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## Description

Switched mode power supply for rail mounting, with independent change-over of input voltages (AC 115/230 V), integral passive power factor compensation (PFC), high power reserve and optional parallel mode.

## Features and Benefits

- The devices switches over automatically when connected to AC 115 V AC and 230 V
- Wide range inputs from AC 90 to 132 V at rated input voltage 115 V, and AC 180 to 264 V at rated input voltage 230 V
- Efficiency up to 86 %
- Integral passive power factor compensation
- Parallel mode for performance improvement (selectable by switch)

## Typical applications

Process control, industrial switch- and controlgear, machine construction, telecommunication systems

## Order numbering code

### Type No.

**SMP21** Single phase switch-mode power supply for rail mounting

#### Connector design

**L** pcb mounting (preferred type)

**S** plug-in type

#### Terminal design

**20** screw terminals

#### Output voltage

**DC24V** DC 24 V

#### Output current

**5 A**

**SMP21-L20-DC24V-5A** ordering example

## Approvals and standards

Approval authority	Standards
UL	UL508, CSA C22.2 No. 107.1 (listed) UL 60950-1, CSAC22.2 No. 60950-1 (recognized)
TÜV Rheinland	EN 60950-1 / EN61558-1 / EN61558-2-16

## EMC

EN 61000-6-3, EN 61000-6-2, EN 61204-3



**SMP21-DC24V-5A**  
**Version L20**

## Technical data ( $T_U = 25^\circ\text{C}$ , $U_B = \text{AC } 115 / 230 \text{ V}$ , $I_0 = 5 \text{ A}$ )

### Operating data

Input voltage ranges  $U_E$  AC 90...132 V / AC 180...264 V

Operating voltage range  $U_B$  AC 115 / 230 V

Effective output 120 W

Output voltage  $U_O$  24 V SELV

Output current rating  $I_O$  5 A

Efficiency 84 % min. / 86 % typically

### General data

Switching frequency 55 kHz

Insulation voltage between input and output AC 3000 V, DC 4242 V

input and protective conductor AC 1500 V, DC 2121 V

output and protective conductor AC 500 V, DC 710 V

Insulation resistance 100 M $\Omega$  (DC 500 V) between input and output

Ambient temperature  $-35^\circ\text{C} \dots +71^\circ\text{C}$

Derating factor (see curve) 2.5 % /  $^\circ\text{C}$

Storage temperature  $-40^\circ\text{C} \dots +85^\circ\text{C}$

Relative humidity 20...95 % RH

MTBF to Bellcore, ed. 6 530,000 hours at  $40^\circ\text{C}$ , GB

Max. altitude in operation to IEC 60068-2-13 5000 m above sea level

Cooling by convection

Mounting direction wall-mounted (see dimensions)

Pollution degree 2

### Input circuit

Input rated voltage AC 115 / 230 V

Input voltage ranges AC 90...132 V / DC 180...264 V

Input current 0.83 A typically at  $U_B = \text{AC } 230 \text{ V}$   
2.2 A typically at  $U_B = \text{AC } 115 \text{ V}$

Max. input current 1.4 A at  $U_B = \text{AC } 180 \text{ V}$   
2.8 A at  $U_B = \text{AC } 90 \text{ V}$

