN 60529)	IP00
Operating specifications	
Ambient temperature	+5 to +40 °C
Transportation and storage temperature range	-20 to +50 °C
Self-discharge rate	Approx. 3 % per month at a battery temperature of 20 °C
Service life	
The service life of the chemical lead-acid batteries (reduction to 50 % of original capacity) depends on the battery temperature as follows:	
At +20 °C	Approx. 4 years
At +25 °C	Approx. 3.5 years
At +30 °C	Approx. 3 years
At +35 °C	Approx. 2.5 years
At +40 °C	Approx. 2 years
At +45 °C	Approx. 1.5 years
At +50 °C	Approx. 1 year
Mechanical specifications	
Connection	1 terminal each for 0.08 to 4 mm^2 for + BAT - BAT
Supplied accessories	Accessory pack with FK2 spare fuses 15 A and 20 A
Dimensions (W x H x D) in mm	Approx. 186 x 168 x 121
Weight	Approx. 6.0 kg
Mounting	Can be screwed on level surface (Keyhole mounting for hanging in M4 screws)

1) For storage, installation and operation of the lead-acid batteries, the appropriate DIN/VDE regulations or the country-specific directives (e.g. VDE 0510 Part 2/EN 50272-2) must be observed.The battery location must be sufficiently ventilated, potential ignition sources must be at least 50 cm away.

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Battery module 12 Ah

Overview



- Battery for DC UPS module 6 A and 15 A and DC UPS module 40 A
- Contains two maintenance-free, sealed lead-acid batteries from the same batch fitted in a holder and connected in series
- Completely prewired with battery fuse holder and terminals
- Accessory pack with FK2 spare fuses 15 A and 20 A
- Low self-discharge rate of approx. 3 % per month (at +20 °C)

Technical specifications

	Battery module 12 Ah
Order No.	**6EP1 935-6MF01**
Battery type, charging current/ charging voltage	**Maintenance-free, sealed lead-acid batteries** [1]
Recommended end-of-charge voltage (standby use)	
• For +25 °C battery temperature	27.0 V DC
• For other battery temperatures	27.8 V for +10 °C; 27.3 V for +20 °C; 26.8 V for +30 °C; 26.7 V for +35 °C; 26.6 V for +40 °C
Recommended charging current	Max. 3 A
Protection	
Short-circuit protection	Battery fuse 15 A/32 V (FK2 flat fuse + holder)
Battery protection	Valve control
Safety	
Protective class	Class III
UL/cUL (CSA) approval	UL/cUL recognized (UL1778, CSA 22.2 No. 107.1-95), File E219627
Degree of protection (EN 60529)	IP00
Operating specifications	
Ambient temperature	+5 to +40 °C
Transportation and storage temperature range	-20 to +50 °C
Self-discharge rate	Approx. 3 % per month at a battery temperature of 20 °C
Service life	
The service life of the chemical lead-acid batteries (reduction to 50 % of original capacity) depends on the battery temperature as follows:	
At +20 °C	Approx. 4 years
At +25 °C	Approx. 3.5 years
At +30 °C	Approx. 3 years
At +35 °C	Approx. 2.5 years
At +40 °C	Approx. 2 years
At +45 °C	Approx. 1.5 years
At +50 °C	Approx. 1 year
Mechanical specifications	
Connection	1 terminal each for 0.08 to 4 mm^2 for + BAT - BAT
Supplied accessories	Accessory pack with FK2 spare fuses 15 A and 20 A
Dimensions (W x H x D) in mm	Approx. 253 x 118 x 121
Weight	Approx. 9.0 kg
Mounting	Can be screwed on level surface (Keyhole mounting for hanging in M4 screws)

1) For storage, installation and operation of the lead-acid batteries, the appropriate DIN/VDE regulations or the country-specific directives (e.g. VDE 0510 Part 2/EN 50272-2) must be observed. The battery location must be sufficiently ventilated, potential ignition sources must be at least 50 cm away.

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SITOP power
Alternative voltages

10



10/2 SITOP power flexi 120 W
10/2 SITOP power dual 15 V
10/2 SITOP modular 48 V/20 A



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Alternative voltages

Overview

	SITOP power flexi 120 W	SITOP power dual 15 V	SITOP modular 48 V/20 A
			

Application

SITOP power flexi 120 W	SITOP power dual 15 V	SITOP modular 48 V/20 A
The power supply unit with adjustable output voltage from 3 V to 52 V; suitable for all applications where a special voltage deviating from 24 V is required.	The industry-standard power supply unit with two 15 V outputs which can be connected in parallel or in series; can be used, for example, for supplying electronic loads with ±15 V.	The modular 48 V power supply unit with three-phase wide-range input for powerful loads which are powered by twice the voltage instead of the usual 24 V.

Technical specifications

Power supply, type	**3 to 52 V/2 to 10 A**	**2 x 15 V/3.5 A**	**48 V/20 A**
Order No.	**6EP1 353-2BA00**	**6EP1 353-0AA00**	**6EP1 457-3BA00**
Input	Single-phase AC	Single-phase AC	Three-phase AC
Rated voltage $V_{in\ rated}$	**120/230 V AC**	**120 to 230 V AC**	**400 to 500 V 3 AC**
	Settable using wire jumper	wide-range input	wide-range input
Voltage range	85 to 132 V/170 to 264 V AC	93 to 264 V AC	320 to 550 V (startup from V_{in} > 340 V)
Overvoltage strength	2.3 x $V_{in\ rated}$, 1.3 ms	Surge voltage acc. to EN 61000-6-2 Table 4	2.3 x $V_{in\ rated}$, 1.3 ms
Mains buffering at $I_{out\ rated}$	> 10 ms at V_{in} = 93/187 V (P_{out} = 120 W)	> 10/40 ms at V_{in} = 120/187 V	> 6 ms at V_{in} = 400 V
Rated line frequency; range	50/60 Hz, 47 to 63 Hz	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz
Rated current $I_{in\ rated}$	2.2/0.9 A	1.9 to 1.15 A	2.2 A (V_{in} = 400 V)
Inrush current limitation (+ 25 °C)	< 32 A	< 30 A, typ. 3 ms	< 70 A
I^2t	< 0.8 A^2s	< 3 A^2 s	< 2.8 A^2s
Integrated line-side fuse	T3.15 A/250 V (not accessible)	T4 A/250 V (not accessible)	none
Recommended circuit-breaker (IEC 898) in mains supply line	From 6 A Characteristic C	From 10 A Characteristic C or from 16 A Characteristic B	Required: 3-pole coupled circuit-breaker 10 to 16 A Char. C or motor circuit-breaker 3RV1021-1DA10, setting 3 A
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**3 to 52 V DC**	**2 x 15 V DC**	**48 V DC**
Total tolerance	± 1 %	± 2 %	± 3 %
• Stat. mains compensation	Approx. 0.1 %	Approx. 0.2 %	Approx. ± 0.1 %
• Stat. load compensation	Approx. 0.2 %	Approx. 0.2 %	Approx. ± 0.2 %
Sense line connection	Yes, maximum voltage control 0.5 V per line	-	-
Residual ripple (clock frequency: approx. 50 kHz)	< 50 mV_{pp}	< 50 mV_{pp} (typ. 20 mV_{pp})	< 100 mV_{pp}
Spikes (bandwidth: 20 MHz)	< 100 mV_{pp}	< 150 mV_{pp} (typ. 150 mV_{pp})	< 200 mV_{pp}
Setting range	3 to 52 V, via potentiometer or analog control voltage signal 0 to 2.5 V	14.5 to 17 V	42 to 56 V (max. 960 W)
Status display	Green LED for 24 V O.K.	Green LED for V_{out} >10 V (summation display)	Green LED for 48 V O.K.
Signalling	Power Good via relay contact, current monitor signal 0 to 2.5 V	-	possible using signalling module (6EP1 961-3BA10)
Power ON/OFF behavior	No overshoot of V_{out} (soft start)	Overshoot of V_{out} < 3%	No overshoot of V_{out} (soft start)
Starting delay/voltage rise	< 3 s/typ. 80 ms	< 1 s	< 2.5 s/< 500 ms
Rated current $I_{out\ rated}$	**2 to 10 A** (max. 120 W)	**2 x 3.5 A**	**20 A**
Current range			
• up to + 45 °C	0 to 10 A (max. 120 W)	2 x 0 to 3.5 A	0 to 20 A
• up to + 60 °C	0 to 10 A (max. 120 W)	2 x 0 to 2.5 A	0 to 20 A

Continued on page 10/3.

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Technical specifications (continued)

Power supply, type	3 to 52 V/2 to 10 A	2 x 15 V/3.5 A	48 V/20 A
Order No.	**6EP1 353-2BA00**	**6EP1 353-0AA00**	**6EP1 457-3BA00**
Dyn. V/I with			
• Starting on short circuit	Constant current 2 to 10 A		Constant current approx. 23 A
• Short-circuit in operation	Constant current 2 to 10 A		typ. 60 A for 25 ms
Parallel connection for increased output	Yes, 2	Yes, 2	Yes, 2
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 84 % (at 24 V/5 A)	Approx. 80 %	Approx. 90 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 23 W (at 24 V/5 A)	Approx. 27 W	Approx. 106 W
Protection and monitoring			
Output overvoltage protection	Yes, acc. to EN 60950	Yes, acc. to EN 60950	Yes, acc. to EN 60950
Current limitation	2 to 10 A, adjustable via potentiometer or analog control voltage signal 0 to 2.5 V	Limit point < 4.9 A; switch-off point < 6 A	typ. 23 A
Short-circuit protection	Electronic current limiting (2 to 10 A) in the range 3 to12 V or power limiting (120 W) in the range 12 to 52 V	Electronic shutdown, automatic restart	Choice of stabilized current characteristic approx. 23 A or latching shutdown
Overload/short-circuit indicator	Red LED for current or power limiting	-	Yellow LED for "overload", red LED for "latching shutdown"
Safety			
Galvanic isolation primary/ secondary	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178	Yes, SELV output voltage V_{out} acc. to EN 60950	Yes, SELV output voltage V_{out} acc. to EN 60950
Protective class	Class I	Class I	Class I
Discharge current	< 3.5 mA	< 3.5 mA	< 3.5 mA
TÜV test	Yes	-	Yes
CE marking	Yes	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E143289	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M91), File E179336	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M95), File E197259
FM approval	-	-	-
Appr. for use in marine vessels	-	-	-
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Interference emission	EN 55022 Class B	EN 55011 Class A	EN 55022 Class B
Line harmonics limitation	EN 61000-3-2	-	EN 61000-3-2
Interference immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating specifications			
Ambient temperature range	0 to +60 °C with natural convection	0 to +60 °C with natural convection, derating above +45 °C	0 to +60 °C with natural convection
Transportation and storage temperature range	-25 to + 85 °C	-40 to +70 °C	-25 to +85 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721	Climatic class 3K3 acc. to EN 60721	Climatic class 3K3 acc. to EN 60721
Mechanical specifications			
Connections			
• Mains input L1, N, PE	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.2 to 4 mm^2 single-core/finely stranded (L1, L2, L3, PE)
• Output	One screw-type terminal for 0.5 to 2.5 mm^2 (L+) and 2 screw-type terminals for 0.5 to 2.5 mm^2 (M)	One screw-type terminal for 0.5 to 2.5 mm^2 (P15_1, GND1, GDN2) and 2 screw-type terminals for 0.5 to 2.5 mm^2 (P15_2)	2 screw-type terminals each for 0.33 to 10 mm^2 (+, -)
• Messages, control inputs	One screw-type terminal each for 0.14 to 1.5 mm^2	-	-
Dimensions (W x H x D) in mm	75 x 125 x 125	75 x 125 x 125	240 x 125 x 125
Weight approx.	Approx. 0.9 kg	Approx. 0.75 kg	3.2 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5
Accessories	-	-	Signalling module (6EP1961-3BA10)

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SITOP power
AS interface
power supplies

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11/2 The IP65 version
11/2 The IP20 version



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Single-phase AS interface power supplies, stabilized

Overview

The IP65 version	The IP20 version
	

Application

The AS interface power supply unit with IP65 degree of protection for any mounting position is particularly suitable for use in extremely harsh environments. Thanks to the 24 V DC input voltage it is ideally suitable for use together with a proven SITOP power 24 V standard power supply unit.

This AS interface power supply unit with its wide-range input of 93 to 264 V AC and 110 to 350 V DC can be universally used in all typical power supply networks. With limitation of the input current harmonics acc. to EN 61000-3-2; with SIMATIC S7-300 design.

Technical specifications

Power supply, type	**2.4 A**	**7 A**
Order No.	**6EP1 632-1AL01**	**6EP1 354-1AL01**
Input	DC voltage	Single-phase AC
Rated voltage $V_{in\ rated}$	**24 V DC**	**120 to 230 V AC** wide-range input
Voltage range	20.4 to 28.8 V DC	93 to 264 V AC/110 to 350 V DC
Overvoltage strength	35 V DC for max. 500 ms	2.3 x $V_{in\ rated}$, 1.3 ms
Mains buffering at $I_{out\ rated}$	> 10 ms	> 20 ms at V_{in} = 93/187 V
Rated line frequency; range	-	0/50/60 Hz; 47 to 63 Hz
Rated input current $I_{in\ rated}$	3.6 A	2.2 to 1.2 A
Inrush current limitation (+25 °C)	-	< 20 A, < 3 ms
I^2t	-	< 1.5 A^2s
Integrated line-side fuse	T 6.3 A (not accessible)	T 6.3 A (not accessible)
Recommended circuit-breaker (IEC 898) in mains supply line	From 10 A, Characteristic C or from 6 A, Characteristic D	From 16 A, Characteristic C
Output	Stabilized, floating direct voltage acc. to AS interface specifications	Stabilized, floating direct voltage acc. to AS interface specification
Rated voltage $V_{out\ rated}$	**30 V DC**	**30 V DC**
Total tolerance	29.5 V to 31.6 V DC	29.5 to 31.6 V DC
Residual ripple	< 300 mV_{pp}	< 300 mV_{pp}
Spikes	< 50 mV_{pp}	< 50 mV_{pp}
Status display	Green LED	Green LED
Rated current $I_{out\ rated}$	**2.4 A**	**7 A**
Efficiency / power loss		
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	> 81%	> 85%
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	< 17 W	< 37 W
Protection and monitoring functions		
Output overvoltage protection	-	Yes
Current limiting	From approx. 2.9 A	From approx. 7.4 A
Short-circuit protection	Constant current characteristic approx. 2.9 A	Constant current characteristic approx. 7.4 A

Continued on page 11/3.

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Power supply, type	2.4 A	7 A
Order No.	**6EP1 632-1AL01**	**6EP1 354-1AL01**
Safety		
Galvanic isolation primary/secondary	Yes, SELV output voltage V_{out} acc. to EN 60950	Yes, SELV output voltage V_{out} acc. to EN 60950
Protective class	Class I	Class I
Degree of protection (EN 60529)	IP65 [1]	IP20
CE marking	Yes	Yes
UL/cUL (CSA) approval	UL (UL 508), File 179336, CSA (CSA 22.2 No. 14-95)	cULus (UL 508, CSA 22.2 No.14-M91), File E143289
EMC		
Interference emission	EN 55022 Class B	EN 55022 Class B
Line harmonics limitation	Not applicable	EN 61000-3-2
Interference immunity	EN 61000-6-2	EN 61000-6-2
Operating specifications		
Ambient temperature range	-25 to +55 °C	0 to +55 °C
Transportation and storage temperature range	-25 to +85 °C	-25 to +85 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications		
Input connections	Circular connector 0.5 to 2.5 mm^2 [1] [2]	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded
Output connections AS i +	500 mm three-core cable AWG 14 [1]	3 screw-type terminals for 0.5 to 2.5 mm^2
Output connections AS i -	500 mm three-core cable AWG 14 [1]	3 screw-type terminals for 0.5 to 2.5 mm^2
Output connections Ground	500 mm three-core cable AWG 14 [1]	2 screw-type terminals for 0.5 to 2.5 mm^2
Dimensions (W x H x D) in mm	224 x 80 x 57	200 x 125 x 135
Weight approx.	1.0 kg	1.8 kg
Mounting	Wall mounting, any mounting position	Snap-mounting on DIN rail EN 50022-35x15 mm and S7 rail
Accessories	6-pin circular input connector (6ES5 760-2CA11) and AS interface coupling module PG (3RG9 220-0AA00)	-

1) In IP20 degree of protection with screw-type terminals on request.

2) The counterpart must be ordered separately (not included in the scope of delivery); see Accessories.

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SITOP power
Customized

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12/2 Description
12/3 Specification sheet



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Customized

Overview

Our tried and tested standard power supplies cannot, of course, be suitable for absolutely every application. Does your application require a voltage level other than 24 V, or is a 19" or open-frame version necessary, or are the environmental conditions of your system sometimes outside the normal ranges? We offer the possibility for optimum adaptation to your application-specific requirements.

Thanks to the experience and know-how of our development team, we are able to offer you a tailored solution by applying a modular power supply concept. Your specific requirements can be fulfilled by modifying existing equipment or by complete new developments on the basis of pre-developed standard components. Your advantages are evident:

- Adaptation of the power supply to your application, and not vice versa as in the past
- Highly flexible electrical parameters
- AC or DC input
- Several output voltages possible
- High reliability through use of standard components
- Variability with respect to design requirements
- Adaptable mechanical system.

You therefore benefit from the competence of mass production together with a maximum of development reliability and quality. Further decisive criteria for the success of your application are:

- High availability thanks to fast development cycles
- Short time span between development and start of series production thanks to tried and tested launch procedures
- Prices in line with the market.

Our customized solutions are currently in use in many sectors of mechanical engineering, automation engineering, vehicle electronics, equipment design and industrial measurement engineering, among others.

Our product range is open to any application. If you are interested and require further information, please copy the following page, fill in the parameters of your specific requirement and fax it to the stated number.

Form for inquiry is also available at:

http://intra1.nbgm.siemens.de/extern/spiegeln/sitop/html_76/formular.htm

You can fill it out right on the screen and send it to us immediately. We will contact you without delay.



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FAX reply

Specification sheet for customized power supplies

Recipient:

SIEMENS AG
A&D SE PS 1
Würzburger Straße 121
90766 Fürth
FAX: 0911 750-9991

Sender:

Company: ____________________

Department: ____________________

Name: ____________________

City: ____________________

FAX: ____________________

Phone: ____________________

Application:

Electrical requirements:

Input voltage:	V_{in}: ________		Tolerance Δ V_{in} : ________	
Frequency:	f_{in}: ________		Tolerance Δ f_{in} : ________	
Mains buffering time:	T_{in}: ________			
Output voltage:	V_{out1}: ________	V_{out2}: ________	V_{out3}: ________	V_{out4}: ________
Output current:	I_{out1}: ________	I_{out2}: ________	I_{out3}: ________	I_{out4}: ________

Other: -

- - - - - - - - - - - - - - - - - - - -

Mechanical requirements:

Design/dimensions: (attach drawing if necessary)	________	Enclosure:	________
Connections:	________	Other:	________

General requirements:

Efficiency:	________		
Ambient temperature:	________	Signalling:	________
Standards:	☐ EN 60950	☐ UL	☐ cUL (CSA) ________
	☐ EN 61000-6-1/2	☐ EN 61000-6-3/4	
	☐ ________		
Quantity/year:	________	Delivery:	________
Price expectations:	________		

Remarks: ____________________

____

____

____

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LOGO!Power

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13/2 LOGO!Power 5 V
13/4 LOGO!Power 12 V
13/6 LOGO!Power 15 V
13/8 LOGO!Power 24 V



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LOGO!Power 5 V

Overview

LOGO!Power 5 V





Application

LOGO!Power supplies are primary switched-mode power supplies that are optimized to the LOGO! logic modules in terms of functionality and design. With the wide input range of 85 V to 264 V AC, radio interference level B and assembly option in built-in miniature distribution boards, they can be used universally in a diverse range of applications in the low-end performance range.

