



POWER SUPPLY TUL500EN

CERTIFIED with the standard
EN 54-4:1997+A1:2002+A2:2006
EN 12101-10:2005

Installation Manual

GENERAL FEATURES

The Power Supply TUL500EN has been designed to be used as a Power Unit with power backup in Fire Alarm Systems, in conformity to regulation (EU) No 305/2011 and how power supply equipment in systems for smoke control and heat.

Its mechanical and electrical features make it complying to EN 54-4: 2007 Standard (Fire Alarm detecting and signaling devices. Part 4: Power supply devices) which includes A1:2002 and A2:2006 updates.

FUNCTIONAL FEATURES

The power supply unit is made by a switching power supply, limited in constant precision current (rectangular limitation), two 12 V \equiv 17 Ah batteries (not included) digital and analogical control circuit and micro-controlled supervision circuit.

Power is available on 3 terminal-outputs protected by electronic fuses: A, B and C, for generic loads and one connection BATT (with fuse): for back-up batteries. When a fuse trips, the corresponding LED on control board (see Pict.2, DL1, DL6, DL7, DL8) will turn ON.

Electronic fuses try periodically to restore the power output: if an overload is removed, the power will be available within 10 sec max.

The battery charge occurs at constant current (1 A) until the battery voltage reaches its nominal value (27,6 V \equiv @ 25° C), with temperature compensation. Maximum current supplied by the unit is 5 A, where 4 A is for charge and 1 A is for recharging the battery.

The power supply is able to give 7 A peak for 25 seconds @ 25°C.

Four LEDs show the loads current consumption (3 green and 1 red: DL2, DL3, DL4, DL5)

One LED shows the Mains presence (LED1)

Check of battery efficiency

The power supply periodically carries out the efficiency of the batteries:

- At first activation of the power supply, the microprocessor will carry out the test of battery presence after about 20 seconds. If connected, the test will be carried out every 10 minutes whilst in case it is not connected, it will continue carry out the test every 20 seconds showing indication FAILURE.
- During normal operation, the battery efficiency is checked by controlling the batteries voltage. If batteries do not manage to maintain an acceptable voltage during test, there will be the indication FAILURE.
- A test of the battery internal resistance is carried out within 15 seconds after the battery connection and then repeated every 2,5 hours, at least (in conformity to attachment EN54-4/A2); if the internal resistance is over 1 ohm, there will be a FAILURE indication. With internal resistance failure detected, this test is repeated every 5 minutes at most 5 times, to ensure recovery from spurious failure detection. It will then be necessary to replace the batteries and check that terminals and fuses have a good electrical contact. When the battery is replaced, the user should wait 15 seconds after battery connection, with presence of mains voltage, for the repetition of the test and check if the failure is removed. It is possible repeat the test by pressing the button on the back of front panel display board for more than 2,5 seconds.

A microcontroller system controls various possible anomalies and gives a FAILURE indication in the following conditions:

1. Output Fuses or Battery fuse interruptions
2. Overloaded Battery (> 28,3 V \equiv)
3. Low Battery Voltage (< 20,8 V \equiv)
4. Mains power supply absence and no battery charge
5. Disconnected Battery
6. Internal battery resistance >1 Ω

Failures are displayed on a frontal board; the detailed failure is showed on the internal power supply board.

In order to avoid that a possible failure in the regulator damages the charges or the battery, a protection circuit has been inserted against over-Voltages, made of a SCR and a fuse. A fuse for mains alternated supplying is also present.

In case of failure in the power supply or of mains missing, the logic and control circuits are supplied by batteries.



