

Installation guide



SMPS 1000

230 V / 24 V / 48 V

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Issue 2, April 99



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NS-ISO 9001 Certificate No.4

This product holds a CE mark and satisfies all requirements covering relevant standards and directives.

EMC

Generic Immunity Standard

- EN50082-1 Residential, Commercial and Light Industry
- EN50082-2 Industrial Environment

Generic Emission Standard

- EN50081-1 Residential, Commercial and Light Industry
- EN50081-2 Industrial Environment

LVD

- LVD73/23/EEC Low Voltage Directive

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1. Warning

This product has no user serviceable parts inside. There are Hazardous Voltages inside during operation! Do not expose unit to moisture, water, dust or other items that may result in short-circuits or fire. Do not block the air flow through or around the module.

Removal of cover should be done by authorised service persons only. Wait for 10 minutes after disconnection before removing cover to ensure all high voltages has been discharged to a safe level.

Connection to other than ELTEK systems must be approved by ELTEK and done by authorised service persons only to avoid hazard, malfunction or failure of module.

2. Installation

Please check that the equipment is not damaged and is in accordance with your order. Compare the barcode labels on the module (see figure 3) and the package - they should be identical. Check input and output voltages against your system voltage levels.

Insert the module into the subrack by sliding the module in through the subrack guides. Make sure the four screws located at the upper and lower part of the front plate mates with corresponding threaded holes in the subrack, and that the backplane and module connectors mate properly. Press the module firmly in until both backplane connectors are fully engaged. Fasten the module with the four screws - maximum torque is 1 N/m.

The red and yellow LED's may blink during softstart, then the green LED should light up under normal operation. If the rectifier is actively turned off by its shutdown signal, no LED's will be lit. Refer to "Operation" for details.

3. Connections

The SMPS1000SI is normally connected to a PR 700 sub-rack providing all connections to the module. Figure 2 shows a table and connector layout with explanation of the signals if used as a stand-alone module. Pins that are not mentioned are not in use. See also Installation Guide and the module Technical Specification ELTEK TE-37037-B4.

4. Operation

The SMPS 1000 SI is intended for use as a stand-alone module or in systems with multiple modules and an external alarm / control module, but operates in a default mode if the control module fails. Stand-alone functionality is limited but can be realised with simple external circuitry.

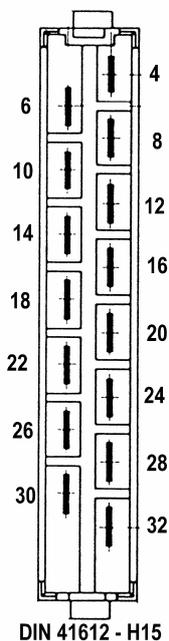
Visual indications

FRONT GREEN LED: "POWER" - indicates module operation with output voltage >5V.

FRONT YELLOW LED: "LIMIT" - indicates constant power or constant current limit modes. It may indicate overtemperature limiting since the current limit is then reduced.

FRONT RED LED: "ALARM" - indicates an error state. The Alarm relay will change into passive (de-energised) state simultaneously, and the module is in shutdown mode.

YELLOW LED on top of rectifier (see fig. 3): Current share MASTER indication. Refer to "Adjustments" below for function description. The MASTER LED is usually visible from front of the system through the blind panel above the rectifier module(s).

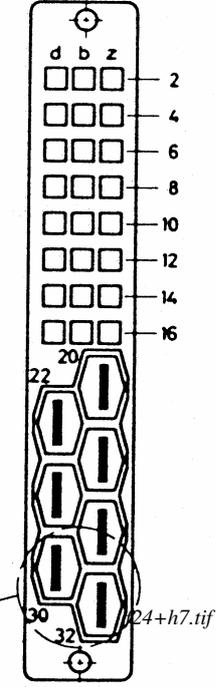


Pin number : Signal name	Explanation
Upper connector: DIN H15	Output voltage
4, 12, 14, 16, 24, 26, 28:	Positive output voltage - paralleled pins. V1+
6, 8, 10, 18, 20, 22, 30:	Negative output voltage - paralleled pins V1-
32 : safety earth	First mating contact, connected to module chassis

Fig. 1 Power plane connection, upper connector

h15fig.tif

Pin number : Signal name	Explanation
Lower connector: DIN F24+H7	Input and signal interface
6d : Ibus1	Current share bus
6b / 8d: rs1- / rs1+	Remote voltage sense neg. / pos.
6z: Vadj1	Analogue output voltage control. System use only
8b: Va	15V / 10mA aux. output, local backplane use only
10d / 10b : pp- / pp+	Power present loop for physical detection of unit
12d	Shutdown signal sd+ = 5V referred to V1-
16d / 16b / 16 z: AL1, NO / C / NC	The relay is energised during normal operation (failsafe). Alarm relay output: NO=normally open (open= alarm), C = common, NC=normally closed (closed= alarm)
28: Live	Live AC input line (fused F5A(H), fast, high rupture)
30: Neutral	Neutral AC input line (unfused)
32: safety earth	First mating chassis connection for module



