

Features

Range of modular DC power supplies

- High efficiency (up to 91%)
- Low (< 0.4 W) stand-by power absorption
- Thermal protection: internal, with V_{out} shutdown
- Short circuit protection: hiccup (auto-recovery) mode
- Input protection: replaceable internal fuse plus spare (78.36)
- Overvoltage protection: varistor
- Flyback topology
- Compliant to EN 60950-1 and EN 61204-3
- Parallel working for automatic redundancy: with OR-IN diode
- Dual and series connection permissible
- Small dimensions: 17.5 mm (1 module) or 70 mm (4-modules) wide, 60 mm deep
- 35 mm rail (EN 60715) mount

Screw terminal



For outline drawing see page 8

78.12....2400



• 24 V DC, 12 W output

NEW 78.12....1200



• 12 V DC, 12 W output

78.36



• 24 V DC, 36 W output

- * (see diagrams L78)
 ** peak to peak, 100 Hz component, with 100 V AC input
 *** 88...100 V AC with output current limited to 80 % I_N
 **** (see derating diagrams P78)

Output specification

Output current (–20...+40°C, 230 V AC input) A	0.63	1.25	1.7
Rated current I _N (50°C, full input operating range) A	0.50	1	1.5
Rated voltage V	24	12	24
Rated power W	12	12	36
Output power (–20...+40°C, 230 V AC input) W	15	15	40
Peak current capability for 3 ms *	2	3	8
Output voltage adjust V	—	—	—
Voltage variation (from no-load to full-load)	< 1 %	< 1 %	< 1 %
Voltage ripple @ full load **	< 200	< 200	< 200
Hold-up time@full load: with 100 V AC input ms	< 10	< 10	< 20
with 260 V AC input ms	< 90	< 90	< 100

Input specification

Nominal voltage (U _N) V AC (50/60 Hz)	110...240	110...240	110...240
V DC (not polarized)	220	220	220
Operating range V AC (50/60 Hz)	100...265***	100...265***	100...265***
V DC	140...370	140...370	140...370
Max power absorption VA	28.2	32	57.5
(@ 100 V AC, 50 Hz) W	14.2	17.2	43
Stand-by power absorption W	< 0.4	< 0.4	< 0.4
Power factor	0.50	0.53	0.74
Max current absorption (@ 88 V AC) A	0.25	0.30	0.6
Max. inrush current (peak @ 265 V) for 3 ms A	10	10	12
Replaceable protection fuse	—	—	1 A - T

Technical data

Efficiency (@ 230 V AC) %	85	87	86
MTTF H	> 400.000	> 400.000	> 600.000
Start-up delay s	< 1	< 1	< 1
Dielectric strength between input/output V AC	2,500 (class II)	2,500 (class II)	3,000 (class II)
Dielectric strength between input/PE V AC	—	—	—
Ambient temperature range **** °C	–20...+60	–20...+60	–20...+70
Protection category	IP 20	IP 20	IP 20

Approvals (according to type)



Features

Range of modular DC power supplies

- High efficiency (up to 91%)
- Low (< 0.4 W) stand-by power absorption
- Thermal protection: internal, with V_{out} shutdown
- Short circuit protection: hiccup (auto-recovery) mode
- Overload protection: fold-back mode (78.50 only)
- Input protection: replaceable internal fuse plus spare
- Overvoltage protection: varistor
- Flyback topology
- ZVS (Zero-voltage-switching), quasi-resonant mode technology
- Compliant to EN 60950-1 and EN 61204-3
- Parallel working for automatic redundancy: with OR-IN diode
- Dual and series connection permissible
- Small dimensions: 70 mm (4-modules) wide, 60 mm deep
- 35 mm rail (EN 60715) mount

Screw terminal



For outline drawing see page 8

Output specification

Output current (-20...+40°C, 230 V AC input) A	2.8	4.6
Rated current I _N (50°C, full input operating range) A	2.5	4.2
Rated voltage V	24	12
Rated power W	60	50
Output power (-20...+40°C, 230 V AC input) W	68	55
Peak current capability for 3 ms *	10	12
Output voltage adjust V	24...28	12...15
Voltage variation (from no-load to full-load)	< 1 %	< 1 %
Voltage ripple @ full load ** mV	< 200	< 200
Hold-up time@full load: with 100 V AC input ms	< 20	< 30
with 260 V AC input ms	< 130	< 150