Technical specifications

Power supply, type	**5 V/3 A**	**5 V/6.3 A**
Order No.	**6EP1 311-1SH02**	**6EP1 311-1SH12**
Input	Single-phase AC	Single-phase AC
Rated voltage $V_{in\ rated}$	**100 to 240 V AC**	**100 to 240 V AC**
	wide-range input	wide-range input
Voltage range	85 to 264 V AC	85 to 264 V AC
Overvoltage strength	2.3 x $V_{in\ rated}$/1.3 ms	2.3 x $V_{in\ rated}$/1.3 ms
Mains buffering at $I_{out\ rated}$	> 40 ms at V_{in} = 187 V	> 40 ms at V_{in} = 187 V
Rated line frequency; range	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz
Rated current $I_{in\ rated}$	0.36 to 0.22 A	0.71 to 0.37 A
Inrush current limitation (+25 °C)	< 15 A	< 30 A
I^2t	< 0.8 A^2s	< 3 A^2s
Integrated line-side fuse	Internal	Internal
Recommended circuit-breaker (IEC 898) in mains supply line	From 16 A Characteristic B or from 10 A Characteristic C	From 16 A Characteristic B or from 10 A Characteristic C
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**5 V DC**	**5 V DC**
Total tolerance, static	± 3 %	± 3 %
• Static mains compensation	Approx. 0.2 %	Approx. 0.1 %
• Static load compensation	Approx. 1.5 %	Approx. 2 %
Residual ripple (clock frequency approx. 90 kHz)	< 100 mV_{pp}	< 100 mV_{pp}
Spikes (bandwidth approx. 20 MHz)	< 100 mV_{pp}	< 100 mV_{pp}
Setting range	4.6 to 5.4 V	4.6 to 5.4 V
Status display	Green LED for output voltage OK	Green LED for output voltage OK
Power ON/OFF behavior	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)
Starting delay/voltage rise	< 0.5 s/typ. 15 ms	< 0.5 s/typ. 10 ms
Rated current $I_{out\ rated}$	**3 A**	**6.3 A**
Current range up to +55 °C	0 to 3 A	0 to 6.3 A
Parallel connection for increased output	Yes	Yes

Continued on page 13/3.

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Power supply, type	5 V/3 A	5 V/6.3 A
Order No.	**6EP1 311-1SH02**	**6EP1 311-1SH12**
Efficiency		
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	typ. 76 %	typ. 83 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	typ. 5 W	typ. 6 W
Control		
Dyn. mains compensation ($V_{in\ rated}$ ± 15 %)	< 0.2 % V_{out}	< 0.2 % V_{out}
Dyn. load compensation (I_{out}: 10/90/10 %)	± 4 % V_{out}	± 6.5 % V_{out}
Settling time		
• Load step from 10 to 90 %	typ. 20 ms	typ. 20 ms
• Load step from 90 to 10 %	typ. 20 ms	typ. 20 ms
Protection and monitoring		
Current limitation	typ. 3.8 A	typ. 8.2 A
Short-circuit protection	Stabilized current characteristic	Stabilized current characteristic
RMS sustained short-circuit current	< 5 A	< 10 A
Overload/short-circuit indicator	-	-
Safety		
Galvanic isolation primary/secondary	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178
Protective class	Class II (without PE conductor)	Class II (without PE conductor)
CE marking	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M95), File E197259; cURus recognized (UL 60950, CSA 22.2 No. 60950), File E151273	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M95), File E197259; cURus recognized (UL 60950, CSA 22.2 No. 60950), File E151273
FM approval	Yes, Class I Div. 2, Group A, B, C, D T4	Yes, Class I Div. 2, Group A, B, C, D T4
Appr. for use in marine vessels	Yes, GL (Germanischer Lloyd)	Yes, GL (Germanischer Lloyd)
Degree of protection (EN 60529)	IP20	IP20
EMC		
Interference emission	EN 55022 Class B	EN 55022 Class B
Line harmonics limitation	Not applicable	Not applicable
Interference immunity	EN 61000-6-2	EN 61000-6-2
Operating specifications		
Ambient temperature range	-20 to +55 °C with natural convection	-20 to +55 °C with natural convection
Transportation and storage temperature range	-40 to +70 °C	-40 to +70 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications		
Mains input connections L1, N	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded
Connections		
• Output +	2 screw-type terminals each for 0.5 to 2.5 mm^2	2 screw-type terminals each for 0.5 to 2.5 mm^2
• Output -		
Dimensions (W x H x D) in mm	54 x 90 x 55	72 x 90 x 55
Weight	Approx. 0.17 kg	Approx. 0.25 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x7.5/15	Snap-mounting on DIN rail EN 50022-35x7.5/15

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LOGO!Power 12 V

Overview





Application

LOGO!Power supplies are primary switched-mode power supplies that are optimized to the LOGO! logic modules in terms of functionality and design. With the wide input range of 85 V to 264 V AC, radio interference level B and assembly option in built-in miniature distribution boards, they can be used universally in a diverse range of applications in the low-end performance range.

Technical specifications

Power supply, type	**12 V/1.9 A**	**12 V/4.5 A**
Order No.	**6EP1 321-1SH02**	**6EP1 322-1SH02**
Input	Single-phase AC	Single-phase AC
Rated voltage $V_{in\ rated}$	**100 to 240 V AC**	**100 to 240 V AC**
	wide-range input	wide-range input
Voltage range	85 to 264 V AC	85 to 264 V AC
Overvoltage strength	2.3 x $V_{in\ rated}$/1.3 ms	2.3 x $V_{in\ rated}$/1.3 ms
Mains buffering at $I_{out\ rated}$	> 40 ms at V_{in} = 187 V	> 40 ms at V_{in} = 187 V
Rated line frequency; range	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz
Rated current $I_{in\ rated}$	0.53 to 0.3 A	1.13 to 0.61 A
Inrush current limitation (+25 °C)	< 15 A	< 30 A
I^2t	< 0.8 A^2s	< 3 A^2s
Integrated line-side fuse	Internal	Internal
Recommended circuit-breaker (IEC 898) in mains supply line	From 16 A Characteristic B or from 10 A Characteristic C	From 16 A Characteristic B or from 10 A Characteristic C
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**12 V DC**	**12 V DC**
Total tolerance, static	± 3 %	± 3 %
• Static mains compensation	Approx. 0.2 %	Approx. 0.1 %
• Static load compensation	Approx. 1.5 %	Approx. 1.5 %
Residual ripple (clock frequency approx. 90 kHz)	< 200 mV_{pp}	< 200 mV_{pp}
Spikes (bandwidth approx. 20 MHz)	< 300 mV_{pp}	< 300 mV_{pp}
Setting range	10.5 to 16.1 V	10.5 to 16.1 V
Status display	Green LED for output voltage OK	Green LED for output voltage OK
Power ON/OFF behavior	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)
Starting delay/voltage rise	< 0.5 s/typ. 15 ms	< 0.5 s/typ. 10 ms
Rated current $I_{out\ rated}$	**1.9 A**	**4.5 A**
Current range up to +55 °C	0 to 1.9 A	0 to 4.5 A
Parallel connection for increased output	Yes	Yes

Continued on page 13/5.

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LOGO!Power 12 V

Power supply, type	12 V/1.9 A	12 V/4.5 A
Order No.	**6EP1 321-1SH02**	**6EP1 322-1SH02**
Efficiency		
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	typ. 80 %	typ. 85 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	typ. 5 W	typ. 10 W
Control		
Dyn. mains compensation ($V_{in\ rated}$ ± 15 %)	< 0.2 % V_{out}	< 0.2 % V_{out}
Dyn. load compensation (I_{out}:10/90/10 %)	± 3 % V_{out}	± 4.2 % V_{out}
Settling time		
• Load step from 10 to 90 %	typ. 20 ms	typ. 20 ms
• Load step from 90 to 10 %	typ. 20 ms	typ. 20 ms
Protection and monitoring		
Current limitation	typ. 2.5 A	typ. 5.9 A
Short-circuit protection	Stabilized current characteristic	Stabilized current characteristic
RMS sustained short-circuit current	< 4 A	< 8 A
Overload/short-circuit indicator	-	-
Safety		
Galvanic isolation primary/secondary	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178
Protective class	Class II (without PE conductor)	Class II (without PE conductor)
CE marking	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M95), File E197259; cURus recognized (UL 60950, CSA 22.2 No. 60950), File E151273	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M95), File E197259; cURus recognized (UL 60950, CSA 22.2 No. 60950), File E151273
FM approval	Yes, Class I Div. 2, Group A, B, C, D T4	Yes, Class I Div. 2, Group A, B, C, D T4
Appr. for use in marine vessels	Yes, GL, ABS	Yes, GL, ABS
Degree of protection (EN 60529)	IP20	IP20
EMC		
Interference emission	EN 55022 Class B	EN 55022 Class B
Line harmonics limitation	Not applicable	Not applicable
Interference immunity	EN 61000-6-2	EN 61000-6-2
Operating specifications		
Ambient temperature range	-20 to +55 °C with natural convection	-20 to +55 °C with natural convection
Transportation and storage temperature range	-40 to +70 °C	-40 to +70 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications		
Connections		
• Mains input L1, N	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/ finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/ finely stranded
• Output +	2 screw-type terminals each for 0.5 to 2.5 mm^2	2 screw-type terminals each for 0.5 to 2.5 mm^2
• Output -		
Dimensions (W x H x D) in mm	54 x 90 x 55	72 x 90 x 55
Weight	Approx. 0.17 kg	Approx. 0.25 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x7.5/15	Snap-mounting on DIN rail EN 50022-35x7.5/15

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LOGO!Power 15 V

Overview





Application

LOGO!Power supplies are primary switched-mode power supplies that are optimized to the LOGO! logic modules in terms of functionality and design. With the wide input range of 85 V to 264 V AC, radio interference level B and assembly option in built-in miniature distribution boards, they can be used universally in a diverse range of applications in the low-end performance range.

Technical specifications

Power supply, type	**15 V/1.9 A**	**15 V/4 A**
Order No.	**6EP1 351-1SH02**	**6EP1 352-1SH02**
Input	Single-phase AC	Single-phase AC
Rated voltage $V_{in\ rated}$	**100 to 240 V AC**	**100 to 240 V AC**
	wide-range input	wide-range input
Voltage range	85 to 264 V AC	85 to 264 V AC
Overvoltage strength	2.3 x $V_{in\ rated}$/1.3 ms	2.3 x $V_{in\ rated}$/1.3 ms
Mains buffering at $I_{out\ rated}$	> 40 ms at V_{in} = 187 V	> 40 ms at V_{in} = 187 V
Rated line frequency; range	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz
Rated current $I_{in\ rated}$	0.63 to 0.33 A	1.24 to 0.68 A
Inrush current limitation (+25 °C)	< 15 A	< 30 A
I^2t	< 0.8 A^2s	< 3 A^2s
Integrated line-side fuse	Internal	Internal
Recommended circuit-breaker (IEC 898) in mains supply line	From 16 A Characteristic B or from 10 A Characteristic C	From 16 A Characteristic B or from 10 A Characteristic C
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**15 V DC**	**15 V DC**
Total tolerance, static	± 3 %	± 3 %
• Static mains compensation	Approx. 0.1 %	Approx. 0.1 %
• Static load compensation	Approx. 1.5 %	Approx. 1.5 %
Residual ripple (clock frequency approx. 90 kHz)	< 200 mV_{pp}	< 200 mV_{pp}
Spikes (bandwidth approx. 20 MHz)	< 300 mV_{pp}	< 300 mV_{pp}
Setting range	10.5 to 16.1 V	10.5 to 16.1 V
Status display	Green LED for output voltage OK	Green LED for output voltage OK
Power ON/OFF behavior	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)
Starting delay/voltage rise	< 0.5 s/typ. 15 ms	< 0.5 s/typ. 10 ms
Rated current $I_{out\ rated}$	**1.9 A**	**4 A**
Current range up to +55 °C	0 to 1.9 A	0 to 4 A
Parallel connection for increased output	Yes	Yes

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LOGO!Power 15 V

Power supply, type	15 V/1.9 A	15 V/4 A
Order No.	**6EP1 351-1SH02**	**6EP1 352-1SH02**
Efficiency		
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	typ. 80 %	typ. 85 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	typ. 7 W	typ. 11 W
Control		
Dyn. mains compensation ($V_{in\ rated}$ ± 15 %)	< 0.2 % V_{out}	< 0.2 % V_{out}
Dyn. load compensation (I_{out}: 10/90/10 %)	± 2.8 % V_{out}	± 3.3 % V_{out}
Settling time		
• Load step from 10 to 90 %	typ. 20 ms	typ. 20 ms
• Load step from 90 to 10 %	typ. 20 ms	typ. 20 ms
Protection and monitoring		
Current limitation	typ. 2.7 A	typ. 5.0 A
Short-circuit protection	Stabilized current characteristic	Stabilized current characteristic
RMS sustained short-circuit current	< 4 A	< 8 A
Overload/short-circuit indicator	-	-
Safety		
Galvanic isolation primary/secondary	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178
Protective class	Class II (without PE conductor)	Class II (without PE conductor)
CE marking	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M95), File E197259; cURus recognized (UL 60950, CSA 22.2 No. 60950), File E151273	Yes, cULus listed (UL 508, CSA 22.2 No. 14-M95), File E197259; cURus recognized (UL 60950, CSA 22.2 No. 60950), File E151273
FM approval	Yes, Class I Div. 2, Group A, B, C, D T4	Yes, Class I Div. 2, Group A, B, C, D T4
Appr. for use in marine vessels	Yes, GL (Germanischer Lloyd)	Yes, GL (Germanischer Lloyd)
Degree of protection (EN 60529)	IP20	IP20
EMC		
Interference emission	EN 55022 Class B	EN 55022 Class B
Line harmonics limitation	Not applicable	Not applicable
Interference immunity	EN 61000-6-2	EN 61000-6-2
Operating specifications		
Ambient temperature range	-20 to +55 °C with natural convection	-20 to +55 °C with natural convection
Transportation and storage temperature range	-40 to +70 °C	-40 to +70 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications		
Mains input connections L1, N	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded
Connections		
• Output +	2 screw-type terminals each for 0.5 to 2.5 mm^2	2 screw-type terminals each for 0.5 to 2.5 mm^2
• Output -		
Dimensions (W x H x D) in mm	54 x 90 x 55	72 x 90 x 55
Weight	Approx. 0.17 kg	Approx. 0.25 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5

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LOGO!Power 24 V

Overview





Application

LOGO!Power supplies are primary switched-mode power supplies that are optimized to the LOGO! logic modules in terms of functionality and design. With the wide input range of 85 V to 264 V AC, radio interference level B and assembly option in built-in miniature distribution boards, they can be used universally in a diverse range of applications in the low-end performance range.

Technical specifications

Power supply, type	**24 V/1.3 A**	**24 V/2.5 A**	**24 V/4 A**
Order No.	**6EP1 331-1SH02**	**6EP1 332-1SH42**	**6EP1 332-1SH51**
Input	Single-phase AC	Single-phase AC	Single-phase AC
Rated voltage $V_{in\ rated}$	**100 to 240 V AC**	**100 to 240 V AC**	**100 to 240 V AC**
	wide-range input	wide-range input	wide-range input
Voltage range	85 to 264 V AC	85 to 264 V AC	85 to 264 V AC
Overvoltage strength	2.3 x $V_{in\ rated}$/1.3 ms	2.3 x $V_{in\ rated}$/1.3 ms	2.3 x $V_{in\ rated}$/1.3 ms
Mains buffering at $I_{out\ rated}$	> 40 ms at V_{in} = 187 V	> 40 ms at V_{in} = 187 V	> 40 ms at V_{in} = 187 V
Rated line frequency; range	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz	50/60 Hz; 47 to 63 Hz
Rated current $I_{in\ rated}$	0.7 to 0.35 A	1.22 to 0.66 A	1.95 to 0.97 A
Inrush current limitation (+25 °C)	< 15 A	< 30 A	< 30 A
I^2t	< 0.8 A^2s	< 3 A^2s	< 2.5 A^2s
Integrated line-side fuse	Internal	Internal	Internal
Recommended circuit-breaker (IEC 898) in mains supply line	From 16 A Characteristic B or from 10 A Characteristic C	From 16 A Characteristic B or from 10 A Characteristic C	From 16 A Characteristic B or from 10 A Characteristic C
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**	**24 V DC**	**24 V DC**
Total tolerance, static	± 3 %	± 3 %	± 3 %
• Static mains compensation	Approx. 0.1 %	Approx. 0.1 %	Approx. 0.1 %
• Static load compensation	Approx. 1.5 %	Approx. 1.5 %	Approx. 1.5 %
Residual ripple (clock frequency approx. 90 kHz)	< 200 mV_{pp}	< 200 mV_{pp}	< 200 mV_{pp}
Spikes (bandwidth approx. 20 MHz)	< 300 mV_{pp}	< 300 mV_{pp}	< 300 mV_{pp}
Setting range	22.2 to 26.4 V	22.2 to 26.4 V	22.2 to 26.4 V
Status display	Green LED for output voltage OK	Green LED for output voltage OK	Green LED for output voltage OK
Power ON/OFF behavior	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)
Starting delay/voltage rise	< 0.5 s/typ. 15 ms	< 0.5 s/typ. 10 ms	< 0.5 s/typ. 35 ms
Rated current $I_{out\ rated}$	**1.3 A**	**2.5 A**	**4 A**
Current range up to +55 °C	0 to 1.3 A	0 to 2.5 A	0 to 4 A
Parallel connection for increased output	Yes	Yes	Yes

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LOGO!Power 24 V

Power supply, type	24 V/1.3 A	24 V/2.5 A	24 V/4 A
Order No.	**6EP1 331-1SH02**	**6EP1 332-1SH42**	**6EP1 332-1SH51**
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	typ. 82 %	typ. 87 %	typ. 89 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	typ. 7 W	typ. 9 W	typ. 12 W
Control			
Dyn. mains compensation ($V_{in\ rated}$ ± 15 %)	< 0.2 % V_{out}	< 0.2 % V_{out}	< 0.2 % V_{out}
Dyn. load compensation (I_{out}: 10/90/10 %)	± 1.5 % V_{out}	± 1.5 % V_{out}	± 1.5 % V_{out}
Settling time			
• Load step from 10 to 90 %	typ. 20 ms	typ. 20 ms	typ. 20 ms
• Load step from 90 to 10 %	typ. 20 ms	typ. 20 ms	typ. 20 ms
Protection and monitoring			
Current limitation	typ. 2 A	typ. 3.4 A	typ. 4.7 A
Short-circuit protection	Stabilized current characteristic	Stabilized current characteristic	Stabilized current characteristic
RMS sustained short-circuit current	< 4 A	< 8 A	< 10 A
Overload/short-circuit indicator	-	-	-
Safety			
Galvanic isolation primary/secondary	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178	Yes, SELV output voltage V_{out} acc. to EN 60950 and EN 50178
Protective class	Class II (without PE conductor)	Class II (without PE conductor)	Class II (without PE conductor)
CE marking	Yes	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus listed (UL 508, CSA 22.2), File E197259; cURus recognized (UL 60950, CSA 22.2), File E151273	Yes, cULus listed (UL 508, CSA 22.2), File E197259; cURus recognized (UL 60950, CSA 22.2), File E151273	Yes, cULus listed (UL 508, CSA 22.2), File E197259; cURus recognized (UL 60950, CSA 22.2), File E151273
FM approval	Yes, Class I Div. 2, Group A, B, C, D T4	Yes, Class I Div. 2, Group A, B, C, D T4	Available soon
Appr. for use in marine vessels	Yes, GL, ABS	Yes, GL, ABS	Yes, ABS
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Interference emission	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Line harmonics limitation	Not applicable	Not applicable	EN 61000-3-2
Interference immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating specifications			
Ambient temperature range	-20 to +55 °C with natural convection	-20 to +55 °C with natural convection	-20 to +55 °C with natural convection
Transportation and storage temperature range	-40 to +70 °C	-40 to +70 °C	-40 to +70 °C
Humidity rating	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation	Climatic class 3K3 acc. to EN 60721, no condensation
Mechanical specifications			
Mains input connections L1, N	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded	One screw-type terminal each for 0.5 to 2.5 mm^2 single-core/finely stranded
Connections			
• Output +	2 screw-type terminals each for 0.5 to 2.5 mm^2	2 screw-type terminals each for 0.5 to 2.5 mm^2	2 screw-type terminals each for 0.5 to 2.5 mm^2
• Output -			
Dimensions (W x H x D) in mm	54 x 90 x 55	72 x 90 x 55	90 x 90 x 55
Weight	Approx. 0.17 kg	Approx. 0.25 kg	Approx. 0.34 kg
Mounting	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5	Snap-mounting on DIN rail EN 50022-35x15/7.5

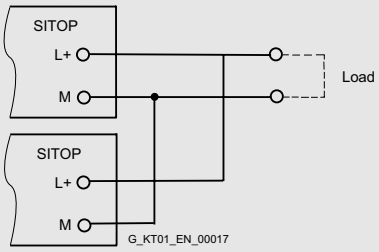
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Notes

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Technical information and configuration

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Power supplies general

Power supplies

In plant construction or mechanical engineering, or in any other situations in which electrical controls are used, a safe and reliable power supply is needed to supply the process with power.

The functional reliability of electronic controls and therefore the reliable operation of automated installations is extremely closely linked to the resistance of the load power supply to failure. Final control elements as well as input and output modules will only respond to command signals if the power supply is operating reliably.

In addition to general requirements such as reliability, particular demands are placed on the electromagnetic compatibility (EMC) of the power supply with reference to the tolerance range of the output voltage as well as its ripple.