24+7

Fig. 2 Power plane connection, lower connector

Measurement points

At the front of the module the output current can be measured by connecting a digital multimeter to the test points. Shunt resistance is nominally $5\text{ m}\Omega \pm 5\%$ (giving 5mV/A). For voltage measurement, an external system measuring point must be used. Do not attempt to remove covers to measure if you are not a qualified service person.

Error state table and fault-finding

A summary of operating and failure modes of the module is given in table 1 below. It includes tips for error recovery and verification. "Call service" means you should

4 Operation

contact your dealer, representative or one of the given factory sites for qualified assistance with your problem.

Symptom	Possible error	How to fault-find, recover or restart
ALL LED'S OFF	Normal disconnect	Both input and output are disconnected from power sources
	External shutdown	External shutdown command from the alarm module. Refer to the alarm / supervision module manual for check of shutdown mode. Try to restart system from AL175 after reading the error messages.
POWER LED ON, MASTER LED ON	Normal operation	OK - module is always master in stand alone mode.
POWER LED ON, MASTER LED OFF	Stand alone: share bus error	Restart the module by disconnect / reconnect. If module does not deliver power, remove it from the system. If unit delivers power check system current share bus or call service
	System: OK	Another module is master, this module runs as slave
POWER LED ON, LIMIT LED ON	Normal operation - Power or current limit during charging	To verify module is OK: Check output voltage - should be slightly below float voltage. Measure current, it should read more than nominal current
	➤ Overtemp. Limit	To verify overtemperature limit: module current reading is less than nominal current while output voltage is OK and limit LED is ON.
	➤ Low input voltage limit	Reduced power limit when voltage is between 150 and 207 V _{AC} . Check input voltage

<p>ALARM LED (RED) ON</p> <p>ALL OTHER LED'S OFF</p>	<p>Module alarm:</p> <ul style="list-style-type: none"> ➤ Loss of input voltage <p>Internal shutdown:</p> <ul style="list-style-type: none"> ➤ Overvoltage protection ➤ Mains fuse blown ➤ Overtemperature protection ➤ Module failure 	<p>Observe system. If all modules act equal, most likely errors are:</p> <ul style="list-style-type: none"> ➤ Line input voltage failure. Check all system line input voltage fuses or circuit breakers. Measure line voltage. If $< 150 V_{ac}$, modules may have entered mains low protect mode. Note: For voltages of 140-155 V_{ac}, some modules may enter protection mode, some not. <p>If modules act differently, the most likely errors are:</p> <ul style="list-style-type: none"> ➤ Overvoltage protection. Each unit monitors its own voltage and shuts down if an internal error makes the output voltage go above legal levels. <p>Check if the rectifier delivers current. If current is delivered, an internal module failure has occurred, and the rectifier must be repaired. If no current is delivered, remove the rectifier from the system let it rest for one minute and reconnect. If rectifier goes back to failure condition it should be removed for repair.</p> <ul style="list-style-type: none"> ➤ Check the input fuse (located at the bottom of the module). Check fuse, try to replace it and reconnect. If the fuse blows again, do NOT attempt to restart it more than once (1 time). ➤ Observe the module. If it is extremely hot, it may have entered the overtemperature shutdown mode. It should restart after < 5 minutes at ambient temperatures below 55 degrees C. If it starts, the LIMIT LED should be lit since it enters the temperature limit mode. Try to disconnect, let module cool down, then reconnect it. <p>None of above solved problem – probably module fault. Call service.</p>
<p>Power LED on, Alarm LED on</p>	<p>Module error</p>	<p>This mode may occur for a short time only during power-up or power-down. Otherwise, call service.</p>
<p>Limit LED on, Power LED off</p>	<p>Output short circuit, $V_{out} < 10V_{dc}$</p>	<p>The output voltage is low, but the module is still in continuous current limiting mode. Measure the output current. It should read $> 70 mV$. If not, a module overtemperature or failure has occurred. Observe the system voltage - if it is low but increasing, the battery is being charged from a completely empty state. If it is constantly low ($< 20V$), try to isolate the error by disconnecting the load circuits. Then, try to disconnect and isolate the power modules if one output stage has failed. If the error cannot be isolated, turn off your system to avoid fire hazard from a short-circuit. Isolate the battery (if any) by disconnecting the battery fuse. Call service.</p>

