

INDUSTRIAL POWER SUPPLIES

SFL-SERIES

- ◆ SFL 6-12-100
- ◆ SFL 3-24-100
- ◆ SFL 1.5-48-100
- ◆ SFL 6-24-100
- ◆ SFL 3-48-100
- ◆ SFL 12-24-100
- ◆ SFL 6-48-100
- ◆ SFL 24-24-100
- ◆ SFL 12-48-100

Operating Instructions

1. Application

The SFL-series are compact, rugged switching power supplies designed for applications in process automation and other industrial control equipment demanding high reliability and tight output voltage regulation under severe factory-floor conditions.

1.1 Main Features:

- Output Power: 75 / 150 / 300 / 600 W
- Output voltage: 24 / 48 VDC (SFL 75 Watt Models also with 12VDC)
- Output voltage adjustable
- Tight output voltage regulation
- Low ripple and noise
- Short circuit protection
- Input 115/230VAC selectable: 93-132VAC / 187-264VAC ½ 130-185VDC / 264-373VDC
- Safety according to EN60950, safety class 1
- UL/cUL 1950 (File No.: E181381) and UL/cUL 508 (File No.: E181381) approval
- EMC complies with EN 50081-2 and EN 50082-2
- Conducted EMI complies with EN55011 class B, EN 55022 class B and FCC class B
- CE-mark (LVD and EMC-Directive)
- Environment test according to IEC 68-2-6 and IEC 68-2-27
- Protection IP20
- Plug-in connectors
- LED as output voltage indicator
- Simple clip mounting on DIN-rail, Panel Mounting with optional mounting-kit

2. Standards and Instruction

2.1 Safety and Warnings

The power supply is constructed in accordance with the safety requirements of UL 1950, UL 508 and EN 60950 and carries the European CE-mark. It is UL / cUL-approved.

Installation requirements for the power supply must be in accordance with UL or the appropriate national standards.

High voltages are present on the power supply under normal operating conditions. However, these are inaccessible. Only qualified personnel should work on the power supply. To ensure normal operation, appropriate installation, transport and storage conditions should be observed.

2.2 Instructions:

- Check instruction manual
- Heatsink temperatures of 100°C can be reached
- Risk of electric shock and electrical energy discharge. The power supply must not be opened until at least 5 minutes after complete disconnection of the mains.



3. Connection- and Operating Instructions

3.1 Mounting:

The mounting position has to fulfil the requirements for a fireproof case according to UL 1950, EN 60950 (IEC950) or other appropriate national standards. A sufficiently strong DIN-rail TS35 has to be provided. A mounting kit for Panel Mounting is available - see Figure 2.

The correct mounting position for optimal cooling performance must be observed (output connector on top). Above and below the power supply, a minimum free space of 80mm is required and on each side of the power supply, a minimum space of 50mm is required which allows air convection. The air temperature, measured 10mm below the power supply, must not exceed the specified values in the datasheet. Observe power derating above 50°C! (see Figure 4)



Attention: In case of non-observance or exceeding the mentioned limiting value of the data sheet, the function and electrical safety can be impaired and can destroy the power supply.



3.1.1 SFL 75 Watt, SFL 150 Watt and SFL 300 Watt Models

Mounting: Holding the power supply close to the fixing position, place the upper part of the DIN rail clip over the upper edge of the DIN rail. Push the lower part of the power supply inwards until the power supply is properly seated. See Figure 1a and 1b

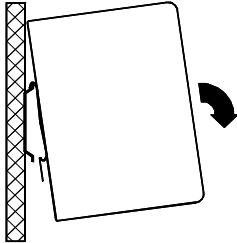


Figure 1a

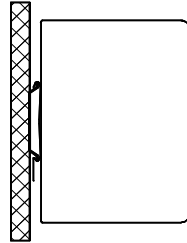


Figure 1b

Removing: Grip both sides of the power supply near the bottom and pull outwards and upwards. The power supply will disengage from the DIN rail. See Figure 1c