Important factors that determine problem-free implementation are, in particular:

- An input current with a low harmonic content
- Low emitted interference and
- Adequate immunity (noise immunity) to interference

EMC	Types of interference
Emission (emitted interference)	Interference caused by television and radio reception
	Interference coupling with data lines or power supply cables
Immunity (immunity to interference)	Faults on the power cable due to switching non-resistive loads such as motors or contactors
	Static discharge due to lightning strikes
	Electrostatic discharge through the human body
	Conducted noise induced by radio frequencies

Certain disturbing phenomena

General notes on DC power supplies

The DC power supply is a static device with one or more inputs and one or more outputs that converts a system of AC voltage and AC current and/or DC voltage and DC current to a system with different values of DC voltage and DC current by means of electromagnetic induction for the purpose of transmitting electrical energy.

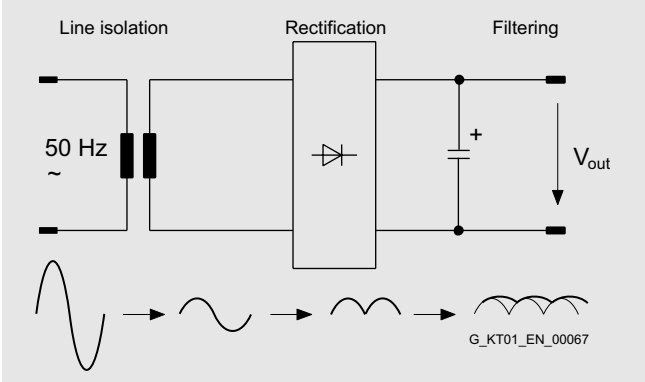
The type of construction of a DC power supply is usually decided by its intended use.

Unstabilized DC power supplies

The AC mains voltage is transformed using 50 Hz/60 Hz safety transformers to a protective extra-low voltage and smoothed with down-circuit rectification and capacitor filtering.

In the case of unstabilized DC power supplies, the DC output voltage is not stabilized at a specific value, but the value is varied in accordance with the variation in (mains) input voltage and the loading.

The ripple is in the Volt range and is dependent on the loading. The value for the ripple is usually specified as a percentage of the DC output voltage level. Unstabilized DC power supplies are characterized by their rugged, uncomplicated design that is limited to the important factors and focussed on a long service life.



Block diagram of an unstabilized power supply

Stabilized DC power supplies

Stabilized DC power supplies have electronic regulation circuits that maintain the DC voltage at the output at a specific value with as little variation as possible. Effects such as variation in input voltage or changes in load at the output are electrically compensated in the specified function area.

The ripple in the output voltage for stabilized DC power supplies lies in the millivolt range and is mainly dependent on the loading at the outputs.

Stabilized DC power supplies can be implemented on different functional principles. The most common types of circuit are:

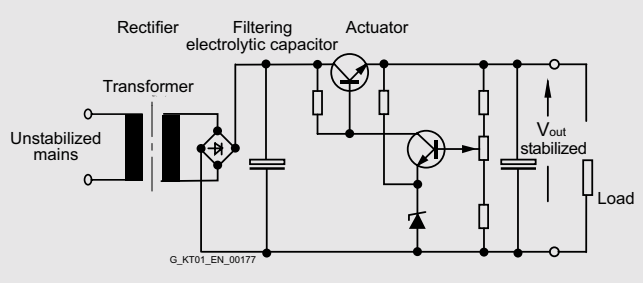
- Linear stabilized power supplies
- Magnetic voltage stabilizer
- Secondary pulsed switched-mode power supplies
- Primary pulsed switched-mode power supplies

The most suitable principle for a particular application case will depend mainly on the application. The objective is to generate a DC voltage to supply the specific load as inexpensively and as accurately as possible.

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Stabilized DC power supplies (continued)

Linear stabilized power supplies



Block diagram: Linear regulator

The linear regulator operates according to a conventional principle. The supply is provided from an AC supply system (one, two or three conductor supply).

A transformer is used to adapt it to form the required secondary voltage.

The rectified and filtered secondary voltage is converted into a stabilized voltage at the output by a regulation section. The regulation section comprises a final control element and a control amplifier. The difference between the stabilized output voltage and the unstabilized voltage at the filter capacitor is converted into a thermal loss in the final control element. The final control element functions in this case like a rapidly changeable ohmic impedance. The thermal loss that arises in each case is the product of output current and voltage drop over the final control element.

This system is extremely adaptable. Even without any further modifications, several output voltages are possible. In the case of multiple outputs, the individual secondary circuits are generated from separate secondary windings of the input transformer. Some applications can only be resolved in accordance with this circuit principle. Especially when highly accurate regulation, minimal residual ripple and fast compensation times are required.

The efficiency is, however, poor and the weight and volume are considerable. The linear regulator is therefore only an economical alternative at low power ratings.

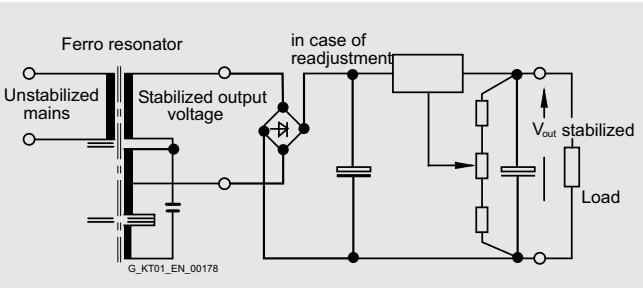
Advantages:

- Simple, well-proven circuit principle
- Good to excellent control characteristics
- Fast settling time

Disadvantages:

- Relatively high weight and large volume due to the 50 Hz transformer
- Poor efficiency, heat dissipation problems
- Low storage time

Magnetic stabilizer



Block diagram: Magnetic stabilizer

The complete transformer comprises two components. The so-called "ferro resonator" and a series connected auxiliary regulation section. The input winding and the resonance winding of the magnetic stabilizer are decoupled to a large extent by means of the air gap. The magnetic stabilizer supplies a well-stabilized AC voltage. This is rectified and filtered. The transformer itself is operated in the saturation range.

The ferro resonator frequently has a linear regulator connected to the output to improve the control accuracy. Secondary pulsed switched-mode regulators are frequently also connected to the output.

The magnetic stabilizer technique is reliable and rugged but is also large-volume, heavy and relatively expensive.

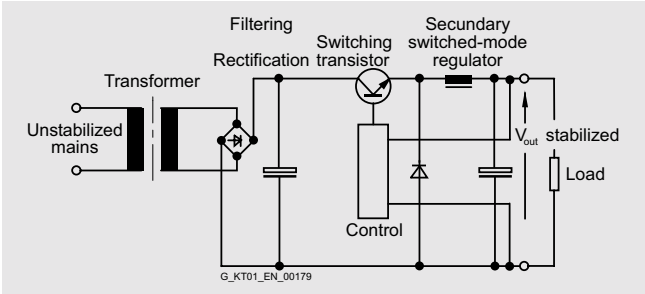
Advantages:

- Good to excellent control characteristics in combination with series connected linear regulators
- Significantly better efficiency than a linear regulator alone

Disadvantages:

- The ferro resonator is frequency dependent
- The power supplies are large and heavy due to the magnetic components

Secondary pulsed switched-mode power supplies:



Block diagram: Secondary pulsed switched-mode power supply

Isolation from the supply system is implemented in this case with a 50 Hz transformer. Following rectification and filtering, the energy is switched at the output by means of pulsing through a switching transistor in the filtering and storage circuit. Thanks to the transformer at the input, that acts as an excellent filter, the mains pollution is low.
The efficiency of this circuit is extremely high.

This concept offers many advantages for power supplies with numerous different output voltages.

To protect the connected loads, however, care must be taken; in the event of the switching transistor breaking down, the full, unstabilized DC voltage of the filter capacitor will be applied to the output. This danger, however, also exists in the case of linear stabilized power supplies.

Advantages:

- Simple design and high efficiency
- Multiple outputs, also galvanically isolated from one another, are easily implemented by means of several secondary windings
- Fewer problems with interference than with primary pulsed switched-mode power supplies

Disadvantages:

- The 50 Hz transformer makes the power supplies relatively large and heavy
- The output ripple (spikes) correspond to those of a primary pulsed switched-mode power supply

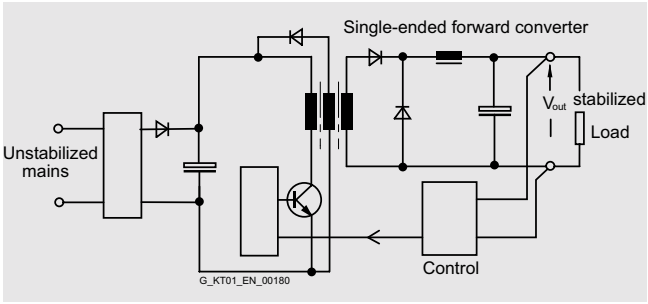
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Stabilized DC power supplies

Stabilized DC power supplies (continued)

Primary pulsed switched-mode power supplies:

In other literature, the term SMPS (Switch Mode Power Supply) or primary switched-mode regulator is often used.



Block diagram: Single-ended forward converter

The primary switched-mode regulators are available in many different circuit variants. The most important basic circuits are single-ended forward converters, flyback converters, half-bridge converters, full-bridge converters, push-pull converters and resonance converters.

The general principle of operation of the primary switched-mode regulator is shown in the block diagram of the single-ended forward converters.

The unstabilized supply voltage is first rectified and filtered. The capacitance of the capacitor in the DC link determines the storage time of the power supply on failure of the input voltage. The voltage at the DC link is approximately 320 V DC for a 230 V supply. A single-ended converter is then supplied with this DC voltage and transfers the primary energy through a transformer to the secondary side with the help of a pulse width regulator at a high switching frequency. The switching transistor has low power losses when functioning as a switch, so that the power balance lies between > 70 % and 90 % depending on the output voltage and current.

The volume of the transformer is small in comparison with a 50 Hz transformer due to the high switching frequency because the transformer size taking into account the higher switching frequency is smaller. Using modern semiconductors, switching frequencies of 100 kHz and above can be achieved. At excessively high switching frequencies, the switching losses increase, so that in each case a compromise has to be made between a high efficiency and the largest possible switching frequency. In most applications, the switching frequencies lie between 20 kHz and 250 kHz depending on the output power.

The voltage from the secondary winding is rectified and filtered. The system deviation at the output is fed back to the primary circuit through an optocoupler. By controlling the pulse width (conducting phase of the switching transistor in the primary circuit), the necessary energy is transferred to the secondary circuit and the output voltage is regulated. During the non-conducting phase of the switching transistor, the transformer is demagnetized through an auxiliary winding. Just enough energy is transferred as is removed at the output.
The maximum pulse width for the pulse/pause ratio for these circuits is < 50 %.

Advantages:

- Small magnetic components (transformer, storage reactor, filter) thanks to the high operating frequency
- High efficiency thanks to pulse width regulation
- Compact equipment units
- Forced-air cooling is not necessary up to the kW range
- High storage times are possible on mains failure by increasing the capacitance in the DC link
- Larger input voltage range is possible

Disadvantages:

- High cost circuit, many active components
- Higher costs for interference suppression
- The mechanical design must be in accordance with HF criteria

Primary switched-mode power supplies have become more and more popular over the last few years. Especially due to the small size, low weight, high efficiency and excellent price/performance ratio.

Summary

The most important characteristics of the circuit types described above are summarized in Table 2.

	Circuit types			
Comparison criteria	**Primary switched-mode**	**Secondary switched-mode**	**Linear regulator**	**Magnetic stabilizer**
Input voltage range	Very large	Medium	Very small	Large
Regulation speed	Medium	Medium	Very fast	Slow
Storage time after power failure	Very long	Long	Very short	Long
Residual ripple	Medium	Medium	Very low	Medium
Power loss	Very small	Small	Large	Very small
Frame size	Very small	Medium	Very large	Large
Weight	Very light	Medium	Heavy	Very heavy
Interference suppression costs	Very large	Medium	Low	Medium

Comparison criteria for basic circuit variants

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Supply system data

When dimensioning and selecting plant components, the mains data, mains conditions and the operating modes must be taken into account for these components.

The most important data for a supply system is the rated voltage and rated frequency. These data for the supply system are designated as rated values in accordance with international agreements.

Rated voltage and rated frequency

Since May 1987, the standard DIN IEC 60038 "IEC rated voltages" has been applicable in the Federal Republic of Germany.

The international standard IEC 60038, Edition 6, 1983, "IEC standard voltages" has been included in this standard unmodified.

The IEC 60038 standard is the result of an international agreement to reduce the diverse rated voltage values that are in use for electrical supply networks and traction power supplies, load installations and equipment.

Conversion of low-voltage supply systems

In the low-voltage range, it is emphasized in IEC 60038 that 220/380 V and 240/415 V voltage values for three-phase electricity supplies have been replaced by a single internationally standardized value of 230/400 V.
The tolerances for the rated voltages of the supply systems that were specified for the transition period up to 2003 were intended to ensure that equipment rated for the previous voltages could be operated safely until the end of its service life.

Year	Rated voltage	Tolerance range
Up to 1987	220 V/380 V	-10 % to +10 %
From 1988 to 2003	230 V/400 V	-10 % to + 6 %
From 2003	230 V/400 V	-10 % to +10 %

Conversion of low-voltage supply systems

The IEC recommendations have been implemented as national regulations in the most important countries, as far as the conditions in the country allow.

International supply voltages and frequencies in low-voltage supply systems

Country	Mains voltage
Western Europe:	
Belgium	50 Hz 230/400 – 127-220 V
Denmark	50 Hz 230/400 V
Germany	50 Hz 230/400 V
Finland	50 Hz 230/400-500[1] – 660[1] V
France	50 Hz 127/220 – 230/400 – 500[1] – 380/660[1] – 525/910[1] V
Greece	50 Hz 230/400 – 127/220[2] V
Great Britain	50 Hz (230/400 V)[3]
Ireland	50 Hz 230/400 V
Iceland	50 Hz 127/220[2] – 230/400 V
Italy	50 Hz 127/220 – 230/400 V
Luxembourg	50 Hz 230/400 V
Netherlands	50 Hz 230/400 – 660[1] V
Northern Ireland	50 Hz 230/400 – Belfast 220/380 V
Norway	50 Hz 230-230/400-500[1] – 690[1] V
Austria	50 Hz 230/400 – 500[1] – 690[1] V
Portugal	50 Hz 230/400 V
Sweden	50 Hz 230/400 V
Switzerland	50 Hz 230/400 – 500[2] V
Spain	50 Hz 230/400 V
Eastern Europe	
Albania	50 Hz 230/400 V
Bulgaria	50 Hz 230/400 V
Russian Federation	50 Hz 230/400 – 690[1] V
Croatia	50 Hz 230/400 V
Poland	50 Hz 230/400 V
Rumania	50 Hz 230/400 V
Serbia	50 Hz 230/400 V
Slovakia	50 Hz 230/400 – 500[1] – 690[1] V
Slovenia	50 Hz 230/400 V
Chechnya	50 Hz 230/400 – 500[1] – 690[1] V
Hungary	50 Hz 230/400 V

1) Industry only.
2) No further expansion.
3) From 2003.

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Mains specifications, line-side connection

International supply voltages and frequencies in low-voltage supply systems (continued)

Country	Mains voltage
Middle-East:	
Afghanistan	50 Hz 220/380 V
Bahrain	50 Hz 230/400 V
Cyprus	50 Hz 240/415 V
Iraq	50 Hz 220/380 V
Israel	50 Hz 230/400 V
Jordan	50 Hz 220/380 V
Kuwait	50 Hz 240/415 V
Lebanon	50 Hz 110/190 – 220/380 V
Oman	50 Hz 220/380 – 240/415 V
Qatar	50 Hz 240/415 V
Saudi Arabia	60 Hz 127/220 – 220/380 – 480[1)] V (220/380 – 240/415 V 50 Hz: remainder only)
Syria	50 Hz 115/200 – 220/380 – 400[1)] V
Turkey	50 Hz 220/380 V (parts of Istanbul: 110/190 V)
United Arab Emirates (Abu Dhabi; Ajman; Dubai; Fujayrah; Ras al Khaymah; Sharjah; Um al Qaywayn)	50 Hz 220/380 – 240/415 V
Yemen (North)	50 Hz 220/380 V
Yemen (South)	50 Hz 230/400 V
Far East:	
Bangladesh	50 Hz 230/400 V
Burma	50 Hz 230/400 V
Peoples Republic of China	50 Hz 127/220 – 220/380 V (in mining: 1140 V)
Hong Kong	50 Hz 200/346 V
India	50 Hz 220/380 – 230/400 – 240/415 V
Indonesia	50 Hz 127/220 – 220/380 – 400[1)] V
Japan	50 Hz 100/200 – 400[1)] V
South Honshu, Shikoku, Kyushu, Hokkaido, North Honshu	60 Hz 110/220 – 440[1)] V
Cambodia	50 Hz 120/208 V – Phnom Penh 220/238 V
Korea (North)	60 Hz 220/380 V
Korea (South)	60 Hz 100/200[2)] – 220/380 – 440[1)] V
Malaysia	50 Hz 240/415 V
Peoples Republic of Mongolia	50 Hz 220/380 V
Pakistan	50 Hz 230/400 V
Philippines	60 Hz 110/220 – 440 V
Singapore	50 Hz 240/415 V
Sri Lanka	50 Hz 230/400 V
Taiwan	60 Hz 110/220 – 220 – 440 V
Thailand	50 Hz 220/380 V
Vietnam	50 Hz 220/380 V
North America:	
Canada	60 Hz 600 – 120/240 – 460 – 575 V
USA	60 Hz 120/208 – 120/240 – 277/480 – 600[1)] V
Central America:	
Bahamas	60 Hz 115/200 – 120/208 V
Barbados	50 Hz 110/190 – 120/208 V
Belize	60 Hz 110/220 – 220/440 V
Costa Rica	60 Hz 120/208[2)] – 120/240 – 127/220 – 254/440[2)] – 227/480[1)] V
Dominican Republic	60 Hz 120/208 – 120/240 – 480[1)] V

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International supply voltages and frequencies in low-voltage supply systems (continued)

Country	Mains voltage
Central America (continued)**:**	
Guatemala	60 Hz 120/208 – 120/240 – 127/220 – 277/480[1] – 480[1] – 550[1] V
Haiti	50 Hz 220/380 V (Jacmel), 60 Hz 110/220 V
Honduras	60 Hz 110/220 – 127/220 – 277/480 V
Jamaica	50 Hz 110/220 – 440[1] V
Cuba	60 Hz 120/240 – 220/380 – 277/480[1] – 440[1] V
Mexico	60 Hz 127/220 – 440[1] V
Nicaragua	60 Hz 110/220 – 120/240 – 127/220 – 220/440 – 254/40[1] V
Panama	60 Hz 120/208[1] – 120/240 – 254/4401) – 277/480[1] V
Puerto Rico	60 Hz 120/208 – 480 V
El Salvador	60 Hz 110/220 – 120/208 – 127/220 – 220/440 – 240/480[1] – 254/440[1] V
Trinidad	60 Hz 110/220 – 120/240 – 230/400 V
South America:	
Argentina	50 Hz 220/380 V
Bolivia	60 Hz 220/380 – 480 V, 50 Hz 110/220 – 220/380 V (exception)
Brazil	60 Hz 110/220 – 220/440 – 127/220 – 220/380 V
Chile	50 Hz 220/380 V
Ecuador	60 Hz 120/208 – 127/220 V
Guyana	50 Hz 110/220 V (Georgetown), 60 Hz 110/220 – 240/480 V
Columbia	60 Hz 110/220 – 150/260 – 440 V
Paraguay	60 Hz 220/380 – 220/440 V
Peru	60 Hz 220 – 220/380/440 V
Surinam	60 Hz 115/230 – 127/220 V
Uruguay	50 Hz 220 V
Venezuela	60 Hz 120/208 – 120/240 – 208/416 – 240/480 V
Africa:	
Egypt	50 Hz 110/220 – 220/380 V
Ethiopia	50 Hz 220/380 V
Algeria	50 Hz 127/220 – 220/380 V
Angola	50 Hz 220/380 V
Benin	50 Hz 220/380 V
Ivory Coast	50 Hz 220/380 V
Gabon	50 Hz 220/380 V
Ghana	50 Hz 127/220 – 220/380 V
Guinea	50 Hz 220/380 V
Kenya	50 Hz 220/380 V
Cameroon	50 Hz 127/220 – 220/380 V
Congo	50 Hz 220/380 V
Liberia	60 Hz 120/208 – 120/240 V
Libya	50 Hz 127/220 [2] – 220/380 V
Madagascar	50 Hz 127/220 – 220/380 V
Malawi	50 Hz 220/380 V
Mali	50 Hz 220/380 V
Morocco	50 Hz 115/200 – 127/220 – 220/380 – 500[1] V
Mauritius	50 Hz 240/415 V
Mozambique	50 Hz 220/380 V
Namibia	50 Hz 220/380 V
Niger	50 Hz 220/380 V

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Mains specifications, line-side connection

International supply voltages and frequencies in low-voltage supply systems (continued)

Country	Mains voltage
Africa (continued)**:**	
Nigeria	50 Hz 220/415 V
Rwanda	50 Hz 220/380 V
Zambia	50 Hz 220/380 V – 415 – 550[1)] V
Senegal	50 Hz 127/220 – 220/380 V
Sierra Leone	50 Hz 220/380 V
Somalia	50 Hz 220-220/440 V
Sudan	50 Hz 240/415 V
South Africa	50 Hz 220/380 – 500[1)] – 550/950[1)] V
Swaziland	50 Hz 220/380 V
Tanzania	50 Hz 230/400 V
Togo	50 Hz 127/220 – 220/380 V
Tunisia	50 Hz 115/200 – 220/380 V
Uganda	50 Hz 240/415 V
Zaire	50 Hz 220/380 V
Zimbabwe	50 Hz 220/380 V

Connection and fusing on the line side

All SITOP and LOGO!Power supplies are built-in devices. For installation of the devices, the relevant DIN/VDE specifications or country-specific regulations must be taken into account. The supply voltage must be connected in accordance with VDE 0100 and VDE 0160. On installation, protective gear and isolating gear must be provided for disconnecting the power supply.

