



BLOCK CATALOGUE 2

Switched mode power supplies / Power supply accessories / Electronic fuse / Redundant module
Uninterruptible power supplies / Transformer power supplies / Step-down converter DC/DC

DC POWER SUPPLIES



perfecting power



Catalogues

Catalogue 1 TRANSFORMERS

- Control transformers
- Isolating transformers
- Safety transformers
- PCB transformers
- Dry-type power transformers
- Autotransformers / Adapter transformers
- Toroidal transformers
- 100 Vac transformers
- Electronic transformers
- Starting current limiters
- Energy-saving systems
- Testing and measuring equipment
- Winding wires
- Housings
- Inductive components for switched mode power supplies

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Catalogue 2 DC POWER SUPPLIES

- Switched mode power supplies, PEL series
- Switched mode power supplies, PowerVision series
- Switched mode power supplies, PSR series
- Electronic circuit breakers
- Redundancy modules
- Capacitive buffer modules
- Uninterruptible power supplies
- DC-DC converters
- Linear stabilised transformer power supplies
- Non stabilised transformer power supplies
- Adapter transformers for power supplies

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Catalogue 3 EMC FILTERS/REACTORS

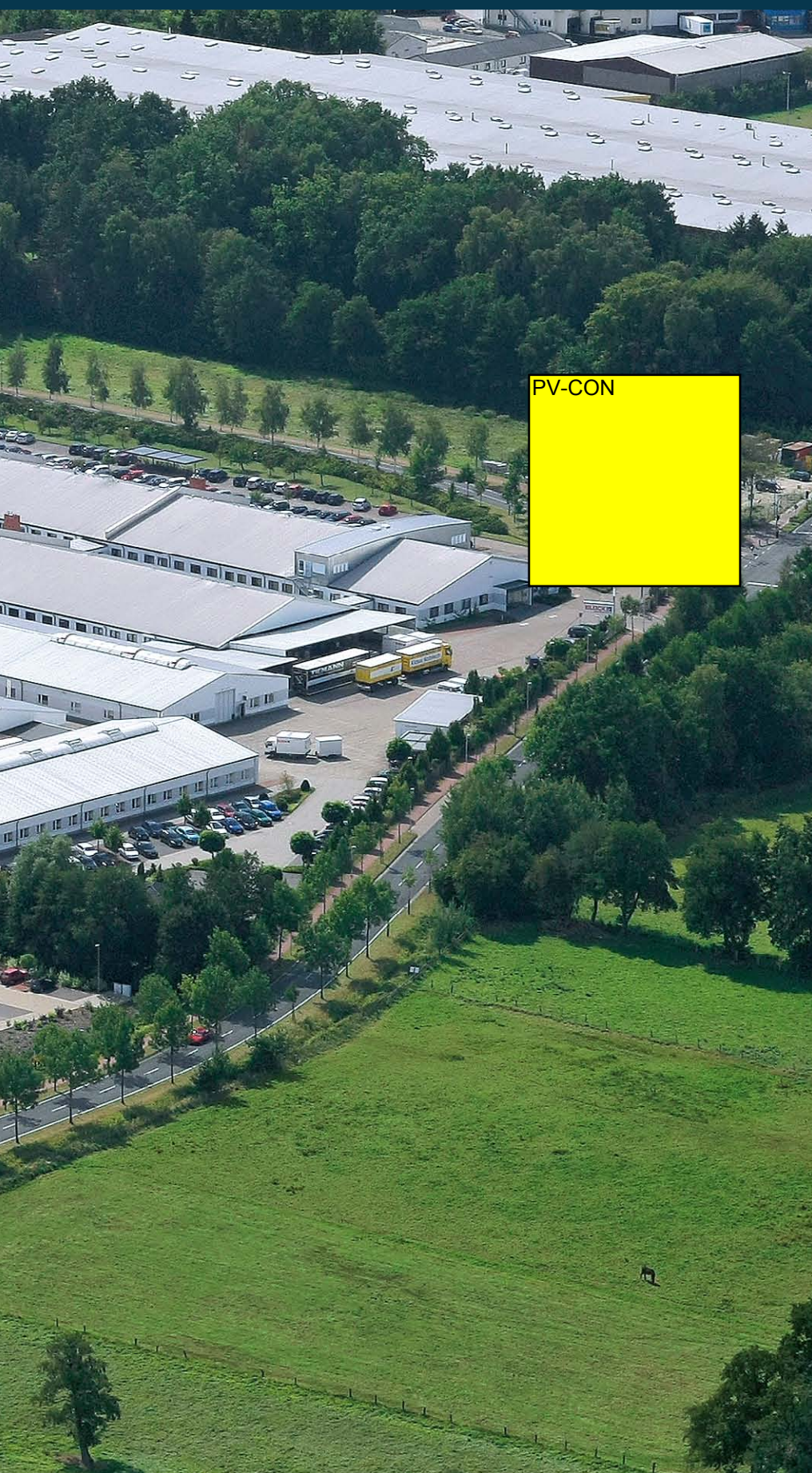
- Line reactors
- Filter reactors
- Harmonics filters
- Interference filters
- Sinusoidal filters
- All-pole filters
- Motor reactors
- Stabilisers
- Testing lab

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PV-CON

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BLOCK's products and solutions guarantee maximum voltage and power supply quality in every single area of business and industry. Encompassing over 2200 standard products as well as a myriad of customised solutions, our extensive product portfolio is a reliable choice for customers throughout the world who want exactly the right amount of power and power quality.

Our transformers, power supplies, reactors and interference filters, not to mention our other innovative products and solutions, improve the efficiency of devices, plants, control facilities and systems by minimising the wear and tear these experience, extending their service life and enabling them to use energy in a way that is more efficient and cost-effective.

All BLOCK products are developed and produced in-house, from the research and development phase to production and quality assurance, right through to certification. At our in-house testing lab, we perform tests relating to electromagnetic compatibility (EMC) and device safety, as well as simulating environmental influences.

Through our unwavering commitment to providing customers with everything they need from a single source, we can respond to even the most unconventional demands using an approach that is highly flexible, prompt and creative.

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Contacts around the globe.

Commercial relationships reaching all four corners of the globe have long been a reality here at BLOCK. When it comes to connecting to the grid, our products are the first choice in many countries. With six BLOCK companies as well as numerous national and international agencies situated right across the globe, we successfully supply international markets with transformers, reactors, EMC filters, switched mode power supplies, and much more.

Well over half of our deliveries are exported to destinations throughout the world. This being the case, it goes without saying that precise knowledge of the technical requirements and standards of individual countries is a must. That's why all the key national and international marks of conformity are applied to BLOCK products.

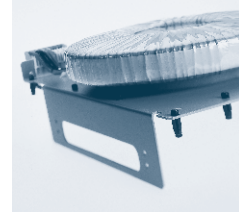
Comprehensive warehousing facilities ensure items are available quickly, keeping downtimes to a minimum, whilst our logistics system gets them to our customers without delay.

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Individual

Our practical collaborative work with industry means that we here at BLOCK are continually able to develop sophisticated solutions. Thanks to our unique vertical range of manufacture as well as our unparalleled technological expertise, we can address individual customer requirements and problems directly. The result is applications

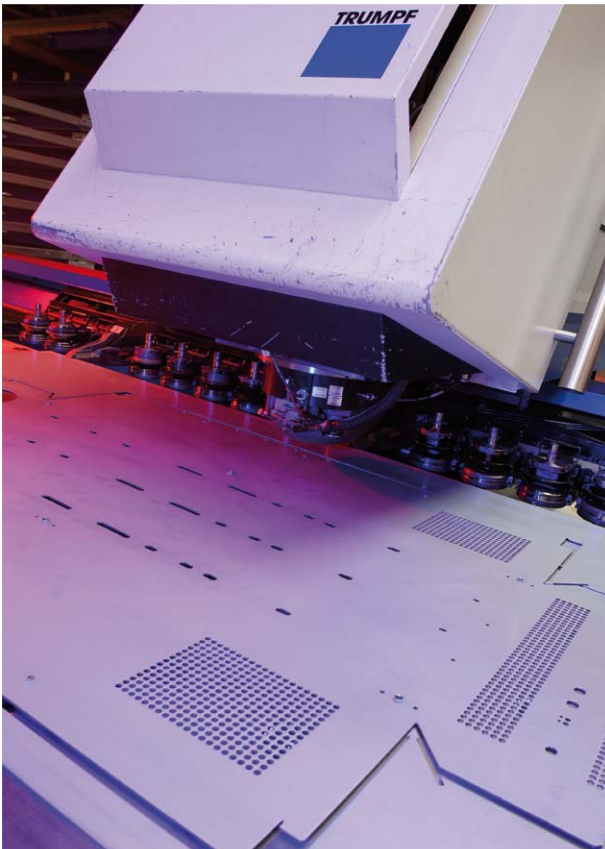
tailored specifically to our customers, which are ultimately transformed into products at our prototyping facilities. Our cutting-edge machinery means we have the tools to produce both individual and series-manufactured items cost-effectively and with a short lead time. So we can make specific customer requirements a reality.



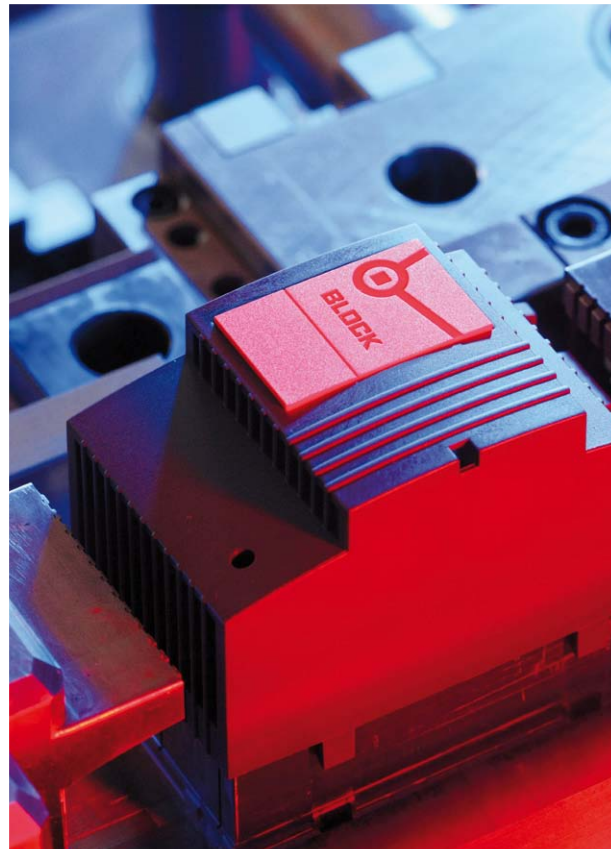
A space-saving toroidal transformer developed specifically for lifts.

CUSTOM MADE

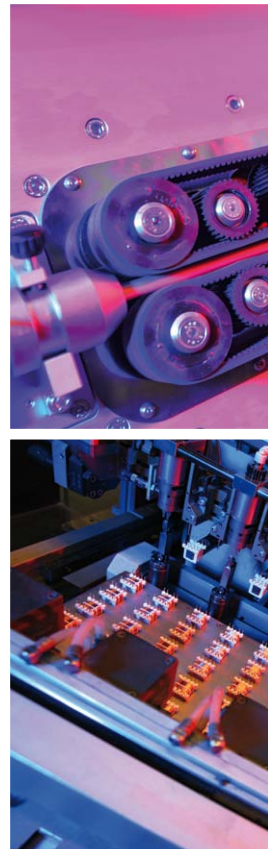
2500 m² punching and nibbling machines for metalworking



Plastic injection moulding with in-house toolmaking facilities



Automated cable assembly
Fully automatic coil production
for small transformers

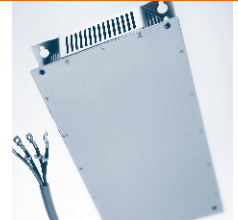


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**CUSTOM
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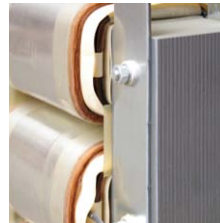


Cable drums (filters) for tractors, to supply power out in fields.

EMC filters, suitable for a frequency converter

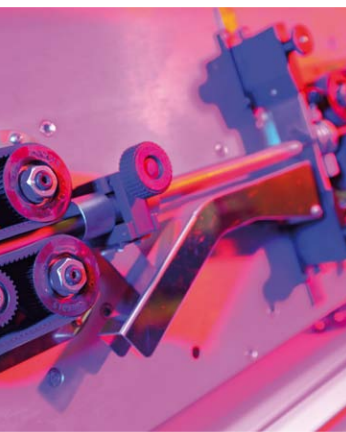


Ferrite components for rail engineering



Welding transformer

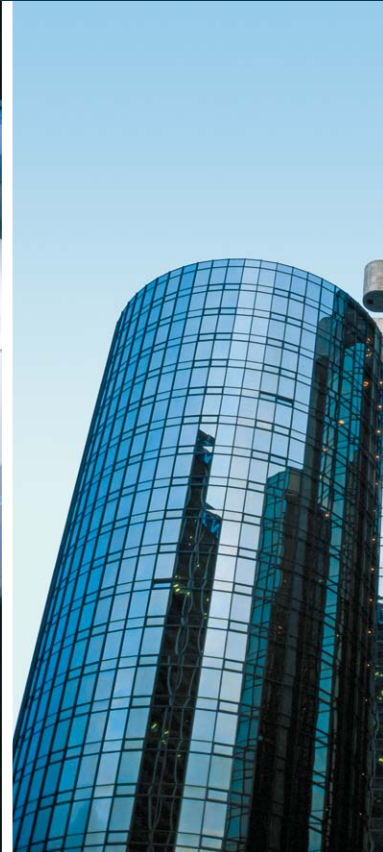
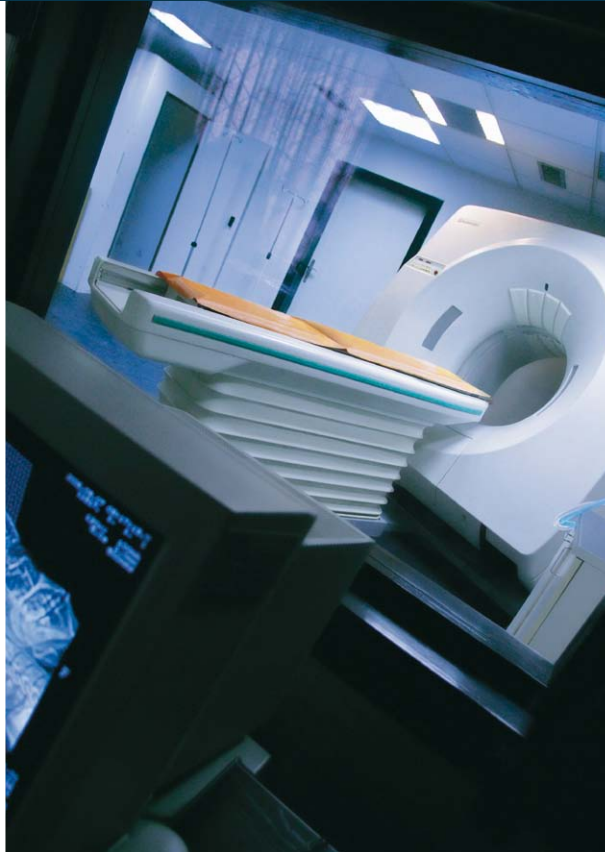
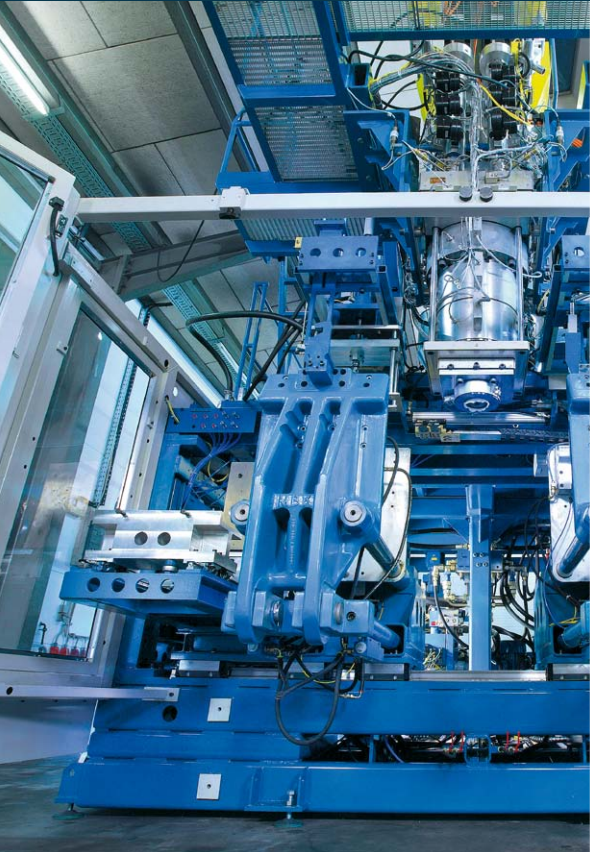
Europe's largest low-voltage winding machine combining foil and wire winding



State-of-the-art production lines: SMD printed circuit board manufacturing



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CUSTOM MADE

Individual

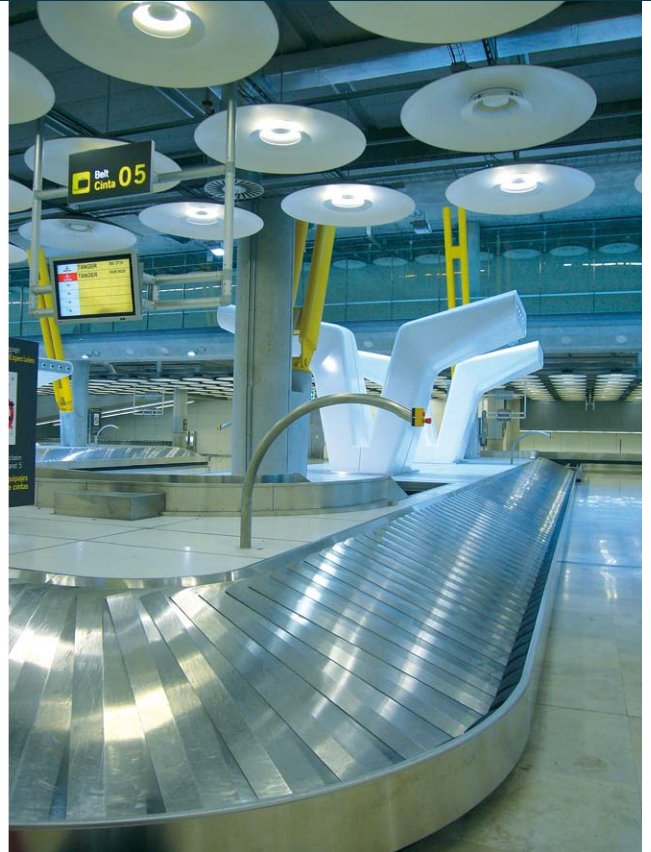
You can find our products and solutions at work no matter which business and industrial sectors you look in - from mechanical and system engineering to drive, materials handling and medical technology, regenerative energies and energy efficiency, building infrastructure, shipbuilding and rail engineering. We focus our efforts on what we can realistically achieve through technology and on maximum product quality. That's why we're able to pass major benefits on to customers across the world, and particularly in our target markets of Europe, Asia and the USA.



Built-in door power supplies for building technology



Power supplies for LED street lighting technology



Reactors for generating energy in wind turbines

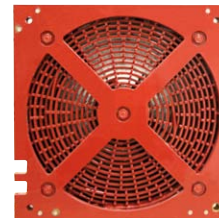


Harmonics filters for drive technology

Switched mode power supply for high-intensity floodlights, for lighting up buildings and large events



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 MADE**

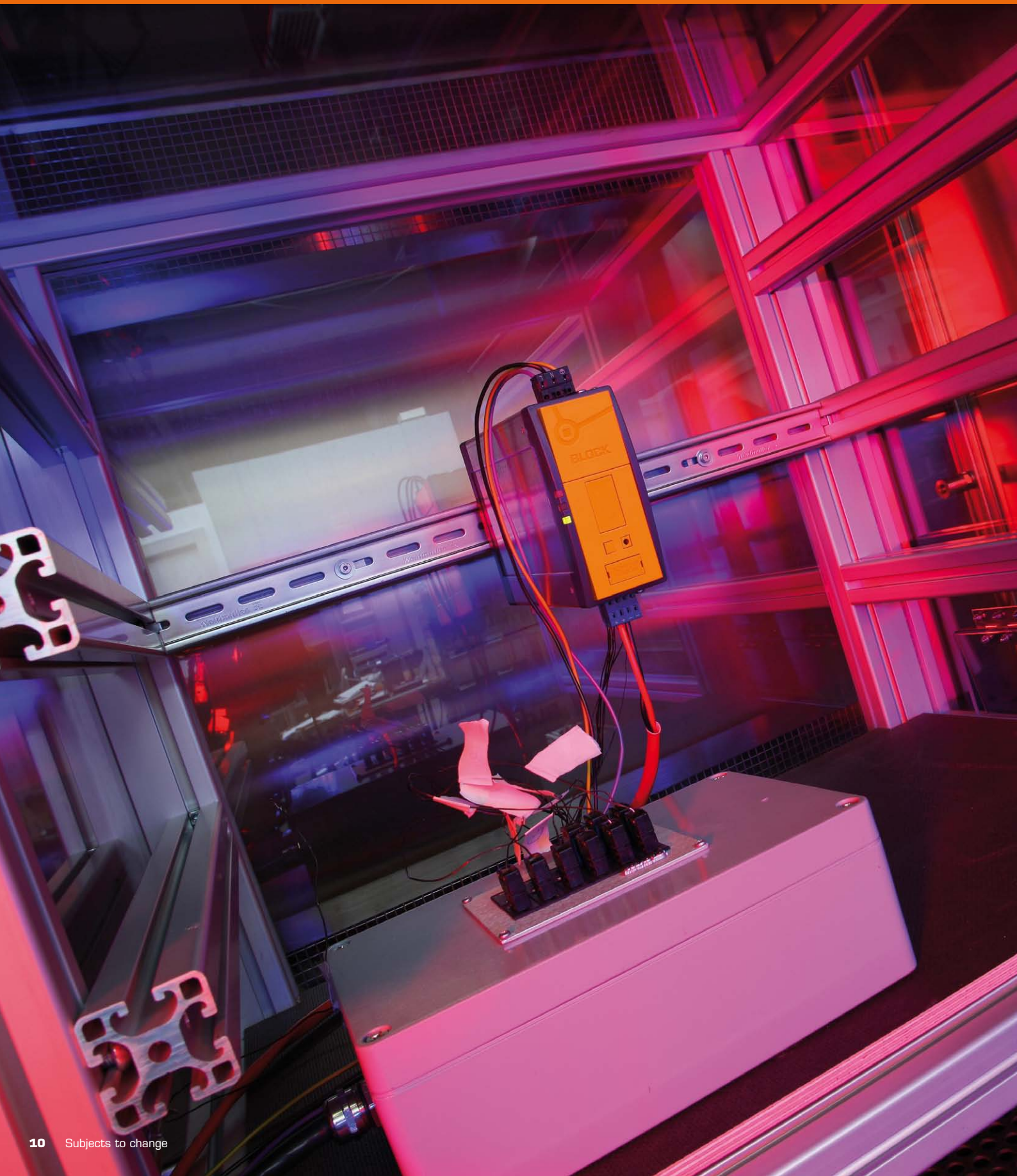


Reactors for rail engineering

Transformers for the ground power supply at airports



Overview of sections



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Switched mode power supplies



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Transformer power supplies

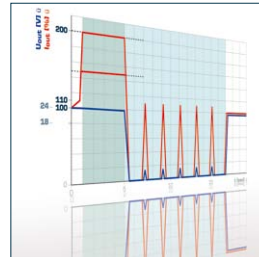


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Technical informations

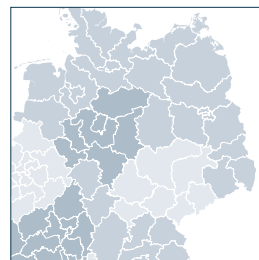


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Agencies
Distributors
General terms and conditions



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2.1

Switched mode power supplies

OVERVIEW SWITCHED MODE POWER SUPPLIES AND MODULES 14

PEL series 20

PEL 21
single phase, 12, 18, 24 Vdc, 1.3 - 6.5 A, low step profile

PELR 25
Redundant module, 12 - 24 Vdc, 2 x 5 / 1 x 10 A

PowerVision series 28

PVSE 230 30
single phase, 12 - 48 Vdc, 3 - 20 A, Real Power Boost, Top Boost

PVSE 400 35
three phase, 24 - 48 Vdc, 10 - 40 A, Real Power Boost, Top Boost

PVSB 400 40
three phase, 24 Vdc, 10 - 40 A, Real Power Boost, Top Boost, output current and voltage monitoring

PVSL 400 44
three phase, 24 Vdc, 10 - 40 A, Real Power Boost, Top Boost, output current and voltage monitoring, power input monitoring

PVFE 48
Electronic fuse, 24 Vdc, output rated current up to 2/4 x 6 A, 2/4 x 10 A

PVFB 51
Electronic fuse, 24 Vdc, output rated current 4 x 8 A

PVRE 54
Redundant module, 24 Vdc, output rated current 40 A

PVRB 57
Redundant module, 24 Vdc, output rated current 20 A, current and voltage monitoring

PVUC 60
Buffer module, 24 Vdc, 10 - 20 A



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Transformer power supplies

PVUA Uninterruptible power supply, 24 Vdc, 10 - 20 A	63
PVA Accumulator module for PVUA, 24 Vdc, 3.2 - 12 Ah	66
PVAF Accumulator module for PVUA, 24 Vdc, 1.2 - 12 Ah	69
PVAT3 Autotransformer, three phase, from 690 up to 400 Vac	71
PV-KOK2 Communication cable for the product line PowerVision	74
PV-WB2 Plate for direct wall screw mounting sideways, for all PowerVision devices	74
PV-TS35M Equipment for rail mounting sideways, for all PowerVision devices	74
PV-USB/SERIELL USB converter for the product line PowerVision	75
PV-CON Female plug for the product line PowerVision	75
PSR series	76
PSR 230 single phase, 12 - 48 Vdc, 1 - 15 A, GL approval	76
PSRA 3 Primary switch mode power supply for AS-i bus system., single phase, 30.5 Vdc, 3 A, GL approval	80
PSR 500 three phase, 24 Vdc, 5 - 40 A	83
DC/DC converter	86
SDC input rated voltage 10 - 60 Vdc, output rated voltage 4.5 - 30 Vdc, output rated current 0 - 20 A	86

OVERVIEW TRANSFORMER POWER SUPPLIES LINEAR STABILISED

GLS **90**
single phase, 24 Vdc, 0.5 - 5 A

LPS 230 **93**
single phase, 115 or 230 Vac, 5 - 15 Vdc, 1 - 15 A

OVERVIEW TRANSFORMER POWER SUPPLIES NON-STABILISED

DCT **98**
single phase, 12 - 24 Vdc, 0.5 - 4 A,
rail mounting

GLC **102**
single phase, 230 or 400 Vac, 24 Vdc, 1 - 10 A,
rail mounting

GNC **107**
single phase, 230 and 400 Vac, 24 Vdc, 2.5 - 15 A

DNC **111**
three phase, universal input voltage,
24 Vdc, 4 - 50 A

UDNC **115**
three phase, universal input voltage,
24 Vdc, 9 - 46 A

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Overview switched mode power supplies

PowerVision series



PowerVision, a product line that's a leading light in the world of power supplies in terms of its technical and economical benefits. PowerVision is a true system of perfectly matched components: all of the modules are slim, feature communication capabilities and boast maximum power reserves for optimum system availability. And all this is available at a cost that won't break the bank. This concept has been brought to life thanks to unique innovations such as the fully equipped Line versions, which do away with the need for a whole range of other diagnostics modules in the wiring cabinet. What's more, the built-in fault memory provides a truly easy means of troubleshooting any faults which might occur in the system. The power supply system is complemented by other modules which increase the operational reliability of machines and systems still further.

PEL series



Our powerful miniature units ensure optimum power supply for miniature controllers. The output voltage can be set easily using the rotary potentiometer on the front of the housing. A powerful and flexible option that's still light and compact.

PSR series









Our star products with universal appeal: ideal for voltage supplies virtually anywhere in the world thanks to their wide-range inputs. Whether they're being used in industrial applications or hooked up to public supply networks, our primary switched-mode regulators will guarantee a secure connection wherever they are. The DIN rail fastening method and pluggable spring-loaded terminals ensure quick and easy mounting.

Power at a glance

Rated output voltage	Type	Rated input voltage	20 – 30 W	50 – 60 W	70 – 100 W	120 W	180 – 240 W	450 – 480 W	720 – 960 W	Page
12 Vdc	PEL	100 – 240 Vac	2 A	4 A	6,5 A					21
	PSR	100 – 240 Vac	2 A	4 A	8 A					76
	PVSE	100 – 240 Vac			6 A	10 A	15 A			30
18 Vdc	PEL	100 – 240 Vac	1,1 A							21
24 Vdc	PEL	100 – 240 Vac	1,3 A	2,5 A	4 A					21
	PSR	100 – 240 Vac	1,3 A	2,5 A		5 A	10 A			76
	PVSE	110 – 240 Vac			3 A	5 A	10 A	20 A		30
30 Vdc	PVSE	110 – 240 Vac						15 A		30
AS-i	PSRA 3	85 – 264 Vac			3 A					80
48 Vdc	PVSE	110 – 240 V					5 A	10 A		30
24 Vdc	PVSE	3 x 400 – 500 Vac					10 A	20 A	40 A	35
	PVSB	3 x 400 – 500 Vac					10 A	20 A	40 A	40
	PVSL	3 x 400 – 500 Vac					10 A	20 A	40 A	44
	PSR	3 x 400 Vac				5 A	10 A	20 A	40 A	83
	PVSE	3 x 400 – 500 Vac							25 A	35
30 Vdc	PVSE	3 x 400 – 500 Vac							25 A	35
48 Vdc	PVSE	3 x 400 – 500 Vac							20 A	35
	PSR	3 x 400 Vac				5 A				83

Additional modules

	Electronic circuit breakers	Redundancy modules	Capacitive buffer modules	UPS Accumulator management	Accumulator modules	Page
Power Vision						45
PEL						45

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Real Power Boost: Reliable starting of heavy loads thanks to huge power reserves [Page 123](#)



Top Boost: Transient current rise makes possible the selective tripping of circuit breakers at 24 Vdc [Page 124](#)



LED signalling: Colour-coded LEDs provide information about the operational status of the device



Parallel connection option: For increased power and redundancy



2-phase operation: Error-free function 3-phase devices even if one phase fails irreparably



Active inrush current limiting: Actively limits the inrush current of the devices to the rated input current



Interface: Used to set the device parameters and to visualise relevant operating data [Page 125](#)



DC current and voltage monitoring: Permanent current and voltage monitoring at 24 Vdc



AC power input monitoring: Permanent monitoring of voltage, frequency and phase sequence direction on the primary side



Configurable overcurrent behaviour: Implementation of output characteristic for optimum dimensioning of the entire system [Page 125](#)



Display: Used to set the device parameters and visualise operating data. Active signal outputs:



Active signal outputs for remote monitoring



Isolated signal contact for remote monitoring



Stabilised output voltage: Stabilised and configurable output voltage



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LED signalling: Colour-coded LEDs provide information about the operational status of the device



Parallel connection option:
For increased power and redundancy



Active current limiting in the event of an error:
Current limiting is activated in the event of an overload at the device output



Interface: Used to set the device parameters and to visualise relevant operating data
[Page 125](#)



DC current and voltage monitoring:
Permanent current and voltage monitoring at 24 Vdc



Configurable overcurrent behaviour: Implementation of output characteristic for optimum dimensioning of the entire system
[Page 125](#)



Display: Used to set the device parameters and visualise operating data. Active signal outputs:



Active signal outputs for remote monitoring



Isolated signal contact for remote monitoring

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PEL power supplies

Our powerful miniature units ensure optimum power supply for miniature controllers. Versions with a 12, 18 and 24 V output voltage are available, enabling them to be used in a whole range of different ways - making them a powerful and flexible option that's still light and compact. Our real all-rounders, these power supply units are suitable for a highly diverse range of applications (solar, measurement and control technology as well as industrial and building automation). When hooked up to public supply networks, our primary switched-mode regulators ensure a secure connection - wherever they are used. The DIN rail fastening method and spring-loaded terminals make for quick and easy mounting.

24 Vdc
18 Vdc
12 Vdc



Single phase, primary switched mode power supply
PEL



General Data

Input rated voltage 100 - 240 Vac
Output rated voltage 12 - 24 Vdc
Output rated current 1.3 - 6.5 A
Ambient temperature -25° C to +55° C
Efficiency up to 88 %
Protection index IP 20

Advantages

Stabilised and adjustable output voltage
DC OK signalling via LEDs
Parallel connection option
Service-friendly spring-loaded connector system
Panel installation on mounting rails

Applications

Primary switch mode power supply is concentrated on the core task of voltage and current supply. Flat step profile optimized for installation in control panels in the building automation.

Standards

Primary switched mode power supply to UL 60950, UL 508

Safety:
EN 61558-2-17, EN 60950 (SELV)

EMC:
EN 61204-3

Certifications



UL/CSA 60950 recognised, UL508 listed, Germanischer Lloyd

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SWITCHED MODE POWER SUPPLIES/ PEL SERIES



Single phase, primary switched mode power supply **PEL**

Type	PEL 230/12-2	PEL 230/12-4	PEL 230/12-6,5	PEL 230/18-1,1
Electrical data				
<u>Input</u>				
Input rated voltage	100 - 240 Vac	100 - 240 Vac	100 - 240 Vac	100 - 240 Vac
Input voltage range	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)
Input rated current (rated load)	0.7 / 0.4 A (110 / 230 Vac)	0.9 / 0.5 A (110 / 230 Vac)	1.6 / 0.9 A (110 / 230 Vac)	0.6 / 0.4 A (110 / 230 Vac)
Rated frequency range	44 - 66 Hz / 0 Hz	44 - 66 Hz / 0 Hz	44 - 66 Hz / 0 Hz	44 - 66 Hz / 0 Hz
Starting current limiter	<30 A, NTC	<30 A, NTC	<30 A, NTC	<30 A, NTC
Input fuse internal	2 A (slow-blow)	2 A (slow-blow)	4 A (slow-blow)	2 A (slow-blow)
Recommended back-up fuse (circuit breaker)	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C
Mains buffering	10 / 80 ms	10 / 80 ms	15 / 100 ms	10 / 80 ms
<u>Output</u>				
Output rated voltage	12 Vdc ±2 %	12 Vdc ±2 %	12 Vdc ±2 %	18 Vdc ±2 %
Output voltage range	10.5 - 15.5 Vdc	10.5 - 15.5 Vdc	10.5 - 15.5 Vdc	15.5 - 19.0 Vdc
Output rated current	2.00 A	4.00 A	6.50 A	1.10 A
Overload behaviour	Constant current	Constant current	Constant current	Constant current
Ripple factor	typ. 100 mVss	typ. 100 mVss	typ. 100 mVss	typ. 100 mVss
Parallel connection	Yes	Yes	Yes	Yes
Serial operation	Yes	Yes	Yes	Yes
Efficiency	typ. 80 %	typ. 85 %	typ. 87 %	typ. 80 %
<u>Signalling</u>				
Power Good (DC OK)	LED green	LED green	LED green	LED green
Feedback voltage max.	25 Vdc	25 Vdc	25 Vdc	25 Vdc
<u>Standards</u>				
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply
<u>Approvals</u>				
Approvals	cURus, cULus, GL	cURus (prepared), cULus (prepared), GL	cURus (prepared), cULus (prepared), GL	cURus, cULus, GL
<u>Environment</u>				
Ambient temperature	-25° C to +55° C	-25° C to +55° C	-25° C to +55° C	-25° C to +55° C
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Derating	-3 %/K > +45° C	-3 %/K > +45° C	-3 %/K > +45° C	-3 %/K > +45° C
Current capacity by any mounting position	max. 1.4 A	max. 2.4 A	max. 3.9 A	max. 0.8 A
<u>Safety and protection</u>				
Protection index	IP 20	IP 20	IP 20	IP 20
Safety class	II, (in closed cabinet)	II, (in closed cabinet)	II, (in closed cabinet)	II, (in closed cabinet)
<u>Order numbers</u>				
Order Number	PEL 230/12-2	PEL 230/12-4	PEL 230/12-6,5	PEL 230/18-1,1



Single phase, primary switched mode
power supply
PEL

Type	PEL 230/24-1,3	PEL 230/24-2,5	PEL 230/24-4
Electrical data			
Input			
Input rated voltage	100 - 240 Vac	100 - 240 Vac	100 - 240 Vac
Input voltage range	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)
Input rated current (rated load)	0.7 / 0.4 A (110 / 230 Vac)	1.4 / 0.6 A (110 / 230 Vac)	1.6 / 0.9 A (110 / 230 Vac)
Rated frequency range	44 - 66 Hz / 0 Hz	44 - 66 Hz / 0 Hz	44 - 66 Hz / 0 Hz
Starting current limiter	<30 A, NTC	<30 A, NTC	<30 A, NTC
Input fuse internal	2 A (slow-blow)	2 A (slow-blow)	2 A (slow-blow)
Recommended back-up fuse (circuit breaker)	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C
Mains buffering	10 / 80 ms	10 / 80 ms	15 / 100 ms
Output			
Output rated voltage	24 Vdc ±2 %	24 Vdc ±2 %	24 Vdc ±2 %
Output voltage range	22.8 - 26.4 Vdc	22.8 - 26.4 Vdc	22.8 - 26.4 Vdc
Output rated current	1.30 A	2.50 A	4.00 A
Overload behaviour	Constant current	Constant current	Constant current
Ripple factor	typ. 100 mVss	typ. 100 mVss	typ. 100 mVss
Parallel connection	Yes	Yes	Yes
Serial operation	Yes	Yes	Yes
Efficiency	typ. 82 %	typ. 88 %	typ. 88 %
Signalling			
Power Good (DC OK)	LED green	LED green	LED green
Feedback voltage max.	30 Vdc	30 Vdc	30 Vdc
Standards			
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply
Approvals			
Approvals	cURus, cULus, GL	cURus, cULus, GL	cURus (prepared), cULus (prepared), GL
Environment			
Ambient temperature	-25° C to +55° C	-25° C to +55° C	-25° C to +55° C
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Derating	-3 %/K > +45° C	-3 %/K > +45° C	-3 %/K > +45° C
Current capacity by any mounting position	max. 0.9 A	max. 1.6 A	max. 2.4 A
Safety and protection			
Protection index	IP 20	IP 20	IP 20
Safety class	II, (in closed cabinet)	II, (in closed cabinet)	II, (in closed cabinet)
Order numbers			
Order Number	PEL 230/24-1,3	PEL 230/24-2,5	PEL 230/24-4

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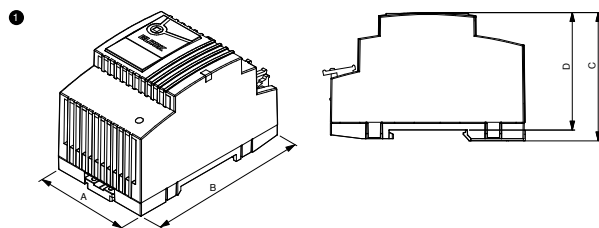
2.4



Single phase, primary switched mode power supply **PEL**

Mechanical data	Typ	Connections output, (spring clamp terminal)	Connections input, (spring clamp terminal)	Mounting position	Fixing method	Weight	Dimension picture (in mm)			
							A	B	C	D
	PEL 230/12-2	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	0.17 kg	54	89	59	54
	PEL 230/12-4	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	0.24 kg	72	89	59	54
	PEL 230/12-6,5	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	0.30 kg	90	89	59	54
	PEL 230/18-1,1	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	0.17 kg	54	89	59	54
	PEL 230/24-1,3	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	0.17 kg	54	89	59	54
	PEL 230/24-2,5	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	0.24 kg	72	89	59	54
	PEL 230/24-4	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	0.30 kg	90	89	59	54

Dimension pictures



Redundant module
PELR



General Data

Input rated voltage 12 - 24 Vdc
Output rated voltage 12 - 24 Vdc
Output rated current 2 x 5/1 x 10 A
Ambient temperature -25° C to +55° C
Efficiency typ. 97 %
Protection index IP 20

Advantages

Signalling via LEDs
Service-friendly spring-loaded connector system
Panel installation on mounting rails

Applications

Redundancy module for decoupling two power supplies for building a fail-safe delivery system. set of machines and equipment requiring high operational reliability.

Standards

Redundancy module
to UL 60950, UL 508

Safety:
EN 60950 (SELV), EN 60204 (PELV)

EMC:
EN 61000-6-3 (Interference emissions), EN 61000-6-2 (Interference immunity)

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Redundant module **PELR**

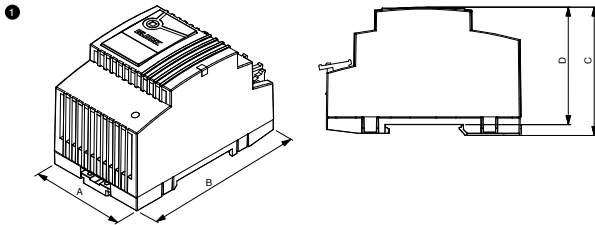
Type		PELR 24/24-5
Electrical data	Input	
	Input rated voltage	24 Vdc
	Input voltage range	11 - 30 Vdc
	Input rated current	2 x 5 A / 1 x 10 A
	Output	
	Output voltage	Uin-0,7 V@10 A
	Output rated current	10.00 A
	Internal fuse	No
	Parallel connection	Yes
	max. Power loss idling/nominal load	1 / 7 W (10 A)
	Efficiency	97 %
	Signalling	
	Operating status	LED green
	Feedback voltage max.	35 Vdc
	Standards	
	Classification	Redundancy module
	Environment	
	Ambient temperature	-25° C bis +55° C
	Storage temperature	-25° C to +85° C
Safety and protection		
Protection index	IP 20	
Safety class	III	
Order numbers		
Order Number	PELR 24/24-5	



Redundant module
PELR

Mechanical data	Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)						
								A	B	C	D		
	PELR 24/24-5	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	0.16 kg	①	72	89	59	54		

Dimension pictures



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The system PowerVision

Versatile and powerful

In addition to three-phase and single-phase switched mode power supplies, system modules ensure a selectively protected, uninterruptible and redundant power supply. All the components for the system concept are available from a single source.