Input specification

Nominal voltage (U _N)	V AC (50/60 Hz)	110...240	110...240
	V DC (not polarized)	220	220
Operating range	V AC (50/60 Hz)	88...265	88...265
	V DC	140...370	140...370
Max power absorption	VA	90	89
(@ 100 V AC, 50 Hz)	W	67.5	58.3
Stand-by power absorption	W	< 0.4	< 0.4
Power factor		0.75	0.65
Max current absorption (@ 88 V AC)	A	0.9	0.85
Max. inrush current (peak @ 265 V) for 3 ms A		30	30
Replaceable protection fuse		1.6 A - T	1.6 A - T

Technical data

Efficiency (@ 230 V AC)	%	91	90
MTTF	H	> 500.000	> 400.000
Start-up delay	s	< 1	< 1
Dielectric strength between input/output	V AC	3,000 (class II)	3,000 (class II)
Dielectric strength between input/PE	V AC	1,500 (class II)	1,500 (class II)
Ambient temperature range ***	°C	-20...+70	-20...+70
Protection category		IP 20	IP 20

Approvals (according to type)



78.60



- 24 V DC, 60 W output
- Voltage regulation 24-28V
- ZVS technology

78.50



- 12 V DC, 50 W output
- Voltage regulation 12-15V
- ZVS technology
- Suitable for battery charging

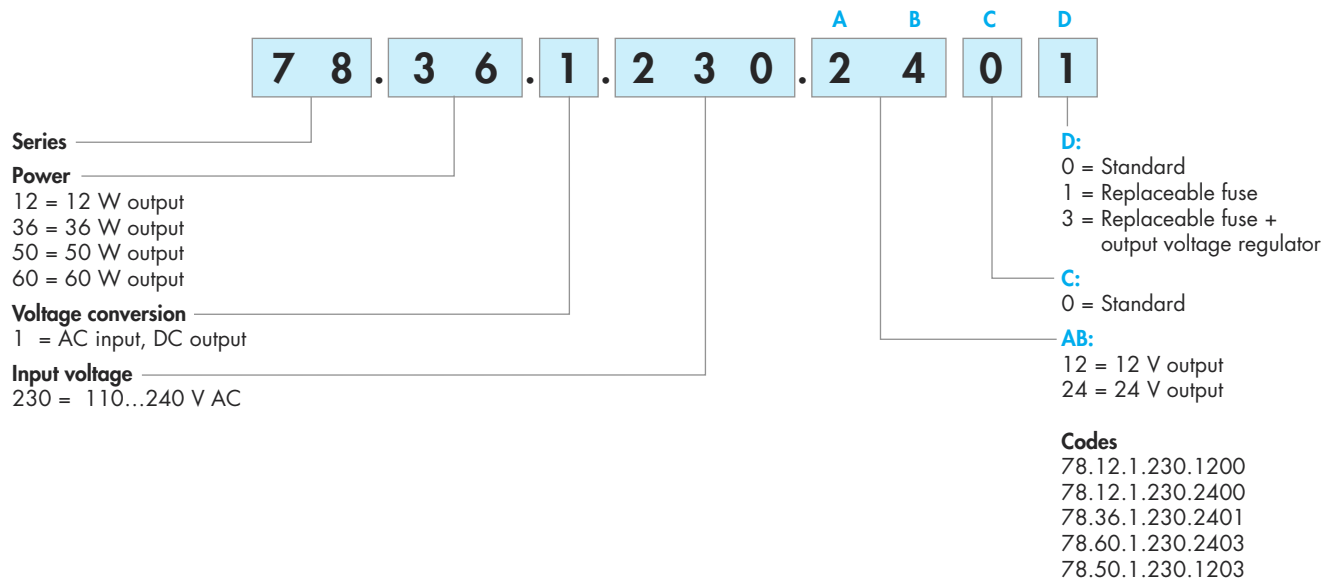
* (see diagrams L78)

** peak to peak, 100 Hz component, with 100 V AC input

*** (see derating diagrams P78)

Ordering information

Example: 78 series switching power supply, 36 W 24 V DC output, supply voltage 110...240 V AC, replaceable fuse.



