

MANUAL

Function Line | PROTECTION TECHNOLOGY
MADE SIMPLE

BL18 | POWER SUPPLY AND BATTERY CHARGING UNIT



POWER SUPPLY AND BATTERY CHARGING UNIT

Original document

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1. Application

The *BL18* is a versatile direct voltage supply unit that can be applied both, as battery charger and as stabilized power pack supply unit.

If applied as battery charger, the *BL18* serves to either charge or to maintain closed or gas-proof 24 V lead-acid batteries in full charge condition by providing the facility to simultaneously supply consumers with DC current (parallel operation). When the *BL18* is operated in parallel with a battery or with another consumer and the battery has to be disconnected, e.g. for maintenance or exchange, the supply of this consumer will be backed-up to the battery charger's nominal capacity.

Thanks to the unit's short-circuit capacity, it must not be switched off in case of short-circuit type occurrences, such as e.g. start of an Diesel engine or similar situations.

As stabilized power pack supply unit, the *BL18* supplies connected consumers with a stabilized DC voltage that can be adjusted within a range of 24V to 27.5 V and/or 12 V to 24 V.

Attention!

The internal over voltage protection of the BL18 is up to the standards as per EN6100-4-5 whereas particular over voltage situations (e.g. lightning effects, switching actions, converter reactions etc) that might occur in switchgear assemblies, may lead to an overload and even destruction of the unit's internal protection.

For the energy coordination of an external over voltage limitation, it is therefore essential that the device-internal over voltage protection function of the BL18-400 will be available from a line-to-line voltage of $\geq 624 \text{ Vac}_{\text{rms}}$ and up! For the voltage limitation, star connected metal-oxide varistors (MOV) of the type S14K320 are applied.

In case that the coordination with external over voltage protection can not be realized or ensured, we would recommend to connect impedances in series with the mains supply inputs of the *BL18-400* in order to assure the energy limitation of the device's internal over voltage protection.

2. Characteristics and Features

- Input voltage 3x380-500VAC $\pm 10\%$
- Safety according to VDE 0805/EN 60950
- Surge voltage stability according to EN 6100-4-5
- High stability of output voltage
- Low residual ripple
- High efficiency
- Screw type and plug-in connectors
- Suppression of radio interferences acc. to VDE 0875/T11/EN 55011, class B
- Interference immunity according to EN 50082-2
- Short-circuit and no-load proof
- Compact housing
- Low weight (1.9 kg)
- Snap-on fastening on DIN rail
- Indication of working condition (via LED)

3. Functions and Adjustments

Apart from the lower plug-and-socket connector, the *BL18* is equipped with a trimming potentiometer for the adjustment of the output voltage (see fig. 3.1). By means of a normal slotted screwdriver, the output voltage can be adjusted within a range of 24 v to 27.5 V and from 12 V to 14 V. Turning the screwdriver to the left reduces and turning it to the right increases the output voltage. The LED at the front plate of the unit indicates readiness for operation.

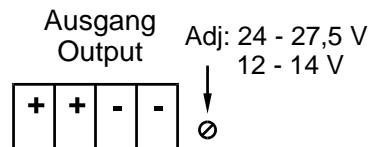


Figure 3.1: Secondary side connecting terminals and trimming potentiometer for the output voltage

3.1 Mounting and Connecting

To allow best possible cooling, the proper mounting position has to be unconditionally observed taking into account that input terminals (L1/L2/L3/PE or L1/N/PE) have to be placed on top and the output terminals (+/-) at the bottom.

There must be a head space of at least 100 mm above and below and of at least 30 mm at both sides of the *BL18* device.

The inlet air temperature must not exceed the admissible ambient temperature specified in the technical data.

Connection of the three-phase input voltage is to be made according to the scheme that is printed on the housing of the unit. For this purpose it is not necessary to observe the indicated phase sequence. The feed lines (= primary sides?) of the unit should be protected by either a three-pole L-miniature circuit breaker or via a three-pole motor protecting switch (adjusted to 2.5 A).

It is not allowed to operate the unit if one of the phases had failed. The protected earth (PE) of the BL18 and protected earth of the switchboard have to be connected. Installation of the switchboard has to be carried out in compliance with the regulations VDE 0100 and VDE 0160.

