Power Supply SITOP

Catalog KT 10.1 · 2009

SITOP

Answers for industry.

SIEMENS

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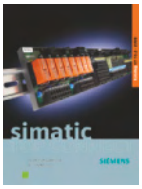

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SITOP
Power supply SITOP

Catalog KT 10.1 · 2009

The products and systems described in this catalog are manufactured/distributed under application of a certified quality management system in accordance with DIN EN ISO 9001 (Certified Registration No. 1108). The certificate is recognized by all IQNet countries.

Supersedes:
Catalog KT 10.1 · 2008

Refer to the Industry Mall for current updates of this catalog:
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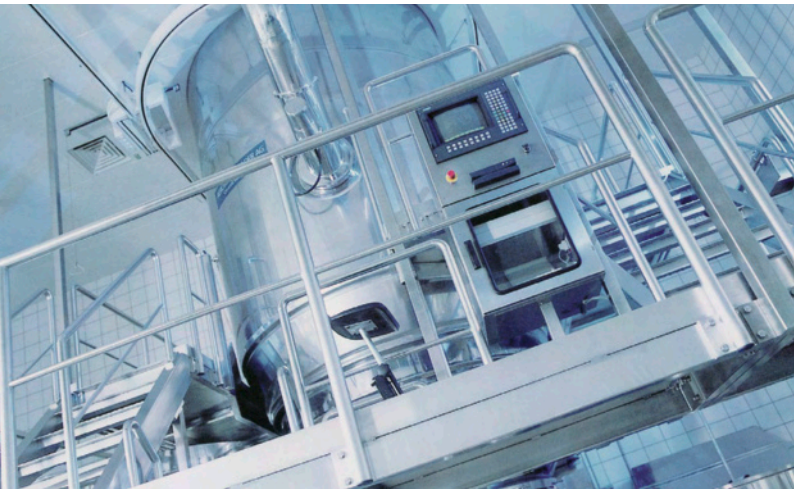
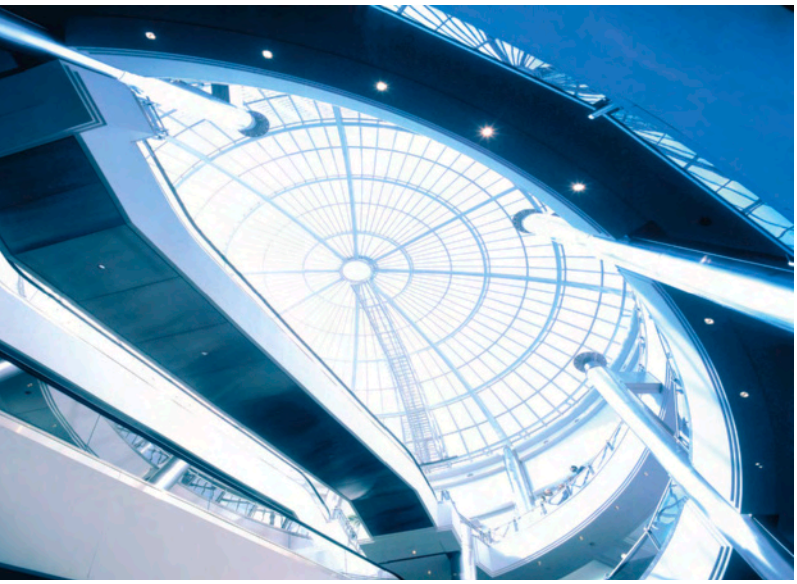
The products contained in this catalog can also be found in the e-Catalog CA 01.
Order No.:
E86060-D4001-A510-C7-7600

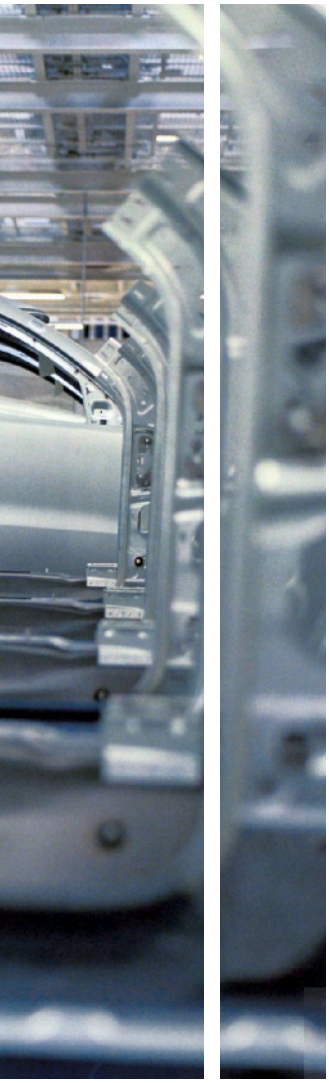
Please contact your local Siemens branch

SITOP 24 V

SITOP





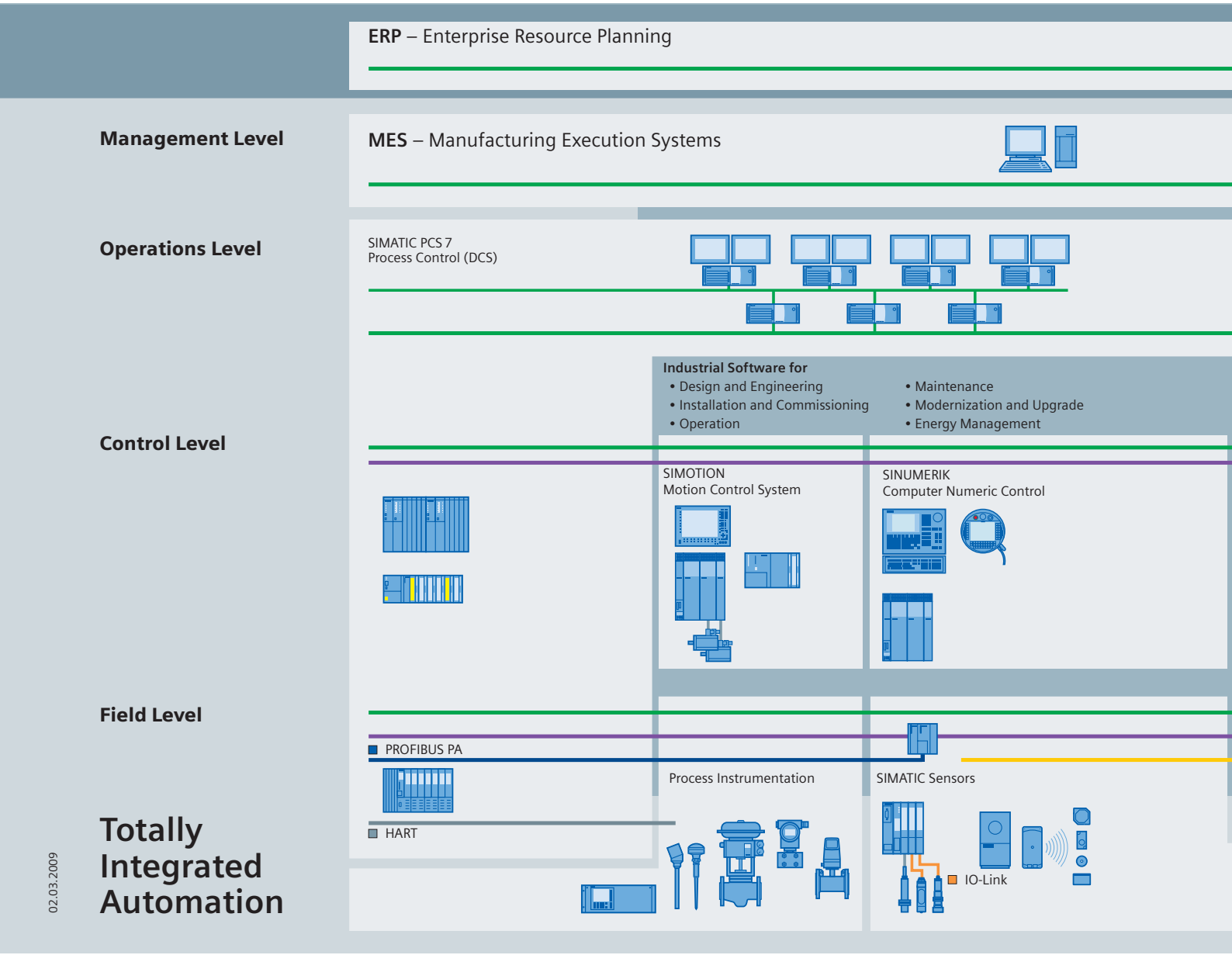


Answers for Industry.

Siemens Industry responds to the challenges in manufacturing automation, process automation, and building automation. Our drives and automation solutions based on Totally Integrated Automation (TIA) and Totally Integrated Power (TIP) are used in all sectors. In the manufacturing as well as in the process industry. In industrial and non-residential buildings.

We can provide you with automation systems, drives, low-voltage controls and distribution, and industrial software, from standard products right up to complete sector-specific solutions. With the industrial software, our customers from the manufacturing sector can optimize their entire value added chain – from product design and development, through production and sales, right up to service. With our electrical and mechanical components, we offer you integral technologies for the entire drive train – from the clutch to the gears, from the motor to control and drive solutions for all sectors of mechanical engineering. With the technology platform TIP, we offer you integrated solutions for energy distribution. The high quality of our products sets standards in the industry. A high degree of environmental protection is part of our strict and consistently implemented environmental management program. The possible environmental effects of a product are examined back at the product-development stage: Many of our products and systems therefore meet the EC directive RoHS (Restriction of Hazardous Substances). Our sites are, of course, certified in accordance with DIN EN ISO 14001. But environmental protection also involves utilizing valuable resources as efficiently as possible. The best example of this is provided by our energy-efficient drives, which require up to 60% less power.

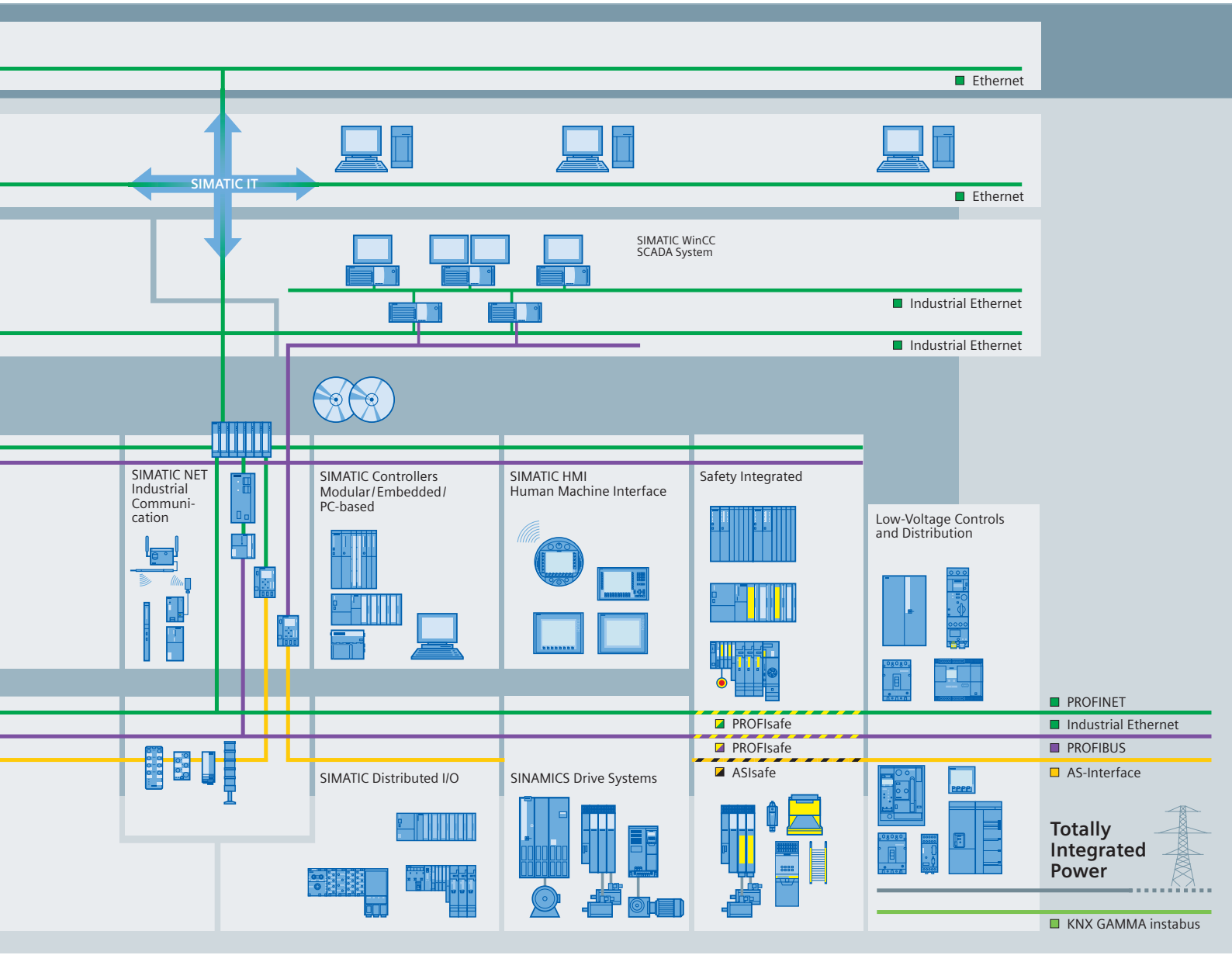
Take a closer look yourself at the options our automation and drives products have to offer. And discover how you can increase your competitiveness with us on a lasting basis.



Set the standards for productivity and competitiveness.

Totally Integrated Automation.

With Totally Integrated Automation (TIA), Siemens is the only vendor to offer an integrated basis for implementing customer-specific automation solutions – in all sectors, from incoming to outgoing logistics.



TIA excels through its unique uniformity.

Thanks to reduced interfacing overhead, it provides maximum transparency at all levels – from the field level, through the plantmanagement level to the corporate management level. Needless to say, you will also benefit throughout the entire life cycle of your plant – from its initial planning to its operation and its ultimate modernization. And thanks to the integration in the development of our products and systems, we can offer you maximum security of investment due to the avoidance of unnecessary interfaces.

Even during the development of our products and systems, the unique integration of our products and systems is a defined property.

The result: the best interaction of all components – from controllers, HMI components, and drives, all the way to the process control system. This reduces the complexity of the automation solution in your plant. You can notice this, for example, in the form of time and money saved during the engineering of the automation solution, as well as during operation with the integrated diagnostic options of Totally Integrated Automation for increasing the availability of your plant.

SITOP

SITOP – reliable 24-V power supply

Efficient operation of a machine or plant requires a reliable, constant power supply. The quality and reliability of the SITOP stabilized power supplies ensure high levels of safety in DC power supply in industrial engineering and building management systems.
They supply a stabilized 24 volts but also other output voltages. Even in the case of large input voltage variations, the output voltage is kept stable with a high degree of accuracy. This enables the use of primary switched-mode power supplies in many applications for the supply of sensitive electronic systems – all the way up to loads requiring high currents up to 40 A.
The fan-free power supplies are characterized by their compact and rugged design, high levels of efficiency and high overload capacity. The large input voltage range and the international approvals mean that use is possible in almost all supply networks worldwide.

The complete SITOP range

In addition to the power supplies, the perfectly coordinated complete range offers a unique choice of modules – from those that protect the 24-V power supply against interference on the primary and secondary side, right up to those providing all-round protection.
For example, with the innovative SITOP UPS500 capacitor-based uninterruptible power supply or with the new SITOP PSE200U selectivity module for reliable selectivity in the output circuit.

modular

Technology power supply for demanding solutions: SITOP modular

The first modular power supply meets the highest requirements for reliable 24 volts in global use. The rugged standard mounting rail devices in a metal enclosure can be expanded with all SITOP DC UPSs and expansion modules. This modularity offers unsurpassed benefits with respect to flexibility, simple handling and price/performance.
Even without expansion modules, the primary switched-mode power supplies offer extensive functions. The wide-range input enables connection to the most diverse supply networks worldwide and compensates even for large voltage fluctuations. Even brief interruptions in the power supply are bridged. The single-phase power supplies with 5 A and 10 A output current even have an ultra-wide-range input and are thus also suitable for operation on two phases of a 3-phase supply network.
The new 3-phase 20 A and 40 A power supplies are impressive proof that high functionality and performance power do not automatically require a lot of space. With widths of only 70 mm and 150 mm, they are among the most compact of their performance class.
Despite its slim design, SITOP modular has significant performance reserves and thus offers a high degree of security. The integral power-boost function briefly supplies up to 3 times the rated current and 50 % extra power is available for 5 seconds. Loads with a high starting current can thus be switched on without any problems. You can choose between automatic restart and switch-off in response to overload.

Information on the structure of the catalog

The **24-V power supplies** are sorted according to type of mains connection (single-phase, 2-phase and 3-phase) and according to output current (ascending to 40 A). **A color is assigned to each product family** to make it obvious at a glance to which product family a device belongs. The essential features of the product families are described on the following pages.

- Ultra-wide-range input for universal and safe use
- Extra-Power (1.5 × I_{rated} for 5 s) for brief operational overload
- Power-Boost (3 × I_{rated} for 25 ms) for triggering protective equipment
- Selectable short-circuit response: Constant current with automatic restart or latching shutdown
- Switchable output characteristic for uniform power distribution in case of parallel operation
- Efficiency up to 93 % minimizes heat generation and energy consumption
- Signaling contact and 3 LEDs for sensing the operating state
- Output voltage adjustable up to 28.8 V for compensating voltage drops
- For demanding applications from 5 to 40 A
- 48-V 20 A power supply for small cable cross-sections
- Rugged and compact metal housing
- No lateral installation clearances required
- The innovated SITOP PSU300M 20 A and 40 A 3-phase power supplies require less than half the installation space
- Temperature range from 0 to +60 °C
- Optionally with boards coated for protection
- Certified in accordance with CE and cULus/CSA
- Functionally expandable with all SITOP expansion modules and DC UPS

modular

smart

Powerful standard power supply: SITOP smart

Slimline dimensions, strong performance. The SITOP smart range of power supplies requires less space on the standard mounting rail and offers high functionality at a reasonable price. Due to the flexible overload response, even loads with high starting currents can be switched on without problems. If required, 50 % extra power is made available for 5 seconds. The 1-phase versions also continuously supply 120 % of the rated power provided the ambient temperature does not exceed 45 °C. Numerous certificates facilitate universal and global use as well as use in areas subject to explosion hazard.

- Space-saving, rugged design for universal applications
- Extra-Power (1.5 × I_{rated} for 5 s) for brief operational overload
- Permanent overload capacity (1.2 × I_{rated}) to 45 °C ambient temperature
- Constant current with automatic restart
- Green LED for "24 V OK"
- Adjustable output voltage from 22.8 to 28.0 V for compensating voltage drops
- For 24 V standard applications from 2.5 A to 10 A
- 48-V 10 A power supply for small cable cross-sections
- No lateral installation clearances required
- Temperature range from 0 to +60 °C
- Certified in accordance with CE, UL, CSA, ATEX and GL for universal use
- Functionally expandable with DC UPS modules, redundancy module, selectivity module and diagnostics module

Overview of product families

LOGO!Power

Flat power supply for distribution boards: LOGO!Power

The mini power supplies are available with 24 V and alternative output voltages of 5 V, 12 V and 15 V, and they can even be installed in built-in miniature distribution boards thanks to their flat stepped profiles. The function "Constant current in event of overload" even allows the connection of difficult loads such as DC/DC converters or motors. The wide-range input, a wide temperature range and extensive certification make the low-cost LOGO! power supplies the universal devices for use in a host of applications.

- Mini power supply for low installation depths thanks to flat step profile
- Wide-range input 85 to 264 V AC for universal safe use
- Three performance classes to 4 A at 24 V, two for 5 V, 12 V and 15 V
- Reliable use in system networks with LOGO! Logic module
- Constant current under overload conditions for reliable connection of difficult loads
- Green LED for "Output voltage OK"
- Large setting range for output voltage
- Large temperature range from -20 °C to +55 °C
- Certified in accordance with UL/cUL, ATEX, FM and GL for universal use

SIMATIC design

Optimal supply to SIMATIC controllers, and more: SITOP in SIMATIC design:

The original power supplies of the SIMATIC controllers provide the PLC network optimally with 24 V, but also other loads.

- System-tested 24 V for reliable power supply in the SIMATIC system network
- Optimum functional coordination with SIMATIC S7 and ET200
- Flexible mounting onto S7-300 DIN rail, ET200pro rack or standard mounting rail
- Space-saving, rugged design for universal applications

Design S7-1200 design: 24 V/2.5 A. The compact PM1207 power module requires little space in the micro PLC network. It provides the supply to CPUs with 24-V input, to signal modules, and to 24-V loads connected to the modules. Automatic range switching
ensures problem-free mains connection.

Design S7-200: 24 V/3.5 A. The flat power supply is especially suitable where installation height and control cabinet depth are restricted.

Design S7-300: 24 V/2 A, 5 A and 10 A. The new power supplies now require even less space on the S7 rail and range switching to single-phase 120/ 230 V AC systems now takes place automatically. The 2 A and 5 A devices are also available as outdoor versions and can easily handle temperatures between –25 °C and +70 °C as well as higher vibration and shock loads.

SIMATIC ET200pro design: 24 V/8 A. The SIMATIC ET200pro PS power supply in degree of protection IP67 functions as a power supply for electronics/sensors and load voltage of the I/O device, and it has a signaling contact for "24 V OK" and "Overtemperature" as well as a second connector for looping through the input voltage.

Special designs and application areas

Equipped for special tasks and conditions – power supplies in special design, for special applications

The SITOP power supplies cover even individual infeed tasks. They can handle restricted installation space and harsh environmental conditions. The standard power supply units also fulfill exceptional requirements.

The smallest ones: 24 V/0.375 and 0.5 A. At only 22.5 mm, these mini devices are the slimmest of the SITOP family and are therefore especially suitable for supplying low-voltage devices.

The universal types: 24 V/2.5 A, 4 A and 10 A. These devices with universal input can be connected to single-phase AC as well as to DC systems.

The DC/DC converter: 24 V/2 A. With an input range from 38 V to 121 V DC for supply from battery and DC systems.

SITOP PSA100E: The single-phase power supply for the basic industrial requirement of 2.5 to 12 A can be mounted on a standard mounting rail or straight onto the wall.

Flat design: 24 V/5 A and 10 A. The compact metal housing can be accommodated where only limited installation depth is available, even in masked machine supporting frames or hinged frames

SITOP PSU300P: 24 V/8 A. The rugged metal housing in degree of protection IP67 is designed for cabinet-free use at temperatures from -25 to +55 °C. It has the same design as the SIMATIC ET200pro PS but without the 2nd connector for looping through the input voltage.

Alternative voltages

Not just 24-V power supplies with alternative output voltages

SITOP provides a reliable supply of precisely stabilized DC voltage not just to 24-V loads, but also to loads with "alternative" supply voltage.

SITOP DC/DC: 12 V/2.5 A. The DC/DC converter in a slim standard mounting rail housing is supplied with 24 V. A SITOP DC UPS can also be used to provide an uninterruptible 12 V supply, for example.

SITOP flexi: 3 to 52 V/10 A. Limitless diversity thanks to variable output. Flexible adjustment between 3 and 52 V enables a standard device to be used for different special voltages.

SITOP dual: 2 x 15 V/3.5 A. The electronics power supply for the control cabinet. The industry-standard rail-mounted device has two 15 V outputs. For, say, electronic loads supplied with ±15 volts.

LOGO!Power: 5, 12, 15 V. The mini power supply with these output voltages is available in two performance classes. Further features on Page 1/8.

SITOP smart: 48 V/10 A. SITOP modular: 48 V/20 A. The high output voltage enables smaller core cross-sections of the load supply lines.

Expansion modules

Reliable protection against the most varied hazard sources: SITOP expansion modules

A power supply unit cannot on its own guarantee fault-free 24-V supply. Power failures, extreme variations in the mains voltage, or a faulty load can bring plant operation to a standstill and cause high costs. The expansion modules offer everything from extensive protection against interference on the primary and secondary side, right up to complete all-round protection.

- The **signaling module** with signal contacts and remote ON/OFF function optimally integrates SITOP modular (devices without integral signaling contact) into automated plants.
- For maximum availability, the **redundancy module** decouples SITOP power supplies of the same type.
- The **buffer module** bridges short power failures up to 3 seconds with capacitors as energy storage.
- The **SITOP select diagnostics module and the new SITOP PSE200U selectivity module** offer selective protection of individual 24 V paths against overload and short-circuits. With this protection and by means of fast fault localization, downtimes can be reduced to a minimum. New features of the selectivity module include the finely adjustable current range (from 0.5 A), remote reset, and a reset button for each channel.

DC UPS

24 V that can always be relied on – even when the power fails: Uninterruptible power supply

Supply network irregularities in the millisecond range are compensated for supremely well by all our power supplies. Large fluctuations or even power failures, however, require special measures: The buffer module (see SITOP expansion modules) ensures optimal protection in the case of brief power failures up to 3 seconds. Longer power failures into the minute range can be bridged with the new maintenance-free SITOP UPS500 with capacitor technology. The DC UPS modules with battery modules secure continued operation for hours! Both DC UPS systems can be integrated simply into PC-based automation solutions using a free software tool.

The **new SITOP UPS500** is completely maintenance-free because it saves the energy in high-capacity **double-layer capaitors**, that have a long service life even in high temperatures, and do not need to be replaced. The installation location does not have to be ventilated because no gas is emitted. The innovative DC UPS buffers 24 V into the minute range and makes it possible to back up data and to shut down PC-based applications safely (e.g. with SIMATIC PC).
The SITOP UPS500S is designed for installing on a standard mounting rail and it can be modularly expanded to extend the backup time. The UPS500P in degree of protection IP65 is suitable for distributed use.
The **SITOP DC UPS with battery modules** using lead gel batteries up to 12 Ah enables process operation to continue for hours. The availability, battery supply line, aging status, and charge status are permanently monitored. The integral battery management system ensures optimal charging of the battery modules and a long service life.

In order to enable you to find the right controlled power supply for any application as quickly as possible, we have presented in the table below an overview of all the power supplies in the catalog sorted according to input voltages, output voltages and output current.

Selection guide

Input voltage			AC voltage single-phase 120 V, 230 V AC	AC voltage three-phase 400 V, 500 V 3 AC	DC voltage 24 V DC	Other DC voltages
Output voltage	**Output current**	**Order No.**				
5 V DC	3 A	6EP1 311-1SH02	Page 12/6			
	6.3 A	6EP1 311-1SH12	Page 12/6			
12 V DC	1.9 A	6EP1 321-1SH02	Page 12/6			
	4.5 A	6EP1 322-1SH02	Page 12/7			
15 V DC	1.9 A	6EP1 351-1SH02	Page 12/7			
	4 A	6EP1 352-1SH02	Page 12/7			
	2 × 3.5 A	6EP1 353-0AA00	Page 12/2			
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 2/2			
	2 A	6EP1 732-0AA00				Page 2/3
		6ES7 307-1BA01-0AA0	Page 2/3			
		6ES7 305-1BA80-0AA0			Page 2/3	Page 2/3
	2.5 A	6EP1 332-2BA10	Page 3/2			
		6EP1 332-1SH71	Page 3/2			
		6EP1 332-1SH12	Page 3/3			Page 3/3
		6EP1 332-1SH42	Page 3/2			
		6EP1 621-2BA00			Page 12/2	
		6EP1 232-1AA00	Page 3/3			
	3.5 A	6EP1 332-1SH31	Page 4/2			
	3.7 A	6EP1 332-2BA00	Page 4/2			
	4 A	6EP1 332-1SH22	Page 4/3			Page 4/3
		6EP1 332-1SH51	Page 4/2			
		6EP1 232-1AA10	Page 4/3			
	5 A	6EP1 333-3BA00	Page 5/2	Page 8/2		
		6EP1 333-2AA01	Page 5/2			
		6EP1 333-2BA01	Page 5/2			
		6ES7 307-1EA01-0AA0	Page 5/3			
		6ES7 307-1EA80-0AA0	Page 5/3			
		6EP1 333-1AL12	Page 5/3			
	6 A	6EP1 233-1AA00	Page 5/3			
	8 A	6EP1 433-2CA00		Page 8/2		
		6ES7 148-4PC00-0HA0		Page 8/2		
	10 A	6EP1 334-3BA00	Page 6/2	Page 8/2		
		6EP1 334-2AA01	Page 6/2			
		6EP1 334-2BA01	Page 6/2			
		6ES7 307-1KA02-0AA0	Page 6/3			
		6EP1 334-1AL12	Page 6/3			
		6EP1 334-1SH01	Page 6/3			Page 6/3
		6EP1 434-2BA00		Page 8/3		
	12 A	6EP1 234-1AA00	Page 6/3			
	20 A	6EP1 336-3BA00	Page 7/2			
		6EP1 436-3BA00		Page 8/3		
		6EP1 436-3BA10		Page 8/3		
		6EP1 436-2BA00		Page 8/3		
	30 A	6EP1 437-2BA00		Page 9/2		

Continued on page 1/12.

Selection guide (continued)

Input voltage			AC voltage single-phase 120 V, 230 V AC	AC voltage three-phase 400 V, 500 V 3 AC	DC voltage 24 V DC	Other DC voltages
Output voltage	**Output current**	**Order No.**				
	40 A	6EP1 337-3BA00	Page 7/2			
		6EP1 437-3BA00		Page 9/2		
		6EP1 437-3BA10		Page 9/2		
		6EP1 437-2BA10		Page 9/3		
Expansion modules	Signaling module	6EP1 961-3BA10			Page 10/2	
	Buffer module	6EP1 961-3BA01			Page 10/2	
	Redundancy module	6EP1 961-3BA20			Page 10/2	
	Selectivity module	6EP1 961-2BA10			Page 10/4	
		6EP1 961-2BA20			Page 10/4	
	Diagnostics module	6EP1 961-2BA00			Page 10/4	
	Inrush current limiter	6EP1 967-2AA00	Page 10/7			
SITOP UPS 500	7 A	6EP 1933-2NC01			Page 11/5	
		6EP 1933-2NC11			Page 11/5	
	15 A	6EP1 933-2EC41			Page 11/5	
		6EP1 933-2EC51			Page 11/5	
DC UPS modules	6 A	6EP1 931-2DC21			Page 11/16	
		6EP1 931-2DC31			Page 11/16	
		6EP1 931-2DC42			Page 11/16	
	15 A	6EP1 931-2EC21			Page 11/16	
		6EP1 931-2EC31			Page 11/16	
		6EP1 931-2EC42			Page 11/16	
	40 A	6EP1 931-2FC21			Page 11/16	
		6EP1 931-2FC42			Page 11/16	
Battery modules	1.2 Ah	6EP1 935-6MC01			Page 11/20	
	2.5 Ah	6EP1 935-6MD31			Page 11/20	
	3.2 Ah	6EP1 935-6MD11			Page 11/20	
	7 Ah	6EP1 935-6ME21			Page 11/21	
	12 Ah	6EP1 935-6MF01			Page 11/21	
48 V DC	10 A	6EP1 456-2BA00		Page 12/3		
	20 A	6EP1 457-3BA00		Page 12/3		
3 - 52 V DC	10 A/120 W	6EP1 353-2BA00	Page 12/2			

Note:

Some power supplies are already listed in the catalog as SIPLUS versions. You can request other devices in versions of varying ruggedness on the Internet at www.siemens.com/siplus under "Enquiry form for special solutions".

SITOP 24 V 1-phase

2

Output currents up to 2 A

Overview

Product	The smallest ones		LOGO!Power
Power supply, type	0.5 A	0.375 A	1.3 A
Order No.	6EP1 331-2BA10	6EP1 731-2BA00[1]	6EP1 331-1SH02
The product families are highlighted in the same color. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.			
	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 slim design, they are particularly suitable for solutions where space is limited and in conjunction with low-voltage switchgear.	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 slim design, they are particularly suitable for solutions where space is limited and in conjunction with low-voltage switchgear.	The power supplies of the LOGO!Power range are optimally matched to the LOGO! logic modules in their functionality and design. With the wide-range input 85 V to 264 V AC and the possibility of mounting in small distribution boards, they can be used universally in the most diverse application areas in the low-end performance range.
Dimension drawing	Page 15/2, Dimension drawing 1	Page 15/2, Dimension drawing 1	Page 15/2, Dimension drawing 2

Technical specifications

Input			
Rated voltage value $V_{in\ rated}$	1-phase AC **120-230 V AC** wide-range input	DC voltage **48-220 V DC** wide-range input	1-phase AC **100-240 V AC** Wide-range input
Voltage range	93 ... 264 V	30 ... 264 V (30 ... 187 V AC)	85 ... 264 V
Overvoltage resistance Mains buffering at $I_{out\ rated}$ Rated line frequency; range	2.3 × $V_{in\ rated}$, 1.3 ms > 10 ms at V_{in} = 230 V 50/60 Hz, 47 ... 63 Hz	> 10 ms at V_{in} = 220 V –	2.3 × $V_{in\ rated}$/1.3 ms > 40 ms at V_{in} = 187 V 50/60 Hz; 47 ... 63 Hz
Rated current value $I_{in\ rated}$ Making current limit (+25 °C) I^2t	0.22-0.13 A < 23 A, typ. 1 ms 0.3 A^2s	0.3-0.06 A < 35 A, typ. 3 ms 1.2 A^2s	0.7-0.35 A < 15 A < 0.8 A^2s
Built-in incoming fuse Recommended miniature circuit breaker (IEC 898) in the mains power input	T 2 A/250 V (not accessible) From 3 A, Characteristic C	F 4 A/250 V (not accessible) From 6 A, Characteristic C, suitable for DC	Internal From 16 A, Characteristic B or from 10 A, Characteristic C
Output			
Rated voltage value $V_{out\ rated}$	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
Total tolerance • Static mains compensation • Static load balancing	±3 % Approx. 0.2 % Approx. 0.7 %	±3 % Approx. 0.1 % Approx. 0.1 %	±3 % Approx. 0.1 % Approx. 1.5 %
Residual ripple Spikes (bandwidth: 20 MHz)	< 150 mV_{pp} (typ. 50 mV_{pp}) < 240 mV_{pp} (typ. 150 mV_{pp})	< 150 mV_{pp} (typ. 50 mV_{pp}) < 240 mV_{pp} (typ. 50 mV_{pp})	< 200 mV_{pp} (typ. 10 mV_{pp}) < 300 mV_{pp} (typ. 20 mV_{pp})
Adjustment range Status display On/off behavior	– Green LED for 24 V OK No overshoot of V_{out} (soft start)	– Green LED for 24 V OK No overshoot of V_{out} (soft start)	22.2 ... 26.4 V Green LED for 24 V OK No overshoot of V_{out} (soft start)
Startup delay/voltage rise Rated current value $I_{out\ rated}$	< 1.5 s/typ. 20 ms **0.5 A**	< 2.5 s/typ. 90 ms **0.375 A**	< 0.5 s/typ. 15 ms **1.3 A**
Current range • Up to +60 °C • Derating	 0 ... 0.5 A 0 ... 0.5 A (up to +70 °C)	 0 ... 0.375 A 0 ... 0.255 A (up to +70 °C)	 0 ... 1.3 A (up to +55 °C) –
Dynamic overcurrent on • Power-up on short circuit • Short circuit during operation	 Constant current approx. 0.6 A Constant current approx. 0.6 A	 Typ. 2.7 A for 200 ms	
Parallel switching for enhanced performance	Not permitted	Not permitted	Yes, 2 units
Continuation of the table	Page 2/4, column 1	Page 2/4, column 2	Page 2/4, column 3

[1] SIPLUS module 6AG1 931-2BA00-3AA0 for use under medial load (e.g. sulfur chloride atmosphere).

The S7-300 version	The DC/DC converter	The outdoor version
2 A	2 A	2 A
6ES7 307-1BA01-0AA0	6EP1 732-0AA00	6ES7 305-1BA80-0AA0[2)]
		
The proven power supply in SIMATIC S7-300 design; with PS-CPU connecting comb and for mounting direct on S7 rail.	The DC/DC converter for supply from battery and DC systems; with a wide input voltage range from 38 V to 121 V DC.	The power supply unit for extreme environmental conditions in SIMATIC S7-300 design; can be snapped onto S7 rail; with PS-CPU connecting comb.
Page 15/2, Dimension drawing 3	Page 15/4, Dimension drawing 1	Page 15/3, Dimension drawing 2
Input		
1-phase AC **120/230 V AC** automatic range switch-over 85 ... 132 V/170 ... 264 V	DC voltage **48-110 V DC** wide-range input 38 ... 121 V	DC voltage **24-110 V DC** wide-range input 16.8 ... 138 V
2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V 50/60 Hz, 47 ... 63 Hz	> 5 ms at V_{in} = 48 V –	154 V; 0.1 s > 10 ms at $V_{in\ rated}$ –
0.9/0.5 A < 22 A, < 3 ms < 1.0 A^2s	1.2-0.5 A < 33 A	2.7-0.6 A (4.0-0.9 A) < 20 A, < 10 ms < 5 A^2s
T 1.6 A/250 V (not accessible) 3 A, Characteristic C	T 2.5 A (not accessible) 10 to 25 A, Characteristic B, or 6 to 25 A, Characteristic C, suitable for DC	T 6.3 A/250 V (not accessible) From 10 A, Characteristic C, suitable for DC
Output		
Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
±3 % Approx. 0.1 % Approx. 0.2 %	±1 % Approx. 0.1 % Approx. 0.4 %	±3 % Approx. 0.2 % Approx. 0.4 %
< 50 mV_{pp} (typ. < 5 mV_{pp}) < 150 mV_{pp} (typ. < 20 mV_{pp})	< 100 mV_{pp} < 300 mV_{pp}	< 150 mV_{pp} (typ. < 30 mV_{pp}) < 240 mV_{pp} (typ. < 150 mV_{pp})
– Green LED for 24 V OK No overshoot of V_{out} (soft start)	23.5 ... 26.5 V Green LED for 24 V OK Overshoot of V_{out} on startup max. 25 V	– Green LED for 24 V OK No overshoot of V_{out} (soft start)
< 2 s/typ. 10 ms **2 A**	< 3 s/typ. 30 ms **2 A**	< 3 s/typ. 5 ms **2 A (3 A at V_{in} > 24 V)**
0 ... 2 A –	0 ... 2 A 0 ... 2 A (up to +70 °C)	0 ... 2 A (3 A) –
Typ. 9 A for 90 ms Typ. 9 A for 90 ms		Typ. 9 A for 270 ms Typ. 9 A for 270 ms
Yes	Yes, 2 units	Yes, 2 units
Page 2/5, column 4	Page 2/5, column 5	Page 2/5, column 6

[2)] SIPLUS module 6AG1 305-1BA80-2AA0 for temperature range – 25 to + 60 °C and use under medial load (e.g. sulfur chloride atmosphere). This SIPLUS power supply conforms with standards for electronic equipment used on rolling stock (EN 50155, temperature T1, category 1).

Output currents up to 2 A

Continued from	Page 2/2, column 1	Page 2/2, column 2	Page 2/2, column 3
Power supply, type (repeated)	0.5 A	0.375 A	1.3 A
Order No. (repeated)	6EP1 331-2BA10	6EP1 731-2BA00	6EP1 331-1SH02
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. 7 W
Closed-loop control			
Dyn. mains compensation ($V_{in\ rated}$ ±15 %)	Typ. ±0.3 % V_{out}	Typ. ±0.3 % V_{out}	< 0.2 % V_{out}
Dynamic load smoothing (I_{out}: 50/100/50 %)	Typ. ±0.7 % V_{out}	Typ. ±0.4 % V_{out}	Typ. ±1.5 % V_{out} (I_{out}: 10/90/10 %)
Load step settling time			
• 50 to 100 %	Typ. 1.5 ms	Typ. 2 ms	Typ. 20 ms (10 to 90 %)
• 100 to 50 %	Typ. 1.5 ms	Typ. 2 ms	Typ. 20 ms (90 to 10 %)
Protection and monitoring			
Output overvoltage protection	Yes, according to EN 60950	Yes, according to EN 60950	Yes, according to EN 60950
Current limitation	0.55 ... 0.65 A	0.41 ... 0.49 A	Typ. 2 A
Short-circuit protection	Constant current characteristic up to 0 V	Electronic shutdown, automatic restart	Constant current characteristic
Sustained short-circuit current rms value	< 0.65 A	< 0.9 A	< 4 A
Overload/short-circuit indicator	–	–	–
Safety			
Primary/secondary isolation	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178
Protection class	Class I	Class I	Class II (without protective conductor)
Leakage current	< 3.5 mA	< 3.5 mA	
German Technical Inspectorate approval	Yes	Yes	Yes; CB scheme
CE mark	Yes	Yes	Yes
UL/cUL (CSA) approval	cULus-listed (UL 508, CSA C22.2 No. 142), File E143289; cURus-recognized (UL 60950, CSA C22.2 No. 60950), File E151273	cULus-listed (UL 508, CSA C22.2 No. 142), File E143289; cURus-recognized (UL 60950, CSA C22.2 No. 60950), File E151273	cULus-listed (UL 508, CSA C22.2 No. 14), File E197259; cURus-recognized (UL 60950, CSA C22.2 No. 60950), File E151273
Explosion protection	–	–	ATEX EX II 3G Ex nA IIC T3
FM approval	–	–	Class I Div. 2, Group A, B, C, D T4
Marine approval	–	–	GL, ABS
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Emitted interference	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Supply harmonics limitation	Not applicable	Not applicable	Not applicable
Noise immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating data			
Ambient temperature range	–25 ... +70 °C with natural convection	–25 ... +70 °C with natural convection	–20 ... +55 °C with natural convection
Transport/storage temperature range	–40 ... +70 °C	–40 ... +70 °C	–40 ... +70 °C
Humidity class	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation
Mechanics			
Connections			
• Supply input L, N, PE (DC input: L+1, M1, PE)	1 screw terminal each for 0.5 ... 2.5 mm² single-core/finely stranded	1 screw terminal each for 0.5 ... 2.5 mm² single-core/finely stranded	1 screw terminal each for 0.5 ... 2.5 mm² single-core/finely stranded
• Output +	1 screw terminal for 0.5 ... 2.5 mm²	1 screw terminal for 0.5 ... 2.5 mm²	2 screw terminals for 0.5 ... 2.5 mm²
• Output –	2 screw terminals for 0.5 ... 2.5 mm²	2 screw terminals for 0.5 ... 2.5 mm²	2 screw terminals for 0.5 ... 2.5 mm²
Dimensions (W × H × D) in mm	22.5 × 80 × 91	22.5 × 80 × 91	54 × 90 × 55
Weight, approx.	0.11 kg	0.14 kg	0.17 kg
Installation	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15
Accessories			
	–	–	–

Page 2/3, column 4	Page 2/3, column 5	Page 2/3, column 6
2 A	2 A	2 A
6ES7 307-1BA01-0AA0	6EP1 732-0AA00	6ES7 305-1BA80-0AA0
Approx. 84 % Approx. 9 W	Approx. 84 % Approx. 9 W	Approx. 75 % Approx. 16 W (24 W)
Typ. ±0.1 % V_{out} Typ. ±0.8 % V_{out}	Typ. ±0.3 % V_{out} Typ. ±0.8 % V_{out}	Typ. ±0.3 % V_{out} Typ. ±2.5 % V_{out}
< 1 ms (typ. 0.5 ms) < 1 ms (typ. 0.5 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)
Additional control loop, shutdown at < 28.8 V, automatic restart 2.2 ... 2.6 A	Yes, suppressor diode at output 2.1 ... 3 A	Additional control loop, shutdown at approx. 30 V, automatic restart 3.3 ... 3.9 A
Electronic shutdown, automatic restart	Electronic shutdown, automatic restart	Electronic shutdown, automatic restart
< 2 A –	< 2 A –	< 2 A –
Yes, safety extra low output voltage V_{out} according to EN 60950-1 and EN 50178 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178, creepage distances and clearances > 5 mm Class I
< 3.5 mA (typ. 0.5 mA) Yes Yes	< 3.5 mA (typ. 0.7 mA) Yes Yes	< 3.5 mA (typ. 0.7 mA) Yes Yes
cULus-listed (UL 508, CSA C22.2 No. 142), File E143289	cULus-listed (UL 508, CSA C22.2 No. 142), File E179336	UL-listed (UL 508), File E143289, CSA (CSA C22.2 No. 14)
ATEX 94/9/EC EX II 3G; EEx, nA, II, T4 U UL 1604 Class I Div. 2 Group A, B, C, D Class I Div. 2 Group A, B, C, D T4 In S7-300 system IP20	– – – IP20	– – GL IP20
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 ... +60 °C with natural convection –40 ... +85 °C Climate class 3K3 according to EN 60721, no condensation	0 ... +70 °C with natural convection –40 ... +70 °C Climate class 3K3 according to EN 60721, no condensation	–25 ... +70 °C with natural convection –40 ... +85 °C Climate class 3K5 according to EN 60721, transient condensation permitted
1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/finely stranded 2 screw terminals for 0.5 ... 2.5 mm^2 2 screw terminals for 0.5 ... 2.5 mm^2	1 screw terminal each for 2 × 0.5 ... 2.5/1.5 mm^2 single-core/finely stranded 1 screw terminal for 2 × 0.5 ... 2.5 mm^2 1 screw terminal for 2 × 0.5 ... 2.5 mm^2	1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/finely stranded 3 screw terminals for 0.5 ... 2.5 mm^2 3 screw terminals for 0.5 ... 2.5 mm^2
40 × 125 × 120 0.4 kg Can be mounted onto S7 rail	80 × 135 × 120 0.5 kg Snaps onto DIN rail EN 60715 35×15	80 × 125 × 120 0.75 kg Can be mounted onto S7 rail
Mounting adapter for standard mounting rail (6EP1 971-1BA00)	–	Mounting adapter for standard mounting rail (6ES7390-6BA00-0AA0)

Output currents up to 2 A

Selection and ordering data

Product	Input Voltage $V_{in\ rated}$	Output Voltage $V_{out\ rated}$	Current $I_{out\ rated}$	Order No.	Price in euros per PU
The smallest ones					
	**120-230 V AC** **48-220 V DC**	**24 V DC** **24 V DC**	0.5 A 0.375 A	**6EP1 331-2BA10** **6EP1 731-2BA00**	
LOGO!Power					
	**100-240 V AC**	**24 V DC**	1.3 A	**6EP1 331-1SH02**	
The S7-300 version					
	**120/230 V AC**	**24 V DC**	2 A	**6ES7 307-1BA01-0AA0**	
The DC/DC converter					
	**48-110 V DC**	**24 V DC**	2 A	**6EP1 732-0AA00**	
The outdoor version					
	**24-110 V DC**	**24 V DC**	2 A	**6ES7 305-1BA80-0AA0**	

SITOP 24 V 1-phase

3

Output current 2.5 A

Overview

Product	SITOP smart	LOGO!Power	The S7-1200 version
Power supply, type	2.5 A	2.5 A	2.5 A
Order No.	6EP1 332-2BA10	6EP1 332-1SH42	6EP1 332-1SH71
The product families are highlighted in the same color. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.	 The single-phase power supply for universal use; complies with EU directive 94/9/EEC (ATEX 100a); slim design; with 50 % extra power for 5 s and 120 % rated power up to 45 °C.	 The power supplies of the LOGO!Power range are optimally matched to the LOGO! logic modules in their functionality and design. With the wide-range input 85 V to 264 V AC and the possibility of mounting in small distribution boards, they can be used universally in the most diverse application areas in the low-end performance range.	 The power supply PM1207 (Power Module) is optimized for the new SIMATIC S7-1200 controllers in terms of design and functionality and serves as an external supply for the inputs and outputs which, to prevent an imbalance, must not be drawn from the CPU encoder supply.
Dimension drawing	Page 15/4, Dimension drawing 2	Page 15/5, Dimension drawing 1	Page 15/5, Dimension drawing 2

Technical specifications

Input			
Rated voltage value $V_{in\ rated}$	1-phase AC **120/230 V AC** set by means of selector switch	1-phase AC **100-240 V AC** Wide-range input	**120/230 V AC** Automatic range selection
Voltage range	85 ... 132 V/170 ... 264 V	85 ... 264 V	85 ... 132 V/176 ... 264 V
Overvoltage resistance Mains buffering at $I_{out\ rated}$	2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V	2.3 × $V_{in\ rated}$, 1.3 ms > 40 ms at V_{in} = 187 V	2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V
Rated line frequency; range	50/60 Hz; 47 ... 63 Hz	50/60 Hz; 47 ... 63 Hz	50/60 Hz; 47 ... 63 Hz
Rated current value $I_{in\ rated}$ Making current limit (+ 25 °C) I^2t	1.1/0.65 A < 27 A, typ. 3 ms < 0.3 A^2s	1.22-0.66 A < 30 A < 3 A^2s	1.2/0.67 A < 13 A, < 3 ms (V_{in} = 230 V) < 0.5 A^2s
Built-in incoming fuse Recommended miniature circuit breaker (IEC 898) in the mains power input	T 2 A/250 V (not accessible) From 3 A, Characteristic C	Internal From 16 A, Characteristic B or from 10 A, Characteristic C	T 3.15 A/250 V (not accessible) 16 A, Characteristic B; 10 A, Characteristic C
Output			
Rated voltage value $V_{out\ rated}$	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
Total tolerance • Static mains compensation • Static load balancing	± 3 % Approx. 0.1 % Approx. 0.5 %	±3 % Approx. 0.1 % Approx. 1.5 %	±3 % Approx. ±0.1 % Approx. ±0.2 %
Residual ripple Spikes (bandwidth: 20 MHz)	< 150 mV_{pp} (typ. 10 mV_{pp}) < 240 mV_{pp} (typ. 50 mV_{pp})	< 200 mV_{pp} (typ. 10 mV_{pp}) < 300 mV_{pp} (typ. 40 mV_{pp})	< 150 mV_{pp} < 240 mV_{pp}
Adjustment range Status display On/off behavior	22.8 ... 28.0 V Green LED for 24 V OK Overshoot of V_{out} approx. 4 %	22.2 ... 26.4 V Green LED for 24 V OK No overshoot of V_{out} (soft start)	– Green LED for 24 V OK No overshoot of V_{out} (soft start)
Startup delay/voltage rise	< 0.1 s at 230 V AC/typ. 50 ms	< 0.5 s/typ. 10 ms	< 2 (6) s at 230 (120) V/ typ. 10 ms
Rated current value $I_{out\ rated}$	**2.5 A**	**2.5 A**	**2.5 A**
Current range • Up to + 60 °C • Derating	0 ... 2.5 A 0 ... 3 A (up to +45 °C)	0 ... 2.5 A (up to +55 °C) –	0 ... 2.5 A –
Dynamic overcurrent on • Power-up on short circuit • Short circuit during operation	Typ. 7 A for 100 ms Typ. 7 A for 200 ms		Typ. 6 A for 100 ms Typ. 6 A for 100 ms
Parallel switching for enhanced performance	Yes, 2 units	Yes, 2 units	Yes, 2 units
Continuation of the table	Page 3/4, column 1	Page 3/4, column 2	Page 3/4, column 3