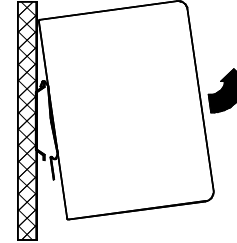


Figure 1c

3.1.2 SFL 600 Watt Models

Mounting: Holding the power supply close to the fixing position, place the upper part of the DIN rail clip over the upper edge of the DIN rail. Push the power supply first downwards (Step 1) and then inwards (Step 2) until the power supply is properly seated. See Figure 1d and 1e

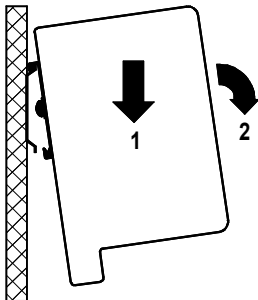


Figure 1d

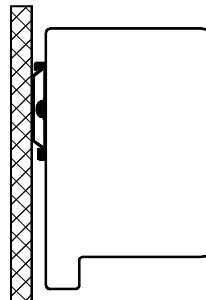


Figure 1e

Removing: Grip both sides of the power supply near the bottom. Push the power supply first downwards (Step 3) then outwards (Step 4) and upwards. The power supply will disengage from the DIN rail. See Figure 1f

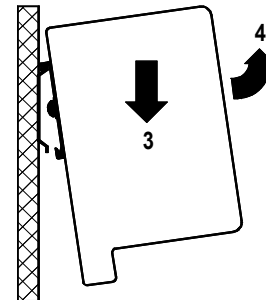


Figure 1f

3.2 Panel Mounting Brackets

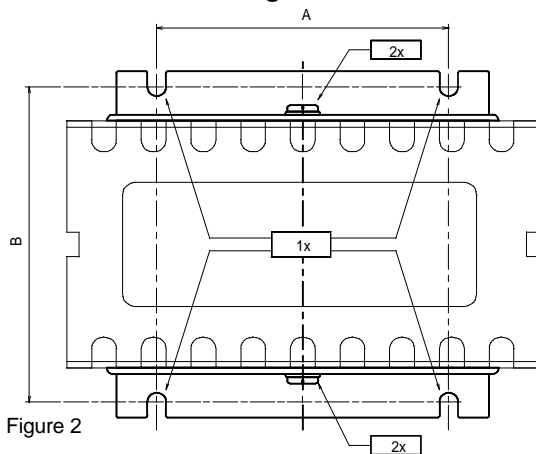


Figure 2

Part number	A [mm]	B [mm]	1x	Optional Panel Mounting Kit
SFL 6-12-100		134.6	2 x M4	SFL 75-PMBRK
SFL 3-24-100		134.6	2 x M4	SFL 75-PMBRK
SFL 1.5-48-100		134.6	2 x M4	SFL 75-PMBRK
SFL 6-24-100	105.0	134.6	4 x M4	SFL 150-PMBRK
SFL 3-48-100	105.0	134.6	4 x M4	SFL 150-PMBRK
SFL 12-24-100	105.0	134.6	4 x M4	SFL 300-PMBRK
SFL 6-48-100	105.0	134.6	4 x M4	SFL 300-PMBRK
SFL 24-24-100	115.0	197.2	4 x M4	SFL 600-PMBRK
SFL 12-48-100	115.0	197.2	4 x M4	SFL 600-PMBRK

2x: Remove both screws from the case, one screw on each side of the power supply, two screws on each side of SFL 600 Watt models. Place one mounting angle on each side of the case and fix these with the original screws.

3.3 Installation

Only qualified personnel can carry out the installation. The connection (L, N, FG) of the supply voltage has to be carried out according to appropriate national standards. A circuit breaker within easy access is needed to disconnect the power supply. (Circuit breaker see chapter 7.3)

Before installation, ensure this circuit breaker is in the **OFF** position, and the input voltage selector is switched to the appropriate position.



In case of non-observance touching at any alive components or improper dealing with these power supplies can cause death or severe injuries.

DANGER: Never work on the power supply if power is applied!