Power supply units cause a current inrush immediately after application of the input voltage due to charging of the load capacitor; it soon falls back to the rated input current level after a few milliseconds. Aside from the internal impedances of the power supply, the current inrush is largely dependent on the size of the input voltage applied as well as the source impedance of the supply network and the line impedance of the supply line. The maximum current inrush for SITOP power supplies is specified in the applicable technical data. It is important for dimensioning up-circuit protective devices.

Single-phase SITOP and LOGO!Power supplies are equipped with internal device protection (fuses). For connection to the supply system, only one protective device (fuse or circuit-breaker) must be provided for conductor protection in accordance with the current rating of the installed cable. The circuit-breakers recommended in the data sheets and operating instructions have been selected such that even during the maximum current inrush that can occur under worst case conditions on switching on the supply voltage, the circuit-breaker will not trip.

Three-phase SITOP power supplies do not have internal device protection. The up-circuit protective device (three-phase coupled miniature circuit-breaker or motor protection switch) protects the cables and devices. The protective devices specified in the data sheets and operating instructions are optimized to the characteristics of the relevant power supplies.

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Possible system disturbances and causes

Overview

The quality of the mains voltage has become a decisive factor in the functioning, reliability, maintenance costs and service life of highly sensitive electronic installations and devices (computers, industrial controls, instrumentation, etc.).

Mains disturbances cause system failures and affect the function of plants as well as electronic consumers. They can also result in total failure of the installation or equipment.

The most frequent types of disturbance are:

- Long-term overvoltages
- Long-term undervoltages
- Burst interference and transients
- Voltage reduction and surges
- Electrical noise
- Momentary mains breaks
- Long-term mains breaks

Mains disturbances can be caused by a number of things, e.g.:

- Switching operations in the supply system
- Long cable paths in the supply system
- Environmental influences, such as storms
- Mains overloads

Typical causes of mains disturbances generated in-house are:

- Thyristor-controlled drives
- Lifts, air-conditioning, photocopiers
- Motors, power factor correction equipment
- Electrical welding, large machines
- Switching of lighting equipment

Disturbances in mains voltages can occur individually or in combination. Possible reasons for these disturbances and reactions can be:

Mains disturbances	Percentage of total disturbance	Effect
Overvoltage Over a long period, the mains voltage is exceeded by more than +6% (acc. to DIN IEC 60038)	approx. 15% - 20%	Can result in overheating and even thermal destruction of individual components. Causes total failure.
Undervoltage Over a long period, the mains voltage is reduced by more than 10% (acc. to DIN IEC 60038)	approx. 20% - 30%	Can result in undefined operating states for loads. Causes data errors.
Burst interference Energy-rich impulses (e.g. 700 V/1 ms) and energy-poor transients (e.g. 2500 V/20 µs) result from switching operations in the supply system	approx. 30% - 35%	Can result in undefined operating states for the loads and can lead to the destruction of components.
Voltage reduction and surges The voltage level changes suddenly and in an uncontrolled manner, e.g. due to changes in loading and long cable runs	approx. 15% - 30%	Can result in undefined operating states and destruction of components. Causes data errors.
Electrical noise A mix of frequencies superimposed on the mains due to bad grounding and/or strong HF emitters, such as television transmitters or storms	approx. 20% - 35%	Can result in undefined operating states for loads. Causes data errors.
Voltage interruption Short-term interruption of the mains voltage (up to 10 ms), due to short-circuiting in neighboring supply systems or starting of large electrical machines	approx. 8% - 10%	Can result in undefined operating states for loads especially those with insufficient mains buffering. Causes data errors.
Voltage interruption Long interruption of the mains voltage (longer than 10 ms)	approx. 2% - 5%	Can result in undefined operating states for loads especially those with insufficient mains buffering. Causes data errors.

Mains disturbances and effects

The SITOP product family offers a range of possibilities for minimizing or preventing the risk of mains disturbances at the planning stage.

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Mounting, Mounting areas and fixing options

Mounting

All SITOP and LOGO!Power supplies are built-in devices. With the exception of the variants with IP65 degree of protection, the power supplies must be mounted vertically so that the air can enter the ventilation slots at the bottom of the devices and leave through the upper part of the devices. If the units are not mounted vertically (at your own risk), the ambient temperature should not exceed +45 °C and the load current should not exceed approx. 50% of the rated current value. Variants with IP65 degree of protection can be mounted in any mounting position. The minimum distances specified in the corresponding operating manual for the top, bottom, and side of the devices must be observed to ensure free air convection.

Mounting areas and fixing options

Power supply	Order No.	Required mounting area in mm (W x H)	Mounting on a standard rail acc. to DIN EN 50022		Wall mounting
			35 x 7.5 mm	35 x 15 mm	
SITOP power 24 V, one-phase and two-phase power supplies					
24 V/0.5 A	6EP1331-2BA10	22.5 x 180	X	X	
24 V/0.375 A	6EP1731-2BA00	22.5 x 180	X	X	
24 V/2 A	6EP1331-2BA00	50 x 225	X	X	
	6ES7307-1BA00-0AA0	50 x 205		1)	
	6ES7305-1BA80-0AA0	80 x 225		1)	
	6EP1732-0AA00	80 x 235		X	X
24 V/2.5 A	6EP1332-1SH12	80 x 335		X	X
24 V/3.5 A	6EP1332-1SH31	160 x 280	X	X	X
24 V/4 A	6EP1332-1SH22	80 x 335		X	X
24 V/5 A	6EP1333-3BA00	70 x 225	X	X	
	6EP1333-2BA00	75 x 225	X	X	
	6EP1333-2AA00	75 x 225	X	X	
	6ES7307-1EA00-0AA0	80 x 205		1)	
	6ES7307-1EA80-0AA0	80 x 225		1)	
	6EP1333-1AL12	160 x 230	X	X	
24 V/10 A	6EP1334-3BA00	90 x 225	X	X	
	6EP1334-2BA00	100 x 225	X	X	
	6EP1334-2AA00	100 x 225	X	X	
	6EP1334-2CA00	160 x 290			X
	6ES7307-1KA01-0AA0	120 x 205		1)	
	6EP1334-1AL12	160 x 230	X	X	
	6EP1334-1SH01	200 x 325		X	
24 V/20 A	6EP1336-3BA00	160 x 225	X	X	
	6EP1336-2BA00	320 x 225	X	X	
	6EP1536-2AA00	320 x 280	X	X	
24 V/40 A	6EP1337-3BA00	240 x 225	X	X	
SITOP power 24 V, three-phase power supplies					
24 V/10 A	6EP1434-2BA00	320 x 225	X	X	
24 V/20 A	6EP1436-3BA00	160 x 225	X	X	
	6EP1436-2BA00	320 x 225	X	X	
24 V/30 A	6EP1437-2BA00	320 x 280	X	X	
24 V/40 A	6EP1437-3BA00	240 x 225	X	X	
	6EP1437-2BA10	320 x 280	X	X	
SITOP power 24 V, uninterruptible power supplies					
DC UPS 6 A (with serial interface / USB interface)	6EP1931-2DC21 (-2DC31/-2DC41)	50 x 225	X	X	
DC UPS 15 A (with serial interface / USB interface)	6EP1931-2EC21 (-2EC31/-2EC41)	50 x 225	X	X	
DC UPS 40 A	6EP1931-2FC01	280 x 290	X	X	

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Power supply	Order No.	Required mounting area in mm (W x H)	Mounting on a standard rail acc. to DIN EN 50022		Wall mounting
			35 x 7.5 mm	35 x 15 mm	
SITOP power 24 V, uninterruptible power supplies					
Battery module 2.5 Ah	6EP1935-6MD31	285 x 171	X	X	X
Battery module 3.2 Ah	6EP1935-6MD11	210 x 171	X	X	X
Battery module 7 Ah	6EP1935-6ME21	206 x 188			X
Battery module 12 Ah	6EP1935-6MF01	273 x 138			X
SITOP power 24 V, additional components					
Buffer module	6EP1961-3BA00	70 x 225	X	X	
Redundancy module	6EP1961-3BA20	70 x 225	X	X	
Diagnosis module	6EP1961-2BA00	72 x 190	X	X	
SITOP power alternative voltages					
3-52 V/120 W	6EP1353-2BA00	75 x 225	X	X	
2 x 15 V/3.5 A	6EP1353-0AA00	75 x 325	X	X	
48 V/20 A	6EP1457-3BA00	240 x 255	X	X	
SITOP power AS interface					
30 V/2.4 A	6EP1632-1AL01	260 x 80			X
30 V/7 A	6EP1354-1AL01	200 x 325		X	
LOGO!Power supplies					
5 V/3 A	6EP1311-1SH02	54 x 130	X	X	
12 V/1.9 A	6EP1321-1SH02	54 x 130	X	X	
15 V/1.9 A	6EP1351-1SH02	54 x 130	X	X	
24 V/1.3 A	6EP1331-1SH02	54 x 130	X	X	
5 V/6.3 A	6EP1311-1SH12	72 x 130	X	X	
12 V/4.5 A	6EP1322-1SH02	72 x 130	X	X	
15 V/4 A	6EP1352-1SH02	72 x 130	X	X	
24 V/2.5 A	6EP1332-1SH42	72 x 130	X	X	
24 V/4 A	6EP1332-1SH51	90 x 130	X	X	

1) With an additional mounting adapter.

Planning aids

For planning and construction, operating manuals with mounting options, dimension drawings, and principle circuits with pin names in different file formats (suitable for CAD applications) are available for download on the Internet.

Additional information is available in the Internet under:



http://www.siemens.com/automation/sitop

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Parallel connection for redundant operation and performance enhancement

Parallel connection for redundant operation

Two SITOP power supplies of the same type can be connected in parallel through diodes for a redundant configuration. Hundred percent redundancy only exists for two power supplies when the total load current is no higher than that which one power supply can supply alone and when the supply for the primary side is also implemented redundantly (i.e. a short-circuit on the primary side will not trigger a shared fuse which would disconnect both power supplies from the mains).

Parallel connection with decoupling diodes for redundant operation is permitted for all SITOP power supplies. The diodes V1 and V2 are used for decoupling. They must have a blocking voltage of at least 40 V and it must be possible to load them with a current equal to or greater than the maximum output current of the respective SITOP power supply. For diode dimensioning, see the following note "General information on selection of diodes".

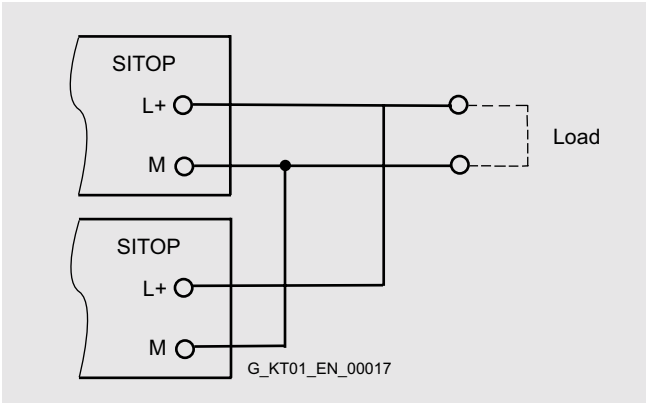
As a simple alternative to diode dimensioning, the prepared add-on module "SITOP modular redundancy module" (Order No. 6EP1961-3BA20, see Section 8) is available for redundant connection of two power supplies.

General information on selection of diodes:

The diodes must be dimensioned for the maximum dynamic current. This can be the dynamic current during power-up in the short-circuit case or the dynamic current during a short-circuit in operation (the largest of the two values should be taken from the relevant technical specifications).

To dissipate the significant power losses of the decoupling diodes (current x diode conductive-state voltage), the diodes must be mounted on suitably dimensioned heat sinks.

An additional safety margin is recommended, because the output capacitor integral to the power supply generates an additional peak current in the short-circuit case. This additional current flows only for a few milliseconds which is a period (< 8.3 ms, so-called permissible surge current for diodes) in which diodes are permitted to be loaded with a multiple of the rated current.



Parallel connection of two SITOP power supplies for redundant operation

Example 1

Two single-phase SITOP modular power supplies with 10 A rated output current (Order No.: 6EP1334-3BA00) are connected in parallel. The dynamic current in the event of a short-circuit during operation is approx. 30 A for 25 ms.

The diodes should therefore have a loading capability of 40 A to be safe, the common heat sink for both diodes must be dimensioned for the maximum possible current of approx. 24 A (RMS sustained short-circuit current) x diode conductive-state voltage.

Example 2

Two SITOP power supplies with 40 A rated output current (Order No. 6EP1437-2BA10) are connected in parallel. The dynamic current in the event of a short-circuit during operation is approx. 70 A for 600 ms, the RMS value is < 54 A.

The selected diodes should therefore have a loading capability of 100 A to be safe, the heat sink per diode must be dimensioned for the continuous possible current of 54 A x diode conductive-state voltage.

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Parallel connection for performance enhancement

To enhance performance, identical types of most SITOP power supplies can be connected in parallel galvanically (the same principle as parallel connection for redundant operation, but without decoupling diodes):

Advantage

The costs for mounting the diodes onto heat sinks and the not insignificant power losses of the decoupling diodes (current x diode conducting-state voltage) are avoided.

The types permitted for direct galvanic parallel connection are listed in the relevant technical specifications under "Output, parallel connection for performance enhancement".

Precondition

- The output cables connected to terminals L+ and M of every SITOP power supply should be installed with an identical length and cross-section (or the same impedance) to the common external linking point.
- The SITOP power supplies connected in parallel must be switched simultaneously using a common switch in the mains supply line (e.g. using the main switch available in control cabinets).
- The output voltages of the power supplies must be measured under no-load operation before they are connected in parallel and are permitted to differ by up to 50 mV. This usually corresponds to the factory default setting. If the output voltage is changed in the case of variable power supplies, the M terminals should first be connected and then the voltage difference between the L+ output terminals measured under no-load conditions before these are connected. This voltage difference must not exceed 50 mV.

Note

With a direct galvanic connection in parallel of more than two SITOP power supplies, further circuit measures may be necessary for short-circuit and overload protection!

Parallel connection for redundant operation and for performance enhancement

Almost 100% redundancy

Using the types permitted for direct galvanic parallel connection (see the relevant technical specifications under "Output, parallel connection for performance enhancement"), the performance can be increased without the need for decoupling diodes and redundancy of almost 100% can be implemented by direct galvanic parallel connection of an additional power supply of the same type to the power supplies required to satisfy the performance requirements. This means that at least one more power supply is required than is necessary for the sum of all load currents.

A decoupling diode is normally required for redundancy to ensure that a power supply that has failed as a result of short-circuiting of the outputs (especially as a result of short-circuiting the output electrolytic capacitor) does not also short-circuit the power supply that remains intact. A redundancy of almost 100% can be implemented with this type of circuit.

Example

A load current of up to 40 A is required, the power supply must operate on both 400 V and 500 V three-phase supplies (without switch-over).

The three-phase 20 A SITOP modular power supply (Order No.: 6EP1436-3BA00) is suitable for this purpose. For load currents up to 40 A, direct galvanic parallel connection of two SITOP modular power 20 supplies is necessary. By connecting another SITOP modular 20 in parallel, performance enhancement and redundancy are implemented simultaneously (if one of the three power supplies fails to supply an output voltage, the remaining two 20 A power supplies are capable of supplying a total load current of 40 A).

Note

With a direct galvanic connection in parallel of more than two SITOP power supplies, further circuit measures may be necessary for short-circuit and overload protection!

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Series connection to increase the voltage

Series connection to increase the voltage

To generate a load voltage of e.g. 48 V DC, two 24 V SITOP power supplies of the same type can be connected in series. The SITOP outputs L+ and M are isolated up to at least 60 V DC against PE (air gaps and creepage distances as well as radio interference suppression capacitors on L+ and M against PE), so that with this type of series connection (see Figure), the following points can be earthed:

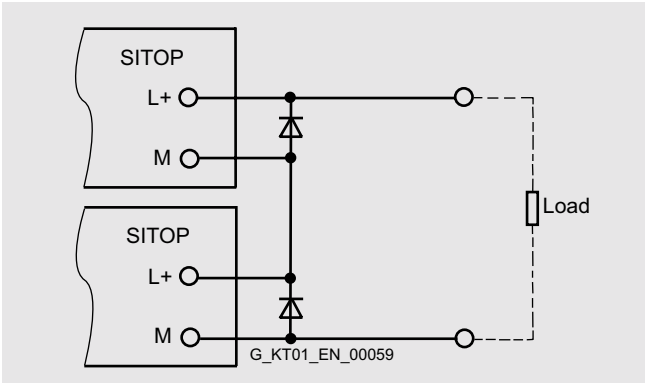
- M of the lower power supply (results in +48 V DC against PE)
- Midway M/L+ between both power supplies (results in ± 24 V DC against PE)
- L+ of the upper power supply (results in – 48 V DC against PE)

Note:

If two devices are connected in parallel, it cannot be guaranteed that the voltage will remain below maximum permissible SELV voltage of 60 V DC in the event of a fault.

The purpose of diodes V1 and V2 is to protect the electrolytic output capacitor integrated in the power supply against reverse voltages > 1 V. As a result of the not absolutely simultaneous power-up (even when a common mains switch is used for switching on, differences of a few tens of milliseconds can occur between the various start-up delays), the SITOP power which starts up more quickly supplies current from output L+ to the M output of the slower SITOP power whose output electrolytic capacitor is then theoretically impermissibly discharged.

The internal LC filter causes the internal rectifier diode on the secondary side to accept this current a few milliseconds later; this means that the external diode connected with its anode to M and cathode to L+ is essential on each power supply. These diodes are, however, only loaded dynamically, so the 8.3 ms surge current loading capability (specified in the data sheets for suitable diodes) can be used as a basis for dimensioning and it is not usually necessary to cool the diodes using heat sinks.



Series connection: Two SITOP power supplies for doubling the voltage

Example:

Two single-phase SITOP power supplies with 10 A rated output current (Order No.: 6EP1334-2BA00) should be connected in series to increase the voltage. They supply approximately 38 A dynamically for 200 ms on power-up in the short-circuit case or e.g. also with loads with a high-capacitance input capacitor that momentarily act as a short-circuit at the start.

Suitable diodes for V1 and V2 are, for example, of Type SB 340 [1] (Schottky diode in axially wired enclosure DO-201AD with approx. 5.3 mm diameter and approx. 9.5 mm length of body).

40 V are permissible as the blocking voltage, and the stationary direct current load capacity $I_{F\,AV}$ is 3 A. The important dynamic surge current loading capacity $I_{F\,SM}$ important in this case is sufficient for the selected SITOP power supply (more than 100 A for 8.3 ms). For SITOP power supplies with a low rated output current, this diode can also be used, but is over-dimensioned.

- Manufacturer: General Instrument
- Distributor: e.g. RS Components, Spoerle

1) We do not accept any liability for this diode recommendation.

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Battery charging with SITOP power supplies

The SITOP modular power supplies 5 A to 40 A with stabilized output voltage that can be set between 24.0 V and 28.8 V supply a constant output current of approximately 1.2 x rated current under overload conditions (e.g. a completely discharged 24 V lead-acid battery). In the case of a V/I characteristic set for parallel operation, the battery will be charged with a constant current until approximately 95% of the set SITOP output voltage has been achieved. The charging current is then continuously reduced from 1.2 x rated current at 95% of the set voltage to approx. 0 A or the self-discharge current of the battery at 100% of the set output voltage, i.e. resistance characteristic in this range.

As reverse voltage protection and polarity reversal protection, we recommend that a diode suitable for at least 1.2 x rated current of the power supply with a blocking voltage of at least 40 V is connected in series with the + output (anode connected to + output of the SITOP modular and cathode connected to positive pole of the battery).