ATTENTION, RISK OF
ELECTRICAL SHOCK



ATTENTION, READ THE
DOCUMENTATION

ELECTRICAL SPECIFICATIONS	
Functional class EN 12101-10:2007	A (Suitable to be use in EFC systems)
Mains Supplying Voltage	230 V~ (alternate current) +10% / -15%
Ac mains frequency	50 Hz sinusoidal
Current consumption by mains	1,1 A max. (full load)
Output Voltage	27,6 V=== (direct current) (20V=== ÷ 30V===)
Minimum output Voltage	20 V=== at max charge, with mains absence and battery discharged
Switching-off threshold Voltage	20 V===
Output current max	5 A max.(see fig. 4)
Max current for battery recharge	1 A
Max current for charges ($I_{max,a}$) with battery recharging	4 A
Max current for charges without battery recharging ($I_{max,b}$)	5 A
Max current for any output	2 A
Max current with 2 output in parallel	4 A
Max current with 3 output in parallel	4 A (7 A peak for 25 seconds @ 25°C)
Max total peak current for the outputs	7 A peak for 25 seconds @ 25°C
Minimum current for charges (I_{min})	0 A
Regulations towards mains variations at full charge (+10% / - 15%)	Better than 1%
Regulations towards charge variations (0 to 100%)	Better than 1%
Ripple at full charge	1 Vpp (at 195,5 V~) 30mVpp (at 253 V~)
Compensation of output Voltage according to temperature	4 mV/ K
Protection against battery polarity inversion	Diode
Interruption time	None
Batteries max capacity	17Ah
Recommended batteries: 2 x 12 V=== in series, 17 Ah, hermetic with valve and according to regulations IEC 61056-1 e IEC 61056-2. Casing with inflammability class UL-94-V2 or better	Type:YUASA NP 17-12 or equivalent.
Max current without mains supply	5 A
Alarm threshold of battery internal resistance	1 Ω
Missing mains and failure output relay – dry contacts	25 V~ or 60 V=== 1 A MAX
Terminals and cables	Mains supply : $\Phi 1,50 \pm 2,0$ mm Outputs : $\Phi 1,50 \pm 2,0$ mm Battery terminal BATT: Size M6 Crimp 0,5-2,0 Battery cables BATT: $\Phi 1,5$ mm

Tab 1

MECHANICAL SPECIFICATIONS	
Size in mm.	width 310; height 373; depth 170
Weight	5,6 Kg
ENVIRONMENTAL SPECIFICATIONS	
Operating temperature	from -5°C to +40°C
Humidity	from 5% to 93% ± 2 %
cooling	air cooling
IP	30
Environmental class and Installation site	3K5 of EN 60721-3-3:1995 (Indoor use: sheltered from atmospheric agents. Control of temperature and humidity is not required)

Tab 2

FUSES			
FUSE1	Fuse of the 230 Vac supplying input (T4 AL 250V~). Not Replaceable	F 4	Electronic Fuse related to output B (2,5 A self resetting)
F1	Battery fuse (T6,3 AL 250 V~)	F 3	Electronic Fuse related to output C (2,5 A self resetting)
F2	Electronic Fuse related to output A (2,5 A self resetting)		

Tab 3

Recommended types and sections of installation cables (certified EN50200)	
Mains supply 230 V~ L-N-PE	FTG10OM1 0,6/1 kV: 3 x 1,5 mm ² ÷2,0 mm ²
A, B, C output terminals	FRHRRNS 2150: 2 x 1,5 mm ² ÷2,0 mm ²
Indication inputs/outputs	FRHRRNS 2050: 2 x 0,5 mm ² ÷1,5 mm ²

Tab 4

The power supply has been certified using YUASA NP 17-12 batteries

SECURITY INSTRUCTIONS

1. For mains input and DC outputs + alarms, use separate holes on the bottom of the box to pass the cables. Furthermore, the material of the joint pipe/box must have a flammability class V-1 or better
2. The relay contact "GUASTO" and "RETE" must be connected only to circuits operating with SELV Voltage.
3. For AC supplying, provide an omnipolar switch of the power supply network compliant with Annex L. of IEC 62368-1 (separation between the contacts of at least 3 mm), easily accessible.
4. The wires must have a section of 1,5 mm and be equipped with adequate buttonholes where they are subject to pressure contact.
5. The installation of the power supply must be carried out by qualified personnel aware of the security standard IEC 62368-1 and concerning power supplies CEI-64-8.

INSTALLATION

Mechanical mounting

This device has to be mounted on vertical stable walls, suitable to support the power supply, by means of 4 screws with 8 mm diameter, for spacers and screws on the 4 holes on the bottom of the box. The battery must be fixed using the strap given within.

Electrical connection

Connect the power supply unit to the mains 230 V~ by use of an omnipolar switch of the power supply network compliant with Annex L. of IEC 62368-1 (separation between the contacts of at least 3 mm), easily accessible, aimed to protect the line against possible short circuit and operator against current leakage.

IMPORTANT: use different cables-passes and pipes for ac supplying input (mains 230 V~) and dc outputs + alarms (SELV) – see Pict. 2

The minimum section recommended for ground connection is 1,5 mm².