3

The universal types	SITOP PSA100E
2.5 A	2.5 A
6EP1 332-1SH12	6EP1 232-1AA00
	
The universal power supplies for all supply networks, with a wide-range input from 93 to 264 V AC and 110 to 350 V DC for supply from all typical networks.	The power supply is optimally tailored to standard requirements in the industrial environment; rugged metal enclosure; flexible mounting either on standard rails or directly on a wall; removable terminals.
Page 15/4, Dimension drawing 1	Page 15/6, Dimension drawing 1
1-phase AC or DC **120-230 V AC** wide-range input 93 ... 264 V AC or 110 ... 350 V DC	1-phase AC **230 V AC** 187 ... 264 V
2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 120 V, > 80 ms (typ. 100 ms) at V_{in} = 187 V 0/50/60 Hz, 47 ... 63 Hz	– > 10 ms 50/60 Hz; 47 ... 63 Hz
1.3-0.7 A < 33 A, < 3 ms (V_{in} = 230 V) < 3.5 A^2s	0.65 A < 30 A < 0.8 A^2s
T 3.15 A (not accessible) Two-pole miniature circuit breaker from 10 A, Characteristic C or from 6 A, Characteristic D	Internal From 6 A, Characteristic C
Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
± 1 % Approx. 0.1 % Approx. 0.2 %	± 3 % Approx. 0.1 % Approx. 0.5 %
< 50 mV_{pp} (typ. 40 mV_{pp}) < 100 mV_{pp} (typ. 40 mV_{pp})	< 150 mV_{pp} < 250 mV_{pp}
– Green LED for 24 V OK No overshoot of V_{out} (soft start)	23 ... 26 V Green LED for 24 V OK Overshoot of V_{out} < 1 %
< 0.6 s/typ. 20 ms	< 1.5 s/< 100 ms
2.5 A	**2.5 A**
0 ... 2.5 A –	0 ... 2.5 A (up to +45 °C) 0 ... 1.25 A (up to +70 °C)
Approx. 2.8 A constant current Approx. 2.8 A constant current	
Yes, up to 10 units	Yes, 2 units
Page 3/5, column 4	Page 3/5, column 5

Output current 2.5 A

Continued from	Page 3/2, column 1	Page 3/2, column 2	Page 3/2, column 3
Power supply, type	2.5 A	2.5 A	2.5 A
Order No.	6EP1 332-2BA10	6EP1 332-1SH42	6EP1 332-1SH71
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 85 %	Approx. 87 %	Approx. 83 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 9 W	Approx. 9 W	Approx. 12 W
Closed-loop control			
Dyn. mains compensation ($V_{in\ rated}$ ±15 %)	Typ. ±0.3 % V_{out}	< 0.2 % V_{out}	Typ. ±0.3 % V_{out}
Dynamic load smoothing (I_{out}: 50/100/50 %)	Typ. ±1 % V_{out}	Typ. ±1.5 % V_{out} (I_{out}: 10/90/10 %)	Typ. ±3 % V_{out}
Load step settling time			
• 50 to 100 %	Typ. 0.2 ms	Typ. 20 ms (10 to 90 %)	< 5 ms
• 100 to 50 %	Typ. 0.2 ms	Typ. 20 ms (90 to 10 %)	< 5 ms
Protection and monitoring			
Output overvoltage protection	< 33 V	Yes, according to EN 60950	< 33 V
Current limitation	Typ. 3.2 to 3.4 A, overload capability 150 % $I_{out\ rated}$ up to 5 s/min	Typ. 3.4 A	2.65 A
Short-circuit protection	Constant current characteristic	Constant current characteristic	Constant current characteristic
Sustained short-circuit current rms value	Approx. 5 A	< 8 A	–
Overload/short-circuit indicator	–	–	–
Safety			
Primary/secondary isolation	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178	Yes, safety extra low output voltage according to EN 60950 and EN 50178
Protection class	Class I	Class II (without protective conductor)	Class I
Leakage current	< 3.5 mA (typ. 0.4 mA)	–	< 3.5 mA
Safety approval	Yes; CB scheme	Yes; CB scheme	Yes
CE mark	Yes	Yes	Yes
UL/cUL (CSA) approval	cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259, cCSAus (CSA C22.2 No. 60950-1, UL 60950-1)	cULus-Listed (UL 508, CSA C22.2 No. 107.1), File E197259; cURus-Recognized (UL 60950, CSA C22.2 No. 60950), File E151273	cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259
Explosion protection	ATEX EX II 3G Ex nA II T4 U; UL 1604	ATEX EX II 3G Ex nA IIC T3	–
FM approval	–	Class I Div. 2, Group A, B, C, D T4	–
Marine approval	GL	GL, ABS	–
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Emitted interference	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Supply harmonics limitation	Not applicable	Not applicable	Not applicable
Noise immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating data			
Ambient temperature range	0 ... + 60 °C with natural convection	– 20 ... + 55 °C with natural convection	0 ... + 60 °C with natural convection
Transport/storage temperature range	– 40 ... + 85 °C	– 40 ... + 70 °C	– 25 ... + 85 °C
Humidity class	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation
Mechanics			
Connections			
• Supply input L, N, PE	One screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded	One screw terminal each (L, N) for 0.5 ... 2.5 mm^2 single-core/ finely stranded	One screw terminal each for 0.5 ... 2.5 mm^2
• Output +	2 screw terminals for 0.5 ... 2.5 mm^2	2 screw terminals for 0.5 ... 2.5 mm^2	2 screw terminals for 0.5 ... 2.5 mm^2
• Output –	2 screw terminals for 0.5 ... 2.5 mm^2	2 screw terminals for 0.5 ... 2.5 mm^2	2 screw terminals for 0.5 ... 2.5 mm^2
Dimensions (W × H × D) in mm	32.5 × 125 × 125	72 × 90 × 55	70 × 100 × 75
Weight, approx.	0.32 kg	0.25 kg	0.3 kg
Installation	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 -35×7.5/15, wall mounting
Accessories			
	–	–	–

Page 3/3, column 4	Page 3/3, column 5
2.5 A	2.5 A
6EP1 332-1SH12	6EP1 232-1AA00
Approx. 85 % Approx. 11 W	Approx. 84 % Approx. 11 W
Typ. ±0.3 % V_{out} Typ. ±0.5 % V_{out}	< 0.3 % V_{out} Typ. ±2.0 % V_{out}
< 2 ms (typ. 1 ms) < 2 ms (typ. 1 ms)	Typ. 0.2 ms Typ. 0.2 ms
Yes, according to EN 60950 2.8 A	< 35 V 3 A
Constant current characteristic up to 0 V	Electronic shutdown, automatic restart
< 3 A	< 2 A
–	–
Yes, safety extra low output voltage V_{out} according to EN 60950 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I
< 3.5 mA Yes Yes	< 3.5 mA (typ. 0.4 mA) Yes; CB scheme Yes
cULus-listed (UL 508, CSA C22.2 No. 142), File E143289	cULus-listed (UL 508, CSA C22.2 No.107.1), File E197259
–	–
– – IP20	– – IP20
EN 55022 Class B Not applicable EN 61000-6-2	EN 55022 Class B Not applicable EN 61000-6-2
0 ... + 60 °C with natural convection – 25 ... + 85 °C Climate class 3K3 according to EN 60721, no condensation	–10 ... +70 °C for natural convection – 25 ... + 85 °C Climate class 3K3 according to EN 60721, no condensation
One screw terminal each for 2 × 0.5 ... 1.5 mm^2 finely standed, 2 × 0.5 ... 2.5 mm^2 single-core 1 screw terminal for 2 × 0.5 ... 2.5 mm^2 1 screw terminal for 2 × 0.5 ... 2.5 mm^2	Removable screw terminal, each 1 × 0.5 ... 2.5 mm^2 Removable screw terminal, 1 × 0.5 ... 2.5 mm^2 Removable screw terminal, 1 × 0.5 ... 2.5 mm^2
80 × 135 × 120 0.5 kg Snaps onto DIN rail EN 60715 35× 15, wall mounting	52 × 170 × 110 0.8 kg Snaps onto DIN rail EN 60715 35×7.5/15, wall mounting
–	–

Output current 2.5 A

Selection and ordering data

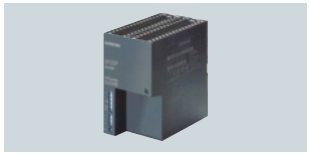
Product	Input Voltage $V_{in\ rated}$	Output Voltage $V_{out\ rated}$	Current $I_{out\ rated}$	Order No.	Price in euros per PU
SITOP smart					
	**120/230 V AC**	**24 V DC**	2.5 A	**6EP1 332-2BA10**	
LOGO!Power					
	**100-240 V AC**	**24 V DC**	2.5 A	**6EP1 332-1SH42**	
The S7-1200 version					
	**120/230 V AC**	**24 V DC**	2.5 A	**6EP1 332-1SH71**	
The universal types					
	**120-230 V AC**	**24 V DC**	2.5 A	**6EP1 332-1SH12**	
SITOP PSA100E					
	**230 V AC**	**24 V DC**	2.5 A	**6EP1 232-1AA00**	

SITOP 24 V 1-phase

4

Output current 4 A

Overview

Product	LOGO!Power	The S7-200 type	The Class2 version
Power supply, type	4 A	3.5 A	3.7 A
Order No.	6EP1 332-1SH51	6EP1 332-1SH31[1]	6EP1 332-2BA00
			
	The power supplies of the LOGO!Power range are optimally matched to the LOGO! logic modules in their functionality and design. With the wide-range input 85 V to 264 V AC, they can be used universally in the low-end performance range.	Optimally matched in design and functionality to the SIMATIC S7-200 micro PLC; flat design, particularly suitable for low cabinet depths.	The Class2 version with output limited to 100 W maximum.
Dimension drawing	Page 15/6, Dimension drawing 2	Page 15/7, Dimension drawing 1	Page 15/7, Dimension drawing 2

The product families are highlighted in the same color. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.

4

Technical specifications

Input			
Rated voltage value $V_{in\ rated}$	1-phase AC **100-240 V AC**	1-phase AC **120/230 V AC**	1-phase AC **120/230 V AC**
Voltage range	Wide-range input 85 ... 264 V	Set via wire jumper 93 ... 132 V/187 ... 264 V	Set via wire jumper 93 ... 132 V/187 ... 264 V
Overvoltage resistance	2.3 × $V_{in\ rated}$, 1.3 ms	2.3 × $V_{in\ rated}$, 1.3 ms	2.3 × $V_{in\ rated}$, 1.3 ms
Mains buffering at $I_{out\ rated}$	> 40 ms at V_{in} = 187 V	> 20 ms at V_{in} = 187 V	> 10 ms at V_{in} = 93/187 V
Rated line frequency; range	50/60 Hz; 47 ... 63 Hz	50/60 Hz, 47 ... 63 Hz	50/60 Hz, 47 ... 63 Hz
Rated current value $I_{in\ rated}$	1.95-0.97 A	1.65/0.95 A	1.8/0.7 A
Making current limit (+ 25 °C)	< 30 A	< 33 A, < 3 ms (V_{in} = 230 V)	< 32 A, typ. 3 ms (V_{in} = 230 V)
I^2t	< 2.5 A^2s	< 1.0 A^2s	< 0.8 A^2s
Built-in incoming fuse	Internal	T 2.5 A/250 V (not accessible)	T 3.15 A/250 V (not accessible)
Recommended miniature circuit breaker (IEC 898) in the mains power input	From 16 A, Characteristic B or from 10 A, Characteristic C	Two-pole miniature circuit breaker from 10 A, Characteristic C or from 6 A, Characteristic D	From 6 A, Characteristic C
Output			
Rated voltage value $V_{out\ rated}$	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
Total tolerance	±3 %	±5 % (typ. ±2 %)	±3 %
• Static mains compensation	Approx. 0.1 %	Approx. 0.1 %	Approx. 0.1 %
• Static load balancing	Approx. 1.5 %	Approx. 0.2 %	Approx. 0.2 %
Residual ripple	< 200 mV_{pp} (typ. 10 mV_{pp})	< 150 mV_{pp} (typ. 30 mV_{pp})	< 150 mV_{pp}
Spikes (bandwidth: 20 MHz)	< 300 mV_{pp} (typ. 20 mV_{pp})	< 240 mV_{pp} (typ. 110 mV_{pp})	< 240 mV_{pp}
Adjustment range	22.2 ... 26.4 V	–	22.8 ... 26.4 V[2]
Status display	Green LED for 24 V OK	–	Green LED for 24 V OK
On/off behavior	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)
Startup delay/voltage rise	< 0.5 s/typ. 35 ms	< 1 s/typ. 80 ms	< 3 s/typ. 80 ms
Rated current $I_{out\ rated}$	**4 A**	**3.5 A**	**3.7 A**
Current range			
• Up to + 60 °C	0 ... 4 A (up to +55 °C)	0 ... 3.5 A	0 ... 3.7 A
• Derating	–	–	–
Dynamic overcurrent on			
• Power-up on short circuit		Typ. 5 A for 100 ms	
• Short circuit during operation		Typ. 5 A for 100 ms	
Parallel switching for enhanced performance	Yes, 2 units	Yes, up to 5 units	Yes, 2 units[2]
Continuation of the table	Page 4/4, column 1	Page 4/4, column 2	Page 4/4, column 3

[1] SIPLUS module 6AG1 203-1SH31-2AA0 for extended temperature range –25 °C to +70 °C and use under medial load (e.g. chlorine sulfur atmosphere).

[2] Only permissible at ambient temperature 0 °C to +50 °C.

The universal types	SITOP PSA100E
4 A	4 A
6EP1 332-1SH22	6EP1 232-1AA10
	
The universal power supplies for all supply networks, with a wide-range input from 93 to 264 V AC and 110 to 350 V DC for supply from all typical networks.	The power supply is tailored to standard requirements in the industrial environment; rugged metal enclosure; flexible mounting either on standard rails or directly on a wall; removable terminals.
Page 15/4, Dimension drawing 1	Page 15/6, Dimension drawing 1
1-phase AC or DC **120-230 V AC** wide-range input 93 ... 264 V AC or 110 ... 350 V DC	1-phase AC **230 V AC** 187 ... 264 V
2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 120 V, >80 ms (typ. 100 ms) at V_{in} = 187 V 0/50/60 Hz, 47 ... 63 Hz	– > 10 ms 50/60 Hz; 47 ... 63 Hz
1.8-1.1 A < 33 A, < 3 ms (V_{in} = 230 V) < 3.5 A^2s	1.1 A < 30 A < 0.8 A^2s
T 3.15 A (not accessible) Two-pole miniature circuit breaker from 10 A, Characteristic C, or from 6 A, Characteristic D	Internal From 6 A, Characteristic C
Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
±1 % Approx. 0.1 % Approx. 0.2 %	±3 % Approx. 0.1 % Approx. 0.5 %
< 50 mV_{pp} (typ. 40 mV_{pp}) < 100 mV_{pp} (typ. 40 mV_{pp})	< 150 mV_{pp} < 250 mV_{pp}
– Green LED for 24 V OK No overshoot of V_{out} (soft start)	23 ... 26 V Green LED for 24 V OK Overshoot of V_{out} < 1 %
< 0.6 s/typ. 20 ms **4 A**	< 1.5 s/< 200 ms **4 A**
0 ... 2.5 A 0 ... 4 A (up to +50 °C)	0 ... 4 A (up to +45 °C) 0 ... 2 A (up to +70 °C)
Approx. 4.4 A constant current Approx. 4.4 A constant current	
Yes, up to 10 units	Yes, 2 units
Page 4/5, column 4	Page 4/5, column 5

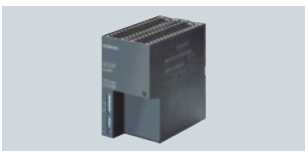
Output current 4 A

Continued from	Page 4/2, column 1	Page 4/2, column 2	Page 4/2, column 3
Power supply, type	4 A	3.5 A	3.7 A
Order No.	6EP1 332-1SH51	6EP1 332-1SH31	6EP1 332-2BA00
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$ Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 89 % Approx. 12 W	Approx. 84 % Approx. 16 W	> 80 % Approx. 22 W
Closed-loop control			
Dyn. mains compensation ($V_{in\ rated}$ ±15 %) Dynamic load smoothing (I_{out}: 50/100/50 %)	< 0.2 % V_{out} Typ. ±1.5 % V_{out} (I_{out}: 10/90/10 %)	Typ. ±0.3 % V_{out} Typ. ±3 % V_{out}	Typ. ±0.3 % V_{out} Typ. ±2.5 % V_{out}
Load step settling time • 50 to 100 % • 100 to 50 %	 Typ. 20 ms (10 to 90 %) Typ. 20 ms (90 to 10 %)	 < 5 ms < 5 ms	 Typ. 0.2 ms Typ. 0.2 ms
Protection and monitoring			
Output overvoltage protection Current limitation	Yes, according to EN 60950 Typ. 4.7 A	Yes, according to EN 60950 3.8 A	Yes, according to EN 60950 Typ. 3.8 ... 4.1 A
Short-circuit protection	Constant current characteristic	Constant current characteristic up to typ. 14 V, electronic shut-down below that, automatic restart	Electronic shutdown, automatic restart
Sustained short-circuit current rms value	<10 A	< 4 A	–
Overload/short-circuit indicator	–	–	–
Safety			
Primary/secondary isolation Protection class	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class II (without protective conductor)	Yes, safety extra low output voltage V_{out} according to EN 60950 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 Class I
Leakage current Safety approval CE mark	– Yes; CB scheme Yes	< 3.5 mA Yes Yes	< 3.5 mA (typ. 0.4 mA) Yes; CB scheme Yes
UL/cUL (CSA) approval	cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259; cURus-recognized (UL 60950, CSA C22.2 No. 60950), File E151273	cULus-listed (UL 508, CSA C22.2 No. 142), File E143289	cULus-listed (UL 508, CSA C22.2 No. 142), File E143289; cURus-recognized (UL 1950, CSA C22.2 No. 60950), File E151273; UL 1310
Explosion protection FM approval Marine approval Degree of protection (EN 60529)	ATEX EX II 3G Ex nA IIC T3 Class I Div. 2, Group A, B, C, D T4 GL, ABS IP20	– – – IP20	– – – IP20
EMC			
Emitted interference Supply harmonics limitation Noise immunity	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 55022 Class B EN 61000-3-2 EN 61000-6-2
Operating data			
Ambient temperature range Transport/storage temperature range Humidity class	–20 ... +55 °C with natural convection –40 ... +70 °C Climate class 3K3 according to EN 60721, without condensation	0 ... +60 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, without condensation	0 ... +60 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, without condensation
Mechanics			
Connections • Supply input L, N, PE • Output + • Output –	 1 screw terminal each (L, N) for 0.5 ... 2.5 mm^2 single-core/ finely stranded 2 screw terminals each for 0.5 ... 2.5 mm^2 2 screw terminals each for 0.5 ... 2.5 mm^2	 1 screw terminal each for 0.5 ... 1,5 mm^2 single-core/ finely stranded 1 screw terminal for 0.5 ... 1 mm^2 2 screw terminals for 0.5 ... 1 mm^2	 One screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded 1 screw terminal for 0.5 ... 2.5 mm^2 2 screw terminals for 0.5 ... 2.5 mm^2
Dimensions (W × H × D) in mm Weight, approx. Installation	90 × 90 × 55 0.34 kg Snaps onto DIN rail EN 60715 35×7.5/15	160 × 80 × 62 0.5 kg Snaps onto DIN rail EN 60715 35×7.5/15, wall mounting	75 × 125 × 125 0.75 kg Snaps onto DIN rail EN 60715 35×7.5/15
Accessories			
	–	Mounting bracket (6EP1971-1AA01)	–

Page 4/3, column 4	Page 4/3, column 5
4 A	4 A
6EP1 332-1SH22	6EP1 232-1AA10
Approx. 85 % Approx. 17 W	Approx. 87 % Approx. 15 W
Typ. ±0.3 % V_{out} Typ. ±0.5 % V_{out}	< 0.3 % V_{out} Typ. ±3.0 % V_{out}
< 2 ms (typ. 1 ms) < 2 ms (typ. 1 ms)	Typ. 0.2 ms Typ. 0.2 ms
Yes, according to EN 60950 4.4 A	< 35 V Typ. 4.4 A
Constant current characteristic up to 0 V	Electronic shutdown, automatic restart
< 5 A –	< 3 A –
Yes, safety extra low output voltage V_{out} according to EN 60950 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I
< 3.5 mA Yes Yes	< 3.5 mA (typ. 0.4 mA) Yes; CB scheme Yes
cULus-listed (UL 508, CSA C22.2 No. 142), File E143289	cULus-listed (UL 508, CSA C22.2 No.107.1), File E197259
– – – IP20	– – – IP20
EN 55022 Class B EN 61000-3-2 EN 61000-6-2	EN 55022 Class B – EN 61000-6-2
0 ... +50 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, without condensation	–10 ... +70 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, without condensation
One screw terminal each for 2 × 0.5 ... 1.5 mm² finely stranded, 2 × 0.5 ... 2.5 mm² single-core 1 screw terminal for 2 × 0.5 ... 2.5 mm² 1 screw terminal for 2 × 0.5 ... 2.5 mm²	Removable screw terminal, each 1 × 0.5 ... 2.5 mm² Removable screw terminal for 1 × 0.5 ... 2.5 mm² Removable screw terminal for 1 × 0.5 ... 2.5 mm²
80 × 135 × 120 0.5 kg Snaps onto DIN rail EN 60715 35×15, wall mounting	52 × 170 × 110 0.8 kg Snaps onto DIN rail EN 60715 35×7.5/15, wall mounting
–	–

Output current 4 A

Selection and ordering data

Product	Input Voltage $V_{in\ rated}$	Output Voltage $V_{out\ rated}$	Current $I_{out\ rated}$	Order No.	Price in euros per PU
LOGO!Power					
	**100-240 V AC**	**24 V DC**	4 A	**6EP1 332-1SH51**	
The S7-200 type					
	**100/230 V AC**	**24 V DC**	3.5 A	**6EP1 332-1SH31**	
The Class2 version					
	**120/230 V AC**	**24 V DC**	3.7 A	**6EP1 332-2BA00**	
The universal types					
	**120-230 V AC**	**24 V DC**	4 A	**6EP1 332-1SH22**	
SITOP PSA100E					
	**230 V AC**	**24 V DC**	4 A	**6EP1 232-1AA10**	

SITOP 24 V
1-phase and 2-phase

5

SITOP 24 V
1-phase and 2-phase

Output currents 5 A and 6 A

Overview

Product	SITOP modular	SITOP smart	
Power supply, type	5 A	5 A	5 A
Order No.	6EP1 333-3BA00[1)]	6EP1 333-2AA01	6EP1 333-2BA01
The product families are highlighted in the same color. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.			
	The modular power supply with 1-phase and 2-phase wide-range input for global use; with switchable output characteristic; functional expansion possible using expansion modules.	The 1-phase power supply for universal use; complies with EU directive 94/9/EEC (ATEX 100a); slim design; with 50 % extra power for 5 s and 120 % rated power up to 45 °C; without limiting supply harmonics.	The 1-phase power supply for universal use; complies with EU directive 94/9/EEC (ATEX 100a); slim design; with 50 % extra power for 5 s and 120 % rated power up to 45 °C.
Dimension drawing	Page 15/8, Dimension drawing 1	Page 15/8, Dimension drawing 2	Page 15/8, Dimension drawing 2

5

Technical specifications

Input			
Rated voltage value $V_{in\ rated}$ Voltage range	1-phase and 2-phase AC **120-230/230-500 V AC** Set by means of selector switch on device 85 ... 264 V/176 ... 500 V	1-phase AC **120/230 V AC** Set by means of selector switch on device 85 ... 132 V/170 ... 264 V	1-phase AC **120/230 V AC** Set by means of selector switch on device 85 ... 132 V/170 ... 264 V
Overvoltage resistance Mains buffering at $I_{out\ rated}$ Rated line frequency; range	1300 V_{peak}, 1.3 ms > 25 ms at V_{in} = 120/230 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 ... 63 Hz
Rated current value $I_{in\ rated}$ Making current limit (+ 25 °C) I^2t	2.2-1.2/1.2-0.61 A < 35 A < 1.7 A^2s	2.1/1.15 A < 32 A, typ. 3 ms < 0.8 A^2s	2.1/1.15 A < 32 A, typ. 3 ms < 0.8 A^2s
Built-in incoming fuse Recommended miniature circuit breaker (IEC 898) in the mains power input	T 3.15 A (not accessible) From 6 A (10 A) Characteristic C (B); with 2-phase operation: miniature circuit breaker with two-pole connection or circuit breaker 3RV1021-1EA10	T 3.15 A/250 V (not accessible) From 6 A, Characteristic C	T 3.15 A/250 V (not accessible) From 6 A, Characteristic C
Output			
Rated voltage value $V_{out\ rated}$	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
Total tolerance • Static mains compensation • Static load balancing	±3 % Approx. 0.1 % Approx. 0.1 %	±3 % Approx. 0.1 % Approx. 0.5 %	±3 % Approx. 0.1 % Approx. 0.5 %
Residual ripple Spikes (bandwidth: 20 MHz)	< 50 mV_{pp} < 200 mV_{pp}	< 150 mV_{pp} (typ. 50 mV_{pp}) < 240 mV_{pp} (typ. 150 mV_{pp})	< 150 mV_{pp} (typ. 50 mV_{pp}) < 240 mV_{pp} (typ. 150 mV_{pp})
Adjustment range Status display On/off behavior	24 ... 28.8 V (max. 120 W) Green LED for 24 V OK Overshoot of V_{out} approx. 3 %	22.8 ... 28 V Green LED for 24 V OK Overshoot of V_{out} approx. 4 %	22.8 ... 28 V Green LED for 24 V OK Overshoot of V_{out} approx. 4 %
Startup delay/voltage rise Rated current value $I_{out\ rated}$	< 1 s/< 50 ms **5 A**	< 0.1 s at 230 V AC/typ. 50 ms **5 A**	< 0.1 s at 230 V AC/typ. 50 ms **5 A**
Current range • Up to + 60 °C • Derating	0 ... 5 A –	0 ... 5 A 0 ... 6 A (up to +45 °C)	0 ... 5 A 0 ... 6 A (up to +45 °C)
Dynamic overcurrent on • Power-up on short circuit • Short circuit during operation	Approx. 5.5 A constant current Typ. 15 A for 25 ms	Typ. 17 A for 100 ms Typ. 17 A for 200 ms	Typ. 17 A for 100 ms Typ. 17 A for 200 ms
Parallel switching for enhanced performance	Yes, 2 units (switchable characteristic)	Yes, 2 units	Yes, 2 units
Continuation of the table	Page 5/4, column 1	Page 5/4, column 2	Page 5/4, column 3

[1)] SITOP modular plus 6EP1 333-3BA00-8AC0, PCB with protective coating.

The S7-300 version	The outdoor version	The flat design	SITOP PSA100E
5 A	5 A	5 A	6 A
6ES7 307-1EA01-0AA0	6ES7 307-1EA80-0AA0[2]	6EP1 333-1AL12	6EP1 233-1AA00
			
The proven power supply in SIMATIC S7-300 design; with PS-CPU connecting comb and for mounting directly on S7 rail.	The power supply for extreme environmental conditions in SIMATIC S7-300 design; can be snapped onto S7 rail; with PS-CPU connecting comb.	The flat design 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 power supply is tailored to standard requirements in the industrial environment; rugged metal enclosure; flexible mounting either on standard rails or directly on a wall; removable terminals.
Page 15/3, Dimension drawing 1	Page 15/3, Dimension drawing 2	Page 15/9, Dimension drawing 1	Page 15/6, Dimension drawing 1
1-phase AC **120/230 V AC** Automatic range switching 85 ... 132 V/170 ... 264 V	1-phase AC **120/230 V AC** Set by means of selector switch on device 93 ... 132 V/187 ... 264 V	1-phase AC **120/230 V AC** Set by means of selector switch on device 85 ... 132 V/170 ... 264 V	1-phase AC **230 V AC** 187 ... 264 V
2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 ... 63 Hz	– > 10 ms 50/60 Hz; 47 ... 63 Hz
2.3/1.2 A < 20 A, < 3 ms < 1.2 A^2s	2.1/1.2 A < 45 A, < 3 ms < 1.8 A^2s (typ. 1.2 A^2s)	2.2/1.2 A < 32 A, < 3 ms < 0.8 A^2s	1.4 A < 35 A < 1.2 A^2s
T 3.15 A/250 V (not accessible) From 6 A, Characteristic C	T 3.15 A/250 V (not accessible) From 10 A, Characteristic C or from 6 A, Characteristic D	T 3.15 A/250 V (not accessible) From 6 A, Characteristic C	Internal From 10 A, Characteristic C
Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
±3 % Approx. 0.1 % Approx. 0.5 %	±3 % Approx. 0.2 % Approx. 0.4 %	±1 % Approx. 0.1 % Approx. 0.5 %	±3 % Approx. 0.1 % Approx. 0.5 %
< 50 mV_{pp} (typ. 10 mV_{pp}) < 150 mV_{pp} (typ. 20 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})	< 150 mV_{pp} < 250 mV_{pp}
– Green LED for 24 V OK No overshoot of V_{out} (soft start)	– Green LED for 24 V OK No overshoot of V_{out} (soft start)	22 ... 29 V Green LED for 24 V OK No overshoot of V_{out} (soft start)	23 ... 26 V Green LED for 24 V OK Overshoot of V_{out} < 5 %
< 2 s/typ. 10 ms **5 A**	< 3 s/typ. 100 ms **5 A**	< 2 s/typ. 40 ms **5 A**	< 0.3 s/< 500 ms **6 A**
0 ... 5 A –	0 ... 5 A 0 ... 5 A (up to +70 °C)	0 ... 5 A –	0 ... 6 A (up to +45 °C) 0 ... 3 A (up to +70 °C)
Typ. 20 A for 100 ms Typ. 20 A for 100 ms	Typ. 20 A for 180 ms Typ. 20 A for 80 ms	Typ. 20 A for 500 ms Typ. 20 A for 500 ms	
Yes	Not permitted	Yes, 2 units	Yes, 2 units
Page 5/5, column 4	Page 5/5, column 5	Page 5/5, column 6	Page 5/5, column 7

[2] SIPLUS module 6AG1 307-1EA80-2AA0 for temperature range -25 °C to +60 °C and use under medium load (e.g. sulfur chloride atmosphere). This SIPLUS power supply conforms with standards for electronic equipment used on rolling stock (EN 50155, temperature T1, category 1).

Output currents 5 A and 6 A

Continued from	Page 5/2, column 1	Page 5/2, column 2	Page 5/2, column 3
Power supply, type (repeated)	5 A	5 A	5 A
Order No. (repeated)	6EP1 333-3BA00	6EP1 333-2AA01	6EP1 333-2BA01
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. 17 W	Approx. 17 W
Closed-loop control			
Dyn. mains compensation ($V_{in\ rated}$ ±15 %)	Typ. ±0.1 % V_{out}	Typ. ±0.3 % V_{out}	Typ. ±0.3 % V_{out}
Dynamic load smoothing (I_{out}: 50/100/50 %)	Typ. + 3 % V_{out}	Typ. ±1 % V_{out}	Typ. ±1 % V_{out}
Load step settling time			
• 50 to 100 %	< 5 ms (typ. 2 ms)	Typ. 0.2 ms	Typ. 0.2 ms
• 100 to 50 %	< 5 ms (typ. 2 ms)	Typ. 0.2 ms	Typ. 0.2 ms
Protection and monitoring			
Output overvoltage protection	< 35 V	< 33 V	< 33 V
Current limitation	Typ. 5.5 A	Typ. 6.4 ... 6.6 A, overload capability 150 % $I_{out\ rated}$ up to 5 s/min	Typ. 6.4 ... 6.6 A, overload capability 150 % $I_{out\ rated}$ up to 5 s/min
Short-circuit protection	Alternatively, constant current characteristic approx. 5.5 A or latching shutdown	Constant current characteristic	Constant current characteristic
Sustained short-circuit current rms value	Approx. 5.5 A	Approx. 10 A	Approx. 10 A
Overload/short-circuit indicator	LED yellow for "overload", LED red for "latching shutdown"	–	–
Safety			
Primary/secondary isolation	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178
Protection class	Class I	Class I	Class I
Leakage current	< 3.5 mA (typ. 0.25 mA)	< 3.5 mA (typ. 0.4 mA)	< 3.5 mA (typ. 0.4 mA)
Safety approval	Yes	Yes; CB scheme	Yes; CB scheme
CE mark	Yes	Yes	Yes
UL/cUL (CSA) approval	cULus-listed (UL 508, CSA C22.2 No. 14), File E197259	cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259, cCSAus (CSA C22.2 No. 60950-1, UL 60950-1)	cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259, cCSAus (CSA C22.2 No. 60950-1, UL 60950-1)
Explosion protection	–	ATEX EX II 3G EEx nA II T4 U; UL 1604	ATEX EX II 3G EEx nA II T4 U; UL 1604
FM approval	–	–	–
Marine approval	–	GL	GL
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Emitted interference	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Supply harmonics limitation	EN 61000-3-2	–	EN 61000-3-2
Noise immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating data			
Ambient temperature range	0 ... + 60 °C with natural convection	0 ... + 60 °C with natural convection	0 ... + 60 °C with natural convection
Transport/storage temperature range	– 25 ... + 85 °C	– 40 ... + 85 °C	– 40 ... + 85 °C
Humidity class	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation
Mechanics			
Connections			
• Supply input L, N, PE	1 screw terminal each for 0.2 ... 2.5 mm^2 single-core/ finely stranded	1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded	1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded
• Output +	2 screw terminals for 0.2 ... 2.5 mm^2	2 screw terminals for 0.5 ... 2.5 mm^2	2 screw terminals for 0.5 ... 2.5 mm^2
• Output –	2 screw terminals for 0.2 ... 2.5 mm^2	2 screw terminals for 0.5 ... 2.5 mm^2	2 screw terminals for 0.5 ... 2.5 mm^2
Dimensions (W × H × D) in mm	70 × 125 × 125	50 × 125 × 125	50 × 125 × 125
Weight, approx.	1.2 kg	0.5 kg	0.5 kg
Installation	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15
Accessories			
	Buffer module (6EP1961-3BA00) Signal. module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)	–	–

Page 5/3, column 4	Page 5/3, column 5	Page 5/3, column 6	Page 5/3, column 7
5 A	5 A	5 A	6 A
6ES7 307-1EA01-0AA0	6ES7 307-1EA80-0AA0	6EP1 333-1AL12	6EP1 233-1AA00
Approx. 87 % Approx. 18 W	Approx. 84 % Approx. 23 W	Approx. 88 % Approx. 17 W	Approx. 87 % Approx. 22 W
Typ. ±0.1 % V_{out} Typ. ±1 % V_{out}	Typ. ±0.3 % V_{out} Typ. ±3 % V_{out}	Typ. ±0.3 % V_{out} Typ. ±0.5 % V_{out}	< 0.3 % V_{out} Typ. ±2.0 % V_{out}
Typ. 0.3 ms Typ. 0.3 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)	Typ. 0.1 ms Typ. 0.1 ms
Additional control loop, shutdown at < 28.8 V, automatic restart 5.5 ... 6.5 A	Additional control loop, shutdown at approx. 30 V, automatic restart 5.5 ... 6.5 A	Additional control loop, shutdown at approx. 33 V, automatic restart 5.5 ... 6.5 A	< 35 V Typ. 6.6 A
Electronic shutdown, automatic restart < 7 A –	Electronic shutdown, automatic restart < 5 A –	Electronic shutdown, automatic restart < 5 A –	Electronic shutdown, automatic restart < 3.6 A –
Yes, safety extra low output voltage V_{out} according to EN 60950-1 and EN 50178 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178, creepage distances and clearances > 8 mm Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I
< 3.5 mA (typ. 0.5 mA) Notified Body Yes	< 3.5 mA (typ. 0.3 mA) Yes Yes	< 3.5 mA (typ. 0.26 mA) Yes Yes	< 3.5 mA (typ. 0.8 mA) Yes; CB scheme Yes
cULus-listed (UL 508, CSA C22.2 No. 142) File E143289	UL-listed (UL 508) File E143289, CSA (CSA C22.2 No. 14)	cULus-listed (UL 508, CSA C22.2 No. 14), File E197259	cULus-listed (UL 508, CSA C22.2 No.107.1), File E197259
ATEX 94/9/EC EX II 3G; EEx, nA, II, T4 U; UL 1604 Class I Div. 2 Group A, B, C, D Class I Div. 2 Group A, B, C, D, T 4 In S7-300 system IP20	– – GL IP20	– – – IP20	– – – IP20
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	EN 55022 Class B – EN 61000-6-2
0 ... +60 °C with natural convection – 40 ... + 85 °C Climate class 3K3 according to EN 60721, no condensation	– 25 ... + 70 °C with natural convection – 40 ... + 85 °C Climate class 3K5 according to EN 60721, transient condensation permitted	0 ... + 60 °C with natural convection – 25 ... + 85 °C Climate class 3K3 according to EN 60721, no condensation	–10 ... +70 °C with natural convection – 25 ... +85 °C Climate class 3K3 according to EN 60721, no condensation
1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded 3 screw terminals for 0.5 ... 2.5 mm^2 3 screw terminals for 0.5 ... 2.5 mm^2	1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded 3 screw terminals for 0.5 ... 2.5 mm^2 3 screw terminals for 0.5 ... 2.5 mm^2	1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded 3 screw terminals for 0.5 ... 2.5 mm^2 3 screw terminals for 0.5 ... 2.5 mm^2	Removable screw terminal each for 1 × 0.5 ... 2.5 mm^2 Removable screw terminal, 1 × 0.5 ... 2.5 mm^2 Removable screw terminal, 1 × 0.5 ... 2.5 mm^2
60 × 125 × 120 0.6 kg Can be mounted onto S7 rail	80 × 125 × 120 0.57 kg Can be mounted onto S7 rail	160 × 130 × 60 0.6 kg Snaps onto DIN rail EN 60715 35×7.5/15	52 × 170 × 110 0.9 kg Snaps onto DIN rail EN 60715 35×7.5/15, wall mounting
Mounting adapter for standard mounting rail (6EP1 971-1BA00)	Mounting adapter for standard mounting rail (6ES7390-6BA00-0AA0)	Mounting bracket (6EP1971-1AA01)	–

Output currents 5 A and 6 A

Selection and ordering data

Product	Input Voltage $V_{in\ rated}$	Output Voltage $V_{out\ rated}$	Current $I_{out\ rated}$	Order No.	Price in euros per PU
SITOP modular					
	**120-230/230-500 V AC**	**24 V DC**	5 A	**6EP1 333-3BA00**	
SITOP smart					
	**120/230 V AC**	**24 V DC**	5 A	**6EP1 333-2AA01**	
	120/230 V AC	**24 V DC**	5 A	**6EP1 333-2BA01**	
The S7-300 version					
	**120/230 V AC**	**24 V DC**	5 A	**6ES7 307-1EA01-0AA0**	
The outdoor version					
	**120/230 V AC**	**24 V DC**	5 A	**6ES7 307-1EA80-0AA0**	
The flat design					
	**120/230 V AC**	**24 V DC**	5 A	**6EP1 333-1AL12**	
SITOP PSA100E					
	**230 V AC**	**24 V DC**	6 A	**6EP1 233-1AA00**	

SITOP 24 V
1-phase and 2-phase

6

Output currents 10 A and 12 A

Overview

Product	SITOP modular	SITOP smart	
Power supply, type	10 A	10 A	10 A
Order No.	6EP1 334-3BA00[1)2)]	6EP1 334-2AA01	6EP1 334-2BA01[3)]
The product families are highlighted in the same colors. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.	 The modular power supply with 1-phase and 2-phase wide-range input for global use; with switchable output characteristics; functional expansion possible using expansion modules.	 The single-phase power supply for universal use; complies with EU directive 94/9/EEC (ATEX 100a); slim design; with 50 % extra power for 5 s and 120 % rated power up to 45 °C; without limiting supply harmonics.	 The single-phase power supply for universal use; complies with EU directive 94/9/EEC (ATEX 100a); slim design; with 50 % extra power for 5 s and 120 % rated power up to 45 °C.
Dimension drawing	Page 15/9, Dimension drawing 2	Page 15/10, Dimension drawing 1	Page 15/10, Dimension drawing 1

Technical specifications

Input			
Rated voltage value $V_{in\ rated}$ Voltage range	1-phase and 2-phase AC **120-230/230-500 V AC** Set by means of selector switch on device 85 ... 264 V/176 ... 550 V	1-phase AC **120/230 V AC** Set by means of selector switch on device 85 ... 132 V/170 ... 264 V	1-phase AC **120/230 V AC** Set by means of selector switch on device 85 ... 132 V/170 ... 264 V
Overvoltage resistance Mains buffering at $I_{out\ rated}$ Rated line frequency; range	1300 V_{peak}, 1.3 ms > 25 ms at V_{in} = 120/230 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 ... 63 Hz
Rated current value $I_{in\ rated}$ Making current limit (+ 25 °C) I^2t	4.4-2.4/2.4-1.1 A < 35 A < 4.0 A^2s	4.1/2.4 A < 65 A, typ. 3 ms < 3.3 A^2s	4.1/2.0 A < 65 A, typ. 3 ms < 3.3 A^2s
Built-in incoming fuse Recommended miniature circuit breaker (IEC 898) in the mains power input	T 6.3 A (not accessible) From 6 A (10 A) Characteristic C (B); with 2-phase operation: miniature circuit breaker with two-pole connection or circuit breaker 3RV1021-1EA10	T 6.3 A/250 V (not accessible) From 10 A, Characteristic C	T 6.3 A/250 V (not accessible) From 10 A, Characteristic C
Output			
Rated voltage value $V_{out\ rated}$	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
Total tolerance • Static mains compensation • Static load balancing	±3 % Approx. 0.1 % Approx. 0.1 %	±3 % Approx. 0.1 % Approx. 0.5 %	±3 % Approx. 0.1 % Approx. 0.5 %
Residual ripple Spikes (bandwidth: 20 MHz)	< 50 mV_{pp} < 200 mV_{pp}	< 150 mV_{pp} (typ. 50 mV_{pp}) < 240 mV_{pp} (typ. 150 mV_{pp})	< 150 mV_{pp} (typ. 50 mV_{pp}) < 240 mV_{pp} (typ. 150 mV_{pp})
Adjustment range Status display On/off behavior	24 ... 28.8 V (max. 240 W) Green LED for 24 V OK Overshoot of V_{out} approx. 3 %	22.8 ... 28 V Green LED for 24 V OK Overshoot of V_{out} approx. 4 %	22.8 ... 28 V Green LED for 24 V OK Overshoot of V_{out} approx. 4 %
Startup delay/voltage rise Rated current value $I_{out\ rated}$	< 1 s/< 50 ms **10 A**	< 0.1 s at 230 V AC/typ. 50 ms **10 A**	< 0.1 s at 230 V AC/typ. 50 ms **10 A**
Current range • Up to +60 °C • Derating	 0 ... 10 A 0 ... 10 A	 0 ... 10 A 0 ... 12 A (up to +45 °C)	 0 ... 10 A 0 ... 12 A (up to +45 °C)
Dynamic overcurrent on • Power-up on short circuit • Short circuit during operation	 Approx. 12 A constant current Typ. 30 A for 25 ms	 Typ. 30 A for 100 ms Typ. 33 A for 200 ms	 Typ. 30 A for 100 ms Typ. 33 A for 200 ms
Parallel switching for enhanced performance	Yes, 2 units (switchable characteristic)	Yes, 2 units	Yes, 2 units
Continuation of the table	Page 6/4, column 1	Page 6/4, column 2	Page 6/4, column 3

1) SIPLUS module 6AG1 334-3BA00-4AA0 for use under medial load (e.g. sulfur chloride atmosphere).

2) SITOP modular plus 6EP1 334-3BA00-8AB0, PCB with protective coating.

3) SIPLUS module 6AG1 344-2BA01-4AA0 for use under medial load (e.g. sulfur chloride atmosphere).