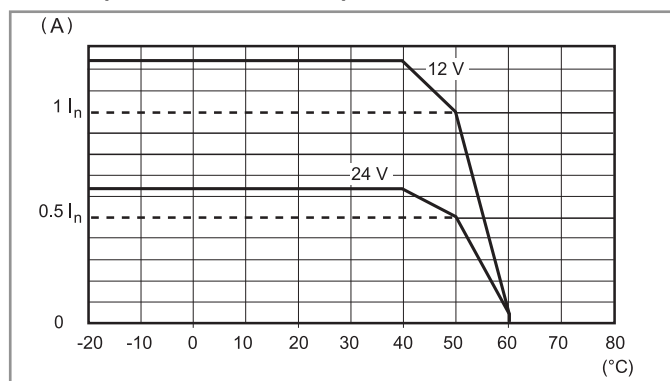
Technical data

EMC specifications (according to EN 61204-3)		Reference standard	78.12, 78.36	78.60, 78.50
Electrostatic discharge	contact discharge	EN 61000-4-2	4 kV	4 kV
	air discharge	EN 61000-4-2	8 kV	8 kV
Radiated electromagnetic field	80 ... 1,000 MHz	EN 61000-4-3	6 V/m	10 V/m
	1 ... 2.8 GHz	EN 61000-4-3	3 V/m	3 V/m
Fast transients (burst 5/50 ns, 5 and 100 kHz)	on supply terminals	EN 61000-4-4	2 kV	3 kV
Voltage pulses on supply terminals (surge 1.2/50 µs)	common mode	EN 61000-4-5	2 kV	2 kV
	differential mode	EN 61000-4-5	2 kV (78.12), 4 kV* (78.36)	4 kV *
Radio-frequency common mode voltage (0.15...230 MHz)	on supply terminals	EN 61000-4-6	6 V	10 V
Short interruptions		EN 61000-4-11	5 cycles	6 cycles
Radio-frequency conducted emissions	0.15...30 MHz	EN 55022	class B	class B
Radiated emissions	30...1,000 MHz	EN 55022	class B	class B
Terminals			solid cable	stranded cable
Max. wire size		mm ²	1 x 4 / 2 x 2.5	1 x 4 / 2 x 2.5
		AWG	1 x 12 / 2 x 14	1 x 12 / 2 x 14
 Screw torque		Nm	0.8	
Wire strip length		mm	9	
Other data				
Power lost to the environment	without output current	W	0.4	
	with rated output current	W	2 (78.12), 5 (78.36, 78.50), 5.4 (78.60)	

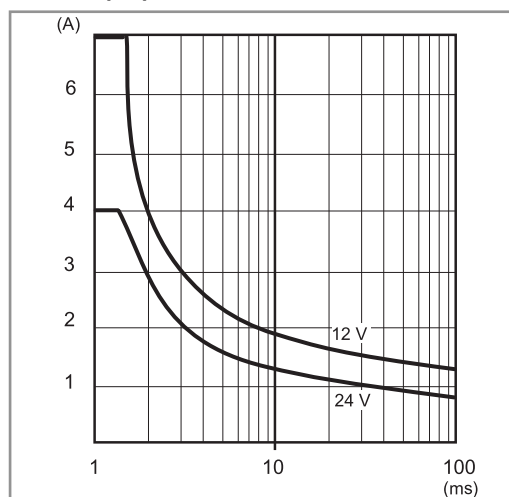
* input fuse may blow for surges higher than 1.5 kV

Output specification

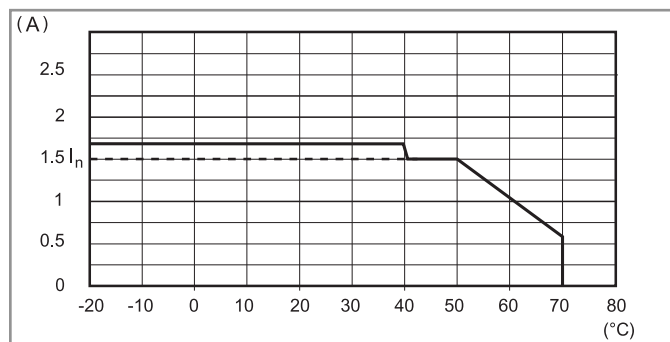
L78-1 Output current v ambient temperature (78.12)