The output voltage of the power supply must be set at no-load to the end-of-charge voltage plus the voltage drop at the diode. For an end-of-charge voltage of e.g. 27.0 V DC (usual at 20 °C to 30 °C battery temperature; in each case, compliance with the specifications of the battery manufacturer must be observed!) and 0.8 V voltage drop at the diode, SITOP modular must be set to 27.8 V during no-load operation.

General note for using SITOP power supplies as a battery charging unit

When SITOP modular is used as a battery charging unit, the regulations of VDE 0510 or the relevant national regulations must be observed and adequate ventilation must be provided. The SITOP modular power supplies are designed as rack-mounting units, and protection against electric shock should therefore be provided by installation in an appropriate housing.

The value recommended by the battery manufacturer must be set as the end-of-charge voltage (depending on the battery temperature). An ideal temperature for the lead-acid battery is between +20 and 30 °C and the recommended end-of-charge voltage in this case is usually about 27 V.

Fusing of 24 V power supply circuits and selectivity

With unstabilized rectifiers (power transformer equipped with rectifier) the output usually had to be protected with a suitable fuse so that its rectifier diodes would not fail in the event of an overload or a short-circuit (this would destroy the DC loads due to the resulting alternating voltage and lead to serious damage in most cases).

On the other hand, the stabilized SITOP power supplies comply with the standard applicable to the electrical equipment of machines DIN VDE 0113 Part 1, Section 7.2.9 (November 1998) or EN 60204-1 and are provided with integral electronic short-circuit protection which automatically protects both the power supply and the supplied 24 V DC circuits against an excess current in the event of an overload/short-circuit. A differentiation must be made between the following three cases with respect to fusing on the secondary side:

Example 1: No fusing

Fusing the secondary side (24 V DC) for protecting the load circuits and lines is not required if the respective cross-sections are selected for the maximum possible output current RMS value. Depending on the event (short-circuit or overload) this may either be the short-circuit RMS value or the current limitation value.

Example SITOP power 10 (Order No.: 6EP1334-2BA00)

- Rated current 10 A
- Current limitation typ. 13 to 15 A
- Short-circuit RMS value < 21 A

The technical specifications usually specify typical values, maximum values are approx. 2 A above the typical value. In the example here, a maximum possible output current RMS value of approx. 23 A must therefore be used for line dimensioning.

Example 2: Reduced cross-sections

If smaller cross-sections are used than specified in DIN VDE 0113 Part 1 or EN 60204-1, the associated 24 V load supply lines must be provided with appropriate line protection (see DIN VDE 0113 Part 1 or EN 60204-1).

It is then unimportant whether the power supply enters current limiting mode (overload) or delivers the maximum short-circuit current (low-resistance short-circuit). The load supply line is in any case protected against an overload by the line protection matched to the conductor cross-section.

Example 3: Selectivity

In cases where a load which has failed (e.g. because of a short-circuit) has to be rapidly detected or where it is essential to selectively switch it off before the power supply enters current limiting mode (with current limiting mode, the voltage would also fall for all remaining 24 V DC loads), there are two possibilities for the secondary side connection.

- **Use of a 4-channel electronic diagnosis module SITOP select (Order No.: 6EP1961-2BA00), with a current adjustable from 2 A to 10 A for each channel**
- Series connection of appropriate 24 V DC fuses or circuit-breakers

The basis for selection of the 24 V DC fuse or circuit-breaker is the short-circuit current above the rated current which the SITOP power supplies deliver in the event of a short-circuit during operation (values are specified in the respective technical specifications under "Output, dynamic V/I on short-circuit during operation").

It is not easy to calculate the amount of the short-circuit current flowing into the usually not ideal "short-circuit" and the amount flowing into the remaining loads. This depends on the type of overload (high-resistance or low-resistance short-circuit) and the type of load connected (resistive, inductive and capacitive/electronic loads).

However, it can be assumed with a first approximation in the average case encountered in practice that the difference of dyn. V/I minus 50% SITOP rated output current is available for the immediate tripping of a circuit-breaker within a typical time of 12 ms (with 14 times the rated DC with a circuit-breaker characteristic C acc. to IEC 898 or with 7 times the rated DC with a circuit-breaker characteristic B or with 5 times the rated DC with a circuit-breaker characteristic A). Please refer to the following tables for circuit-breakers appropriate for selected fusing according to this assumption.

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Fusing of the output circuit 24 V DC, selectivity

List of ordering data and tripping characteristics of single-pole circuit-breakers 5SY4...

acc. to IEC 898/EN 60898 (DIN VDE 0641 Part 11), for use up to 60 V DC (250 V AC, switching capacity 10,000 A)

Rated current	Tripping characteristic	Order No.	Range for immediate tripping < 100 ms for operation with direct current (alternating current)	Required DC for immediate tripping in < 100 ms	Required DC for immediate tripping in approx. 12 ms
1 A	Type A	5SY4 101-5	DC: 2 to 5 (AC: 2 to 3) x I_{rated}	2 to 5 A DC	5 A DC
1 A	Type C	5SY4 101-7	DC: 5 to 14 (AC: 5 to 10) x I_{rated}	5 to 14 A DC	14 A DC
1.6 A	Type A	5SY4 115-5	DC: 2 to 5 (AC: 2 to 3) x I_{rated}	3.2 to 8 A DC	8 A DC
1.6 A	Type C	5SY4 115-7	DC: 5 to 14 (AC: 5 to 10) x I_{rated}	8 to 22.4 A DC	22.4 A DC
2 A	Type A	5SY4 102-5	DC: 2 to 5 (AC: 2 to 3) x I_{rated}	4 to 10 A DC	10 A DC
2 A	Type C	5SY4 102-7	DC: 5 to 14 (AC: 5 to 10) x I_{rated}	10 to 28 A DC	28 A DC
3 A	Type A	5SY4 103-5	DC: 2 to 5 (AC: 2 to 3) x I_{rated}	6 to 15 A DC	15 A DC
3 A	Type C	5SY4 103-7	DC: 5 to 14 (AC: 5 to 10) x I_{rated}	15 to 42 A DC	42 A DC
4 A	Type A	5SY4 104-5	DC: 2 to 5 (AC: 2 to 3) x I_{rated}	8 to 20 A DC	20 A DC
4 A	Type C	5SY4 104-7	DC: 5 to 14 (AC: 5 to 10) x I_{rated}	20 to 56 A DC	56 A DC
6 A	Type A	5SY4 106-5	DC: 2 to 5 (AC: 2 to 3) x I_{rated}	12 to 30 A DC	30 A DC
6 A	Type B	5SY4 106-6	DC: 3 to 7 (AC: 3 to 5) x I_{rated}	18 to 42 A DC	42 A DC
6 A	Type C	5SY4 106-7	DC: 5 to 14 (AC: 5 to 10) x I_{rated}	30 to 84 A DC	84 A DC
8 A	Type A	5SY4 108-5	DC: 2 to 5 (AC: 2 to 3) x I_{rated}	16 to 40 A DC	40 A DC
8 A	Type C	5SY4 108-7	DC: 5 to 14 (AC: 5 to 10) x I_{rated}	40 to 112 A DC	112 A DC
10 A	Type A	5SY4 110-5	DC: 2 to 5 (AC: 2 to 3) x I_{rated}	20 to 50 A DC	50 A DC
10 A	Type B	5SY4 110-6	DC: 3 to 7 (AC: 3 to 5) x I_{rated}	30 to 70 A DC	70 A DC
10 A	Type C	5SY4 110-7	DC: 5 to 14 (AC: 5 to 10) x I_{rated}	50 to 140 A DC	140 A DC
13 A	Type A	5SY4 113-5	DC: 2 to 5 (AC: 2 to 3) x I_{rated}	26 to 65 A DC	65 A DC
13 A	Type B	5SY4 113-6	DC: 3 to 7 (AC: 3 to 5) x I_{rated}	39 to 91 A DC	91 A DC
13 A	Type C	5SY4 113-7	DC: 5 to 14 (AC: 5 to 10) x I_{rated}	65 to 182 A DC	182 A DC
16 A	Type A	5SY4 116-5	DC: 2 to 5 (AC: 2 to 3) x I_{rated}	32 to 80 A DC	80 A DC
16 A	Type B	5SY4 116-6	DC: 3 to 7 (AC: 3 to 5) x I_{rated}	48 to 112 A DC	112 A DC
16 A	Type C	5SY4 116-7	DC: 5 to 14 (AC: 5 to 10) x I_{rated}	80 to 224 A DC	224 A DC

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Ordering data and tripping characteristics of Siemens single-pole circuit-breaker terminals type 8WA1 011-...

Suitable for up to 60 V DC (250 V AC)

The following space-saving circuit-breaker terminals for mere short-circuit protection can only be snap-mounted on DIN rail EN 50 022-35x15. They are also available with an auxiliary switch (1 NO contact and 1 NC contact) and feature higher sensitivity than circuit breakers acc. to IEC 898 (EN 60 898), type B.

Tripping times/ranges are within narrower tolerances than those of circuit-breakers. When operated with DC, these circuit-breaker terminals do not trip at currents below the rated current, from 1.1 times the rated current, the circuit-breaker terminal may trip after as little as 100 ms.

The circuit-breaker rated value must therefore be above the load inrush current peak value. In general, however, the first three milliseconds of the load inrush current may be ignored because no less than 20 to 100 times the rated current is required to trip the circuit-breaker terminals during this period of time.

- The circuit-breaker terminals already trip after 40 ms at 1.2 to 1.9 times the rated DC.
- The circuit-breaker terminals already trip after 20 ms at 1.7 to 2.6 times the rated DC.
- The circuit-breaker terminals already trip after 12 ms at 2.2 to 3.8 times the rated DC.

Ordering data and tripping characteristics of Siemens single-pole circuit-breaker terminals type 8WA1 011-...

Rated current DC	2 A	4 A	6 A	10 A
Order No. (without auxiliary switch)	**8WA1 011-1SF25**	**8WA1 011-1SF26**	**8WA1 011-1SF27**	**8WA1 011-1SF28**
Order No. (with auxiliary switch 1 NO + 1 NC)	**8WA1 011-6SF25**	**8WA1 011-6SF26**	**8WA1 011-6SF27**	**8WA1 011-6SF28**
Required DC for immediate tripping in 40 ms	2.4 to 3.8 A	4.8 to 7.6 A	7.2 to 11.4 A	12 to 19 A
Required DC for immediate tripping in 20 ms	3.4 to 5.2 A	6.8 to 10.7 A	10.2 to 15.6 A	17 to 26 A
Required DC for immediate tripping in approx. 12 ms	4.4 to 7.6 A	8.8 to 15.2 A	13.2 to 22.8 A	22 to 38 A

For more data, refer to catalog "Industrial switchgear" (Catalog LV 10)

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Fusing of the output circuit 24 V DC, selectivity

Miniature circuit-breakers in 24 V DC circuits which are powered by SITOP power supply units

Technical specifications		
Type	**5 A**	**10 A**
Order No.	**6EP1 333-2BA00/ 6EP1 333-2AA00**	**6EP1 334-2BA00/ 6EP1 334-2AA00**
Input	Single-phase	Single-phase
Rated voltage $V_{in\ rated}$	**120/230 V AC**	**120/230 V AC**
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**	**24 V DC**
Rated current $I_{out\ rated}$	**5 A**	**10 A**
Dyn. V/I with short-circuit in operation, typ.	20 A for 350 ms	38 A for 200 ms
Tripping of output m.c.b	The following are approximately available for selective tripping in practice	
SITOP, dyn. V/I - 50% $I_{out\ rated}$, typ.	17.5 A for 350 ms	33 A for 200 ms
CBs to IEC 898, type 5SY4 1.., selectively trippable in approx. 12 ms	1 A Type A (trips at 5 A DC after typ. 12 ms) 1 A Type C (trips at 14 A DC after typ. 12 ms) 1.6 A Typ A (trips at 8 A DC after typ. 12 ms)	
	-	1.6 A Type C (trips at 22.4 A DC after typ. 12 ms)
	2 A Type A (trips at 10 A DC after typ. 12 ms)	
	-	2 A Type C (trips at 28 A DC after typ. 12 ms)
	3 A Type A (trips at 15 A DC after typ. 12 ms)	
	-	4 A Type A (trips at 20 A DC after typ. 12 ms)
	-	6 A Type A (trips at 30 A DC after typ. 12 ms)
Siemens CB terminals, Type 8WA1 011..., selectively trippable in approx. 12 ms	2 A Order No. 8WA1 011-1SF25 (trips at 7.6 A DC after max. 12 ms)	
	4 A Order No. 8WA1 011-1SF26 (trips at 15.2 A DC after max. 12 ms)	
	-	6 A Order No. 8WA1 011-1SF27 (trips at 22.8 A DC after max. 12 ms)
in 20 ms	-	10 A Order No. 8WA1 011-1SF28 (trips at 26 A DC after max. 12 ms)

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Miniature circuit-breakers in 24 V DC circuits which are powered by SITOP power supply units

Technical specifications		
Type	**5 A**	**10 A**
Order No.	**6EP1 333-3BA00**	**6EP1 334-3BA00**
Input	Single-phase, two-phase	Single-phase, two-phase
Rated voltage $V_{in\ rated}$	**120/230-500 V AC**	**120/230-500 V AC**
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**	**24 V DC**
Rated current $I_{out\ rated}$	**5 A**	**10 A**
Dyn. V/I with short-circuit in operation, typ.	15 A for 25 ms	30 A for 25 ms
Tripping of output m.c.b	The following are approximately available for selective tripping in practice	
SITOP, dyn. V/I - 50% $I_{out\ rated}$, typ.	12.5 A for 25 ms	25 A for 25 ms
CBs to IEC 898, type 5SY4 1.., selectively trippable in approx. 12 ms	1 A Type A (trips at 5 A DC after typ. 12 ms)	
	-	1 A Type C (trips at 14 A DC after typ. 12 ms)
	1.6 A Type A (trips at 8 A DC after typ. 12 ms)	
	-	1.6 A Type C (trips at 22.4 A DC after typ. 12 ms)
	2 A Type A (trips at 10 A DC after typ. 12 ms)	
	-	3 A Type A (trips at 15 A DC after typ. 12 ms)
	-	4 A Type A (trips at 20 A DC after typ. 12 ms)
Siemens CB terminals, Type 8WA1 011..., selectively trippable in approx. 12 ms	2 A Order No. 8WA1 011-1SF25 (trips at 7.6 A DC after max. 12 ms)	
	-	4 A Order No. 8WA1 011-1SF26 (trips at 15.2 A DC after max. 12 ms)
	-	6 A Order No. 8WA1 011-1SF27 (trips at 22.8 A DC after max. 12 ms)
in 20 ms	4 A Order No. 8WA1 011-1SF26 (trips at 10.7 A DC after max. 20 ms)	-

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Fusing of the output circuit 24 V DC, selectivity

Miniature circuit-breakers in 24 V DC circuits which are powered by SITOP power supply units

Technical specifications		
Type	**20 A**	**40 A**
Order No.	**6EP1 436-2BA00**	**6EP1 437-2BA10**
Input	Three-phase	Single-phase, two-phase
Rated voltage $V_{in\ rated}$	**400-500 V 3 AC**	**400-500 V AC**
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**	**24 V DC**
Rated current $I_{out\ rated}$	**20 A**	**40 A**
Dyn. V/I with short-circuit in operation, typ.	Approx. 30 A constant current	70 A for 600 ms
Tripping of output m.c.b	The following are approximately available for selective tripping in practice	
SITOP, dyn. V/I - 50% $I_{out\ rated}$, typ.	20 A (without interruption)	50 A for 600 ms
CBs to IEC 898, type 5SY4 1.., selectively trippable in approx. 12 ms	1 A Type A (trips at 5 A DC after typ. 12 ms)	
	1 A Type C (trips at 14 A DC after typ. 12 ms)	
	1.6 A Type A (trips at 8 A DC after typ. 12 ms)	
	-	1.6 A Type C (trips at 22.4 A DC after typ. 12 ms)
	2 A Type A (trips at 10 A DC after typ. 12 ms)	
	-	2 A Type C (trips at 28 A DC after typ. 12 ms)
	3 A Type A (trips at 15 A DC after typ. 12 ms)	
	-	3 A Type C (trips at 42 A DC after typ. 12 ms)
	4 A Type A (trips at 20 A DC after typ. 12 ms)	
	-	6 A Type A (trips at 30 A DC after typ. 12 ms)
	-	6 A Type B (trips at 42 A DC after typ. 12 ms)
	-	8 A Type A (trips at 40 A DC after typ. 12 ms)
	-	10 A Type A (trips at 50 A DC after typ. 12 ms)
Siemens CB terminals, Type 8WA1 011..., selectively trippable in approx. 12 ms	2 A Order No. 8WA1 011-1SF25 (trips at 7.6 A DC after max. 12 ms)	
	4 A Order No. 8WA1 011-1SF26 (trips at 15.2 A DC after max. 12 ms)	
	-	6 A Order No. 8WA1 011-1SF27 (trips at 22.8 A DC after max. 12 ms)
	-	10 A Order No. 8WA1 011-1SF28 (trips at 38 A DC after max. 12 ms)

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Miniature circuit-breakers in 24 V DC circuits which are powered by SITOP power supply units

Technical specifications		
Type	**20 A**	**40 A**
Order No.	**6EP1 436-3BA00 (6EP1 336-3BA00)**	**6EP1 437-3BA00 (6EP1 337-3BA00)**
Input	Three-phase (single-phase)	Three-phase (single-phase)
Rated voltage $V_{in\ rated}$	**400-500 V 3 AC (120/230 V AC)**	**400-500 V 3 AC (120/230 V AC)**
Output	Stabilized, floating direct voltage	Stabilized, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**	**24 V DC**
Rated current $I_{out\ rated}$	**20 A**	**40 A**
Dyn. V/I with short-circuit in operation, typ.	Approx. 60 A for 25 ms	Approx. 120 A for 25 ms
Tripping of output m.c.b	The following are approximately available for selective tripping in practice	
SITOP, dyn. V/I - 50% $I_{out\ rated}$, typ.	50 A for 25 ms	100 A for 25 ms
CBs to IEC 898, type 5SY4 1.., selectively trippable in approx. 12 ms	1 A Type A (trips at 5 A DC after typ. 12 ms)	
	1 A Type C (trips at 14 A DC after typ. 12 ms)	
	1.6 A Type A (trips at 8 A DC after typ. 12 ms)	
	1.6 A Type C (trips at 22.4 A DC after typ. 12 ms)	
	2 A Type A (trips at 10 A DC after typ. 12 ms)	
	2 A Type C (trips at 28 A DC after typ. 12 ms)	
	3 A Type A (trips at 15 A DC after typ. 12 ms)	
	3 A Type C (trips at 42 A DC after typ. 12 ms)	
	4 A Type A (trips at 20 A DC after typ. 12 ms)	
	-	4 A Type C (trips at 56 A DC after typ. 12 ms)
	6 A Type A (trips at 30 A DC after typ. 12 ms)	
	6 A Type B (trips at 42 A DC after typ. 12 ms)	
	-	6 A Type C (trips at 84 A DC after typ. 12 ms)
	8 A Type B (trips at 40 A DC after typ. 12 ms)	
	10 A Type A (trips at 50 A DC after typ. 12 ms)	
	-	10 A Type B (trips at 70 A DC after typ. 12 ms)
	-	13 A Type A (trips at 65 A DC after typ. 12 ms)
	-	13 A Type B (trips at 91 A DC after typ. 12 ms)
	-	16 A Type A (trips at 80 A DC after typ. 12 ms)
	-	20 A Type A (trips at 100 A DC after typ. 12 ms)
Siemens CB terminals, Type 8WA1 011..., selectively trippable in approx. 12 ms	2 A Order No. 8WA1 011-1SF25 (trips at 7.6 A DC after max. 12 ms)	
	4 A Order No. 8WA1 011-1SF26 (trips at 15.2 A DC after max. 12 ms)	
	6 A Order No. 8WA1 011-1SF27 (trips at 22.8 A DC after max. 12 ms)	
	10 A Order No. 8WA1 011-1SF28 (trips at 38 A DC after max. 12 ms)	

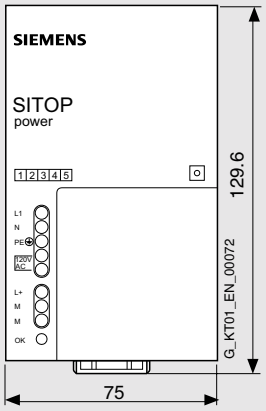
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Notes