The S7-300 version	The flat design	The universal type	SITOP PSA100E
10 A	10 A	10 A	12 A
6ES7 307-1KA02-0AA0	6EP1 334-1AL12	6EP1 334-1SH01	6EP1 234-1AA00
			
The proven power supply in SIMATIC S7-300 design; with PS-CPU connecting comb and for mounting direct on S7 rail.	The flat design 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 for all supply networks, with a wide-range input from 93 to 264 V AC and 110 to 350 V DC for supply from all typical networks.	The power supply is optimally tailored to standard requirements in the industrial environment; rugged metal enclosure; flexible mounting either on standard rails or directly on a wall; removable terminals.
Page 15/10, Dimension drawing 2	Page 15/9, Dimension drawing 1	Page 15/11, Dimension drawing 1	Page 15/6, Dimension drawing 1
1-phase AC **120/230 V AC** Automatic range switch 85 ... 132 V/170 ... 264 V	1-phase AC **120/230 V AC** Set by means of selector switch on device 85 ... 132 V/170 ... 264 V	1-phase AC or DC **120-230 V AC** wide-range input 93 ... 264 V AC or 110 ... 350 V DC	1-phase AC **230 V AC** 187 ... 264 V
2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V 50/60 Hz, 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 93/187 V 0/50/60 Hz, 47 ... 63 Hz	– > 10 ms 50/60 Hz; 47 ... 63 Hz
4.2/1.9 A < 55 A, < 3 ms < 3.3 A^2s	4.0/2.5 A < 65 A, < 3 ms < 3.3 A^2s	2.5-1.3 A < 20 A, < 3 ms < 1.5 A^2s	2.5 A < 50 A < 3.3 A^2s
T 6.3 A/250 V (not accessible) From 10 A, Characteristic C	T 6.3 A/250 V (not accessible) From 10 A, Characteristic C	T 6.3 A (not accessible) From 16 A, Characteristic C	Internal From 10 A, Characteristic C
Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
±3 % Approx. 0.1 % Approx. 0.5 %	±1 % Approx. 0.1 % Approx. 0.5 %	±1 % Approx. 0.1 % Approx. 0.2 %	±3 % Approx. 0.1 % Approx. 0.5 %
< 50 mV_{pp} (typ. 15 mV_{pp}) < 150 mV_{pp} (typ. 60 mV_{pp})	< 150 mV_{pp} (typ. 50 mV_{pp}) < 240 mV_{pp} (typ. 200 mV_{pp})	< 100 mV_{pp} < 100 mV_{pp}	< 150 mV_{pp} < 250 mV_{pp}
– Green LED for 24 V OK No overshoot of V_{out} (soft start)	22 ... 29 V Green LED for 24 V OK No overshoot of V_{out} (soft start)	– Green LED for 24 V OK No overshoot of V_{out} (soft start)	23 ... 26 V Green LED for 24 V OK Overshoot of V_{out} < 5 %
< 2 s/typ. 10 ms **10 A**	< 2 s/typ. 40 ms **10 A**	< 3 s/typ. 100 ms **10 A**	< 0.3 s/< 500 ms **12 A**
0 ... 10 A –	0 ... 10 A –	0 ... 10 A –	0 ... 12 A (up to +45 °C) 0 ... 6 A (up to +70 °C)
Typ. 38 A for 80 ms Typ. 38 A for 80 ms	Typ. 35 A for 700 ms Typ. 35 A for 700 ms	Approx. 11 A constant current Approx. 11 A constant current	
Yes	Yes, 2 units	Yes, 2 units	Yes, 2 units
Page 6/5, column 4	Page 6/5, column 5	Page 6/5, column 6	Page 6/5, column 7

Output currents 10 A and 12 A

Continuation of the table	Page 6/2, column 1	Page 6/2, column 2	Page 6/2, column 3
Power supply, type (repeated)	10 A	10 A	10 A
Order No. (repeated)	6EP1 334-3BA00	6EP1 334-2AA01	6EP1 334-2BA01
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 87 %	Approx. 90 %	Approx. 91 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 36 W	Approx. 27 W	Approx. 24 W
Closed-loop control			
Dyn. mains compensation ($V_{in\ rated}$ ±15 %)	Typ. ±0.1 % V_{out}	Typ. ±0.3 % V_{out}	Typ. ±0.3 % V_{out}
Dynamic load smoothing (I_{out}: 50/100/50 %)	Typ. + 3 % V_{out}	Typ. ±1 % V_{out}	Typ. ±1 % V_{out}
Load step settling time			
• 50 to 100 %	< 5 ms (typ. 2 ms)	Typ. 0.2 ms	Typ. 0.2 ms
• 100 to 50 %	< 5 ms (typ. 2 ms)	Typ. 0.2 ms	Typ. 0.2 ms
Protection and monitoring			
Output overvoltage protection	< 35 V	< 33 V	< 33 V
Current limitation	Typ. 12 A	Typ. 12.5 ... 13.5 A, overload capability 150 % $I_{out\ rated}$ up to 5 s/min	Typ. 12.5 ... 13.5 A, overload capability 150 % $I_{out\ rated}$ up to 5 s/min
Short-circuit protection	Alternatively, constant current characteristic approx. 12 A or latching shutdown	Constant current characteristic	Constant current characteristic
Sustained short-circuit current rms value	Approx. 12 A	Approx. 16 A	Approx. 16 A
Overload/short-circuit indicator	LED yellow for "overload", LED red for "latching shutdown"	–	–
Safety			
Primary/secondary isolation	Safety extra low output voltage V_{out} according to EN 60950 and EN 50178	Safety extra low output voltage V_{out} according to EN 60950 and EN 50178	Safety extra-low output voltage V_{out} according to EN 60950 and EN 50178
Protection class	Class I	Class I	Class I
Leakage current	< 3.5 mA (typ. 0.32 mA)	< 3.5 mA (typ. 0.8 mA)	< 3.5 mA (typ. 0.8 mA)
Safety approval	Yes	Yes; CB scheme	Yes; CB scheme
CE mark	Yes	Yes	Yes
UL/cUL (CSA) approval	Yes, cULus-listed (UL 508, CSA C22.2 No. 14), File E197259	Yes, cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259, cCSAus (CSA C22.2 No. 60950-1, UL 60950-1)	Yes, cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259, cCSAus (CSA C22.2 No. 60950-1, UL 60950-1)
Explosion protection	–	ATEX EX II 3G EEx nA II T4 U; UL 1604	ATEX EX II 3G EEx nA II T4 U; UL 1604
FM approval	–	–	–
Marine approval	–	GL	GL
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Emitted interference	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Supply harmonics limitation	EN 61000-3-2	–	EN 61000-3-2
Noise immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating data			
Ambient temperature range	0 ... +60 °C with natural convection	0 ... +60 °C with natural convection	0 ... +60 °C with natural convection
Transport/storage temperature range	–25 ... +85 °C	–40 ... +85 °C	–40 ... +85 °C
Humidity class	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation
Mechanics			
Connections			
• Supply input L, N, PE	1 screw terminal each for 0.2 ... 2.5 mm^2 single-core/ finely stranded	1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded	1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded
• Output +	2 screw terminals for 0.2 ... 2.5 mm^2	2 screw terminals for 0.5 ... 2.5 mm^2	2 screw terminals for 0.5 ... 2.5 mm^2
• Output –	2 screw terminals for 0.2 ... 2.5 mm^2	2 screw terminals for 0.5 ... 2.5 mm^2	2 screw terminals for 0.5 ... 2.5 mm^2
Dimensions (W × H × D) in mm	90 × 125 × 125	70 × 125 × 125	70 × 125 × 125
Weight, approx.	1.4 kg	0.75 kg	0.8 kg
Installation	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15
Accessories			
	Buffer module (6EP1961-3BA00) Signal. module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)	–	–

Page 6/3, column 4	Page 6/3, column 5	Page 6/3, column 6	Page 6/3, column 7
10 A	10 A	10 A	12 A
6ES7 307-1KA02-0AA0	6EP1 334-1AL12	6EP1 334-1SH01	6EP1 234-1AA00
Approx. 90 % Approx. 27 W	Approx. 89 % Approx. 30 W	Approx. 85 % Approx. 42 W	Approx. 88 % Approx. 39 W
Typ. ±0.1 % V_{out} Typ. ±2 % V_{out}	Typ. ±0.3 % V_{out} Typ. ±0.6 % V_{out}	Typ. ±0.3 % V_{out} Typ. ±1.5 % V_{out}	< 0.3 % V_{out} Typ. ±3.5 % V_{out}
< 0.1 ms < 0.1 ms	< 5 ms (typ. 0.1 ms) < 5 ms (typ. 0.2 ms)	< 20 ms (typ. 10 ms) < 20 ms (typ. 10 ms)	Typ. 0.1 ms Typ. 0.1 ms
Additional control loop, shutdown at < 28.8 V, automatic restart 11 ... 12 A	Additional control loop, shutdown at approx. 33 V, automatic restart 11 ... 13 A	Yes, according to EN 60950 11 ... 13 A	< 35 V Typ. 13.2 A
Electronic shutdown, automatic restart	Electronic shutdown, automatic restart	Constant current characteristic approx. 11 A	Electronic shutdown, automatic restart
< 12 A –	< 10 A –	< 14 A –	< 7.5 A –
Yes, safety extra low output voltage V_{out} according to EN 60950-1 and EN 50178 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I
< 3.5 mA (typ. 0.6 mA) Yes Yes	< 3.5 mA (typ. 0.27 mA) Yes Yes	< 3.5 mA Yes Yes	< 3.5 mA (typ. 0.8 mA) Yes; CB scheme Yes
cULus-listed (UL 508, CSA C22.2 No. 142), File E143289	cULus-listed (UL 508, CSA C22.2 No. 14), File E197259	cULus-listed (UL 508, CSA C22.2 No. 142), File E143289	Yes, cULus-listed (UL 508, CSA C22.2 No.107.1), File E197259
ATEX 94/9/EC EX II 3G; EEx, nA, II, T4 U; UL 1604 Class I Div. 2 Group A, B, C, D Class I Div. 2, Group A, B, C, D, T4 In S7-300 system IP20	– – – IP20	– – – IP20	– – – IP20
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	EN 55022 Class B – EN 61000-6-2
0 ... +60 °C with natural convection –40 ... +85 °C Climate class 3K3 according to EN 60721, no condensation	0 ... +60 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, no condensation	0 ... +60 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, no condensation	–10 ... +70 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, no condensation
1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded 4 screw terminals for 0.5 ... 2.5 mm^2 4 screw terminals for 0.5 ... 2.5 mm^2	1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded 3 screw terminals for 0.5 ... 2.5 mm^2 3 screw terminals for 0.5 ... 2.5 mm^2	1 screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded 3 screw terminals for 0.5 ... 2.5 mm^2 3 screw terminals for 0.5 ... 2.5 mm^2	Removable screw terminal, each 1 × 0.5 ... 2.5 mm^2 Removable screw terminal, 1 × 0.5 ... 2.5 mm^2 Removable screw terminal, 1 × 0.5 ... 2.5 mm^2
80 × 125 × 120 0.8 kg Can be mounted onto S7 rail	160 × 130 × 60 0.72 kg Snaps onto DIN rail EN 60715 35×7.5/15	200 × 125 × 135 1.8 kg Snaps onto DIN rail EN 60715 35×15 or onto S7 rail	52 × 170 × 110 0.9 kg Snaps onto DIN rail EN 60715 35×7.5/15, wall mounting
Mounting adapter for standard mounting rail (6EP1 971-1BA00)	Mounting bracket (6EP1971-1AA01)	–	–

Output currents 10 A and 12 A

Selection and ordering data

Product	Input Voltage $V_{in\ rated}$	Output Voltage $V_{out\ rated}$	Current $I_{out\ rated}$	Order No.	Price in euros per PU
SITOP modular					
	**120-230/230-500 V AC**	**24 V DC**	10 A	**6EP1 334-3BA00**	
SITOP smart					
	**120/230 V AC**	**24 V DC**	10 A	**6EP1 334-2AA01**	
	120/230 V AC	**24 V DC**	10 A	**6EP1 334-2BA01**	
The S7-300 version					
	**120/230 V AC**	**24 V DC**	10 A	**6ES7 307-1KA02-0AA0**	
The flat design					
	**120/230 V AC**	**24 V DC**	10 A	**6EP1 334-1AL12**	
The universal type					
	**120 - 230 V AC**	**24 V DC**	10 A	**6EP1 334-1SH01**	
SITOP PSA100E					
	**230 V AC**	**24 V DC**	12 A	**6EP1 234-1AA00**	

SITOP 24 V
1-phase and 2-phase

Output currents 20 A and 40 A

Overview

Product	SITOP modular	SITOP modular
Power supply, type	20 A	40 A
Order No.	6EP1 336-3BA00[1)]	6EP1 337-3BA00
The product families are highlighted in the same color. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.		
	The modular power supply units with 1-phase and 2-phase inputs for global use; with switchable output characteristics; functional expansion possible using expansion modules.	
Dimension drawing	Page 15/11, Dimension drawing 2	Page 15/12, Dimension drawing 1

Technical specifications

Input		
Rated voltage value $V_{in\ rated}$ Voltage range	1-phase/2-phase AC **120/230 V AC** Set by means of wire jumper on the device 85 ... 132/176 ... 264 V (startup from V_{in} > 93/183 V)	1-phase/2-phase AC **120/230 V AC** Set by means of wire jumper on the device 85 ... 132/176 ... 264 V (startup from V_{in} > 95/190 V)
Overvoltage strength Mains buffering at $I_{out\ rated}$ Rated line frequency; range	2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 230 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 20 ms at V_{in} = 230 V 50/60 Hz; 47 ... 63 Hz
Rated current value $I_{in\ rated}$ Switch-on current limit (+25 °C) I^2t	7.7/3.5 A < 60 A < 9.9 A^2s	15.0/8.0 A < 125 A < 26 A^2s
Built-in incoming fuse Recommended miniature circuit breaker (IEC 898) in the mains power input	Yes 10 A, Characteristic C (2-pole-linked with 2-phase operation) or circuit breaker 3RV1421-1JA10 (120 V) or 3RV1421-1FA10 (230 V)	Yes 20 A, Characteristic C (2-pole-linked with 2-phase operation) or circuit breaker 3RV1421-4BA10 (120 V) or 3RV1421-1JA10 (230 V)
Output		
Rated voltage value $V_{out\ rated}$	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
Total tolerance • Static mains compensation • Static load balancing	±3 % Approx. 0.1 % Approx. 0.1 %	±3 % Approx. 0.1 % Approx. 0.1 %
Residual ripple Spikes (bandwidth: 20 MHz)	< 100 mV_{pp} (typ. 30 mV_{pp}) < 200 mV_{pp} (typ. 60 mV_{pp})	< 100 mV_{pp} (typ. 60 mV_{pp}) < 200 mV_{pp} (typ. 120 mV_{pp})
Adjustment range Status display On/off behavior	24 ... 28.8 V (max. 480 W) Green LED for 24 V OK Overshoot of V_{out} approx. 3 %	24 ... 28.8 V (max. 960 W) Green LED for 24 V OK Overshoot of V_{out} approx. 3 %
Startup delay/voltage rise Rated current $I_{out\ rated}$	< 0.1 s/< 50 ms **20 A**	< 0.1 s/< 50 ms **40 A**
Current range • Up to +60 °C • Derating	 0 ... 20 A –	 0 ... 40 A –
Dynamic overcurrent on • Power-up on short circuit • Short circuit during operation	 Approx. 23 A constant current Typ. 60 A for 25 ms	 Approx. 46 A constant current Typ. 120 A for 25 ms
Parallel switching for enhanced performance	Yes, 2 units (switchable characteristic)	Yes, 2 units (switchable characteristic)
Continuation of the table	Page 7/3, column 1	Page 7/3, column 2

[1)] SITOP modular plus 6EP1 336-3BA00-8AC0, PCB with protective coating.

Continued from	Page 7/2, column 1	Page 7/2, column 2
Power supply, type (repeated)	20 A	40 A
Order No. (repeated)	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
Closed-loop control		
Dyn. mains compensation ($V_{in\ rated}$ ±15 %)	< 1 % V_{out}	< 1 % V_{out}
Dynamic load smoothing (I_{out}: 50/100/50 %)	Typ. ±2 % V_{out}	Typ. ±2 % V_{out}
Load step settling time		
• 50 to 100 %	< 5 ms (typ. 2 ms)	< 5 ms (typ. 2 ms)
• 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	Alternatively, constant current characteristic approx. 23 A or latching shutdown	Alternatively, constant current characteristic approx. 46 A or latching shutdown
Sustained short-circuit current rms value	Approx. 23 A	Approx. 46 A
Overload/short-circuit indicator	LED yellow for "overload", LED red for "latching shutdown"	LED yellow for "overload", LED red for "latching shutdown"
Safety		
Primary/secondary isolation	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178
Protection class	Class I	Class I
Leakage current	< 3.5 mA (typ. 0.4 mA)	< 3.5 mA (typ. 0.4 mA)
Safety approval	Yes	Yes
CE mark	Yes	Yes
UL/cUL (CSA) approval	cULus-listed (UL 508, CSA C22.2 No. 14), File E197259	cULus-listed (UL 508, CSA C22.2 No. 14), File E197259
Degree of protection (EN 60529)	IP20	IP20
EMC		
Emitted interference	EN 55022 Class B	EN 55022 Class B
Supply harmonics limitation	EN 61000-3-2	–
Noise immunity	EN 61000-6-2	EN 61000-6-2
Operating data		
Ambient temperature range	0 ... +60 °C with natural convection	0 ... +60 °C with natural convection
Transport/storage temperature range	–25 ... +85 °C	–25 ... +85 °C
Humidity class	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation
Mechanics		
Connections		
• Supply input L, N, PE	One screw terminal each for 0.2 ... 4 mm^2 single-core/ finely stranded	One screw terminal each for 0.2 ... 4 mm^2 single-core/ finely stranded
• Output +	2 screw terminals for 0.5 ... 4 mm^2	2 screw terminals for 0.5 ... 10 mm^2
• Output –	2 screw terminals for 0.5 ... 4 mm^2	2 screw terminals for 0.5 ... 10 mm^2
Dimensions (W × H × D) in mm	160 × 125 × 125	240 × 125 × 125
Weight, approx.	2.2 kg	2.9 kg
Installation	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15
Accessories		
	Buffer module (6EP1961-3BA00) Signaling module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)	Buffer module (6EP1961-3BA00) Signaling module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)

Output currents 20 A and 40 A

Selection and ordering data

Product	Input Voltage $V_{in\ rated}$	Output Voltage $V_{out\ rated}$	Current $I_{out\ rated}$	Order No.	Price in euros per PU
SITOP modular					
	**120/230 V AC**	**24 V DC**	20 A	**6EP1 336-3BA00**	
SITOP modular					
	**120/230 V AC**	**24 V DC**	40 A	**6EP1 337-3BA00**	

SITOP 24 V 3-phase

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Output currents 5 A to 20 A

Overview

Product	SITOP modular	SITOP modular	SITOP PSU300P
Power supply, type	5 A	10 A	8 A
Order No.	6EP1 333-3BA00	6EP1 334-3BA00	6EP1 433-2CA00
The product families are highlighted in the same color. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.			
	The modular power supply units with wide-range input for 2-phase connection to three-phase supply networks; for global use; with switchable output characteristics; functional expansion possible using expansion modules.	The modular power supply units with wide-range input for 2-phase connection to three-phase supply networks; for global use; with switchable output characteristics; functional expansion possible using expansion modules.	The power supplies with IP67 degree of protection, SITOP PSU300P and SIMATIC ET200pro PS[1], serve as electronics/encoder and load power supplies for the new I/O device. With a signaling contact for "24 V OK" and "Overtemperature", and in the case of SIMATIC ET200pro with a second plug-in connector for input voltage loop-through.
Dimension drawing	Page 15/8, Dimension drawing 1	Page 15/9, Dimension drawing 2	Page 15/12, Dimension drawing 2

Technical specifications

Input			
Rated voltage value $V_{in\ rated}$	2-phase AC **120-230/230-500 V 2 AC** Set by means of selector switch on device	2-phase AC **120-230/230-500 V 2 AC** Set by means of selector switch on device	3-phase AC **400-480 V 3 AC** Wide-range input
Voltage range	85 ... 264/176 ... 550 V	85 ... 264/176 ... 550 V	340 ... 550 V (320 ... 340 V for max. 1 min)
Overvoltage resistance	1300 V_{peak}, 1.3 ms	1300 V_{peak}, 1.3 ms	Implemented internally with varistors
Mains buffering at $I_{out\ rated}$	Typ. 150 ms at V_{in} = 400 V	Typ. 120 ms at V_{in} = 400 V	> 15 ms at V_{in} = 400 V
Rated line frequency; range	50/60 Hz; 47 ... 63 Hz	50/60 Hz; 47 ... 63 Hz	50/60 Hz; 45 ... 66 Hz
Rated current value $I_{in\ rated}$	2.2-1.2/1.2-0.61 A	4.4-2.4/2.4-1.1 A	0.5 A (at V_{in} 400 V)
Making current limit (+25 °C)	< 35 A	< 35 A	< 40 A
I^2t	< 1.7 A^2s	< 4.0 A^2s	< 3.5 A^2s
Built-in incoming fuse	T 3, 15 A	T 6.3 A	Internal, 4 A
Required protection in the main supply conductor	Miniature circuit breaker 6 A (10 A) Characteristic C (B), 2-pole connection or circuit breaker 3RV1021-1DA10, setting 3 A	Miniature circuit breaker 6 A (10 A) Characteristic C (B), 2-pole connection or circuit breaker 3RV1021-1DA10, setting 3 A	Circuit breaker 2.2 ... 3.2 A 3RV1021-1DA10 or 3RV1721-1DD10 (UL 489)
Output			
Rated voltage value $V_{out\ rated}$	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
Total tolerance	±3 %	±3 %	< ±3 ... -5 %
• Static mains compensation	Approx. 0.1 %	Approx. 0.1 %	Approx. 0.5 %
• Static load balancing	Approx. 0.1 %	Approx. 0.1 %	Approx. 0.5 %
Residual ripple	< 50 mV_{pp}	< 50 mV_{pp}	< 200 mV_{pp}
Spikes (bandwidth: 20 MHz)	< 200 mV_{pp}	< 200 mV_{pp}	< 250 mV_{pp}
Adjustment range	24 ... 28.8 V (max. 120 W)	24 ... 28.8 V (max. 240 W)	–
Status display	Green LED for 24 V OK	Green LED for 24 V OK	Green LED for 24 V OK
Signaling (max. 30 V, 10 mA)	–	–	• Power Good (High level 1L+ for V_{out} in range 21.3 ... 29 V) • Overtemperature warning at least 30 s before switch-off (High level 1L+ when the max. internal temperature is exceeded)
On/off behavior	Overshoot of V_{out} approx. 3 %	Overshoot of V_{out} approx. 3 %	Overshoot of V_{out} <2 %
Startup delay/voltage rise	< 1 s/< 50 ms	< 1 s/< 50 ms	< 1.5 s/< 400 ms
Rated current $I_{out\ rated}$	**5 A**	**10 A**	**8 A**
Current range			
• Up to +60 °C	0 ... 5 A	0 ... 10 A	0 ... 8 A (up to +55 °C)
• Derating	–	–	–
Continuation of the table	Page 8/4, column 1	Page 8/4, column 2	Page 8/4, column 3

[1] Available with a second plug connector for loop-through of the input voltage as SIMATIC ET200pro PS (6ES7148-4PC00-0HA0).

The well-proven	SITOP PSU300M	SITOP modular	The well-proven
10 A	20 A	20 A	20 A
6EP1 434-2BA00	6EP1 436-3BA10	6EP1 436-3BA00[3]	6EP1 436-2BA00
			
The well-proven power supplies with three-phase wide-range input voltage for supplying all standard applications in automation engineering.	Modular power supply with three-phase wide-range input for global use; slim design; with 50 % extra power and switchable output characteristic; with integrated signaling contact for "24 V OK" function expansion possible using additional modules.	Modular power supply with three-phase wide-range input for use around the world in a wide variety of applications; functional expansion possible using additional modules.	The well-proven power supplies with three-phase wide-range input voltage for supplying all standard applications in automation engineering.
Page 15/13, Dimension drawing 1	Page 15/13, Dimension drawing 2	Page 15/11, Dimension drawing 2	Page 15/13, Dimension drawing 1
3-phase AC **400 - 500 V 3 AC** wide-range input 360 ... 550 V (340 ... 360 V for max. 2 s or for max. 0.9 × $I_{out\ rated}$)	3-phase AC **400-500 V 3 AC** Wide-range input 320 ... 575 V	3-phase AC **400 - 500 V 3 AC** wide-range input 320 ... 550 V (startup from V_{in} > 340 V)	3-phase AC **400 - 500 V 3 AC** wide-range input 360 ... 550 V (340 ... 360 V for max. 2 s or for max. 0.9 × $I_{out\ rated}$)
2.3 × $V_{in\ rated}$, 1.3 ms > 6 ms at V_{in} = 360 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 15 ms at V_{in} = 400 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 6 ms at V_{in} = 400 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 3 ms at V_{in} = 360 V 50/60 Hz; 47 ... 63 Hz
0.65 A (at 400 V) < 25 A < 1.0 A^2s	1.2-1.0 A < 18 A < 0.8 A^2s	1.1-0.9 A < 35 A < 0.7 A^2s	1.2 A (at 400 V) < 25 A < 1.0 A^2s
None 3-pole connected miniature circuit breaker, Char. C up to 25 A (recommended: 6 A) or circuit breaker 3RV1021-1DA10, setting 3 A or 3RV1721-1DD10 (UL 489)	None 3-pole connected miniature circuit breaker 6 ... 16 A Characteristic C or circuit breaker 3RV1021-1DA10, setting 3 A or 3RV1721-1DD10 (UL 489)	None 3-pole connected miniature circuit-breaker 6 to 16 A Characteristic C or circuit breaker 3RV1021-1DA10, setting 3 A or 3RV1721-1DD10 (UL 489)	None 3-pole connected miniature circuit breaker, Char. C up to 25 A (recommended: 6 A) or circuit breaker 3RV1021-1DA10, setting 3 A or 3RV1721-1DD10 (UL 489)
Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
±3 %	±3 % Approx. ±0.1 % Approx. ±0.2 %	±3 % Approx. 0.1 % Approx. 0.2 %	±3 %
< 150 mV_{pp} (typ. 60 mV_{pp}) < 240 mV_{pp} (typ. 120 mV_{pp})	< 100 mV_{pp} < 200 mV_{pp}	< 100 mV_{pp} < 200 mV_{pp}	< 150 mV_{pp} (typ. 60 mV_{pp}) < 240 mV_{pp} (typ. 120 mV_{pp})
22.8 ... 26.4 V[2] Green LED for 24 V OK –	24 ... 28.8 V (max. 480 W) Green LED for 24 V OK relay contact (NO contact, rating 60 V DC/0.3 A) for 24 V OK	24 ... 28.8 V (max. 480 W) Green LED for 24 V OK –	22.8 ... 26.4 V[2] Green LED for 24 V OK –
No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)
< 3 s/typ. 40 ms **10 A**	< 2.5 s/< 500 ms **20 A**	< 2.5 s/< 500 ms **20 A**	< 3 s/typ. 40 ms **20 A**
0 ... 10 A (up to +55 °C) –	0 ... 20 A 14 A (up to +70 °C)	0 ... 20 A –	0 ... 20 A (up to +55 °C) –
Page 8/5, column 4	Page 8/5, column 5	Page 8/5, column 6	Page 8/5, column 7

[2] Only permissible at ambient temperature 0 °C to 45 °C.

[3] SITOP modular plus 6EP1 436-3BA00-8A00, PCB with protective coating.

Output currents 5 A to 20 A

Continued from	Page 8/2, column 1	Page 8/2, column 2	Page 8/2, column 3
Power supply, type (repeated)	5 A	10 A	8 A
Order No. (repeated)	6EP1 333-3BA00	6EP1 334-3BA00	6EP1 433-2CA00
Output			
Dynamic overcurrent on • Power-up on short circuit • Short circuit during operation	 Approx. 5.5 A constant current Typ. 15 A for 25 ms	 Approx. 12 A constant current Typ. 30 A for 25 ms	 Approx. 50 A for 100 ms Approx. 50 A for 100 ms
Parallel switching for enhanced performance	Yes, 2 units (switchable characteristic)	Yes, 2 units (switchable characteristic)	No
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$ Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 87 % Approx. 18 W	Approx. 87 % Approx. 36 W	Typ. 88 % Typ. 25 W
Closed-loop control			
Dyn. mains compensation ($V_{in\ rated}$ ±15 %) Dynamic load smoothing (I_{out}: 50/100/50 %)	Typ. 0.1 % V_{out} Typ. +3 % V_{out}	Typ. 0.1 % V_{out} Typ. +3 % V_{out}	Typ. 0.5 % V_{out} Typ. ±1 % V_{out}
Load step settling time • 50 to 100 % • 100 to 50 %	 < 5 ms (typ. 2 ms) < 5 ms (typ. 2 ms)	 < 5 ms (typ. 2 ms) < 5 ms (typ. 2 ms)	 < 2 ms < 2 ms
Protection and monitoring			
Output overvoltage protection Current limitation	< 35 V Typ. 5.5 A	< 35 V Typ. 12 A	< 33 V Typ. 9.4 A
Short-circuit protection Sustained short-circuit current rms value Overload/short-circuit indicator	Alternatively, constant current characteristic approx. 5.5 A or latching shutdown Approx. 5.5 A LED yellow for "overload", LED red for "latching shutdown"	Alternatively, constant current characteristic approx. 12 A or latching shutdown Approx. 12 A LED yellow for "overload", LED red for "latching shutdown"	Electronic shutdown, automatic restart < 10 A –
Safety			
Primary/secondary isolation Protection class	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I
Leakage current Safety approval CE mark	< 3.5 mA (typ. 0.25 mA) Yes Yes	< 3.5 mA (typ. 0.32 mA) Yes Yes	< 3.5 mA Yes; CB scheme Yes
UL/cUL (CSA) approval Degree of protection (EN 60529)	cULus-listed (UL 508, CSA C22.2 No. 14), File E197259 IP20	cULus-listed (UL 508, CSA C22.2 No. 14), File E197259 IP20	Prepared for UL-listed (UL 508) IP67, enclosure type 4 indoor
EMC			
Emitted interference Supply harmonics limitation Noise immunity	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 55022 Class A – EN 61000-6-2
Operating data			
Ambient temperature range Transport/storage temperature range Humidity class	0 ... +60 °C with natural convection – 25 ... +85 °C Climate class 3K3 according to EN 60721, no condensation	0 ... +60 °C with natural convection – 25 ... +85 °C Climate class 3K3 according to EN 60721, no condensation	–25 ... +55 °C with natural convection –40 ... +70 °C Climate class 3K3 according to EN 60721, no condensation
Mechanics			
Connections • Supply input L1, L2, L3, PE • Output + • Output – • Alarm signals	 One screw terminal each for 0.2 ... 2.5 mm^2 single-core/ finely stranded 2 screw terminals for 0.2 ... 2.5 mm^2 2 screw terminals for 0.2 ... 2.5 mm^2 –	 One screw terminal each for 0.2 ... 2.5 mm^2 single-core/ finely stranded 2 screw terminals for 0.2 ... 2.5 mm^2 2 screw terminals for 0.2 ... 2.5 mm^2 –	 Plug connector HAN Q4/2 1 × 2.5 mm^2 (2-pole cable for +/- with open, labeled ends, 2 × 2.5 mm^2) 1 × 2.5 mm^2 (2-pole cable for +/- with open, labeled ends, 2 × 2.5 mm^2) M12 plug-in connector, 5-pin
Dimensions (W × H × D) in mm Weight, approx. Installation	70 × 125 × 125 1.2 kg Snaps onto DIN rail EN 60715 35×7.5/15	90 × 125 × 125 1.4 kg Snaps onto DIN rail EN 60715 35×7.5/15	310 × 135 × 90 + additional height of connector 2.8 kg Can be mounted onto ET200pro mounting rail
Accessories			
	Buffer module (6EP1961-3BA00) Signal. module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)	Buffer module (6EP1961-3BA00) Signal. module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)	Power connector (3RK1911-2BE50 (2.5 mm^2))

Page 8/3, column 4	Page 8/3, column 5	Page 8/3, column 6	Page 8/3, column 7
10 A	20 A	20 A	20 A
6EP1 434-2BA00	6EP1 436-3BA10	6EP1 436-3BA00	6EP1 436-2BA00
Constant current approx. 18 A Constant current approx. 18 A	Approx. 23 A constant current Typ. 60 A for 25 ms	Approx. 23 A constant current Typ. 60 A for 25 ms	Constant current approx. 30 A Constant current approx. 30 A
Yes, 2 units[1)]	Yes, 2 units (switchable characteristic)	Yes, 2 units (switchable characteristic)	Yes, 2 units[1)]
Approx. 89 % Approx. 30 W	Approx. 93 % Approx. 36 W	Approx. 90 % Approx. 53 W	Approx. 89 % Approx. 59 W
< 1 % V_{out} Typ. ±2 % V_{out}	< 1 % V_{out} Typ. ±2 % V_{out}	< 1 % V_{out} Typ. ±2 % V_{out}	< 1 % V_{out} Typ. ±2 % V_{out}
< 2 ms < 2 ms	< 10 ms (typ. 2 ms) < 10 ms (typ. 2 ms)	< 10 ms (typ. 4 ms) < 10 ms (typ. 4 ms)	< 2 ms < 2 ms
Yes, according to EN 60950 Typ. 10.5 ... 13 A	< 35 V Typ. 23 A, overload capability 150 % $I_{out\ rated}$ up to 5 s/min	< 35 V Typ. 23 A	Yes, according to EN 60950 Typ. 21 ... 26 A
Constant current characteristic < 20 A –	Alternatively, constant current characteristic approx. 23 A or latching shutdown Approx. 23 A LED yellow for "overload", LED red for "latching shutdown"	Alternatively, constant current characteristic approx. 23 A or latching shutdown Approx. 23 A LED yellow for "overload", LED red for "latching shutdown"	Constant current characteristic < 30 A –
Yes, safety extra low output voltage V_{out} according to EN 60950 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 Class I
< 0.35 mA (typ. 0.35 mA) Yes; CB scheme Yes	< 3.5 mA Yes Yes	< 3.5 mA Yes Yes	< 0.35 mA (550 V/60 Hz) Yes; CB scheme Yes
cULus-listed (UL 508, CSA C22.2 No. 142), File E143289 IP20	cULus-listed (UL 508, CSA 22.2 No. 14), File E197259 IP20	UL-listed (UL 508) File E197259, CSA (CSA C22.2 No. 14, CSA C22.2 No. 107.1) IP20	cULus-listed (UL 508, CSA C22.2 No. 142), File E143289 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 55022 Class B EN 61000-3-2 EN 61000-6-2	EN 55022 Class B EN 61000-3-2 EN 61000-6-2
0 ... +55 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, no condensation	–10 ... +60 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, no condensation	0 ... +60 °C with natural convection –25 ... +85°C Climate class 3K3 according to EN 60721, no condensation	0 ... +55 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, no condensation
One screw terminal each for 0.5 ... 2.5 mm² single-core/ finely stranded 1 screw terminal for 0.33 ... 10 mm² 2 screw terminals for 0.33 ... 10 mm² –	One screw terminal each for 0.2 ... 4 mm² solid/ finely stranded 2 screw terminals for 0.2 ... 4 mm² 2 screw terminals for 0.2 ... 4 mm² 2 screws terminals for 0.14 ... 1.5 mm²	One screw terminal each for 0.2 ... 4 mm² single-core/ finely stranded 2 screw terminals for 0.33 ... 4 mm² 2 screw terminals for 0.33 ... 4 mm² –	One screw terminal each for 0.5 ... 2.5 mm² single-core/ finely stranded 1 screw terminal for 0.33 ... 10 mm² 2 screw terminals for 0.33 ... 10 mm² –
280 × 125 × 92 2 kg Snaps onto DIN rail EN 60715 35×7.5/15	70 × 125 × 125 1.2 kg Snaps onto DIN rail EN 60715 35×7.5/15	160 × 125 × 125 2 kg Snaps onto DIN rail EN 60715 35×7.5/15	280 × 125 × 92 2 kg Snaps onto DIN rail EN 60715 35×7.5/15
90° mounting bracket (6EP1971-2BA00)	Buffer module (6EP1961-3BA01) Redundancy module (6EP1961-3BA20)	Buffer module (6EP1961-3BA00) Signal. module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)	90° mounting bracket (6EP1971-2BA00)

[1)] Only permissible at ambient temperature 0 °C to 45 °C.

Output currents 5 A to 20 A

Selection and ordering data

Product	Input Voltage $V_{in\ rated}$	Output Voltage $V_{out\ rated}$	Current $I_{out\ rated}$	Order No.	Price in euros per PU
SITOP modular					
	**120-230/230-500 V 2 AC**	**24 V DC**	5 A	**6EP1 333-3BA00**	
SITOP modular					
	**120-230/230-500 V 2 AC**	**24 V DC**	10 A	**6EP1 334-3BA00**	
SITOP PSU300P					
	**400-480 V 3 AC**	**24 V DC**	8 A	**6EP1 433-2CA00**	
SIMATIC ET200pro PS					
	**400-480 V 3 AC**	**24 V DC**	8 A	**6ES7 148-4PC00-0HA0**	
The well-proven					
	**400-500 V 3 AC**	**24 V DC**	10 A	**6EP1 434-2BA00**	
SITOP PSU300M					
	**400-500 V 3 AC**	**24 V DC**	20 A	**6EP1 436-3BA10**	
SITOP modular					
	**400-500 V 3 AC**	**24 V DC**	20 A	**6EP1 436-3BA00**	
The well-proven					
	**400-500 V 3 AC**	**24 V DC**	20 A	**6EP1 436-2BA00**	

SITOP 24 V 3-phase

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Output currents 30 A and 40 A

Overview

Product	The well-proven	SITOP PSU300M	SITOP modular
Power supply, type	30 A	40 A	40 A
Order No.	6EP1 437-2BA00	6EP1 437-3BA10	6EP1 437-3BA00[2)3)]
The product families are highlighted in the same colors. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.			
	The well-proven power supplies with three-phase wide-range input for supplying power for all standard applications in automation.	Modular power supply with 3-phase wide-range input for use around the world; small frame size; with 50 % extra power and switchable output characteristic; with integrated signaling contact for "24 V OK"; functional expansion possible using expansion modules.	Modular power supplies with three-phase wide-range input for use around the world in a wide variety of applications; functional expansion possible using expansion modules.
Dimension drawing	Page 15/14, Dimension drawing 1	Page 15/14, Dimension drawing 1	Page 15/12, Dimension drawing 1

Technical specifications

	The well-proven	SITOP PSU300M	SITOP modular
Input			
Rated voltage value $V_{in\ rated}$	3-phase AC **400 - 500 V 3 AC** wide-range input	3-phase AC **400 - 500 V 3 AC** wide-range input	3-phase AC **400 - 500 V 3 AC** wide-range input
Voltage range	360 ... 550 V (340 ... 360 V for max. 2 s or for max. 0.9 × $I_{out\ rated}$)	320 ... 575 V	320 ... 550 V (startup from V_{in} > 340 V)
Overvoltage resistance	2.3 × $V_{in\ rated}$, 1.3 ms		2.3 × $V_{in\ rated}$, 1.3 ms
Mains buffering at $I_{out\ rated}$	> 4.5 ms at V_{in} = 360 V	> 15 ms at V_{in} = 400 V	> 6 ms at V_{in} = 400 V
Rated line frequency; range	50/60 Hz; 47 ... 63 Hz	50/60 Hz; 47 ... 63 Hz	50/60 Hz; 47 ... 63 Hz
Rated current value $I_{in\ rated}$	1.4 A (at 400 V)	2.6-2.1 A	2.2 A (V_{in} = 400 V)
Making current limit (+25 °C)	< 25 A	< 56 A	< 70 A
I^2t	< 1.0 A^2s	< 2.24 A^2s	< 2.8 A^2s
Built-in incoming fuse	None	None	None
Required protection in the main supply conductor	3-pole connected miniature circuit breaker, Char. C up to 25 A (recommended: 6 A) or circuit breaker 3RV1021-1DA10, setting 3 A or 3RV1721-1DD10 (UL 489)	3-pole connected miniature circuit breaker 10 to 16 A characteristic C or circuit breaker 3RV1021-1DA10, setting 3 A or 3RV1721-1DD10 (UL 489)	3-pole connected miniature circuit breaker 10 to 16 A characteristic C or circuit breaker 3RV1021-1DA10, setting 3 A or 3RV1721-1DD10 (UL 489)
Output			
Rated voltage value $V_{out\ rated}$	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
Total tolerance	±3 %	±3 %	±3 %
• Static mains compensation		< ±0.1 %	Approx. 0.1 %
• Static load balancing		< ±0.1 %	Approx. 0.2 %
Residual ripple	< 150 mV_{pp} (typ. 50 mV_{pp})	< 100 mV_{pp}	< 100 mV_{pp}
Spikes (bandwidth: 20 MHz)	< 240 mV_{pp} (typ. 200 mV_{pp})	< 200 mV_{pp}	< 200 mV_{pp}
Adjustment range	22.8 ... 26.4 V[1)]	24 ... 28.8 V (max. 960 W)	24 ... 28.8 V (max. 960 W)
Status display	Green LED for 24 V OK	Green LED for 24 V OK	Green LED for 24 V OK
Signaling	–	Relay contact (NO contact, rating 60 V DC/0.3 A) for 24 V OK	–
On/off behavior	Slight overshoot of V_{out} (< 2 V for max. 500 ms)	No overshoot of V_{out} (soft start)	No overshoot of V_{out} (soft start)
Startup delay/voltage rise	< 3 s/typ. 40 ms	< 2.5 s/< 500 ms	< 2.5 s/< 500 ms
Rated current $I_{out\ rated}$	**30 A**	**40 A**	**40 A**
Current range			
• Up to +60 °C	0 ... 30 A (up to +55 °C)	0 ... 40 A	0 ... 40 A
• Derating	–	25 A (up to +70 °C)	–
Dynamic overcurrent on			
• Power-up on short circuit	Approx. 60 A for 600 ms	Approx. 44 A constant current	Approx. 46 A constant current
• Short circuit during operation	Approx. 60 A for 600 ms	Typ. 120 A for 25 ms	Typ. 120 A for 25 ms
Parallel switching for enhanced performance	Yes, 2 units[1)]	Yes, 2 units (switchable characteristic)	Yes, 2 units (switchable characteristic)
Continuation of the table	Page 9/4, column 1	Page 9/4, column 2	Page 9/4, column 3

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

2) SIPLUS module 6AG1 437-3BA00-4AA0 for use under medial load (e.g. sulfur chloride atmosphere).

3) SITOP modular plus 6EP1 437-3BA00-8AA0, PCB with protective coating.

The well-proven	
40 A	
6EP1 437-2BA10	
	
The well-proven power supplies with three-phase wide-range input for supplying power for all standard applications in automation.	
Page 15/14, Dimension drawing 1	
3-phase AC **400 - 500 V 3 AC** wide-range input 360 ... 550 V (340 ... 360 V for max. 2 s or for max. 0.9 × $I_{out\ rated}$)	
2.3 × $V_{in\ rated}$, 1.3 ms > 3 ms at V_{in} = 360 V 50/60 Hz; 47 ... 63 Hz	
1.9 A (at 400 V) < 25 A < 1.0 A^2s	
None 3-pole connected miniature circuit breaker, Char. C up to 25 A (recommended: 6 A) or circuit breaker 3RV1021-1DA10, setting 3 A or 3RV1721-1DD10 (UL 489)	
Controlled, isolated DC voltage **24 V DC**	
±3 %	
< 150 mV_{pp} (typ. 50 mV_{pp}) < 240 mV_{pp} (typ. 200 mV_{pp})	
22.8 ... 26.4 V[1)] Green LED for 24 V OK –	
Slight overshoot of V_{out} (< 2 V for max. 500 ms)	
< 3 s/typ. 40 ms **40 A**	
0 ... 40 A (up to +55 °C) –	
Approx. 70 A for 600 ms Approx. 70 A for 600 ms	
Yes, 2 units[1)]	
Page 9/5, column 4	

Output currents 30 A and 40 A

Continued from	Page 9/2, column 1	Page 9/2, column 2	Page 9/2, column 3
Power supply, type (repeated)	30 A	40 A	40 A
Order No. (repeated)	6EP1 437-2BA00	6EP1 437-3BA10	6EP1 437-3BA00
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 90 %	Approx. 92 %	Approx. 90 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 80 W	Approx. 83 W	Approx. 106 W
Closed-loop control			
Dyn. mains compensation ($V_{in\ rated}$ ±15 %)	< 1 % V_{out}	< 1 % V_{out}	< 1 % V_{out}
Dynamic load smoothing (I_{out}: 50/100/50 %)	Typ. –4 %, +2 % V_{out}	Typ. ±3 % V_{out}	Typ. ±2 % V_{out}
Load step settling time			
• 50 to 100 %	< 3 ms	< 10 ms	< 10 ms (typ. 4 ms)
• 100 to 50 %	< 3 ms	< 10 ms	< 10 ms (typ. 4 ms)
Protection and monitoring			
Output overvoltage protection	Yes, according to EN 60950	< 35 V	< 35 V
Current limitation	Typ. 31.5 ... 39 A	Typ. 44 A, overload capability 150 % $I_{out\ rated}$ up to 5 s/min	Typ. 46 A
Short-circuit protection	Electronic shutdown, automatic restart	Alternatively, constant current characteristic approx. 44 A or latching shutdown	Alternatively, constant current characteristic approx. 46 A or latching shutdown
Sustained short-circuit current rms value	< 48 A	Approx. 44 A	Approx. 46 A
Overload/short-circuit indicator	–	LED yellow for "overload", LED red for "latching shutdown"	LED yellow for "overload", LED red for "latching shutdown"
Safety			
Primary/secondary isolation	Yes, safety extra low output voltage V_{out} according to EN 60950	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178
Protection class	Class I	Class I	Class I
Leakage current	< 0.78 mA (550 V/60 Hz)	< 3.5 mA	< 3.5 mA
Safety approval	Yes; CB scheme	Yes	Yes
CE mark	Yes	Yes	Yes
UL/cUL (CSA) approval	cULus-listed (UL 508, CSA C22.2 No. 142), File E143289	cULus-listed (UL 508, CSA C22.2 No. 14), File E197259	UL-listed (UL 508) File E197259, CSA (CSA C22.2 No. 14, CSA C22.2 No. 107.1)
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Emitted interference	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Supply harmonics limitation	EN 61000-3-2	EN 61000-3-2	EN 61000-3-2
Noise immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating data			
Ambient temperature range	0 ... +55 °C with natural convection	–10 ... +60 °C with natural convection	0 ... +60 °C with natural convection
Transport/storage temperature range	–25 ... +85 °C	–25 ... +85 °C	–25 ... +85 °C
Humidity class	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation
Mechanics			
Connections			
• Supply input L1, L2, L3, PE	One screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded	One screw terminal each for 0.2 ... 4 mm^2 single-core/ finely stranded	One screw terminal each for 0.2 ... 4 mm^2 single-core/ finely stranded
• Output +	1 screw terminal for 0.33 ... 10 mm^2	2 screw terminals for 0.33 ... 10 mm^2	2 screw terminals for 0.33 ... 10 mm^2
• Output –	2 screw terminals for 0.33 ... 10 mm^2	2 screw terminals for 0.33 ... 10 mm^2	2 screw terminals for 0.33 ... 10 mm^2
Alarm signal	–	2 screw terminals for 0.14 ... 2.5 mm^2	–
Dimensions (W × H × D) in mm	280 × 180 × 92	150 × 125 × 150	240 × 125 × 125
Weight, approx.	3.6 kg	3.4 kg	3.2 kg
Installation	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15
Accessories			
	90° mounting bracket (6EP1971-2BA00)	Buffer module (6EP1961-3BA01) Redundancy module (6EP1961-3BA20)	Buffer module (6EP1961-3BA00) Signaling module (6EP1961-3BA10) Redundancy module (6EP1961-3BA20)

Page 9/3, column 4
40 A
6EP1 437-2BA10
Approx. 90 %
Approx. 107 W
< 1 % V_{out}
Typ. –4 %, +2 % V_{out}
< 3 ms < 3 ms
Yes, according to EN 60950 Typ. 42 ... 52 A
Electronic shutdown, automatic restart
< 62 A
–
Yes, safety extra low output voltage V_{out} according to EN 60950 Class I
< 0.78 mA (550 V/60 Hz) Yes; CB scheme Yes
cULus-listed (UL 508, CSA C22.2 No. 142), File E143289 IP20
EN 55022 Class B EN 61000-3-2 EN 61000-6-2
0 ... +55 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, no condensation
One screw terminal each for 0.5 ... 2.5 mm^2 single-core/finely stranded 1 screw terminal for 0.33 ... 10 mm^2 2 screw terminals for 0.33 ... 10 mm^2 –
280 × 180 × 92 3.6 kg Snaps onto DIN rail EN 60715 35×7.5/15
90° mounting bracket (6EP1971-2BA00)

Output currents 30 A and 40 A

Selection and ordering data

Product	Input Voltage $V_{in\ rated}$	Output Voltage $V_{out\ rated}$	Current $I_{out\ rated}$	Order No.	Price in euros per PU
The well-proven					
	**400-500 V 3 AC**	**24 V DC**	30 A	**6EP1 437-2BA00**	
SITOP PSU300M					
	**400-500 V 3 AC**	**24 V DC**	40 A	**6EP1 437-3BA10**	
SITOP modular					
	**400-500 V 3 AC**	**24 V DC**	40 A	**6EP1 437-3BA00**	
The well-proven					
	**400-500 V 3 AC**	**24 V DC**	40 A	**6EP1 437-2BA10**	

SITOP 24 V
Expansion modules

10

Overview

Product	SITOP modular	SITOP modular	SITOP modular
Power supply, type	Signaling module	Redundancy module	Buffer module
Order No.	6EP1 961-3BA10[1]	6EP1 961-3BA20[2]	6EP1 961-3BA01
The product families are highlighted in the same color. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.	 Message signals about the operating status of the power supply can be provided with a signaling module in combination with a SITOP modular (6EP1 .3.-3BA00) regulated power supply, and the power supply can be switched ON/OFF remotely; automatic contacting with the power supply.	 The redundancy module is used to decouple two SITOP modular regulated power supplies in parallel operation. The 24 V supply is reliably maintained when one power supply fails.	 With short-term power failures, the load current can be backed up without interruption via the buffer module in combination with a SITOP modular controlled power supply. The buffer module is connected in parallel to the output of the power supply.
Dimension drawing	Page 15/15, Dimension drawing 1	Page 15/16, Dimension drawing 1	Page 15/15, Dimension drawing 2

Technical specifications

Input/output			
Rated input voltage $V_{in\ rated}$	–	Controlled, isolated DC voltage **24 V DC**	Controlled, isolated DC voltage **24 V DC**
Input voltage range	–	24 ... 28.8 V	24 ... 28.8 V
Control input	Non-isolated input for remote ON/OFF switching of the power supply	–	–
Rated output voltage value $V_{out\ rated}$	–	V_{in} – approx. 0.5 V	V_{in} – approx. 1 V
Rated current value $I_{out\ rated}$	–	20 A (max. aggregate current 40 A)	40 A
Mains buffering	–	–	100 ms at 40 A ... 800 ms at 5 A load current
Buffering time, max.	–	–	3 s
Protection and monitoring			
Current limiting, static	–	–	Typ. 40 A
Short-circuit protection	–	–	Electronically
Signaling/alarm signals			
Status display	–	Green LED for "Infeed 1 and infeed 2 OK"	Green LED for "Supply voltage > 20.5 V"
Signaling	Isolated relay contacts (changeover contacts, rating 6 A/240 V AC) for "Output voltage OK" and "Power supply availability OK"	Isolated relay contact (changeover contacts, rating 6 A/240 V AC) for "Infeed 1 and infeed 2 OK", switching threshold adjustable 20 ... 25 V	–
Continuation of the table	Page 10/3, column 1	Page 10/3, column 2	Page 10/3, column 3

[1] SIPLUS module 6AG1 961-3BA10-7AA0 for extended temperature range -25 °C to +70 °C and use under medial load (e.g. sulfur chloride atmosphere). 6AG1 961-3BA10-6AA0 with hard gold-plated contacts.

[2] SIPLUS module 6AG1 437-3BA20-7AA0 for extended temperature range -40 °C to +70 °C and use under medial load (e.g. sulfur chloride atmosphere).

Continued from	Page 10/2, column 1	Page 10/2, column 2	Page 10/2, column 3
Power supply, type (repeated)	Signaling module	Redundancy module	Buffer module
Order No. (repeated)	6EP1 961-3BA10	6EP1 961-3BA20	6EP1 961-3BA01
Safety			
Galvanic isolation	Yes, safety extra low voltage acc. to EN 60950 (relay contacts)	Yes, safety extra low voltage acc. to EN 60950 (relay contact)	Yes, SELV acc. to EN 60950
Protection class	Class I	Class I	Class I
Safety approval	Yes	Yes	Yes
CE mark	Yes	Yes	Yes
UL/cUL (CSA) approval	UL-listed (UL 508) File E197259, CSA (CSA C22.2 No. 14, CSA C22.2 No. 107.1)	cULus-listed (UL 508, CSA C22.2 No. 14), File E197259	UL-listed (UL 508) File E197259, CSA (CSA C22.2 No. 14, CSA C22.2 No. 107.1)
Explosion Protection	–	UL 1604	–
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Emitted interference	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Noise immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating data			
Ambient temperature range	0 ... +60 °C with natural convection	0 ... +60 °C with natural convection	0 ... +60 °C with natural convection
Transport/storage temperature range	–25 ... +85 °C	–25 ... +85 °C	–25 ... +85 °C
Humidity class	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation
Mechanics			
Connections	Screw terminals for 0.14 ... 2.5 mm^2 single-core/finely stranded	Input, output, and ground: one screw terminal each for 0.33 ... 10 mm^2, single-core/finely stranded; relay contact: one screw terminal each for 0.5 ... 2.5 mm^2, single-core/finely stranded	One screw terminal each for + and – for 0.5 ... 10 mm^2 single-core/finely stranded
Dimensions (W × H × D) in mm	26 × 125 × 116	70 × 125 × 125	70 × 125 × 125
Weight, approx.	0.15 kg	1.0 kg	1.2 kg
Installation	Snaps directly onto side of basic unit (6EP1 .3.-3BA00)	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15

Overview

Product	SITOP PSE200U	SITOP PSE200U	SITOP select
Power supply, type	Selectivity module, 4 × 3 A	Selectivity module, 4 × 10 A	Diagnostics module 4 × 10 A
Order No.	6EP1 961-2BA10	6EP1 961-2BA20	6EP1 961-2BA00
The product families are highlighted in the same color. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.			
	The selectivity module is used in conjunction with 24 V power supplies to distribute the load current over several current circuits and to monitor the individual currents. Faults in individual circuits caused by overload or short-circuit are detected and selectively switched off so that further load current paths remain unaffected by the fault. This achieves fast fault diagnostics and minimizes standstill times.	The selectivity module is used in conjunction with 24 V power supplies to distribute the load current over several current circuits and to monitor the individual currents. Faults in individual circuits caused by overload or short-circuit are detected and selectively switched off so that further load current paths remain unaffected by the fault. This achieves fast fault diagnostics and minimizes standstill times.	The diagnostics module is used in conjunction with 24 V power supplies to distribute the load current over several current circuits and to monitor the individual currents. Faults in individual circuits caused by overload or short-circuit are detected and selectively switched off so that further load current paths remain unaffected by the fault. This achieves fast fault diagnostics and minimizes standstill times.
Dimension drawing	Page 15/17, Dimension drawing 1	Page 15/17, Dimension drawing 1	Page 15/16, Dimension drawing 2

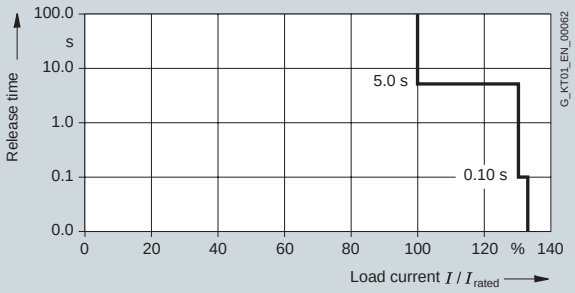
Technical specifications

Input			
Rated voltage $V_{in\ rated}$	Controlled DC voltage **24 V DC**	Controlled DC voltage **24 V DC**	Controlled DC voltage[1] **24 V DC**
Voltage range	22 ... 30 V	22 ... 30 V	22 ... 30 V
Overvoltage strength	35 V	35 V	35 V; 100 ms
Input current $I_{in\ rated}$	12 A	40 A	40 A
Output			
Rated voltage $V_{out\ rated}$	Controlled DC voltage **V_{in} – approx. 0.2 V**	Controlled DC voltage **V_{in} – approx. 0.2 V**	Controlled DC voltage **V_{in} – approx. 0.3 V**
Total tolerance	In accordance with the supplying input voltage	In accordance with the supplying input voltage	In accordance with the supplying input voltage
Number of output channels	4	4	4
Rated current value $I_{out\ rated}$	**3 A per channel**	**10 A per channel**	**10 A per channel**
Adjustment range	0.5 ... 3 A per channel via potentiometer	3 ... 10 A per channel via potentiometer	2 ... 10 A per channel via potentiometer
Parallel switching of several channels	Not permitted	Not permitted	Not permitted
Channel connection	Simultaneous connection of all channels after power up of the supply voltage > 20 V, delay time of 25 ms, 100 ms or adjustable "load optimised" via DIP switch for sequential connection	Simultaneous connection of all channels after power up of the supply voltage > 20 V, delay time of 25 ms, 100 ms or adjustable "load optimised" via DIP switch for sequential connection	Simultaneous connection of all channels after power up of the supply voltage, delay time of 24 ms or 100 ms programmable for sequential connection
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 97 %	Approx. 97 % (typ. 99 %)	Approx. 97 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 9 W	Approx. 30 W (typ. 10 W)	Approx. 30 W
Switch-off characteristic per channel			
Overcurrent switch-off	I_{out} = 1.0 ... 1.3 × set value, switch-off after approx. 5 s	I_{out} = 1.0 ... 1.3 × set value, switch-off after approx. 5 s	I_{out} = 1.0 ... 1.3 × set value, switch-off after approx. 5 s
Current limitation	I_a = 1.3 × set value, switch-off not before typ. 100 ms	I_a = 1.3 × set value, switch-off not before typ. 100 ms	I_{out} = 1.35 × set value, switch-off after approx. 50 ...100 ms
Immediate switch-off	I_{out} > set value and V_{in} < 20 V, switch-off after approx. 0.5 ms	I_{out} > set value and V_{in} < 20 V, switch-off after approx. 0.5 ms	I_{out} > set value and V_{in} < 20 V, switch-off after approx. 0.5 ms
Residual current at switch-off	–	–	Typ. 20 mA
Reset	Using keys for each channel	Using keys for each channel	Using keys on the module
Remote reset	Non-isolated 24 V input (signal level "high" at >15 V)	Non-isolated 24 V input (signal level "high" at >15 V)	–
Continuation of the table	Page 10/5, column 1	Page 10/5, column 2	Page 10/5, column 3

[1] SITOP select is not designed for operation with DC UPS module 40 A (6EP1 931-2FC21/-2FC42).