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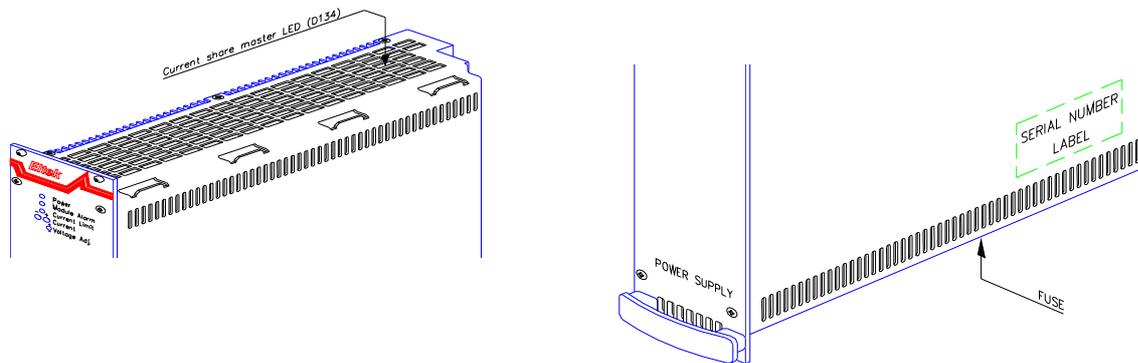
FLASHING POWER AND LIMIT LED'S	Output short circuit, low voltage <5V	A ticking sound from the module hick-up current limiting may be audible. Check output voltage. It should be very low (<5V). Measure module output current with a fast bargraph-multimeter or an analogue mV-meter. Output current increases to 20-30A and shuts down again within a second. Refer to the point above for actions.
UNUSUAL AUDIBLE 100HZ AND HARMONICS	Very high input voltage or module failure	If the line frequency harmonics becomes audible from one or more modules, check the input voltage. If it is <300V _{RMS} , a module failure may have occurred. Call service for check of system currents.
AUDIBLE NOISE AT 500HZ - 10KHZ	Module failure or extreme short-circuit	If one module emits audible noise, a module failure has occurred. If all modules emit the same audible noise, check your system voltages and current. A system short-circuit may have occurred.

Tab. 1 Error condition / fault finding table

Adjustments

Figure 3 shows available adjustments. All potentiometers are factory adjusted and should only be operated by qualified service persons.

- Output voltage adjustment (at front of module): 40 - 58V Factory setting: 53.5V



33448m4c.wmf

33448m4c.wmf

Fig. 3 Location of potentiometers, MASTER LED, FUSE and serial number label (pot2.wmf)

5. Electrical Data

Input

VOLTAGE	230V _{AC} nominal, 1 phase (total range 207 V _{AC} - 275 V _{AC}). 150-207 V _{AC} Reduced output power 300 V _{AC} (Duration < 10 min) 345 V _{AC} (Duration < 400ms)
FREQUENCY	45-65 Hz
FREQUENCY DEVIATION	35 Hz to 100 Hz for < 10 minutes (reduced PF, increased harmonics).
INPUT CURRENT	4.8 A _{RMS} at 230 V _{AC} , 5.5 A _{RMS} maximum at 207V _{AC} - full load. Harmonic currents according to EN 61000-3-2. Current THD < 7% at full load.
POWER FACTOR	Approx. 0.995 at full load, 230V _{AC} +20%/-10% input
EFFICIENCY	>91% typical at 230V _{AC} , 53.5V output and full load. >80% at 20% load
INPUT FUSE	F 8.0A (H) (fast, high rupture capacity) (5*20mm) in Live input line - replaceable from bottom of module (fig. 3). Disconnect module before fuse replacement.
INRUSH CURRENT PROTECTION	<5.5A followed by converter soft-start

Output

Output voltage

	24 V_{DC}	48 V_{DC}
OUTPUT VOLTAGE	20-30 V _{DC} 26.8 V _{DC} nominal	40-58 V _{DC} 53.5 V _{DC} nominal
OVERVOLTAGE PROTECTION LEVEL	30V	59V
HOLD-UP TIME	>10ms at 26.8V output, full load.	>20ms at 53.5V output, full load.
OUTPUT POWER	920W	1000W
VOLTAGE REGULATION	Static $\pm 0.5\%$ for load 100%-0% and input 150-275V _{AC}	
DYNAMIC RESPONSE	$\pm 5.0\%$ - regulation time <10ms - load step 10-90% or opposite	
TEMPERATURE DRIFT	± 100 ppm / °K over temperature range. Remote sense signals allow for compensation of < 1.5V voltage drop at output. If remote sense signals are disconnected, the output voltage will increase with < 0.5V	



If remote sense signals are short-circuited or connected to opposite polarity, the module will have high output voltage and overvoltage shutdown. The sense network may fail.