Supply frequency 47...63 Hz

**Technical data ( $T_U = 25^\circ\text{C}$ ,  $U_B = \text{AC } 115 / 230 \text{ V}$ ,  $I_0 = 5 \text{ A}$ )**

Inrush current at AC 115 V at AC 230 V	24 A max. 48 A max.
Power loss (at $U_B$ 230 V, $I_0$ 5 A)	20 W typically
power factor compensation (passive)	typically 0.7
<b>Output circuit</b>	
Rated voltage $U_0$	DC 24 V SELV
Current rating $I_0$	5 A
Output voltage accuracy	0...+1 %
Min. load	0 %
Supply regulation	$\pm 0.5\%$ at $U_E$ min. ... $U_E$ max.
Load regulation	
Single mode	$\pm 1\%$
Parallel mode	$\pm 5\%$
Voltage adjustment range	DC 22.5...28.5 V at $0.8 \times I_0$
Continuous load	5 A at $U_0 = \text{DC } 24 \text{ V}$ , 4.2 A at $U_0 = \text{DC } 28.5 \text{ V}$
Power boost factor	typically 130 % (110%...145% see output curve)
Short circuit behaviour	U/I trip curve
exposure time	25 / 20 ms
ON delay at:	
resistive load	1 s
capacitive load of 3.500 $\mu\text{F}$	1.5 s
Rise time at:	
resistive load	150 ms
capacitive load of 3.500 $\mu\text{F}$	0.5 s
Release time	150 ms
Residual ripp	50 mV, spectrum = 20 MHz
Power back immunity	DC 35 V min.
Capacitive load	3,500 $\mu\text{F}$ max.
Parallel mode	3 power supplies max. at $0.1 \times I_0 \dots 0.9 \times I_0$

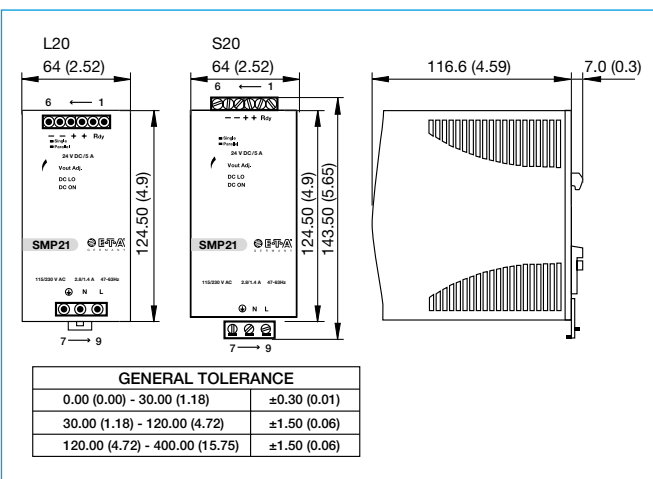
**Technical data ( $T_U = 25^\circ\text{C}$ ,  $U_B = \text{AC } 115 / 230 \text{ V}$ ,  $I_0 = 5 \text{ A}$ )**

<b>Control and protection circuit</b>	
Input protection	internal blade fuse T3.15 A / AC 250 V
Recommended back-up fuse	1-pole MCB, e.g. E-T-A type 4230
Current rating	6 A / 10 A $\rightarrow$ max. 20 A
Characteristic curve	B / C / D
Internal overvoltage protection	varistor
Available power (output RDY)	Contact closed at: DC 17.6...19.4 V
Insulation voltage Contact load at	DC 500 V (to output) DC 60 V / 0.3 A
Overvoltage protection	30...33 V at $0.8 \times I_0$
Output short circuit protection	by reduction of output voltage
Degree of protection	IP20

**Physical data**

Dimensions (h x w x d)	
version L20 with screw terminals	124.5 x 64 x 123.6 mm (4.9 x 2.52 x 4.87 inches)
Version S20 with removeable plug	143.5 x 64 x 123.6 mm (5.65 x 2.52 x 4.87 inches)
Housing material:	metal
Mass	approx. 920 g
Vibration (random vibration, to IEC 60068-2-6)	mounted on symmetrical rail, 10 - 500 Hz, 2 g, on X, Y & Z axis, 60 minutes per axis
Shock (random to IEC 60068-2-6)	15 g (11 ms), 3 axes, 6 sides, 3 times per side

**Dimensions**



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**Mounting and Installation**

Mounting	snap onto DIN rail (TS35/7.5 or TS35/15)
Ventilation / cooling	normal air convection, recommended distance on each side 25 mm
Mounting position	wall-mounted with the input terminals pointing downwards (see dimensions)