3.4 Connections / Connectors

Connectors: The power supply is connected by means of plug-in connectors with screw terminals or screw terminals (SFL 600 Watt Models). The AC-Input wires are connected to the screw terminals L, N and $\underline{\underline{0}}$; the DC-Output wires are connected to the screw terminals +V_{out} and -V_{out} - see Figures 5a to 5d

Connection Cables:

- Input:** 3 x AWG13 max [2.5mm² max], solid or stranded.
- Output:** 2 x AWG13 max [2.5mm² max], solid or stranded. (SFL 75 Watt Models and SFL 150 Watt Models)
 4 x AWG13 max [2.5mm² max], solid or stranded. (SFL 300 Watt Models)
 4 x AWG10 max [6.0mm² max], solid or stranded. (SFL 600 Watt Models)
- On SFL 300 Watt and SFL 600 Watt models all output terminals should be used.
 Strip back the insulation on each wire by approximately 8mm.

4. Internal Fuse

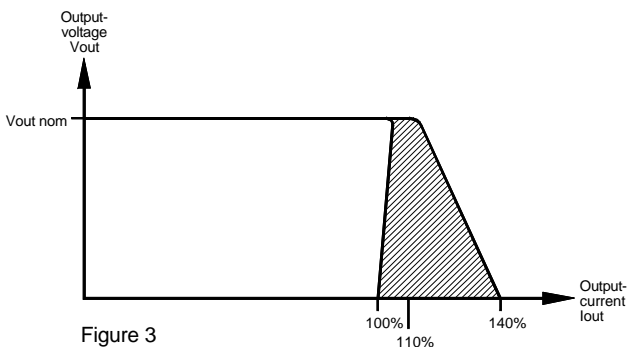
The power supply contains a melting fuse on the primary side. If the fuse breaks, there are faulty components. In this case, the power supply has to be checked or repaired by the supplier.

5. Output Voltage Adjustment

The nominal output voltage can be adjusted with an accessible trim-potentiometer (see Figures 5a to 5d). The adjustment range of output voltage is indicated on chapter 8.2.2.

6. Short Circuit- and Overload Characteristic

A constant current limitation protects the output against overload and short circuit. The output voltage characteristic is shown in the following diagram - see Figure 3.



Order Number	Current Limitation	Short circuit
SFL 75 Watt Models	at typ. 110 %	at typ. 130 %
SFL 150 Watt Models	at typ. 110 %	at typ. 140 %
SFL 300 Watt Models	at typ. 110 %	at typ. 140 %
SFL 600 Watt Models	at typ. 110 %	at typ. 140 %

The current limitation can shift within the hatched area depending on the input voltage.

7. Inrush Current and Main Circuit Breaker (Input Fusing)

7.1 Inrush Current

The inrush current is a high approximately 20ms peak current flowing into a power supply when instant input power is applied. The peak may be much higher than the steady state input current due to the charging of the input capacitors.

7.2 Input Fusing

If an external fuse is essential the user should consider the following:

1. The fuse should have an I²t rating capable of withstanding the turn on inrush current but it should also be fast enough to blow before the components it is intended to protect.

$$I_{in \max} = \frac{P_{out}}{h \cdot V_{in \min}} \quad \text{if input of power supply is supplied with DC}$$

$$I_{in \max} = \frac{P_{out}}{h \cdot V_{in \min} \cdot \cos j} \quad \text{if input of power supply is supplied with AC}$$

2. It should be rated to carry more than the maximum input current. The maximum input current can be calculated as follows:
3. Fuse mounting and termination should be carefully considered to reduce the temperature rise due to contact resistance and thermally insulating fuse holders (any additional heating of the fuse will reduce it's effective current rating).