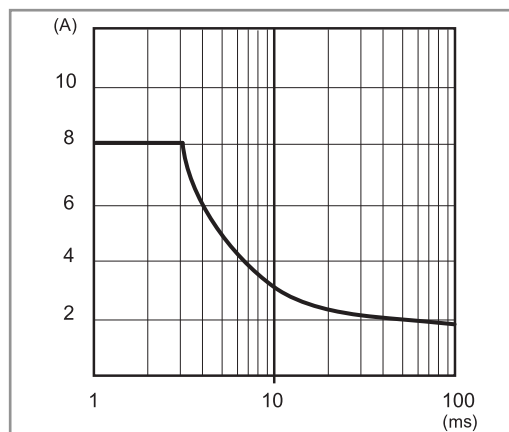
P78-1 Output peak current v time (78.12)



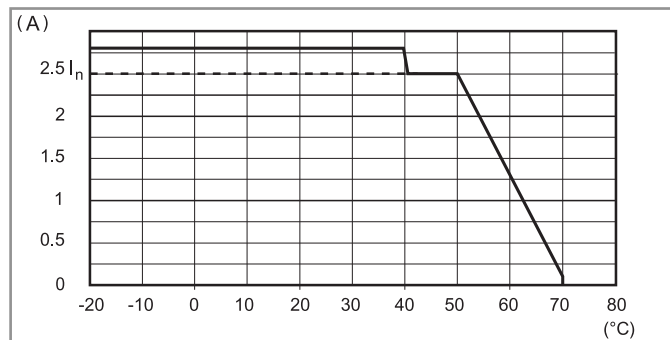
L78-2 Output current v ambient temperature (78.36)



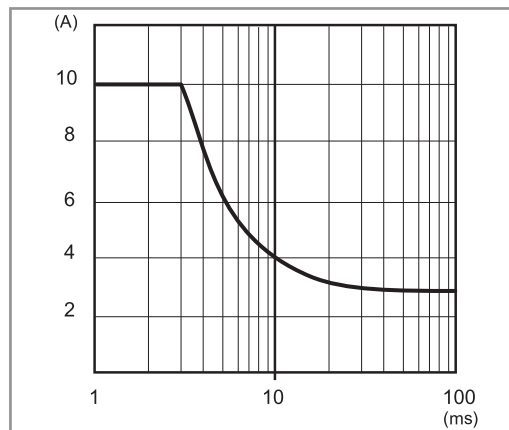
P78-2 Output peak current v time (78.36)



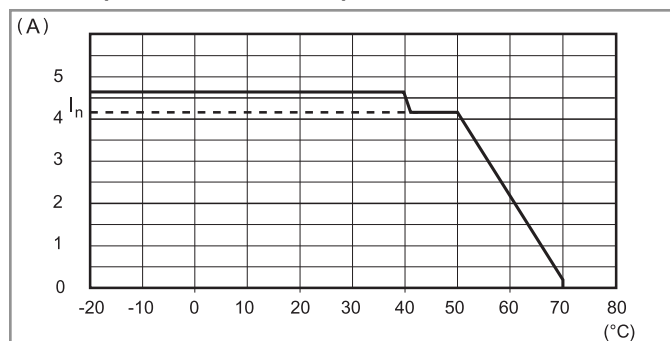
L78-3 Output current v ambient temperature (78.60)



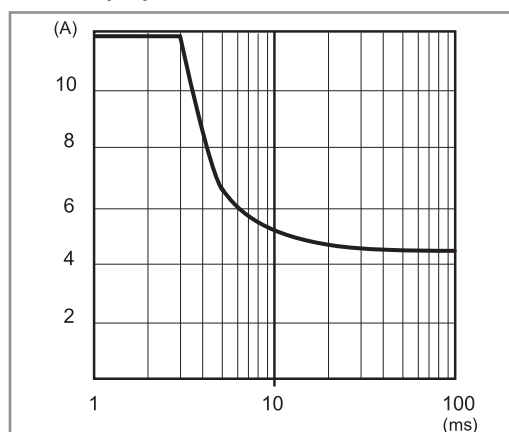
P78-3 Output peak current v time (78.60)