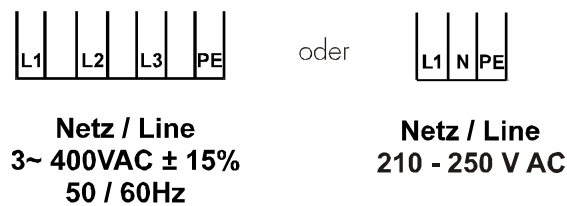


Figure 3.2: Mains Connection

Attention!

For all servicing or installation works, the locally valid safety instructions have to be observed.

The secondary side plug connectors have two parallel connection terminals per pole (+/-) but the current can also be carried by one terminal only.

3.2 Application as stabilized power pack supply unit

As a stabilized power pack supply unit, the BL18 provides a constant output voltage that – each depending on the selected adjustment value - ranges from 24 V to 27.5 V/DC or from 12 V to 14 V/DC.

The output voltage is maintained up to the rated current's load value. If this value is exceeded, the output voltage will automatically be reduced.

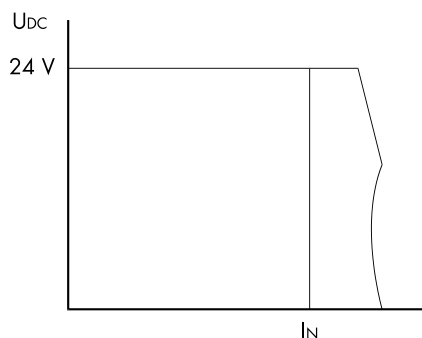


Figure 3.3: Current limitation

3.3 Application as battery charger

For the loading of lead acid batteries at normal temperatures up to 30°C, the trickle charge voltage recommended by battery manufacturers is 2.25 V per cell, i.e. the trickle charge voltage for a 24 V lead-acid battery would be 27 V per cell. At higher ambient temperatures, charging voltages have to be reduced and must be increased accordingly in case of external voltage losses. The factory default setting for the units BL18-400-24 and BL18-230-24 is an output voltage of 27 V/DC.

3.3.1 Battery charging in compliance with I-V – Characteristics

Charging is effected according to I-V characteristics (see fig. 3.4). The initial discharge capacity / rating is high, i.e. approx. 21 – 23 A (I-charge). During discharging of batteries a high initial charging current of approx. 21-23 A (I-charge) flows that is limited by the BL18. As soon as the charging voltage reaches the adjusted value (trickle charge voltage) there is transition to charging at constant voltage (U-charge). In doing so the charging current will decrease until the unit supplies a lower trickle current and the current that is possibly required by connected consumers. In this case the advantage of this charging method - compared to loading at constant current - becomes quite obvious: The reduction of current upon reaching of the trickle charge voltage avoids overcharge of the battery thus preventing inadmissibly high generation of gas which would be the case if a high charging continued flowing after the battery's full charge.

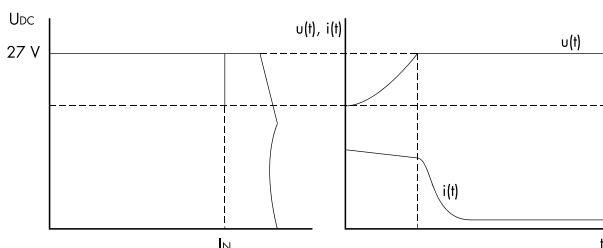


Figure 3.4: Charging acc. to IU-characteristic

3.4 Reduction of the power output

At an ambient temperature of more than 60°C the load capacity of the unit will decrease proportional as shown in the diagram below.

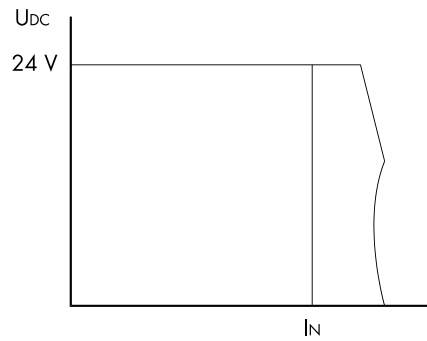


Figure3.5: Reduction of the power output

To avoid overheating of the units, it is necessary to reduce the consumer load accordingly.