**POWER
VISION**

**powerful
comprehensive
communicative
programmable**



PowerVision power supplies

In addition to the electrical and mechanical data on the following pages, you will find more technical information about the individual PV modules from page 122 in Chapter 2.3

Many of today's projects rely on compact switched mode power supplies which ensure maximum system availability. To meet this demand, we offer an extensive range of high-quality switched mode power supplies - from the Economy version whose main focus is on supplying power, right up to the Line version, which also supports preventive I/O monitoring.

Economy

The low-cost option

The PVSE 230 and PVSE 400 are optimised single-phase or three-phase switched mode power supplies with high-precision output voltage, and are designed to meet all automation technology requirements. They are focused on the key task of supplying voltage and current, and offer maximum power reserves of up to 200% thanks to their real power boost function. Meanwhile, the top boost function provides up to 60 A above the rated current in the event of a fault, which allows you to adopt cost-effective protection measures in the form of standard miniature circuit breakers.

Available with rated output currents of 3, 5, 6, 10, 15 or 20 A for the PVSE 230 and 10, 20, 25 or 40 A for the PVSE 400. Also available with a DC OK signal output and an active starting current limiting option.

Basic

Featuring load monitoring

The PVSB 400 is a three-phase switched mode power supply with high-precision output voltage and is designed to meet all automation technology requirements. It features a multitude of parameterisation and display functions including output current and voltage monitoring. In addition to the PVSE power reserves, a serial interface and four active signal outputs ensure uninterrupted communication with the system environment.

Available with rated output currents of 10, 20 or 40 A; also available with active starting current limiting as an option.

Line

Featuring load and mains supply monitoring

The PVSL 400 is a top-of-the-range three-phase switched mode power supply with high-precision output voltage, and is designed to meet all automation technology requirements. It features a whole range of parameterisation and display functions, including output current and voltage monitoring as well as integrated supply input analysis.

In addition to the features of the Basic version, this model also offers full input monitoring.

Available with rated output currents of 10, 20 or 40 A; also available with active starting current limiting as an option.

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Single phase, primary switched mode power supply, Economy **PVSE 230**



General Data

Input rated voltage 100 - 240 Vac
Output rated voltage 12 - 48 Vdc
Output rated current 3 - 20 A
Ambient temperature -10° C to +70° C
Efficiency up to 92 %
Protection index IP 20

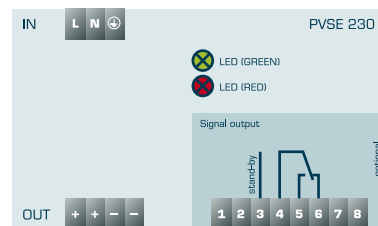
Advantages

Stabilised and adjustable output voltage
Up to 200 % real power boost for 4 seconds
Top boost to trip miniature circuit breakers
DC OK signalling
Stand-by-input
Parallel connection option
Service-friendly spring-loaded connector system
Optional with active inrush current limiter
Panel installation on mounting rails

Applications

Primary switched mode power supply with massive power reserves focussing on the key task of power supply.

Simplified diagram



Standards

Primary switched mode power supply
to UL 60950, UL 508

Safety:
EN 61558-2-17, EN 60950 (SELV), EN 60204 (PELV)

EMC:
EN 61204-3

Certifications



UL/CSA 60950 recognised, UL508 listed



Single phase, primary switched mode
power supply, Economy
PVSE 230

More technical information you will
find on Page 126 in Chapter 2.3

Type	PVSE 230/12-6	PVSE 230/12-10	PVSE 230/12-15	PVSE 230/24-3
Electrical data				
Input				
Input rated voltage	100 - 240 Vac	100 - 240 Vac	100 - 240 Vac	100 - 240 Vac
Input rated current (rated load)	0.86 / 0.51 Aac (110 / 230 Vac)	1.7 / 0.97 Aac (110 / 230 Vac)	1.9 / 0.9 Aac (110 / 230 Vac)	0.86 / 0.51 Aac (110 / 230 Vac)
Input voltage range	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)
Rated frequency range	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz
Starting current limiter	<15 A, NTC	<15 A, NTC	<2 x rated current, active	<15 A, NTC
Input fuse internal	2 A (slow-blow)	4 A (slow-blow)	6.3 A (slow-blow)	2 A (slow-blow)
Recommended back-up fuse (circuit breaker)	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C
Harmonic correction	-	-	active	-
Mains buffering	10 / 70 ms (110 / 230 Vac)	12 / 35 ms (110 / 230 Vac)	30 / 30 ms (110 / 230 Vac)	10 / 70 ms (110 / 230 Vac)
Output				
Output rated voltage	12 Vdc ±1 %	12 Vdc ±1 %	12 Vdc ±1 %	24 Vdc ±1 %
Output voltage range	11 - 18 Vdc	11 - 18 Vdc	11 - 18 Vdc	22 - 29.5 Vdc
Output rated current	6.00 A	10.00 A	15.00 A	3.00 A
Parallel connection	Yes	Yes	Yes	Yes
Power boost	12 A / 4 s (9 A / 8 s)	20 A / 4 s (15 A / 8 s)	30 A / 4 s (22.5 A / 8 s)	6.5 A / 4 s (5.8 A / 8 s)
Overload behaviour	Constant current	Constant current	Constant current	Constant current
max. Power loss idling/nominal load	3.0 / 8.8 W	5.0 / 14.6 W	4.6 / 23.4 W	3.0 / 8.8 W
Serial operation	Yes	Yes	Yes	Yes
Efficiency	typ. 83 %	typ. 87.8 %	typ. 87 %	typ. 87.7 %
Ripple factor	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss
Top Boost	21 A / 25 ms	60 A / 25 ms	55 A / 25 ms	14 A / 25 ms
Signalling				
Stand-by-input	Yes, active at 10 to 28.8 Vdc	Yes, active at 10 to 28.8 Vdc	Yes, active at 10 to 28.8 Vdc	Yes, active at 10 to 28.8 Vdc
Power Good (DC OK)	LED green, LED red	LED green, LED red	LED green, LED red	LED green, LED red
Potential free signal contact	Changeover contact	Changeover contact	Changeover contact	Changeover contact
Active signal outputs	No	No	No	No
Display, interface	No	No	No	No
Feedback voltage max.	25 Vdc	25 Vdc	25 Vdc	35 Vdc
Standards				
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply
Approvals				
Approvals	cURus, cULus	cURus, cULus	cURus, cULus	cURus, cULus
Environment				
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Derating	-3 %/K > +50° C, -5 %/Vac < 95 Vac	-3 %/K > +50° C, -5 %/Vac < 95 Vac	-3 %/K > +50° C, -1.5 %/Vac < 110 Vac	-3 %/K > +50° C, -5 %/Vac < 95 Vac
Ambient temperature	-10° C to +70° C	-10° C to +70° C	-10° C to +70° C	-10° C to +70° C
Safety and protection				
Safety class	I, with PE connection	I, with PE connection	I, with PE connection	I, with PE connection
Protection index	IP 20	IP 20	IP 20	IP 20
Accessory				
Connector for signalling	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)
Order numbers				
Order Number	PVSE 230/12-6	PVSE 230/12-10	PVSE 230/12-15	PVSE 230/24-3

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Single phase, primary switched mode power supply, Economy **PVSE 230**

More technical information you will
find on Page 126 in Chapter 2.3

Type	PVSE 230/24-3B	PVSE 230/24-5	PVSE 230/24-5B	PVSE 230/24-10
Electrical data				
Input				
Input rated voltage	100 - 240 Vac	100 - 240 Vac	100 - 240 Vac	110 - 240 Vac
Input rated current (rated load)	0.86 / 0.51 A (110 / 230 Vac)	1.7/0.97 Aac (110 / 230 Vac)	1.7/0.97 Aac (110 / 230 Vac)	2.5 / 1.2 Aac (110 / 230 Vac)
Input voltage range	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)
Rated frequency range	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz
Starting current limiter	<2 x rated current, active	<15 A, NTC	<2 x rated current, active	<2 x rated current, active
Input fuse internal	2 A (slow-blow)	4 A (slow-blow)	4 A (slow-blow)	6,3 A (slow-blow)
Recommended back-up fuse (circuit breaker)	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	10 A, 16 A, characteristics B, C
Harmonic correction	-	-	-	active
Mains buffering	10 / 70 ms (110 / 230 Vac)	12 / 35 ms (110 / 230 Vac)	12 / 35 ms (110 / 230 Vac)	24 / 24 ms (110 / 230 Vac)
Output				
Output rated voltage	24 Vdc ±1 %	24 Vdc ±1 %	24 Vdc ±1 %	24 Vdc ±1 %
Output voltage range	22 - 29.5 Vdc	22 - 29.5 Vdc	22 - 29.5 Vdc	22 - 29.5 Vdc
Output rated current	3.00 A	5.00 A	5.00 A	10.00 A
Parallel connection	Yes	Yes	Yes	Yes
Power boost	6,5 A / 4 s (5,8 A / 8 s)	10 A / 4 s (7,5 A / 8 s)	10 A / 4 s (7,5 A / 8 s)	20 A / 4 s (15 A / 8 s)
Overload behaviour	Constant current	Constant current	Constant current	Constant current
max. Power loss idling/nominal load	3.0 / 8.8 W	5.0 / 14.6 W	5.0 / 14.6 W	3.5 / 19.7 W
Serial operation	Yes	Yes	Yes	Yes
Efficiency	typ. 87.7 %	typ. 87.8 %	typ. 87.8 %	typ. 91.8 %
Ripple factor	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss
Top Boost	14 A / 25 ms	21 A / 25 ms	21 A / 25 ms	60 A / 25 ms
Signalling				
Stand-by-input	Yes, active at 10 to 28.8 Vdc	Yes, active at 10 to 28.8 Vdc	Yes, active at 10 to 28.8 Vdc	Yes, active at 10 to 28.8 Vdc
Power Good (DC OK)	LED green, LED red	LED green, LED red	LED green, LED red	LED green, LED red
Potential free signal contact	Changeover contact	Changeover contact	Changeover contact	Changeover contact
Active signal outputs	No	No	No	No
Display, interface	No	No	No	No
Feedback voltage max.	35 Vdc	35 Vdc	35 Vdc	35 Vdc
Standards				
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply
Approvals				
Approvals	cURus, cULus	cURus, cULus	cURus, cULus	cURus, cULus
Environment				
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Derating	-3 %/K > +50° C, -5 %/Vac < 95 Vac	-3 %/K > +50° C, -5 %/Vac < 95 Vac	-3 %/K > +50° C, -5 %/Vac < 95 Vac	-3 %/K > +50° C, -1.5 %/Vac < 110 Vac
Ambient temperature	-10° C to +70° C	-10° C to +70° C	-10° C to +70° C	-10° C to +70° C
Safety and protection				
Safety class	I, with PE connection	I, with PE connection	I, with PE connection	I, with PE connection
Protection index	IP 20	IP 20	IP 20	IP 20
Accessory				
Connector for signalling	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)
Order numbers				
Order Number	PVSE 230/24-3B	PVSE 230/24-5	PVSE 230/24-5B	PVSE 230/24-10



Single phase, primary switched mode
power supply, Economy
PVSE 230

More technical information you will
find on Page 126 in Chapter 2.3

Type	PVSE 230/24-20	PVSE 230/30-15	PVSE 230/48-5	PVSE 230/48-10
Electrical data				
Input				
Input rated voltage	110 - 240 Vac	110 - 240 Vac	110 - 240 Vac	110 - 240 Vac
Input rated current (rated load)	5.7 / 2.3 Aac (110 / 230 Vac)	5.7 / 2.3 Aac (110 / 230 Vac)	2.5 / 1.2 Aac (110 / 230 Vac)	5.7 / 2.3 Aac (110 / 230 Vac)
Input voltage range	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)	85 - 264 Vac (120 - 373 Vdc)
Rated frequency range	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz
Starting current limiter	<2 x rated current, active	<2 x rated current, active	<2 x rated current, active	<2 x rated current, active
Input fuse internal	10 A (slow-blow)	10 A (slow-blow)	6.3 A (slow-blow)	10 A (slow-blow)
Recommended back-up fuse (circuit breaker)	10 A, 16 A, characteristics B, C	10 A, 16 A, characteristics B, C	10 A, 16 A, characteristics B, C	10 A, 16 A, characteristics B, C
Harmonic correction	active	active	active	active
Mains buffering	20 / 25 ms (110 / 230 Vac)	20 / 25 ms (110 / 230 Vac)	24 / 24 ms (110 / 230 Vac)	20 / 25 ms (110 / 230 Vac)
Output				
Output rated voltage	24 Vdc ±1 %	30 Vdc ±1 %	48 Vdc ±1 %	48 Vdc ±1 %
Output voltage range	22 - 29.5 Vdc	27 - 43 Vdc	33 - 52 Vdc	33 - 52 Vdc
Output rated current	20.00 A	15.00 A	5.00 A	10.00 A
Parallel connection	Yes	Yes	Yes	Yes
Power boost	30 A / 4 s (125 A / 8 s)	15 A / 4 s (12.5 A / 8 s)	10 A / 4 s (7.5 A / 8 s)	15 A / 4 s (12.5 A / 8 s)
Overload behaviour	Constant current	Constant current	Constant current	Constant current
max. Power loss idling/nominal load	4.8 / 50.2 W	4.8 / 50.2 W	7.4 / 21.6 W	4.8 / 50.2 W
Serial operation	Yes	Yes	Yes	Yes
Efficiency	typ. 91 %	typ. 91 %	typ. 91 %	typ. 91 %
Ripple factor	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss
Top Boost	80 A / 25 ms	70 A / 25 ms	30 A / 25 ms	40 A / 25 ms
Signalling				
Stand-by-input	Yes, active at 10 to 28.8 Vdc	Yes, active at 10 to 28.8 Vdc	Yes, active at 10 to 28.8 Vdc	Yes, active at 10 to 28.8 Vdc
Power Good (DC OK)	LED green, LED red	LED green, LED red	LED green, LED red	LED green, LED red
Potential free signal contact	Changeover contact	Changeover contact	Changeover contact	Changeover contact
Active signal outputs	No	No	No	No
Display, interface	No	No	No	No
Feedback voltage max.	35 Vdc	63 Vdc	63 Vdc	63 Vdc
Standards				
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply
Approvals				
Approvals	cURus (prepared), cULus (prepared)	cURus (prepared), cULus (prepared)	cURus, cULus	cURus (prepared), cULus (prepared)
Environment				
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Derating	-3 %/K > +50° C, -1.5 %/Vac < 110 Vac	-3 %/K > +50° C, -1.5 %/Vac < 110 Vac	-3 %/K > +50° C, -1.5 %/Vac < 110 Vac	-3 %/K > +50° C, -1.5 %/Vac < 110 Vac
Ambient temperature	-10° C to +70° C	-10° C to +70° C	-10° C to +70° C	-10° C to +70° C
Safety and protection				
Safety class	I, with PE connection	I, with PE connection	I, with PE connection	I, with PE connection
Protection index	IP 20	IP 20	IP 20	IP 20
Accessory				
Connector for signalling	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)
Order numbers				
Order Number	PVSE 230/24-20	PVSE 230/30-15	PVSE 230/48-5	PVSE 230/48-10

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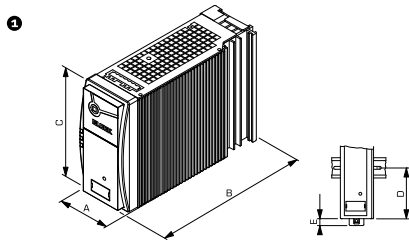


Single phase, primary switched mode power supply, Economy **PVSE 230**

More technical information you will find on Page 126 in Chapter 2.3

Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Connections signalling, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)	A	B	C	D	E
PVSE 230/12-6	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	0.80 kg		40	163.5	127	76	12.5
PVSE 230/12-10	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.10 kg		57	163.5	127	76	12.5
PVSE 230/12-15	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.30 kg		57	179.5	127	76	12.5
PVSE 230/24-3	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	0.80 kg		40	163.5	127	76	12.5
PVSE 230/24-3B	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	0.80 kg		40	163.5	127	76	12.5
PVSE 230/24-5	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.10 kg		57	163.5	127	76	12.5
PVSE 230/24-5B	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.10 kg		57	163.5	127	76	12.5
PVSE 230/24-10	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.30 kg		57	179.5	127	76	12.5
PVSE 230/24-20	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	2.30 kg		97	187.5	127	76	12.5
PVSE 230/30-15	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	2.30 kg		97	187.5	127	76	12.5
PVSE 230/48-5	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.30 kg		57	179.5	127	76	12.5
PVSE 230/48-10	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	2.30 kg		97	187.5	127	76	12.5

Dimension pictures



Three phase, primary switched mode power supply, Economy
PVSE 400



General Data

Input rated voltage 3 x 400 - 500 Vac
Output rated voltage 24 - 48 Vdc
Output rated current 10 - 40 A
Ambient temperature -25° C to +70° C
Efficiency up to 95 %
Protection index IP 20

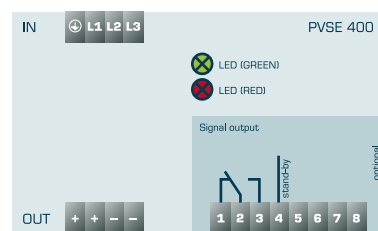
Advantages

Stabilised and adjustable output voltage
Up to 200 % real power boost for 4 seconds
Top boost to trip miniature circuit breakers
DC OK signalling
Parallel connection option
Service-friendly spring-loaded connector system
Can be supplied with active inrush current limiting option
Can be supplied with isolated DC OK signalling function
Panel installation on mounting rails

Applications

Primary switched mode power supply with massive power reserves focussing on the key task of power supply.

Simplified diagram



Standards

Primary switched mode power supply to UL 60950, UL 508

Safety:
EN 61558-2-17, EN 60950 (SELV), EN 60204 (PELV)

EMC:
EN 61204-3

Certifications



UL/CSA 60950 recognised, UL508 listed

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Three phase, primary switched mode power supply, Economy **PVSE 400**

More technical information you will
find on Page 128 in Chapter 2.3

Type	PVSE 400/24-10	PVSE 400/24-10B	PVSE 400/24-10W	PVSE 400/24-20
Electrical data				
Input				
Input rated voltage	3 x 400 - 500 Vac	3 x 400 - 500 Vac	3 x 400 - 500 Vac	3 x 400 - 500 Vac
Input voltage range	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)
Input rated current (rated load)	0.6 A (3 x 340 Vac)	0.6 A (3 x 340 Vac)	0.6 A (3 x 340 Vac)	1.1 A (3 x 340 Vac)
Rated frequency range	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz
Starting current limiter	<30 A, NTC	<2 x rated current, active	<30 A, NTC	<30 A, NTC
Input fuse internal	3 x 1.6 A (slow-blow)	3 x 1.6 A (slow-blow)	3 x 1.6 A (slow-blow)	3 x 2.5 A (slow-blow)
Recommended back-up fuse (circuit breaker)	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C
Harmonic correction	passive	passive	passive	passive
Mains buffering	22.6 / 51.5 ms (400 / 500 Vac)	22.6 / 51.5 ms (400 / 500 Vac)	22.6 / 51.5 ms (400 / 500 Vac)	13.2 / 36.8 ms (400 / 500 Vac)
Output				
Output rated voltage	24 Vdc \pm 1 %	24 Vdc \pm 1 %	24 Vdc \pm 1 %	24 Vdc \pm 1 %
Output voltage range	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc
Output rated current	10.00 A	10.00 A	10.00 A	20.00 A
Parallel connection	Yes	Yes	Yes	Yes
Power boost	20 A / 4 s (15 A / 8 s)	20 A / 4 s (15 A / 8 s)	20 A / 4 s (15 A / 8 s)	40 A / 4 s (30 A / 8 s)
Overload behaviour	Constant current	Constant current	Constant current	Constant current
max. Power loss idling/nominal load	7.8 / 19.9 W	7.8 / 19.9 W	7.8 / 19.9 W	8.3 / 38.4 W
Serial operation	Yes	Yes	Yes	Yes
Efficiency	typ. 91.7 %	typ. 91.7 %	typ. 91.7 %	typ. 92.9 %
Ripple factor	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss
Top Boost	70 A / 50 ms	70 A / 50 ms	70 A / 50 ms	80 A / 50 ms
Signalling				
Power Good (DC OK)	LED green, LED red	LED green, LED red	LED green, LED red	LED green, LED red
Potential free signal contact	No	No	No	No
Active signal outputs	No	No	No	No
Stand-by-input	No	No	No	No
Display, interface	No	No	No	No
Feedback voltage max.	35 Vdc	35 Vdc	35 Vdc	35 Vdc
Standards				
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply
Approvals				
Approvals	cURus, cULus	cURus, cULus	cURus, cULus	cURus, cULus
Environment				
Ambient temperature	-25° C to +70° C	-25° C to +70° C	-25° C to +70° C	-25° C to +70° C
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Derating	-3 %/K > +50° C	-3 %/K > +50° C	-3 %/K > +50° C	-3 %/K > +50° C
Safety and protection				
Protection index	IP 20	IP 20	IP 20	IP 20
Safety class	I, with PE connection	I, with PE connection	I, with PE connection	I, with PE connection
Accessory				
Connector for signalling	PV-CON (optional)	-	-	PV-CON (optional)
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)
Direct screw fastening plate for lateral mounting	-	PV-WB2 (optional)	-	-
Order numbers				
Order Number	PVSE 400/24-10	PVSE 400/24-10B	PVSE 400/24-10W	PVSE 400/24-20



Three phase, primary switched mode power supply, Economy **PVSE 400**

More technical information you will find on Page 128 in Chapter 2.3

Type	PVSE 400/24-20B	PVSE 400/24-20W	PVSE 400/24-40	PVSE 400/24-40B
Electrical data				
Input				
Input rated voltage	3 x 400 - 500 Vac	3 x 400 - 500 Vac	3 x 400 - 500 Vac	3 x 400 - 500 Vac
Input voltage range	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)
Input rated current (rated load)	1.1 A (3 x 340 Vac)	1.1 A (3 x 340 Vac)	2 A (3 x 340 Vac)	2 A (3 x 340 Vac)
Rated frequency range	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz
Starting current limiter	<2 x rated current, active	<30 A, NTC	<30 A, NTC	<2 x rated current, active
Input fuse internal	3 x 2.5 A (slow-blow)	3 x 2.5 A (slow-blow)	3 x 6.3 A (slow-blow)	3 x 6.3 A (slow-blow)
Recommended back-up fuse (circuit breaker)	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	10 A, 16 A, characteristics B, C	10 A, 16 A, characteristics B, C
Harmonic correction	passive	passive	passive	passive
Mains buffering	13.2 / 36.8 ms (400 / 500 Vac)	13.2 / 36.8 ms (400 / 500 Vac)	15.6 / 42.9 ms (400 / 500 Vac)	15.6 / 42.9 ms (400 / 500 Vac)
Output				
Output rated voltage	24 Vdc ±1 %	24 Vdc ±1 %	24 Vdc ±1 %	24 Vdc ±1 %
Output voltage range	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc
Output rated current	20.00 A	20.00 A	40.00 A	40.00 A
Parallel connection	Yes	Yes	Yes	Yes
Power boost	40 A / 4 s (30 A / 8 s)	40 A / 4 s (30 A / 8 s)	60 A / 4 s (50 A / 8 s)	60 A / 4 s (50 A / 8 s)
Overload behaviour	Constant current	Constant current	Constant current	Constant current
max. Power loss idling/nominal load	8.3 / 38.4 W	8.3 / 38.4 W	7.0 / 66.2 W	7.0 / 66.2 W
Serial operation	Yes	Yes	Yes	Yes
Efficiency	typ. 92.9 %	typ. 92.9 %	typ. 93.1 %	typ. 93.1 %
Ripple factor	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss
Top Boost	80 A / 50 ms	80 A / 50 ms	100 A / 50 ms	100 A / 50 ms
Signalling				
Power Good (DC OK)	LED green, LED red	LED green, LED red	LED green, LED red	LED green, LED red
Potential free signal contact	No	No	No	No
Active signal outputs	No	No	No	No
Stand-by-input	No	No	No	No
Display, interface	No	No	No	No
Feedback voltage max.	35 Vdc	35 Vdc	35 Vdc	35 Vdc
Standards				
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply
Approvals				
Approvals	cURus, cULus	cURus, cULus	cURus, cULus	cURus, cULus
Environment				
Ambient temperature	-25° C to +70° C	-25° C to +70° C	-25° C to +55° C	-25° C to +55° C
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Derating	-3 %/K > +50° C	-3 %/K > +50° C	-5 %/K > +45° C	-3 %/K > +50° C
Safety and protection				
Protection index	IP 20	IP 20	IP 20	IP 20
Safety class	I, with PE connection	I, with PE connection	I, with PE connection	I, with PE connection
Accessory				
Connector for signalling	-	PV-CON (optional)	PV-CON (optional)	-
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	-	-	PV-WB2 (optional)
Order numbers				
Order Number	PVSE 400/24-20B	PVSE 400/24-20W	PVSE 400/24-40	PVSE 400/24-40B

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Three phase, primary switched mode power supply, Economy **PVSE 400**

More technical information you will
find on Page 128 in Chapter 2.3

Type	PVSE 400/24-40W	PVSE 400/30-25A	PVSE 400/48-10	PVSE 400/48-20
Electrical data				
Input				
Input rated voltage	3 x 400 - 500 Vac	3 x 400 - 500 Vac	3 x 400 - 500 Vac	3 x 400 - 500 Vac
Input voltage range	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)
Input rated current (rated load)	2 A (3 x 340 Vac)	1.6 A (3 x 340 Vac)	1.1 A (3 x 340 Vac)	2 A (3 x 340 Vac)
Rated frequency range	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz
Starting current limiter	<30 A, NTC	<30 A, NTC	<30 A, NTC	<30 A, NTC
Input fuse internal	3 x 6.3 A (slow-blow)	3 x 6.3 A (slow-blow)	3 x 6.3 A (slow-blow)	3 x 6.3 A (slow-blow)
Recommended back-up fuse (circuit breaker)	10 A, 16 A, characteristics B, C	10 A, 16 A, characteristics B, C	10 A, 16 A, characteristics B, C	10 A, 16 A, characteristics B, C
Harmonic correction	passive	passive	passive	passive
Mains buffering	15,6 / 42,9 ms (400 / 500 Vac)	15,6 / 42,9 ms (400 / 500 Vac)	12 / 35 ms (400 / 500 Vac)	15,6 / 42,9 ms (400 / 500 Vac)
Output				
Output rated voltage	24 Vdc ±1 %	30 Vdc ±1 %	48 Vdc ±1 %	48 Vdc ±1 %
Output voltage range	22,8 - 28,8 Vdc	27 - 43 Vdc	37 - 51 Vdc	37 - 51 Vdc
Output rated current	40.00 A	25.00 A	10.00 A	20.00 A
Parallel connection	Yes	Yes	Yes	Yes
Power boost	60 A / 4 s (50 A / 8 s)	45 A / 4 s (35 A / 8 s)	15 A / 4 s (12.5 A / 8 s)	30 A / 4 s (25 A / 8 s)
Overload behaviour	Constant current	Constant current	Constant current	Constant current
max. Power loss idling/nominal load	7,0 / 66,2 W	5,2 / 47,3 W	8,2 / 38 W	5,2 / 59,2 W
Serial operation	Yes	Yes	Yes	Yes
Efficiency	typ. 93,1 %	typ. 94,1 %	typ. 93 %	typ. 94,4 %
Ripple factor	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss
Top Boost	100 A / 50 ms	85 A / 50 ms	55 A / 50 ms	80 A / 50 ms
Signalling				
Power Good (DC OK)	LED green, LED red	LED green, LED red	LED green, LED red	LED green, LED red
Potential free signal contact	No	Switch over	Switch over	Switch over
Active signal outputs	No	No	No	No
Stand-by-input	No	No	No	No
Display, interface	No	No	No	No
Feedback voltage max.	35 Vdc	63 Vdc	63 Vdc	63 Vdc
Standards				
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply
Approvals				
Approvals	cURus, cULus	cURus, cULus	cURus, cULus	cURus, cULus
Environment				
Ambient temperature	-25° C to +55° C	-25° C to +70° C	-25° C to +70° C	-25° C to +70° C
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Derating	-5 %/K > +45° C	-3 %/K > +50° C	-3 %/K > +50° C	-3 %/K > +50° C
Safety and protection				
Protection index	IP 20	IP 20	IP 20	IP 20
Safety class	I, with PE connection	I, with PE connection	I, with PE connection	I, with PE connection
Accessory				
Connector for signalling	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)
Direct screw fastening plate for lateral mounting	-	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)
Order numbers				
Order Number	PVSE 400/24-40W	PVSE 400/30-25A	PVSE 400/48-10	PVSE 400/48-20

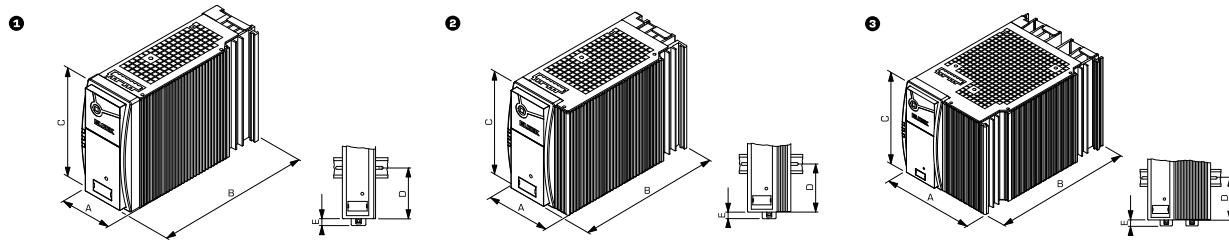


Three phase, primary switched mode power supply, Economy
PVSE 400

More technical information you will find on Page 128 in Chapter 2.3

Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Connections signalling, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)					
							A	B	C	D	E	
PVSE 400/24-10	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.00 kg	①	57	179.5	127	76	12.5
PVSE 400/24-10B	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.00 kg	①	57	179.5	127	76	12.5
PVSE 400/24-10W	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35, send with WB2	1.00 kg	①	-	-	-	-	-
PVSE 400/24-20	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.30 kg	②	77	179.5	127	76	12.5
PVSE 400/24-20B	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.30 kg	②	77	179.5	127	76	12.5
PVSE 400/24-20W	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35, send with WB2	1.30 kg	①	-	-	-	-	-
PVSE 400/24-40	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	2.50 kg	③	128	205.5	127	76	12.5
PVSE 400/24-40B	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	2.50 kg	③	128	205.5	127	76	12.5
PVSE 400/24-40W	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35, send with WB2	2.50 kg	①	-	-	-	-	-
PVSE 400/30-25A	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	2.50 kg	③	128	205.5	127	76	12.5
PVSE 400/48-10	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.30 kg	②	77	179.5	127	76	12.5
PVSE 400/48-20	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	2.50 kg	③	128	205.5	127	76	12.5

Dimension pictures



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Three phase, primary switched mode power supply, Basic **PVSB 400**



General Data

Input rated voltage	3 x 400 - 500 Vac
Output rated voltage	24 Vdc
Output rated current	10 - 40 A
Ambient temperature	-25° C to +70° C
Efficiency	up to 94 %
Protection index	IP 20

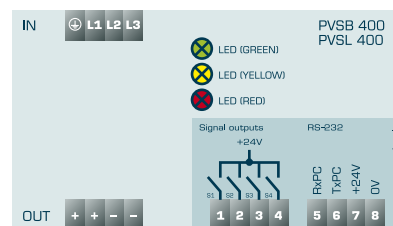
Advantages

LCD
Output current and voltage monitoring
RS-232 interface
Stabilised and digitally adjustable output voltage
Up to 200 % real power boost for 4 seconds
Top boost to trip miniature circuit breakers
3 LEDs and active signal outputs to indicate operating status
Parallel connection option
Service-friendly spring-loaded connector system
Can be supplied with active inrush current limiting option
Panel installation on mounting rails

Applications

Primary switch mode power supply with high power reserves for all automation requirements with a variety of parameter setting and display functions, including output current and output voltage monitoring.

Simplified diagram



Standards

Primary switched mode power supply
to UL 60950, UL 508

Safety:
EN 61558-2-17, EN 60950 (SELV), EN 60204 (PELV)

EMC:
EN 61204-3

Certifications



UL/CSA 60950 recognised, UL508 listed



Three phase, primary switched mode power supply, Basic **PVSB 400**

More technical information you will find on Page 130 in Chapter 2.3

Type	PVSB 400/24-10	PVSB 400/24-10B	PVSB 400/24-20	PVSB 400/24-20B
Electrical data				
Input				
Input rated voltage	3 x 400 - 500 Vac	3 x 400 - 500 Vac	3 x 400 - 500 Vac	3 x 400 - 500 Vac
Input voltage range	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)
Input rated current (rated load)	0.6 A (3 x 340 Vac)	0.6 A (3 x 340 Vac)	1.1 A (3 x 340 Vac)	1.1 A (3 x 340 Vac)
Rated frequency range	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz
Starting current limiter	<30 A, NTC	<2 x rated current, active	<30 A, NTC	<2 x rated current, active
Input fuse internal	3 x 1.6 A (slow-blow)	3 x 1.6 A (slow-blow)	3 x 2.5 A (slow-blow)	3 x 2.5 A (slow-blow)
Recommended back-up fuse (circuit breaker)	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C
Harmonic correction	passive	passive	passive	passive
Mains buffering	22.6 / 51.5 ms (400 / 500 Vac)	22.6 / 51.5 ms (400 / 500 Vac)	13.2 / 36.8 ms (400 / 500 Vac)	13.2 / 36.8 ms (400 / 500 Vac)
Output				
Output rated voltage	24 Vdc ±1 %	24 Vdc ±1 %	24 Vdc ±1 %	24 Vdc ±1 %
Output voltage range	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc
Output rated current	10.00 A	10.00 A	20.00 A	20.00 A
Parallel connection	Yes	Yes	Yes	Yes
Power boost	20 A / 4 s (15 A / 8 s)	20 A / 4 s (15 A / 8 s)	40 A / 4 s (30 A / 8 s)	40 A / 4 s (30 A / 8 s)
Overload behaviour	Constant current or fuse	Constant current or fuse	Constant current or fuse	Constant current or fuse
Efficiency	typ. 91.7 %	typ. 91.7 %	typ. 92.9 %	typ. 92.9 %
Ripple factor	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss
Top Boost	70 A / 50 ms	70 A / 50 ms	80 A / 50 ms	80 A / 50 ms
Signalling				
Power Good (DC OK)	LED green, LED red, LED yellow	LED green, LED red, LED yellow	LED green, LED red, LED yellow	LED green, LED red, LED yellow
Potential free signal contact	No	No	No	No
Active signal outputs	4 x 24 Vdc, 2 configurable	4 x 24 Vdc, 2 configurable	4 x 24 Vdc, 2 configurable	4 x 24 Vdc, 2 configurable
Stand-by-input	No	No	No	No
Display, interface	Yes, RS 232	Yes, RS 232	Yes, RS 232	Yes, RS 232
Feedback voltage max.	35 Vdc	35 Vdc	35 Vdc	35 Vdc
Standards				
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply
Approvals				
Approvals	cURus, cULus	cURus, cULus	cURus, cULus	cURus, cULus
Environment				
Ambient temperature	-25° C to +70° C	-25° C to +70° C	-25° C to +70° C	-25° C to +70° C
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Derating	-3 %/K > +50° C	-3 %/K > +50° C	-3 %/K > +50° C	-3 %/K > +50° C
Safety and protection				
Protection index	IP 20	IP 20	IP 20	IP 20
Safety class	I, with PE connection	I, with PE connection	I, with PE connection	I, with PE connection
Accessory				
Connector for signalling	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)
Adapter cable	PV-KOK2 (optional)	PV-KOK2 (optional)	PV-KOK2 (optional)	PV-KOK2 (optional)
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)
Order numbers				
Order Number	PVSB 400/24-10	PVSB 400/24-10B	PVSB 400/24-20	PVSB 400/24-20B

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Three phase, primary switched mode power supply, Basic **PVSB 400**

More technical information you will
find on Page 130 in Chapter 2.3

		PVSB 400/24-40	PVSB 400/24-40B	
Electrical data	Type	PVSB 400/24-40	PVSB 400/24-40B	
	<u>Input</u>			
	Input rated voltage	3 x 400 - 500 Vac	3 x 400 - 500 Vac	
	Input voltage range	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)	
	Input rated current (rated load)	2 A (3 x 340 Vac)	2 A (3 x 340 Vac)	
	Rated frequency range	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	
	Starting current limiter	<30 A, NTC	<2 x rated current, active	
	Input fuse internal	3 x 6.3 A (slow-blow)	3 x 6.3 A (slow-blow)	
	Recommended back-up fuse (circuit breaker)	10 A, 16 A, characteristics B, C	10 A, 16 A, characteristics B, C	
	Harmonic correction	passive	passive	
	Mains buffering	15.6 / 42.9 ms (400 / 500 Vac)	15.6 / 42.9 ms (400 / 500 Vac)	
	<u>Output</u>			
	Output rated voltage	24 Vdc ±1 %	24 Vdc ±1 %	
	Output voltage range	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc	
	Output rated current	40.00 A	40.00 A	
Parallel connection	Yes	Yes		
Power boost	60 A / 4 s (50 A / 8 s)	60 A / 4 s (50 A / 8 s)		
Overload behaviour	Constant current or fuse	Constant current or fuse		
Efficiency	typ. 93.1 %	typ. 93.1 %		
Ripple factor	typ. 70 mVss	typ. 70 mVss		
Top Boost	100 A / 50 ms	100 A / 50 ms		
<u>Signalling</u>				
Power Good (DC OK)	LED green, LED red, LED yellow	LED green, LED red, LED yellow		
Potential free signal contact	No	No		
Active signal outputs	4 x 24 Vdc, 2 configurable	4 x 24 Vdc, 2 configurable		
Stand-by-input	No	No		
Display, interface	Yes, RS 232	Yes, RS 232		
Feedback voltage max.	35 Vdc	35 Vdc		
<u>Standards</u>				
Classification	Primary switched mode power supply	Primary switched mode power supply		
<u>Approvals</u>				
Approvals	cURus, cULus	cURus, cULus		
<u>Environment</u>				
Ambient temperature	-25° C to +55° C	-25° C to +55° C		
Storage temperature	-25° C to +85° C	-25° C to +85° C		
Derating	-5 %/K > +50° C	-5 %/K > +45° C		
<u>Safety and protection</u>				
Protection index	IP 20	IP 20		
Safety class	I, with PE connection	I, with PE connection		
<u>Accessory</u>				
Connector for signalling	PV-CON (optional)	PV-CON (optional)		
Adapter cable	PV-KOK2 (optional)	PV-KOK2 (optional)		
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)		
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	PV-WB2 (optional)		
<u>Order numbers</u>				
Order Number	PVSB 400/24-40	PVSB 400/24-40B		

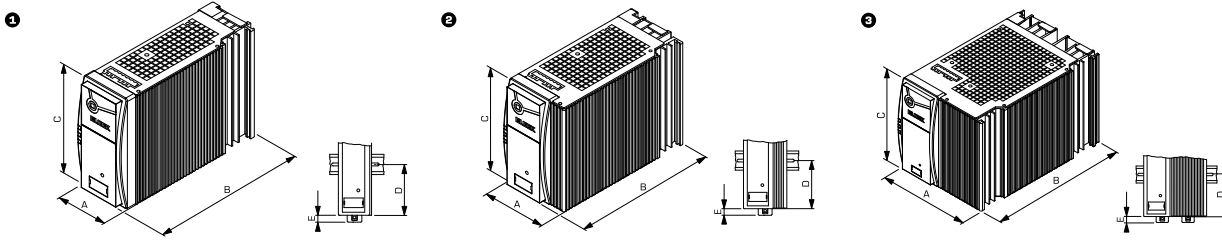


Three phase, primary switched mode power supply, Basic
PVS 400

More technical information you will find on Page 130 in Chapter 2.3

Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Connections signalling, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)					
							A	B	C	D	E	
PVS 400/24-10	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.00 kg	①	57	179.5	127	76	12.5
PVS 400/24-10B	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.00 kg	②	57	179.5	127	76	12.5
PVS 400/24-20	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.30 kg	③	77	179.5	127	76	12.5
PVS 400/24-20B	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.30 kg	④	77	179.5	127	76	12.5
PVS 400/24-40	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	2.50 kg	⑤	128	205.5	127	76	12.5
PVS 400/24-40B	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	2.50 kg	⑥	128	205.5	127	76	12.5

Dimension pictures



2.1

2.2

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2.4

Three phase, primary switched mode power supply, Line **PVSL 400**



General Data

Input rated voltage	3 x 400 - 500 Vac
Output rated voltage	24 Vdc
Output rated current	10 - 40 A
Ambient temperature	-25° C to +70° C
Efficiency	up to 92 %
Protection index	IP 20

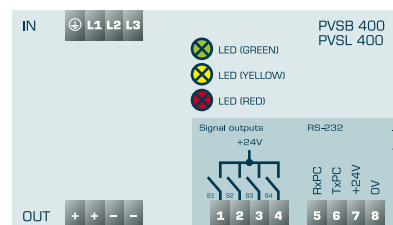
Advantages

Power input monitoring
LCD
Current and voltage output monitoring
RS-232 interface
Stabilised and adjustable output voltage
Up to 200 % real power boost for 4 seconds
Top boost to trip miniature circuit breakers
3 LEDs and active signal outputs to indicate operating status
Parallel connection option
Service-friendly spring-loaded connector system
Can be supplied with active inrush current limiting
Panel installation on mounting rails

Applications

Primary switch mode power supply with high power reserves for all automation requirements with a variety of parameter setting and display functions, including output current and output voltage monitoring. Intelligent additional functions for the input power to replace a variety of external devices such as diagnostic Voltmeter, phase meter, hour meter.