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Dimension drawings

15



15/2 SITOP power
Single-, two-, three-phase

15/9 SITOP power
Additional components

15/11 SITOP power
Uninterruptible power supplies

15/13 SITOP power
Alternative voltages

15/14 SITOP power
AS interface power supplies

15/15 LOGO!Power

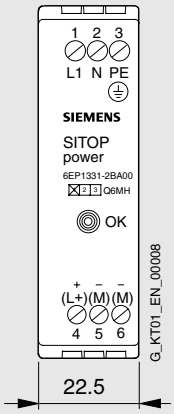


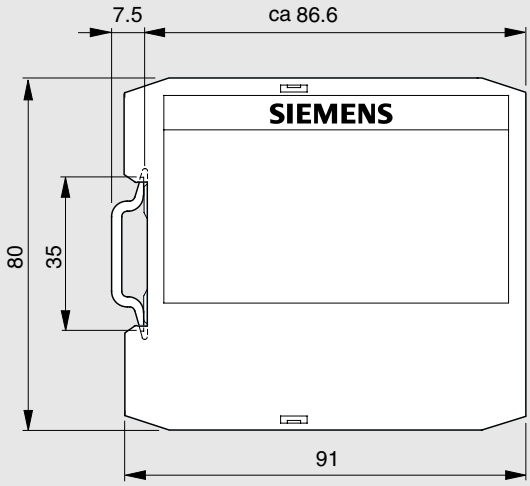
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SITOP power
Single-, two-, three-phase

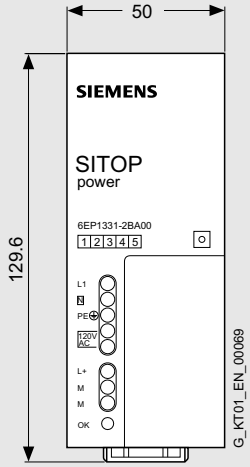
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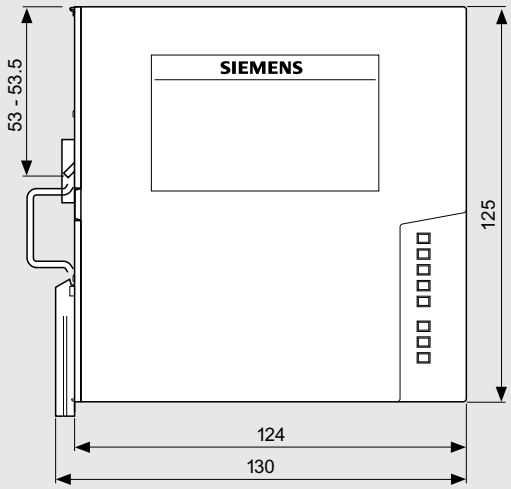
Order No.: **6EP1 331-2BA10, 6EP1 731-2BA00**



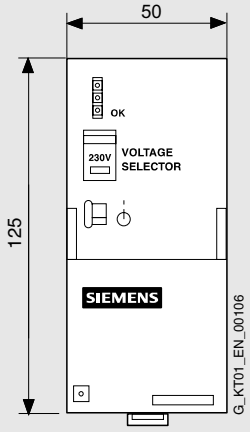


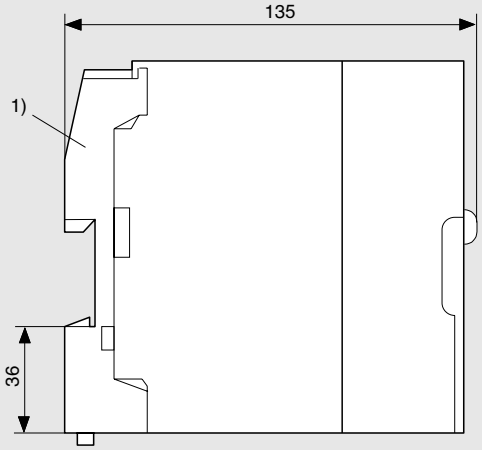
Order No.: **6EP1 331-2BA00**





Order No.: **6EP1 331-1SL11, 6ES7 307-1BA00-0AA0**



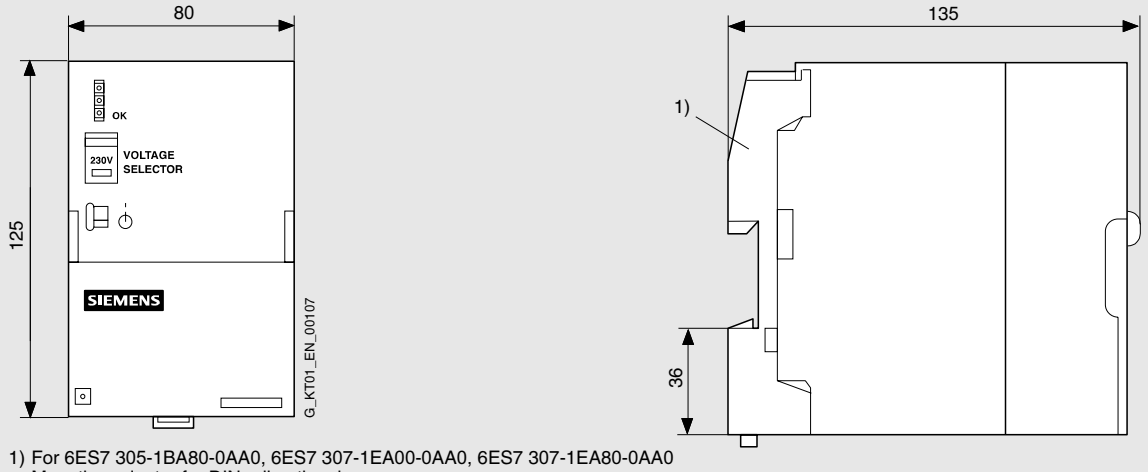


1) For 6ES7 307-1BA00-0AA0
Mounting adapter for DIN rail optional

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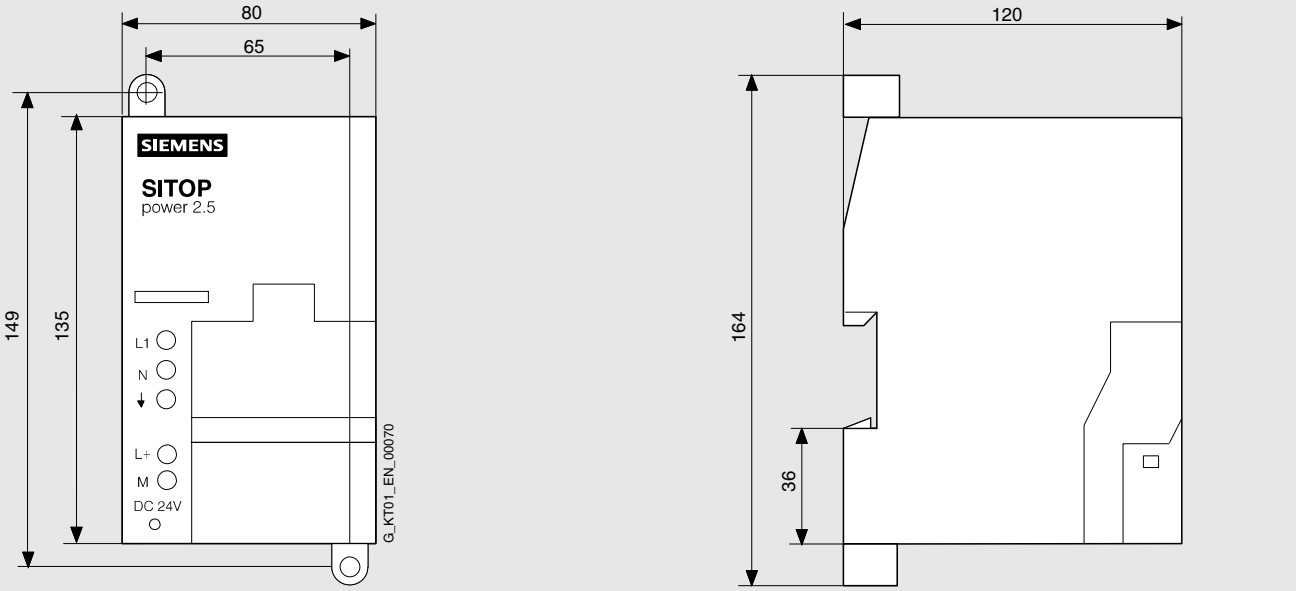
Dimensions in mm

Order No.: **6ES7 305-1BA80-0AA0, 6EP1 333-1SL11, 6ES7 307-1EA00-0AA0, 6ES7 307-1EA80-0AA0**

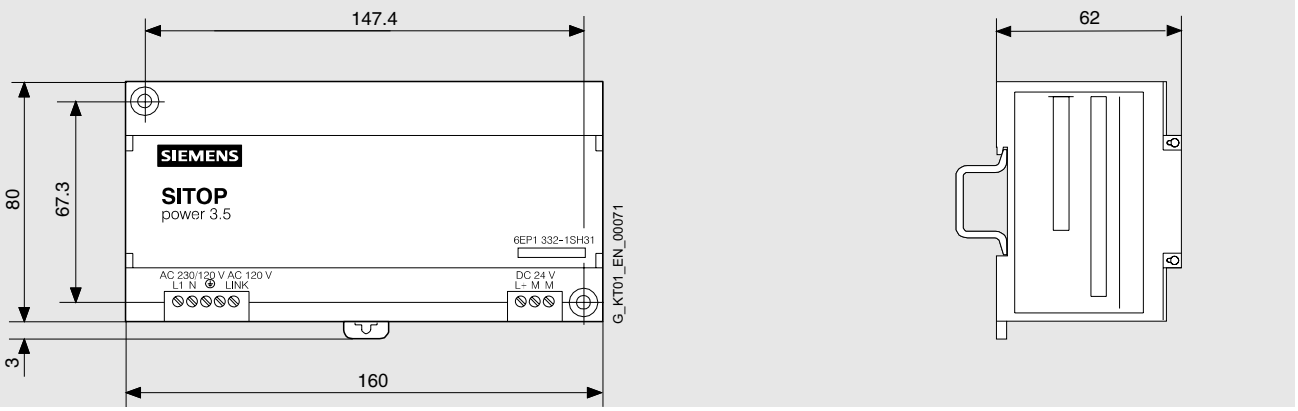


1) For 6ES7 305-1BA80-0AA0, 6ES7 307-1EA00-0AA0, 6ES7 307-1EA80-0AA0
Mounting adapter for DIN rail optional

Order No.: **6EP1 732-0AA00, 6EP1 332-1SH12, 6EP1 332-1SH22**



Order No.: **6EP1 332-1SH31**

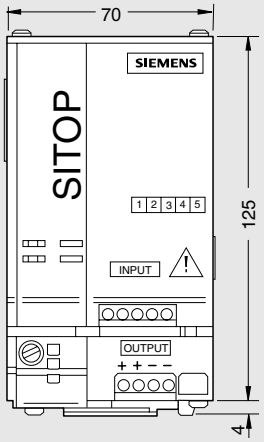


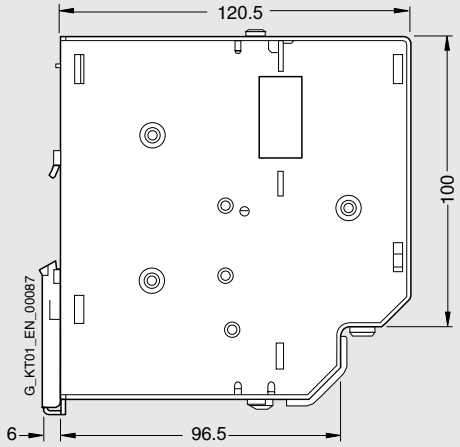
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SITOP power
Single-, two-, three-phase

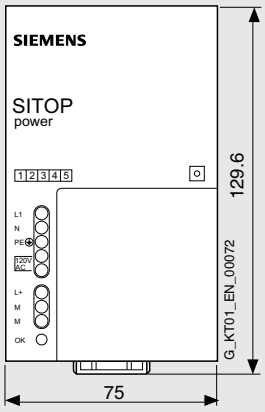
Dimensions in mm

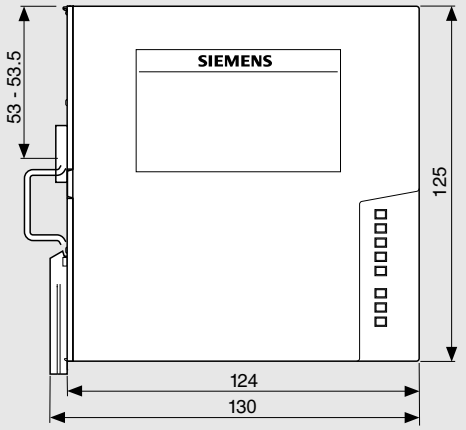
Order No.: **6EP1 333-3BA00**



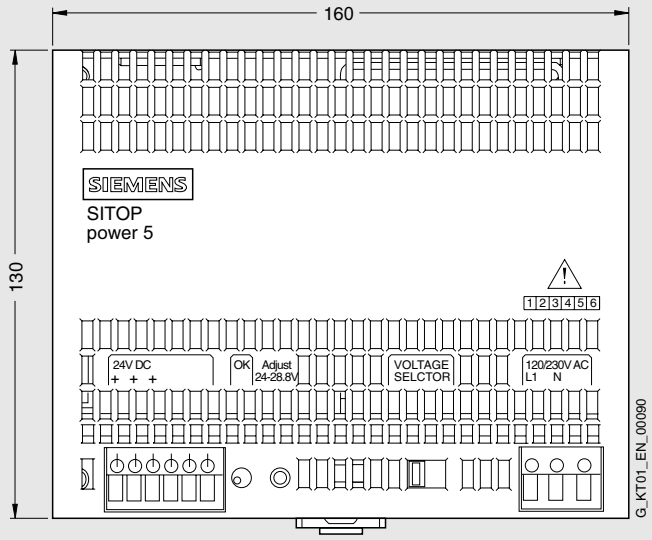


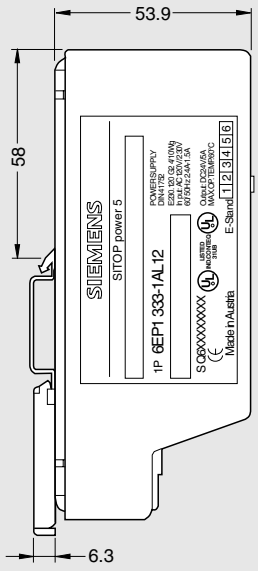
Order No.: **6EP1 333-2BA00, 6EP1 333-2AA00**





Order No.: **6EP1 333-1AL12, 6EA1 334-1AL12**

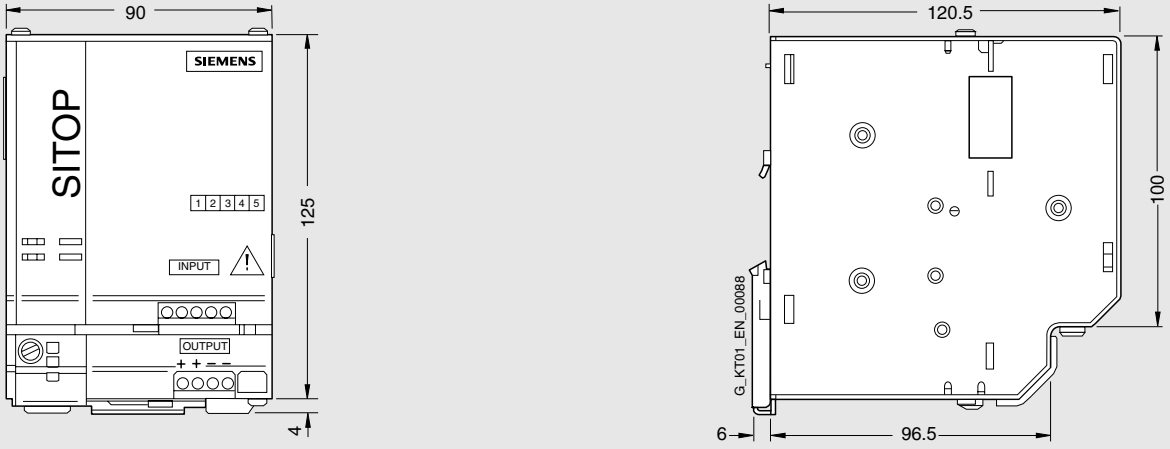




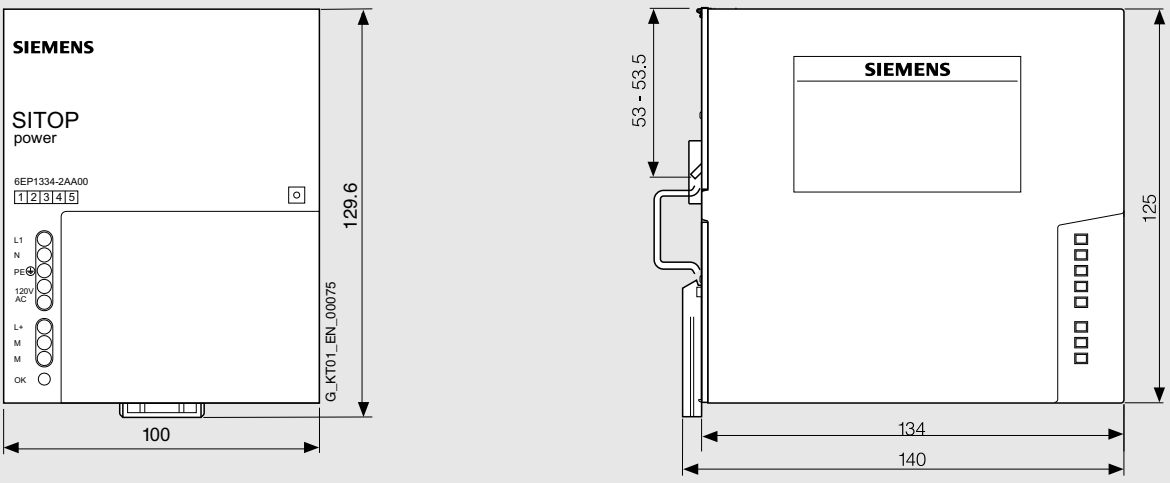
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Dimensions in mm

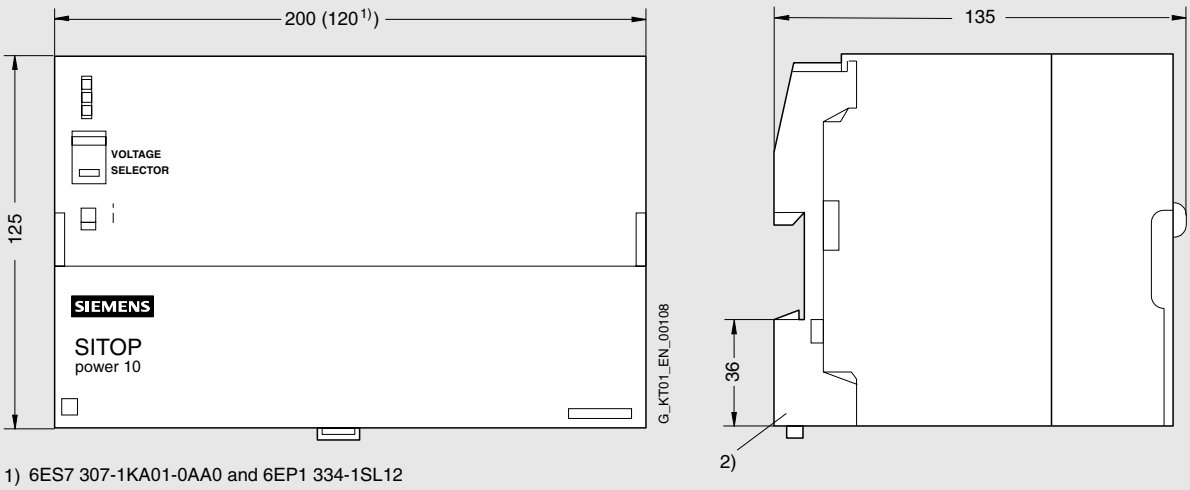
Order No.: **6EP1 334-3BA00**



Order No.: **6EP1 334-2BA00, 6EP1 334-2AA00**



Order No.: **6EP1 334-1SL12, 6ES7 307-1KA01-0AA0, 6EP1 334-1SH01**



1) 6ES7 307-1KA01-0AA0 and 6EP1 334-1SL12

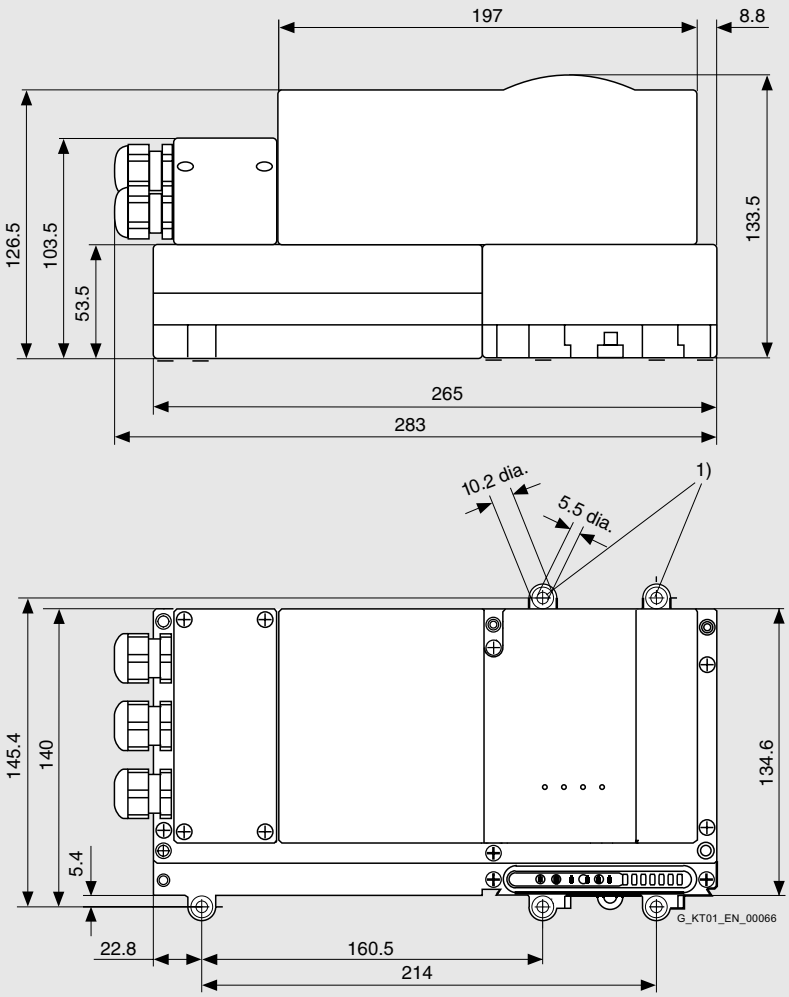
2) For 6ES7 307-1KA01-0AA0
Mounting adapter for DIN rail optional