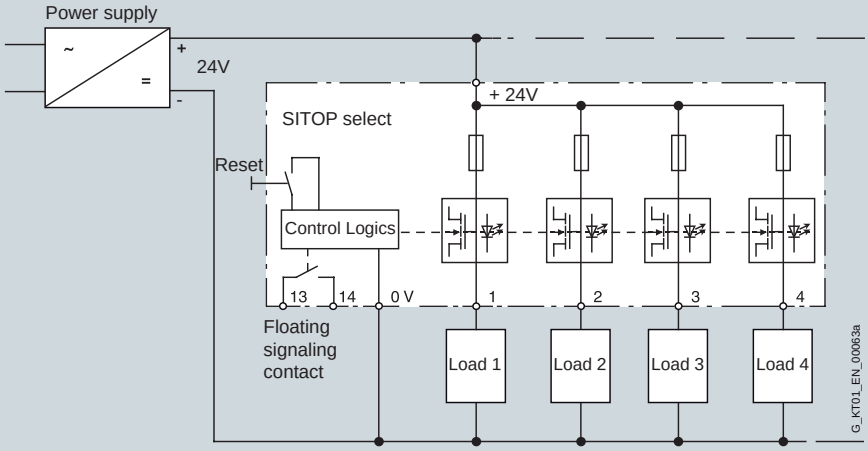
Continued from	Page 10/4, column 1	Page 10/4, column 2	Page 10/4, column 3
Power supply, type (repeated)	Selectivity module, 4 × 3 A	Selectivity module, 4 × 10 A	Diagnostics module 4 × 10 A
Order No. (repeated)	6EP1 961-2BA10	6EP1 961-2BA20	6EP1 961-2BA00
Protection and monitoring			
Device/Line protection	5 A internal fuse per channel (not accessible)	15 A internal fuse per channel (not accessible)	FKS blade-type fuse per channel (equipped with 15 A fuse in as-delivered state)
Status displays	Three-color LED per channel: • Green LED for "Output switched through" • Yellow LED for "Output switched off manually" • Red LED for "Output switched off due to overcurrent"	Three-color LED per channel: • Green LED for "Output switched through" • Yellow LED for "Output switched off manually" • Red LED for "Output switched off due to overcurrent"	Two-color LED per channel: • Green LED for "Output switched through" • Red LED for "Output switched off due to overcurrent"
Signaling	Common signal contact (changeover contact, rating 0.5 A/24 V DC)	Common signal contact (changeover contact, rating 0.5 A/24 V DC)	Common signal contact (NO contact, rating 0.5 A/24 V DC)
Safety			
	In accordance with EN 60950 and EN 50178	In accordance with EN 60950 and EN 50178	In accordance with EN 60950 and EN 50178
Protection class	Class III	Class III	Class III
Degree of protection (EN 60529)	IP20	IP20	IP20
CE mark	Yes	Yes	Yes
UL/cUL (CSA) approval	Available soon	Available soon	cULus-listed (UL 508, CSA C22.2 No. 14), File E197259; cURus-recognized (UL 60950, CSA C22.2 No. 60950), File E151273
Explosion protection	ATEX EX II 3G Ex nAC II T4	ATEX EX II 3G Ex nAC II T4	ATEX EX II 3G Ex nAC IIC T4 U; UL 1604
EMC			
Emitted interference	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Noise immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating data			
Ambient temperature range	0 ... +60 °C with natural convection	0 ... +60 °C with natural convection	0 ... +60 °C with natural convection
Transport/storage temperature range	−25 ... +85 °C	−25 ... +85 °C	−25 ... +85 °C
Humidity class	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation	Climate class 3K3 according to EN 60721, no condensation
Mechanics			
Connections			
• Input +24 V	2 screw terminal for 0.5 ... 10 mm^2	2 screw terminal for 0.5 ... 10 mm^2	2 screw terminals for 0.33 ... 10 mm^2
• Input 0 V	2 screw terminals for 0.5 ... 4 mm^2	2 screw terminals for 0.5 ... 4 mm^2	2 screw terminals for 0.22 ... 4 mm^2
• Output 1 ... 4	1 screw terminal each for 0.5 ... 4 mm^2	1 screw terminal each for 0.5 ... 4 mm^2	1 screw terminal each for 0.22 ... 4 mm^2
• Signaling contact	3 screw terminals for 0.5 ... 4 mm^2	3 screw terminals for 0.5 ... 4 mm^2	2 screw terminals for 0.22 ... 4 mm^2
• Remote reset	1 screw terminal for 0.5 ... 4 mm^2	1 screw terminal for 0.5 ... 4 mm^2	–
Dimensions (W × H × D) in mm	70 × 80 × 72	70 × 80 × 72	72 × 90 × 90
Weight, approx.	0.2 kg	0.2 kg	0.4 kg
Installation	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15

Characteristics

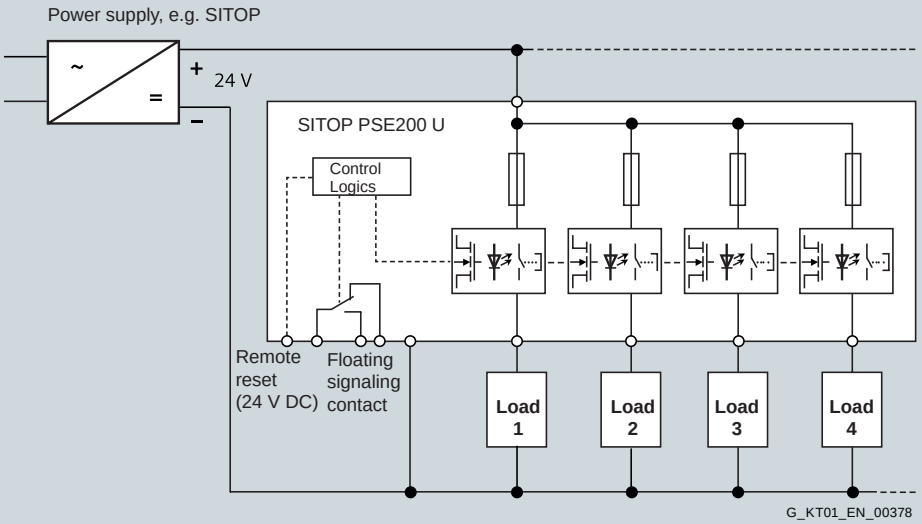


Switch-off characteristic

Circuit diagrams



Switching principle SITOP select



Switching principle SITOP PSE200U

Overview

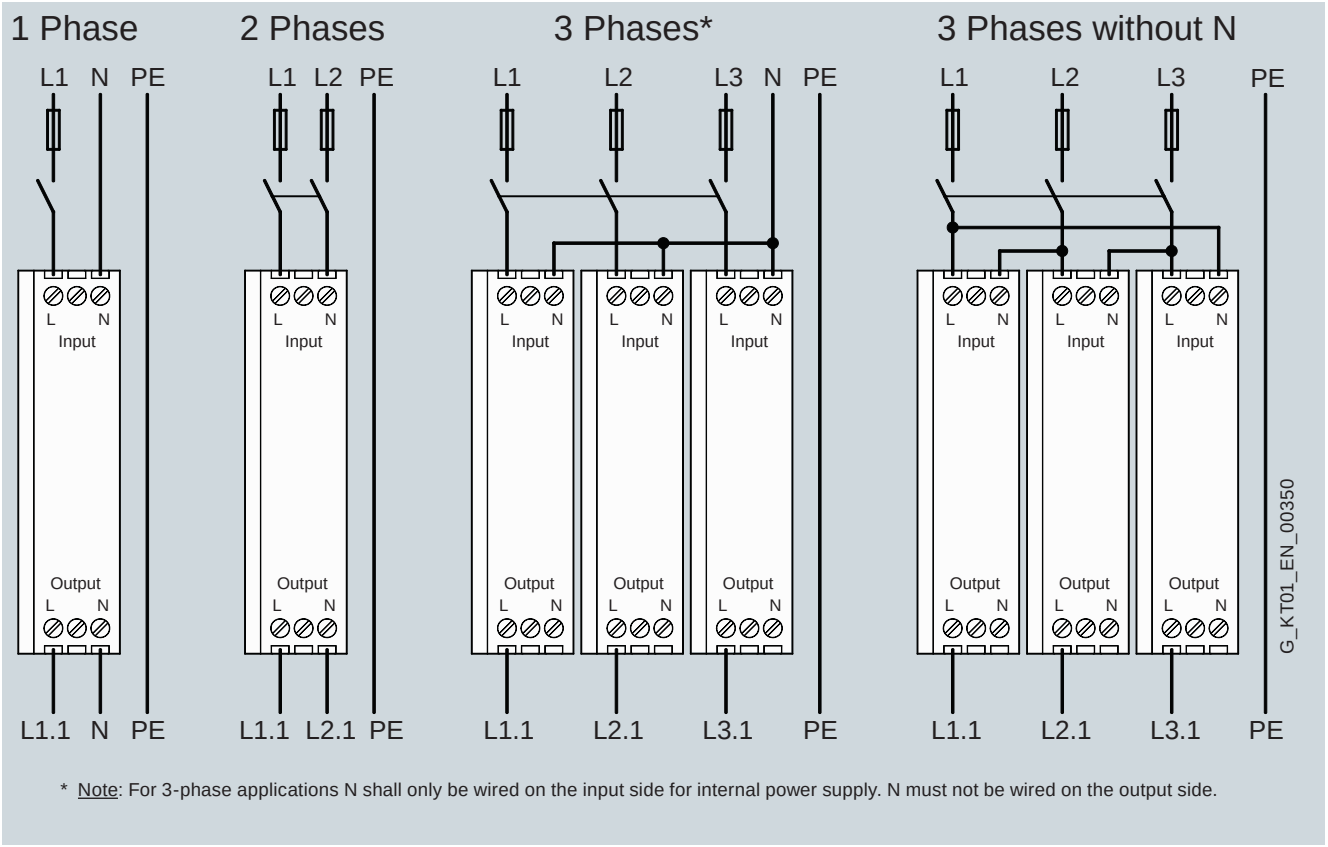
Product	SITOP
Power supply, type	Inrush current limiter
Order No.	6EP1 967-2AA00
The product families are highlighted in the same color. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.	 The SITOP inrush current limiter is used to reliably reduce the starting currents that are caused, for example, by capacitors or with pulse-controlled power supplies by the rectifier circuit on the input side with capacitor charging. In 1-phase AC networks, it is supplied with rated voltages of 100 V, 120 V or 230 V and in 2-phase and 3-phase AC networks with 208 V to 480 V on the line side upstream of capacitors and power supplies and it limits the inrush current temperature-independently up to e. g. < 10 A at 230 V. In static operation the limit restistance is bypassed after ca. 120 ms and the resulting power loss is reduced.
Dimension drawing	Page 15/17, Dimension drawing 2

Technical specifications

Input	
Rated voltage $V_{in\ rated}$ Voltage range	AC voltage 1-phase, 2-phase, 50/60 Hz 100 ... 480 V AC 85 ... 575 V AC
Overvoltage strength	–
Input current $I_{in\ rated}$	–
Output	
Rated voltage $V_{out\ rated}$	In accordance with the supply voltage
Rated current value $I_{out\ rated}$	Max. 10 A
Mains buffering	–
Buffering time, max.	–
Parallel switching for enhanced performance	No
Protection and monitoring	
Current limiting, static	–
Short-circuit protection	Must be ensured with an upstream protective device
Continuation of the table	Page 10/8, column 1

Continued from	Page 10/7, column 1
Power supply, type (repeated)	Inrush current limiter
Order No. (repeated)	6EP1 967-2AA00
Signaling/alarm signals	
Status display	Green LED
Alarm signals	–
Safety	
	In accordance with EN 60950 and EN 50178
Galvanic isolation	No
Protection class	Class II
CE mark	Yes
UL/cUL (CSA) approval	Yes, cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259
Degree of protection (EN 60529)	IP20
EMC	
Emitted interference	EN 61000-6-3
Noise immunity	EN 61000-6-2
Operating data	
Ambient temperature range	0 ... +60 °C with natural convection
Transport/storage temperature range	– 40 ... +85 °C
Humidity class	Climate class 3K3 according to EN 60721, no condensation
Mechanics	
Connections	Input and output (L1, N): One screw terminal each for 0.2 ... 2.5 mm^2, single-core/finely stranded;
Dimensions (W × H × D) in mm	22.5 × 80 × 91
Weight, approx.	0.12 kg
Installation	Snaps onto DIN rail EN 60715 35×7.5/15

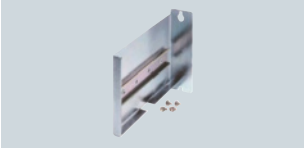
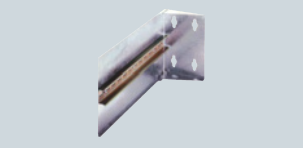
Circuit diagrams



* Note: For 3-phase applications N shall only be wired on the input side for internal power supply. N must not be wired on the output side.

SITOP inrush current limiter connection diagram

Accessories

Product	90° mounting bracket	90° mounting bracket
Mounting bracket	For a depth of 240 mm	For a depth of 320 mm
Order No.	6EP1 971-1AA01	6EP1 971-2BA00
The product families are highlighted in the same color. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.		
	The combination of a SITOP power supply and a 90° mounting bracket results in a minimum surface area requirement on the rear panel of the control cabinet (the width of the power supply becomes the depth, and the depth becomes the width). The mounting bracket is suitable for control cabinets with a depth of 240 or 320 mm or more.	
Dimension drawing	Page 15/18, Dimension drawing 1	Page 15/18, Dimension drawing 2

Technical specifications

Mounting bracket Dimensions (W × H × D) in mm Sheet thickness	For a depth of 240 mm 50 × 159 × 236 2 mm	For a depth of 320 mm 100 × 150 × 320 1.5 mm
Mounting rail, attached	DIN rail EN 60715 35×7.5	DIN rail EN 60715 35×15
Weight, approx.	0.9 kg	0.9 kg
Installation	Can be screwed onto a flat surface (keyhole mounting for hooking onto M5 screws, drill hole distance 147.5 mm height)	Can be screwed onto a flat surface (keyhole mounting for hooking onto M6 screws, drill hole distance 90 mm height, 50 mm side distance)
Accessories, included	2 M5 combi screws and 2 M5 self-tapping screws	4 M6 combi screws
Suitable, for example, 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 24 V/10 A (6EP1 434-2BA00) SITOP 24 V/20 A (6EP1 336-3BA00, 6EP1 436-2BA00, 6EP1 436-3BA00) SITOP 24 V/30 A (6EP1 437-2BA00) SITOP 24 V/40 A (6EP1 337-3BA00, 6EP1 437-2BA10, 6EP1 437-3BA00) SITOP 48 V/20 A (6EP1 457-3BA00)

Mounting adapter for DIN rail

The 24 V/2 A (6ES7 305-1BA80-0AA0) and 24 V/5 A (6ES7 307-1EA80-0AA0) single-phase power supplies are special mechanical versions for SIMATIC S7-300 which can be snapped onto the standard mounting rails. An adapter (6SE7 390-6BA00-0AA0) for mounting on the standard mounting rail EN 60715 35×15 is available individually as accessory.

The 24 V/ 2 A (6ES7 307-1BA01-0AA0), 24 V/5 A (6ES7-307-1EA01-0AA0) and 10A (6ES7-307-1KA02-0AA0) power supplies are variants for SIMATIC S7-300 and can be snapped onto the S7 mounting rail.
A mounting adapter (6EP1 971-1BA00) for the installation on the standard rail EN 60715 35×15/7.5 is individually available as spare part.

Connector for devices in IP65 and IP67 degree of protection

For the SITOP PSU300P power supply (6EP1 433-2CA00) in IP67 and IP65 degree of protection, a power connection plug (3RK1 911-2BE50) is available as a spare part.

For the maintenance-free DC UPS modules SITOP UPS500P (6EP1 933-2NC01, 6EP1 933-2NC11) in IP65 degree of protection, a connector kit (6EP1 975-2ES00) for input and output with pre-assembled 2 m USB cable is available as spare part.

Selection and ordering data

Product	Input Voltage $V_{in\ rated}$	Output Voltage $V_{out\ rated}$	Current $I_{out\ rated}$	Order No.	Price in euros per PU
SITOP modular	Signaling module				
	–	–	–	**6EP1 961-3BA10**	
SITOP modular	Redundancy module				
	**24 V DC**	**V_{in} – approx. 0.5 V**	20 A	**6EP1 961-3BA20**	
SITOP modular	Buffer module				
	**24 V DC**	**V_{in} – approx. 1 V**	40 A	**6EP1 961-3BA01**	
SITOP PSE200U	Selectivity module				
	**24 V DC**	**V_{in} – approx. 0.2 V**	3 A per channel 10 A per channel	**6EP1 961-2BA10** **6EP1 961-2BA20**	
SITOP select	Diagnostics module				
	**24 V DC**	**V_{in} – approx. 0.3 V**	10 A per channel	**6EP1 961-2BA00**	
SITOP	Inrush current limiter				
	**100-480 V AC**	**100-480 V AC**	10 A	**6EP1 967-2AA00**	

Product	Description	Order No.	Price in euros per PU
90° mounting bracket			
	For a depth of 240 mm	**6EP1 971-1AA01**	
90° mounting bracket			
	For a depth of 320 mm	**6EP1 971-2BA00**	
Mounting adapter			
	For DIN rail EN 60715 35× 15/7.5	**6EP1 971-1BA00**	
Mounting adapter			
	For DIN rail EN 60715 35× 15/7.5	**6ES7 390-6BA00-0AA0**	
Power connection plug			
	For SITOP PSU300P (6EP1 433-2CA00)	**3RK1 911-2BE50**	
Connector set			
	For SITOP UPS500P (6EP1 933-2NC01/-2NC11)	**6EP1 675-2ES00**	

SITOP 24 V DC uninterruptible power supply

11

Overview

Overview

Backup module (see chapter 10)

Expansion module with electrolyte capacitors for bridging temporary power failures. Can be combined with SITOP modular

Selection criteria:

- Low-cost protection against power failures for max. 3 seconds
- Supports the power supply unit when there is a temporarily increased power demand
- High load current up to 40 A

SITOP DC UPS module

DC UPS module with maintenance-free lead-gel batteries for energy storage. Bridging of power failures even for hours.

Selection criteria:

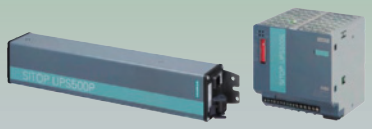
- The 24 V power supply is maintained for a long time, e.g. in order to continue processes.
- High load current up to 40 A

SITOP UPS500

DC UPS with high-capacity double-layer capacitors. Bridging of power failures for several minutes.

Selection criteria:

- Backup of data and closing of applications within minutes.
- Absolutely maintenance-free
- High ambient temperatures up to 60 °C
- No ventilation is required since no gas is emitted
- For distributed applications without control cabinet



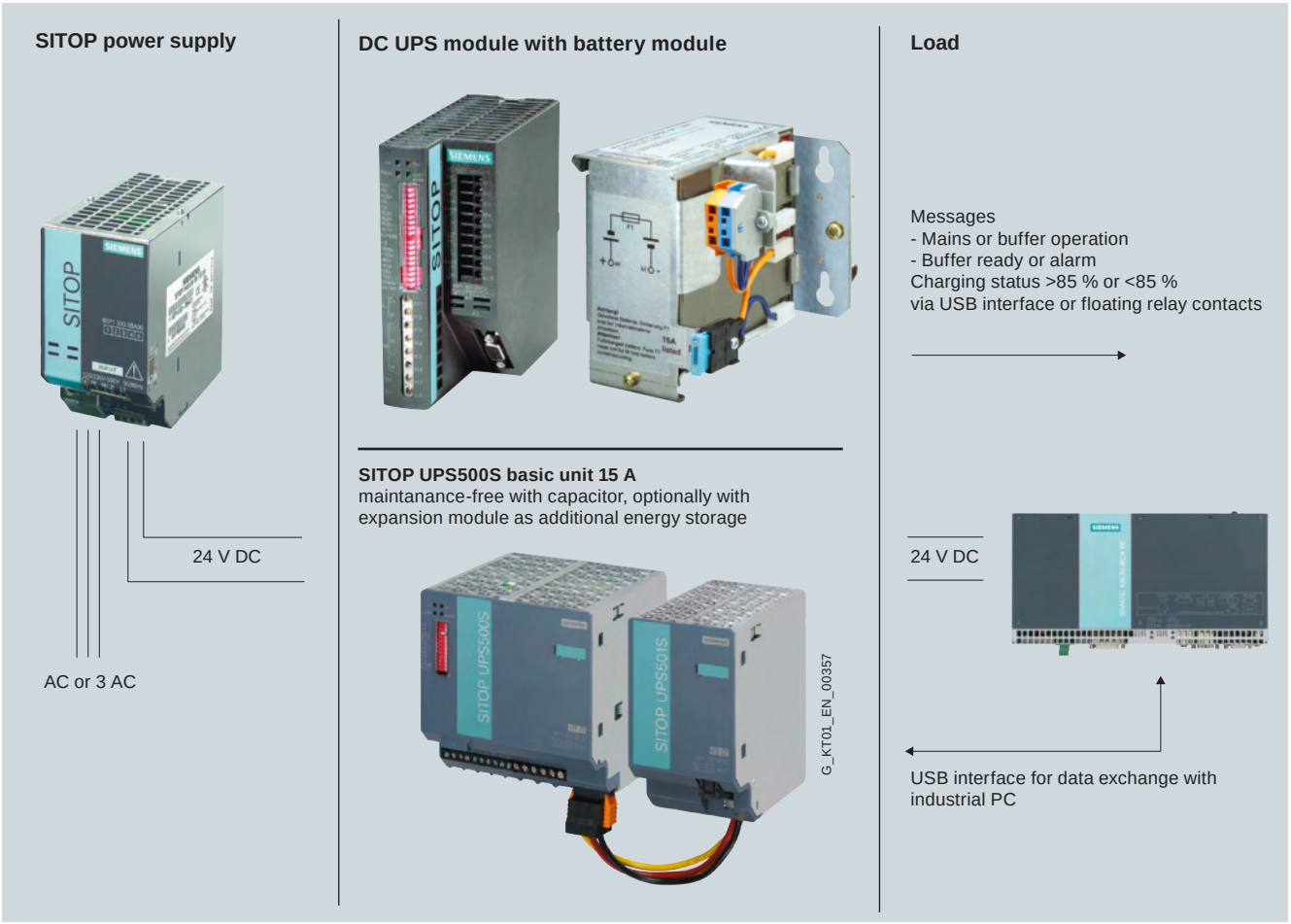
G_KT01_EN_00375

The uninterruptible power supply DC with battery modules consists of DC UPS modules with 6 A, 15 A, or 40 A output current and the battery modules 1.2 Ah, 3.2 Ah, 7 Ah and 12 Ah (contains lead-acid batteries with corrosion-resistant lead-calcium high-performance grid plates and fiber-glass mat) and 2.5 Ah (contains high-purity lead-acid "high-temperature batteries").

The maintenance-free SITOP UPS500 with capacitors as energy storage units is especially well suited for use at high ambient temperatures. Another advantage of these high-capacity double-layer capacitors is the shorter charge times.

For flexible use, there is the SITOP UPS500S - 15 A basic unit in 2.5 kW and 5 kW versions. A maximum of 3 SITOP UPS501S expansion modules with 5 kW can be connected in parallel to increase the buffer times. The IP65 version SITOP UPS500P disposes of capacitors for 5 or 10 kW and provides up to 7 A of output current.

Overview (continued)

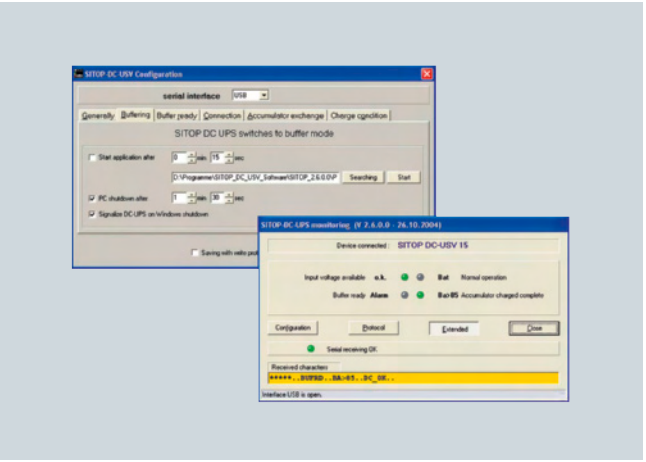


DC UPS software

The uninterruptible power supplies DC are optionally available with USB interface or serial interface. All relevant messages about the status of the uninterruptible power supply DC can be transferred to a PC (e.g. SIMATIC IPC) via this interface.

SITOP DC UPS software provides the user with a software tool that is extremely easy to operate and can be used to further process the signals sent from the uninterruptible power supply DC on the PC. In monitoring mode, the statuses of the uninterruptible power supply DC are visualized on the PC.
Secure shutdown on power failure and automatic restart of the PC are supported. It is also possible to freely define responses to the different operating states of the uninterruptible power supply DC, permitting extremely flexible integration into a wide variety of applications.

The software runs under the operating systems, Windows 2000, Windows XP and Windows Vista. It is available as freeware on the SITOP homepage and can be downloaded free of charge.
www.siemens.com/sitop



SITOP DC UPS software monitoring and configuration window

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DC UPS with capacitors

Overview

Uninterruptible power supplies normally store the electrical energy in lead-acid batteries. Temperatures such as those prevalent in control cabinets considerably shorten the service life of the battery, however, and the batteries must be replaced on a regular basis – annually at an ambient temperature of 40 °C, for example. The innovative SITOP UPS500, however, is based on absolutely maintenance-free capacitors with a long service life. Even at temperatures of 50 °C they still have more than 80 % of their capacity after 8 years, so there is no need to replace the energy stores. Because the capacitors do not emit any gas, the control cabinet does not have to be ventilated.

Another advantage is the significantly shorter charging times of the double-layer capacitors, which ensure that the buffer is ready very quickly after loss of power.

The IP65 version SITOP UPS500P has capacitors for 5 or 10 kW and provides up to 7 A of output current. The oblong metal enclosure is also suitable for installing on support arm systems.

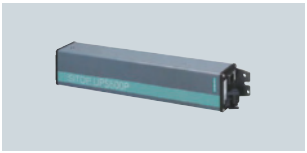
Selection table SITOP UPS500 (optional with SITOP UPS501S expansion module) and mains buffering times

Buffering and charging times										
SITOP UPS500S/501S configurations									**UPS500P**	
Basic unit	2.5 kW	5 kW	2.5 kW	5 kW	2.5 kW	5 kW	2.5 kW	5 kW	5 kW	10 kW
Expansion modules	–	–	1 × 5 kW	1 × 5 kW	2 × 5 kW	2 × 5 kW	3 × 5 kW	3 × 5 kW	–	–
Total energy	2.5 kW	5 kW	7.5 kW	10 kW	12.5 kW	15 kW	17.5 kW	20 kW	5 kW	10 kW
Load current	**Buffer times**									
0.5 A	134 s	236 s	390 s	478 s	632 s	748 s	851 s	1007 s	284 s	647 s
0.8 A	90 s	167 s	266 s	346 s	440 s	527 s	580 s	706 s	190 s	435 s
1 A	75 s	138 s	219 s	296 s	365 s	414 s	490 s	572 s	153 s	351 s
2 A	38 s	76 s	122 s	156 s	203 s	230 s	265 s	306 s	80 s	152 s
3 A	26 s	52 s	82 s	106 s	136 s	159 s	186 s	213 s	53 s	108 s
4 A	19 s	39 s	61 s	81 s	101 s	120 s	139 s	160 s	40 s	84 s
5 A	15 s	31 s	49 s	65 s	81 s	95 s	111 s	130 s	30 s	68 s
7 A	12 s	26 s	40 s	55 s	67 s	80 s	94 s	106 s	25 s	57 s
6 A	10 s	21 s	34 s	47 s	58 s	69 s	81 s	82 s	21 s	49 s
8 A	8 s	18 s	29 s	40 s	50 s	59 s	69 s	79 s	–	–
10 A	6 s	15 s	23 s	32 s	39 s	47 s	54 s	62 s	–	–
12 A	4 s	12 s	19 s	26 s	32 s	38 s	44 s	52 s	–	–
15 A	3 s	9 s	14 s	20 s	25 s	30 s	35 s	40 s	–	–
Load current	**Buffer times**									
2 A	54 s	120 s	158 s	223 s	263 s	318 s	355 s	417 s	130 s	360 s
1 A	110 s	205 s	311 s	425 s	503 s	625 s	695 s	816 s	-	-

Important information for selecting the energy storage units:

When the mains buffering times were determined, the discharge period of new or non-aged, completely charged capacitors was used as a basis. At a continuous ambient temperature of +50 °C, a loss of capacity of approx. 20 % must be considered after a service life of 8 years.

Overview

Product	SITOP UPS500S 15 A	SITOP UPS500P 7 A
Power supply, type	Basic unit 15 A	Basic device 7 A, IP65
Order No.	**6EP1 933-2EC41** (with USB interface and 2.5 kW) **6EP1 933-2EC51** (with USB interface and 5 kW)	**6EP1 933-2NC01** (with USB interface and 5 kW) **6EP1 933-2NC11** (with USB interface and 10 kW)
The product families are highlighted in the same colors. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.		
	• Compact design, only 120 mm wide • Two versions with integrated energy storage units: 2.5 kW or 5 kW • Can be expanded easily using a user-friendly plug-in system with the expansion module 5 kW • Absolutely uninterruptible bridging of power failures, as soon as the DC UPS input voltage falls below the value set by the DIP switches • High level of safety and availability through monitoring of operational readiness, and monitoring of the capacitor charge (message "> 85 % charged") • Support for automatic warm restart of industrial PCs through selectable shutdown characteristics • With USB interface	• Compact design, degree of protection IP65 • For distributed use, e.g. on support arms • Integrated energy storage: 5 kW or 10 kW • Ambient temperature range for operation: 0 to +55 °C • High degree of efficiency 96.9 % or low power loss, approx. 6 W with 7 A load current • USB interface • Indication of the operating states normal operation, buffer mode, alarm message "Buffer not ready" and indication of the capacitor charge > 85 %
Dimension drawing	Page 15/19, Dimension drawing 1	Page 15/19, Dimension drawing 3

Technical specifications

Input L+/ M with normal operation		
Rated voltage $V_{in\ rated}$ [1] Voltage range	Controlled DC voltage **24 V DC** 22 ... 29 V	Controlled DC voltage **24 V DC** 22.5 ... 29 V
Connection threshold for buffering	22.5 V DC ± 0.1 V (factory setting), adjustable in the range 22 ... 25,5 V DC (in 0.5 V steps)	22.5 V DC ±0.1 V DC
Rated current value $I_{in\ rated}$	15.2 A + approx. 2.3 A with empty energy storage (capacitor)	7 A + approx. 2 A with empty energy storage (capacitor)
Continuation of the table	Page 11/6, column 1	Page 11/6, column 2

DC UPS with capacitors

Continued from	Page 11/5, column 1	Page 11/5, column 2
Power supply, type (repeated)	Basic unit 15 A	Basic device 7 A, IP65
Order No. (repeated)	**6EP1 933-2EC41** (with USB interface and 2.5 kW) **6EP1 933-2EC51** (with USB interface and 5 kW)	**6EP1 933-2NC01** (with USB interface and 5 kW) **6EP1 933-2NC11** (with USB interface and 10 kW)
Mains buffering		
Mains buffering or buffering times without expansion modules	6EP1 933-2EC41: 15 A for 3 s or 10 A for 6 s or 5 A for 15 s or 2 A for 38 s 6EP1 933-2EC51: 15 A for 9 s or 10 A for 15 s or 5 A for 31 s or 2 A for 76 s	7 A for 49 s or 5 A for 68 s or 3 A for 108 s or 1 A for 351 s
Mains buffering or buffering times with expansion modules	For longer buffering times, see table	Not applicable
On/off control circuit	External isolated NO contact required (loading max. 15 V DC/max. 10 mA). Buffering is terminated by disconnecting the control circuit.	Not applicable
Methods of setting the buffering time	Adjustable using DIP switches to a maximum buffering time up to forced shutdown at approx. 7 V internal capacitor voltage (output remains constant at 24 V up to that point) or to a time limit of 5 ... 315 s (in 10 s increments) if the energy content is sufficient for the required current	Not applicable
Interruption	Adjustable with DIP switch, either: • Interruption of the output voltage despite returning input voltage for 5 s following expiry of set buffering time to support automatic restarting of industrial PCs Or • No forced interruption at the end of the set buffer time	Not applicable
Continuation of the table	Page 11/7, column 1	Page 11/7, column 2

[1] All SITOP 24 V DC power supplies are permissible without restriction.

Continued from	Page 11/6, column 1	Page 11/6, column 2
Power supply, type (repeated)	Basic unit 15 A	Basic device 7 A, IP65
Order No. (repeated)	**6EP1 933-2EC41** (with USB interface and 2.5 kW) **6EP1 933-2EC51** (with USB interface and 5 kW)	**6EP1 933-2NC01** (with USB interface and 5 kW) **6EP1 933-2NC11** (with USB interface and 10 kW)
Output L+/M in normal operation		
Rated voltage value $V_{out\ rated}$	24 V DC (controlled)	24 V DC (controlled)
Voltage range	23.3 ... 24.7 V DC or 24 V DC ±3 %	23.3 ... 24.7 V DC or 24 V DC ±3 %
Startup delay	Approx. 600 ms	Approx. 600 ms
Voltage rise	Approx. 25 ms	Approx. 25 ms
Output current I_{out}	**0 ... 15 A**	**0 ... 7 A**
Dynamic current with overload	Electronic current limitation to typically 25 A for approx. 200 ms, then electronic shutdown of the output with automatic restart attempts (approx. 20 s intervals between restart attempts)	Electronic shutdown at typ. 30 A, automatic restart after 20 s
Dynamic current with short-circuit	Electronic current limitation to typically 25 A for approx. 110 ms, then electronic shutdown of the output with automatic restart attempts (approx. 20 s intervals between restart attempts)	Electronic shutdown at typ. 30 A, automatic restart after 20 s
Output L+/M with buffer mode		
Rated voltage value $V_{out\ rated}$	24 V DC	24 V DC
Approximate voltage range	23.3 ... 24.7 V DC or 24 V DC ±3 %	23.3 ... 24.7 V DC or 24 V DC ±3 %
Output current I_{out}	0 ... 15 A	0 ... 7 A
Dynamic current with overload	Electronic current limitation to typically. 25 A for approx. 200 ms, then electronic shutdown of the output (restart following return to normal operation)	Electronic shutdown at typ. 30 A, automatic restart after 20 s
Dynamic current with short-circuit	Electronic current limitation to typically. 25 A for approx. 110 ms, then electronic shutdown of the output (restart following return to normal operation)	Electronic shutdown at typ. 30 A, automatic restart after 20 s
Charging current	Approx. 1 A (factory setting), adjustable to 1 A or 2 A (charging is carried out with closed and open on/off circuit)	2 A permanently set
Charging time after a discharge	6EP1 933-2EC41: 110 s with 1 A, 54 s with 2 A 6EP1 933-2EC51: 205 s with 1 A, 120 s with 2 A	Approx. 300 s
Charging time with expansion modules	For longer charging times, see table	Not applicable
Continuation of the table	Page 11/8, column 1	Page 11/8, column 2

DC UPS with capacitors

Continued from	Page 11/7, column 1	Page 11/7, column 2
Power supply, type (repeated)	Basic unit 15 A	Basic device 7 A, IP65
Order No. (repeated)	**6EP1 933-2EC41** (with USB interface and 2.5 kW) **6EP1 933-2EC51** (with USB interface and 5 kW)	**6EP1 933-2NC01** (with USB interface and 5 kW) **6EP1 933-2NC11** (with USB interface and 10 kW)
Efficiency/heat loss		
At $V_{out\ rated}$, $I_{out\ rated}$ approx.	97.5 % / 9 W	96.5 % / 5.2 W
Protection and monitoring		
Reverse polarity protection	Against reversed input voltage	Against reversed input voltage
Overload protection	Electronic shutdown of the output in accordance with "dynamic current with overload" in normal operation (automatic restart attempts) or in buffer mode (restart following return to normal operation)	Electronic shutdown of the output in accordance with "dynamic current with overload" in normal operation (automatic restart attempts) or in buffer mode (restart following return to normal operation) Thermal overload protection
Short-circuit protection	Electronic shutdown of the output in accordance with "dynamic current with short-circuit" in normal operation (automatic restart attempts) or in buffer mode (restart following return to normal operation), built-in (non-accessible) 20 A fuse	Electronic shutdown of the output in accordance with "dynamic current with overload" in normal operation (automatic restart attempts) or in buffer mode (restart following return to normal operation) Thermal overload protection
Signaling		
Normal operation	Green LED (OK) and isolated relay contact (changeover contact)[2]	Green LED (OK)
Buffer mode (capacitor supplies load alone or in addition to the PS in the case of overload)	Yellow LED (Bat) and isolated relay contact (changeover contact)[2]	Yellow LED (Bat)
Alarm (buffer not ready, or prewarning from < 12 V capacitor voltage)	Red LED (alarm) and isolated relay contact (changeover contact)[2]	Red LED (Alarm)
"Capacitor charge > 85 %"[1]	Second green LEDs (Bat > 85 %) and isolated relay contact (NO contact)[2]	Second green LED (Bat > 85 %)
Continuation of the table	Page 11/9, column 1	Page 11/9, column 2

1) 85 % with regard to residual capacity still available depending on aging. The original capacity (= capacity when new) reduces by only approx. 20 % within 8 years of operation even at a high ambient temperature of the device of +50 °C, for example, so that 80 % residual capacity still remains. The backup times also reduce by approximately 20 % in 8 years (at +50 °C) with small currents (up to approximately 5 A), and by approximately 30 % with high load currents (over 10 A).
Note: The lower the ambient temperature, the smaller the capacity reduction (approximately one half per 10 °C lower ambient temperature, that is at +40 °C, for example, only 10 % capacity reduction in 8 years)

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

Continued from	Page 11/8, column 1	Page 11/8, column 2
Power supply, type (repeated)	Basic unit 15 A	Basic device 7 A, IP65
Order No. (repeated)	**6EP1 933-2EC41** (with USB interface and 2.5 kW) **6EP1 933-2EC51** (with USB interface and 5 kW)	**6EP1 933-2NC01** (with USB interface and 5 kW) **6EP1 933-2NC11** (with USB interface and 10 kW)
USB interface		
	Output of all alarm signals and receipt of the "Remote timer start" signal. Technical design: Specification 2.0 with full speed, i.e. 2 Mbit/s. Supplied with +5 V by DC UPS ("self powered"). Required connection to the 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	Output of all alarm signals and receipt of the "Remote timer start" signal. Techn. design: Specification 2.0 at full speed, i.e. 2 Mbit/s. Supplied with +5 V by DC UPS ("self-powered"). Required connection to PC: see connector set
Software	A software tool (runs under Windows 2000, Windows XP and Windows Vista) for reading out and processing the signals can be downloaded from the Internet at http://www.siemens.com/sitop-usp This site also provides more information on the interface.	A software tool (runs under Windows 2000, Windows XP and Windows Vista) for reading out and processing the signals can be downloaded from the Internet at http://www.siemens.com/sitop-usp This site also provides more information on the interface.
Control signals		
On/off control signal	Buffering is terminated by opening the control circuit or by means of DIP switches on the device (DIP switch must be in "Off" position). All other functions are retained.	Not applicable
"Remote timer start" via USB interface	Starts mains buffering for the set buffer time	
Safety		
Primary/secondary isolation	No	
Protection class	Class III (ext. circuit and power supply unit: SELV in accordance with EN 60950 required)	
EMC		
Emitted interference	Radio interference suppression according to EN 55022, limit-value curve B	
Noise immunity	Noise immunity according to EN 61000-6-2	
Ambient conditions		
Ambient temperature during operation	0 ... +60 °C with natural convection	0 ... +55 °C with natural convection
Transport/storage temperature	–40 ... +70 °C	–40 ... +70 °C
Degree of protection (EN 60529)	IP20	IP65
Humidity class	Conditions of use in accordance with EN 60721, climate class 3K3 (relative humidity 5 % to 85 % and absolute humidity 1 g/m^3 to 25 g/m^3; no condensation)	
Continuation of the table	Page 11/10, column 1	Page 11/10, column 2

DC UPS with capacitors

Continued from	Page 11/9, column 1	Page 11/9, column 2
Power supply, type (repeated)	Basic unit 15 A	Basic device 7 A, IP65
Order No. (repeated)	**6EP1 933-2EC41** (with USB interface and 2.5 kW) **6EP1 933-2EC51** (with USB interface and 5 kW)	**6EP1 933-2NC01** (with USB interface and 5 kW) **6EP1 933-2NC11** (with USB interface and 10 kW)
Approvals		
CE mark	Yes	Yes
UL/cUL (CSA) approvals	cULus-Listed (UL 508, CSA C22.2 No.107.1) File E197259; cCSAus (CSA C22.2 No. 60950-1-03, UL 60950-1)	–
Mechanics		
Input connections 24 V DC	2 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	Connector set[1)]
Output connections 24 V DC	4 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	Connector set[1)]
Connections for control circuit and alarm signals	10 screw terminals for 0.5 ... 2.5 mm^2/20 ... 13 AWG	Not applicable
USB connection	Yes	Yes
Dimensions (W × H × D) in mm	120 × 125 × 125	400 (without connector) × 80 × 80 470 (without connector) × 80 × 80
Weight	Approx. 1.0 kg	Approx. 1.9 kg Approx. 2.2 kg
Installation	Snaps onto DIN rail EN 60715 35×7.5/15	Screw mounting

Overview

Product	**SITOP UPS501S**
Power supply, type	Extension module
Order No.	**6EP1 935-5PG01**

The product families are highlighted in the same colors. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.

- Additional energy storage (5 kW)
- Up to 3 expansion modules can be connected to a SITOP UPS500S to extend the buffer times
- Complete with balancing and safety circuits

Dimension drawing	Page 15/19, Dimension drawing 2

Technical specifications

Mechanics	
Connections	Can be easily connected to SITOP UPS500S via a user-friendly plug-in system
Dimensions (W × H × D) in mm	Approx. 70 × 125 × 125
Weight	Approx. 0.7 kg
Installation	Snaps onto DIN rail EN 60715 35×7.5/15

[1)] The connector set contains connection plugs for input and output and pre-assembled USB cables, 2 m long (connector set not included in the scope of supply SITOP UPS500P!) MLFB: 6EP1 975-2ES00.

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, the textile industry, all types of production lines and filling systems, and in conjunction with 24 V industrial PCs. This prevents the negative effects which often result from power failures.

DC UPS modules: 6 A, 15 A, 40 A

Battery modules:
- 1.2 Ah (contains lead-acid batteries with corrosion-resistant lead-calcium, high-capacity grid plates and fiberglass mat)
- 3.2 Ah (contains lead-acid batteries with corrosion-resistant lead-calcium, high-capacity grid plates and fiberglass mat)
- 7 Ah (contains lead-acid batteries with corrosion-resistant lead-calcium, high-capacity grid plates and fiberglass mat)
- 12 Ah (contains lead-acid batteries with corrosion-resistant lead-calcium, high-capacity grid plates and fiberglass mat)
- 2.5 Ah (contains "high-temperature battery" lead-acid type)

Selection table for battery modules and mains buffering 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	11 h	2 h
2 A	11 min	45 min	2.5 h	5 h	45 min
3 A	4 min	25 min	1.5 h	3 h	30 min
4 A	2 min	20 min	45 min	2 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	–

Important information for selecting the battery capacity:

- The mains buffering times are based on the discharge period of new or non-aged, fully charged battery modules at a battery temperature of not less than +25 °C down to a battery voltage of 21 V (with voltage drops in the DC UPS, approximately 20.4 V DC still remain for the load).

  Battery aging reduces the still available battery capacity up to the end of the service life to typically around 50 % of the original capacity value when new (1.2 Ah or 3.2 Ah or 7 Ah, etc.) and the internal resistance increases. When the message "Battery charge > 85 %" appears, only around 50 % × 85 % = approx. 43 % of the originally available capacity can be assumed at the end of the battery service life.

  At battery temperatures below +25 °C, the available capacity drops by another 30 % at + 5 °C battery temperature from approx. 43 % to approx. 70 %. There is then only around 30 % of the original capacity available.

  A significantly larger battery capacity must therefore be selected when configuring the plant: A drop to approx. 50 % is compensated for by selecting 1 / approx. 0.5 = approx. double the battery capacity (required as per the table for the relevant load current and the relevant buffering time). Available capacity of approx. 43 % is compensated for by selecting 1 / approx. 0.43 = approx. 2.33 times battery capacity. Available capacity of approx. 30 % is compensated for by selecting 1 / approx. 0.3 = approx. 3.33 times battery capacity.

Recommendation:

- Instead of installing double the battery capacity to cope with battery aging, regular battery replacement midway through the expected service life (reduction of capacity to approx. 50 %) can be more advisable for the following reasons: Until the halfway point of the expected battery service life (or slightly beyond), capacity does not drop below 100 %. With regular replacement after halfway through expected service life, only single battery capacity (instead of double capacity) must be installed regarding aging (→neutral in price with regard to battery module costs but requires only half the space).

  Replacing after half the service life dispenses in particular with the large scatter range of the residual capacity at the end of the service life, which is not accurately defined by battery manufacturers (after the full time, many batteries are above, but many are also below the average of 50 % residual capacity, that is, even if double the capacity is installed, the influence of aging at the end of service life is not reliably compensated for, but only typically) →In the case of replacement after half the expected service life, the configured buffering time is maintained significantly more reliably.

DC UPS modules and battery modules

Overview (continued)

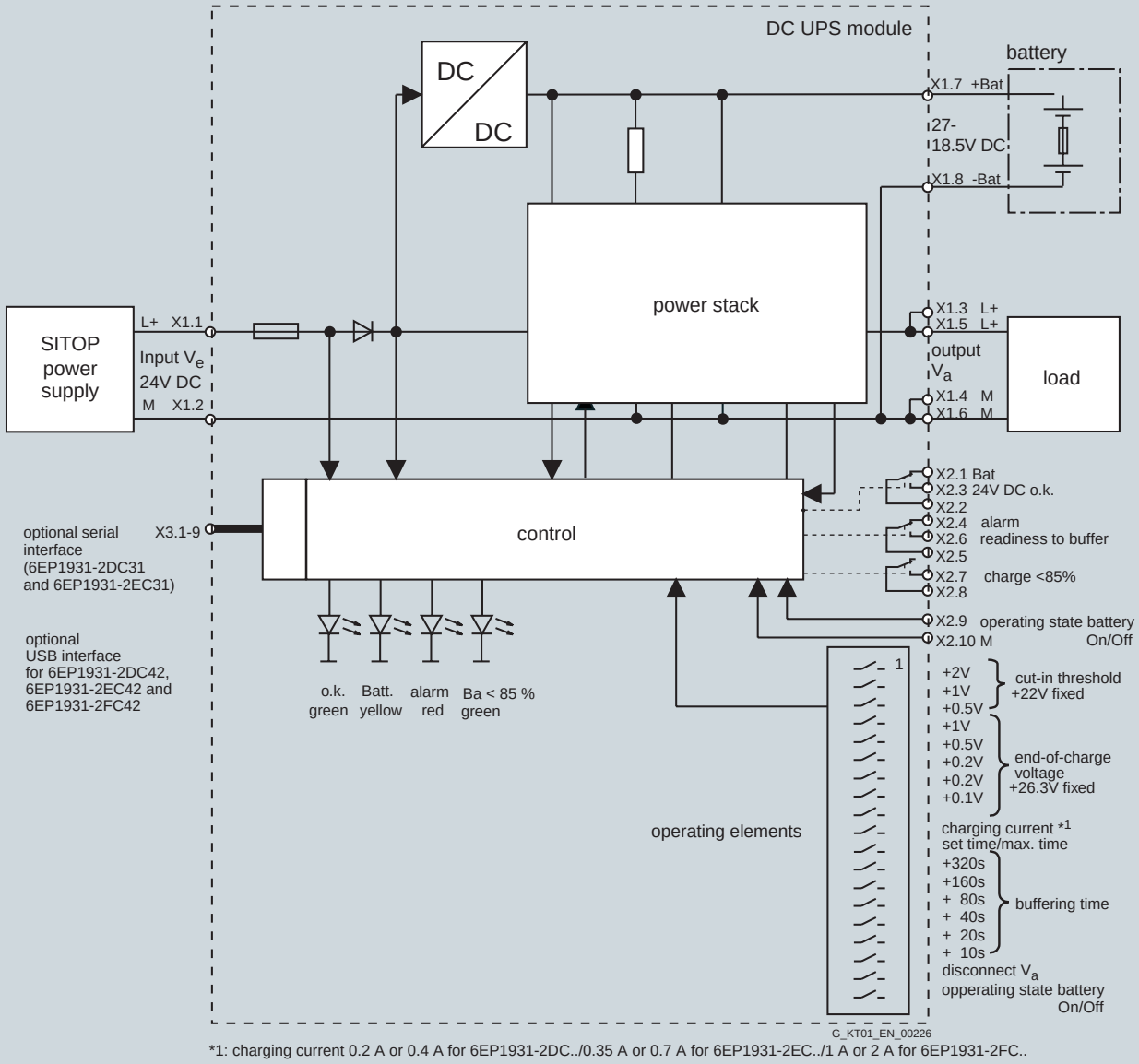
In the case of batteries stored in cool conditions (not exceeding +25 °C) and for not longer than approximately 4 months, the following service life can be assumed, strongly dependent on battery temperature:

Battery temperature	Drop to approx. 50 % of residual capacity	Recommendation: Replace (with 100 % residual capacity) every	Alternative recommendation
+20 °C	4 years	2 years	
+30 °C	2 years	1 year	
+40 °C	1 year	0.5 years	Install double capacity and replace (1 × per year)

In normal cases (installation in the coolest location in the control cabinet at approx. +30 °C), the battery with single installed battery capacity should be replaced in accordance with the selection table after 1 year of operation!