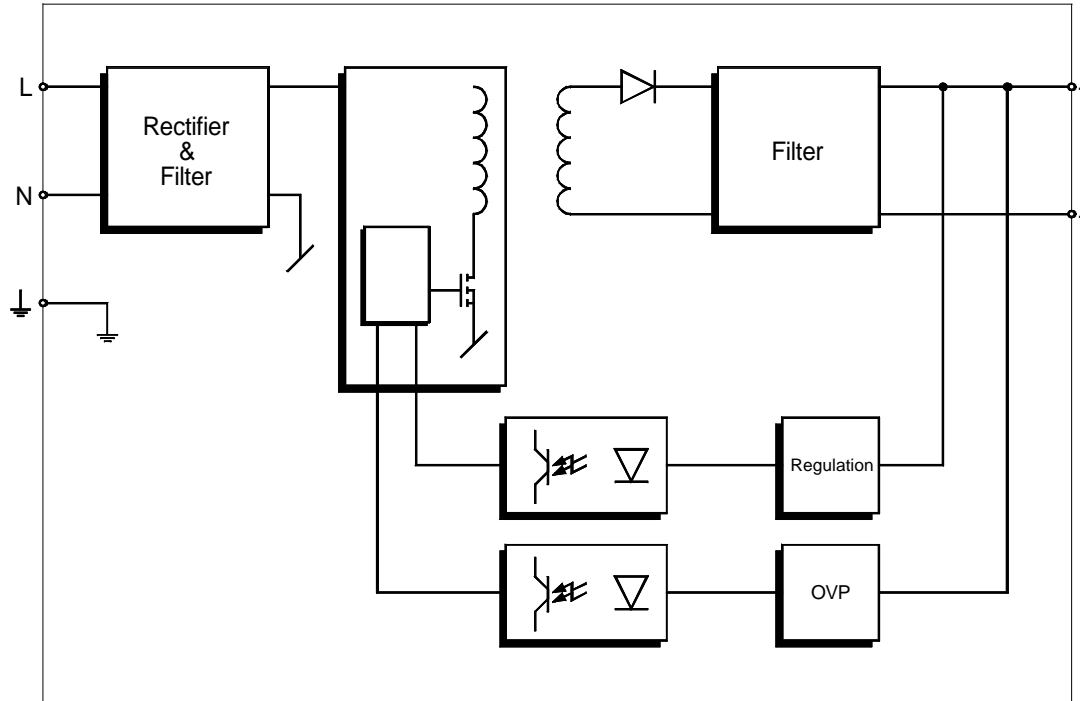
7.3 Main Circuit Breaker (MCB)

Recommended main circuit breaker, characteristic C

SFL 75 Watt Models ⇒ 5A	SFL 150 Watt Models ⇒ 10A
SFL 300 Watt Models ⇒ 15A	SFL 600 Watt Models ⇒ 20A

8. Technical Specifications

8.1 Block Diagram



8.2 Specifications

8.2.1 Input Specifications

Order No. Model	Input Voltage	Output Power max.	Output voltage adjustable	Output Current max.	Inrush current max. ¹	
					115 VAC	230 VAC
SFL 6-12-100	115/230 VAC selectable	75 Watt	12 VDC	6.0 A	16.5 A	33.0 A
SFL 3-24-100		75 Watt	24 VDC	3.0 A		
SFL 1.5-48-100		75 Watt	48 VDC	1.5 A		
SFL 6-24-100	93-132 VAC / 187-264 VAC (47-63 Hz)	150 Watt	24 VDC	6.0 A	35.0 A	70.0 A
SFL 3-48-100		150 Watt	48 VDC	3.0 A		
SFL 12-24-100		300 Watt	24 VDC	12.0 A	35.0 A	70.0 A
SFL 6-48-100		300 Watt	48 VDC	6.0 A		
SFL 24-24-100		600 Watt	24 VDC	24.0 A		
SFL 12-48-100		600 Watt	48 VDC	12.0 A	70.0 A	80.0 A

¹ see chapter 7.1

8.2.2 Output Specifications

Output voltage adjustment range, with potentiometer	12 V Models 24 V Models 48 V Models	12 - 14 VDC 24 - 28 VDC 48 - 52 VDC
Ripple and noise (20MHz bandwidth)		<50mVpp
Electronic short circuit protection, current limitation	see Figure 3	110 % typ. (constant current)
Parallel operation	for 75 W, 150W Models for 300W, 600W Models	up to 5 power supplies possible Option RED required
Overvoltage protection		140% typ. $V_{out\ nom.}$
Hold-up time		min. 30 ms at full load