Simplified diagram



Standards

Primary switched mode power supply
to UL 60950, UL 508

Safety:
EN 61558-2-17, EN 60950 (SELV), EN 60204 (PELV)

EMC:
EN 61204-3

Certifications



UL/CSA 60950 recognised, UL508 listed



Three phase, primary switched mode power supply, Line **PVSL 400**

More technical information you will find on Page 132 in Chapter 2.3

Type	PVSL 400/24-10	PVSL 400/24-10B	PVSL 400/24-20	PVSL 400/24-20B
Electrical data				
Input				
Input rated voltage	3 x 400 - 500 Vac	3 x 400 - 500 Vac	3 x 400 - 500 Vac	3 x 400 - 500 Vac
Input voltage range	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)
Input rated current (rated load)	0.6 A (3 x 340 Vac)	0.6 A (3 x 340 Vac)	1.1 A (3 x 340 Vac)	1.1 A (3 x 340 Vac)
Rated frequency range	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz
Starting current limiter	<30 A, NTC	<2 x rated current, active	<30 A, NTC	<2 x rated current, active
Input fuse internal	3 x 1.6 A (slow-blow)	3 x 1.6 A (slow-blow)	3 x 2.5 AT	3 x 2.5 A (slow-blow)
Recommended back-up fuse (circuit breaker)	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C	6 A, 10 A, 16 A, characteristics B, C
Harmonic correction	passive	passive	passive	passive
Mains buffering	22.6 / 51.5 ms (400 / 500 Vac)	22.6 / 51.5 ms (400 / 500 Vac)	13.2 / 36.8 ms (400 / 500 Vac)	13.2 / 36.8 ms (400 / 500 Vac)
Output				
Output rated voltage	24 Vdc ±1 %	24 Vdc ±1 %	24 Vdc ±1 %	24 Vdc ±1 %
Output voltage range	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc
Output rated current	10.00 A	10.00 A	20.00 A	20.00 A
Parallel connection	Yes	Yes	Yes	Yes
Power boost	20 A / 4 s (15 A / 8 s)	20 A / 4 s (15 A / 8 s)	40 A / 4 s (30 A / 8 s)	40 A / 4 s (30 A / 8 s)
Overload behaviour	Constant current or fuse	Constant current or fuse	Constant current or fuse	Constant current or fuse
Efficiency	typ. 91.7 %	typ. 91.7 %	typ. 92.9%	typ. 92.9 %
Ripple factor	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss	typ. 70 mVss
Top Boost	70 A / 50 ms	70 A / 50 ms	80 A / 50 ms	80 A / 50 ms
Signalling				
Power Good (DC OK)	LED green, LED red, LED yellow	LED green, LED red, LED yellow	LED green, LED red, LED yellow	LED green, LED red, LED yellow
Active signal outputs	4 x 24 Vdc, 2 configurable	4 x 24 Vdc, 2 configurable	4 x 24 Vdc, 2 configurable	4 x 24 Vdc, 2 configurable
Stand-by-input	No	No	No	No
Display, interface	Yes, RS 232	Yes, RS 232	Yes, RS 232	Yes, RS 232
Feedback voltage max.	35 Vdc	35 Vdc	35 Vdc	35 Vdc
Standards				
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply
Approvals				
Approvals	cURus, cULus	cURus, cULus	cURus, cULus	cURus, cULus
Environment				
Ambient temperature	-25° C to +70° C	-25° C to +70° C	-25° C to +70° C	-25° C to +70° C
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Derating	-3 %/K > +50° C	-3%/K> +50°C	-3%/K > +50°C	-3 %/K > +50° C
Safety and protection				
Protection index	IP 20	IP 20	IP 20	IP 20
Safety class	I, with PE connection	I, with PE connection	I, with PE connection	I, with PE connection
Accessory				
Connector for signalling	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)
Adapter cable	PV-KOK2 (optional)	PV-KOK2 (optional)	PV-KOK2 (optional)	PV-KOK2 (optional)
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)
Order numbers				
Order Number	PVSL 400/24-10	PVSL 400/24-10B	PVSL 400/24-20	PVSL 400/24-20B

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Three phase, primary switched mode power supply, Line **PVSL 400**

More technical information you will
find on Page 132 in Chapter 2.3

Type		PVSL 400/24-40	PVSL 400/24-40B
Electrical data	Input		
	Input rated voltage	3 x 400 - 500 Vac	3 x 400 - 500 Vac
	Input voltage range	340 - 550 Vac (480 - 780 Vdc)	340 - 550 Vac (480 - 780 Vdc)
	Input rated current (rated load)	2 A (3 x 340 Vac)	2 A (3 x 340 Vac)
	Rated frequency range	44 Hz - 66 Hz / 0 Hz	44 Hz - 66 Hz / 0 Hz
	Starting current limiter	<30 A, NTC	<2 x rated current, active
	Input fuse internal	3 x 6.3 A (slow-blow)	3 x 6.3 A (slow-blow)
	Recommended back-up fuse (circuit breaker)	10 A, 16 A, characteristics B, C	10 A, 16 A, characteristics B, C
	Harmonic correction	passive	passive
	Mains buffering	15.6 / 42.9 ms (400 / 500 Vac)	15.6 / 42.9 ms (400 / 500 Vac)
	Output		
	Output rated voltage	24 Vdc ±1 %	24 Vdc ±1 %
	Output voltage range	22.8 - 28.8 Vdc	22.8 - 28.8 Vdc
	Output rated current	40.00 A	40.00 A
Parallel connection	Yes	Yes	
Power boost	60 A / 4 s (50 A / 8 s)	60 A / 4 s (50 A / 8 s)	
Overload behaviour	Constant current or fuse	Constant current or fuse	
Efficiency	typ. 93.1 %	typ. 93.1%	
Ripple factor	typ. 70 mVss	typ. 70 mVss	
Top Boost	100 A / 50 ms	100 A / 50 ms	
Signalling			
Power Good (DC OK)	LED green, LED red, LED yellow	LED green, LED red, LED yellow	
Active signal outputs	4 x 24 Vdc, 2 configurable	4 x 24 Vdc, 2 configurable	
Stand-by-input	No	No	
Display, interface	Yes, RS 232	Yes, RS 232	
Feedback voltage max.	35 Vdc	35 Vdc	
Standards			
Classification	Primary switched mode power supply	Primary switched mode power supply	
Approvals			
Approvals	cURus, cULus	cURus, cULus	
Environment			
Ambient temperature	-25° C to +55° C	-25° C to +55° C	
Storage temperature	-25° C to +85° C	-25° C to +85° C	
Derating	-5 %/K > +50° C	-5 %/K > +45° C	
Safety and protection			
Protection index	IP 20	IP 20	
Safety class	I, with PE connection	I, with PE connection	
Accessory			
Connector for signalling	PV-CON (optional)	PV-CON (optional)	
Adapter cable	PV-KOK2 (optional)	PV-KOK2 (optional)	
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)	
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	PV-WB2 (optional)	
Order numbers			
Order Number	PVSL 400/24-40	PVSL 400/24-40B	

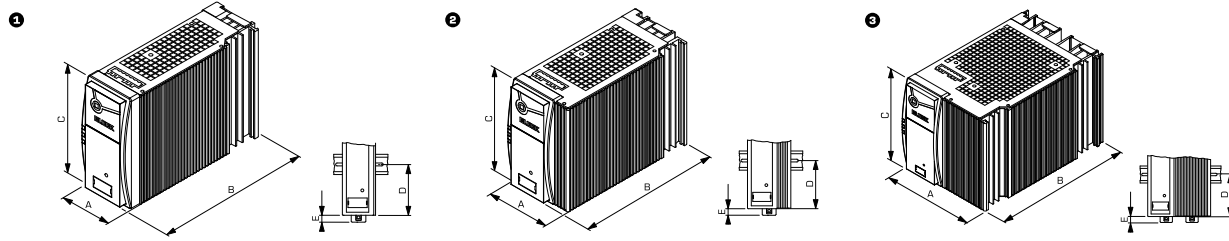


Three phase, primary switched mode power supply, Line
PVSL 400

More technical information you will find on Page 132 in Chapter 2.3

Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Connections signalling, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)					
							A	B	C	D	E	
PVSL 400/24-10	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.00 kg	①	57	179.5	127	76	12.5
PVSL 400/24-10B	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.00 kg	②	57	179.5	127	76	12.5
PVSL 400/24-20	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.30 kg	③	77	179.5	127	76	12.5
PVSL 400/24-20B	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	1.30 kg	④	77	179.5	127	76	12.5
PVSL 400/24-40	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	2.50 kg	⑤	128	205.5	127	76	12.5
PVSL 400/24-40B	max. 2.5 mm ²	max. 10 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	2.50 kg	⑥	128	205.5	127	76	12.5

Dimension pictures



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Electronic protection module, Economy **PVFE**



General Data

Input rated voltage 24 Vdc
Output rated voltage 24 Vdc
Output rated current up to 2/4 x 6 A, 2/4 x 10 A
Ambient temperature -10° C to +60° C
Efficiency typ. 96 %
Protection index IP 20

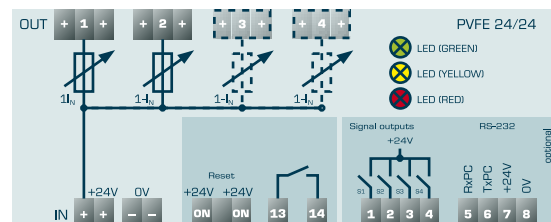
Advantages

Current monitoring and shutdown in the event of an error
Up to 4 current channels per module
Delayed switching-in of channels
Reactivation of tripped channels via external signal
Isolated signal contact
Service-friendly spring-loaded connector system
LCD
Current and voltage monitoring
Active signal outputs for watchdog functions
RS-232 interface
Panel installation on mounting rails

Applications

Electronic circuit breaker for machines and installations for which a maximum of operational safety is our top priority. The module can without regard to line impedances defective 24-VDC power trails off selectively. A variety of parameter settings and display functions, including output current and output voltage monitoring are integrated.

Simplified diagram



Standards

Electronic circuit breaker
to UL 60950, UL 508

Safety:
EN 60950, EN 60950 (SELV), EN 60204 (PELV)

EMC:
EN 61000-6-3 (Interference emissions), EN 61000-6-2 (Interference immunity)

Certifications



UL/CSA 60950 recognised, UL508 listed



Electronic protection module, Economy PVFE

More technical information you will find on Page 134 in Chapter 2.3

Type	PVFE 24/24-12	PVFE 24/24-20	PVFE 24/24-24	PVFE 24/24-40
Electrical data				
Input				
Input rated voltage	24 Vdc	24 Vdc	24 Vdc	24 Vdc
Input voltage range	18 - 30 Vdc	18 - 30 Vdc	18 - 30 Vdc	18 - 30 Vdc
Input fuse internal	2 x 15 A (slow-blow)	2 x 15 A (slow-blow)	4 x 15 A (slow-blow)	4 x 15 A (slow-blow)
Voltage drop per channel at rated load	140 mVdc	240 mVdc	140 mVdc	240 mVdc
Output				
Output rated voltage	24 Vdc	24 Vdc	24 Vdc	24 Vdc
Number of current channels	2	2	4	4
Output rated current	1 - 6 A (adjustable in 1 A steps)	1 - 10 A (adjustable in 1 A steps)	1 - 6 A (adjustable in 1 A steps)	1 - 10 A (adjustable in 1 A steps)
Overload behaviour	Shutdown without current limiting	Shutdown without current limiting	Shutdown without current limiting	Shutdown without current limiting
Parallel connection	No	No	No	No
Turn on capacity	max. 20.000 µF per channel	max. 20.000 µF per channel	max. 20.000 µF per channel	max. 20.000 µF per channel
Serial operation	No	No	No	No
max. Power loss idling/nominal load	2 / 4 W	2 / 7 W	2 / 5.5 W	2 / 12 W
Efficiency	typ. 96 %	typ. 96 %	typ. 96 %	typ. 96 %
Signalling				
Power Good (DC OK)	LED green, LED red, LED yellow	LED green, LED red, LED yellow	LED green, LED red, LED yellow	LED green, LED red, LED yellow
Display, interface	Yes, RS 232	Yes, RS 232	Yes, RS 232	Yes, RS 232
Reset input	Yes, (18 - 30 Vdc)	Yes, (18 - 30 Vdc)	Yes, (18 - 30 Vdc)	Yes, (18 - 30 Vdc)
Feedback voltage max.	33 Vdc	33 Vdc	33 Vdc	33 Vdc
Active signal outputs	4 x 24 Vdc, 1 configurable	4 x 24 Vdc, 1 configurable	4 x 24 Vdc, 1 configurable	4 x 24 Vdc, 1 configurable
Potential free signal contact	Closing contact, configurable	Closing contact, configurable	Closing contact, configurable	Closing contact, configurable
Standards				
Classification	Electronic circuit breaker	Electronic circuit breaker	Electronic circuit breaker	Electronic circuit breaker
Approvals				
Approvals	cURus, cULus	cURus, cULus	cURus, cULus	cURus, cULus
Environment				
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Ambient temperature	-10° C to + 60° C	-10° C to + 60° C	-10° C to + 60° C	-10° C to + 60° C
Safety and protection				
Protection index	IP 20	IP 20	IP 20	IP 20
Safety class	III, without PE connection	III, without PE connection	III, without PE connection	III, without PE connection
Accessory				
Connector for signalling	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)
Adapter cable	PV-KOK2 (optional)	PV-KOK2 (optional)	PV-KOK2 (optional)	PV-KOK2 (optional)
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)
Order numbers				
Order Number	PVFE 24/24-12	PVFE 24/24-20	PVFE 24/24-24	PVFE 24/24-40

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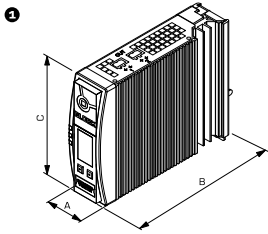


Electronic protection module, Economy **PVFE**

More technical information you will find on Page 134 in Chapter 2.3

Mechanical data	Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Connections signalling relay, reset (spring clamp terminal, pluggable)	Connections signalling, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)		
									A	B	C
PVFE 24/24-12		max. 10 mm ²	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	0.80 kg	40	163.5	127
PVFE 24/24-20		max. 10 mm ²	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	0.80 kg	40	163.5	127
PVFE 24/24-24		max. 10 mm ²	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	0.80 kg	40	163.5	127
PVFE 24/24-40		max. 10 mm ²	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	0.80 kg	40	163.5	127

Dimension pictures



Electronic fuse, Basic
PVFB



General Data

Input rated voltage 24 Vdc
Output rated voltage 24 Vdc
Output rated current 4 x 8 A
Ambient temperature -10° C to +60° C
Efficiency typ. 96 %
Protection index IP 20

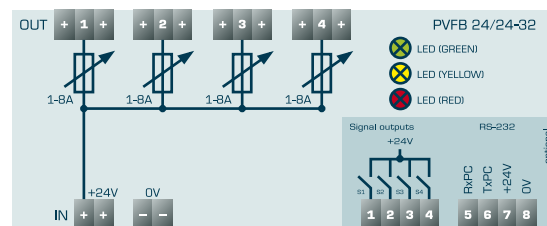
Advantages

Active current limiting in the event of an error
Current monitoring and shutdown in the event of an error
4 current channels
Delayed switching-in of channels
Service-friendly spring-loaded connector system
LCD
Current and voltage monitoring
Active signal outputs for watchdog function
RS-232 interface
Panel installation on mounting rails

Applications

Electronic fuse for machines and installations for which a maximum of operational safety is our top priority. The module can without regard to line impedances defective 24-VDC power trails off selectively. A variety of parameter settings and display functions, including output current and output voltage monitoring are integrated.

Simplified diagram



Standards

Electronic circuit breaker
to UL 60950, UL 508

Safety:
EN 60950, EN 60950 (SELV), EN 60204 (PELV)

EMC:
EN 61000-6-3 (Interference emissions), EN 61000-6-2 (Interference immunity)

Certifications



UL/CSA 60950 recognised, UL508 listed



Electronic fuse, Basic **PVFB**

Type		PVFB 24/24-32
Electrical data	Input	
	Input rated voltage	24 Vdc
	Input voltage range	18 - 30 Vdc
	Input fuse internal	4 x 15 A (slow-blow)
	Voltage drop per channel at rated load	200 mVdc
	Output	
	Output rated voltage	24 Vdc
	Number of current channels	4
	Output rated current	1 - 8 A (adjustable in 1 A steps)
	Overload behaviour	Shutdown with active current limiting
Parallel connection	No	
Turn on capacity	typ. 20.000 µF	
Serial operation	No	
max. Power loss idling/nominal load	2 / 8.2 W	
Efficiency	typ. 96 %	
Signalling		
Power Good (DC OK)	LED green, LED red, LED yellow	
Potential free signal contact	No	
Display, interface	Yes, RS 232	
Reset input	No	
Feedback voltage max.	33 Vdc	
Standards		
Classification	Electronic circuit breaker	
Approvals		
Approvals	cURus, cULus	
Environment		
Ambient temperature	-10° C to + 60° C	
Storage temperature	-25° C to +85° C	
Safety and protection		
Protection index	IP 20	
Safety class	III, without PE connection	
Accessory		
Connector for signalling	PV-CON (optional)	
Adapter cable	PV-KOK2 (optional)	
Side DIN Rail mounting	PV-TS35M (optional)	
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	
Order numbers		
Order Number	PVFB 24/24-32	

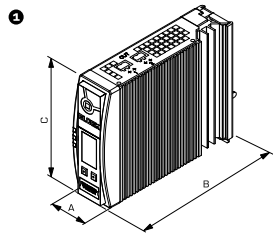


**Electronic fuse, Basic
PVFB**

More technical information you will find on Page 136 in Chapter 2.3

Mechanical data	30									
	mm									
Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Connections signalling, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)	A	B	C
PVFB 24/24-32	max. 10 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	vertical	DIN Rail system TH 35	0.80 kg	➊	40	163.5	127

Dimension pictures



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Redundant module, Economy **PVRE**



General Data

Input rated voltage 24 - 48 Vdc
Output rated voltage 24 - 48 Vdc
Output rated current 40 A
Ambient temperature -10° C to +60° C
Efficiency typ. 96 %
Protection index IP 20

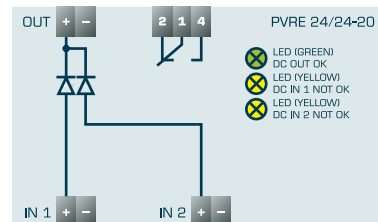
Advantages

Reverse polarity protection
Isolated signal contact
3 LEDs for signalling purposes
Service-friendly spring-loaded connector system
Panel installation on mounting rails

Applications

Redundancy module for decoupling two power supplies for building a fail-safe delivery system. set of machines and equipment requiring high operational reliability.

Simplified diagram



Standards

Redundancy module
to UL 60950, UL 508

Safety:
EN 60950 (SELV), EN 60204 (PELV)

EMC:
EN 61000-6-3 (Interference emissions), EN 61000-6-2 (Interference immunity)

Certifications



UL/CSA 60950 recognised, UL508 listed



Redundant module, Economy **PVRE**

More technical information you will find on Page 138 in Chapter 2.3

		PVRE 24/24-20	PVRE 48/48-20
Electrical data	Type	PVRE 24/24-20	PVRE 48/48-20
	<u>Input</u>		
	Input rated voltage	24 Vdc	48 Vdc
	Input voltage range	18 - 30 Vdc	36 - 54 Vdc
	Input rated current	2 x 20 A / 1 x 40 A	2 x 20 A / 1 x 40 A
	<u>Output</u>		
	Output rated voltage	24 Vdc	48 Vdc
	Output voltage	typ. U _{in} - 1 Vdc (20 A)	typ. U _{in} - 1 Vdc (20 A)
	Output rated current	40.00 A	40.00 A
	Internal fuse	No	No
	Parallel connection	Yes	Yes
	max. Power loss idling/nominal load	1.5 / 14 W (20 A), 1.5 / 26 W (40 A)	1.7 / 20 W (20 A), 1.7 / 40 W (40 A)
	Efficiency	typ. 97 %	typ. 96 %
	<u>Signalling</u>		
	Power Good (DC OK)	LED green, LED red, LED yellow	LED green, LED red, LED yellow
	Potential free signal contact	Changeover contact	Changeover contact
	Active signal outputs	No	No
	Display, interface	No	No
	Feedback voltage max.	35 Vdc	60 Vdc
	<u>Standards</u>		
Classification	Redundancy module	Redundancy module	
<u>Approvals</u>			
Approvals	cURus, cULus	cURus (prepared), cULus (prepared)	
<u>Environment</u>			
Ambient temperature	-10° C to +60° C	-10° C to +60° C	
Storage temperature	-25° C to +85° C	-25° C to +85° C	
<u>Safety and protection</u>			
Protection index	IP 20	IP 20	
Safety class	III, without PE connection	III, without PE connection	
<u>Accessory</u>			
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)	
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	PV-WB2 (optional)	
<u>Order numbers</u>			
Order Number	PVRE 24/24-20	PVRE 48/48-20	

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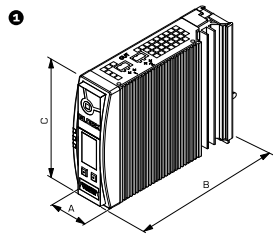
More technical information you will find on Page 138 in Chapter 2.3



Redundant module, Economy **PVRE**

Mechanical data	Typ	Connections input, (spring clamp terminal, pluggable)		Connections output, (spring clamp terminal, pluggable)		Connections signalling relay, reset (spring clamp terminal, pluggable)		Mounting position	Fixing method	Weight	Dimension picture (in mm)	Dimension picture (in mm)		
		A	B	A	B	A	B					C		
PVRE 24/24-20		max. 10 mm ²	max. 10 mm ²	max. 10 mm ²	max. 10 mm ²	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	1.00 kg	④	40	163.5	127
PVRE 48/48-20		max. 10 mm ²	max. 10 mm ²	max. 10 mm ²	max. 10 mm ²	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	1.00 kg	①	40	163.5	127

Dimension pictures



Redundant module, Basic
PVRB



General Data

Input rated voltage 24 Vdc
Output rated voltage 24 Vdc
Output rated current 20 A
Ambient temperature -10° C to +60° C
Efficiency typ. 96 %
Protection index IP 20

Advantages

LCD
Current and voltage monitoring
Active signal contacts for watchdog functions
RS-232 interface
Reverse polarity protection
Isolated signal contact
3 LEDs for signalling purposes
Service-friendly spring-loaded connector system
Panel installation on mounting rails

Applications

Redundancy module for decoupling two power supplies for building a fail-safe delivery system. set of machines and equipment requiring high operational reliability. A variety of parameter settings and display functions, including output current and output voltage monitoring are integrated.

Standards

Redundancy module
to UL 60950, UL 508

Safety:
EN 60950 (SELV), EN 60204 (PELV)

EMC:
EN 61000-6-3 (Interference emissions), EN 61000-6-2 (Interference immunity)

Certifications



UL/CSA 60950 recognised, UL508 listed

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Redundant module, Basic **PVRB**

Type		PVRB 24/24-20
Electrical data	<u>Input</u>	
	Input rated voltage	24 Vdc
	Input voltage range	18 - 30 Vdc
	Input rated current	2 x 20 A / 1 x 40 A
	<u>Output</u>	
	Output rated voltage	typ. U _{in} - 1 Vdc (20 A)
	Output voltage	typ. U _{in} - 1 Vdc (20 A)
	Output rated current	20.00 A
	Internal fuse	No
	Parallel connection	Yes
max. Power loss idling/nominal load	1.5 / 14 W (20 A), 1.5 / 26 W (40 A)	
Efficiency	typ. 97 %	
<u>Signalling</u>		
Power Good (DC OK)	LED green, LED red, LED yellow	
Potential free signal contact	Changeover contact	
Active signal outputs	3 x 24 Vdc, 2 configurable	
Display, interface	Yes, RS 232	
Feedback voltage max.	35 Vdc	
<u>Standards</u>		
Classification	Redundancy module	
<u>Approvals</u>		
Approvals	cURus, cULus	
<u>Environment</u>		
Ambient temperature	-10° C to +60° C	
Storage temperature	-25° C to +85° C	
<u>Safety and protection</u>		
Protection index	IP 20	
Safety class	III, without PE connection	
Reverse connection protection	Yes	
<u>Accessory</u>		
Connector for signalling	PV-CON (optional)	
Adapter cable	PV-KOK2 (optional)	
Side DIN Rail mounting	PV-TS35M (optional)	
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	
<u>Order numbers</u>		
Order Number	PVRB 24/24-20	

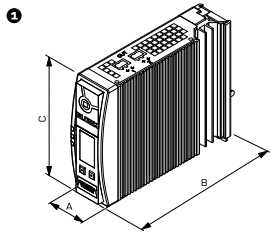


Redundant module, Basic
PVRB

More technical information you will find on Page 140 in Chapter 2.3

Mechanical data	30 mm		
	Typ		
Connections input, (spring clamp terminal, pluggable)	max. 10 mm ²	max. 10 mm ²	max. 2.5 mm ²
Connections output, (spring clamp terminal, pluggable)			
Connections signalling relay, reset (spring clamp terminal, pluggable)			
Connections signalling, (spring clamp terminal, pluggable)			
Mounting position	vertical		
Fixing method	DIN Rail system TH 35		
Weight	1.00 kg		
Dimension picture (in mm)			
	1	A	B
		40	163.5
		C	127

Dimension pictures



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Buffer module **PVUC**



General Data

Input rated voltage 24 Vdc
Output rated voltage 24 Vdc
Output rated current 10 - 20 A
Ambient temperature -10° C to +60° C
Efficiency typ. 97 %
Protection index IP 20

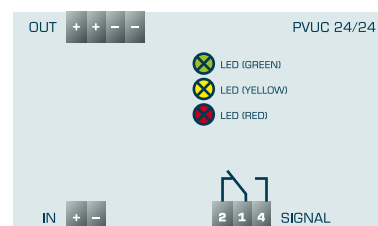
Advantages

Electronic overcurrent and short circuit protection
Reverse polarity protection
Configurable switch-in threshold
3 LEDs for signalling purposes
Isolated signal contact
Service-friendly spring-loaded connector system
Parallel connection option
Decoupled output
Panel installation on mounting rails

Applications

Maintenance-free buffer module to secure the power supply during short power interruptions.

Simplified diagram



Standards

Maintenance-free buffer module
to UL 508

Safety:
EN 60950, EN 60950 (SELV), EN 60204 (PELV)

EMC:
EN 61000-6-3 (Interference emissions), EN 61000-6-2 (Interference immunity)

Certifications



UL 508

More technical information you will find on Page 142 in Chapter 2.3



Buffer module PVUC

Type	PVUC 24/24-10	PVUC 24/24-20
Electrical data		
Input		
Input rated voltage	24 Vdc	24 Vdc
Input voltage range	20 - 30 Vdc	20 - 30 Vdc
Current input (idle/charging/max.)	60 mA / 1 A / 11 A	60 mA / 1 A / 22 A
Switching threshold for buffer mode	20 - 24 Vdc	21 - 24 Vdc
Output		
Output rated voltage	24 Vdc	24 Vdc
Output voltage normal operation	typ. $U_{in} - 0.5$ Vdc (10 A)	typ. $U_{in} - 1$ Vdc (20 A)
Output rated voltage, battery mode	20 - 24 Vdc (adjustable)	20 - 24 Vdc (adjustable)
Output rated current	10.00 A	20.00 A
Buffer period	0.4 s (10 A) / 6.3 s (1 A)	0.4 s (20 A) / 15.5 s (1 A)
Charging time	typ. 5 minutes	typ. 5 minutes
Internal fuse	No	No
Overload behaviour	Constant current (typ. 11 A)	Constant current (typ. 22 A)
Parallel connection	Yes	Yes
Serial operation	No	No
max. Power loss idling/nominal load	1.5 / 6.5 W	1.5 / 15 W
Efficiency	typ. 97 %	typ. 97 %
Storage medium		
Type of the storage medium	Capacities, internal	Capacities, internal
Signalling		
Operating status	LED green, LED red, LED yellow	LED green, LED red, LED yellow
Potential free signal contact	Changeover contact	Changeover contact
Active signal outputs	No	No
Display, interface	No	No
Feedback voltage max.	35 Vdc	35 Vdc
Standards		
Classification	Maintenance-free buffer module	Maintenance-free buffer module
Approvals		
Approvals	cULus	cULus
Environment		
Ambient temperature	-10° C to +60° C	-10° C to +60° C
Storage temperature	-25° C to +85° C	-25° C to +85° C
Safety and protection		
Protection index	IP 20	IP 20
Safety class	III, without PE connection	III, without PE connection
Reverse connection protection	Yes	Yes
Accessory		
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	PV-WB2 (optional)
Order numbers		
Order Number	PVUC 24/24-10	PVUC 24/24-20

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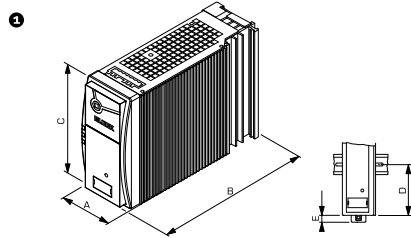


Buffer module **PVUC**

More technical information you will find on Page 142 in Chapter 2.3

Mechanical data	Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Connections signalling, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)				
								A	B	C	D	E
PVUC 24/24-10		max. 2.5 mm ²	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	1.00 kg	57	179.5	127	76	12.5
PVUC 24/24-20		max. 10 mm ²	max. 10 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	1.00 kg	57	179.5	127	76	12.5

Dimension pictures



Uninterruptible power supply
PVUA



General Data

Input rated voltage 24 Vdc
Output rated voltage 24 Vdc
Output rated current 10 - 20 A
Ambient temperature -10° C to +60° C
Efficiency up to 97 %
Protection index IP 20

Advantages

Electronic overcurrent and short circuit protection
Active current limiting in the event of an error
Optimum battery management
Temperature-controlled charging voltage
Accum. presence and quality check
Service-friendly spring-loaded connector system
Isolated signal contact
Reverse polarity protection
Exhaustive discharge protection for accumulator
LCD
Current and voltage monitoring
Active signal outputs for watchdog functions
RS-232 interface
Decoupled output

Applications

Load and control module for building a secure 24-Vdc power supply in case of power failure. A variety of parameter settings and display functions, including output current and output voltage monitoring are integrated.

Standards

Uninterruptible power supply
to UL 60950, UL 508

Safety:
EN 60950, EN 60950 (SELV), EN 60204 (PELV)

EMC:
EN 61000-6-3 (Interference emissions), EN 61000-6-2 (Interference immunity)

Certifications



UL/CSA 60950 recognised, UL508 listed

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Uninterruptible power supply PVUA

More technical information you will find on Page 144 in Chapter 2.3

Type	PVUA 24/24-10	PVUA 24/24-20	PVUA 24/24-40
Electrical data			
Input			
Input rated voltage	24 Vdc	24 Vdc	24 Vdc
Input voltage range	18 - 29 Vdc	18 - 29 Vdc	18 - 29 Vdc
Current input (idle/charging/max.)	0.1 / 0.8 / 10.8 A	0.1 / 1.5 / 21.5 A	0.1 / 2.5 / 42.5 A
Switching threshold for buffer mode	20 - 25.5 Vdc	20 - 25.5 Vdc	20 - 25.5 Vdc
Output			
Output voltage normal operation	typ. U _{in} - 1 Vdc (10 A)	typ. U _{in} - 1 Vdc (20 A)	typ. U _{in} - 1 Vdc (40 A)
Output rated voltage, battery mode	typ. battery voltage - 1 Vdc (10 A)	typ. battery voltage - 1 Vdc (20 A)	typ. battery voltage - 1 Vdc (40 A)
Output rated voltage	24 Vdc	24 Vdc	24 Vdc
Output rated current	10.00 A	20.00 A	40.00 A
Internal fuse	15 A (slow-blow)	30 A (slow-blow)	2 x 30 A (slow-blow)
Overload behaviour	Constant current with cyclic shutdown	Constant current with cyclic shutdown	
Parallel connection	No	No	Yes
Serial operation	No	No	No
max. Power loss idling/nominal load	15 / 20 W	15 / 30 W	15 / 30 W
Efficiency	typ. 95.4 %	typ. 96.3 %	typ. 97 %
Storage medium			
Type of the storage medium	Accumulator, external	Accumulator, external	Accumulator, external
Rated charging voltage	24 Vdc	24 Vdc	24 Vdc
Charge voltage range	26 to 29.5 Vdc	26 to 29.5 Vdc	26 to 29.5 Vdc
Temperaturmachführung der Ladespannung	automatical or manual	automatical or manual	automatical or manual
Charging current	max. 0.6 A	max. 1.0 A	max. 2.0 A
Recommended storage medium	24 Vdc / 1.2 Ah, 3.2 Ah, 7 Ah, 12 Ah	24 Vdc / 7 Ah, 12 Ah	24 Vdc / 7 Ah, 12 Ah
Signalling			
Operating status	LED green, LED red, LED yellow	LED green, LED red, LED yellow	LED green, LED red, LED yellow
Potential free signal contact	Changeover contact, configurable	Changeover contact, configurable	Changeover contact, configurable
Active signal outputs	3 x 24 Vdc, 2 configurable	3 x 24 Vdc, 2 configurable	4 x 24 Vdc, 3 configurable
Remote shutdown in buffer mode operation	Yes (break contact)	Yes (break contact)	Yes (break contact)
Display, interface	Yes, RS 232	Yes, RS 232	Yes, RS 232
Feedback voltage max.	35 Vdc	35 Vdc	35 Vdc
Standards			
Classification	Uninterruptible power supply	Uninterruptible power supply	Uninterruptible power supply
Approvals			
Approvals	cURus, cULus	cURus, cULus	
Environment			
Ambient temperature	-10° C to +60° C	-10° C to +60° C	-25° C to +60° C
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Safety and protection			
Protection index	IP 20	IP 20	IP 20
Accessory			
Connector for signalling	PV-CON (optional)	PV-CON (optional)	PV-CON (optional)
Adapter cable	PV-KOK2 (optional)	PV-KOK2 (optional)	PV-KOK2 (optional)
Side DIN Rail mounting	PV-TS35M (optional)	PV-TS35M (optional)	PV-TS35M (optional)
Direct screw fastening plate for lateral mounting	PV-WB2 (optional)	PV-WB2 (optional)	PV-WB2 (optional)
Order numbers			
Order Number	PVUA 24/24-10	PVUA 24/24-20	PVUA 24/24-40

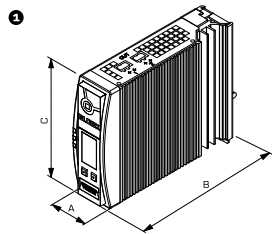


Uninterruptible power supply **PVUA**

More technical information you will find on Page 144 in Chapter 2.3

Mechanical data	Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Connections signalling, (spring clamp terminal, pluggable)	Connections storage medium, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)		
									A	B	C
	PVUA 24/24-10	max. 2.5 mm ²	max. 2.5 mm ²	max. 0.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	0.80 kg	40	163.5	127
	PVUA 24/24-20	max. 10 mm ²	max. 10 mm ²	max. 0.5 mm ²	max. 10 mm ²	vertical	DIN Rail system TH 35	0.80 kg	57	163.5	127
	PVUA 24/24-40	max. 10 mm ²	max. 10 mm ²	max. 0.5 mm ²	max. 10 mm ²	vertical	DIN Rail system TH 35	0.80 kg	57	163.5	127

Dimension pictures



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Accumulator module **PVA**



General Data

Input rated voltage 24 Vdc
Output rated voltage 24 Vdc
Capacity 3.2 - 12 Ah
Ambient temperature -10° C to +40° C
Protection index IP 20

Advantages

Includes temperature meter in housing
Includes battery fuse
Various mounting options
Hard-wearing housing
Service-friendly spring-loaded connector system

Applications

Battery module for building a secure 24-Vdc power supply in case of power failure.

More technical information you will find on Page 146 in Chapter 2.3



Accumulator module **PVA**

		Type	PVA 24/3,2Ah	PVA 24/7Ah	PVA 24/12Ah
Electrical data	Type				
	<u>Input</u>				
	Input rated voltage		24 Vdc	24 Vdc	24 Vdc
	Rated capacity		3.2 Ah	7.0 Ah	12.0 Ah
	<u>Output</u>				
	Output rated voltage		24 Vdc	24 Vdc	24 Vdc
	Output rated current		max. 21.00 A	max. 21 A	max. 21 A
	Internal fuse		15 A (slow-blow)	25 A (slow-blow)	25 A (slow-blow)
	Parallel connection		Yes	Yes	Yes
	Resistor for temperature measurement		NTC K164 / 4,7 kΩ	NTC K164 / 4,7 kΩ	NTC K164 / 4,7 kΩ
	<u>Environment</u>				
	Ambient temperature		-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
	Storage temperature		-20° C to +40° C	-20° C to +40° C	-20° C to +40° C
	Service life		5 years by +20° C	5 years by +20° C	5 years by +20° C
Latest commissioning (only accumulators)		6 months by +30° C to +40° C	6 months by +30° C to +40° C	6 months by +30° C to +40° C	
<u>Safety and protection</u>					
Protection index		IP 20	IP 20	IP 20	
Safety class		III, without PE connection	III, without PE connection	III, without PE connection	
<u>Order numbers</u>					
Order Number		PVA 24/3,2Ah	PVA 24/7Ah	PVA 24/12Ah	

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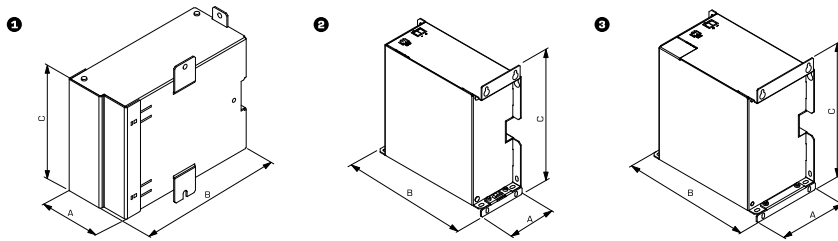


Accumulator module **PVA**

More technical information you will find on Page 146 in Chapter 2.3

Mechanical data	Typ	Connections input / output (spring clamp terminal, pluggable)	Connections temperature measurement, (spring clamp terminal, pluggable)	Fixing method	Weight	Dimension picture (in mm)		
						1	2	3
	PVA 24/3,2Ah	max. 2.5 mm ²	max. 2.5 mm ²	Straps at the case	4.20 kg	73	175.5	165
	PVA 24/7Ah	max. 10 mm ²	max. 2.5 mm ²	Straps at the case	6.50 kg	86	217.5	236
	PVA 24/12Ah	max. 10 mm ²	max. 2.5 mm ²	Straps at the case	10.60 kg	120.5	217.5	236

Dimension pictures



Accumulator module **PVAF**



General Data

Input rated voltage 24 Vdc
Output rated voltage 24 Vdc
Capacity 1.2 - 12 Ah
Ambient temperature -10° C to +40° C
Protection index IP 20

Advantages

Includes temperature meter in housing
Includes battery fuse
Various mounting options
Hard-wearing housing
Service-friendly spring-loaded connector system

Applications

Battery module for building a secure 24-Vdc power supply in case of power failure.

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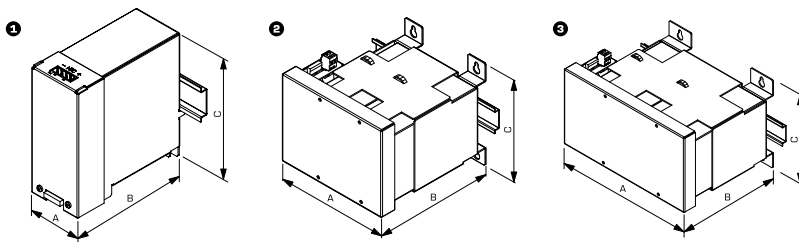


Accumulator module **PVAF**

More technical information you will find on Page 146 in Chapter 2.3

		PVAF 24/1,2Ah	PVAF 24/7Ah	PVAF 24/12Ah	
Electrical data	Type	PVAF 24/1,2Ah	PVAF 24/7Ah	PVAF 24/12Ah	
	Input				
	Input rated voltage	24 Vdc	24 Vdc	24 Vdc	
	Rated capacitie	1.2 Ah	7.0 Ah	12.0 Ah	
	Output				
	Output rated voltage	24 Vdc	24 Vdc	24 Vdc	
	Output rated current	max. 7,50 A	max. 21 A	max. 21 A	
	Internal fuse	15 A (slow blow)	25 A (slow-blow)	25 A (slow-blow)	
	Parallel connection	Yes	Yes	Yes	
	Resistor for temperature measurement	NTC K164 / 4,7 kΩ	NTC K164 / 4,7 kΩ	NTC K164 / 4,7 kΩ	
	Environment				
	Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	
	Storage temperature	-20° C to +40° C	-20° C to +40° C	-20° C to +40° C	
	Service life	5 years by +20° C	5 years by +20° C	5 years by +20° C	
Latest commissioning (only accumulators)	6 months by +30 - +40° C	6 months by +30 - +40° C	6 months by +30 - +40° C		
Safety and protection					
Protection index	IP 20	IP 20	IP 20		
Safety class	III, without PE connection	III, without PE connection	III, without PE connection		
Order numbers					
Order Number	PVAF 24/1,2Ah	PVAF 24/7Ah	PVAF 24/12Ah		
Mechanical data	Terminal and mounting				
	Connections input / output (spring clamp terminal, pluggable)	max. 10 mm ²	max. 10 mm ²	max. 10 mm ²	
	Connections temperature measurement, (spring clamp terminal, pluggable)	max. 2.5 mm ²	max. 2.5 mm ²	max. 2.5 mm ²	
	Fixing method	Straps at the case	Straps at the case	Straps at the case	
	Measures and weights				
	Wide	136 mm	163 mm	230 mm	
	Height	55 mm	145 mm	145 mm	
	Depth	126.6 mm	173.5 mm	173.5 mm	
	Weight	1.80 kg	6.50 kg	10.60 kg	
	Dimension picture (in mm)	1	2	3	
A	136	163	230		
B	55	173.5	173.5		
C	126.6	145	145		

Dimension pictures



Autotransformer **PVAT3**



General Data

Input rated voltage 3 x 690 Vac
Output rated voltage 3 x 400 Vac
Rated power 650 - 1386 VA
Ambient temperature +60° C
Protection index IP 00

Applications

Matching transformers to adjust the supply voltage of three-phase switching power supplies from 690 Vac to 400 Vac.