- On the DC UPS module 40 A, at least 2 battery modules from 7 Ah must be switched in parallel. When connecting battery modules in parallel, you must ensure identical capacity and aging.
- After a power failure, the battery module is disconnected from the loads at the end of the selected buffering time either automatically or electronically by opening the On/Off control circuit, and as soon as the 24 V input voltage is available again, it is quickly re-charged with the charge current of the relevant DC UPS module (with *I*-*V* charge characteristic: First constant current *I* for fast charging, and changeover to constant voltage *V* to maintain the charge when the battery is almost full).

Integration



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

Function

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

"Long" power failure with DC UPS without serial or USB port (Fig. 11/1)

Power restoration only once buffer time tp has expired (t3 follows t4):

Upon failure of the input voltage on the DC UPS module (time t1), the battery "Bat" immediately takes over the DC supply, and the output voltage V_{out} is then retained absolutely without interruption.

The isolated changeover contact "OK/Bat" switches over to its off position "Bat".

At the same point in 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}" in this example has no effect because the input voltage returns at time t3 only once the set buffer time (time t4) has expired.

"Short" power failure with DC UPS without serial or USB port (Fig. 11/2)

Power restoration before buffer time tp has expired (t3 before t4):

Upon failure of the input voltage on the DC UPS module (time t1), the battery "Bat" immediately takes over the DC supply, and the output voltage V_{out} is then retained absolutely without interruption.

The isolated changeover contact "OK/Bat" switches over to its off position "Bat".

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

With the DIP switch set to "Interruption output V_{out}", the output voltage V_{out} is automatically interrupted for 5 s once the set buffer time tp (time t4) has expired.

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).

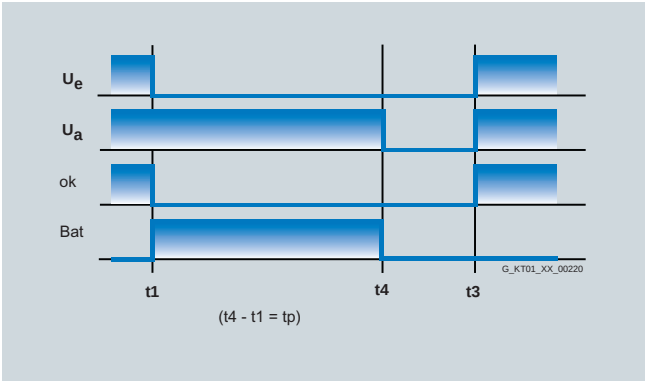


Figure 11/1 "Long power failure"

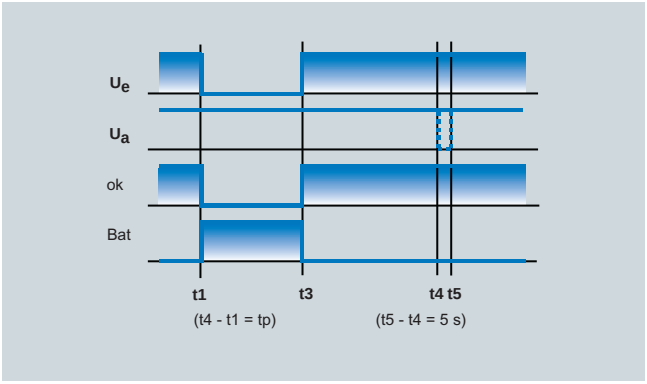


Figure 11/2 "Short power failure"

DC UPS without serial or USB port (6EP1931-2DC21/-2EC21/-2FC21)

DIP switch settings on device: buffer time tp (from 5 s to 635 s with bottom row nos. 2 to 7) / / t = according to setting (with bottom row no. 1 to left) / ⊔ = with setting for 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 operation (batteries connected to output, batteries supply the load)
Remote:	Signal for remote timer start with signal level = 0 at pin 7 of 9-pin serial interface (pin 7 is usually the positive power supply for the interface)
t1:	Input voltage V_{in} missing or falls below the set connection threshold
t2:	Buffer time set on DIP switches is started by remote timer start (signal level = 0)
t3:	Input voltage V_{in} rises above set connection threshold
t4:	End of set buffer time (output is switched off and/or battery is disconnected)
t5:	Output is connected again 5 s after shutdown
tp:	Buffer time set on the DIP switches (bottom row nos. 2 to 7)

Function (continued)

"Long" power failure with DC UPS with serial or USB port (Fig. 11/3)

Power restoration only once buffer time tp has expired (t3 follows t4):

Upon failure of the input voltage on the DC UPS module (time t1), the battery "Bat" immediately takes over the DC supply, and the output voltage V_{out} is then retained absolutely without interruption.

The isolated changeover contact "OK/Bat" switches over to its off position "Bat".

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

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

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

"Short" power failure with DC UPS with serial or USB port (Fig. 11/4)

Power restoration before buffer time tp has expired (t3 before t4):

Upon failure of the input voltage on the DC UPS module (time t1), the battery "Bat" immediately takes over the DC supply, and the output voltage V_{out} is then retained absolutely without interruption.

The isolated changeover contact "OK/Bat" switches over to its off position "Bat".

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

With the DIP switch set to "Interruption output V_{out}", the output voltage V_{out} is automatically interrupted for 5 s once the set buffer time tp (time t4) has expired.

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

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

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

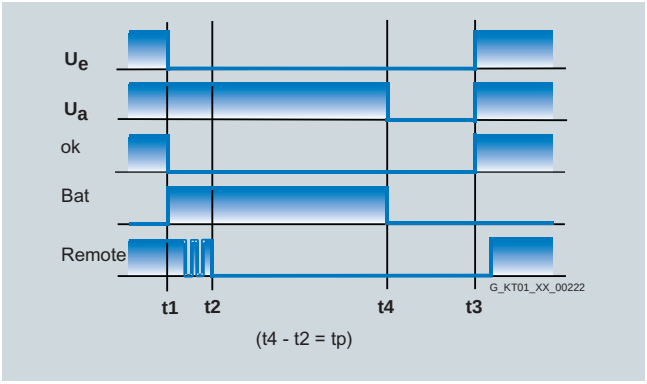


Figure 11/3 "Long power failure"

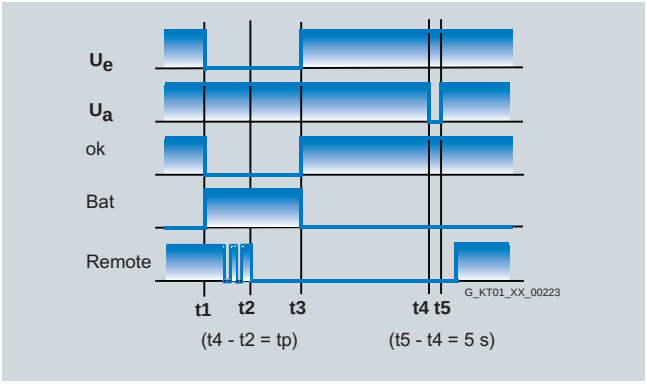


Figure 11/4 "Short power failure"

DC UPS with serial or USB port (6EP1931-2DC31/-2DC42/-2EC31/-2EC42/-2FC42)

DIP switch settings on device: buffer time tp (from 5 s to 635 s with bottom row nos. 2 to 7) / / t = max. time (with bottom row no. 1 to right) / interruption of U_{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 operation (batteries connected to output, batteries supply the load)
Remote:	Signal for remote timer start with signal level = 0 at pin 7 of 9-pin serial interface (pin 7 is usually the positive power supply for the interface)
t1:	Input voltage V_{in} missing or falls below the set connection threshold
t2:	Buffer time set on DIP switches is started by remote timer start (signal level = 0)
t3:	Input voltage V_{in} rises above set connection threshold
t4:	End of set buffer time (output is switched off and/or battery is disconnected)
t5:	Output is connected again 5 s after shutdown
tp:	Buffer time set on the DIP switches (bottom row nos. 2 to 7)

DC UPS modules and battery modules

Overview

Product	DC UPS module	DC UPS module	DC UPS module
Power supply, type	6 A	15 A	40 A
Order No.	**6EP1 931-2DC21** **6EP1 931-2DC31** (with serial interface) **6EP1 931-2DC42** (with USB interface)	**6EP1 931-2EC21**[1] **6EP1 931-2EC31** (with serial interface) **6EP1 931-2EC42** (with USB interface)	**6EP1 931-2FC21** **6EP1 931-2FC42** (with USB interface)
The product families are highlighted in the same colors. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.			
Dimension drawing	Page 15/20, Dimension drawing 1	Page 15/20, Dimension drawing 1	Page 15/20, Dimension drawing 2

Technical specifications

Input L+/M in normal operation			
Rated voltage value $V_{in\ rated}$[2] Voltage range	Controlled DC voltage **24 V DC** 22 ... 29 V	Controlled DC voltage **24 V DC** 22 ... 29 V	Controlled DC voltage **24 V DC** 22 ... 29 V
Connection threshold for battery	22.5 V DC ±0.1 V (factory setting), **adjustable in the range 22 ... 25.5 V DC** (in 0.5 V increments)	22.5 V DC ±0.1 V (factory setting), **adjustable in the range 22 ... 25.5 V DC** (in 0.5 V increments)	22.5 V DC ±0.1 V (factory setting), **adjustable in the range 22 ... 25.5 V DC** (in 0.5 V increments)
Rated current $I_{in\ rated}$	6 A + approx. 0.6 A with empty battery	15 A + approx. 1 A with empty battery	40 A + approx. 2.6 A with empty battery
Mains buffering			
Mains buffering or buffer time	Dependent on connected battery and load current, see selection table battery modules and mains buffering times as well as the relevant important information notes!		
On/off control circuit	External isolated NO contact required (max. load 15 V DC / max. 10 mA). With an open control circuit, the battery is isolated from output L+, thus canceling mains buffering. If there is no input voltage, a quiescent current of approximately 0.3 mA is drawn from the battery disconnected from the output.		
Methods of setting the buffering time	**Adjustable** using DIP switches to a maximum buffering time up to forced shutdown due to exhaustive discharge protection (at approx. 19 V) or to a time limit **of 5 ... 635 s** (in 10 s steps)		
Interruption	**Adjustable** using DIP switch, **either:** • Interruption in output voltage despite returning input voltage for min. 5 s following expiry of set buffer time to support automatic restarting of industrial PCs • No forced interruption on expiry of the set buffer time		
Output L+/M in normal operation			
Rated voltage value $V_{out\ rated}$	**24 V DC** (output voltage of SITOP power supply)	**24 V DC** (output voltage of SITOP power supply)	**24 V DC** (output voltage of SITOP power supply)
Voltage range	Input voltage V_{in} less approx. 0.5 V DC	Input voltage V_{in} less approx. 0.5 V DC	Input voltage V_{in} less approx. 0.5 V DC
Startup delay	Approx. 1 s	Approx. 1 s	Approx. 1 s
Voltage rise	Typ. 60 ms	Typ. 60 ms	Typ. 360 ms
Output current I_{out}	**0 ... 6 A**	**0 ... 15 A**	**0 ... 40 A**
Dynamic current with overload	Electronic current limitation to 1.05 ... 1.4 × $I_{out\ rated}$ for approx. 80 ms, then electronic shutdown of the output with automatic restart attempts (approx. 20 s intervals between restart attempts)		
Dynamic current with short-circuit	Electronic current limitation to 1.5 ... 3 × $I_{out\ rated}$ for approx. 20 ms, then electronic shutdown of the output with automatic restart attempts (approx. 20 s intervals between restart attempts)		
Output L+/M with battery operation			
Rated voltage value $V_{out\ rated}$	**24 V DC** (from battery module)	**24 V DC** (from battery module)	**24 V DC** (from battery module)
Approximate voltage range	27 ... 19 V DC at I_{out} = 0.05 × C × 1/h or 24 V at I_{out} = 1 × C × 1/h or 23 V at I_{out} = 2 × C × 1/h (C = total connected battery capacity in Ah), 19 V switch-off threshold for deep discharge protection		
Output current I_{out}[3]	**0 ... 6 A** (permanently permissible)	**0 ... 15 A** (permanently permissible)	**0 ... 40 A** (permanently permissible)
Dynamic current with overload	Electronic current limitation to 1.05 ... 1.4 × $I_{out\ rated}$ for approx. 80 ms, then latching switch-off of output (restart following return to normal operation)		
Dynamic current with short-circuit	Electronic current limitation to 1.5 ... 3 × $I_{out\ rated}$ for approx. 20 ms, then latching switch-off of output (restart following return to normal operation)		
Continuation of the table	Page 11/17, column 1	Page 11/17, column 2	Page 11/17, column 3

Continued from	Page 11/16, column 1	Page 11/16, column 2	Page 11/16, column 3
Power supply, type (repeated)	6 A	15 A	40 A
Order No. (repeated)	6EP1 931-2DC21 6EP1 931-2DC31 (with serial interface) 6EP1 931-2DC42 (with USB interface)	6EP1 931-2EC21[1)] 6EP1 931-2EC31 (with serial port) 6EP1 931-2EC42 (with USB port)	6EP1 931-2FC21 6EP1 931-2FC42 (with USB interface)
Output +Bat/-Bat in normal operation			
Output +Bat/-Bat in normal operation	***I-V* charging characteristic** (first constant current *I*, then constant voltage *V*)	***I-V* charging characteristic** (first constant current *I*, then constant voltage *V*)	***I-V* charging characteristic** (first constant current *I*, then constant voltage *V*)
End-of-charge voltage *V*	26.6 V DC ±0.1 V (factory setting for +40 °C battery temperature), **adjustable in the range 26.3 to 29.3 V** (in 0.1 V increments)	26.6 V DC ±0.1 V (factory setting for +40 °C battery temperature), **adjustable in the range 26.3 to 29.3 V** (in 0.1 V steps)	26.6 V DC ±0.1 V (factory setting for +40 °C battery temperature), **adjustable in the range 26.3 to 29.3 V** (in 0.1 V steps)
Charging current *I*	Approx. 0.4 A (factory setting), **adjustable to 0.2 A or 0.4 A** (charging is carried out with closed and open on/off circuit) At a battery voltage of < 6 V (batteries defective), charging is not carried out as a protective measure.	Approx. 0.7 A (factory setting), **adjustable to 0.35 A or 0.7 A** (charging is carried out with closed and open on/off circuit) At a battery voltage of < 6 V (batteries defective), charging is not carried out as a protective measure.	Approx. 2 A (factory setting), **adjustable to 1 A or 2 A** (charging is carried out with closed and open on/off circuit) At a battery voltage of < 6 V (batteries defective), charging is not carried out as a protective measure.
Efficiency/heat loss			
At $V_{out\ rated}$, $I_{out\ rated}$ approx.	95 % / 7 W	96.2 % / 14 W	97.2 % / 28.6 W
With battery operation, approx.	94.5 % / 8 W	96 % / 15 W	96.9 % / 33.6 W
Protection and monitoring			
Reverse polarity protection	Against polarity reversal on input voltage and batteries	Against polarity reversal on input voltage and batteries	Against polarity reversal on input voltage and batteries
Overload protection	In accordance with "dynamic current with overload" in normal operation (automatic restart attempts) or in battery mode (restart following return to normal operation)		
Short-circuit protection	In accordance with "dynamic current with short-circuit" in normal operation (automatic restart attempts) or in battery mode (restart following return to normal operation). Built-in (not accessible) 16 A fuse (6 A and 15 A on DC UPS module) or 64 A fuse (40 A on DC UPS module).		
Exhaustive discharge protection	Automatic shutdown when battery voltage falls below approx. 19 V. At a battery voltage of < 6 V (batteries defective), charging is not carried out as a protective measure.		
Monitoring "Wire breakage in battery circuit"	Alarm signal if battery circuit not closed or if it opens during operation (cyclic test approximately every 20 s)		
Monitoring "Battery replacement required"	Alarm signal flashing at approx. 0.25 Hz repetition frequency (approx. 2 s alarm, approx. 2 s no alarm, approx. 2 s alarm, etc.). Check every 4 hours with 6 ohm load for 1 s if no buffer mode or switch-off has taken place within 4 hours.	Alarm signal flashing at approx. 0.25 Hz repetition frequency (approx. 2 s alarm, approx. 2 s no alarm, approx. 2 s alarm, etc.). Check every 4 hours with 3 ohm load for 1 s if no buffer mode or switch-off has taken place within 4 hours.	Alarm signal flashing at approx. 0.25 Hz repetition frequency (approx. 2 s alarm, approx. 2 s no alarm, approx. 2 s alarm, etc.). Check every 4 hours with 1 ohm load for 1 s if no buffer mode or switch-off has taken place within 4 hours. No monitoring if switch position of compatibility switch is "On"!
Monitoring "Battery charge > 85 %"	Indication whether batteries are charged to at least 85 % of residual capacity still available depending on aging		
Signaling[4)]			
Normal operation	Green LED (OK) and isolated changeover contact "24 V DC OK/Bat" at setting "24 V DC OK" [5)]		
Buffer or battery mode (battery supplies load alone or in addition to PS in the case of overload)	Yellow LED (Bat) and isolated changeover contact "24 V DC OK/Bat" at setting "Bat" (= de-energized position)		
Alarm (buffer not ready or prewarning from < 20.4 V battery voltage)	Red LED (alarm) and isolated changeover contact at setting "Alarm" (= de-energized position). Causes of the buffer not being ready during normal operation can include: Off status or open on/off control circuit, battery module not connected, polarity reversal or defective battery (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 can be: Accumulator voltage has dropped below 20.4 V DC (= pre-warning before shutdown through exhaustive discharge protection) and shutdown of the accumulator due to overload, short-circuit, exhaustive discharge protection or expired buffer time. The red LED then goes out.		
"Battery replacement required"	Red LED (alarm) flashing at 0.25 Hz and floating changeover contact (alarm) switching at approx. 0.25 Hz		
"Battery charge > 85 %"	Second green LED (Bat > 85 %) and floating NO contact closed (de-energized position = open)		
Continuation of the table	Page 11/18, column 1	Page 11/18, column 2	Page 11/18, column 3

DC UPS modules and battery modules

Continued from	Page 11/17, column 1	Page 11/17, column 2	Page 11/17, column 3
Power supply, type (repeated)	6 A	15 A	40 A
Order No. (repeated)	6EP1 931-2DC21 6EP1 931-2DC31 (with serial interface) 6EP1 931-2DC42 (with USB interface)	6EP1 931-2EC21[1)] 6EP1 931-2EC31 (with serial interface) 6EP1 931-2EC42 (with USB interface)	6EP1 931-2FC21 6EP1 931-2FC42 (with USB interface)
Signaling[4)]			
Compatibility switch (only with 6EP1931-2FC21)	–	–	The following can be selected using DIP switches: Switch position "Off" - "significant properties analogous to new DC UPS range" or "On" switch position - "analogous to previous DC UPS module 40 (6EP1931-2FC01)". With compatibility switch in "On" position: Output of the Alarm signal changes: - The red LED flashes on wire-break between rechargeable battery and UPS DC module with $^1/_3$ Hz and isolated changeover contact (alarm) switching at approx. $^1/_3$ Hz. A battery test does not take place
Optional interface and software			
Serial interface	Only on **6EP1 931-2.C31** Output of all alarm signals and receipt of the "Remote timer start" signal. Technical design: PC-compatible. 8N1 send and receive, 9600 baud, 8 data bits, 1 stop bit, no parity bit. Required connection to the PC: 1 : 1 interconnected 9-pole sub D extension cable (connector/socket); only pin 2 (RXD), pin 3 (TDX) and pin 7 (RTS) are required.		–
USB interface	Only on **6EP1 931-2.C42** Output of all alarm signals and receipt of the "Remote timer start" signal. Technical design: Specification 2.0 with full speed, i.e. 2 Mbit/s. Supplied with +5 V by DC UPS ("self powered"). Required connection to the 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 for reading out and processing the signals (can run under Windows 2000, Windows XP and Windows Vista) is available for downloading from the Internet at http://www.siemens.com/sitop. Further information about the interface is available there.		
Control signals			
On/off control signal	Buffering is terminated or the battery is disconnected from the output by opening the control circuit or by means of DIP switches on the device (DIP switch must be in "Off" position). All other functions are retained.		
"Remote timer start" via serial interface or USB	Starts mains buffering for the set buffer time	Starts mains buffering for the set buffer time	Starts mains buffering for the set buffer time
Safety			
Primary/secondary isolation	No	No	No
Protection class	Class III (ext. circuit and power supply unit: safety extra low voltage required in accordance with EN 60950)	Class III (ext. circuit and power supply unit: safety extra low voltage required in accordance with EN 60950)	Class III (ext. circuit and power supply unit: safety extra low voltage required in accordance with EN 60950)
EMC			
Emitted interference	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Noise immunity	Noise immunity according to EN 61000-6-2	Noise immunity according to EN 61000-6-2	Noise immunity according to EN 61000-6-2
Ambient conditions			
Ambient temperature during operation	0 ... +60 °C with natural convection	0 ... +60 °C with natural convection	0 ... +60 °C with natural convection
Transport/storage temperature	–40 ... +70 °C	–40 ... +70 °C	–40 ... +70 °C
Degree of protection (EN 60529)	IP20	IP20	IP20
Humidity class	Conditions of use in accordance with EN 60721, climate class 3K3 (relative humidity 5 % to 85 % and absolute humidity 1 g/m^3 to 25 g/m^3; no condensation)	Conditions of use in accordance with EN 60721, climate class 3K3 (relative humidity 5 % to 85 % and absolute humidity 1 g/m^3 ... 25 g/m^3; no condensation)	Conditions of use in accordance with EN 60721, climate class 3K3 (relative humidity 5 % to 85 % and absolute humidity 1 g/m^3 to 25 g/m^3; no condensation)
Continuation of the table	Page 11/19, column 1	Page 11/19, column 2	Page 11/19, column 3

Continued from	Page 11/18, column 1	Page 11/18, column 2	Page 11/18, column 3
Power supply, type (repeated)	6 A	15 A	40 A
Order No. (repeated)	6EP1 931-2DC21 6EP1 931-2DC31 (with serial interface) 6EP1 931-2DC42 (with USB interface)	6EP1 931-2EC21[1)] 6EP1 931-2EC31 (with serial interface) 6EP1 931-2EC42 (with USB interface)	6EP1 931-2FC21 6EP1 931-2FC42 (with USB interface)
Approvals			
CE mark	Yes	Yes	Yes
UL/cUL (CSA) approval	cULus-listed (UL 508, CSA C22.2 No. 107.1) File E197259	cULus-listed (UL 508, CSA C22.2 No. 107.1) File E197259	cULus-listed (UL 508, CSA C22.2 No. 107.1) File E197259
Mechanics			
Input connections 24 V DC	2 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	2 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	2 screw terminals for 0.33 ... 10 mm^2/22 ... 7 AWG
Output connections 24 V DC	4 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	4 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	4 screw terminals for 0.33 ... 10 mm^2/22 ... 7 AWG
Battery module connections 24 V DC	2 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	2 screw terminals for 1 ... 4 mm^2/17 ... 11 AWG	2 screw terminals for 0.33 ... 10 mm^2/22 ... 7 AWG
Connections for control circuit and alarm signals	10 screw terminals for 0.5 ... 2.5 mm^2/20 ... 13 AWG	10 screw terminals for 0.5 ... 2.5 mm^2/20 ... 13 AWG	10 screw terminals for 0.5 ... 2.5 mm^2/20 ... 13 AWG
Dimensions (W × H × D) in mm	50 × 125 × approx. 125	50 × 125 × approx. 125	102 × 125 × 125
Weight, approx.	0.4 kg (with serial or USB interface: 0.45 kg)	0.4 kg (with serial or USB interface: 0.45 kg)	1.1 kg (with USB interface: 1.1 kg)
Installation	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15

1) SIPLUS module 6AG1 931-2EC21-2AA0 for extended temperature range -25 °C to +60 °C and use under medial load (e.g. chlorine-sulfur atmosphere).

2) All SITOP 24 V DC power supplies are permissible without restriction.

3) Two battery modules connected in parallel are required in order to achieve more than 20 A up to max. 40 A output current on the DC UPS module.

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

5) "24 V DC OK" means: Voltage of the power supply unit is greater than the battery connection threshold set on the DC UPS module 40

DC UPS modules and battery modules

Overview

Product	Battery module 1.2 Ah	Battery module 2.5 Ah	Battery module 3.2 Ah
Battery type	Maintenance-free lead-acid batteries	Maintenance-free pure lead batteries	Maintenance-free, closed lead-acid batteries
Order No.	6EP1 935-6MC01	6EP1 935-6MD31	6EP1 935-6MD11
The product families are highlighted in the same colors. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.			
	Battery module for DC UPS module 6 A It has two maintenance-free, closed lead-acid batteries (from the same lot) which are installed in a holder and connected in series with corrosion-resistant lead-calcium high-performance grid plates and glass fiber. Completely prewired with battery retainer and terminals Low self-discharge rate of approximately 3 % per month (at +20 °C)	High-temperature battery module for DC UPS module 6 A and 15 A It has two maintenance-free, closed pure lead-acid batteries (from the same lot), which are installed in a holder and connected in series. Completely prewired with battery retainer and terminals Low self-discharge rate of approximately 3 % per month (at +20 °C)	Battery module for DC UPS module 6 A and 15 A It has two maintenance-free, closed lead-acid batteries (from the same lot) which are installed in a holder and connected in series with corrosion-resistant lead-calcium high-performance grid plates and glass fiber. Complete with battery retainer and terminals Low self-discharge rate of approximately 3 % per month (at +20 °C)
Dimension drawing	Page 15/21, Dimension drawing 5	Page 15/21, Dimension drawing 1	Page 15/21, Dimension drawing 2

Technical specifications

Charging current/charging voltage			
	Maintenance-free, closed lead-acid batteries	**Maintenance-free pure lead-acid batteries**	**Maintenance-free, closed lead-acid batteries**
Recommended end-of-charge voltage (stand-by use), dependent on battery temperature	27.8 V at +10 °C 27.3 V at +20 °C 26.8 V at +30 °C 26.6 V at +40 °C	29.0 V at –10 °C 28.6 V at 0 °C 28.3 V at +10 °C 27.9 V at +20 °C 27.5 V at +30 °C 27.2 V at +40 °C 26.8 V at +50 °C 26.4 V at +60 °C	27.8 V at +10 °C 27.3 V at +20 °C 26.8 V at +30 °C 26.6 V at +40 °C
Recommended charging current	Max. 0.3 A	Max. 5 A	Max. 0.8 A
Protection			
Short-circuit protection	Battery fuse 7.5 A/32 V (solid-state circuitry blade-type fuse + support)	Battery fuse 15 A/32 V (solid-state circuitry blade-type fuse + support)	Battery fuse 15 A/32 V (solid-state circuitry blade-type fuse + support)
Battery protection	Valve control	Valve control	Valve control
Safety			
Protection class	Class III	Class III	Class III
UL/cUL (CSA) approval	cURus-recognized (UL 1778, CSA C22.2 No. 107.1), File E219627	cURus-recognized (UL 1778, CSA C22.2 No. 107.1), File E219627	cURus-recognized (UL 1778, CSA C22.2 No. 107.1), File E219627
Degree of protection (EN 60529)	IP00	IP00	IP00
Operating data[1]			
Ambient temperature range	+5 ... +40 °C	–40 ... +60 °C with natural convection	+5 ... +40 °C with natural convection
Transport/storage temperature range	–20 ... +50 °C	–40 ... +60 °C	–20 ... +50 °C
Self-discharge rate	Approx. 3 % per month at 20 °C battery temperature (increases with the temperature)	Approx. 3 % per month at 20 °C battery temperature (increases with the temperature)	Approx. 3 % per month at 20 °C battery temperature (increases with the temperature)
Continuation of the table	Page 11/22, column 1	Page 11/22, column 2	Page 11/22, column 3

[1] For storage, mounting and operation of lead-acid batteries, the relevant DIN/VDE regulations or country-specific regulations (e.g. VDE 0510 Part 2/EN 50272-2) must be observed. You must ensure that the battery site is sufficiently ventilated. Possible sources of ignition must be at least 50 cm away.

Battery module 7 Ah	**Battery module 12 Ah**
Maintenance-free, closed lead-acid batteries	Maintenance-free, closed lead-acid batteries
6EP1 935-6ME21	6EP1 935-6MF01
	
Battery module for DC UPS module 6 A, 15 A, and 40 A (for > 20 to 40 A, 2 modules are required in parallel). It has two maintenance-free, closed lead-acid batteries (from the same lot) which are installed in a holder and connected in series with corrosion-resistant lead-calcium high-performance grid plates and glass fiber. Completely pre-wired with terminals and battery retainer Low self-discharge rate of approximately 3 % per month (at +20 °C)	Battery module for DC UPS module 6 A and 15 A and DC UPS module 40 A (for > 20 to 40 A, 2 modules are required in parallel) It has two maintenance-free, closed lead-acid batteries (from the same lot) which are installed in a holder and connected in series with corrosion-resistant lead-calcium high-performance grid plates and glass fiber. Completely pre-wired with terminals and battery retainer Low self-discharge rate of approximately 3 % per month (at +20 °C)
Page 15/21, Dimension drawing 3	Page 15/21, Dimension drawing 4

Maintenance-free, closed lead-acid batteries	**Maintenance-free, closed lead-acid batteries**
27.8 V at +10 °C 27.3 V at +20 °C 26.8 V at +30 °C 26.6 V at +40 °C	27.8 V at +10 °C 27.3 V at +20 °C 26.8 V at +30 °C 26.6 V at +40 °C
Max. 1.75 A	Max. 3 A
Battery fuse 20 A/32 V (solid-state circuitry blade-type fuse + support)	Battery fuse 20 A/32 V (solid-state circuitry blade-type fuse + support)
Valve control	Valve control
Class III	Class III
cURus-recognized (UL 1778, CSA C22.2 No. 107.1), File E219627	cURus-recognized (UL 1778, CSA C22.2 No. 107.1), File E219627
IP00	IP00
+5 ... +40 °C	+5 ... +40 °C
–20 ... +50 °C	–20 ... +50 °C
Approx. 3 % per month at 20 °C battery temperature	Approx. 3 % per month at 20 °C battery temperature
Page 11/23, column 4	Page 11/23, column 5

DC UPS modules and battery modules

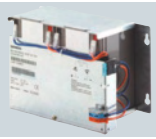
Continuation of the table	Page 11/20, column 1	Page 11/20, column 2	Page 11/20, column 3
Battery type (repeated)	Maintenance-free lead-acid batteries	Maintenance-free pure lead batteries	Maintenance-free, closed lead-acid batteries
Order No. (repeated)	6EP1 935-6MC01	6EP1 935-6MD31	6EP1 935-6MD11
Service life[1]			
The service life of the lead-acid batteries (when capacity falls to 50 % of original capacity) depends on the battery temperature as follows:	Approx. 4 years at +20 °C Approx. 2 years at +30 °C Approx. 1 year at +40 °C	Approx. > 10 years at +20 °C Approx. 7 years at +30 °C Approx. 3 years at +40 °C Approx. 1.5 years at +50 °C Approx. 1 year at +60 °C	Approx. 4 years at +20 °C Approx. 2 years at +30 °C Approx. 1 year at +40 °C
Mechanics			
Connection	1 screw terminal each for 0.08 to 2.5 mm^2 for +BAT and –BAT	1 screw terminal each for 0.08 to 2.5 mm^2 for +BAT and –BAT	1 screw terminal each for 0.08 to 2.5 mm^2 for +BAT and –BAT
Accessories, included	Accessories pack with solid-state circuitry fuse 7.5 A	Accessories pack with solid-state circuitry fuse 15 A	Accessories pack with solid-state circuitry fuse 15 A
Dimensions (W × H × D) in mm	96 × 106 × 108	265 × 151 × 91	190 × 151 × 82
Weight, approx.	1.8 kg	3.8 kg	3.2 kg
Installation	Snaps onto DIN rail EN 60715 35×7.5/15 or keyhole mounting for hooking in to M4 screws	Snaps onto DIN rail EN 60715 35×7.5/15 or keyhole mounting for hooking in to M4 screws	Snaps onto DIN rail EN 60715 35×7.5/15 or keyhole mounting for hooking in to M4 screws

[1] Along with the storage and operating temperature, other factors such as the duration of the storage period and the charge status during storage have a decisive influence on the possible useful life. Batteries should therefore be stored as briefly as possible, always fully charged, and within the temperature range 0 to +20 °C.

Page 11/21, column 4	Page 11/21, column 5
Maintenance-free, closed lead-acid batteries	Maintenance-free, closed lead-acid batteries
6EP1 935-6ME21	6EP1 935-6MF01
Approx. 4 years at +20 °C Approx. 2 years at +30 °C Approx. 1 year at +40 °C	Approx. 4 years at +20 °C Approx. 2 years at +30 °C Approx. 1 year at +40 °C
1 screw terminal each for 0.08 to 4 mm^2 for +BAT and –BAT	1 screw terminal each for 0.08 to 4 mm^2 for +BAT and –BAT
Accessories pack with spare solid-state circuitry fuse 15 A and 20 A	Accessories pack with spare solid-state circuitry fuse 15 A and 20 A
186 × 168 × 121	253 × 168 × 121
6.0 kg	9.0 kg
Can be screwed onto flat surface ("keyhole mounting" for hooking onto M4 screws)	Can be screwed onto flat surface ("keyhole mounting" for hooking onto M4 screws)

DC UPS

Selection and ordering data

Product	Input Voltage $V_{in\ rated}$	Output Voltage $V_{out\ rated}$	Current $I_{out\ rated}$	Order No.	Price in euros per PU
SITOP UPS500S					
	**24 V DC**	**24 V DC**	15 A	**6EP1 933-2EC41** **6EP1 933-2EC51**	
SITOP UPS501S					
	**24 V DC**	**24 V DC**	15 A	**6EP1 935-5PG01**	
SITOP UPS500P					
	**24 V DC**	**24 V DC**	7 A	**6EP1 933-2NC01** **6EP1 933-2NC11**	
Connector set					
	Connector set with connector for input and output with pre-assembled USB cable (2 m long)			**6EP1 975-2ES00**	
DC UPS module					
	**24 V DC**	**24 V DC**	6 A	**6EP1 931-2DC21** **6EP1 931-2DC31** **6EP1 931-2DC42**	
	24 V DC	**24 V DC**	15 A	**6EP1 931-2EC21** **6EP1 931-2EC31** **6EP1 931-2EC42**	
	**24 V DC**	**24 V DC**	40 A	**6EP1 931-2FC21** **6EP1 931-2FC42**	
Battery module 1.2 Ah					
				**6EP1 935-6MC01**	
Battery module 2.5 Ah					
				**6EP1 935-6MD31**	
Battery module 3.2 Ah					
				**6EP1 935-6MD11**	
Battery module 7 Ah					
				**6EP1 935-6ME21**	
Battery module 12 Ah					
				**6EP1 935-6MF01**	

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SITOP
Alternative voltages

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Overview

Product	SITOP DC/DC	SITOP flexi	SITOP dual
Power supply, type	12 V	3 ... 52 V	2 × 15 V
Order No.	6EP1 621-2BA00	6EP1 353-2BA00	6EP1 353-0AA00
The product families are highlighted in the same color. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.	 DC/DC converter for connection to 24 V DC networks over permanent wiring. Output voltage 12 V DC; floating, short circuit-proof, open circuit-proof.	 The power supply with flexible output voltage from 3 to 52 V; suitable for all application areas requiring a special voltage other than 24 V.	 The industrial power supply with two 15 V outputs that can be switched in parallel and in series; can be used, for example, to supply electronic loads with ±15 V.
Dimension drawing	Page 15/22, Dimension drawing 1	Page 15/22, Dimension drawing 2	Page 15/22, Dimension drawing 2

Technical specifications

Input			
Rated voltage value $V_{in\ rated}$	DC voltage (SELV or PELV) **24 V DC**[1]	1-phase AC **120/230 V AC** Set via wire jumper	1-phase AC **120 - 230 V AC** wide-range input
Voltage range	18.5 ... 30.2 V	85 ... 132 V/170 ... 264 V	93 ... 264 V
Overvoltage resistance	–	2.3 × $V_{in\ rated}$, 1.3 ms	Surge voltage in accordance with EN 61000-6-2 Table 4
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
Rated line frequency; range	–	50/60 Hz, 47 ... 63 Hz	50/60 Hz; 47 ... 63 Hz
Rated current value $I_{in\ rated}$	2.5 A	2.2/0.9 A	1.9-1.15 A
Making current limit (+25 °C)	< 20 A	< 32 A	< 30 A, typ. 3 ms
I^2t		< 0.8 A^2s	< 3 A^2s
Built-in incoming fuse	(not accessible)	T 3.15 A/250 V (not accessible)	T4 A/250 V (not accessible)
Recommended miniature circuit breaker (IEC 898) in the mains power input	10 A Characteristic B	From 6 A Characteristic C	From 10 A Characteristic C or from 16 A Characteristic B

Output			
Rated voltage value $V_{out\ rated}$	Controlled, isolated DC voltage **12 V DC**	Controlled, isolated DC voltage **3 - 52 V DC**	Controlled, isolated DC voltage **2 × 15 V DC**
Total tolerance	±3 %	±1 %	±2 %
• Static mains compensation	Approx. 0.1 %	Approx. 0.1 %	Approx. 0.2 %
• Static load balancing	Approx. 0.4 %	Approx. 0.2 %	Approx. 0.2 %
Sense line connection	–	Yes, maximum voltage control 0.5 V per line	–
Residual ripple	< 100 mV_{pp}	< 50 mV_{pp} (typ. 20 mV_{pp})	< 50 mV_{pp} (typ. 20 mV_{pp})
Spikes (bandwidth: 20 MHz)	< 200 mV_{pp}	< 100 mV_{pp} (typ. 80 mV_{pp})	< 150 mV_{pp}
Adjustment range	12 ... 14 V	3 ... 52 V, via potentiometer or analog control voltage signal 0 ... 2.5 V	14.5 ... 17 V
Status display	Green LED for 12 V OK	Green LED for 24 V OK	Green LED for V_{out} >10 V (summation display)
Signaling	–	Power good via relay contact, current monitor signal 0 ... 2.5 V	–
On/off behavior		No overshoot of V_{out} (soft start)	Overshoot of V_{out} <3 %
Startup delay/voltage rise	< 0.5 s/typ. 300 ms	< 3 s/typ. 80 ms	< 1 s/–
Rated current value $I_{out\ rated}$	**2.5 A**	**2-10 A** (approx. 120 W)	**2 × 3.5 A**
Continuation of the table	Page 12/4, column 1	Page 12/4, column 2	Page 12/4, column 3

[1] The supply voltage must be separated safety (SELV or PELV) from the AC infeed system.

SITOP smart	SITOP modular
48 V	48 V
6EP1 456-2BA00	6EP1 457-3BA00
	
The three-phase 48 V power supply for powerful loads that are supplied with double the usual 24 V; with wide-range input; slim design; with 50 % extra power for 5 s.	The modular 48 V power supply for powerful loads that are supplied with double the usual 24 V; with wide-range input and switchable output characteristic; function expansion possible with expansion module.
Page 15/22, Dimension drawing 3	Page 15/23, Dimension drawing 1
3-phase AC **400 - 500 V 3 AC** wide-range input 360 ... 550 V	3-phase AC **400 - 500 V 3 AC** wide-range input 320 ... 550 V (startup from V_{in} > 340 V)
2.3 × $V_{in\ rated}$, 1.3 ms > 7 ms at V_{in} = 400 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 6 ms at V_{in} = 400 V 50/60 Hz; 47 ... 63 Hz
1.1-0.9 A < 18 A < 0.8 A^2s	2.2 A (V_{in} = 400 V) < 70 A < 2.8 A^2s
None 3-pole connected miniature circuit breaker 6 ... 16 A characteristic C or motor circuit breaker 3RV1021-1DA10, setting 3 A or 3RV1721-1DD10 (UL 489)	None 3-pole connected miniature circuit breaker 10 ... 16 A characteristic C or motor circuit breaker 3RV1021-1DA10, setting 3 A or 3RV1721-1DD10 (UL 489)
Controlled, isolated DC voltage **48 V DC**	Controlled, isolated DC voltage **48 V DC**
±3 % Approx. 0.1 % Approx. 0.2 %	±3 % Approx. 0.1 % Approx. 0.2 %
– < 350 mV_{pp} < 240 mV_{pp}	– < 100 mV_{pp} (typ. 10 mV_{pp}) < 200 mV_{pp} (typ. 80 mV_{pp})
42 ... 56 V (max. 480 W)	42 ... 56 V (max. 960 W)
Green LED for 48 V OK Power good via relay contact (NO contact, rating 60 V/0.3 A) for output voltage OK No overshoot of V_{out} (soft start)	Green LED for 48 V OK Possible via signaling module (6EP1 961-3BA10) No overshoot of V_{out} (soft start)
< 2.5 s/< 500 ms **10 A**	< 2.5 s/typ. 20 ms **20 A**
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Alternative voltages

Continued from	Page 12/2, column 1	Page 12/2, column 2	Page 12/2, column 3
Power supply, type (repeated)	12 V	3 ... 52 V	2 × 15 V
Order No. (repeated)	6EP1 621-2BA00	6EP1 353-2BA00	6EP1 353-0AA00
Output (continued)			
Current range • Up to +60 °C • Derating	 0 ... 2.5 A –	 0 ... 10 A (approx. 120 W) –	 2 × 0 ... 2.5 A 2 × 0 ... 3.5 A (up to +45 °C)
Dynamic overcurrent on • Power-up on short circuit • Short circuit during operation	 3.3 A 3.3 A	 Constant current 2 ... 10 A Constant current 2 ... 10 A	 – –
Parallel switching for enhanced performance	Yes, 2 units	Yes, 2 units	Yes, 2 units
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$ Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 83 % Approx. 6.1 W	Approx. 84 % (at 24 V/5 A) Approx. 23 W (at 24 V/5 A)	Approx. 80 % Approx. 27 W
Protection and monitoring			
Output overvoltage protection Current limitation	< 24 V 3.0 ... 3.6 A	Yes, according to EN 60950 2 ... 10 A, adjustable using potentiometer or analog control voltage signal 0 ... 2.5 V	Yes, according to EN 60950 Limit point < 4.9 A; switch-off point < 6 A
Short-circuit protection	Electronic shutdown, automatic restart	Electronic current limiting (2 ... 10 A) in the range 3 ... 12 V or power limiting (approx. 120 W) in the range 12 ... 52 V	Electronic shutdown, automatic restart
Sustained short-circuit current rms value	Approx. 3.6 A	According to the adjusted current regulation	–
Overload/short-circuit indicator	Red LED	Red LED for current or power limiting	–
Safety			
Primary/secondary isolation Protection class	Yes, safety extra low output voltage V_{out} according to EN 60950 Class II	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 Class I
Leakage current Safety approval CE mark	– Yes Yes	< 3.5 mA Yes Yes	< 3.5 mA Yes Yes
UL/cUL (CSA) approval	cCSAus (UL 508, CSA22.2-107, UL60950-1, CSA22.2-60950-1)	cULus-listed (UL 508, CSA C22.2 No. 142), File E143289	cULus-listed (UL 508, CSA C22.2 No. 142), File E179336
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Emitted interference Supply harmonics limitation Noise immunity	EN 55022 Class B - EN 61000-6-2	EN 55022 Class B EN 61000-3-2 EN 61000-6-2	EN 55011 Class A – EN 61000-6-2
Operating data			
Ambient temperature range Transport/storage temperature range Humidity class	0 ... +60 °C with natural convection – 40 ... +85 °C Climate class 3K3 according to EN 60721, without condensation	0 ... +60 °C with natural convection – 25 ... +85 °C Climate class 3K3 according to EN 60721, without condensation	0 ... +60°C with natural convection, – 40 ... +70 °C Climate class 3K3 according to EN 60721, without condensation
Mechanics			
Connections • Supply input L1, N, PE • Output • Alarm signals, control inputs	 One screw terminal each for 0.5 ... 2.5 mm² (L+, N, PE) 2 screw-type terminals each for 0.5 ... 2.5 mm² (+ and –) –	 One screw terminal each for 0.5 ... 2.5 mm² single-core/ finely stranded 1 screw-type terminal for 0.5 ... 2.5 mm² (L+) and 2 screw-type terminals for 0.5 ... 2.5 mm² (M) Screw terminals for 0.14 ... 1.5 mm²	 One screw terminal each for 0.5 ... 2.5 mm² single-core/ finely stranded 1 screw-type terminal each for 0.5 ... 2.5 mm² (P15_1, GND1, GDN2) and 2 screw-type terminals for 0.5 ... 2.5 mm² (P15_2) –
Dimensions (W × H × D) in mm Weight, approx. Installation	32.5 × 125 × 125 0.32 kg Snaps onto DIN rail EN 60715 -35×7.5/15	75 × 125 × 125 0.9 kg Snaps onto DIN rail EN 60715 35×7.5/15	75 × 125 × 125 0.75 kg Snaps onto DIN rail EN 60715 35×7.5/15
Accessories			
	–	–	–

Page 12/3, column 4	Page 12/3, column 5
48 V	48 V
6EP1 456-2BA00	6EP1 457-3BA00
0 ... 10 A	0 ... 20 A
–	–
Constant current approx. 11 A Typ. 15 A for 5 s/min	Constant current approx. 23 A Typ. 60 A for 25 ms
Yes, 2 units	Yes, 2 units
Approx. 93 % Approx. 36 W	Approx. 90 % Approx. 106 W
Yes, according to EN 60950 Typ. 11 A, overload capability 150 % $I_{out\ rated}$ up to 5 s/min	Yes, according to EN 60950 Typ. 23 A
Constant current characteristic approx. 11 A	Alternatively, constant current characteristic approx. 23 A or latching shutdown
Approx. 11 A	Approx. 23 A
–	LED yellow for "overload", LED red for "latching shutdown"
Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class I	Yes, safety extra low output voltage V_{out} according to EN 60950 Class I
< 3.5 mA Yes Yes	< 3.5 mA (typ. 0.68 mA) Yes Yes
cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259 IP20	cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259; cCSAus (CSA C22.2, No. 60950, UL 60950) 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 ... +60 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, without condensation	0 ... +60 °C with natural convection –25 ... +85 °C Climate class 3K3 according to EN 60721, without condensation
One screw terminal each for 0.2 ... 4 mm^2 single-core/ finely stranded One screw terminal each for 0.2 ... 4 mm^2 (+, –)	One screw terminal each for 0.2 ... 4 mm^2 single-core/ finely stranded 2 screw terminals each for 0.33 ... 10 mm^2 (+, –)
2 screw terminals 0.2 ... 4 mm^2 (relay contact 13, 14)	–
70 × 125 × 125 1.2 kg Snaps onto DIN rail EN 60715 35×7.5/15	240 × 125 × 125 3.2 kg Snaps onto DIN rail EN 60715 35×7.5/15
–	Signaling module (6EP1961-3BA10)

Overview

Product	LOGO!Power		
Power supply, type	5 V/3 A	5 V/6.3 A	12 V/1.9 A
Order No.	6EP1 311-1SH02	6EP1 311-1SH12	6EP1 321-1SH02
The product families are highlighted in the same color. For an explanation of the product groups, see Chapter 1, pages 1/6 to 1/10.			
	The power supplies of the LOGO!Power range are optimally matched to the LOGO! logic modules in their functionality and design; with the wide-range input 85 V to 264 V AC and option for installing in built-in miniature distribution boards, they can be used universally in the low-end performance range.		
Dimension drawing	Page 15/2, Dimension drawing 2	Page 15/5, Dimension drawing 1	Page 15/2, Dimension drawing 2