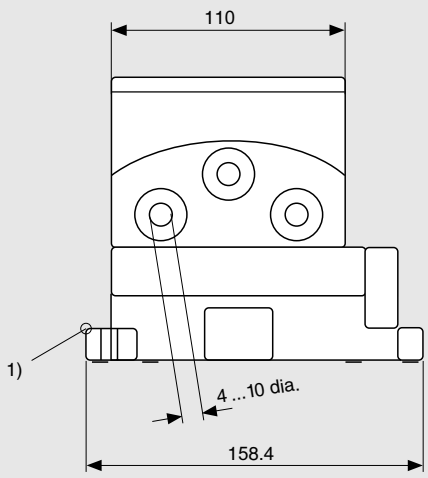
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SITOP power
Single-, two-, three-phase

Dimensions in mm

Order No.: **6EP1 334-2CA00**



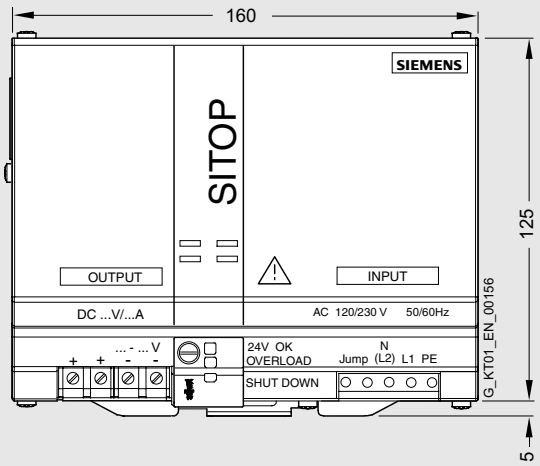


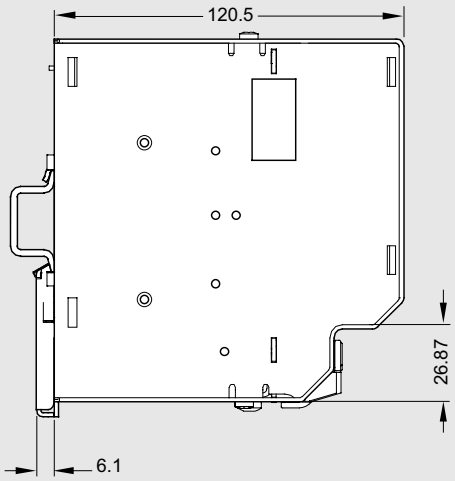
1) Fixing lugs
(only in connection with accessory connector seal 6EP1 971-2CA00)

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Dimensions in mm

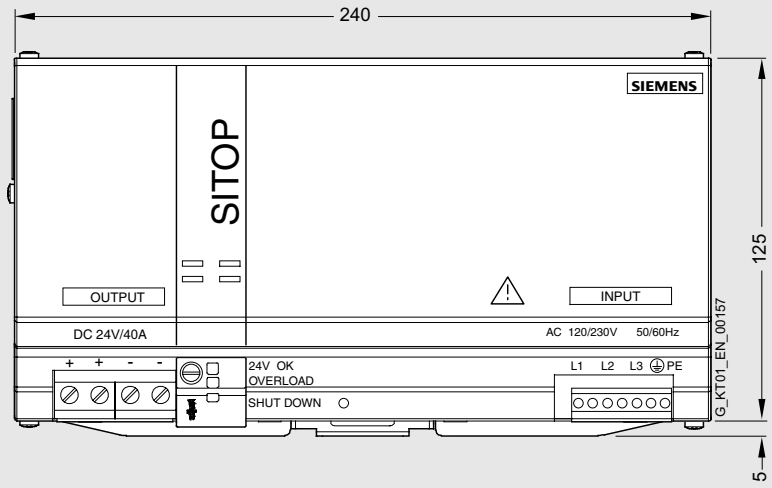
Order No.: **6EP1 336-3BA00, 6EP1 436-3BA00**

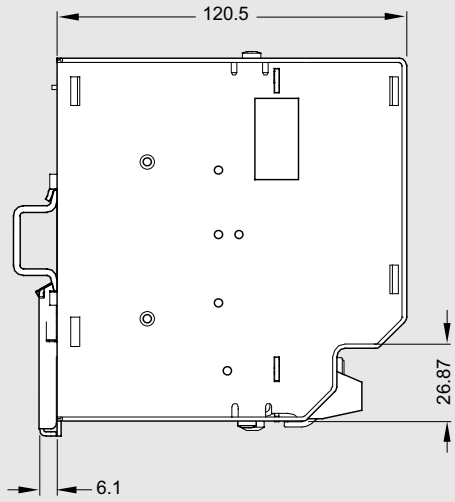




Snap-mounting on DIN rail
DIN EN 50022-35x15/7.5

Order No.: **6EP1 337-3BA00, 6EP1 437-3BA00**





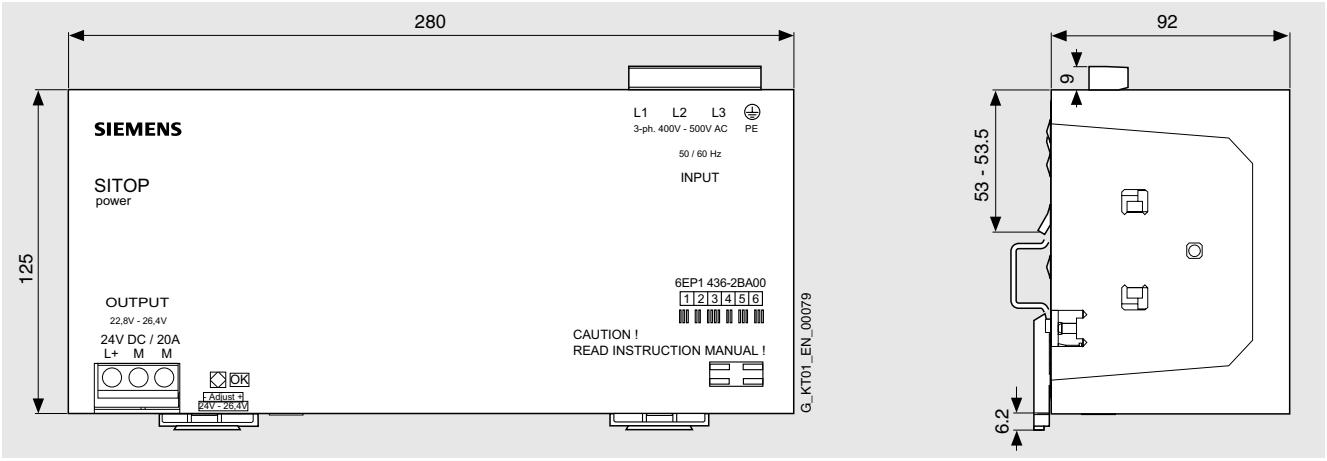
Snap-mounting on DIN rail
DIN EN 50022-35x15/7.5

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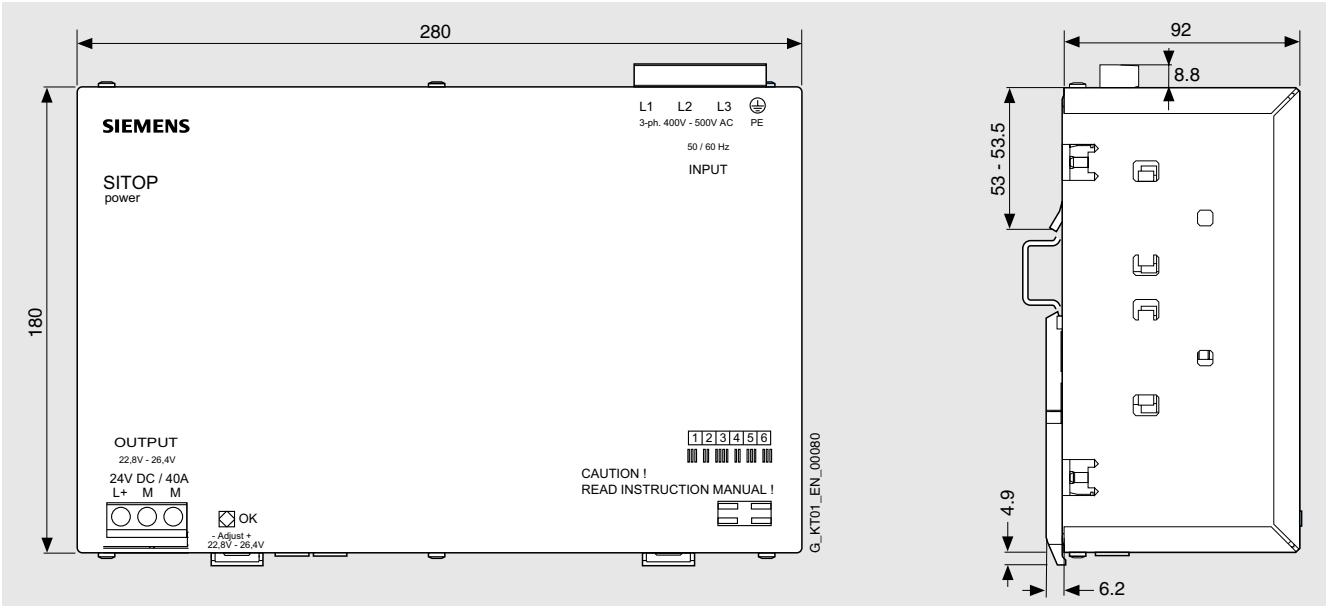
SITOP power
Single-, two-, three-phase

Dimensions in mm

Order No.: **6EP1 336-2BA00, 6EP1 434-2BA00, 6EP1 436-2BA00**



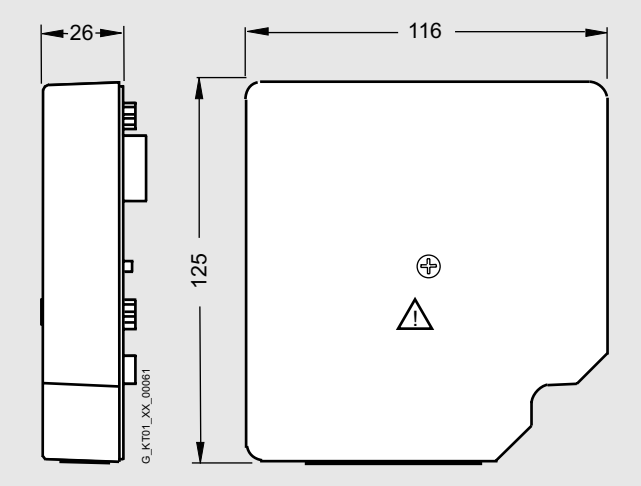
Order No.: **6EP1 536-2AA00, 6EP1 437-2BA00, 6EP1 437-2BA10**



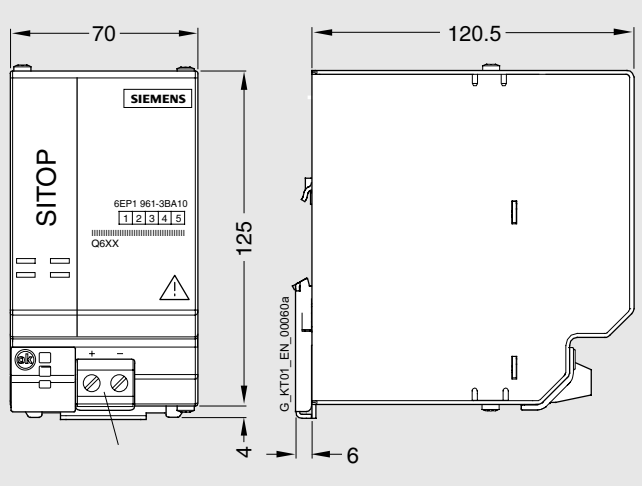
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Dimensions in mm

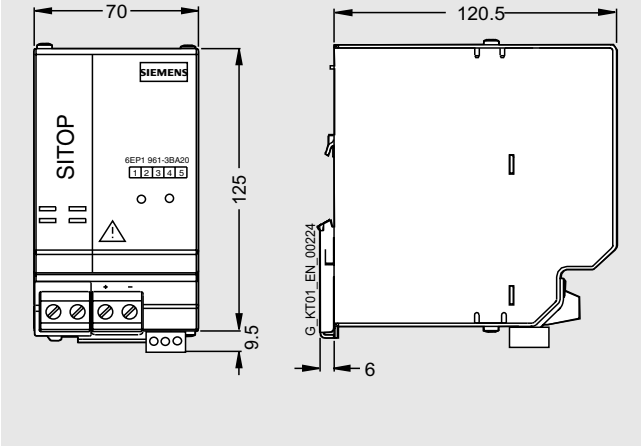
Order No.: **6EP1 961-3BA10**



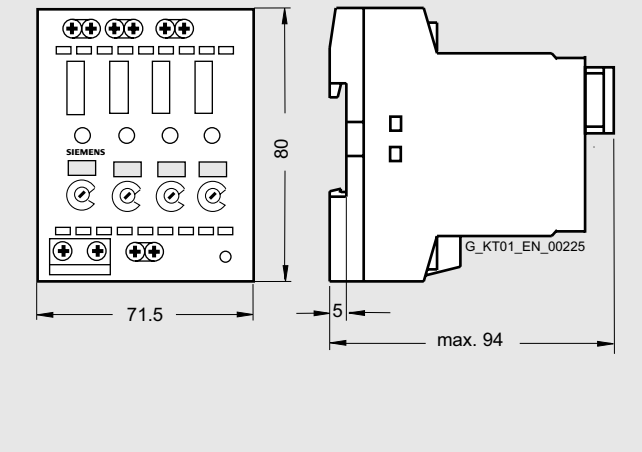
Order No.: **6EP1 961-3BA00**



Order No.: **6EP1 961-3BA20**



Order No.: **6EP1 961-2BA00**

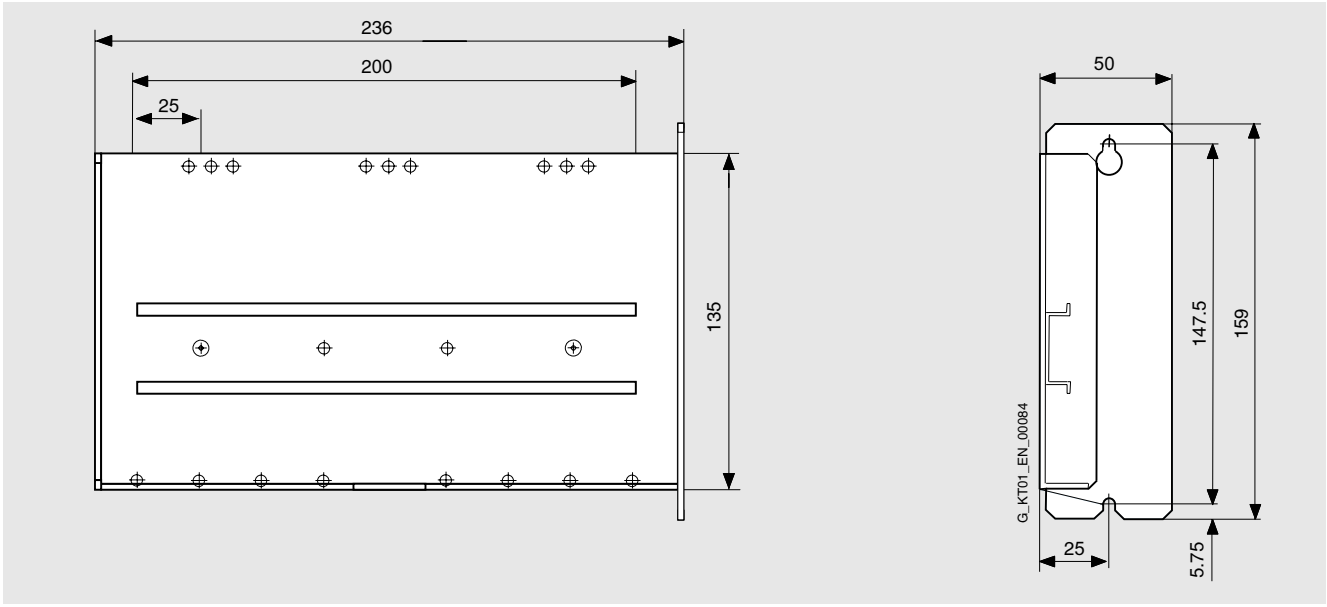


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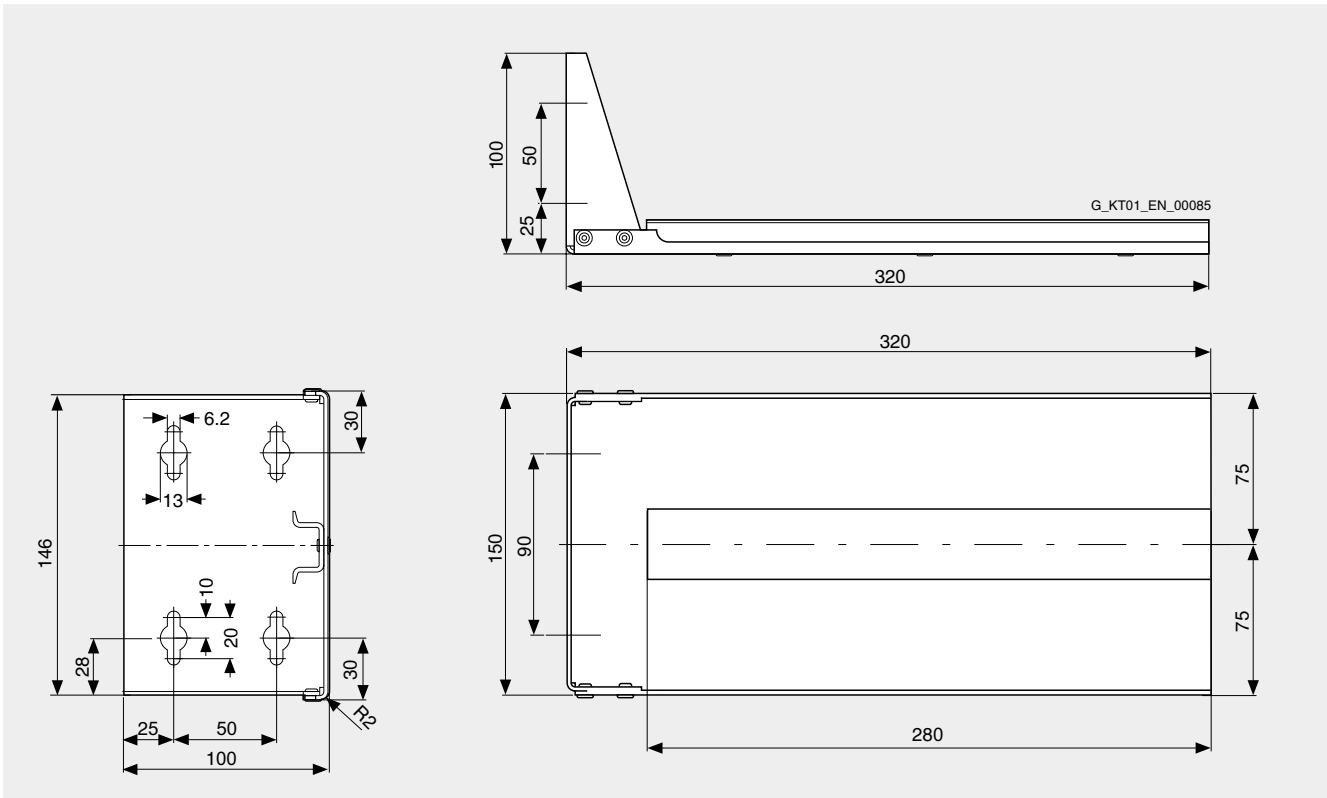
SITOP power
Accessories