4. Technical Data

General Data

Type:	BL18
Permissible operating time:	continuous operation
Connection terminals:	max. 2.5 mm ² (wire connection)
Type of cooling:	convection cooling
Maintenance:	none
Short circuit:	sustained short circuit proof
No-load:	sustained no-load proof
Mounting position:	wall mounting, input terminals on top, output terminals at bottom

Input Circuit (three-phase)

Input voltage:	3 x 380-500VAC ± 10
Over voltage protection:	star connected metal-oxide varistors (MOV) S14K320
Application (1 mA-value):	510 V (single varistor)
Energy absorption:	84 J (2 ms) (single varistor)
Input rated current:	3 x 1.5 A (24 V type)/3 x 0,8 A (12 V type)
Frequency range:	47 - 63 Hz
In-rush current:	50 A
Power factor $\cos\phi$:	0.55 capacitive
Fuse:	three-pole miniature c.b. or motor protection switch setting 2.5 A)

Input Circuit (single-phase)

Input voltage:	1 x 230 V AC $\pm 15\%$ at $U_{\text{sec}} = 24 \text{ V DC}/18 \text{ A}$, $+15\%/-10\%$ at $U_{\text{sec}} = 27.5 \text{ V DC}/18 \text{ A}$
Input rated current:	4.4 A (24 V type)/2.4 A (12 V type)

Output Circuit

Output voltage:	27 V DC $\pm 1\%$ / 13,5 V DC $\pm 1\%$ (preset by manufacturer)
Setting range:	24 - 27.5 V (24 V type)/12 - 14 V (12 V type)
Max. output current:	18 A
Limitation of current:	typically 20 A, starting point at 18.5 ... 21.5 A limit point at 20.0 ... 26.0 A
Output:	480 W
Residual ripple:	<100 mV
Efficiency:	90%
Max. power loss:	53 W
Load capacity of output terminals:	$\leq 20 \text{ A}$ at $T_U = 0^\circ\text{C}$ up to $+45^\circ\text{C}$ 0.2 A- reduction/ $^\circ\text{C}$ from $+45^\circ\text{C}$ to $\leq 17 \text{ A}$ at $T_U = +60^\circ\text{C}$

Regulation

Mains regulation:	<0.1% of the output voltage at $U_{\text{mains}} \pm 15\%$
Load regulation:	<0.1% of the output voltage between 0 and 20 A
Correction time:	<2 ms at a load change from 10 to 90% of rated current, overshooting <2%
Mains failure bridging time:	>5 ms at $U_{\text{mains}} = 400 \text{ V AC}$ and $U_{\text{sec}} = 24 \text{ V DC} / 16 \text{ A}$

Tests and regulations

Radio-interference suppression:	VDE 0875 part 11, EN 55011 class B
Static discharge ESD, IEC 801-2:	8 kV contact discharge 15 kV air discharge
Electromagnetic fields, IEC 801-3:	10 V/m
Burst IEC 801-4:	4 kV input 2 kV output, capacitive coupling
Surge IEC 801-5, EN 6100-4-5:	4 kV asymmetric, 4 kV symmetric
Safety rules	VDE 0805/11.93, EN 60950, IEC 950
Test voltage:	3 kV AC : all safety relevant components 1.5 kV DC: finished product between primary and secondary side 1.5 kV DC: finished product between primary and protection earth 0.5 kV DC: finished product between secondary and protection earth
protection class:	class I
Degree of protection:	IP20
Discharge current:	<0.75 mA (47 - 63 Hz mains frequency and $U_{\text{mains, max}}$)

Operating data

Temperature range	during operation: 0 to +70°C, with free convection during storage: -25 to +85°C
Derating of output:	2.5 %/K above +60°C (see Fig.3.5)

Housing

Dimensions (Width x Height x Depth):	240 mm x 130 mm (153 mm) x 86 mm
Space for convection:	above and below the unit 100 mm, at the sides 30 mm
Weight:	approx. 1.9 kg
Mounting:	DIN-rail mounting acc.to DIN EN 50022-35