Technical specifications

Input			
Rated voltage value $V_{in\ rated}$ Voltage range	1-phase AC **100 - 240 V AC** Wide-range input 85 ... 264 V	1-phase AC **100 - 240 V AC** Wide-range input 85 ... 264 V	1-phase AC **100 - 240 V AC** Wide-range input 85 ... 264 V
Overvoltage resistance Mains buffering at $I_{out\ rated}$ Rated line frequency; range	2.3 × $V_{in\ rated}$, 1.3 ms > 40 ms at V_{in} = 187 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 40 ms at V_{in} = 187 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 40 ms at V_{in} = 187 V 50/60 Hz; 47 ... 63 Hz
Rated current value $I_{in\ rated}$ Switch-on current limiting (+25 °C) I^2t	0.36-0.22 A <15 A < 0.8 A^2s	0.71-0.37 A < 30 A < 3 A^2s	0.53-0.3 A <15 A < 0.8 A^2s
Built-in incoming fuse Recommended miniature circuit breaker (IEC 898) in the mains power input	Internal From 16 A Characteristic B or from 10 A Characteristic C	Internal From 16 A Characteristic B or from 10 A Characteristic C	Internal From 16 A Characteristic B or from 10 A Characteristic C
Output			
Rated voltage value $V_{in\ rated}$	Controlled, isolated DC voltage **5 V DC**	Controlled, isolated DC voltage **5 V DC**	Controlled, isolated DC voltage **12 V DC**
Total tolerance, static • Static mains compensation • Static load balancing	±3 % Approx. 0.2 % Approx. 1.5 %	±3 % Approx. 0.1 % Approx. 2 %	±3 % Approx. 0.2 % Approx. 1.5 %
Residual ripple Spikes (bandwidth approx. 20 MHz)	< 100 mV_{pp} (typ. 10 mV_{pp}) < 100 mV_{pp} (typ. 30 mV_{pp})	< 100 mV_{pp} (typ. 15 mV_{pp}) < 100 mV_{pp} (typ. 30 mV_{pp})	< 200 mV_{pp} (typ. 10 mV_{pp}) < 300 mV_{pp} (typ. 30 mV_{pp})
Adjustment range Status display Response on activation/deactivation	4.6 ... 5.4 V Green LED for 5 V OK No overshoot of V_{out} (soft start)	4.6 ... 5.4 V Green LED for 5 V OK No overshoot of V_{out} (soft start)	10.5 ... 16.1 V Green LED for 12 V OK No overshoot of V_{out} (soft start)
Startup delay/voltage rise Rated current value $I_{out\ rated}$ Current range up to +55 °C	< 0.5 s/typ. 15 ms **3 A** 0 ... 3 A	< 0.5 s/typ. 10 ms **6.3 A** 0 ... 6.3 A	< 0.5 s/typ. 15 ms **1.9 A** 0 ... 1.9 A
Parallel switching for enhanced performance	Yes, 2 units	Yes, 2 units	Yes, 2 units
Continuation of the table	Page 12/8, column 1	Page 12/8, column 2	Page 12/8, column 3

LOGO!Power		
12 V/4.5 A	15 V/1.9 A	15 V/4 A
6EP1 322-1SH02	6EP1 351-1SH02	6EP1 352-1SH02
		
The power supplies of the LOGO!Power range are optimally matched to the LOGO! logic modules in their functionality and design; with the wide-range input 85 V to 264 V AC and option for installing in built-in miniature distribution boards, they can be used universally in the low-end performance range.		
Page 15/5, Dimension drawing 1	Page 15/2, Dimension drawing 2	Page 15/5, Dimension drawing 1
1-phase AC **100 - 240 V AC** Wide-range input 85 ... 264 V	1-phase AC **100 - 240 V AC** Wide-range input 85 ... 264 V	1-phase AC **100 - 240 V AC** Wide-range input 85 ... 264 V
2.3 × $V_{in\ rated}$, 1.3 ms > 40 ms at V_{in} = 187 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 40 ms at V_{in} = 187 V 50/60 Hz; 47 ... 63 Hz	2.3 × $V_{in\ rated}$, 1.3 ms > 40 ms at V_{in} = 187 V 50/60 Hz; 47 ... 63 Hz
1.13-0.61 A < 30 A < 3 A^2s	0.63-0.33 A <15 A < 0.8 A^2s	1.24-0.68 A < 30 A < 3 A^2s
Internal From 16 A Characteristic B or from 10 A Characteristic C	Internal From 16 A Characteristic B or from 10 A Characteristic C	Internal From 16 A Characteristic B or from 10 A Characteristic C
Controlled, isolated DC voltage **12 V DC**	Controlled, isolated DC voltage **15 V DC**	Controlled, isolated DC voltage **15 V DC**
±3 % Approx. 0.1 % Approx. 1.5 %	±3 % Approx. 0.1 % Approx. 1.5 %	±3 % Approx. 0.1 % Approx. 1.5 %
< 200 mV_{pp} (typ. 10 mV_{pp}) < 300 mV_{pp} (typ. 40 mV_{pp})	< 200 mV_{pp} (typ. 10 mV_{pp}) < 300 mV_{pp} (typ. 30 mV_{pp})	< 200 mV_{pp} (typ. 10 mV_{pp}) < 300 mV_{pp} (typ. 40 mV_{pp})
10.5 ... 16.1 V Green LED for 12 V OK No overshoot of V_{out} (soft start)	10.5 ... 16.1 V Green LED for 15 V OK No overshoot of V_{out} (soft start)	10.5 ... 16.1 V Green LED for 15 V OK No overshoot of V_{out} (soft start)
< 0.5 s/typ. 10 ms **4.5 A** 0 ... 4.5 A	< 0.5 s/typ. 15 ms **1.9 A** 0 ... 1.9 A	< 0.5 s/typ. 10 ms **4 A** 0 ... 4 A
Yes, 2 units	Yes, 2 units	Yes, 2 units
Page 12/9, column 4	Page 12/9, column 5	Page 12/9, column 6

Alternative voltages

Continued from	Page 12/6, column 1	Page 12/6, column 2	Page 12/6, column 3
Power supply, type (repeated)	5 V/3 A	5 V/6.3 A	12 V/1.9 A
Order No. (repeated)	6EP1 311-1SH02	6EP1 311-1SH12	6EP1 321-1SH02
Efficiency			
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 76 %	Approx. 83 %	Approx. 80 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 5 W	Approx. 6 W	Approx. 5 W
Closed-loop control			
Dyn. mains compensation ($V_{in\ rated}$ ±15 %)	< 0.2 % V_{out}	< 0.2 % V_{out}	< 0.2 % V_{out}
Dynamic load smoothing (I_{out}: 10/90/10 %)	Typ. ±4 % V_{out}	Typ. ±6.5 % V_{out}	Typ. ±3 % V_{out}
Load step settling time			
• 10 to 90 %	Typ. 20 ms	Typ. 20 ms	Typ. 20 ms
• 90 to 10 %	Typ. 20 ms	Typ. 20 ms	Typ. 20 ms
Protection and monitoring			
Current limiting	Typ. 3.8 A	Typ. 8.2 A	Typ. 2.5 A
Short-circuit protection	Constant current characteristic	Constant current characteristic	Constant current characteristic
Sustained short-circuit current rms value	< 5 A	< 10 A	< 4 A
Overload/short-circuit indicator	–	–	–
Safety			
Primary/secondary galvanic isolation	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178
Protection class	Class II (without protective conductor)	Class II (without protective conductor)	Class II (without protective conductor)
Safety approval	Yes; CB scheme	Yes; CB scheme	Yes; CB scheme
CE mark	Yes	Yes	Yes
UL/cUL (CSA) approval	cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259; cURus-recognized (UL 60950, CSA C22.2 No. 60950), File E151273	cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259; cURus-recognized (UL 60950, CSA C22.2 No. 60950), File E151273	cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259; cURus-recognized (UL 60950, CSA C22.2 No. 60950), File E151273
Explosion protection	ATEX EX II 3G Ex nA IIC T3	ATEX EX II 3G Ex nA IIC T3	ATEX EX II 3G Ex nA IIC T3
FM approval	Class I Div. 2, Group A, B, C, D, T4	Class I Div. 2, Group A, B, C, D, T4	Class I Div. 2, Group A, B, C, D T4
Marine approval	GL	GL	GL, ABS
Degree of protection (EN 60529)	IP20	IP20	IP20
EMC			
Emitted interference	EN 55022 Class B	EN 55022 Class B	EN 55022 Class B
Supply harmonics limitation	Not applicable	Not applicable	Not applicable
Noise immunity	EN 61000-6-2	EN 61000-6-2	EN 61000-6-2
Operating data			
Ambient temperature range	–20 ... +55 °C with natural convection	–20 ... +55 °C with natural convection	–20 ... +55 °C with natural convection
Transport/storage temperature range	–40 ... +70 °C	–40 ... +70 °C	–40 ... +70 °C
Humidity class	Climate class 3K3 according to EN 60721, without condensation	Climate class 3K3 according to EN 60721, without condensation	Climate class 3K3 according to EN 60721, without condensation
Mechanics			
Supply input connections L1, N	One screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded	One screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded	One screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded
Connections			
• Output +	2 screw terminals each for 0.5 to 2.5 mm^2	2 screw terminals each for 0.5 to 2.5 mm^2	2 screw terminals each for 0.5 ... 2.5 mm^2
• Output –			
Dimensions (W × H × D) in mm	54 × 90 × 55	72 × 90 × 55	54 × 90 × 55
Weight, approx.	0.17 kg	0.25 kg	0.17 kg
Installation	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15	Snaps onto DIN rail EN 60715 35×7.5/15

Page 12/7, column 4	Page 12/7, column 5	Page 12/7, column 6
12 V/4.5 A	15 V/1.9 A	15 V/4 A
6EP1 322-1SH02	6EP1 351-1SH02	6EP1 352-1SH02
Approx. 85 % Approx. 10 W	Approx. 80 % Approx. 7 W	Approx. 85 % Approx. 11 W
< 0.2 % V_{out} Typ. ±4.2 % V_{out}	< 0.2 % V_{out} Typ. ±2.8 % V_{out}	< 0.2 % V_{out} Typ. ±3.3 % V_{out}
Typ. 20 ms Typ. 20 ms	Typ. 20 ms Typ. 20 ms	Typ. 20 ms Typ. 20 ms
Typ. 5.9 A Constant current characteristic < 8 A –	Typ. 2.7 A Constant current characteristic < 4 A –	Typ. 5.0 A Constant current characteristic < 8 A –
Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class II (without protective conductor)	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class II (without protective conductor)	Yes, safety extra low output voltage V_{out} according to EN 60950 and EN 50178 Class II (without protective conductor)
Yes; CB scheme Yes	Yes; CB scheme Yes	Yes; CB scheme Yes
cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259; cURus-recognized (UL 60950, CSA C22.2 No. 60950), File E151273 ATEX EX II 3G Ex nA IIC T3 Class I Div. 2, Group A, B, C, D, T4 GL, ABS IP20	cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259; cURus-recognized (UL 60950, CSA C22.2 No. 60950), File E151273 ATEX EX II 3G Ex nA IIC T3 Class I Div. 2, Group A, B, C, D, T4 GL IP20	cULus-listed (UL 508, CSA C22.2 No. 107.1), File E197259; cURus-recognized (UL 60950, CSA C22.2 No. 60950), File E151273 ATEX EX II 3G Ex nA IIC T3 Class I Div. 2, Group A, B, C, D, T4 GL 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
–20 ... +55 °C with natural convection –40 ... +70 °C Climate class 3K3 according to EN 60721, without condensation	–20 ... +55 °C with natural convection –40 ... +70 °C Climate class 3K3 according to EN 60721, without condensation	–20 ... +55 °C with natural convection –40 ... +70 °C Climate class 3K3 according to EN 60721, without condensation
One screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded 2 screw terminals each for 0.5 ... 2.5 mm^2	One screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded 2 screw terminals each for 0.5 ... 2.5 mm^2	One screw terminal each for 0.5 ... 2.5 mm^2 single-core/ finely stranded 2 screw terminals each for 0.5 to 2.5 mm^2
72 × 90 × 55 0.25 kg Snaps onto DIN rail EN 60715 35×7.5/15	54 × 90 × 55 0.17 kg Snaps onto DIN rail EN 60715 35×7.5/15	72 × 90 × 55 0.25 kg Snaps onto DIN rail EN 60715 35×7.5/15

Alternative voltages

Selection and ordering data

Product	Input Voltage $V_{in\ rated}$	Output Voltage $V_{out\ rated}$	Current $I_{out\ rated}$	Order No.	Price in euros per PU
SITOP DC/DC					
	**24 V DC**	**12 V DC**	2.5 A	**6EP1 621-2BA00**	
SITOP flexi					
	**120/230 V AC**	**3 - 52 V DC**	2-10 A	**6EP1 353-2BA00**	
SITOP dual					
	**120/230 V AC**	**2 × 15 V DC**	2 × 3.5 A	**6EP1 353-0AA00**	
SITOP smart					
	**400-500 V 3 AC**	**48 V DC**	10 A	**6EP1 456-2BA00**	
SITOP modular					
	**400-500 V 3 AC**	**48 V DC**	20 A	**6EP1 457-3BA00**	
LOGO!Power					
	**100-240 V AC**	**5 V DC**	3 A	**6EP1 311-1SH02**	
		5 V DC	6.3 A	**6EP1 311-1SH12**	
		12 V DC	1.9 A	**6EP1 321-1SH02**	
		12 V DC	4.5 A	**6EP1 322-1SH02**	
		**15 V DC**	1.9 A	**6EP1 351-1SH02**	
		15 V DC	4 A	**6EP1 352-1SH02**	

Customized power supplies

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Customized power supplies

Overview

Our well-proven standard power supplies cannot, of course, satisfy the requirements of every application. We offer you the opportunity to optimize your system to application-specific requirements.

You benefit from the expertise of large-scale production and gain maximum development security and quality.

Our customer-specific solutions are used today in many sectors of mechanical engineering, in automation technology, vehicle electronics, equipment manufacturing and in industrial instrumentation technology.

Our offer is fundamentally open to every application case. If we have awakened your interest or if you would like to receive further details, please complete the fax form with the parameters of your specific application profile and fax it to the stated number. You will also find the form on the Internet at:

www.siemens.com/sitop

You can fill it out on the screen and send it back to us immediately. We will then contact you as soon as possible.

FAX response

Specification sheet for customized power supplies

Fax recipient:

SIEMENS AG
Industry Sector
I IA SE IP
Würzburger Straße 121
90766 Fürth, Germany

FAX: +49 (0) 911 750-9991

Fax sender:

Company: ______________________

Department: ______________________

Name: ______________________

Location: ______________________

FAX: ______________________

Phone: ______________________

Application/operating range:

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 currents:	I_{out1}: ______	I_{out2}: ______		I_{out3}: ______		I_{out4}: ______	

Other: -

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

Mechanical requirements:

Design/dimensions:
(enclose drawing where appropriate) ______________________ Enclosure: ______________________

Connections: ______________________ Other: ______________________

General requirements:

Efficiency: ______________________

Ambient temperature: ______________________ Signaling: ______________________

Standards:

- ☐ EN 60950
- ☐ UL
- ☐ cUL (CSA) ______________________
- ☐ EN 61000-6-1/2
- ☐ EN 61000-6-3/4
- ☐ ______________________

Quantity per annum: ______________________ Start of delivery: ______________________

Suggested price: ______________________

Comment: ______________________

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____

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Notes

Technical information and notes on configuration

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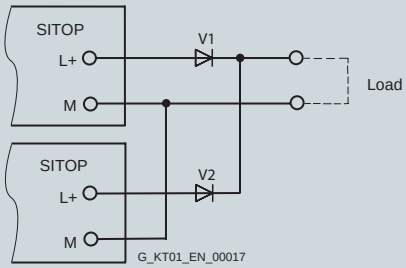


Power supply in general

Power supplies

In plant building or mechanical equipment manufacture, 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 plants is extremely closely linked to the failsafe option 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 requirements such as safety, 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
- a low emitted interference and
- an adequate immunity (noise immunity) to interference

EMC	Interference phenomena
Emission (emitted interference)	Interference caused by television and radio reception Interference coupling on data lines or power supply cables
Noise 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

Selected interference 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.

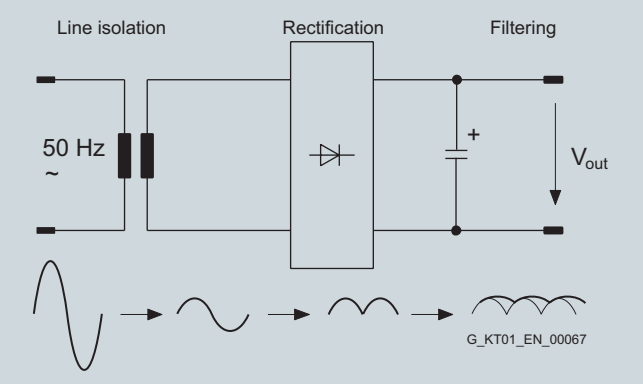
The type of construction of a DC power supply is primarily decided by its intended use.

Non-stabilized 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 non-stabilized 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. Non-stabilized DC power supplies are characterized by their rugged, uncomplicated design that is limited to the important factors and focused on a long service life.



Block diagram of a non-stabilized power supply

Stabilized DC power supplies

Stabilized DC power supplies have electronic control 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.

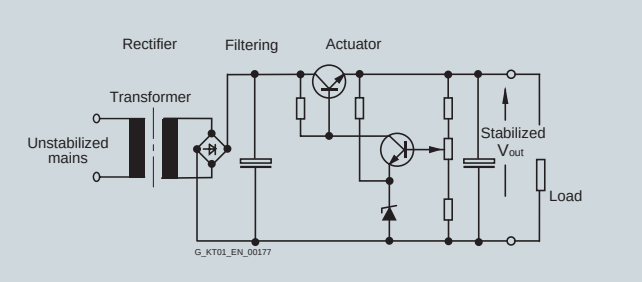
Stabilized DC power supplies can be implemented on different functional principles. The most common types of circuit are:

- Linear stabilized power supplies
- Magnetic voltage stabilizers
- 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.

Stabilized DC power supplies (continued)

Linear stabilized power supplies



Block diagram: Transformer with in-phase regulation

The transformer with in-phase regulation 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 to a stabilized voltage at the output in a regulation section. The regulation section comprises a final control element and a control amplifier. The difference between the stabilized output voltage and the non-stabilized 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 further modifications, several output voltages are possible. In the case of multiple outputs, the individual secondary circuits are usually 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 transformer with in-phase regulation is therefore only an economical alternative at low power ratings.

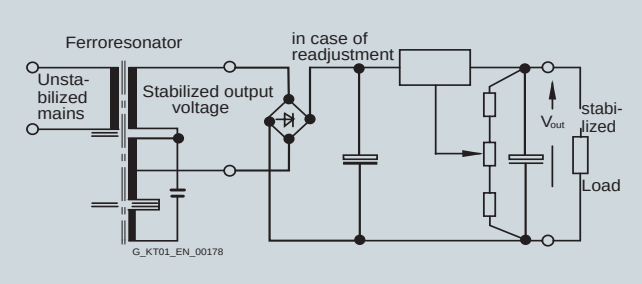
Advantages:

- Simple, well-proven circuit principle
- Good to excellent control characteristics
- Fast compensation 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 "ferro resonator" and a series-connected auxiliary regulator. 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 transformer with in-phase regulation connected downstream 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.

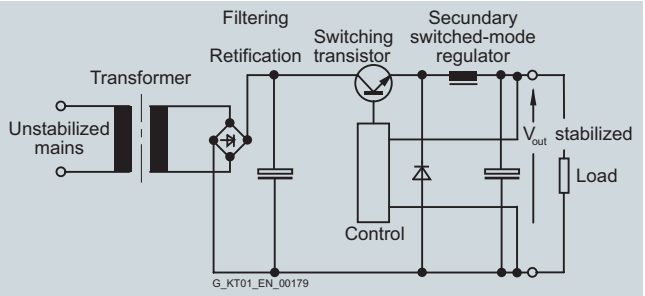
Advantages:

- Good to excellent control characteristics in combination with series-connected linear regulators
- Significantly better efficiency than a transformer with in-phase regulation 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, non-stabilized DC voltage of the filter capacitor will be applied to the output. However, this danger 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:

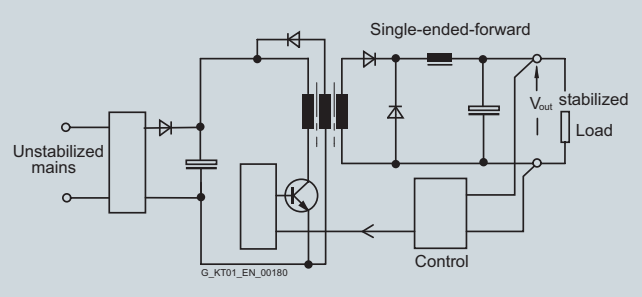
- The 50 Hz transformer makes the power supplies relatively large and heavy
- The output ripple (spikes) correspond to those of a primary pulsed switched-mode power supply

Power supply in general

Stabilized DC power supplies (continued)

Primary pulsed switched-mode power supplies:

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



Block diagram: Single-ended forward converter

The primary switched-mode regulators are available in many different circuit versions. 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 converter:

The non-stabilized 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, clock frequencies of 100 kHz and above can be achieved. However, switching losses increase at excessively high clock frequencies so that in each case a compromise has to be made between high efficiency and the largest possible clock frequency. In most applications, the clock frequencies lie between approximately 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. Exactly the same amount of energy is transferred as is removed at the output. The maximum pulse width for the pulse duty factor 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 in case of power failure by increasing the capacitance in the DC link
- Large input voltage range possible

Disadvantages:

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

Primary switched-mode power supplies have taken over from the other switching modes in recent years. This is due, in particular, to their compact size, minimal weight, high efficiency and excellent price/performance ratio.

Summary

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

Comparison criteria	Connection types			
	Primary-switched mode	**Secondary-switched mode**	**Transformer with in-phase regulation**	**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 overhead	Very large	Medium	Low	Medium

Comparison criteria for basic circuit variants

Supply system data

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

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

Rated voltages and rated frequencies

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" was included unmodified in this standard.

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 systems

In the low-voltage range, it is emphasized in IEC 60038 that the 220 V/380 V and 240 V/415 V values for three-phase power supply systems have been replaced by a single, internationally standardized value of 230 V/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 %
1988 to 2003	230 V/400 V	– 10 % to + 6 %
Since 2003	230 V/400 V	– 10 % to +10 %

Conversion of low-voltage 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 systems

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

[1] Industry only.

[2] No further expansion.

Supply system data, line-side connection

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

Country	Supply 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: a few remaining areas 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; Fujairah; 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
Cambodia	50 Hz 120/208 V – Phnom Penh 220/238 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
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
Pakistan	50 Hz 230/400 V
People's Republic of China	50 Hz 127/220 – 220/380 V (in mining: 1140 V)
People's Republic of Mongolia	50 Hz 220/380 V
Philippines	60 Hz 110/220 – 440 V
Singapore	50 Hz 240/415 V
South Honshu, Shikoku, Kyushu, Hokkaido, North Honshu	60 Hz 110/220 – 440[1] 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
Cuba	60 Hz 120/240 – 220/380 – 277/480[1] – 440[1] V

[1] Industry only

[2] No further expansion

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

Country	Supply voltage
Central America (continued)**:**	
Dominican Republic	60 Hz 120/208 – 120/240 – 480[1] V
El Salvador	60 Hz 110/220 – 120/208 – 127/220 – 220/440 – 240/480[1] – 254/440[1] V
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
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 – 254/440[1] – 277/480[1] V
Puerto Rico	60 Hz 120/208 – 480 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
Columbia	60 Hz 110/220 – 150/260 – 440 V
Ecuador	60 Hz 120/208 – 127/220 V
Guyana	50 Hz 110/220 V (Georgetown), 60 Hz 110/220 – 240/480 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:	
Algeria	50 Hz 127/220 – 220/380 V
Angola	50 Hz 220/380 V
Benin	50 Hz 220/380 V
Cameroon	50 Hz 127/220 – 220/380 V
Congo	50 Hz 220/380 V
Egypt	50 Hz 110/220 – 220/380 V
Ethiopia	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
Ivory Coast	50 Hz 220/380 V
Kenya	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
Mauritius	50 Hz 240/415 V
Morocco	50 Hz 115/200 – 127/220 – 220/380 – 500[1] V
Mozambique	50 Hz 220/380 V
Namibia	50 Hz 220/380 V
Niger	50 Hz 220/380 V

[1] Industry only.

[2] No further expansion.

Supply system data, line-side connection

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

Country	Supply voltage
Africa (continued)**:**	
Nigeria	50 Hz 220/415 V
Rwanda	50 Hz 220/380 V
Senegal	50 Hz 127/220 – 220/380 V
Sierra Leone	50 Hz 220/380 V
Somalia	50 Hz 220-220/440 V
South Africa	50 Hz 220/380 – 500 [1] – 550/950 [1] V
Sudan	50 Hz 240/415 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
Zambia	50 Hz 220/380 V – 415 – 550 [1] V
Zimbabwe	50 Hz 220/380 V

Connection and fusing on the line side

All SITOP and LOGO!Power supplies are built-in devices. Compliance with the pertinent country-specific regulations is essential for installation and electrical connection of the devices. During installation, protective gear and isolating gear must be provided for activating the power supply.

Power supply units cause a current inrush immediately after connection of the input voltage due to charging of the load capacitor, however, it falls back to the rated input current level after a few milliseconds. Aside from the internal impedances of the power supply, the inrush current is 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 inrush current for the 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 MCB) must be provided for line protection in accordance with the rated current of the installed cable. The miniature circuit breakers recommended in the data sheets and operating instructions were selected such that even during the maximum inrush current that can occur under worst-case conditions when switching on the supply voltage, the miniature circuit breaker will not trip. A two-pole connected miniature circuit breaker is required for the connection of certain device types.

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.

[1] Industry only.

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 loads. 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
- Interference pulses and transients
- Voltage dips and surges
- Electrical noise
- Momentary network failure
- Long-term network failure

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 thunderstorms
- Mains overloads

Typical causes of mains disturbances generated in-house are:

- Thyristor-controlled drives
- Elevators, air-conditioning, photocopiers
- Motors, reactive-power compensation systems
- 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 include:

System disturbances	Percentage of total disturbance	Effect
Overvoltage The supply voltage is exceeded for a long period 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 The supply voltage is reduced for a long period by more than + 10 % (acc. to DIN IEC 60038)	Approx. 20 % – 30 %	Can result in undefined operating states of loads. Causes data errors.
Interference pulses Energy-rich pulses (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 of the loads and can lead to the destruction of components.
Voltage dips and surges The voltage level changes suddenly and in an uncontrolled manner, e.g. due to changes in loading and long cable routes	Approx. 15 % – 30 %	Can result in undefined operating states and destruction of components. Cause data errors.
Electrical noise A mix of frequencies superimposed on the mains due to bad grounding and/or strong HF emitters, such as radio transmitters or thunderstorms	Approx. 20 % – 35 %	Can result in undefined operating states of loads. Causes data errors.
Voltage interruption Short-term interruption of the supply voltage (up to approx. 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 of loads, especially those with insufficient mains buffering. Causes data errors.
Voltage interruption Long interruption of the supply voltage (longer than approx. 10 ms)	Approx. 2 % – 5 %	Can result in undefined operating states of 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 already during the planning stage.

Installation instructions, mounting areas and fixing options

Installation instructions

All SITOP and LOGO!Power supplies are built-in devices. They must be mounted vertically so that the supply 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. The minimum distances specified in the relevant operating instructions 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	Mounting on a standard mounting rail acc. to EN 60715		Wall mounting
		in mm (W × H)	35 × 7.5 mm	35 × 15 mm	
SITOP 24 V, 1-phase and 2-phase power supplies					
24 V/0.375 A	6EP1731-2BA00	22.5 × 180	X	X	
24 V/0.5 A	6EP1331-2BA10	22.5 × 180	X	X	
24 V/1.3 A	6EP1331-1SH02	54 × 130	X	X	
24 V/2 A	6ES7307-1BA01-0AA0[3]	40 × 205	[2]	[2]	
	6ES7305-1BA80-0AA0[3]	80 × 225		[1]	
	6EP1732-0AA00	80 × 235		X	X
24 V/2.5 A	6EP1332-2BA10	33 × 225	X	X	
	6EP1332-1SH42	72 × 130	X	X	
	6EP1332-1SH71	70 × 140	X	X	X
	6EP1232-1AA00	52 (110) × 230	X	X	X
	6EP1332-1SH12	80 × 335		X	X
24 V/3.5 A	6EP1332-1SH31	160 × 280	X	X	X
24 V/3.7 A	6EP1332-2BA00	75 × 225	X	X	
24 V/4 A	6EP1332-1SH22	80 × 335		X	X
	6EP1332-1SH51	90 × 130	X	X	
	6EP1232-1AA10	52 (110) × 230	X	X	X
24 V/5 A	6EP1333-3BA00	70 × 225	X	X	
	6EP1333-2BA01	50 × 225	X	X	
	6EP1333-2AA01	50 × 225	X	X	
	6ES7307-1EA01-0AA0[3]	60 × 205	[2]	[2]	
	6ES7307-1EA80-0AA0[3]	80 × 225		[1]	
	6EP1333-1AL12	160 × 230	X	X	
24 V/6 A	6EP1233-1AA00	52 (110) × 230	X	X	X
24 V/10 A	6EP1334-3BA00	90 × 225	X	X	
	6EP1334-2BA01	70 × 225	X	X	
	6EP1334-2AA01	70 × 225	X	X	
	6ES7307-1KA02-0AA0[3]	80 × 205	[2]	[2]	
	6EP1334-1AL12	160 × 230	X	X	
	6EP1334-1SH01	200 × 325		X	
24 V/12 A	6EP1234-1AA00	52 (110) × 230	X	X	X
24 V/20 A	6EP1336-3BA00	160 × 225	X	X	
24 V/40 A	6EP1337-3BA00	240 × 225	X	X	
SITOP 24 V, three-phase power supplies					
24 V/8 A	6EP1433-2CA00[4]	approx. 310 × 285			X
	6ES7148-4PC00-0AA0[4]	approx. 310 × 285			X
24 V/10 A	6EP1434-2BA00	320 × 225	X	X	
24 V/20 A	6EP1436-3BA10	70 × 225	X	X	
	6EP1436-3BA00	160 × 225	X	X	
	6EP1436-2BA00	320 × 225	X	X	
24 V/30 A	6EP1437-2BA00	320 × 280	X	X	
24 V/40 A	6EP1437-3BA10	150 × 225	X	X	
	6EP1437-3BA00	240 × 225	X	X	
	6EP1437-2BA10	320 × 280	X	X	

Power supply	Order No.	Required mounting area	Mounting on a standard mounting rail acc. to EN 60715		Wall mounting
		in mm (W × H)	35 × 7.5 mm	35 × 15 mm	
SITOP 24 V, uninterruptible power supplies					
SITOP UPS500S (2.5 kWs and 5 kWs)	6EP1933-2EC41/ -2EC51	120 × 225	X	X	
SITOP UPS501S Extension module	6EP1935-5PG01	70 × 225	X	X	
SITOP UPS500P (5 kWs)	6EP1933-2NC01	500 × 178			X
SITOP UPS500P (10 kWs)	6EP1933-2NC11	570 × 178			X
DC UPS 6 A (with serial/ USB interface)	6EP1931-2DC21 (-2DC31/-2DC42)	50 × 225	X	X	
DC UPS 15 A (with serial/ USB interface)	6EP1931-2EC21 (-2EC31/-2EC42)	50 × 225	X	X	
DC UPS 40 A (with USB interface)	6EP1931-2FC21 (-2FC42)	102 × 225	X	X	
SITOP 24 V, uninterruptible power supplies					
Battery module 1.2 Ah	6EP1935-6MC01	116 × 126	X	X	X
Battery module 2.5 Ah	6EP1935-6MD31	285 × 171	X	X	X
Battery module 3.2 Ah	6EP1935-6MD11	210 × 171	X	X	X
Battery module 7 Ah	6EP1935-6ME21	206 × 188			X
Battery module 12 Ah	6EP1935-6MF01	273 × 138			X
SITOP 24 V, expansion modules					
Signaling module	6EP1961-3BA10	26 × 225			
Redundancy module	6EP1961-3BA20	70 × 225	X	X	
Buffer module	6EP1961-3BA01	70 × 225	X	X	
Selectivity module	6EP1961-2BA10/ -2BA20	72 × 180	X	X	
Diagnostics module	6EP1961-2BA00	72 × 190	X	X	
Inrush current limiter	6EP1967-2AA00	22.5 × 180	X	X	
SITOP alternative voltages					
12 V/2.5 A	6EP1621-2BA00	32.5 × 225	X	X	
3-52 V/120 W	6EP1353-2BA00	75 × 225	X	X	
2 × 15 V/3.5 A	6EP1353-0AA00	75 × 325	X	X	
48 V/10 A	6EP1456-2BA00	70 × 225	X	X	
48 V/20 A	6EP1457-3BA00	240 × 255	X	X	
5 V/3 A	6EP1311-1SH02	54 × 130	X	X	
5 V/6.3 A	6EP1311-1SH12	72 × 130	X	X	
12 V/1.9 A	6EP1321-1SH02	54 × 130	X	X	
12 V/4.5 A	6EP1322-1SH02	72 × 130	X	X	
15 V/1.9 A	6EP1351-1SH02	54 × 130	X	X	
15 V/4 A	6EP1352-1SH02	72 × 130	X	X	

1) With additional mounting adapter 6ES7390-6BA00-0AA0.

2) With additional mounting adapter 6EP1 971-1BA00.

3) Installation on S7-rail.

4) Installation on mounting rail ET200pro.

Planning aids

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

More information is available on the Internet at

http://www.siemens.com/sitop

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. 100 % 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".

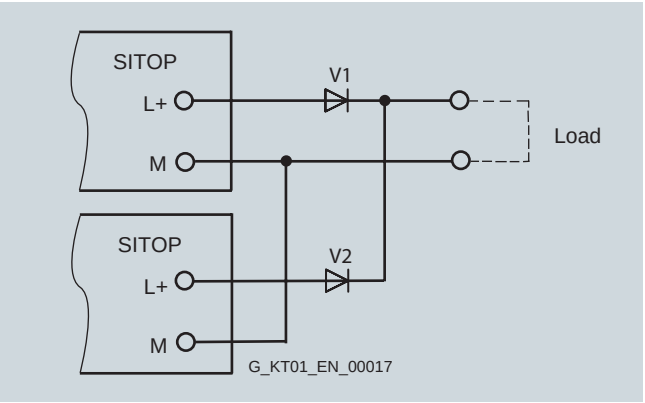
The ready-to-use expansion "SITOP modular redundancy module" is available as a simple alternative to diode dimensioning (Order No.: 6EP1961-3BA20, see Section 8) for redundant connection of two power supplies.

General information on selection of diodes:

The diodes must be dimensioned for the maximum dynamic overcurrent. This can be the dynamic overcurrent during power-up in the short-circuit case, or the dynamic overcurrent 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 loss of the decoupling diodes (sustained short-circuit current × diode conductive-state voltage), the diodes must be equipped with 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 so it is within the period in which diodes are permitted to be loaded with a multiple of the rated current (< 8.3 ms, known as the permissible surge current for diodes) .



Parallel connection of two SITOP power supplies for redundant operation

Example

Two 1-phase SITOP modular power supplies with 10 A rated output current, (Order No.: 6EP1 334-3BA00) are connected in parallel. The dynamic overcurrent in the event of a short-circuit during operation is approximately 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 approximately 24 A (sustained short-circuit current rms value) × diode conductive-state voltage.

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 for the decoupling diodes (current × 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".

Requirement:

- The output cables connected to terminals "+" and "-" of every power supply should be installed with an identical length and cross-section (or the same impedance) to the common external linking point.
- The 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 case of variable power supplies, the "-" terminals should first be connected and then the voltage difference between the "+" output terminals measured under no-load conditions before they 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 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"), performance can be increased without the need for decoupling diodes, and simultaneously, 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. This means that at least one 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 supplies that remain 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 and the power supplies must operate on both 400 V and 500 V three-phase supplies (without switch-over).

The three-phase type SITOP modular 20 A is suitable for this (Order No.: 6EP1 436-3BA10). 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!

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 "+" and "-" are isolated up to at least 60 V DC against PE (creepages and clearances as well as radio interference suppression capacitors on "+" and "-" against PE) so that with this type of series connection (see Figure), the following points can be grounded:

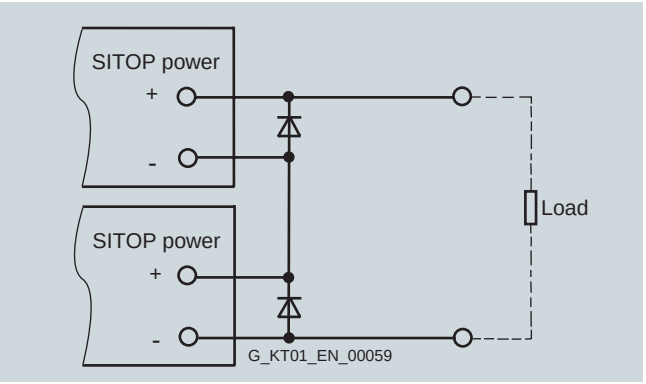
- "–" of the lower power supply (results in +48 V DC against PE)
- Midway "+"/ "–" between both power supplies (results in ±24 VDC against PE)
- "+" of the higher power supply (results in –48 V DC against PE)

Note:

If two devices are connected in parallel, it cannot be guaranteed that the voltage will remain below the 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 startup-up delays), the power supply which starts up more quickly supplies current from output "–" of the slower power supply whose output electrolytic capacitor is then theoretically impermissibly discharged.

The internal LC filter causes the internal rectifier diode on the secondary side of the slower-starting power supply to accept this current a few milliseconds later; this means that the external diode connected with its anode to "–" and cathode to "+" is essential on each power supply. These diodes are, however, only loaded dynamically, so that 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 of two SITOP power units to double the voltage

Example:

Two single-phase SITOP modular power supplies with 10 A rated output current (Order No.: 6EP1 334-1AL12) should be connected in series for increasing the voltage. They supply approximately 35 A dynamically for 700 ms on power-up in the short-circuit case or also, for example, with loads with a high-capacity 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 approximately 5.3 mm diameter and approximately 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 dynamic surge current loading capacity $I_{F\,SM}$ important in this case is sufficient for the selected SITOP power supply at more than 100 A for 8.3 ms. For SITOP power supplies with a lower rated output current, this diode can also be used, but it is over-dimensioned.

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

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

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 to 28.8 V supply a constant output current of approximately 1.2 × 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 × rated current at 95 % of the set voltage to approximately 0 A or the self-discharge current of the battery at 100 % of the set output voltage, that is, resistance characteristic in this range.

As reverse voltage protection and polarity reversal protection, we recommend that a diode suitable for at least 1.2 × 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 of the battery location 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 to 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 non-stabilized 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 are provided with integral electronic short-circuit protection that 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 distinction 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.

Fusing of 24 V power supply circuits and selectivity (continued)

Example SITOP modular 10 A (Order No.: 6EP1334-3BA00)

- 10 A rated current
- Current limitation typ. 12 A
- Short-circuit current rms value approximately 12 A

The technical specifications usually specify typical values, maximum values are approximately 2 A above the typical value. In the example here, a maximum possible output current rms value of approximately 14 must therefore be used for line dimensioning.

Example 2: Reduced conductor cross-sections

If smaller conductor cross-sections are used than specified in the relevant standards (e.g. EN 60204-1), the affected 24 V load infeed cables must be protected with a suitable circuit breaker.

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 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:

- **a selectivity module SITOP PSE200U or a diagnostics module SITOP select for the distribution of the 24 V DC supply over up to 4 load feeders.**
  Each output is adjustable between
  0.5 A and 3 A (Order No.: 6EP1961-2BA10) or
  3 A and 10 A ((Order No.: 6EP1961-2BA20) or
  2 A and 10 A (Order No.: 6EP1961-2BA00)
- Series connection of appropriate 24 V DC fuses or miniature 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 dynamic overcurrent 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.

Fusing of the 24 V DC output circuit, selectivity

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

acc. to IEC 898 / EN 60898, for use up to 60 V (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 ... 5 (AC: 2 ... 3) × I_{rated}	2 ... 5 A DC	5 A DC
1 A	Type C	5SY4 101-7	DC: 5 ... 14 (AC: 5 ... 10) × I_{rated}	5 ... 14 A DC	14 A DC
1.6 A	Type A	5SY4 115-5	DC: 2 ... 5 (AC: 2 ... 3) × I_{rated}	3.2 ... 8 A DC	8 A DC
1.6 A	Type C	5SY4 115-7	DC: 5 ... 14 (AC: 5 ... 10) × I_{rated}	8 ... 22.4 A DC	22.4 A DC
2 A	Type A	5SY4 102-5	DC: 2 ... 5 (AC: 2 ... 3) × I_{rated}	4 ... 10 A DC	10 A DC
2 A	Type C	5SY4 102-7	DC: 5 ... 14 (AC: 5 ... 10) × I_{rated}	10 ... 28 A DC	28 A DC
3 A	Type A	5SY4 103-5	DC: 2 ... 5 (AC: 2 ... 3) × I_{rated}	6 ... 15 A DC	15 A DC
3 A	Type C	5SY4 103-7	DC: 5 ... 14 (AC: 5 ... 10) × I_{rated}	15 ... 42 A DC	42 A DC
4 A	Type A	5SY4 104-5	DC: 2 ... 5 (AC: 2 ... 3) × I_{rated}	8 ... 20 A DC	20 A DC
4 A	Type C	5SY4 104-7	DC: 5 ... 14 (AC: 5 ... 10) × I_{rated}	20 ... 56 A DC	56 A DC
6 A	Type A	5SY4 106-5	DC: 2 ... 5 (AC: 2 ... 3) × I_{rated}	12 ... 30 A DC	30 A DC
6 A	Type B	5SY4 106-6	DC: 3 ... 7 (AC: 3 ... 5) × I_{rated}	18 ... 42 A DC	42 A DC
6 A	Type C	5SY4 106-7	DC: 5 ... 14 (AC: 5 ... 10) × I_{rated}	30 ... 84 A DC	84 A DC
8 A	Type A	5SY4 108-5	DC: 2 ... 5 (AC: 2 ... 3) × I_{rated}	16 ... 40 A DC	40 A DC
8 A	Type C	5SY4 108-7	DC: 5 ... 14 (AC: 5 ... 10) × I_{rated}	40 ... 112 A DC	112 A DC
10 A	Type A	5SY4 110-5	DC: 2 ... 5 (AC: 2 ... 3) × I_{rated}	20 ... 50 A DC	50 A DC
10 A	Type B	5SY4 110-6	DC: 3 ... 7 (AC: 3 ... 5) × I_{rated}	30 ... 70 A DC	70 A DC
10 A	Type C	5SY4 110-7	DC: 5 ... 14 (AC: 5 ... 10) × I_{rated}	50 ... 140 A DC	140 A DC
13 A	Type A	5SY4 113-5	DC: 2 ... 5 (AC: 2 ... 3) × I_{rated}	26 ... 65 A DC	65 A DC
13 A	Type B	5SY4 113-6	DC: 3 ... 7 (AC: 3 ... 5) × I_{rated}	39 ... 91 A DC	91 A DC
13 A	Type C	5SY4 113-7	DC: 5 ... 14 (AC: 5 ... 10) × I_{rated}	65 ... 182 A DC	182 A DC
16 A	Type A	5SY4 116-5	DC: 2 ... 5 (AC: 2 ... 3) × I_{rated}	32 ... 80 A DC	80 A DC
16 A	Type B	5SY4 116-6	DC: 3 ... 7 (AC: 3 ... 5) × I_{rated}	48 ... 112 A DC	112 A DC
16 A	Type C	5SY4 116-7	DC: 5 ... 14 (AC: 5 ... 10) × I_{rated}	80 ... 224 A DC	224 A DC

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 60715-35× 15. 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 60898), Type B.

Tripping times/ranges are within narrower tolerances than those of miniature 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	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 + 1NC)	**8WA1 011-6SF25**	**8WA1 011-6SF26**	**8WA1 011-6SF27**	**8WA1 011-6SF28**
Required DC for immediate tripping in 40 ms	2.4 ... 3.8 A	4.8 ... 7.6 A	7.2 ... 11.4 A	12 ... 19 A
Required DC for immediate tripping in 20 ms	3.4 ... 5.2 A	6.8 ... 10.7 A	10.2 ... 15.6 A	17 ... 26 A
Required DC for immediate tripping in approx. 12 ms	4.4 ... 7.6 A	8.8 ... 15.2 A	13.2 ... 22.8 A	22 ... 38 A

For more data, refer to the catalog "Low-voltage switchgear" (Catalog LV 1)

Fusing of the 24 V DC output circuit, selectivity

Miniature circuit breakers acc. to EN 60898 (DIN VDE 0641 T11) in 24 V DC circuits, which are powered by SITOP modular or SITOP smart power supplies

Order No.	$I_{out\ rated}$	$I_{out\ dyn}$	$I >$	Characteristic A									
				1 A	1.6 A	2 A	3 A	4 A	6 A	8 A	10 A	13 A	16 A
6EP1332-2BA10	2.5 A	7 A/ 200 ms	5.8 A/ 200 ms	✓	○	○	○	○	○	○	○	○	○
6EP1333-3BA00	5 A	15 A/ 25 ms	12.5 A/ 25 ms	✓	✓	✓	○	○	○	○	○	○	○
6EP1333-2BA01	5 A	17 A/ 200 ms	14.5 A/ 200 ms	✓	✓	✓	○	○	○	○	○	○	○
6EP1333-2AA01	5 A	17 A/ 200 ms	14.5 A/ 200 ms	✓	✓	✓	○	○	○	○	○	○	○
6EP1334-3BA00	10 A	30 A/ 25 ms	25 A/ 25 ms	✓	✓	✓	✓	✓	○	○	○	○	○
6EP1334-2BA01	10 A	33 A/ 200 ms	28 A/ 200 ms	✓	✓	✓	✓	✓	✓	○	○	○	○
6EP1334-2AA01	10 A	33 A/ 200 ms	28 A/ 200 ms	✓	✓	✓	✓	✓	✓	○	○	○	○
6EP1336-3BA00	20 A	60 A/ 25 ms	50 A/ 25 ms	✓	✓	✓	✓	✓	✓	✓	✓	○	○
6EP1436-3BA00	20 A	60 A/ 25 ms	50 A/ 25 ms	✓	✓	✓	✓	✓	✓	✓	✓	○	○
6EP1436-3BA10	20 A	60 A/ 25 ms	50 A/ 25 ms	✓	✓	✓	✓	✓	✓	✓	✓	○	○
6EP1457-3BA00	20 A	60 A/ 25 ms	50 A/ 25 ms	✓	✓	✓	✓	✓	✓	✓	✓	○	○
6EP1337-3BA00	40 A	120 A/ 25 ms	100 A/ 25 ms	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6EP1437-3BA00	40 A	120 A/ 25 ms	100 A/ 25 ms	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6EP1437-3BA10	40 A	120 A/ 25 ms	100 A/ 25 ms	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

$I_{out\ rated}$: rated output current
$I_{out\ dyn}$: Dynamic overcurrent at short-circuit in operation
$I >$ For selective tripping in practice to provide permanent current ($I > = I_{out\ dyn} - 0.5 \times I_{out\ rated}$)
✓: immediate tripping within 12 ms possible
○: immediate tripping within 12 ms not possible

Fusing of the 24 V DC output circuit, selectivity

	Characteristic B				Characteristic C									
	6 A	10 A	13 A	16 A	1 A	1.6 A	2 A	3 A	4 A	6 A	8 A	10 A	13 A	16 A
	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	○	○	○	○	✓	○	○	○	○	○	○	○	○	○
	○	○	○	○	✓	○	○	○	○	○	○	○	○	○
	○	○	○	○	✓	✓	○	○	○	○	○	○	○	○
	○	○	○	○	✓	✓	✓	○	○	○	○	○	○	○
	○	○	○	○	✓	✓	✓	○	○	○	○	○	○	○
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	✓	✓	✓	○	✓	✓	✓	✓	✓	✓	○	○	○	○

Standards and approvals

Overview of important standards and approvals

EN	European standards
EN 50178	Electronic equipment for use in power installations
EN 55022	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
EN 60529	Degrees of protection provided by enclosures (IP-Code)
EN 60721	Classification of environmental conditions
EN 60950-1	Information technology equipment – Safety
EN 61000-3-2	Electromagnetic compatibility (EMC) – Part 3-2: Limits for harmonic current emissions (equipment input current ≤16 A per phase)
EN 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments
EN 61000-6-3	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light industrial environments

UL	Underwriters Laboratories
UL 508	Industrial control equipment
UL 1604	Electrical equipment for use in class I and class II, division 2, and class III hazardous (classified) locations
UL 1778	Uninterruptible Power Supply Equipment
UL 60950 -1	Information technology equipment – Safety

CSA	Canadian Standards Association
CSA C22.2 No. 14	Industrial control equipment
CSA C22.2 No. 142	Process control equipment
CSA C22.2 No. 107.1	General Use Power Supplies
CSA C22.2 No. 60950-1	Information technology equipment – Safety

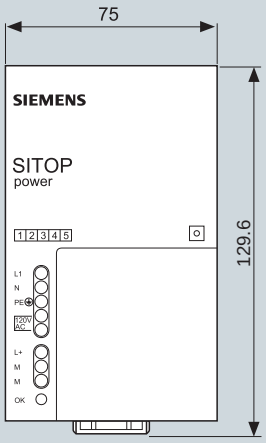
ATEX	Equipment and protective systems intended for use in Potentially Explosive Atmospheres

FM	Factory Mutual Research

ABS	American Bureau of Shipping

GL	Germanischer Lloyd

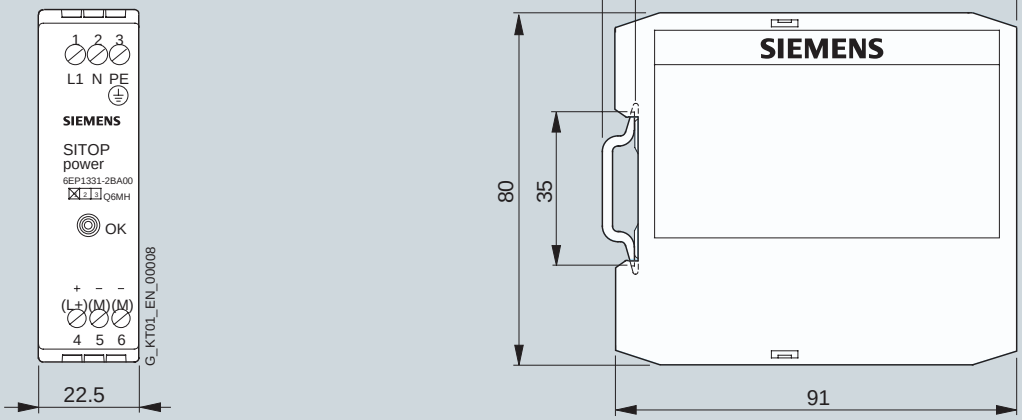
Dimension drawings



SITOP 24 V
1-phase, 2-phase, 3-phase

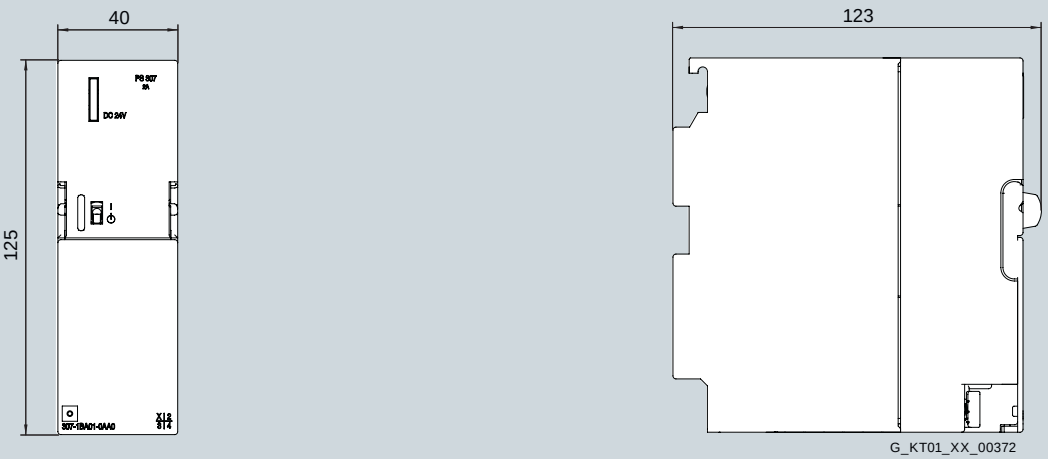
Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order numbers: 6EP1 331-2BA10, 6EP1 731-2BA00