Output current

CONSTANT POWER	24 V: 22 V-38 A, 24 V-37 A, 27 V-36 A 48 V: 43 V-22 A, 48 V-20.5 A, 54 V-18.5 A
SHORT-CIRCUIT BEHAVIOUR	$(0 V_{DC} < V_{OUT} < 5V_{DC})$
HICK-UP MODE WITH SEQUENCE	Shutdown, soft-start, current limit, shutdown.
CURRENT SHARING	The modules exhibit active load sharing when connected in parallel. The share-bus is based on an autonomous, redundant master-slave-system. Maximum module voltage setting error 1.5V. Share tolerance: $\pm 5\%$ between modules.
RIPPLE AND NOISE	< 100 mV peak-to-peak, < 2 mV psophometric.
REVERSE CURRENT AT DC OUTPUT	Max. 20 mA (from battery)

✓ There is no output fuse for reverse polarity protection. I^2t for reverse polarity battery fuse blow: $400A^2s$ (10 ms) (i.e. 200A for 10ms)

Electromagnetic interference

EMISSION, INPUT	EN50081-1, EN50081-2, VDE0871 grade B.
EMISSION, OUTPUT	EN50081-2, VDE0871 grade A.
EMISSION, RADIATED	EN50081-2, E10 marine specifications.
IMMUNITY	EN50082-1, 50082-2, E10 marine specifications.

Safety

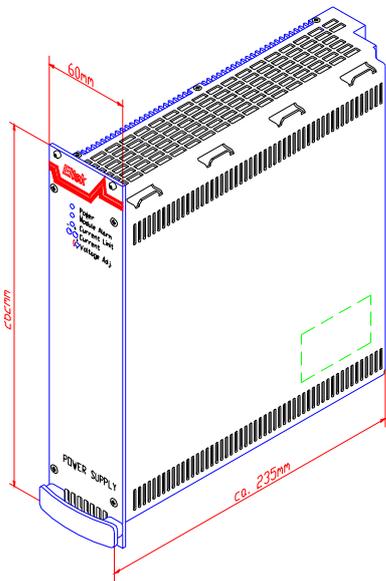
Design standard

IEC 950	Classification of equipment
Mobility	Fixed, for building in, direct plug-in.
Protection class	1 (permanent connection to protective earth).
Supply connection:	Permanent (may be pluggable type B at system level).
Clearance and creepage class	Pollution degree 2, Material group 2 (3a for some parts).
Intended site and usage	For use in restricted access locations - service access area. An external primary circuit breaker must be used in the input line. The 2 safety earth pins of the backplane connectors are first mating, connection first and disconnection last.
IEC protection class	IP20. Current from AC inputs to safety earth: < 10mA at 50Hz. Discharge time of module connector pins to safe level: <10 seconds.

Isolation voltages

- Input - earth: 1.5 kV_{AC} (basic insulation).
- Input - output: 3.0 kV_{AC} (reinforced insulation)
- Output - earth: 1.0 kV_{DC} (basic insulation - SELV according to IEC950)

6. Mechanical Data



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Fig 4. Mechanical dimensions

- Width: 668 mm
- Height: 264 mm (6U)
- Depth: 220 mm (Extended Euro-format). Total depth with connector and front handle: 240 mm
- Weight: < 2.8 kg - See fig. 4.

Environment

Temperature range

- Storage: -25°C to $+85^{\circ}\text{C}$.
- Operation: -10°C to $+70^{\circ}\text{C}$. The module may enter thermal protection mode above 45°C under extreme conditions (power limit, low mains).

Humidity

- Storage: 0-95% Relative Humidity non-condensing
- Operating: 10% - 85% RH non-condensing

Acoustic noise

<40 dB (A) max (30 dB typ.) according to IEC651 at normal line and load.

General

- Internal protection by shutdown is provided for output overvoltage (when given by the module itself), overtemperature and low mains. For overtemperature, current limit is reduced. If temperature increases further, shutdown and alarm is given.

Interface

- Alarm contacts: 125V_{DC}, 1A max floating. Normally open and closed available.
- Shutdown signal: A 5-30 V_{DC} signal is used for external shutdown. The signal is on sd+ , refereed to V1-
- Current share bus: System internal bus. Voltage excursion: 0-15V referred to negative remote sense rs1-.
- Voltage adjust: An external control voltage can be used to control the module output voltage. When not in use, it should be connected to AGND (pin 10z) or active held low at <0.5V. Control voltage 1...5V_{DC} gives approx. output 37V_{DC} to 58V_{DC}. For voltages below 1V, the module returns to its factory setting voltage.
- Module MTBF according to MIL-HDBK 217F.1 parts count: > 100 000 hours.



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