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Standards



Autotransformer
to: VDE 0570 Part 2-13, DIN EN 61558-2-13, EN 61558-2-13,
IEC 61558-2-13

Certifications



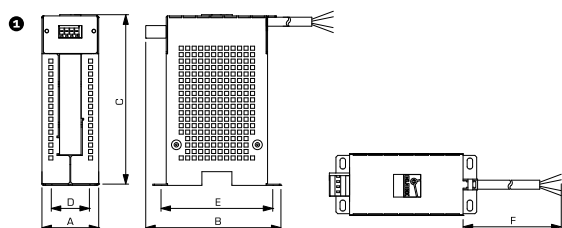
UL 506, CSA 22.2



Autotransformer **PVAT3**

		PVAT3 20	PVAT3 40	
Electrical data	Type	PVAT3 20	PVAT3 40	
	Input			
	Rated input Voltage	3 x 690 Vac	3 x 690 Vac	
	Frequency range	50 - 60 Hz	50 - 60 Hz	
	Output			
	Rated output voltage	3 x 400 Vac	3 x 400 Vac	
	Rated Power	650 VA	1386 VA	
	Rated current	3 x 0.94 A	3 x 2.0 A	
	Vector group	Ya0	Ya0	
	Standards			
	Classification	Autotransformer	Autotransformer	
	Approvals			
	Approvals	cURus	cURus	
	Environment			
	Ambient temperature max.	60° C	60° C	
Safety and protection				
Type	closed type	closed type		
Class of Insulation System	F	F		
Protection index	IP 00	IP 00		
Safety class (prepared)	I	I		
Short circuit strength	non-short-circuit proof	non-short-circuit proof		
Order numbers				
Order Number	PVAT3 20	PVAT3 40		
Mechanical data	Terminal and mounting			
	Terminals PRI	Spring clamp terminal, 4 mm ²	Spring clamp terminal, 4 mm ²	
	Terminals SEC	Supply cable 4 x 1.5 mm ²	Supply cable 4 x 1.5 mm ²	
	Fixing method	Straps at the case	Straps at the case	
	Measures and weights			
	Weight	4.60 kg	6.60 kg	
	Core type	3UI 75/26,5	3UI 75/41,5	
	Dimension picture (in mm)	1	1	
	A	72	90	
	B	170	170	
C	215	215		
D	47.5	63		
E	145	145		
F	350	350		

Dimension pictures



**POWER
VISION**



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Accessories



PV-KOK2

1.8 m long adapter cable for RS-232 interface. Used to connect PowerVision components to controllers or PCs.

Order number

PV-KOK2



PV-WB2

For direct wall screw mounting sideways.

Order number

PV-WB2

PV-TS35M

For mounting sideways on a DIN rail.

Order number

PV-TS35M





PV-USB/SERIELL

USB converter for connection of series equipment (RS232 9 pole Sub-D) to the USB-Bus device.

Order number

PV-USB/SERIELL

Software

Windows-compatible software for the configuration and visualisation of all PowerVision components with integrated control unit. Available for free at www.block-trafo.de.

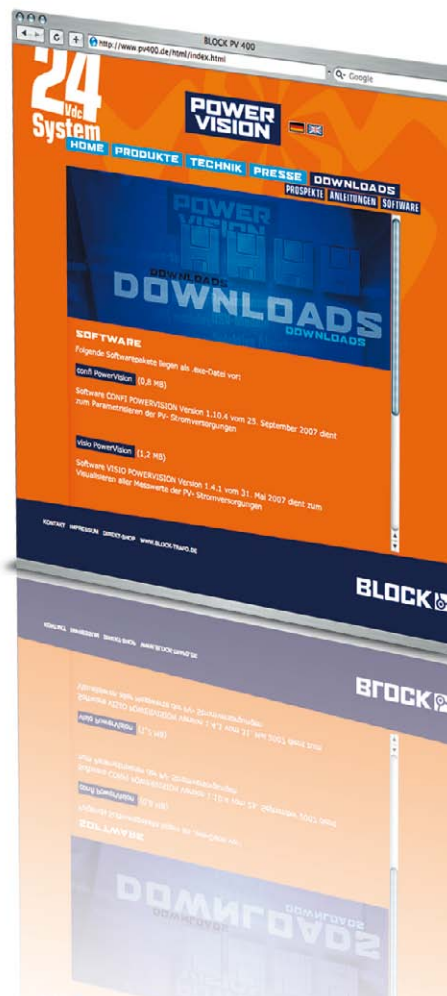


PV-CON

Connector for signal contacts on the front panel of all PowerVision components with integrated control unit.

Order number

PV-CON



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SWITCHED MODE POWER SUPPLIES/ PSR SERIES

Single phase, primary switched mode power supply **PSR 230**



General Data

Input rated voltage 100 - 240 Vac
Output rated voltage 12 - 48 Vdc
Output rated current 1 - 15 A
Ambient temperature up to +70° C
Efficiency up to 90 %
Protection index IP 20

Advantages

Stabilised and adjustable output voltage
DC OK signalling via LEDs
Parallel connection option
Service-friendly spring-loaded connector system
Panel installation on mounting rails

Applications

Primary switch mode power supply is concentrated on the core task of voltage and current supply.

Standards

Primary switched mode power supply
to UL 60950, UL 508, Germanischer Lloyd

Safety:
EN 61558-2-17, EN 60950 (SELV)

EMC:
EN 61204-3

Certifications



UL/CSA 60950 recognised, UL508 listed, Germanischer Lloyd



Single phase, primary switched mode power supply **PSR 230**

Type	PSR 230/12-2	PSR 230/12-4	PSR 230/12-8	PSR 230/12-15
Electrical data				
<u>Input</u>				
Input rated voltage	100 - 240 Vac	100 - 240 Vac	100 - 240 Vac	100 - 240 Vac
Input voltage range	90 - 264 Vac	90 - 264 Vac	97 - 264 Vac	90 - 264 Vac
Input rated current (rated load)	0.3 A (230 Vac)	0.6 A (230 Vac)	1.2 A (230 Vac)	2.8 A (230 Vac)
Low-inrush current	typ. <25 Ap	typ. <30 Ap	typ. <50 Ap	typ. <60 Ap
Rated frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Input fuse internal	2 A (slow-blow)	4 A (slow-blow)	4 A (slow-blow)	6.3 A (slow-blow)
Recommended back-up fuse (circuit breaker)	C10 bzw. B10	C10 or B10	C10 or B16	C10 or B16
Mains buffering	>20 ms	>20 ms	>20 ms	>20 ms
<u>Output</u>				
Output rated voltage	12 Vdc	12 Vdc	12 Vdc	12 Vdc
Output voltage range	11 - 15 Vdc, adjustable	11 - 15 Vdc, adjustable	11 - 15 Vdc, adjustable	11 - 15 Vdc, adjustable
Output rated current	2.00 A	4.00 A	8.00 A	15.00 A
Parallel connection	Yes	Yes	Yes	Yes
Serial operation	Yes	Yes	Yes	Yes
Overload behaviour	Constant current	Constant current	Constant current	Constant current
Efficiency	80 %	89 %	87 %	80 %
<u>Signalling</u>				
Power Good (DC OK)	LED green	LED green	LED green	LED green
Feedback voltage max.	20 Vdc	20 Vdc	20 Vdc	25 Vdc
<u>Standards</u>				
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply
<u>Approvals</u>				
Approvals	GL	GL	GL	GL
<u>Environment</u>				
Ambient temperature	-10° C to +70° C	-10° C to +70° C	-10° C to +70° C	-10° C to +70° C
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Derating	-3 %/K > +50° C	-3 %/K > +50° C	-3 %/K > +50° C	-3 %/K > +50° C
<u>Safety and protection</u>				
Protection index	IP 20	IP 20	IP 20	IP 20
Safety class	I	I	I	I
<u>Accessory</u>				
Wall mounting	WH (optional)	WH (optional)	WH (optional)	WH (optional)
<u>Order numbers</u>				
Order Number	PSR 230/12-2	PSR 230/12-4	PSR 230/12-8	PSR 230/12-15

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SWITCHED MODE POWER SUPPLIES/ PSR SERIES



Single phase, primary switched mode power supply **PSR 230**

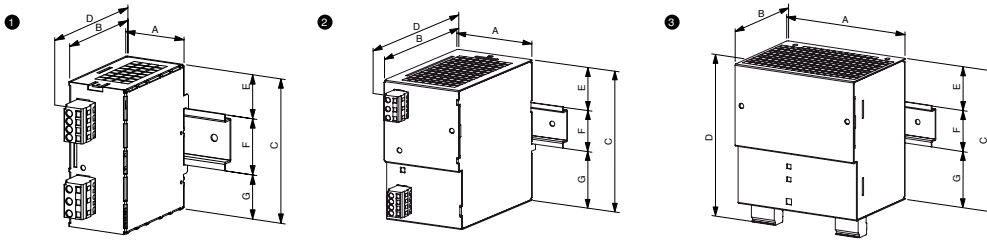
Type		PSR 230/24-1,3	PSR 230/24-2,5	PSR 230/24-5	PSR 230/24-10
Electrical data	Input				
	Input rated voltage	100 - 240 Vac	100 - 240 Vac	100 - 240 Vac	100 - 240 Vac
	Input voltage range	90 - 264 Vac	90 - 264 Vac	90 - 264 Vac	90 - 264 Vac
	Input rated current (rated load)	0.3 A (230 Vac)	0.6 A (230 Vac)	1.2 A (230 Vac)	2.5 A (230 Vac)
	Low-inrush current	typ. <15 Ap	typ. <50 Ap	typ. <30 Ap	typ. <60 Ap
	Rated frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
	Input fuse internal	2 A (slow-blow)	1.6 A (slow-blow)	4 A (slow-blow)	6.3 A (slow-blow)
	Recommended back-up fuse (circuit breaker)	C10 or B10	C10 or B16	C10 or B10	C10 or B16
	Mains buffering	>20 ms	>20 ms	>20 ms	>20 ms
	Output				
Output rated voltage	24 Vdc	24 Vdc	24 Vdc	24 Vdc	
Output voltage range	22 - 28.8 Vdc, adjustable	22 - 28.8 Vdc, adjustable	22 - 28.8 Vdc, adjustable	22.8 - 28.8 Vdc, adjustable	
Output rated current	1.30 A	2.50 A	5.00 A	10.00 A	
Parallel connection	Yes	Yes	Yes	Yes	
Serial operation	Yes	Yes	Yes	Yes	
Overload behaviour	Constant current	Constant current	Constant current	Constant current	
Efficiency	83 %	90 %	90 %	88 %	
Signalling					
Power Good (DC OK)	LED green	LED green	LED green	LED green, LED red	
Feedback voltage max.	30 Vdc	30 Vdc	30 Vdc	33 Vdc	
Standards					
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	
Approvals					
Approvals	cURus, cULus, GL	cURus, cULus, GL	cURus, cULus, GL	cURus, cULus, GL	
Environment					
Ambient temperature	-10° C to +70° C	-10° C to +70° C	-10° C to +70° C	-10° C to +70° C	
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	
Derating	-3 %/K > +50° C	-3 %/K > +50° C	-3 %/K > +55° C	-3 %/K from +50° C, -2 %/V from U _{in} < 97 Vac	
Safety and protection					
Protection index	IP 20	IP 20	IP 20	IP 20	
Safety class	I	I	I	I	
Accessory					
Wall mounting	WH (optional)	WH (optional)	WH (optional)	WH (optional)	
Order numbers					
Order Number	PSR 230/24-1,3	PSR 230/24-2,5	PSR 230/24-5	PSR 230/24-10	



Single phase, primary switched mode
power supply
PSR 230

Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)							
						A	B	C	D	E	F	G	
PSR 230/12-2	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall mounting with bracket holder WH 70	0.30 kg	1	40	70	90	88	27	35	28
PSR 230/12-4	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall mounting with bracket holder WH 70	0.70 kg	2	50.5	115	118	133	37	35	46
PSR 230/12-8	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall mounting with bracket holder WH 70	0.90 kg	2	67	115	120	133	37	35	48
PSR 230/12-15	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall mounting with bracket holder WH 220	0.90 kg	3	113	86.5	120	138	37	35	48
PSR 230/24-1,3	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall mounting with bracket holder WH 70	0.30 kg	1	40	70	90	88	27	35	28
PSR 230/24-2,5	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall mounting with bracket holder WH 70	0.70 kg	2	50.5	115	118	133	37	35	46
PSR 230/24-5	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall mounting with bracket holder WH 70	0.90 kg	2	67	115	120	133	37	35	48
PSR 230/24-10	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall mounting with bracket holder WH 220	0.94 kg	3	113	86.5	120	138	37	35	48

Dimension pictures



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SWITCHED MODE POWER SUPPLIES/ PSR SERIES

Single phase, primary switched mode power supply **PSRA 3**



General Data

Input rated voltage 230 Vac
Output rated voltage 30.5 Vdc
Output rated current 3.00 A
Ambient temperature -10° C to +50° C
Efficiency 90 %
Protection index IP 20
Panel installation on mounting rails

Advantages

Stabilised and adjustable output voltage
DC OK signalling via LEDs
Service-friendly spring-loaded connector system

Applications

Primary switch mode power supply with integrated output filter for AS-i bus system.

Standards

Primary switched mode power supply
to UL 60950, UL 508 ASi, Germanischer Lloyd

Safety:
EN 61558-2-17, EN 60950 (SELV)

EMC:
EN 61204-3

Certifications



UL/CSA 60950 recognised, UL508 listed Germanischer Lloyd, AS-Interface



Single phase, primary switched mode
power supply
PSRA 3

Electrical data	Type	PSRA 3	
	Input		
	Input voltage range	85 - 264 Vac	
	Low-inrush current	<50 Ap	
	Input rated current (rated load)	1.4 A (115 Vac) / 0.8 A (230 Vac)	
	Rated frequency range	50 - 60 Hz	
	Input rated voltage	230 Vac	
	Input fuse internal	3 A (slow-blow)	
	Recommended back-up fuse (circuit breaker)	C10 or B16	
	Mains buffering	115 Vac >15 ms / 230 Vac >50 ms	
	Output		
	Output rated voltage	30.5 Vdc	
	Output voltage range	26 - 33 Vdc, adjustable	
	Output rated current	3.00 A	
	Overload behaviour	Constant current	
	Efficiency	89 %	
	Signalling		
	Power Good (DC OK)	LED green	
	Feedback voltage max.	40 Vdc	
Standards			
Classification	Primary switched mode power supply		
Approvals			
Approvals	cURus, cULus, GL		
Environment			
Ambient temperature	-10° C to 50° C		
Derating	-3 %/K >+50° C		
Safety and protection			
Protection index	IP 20		
Safety class	I		
Accessory			
Wall mounting	WH (optional)		
Order numbers			
Order Number	PSRA 3		

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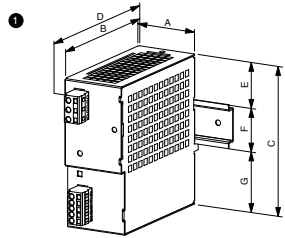
SWITCHED MODE POWER SUPPLIES/ PSR SERIES



Single phase, primary switched mode power supply **PSRA 3**

Mechanical data	Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)	A	B	C	D	E	F	G
								51	115	120	133	37	35	46
PSRA 3		max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	0.60 kg		51	115	120	133	37	35	46

Dimension pictures



Three phase, primary switched mode
power supply
PSR 500



General Data

Input rated voltage 3 x 400 Vac
Output rated voltage 24 Vdc
Output rated current 5 - 40 A
Ambient temperature up to +70° C
Efficiency up to 88 %
Protection index IP 20

Advantages

Stabilised and adjustable output voltage
DC OK signalling via LEDs
Parallel connection option
Service-friendly spring-loaded connector system
Panel installation on mounting rails

Applications

Primary switch mode power supply is concentrated on the core task of voltage and current supply.

Standards

Primary switched mode power supply
to UL 60950, UL 508

Safety:
EN 61558-2-17, EN 60950 (SELV)

EMC:
EN 61204-3

Certifications



UL/CSA 60950 recognised, UL508 listed

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SWITCHED MODE POWER SUPPLIES/ PSR SERIES



Three phase, primary switched mode power supply **PSR 500**

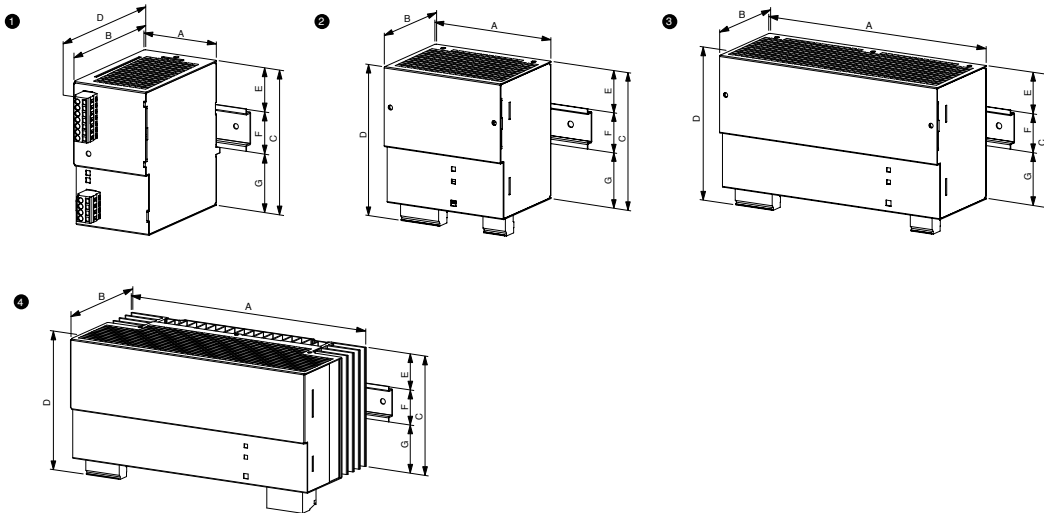
Type	PSR 500/24-5	PSR 500/24-10	PSR 500/24-20	PSR 500/24-40
Electrical data				
Input				
Input rated voltage	3 x 400 - 500 Vac	3 x 400 - 500 Vac	3 x 400 - 500 Vac	3 x 400 - 500 Vac
Input voltage range	325 - 550 Vac	325 - 550 Vac	325 - 550 Vac	325 - 550 Vac
Input rated current (rated load)	3 x 0.3 A (400 Vac)	3 x 0.6 A (400 Vac)	3 x 1.2 A (400 Vac)	3 x 2.4 A (400 Vac)
Low-inrush current	typ. <30 Ap	typ. <30 Ap	typ. <30 Ap	typ. <30 Ap
Rated frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Recommended back-up fuse (circuit breaker)	3 x C10 or B16	3 x C10 or B16	3 x C10 or B16	3 x C10 or B16
Mains buffering	>10 ms by 400 Vac	>10 ms by 400 Vac	>20 ms by 400 Vac	>10 ms by 400 Vac
Output				
Output rated voltage	24 Vdc	24 Vdc	24 Vdc	24 Vdc
Output voltage range	22.8 - 28.8 Vdc, adjustable	22.8 - 28.8 Vdc, adjustable	22.8 - 28.8 Vdc, adjustable	22.8 - 28.8 Vdc, adjustable
Output rated current	5.00 A	10.00 A	20.00 A	40.00 A
Parallel connection	Yes	Yes	Yes	Yes
Serial operation	Yes	Yes	Yes	Yes
Overload behaviour	Constant current	Constant current	Constant current	Constant current
Efficiency	83 %	83 %	85 %	88 %
Signalling				
Power Good (DC OK)	LED green, LED red	LED green, LED red	LED green, LED red	LED green, LED red
Feedback voltage max.	30 Vdc	30 Vdc	30 Vdc	30 Vdc
Standards				
Classification	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply	Primary switched mode power supply
Approvals				
Approvals	cURus, cULus	cURus, cULus	cURus, cULus	cURus, cULus
Environment				
Ambient temperature	-10° C to +60° C	-10° C to +60° C	-10° C to +70° C	-10° C to +70° C
Storage temperature	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C	-25° C to +85° C
Derating	-3 %/K from > +50° C	-3 %/K from > +40° C	-3 %/K from > +50° C	-3 %/K from > +50° C
Safety and protection				
Protection index	IP 20	IP 20	IP 20	IP 20
Safety class	I	I	I	I
Accessory				
Wall mounting	WH (optional)	WH (optional)	WH (optional)	WH (optional)
Order numbers				
Order Number	PSR 500/24-5	PSR 500/24-10	PSR 500/24-20	PSR 500/24-40



Three phase, primary switched mode
power supply
PSR 500

Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)							
						A	B	C	D	E	F	G	
PSR 500/24-5	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall-mounting with bracket holder WH 70	0.70 kg	1	67	115	120	138	37	35	48
PSR 500/24-10	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall-mounting with bracket holder WH 220	0.90 kg	2	113	86.5	120	138	37	35	48
PSR 500/24-20	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall-mounting with bracket holder WH 220	2.00 kg	3	218	118	120	138	37	35	48
PSR 500/24-40	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35	3.80 kg	4	260	120	120	138	37	35	48

Dimension pictures



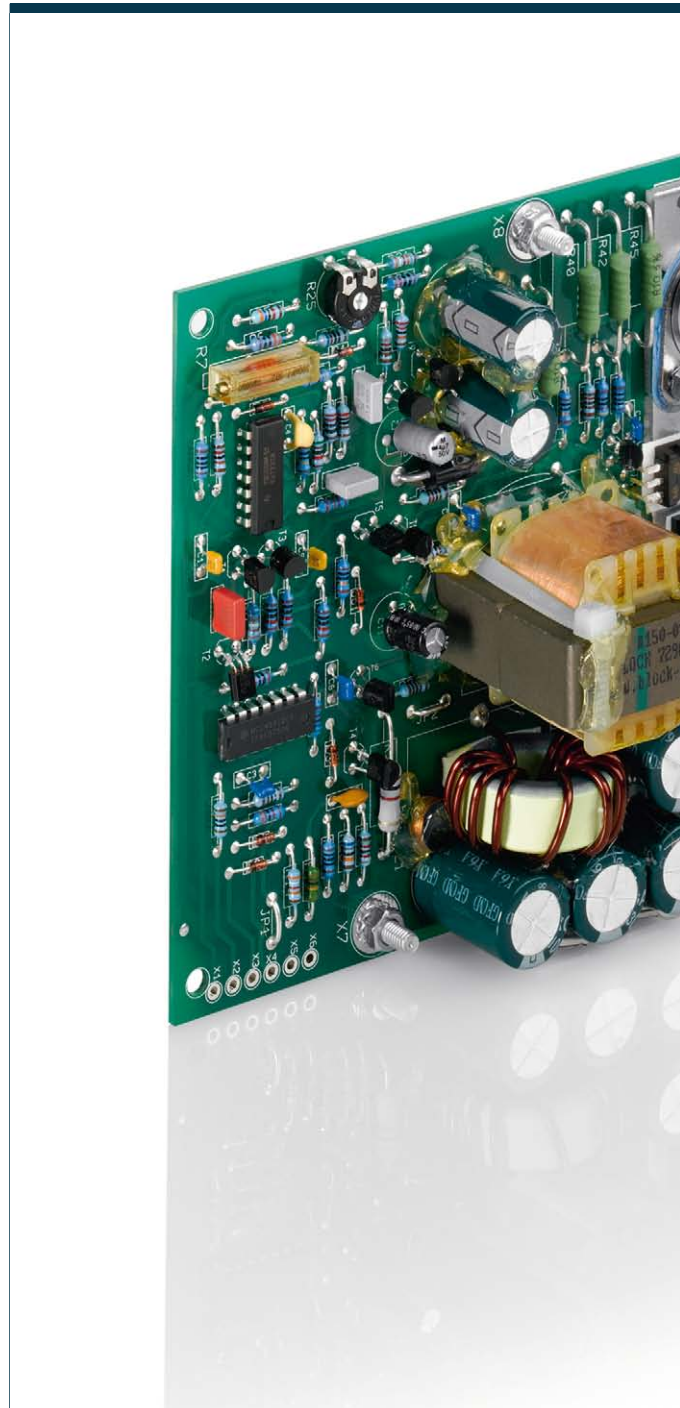
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Step-Down Converter DC/DC **SDC**



General Data

Input rated voltage 10 - 60 Vdc
Output rated voltage 4.5 - 30 Vdc
Output rated current 0 - 20 A
Ambient temperature 0° C to +70° C
Efficiency typ. 75 %
Protection index IP 00

Advantages

Adjustable output voltage
Adjustable current limiting
Stand-by operation
Compensation of voltage drops across output lines
Short circuit proof
Parallel connection option
Vibration proof

Applications

Down converter for low-loss generating output voltages that are lower than the input voltage.



Step-Down Converter DC/DC SDC

		Type	SDC 60/15-20	SDC 60/30-12	
Electrical data	Type		SDC 60/15-20	SDC 60/30-12	
	Input				
	Input rated voltage		10 - 60 Vdc	10 - 60 Vdc	
	Output				
	Output rated voltage		4.5 - 15 Vdc	4.5 - 30 Vdc	
	Output rated current		0 - 20 A	0 - 12 A	
	Tolerance		<3 %	<3 %	
	Efficiency		typ. 75 %	typ. 75 %	
	Load regulation		<2 %	<2 %	
	Ripple factor		150 mVpp	150 mVpp	
	Switching frequency		25 kHz	25 kHz	
	Temperature drift		3 mV/°C	3 mV/°C	
	Input / Output difference		3.5 Vdc (U _{in} > 15 Vdc) / 5 Vdc (U _{in} < 15 Vdc)	3.5 Vdc (U _{in} > 15 Vdc) / 5 Vdc (U _{in} < 15 Vdc)	
	Output limited current		24 to 27 A	17 A ± 10 %	
	Environment				
	Ambient temperature		0° C to +70° C	0° C to +50° C	
Storage temperature		-20° C to +85° C	-20° C to +85° C		
Heat sink temperature		max. 80° C	max. 80° C		
Relative humidity		5 to 80 % RH	5 to 80 % RH		
Order numbers					
Order Number		SDC 60/15-20	SDC 60/30-12		
Mechanical data	Measures and weights				
	Weight		0.40 kg	0.40 kg	
	Wide		127 mm	127 mm	
	Height		51 mm	51 mm	
	Depth		137 mm	137 mm	

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Overview of transformer power supplies linearly regulated

Power at a glance

single phase	Output rated voltage	Type	Input rated voltage	6 W	12 W	25 W	48 W	72 W	120 W	Residual ripple factor	Page
				5 - 12 Vdc	LPS	115 or 230 Vac	0,5 A				
24 Vdc	GLS	230 Vac		0,5 A	1 A	2 A	3 A	5 A		≤30 mVss (U _{rated})	90



Features

		Power supplies	
Type	LPS	GLS	
			
			
			
Page	89	86	



LED signalling: a green LED provide information about the operating status of the device



Parallel connection option: For increased power and redundancy



Stabilised output voltage: Stabilised and configurable output voltage



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TRANSFORMER POWER SUPPLIES/ LINEARLY REGULATED

Single phase, linear stabilised dc power supply **GLS**



General Data

Input rated voltage 230 Vac
Output rated voltage 24 Vdc
Output rated current 0.5 - 5 A
Residual ripple factor 30 mVss
Ambient temperature 40° C, 60° C by reduced power
Protection index IP 00
Panel installation on mounting rails

Advantages

Accurate output current regulation
Short settling time
Low ripple factor
Input and output protection

Applications

Linear regulated DC power supply for environments susceptible to interference for Example in measurement or data transmission.

Standards



Linear stabilised dc power supply / Safety isolating transformer to VDE 0570 part 2-6, EN 61558-2-6, IEC 61558-2-6, UL 1012, UL 506

EMC:
EN 61000-4-4 / EN 61000-4-5 (Interference immunity), EN 50011 (Interference emissions)

Certifications



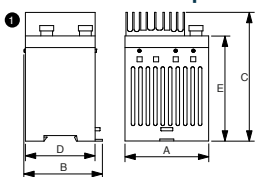
UL 5085-1/-2, CSA 22.2 No.66



Single phase, linear stabilised dc power supply **GLS**

		GLS 230/24-0,5	GLS 230/24-1	GLS 230/24-2	GLS 230/24-3	
Electrical data	Type					
	Input					
	Input rated voltage	230 Vac	230 Vac	230 Vac	230 Vac	
	Frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	
	Output					
	Output rated voltage	24 Vdc	24 Vdc	24 Vdc	24 Vdc	
	Power	12.00 W	24.00 W	48.00 W	72.00 W	
	Output rated current (40°C)	0.50 A	1.00 A	2.00 A	3.00 A	
	Output rated current (60°C)	0.30 A	0.40 A	0.70 A	1.00 A	
	Ripple factor	≤30 mVpp at nom. input volt.	≤30 mVpp at nom. input volt.	≤30 mVpp at nom. input volt.	≤30 mVpp at nom. input volt.	
	Efficiency	50 %	50 %	52 %	52 %	
	Standards					
	Classification	Linear stabilised dc power supply and safety isolating transformer	Linear stabilised dc power supply and safety isolating transformer	Linear stabilised dc power supply and safety isolating transformer	Linear stabilised dc power supply and safety isolating transformer	
	Approvals					
	Approvals	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	
Environment						
Cooling method	by self cooling	by self cooling	by self cooling	by self cooling		
Ambient temperature max.	+40° C, +60° C by reduced power	+40° C, +60° C by reduced power	+40° C, +60° C by reduced power	+40° C, +60° C by reduced power		
Safety and protection						
Type	enclosed	enclosed	enclosed	enclosed		
Class of Insulation System	E	E	E	E		
Protection index	IP 00	IP 00	IP 00	IP 00		
Safety class (prepared)	II	II	II	II		
Short circuit strength	short-circuit proof	short-circuit proof	short-circuit proof	short-circuit proof		
Order numbers						
Order Number	GLS 230/24-0,5	GLS 230/24-1	GLS 230/24-2	GLS 230/24-3		
Mechanical data	Terminal and mounting					
	Terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	
	Fixing method	DIN Rail system TH 35	DIN Rail system TH 35	DIN Rail system TH 35	DIN Rail system TH 35	
	Measures and weights					
	Weight	0.95 kg	1.20 kg	2.60 kg	2.60 kg	
	Dimension picture (in mm)	1	1	1	1	
	A	62.5	62.5	90	90	
	B	85	85	85	85	
	C	135	132	138	168	
	D	75	75	75	75	
E	105	105	113	113		

Dimension pictures



TRANSFORMER POWER SUPPLIES/ LINEARLY REGULATED

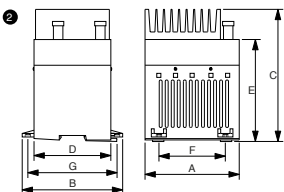


Single phase, linear stabilised dc power supply **GLS**

Electrical data	Type	GLS 230/24-5
	Input	
	Input rated voltage	230 Vac
	Frequency range	50 - 60 Hz
	Output	
	Output rated voltage	24 Vdc
	Power	120.00 W
	Output rated current (40°C)	5.00 A
	Output rated current (60°C)	2.00 A
	Ripple factor	≤30 mVpp at nom. input volt.
	Efficiency	55 %
	Standards	
	Classification	Linear stabilised dc power supply and safety isolating transformer
	Approvals	
	Approvals	cURus (transformer only)
Environment		
Cooling method	by self cooling	
Ambient temperature max.	+40° C, +60° C by reduced power	
Safety and protection		
Type	enclosed	
Class of Insulation System	E	
Protection index	IP 00	
Safety class (prepared)	II	
Short circuit strength	short-circuit proof	
Order numbers		
Order Number	GLS 230/24-5	

Mechanical data	Terminal and mounting	
	Terminals	Screw-type terminals
	Fixing method	DIN Rail system TH 35
	Measures and weights	
	Weight	4.00 kg
	Dimension picture (in mm)	
	A	125
	B	134
	C	175
	D	102
E	135	

Dimension pictures



Linear stabilised dc power supply
LPS



General Data

Input rated voltage 115 or 230 Vac
Output rated voltage 5 - 15 Vdc
Output rated current 0.50 A
Ambient temperature -10° C to +60° C
Protection index IP 20

Advantages

Stabilised and adjustable output voltage
DC OK signalling via LEDs
Parallel connection option
Service-friendly spring-loaded connector system
Panel installation on mounting rails

Applications

Linear regulated DC power supply for environments susceptible to interference for Example in measurement or data transmission.

Standards

Linear stabilized dc power supply
to UL 60950, UL 508

Safety:
EN 61558-2-17, EN 60950 (SELV), EN 60204 (PELV)

EMC:
EN 61204-3

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TRANSFORMER POWER SUPPLIES/ LINEARLY REGULATED



Linear stabilised dc power supply **LPS**

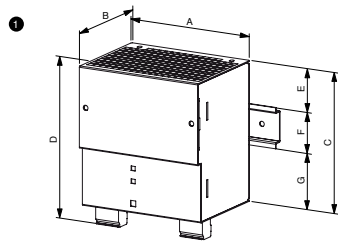
		Type	LPS 230/9-0,5	LPS 230/12-0,5	
Electrical data	Type		LPS 230/9-0,5	LPS 230/12-0,5	
	Input				
	Input rated voltage		115 or 230 Vac, switchable	115 or 230 Vac, switchable	
	Low-inrush current		<10 Ap	<10 Ap	
	Input rated current (rated load)		0.5 A / 0.25 A (115 / 230 Vac)	0.5 / 0.25 A (115 / 230 Vac)	
	Frequency range		50 - 60 Hz	50 - 60 Hz	
	Input fuse internal		160 mA (slow-blow)	315 mA (slow-blow)	
	Output				
	Output rated voltage		5 - 12 Vdc, adjustable	12-15 Vdc, adjustable	
	Output power		2.5 - 6 W, adjustable	6 - 7.5 W, adjustable	
	Output rated current		0.50 A	0.50 A	
	Parallel connection		Yes	Yes	
	Serial operation		Yes	Yes	
	Overload behaviour		Constant current	Constant current	
	Efficiency		50 %	50 %	
	Signalling				
	Power Good (DC OK)		LED green	LED green	
	Standards				
	Classification		Linear stabilised dc power supply	Linear stabilised dc power supply	
	Environment				
	Ambient temperature		-10° C to +60° C	-10° C to +60° C	
Storage temperature		-40° C to +85° C	-40° C to +85° C		
Derating		-3 %/K >40° C	-3 %/K >40° C		
Safety and protection					
Protection index		IP 20	IP 20		
Safety class		I	I		
Accessory					
Wall mounting		WH (optional)	WH (optional)		
Order numbers					
Order Number		LPS 230/9-0,5	LPS 230/12-0,5		



Linear stabilised dc power supply
LPS

Mechanical data	Typ	Connections input, (spring clamp terminal, pluggable)	Connections output, (spring clamp terminal, pluggable)	Mounting position	Fixing method	Weight	Dimension picture (in mm)						
							A	B	C	D	E	F	G
	LPS 230/9-0,5	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall mounting with bracket holder WH 220	1.50 kg	115	95	120	138	37	35	48
	LPS 230/12-0,5	max. 2.5 mm ²	max. 2.5 mm ²	vertical	DIN Rail system TH 35, optional wall mounting with bracket holder WH 220	1.50 kg	115	95	120	138	37	35	48

Dimension pictures



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Overview of transformer power supplies unregulated

Power at a glance

		Output rated voltage	Type	Input rated voltage	6 W	12 W	15 W	25 W	36 W	48 W	60 W	72 W
single phase	24 Vdc		GNC	230 and 400 Vac (± 15 V)							2,5 A	
	12 Vdc		DCT	230 Vac	0,5 A	1 A		2 A		4 A		
	24 Vdc			230 Vac		0,5 A			1,5 A		2,5 A	
	24 Vdc		GLC	230 Vac 400 Vac			1 A			2 A		3 A
three phase	24 Vdc		DNC	Delta connection: 3 x 230 Vac (± 11 V) Star connection: 3 x 400 Vac (± 20 V)								
	24 Vdc		UDNC	Delta connection: 3 x 200/230/240/266/289/332 Vac Star connection: 3 x 346/400/415/460/480/500/575/600 Vac								

Features

		Power supplies				
Type		GNC	DCT	GLC	DNC	UDNC
						
Page		107	98	102	111	115



LED signalling: a green LED provide information about the operating status of the device



Non-stabilised output voltage: Output voltage which is dependent upon the input voltage and the load ratios of the power supply

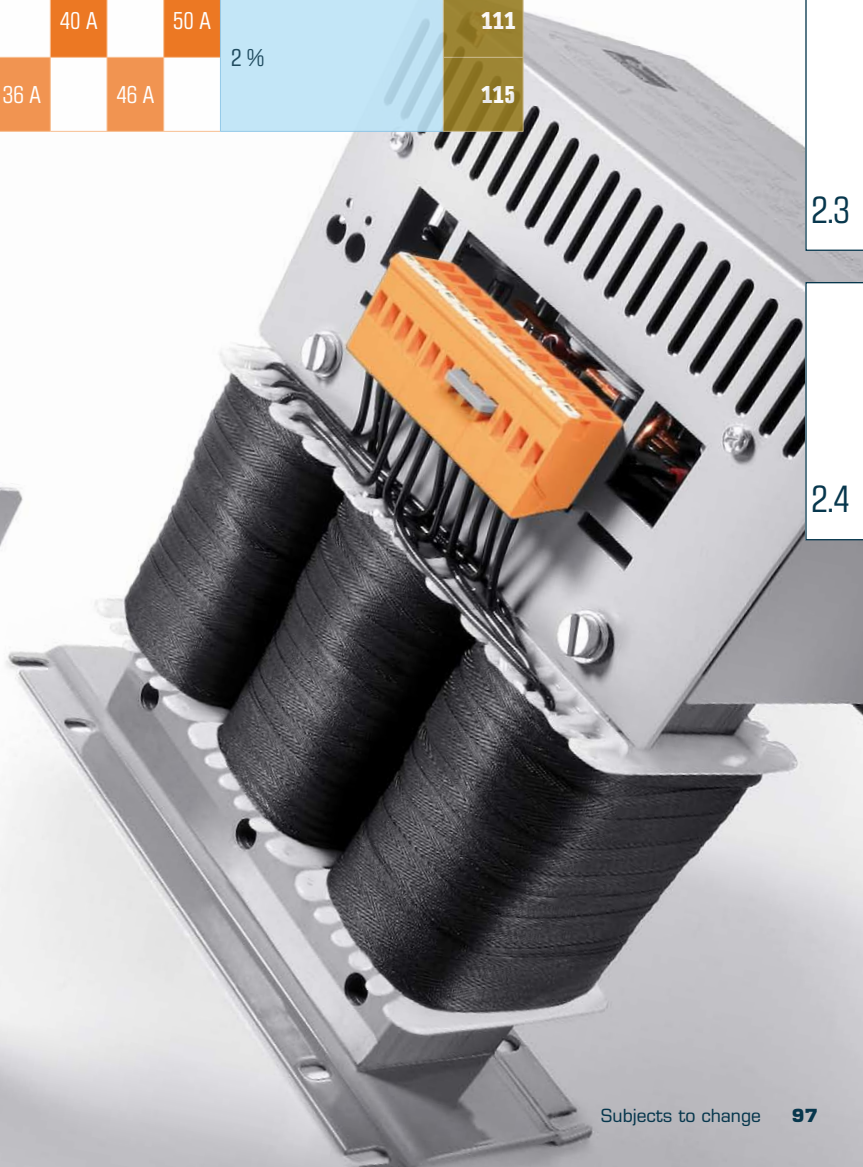
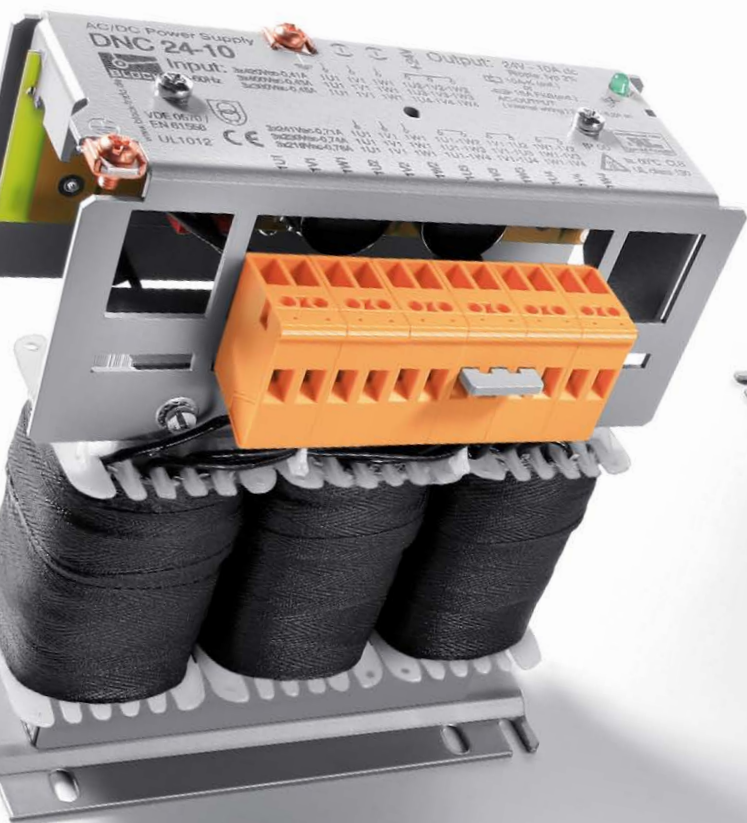
96 W	120 W	180 W	216 W	240 W	324 W	360 W	432 W	480 W	600 W	720 W	864 W	960 W	1104 W	1200 W	Residual ripple factor	Seite
	5 A	7,5 A	10 A	15 A											3 %	107
	5 A	7,5 A	10 A												≤5 %	98
	5 A	7,5 A	10 A											102		
4 A			10 A	15 A	20 A	30 A	40 A	50 A							2 %	111
		9 A	13,5 A	18 A	25 A	36 A	46 A							115		

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Single phase, non-stabilised dc power supply **DCT**



General Data

Input rated voltage 230 Vac
Output rated voltage 12 - 24 Vdc
Output rated current 0.5 - 4 A
Residual ripple factor 5 %
Ambient temperature +25° C
Protection index IP 00

Advantages

Integrated fuse protection and thermal cutout
Seperate windings
Capacitor accessories
Permanent corrosion protection, high insulation value and maximum electrical reliability thanks to XtraDensiFill resin encapsulation
Stable plastic housing for rail mounting, e.g. in consumer units or meter mounting boards

Applications

Robust direct current power is concentrated on the core task of voltage and power supply. Flat step profile optimized for installation in control panels in building automation.