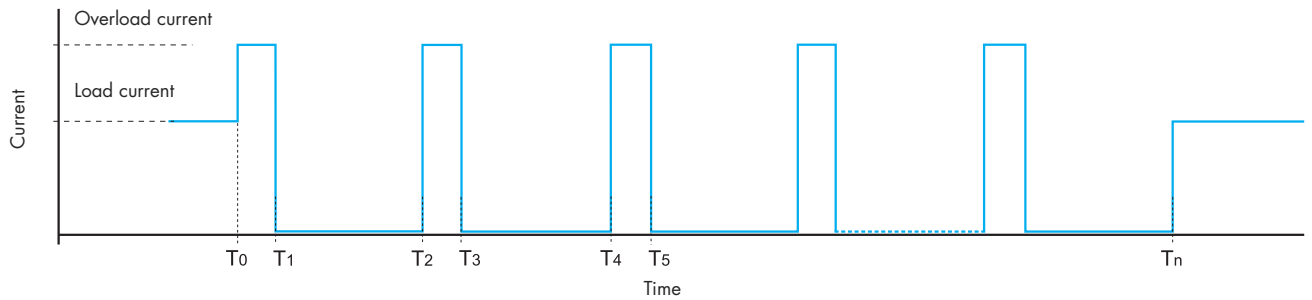
L78-4 Output current v ambient temperature (78.50)



P78-4 Output peak current v time (78.50)

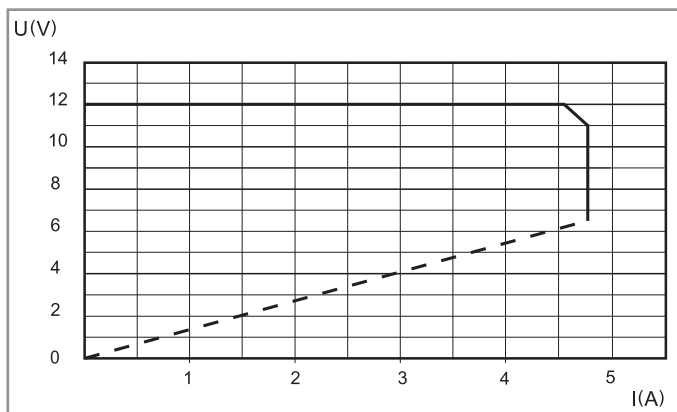


Hiccup mode



Under normal conditions, the 78 Series Power Supply supplies the current required by the load. However, under abnormal conditions such as a short circuit or heavy overload (T_0) the output voltage will be rapidly reduced to zero - followed by the current (T_1). After approximately 2 seconds (T_1 to T_2), the power supply checks for the persistence of the anomaly over the time period T_2 to T_3 (30 to 100ms - dependent on the type of anomaly). If the anomaly persists, as shown above, the current is again reset to 0 A for a further 2 s (T_3 to T_4). This "hiccup" process is repeated until the anomaly is removed (T_n), whereon the power supply then returns to normal working.

Fold-back mode (78.50 only)



Under normal conditions, the 78.50 supplies the current required by the load.

In case of **heavy overload** (up to 110 W / 9.2 A), the fold-back circuit will limit the output current linearly as output voltage decreases, in accordance to the diagram above.

In practice, when overcurrent is drawn by the load, the fold-back circuit reduces both the output voltage and current to well below the normal operating limits.