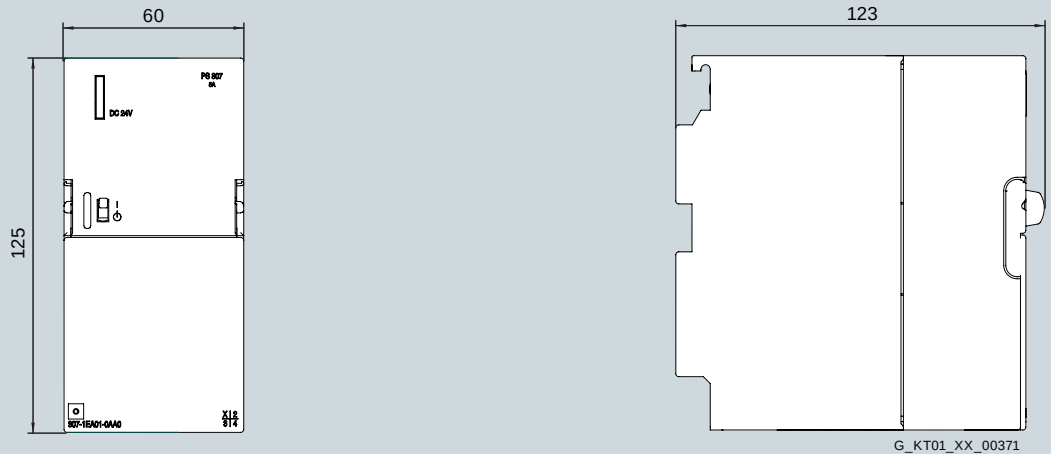
Dimension drawing 2 with dimensions in mm
For devices with order numbers: 6EP1 311-1SH02, 6EP1 321-1SH02, 6EP1 351-1SH02, 6EP1 331-1SH02

Dimension drawing 3 with dimensions in mm
For devices with order number: 6ES7 307-1BA01-0AA0

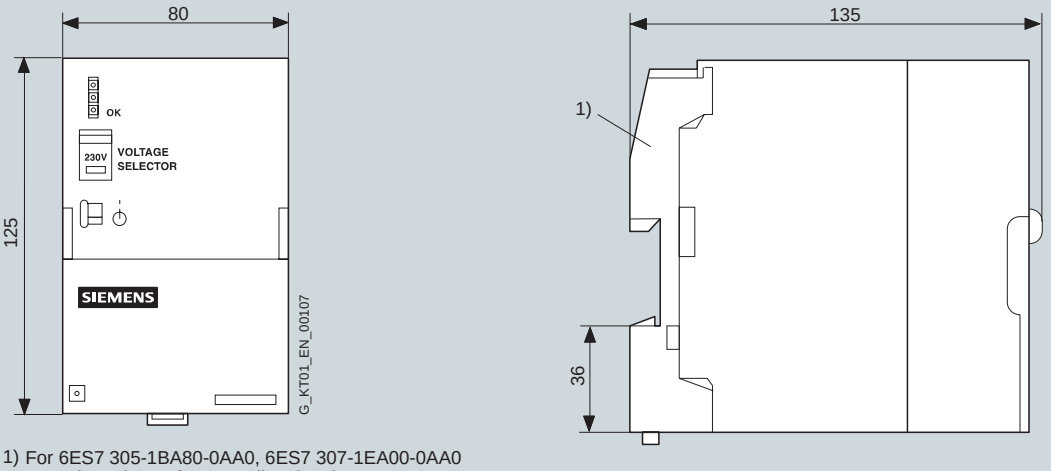


Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order number: 6ES7 307-1EA01-0AA0



Dimension drawing 2 with dimensions in mm
For devices with order numbers: 6ES7 305-1BA80-0AA0, 6ES7 307-1EA80-0AA0



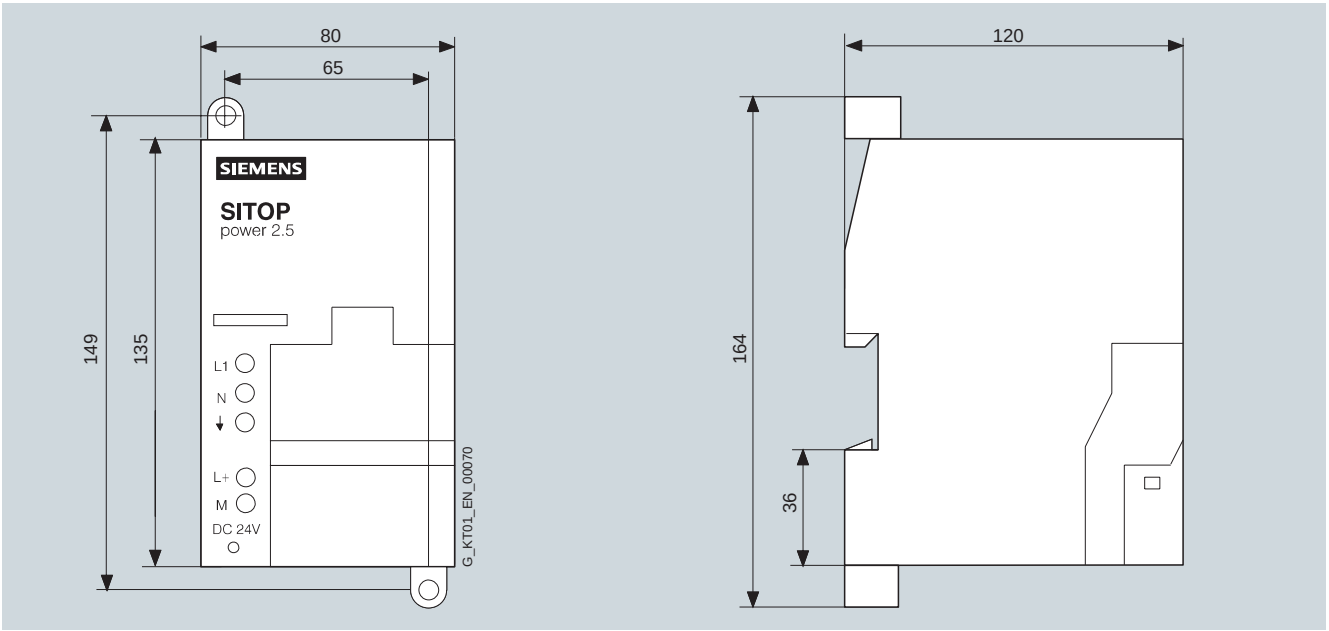
1) For 6ES7 305-1BA80-0AA0, 6ES7 307-1EA00-0AA0
Mounting adapter for DIN rail optional

Dimension drawings

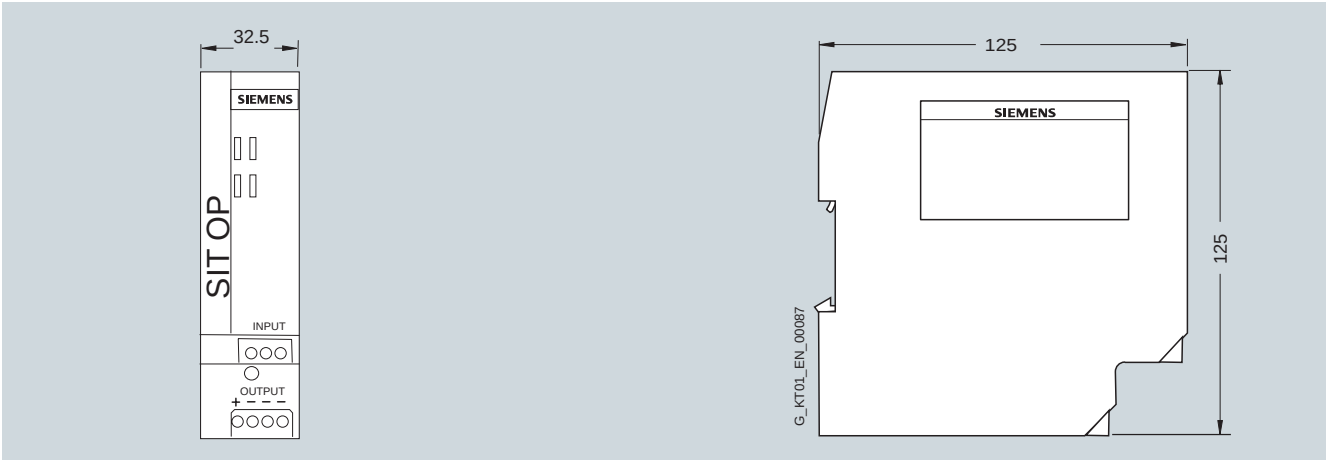
SITOP 24 V
1-phase, 2-phase, 3-phase

Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order numbers: 6EP1 732-0AA00, 6EP1 332-1SH12, 6EP1 332-1SH22

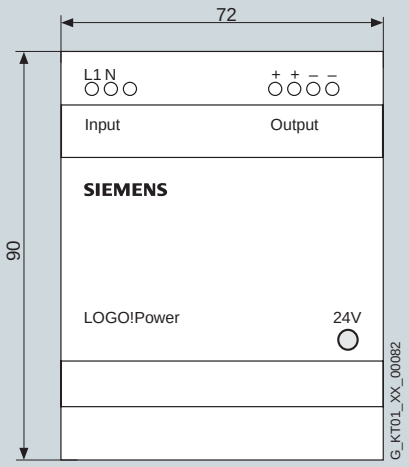


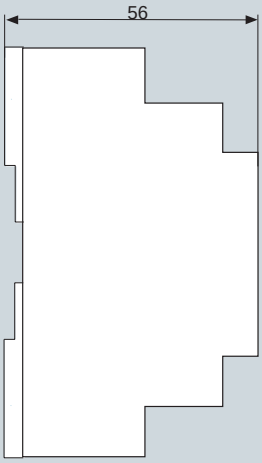
Dimension drawing 2 with dimensions in mm
For devices with order number: 6EP1 332-2BA10



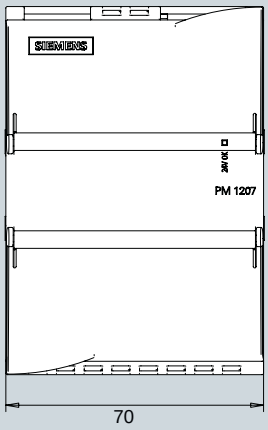
Dimension drawings

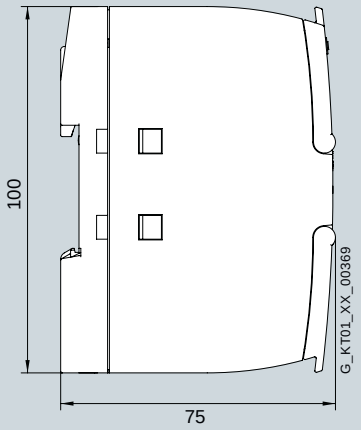
Dimension drawing 1 with dimensions in mm
For devices with order numbers: 6EP1 311-1SH12, 6EP1 322-1SH02, 6EP1 352-1SH02, 6EP1 332-1SH42





Dimension drawing 2 with dimensions in mm
For devices with order number: 6EP1 332-1SH71



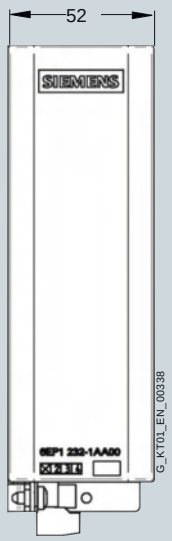


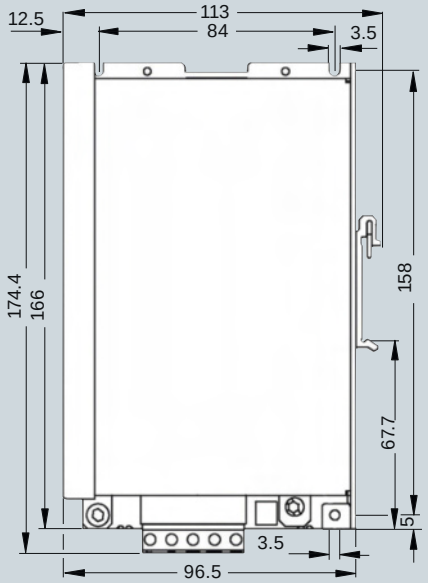
Dimension drawings

SITOP 24 V
1-phase, 2-phase, 3-phase

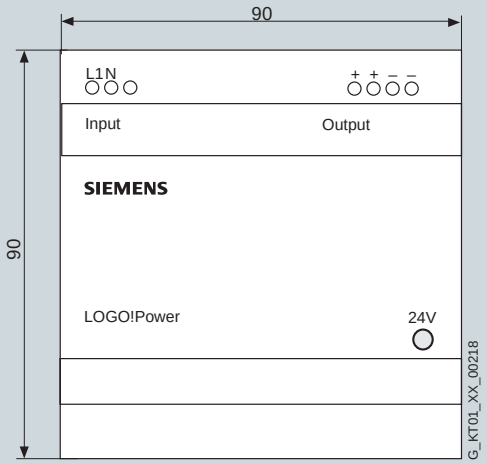
Dimension drawings

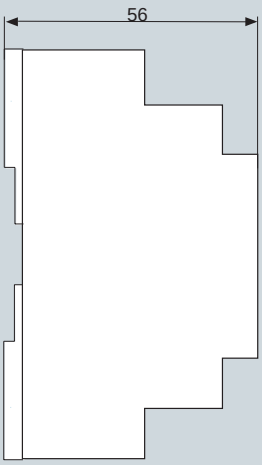
Dimension drawing 1 with dimensions in mm
For devices with order numbers: 6EP1 232-1AA00, 6EP1 232-1AA10, 6EP1 233-1AA00, 6EP1 234-1AA00





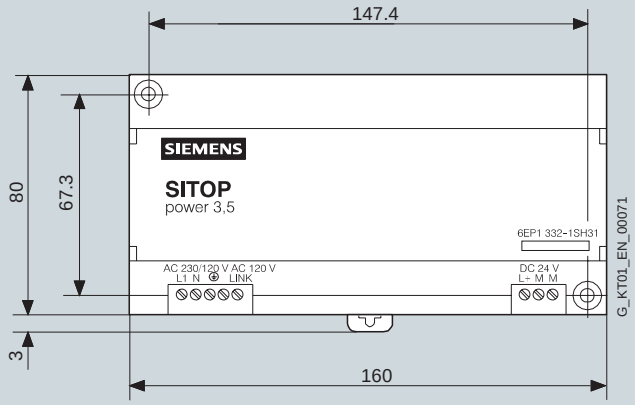
Dimension drawing 2 with dimensions in mm
For devices with order number: 6EP1 332-1SH51



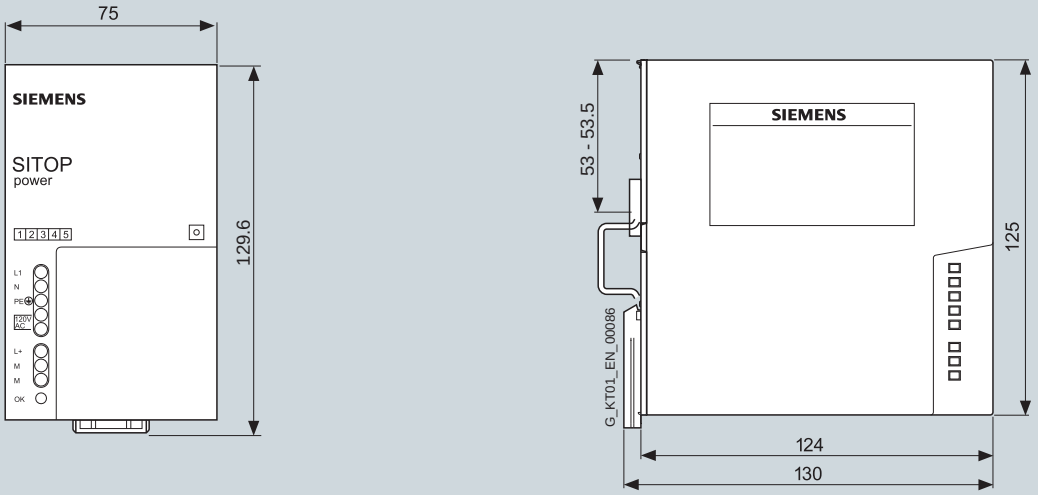


Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order number: 6EP1 332-1SH31



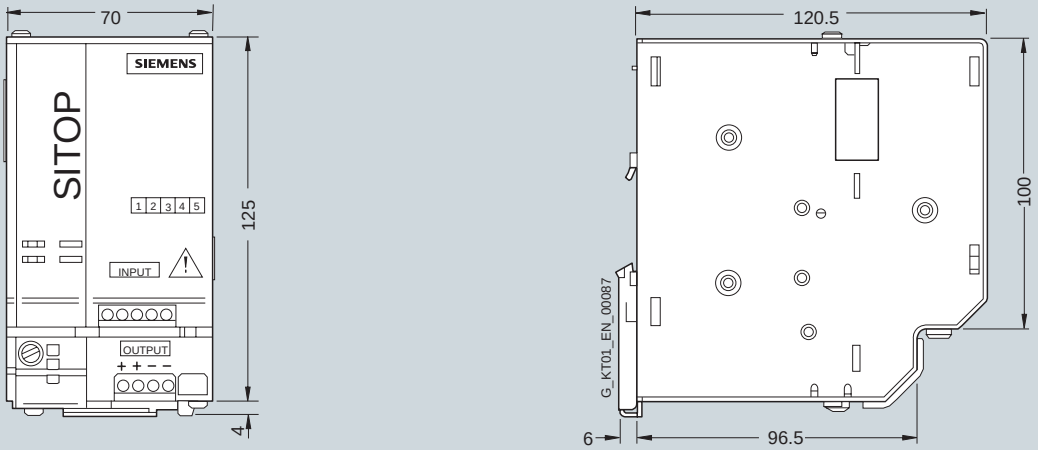
Dimension drawing 2 with dimensions in mm
For devices with order number: 6EP1 332-2BA00



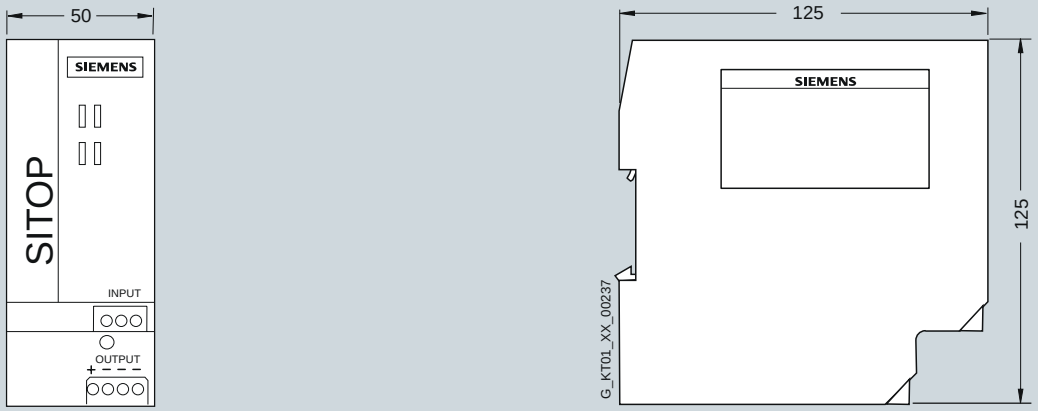
SITOP 24 V
1-phase, 2-phase, 3-phase

Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order number: 6EP1 333-3BA00

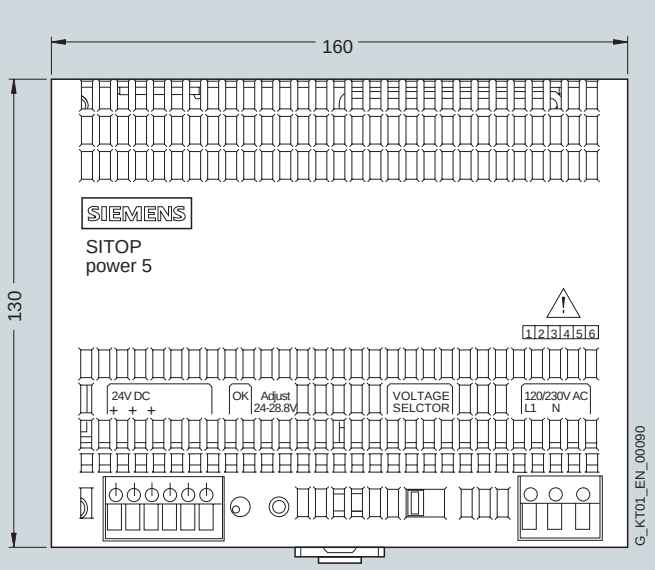


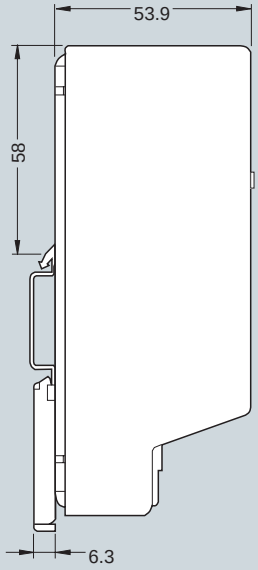
Dimension drawing 2 with dimensions in mm
For devices with order numbers: 6EP1 333-2AA01, 6EP1 333-2BA01



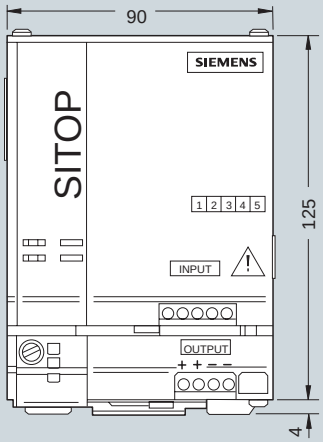
Dimension drawings

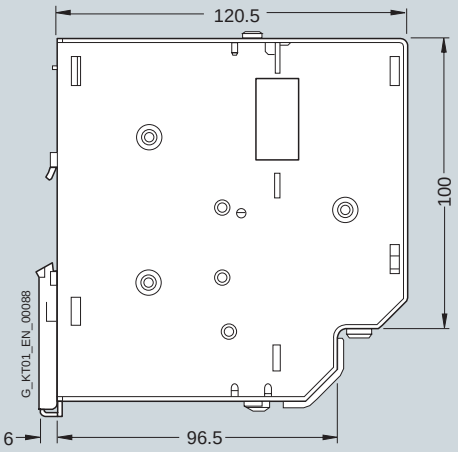
Dimension drawing 1 with dimensions in mm
For devices with order number: 6EP1 333-1AL12, 6EP1 334-1AL12





Dimension drawing 2 with dimensions in mm
For devices with order number: 6EP1 334-3BA00

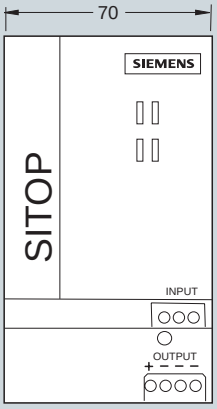


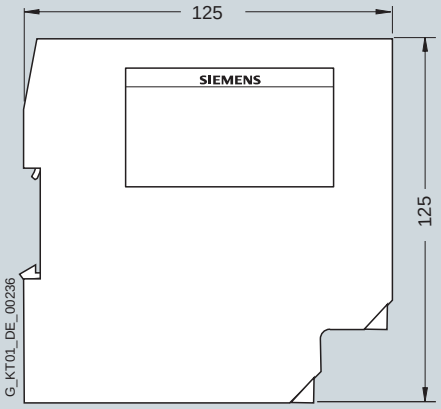


SITOP 24 V
1-phase, 2-phase, 3-phase

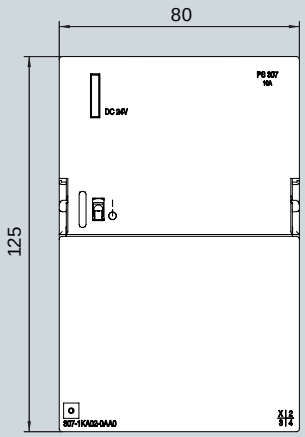
Dimension drawings

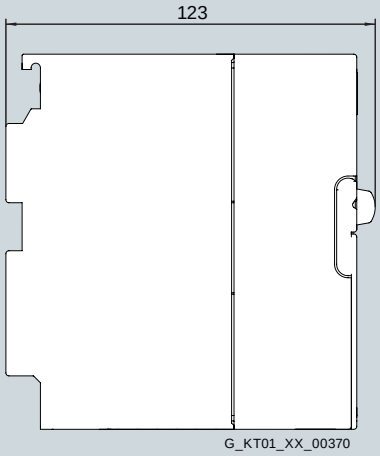
Dimension drawing 1 with dimensions in mm
For devices with order numbers: 6EP1 334-2AA01, 6EP1 334-2BA01





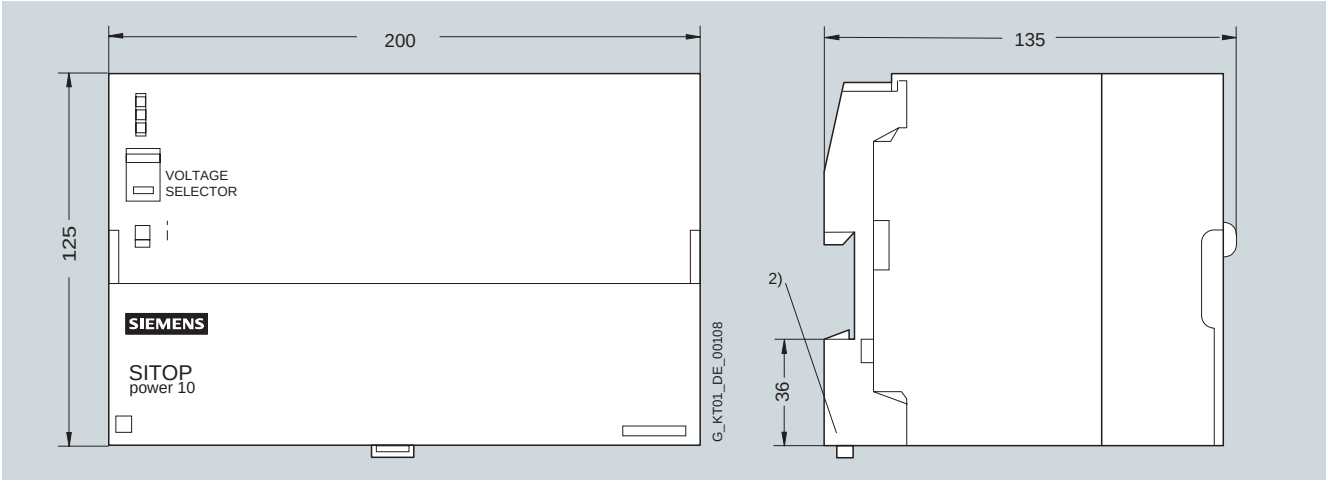
Dimension drawing 2 with dimensions in mm
For devices with order number: 6ES7 307-1KA02-0AA0



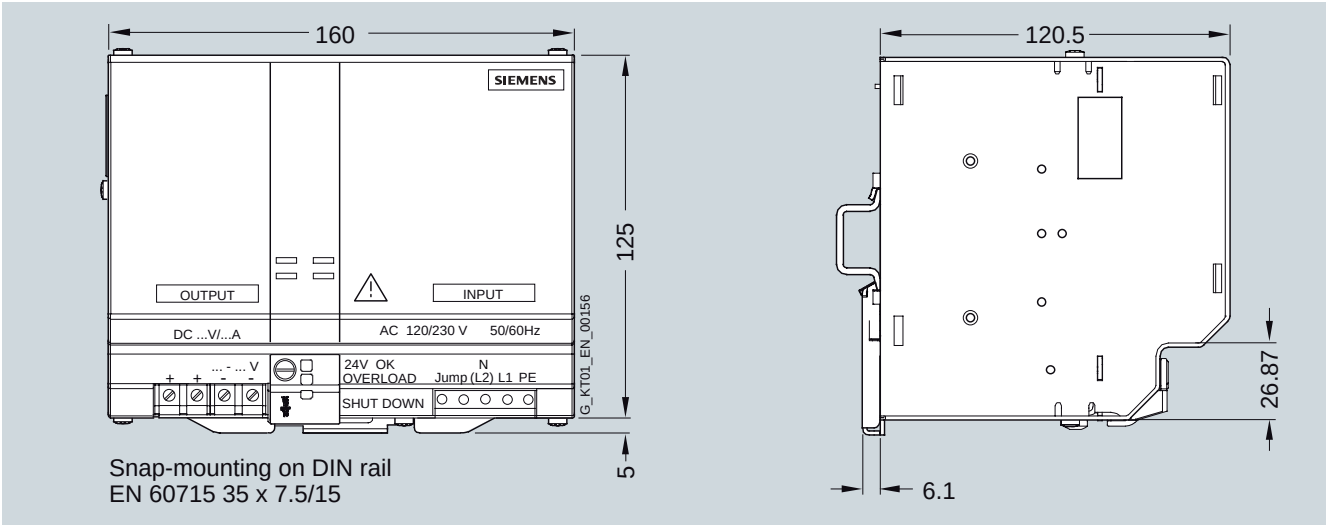


Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order number: 6EP1 334-1SH01



Dimension drawing 2 with dimensions in mm
For devices with order numbers: 6EP1 336-3BA00, 6EP1 436-3BA00

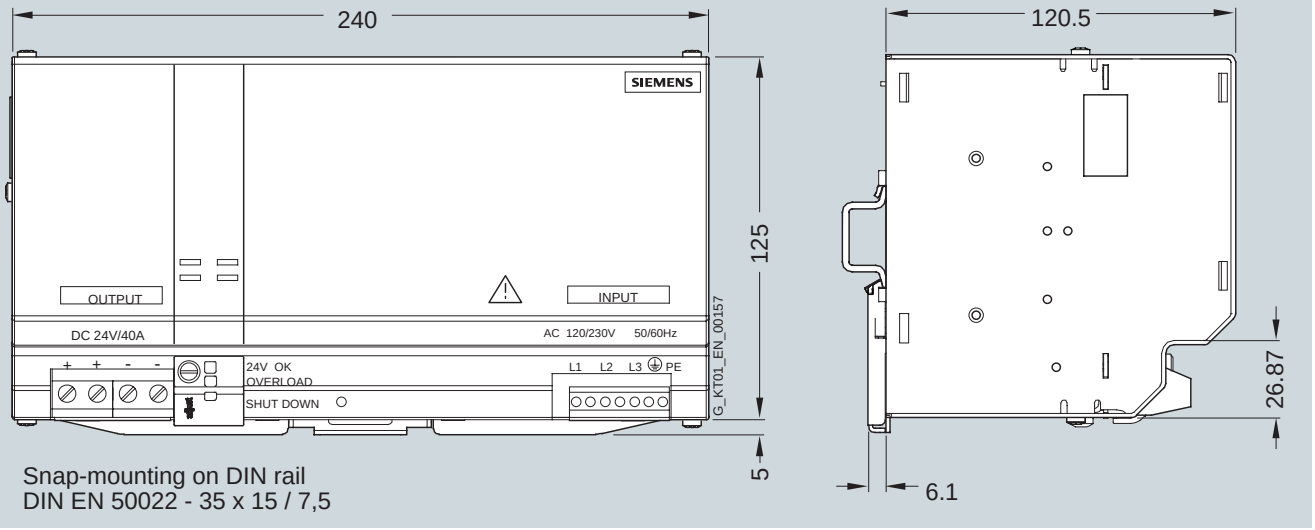


Dimension drawings

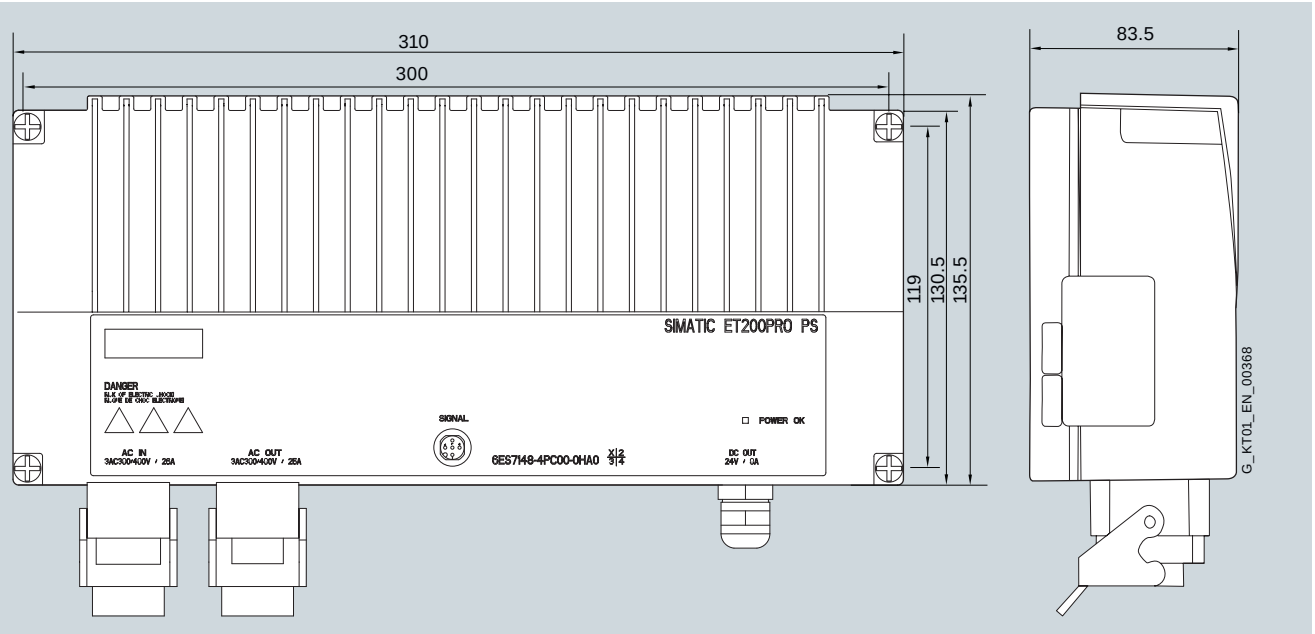
SITOP 24 V
1-phase, 2-phase, 3-phase

Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order numbers: 6EP1 337-3BA00, 6EP1 437-3BA00

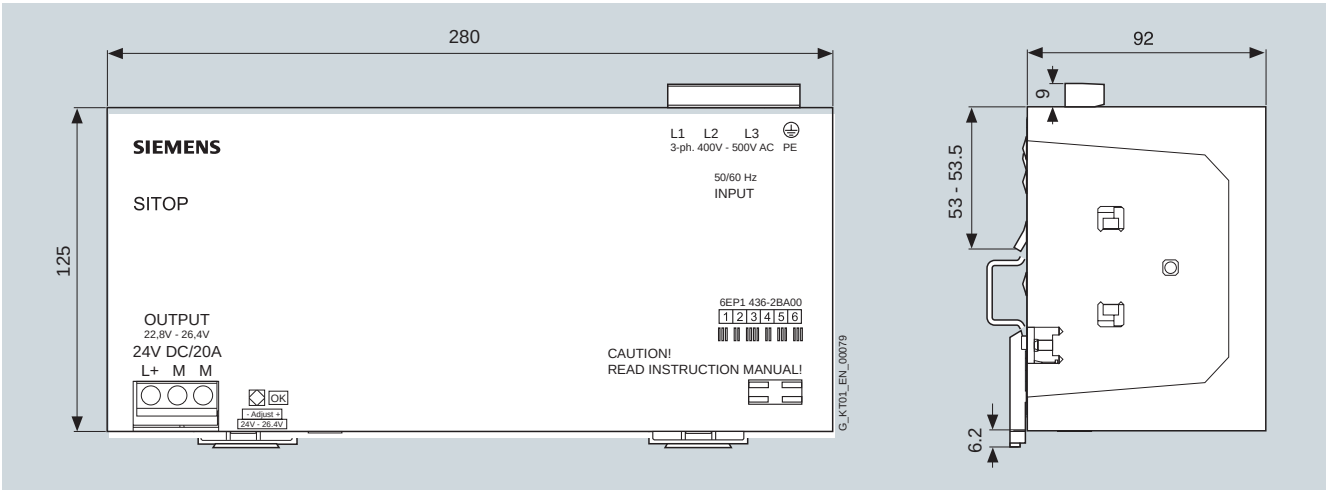


Dimension drawing 2 with dimensions in mm
For devices with order number: 6ES7 148-4PC00-0HA0, 6EP1 433-2CA00

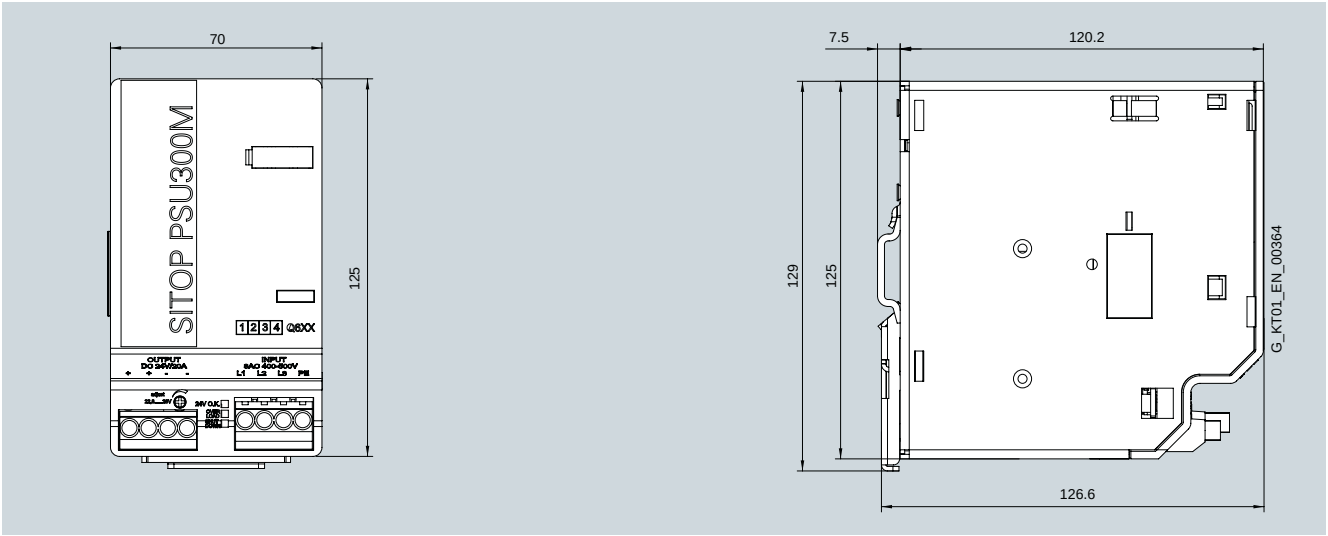


Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order numbers: 6EP1 434-2BA00, 6EP1 436-2BA00



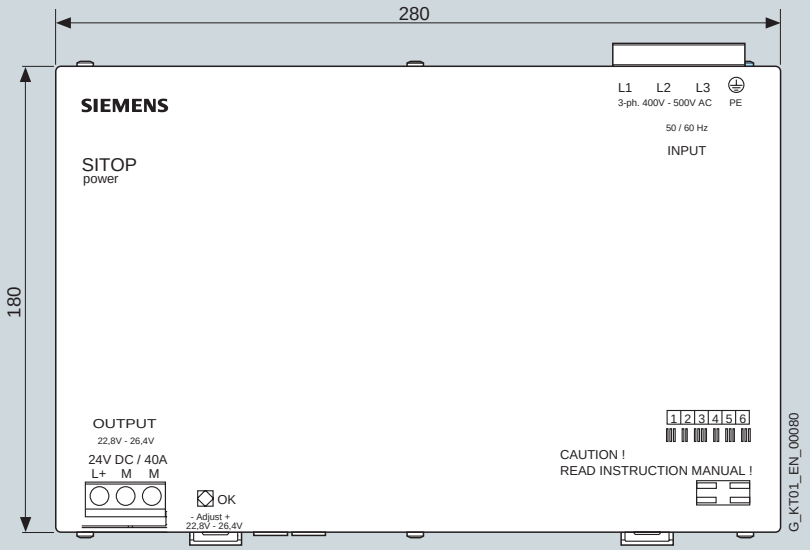
Dimension drawing 2 with dimensions in mm
For devices with order number: 6EP1 436-3BA10

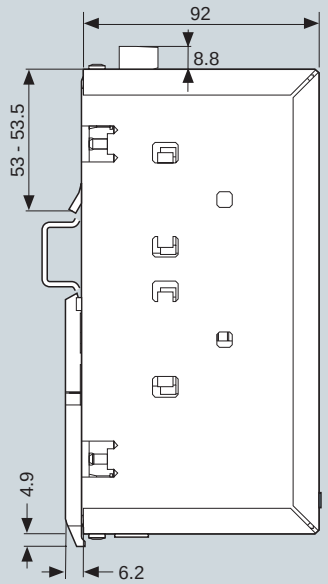


SITOP 24 V
1-phase, 2-phase, 3-phase

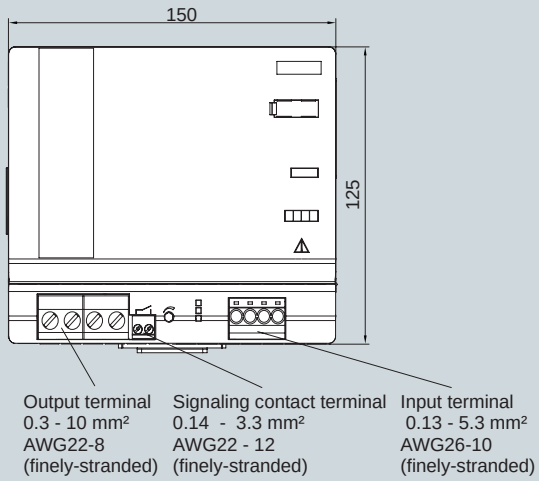
Dimension drawings

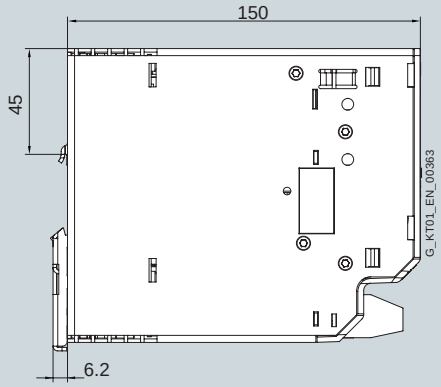
Dimension drawing 1 with dimensions in mm
For devices with order numbers: 6EP1 437-2BA00, 6EP1 437-2BA10





Dimension drawing 1 with dimensions in mm
For devices with order number: 6EP1 437-3BA10

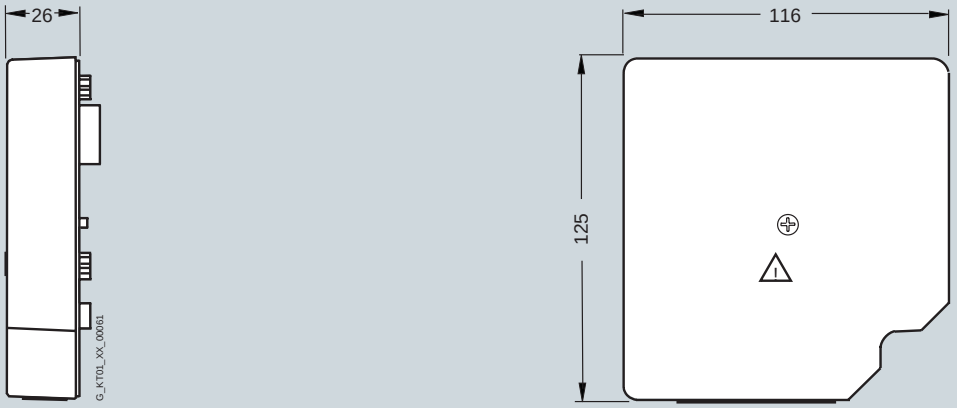




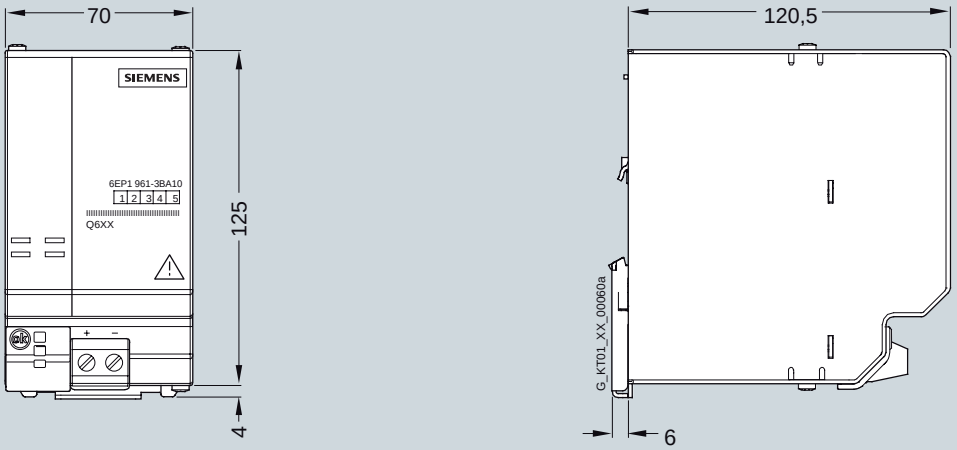
Snap-mounting on DIN rail
DIN EN 60715 35x7.5/15

Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order number: 6EP1 961-3BA10



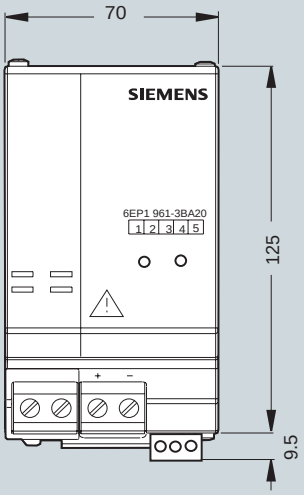
Dimension drawing 2 with dimensions in mm
For devices with order number: 6EP1 961-3BA01

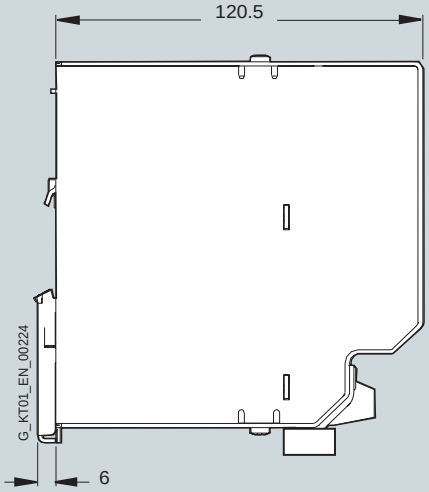


Expansion modules

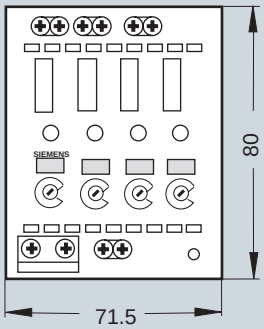
Dimension drawings

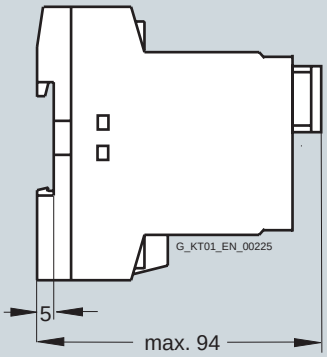
Dimension drawing 1 with dimensions in mm
For devices with order number: 6EP1 961-3BA20





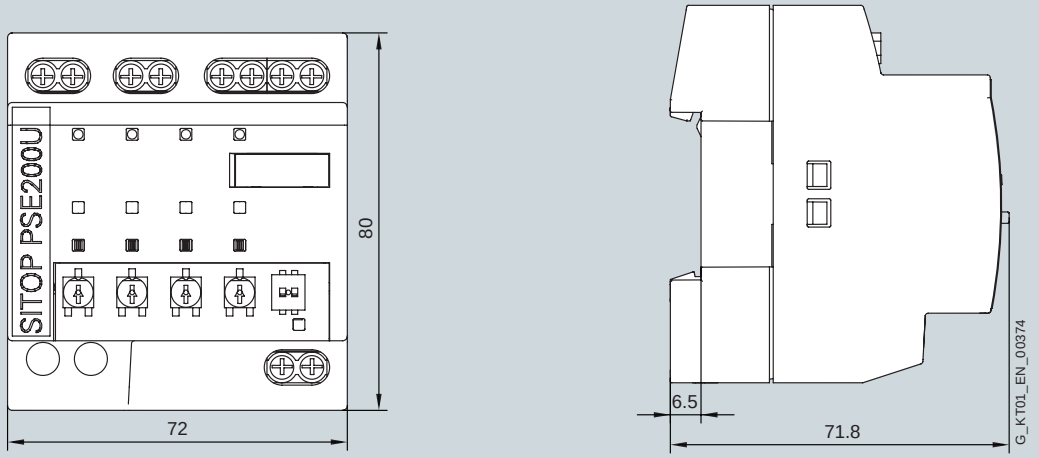
Dimension drawing 2 with dimensions in mm
For devices with order number: 6EP1 961-2BA00