Standards



Non-stabilised dc power supply / Safety isolating transformer
to VDE 0570 part 2-6, EN 61558-2-6, IEC 61558-2-6



Single phase, non-stabilised dc power supply **DCT**

		DCT 12-0,5	DCT 12-1	DCT 12-2	DCT 12-4	
Electrical data	Type					
	Input					
	Input rated voltage	230 Vac	230 Vac	230 Vac	230 Vac	
	Frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	
	Output					
	Output rated voltage	12 Vdc	12 Vdc	12 Vdc	12 Vdc	
	Power	6.00 W	12.00 W	24.00 W	48.00 W	
	Output rated current	0.50 A	1.00 A	2.00 A	4.00 A	
	Ripple factor	≤5 %	≤5 %	≤5 %	≤5 %	
	Standards					
	Classification	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	
	Environment					
	Cooling method	by self cooling	by self cooling	by self cooling	by self cooling	
	Ambient temperature max.	25° C	25° C	25° C	25° C	
	Safety and protection					
	Type	Resin encapsulated transformer	Resin encapsulated transformer	Resin encapsulated transformer	Resin encapsulated transformer	
	Class of Insulation System	B	B	B	B	
	Protection index	IP 00	IP 00	IP 00	IP 00	
	Safety class (prepared)	II	II	II	II	
Short circuit strength	short-circuit proof	short-circuit proof	short-circuit proof	short-circuit proof		
Order numbers						
Order Number	DCT 12-0,5	DCT 12-1	DCT 12-2	DCT 12-4		

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TRANSFORMER POWER SUPPLIES/ UNREGULATED



Single phase, non-stabilised dc power supply **DCT**

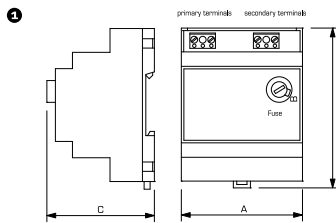
		DCT 24-0,5	DCT 24-1,5	DCT 24-2,5	
Electrical data	Type				
	Input				
	Input rated voltage	230 Vac	230 Vac	230 Vac	
	Frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	
	Output				
	Output rated voltage	24 Vdc	24 Vdc	24 Vdc	
	Power	12.00 W	36.00 W	60.00 W	
	Output rated current	0.50 A	1.50 A	2.50 A	
	Ripple factor	≤5 %	≤5 %	≤5 %	
	Standards				
	Classification	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	
	Environment				
	Cooling method	by self cooling	by self cooling	by self cooling	
	Ambient temperature max.	25° C	25° C	25° C	
	Safety and protection				
	Type	Resin encapsulated transformer	Resin encapsulated transformer	Resin encapsulated transformer	
	Class of Insulation System	B	B	B	
	Protection index	IP 00	IP 00	IP 00	
	Safety class (prepared)	II	II	II	
Short circuit strength	short-circuit proof	short-circuit proof	short-circuit proof		
Order numbers					
Order Number	DCT 24-0,5	DCT 24-1,5	DCT 24-2,5		



Single phase, non-stabilised dc power supply **DCT**

Mechanical data	Typ	Terminals	Fixing method	Weight	Dimension picture (in mm)	Dimension picture (in mm)		
						A	B	C
						1	2	3
DCT 12-0,5	Screw-type terminals	DIN Rail system TH 35	0.45 kg	1	94	63	71	
DCT 12-1	Screw-type terminals	DIN Rail system TH 35	0.51 kg	2	94	63	71	
DCT 12-2	Screw-type terminals	DIN Rail system TH 35	1.08 kg	3	94	63	106	
DCT 12-4	Screw-type terminals	DIN Rail system TH 35	1.90 kg	4	94	63	159	
DCT 24-0,5	Screw-type terminals	DIN Rail system TH 35	0.52 kg	2	94	63	71	
DCT 24-1,5	Screw-type terminals	DIN Rail system TH 35	1.09 kg	3	94	63	106	
DCT 24-2,5	Screw-type terminals	DIN Rail system TH 35	1.93 kg	4	94	63	159	

Dimension pictures



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TRANSFORMER POWER SUPPLIES/ UNREGULATED

Single phase, non-stabilised dc power supply **GLC**



General Data

Input rated voltage 230 and 400 Vac
Output rated voltage 24 Vdc
Output rated current 1 - 10 A
Residual ripple factor 5 %
Ambient temperature +60° C
Protection index IP 00

Advantages

Input and output protection
Separate windings
Capacitor accessories
Double screw terminals on the output
DC OK signalling via LEDs
Panel installation on mounting rails

Applications

Robust direct current power is concentrated on the core task of voltage and power supply.

Standards



Non-stabilised dc power supply / Safety isolating transformer
to VDE 0570 part 2-6, EN 61558-2-6, IEC 61558-2-6, UL 1012

Certifications



UL 5085-1/-2, CSA 22.2 No.66



Single phase, non-stabilised dc power supply **GLC**

		GLC 230/24-1	GLC 230/24-2	GLC 230/24-3	GLC 230/24-5	
Electrical data	Type					
	Input					
	Input rated voltage	230 Vac	230 Vac	230 Vac	230 Vac	
	Frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	
	Output					
	Output rated voltage	24 Vdc	24 Vdc	24 Vdc	24 Vdc	
	Power	24.00 W	48.00 W	72.00 W	120.00 W	
	Output rated current	1.00 A	2.00 A	3.00 A	5.00 A	
	Ripple factor	≤5 %	≤5 %	≤5 %	≤5 %	
	Standards					
	Classification	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	
	Approvals					
	Approvals	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	
	Environment					
	Cooling method	by self cooling	by self cooling	by self cooling	by self cooling	
	Ambient temperature max.	60° C	60° C	60° C	60° C	
	Safety and protection					
Type	enclosed	enclosed	enclosed	enclosed		
Class of Insulation System	E	E	E	E		
Protection index	IP 00	IP 00	IP 00	IP 00		
Safety class (prepared)	II	II	II	II		
Short circuit strength	short-circuit proof	short-circuit proof	short-circuit proof	short-circuit proof		
Order numbers						
Order Number	GLC 230/24-1	GLC 230/24-2	GLC 230/24-3	GLC 230/24-5		

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TRANSFORMER POWER SUPPLIES/ UNREGULATED



Single phase, non-stabilised dc power supply **GLC**

		Type	GLC 230/24-7,5	GLC 230/24-10	GLC 400/24-1	GLC 400/24-2	
Electrical data	Type		GLC 230/24-7,5	GLC 230/24-10	GLC 400/24-1	GLC 400/24-2	
	Input						
	Input rated voltage		230 Vac	230 Vac	400 Vac	400 Vac	
	Frequency range		50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	
	Output						
	Output rated voltage		24 Vdc	24 Vdc	24 Vdc	24 Vdc	
	Power		180.00 W	240.00 W	24.00 W	48.00 W	
	Output rated current		7.50 A	10.00 A	1.00 A	2.00 A	
	Ripple factor		≤5 %	≤5 %	≤5 %	≤5 %	
	Standards						
	Classification		Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	
	Approvals						
	Approvals		cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	
	Environment						
	Cooling method		by self cooling	by self cooling	by self cooling	by self cooling	
	Ambient temperature max.		60° C	60° C	60° C	60° C	
	Safety and protection						
Type		enclosed	enclosed	enclosed	enclosed		
Class of Insulation System		E	E	E	E		
Protection index		IP 00	IP 00	IP 00	IP 00		
Safety class (prepared)		II	II	II	II		
Short circuit strength		short-circuit proof	short-circuit proof	short-circuit proof	short-circuit proof		
Order numbers							
Order Number		GLC 230/24-7,5	GLC 230/24-10	GLC 400/24-1	GLC 400/24-2		



Single phase, non-stabilised dc power supply **GLC**

		GLC 400/24-3	GLC 400/24-5	GLC 400/24-7,5	GLC 400/24-10	
Electrical data	Type					
	Input					
	Input rated voltage	400 Vac	400 Vac	400 Vac	400 Vac	
	Frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	
	Output					
	Output rated voltage	24 Vdc	24 Vdc	24 Vdc	24 Vdc	
	Power	72.00 W	120.00 W	180.00 W	240.00 W	
	Output rated current	3.00 A	5.00 A	7.50 A	10.00 A	
	Ripple factor	≤5 %	≤5 %	≤5 %	≤5 %	
	Standards					
	Classification	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	
	Approvals					
	Approvals	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	
	Environment					
	Cooling method	by self cooling	by self cooling	by self cooling	by self cooling	
	Ambient temperature max.	60° C	60° C	60° C	60° C	
	Safety and protection					
	Type	enclosed	enclosed	enclosed	enclosed	
	Class of Insulation System	E	E	E	E	
Protection index	IP 00	IP 00	IP 00	IP 00		
Safety class (prepared)	II	II	II	II		
Short circuit strength	short-circuit proof	short-circuit proof	short-circuit proof	short-circuit proof		
Order numbers						
Order Number	GLC 400/24-3	GLC 400/24-5	GLC 400/24-7,5	GLC 400/24-10		

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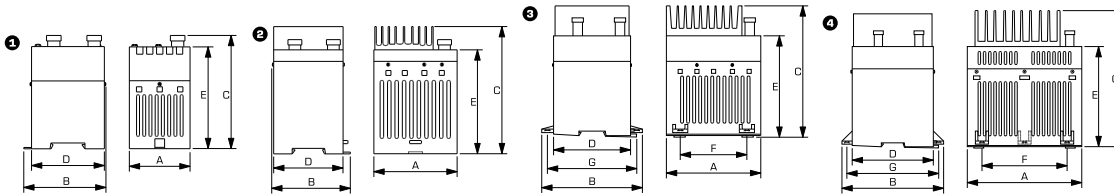
TRANSFORMER POWER SUPPLIES/ UNREGULATED



Single phase, non-stabilised dc power supply **GLC**

Mechanical data	Typ	Terminals	Fixing method	Weight	Dimension picture (in mm)							
					A	B	C	D	E	F	G	
	GLC 230/24-1	Screw-type terminals	DIN Rail system TH 35	1.10 kg	1	62.5	85	116	75	105	-	-
	GLC 230/24-2	Screw-type terminals	DIN Rail system TH 35	1.80 kg	2	90	85	138	75	113	-	-
	GLC 230/24-3	Screw-type terminals	DIN Rail system TH 35	2.30 kg	2	90	85	138	75	113	-	-
	GLC 230/24-5	Screw-type terminals	DIN Rail system TH 35, additional with screws	3.50 kg	3	125	134	175	102	135	87	119
	GLC 230/24-7,5	Screw-type terminals	DIN Rail system TH 35, additional with screws	6.50 kg	4	175	155	212	124	157	130	140
	GLC 230/24-10	Screw-type terminals	DIN Rail system TH 35, additional with screws	7.30 kg	4	175	155	212	124	157	130	140
	GLC 400/24-1	Screw-type terminals	DIN Rail system TH 35	1.10 kg	1	62.5	85	130	75	105	-	-
	GLC 400/24-2	Screw-type terminals	DIN Rail system TH 35	1.80 kg	2	90	85	138	75	113	-	-
	GLC 400/24-3	Screw-type terminals	DIN Rail system TH 35	2.30 kg	2	90	85	138	75	113	-	-
	GLC 400/24-5	Screw-type terminals	DIN Rail system TH 35, additional with screws	3.50 kg	3	125	134	175	102	135	87	119
	GLC 400/24-7,5	Screw-type terminals	DIN Rail system TH 35, additional with screws	6.50 kg	4	175	155	212	124	157	130	140
	GLC 400/24-10	Screw-type terminals	DIN Rail system TH 35, additional with screws	7.30 kg	4	175	155	212	124	157	130	140

Dimension pictures



Single phase, non stabilised
dc power supply
GNC



General Data

Input rated voltage 230 and 400 Vac
Output rated voltage 24 Vdc
Output rated current 2.5 - 15 A
Residual ripple factor 3 %
Ambient temperature +60° C
Protection index IP 00

Advantages

Unsusceptible to voltage surges or transients
High overload capacity
DC OK signalling via LEDs
Capacitor accessories
Very good corrosion protection and low noise thanks to BLOCKIMPEX vacuum impregnation
Impulse loading MKT-capacitors
Varistor wiring
Contact protected screw connection terminals complying with UVV BGV A3

Applications

Rugged DC power supply for harsh industrial applications.

Standards 

Non-stabilised dc power supply / Safety isolating transformer to VDE 0570 part 2-6, EN 61558-2-6, IEC 61558-2-6, UL 1012

Certifications 

UL 5085-1/-2, CSA 22.2 No.66

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TRANSFORMER POWER SUPPLIES/ UNREGULATED



Single phase, non stabilised dc power supply **GNC**

		GNC 24-2,5	GNC 24-5	GNC 24-7,5	GNC 24-10	
Electrical data	Type					
	Input					
	Input rated voltage	230 and 400 Vac, ±15 Vac	230 and 400 Vac, ±15 Vac	230 and 400 Vac, ±15 Vac	230 and 400 Vac, ±15 Vac	
	Frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	
	Output					
	Output rated voltage	24 Vdc	24 Vdc	24 Vdc	24 Vdc	
	Power	60.00 W	120.00 W	180.00 W	240.00 W	
	Output rated current	2.50 A	5.00 A	7.50 A	10.00 A	
	Ripple factor	3 %	3 %	3 %	3 %	
	Standards					
	Classification	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	Single phase non-stabilised dc power supply / safety isolating transformer	
	Approvals					
	Approvals	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	
	Environment					
	Ambient temperature max.	60° C	60° C	60° C	60° C	
	Cooling method	by self cooling	by self cooling	by self cooling	by self cooling	
	Safety and protection					
	Type	open type	open type	open type	open type	
	Class of Insulation System	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130	
Protection index	IP 00	IP 00	IP 00	IP 00		
Safety class (prepared)	I	I	I	I		
Short circuit strength	non-short-circuit proof	non-short-circuit proof	non-short-circuit proof	non-short-circuit proof		
Order numbers						
Order Number	GNC 24-2,5	GNC 24-5	GNC 24-7,5	GNC 24-10		



Single phase, non stabilised dc power supply **GNC**

Electrical data	Type	GNC 24-15
	Input	
	Input rated voltage	230 and 400 Vac, ±15 Vac
	Frequency range	50 - 60 Hz
	Output	
	Output rated voltage	24 Vdc
	Power	360.00 W
	Output rated current	15.00 A
	Ripple factor	3 %
	Standards	
	Classification	Single phase non-stabilised dc power supply / safety isolating transformer
	Approvals	
	Approvals	cURus (transformer only)
	Environment	
	Ambient temperature max.	60° C
	Cooling method	by self cooling
	Safety and protection	
	Type	open type
	Class of Insulation System	VDE=B, UL=class 130
Protection index	IP 00	
Safety class (prepared)	I	
Short circuit strength	non-short-circuit proof	
Order numbers		
Order Number	GNC 24-15	

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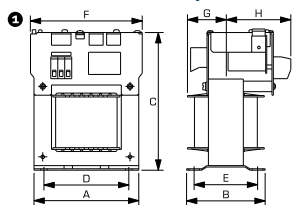
TRANSFORMER POWER SUPPLIES/ UNREGULATED



Single phase, non stabilised
dc power supply
GNC

Mechanical data	Typ	Terminals	Fixing method	Fixing screws	Weight	Dimension picture (in mm)							
						A	B	C	D	E	F	G	H
	GNC 24-2,5	Screw-type terminals	Base plate	M4	2.40 kg	84	76	140	64	64	84	48	40
	GNC 24-5	Screw-type terminals	Base plate	M5	4.60 kg	105	103	160	80.5	86	105	57	52
	GNC 24-7,5	Screw-type terminals	Base plate	M5	6.30 kg	120	112	173	90	94	120	57	56
	GNC 24-10	Screw-type terminals	Base plate	M5	7.45 kg	120	121	173	90	103	120	64	60
	GNC 24-15	Screw-type terminals	Base plate	M6	8.30 kg	150	112	200	122	90	160	55	94

Dimension pictures



Three phase, non stabilised
dc power supply
DNC



General Data

Universal output rated voltage
Output rated voltage 24 Vdc
Output rated power 96 - 1200 W
Residual ripple factor 2 %
Ambient temperature +60° C
Protection index IP 00

Advantages

Unsusceptible to voltage surges or transients
High overload capacity
DC OK signalling via LEDs
Capacitor accessories
Very good corrosion protection and low noise thanks to BLOCKIMPEX vacuum impregnation
Impulse loading MKT-capacitors
Varistor wiring
Contact protected screw connection terminals complying with UVV BGV A3

Applications

Rugged DC power supply for harsh industrial applications.

Standards



Non-stabilised dc power supply / Safety isolating transformer
to VDE 0570 part 2-6, EN 61558-2-6, IEC 61558-2-6, UL 1012

Certifications



UL 5085-1/-2, CSA 22.2 No.66

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TRANSFORMER POWER SUPPLIES/ UNREGULATED



Three phase, non stabilised dc power supply **DNC**

Type		DNC 24-4	DNC 24-10	DNC 24-15 C	DNC 24-20 C	
Electrical data	Input					
	Input rated voltage	Delta-connection: 3x219 Vac/230 Vac/241 Vac Star-connection: 3x380 Vac/400 Vac/420 Vac	Delta-connection: 3x219 Vac/230 Vac/241 Vac Star-connection: 3x380 Vac/400 Vac/420 Vac	Delta-connection: 3x219 Vac/230 Vac/241 Vac Star-connection: 3x380 Vac/400 Vac/420 Vac	Delta-connection: 3x219 Vac/230 Vac/241 Vac Star-connection: 3x380 Vac/400 Vac/420 Vac	Delta-connection: 3x219 Vac/230 Vac/241 Vac Star-connection: 3x380 Vac/400 Vac/420 Vac
	Frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	
	Output					
	Output rated voltage	24 Vdc	24 Vdc	24 Vdc	24 Vdc	
	Power	96.00 W	240.00 W	360.00 W	480.00 W	
	Output rated current	4.00 A	10.00 A	15.00 A	20.00 A	
	Ripple factor	typ. 2 %	typ. 2 %	typ. 2 %	typ. 2 %	
	Standards					
	Classification	Three phase non-stabilised dc power supply / safety isolating transformer	Three phase non-stabilised dc power supply / safety isolating transformer	Three phase non-stabilised dc power supply / safety isolating transformer	Three phase non-stabilised dc power supply / safety isolating transformer	
	Approvals					
	Approvals	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	
	Environment					
	Ambient temperature max.	60° C	60° C	60° C	60° C	
	Cooling method	by self cooling	by self cooling	by self cooling	by self cooling	
	Safety and protection					
Type	open type	open type	open type	open type		
Class of Insulation System	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130		
Protection index	IP 00	IP 00	IP 00	IP 00		
Safety class (prepared)	I	I	I	I		
Short circuit strength	non-short-circuit proof	non-short-circuit proof	non-short-circuit proof	non-short-circuit proof		
Order numbers						
Order Number	DNC 24-4	DNC 24-10	DNC 24-15 C	DNC 24-20 C		



Three phase, non stabilised dc power supply **DNC**

Type	DNC 24-30 C	DNC 24-40 C	DNC 24-50 C
Electrical data			
Input			
Input rated voltage	Delta-connection: 3x219 Vac/230 Vac/241 Vac Star-connection: 3x380 Vac/400 Vac/420 Vac	Delta-connection: 3x219 Vac/230 Vac/241 Vac Star-connection: 3x380 Vac/400 Vac/420 Vac	Delta-connection: 3x219 Vac/230 Vac/241 Vac Star-connection: 3x380 Vac/400 Vac/420 Vac
Frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Output			
Output rated voltage	24 Vdc	24 Vdc	24 Vdc
Power	720.00 W	960.00 W	1200.00 W
Output rated current	30.00 A	40.00 A	50.00 A
Ripple factor	typ. 2 %	typ. 2 %	typ. 2 %
Standards			
Classification	Three phase non-stabilised dc power supply / safety isolating transformer	Three phase non-stabilised dc power supply / safety isolating transformer	Three phase non-stabilised dc power supply / safety isolating transformer
Approvals			
Approvals	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)
Environment			
Ambient temperature max.	60° C	60° C	60° C
Cooling method	by self cooling	by self cooling	by self cooling
Safety and protection			
Type	open type	open type	open type
Class of Insulation System	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130
Protection index	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I
Short circuit strength	non-short-circuit proof	non-short-circuit proof	non-short-circuit proof
Order numbers			
Order Number	DNC 24-30 C	DNC 24-40 C	DNC 24-50 C

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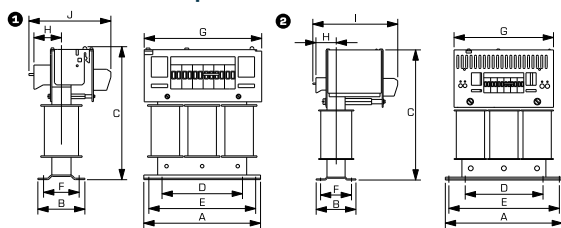
TRANSFORMER POWER SUPPLIES/ UNREGULATED



Three phase, non stabilised dc power supply **DNC**

Mechanical data	Typ	Terminals	Fixing method	Fixing screws	Weight	Dimension picture (in mm)										
						A	B	C	D	E	F	G	H	I		
	DNC 24-4	Screw-type terminals	Base plate	M5	2.50 kg	1	130	72	160	-	105	54	130	37	90	
	DNC 24-10	Screw-type terminals	Base plate	M5	4.30 kg	1	164	66	190	113	150	50	165	40	108	
	DNC 24-15 C	Screw-type terminals	Base plate	M5	6.10 kg	1	164	81	190	113	150	63	165	47	108	
	DNC 24-20 C	Screw-type terminals	Base plate	M6	7.20 kg	1	216	71	220	136	200	55	175	42	140	
	DNC 24-30 C	Screw-type terminals	Base plate	M6	10.60 kg	1	216	92	225	136	200	75	175	51	160	
	DNC 24-40 C	Screw-type terminals	Base plate	M6	16.20 kg	2	266	90	297	176	250	70	225	62	185	
	DNC 24-50 C	Screw-type terminals	Base plate	M6	22.10 kg	2	266	114	297	176	250	94	225	62	185	

Dimension pictures



Three phase, non stabilised universal
dc power supply
UDNC



General Data

Universal input rated voltage
Output rated voltage 24 Vdc
Output rated power 216 - 1104 W
Residual ripple factor 2 %
Ambient temperature +60° C
Protection index IP 00

Advantages

Unsusceptible to voltage surges or transients
High overload capacity
DC OK signalling via LEDs
Capacitor accessories
Very good corrosion protection and low noise thanks to BLOCKIMPEX vacuum impregnation
Impulse loading MKT-capacitors
Varistor wiring
Contact protected screw connection terminals complying with UVV BGV A3

Applications

Rugged DC power supply for harsh industrial applications.

Standards



Non-stabilised dc power supply / Safety isolating transformer to VDE 0570 part 2-6, EN 61558-2-6, IEC 61558-2-6, UL 1012

Certifications



UL 5085-1/-2, CSA 22.2 No.66

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TRANSFORMER POWER SUPPLIES/ UNREGULATED



Three phase, non stabilised universal dc power supply **UDNC**

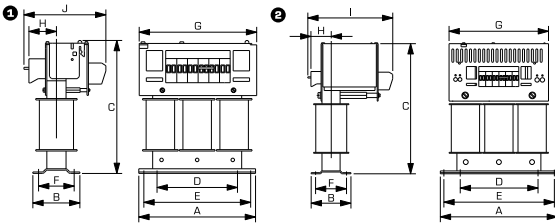
Type		UDNC 24-9 C	UDNC 24-13,5 C	UDNC 24-18 C	UDNC 24-25 C	
Electrical data	Input					
	Input rated voltage	Delta-connection: 3x200 Vac/230 Vac/240 Vac/ 266 Vac/289 Vac/332 Vac Star-connection: 3x346 Vac/400 Vac/415 Vac/ 460 Vac/480 Vac/500 Vac/ 575 Vac/600 Vac	Delta-connection: 3x200 Vac/230 Vac/240 Vac/ 266 Vac/289 Vac/332 Vac Star-connection: 3x346 Vac/400 Vac/415 Vac/ 460 Vac/480 Vac/500 Vac/ 575 Vac/600 Vac	Delta-connection: 3x200 Vac/230 Vac/240 Vac/ 266 Vac/289 Vac/332 Vac Star-connection: 3x346 Vac/400 Vac/415 Vac/ 460 Vac/480 Vac/500 Vac/ 575 Vac/600 Vac	Delta-connection: 3x200 Vac/230 Vac/240 Vac/ 266 Vac/289 Vac/332 Vac Star-connection: 3x346 Vac/400 Vac/415 Vac/ 460 Vac/480 Vac/500 Vac/ 575 Vac/600 Vac	Delta-connection: 3x200 Vac/230 Vac/240 Vac/ 266 Vac/289 Vac/332 Vac Star-connection: 3x346 Vac/400 Vac/415 Vac/ 460 Vac/480 Vac/500 Vac/ 575 Vac/600 Vac
	Frequency range	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	
	Output					
	Output rated voltage	24 Vdc	24 Vdc	24 Vdc	24 Vdc	
	Power	216.00 W	324.00 W	432.00 W	600.00 W	
	Output rated current	9.00 A	13.50 A	18.00 A	25.00 A	
	Ripple factor	2 %	2 %	2 %	2 %	
	Standards					
	Classification	Three phase non-stabilised universal dc power supply / safety isolating transformer	Three phase non-stabilised universal dc power supply / safety isolating transformer	Three phase non-stabilised universal dc power supply / safety isolating transformer	Three phase non-stabilised universal dc power supply / safety isolating transformer	
Approvals						
Approvals	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)	cURus (transformer only)		
Environment						
Ambient temperature max.	60° C	60° C	60° C	60° C		
Cooling method	by self cooling	by self cooling	by self cooling	by self cooling		
Safety and protection						
Type	open type	open type	open type	open type		
Class of Insulation System	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130		
Protection index	IP 00	IP 00	IP 00	IP 00		
Safety class (prepared)	I	I	I	I		
Short circuit strength	non-short-circuit proof	non-short-circuit proof	non-short-circuit proof	non-short-circuit proof		
Order numbers						
Order Number	UDNC 24-9 C	UDNC 24-13,5 C	UDNC 24-18 C	UDNC 24-25 C		



Three phase, non stabilised universal dc power supply **UDNC**

Typ	Terminals	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	E	F	G	H	I
						1	2	3	4	5	6	7	8	9
UDNC 24-9 C	Screw-type terminals	Base plate	M5	4.30 kg	1	164	66	190	113	150	50	165	40	108
UDNC 24-13,5 C	Screw-type terminals	Base plate	M5	6.00 kg	1	164	81	190	113	150	63	165	47	108
UDNC 24-18 C	Screw-type terminals	Base plate	M6	7.30 kg	3	216	71	220	136	200	55	175	42	140
UDNC 24-25 C	Screw-type terminals	Base plate	M6	10.70 kg	4	216	92	225	136	200	75	175	51	160
UDNC 24-36 C	Screw-type terminals	Base plate	M6	16.40 kg	5	266	90	297	176	250	70	225	62	185
UDNC 24-46 C	Screw-type terminals	Base plate	M6	22.30 kg	5	266	114	297	176	250	94	225	62	185

Dimension pictures



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TRANSFORMER POWER SUPPLIES/ UNREGULATED



Three phase, non stabilised universal dc power supply **UDNC**

		Type	UDNC 24-36 C	UDNC 24-46 C
Electrical data	Type			
	Input			
	Input rated voltage		Delta-connection: 3x200 Vac/230 Vac/240 Vac/ 266 Vac/289 Vac/332 Vac Star-connection: 3x346 Vac/400 Vac/415 Vac/ 460 Vac/480 Vac/500 Vac/ 575 Vac/600 Vac	Delta-connection: 3x200 Vac/230 Vac/240 Vac/ 266 Vac/289 Vac/332 Vac Star-connection: 3x346 Vac/400 Vac/415 Vac/ 460 Vac/480 Vac/500 Vac/ 575 Vac/600 Vac
	Frequency range		50 - 60 Hz	50 - 60 Hz
	Output			
	Output rated voltage		24 Vdc	24 Vdc
	Power		864.00 W	1104.00 W
	Output rated current		36.00 A	46.00 A
	Ripple factor		2 %	2 %
	Standards			
Classification		Three phase non-stabilised universal dc power supply / safety isolating transformer	Three phase non-stabilised universal dc power supply / safety isolating transformer	
Approvals				
Approvals		cURus (transformer only)	cURus (transformer only)	
Environment				
Ambient temperature max.		60° C	60° C	
Cooling method		by self cooling	by self cooling	
Safety and protection				
Type		open type	open type	
Class of Insulation System		VDE=B, UL=class 130	VDE=B, UL=class 130	
Protection index		IP 00	IP 00	
Safety class (prepared)		I	I	
Short circuit strength		non-short-circuit proof	non-short-circuit proof	
Order numbers				
Order Number		UDNC 24-36 C	UDNC 24-46 C	



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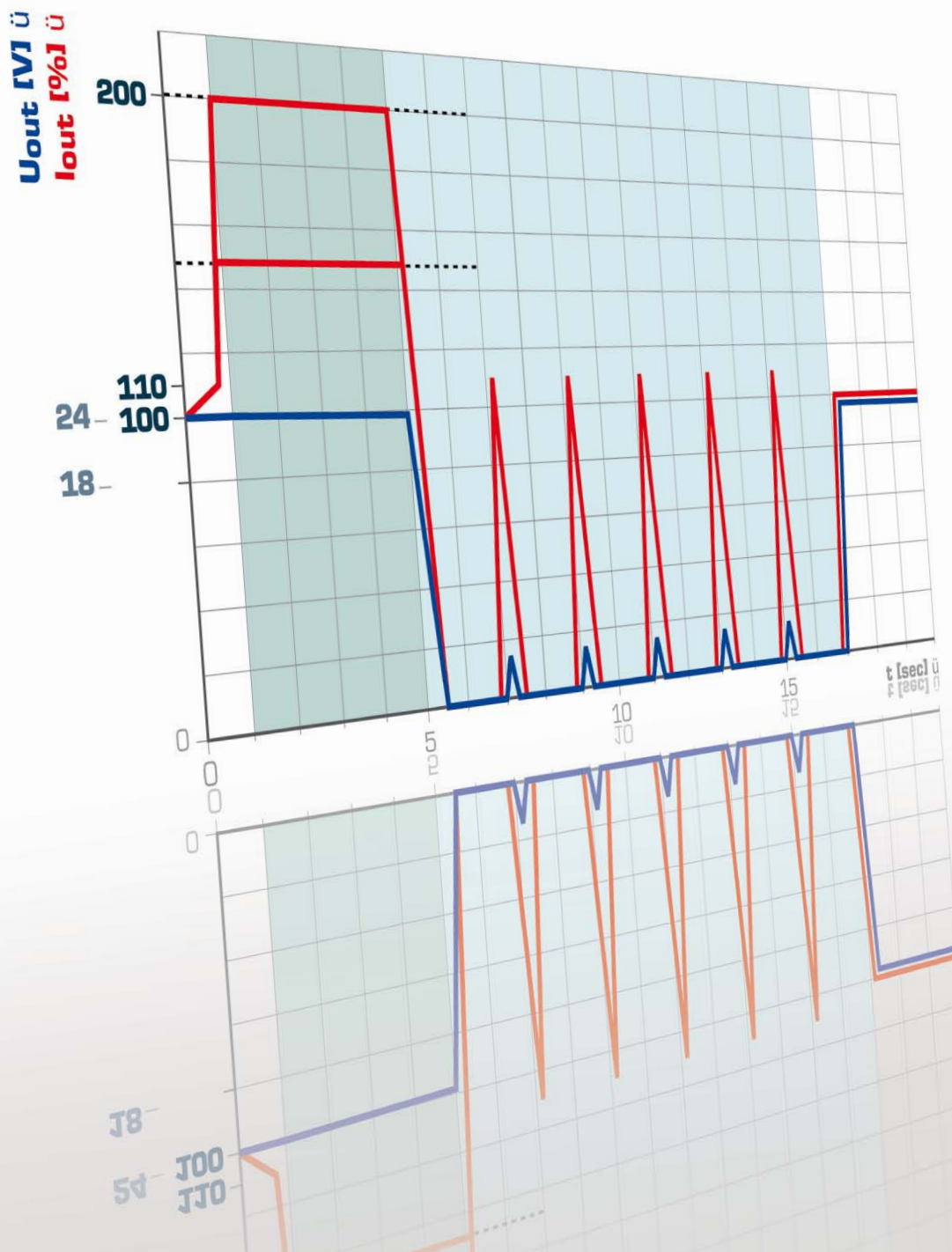
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Technical informations

Content





**Technical informations
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POWER VISION

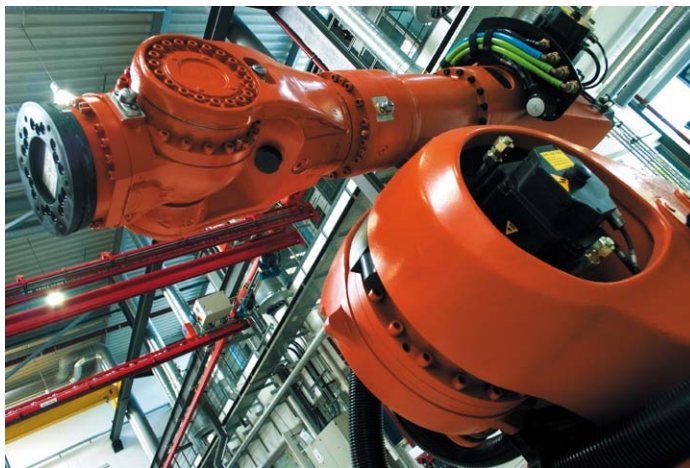
The perfect
power supply system

powerful
comprehensive
communicative
programmable
energy-efficient

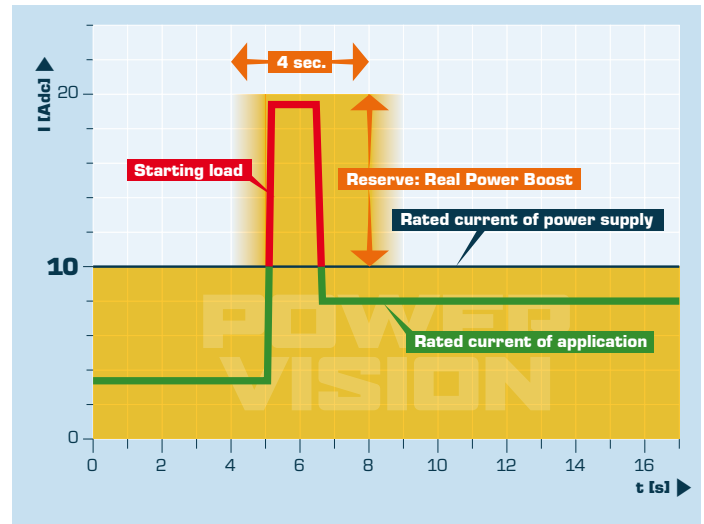


Real Power Boost: For reliable starting up to 200 % power reserve

Conventional switch mode power supplies typically set current limiting at 1.1 times the rated output current. The use of these power supplies becomes very problematic as soon as heavystarting loads are switched in, since these power supplies are not able to make available sufficient current for them. The PowerVision series has power reserves which can make available twice the current at constant voltage for at least 4 seconds. This makes for reliable operation and removes the need for expensive overdimensioning of switch mode power supplies.



Heavy-starting motors and drives (as here in the case of a robot-controlled production facility) require power supplies with high power reserves.



Heavy starting: In rated operation, power can be supplied to the system via a switch mode power supply without problems. However, should a more powerful drive start up, there will be a transient increase in power requirement which goes way above the rated current of the power supply. In order to prevent the supply voltage failing completely, the power supply could be overdimensioned. However, BLOCK's PowerVision with real power boost is a more appropriate solution.

Ingenious proportions and three mounting options



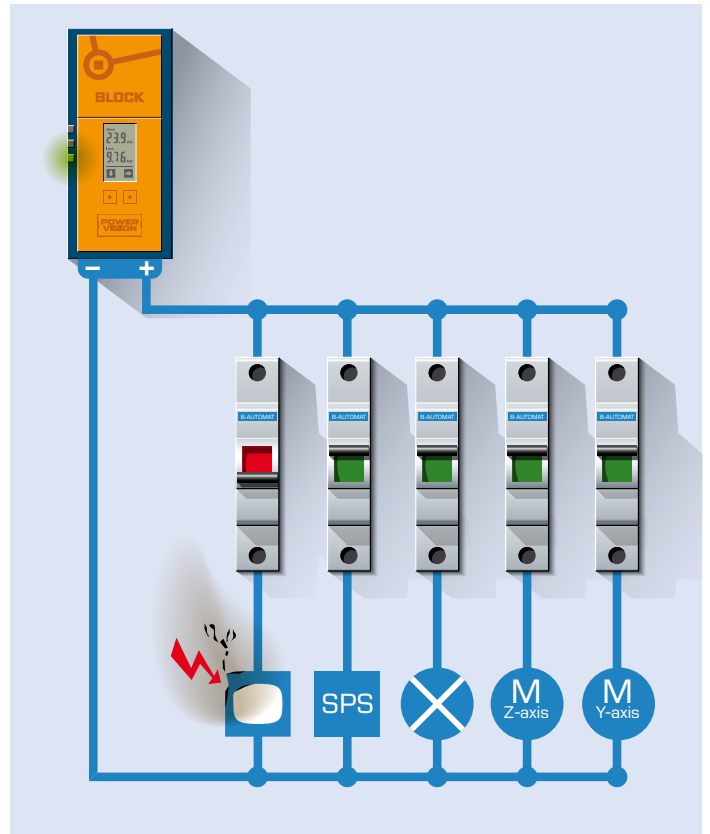
All PowerVision devices are slim, compact and easy to mount. The mounting system has been developed specifically for PowerVision. In addition to the standard 35mm DIN rail mounting snap device integrated into the rear of the unit, the customer also has the possibility to mount it at a 90° angle to the mounting surface, either on a 35 mm DIN rail using the PV-TS35M or screwed directly to the wall with the PV-WB2. This allows a very high flexibility in wiring cabinet installation. Also the direct insert cage clamp terminals that ensure a permanent connection even when under vibration, makes installation even easier. Furthermore, all devices share the same structural shape. This creates more space and transparency in the wiring cabinet.

Top Boost: +60 A additional reserve Cost-effective protection in the form of miniature circuit breakers

In automation technology, the system availability rates required today are generating increased overheads with regard to protection devices for 24 V load circuits. Previously, it was not possible to shut down faulty current paths selectively using conventional miniature circuit breakers, since the required high tripping current could not be provided by the switch mode power supplies. With its stabilised switch mode power supplies, BLOCK can provide a solution offering up to 60 A in excess of the rated current in the event of a short circuit. The proven short circuit and line protection provided by cost-effective miniature circuit breakers is also suitable for use with switch mode power supplies.

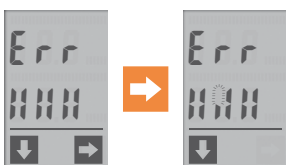


PowerVision's integrated top boost function provides a reliable means of tripping low-cost miniature circuit breakers.



In order for high-speed magnetic miniature circuit breakers to trip, currents which are significantly higher than the rated current are required for a period of 10 to 12 milliseconds. BLOCK's switch mode power supplies are able to supply a powerful 60 A above the rated current for 50 ms. This enables a faulty branch to be shut down selectively in the event of a short circuit whilst the remaining consumers continue to run unaffected.

Fault memory



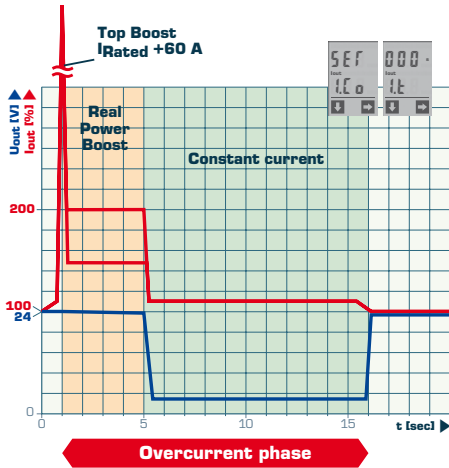
Critical operational statuses are detected by the internal electronics and memorised. The device features an integrated fault manager for self-diagnostics.

Possible errors and faults can be identified by matching the flashing segments on the display to the corresponding error code. Since fault diagnostics data is saved to non-volatile memory, it will be retained even in the event of the power supply being disconnected.