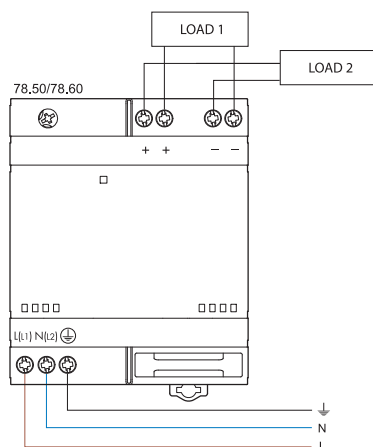
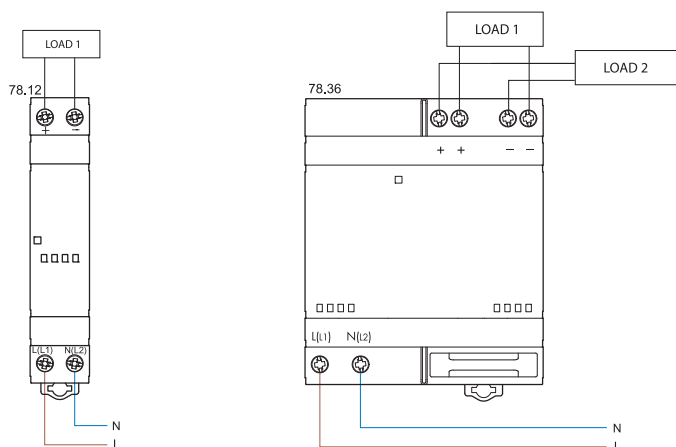
In case of **short circuit**, the power supply will work in hiccup mode.

Both these conditions end when the anomaly is removed, whereon the power supply then returns to normal working.

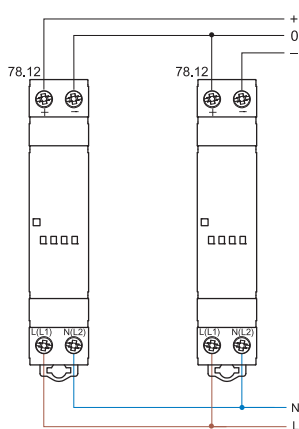
The fold-back mode allows to use the 78.50 power supply as a **battery charger**, particularly for charging lead batteries rated 15...20 Ah.

It is suggested to insert a diode in series between the + output and the + input of the battery (if not already installed in the battery unit).