8.2.3 General Specifications

Operating temperature range	-25°C - +70°C	
Storage temperature range	-25°C - +85°C	
Derating above 50°C	2% / °C	
Humidity (non condensing)	95% rel H max.	
Efficiency	>85%	
Safety class (IEC 536)	Class 1	
Safety standards meets	IEC 950, EN 60950, UL / cUL 1950 (File No. E181381) UL / cUL 508 (File No.: E181381)	
Conducted EMI according to Conducted electromagnetic emission on the Input	EN 55022 Class B EN 55011 Class B	
Radiated EMI according to Radiated electromagnetic emission	EN 55022 Class A	
Electromagnetic susceptibility EMC Electromagnetic Immunity	IEC / EN 61000-4-2	4kV / 8kV
	IEC / EN 61000-4-3	10V / m
	IEC / EN 61000-4-4	2kV
	IEC / EN 61000-4-5	2kV / 4kV
	IEC / EN 61000-4-6	10V
	IEC / EN 61000-4-8	30A / m
Environment	Vibration	IEC 68-2-6 1g _n , 20 sweeps, each axes
	Shock	IEC 68-2-27 15g _n , 11ms, each axes
	Protection Class	IP 20

8.3 Derating Curve

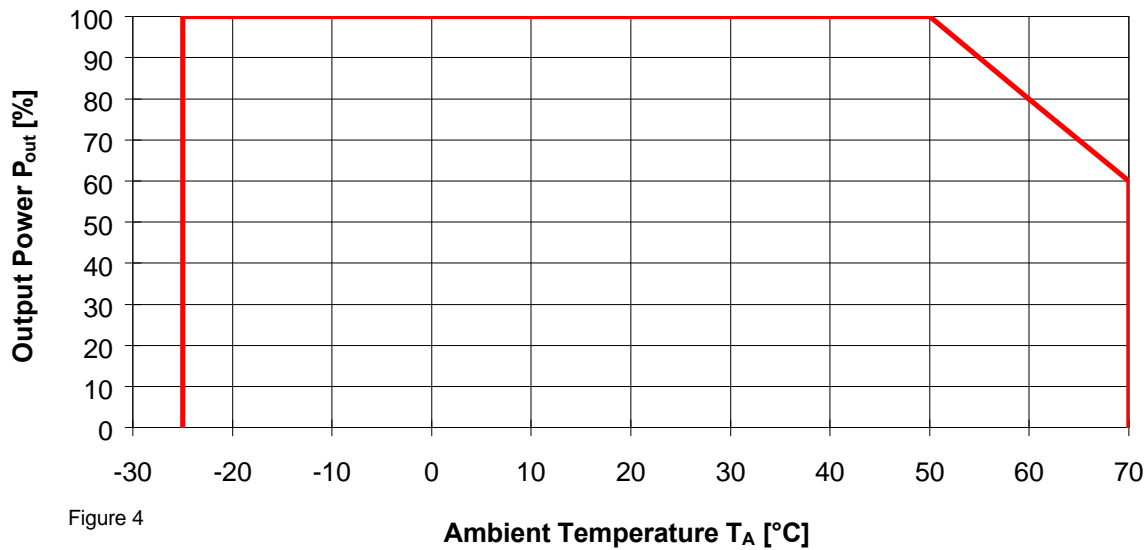


Figure 4

9. Options as covered in separate Applications Information

10. Figures

SFL 75 Watt Models

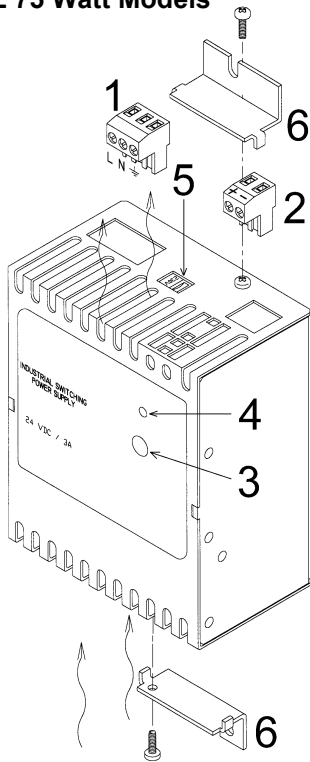


Figure 5a

Pin-Out	
No.	Description
1	Input Connector
2	Output Connector
3	Output Control LED
4	Output Voltage Adjustment
5	Input Voltage Selection Switch
6	Panel Mounting Kit