Configurable overcurrent behaviour

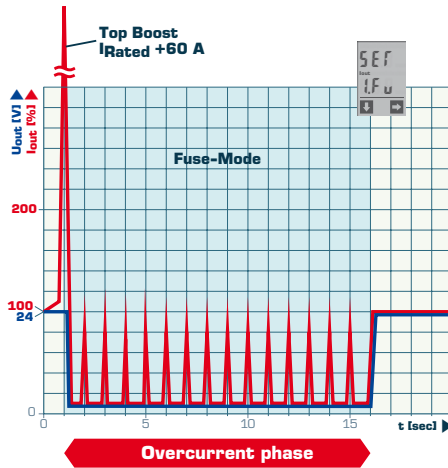
On the Basic and Line models of the PowerVision switch mode power supplies, the output characteristics can be adapted to

the most diverse requirements of a system or machine. Three different characteristics can be set.



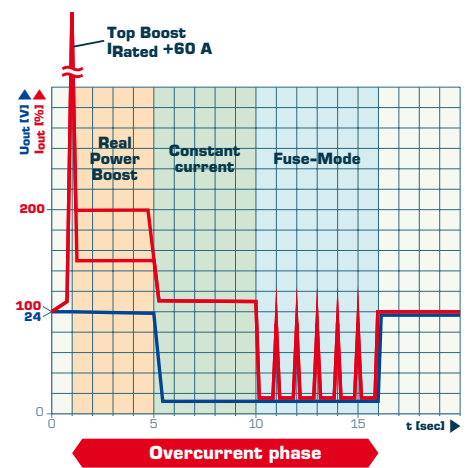
1. permanent constant current

In constant current mode, in the event of overload following power boost, the output current is typically limited to 110 % of the rated current with simultaneously lowered output voltage.



2. permanently reduced current

In fuse mode, the output current is reduced markedly. However, the switch mode power supply does not switch off here. The display, signal outputs and the interface continue working. After around one second, the device attempts to restart the connected consumers. This procedure is repeated until the overload or short circuit has been eliminated.



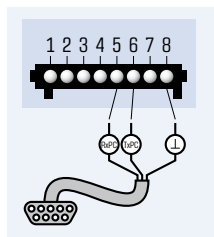
3. time-limited constant current

The switch mode power supply initially operates in constant current mode for a time that can be specified. Once the specified time has elapsed, the device switches to fuse mode and remains in this mode until the overload has been eliminated.

*Instead of the fuse mode, the semi-stabilised switch mode power supplies have a hiccup mode, during which the output of the devices is switched off. The display, signal outputs and the interface are also switched off.

RS-232-Schnittstelle

All PowerVision devices fitted with a serial interface can communicate with a PC or higher-level control system. Key data and possible faults are sent cyclically by the devices. Accordingly, the interface also provides a means of responding to critical operational statuses quickly. Furthermore, many parameter settings can be made via the interface. The software packages can be downloaded free of charge from the Internet. The communication cable (PV-KOK2) can be purchased as an accessory from BLOCK.



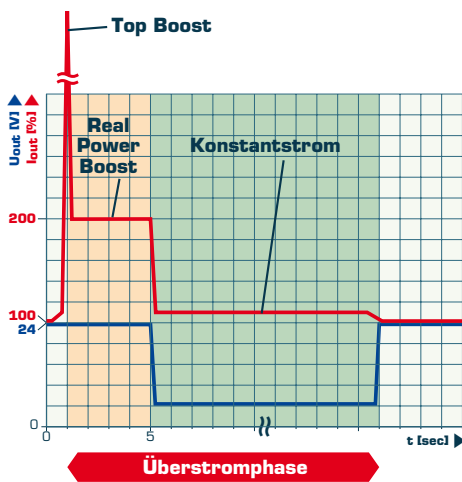
PVSE 230

Single-phase, Economy

Unparalleled power reserves thanks to real power boost and top boost functions increase operational reliability for machines and systems. The device is available with active starting current limiting as an option.



Overload behaviour

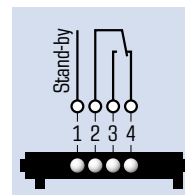


LED signalling

The Economy version is equipped with two LEDs that indicate the current operational status. When the device is running without any errors, the green LED lights up. The red LED signals undervoltage at the power supply output.

Setting the output voltage

The output voltage can be set to between 22.0 and 29.5 V DC on the front panel.

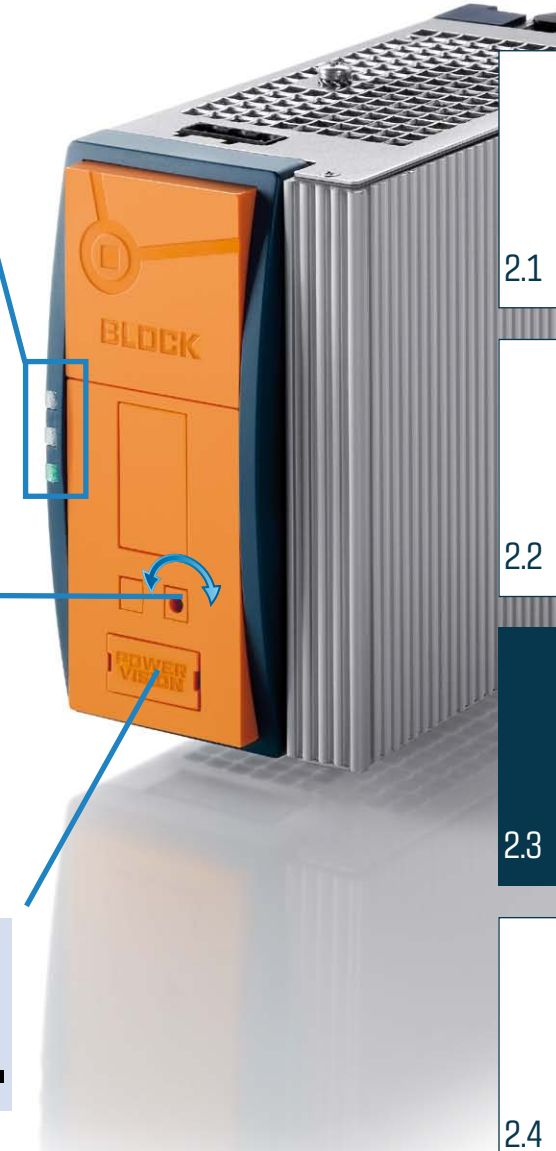


Isolated signal contact

The PVSE 230 switched mode power supply is equipped with an isolated DC OK signalling output. If the output voltage falls below the level set previously, the internal relay drops out. This fault can be queried via the changeover contact.

Stand-by input

The stand-by input allows targeted switch-on and switch-off of the power supply. When an external DC voltage is applied at the stand-by input, the output of the device is not enabled and the switched mode power supply remains on stand-by.



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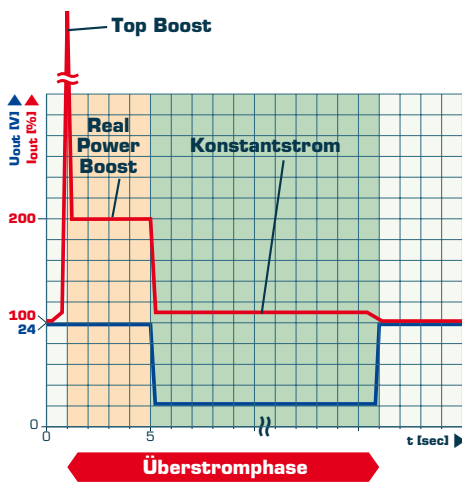
PVSE 400

Three-phase, Economy

The PVSE 400 is an affordable Economy switched mode power supply with high-precision output voltage, and is designed to meet all automation technology requirements. The power supply is optimised for the key task of supplying the voltage and current. Unparalleled power reserves thanks to real power boost and top boost functions increase operational reliability for machines and systems. The device is available with active starting current limiting as an option.



Overload behaviour

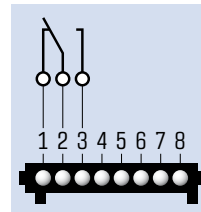


LED signalling

The Economy version is equipped with two LEDs to indicate the operational status. When the device is running without any errors, the green LED lights up. The red LED signals undervoltage at the power supply output.

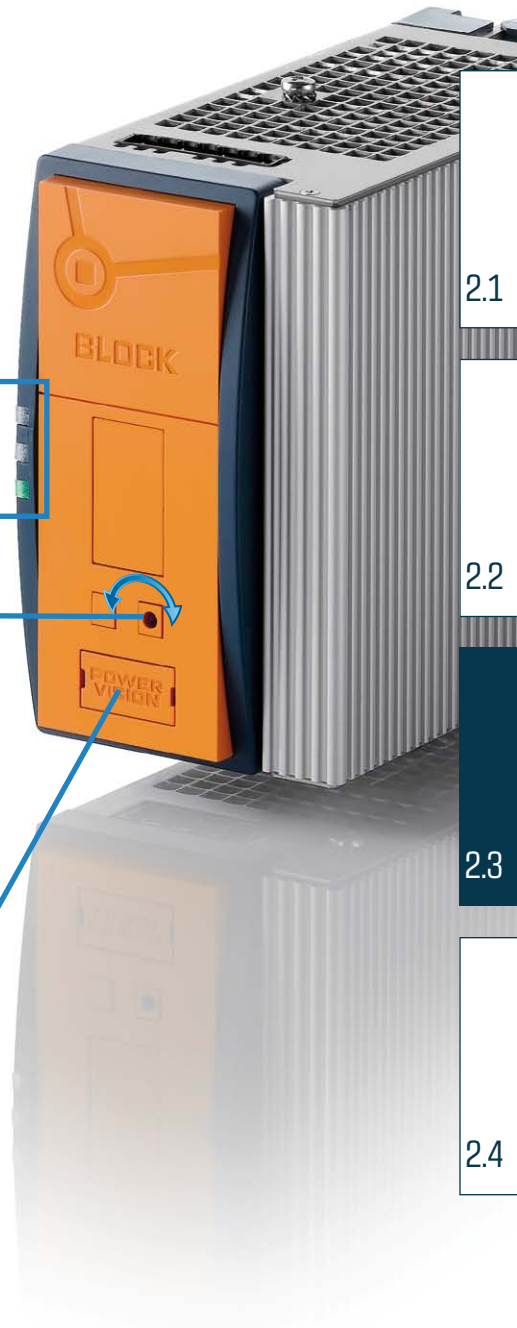
Setting the output voltage

The output voltage can be set to between 22.0 and 28.8 V DC on the front panel.



Isolated DC OK output

The PVSE 400 switched mode power supply can be supplied with an isolated DC OK signal output as an option. In the event of undervoltage at the output, the internal relay drops out. This fault can be queried via the changeover contact.



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PVSB 400

Three-phase, Basic

A smart combination: high-performance power supply with additional output monitoring. In carrying out its key task of supplying voltage and current, the PVSB switched mode power supply is able to increase the operational reliability of machines and systems by drawing on the unparalleled power reserves provided by its real power boost and top boost functions. The device is available with active starting current limiting as an option. Its major plus point is the integrated control unit, which continuously monitors voltage and current at the output. The device also boasts a display and function keys as well as four active signal outputs and an RS-232 interface.



Output monitoring for a more preventive approach

The current and voltage of the PVSB switched mode power supply output are monitored continuously. Key information can be read directly from the display. The integrated control unit is able to detect potential faults affecting equipment at an early stage, store the associated data and output signals accordingly.

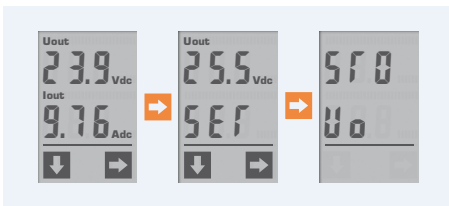
Potential faults the PVSB is able to detect:

- Overcurrent**
When the output current exceeds the rated output current.
- Undervoltage**
When the output voltage falls below the configurable DC OK limit value.
- Hardware fault**
When the device's internal self-testing function fails.

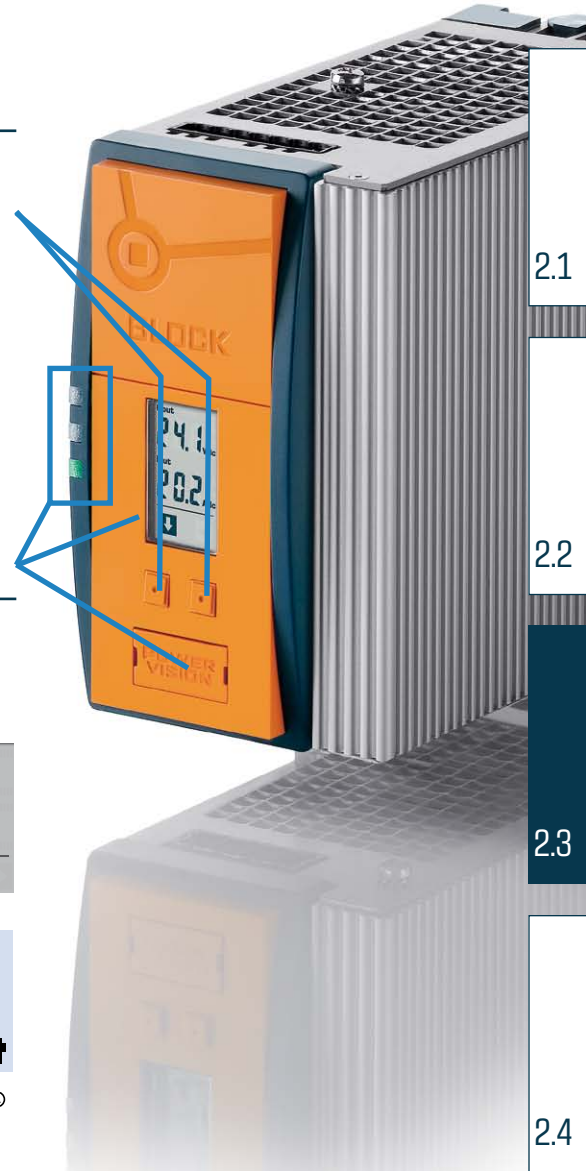
Key information that can be obtained via the display or the interface:

- Output current
- Output voltage
- Max. output current
- Min./max. output voltage
- Visualisation of all faults
- Types of faults
- Hour counter

Setting the output voltage



The output voltage can be set to between 22.0 and 28.8 V DC either digitally using the keys on the device itself or automatically via the interface. Whenever the device is switched on, it will automatically restore the final voltage value stored in its memory.



Communication with the user



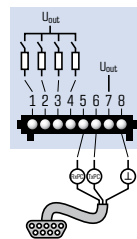
Via the LEDs: Non-critical faults are indicated as warnings by the yellow LED, whilst critical faults are signalled by the red LED.



Via the display: The device features an integrated fault memory for self-diagnostics. The precise nature of any potential faults can be easily identified thanks to the display's system of flashing segments.



Via the active signal outputs: There are four active signal outputs on the front of the PVSb for watchdog functions. The corresponding statuses can be transferred to the higher-level control system. Because the outputs switch the output voltage, they do not need to be conditioned prior to digital signal processing. Two of the four signal outputs can be user-defined with the free parameterisation software, e.g. for the purpose of generating a group signal for all critical statuses.



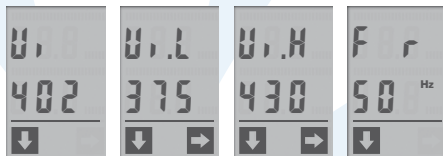
Via the interface: The devices can communicate with a PC or higher-level control system via the serial interface. All the switched mode power supply's key data is sent cyclically, so the user can both view relevant data and respond to critical operational statuses. The PVSb can also be parameterised via this interface. The Powersvision software packages required for communication can be downloaded free of charge from www.block-trafo.de.



PVSL 400

Three-phase, Line

Our top-of-the-range model featuring built-in input and output monitoring: The integrated control unit also supports permanent current and voltage output monitoring for comprehensive supply input monitoring. With real power boost and top boost, the PVSL switched mode power supply boasts high power reserves to ensure maximum operational reliability. The device is available with active starting current limiting as an option. It features a display and function keys as well as four active signal outputs and an RS-232 interface..



**POWER
VISION**

PVSL for tidier wiring cabinets

A PVSL renders the use of various other modules in the wiring cabinet superfluous. The Line version is able to monitor the phase sequence direction and check for failed input phases - as well as keeping an eye on the quality of the incoming supply! Thanks to faster response times in the event of a power failure, there is even time for important data to be stored for restarting the machine.



EINGANGS
SPANNUNGS
ÜBERWACHUNG

DREI
PHASEN
LÄUFER
GERÄT

BETRIEBSSTU
NDENZÄHLER

SIG
NAL
ISIE
RUNG
SYSTEM

AMP
EREM
ETER



Input and output monitoring for a more preventive approach

In addition to the features supported by the PVSB model, the PVSL switched mode power supply is equipped with an integrated supply input monitoring function.

Potential faults the PVSL is able to detect:

Supply undervoltage

When the input voltage of at least one supply input phase falls below a configurable threshold value.

Supply overvoltage

When the input voltage of at least one supply input phase exceeds a configurable threshold value.

Phase error

When a supply input phase fails.

Phase sequence error

When the connected phase sequence direction is anticlockwise.

Frequency error

When the power frequency is outside the frequency range of 44 to 66 Hz.

Power failure

When at least two supply input phases fail (typical response time 4 ms).

Communication error

When the internal communication test fails.

Overcurrent

When the output current exceeds the rated output current.

Undervoltage

When the output voltage falls below the configurable DC OK limit value.

Hardware fault

When the device's internal self-testing function fails.

Key information that can be obtained via the display:

Supply input voltage

Power frequency

Phase sequence direction

Output current

Output voltage

Max. output current

Min./max. output voltage

Types of faults

Hour counter

Key information that can be obtained via the display or the interface:

Supply input voltage

Power frequency

Phase sequence direction

Output current

Output voltage

Max. output current

Min./max. output voltage

Visualisation of all faults

Types of faults

Hour counter

Information that can only be obtained via the interface:

Supply input voltage of the individual phases



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PVFE

Electronic circuit breaker
Economy

A reliable means of detecting faults in circuits: the circuit breaker with additional current and voltage monitoring. Since overcurrents are detected quickly and reliably, just the affected circuit can be shut down - even if long cables are being used. The functions supported by the integrated control unit include voltage and current monitoring. The devices feature a display, function keys, several signal outputs and an RS-232 interface



Integrated control unit for maximum safety

The PVFE module monitors current and voltage continuously. Key information can be read directly from the display. The integrated control unit is able to detect potential faults affecting current paths reliably, output signals accordingly and store the associated data for subsequent analysis.

Potential faults the PVFE module is able to detect:

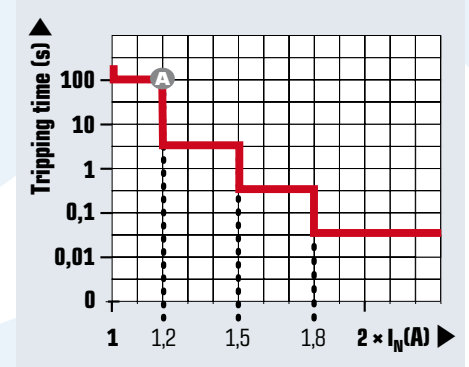
- Overcurrent**
When the output current of a channel exceeds the rated current.
- Channel tripped**
When at least one channel shuts down due to an overcurrent.
- Undervoltage**
When the input voltage falls below a configurable limit value.
- Hardware fault**
When the device's internal self-testing function fails.

Key information that can be obtained via the display or the interface:

- Output current of each channel
- Input voltage
- Max. output current of each channel
- Min. input voltage
- Visualisation of all faults
- Types of faults

Tripping characteristics

Rated currents can be set separately for each channel in 1 A increments. Depending on the level of a possible overcurrent, the affected channel will be shut down safely and reset in accordance with a stored protection characteristic. This is where the flexibility of the PVFE module comes to the fore, since it allows scope for adjusting the tripping time taken to shut down a current path. Once a channel has been shut down, it can be reactivated either via the keys on the module or by means of an external signal.





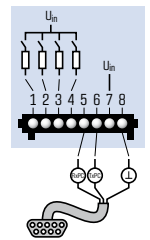
Communication with the user

1 Via the LEDs: When the device is running without any errors, the green LED lights up. Non-critical statuses such as minor overcurrents or an undervoltage at the device input are indicated as warnings by the yellow LED, whilst the red LED signals situations that involve a circuit being shut down.



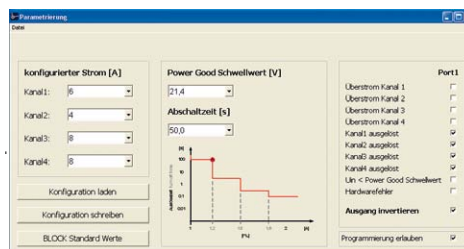
2 Via the display: The output currents of the four channels are shown continuously on the display along with the input voltage. The device features an integrated fault memory for self-diagnostics in the event of a fault.

3 Via the signalling outputs: The PVFE module has four active signal outputs and one isolated signal contact for watchdog functions. The active 24 V signal outputs do not need to be conditioned prior to processing as a digital signal. Signal output 1 is linked to an isolated signal contact on the underside of the device. It can be user-defined with the free parameterisation software, e.g. for the purpose of generating a group signal for tripped circuit branches.



4 Via the interface: The module can communicate with a PC or higher-level control system via the serial interface. Cyclic sending of information means that the user can both view relevant data and respond to faults affecting connected circuits.

Parameter settings can also be made via this interface. The PowerVision software packages required for communication can be downloaded free of charge from www.pv400.de.



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PVFB

Electronic circuit breaker Basic

The PVFB module is the key to maximum system availability and process reliability. What makes this module really special is its integrated current limiting function, which is activated in the event of a fault and prevents a transient voltage dip on circuits not affected by a short circuit on an individual consumer branch. Accordingly, it safeguards the continued operation of vital system components. The functions supported by the integrated control unit include voltage and current monitoring. The devices feature a display, function keys, active signal outputs and an RS-232 interface.



Integrated control unit for maximum safety

The PVFB module monitors current and voltage continuously. Key information can be read directly from the display. The integrated control unit is able to detect potential faults affecting current paths at an early stage, output signals accordingly and store the associated data for subsequent analysis.

Potential faults the PVFB module is able to detect:

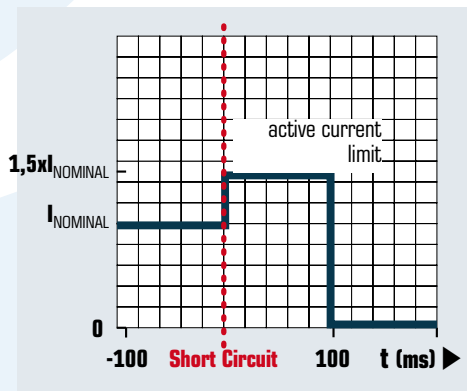
- Overcurrent**
When the output current of a channel exceeds the rated current.
- Channel tripped**
When at least one channel shuts down due to an overcurrent.
- Undervoltage**
When the input voltage falls below a configurable limit value.
- Hardware fault**
When the device's internal self-testing function fails.

Key information that can be obtained via the display or the interface:

- Output current of each channel
- Input voltage
- Max. output current of each channel
- Min. input voltage
- Visualisation of all faults
- Types of faults

Tripping characteristics

Rated currents can be set separately for each channel in 1 A increments. In the event of an overcurrent, the current is limited and the affected channel is shut down safely and reset. Active current limiting is the only way to ensure that, in the event of a short circuit affecting an individual consumer, all other branches will remain unaffected and a voltage dip will not occur. This is where the flexibility of the PVFB module comes to the fore, since it allows scope for adjusting the tripping time taken to shut down a current path. Once a channel has been shut down, it can be reactivated using the keys on the module.





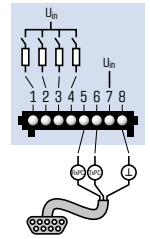
Communication with the user

1 **Via the LEDs:** When the device is running without any errors, the green LED lights up. Non-critical statuses such as minor overcurrents or an undervoltage at the device input are indicated as warnings by the yellow LED, whilst the red LED signals situations that involve a circuit being shut down.

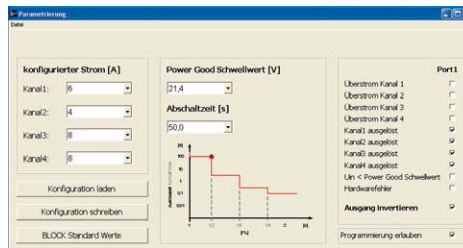


2 **Via the display:** The output currents of the four channels are shown continuously on the display along with the input voltage. The device features an integrated fault memory for self-diagnostics in the event of a fault.

3 **Via the signalling outputs:** There are four active signal outputs on the PVFB module for watchdog functions. The active 24 V signal outputs do not need to be conditioned prior to processing as a digital signal. Two outputs can be user-defined with the free parameterisation software, e.g. for the purpose of generating a group signal for tripped circuit branches.



4 **Via the interface:** The module can communicate with a PC or higher-level control system via the serial interface. Cyclic sending of information means that the user can both view relevant data and respond to faults affecting connected circuits. Parameter settings can also be made via this interface. The PowerVision software packages required for communication can be downloaded free of charge from www.block-trafo.de.



The PowerVision software packages required for communication can be downloaded free of charge from www.block-trafo.de.

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PVRE

Redundancy module
Economy

The ideal way to protect against power supply failures.

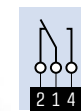
To avoid putting the operational reliability of machines and systems at risk in the event of a power supply failure, availability is safeguarded by two power supplies with the same rating which are decoupled via diodes.



Signalling

1 Via the LEDs: The redundancy module features three LEDs on its front panel. The green LED signals sufficient voltage at the module output. Each of the two yellow LEDs is assigned to a connected power supply and will light up if the power supply fails.

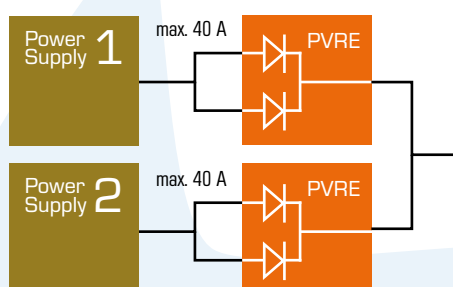
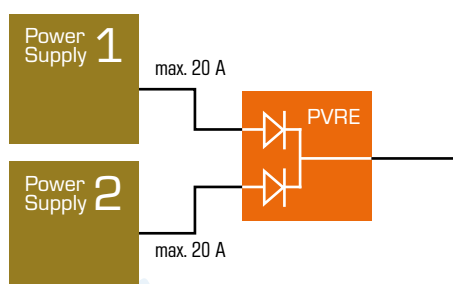
2 Via the isolated signal contact:



The changeover contacts of the integrated relay signal the operational status of the connected power supplies.

During normal operation the relay is active; it drops out in the event of a power supply failure.

Basic structure of re- dundant power supplies



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PVRB

Redundancy module Basic

A smart combination: protection and monitoring in

one. To avoid putting the operational reliability of machines and systems at risk in the event of a power supply failure, availability is safeguarded by two power supplies with the same rating which are decoupled via diodes. What makes this module really special is its integrated control unit, which enables additional monitoring of the voltage and current. This means it is now even possible to keep one eye on the current and voltage conditions prevailing within a system if there are two PowerVision Economy power supplies connected. The module also boasts a display and function keys as well as active signal outputs and an RS-232 interface.



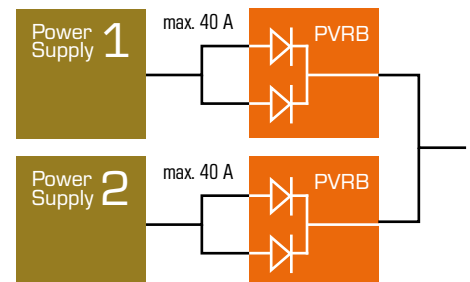
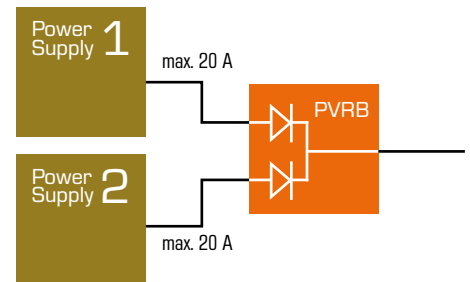
Integrated control unit for maximum safety

The PVRB module monitors current and voltage continuously. Key information can be read directly from the display. The integrated control unit is able to detect potential faults affecting the equipment to which power is being supplied at an early stage, output signals accordingly and store the associated data for subsequent analysis.

Potential faults the redundancy module is able to detect:

- Overcurrent at input**
When one of the two input currents exceeds a configurable limit value.
- Overcurrent at output**
When the output current exceeds a configurable limit value.
- Undervoltage at input**
When one of the two input voltages falls below a configurable limit value.
- Undervoltage at output**
When the output voltage falls below a configurable limit value.
- Hardware fault**
When the device's internal self-testing function fails.

Basic structure of redundant power supplies



Key information that can be obtained via the display or the interface:

- Input voltage 1+2
- Output voltage
- Input current 1+2
- Output current
- Min. input voltages 1+2
- Min. output voltage
- Max. input currents 1+2
- Max. output current
- Visualisation of all faults
- Types of faults

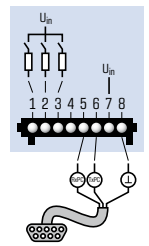


Communication with the user

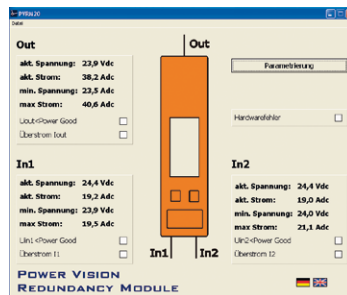
➊ **Via the LEDs:** Non-critical statuses such as minor overcurrents are indicated as warnings by the yellow LED. An undervoltage at the output is signalled by the red LED.

➋ **Via the display:** The currents and voltages of the two inputs and the output are shown continuously on the display. The device features an integrated fault memory for performing diagnostics directly on the device in the event of faults. The precise nature of any potential faults can be easily identified thanks to the display's system of flashing segments.

➌ **Via the signalling outputs:** The redundancy module has three active signal outputs and one isolated signal contact for watchdog functions. The statuses of the signalling outputs can be transferred to the higher-level control system. Because the active signal outputs switch the input voltage, they do not need to be conditioned prior to digital signal processing. Output 1 is linked to an isolated signal contact on the underside of the device. It can be user-defined with the free parameterisation software, e.g. for the purpose of generating a group signal for multiple faults.



➍ **Via the interface:** The module can communicate with a PC or higher-level control system via the serial interface. Cyclic sending of information means that the user can both view relevant data and respond to faults. Parameter settings can also be made via this interface. The PowerVision software packages required for communication can be downloaded free of charge from www.block-trafo.de.



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PVUC

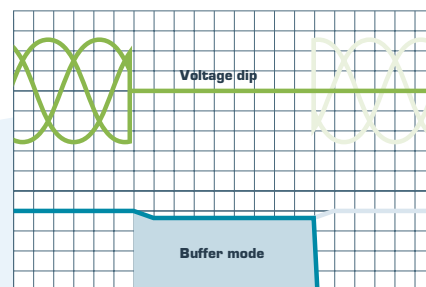
Capacitor-based buffer module

The PVUC – powerful and maintenance-free: A buffer module is able to compensate brief power supply interruptions safely. Mains buffer times are extended for the power supplies and this increases the operational reliability of machines and systems. Transient faults are buffered and in the case of longer failures, there is sufficient time to back up important data for restarting purposes. PowerShield buffer modules are characterised by particularly long buffer times..



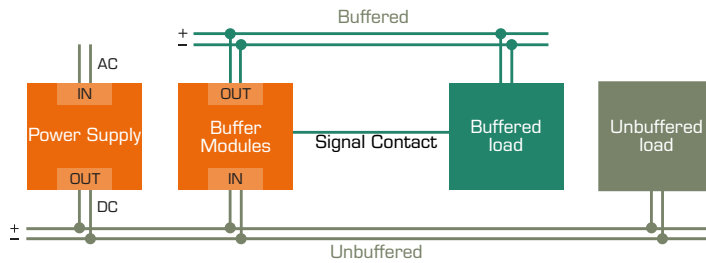
Long buffer times

In the event of a voltage dip, the buffer modules ensure that the voltage supply to connected consumers remains stable. Voltage dips can be compensated for up to 0.4 seconds at a rated current of 20 A, for example. This means that even in the case of power supply interruptions lasting longer than this, there is still enough time to back up relevant data and switch the machine to a safe state under controlled conditions.



Decoupled output

Multiple buffer modules can easily be connected in parallel. The module outputs are decoupled from the inputs. This means that it is possible to specifically buffer just selected consumers.



Signalling

➊ Via the LEDs: There are 3 LEDs for signalling individual operational statuses. When the device is running without any errors, the green LED lights up. The red LED signals undervoltage at the buffered output of the module. The yellow LED lights up when the device is charging.



➋ Via the isolated signal contact: Once the internal capacitors have finished charging and there is sufficient voltage at the buffer module input, the isolated signalling output is activated. The contact drops out as soon as the module runs out of charge and the control level can respond to this change of state.

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PVUA

Uninterruptible power supply



The PVUA module – much more than an ordinary UPS:

A key feature of the PVUA module is its optimum battery management. It also supports complete current and voltage monitoring with numerous signalling options. The module features a display, function keys, several signal outputs and an RS-232 interface. The charging voltage for the connected accumulator module is temperature-controlled; this helps to extend the service life of the accumulator significantly, thereby minimising maintenance overheads.

Integrated control unit for maximum safety

The PVUA module monitors current and voltage continuously. Key information can be read directly from the display. The integrated control unit is able to detect potential faults affecting the equipment to which power is being supplied at an early stage, output signals accordingly and store the associated data for subsequent analysis.

Mögliche Störungen, die durch das PVUA Modul detektiert werden:

Overcurrent	When the output current exceeds a configurable limit value.
Output shut down	When the output is shut down briefly due to an increased overcurrent.
Undervoltage at input	When the input voltage falls below a configurable limit value.
Undervoltage at output	When the output voltage falls below a configurable limit value.
Low accumulator charge	When the charge of the connected accumulator is less than 85%.
Accumulator mode	When the module is in accumulator mode.
Accumulator mode not possible	When the accumulator test fails.
Low accumulator voltage	When the accumulator voltage falls to a critical value in accumulator mode.
Accumulator replacement recommended	When the accumulator quality test fails. It is recommended that you replace the accumulator.
Hardware fault	When the device's internal self-testing function fails.

Key information that can be obtained via the display or the interface:

Input voltage
Output voltage
Output current
Output current
Charging voltage
Charging current
Min. input voltage
Max. output current
Accumulator running hours
Visualisation of all faults
Types of faults



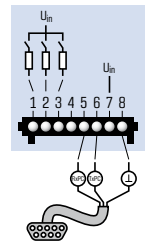
Communication with the user

1 Via the LEDs: When the device is running without any errors, the green LED lights up. Non-critical statuses are indicated as warnings by the yellow LED, whilst critical situations are signalled by the red LED.



2 Via the display: All currents and voltages are shown continuously on the display. Important parameter settings can be made with ease using the keys on the device. The device features an integrated fault memory for self-diagnostics in the event of a fault.

3 Via the signalling outputs: The PVUA module has three active signal outputs and one isolated signal contact for watchdog functions. The active 24 V signal outputs do not need to be conditioned prior to processing as a digital signal. Signal output 1 is linked to an isolated signal contact. It can be user-defined with the free parameterisation software, e.g. for the purpose of generating a group signal for possible faults.



4 Via the interface: The module can communicate with a PC or higher-level control system via the serial interface. Cyclic sending of information means that the user can both view relevant data and respond to faults. Parameter settings can also be made via this interface. The PowerVision software packages required for communication can be downloaded free of charge from www.block-trafo.de.



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PVA / PVAF

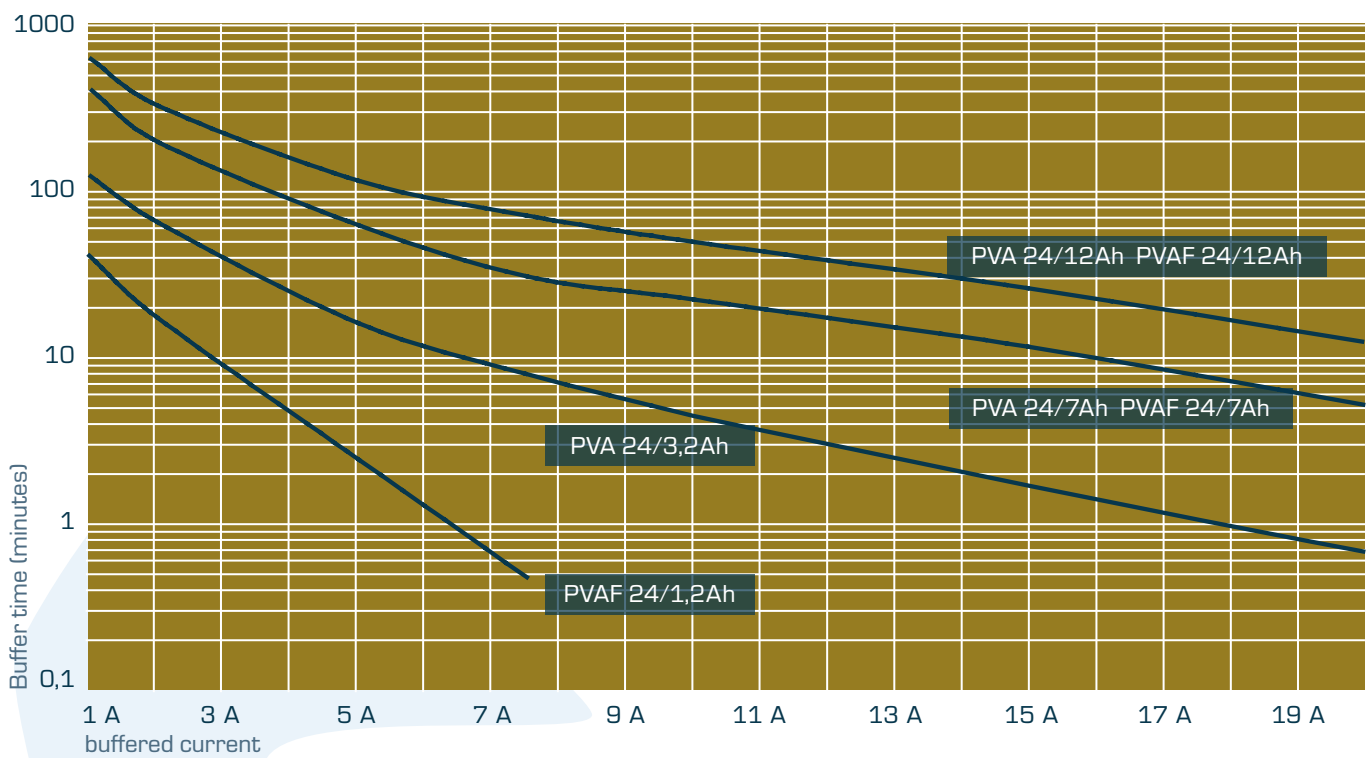
Accumulator modules for PVUA

The accumulator module works in conjunction with the PVUA accumulator manager to provide a backup 24 V DC voltage in the event that the supply voltage fails.

What is really special about this system is its integrated temperature meter. This is located in the accumulator housing, which can be placed in a specific location inside the wiring cabinet. Optimum accumulator charge and therefore long service life is assured.



Buffer times in relation
to load current



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the EU-Symbol (Communautés Européennes)

The CE mark

General Note

The technical explanations contained here represent points of departure for many areas of application, a number of rules apply in addition to special and exceptional cases. The intention here is to provide a brief introduction into the complex subject field.

CE mark

The Council of the European Union has issued some EC Directives based on the Treaty establishing the European Economic Community (EEC), and in particular Article 100. The purpose of these EC Directives is to harmonise the legal and administrative regulations within the various member states of the European Union (EU) in cases where differences between national regulations could result in trade restrictions or hinder the European single market in any other way. Legislative bodies on national levels are required to implement the Directives in the legislation of the country concerned within specified periods of time.

Manufacturers must attach the CE mark to products that fall within the scope of certain EC Directives as an indication of conformity. This affects products covered by Directives based on the "New Approach" (passed 07/05/1985), which outline requirements concerning the technical properties of products.

EC Directives are legally binding regulations issued by the European Union. Consequently, these requirements must be met **in order for the products concerned to be marketed within Europe. They do not relate to trade markets in the rest of the world.** By attaching the CE mark to a product, the manufacturer is confirming that they are compliant with the relevant basic requirements of all the Directives which affect (i.e. are applicable to) that product. The CE mark is only intended to prove to supervisory authorities that the product concerned conforms to the relevant Directive(s). Despite this, it is often mistakenly seen as a mark of quality, which unfortunately leads to it being requested without any legal basis in many cases.

For this reason, we do not display the CE mark on the pages of our catalogues and brochures as part of our advertising strategy, since the mark fulfils a purely legal function for products and its requirements have to be adhered to by all manufacturers or importers.

Although the manufacturer's EC Declaration of Conformity only needs to be kept available for inspection by supervisory bodies (for a period of at least 10 years after the last product was put into circulation), customers are free to request copies of it from us.

The EC Declaration of Conformity for the product concerned contains information on which of the Directives apply to it. The Directives and their amending Directives which are most frequently applicable to the range of products we offer are:

1. The Low Voltage Directive (2006/95/EC) covering electrical equipment for use at a rated voltage of between 50 V_{AC} and 1000 V_{AC} and between 75 V_{DC} and 1500 V_{DC}.

Title: Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

Almost all of the products we manufacture are affected by the Low Voltage Directive. The manufacturer is required to certify in the form of an EC Declaration of Conformity that each piece of electrical equipment, each device, each system and each installation conforms to the safety requirements of the Directive, and the EC conformity mark CE must be attached to the product or - in exceptional cases - the packaging.