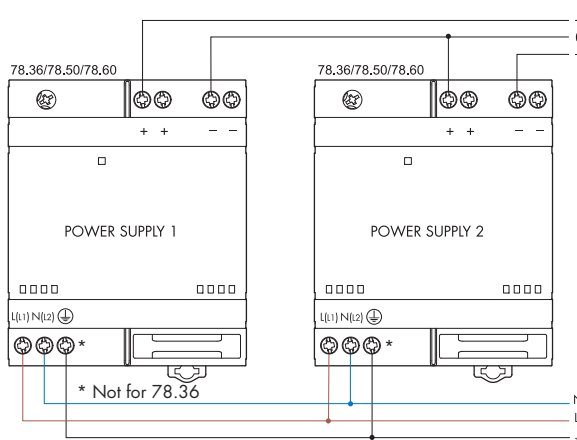
Wiring diagrams



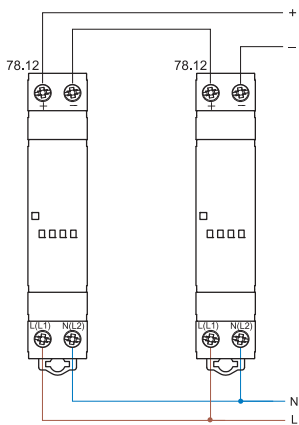
Dual connection



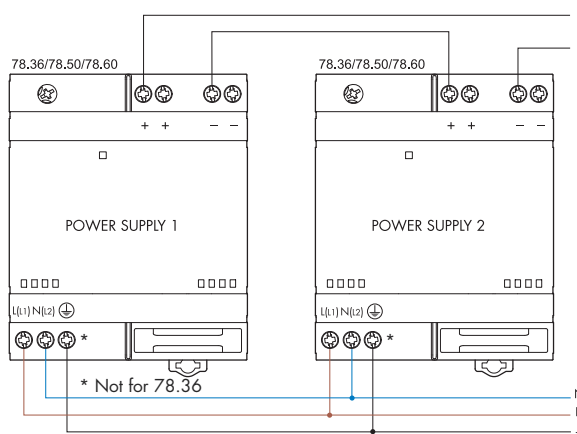
Dual connection



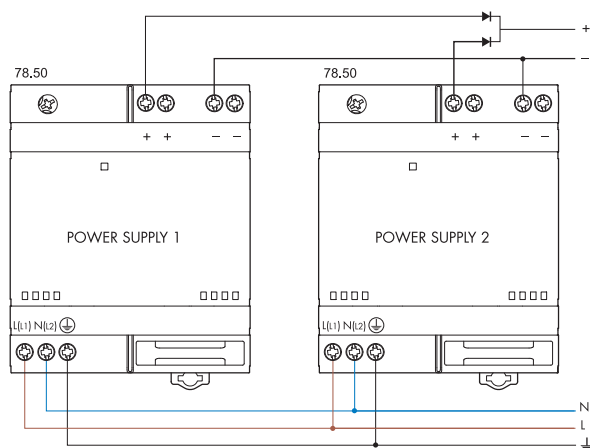
Series connection



Series connection

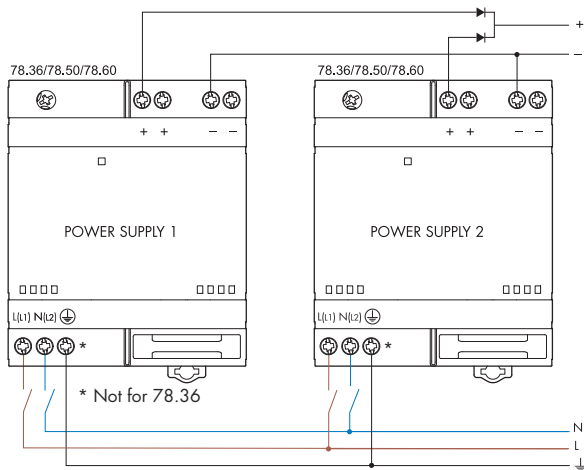


Parallel connection (78.50 only)

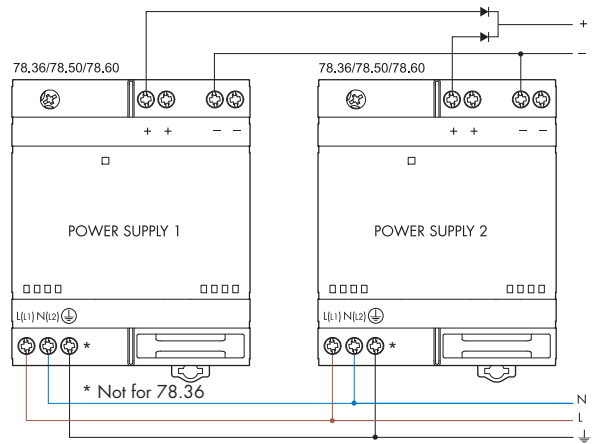


Application example: redundancy connection

Manual

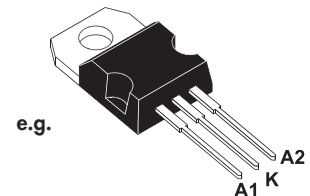
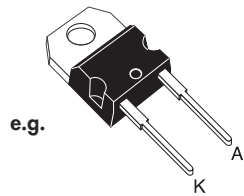
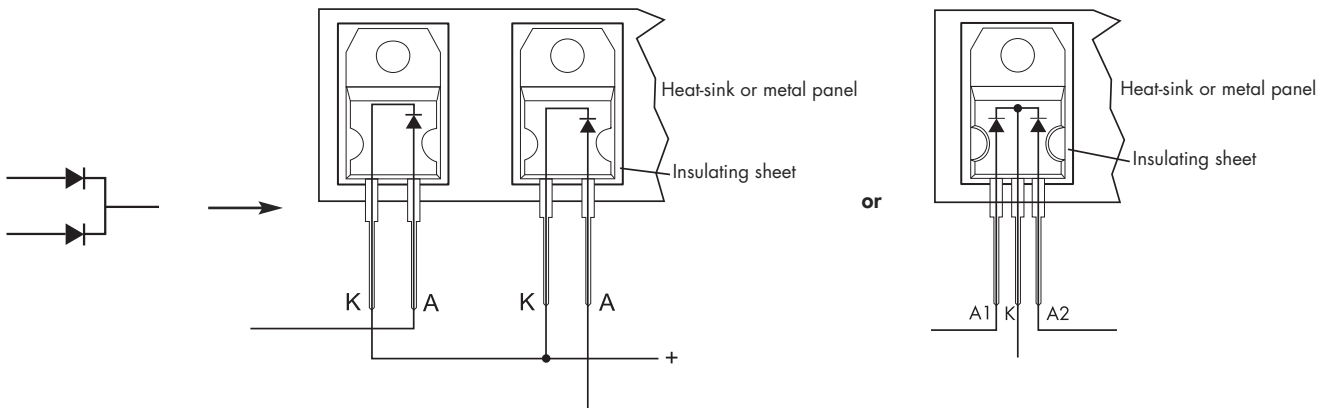