Mechanical Dimensions			
Order Number	Length inch [mm]	Height inch [mm]	Depth inch [mm]
SFL 75 Watt Models	3.543 [90.0]	4.512 [114.6]	2.232 [56.7]
SFL 150 Watt Models	6.181 [157.0]	4.512 [114.6]	2.232 [56.7]
SFL 300 Watt Models	8.150 [207.0]	4.512 [114.6]	3.268 [83.0]
SFL 600 Watt Models	9.567 [243.0]	6.976 [177.2]	3.260 [82.8]

SFL 150 Watt Models

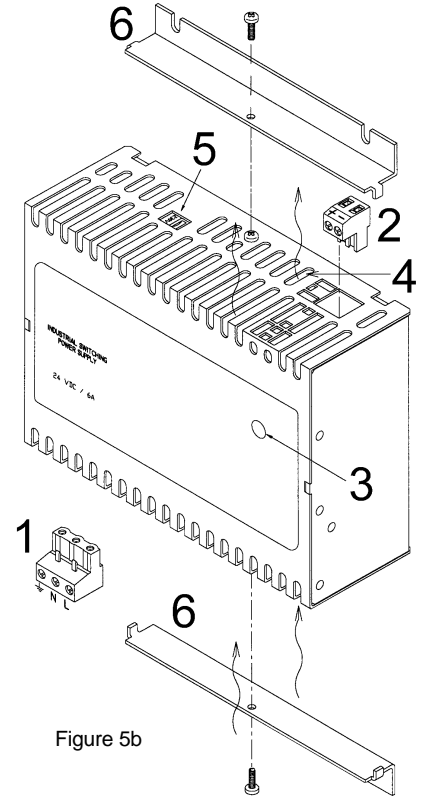


Figure 5b

SFL 300 Watt Models

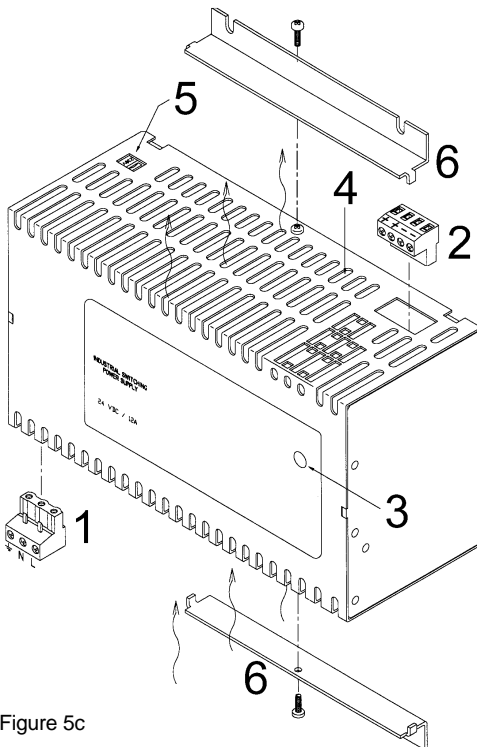


Figure 5c

SFL 600 Watt Models

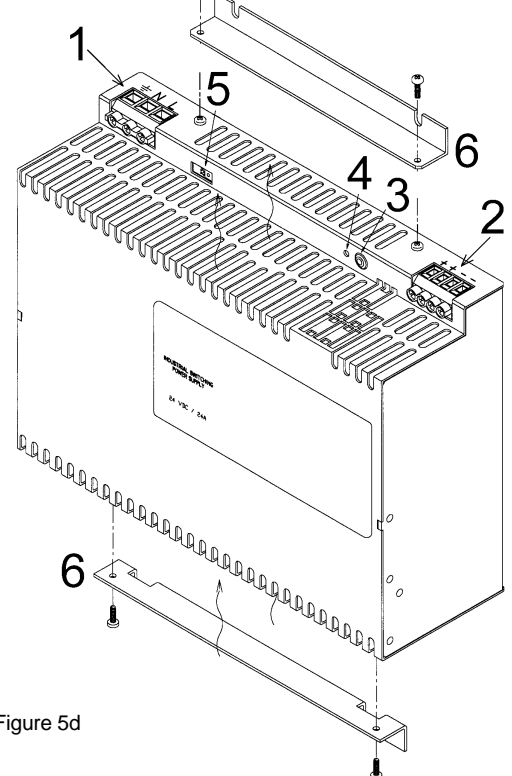


Figure 5d