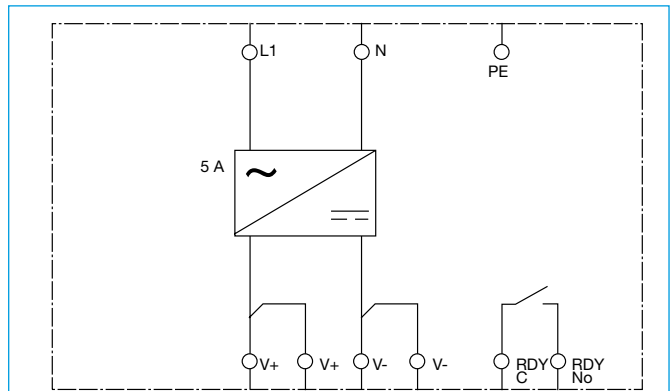
**Version L20 with screw terminals:**

Screw terminals	input terminal	AWG24-10 (0.2 mm <sup>2</sup> – 4 mm <sup>2</sup> ) flexible/rigid
	output terminal	AWG24-10 (0.2 mm <sup>2</sup> – 4 mm <sup>2</sup> ) flexible/rigid
Tightening torque	input connector	1 Nm max.
	Output terminal	0.6 Nm max.
Wire stripping length	8 mm	

**Version S20 with removeable plug**

Screw terminals	input terminal	AWG24-10 (0.2 mm <sup>2</sup> – 4 mm <sup>2</sup> ) flexible/rigid
	output terminal	AWG24-10 (0.2 mm <sup>2</sup> – 4 mm <sup>2</sup> ) flexible/rigid
Tightening torque	input connector	0.5 Nm max.
	Output connector	0.8 Nm max.
Wire stripping length	4...5 mm	