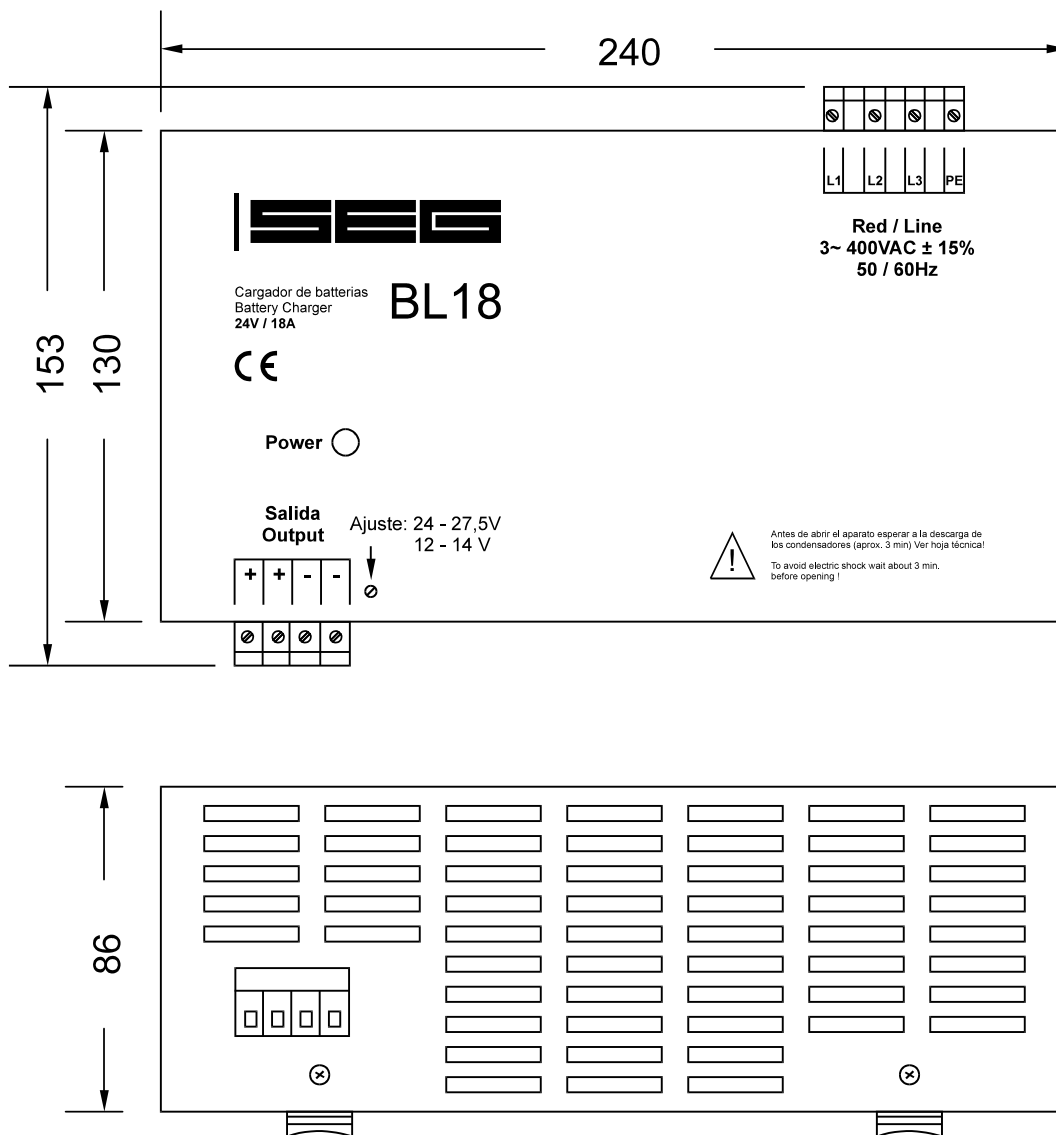


Figure4.1: Housing dimensions

All dimensions in mm!

Please observe!

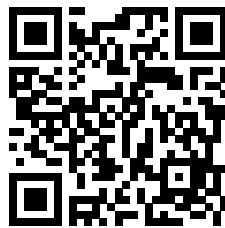
A free space of at least 100 mm must be left above and below the BL18, and of at least 30 mm at both sides.

5. Order form

Power supply and battery charging unit	BL18-	
Output current 18 A		
Input voltage		
230 V 1-phase	230	
400/530 V 3-phase	400	
Output voltage		
12 V (12 - 13.75 V DC)		12
24 V (24 - 27.5 V DC)		24

Function Line

<https://docs.SEGelectronics.de/bl18>



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