Automatic (with parallel connection)



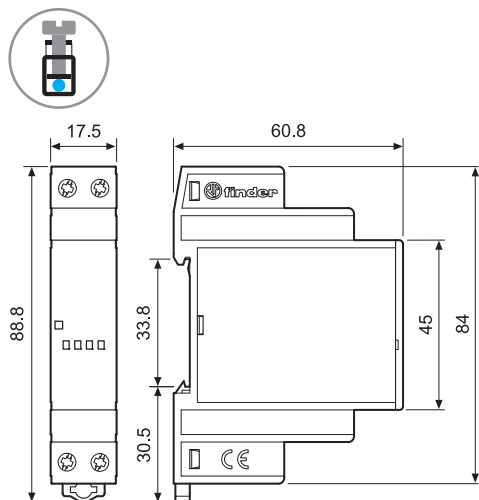
Note: Since parallel working is intended to provide automatic redundancy, rate the load current at no more than I_n .

Diode(s)

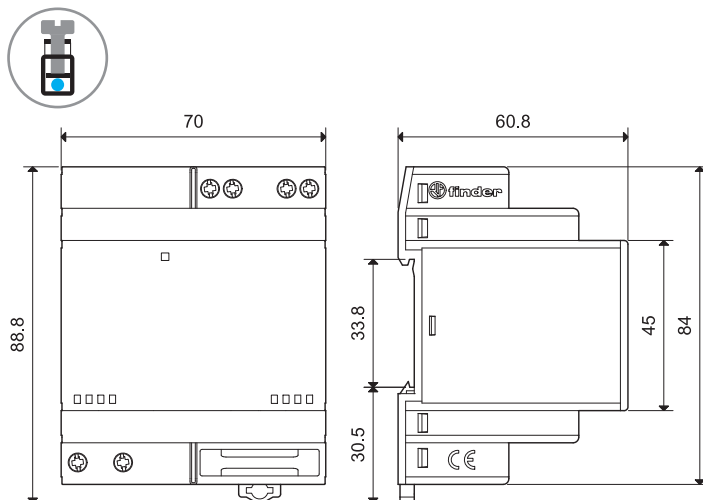


Outline drawings

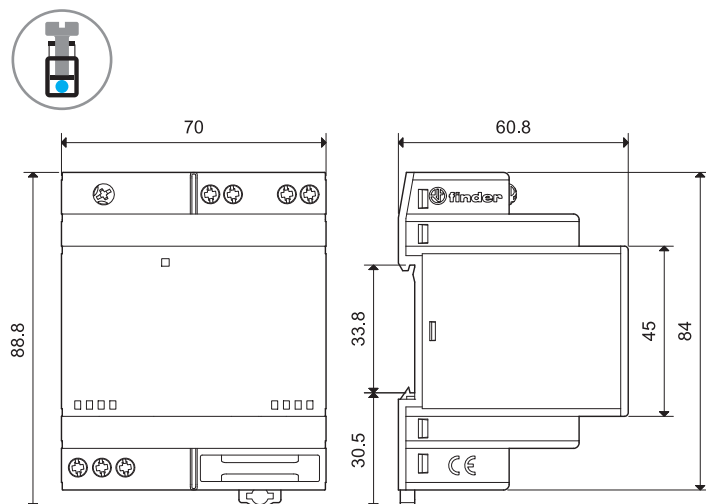
78.12
Screw terminal



78.36
Screw terminal



78.50 / 78.60
Screw terminal



Accessories



060.72

Sheet of marker tags, plastic, 72 tags, 6x12 mm

060.72



019.01

Identification tag, plastic, 1 tag, 17x25.5 mm

019.01