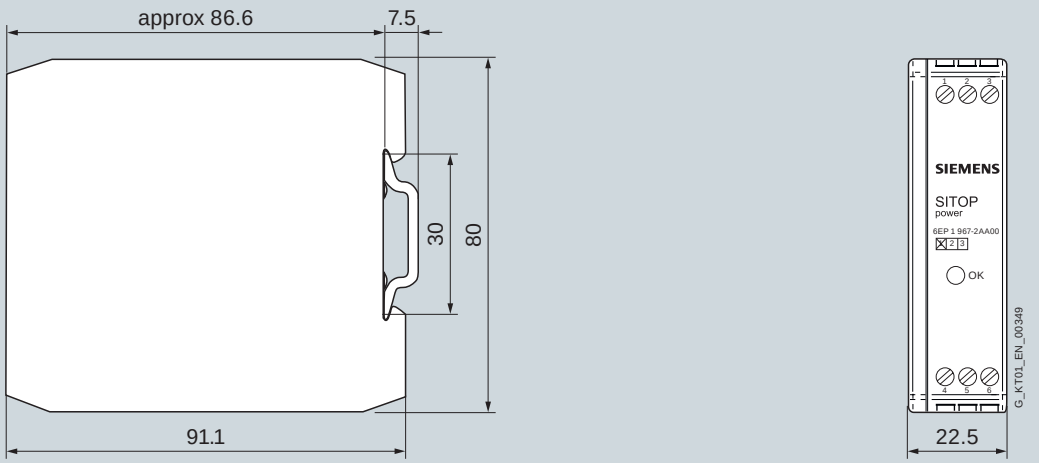


Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order numbers: 6EP1 961-2BA10, 6EP1 961-2BA20



Dimension drawing 2 with dimensions in mm
For devices with order number: 6EP1 967-2AA00

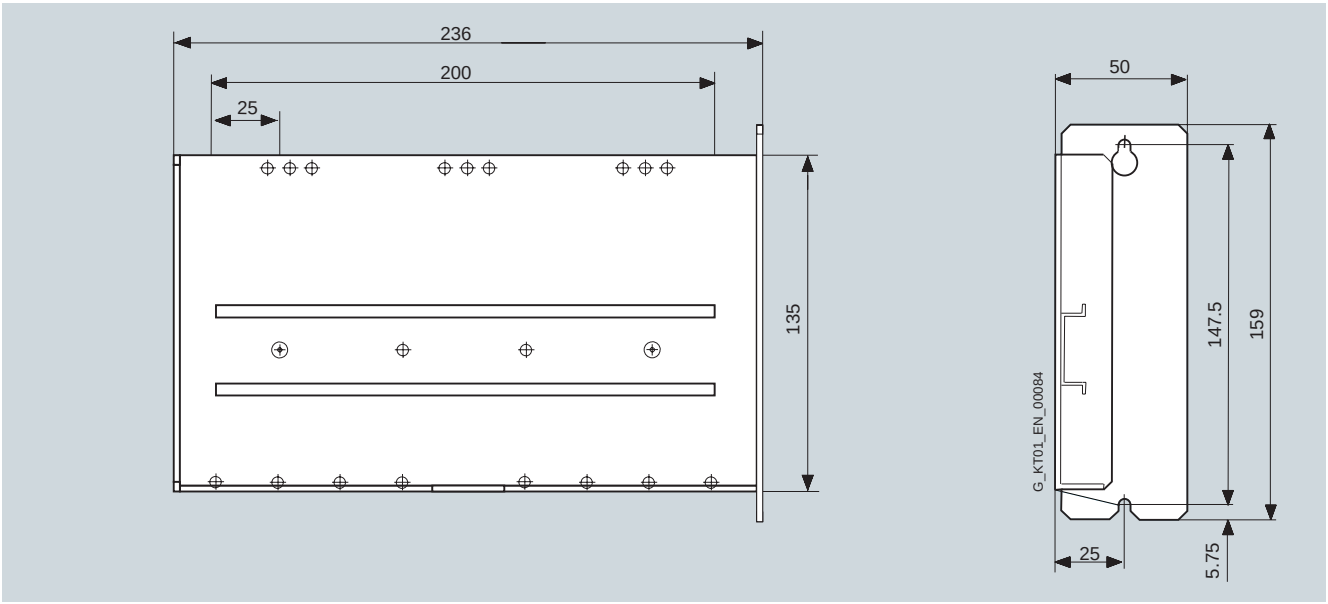


Dimension drawings

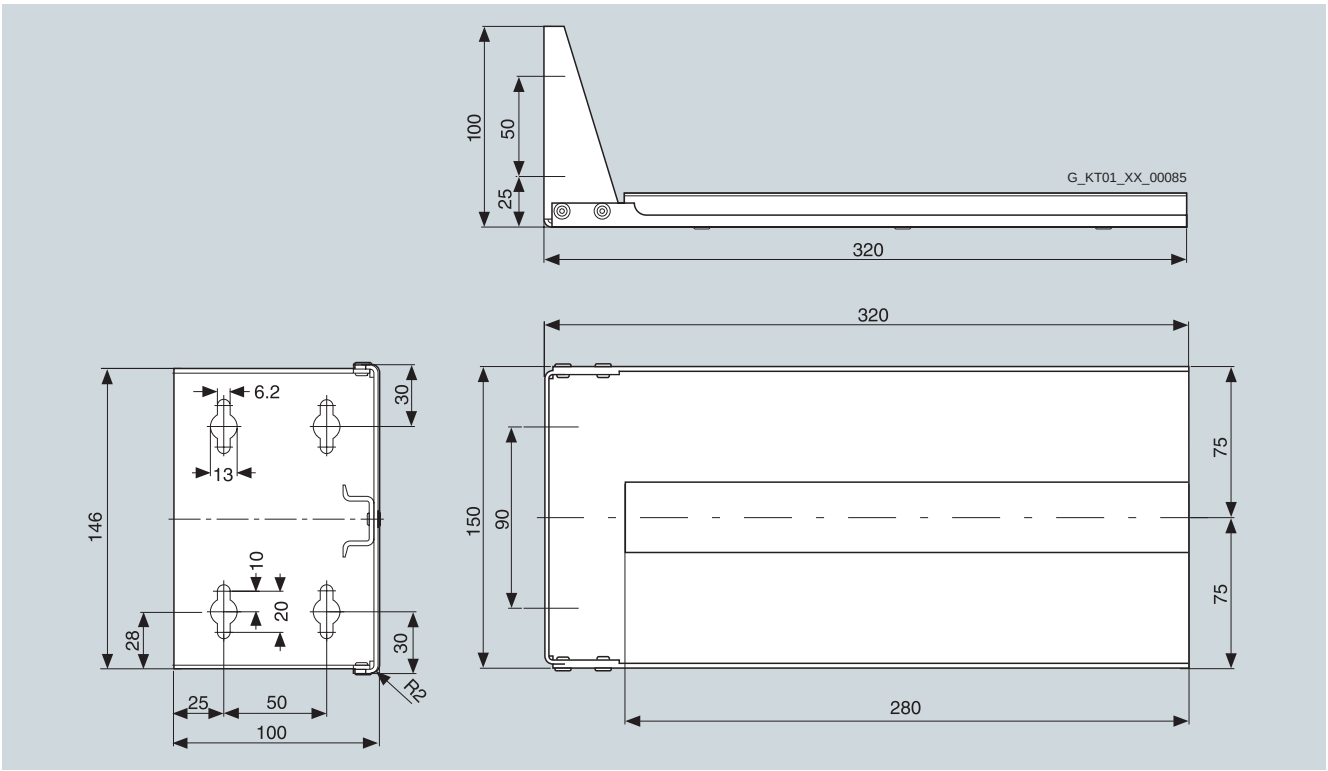
Expansion modules
Mounting bracket

Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order number: 6EP1 971-1AA01

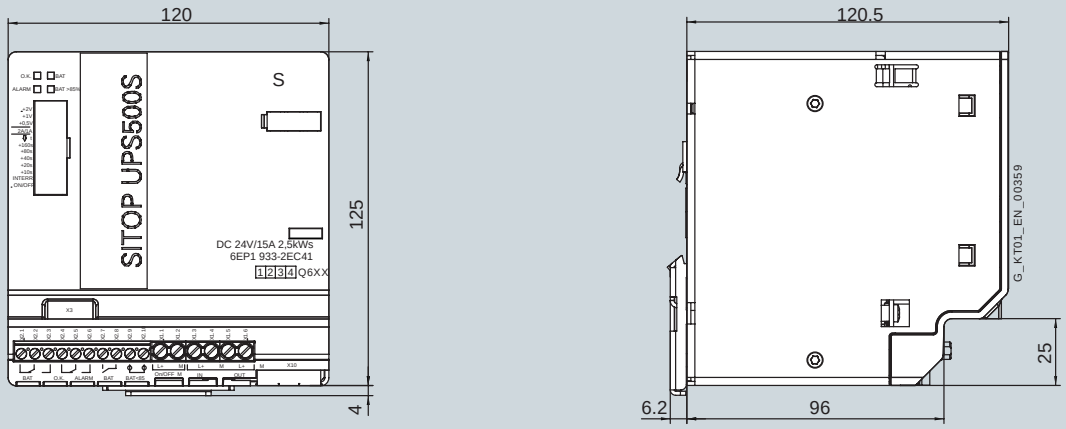


Dimension drawing 2 with dimensions in mm
For devices with order number: 6EP1 971-2BA00

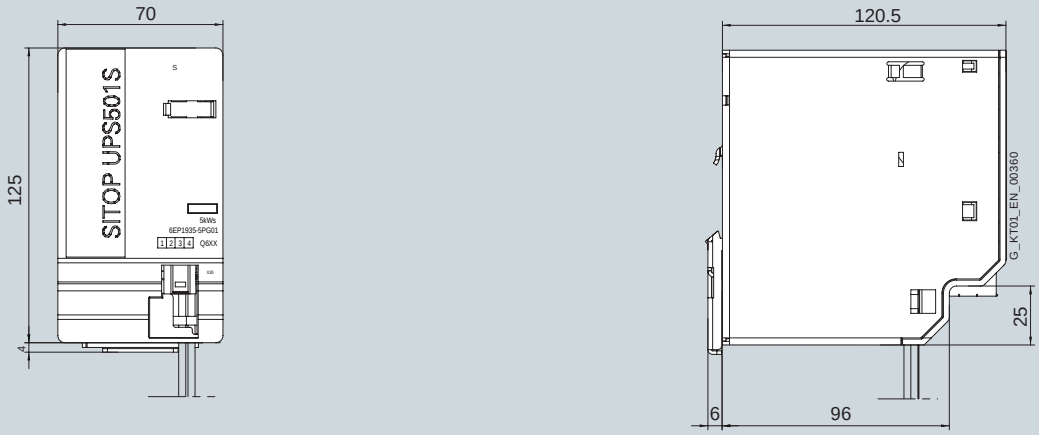


Dimension drawings

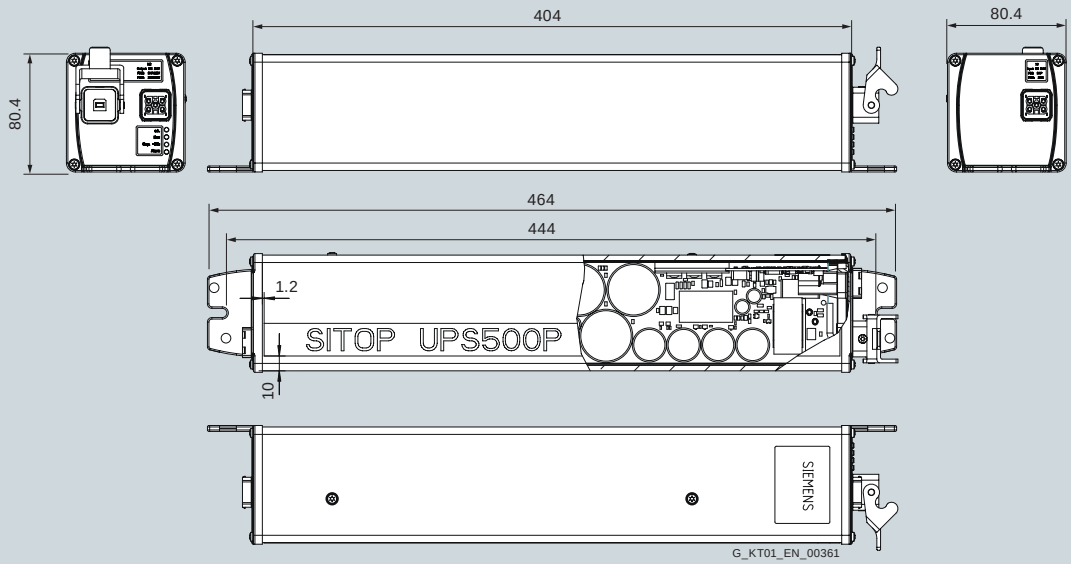
Dimension drawing 1 with dimensions in mm
For devices with order numbers: 6EP1 933-2EC41, 6EP1 933-2EC51



Dimension drawing 2 with dimensions in mm
For devices with order number: 6EP1935-5PG01



Dimension drawing 3 with dimensions in mm
For devices with order numbers: 6EP1 933-2NC01, 6EP1 933-2NC11

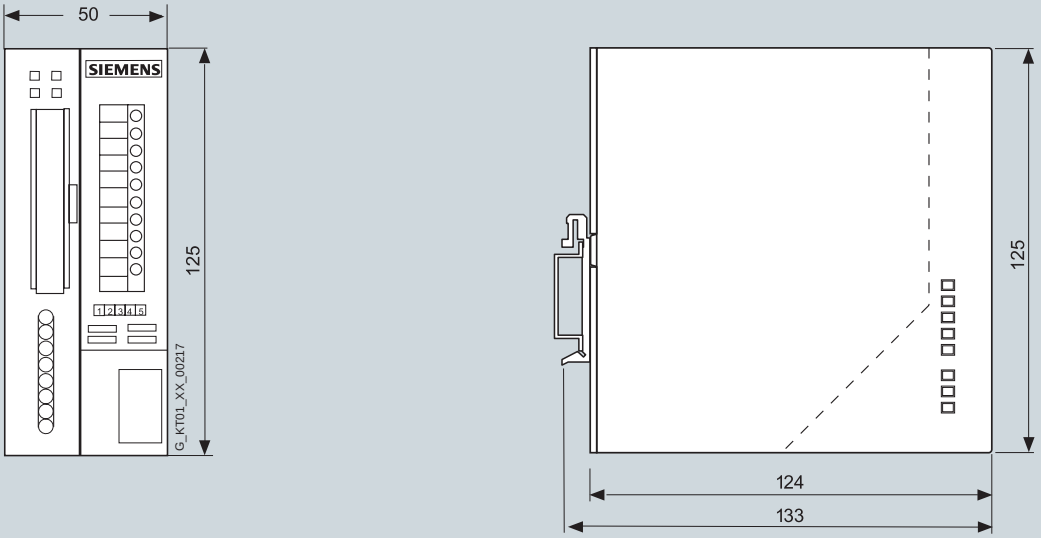


Dimension drawings

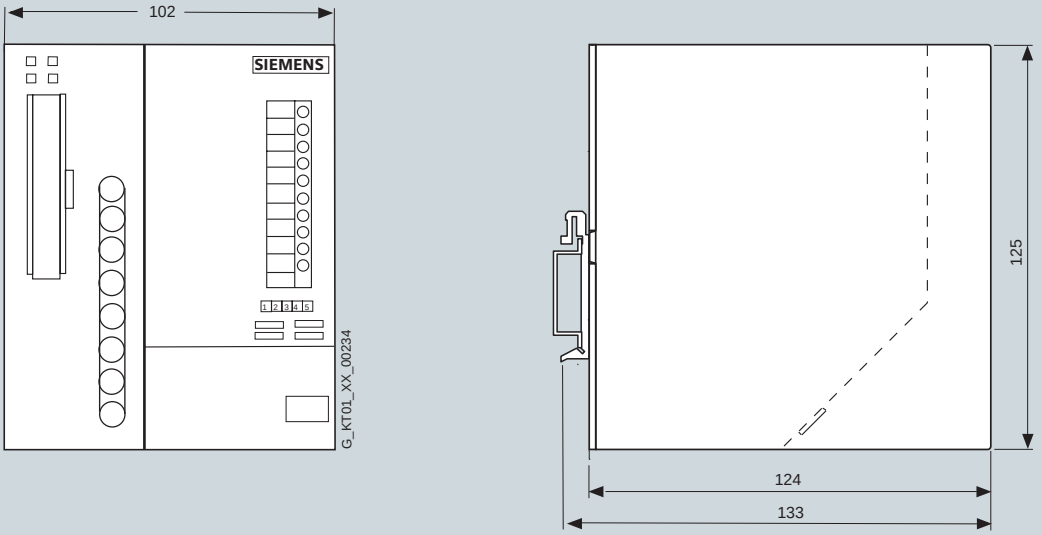
Uninterruptible power supplies

Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order numbers: 6EP1 931-2DC21, 6EP1 931-2DC31, 6EP1 931-2DC42
For devices with order numbers: 6EP1 931-2EC21, 6EP1 931-2EC31, 6EP1 931-2EC42

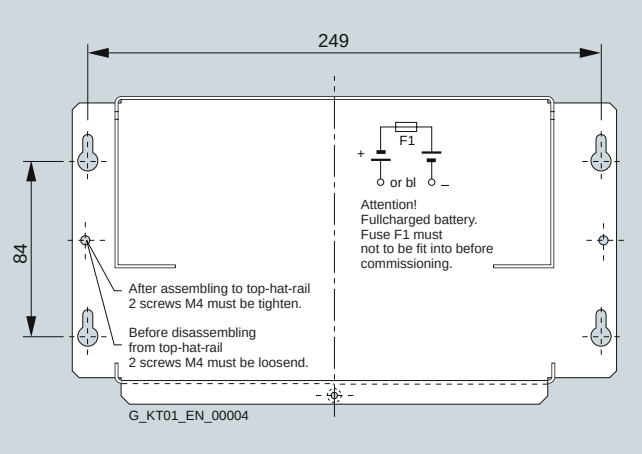


Dimension drawing 2 with dimensions in mm
For devices with order numbers: 6EP1 931-2FC21, 6EP1 931-2FC42

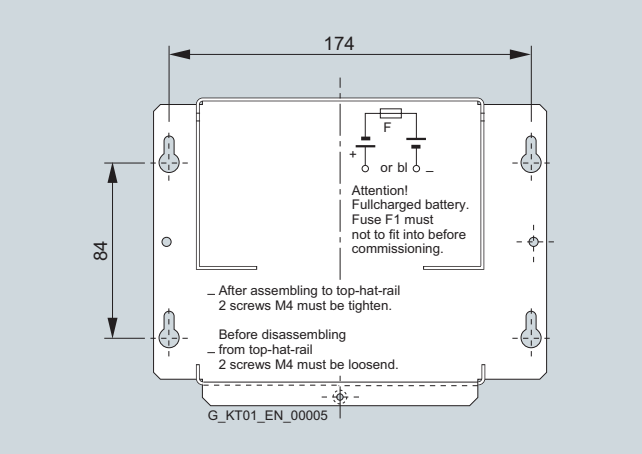


Dimension drawings

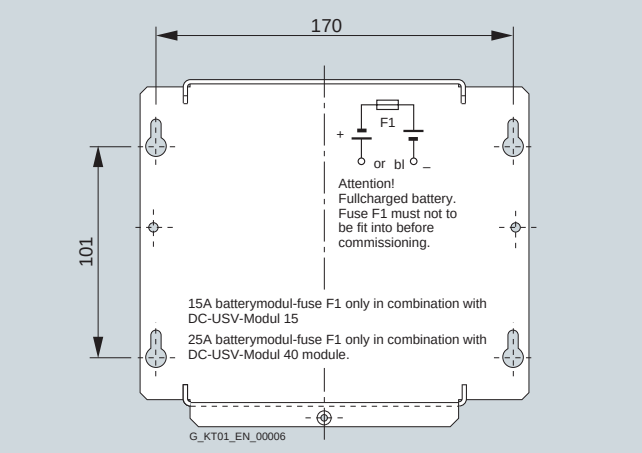
Dimension drawing 1 with dimensions in mm
For devices with order number: 6EP1 935-6MD31



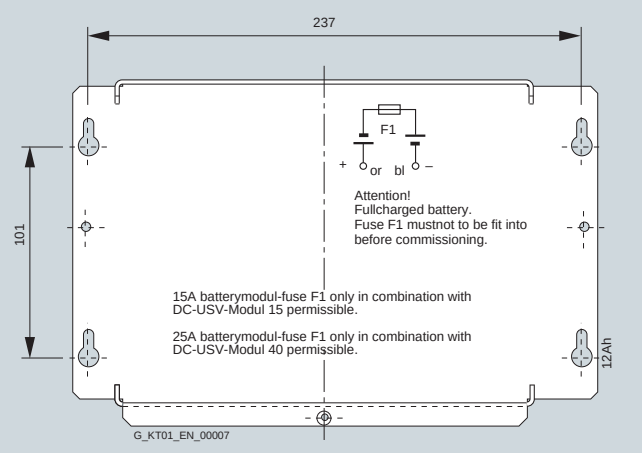
Dimension drawing 2 with dimensions in mm
For devices with order number: 6EP1 935-6MD11



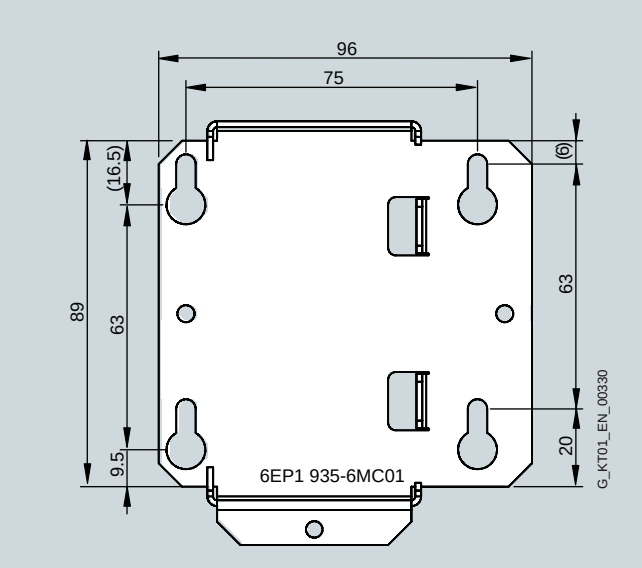
Dimension drawing 3 with dimensions in mm
For devices with order number: 6EP1 935-6ME21



Dimension drawing 4 with dimensions in mm
For devices with order number: 6EP1 935-6MF01



Dimension drawing 5 with dimensions in mm
For devices with order number: 6EP1 935-6MC01

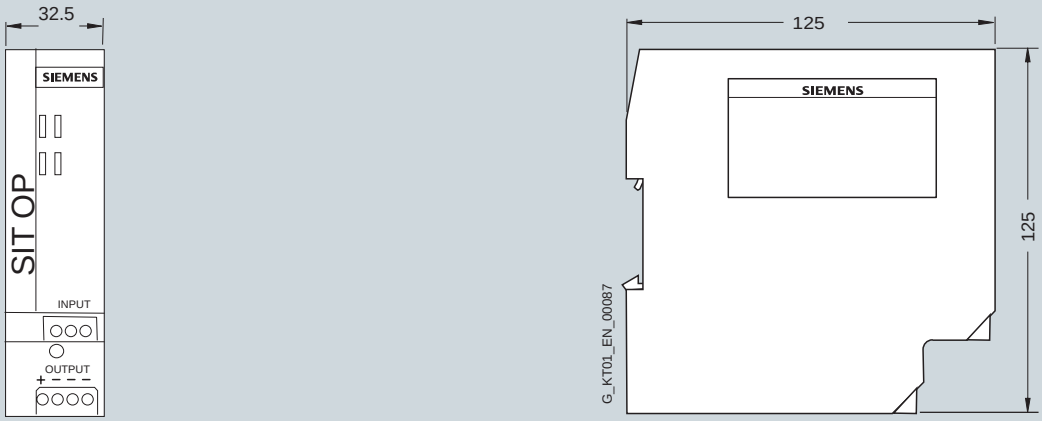


Dimension drawings

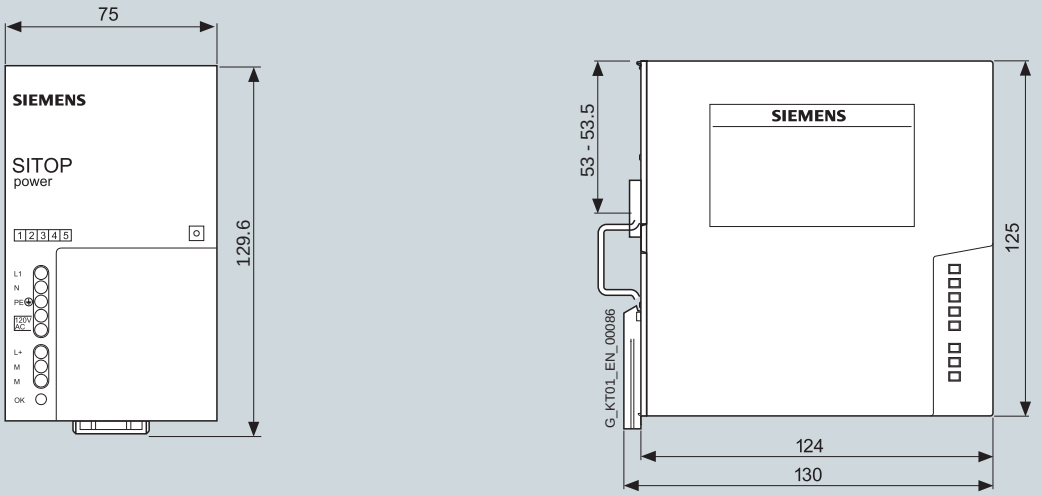
Alternative voltages

Dimension drawings

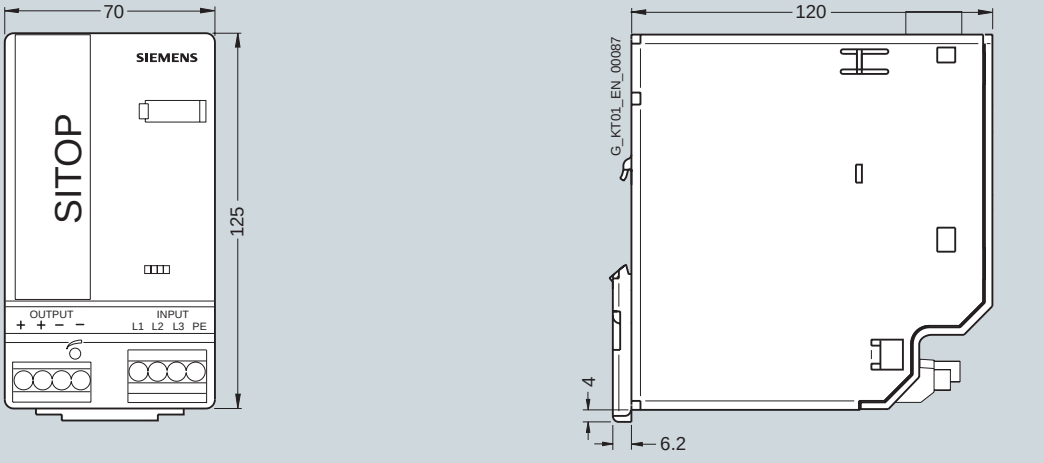
Dimension drawing 1 with dimensions in mm
For devices with order number: 6EP1 621-2BA00



Dimension drawing 2 with dimensions in mm
For devices with order numbers: 6EP1 353-2BA00, 6EP1 353-0AA00

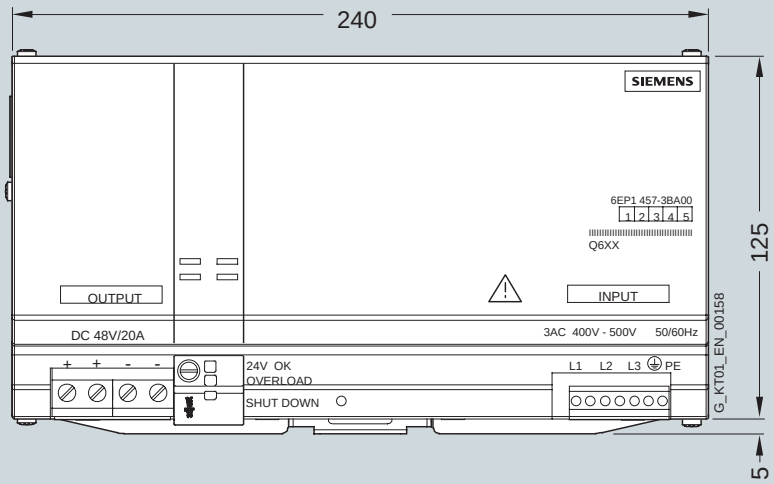


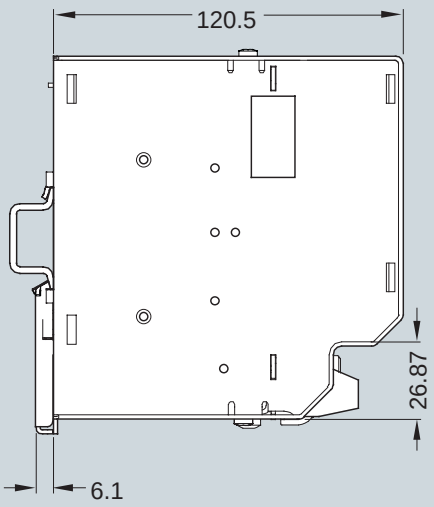
Dimension drawing 3 with dimensions in mm
For devices with order number: 6EP1 456-2BA00



Dimension drawings

Dimension drawing 1 with dimensions in mm
For devices with order number: 6EP1 457-3BA00





Snap-mounting on DIN rail
EN 60715 35x7,5/15

Dimension drawings

Notes

Appendix

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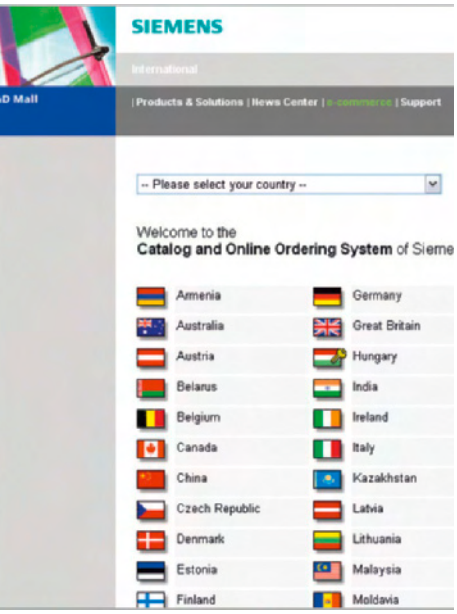
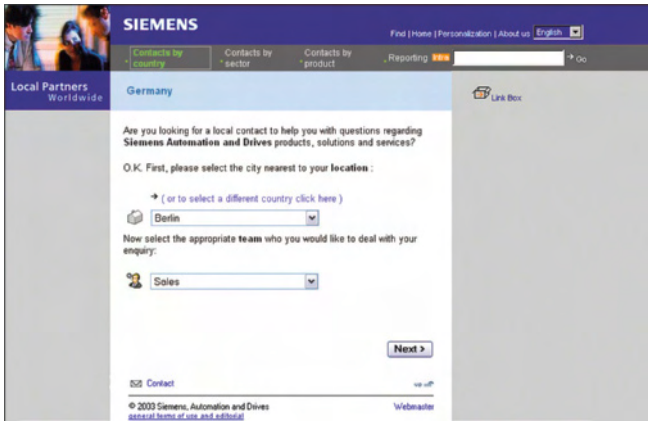
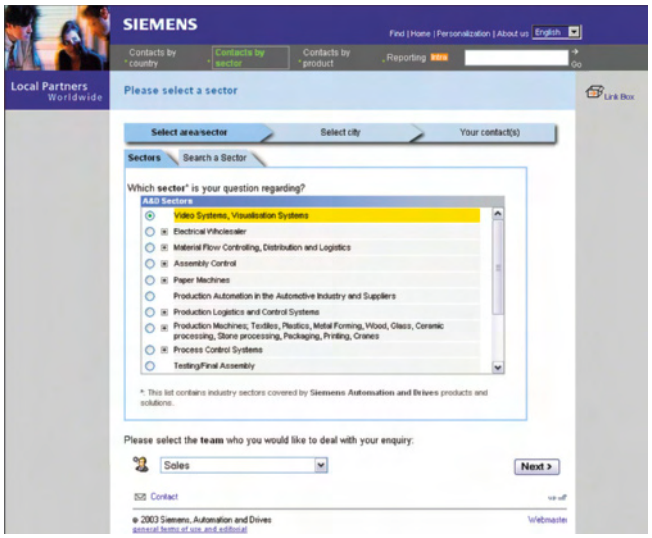


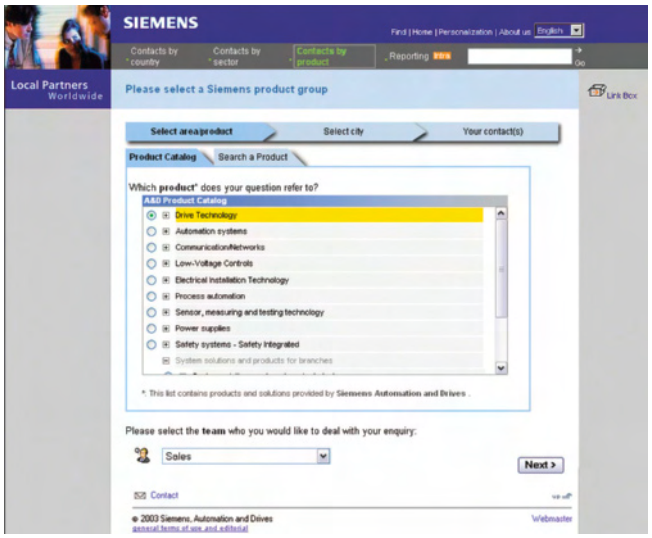
Order No. index

Subject index

Appendix
Siemens Contacts Worldwide







At

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

you can find details of Siemens contact partners worldwide responsible for particular technologies.

You can obtain in most cases a contact partner for

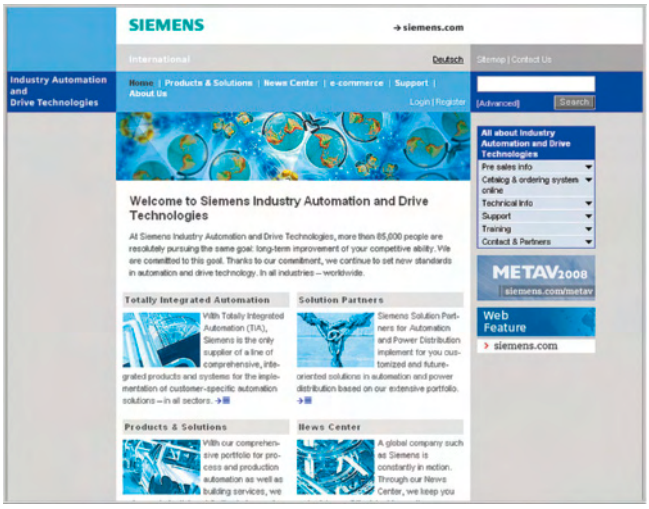
- Technical Support,
- Spare parts/repairs,
- Service,
- Training,
- Sales or
- Consultation/engineering.

You start by selecting a

- Country,
- Product or
- Sector.

By further specifying the remaining criteria you will find exactly the right contact partner with his/her respective expertise.

Siemens Industry Automation and Drive Technologies in the WWW



A detailed knowledge of the range of products and services available is essential when planning and configuring automation systems. It goes without saying that this information must always be fully up-to-date.

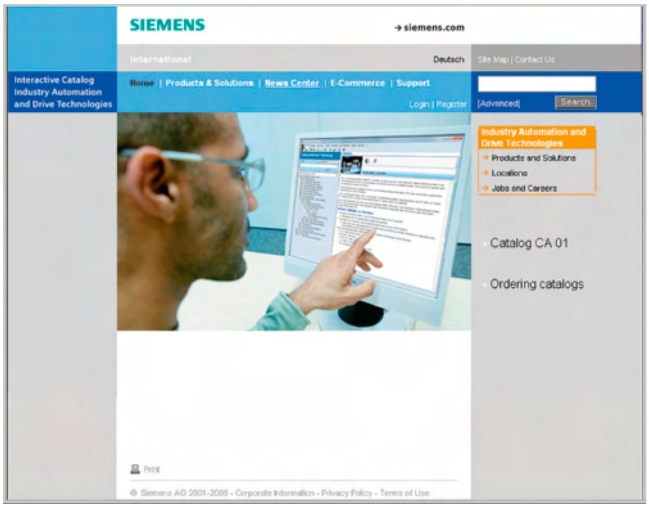
Siemens Industry Automation and Drive Technologies has therefore built up a comprehensive range of information in the World Wide Web, which offers quick and easy access to all data required.

Under the address

http://www.siemens.com/automation

you will find everything you need to know about products, systems and services.

Product Selection Using the Offline Mall of Industry



Detailed information together with convenient interactive functions:
The Offline Mall CA 01 covers more than 80,000 products and thus provides a full summary of the Siemens Industry Automation and Drive Technologies product base.

Here you will find everything that you need to solve tasks in the fields of automation, switchgear, installation and drives.
All information is linked into a user interface which is easy to work with and intuitive.

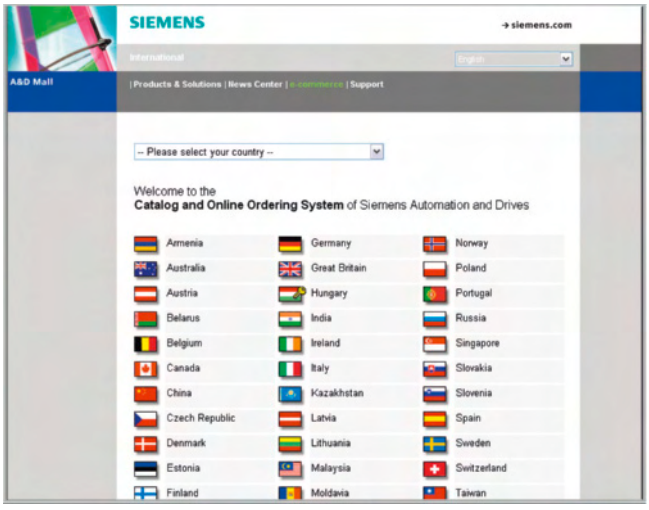
After selecting the product of your choice you can order at the press of a button, by fax or by online link.

Information on the Offline Mall CA 01 can be found in the Internet under

http://www.siemens.com/automation/ca01

or on DVD.

Easy Shopping with the Industry Mall



The Industry Mall is the virtual department store of Siemens AG in the Internet. Here you have access to a huge range of products presented in electronic catalogs in an informative and attractive way.

Data transfer via EDIFACT allows the whole procedure from selection through ordering to tracking of the order to be carried out online via the Internet.

Numerous functions are available to support you.

For example, powerful search functions make it easy to find the required products, which can be immediately checked for availability. Customer-specific discounts and preparation of quotes can be carried out online as well as order tracking and tracing.

Please visit the Industry Mall on the Internet under:

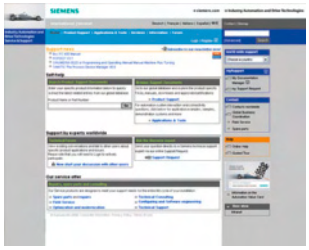
http://www.siemens.com/automation/mall

Services covering the entire life cycle

Our Service & Support accompanies you worlwide in all concerns related to the automation and drive technology of Siemens. In more than 100 countries directly on site and covering all phases of the life cycle of your machines and plants. Round the clock.

An experienced team of specialists with their combined knowhow is ready to assist you. Regular training courses and a close contact of our employees among each other – also across continents – assure a reliable service for multifaceted scopes.

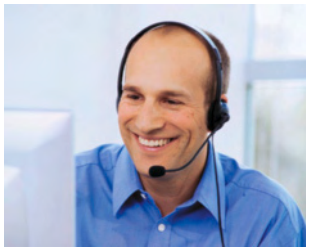
Online Support



The comprehensive information system available round the clock via Internet ranging from Product Support and Service & Support services to Support Tools in the Shop.

http://www.siemens.com/automation/service&support

Technical Support



Competent consulting in technical questions covering a wide range of customer-oriented services for all our products and systems.

http://www.siemens.com/automation/support-request

Technical Consulting

Support in the planning and designing of your project from detailed actual-state analysis, target definition and consulting on product and system questions right to the creation of the automation solution.

Engineering Support

Support in configuring and developing with customer-oriented services from actual configuration to implementation of the automation project.

Field Service

With Field Service, we offer services for startup and maintenance essential for ensuring system availability.

Spare Parts and Repairs

In the operating phase of a machine or automation system, we provide a comprehensive repair and spare parts service ensuring the highest degree of plant availability.

Optimization and Upgrading

After startup or during the operating phase, additional potential for inceasing the productiviy or for reducing costs often arises. For this purpose, we offer you high-quality services in optimization and upgrading.

You find contact details in the Internet under:
http://www.siemens.com/automation/service&support

Knowledge Base on DVD

For locations without online connections to the Internet there are excerpts of the free part of the information sources available on DVD (Service & Support Knowledge Base). This DVD contains all the latest product information at the time of production (FAQs, Downloads, Tips and Tricks, Updates) as well as general information on Service & Support.

The DVD also includes a full-text search and our Knowledge Manager for targeted searches for solutions. The DVD will be updated every 4 months.

Just the same as our online offer in the Internet, the Service & Support Knowledge Base on DVD comes complete in 5 languages (German, English, French, Italian, Spanish).

You can order the **Service & Support Knowledge Base** DVD from your Siemens contact.

Order no. **6ZB5310-0EP30-0BA2**

Automation Value Card

Small card – great support

The Automation Value Card is an integral component of the comprehensive service concept with which Siemens Automation and Drives will accompany you in each phase of your automation project.

It doesn't matter whether you want just specific services from our Technical Support or want to purchase something on our Online portal, you can always pay with your Automation Value Card. No invoicing, transparent and safe. With your personal card number and associated PIN you can view the state of your account and all transactions at any time.

Services on card. This is how it's done.

Card number and PIN are on the back of the Automation Value Card. When delivered, the PIN is covered by a scratch field, guaranteeing that the full credit is on the card.

By entering the card number and PIN you have full access to the Service & Support services being offered. The charge for the services procured is debited from the credits on your Automation Value Card.

All the services offered are marked in currency-neutral credits, so you can use the Automation Value Card worldwide.

Order your Automation and Value Card easily and comfortably like a product with your sales contact.

Automation Value Card order numbers	
Credits	Order no.
200	**6ES7 997-0BA00-0XA0**
500	**6ES7 997-0BB00-0XA0**
1000	**6ES7 997-0BC00-0XA0**
10000	**6ES7 997-0BG00-0XA0**

Detailed information on the services offered is available on our Internet site at:

http://www.siemens.com/automation/service&support

Service & Support à la Card: Examples

Technical Support	
"Priority"	Priority processing for urgent cases
"24 h"	Availability round the clock
"Extended"	Technical consulting for complex questions
"Mature Products"	Consulting service for products that are not available any more
Support Tools in the Support Shop	
	Tools that can be used directly for configuration, analysis and testing

Appendix

Notes

Conditions of sale and delivery
Export regulations

Terms and Conditions of Sale and Delivery

By using this catalog you can acquire hardware and software products described therein from Siemens AG subject to the following terms. Please note! The scope, the quality and the conditions for supplies and services, including software products, by any Siemens entity having a registered office outside of Germany, shall be subject exclusively to the General Terms and Conditions of the respective Siemens entity. The following terms apply exclusively for orders placed with Siemens AG.

For customers with a seat or registered office in Germany

The "General Terms of Payment" as well as the "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry" shall apply.

For software products, the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or registered Office in Germany" shall apply.

For customers with a seat or registered office outside of Germany

The "General Terms of Payment" as well as the "General Conditions for Supplies of Siemens, Automation and Drives for Customers with a Seat or registered Office outside of Germany" shall apply.

For software products, the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or registered Office outside of Germany" shall apply.

General

The dimensions are in mm. In Germany, according to the German law on units in measuring technology, data in inches only apply to devices for export.

Illustrations are not binding.

Insofar as there are no remarks on the corresponding pages, - especially with regard to data, dimensions and weights given - these are subject to change without prior notice.

The prices are in € (Euro) ex works, exclusive packaging.

The sales tax (value added tax) is not included in the prices. It shall be debited separately at the respective rate according to the applicable legal regulations.

Prices are subject to change without prior notice. We will debit the prices valid at the time of delivery.

Surcharges will be added to the prices of products that contain silver, copper, aluminum, lead and/or gold if the respective basic official prices for these metals are exceeded. These surcharges will be determined based on the official price and the metal factor of the respective product.

The surcharge will be calculated on the basis of the official price on the day prior to receipt of the order or prior to the release order.
The metal factor determines the official price as of which the metal surcharges are charged and the calculation method used. The metal factor, provided it is relevant, is included with the price information of the respective products.

An exact explanation of the metal factor and the text of the Comprehensive Terms and Conditions of Sale and Delivery are available free of charge from your local Siemens business office under the following Order Nos.:

- 6ZB5310-0KR30-0BA1
  (for customers based in Germany)
- 6ZB5310-0KS53-0BA1
  (for customers based outside Germany)

or download them from the Internet
http://www.siemens.com/automation/mall
(Germany: Industry Mall Online-Help System)

Export regulations

The products listed in this catalog / price list may be subject to European / German and/or US export regulations.

Therefore, any export requiring a license is subject to approval by the competent authorities.

According to current provisions, the following export regulations must be observed with respect to the products featured in this catalog / price list:

AL	Number of the German Export List Products marked other than "N" require an export license. In the case of software products, the export designations of the relevant data medium must also be generally adhered to. Goods labeled with an "AL" not equal to "N" are subject to a European or German export authorization when being exported out of the EU.
ECCN	Export Control Classification Number Products marked other than "N" are subject to a reexport license to specific countries. In the case of software products, the export designations of the relevant data medium must also be generally adhered to. Goods labeled with an "ECCN" not equal to "N" are subject to a US re-export authorization.

Even without a label or with an "AL: N" or "ECCN: N", authorization may be required due to the final destination and purpose for which the goods are to be used.

The deciding factors are the AL or ECCN export authorization indicated on order confirmations, delivery notes and invoices.

Errors excepted and subject to change without prior notice.

I IA/DT /VuL_ohne MZ/En 12.05.09

Catalogs

Industry Automation, Drive Technologies and Electrical Installation Technology

Further information can be obtained from our branch offices listed in the appendix or at www.siemens.com/automation/partner

Interactive catalog on DVD

	Catalog
for Industry Automation, Drive Technologies and Electrical Installation Technology	**CA 01**

Drive Systems

Variable-Speed Drives	
SINAMICS G110/SINAMICS G120 Inverter Chassis Units SINAMICS G120D Distributed Frequency Inverters	D 11.1
SINAMICS G130 Drive Converter Chassis Units, SINAMICS G150 Drive Converter Cabinet Units	D 11
SINAMICS GM150/SINAMICS SM150 Medium-Voltage Converters	D 12
SINAMICS S150 Drive Converter Cabinet Units	D 21.3
Asynchronous Motors Standardline	D 86.1
Synchronous Motors with Permanent-Magnet Technology, HT-direct	D 86.2
DC Motors	DA 12
SIMOREG DC MASTER 6RA70 Digital Chassis Converters	DA 21.1
SIMOREG K 6RA22 Analog Chassis Converters	DA 21.2
PDF: SIMOREG DC MASTER 6RM70 Digital Converter Cabinet Units	*DA 22*
SIMOVERT PM Modular Converter Systems	DA 45
SIEMOSYN Motors	DA 48
MICROMASTER 420/430/440 Inverters	DA 51.2
MICROMASTER 411/COMBIMASTER 411	DA 51.3
SIMOVERT MASTERDRIVES Vector Control	DA 65.10
SIMOVERT MASTERDRIVES Motion Control	DA 65.11
Synchronous and asynchronous servomotors for SIMOVERT MASTERDRIVES	DA 65.3
SIMODRIVE 611 universal and POSMO	DA 65.4
SIMOTION, SINAMICS S120 and Motors for Production Machines	PM 21
SINAMICS S110 The Basic Positioning Drive	PM 22
Low-Voltage Three-Phase-Motors	
IEC Squirrel-Cage Motors	D 81.1
MOTOX Geared Motors	D 87.1
Automation Systems for Machine Tools SIMODRIVE	NC 60
• Motors	
• Converter Systems SIMODRIVE 611/POSMO	
Automation Systems for Machine Tools SINAMICS	NC 61
• Motors	
• Drive System SINAMICS S120	
Drive and Control Components for Hoisting Equipment	HE 1
Mechanical Driving Machines	
Flender Standard Couplings	MD 10.1

Electrical Installation Technology

PDF: ALPHA Distribution Boards and Terminal Blocks	*ET A1*
PDF: ALPHA 8HP Molded-Plastic Distribution System	*ET A3*
PDF: BETA Low-Voltage Circuit Protection	*ET B1*
PDF: DELTA Switches and Socket Outlets	*ET D1*
PDF: GAMMA Building Management Systems	*ET G1*

PDF: These catalogs are only available as pdf files.

Motion Control

	Catalog
SINUMERIK & SIMODRIVE Automation Systems for Machine Tools	NC 60
SINUMERIK & SINAMICS Automation Systems for Machine Tools	NC 61
SIMOTION, SINAMICS S120 and Motors for Production Machines	PM 21
SINAMICS S110 The Basic Positioning Drive	PM 22

Low-Voltage

Controls and Distribution – SIRIUS, SENTRON, SIVACON	LV 1
Controls and Distribution – Technical Information SIRIUS, SENTRON, SIVACON	LV 1 T
SICUBE System Cubicles and Cubicle Air-Conditioning	LV 50
SIDAC Reactors and Filters	LV 60
SIVACON 8PS Busbar Trunking Systems	LV 70

Process Instrumentation and Analytics

Field Instruments for Process Automation	FI 01
PDF: Indicators for panel mounting	*MP 12*
SIREC Recorders and Accessories	MP 20
SIPART, Controllers and Software	MP 31
PDF: Products for Weighing Technology	*WT 10*
Process Analytical Instruments	PA 01
PDF: Process Analytics, Components for the System Integration	*PA 11*

SIMATIC HMI

Human Machine Interface Systems	ST 80

SIMATIC Industrial Automation Systems

Products for Totally Integrated Automation and Micro Automation	ST 70
SIMATIC PCS 7 Process Control System	ST PCS 7
Add-ons for the SIMATIC PCS 7 Process Control System	ST PCS 7.1
Migration solutions with the SIMATIC PCS 7 Process Control System	ST PCS 7.2
pc-based Automation	ST PC
SIMATIC Control Systems	ST DA

SIMATIC NET

Industrial Communication	IK PI

SIMATIC Sensors

Sensors for Factory Automation	FS 10

Systems Engineering

Power supply SITOP	KT 10.1
System cabling SIMATIC TOP connect	KT 10.2

System Solutions

Applications and Products for Industry are part of the interactive catalog CA 01

TELEPERM M Process Control System

PDF: AS 488/TM automation systems	*PLT 112*

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Industry Automation Division
Systems Engineering
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