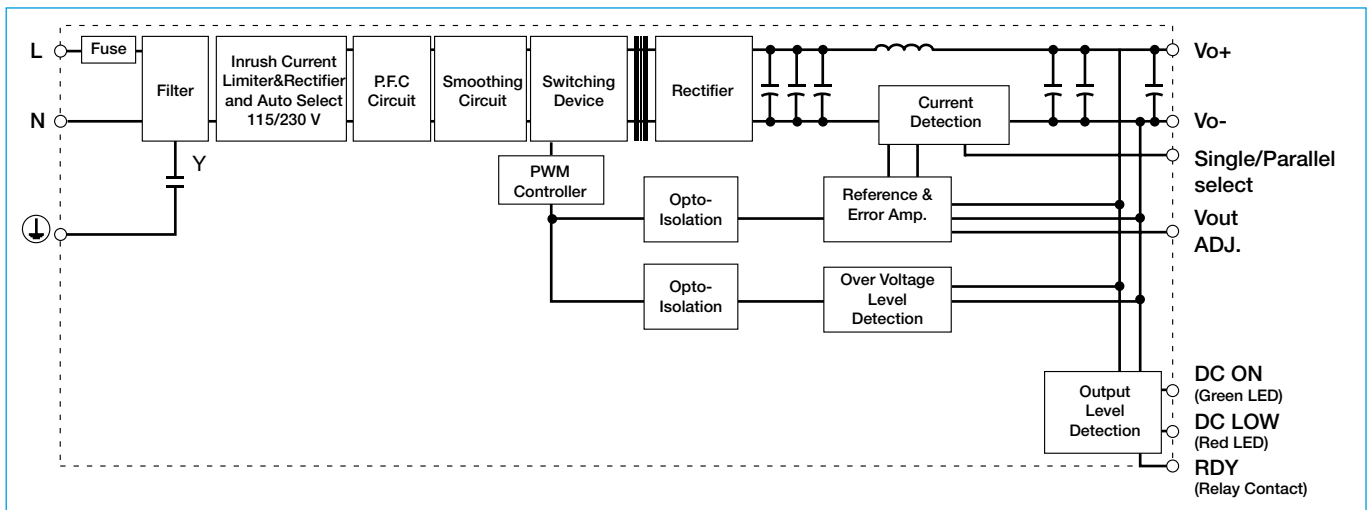
**Pin assignment - Display - Controls**



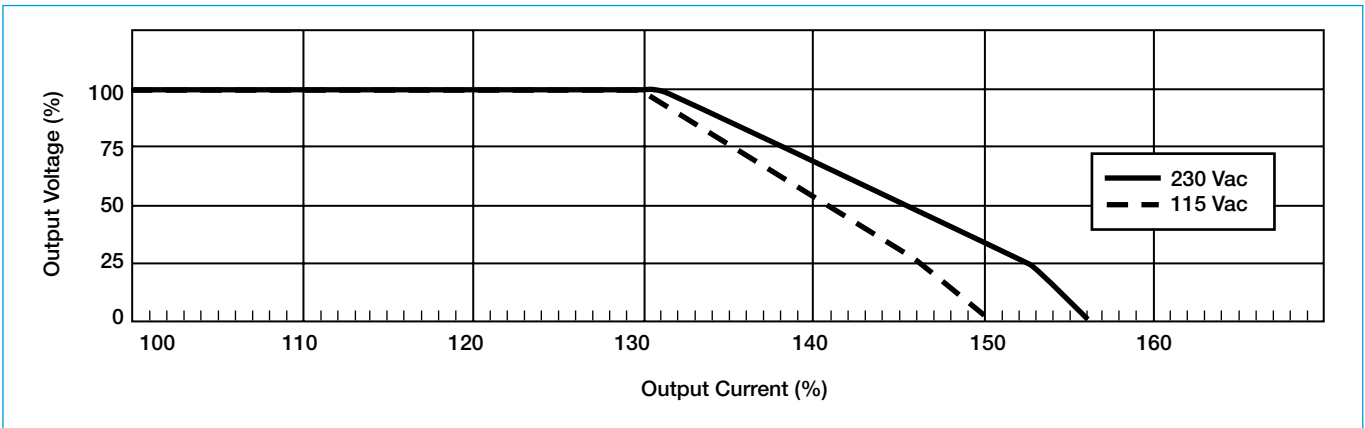
pin no.	name	Description
1	RDY	limit value DC ON, relay contact (make contact)
2		
3,4	V +	output voltage +
5,6	V -	output voltage -
7	PE	earth conductor
8	L	Input voltage, phase conductor (not polarised with DC input voltage)
9	N	Input voltage, neutral conductor (not polarised with DC input voltage)
	DC ON	visual status indication with LED
	DC LO	DC LOW output voltage LED indication
	Vout Adj	potentiometer for adjustment of output voltage $U_o$
	S/P	change-over switch single / parallel mode

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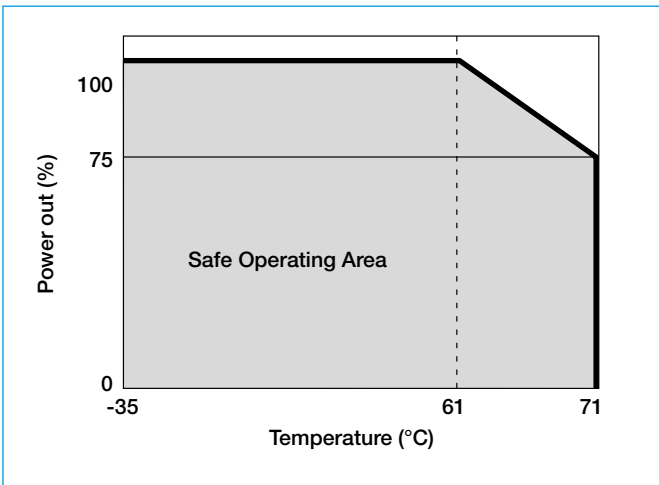
**Schematic diagram**