2. The EMC Directive (2004/108/EC) for apparatus which is liable to generate electromagnetic disturbance, or the performance of which is liable to be affected by such disturbance.

Title: Directive 2004/108/EC of the European Parliament and of the Council of 14 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC.

Legal basis:

In the interest of harmonising the laws of the various member states, on 3 May 1989 the Council of the European Union issued a binding Directive for its members. In Germany, this was implemented in national legislation in the form of the Electromagnetic Compatibility Act (EMVG) on 9 November 1992. The German Federal Network Agency (BNetzA) and its branches are responsible for enforcing (monitoring) the EMC Act.

Definition according to an extract from Article 1:

Electromagnetic compatibility means the ability of equipment to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to other equipment in that environment.

Scope of validity according to an extract from Article 2:

[Apparatus] which [is] liable to generate electromagnetic disturbance, or the performance of which is liable to be affected by such disturbance.

Note: "Apparatus" (as referred to in Article 1) denotes all electrical and electronic equipment, installations and systems that contain electrical and/or electronic components.

Basic process :

As of 1 January 1992 (transition period to 31 December 1995) electrical and electronic apparatus, systems and installations may only be placed on the market or put into service within the European Union if they conform to the EMC safety requirements outlined in the Directive. The manufacturer is required to certify in the form of an EC Declaration of Conformity that each piece of apparatus, each system and each installation conforms to the safety requirements of the Directive, and the EC conformity mark CE must be attached to the product.

Components that are not required to bear this mark:

For the purpose of the EMC Directive, a component is defined as any item which is installed in a piece of apparatus, but which does not itself have an intrinsic function and is not intended for use by the end consumer. According to Article 1 of the EMC Directive, components are therefore not apparatus and are excluded from this Directive from the outset.

Examples:

- a) **Components (for printed circuit boards, apparatus, wiring cabinets)** which, as installation components, are not required to bear the CE mark.
Examples: resistors, capacitors, inductors, integrated circuits.
- b) Components which must bear the CE mark (**those with a housing and contact protection**), which are to be operated independently and/or are sold to end consumers, such as plug-in power supplies, battery charging equipment, personal computers, testing and measuring equipment, isolating transformers for construction sites or service, transformers for halogen lamps.

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Electromagnetic compatibility

Definition

According to the definition in EMC Directive 2004/108/EC, electromagnetic compatibility means the ability of equipment to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to other equipment in that environment.

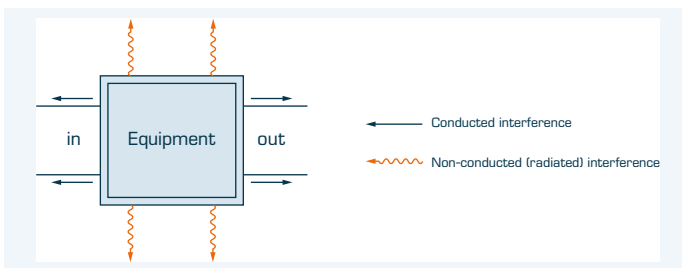
A distinction is drawn between

1. Electromagnetic interference (EMI)
2. Electromagnetic immunity (EMI)

Electromagnetic interference (EMI)

Electromagnetic interference (emitted interference) is any type of electromagnetic phenomenon (e.g. noise, unwanted signal), which could impair the function of a device, installation or system. The generic standards relating to emitted interference are:

- EN 61000-6-3 (living areas, business and trade areas and small companies)
- EN 61000-6-4 (industrial areas)

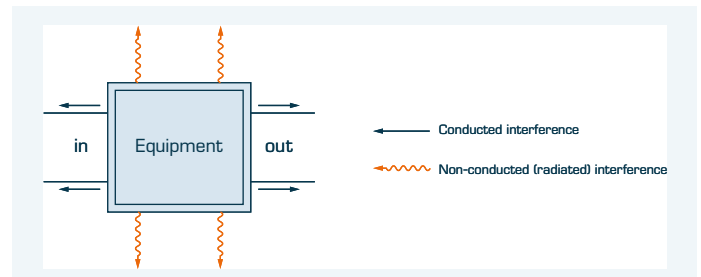


Electromagnetic immunity (EMS)

The relevant testing standards are:

- EN 61000-4-2:1995 +A1:1998 +A2:2001
Electrostatic discharge immunity test
- EN 61000-4-3:2006 +A1:2008
Radiated, radio-frequency, electromagnetic field immunity test
- EN 61000-4-4:2004
Electrical fast transient/burst immunity test
- EN 61000-4-5:2006
Surge immunity test

- EN 61000-4-6:2007
Immunity to conducted disturbances, induced by radio-frequency fields
- EN 61000-4-8:1993 + A1:2001
Power frequency magnetic field immunity test
- EN 61000-4-11:2004
Voltage dips, short interruptions and voltage variations immunity tests
- EN 61000-4-20:2003
Emission and immunity testing in transverse electromagnetic (TEM) waveguides

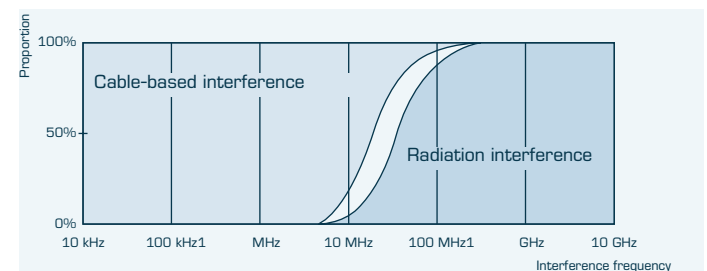


Shielding against interference

There are many ways in which interference can be transferred:

- Electrically in the form of current and voltage (conducted)
- As a magnetic field
- As an electrical field
- As an electromagnetic wave or radiation

Conducted and radiated interference is usually propagated as follows:

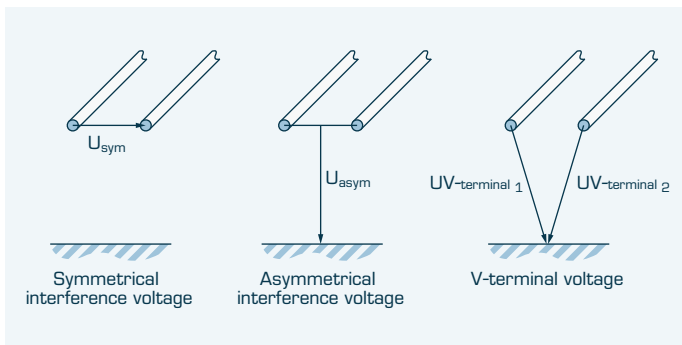


Interference can be attenuated by means of an EMC-compliant set-up using, for example, low-resistance earthing, filters, shielded lines, a metal housing and clearances. However, since the particular EMC measures to be put in place in each case are highly dependent on which components are being used and the operating parameters of the system, it is almost impossible to make any universally applicable statements concerning them.

Conducted interference

On electrical lines, interference voltages occur between conductors as well as between conductors and earth, often up to a frequency of around 30 MHz. A distinction is made between symmetrical interference voltages, asymmetrical interference voltages and a combination of the two: V-terminal voltages.

Reactors, capacitors and filters as well as, indirectly, shielded lines are ideal ways of attenuating conducted interference. Additional protective measures (spark gaps, varistors) are usually required to combat high-energy interference (resulting from lightning strikes, for example).



EMC standards

The principles of EMC standardisation are mainly established by

- CISPR, founded in 1934 (International Special Committee on Radio Interference, Comité international Spécial des Perturbations Radioélectriques) and

- IEC TC77, founded in 1974 (International Electrotechnical Commission Technical Committee 77, Comité d'études 77 de la Commission Electrotechnique Internationale)

in accordance with IEC Directive Guide 107 (EMC Guide to the drafting of electromagnetic compatibility publications).

The aim of Guide 107 is to ensure that the procedures and approaches taken towards EMC standardisation are consistent and to keep everything coherently organised. This takes into account both conducted and radiated phenomena in the frequency range from 0 to 400 GHz, in which it should be possible to achieve electromagnetic compatibility.

As a general rule, four categories of EMC standards are defined and each EMC standard usually falls into just one of these categories.

1. Basic standards, e.g.

- IEC 61000-2-2, -3-2, -4-1, -5-5 etc.,
- CISPR 11, 13, 14, 15, 16, 22

Basic standards may have the status of a standard, but they may also have the status of a technical report. They contain the relevant measurement procedures, ambient condition classifications and testing techniques for EMC. Generic standards, product family standards and product standards continually make reference to these basic standards. It must be possible to tell from the very title that the publication type is that of a basic standard.

2. Generic standards

- Living areas, business and trade areas and small companies: EN 61000-6-3 (emitted interference), EN 61000-6-1 (interference immunity)
- Industrial areas: EN 61000-6-4 (emitted interference), EN 61000-6-2 (interference immunity)

Generic standards are applied to products if there are no product family standards or product standards relating to them. A basic distinction is drawn between the environmental conditions of industrial areas (where power is supplied via an industrial network) and living areas, business and trade areas and small companies (where power is supplied via the public mains network). A limited number of EMC tests specify minimum interference immunity limit values and maximum emitted interference limit values, but do not deal with specific product features.

3. Product family standards, e.g.

- EN 55011 (emitted interference), industrial, scientific and medical (ISM) devices
- EN 55013 (emitted interference), EN 55020 (interference immunity), audio, TV, radio devices
- EN 55014 (emitted interference), EN 55104 (interference immunity), household appliances

Product family standards are tailored to specific product families and contain special guidelines (such as limit values, test set-up information, operating criteria and complaint criteria). Where measurement procedures are concerned, reference is made to basic standards and the limit values are often aligned with generic standards. A product family standard relating to EMC may be an entirely independent standard, or it may be one (independent) part of a series of standards regulating additional issues affecting a product family (e.g. electrical safety).

4. Product standards, e.g.

- EN 61800-3, frequency converters
- EN 50199, arc welding equipment

Product standards are aimed at specific products and have the highest priority in terms of application, which means they must be applied exclusively in order to ensure the product in question is EMC-compliant. The same rules apply to product standards as to product family standards in terms of how the information in basic standards and generic standards can be incorporated into them.

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Classifications

Safety class

Safety class 0, I, II or III (see: VDE 0140/EN 61140/IEC 61140) is a **structural attribute** used to classify electrical equipment according to the degree of safety provided in respect of dangerous electric shock currents. For example:

- **Safety class 0:**
Device with basic insulation as a precautionary measure to provide basic protection, but without any precautionary measures installed for fault protection purposes
- **Safety class I:**
Device with protective conductor connection and (at the very least) basic insulation
- **Safety class II:**
Device without protective conductor connection and with double or increased insulation
- **Safety class III:**
Device with ELV (safety extra-low voltage) supply and in which no voltages higher than the ELV are generated

Electrical equipment which is intended for installation in devices does not have a safety class and may only be designated as "ready" to be used with the relevant class. Electrical equipment that is ready for use in safety class II devices may also be used in safety class I devices.

Degree of protection

The degree of protection specification (see: DIN VDE 0470, EN 60 529, IEC 60529) describes the **extent to which the electrical equipment is protected** by the housing, covers, casings and similar components.

The degree of protection is specified by an IP code, in which the **first digit** (0 to 6) provides information about the level of protection against contact and the ingress of foreign bodies, and the **second digit** (0 to 8) indicates the level of protection against the ingress of water.

Common degrees of protection:

- **IP 00**
No special protection against accidental contact or the ingress of foreign bodies. No special protection against water. **"Open" designs are manufactured with degree of protection IP 00.**
- **IP 20**
Protection against contact and against solid foreign bodies exceeding \varnothing 12 mm in size. No special protection against water.
- **IP 23**
Protection against contact and against solid foreign bodies exceeding \varnothing 12 mm in size. Protection against spraying water; water falling as a spray at any angle up to 60° from the vertical must not have any harmful effects.
- **IP 40**
Protection against contact and against solid foreign bodies exceeding \varnothing 1 mm in size. No special protection against water.
- **IP 44**
Protection against contact and against solid foreign bodies exceeding \varnothing 1 mm in size. Protection against splashing water; water splashing against the equipment from any direction must not have any harmful effects.
- **IP 54**
Full protection against contact. Protection against harmful dust deposits. The ingress of dust is not prevented altogether, but dust must not enter in sufficient quantities to prevent the equipment from operating satisfactorily. Protection against splashing water; water splashing against the equipment from any direction must not have any harmful effects.
- **IP 65**
Full protection against contact. Protection against the ingress of dust. Protection against water jets. Water sprayed from a nozzle and aimed at the equipment from any direction must not have any harmful effects.
- **IP 67**
Full protection against contact. Protection against the ingress of dust. Protection against the effects of temporary immersion in water. Water must not enter in harmful quantities when the housing is temporarily immersed in water under standardised pressure and time conditions.

Note: The degree of protection specified relates to the condition in which the device is delivered and is based on the stipulations regarding how the equipment is set up, or how it is usually set up. The actual degree of protection may change if it is set up or installed in some other way.

Class of insulation

The relevant regulations (see: VDE 0301/HD 566S1/IEC 60085 as well as: VDE 0304/HD 611.1S1/IEC 60216) describe, amongst other things, the **thermal resistance of electrical insulation materials**. Temperatures are assigned to the classes of insulation depending on their thermal resistance duration.

Commonly used classes of insulation:

A (1.05°C), E (1.20°C), B (1.30°C), F (1.55°C), H (1.80°C)

Unless otherwise agreed, transformers and line reactors are dimensioned for class of insulation B, F or H.

Insulation system (EIS)

An electrical insulation system (EIS) is an insulating arrangement which is made up of one or more types of insulation material (electrical insulation material) plus the associated conductive parts, and which is installed in a piece of electrical equipment (see VDE 0302 Part 1/EN 60505/IEC 60505 plus VDE 0302 Part 11/EN 61857-1/IEC 61857-1). Under thermal stress, an assessment is made concerning whether the **combination of insulating materials** is suitable for operation in accordance with the relevant class of insulation.

Rated ambient temperature

The rated ambient temperature is the highest ambient temperature at which a piece of electrical equipment, an electrical device or an installation component (e.g. transformer, reactor, filter) can be operated continuously under normal operating conditions. It is the **temperature of the air in the immediate surroundings**.

Electrical values often refer to the rated ambient temperature and may change at different temperatures. Special attention must be paid to how components are installed in housings with a high degree of protection. Any potentially insufficient cooling measures may lead to impermissibly high temperatures in the housing. Under some circumstances, this may lead to a reduction in the expected service life of the component (see "Class of insulation").

The rated ambient temperature is specified using an abbreviated format (see VDE 0570, EN 61558, IEC 61558).

Example:

$t_r = 25^\circ\text{C}$ or $t_r = 40^\circ\text{C}$

Unless otherwise agreed, the rated ambient temperature used for designing components intended for installation is defined as at least 40°C ; in the case of (table) devices which are to be operated independently it is 25°C .

Test class

The test class specifies the climate category (see: DIN EN 60068/EN 60068/IEC 60068) in the form of a code and indicates the climatic conditions in which the components can be used.

Example:

25/085/21

25 = -25°C , test A: cold, 085 = $+85^\circ\text{C}$, test B: dry heat,

21 = 21 days, test Ca: constant damp heat

The individual tests are outlined in various parts of the relevant standard.

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Marks and symbols



VDE 0570 Part 2-6/EN 61558-2-6/IEC 61558-2-6

Safety transformer, short circuit-proof,

double or increased insulation between PRI and SEC, PRI max. 1000 V, SEC max. 50 V AC voltage (effective value) and/or 120 V smoothed DC voltage, frequency max. 500 Hz



VDE 0570 Part 2-6/EN 61558-2-6/IEC 61558-2-6

Safety transformer, not short circuit-proof,

double or increased insulation between PRI and SEC, PRI max. 1000 V, SEC max. 50 V AC voltage (effective value) and/or 120 V smoothed DC voltage, frequency max. 500 Hz



VDE 0570 Part 2-4/EN 61558-2-4/IEC 61558-2-4

Isolating transformer, short circuit-proof,

double or increased insulation between PRI and SEC, PRI max. 1000 V, SEC max. 500 V AC voltage or 708 V smoothed DC voltage, frequency max. 500 Hz.



VDE 0570 Part 2-4/EN 61558-2-4/IEC 61558-2-4

Isolating transformer, not short circuit-proof,

double or increased insulation between PRI and SEC, PRI max. 1000 V, SEC max. 500 V AC voltage or 708 V smoothed DC voltage, frequency max. 500 Hz.



VDE 0570 Part 2-15/EN 61558-2-15/IEC 61558-2-15

Isolating transformer for supplying medical areas, not short circuit-proof,

double or increased insulation between PRI and SEC; windings installed one above the other; windings-core; windings-shield; shield-core; PRI max. 1000 V, SEC max. 250 V, frequency max. 500 Hz



VDE 0570 Part 2-12/EN 61558-2-12/IEC 61558-2-12

Magnetic voltage stabiliser acting as isolating transformer, short circuit-proof,

double or increased insulation between PRI and SEC, PRI max. 1000 V, SEC max. 500 V, frequency max. 500 Hz (30 kHz internally)



VDE 0570 Part 2-2/EN 61558-2-2/IEC 61558-2-2

Control transformer, not short circuit-proof,

basic insulation between PRI and SEC, PRI max. 1000 V, SEC max. 1000 V AC voltage or 1415 V smoothed DC voltage, frequency max. 500 Hz



VDE 0570 Part 2-1/EN 61558-2-1/IEC 61558-2-1

Mains transformer, not short circuit-proof, basic insulation between PRI and SEC, PRI max. 1000 V, SEC max. 1000 V AC voltage or 1415 V smoothed DC voltage, frequency max. 500 Hz



VDE 0570 Part 2-13/EN 61558-2-13/IEC 61558-2-13

Autotransformer, not short circuit-proof, no insulation between PRI and SEC, PRI max. 1100 V, SEC max. 1000 V AC voltage or 1415 V smoothed DC voltage, frequency max. 500 Hz



VDE 0570 Part 2-20/EN 61558-2-20/IEC 61558-2-20

Small reactor, not overload-free, max. 1000 V, frequency max. 1 MHz



6,3 AT

Specification for the fuse assigned in the case of transformers that are not short circuit-proof; here, 6.3 A time-lag

20 A



Thermal overcurrent release; here, 20 A miniature circuit breaker



Temperature fuse



Temperature fuse



Self-resetting thermal relay

, e.g. thermal time delay switch



Non-self-resetting thermal relay Reset by switching off the mains connection, e.g. thermal time delay switch with locking function, PTC



Non-self-resetting thermal relay Manual reset (e.g. thermal overcurrent release, miniature circuit breaker)



PTC thermistor



NTC thermistor

t_a 40 °C
 t_a 40

Rated ambient temperature; here, 40°C

CL.B
CL.130
class 130

Class of insulation; here, B



Safety class II, total insulation



Protective conductor, earth



Connection for mount or core



Suitable for use with fittings whose flammability properties are not known, e.g. wood, furniture, intermediate ceilings. Sign in acc. with VDE 0710 Part 14.



Sign for domestic use, only for dry rooms, general



Voltage warning, general



Heat source warning: hot surface, general



AC current, also spelled A. C. or ac (alternating current)



DC current, also spelled D. C. or dc (direct current)

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Marks of conformity



CE mark, legal mark of conformity in Europe (stands for Conformité Européenne)



ENEC mark of conformity, Europe; in Germany: certification by VDE (10), European Norms Electrical Certification



VDE mark of conformity, Germany, VDE Testing and Certification Institute



UL mark of conformity (recognized component), USA and Canada; in Germany: certification by UL, Underwriters Laboratories Inc.



UL mark of conformity (recognized component), USA and Canada; in Germany: certification by UL, Underwriters Laboratories Inc., only relates to the integrated transformer.



UL mark of conformity (recognized component), USA, Underwriters Laboratories Inc.



UL mark of conformity, (Listed) USA, Underwriters Laboratories Inc



CSA mark of conformity, Canada, Canadian Standards Association



GL mark of conformity, certification by Germanischer Lloyd



AS-Interface mark of conformity, certification by AS-International Association

Special signs by BLOCK



XtraDenseFill: XtraDenseFill from BLOCK, a casting technique that ensures cavity-free filling of the transformer's entire internal structure thanks to high vacuum and pressure phases. It significantly reduces creepage distances and clearances and enables the electrical equipment to enjoy long-term protection against the effects of its environment. A more compact design can also be used.



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BLOCK ImpEx: Ensures the winding material is covered evenly, thus providing extensive protection against external influences. The resin developed specifically for BLOCKImpEx, together with our in-house-developed impregnation process, seals as many cavities as possible and creates a temperature reserve to ensure efficiency during long periods of operation.



2.3



The BLOCK logo: a sign of quality



The old BLOCK logo: our original logo

2.4





Power supplies

General technical information

A DC power supply is a static device with one or more inputs and one or more outputs. It uses electromagnetic induction to convert the AC voltage and AC current, and/or the DC current, into a system with DC voltage and DC current (usually at different values) for the purpose of transferring electrical energy.

Requirements

The ways in which the designs of DC power supplies differ mainly depend on their intended use. The relevant requirements are set out in installation and device standards (e.g. VDE 0100, VDE 0113/EN 60204/IEC 60204, VDE 0700/EN 60335/IEC 60335, VDE 0805/EN 60950/IEC 60950) and in the standards available for DC power supplies with a general end use (e.g. VDE 0570/EN 61558/IEC 61558, VDE 0557/EN 61204/IEC 61204).

An important selection criterion is the structure of the insulation between the input and output circuits (as already described in "Transformer requirements").

A further distinction is made based on how the AC voltage/AC current and DC voltage/DC current are converted:

- AC-DC converter
AC voltage input, DC voltage output
- DC-DC converter
DC voltage input, DC voltage output
- DC-AC converter
DC voltage input, AC voltage output

Another important selection criterion is the stability and ripple levels of the DC output voltage. This results in the following categories:

- Unregulated DC power supplies
- Regulated DC power supplies

Standards

Unless otherwise agreed with the customer, we manufacture our devices according to the state of the art and the following standards:

Unregulated DC power supplies:

- VDE 0570: Sicherheit von Transformatoren, Netzgeräten und dergleichen
Teil 1: Allgemeine Anforderungen und Prüfungen, in Verbindung mit dem jeweilig zutreffenden Teil 2.
EN 61558, IEC 61558: Safety of power transformers, power supply units and similar, Part 1: General requirements and tests, in accordance with the relevant Part 2.

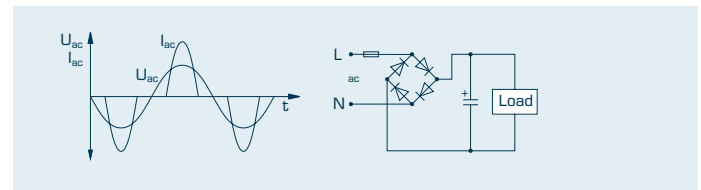
Regulated DC power supplies:

- VDE 0570: Sicherheit von Transformatoren, Netzgeräten und dergleichen,
Teil 1: Allgemeine Anforderungen und Prüfungen, in Verbindung mit dem jeweilig zutreffenden Teil 2.
EN 61558, IEC 61558: Safety of power transformers, power supply units and similar, Part 1: General requirements and tests, in accordance with the relevant Part 2-17.
- And/or:
VDE 0557: Stromversorgungsgeräte für Niederspannung mit Gleichstromausgang
EN 61204, IEC 61204: Low-voltage power supply devices, D. C. output – Performance characteristics and safety requirements.
- And:
VDE 0805: Sicherheit von Einrichtungen der Informationstechnik, EN 60950, IEC 60950: Safety of information technology equipment

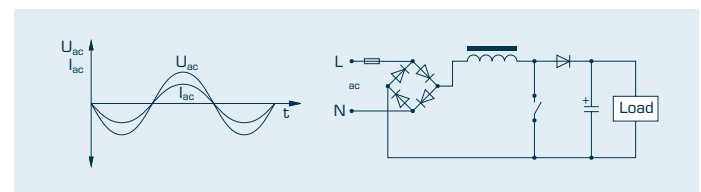
Power factor correction (PFC)

For financial reasons, energy providers strive to keep harmonic content and, consequently, the loads on their mains supplies to a minimum. EMC standards relating to this (see: EN 61000-3-2, for example) have already been brought into force. Efforts are centred around minimising harmonic currents whilst simultaneously correcting the power factor, which refers to the relationship between the active power consumed and the apparent power consumed by a consumer. A power factor of 1 with sinusoidal current consumption yields the lowest mains supply load.

Unfortunately, DC power supplies also cause the phenomena described here (amongst others) due to rectification of the (supply) input voltage with subsequent capacitor smoothing. If the DC voltage falls below the peak value of the feed AC voltage, then the capacitor will be recharged with brief, pulsating currents. In this case, it is less important whether this configuration is operated directly on the mains or with an upstream transformer.



The harmonic content can be reduced within certain limits by connecting a frequency-dependent resistor upstream (see “Line reactors” for information on this). However, correcting the power factor directly and in a way that is dependent on the load requires an electronic control system which ensures that the electrical current is drawn from the mains in a sinusoidal shape and in the same phase position as the voltage. The figure below shows a possible circuit concept:



A semiconductor switch, which is controlled by the magnitude of the load, clock pulse-controls the 50 Hz (supply) input current consumed using a high switching frequency (e.g. 20 kHz) and working in conjunction with the storage reactor. This is “modulated” in synchronism with the phase position of the (supply) input voltage in such a way that a power factor of almost 1 is produced.

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Unregulated DC power supplies

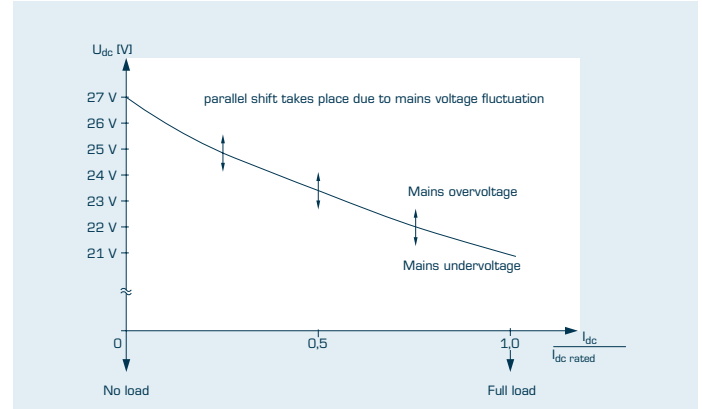
With unregulated DC power supplies, the DC output voltage is not regulated in relation to a specific value, but instead changes on the basis of the fluctuation in the (supply) input voltage and the load associated with this value.

The ripple is within the volt range and may depend on the load. Ripple is usually specified as a percentage value proportional to the DC output voltage level.

Even today, unregulated DC power supplies are still being used in applications thanks mainly to their robust, uncomplicated, stripped-down structure that is built to last.

Stability

The output characteristic below illustrates typical dimensioning of the DC output voltage relative to a rated voltage of $24 V_{DC}$:



The rated voltage of $24 V_{DC}$ is set in relation to the rated input voltage at 50 – 75% of the load. This operational status generally corresponds to real-life requirements, such as a $24 V_{DC}$ control voltage in the system structure.

The “No load” and “Full load” limit values both determine the internal resistance of an unregulated DC power supply that is to be achieved by means of the structure. The more level the output characteristic is required to be, the more complex the component structure needed to achieve this level of “rigidity”. Limit value requirements are defined by the intended use of the application or in device standards

(e.g. VDE 0411 Part 500/EN 61131-2/IEC 61131-2):

Limit values

VDE 0411 Part 500: Programmable controllers:
Equipment requirements and tests

DC voltage upper limit

Peak value	$\leq 30.0 V_S$	With mains overvoltage and no load at output
Arithmetical mean	28.8 V	

DC voltage lower limit

Peak value	$\leq 19.2 V_S$	At rated DC output current with mains undervoltage
Arithmetical mean	20.4 V	

The values specified for the upper and lower voltage limits are adhered to consistently even in the case of mains overvoltage (+10%) and undervoltage (-10%) in accordance with VDE 0175/HD 475S1/IEC 60038, regardless of the load (0 – 100%) associated with our DC power supplies. Operation up to +10% of the mains voltage is permissible, as the DC power supplies are not thermally overloaded up to this point.

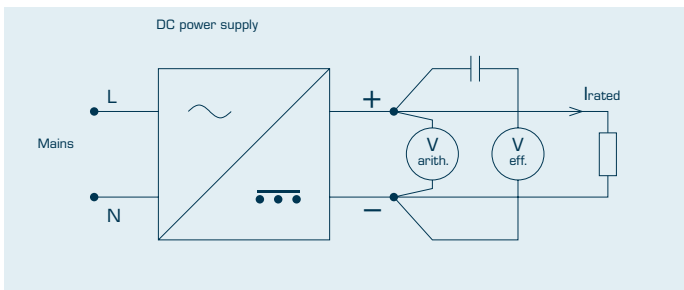


Ripple

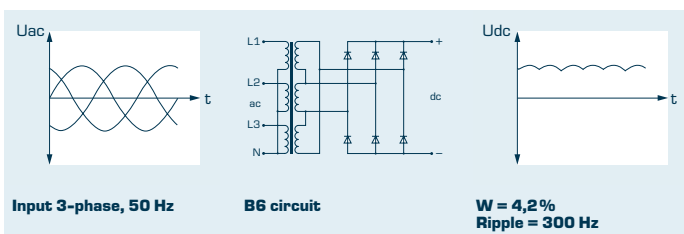
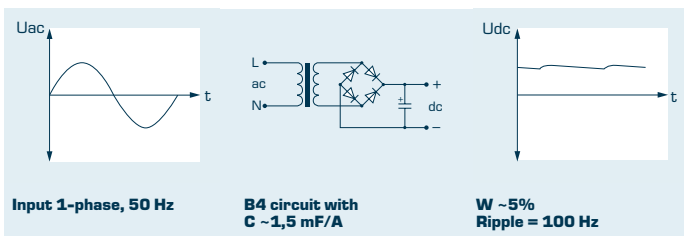
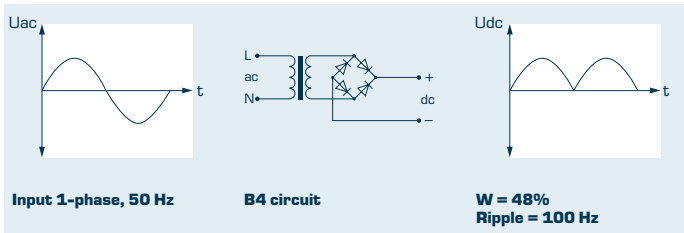
Ripple (see: DIN 41 755-1) is the ratio of the effective value of the superimposed AC voltage U_s to the value of the arithmetical DC voltage U_d and is specified as a percentage value

$$W = \frac{U_s \text{ (eff only ac)}}{U_d \text{ (arithm.)}} \times 100 \%$$

The test setup is identical for single-phase and three-phase DC power supplies:



Unless otherwise specified, the ripple value refers to the load with rated DC current and an actual load impedance. The figures below show typical circuits for unregulated DC power supplies and the ripple levels associated with them:



Mains buffering

Particularly where unregulated DC power supplies are concerned, it is often necessary to prevent mains interruptions that last just a few milliseconds (e.g. as a result of switching processes) from leading to control errors. An additional circuit containing a charging capacitor, which is connected in parallel to the DC output, is able to store energy and redeliver it in the event of a brief mains interruption. The capacitance of the additional charging capacitor can be determined as follows:

$$C = \frac{I_{dc} \times t}{dU_{dc}}$$

C Capacitance of the capacitor charging (mF)
t Power interruption (MS)
 I_{dc} removed DC (A)
 dU_{dc} permissible DC voltage reduction relative to the power failure duration (V)

Example: Switching processes in the mains lead to mains interruptions lasting 1.5 ms. The output voltage of an unregulated DC power supply is 22 V_{DC} at a rated DC current of 3 A_{DC} and the rated (supply) input voltage. What size does the additional charging capacitor need to be in order to prevent the output voltage dropping below 21 V_{DC}?

$$C = \frac{3 \text{ A}_{dc} \times 1,5 \text{ ms}}{1 \text{ V}_{dc}}$$

In this case, a circuit with 4700 µF (next-highest standard value) enables the required level of mains buffering.

Note:

1. When adding to a circuit at a later point, it is necessary to check whether the rectifier (in the existing DC power supply) is able to supply the additional energy required at the point when the system is switched on without the power supply being destroyed as a result.
2. In the case of DC power supplies with high ratings, it is often enough to simply equip the sensitive control component (which consumes a low amount of current) with an additional charging capacitor via a decoupling diode.

A side benefit of a circuit containing a supplementary charging capacitor is that it has a positive effect on ripple levels. In most applications, however, the benefits of mains buffering are far more significant than those associated with lower ripple levels.

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Regulated DC power supplies

Regulated DC power supplies feature electronic regulation circuits in order to keep the DC output voltage (or, in special cases, the DC output current) at a particular value as consistently as possible. Influences such as (supply) input voltage fluctuations or variations in the output load are regulated electronically in the assigned functional area.

The DC output voltage ripple is in the millivolt range and is largely unaffected by the load at the output. The DC output voltage stability settles in the range of 1 - 3%, depending on the switching concept. In many cases, regulated DC power supplies also offer the advantage of electronic current limiting. This can provide protection both for the connected consumer and in the event of the DC power supply being overloaded.

There are two different concepts:

- Linearly regulated DC power supplies
- Clock pulse-controlled DC power supplies

Linearly regulated DC power supplies

These DC power supplies are often also referred to as linear regulators or longitudinal regulators.

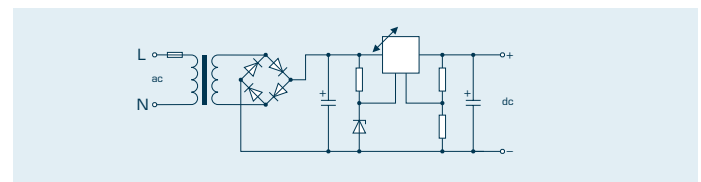
In many cases, the basic structure consists of a 50 Hz transformer (which meets the safety requirements for electrical isolation from the mains), rectification with filtering, and a regulator. This regulator chiefly consists of power transistors and behaves in the same way as a variable resistor. The electronics ensure a stable DC output voltage. The actual value of the DC output voltage is queried at the output by means of a voltage distributor and continually compared with the setpoint (reference voltage, frequently generated by a Zener diode). These two correcting variables permanently control the regulator and determine the DC output voltage level.

Benefits:

- No safety issues in terms of mains isolation by means of 50 Hz transformer
- Multiple input voltages can be implemented easily thanks to primary tapping
- Straightforward circuit concept
- Short settling times
- Extremely low ripple
- Very few EMC problems
- Inexpensive concept up to approx. 50 W

Drawbacks:

- Low level of efficiency
- Efficiency highly dependent on mains voltage fluctuations and the DC output voltage level; approx. 60% at 24 V_{DC}, 35% at 5 V_{DC}
- Pronounced heat build-up, particularly with high DC output currents
- High construction volume
- High weight



Linear regulator

Clock pulse-controlled DC power supplies

These power supplies are also often referred to as switched-mode regulators or switched mode power supplies. In contrast to linearly regulated DC power supplies, where the DC voltage and DC current are regulated continuously, these quantities are switched (chopped) in the case of clock pulse-controlled DC power supplies. As part of this concept, the **power semiconductors used are operated exclusively as switches**. Only slight switching and forward losses occur, which explains the high levels of efficiency that characterise these power supplies.

Regulation is carried out either by modifying the pulse duty ratio (switch-on time to switch-off time) with a constant frequency or by modifying the frequency with a constant pulse duty ratio. The **square-wave voltage** generated as a result can be transformed into practically any voltage level and rectified. A **high clock pulse frequency** ranging from around 20 kHz up to several MHz enables the **use of small ferrite transformers, inductors and capacitors**.

For the sake of clarity, the figures below do not show the (mains) transformer or the rectifier connected downstream. This **intermediate circuit** usually forms the input for the **DC-DC converters**.

A fundamental distinction is drawn between two transformational converter principles on the basis of their transformation behaviour:

With a **feed forward converter**, energy is transported between the primary and the secondary circuit with a closed semiconductor switch.

Description: With the semiconductor switch closed, energy is delivered to the output via the first secondary diode (connected in series to the secondary winding). If the semiconductor switch is open, however, then this diode acts as a block, and the second secondary diode takes on the current (magnetically stored energy) from the storage reactor and delivers it to the output. The third winding and the diode connected in series limit the voltage level at the semiconductor switch. In addition, the energy stored in the ferrite transformer during the switch-on phase is delivered back to the input source (intermediate circuit) during the switch-off phase.

The flyback converter first stores the energy in the ferrite transformer whilst the semiconductor switch is closed, until it is ready to deliver it to the secondary circuit during the blocking phase.

Description: The ferrite transformer collects energy whilst the semiconductor switch is closed. The diode in the secondary circuit acts as a block and no energy is transferred to the output. It is only once the semiconductor switch is opened that the polarity is reversed, the diode becomes conducting and the energy stored in the ferrite transformer is transferred to the output in the secondary circuit.

The key benefits of the feed forward converter are a clean DC output voltage as well as higher performance, e.g. when acting as a push-pull feed forward converter in a half-bridge or full-bridge circuit. The flyback converter is a cheaper option by comparison, but its operating behaviour is less stable.

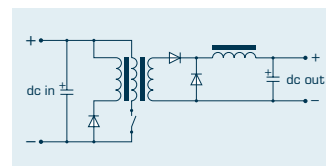
Two reactor converter principles are often used for applications **without electrical isolation** between the input (intermediate circuit) and output

The **step-down converter** is able to convert a higher DC input voltage into a lower DC output voltage (with a correspondingly higher DC output current).

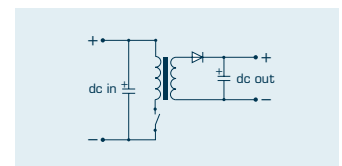
Description: When the semiconductor switch is closed, current flows to the output via the reactor. In the reactor, part of the current is converted into magnetic energy, which in turn is converted back into electrical energy during the blocking phase (with the semiconductor switch open). The polarity at the reactor reverses so that the current can flow to the output via the diode. This means that the DC output voltage is always lower than the DC input voltage.

With the **step-up converter**, it is possible to convert the DC input voltage into a higher DC output voltage (with a correspondingly lower DC output current).

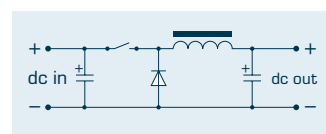
Description: When the semiconductor switch is open, current flows to the output via the reactor and the diode connected in a way that enables it to act as a feed-through. When the semiconductor switch is closed, electrical energy is converted into magnetic energy in the reactor and stored there. During this process, the diode prevents the output from being short-circuited. When the semiconductor switch is open, the magnetic energy is converted back into electrical energy and a DC voltage builds up in series to the output. This means that the DC output voltage is always higher than the DC input voltage.



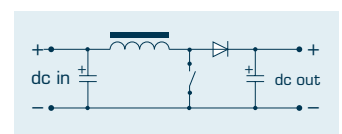
Feed forward converter



Flyback converter



Step-down converter



Step-up converter

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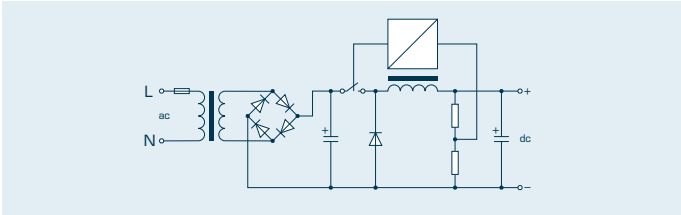
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Secondary clock pulse-controlled DC power supplies

These DC power supplies are also referred to as secondary switched-mode regulators (amongst other things). Their main function is shown by the typical circuit concept below.



A **50 Hz transformer** which meets the safety requirements for electrical isolation is used for adaptation to the mains. Following rectification, an intermediate circuit DC voltage which is higher than the desired DC output voltage should be produced at the charging capacitor. A **step-down converter** with a typical **switching frequency of > 20 kHz** is connected downstream of the intermediate circuit. The regulator controls (clock pulse-controls) the semiconductor switch in a way that establishes a stable DC output voltage. As part of this, the reference voltage integrated into the regulator is compared with the actual value of the output (generated by the voltage distributor). These correcting variables are used to regulate the switch-on and switch-off times for the semiconductor switch.

Benefits:

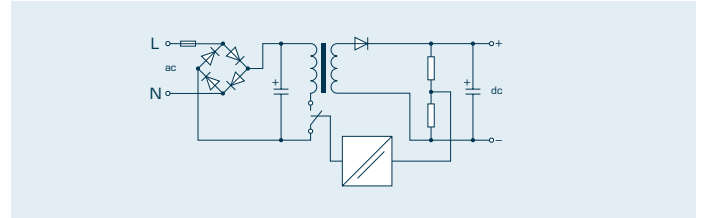
- No safety issues in terms of mains isolation by means of 50 Hz transformer
- Multiple input voltages can be implemented easily thanks to primary tapping
- Circuitry even easier to understand than before
- Relatively high efficiency level; largely unaffected by mains voltage fluctuations and the DC output voltage (approx. 70 – 80%)

Drawbacks:

- High construction volume
- High weight
- Relatively long settling times (compared to linearly regulated DC power supplies) which depend on the switching frequency
- Relatively unclean DC output voltage (spikes, wide-band spectrum)
- EMC problems due to clock pulse control, but a relatively low noise level

Primary clock pulse-controlled DC power supplies

These DC power supplies are also referred to as primary switched-mode regulators (amongst other things). Their main function is shown by the circuit concept below, which is used in many applications



A **converter** with a typical **switching frequency of > 20 kHz** is connected downstream of the intermediate circuit. The regulator controls (clock pulse-controls) the semiconductor switch in a way that establishes a stable DC output voltage. As part of this, the reference voltage integrated into the regulator is compared with the actual value of the output (generated by the voltage distributor). These correcting variables are used to regulate the switch-on and switch-off times for the semiconductor switch.