Dimensions in mm

Order No.: **6EP1 971-1AA01**



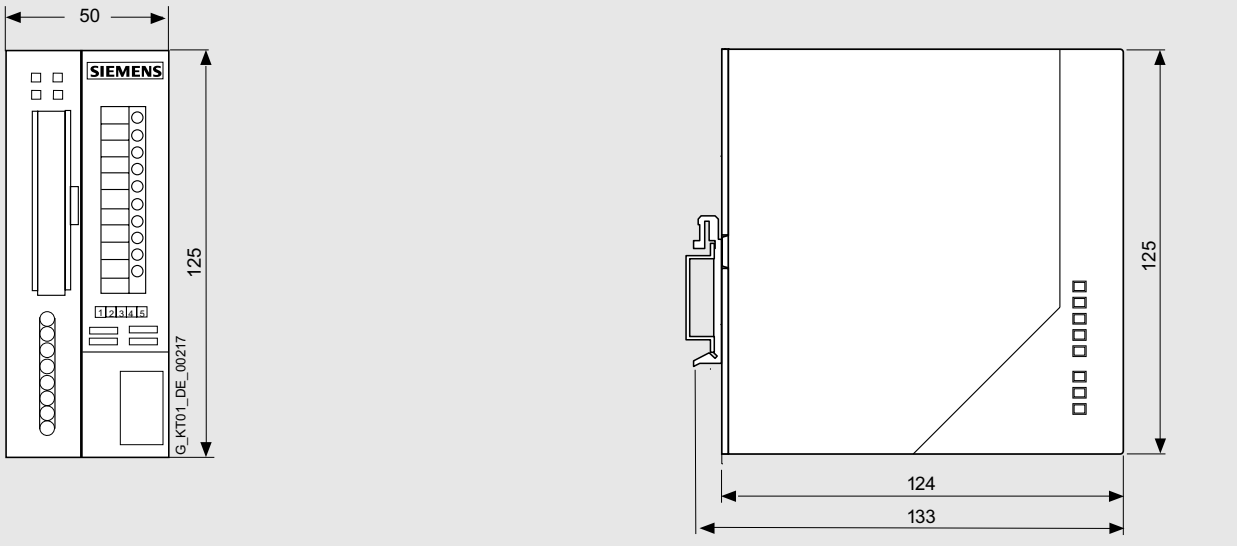
Order No.: **6EP1 971-2BA00**



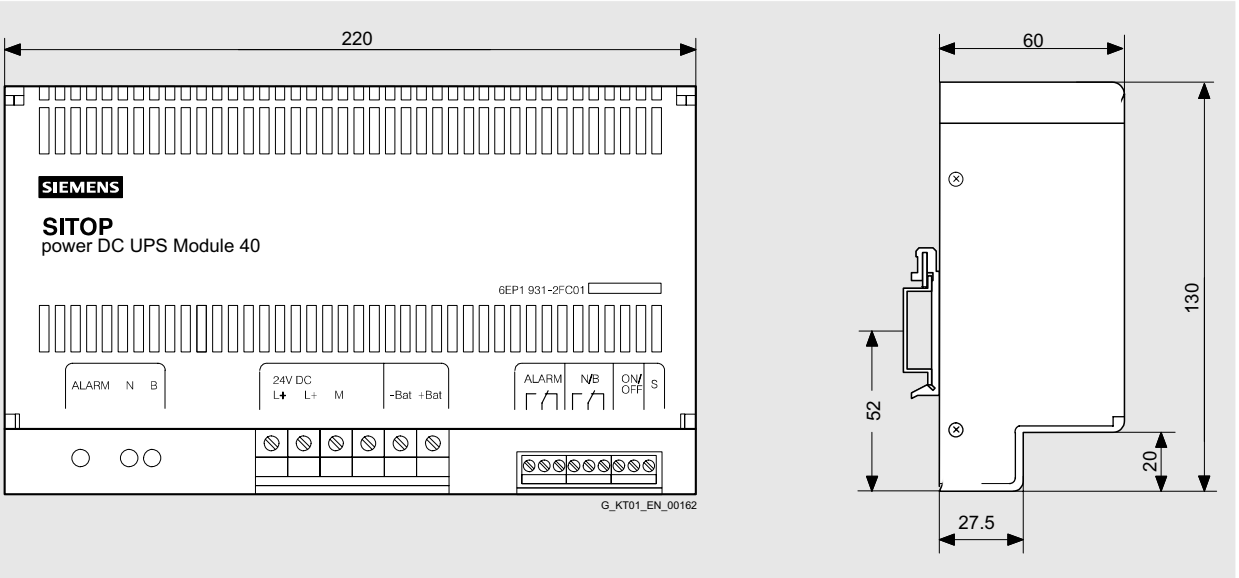
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Dimensions in mm

Order No.: **6EP1 931-2DC21, 6EP1 931-2DC31, 6EP1 931-2DC41**
Order No.: **6EP1 931-2EC21, 6EP1 931-2EC31, 6EP1 931-2EC41**



Order No.: **6EP1 931-2FC01**

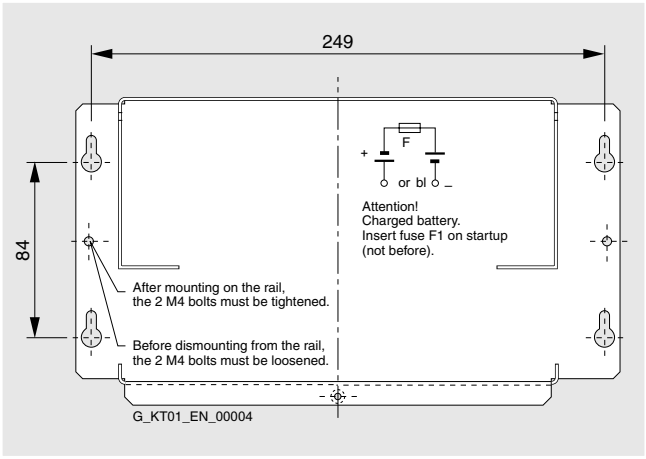


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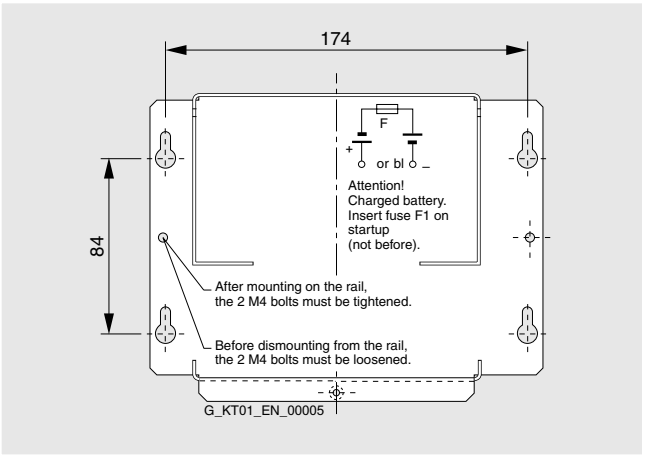
SITOP power
Uninterruptible power supplies

Drilling templates

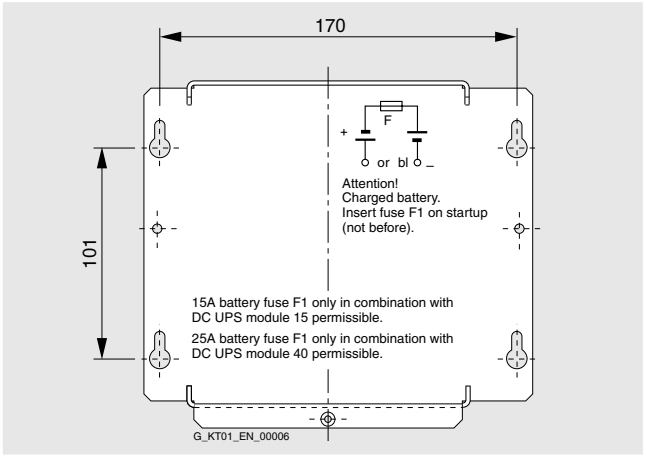
Order No.: **6EP1 935-6MD31**



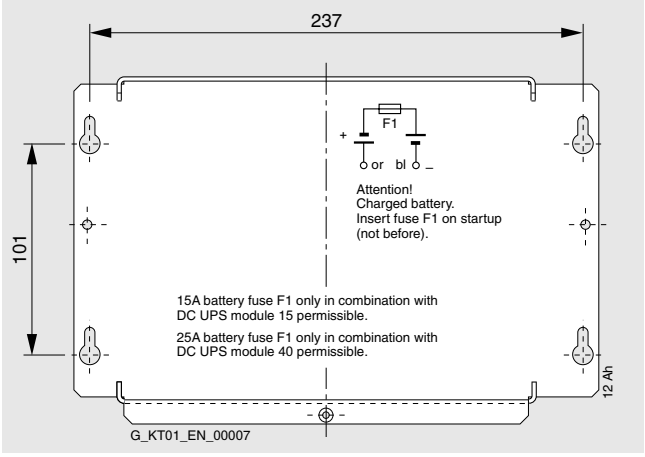
Order No.: **6EP1 935-6MD11**



Order No.: **6EP1 935-6ME21**



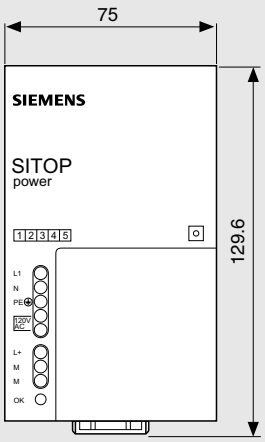
Order No.: **6EP1 935-6MF01**

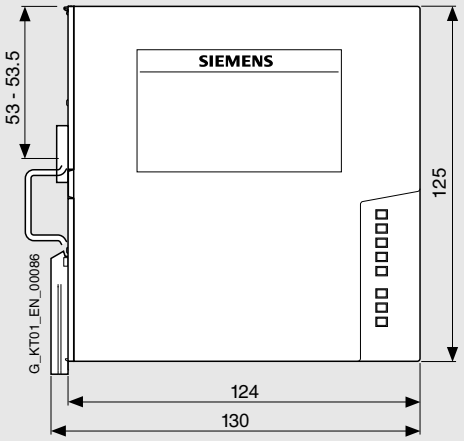


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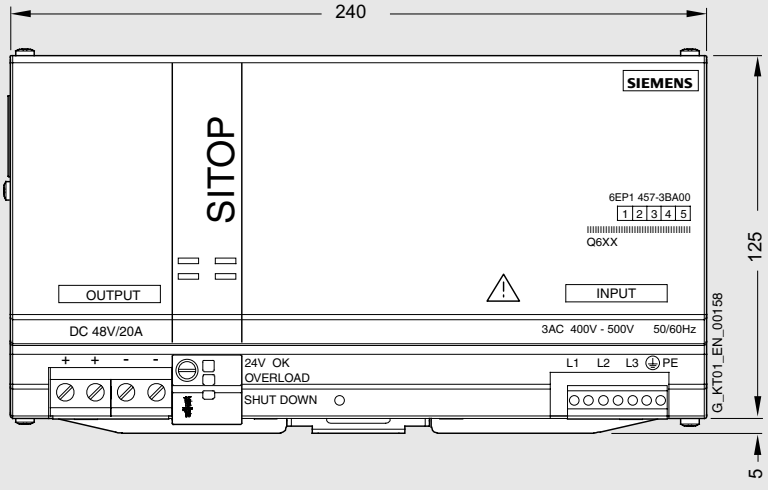
Dimensions in mm

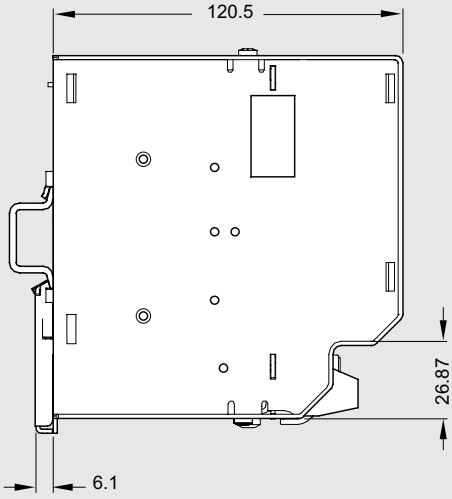
Order No.: **6EP1 353-2BA00, 6EP1 353-0AA00**





Order No.: **6EP1 457-3BA00**





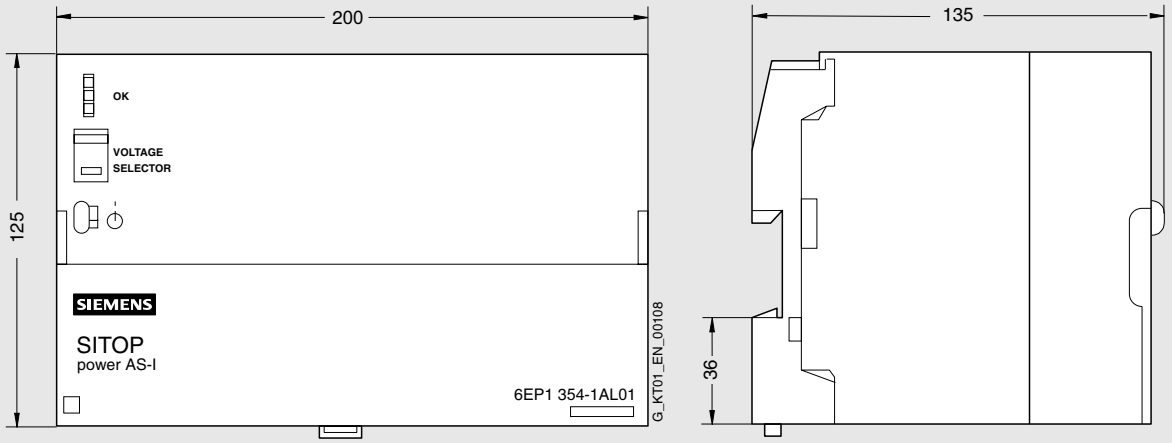
Snap-mounting on DIN rail
DIN EN 50022-35x15/7.5

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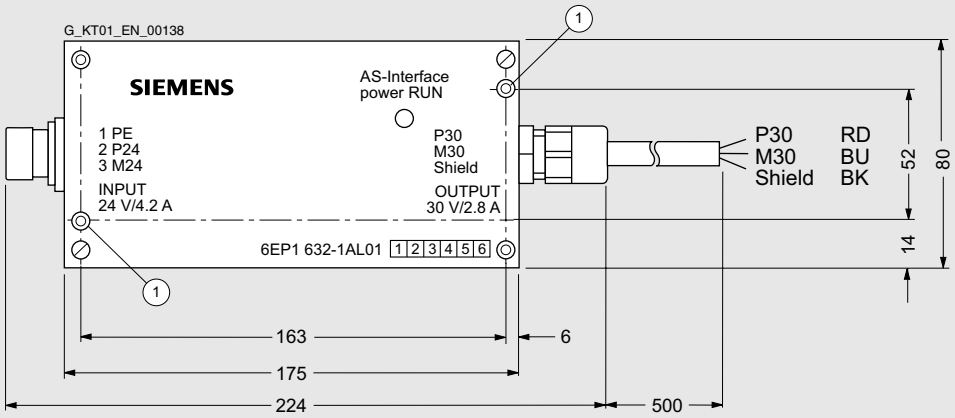
SITOP power
AS interface power supplies

Dimensions in mm

Order No.: **6EP1 354-1AL01**



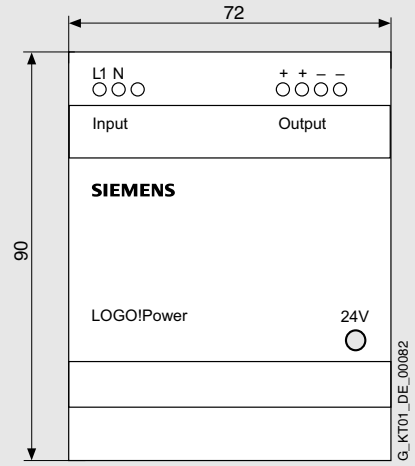
Order No.: **6EP1 632-1AL01**

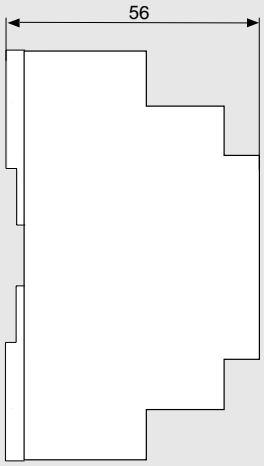


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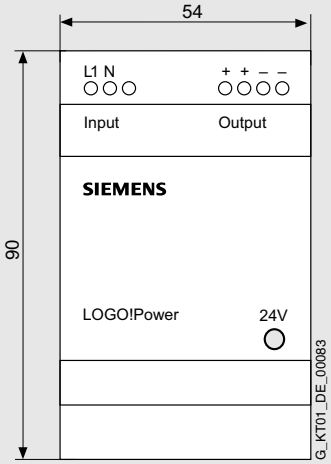
Dimensions in mm

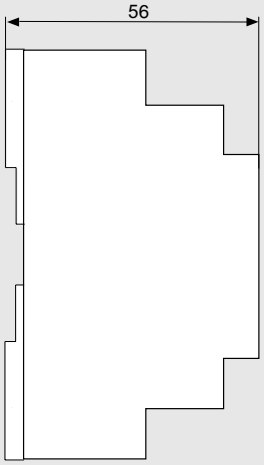
Order No.: **6EP1 311-1SH02, 6EP1 321-1SH02, 6EP1 351-1SH02, 6EP1 331-1SH02**



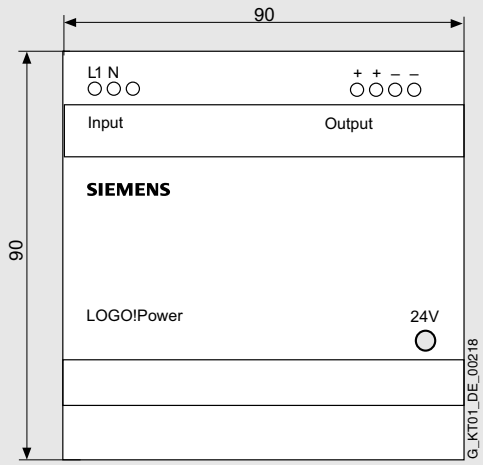


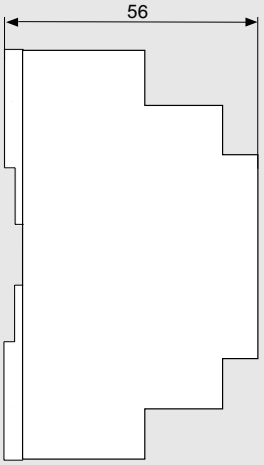
Order No.: **6EP1 311-1SH12, 6EP1 322-1SH02, 6EP1 352-1SH02, 6EP1 332-1SH42**





Order No.: **6EP1 332-1SH51**





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Notes

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16

Appendix





16/2	**SITOP contact persons**
16/7	**Siemens contacts worldwide**
16/8	**Service & Support** Information and Ordering in the Internet and on CD-ROM
16/9	**Indexes**
16/9	Order No. index
16/10	Subject index
16/11	**Customer Support**
16/14	**Conditions of sale and delivery**

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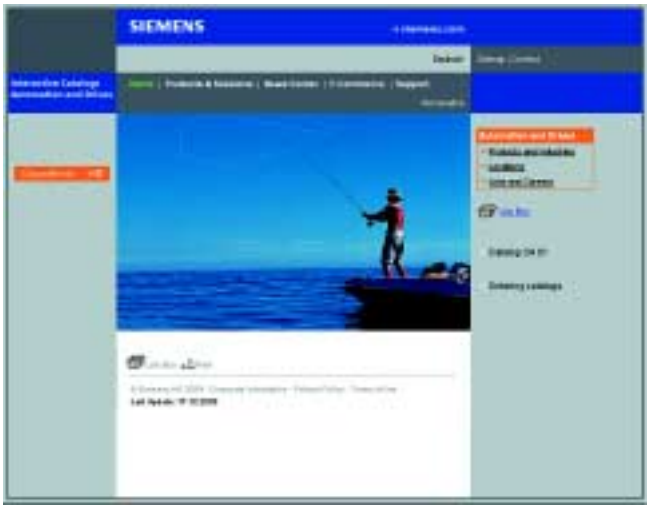
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All information is linked into a user interface which is easy to work with and intuitive.

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