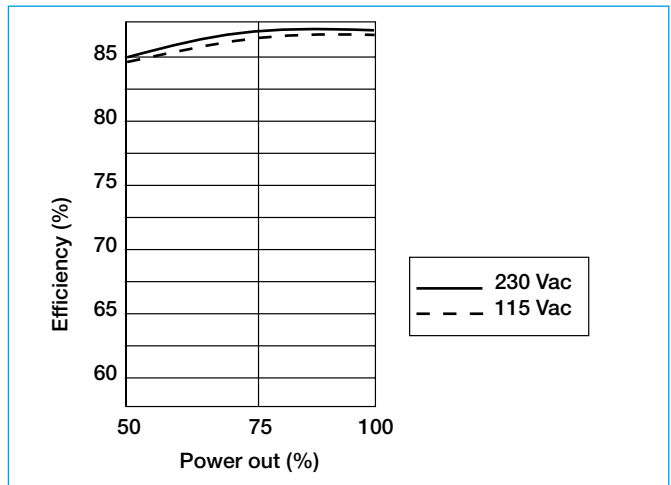
Typical output trip curve



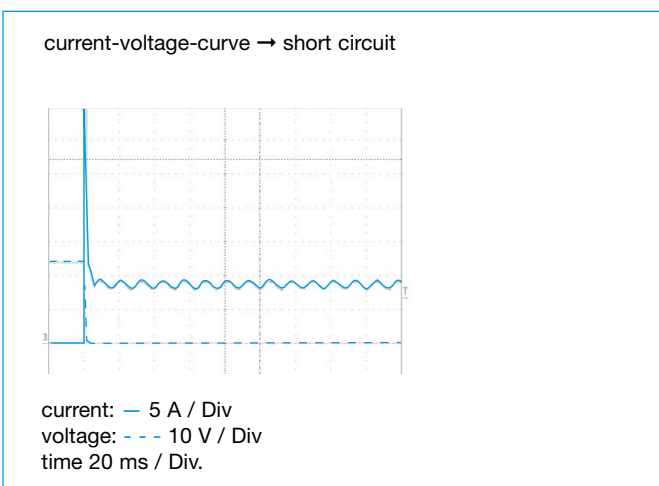
Derating curve



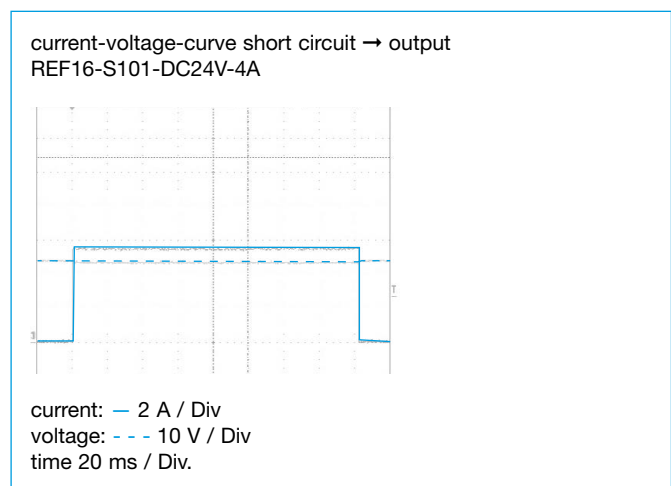
Typical efficiency curve



Current-voltage curve

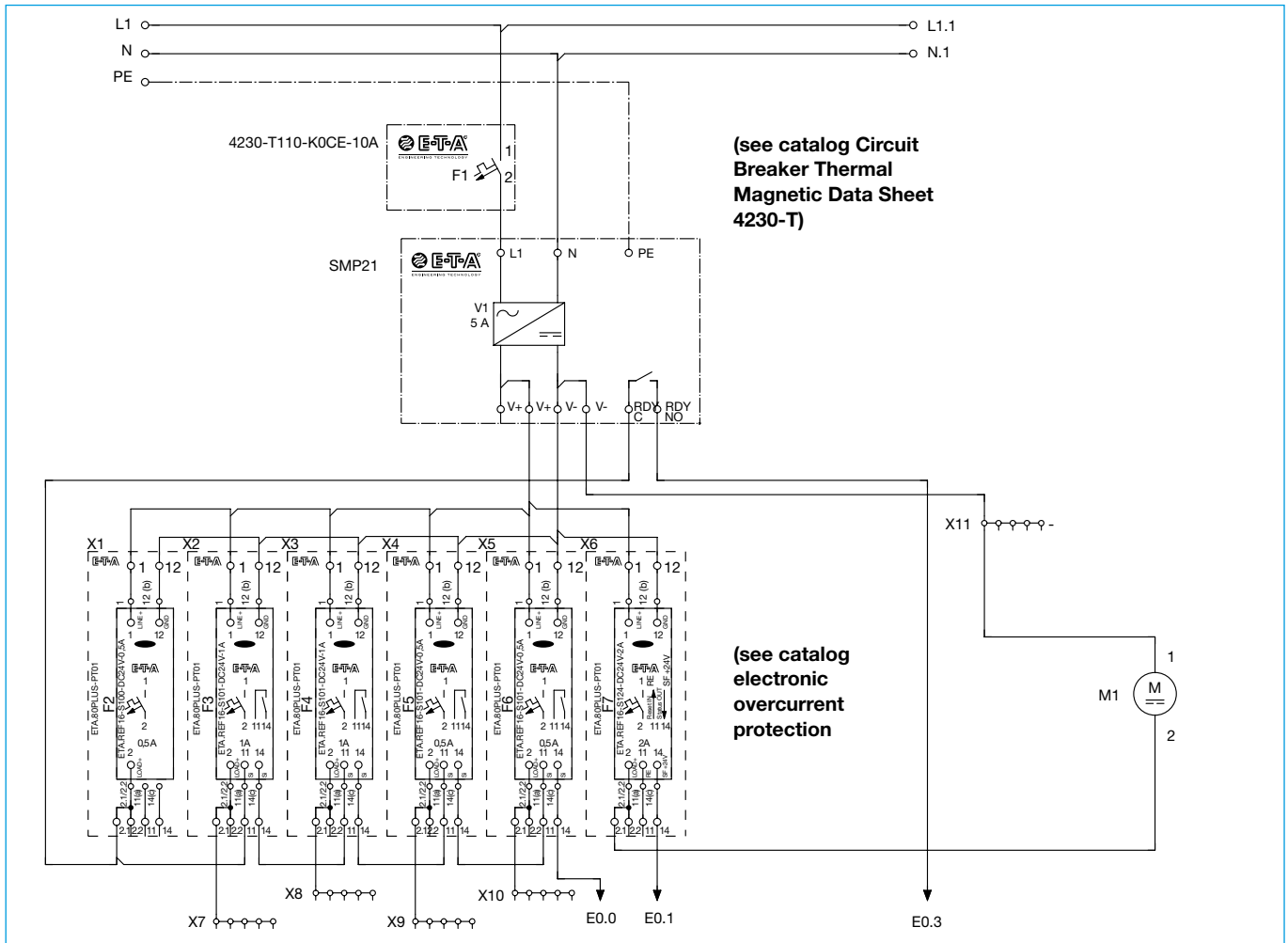


Current-voltage curve



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Application example with protection by 4230-T and REF16-S



Notes for installation

- The power distribution system must only be installed by qualified personnel.
- Only after expert installation must the device be supplied with power.
- The user has to ensure that the cable cross section complies with the applicable current rating.
- The national standards (e.g. for Germany DIN VDE 0100) have to be observed for installation and selection of feed and return cables.
- Recommended circuit breaker for the primary input cable protection: E-T-A type 4230 IN max. 20 A
- Recommended selective overcurrent protection for the secondary output protection: E-T-A types ESS., ESX., and REF...
- In addition special precautions must be taken in the system or machine (e.g. use of a safety PLC) which reliably prevent an automatic re-start of parts of the system (cf. Machinery Directive 2006/42/EU and EN 60204-1, Safety of Machinery). In the event of a failure (short circuit/overload) the load circuit will be disconnected by the circuit breaker/protector or the switched mode power supply.

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