With this type of circuit concept, the ferrite transformer must meet the safety requirements for electrical isolation from the mains; this also applies to the regulator (by using an optocoupler, for example).

Benefits:

- Extremely high efficiency level; largely unaffected by mains voltage fluctuations and the DC output voltage (approx. 75% to over 90%)
- Low construction volume
- Low weight
- Option of wide input voltage range
- Option of AC and DC input voltage, depending on circuit concept

Drawbacks:

- Complex circuitry (number of components; likelihood of failure)
- Relatively long settling times, which also depend on the switching frequency
- Relatively unclean DC output voltage (spikes, wide-band spectrum)
- EMC problems due to clock pulse control, plus a high noise level

Stability

The stability of the DC output voltage of regulated DC power supplies is primarily determined by the **functional area** of the assigned requirements. This includes:

■ Line regulation

Defined between the permissible limit values for the lowest and highest input voltage, usually when the rated DC output current is at its maximum (but only with half the rated DC output current in accordance with VDE 0557/EN 61204/IEC 61204). Line regulation is typically -15% to $+10\%$ relative to the rated input voltage, e.g. 230 V_{AC} .

■ Load regulation

Defined with the least favourable input voltage within the range where line regulation is taking place with load variations from $0 - 100\%$ of the rated DC output current. Regulated DC power supplies without no-load-proof capability should be evaluated at the lower limit values of 10% , 25% or 50% and designated accordingly.

■ Effect of temperature

Often, it is particularly useful to look at how temperature affects the stability of the DC output voltage in the following worst-case scenarios:

- Cold DC power supply at lower limit value of the assigned ambient temperature (e.g. 0°C) and minimum permissible load
- DC power supply at operating temperature and in steady-state condition, at upper limit value of the assigned ambient temperature (e.g. 50°C) and maximum load.

In line with the relevant standards (see: VDE 0557/EN 61204/IEC 61204), the effect of temperature is represented as the temperature coefficient in $\%$ or $^\circ\text{C}$.

Stability refers to the **potential variation in the DC output voltage** relative to the functional area of various parameters, such as line regulation, load regulation and temperature. The value assigned by the manufacturer is specified as a percentage **relative to the rated DC output voltage**.

Typical values:

- 0.5% for linearly regulated DC power supplies
- 2% for clock pulse-controlled DC power supplies

Tolerance

The DC output voltage of regulated DC power supplies **can normally be set** and referred to the rated value. The setting accuracy (resolution) depends on the circuit concept and the assigned setting range. Typical setting ranges (relative to a rated DC output voltage of 24 V_{DC}) are $\pm 5\%$ or 22 V_{DC} to 28.8 V_{DC} . It is important to remember that the **stability** of the DC output voltage may **change** if the rated value setting is different!

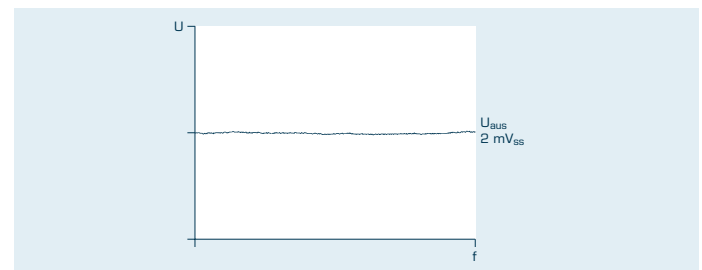
In the case of regulated DC power supplies which cannot be set, the DC output voltage tolerance is usually 2% or 5% , relative to the rated value

Ripple

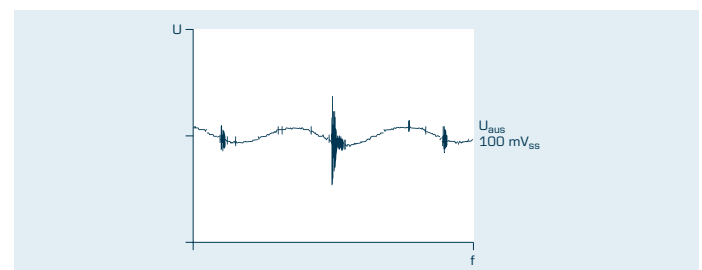
In contrast to unregulated DC power supplies with ripples in the volt range, regulated DC power supplies only demonstrate very low levels of ripple. For this reason, ripple is no longer specified as a percentage, but rather as an absolute voltage value in mV_{pp} (millivolt peak-to-peak). As far as possible, it is also independent of the DC output current level in the assigned functional area. Non-sinusoidal ripples (e.g. spikes) which exhibit wide-band frequency behaviour can occur as a result of regulating and switching procedures within the regulated DC power supply.

The quality of the DC output voltage ripple also differs depending on whether the DC power supply is linearly regulated or clock pulse-controlled.

If the supply DC voltage needs to be as "clean" as possible (as is the case in measurement and control technology, for example), then the linearly regulated DC power supply should be given preference over the other type of power supply.



Linearly regulated



Clock pulse-controlled

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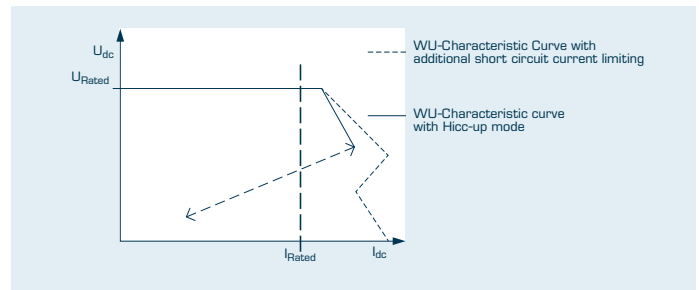
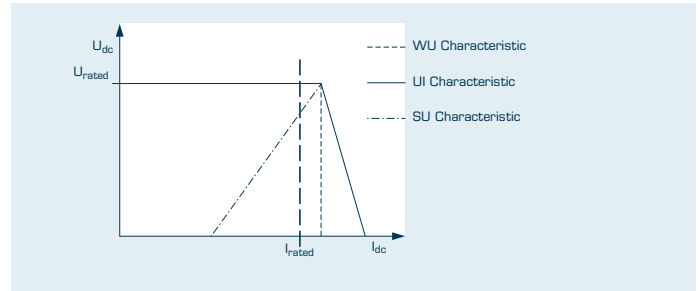
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Current limiting

Regulated DC power supplies usually feature an electronic current limiting function that acts on the output. This not only prevents the load (consumer) from becoming a source of danger (i.e. creating a risk of fire) as a result of excessive current consumption, but also protects the DC power supply itself from being destroyed due to a defective load (consumer).

Depending on the assigned requirements profile and the selected circuit concept, the following load characteristics (see: DIN 41 745, DIN 41 772) or combinations of these are often used:



Combination Example

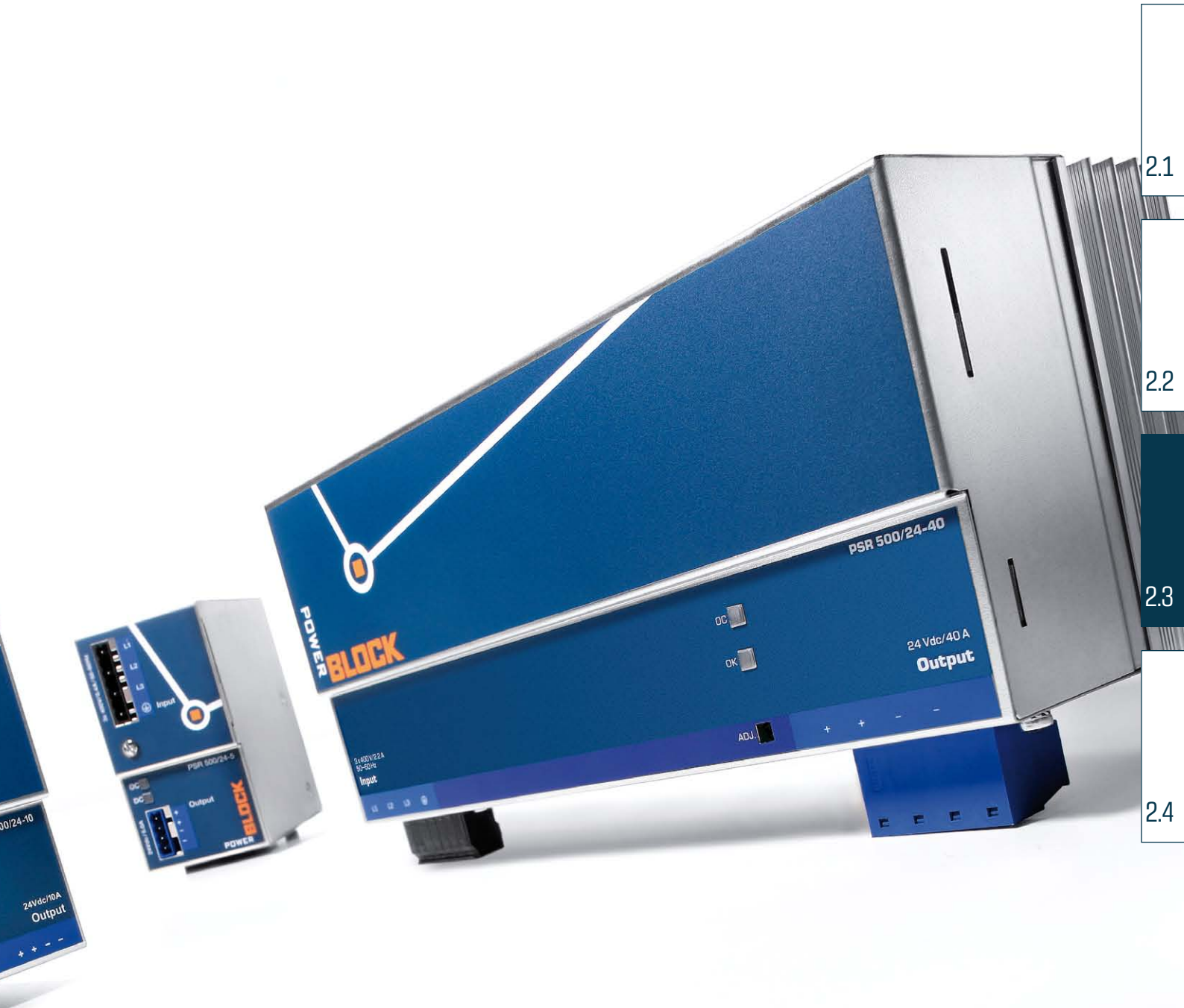
Mains buffering

The mains buffer time - also known as the dwell time (see: VDE 0557/EN 61204/ IEC 61204) – is the time during which a regulated DC power supply is still able to supply the rated DC output current even though the (supply) input voltage has been switched off. In this case, the rated DC output voltage remains within the assigned tolerance range and the (supply) input voltage was at 90% of the rated value before it was switched off.

The most efficient way to increase the mains buffer time is when the **intermediate circuit charging capacitor** of the regulated DC power supply (see the "Primary clock pulse-controlled DC power supplies" wiring diagram, for example) has a **high capacitance** and is therefore able to store a large amount of energy. The charging capacitor which is connected in parallel to the output of a regulated DC power supply can, in principle, be increased in size as well in order to achieve a longer mains buffer time, although this may lead to undesirable effects on the regulating characteristics of the circuit. Furthermore, the DC output voltage may only build up slowly following switch-on, depending on the electronic current limiting concept selected.

In most cases, mains buffer times of 3 - 10 ms can be achieved; this may even be increased to 20 ms with some additional effort. To provide buffering for longer periods (e.g. for backing up data on storage media), a UPS (uninterruptible power supply) is usually required.





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Appendix



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International agencies

1

Belgium
BLOCK Belgium BVBA
Nieuwstraat 2
3200 Aarschot
Phone: +32 1669-6945
Fax: +32 1669-7972
www.block-trafo.de
info.belgium@block-trafo.com

2

Denmark
BLOCK Danmark APS
Max-Planck-Str. 36-46, 27283 Verden
Phone: +49 4231 678-0
Fax: +49 4231 678-177
www.block-trafo.de
info@block-trafo.de

3

France
BLOCK France SARL
Max-Planck-Str. 36-46, 27283 Verden
Phone: +49 4231 678-0
Fax: +49 4231 678-177
www.block-trafo.de
info@block-trafo.de

4

United Kingdom
BLOCK UK LTD.
24 Bentalls Centre
Colchester Road
Heybridge
Maldon, Essex CM9 4GD
Phone: +44 1621 85-0666
Fax: +44 1621 85-0711
www.blockuk.co.uk
info@blockuk.co.uk

5

USA
BLOCK USA, Inc.
1370 Bowes Road, Suite 110
Elgin, Illinois 60123
Phone: +1 847 214 8900
Cell: +1 847 754 5717
Fax: +1 224 569 4312
www.blockusa.com
info@blockusa.com

6

Australia
Capacitor Technologies P/L
Unit 13/40 Edina Road
Ferntree Gully VIC 3156 Australia
PO Box 240 Ferntree Gully
B.C. VIC 3156 Australia
Phone: +61 3 9758 5866
Fax: +61 3 9752 2067
www.captech.com.au
sales@captech.com.au

7

Austria
Regatronic
Regel- und Antriebselektronik GmbH
Gewerbepark 9, 4201 Gramastetten
Phone: +43 7239 7550-0
Fax: +43 7239 7550-50
www.regatronic.at
info@regatronic.at



8

China
Beijing Yizhaohong
Science and Trade Co., Ltd
 B-903, Jia He Li Yuan, Xiaoyunlu Jia32,
 Chaoyang District, Beijing 100027
 Phone: +86 10 8440 2099
 Fax: +86 10 8440 2199

9

Finland
Finn Electric Oy
 P.O. Box 147, 01511 Vantaa
 Juhaniantie 4C, 01740 Vantaa
 Phone: +358 9870027-0
 Fax: +358 9870027-28
 www.finnelectric.fi
 info@finnelectric.fi

10

Greece
Theo. Theodoropoulos
 Georg Glysti Str. 34
 117 44 Neos Kosmos/Athen
 Phone: +30 2109014373
 Fax: +30 2109014373

11

Hungary
Ultima Kft.
 Rétifarkas utca 6.
 1172 Budapest
 Phone: +36 1 432 8820
 Fax: +36 1 264 1254
 www.ultima.hu
 info@ultima.hu

12

Iceland
SPENNUBREYTAB ehf
 Trönuhraun 5, 220 Hafnarfjörður
 Box 400, 222 Hafnarfjörður
 Phone: +354 555-4745
 Fax: +354 565-2005
 www.spennubreytar.is
 spennubreytar@isholf.is

13

India
Spitzen Energy Solutions
 201-209, The Pentagon,
 Shahu College Road,
 Off Pune - Satara Road
 Pune 411009
 Phone: +91 9890362722
 Fax: +91-20-24223789
 info@spitzenenergy.com

14

Israel
Semicom Lexis LTD.
 P.O. Box 3
 60910 Moshav Bney Zion
 Phone: +972 9 7611222
 Fax: +972 9 7413852
 www.semicom.co.il
 malka-a@semicom.co.il

15

Italy
SINTEL
Società Internazionale Elettronica s.r.l.
 Via Raffaello Sanzio, 2/D
 21013 Gallarate/Varese
 Phone: +39 0331 7959-15
 Fax: +39 0331 7959-13
 www.sintelsrl.net
 info@sintelsrl.net

16

Malaysia
Letrimatik Sdn Bhd
 No. 4, Jalan TPK 2/4
 Taman Perindustrian Kinnara
 Batu 7 1/2, Off Jalan Puchong
 Puchong 47100 Selangor
 Phone: +60 3 8076 2588
 Fax: +60 3 8076 2582
 letrim@tm.net.my

17

Netherlands
ELINCOM ELECTRONICS B.V.
 Klaverbaan 101-103
 2908 KD Capelle aan den IJssel
 Phone: +31 10 26402-70
 Fax: +31 10 26402-75
 www.elincom.nl
 info@elincom.nl

18

New Zealand
MARDAG HOLDINGS LIMITED
 17 Wall Place Tawa
 PO BOX 51184 Tawa
 Wellington
 Phone: +64 4 2378912
 Fax: +64 4 2374559
 www.mardag.co.nz
 marcus@mardag.co.nz

19

Russia
MEG Electro Ltd
 Ul Scherbakovskaya 53, Geb.H.3
 105187 Moscow
 Phone: +7 495 720 82 68
 Fax: +7 495 365 88 40
 www.mege.ru
 info@mege.ru

20

Spain
ELECTRONICA OLFER S. L.
 P. A. E. Casablanca II
 Av. Severo Ochoa
 37. C/B. Nave 4D
 28100 Alcobendas - Madrid
 Phone: +34 91 48408-50
 Fax: +34 91 48408-51
 www.olfer.com
 info@olfer.com

21

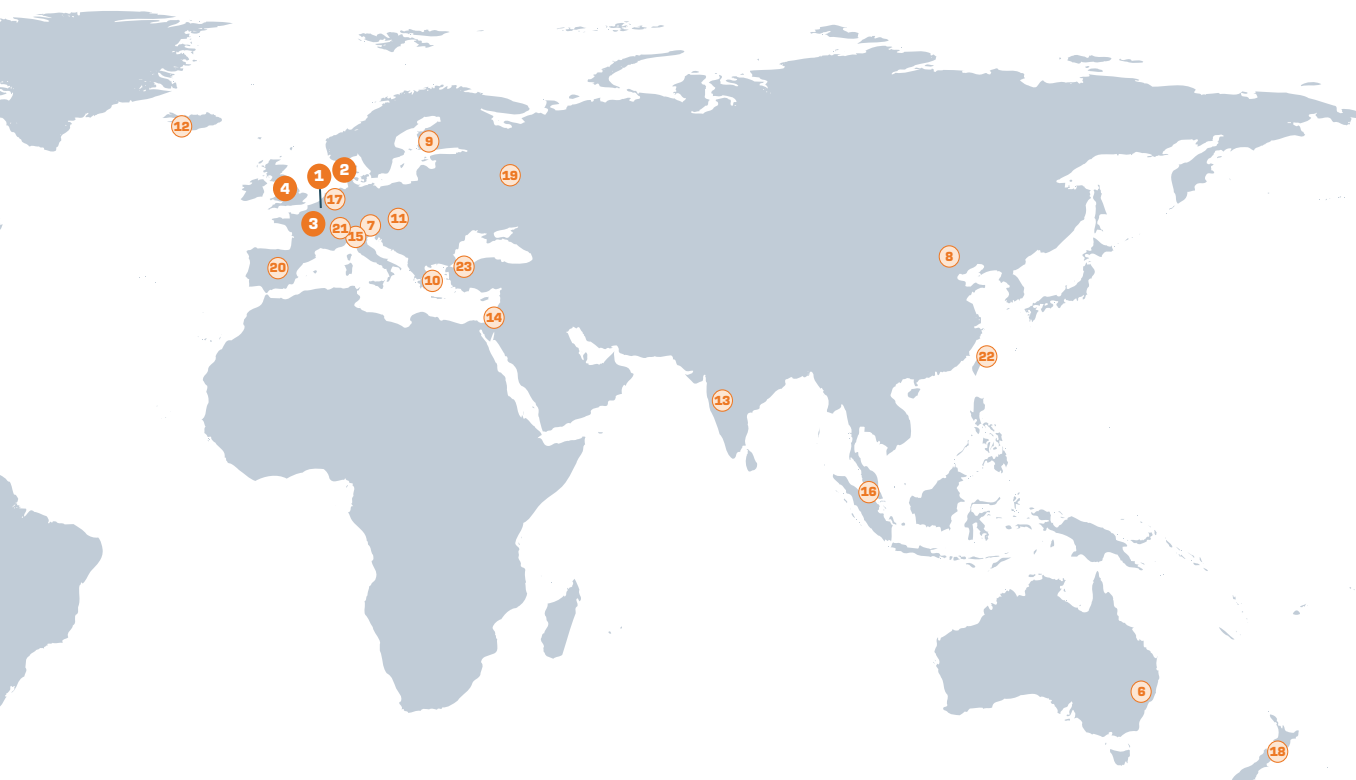
Switzerland
PG Transformers GmbH
 Glattalstrasse 505
 8153 Rümlang
 Phone: +41 44 817 31 51
 Fax: +41 44 817 34 74
 www.pgtrafo.ch
 info@pgtrafo.ch

22

Taiwan
KINGDATRON Electronic
Industrial Co. LTD.
 7th Floor, No. 19, Lane 221, Gang Qian Road
 Taipei Taiwan 11494
 Phone: +886 2 2659-6058 Ext. 19
 Fax: +886 2 2659-6059
 www.keic.com.tw
 sales@kingdatron.com.tw

23

Turkey
SANIL Teknik Elektrik
San. ve Tic. Ltd. Şti.
 Okçumusa Caddesi, Tutsak Sokak
 No: 27/5 Karaköy
 İstanbul 34420
 Phone: +90 212 256 94 28
 Fax: +90 212 256 94 04
 www.sanil.com.tr
 sanil@sanil.com.tr



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Representatives in Germany

01

HAMBURG, SCHLESWIG HOLSTEIN, NORD-OST NIEDERSACHSEN, MECKLENBURG VORPOMMERN BLOCK Transformatoren-Elektronik GmbH

Aurel Bastian-Hauck

Lütjenseer Straße 45a, 22946 Trittau
Tel. +49 4154 794 8592, Fax +49 4154 794 8593
www.block-trafo.de, aurel.bastian-hauck@block-trafo.de

Postleitzahlenbereiche:

17000–19999
20000–21739
22000–25999

02

BREMEN, OLDENBURG, OSNABRÜCK Industrie-Vertretungen Reinhold Neseemann

Neue Heimat 27 A, 28307 Bremen
Tel. +49 421 403744 • Fax +49 421 400394

www.ivn-bremen.de • info@ivn-bremen.de

Postleitzahlenbereiche:

21740–21799
26000–28999
49000–49999

03

HANNOVER, OSTWESTFALEN, KASSEL Ingenieurbüro Dybus GmbH

Postfach 12 48, 30928 Burgwedel
Schulze-Delitzsch-Straße 6a, 30938 Burgwedel
Tel. +49 5139 9959-0 • Fax +49 5139 9959-29
www.dybus.com • info@dybus.com

Postleitzahlenbereiche:

29000–34480
37000–37199
37400–38999

04

NORDRHEIN-WESTFALEN

Ingenieurbüro Martin Schwert Elektrotechnik

Münsterstraße 47, 59368 Werne
Tel. +49 2389 402995-0 • Fax +49 2389 402995-18
martin-schwert@t-online.de

Postleitzahlenbereiche:

40000–48999
50000–53999
57000–59999

05

BERLIN, BRANDENBURG, MAGDEBURG, DRESDEN

BLOCK Transformatoren-Elektronik GmbH

Alexander Walz

Ulmenstraße 115a, 12621 Berlin
Tel. +49 30 5658-7203 • Fax +49 30 5658-7204
www.block-trafo.de • alexander.walz@block-trafo.de

Postleitzahlenbereiche:

01000–03999
10000–16999
39000–39999

06

THÜRINGEN, LEIPZIG BLOCK Transformatoren-Elektronik GmbH

Mike Preiß

Falkenring 21, 98693 Ilmenau OT Oberpörlitz
Tel. +49 3677 679-994 • Fax +49 3677 679-995
www.block-trafo.de • mike.preiss@block-trafo.de

Postleitzahlenbereiche:

04000–09999
36400–36499
37200–37399
98000–99999

07

RHEINLAND PFALZ, SÜD-HESSEN, SAARLAND Ingenieurbüro Dr. Voigt

Konrad-Adenauer-Str. 16 a, 61191 Rosbach
Tel. +49 6003 322-2 • Fax +49 6003 322-0
www.voigt-trafo.de • info@voigt-trafo.de

Postleitzahlenbereiche:

34490–35999
36000–36399
54000–56999
60000–69999
76700–76999

08

FRANKEN, NORDBAYERN BLOCK Transformers-Elektronik GmbH

Alfred Dehmel

Schlösseläcker 18, 92318 Neumarkt
Tel. +49 9181 513-9708 • Fax +49 9181 513-9709
www.block-trafo.de • alfred.dehmel@block-trafo.de

Postleitzahlenbereiche:

90000–92999
95000–97999

Contract distributors



element14

Farnell / element14
www.farnell.com



Mütron Müller GmbH & Co. KG
www.muutron.de



Conrad Electronic SE
www.conrad.de



Avnet Abacus
www.abacus.co.uk



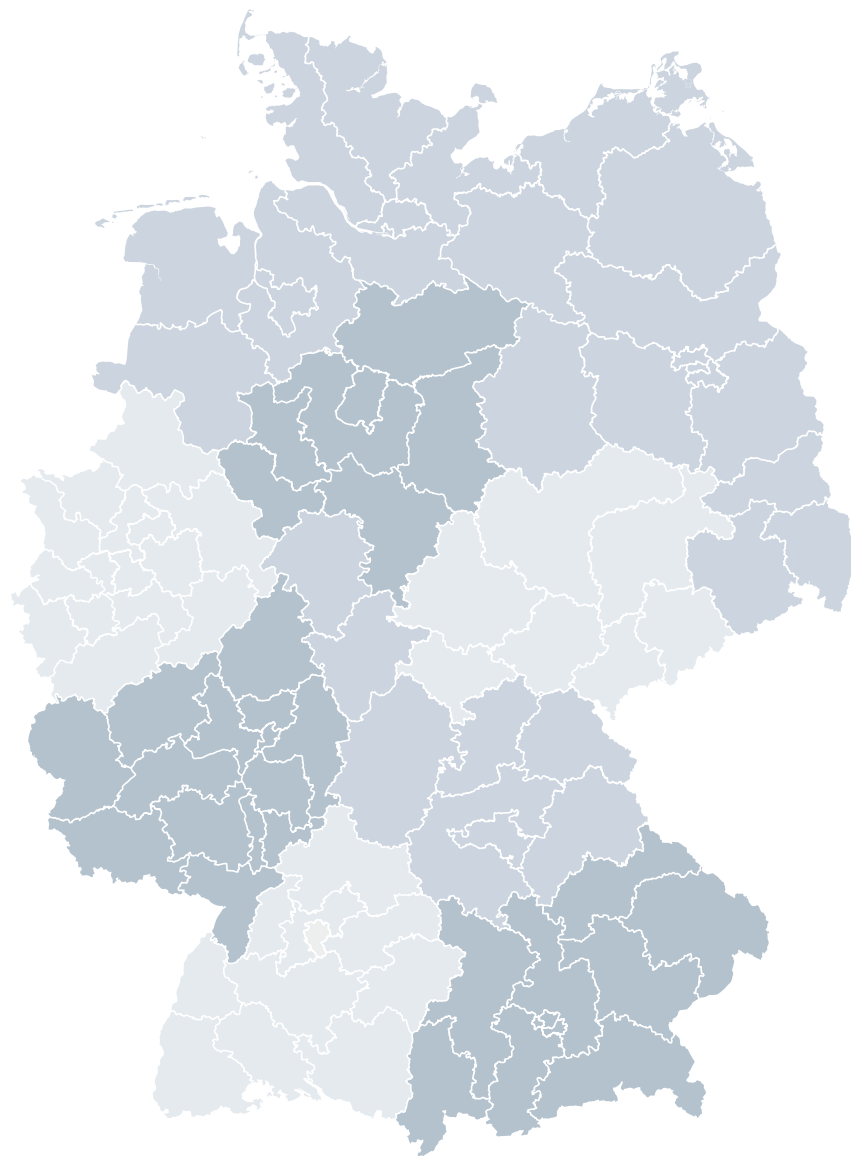
Hagemeyer Deutschland GmbH & Co. KG
www.hagemeyerce.com



HANSETRONIK Elektronikbauteile Vertriebs GmbH
www.hansetronik.de



Reichelt Elektronik
www.reichelt.de



09

BADEN-WÜRTTEMBERG
Ingenieurbüro G. Zimmermann

Wunnensteinstraße 21, 71723 Großbottwar
 Tel. +49 7148 4801-0 • Fax +49 7148 4801-19
 vertrieb@zimmermann-msr.de
 Postleitzahlenbereiche:
 70000-76699
 77000-79999
 88000-89299
 89500-89999

10

SÜDBAYERN

BLOCK Transformers-Elektronik GmbH
Franz Josef Fesl

Oberneureutherwaid 50, 94164 Sonnen
 Tel. +49 8586 9761-28 • Fax +49 8586 9761-95
 www.block-trafo.de • franz.fesl@block-trafo.de
 Postleitzahlenbereiche:
 80000-87999
 89300-89499
 93000-94999

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RS Components Ltd.
www.rs-components.com



EVE GmbH
 ELEKTRONIK DISTRIBUTION
www.eve.de



Bürklin OHG
www.buerklin.com



ELFA AB
www.elfa.se



E.T.N. Groupe
www.etn.fr



Distrelec Schuricht GmbH
www.distrelec.de



DEG Deutsche Elektro-Gruppe GmbH
www.deutsche-elektrogruppe.de

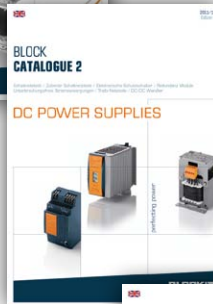
Alphabetical list of types

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AVB	CATALOGUE 1	HFD 210	CATALOGUE 3
BG	CATALOGUE 1	HFD 356	CATALOGUE 3
BR	CATALOGUE 1	HFD 500	CATALOGUE 3
BRS	CATALOGUE 1	HFD 503	CATALOGUE 3
BSD	CATALOGUE 3	HFD 510	CATALOGUE 3
BUST	CATALOGUE 1	HFE 104	CATALOGUE 3
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DSP	CATALOGUE 1	HFV 510	CATALOGUE 3
E-JET	CATALOGUE 1	HIT	CATALOGUE 1
ECO 2003	CATALOGUE 1	HLD 110	CATALOGUE 3
EL	CATALOGUE 1	HLD 310	CATALOGUE 3
EP	CATALOGUE 1	HLD 710	CATALOGUE 3
ES 00	CATALOGUE 1	HLD 810	CATALOGUE 3
ES 30	CATALOGUE 1	HLE 110	CATALOGUE 3
ESG1	CATALOGUE 1	HLE 310	CATALOGUE 3
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ESG5	CATALOGUE 1	HLV 710	CATALOGUE 3
ESG6	CATALOGUE 1	HLV 810	CATALOGUE 3
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ESS	CATALOGUE 1	HS 0110	CATALOGUE 1
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STT	CATALOGUE 1
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VB	CATALOGUE 1
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VBN	CATALOGUE 1
VC	CATALOGUE 1
VCM	CATALOGUE 1
VCN	CATALOGUE 1
VR	CATALOGUE 1
VT-EN	CATALOGUE 1

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General terms and conditions

Section 1 - General

1. Our terms of sale shall apply exclusively. We shall not recognise any terms of the customer which conflict with or diverge from these. For copper costing €150.00 per 100 kg and up, a copper surcharge shall be levied in accordance with the specified copper weight and the DEL (German electrolytic copper) quotation rate applicable on the date when the order is confirmed.
2. All the arrangements made between us and the customer are stipulated in writing in these terms of delivery.
3. Our terms of delivery shall only apply to companies within the meaning of Section 14 of the German Civil Code (BGB).

Section 2 - Conclusion of contract

1. We are entitled to accept the order within two weeks. This acceptance may be granted in writing or by delivering the goods to the customer. The order confirmation created by us shall exclusively determine the scope of delivery. Subsequent additions or alterations to the order must be expressly confirmed by us in writing in order to become effective.
2. If the goods are ordered electronically, then we shall immediately send the customer confirmation that the order has been received. This confirmation in itself does not constitute any binding acceptance of the order.
3. We reserve all existing copyright to documents, calculations, etc. sent by us. These documents and materials shall also remain our property unless otherwise agreed. These documents and materials may only be passed on to third parties with our written consent.
4. Our quotations are without obligation. We reserve the right to make minor alterations to the construction, design or performance of our equipment compared with what we have specified in our catalogues and brochures or on our website, as well as alterations due to technical progress.
5. Partial deliveries are permissible provided the customer may reasonably be expected to accept them. Each partial delivery shall in all cases be regarded as a separate transaction.

Section 3 - Delivery period

1. Our delivery period shall commence when the order confirmation is sent to the customer. However, commencement of the delivery period we specify assumes in all cases that any technical issues and design specifications have been resolved and clarified.
2. Delivery periods are always specified subject to cooperation by the customer with the terms of the contract. Compliance with our delivery obligations assumes that the customer has fulfilled their obligations in a timely and correct manner (e.g. provision of all required documents, permits, approvals, etc.).
3. The delivery period shall be deemed to have been adhered to if the goods have been dispatched in the period leading up to its deadline or if the customer has been notified in writing that they are ready for dispatch. Where any failure to adhere to the agreed delivery period is due to force majeure (e.g. war, natural disasters, etc.) or events such as strikes, etc., then the delivery period shall be extended accordingly.
4. If the customer defaults on accepting delivery, we shall be entitled to demand compensation for any damage we incur as a result. We reserve the right to assert claims beyond this. If compensation is demanded in lieu of performance pursuant to Section 281 of the German Civil Code, then we shall be entitled to demand 20% of the sale price by way of compensation, irrespective of the possibility of claiming higher compensation. The customer reserves the right to provide evidence that a substantially lower level of damage, or no damage at all, has been incurred.

Section 4 - Prices and terms of payment

1. Price lists and prices quoted in catalogues and on websites are without obligation. All fixed-price agreements must be made in writing.
2. The minimum order value is €40 or €150 for custom-made products.

3. Our prices are ex works or ex warehouse (EXW Verden/Aller, Max-Planck-Str. 36-46, Germany, ICC-Incoterms® 2010) and do not include packaging, freight, assembly, commissioning or any other additional costs (e.g. customs duties); these shall be charged separately.
4. Our prices do not include statutory value added tax; this is itemised separately in the invoice at the applicable statutory rate.
5. The purchase price must be paid within 30 days net of the invoicing date without a discount or within 10 days net of the invoicing date with a 2% discount, with no transaction charges in either case. Once the relevant deadline has passed, the customer shall be deemed to have defaulted on payment. The statutory regulations concerning the consequences of payment default shall apply. The same applies to part deliveries invoiced separately.

Section 5 - Right of return/withdrawal for consumer contracts

1. We shall grant the statutory right of return or withdrawal only in the case of legal transactions made with a natural person as defined in the legal system of the Federal Republic of Germany. Such customers shall no longer be bound by their order if they withdraw from the contract within 2 weeks by issuing a written declaration (e.g. letter, fax, e-mail), or by returning the goods (no reasons need be given). This period shall begin, at the earliest, when the customer receives this information. Dispatching the goods or sending the declaration of withdrawal within this time limit shall suffice in order for the deadline to be met. The declaration of withdrawal must be sent to or goods returned to BLOCK Transformatoren Elektronik GmbH, Max-Planck-Straße 36-46, 27283 Verden, Germany. If withdrawal from the contract is effected, the goods and services received by both parties must be returned and, where applicable, any profits gained (e.g. interest) must be surrendered. If the items received are not returned at all or are only returned in a deteriorated condition, then compensation for lost value must be paid. This does not apply if the deteriorated condition can be traced back exclusively to inspecting or trying out the items (such as would be possible in a shop). You can also avoid any obligation to pay compensation for lost value by not using the items as if they were your own property and refraining from any actions that may cause them to decrease in value. Items shall be returned at our expense unless the price of the items to be returned is 40 euros or less or if, in the case of higher-priced items, the consumer has not yet rendered counter-performance or made a part payment by the date of withdrawal from the contract. Items that cannot be sent in a parcel shall be picked up from your premises.

Section 6 - Transfer of risk

1. Unless otherwise specified in the order confirmation, it is agreed that delivery shall be made ex works (EXW Verden/Aller, Max-Planck-Str. 36-46, Germany, ICC-Incoterms® 2010). If we have agreed with the customer that the item to be delivered is to be dispatched, then we shall be entitled to choose the type of dispatch.
2. Risk of accidental loss or of damage to the items is transferred to the customer at the point when the items are handed over to or, in the case of a sale by delivery to a place other than the place of performance, when the items are surrendered to the carrier or other person responsible for delivery.

Section 7 - Liability for defects

1. The assertion of claims for defects assumes that the customer has fulfilled their obligations to inspect the goods and lodge complaints in accordance with Section 377 of the German Commercial Code (HGB). In particular, the function of devices must be checked before being put into operation and measuring instruments must be checked and, if necessary, adjusted to ensure they are displaying the correct readings. The specifications in the relevant operating instructions must be observed in this respect.
2. The customer may not derive any additional rights from material defects which do not affect or only negligibly affect the goods' value or suitability for the purpose recognised by us.

3. If the purchased goods are defective, we shall either make subsequent improvements or deliver additional goods, at our discretion. If we choose to make improvements, we shall be obligated to bear all costs required for this, in particular transport, labour and material costs. This shall not apply if the goods ordered have been taken to a location other than the place of performance and the costs increase as a result of this.
4. If we fail in our duty to render supplementary performance, the customer may demand withdrawal from the sales contract or a reduction in the price.
5. If the customer receives an incorrect or incomplete set of assembly instructions, we are only obligated to supply a set that is correct and complete. This applies even if the inaccuracies in or incompleteness of the assembly instructions render correct assembly impossible.
6. Unless otherwise stipulated above, liability is excluded.
7. The period during which claims for defects may be asserted is twelve months from the point of transfer of risk.
8. Assignment of warranty claims is only permissible with our prior written consent.

Section 8 - Damages

1. We shall only be liable for damages in accordance with statutory regulations in cases of personal injury, if the damage is covered by the scope of the German Product Liability Act (ProdHaftG), or if the damage is due to wilful intent or gross negligence.
2. In addition, if the damage is due to culpable breach of an essential contractual duty or a cardinal obligation, we shall only be liable for the damage that is typical for the type of contract concerned.
3. Any additional contractual claims or claims in tort on the part of the customer are excluded. Therefore, we shall in particular not be liable for any damage not occurring on the actual item delivered, or for loss of profits or other financial losses sustained by the customer.

Section 9 - Limitation

1. Accordingly, the right to withdrawal from the contract or a price reduction is excluded according to the legal regulations.

Section 10 - Retention of title

1. We shall reserve the title to the goods delivered until all our claims against the customer based on the business relationship have been paid, including any future claims which may arise from contracts concluded at the same time or a later date.
2. The customer is obligated to handle the goods delivered with care at all times and to insure them against fire, water and theft damage at their own expense.
3. If the customer acts in breach of contract, and in particular if they default on payment, we shall be entitled to withdraw from the contract and reclaim any goods. For the purpose of reclaiming the goods, the customer hereby irrevocably permits us to access their business and storage premises unimpeded and to remove the goods. Once we have taken back the purchased goods, we shall also be entitled to realise them. Any revenue obtained from this shall be offset against the accounts payable of the customer.
4. The customer is required to inform us immediately in writing of any seizure of the delivered goods. The customer is prohibited from entering into any agreements with their own customers that may negatively affect our rights.
5. The customer is entitled to re-sell or process the purchased goods in the normal course of business. Any processing shall be performed on our behalf. If the goods subject to retention of title are processed, combined or merged with other goods, we shall in all cases acquire a co-ownership share of the new item; in the case of processing, this shall be equivalent to the value (= gross invoice value including additional costs and taxes) of the goods subject to retention of title in proportion to the value of the new item, and in the case of combination or merging, it shall be equivalent to the value of the goods subject to retention of title in proportion to the value of the other goods.

6. The customer hereby assigns to us all claims to which they are entitled from the resale, up to the value of the invoice amount (incl. VAT). Even after assignment, the customer shall remain authorised to collect on these claims. Our powers to collect on these claims ourselves shall remain unaffected by this, but we shall not exercise this right as long as the customer fulfils their payment obligations and any other obligations, and as long as no petition to open insolvency proceedings against the customer's assets has been filed. If requested to do so, the customer must inform us of the assigned claims and debtors concerned, provide all the information required to collect on these claims, hand over the relevant documentation, and notify the debtors of the assignment.
7. The customer shall assign to us all claims against a third party that arise if the purchased goods are attached to a piece of real estate.
8. To the extent that and for as long as the retention of title exists, the customer may neither pledge goods or items manufactured from these goods nor assign them by way of security. The conclusion of financial contracts (e.g. leasing) which include the assignment of our rights to retention of title must be approved by us in writing beforehand, unless the contract obligates the financing institution to immediately pay out to us the share of the purchase price to which we are entitled.
9. At the request of the customer, we undertake to release at our own discretion securities to which we are entitled, provided that the realisable value of the securities exceeds the claims to be secured by more than 20% or their par value by more than 50%.

Section 11 - Delivering equipment for trial use

1. If equipment is delivered for trial use, the customer must, unless otherwise agreed, pay the freight costs as well as the costs for packaging, insurance and any depreciation which may have occurred. Additionally, the customer assumes liability for any loss of or damage to the goods delivered throughout the entire trial period. If returned, the goods must always be returned in a perfectly clean condition and with transport insurance at the customer's expense.

Section 12 - Miscellaneous

1. Liability for a breach of duties under the German Equipment and Product Safety Act is limited to products which were placed on the market after 01/05/2004.

Section 13 - Place of jurisdiction – Place of performance

1. The place of jurisdiction shall be our place of business. The same applies if the customer does not have a general place of jurisdiction in Germany or the location in which they are domiciled or normally resident is not known at the time when action is brought. However, we shall also be entitled to bring action against the customer at the court with jurisdiction at the location of their place of business or residence.
2. The laws of the Federal Republic of Germany shall apply; the United Nations Convention on Contracts for the International Sale of Goods is excluded. This shall apply even if the customer is from another country or is based in another country.
3. Unless otherwise stated in the order confirmation, the place of performance shall be our place of business.
4. If any provision of the contract with the customer, including these general terms of business, is or becomes invalid in whole or in part, then this shall not affect the validity of the remaining provisions. The provision which is entirely or partly invalid shall be substituted by one which most closely approximates the invalid provision in terms of its intended commercial outcome.

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For translation purpose only



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