For connections refer to Pict. 2. In this figure the following important details are shown:

Output Terminals (Power supply unit)

Output terminal board (power supply)			
BATT +	Positive pole of the battery	B +	Positive output for charge B
BATT -	Negative pole of the battery	B -	Negative output for charge B
A +	Positive output for charge A	C +	Positive output for charge C
A -	Negative output for charge A	C -	Negative output for charge C

Tab 4

Terminal board Alternated Supplying

L connection to mains line (230 V~)



Protection ground connection

N connection to neutral

Checks and Adjustments

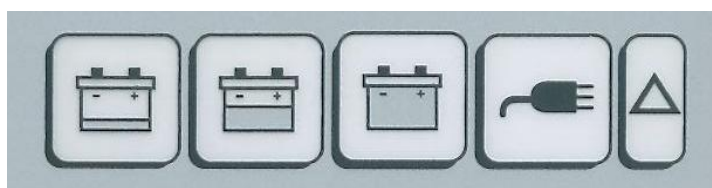
Control is shown below (VRES1) is adjusted at factory and **must not be altered by the operator.** Tampering of this control automatically means the lost of the warranty.

VRES1 - Potentiometer for adjustment of the output Voltage

INDICATION ON THE FRONT PANEL (located on the door of the power supply):

Standard visualization

Pict.1



Battery low
or Battery fuse
fault
(if flashing)

Battery OK

Battery
Overcharged
or Battery
resistance
high
(if flashing)

Mains

Failure

Low battery:

Battery voltage lower than 20,8 V ===
Battery fuse fault (if flashing)

Battery ok:

Voltage between 20,9 V === and 28 V ===

Overcharged battery:

Battery voltage over 28 V ===
Battery resistance high >1 Ω (if flashing)

Mains:

Presence of 230 V~ mains

Failure :

LED of general failure, it is activated in case of:

Absence of 230 V~ mains
Faulty fuse
Loss of battery charge
Low battery
Overcharged battery
Disconnected battery
Battery resistance > 1 Ω

Alternate visualization

Pushing SW2 (Pict. 3) on the display board for less than 2 seconds, the Amperometer function is activated. The five LEDs bar show, from left to right, the current level supplied to the charges; 1 A for every leds. When the Switch button is pushed again, or after 1 minute, the display go back to the standard visualization.

CONNECTION OF CONTROL BOARD (placed near the power board)

Refer to Pict. 2

Relay "RETE" of mains missing, – Terminals NC, NO, C (operating with SELV Voltages)

Relay output with intervention for missing mains and programmable activation delay

DIP-SWITCH			Delay	EN54-4 Compliant
1	2	3		
OFF	OFF	OFF	25 min	YES (Factory default)
OFF	OFF	ON	15 sec	YES
OFF	ON	OFF	60 sec	YES
OFF	ON	ON	5 min	YES
ON	OFF	OFF	15 min	YES
ON	OFF	ON	60 min	NO
ON	ON	OFF	120 min	NO
ON	ON	ON	240 min	NO

Tab 5

In order to be compliant to the EN54-4 standards, the maximum delay permitted is 30 MINUTES of missing mains. On the contrary the power supply is not compliant to the standards.

Ten seconds after the mains is restored the relays goes back to normal condition.

Relay "GUASTO" of failure indication – Terminals NC, NO, C (operating with SELV Voltages)

Output relay failure indication is active for:

- Low battery (voltage lower than 20,8 V ===)
- Overcharged battery (voltage over 28,3 V ===)
- Disconnected battery
- Battery internal resistance > 1 Ω
- Faulty fuse

START UP OF THE SYSTEM

Even if not imperative, the following sequence of connection is suggested:

1. Connect mains and ground to the concerned terminal AC1. Turn ON the AC power. The load LEDs flash and after about 20 seconds the missed battery LED flashes
2. Connect the battery. After 20 seconds the LED switches off
3. Connect the loads: the LEDs, indicating the current supplied, light up

SYSTEM RUNNING

Battery voltage is monitored continuously, if the voltage drops below $V(B)_{low} = 20,8 \text{ V} \text{---}$, the relay "GUASTO" turns on and the Front panel "Battery Low" lights on.

If the voltage drops below $V(B)_{min} = 19,8 \text{ V} \text{---}$, the battery is isolated to avoid the deep discharge. After the battery gets unplugged, the battery will be connected to the system if the voltage is higher than $16 \text{ V} \text{---}$.

Battery internal resistance is tested every 2,5 hours, at least. If the resistance is higher than 1 Ohm a warning is raised. The Front Panel LED "Failure" is lighted on, the LED "Overcharged battery" slow flashes and the internal DL1 quick flashes.

Battery Fuse monitoring, in case of fault of the fuse, the LED "Low battery" starts to flash slowly. When the fuse is replaced the signal disappear.

Fuses monitoring, if a fuse became open the LED lights on, when the cause of fault disappears the LED lights off.

Mains monitoring, when the mains is missed, The Front Panel LED "Mains" is lighted off, and the relay "RETE" is activated. When the mains return LED "Mains" is lighted on, and the relay "RETE" is restored.

SERVICING

Periodical programmed servicing must be carried out by qualified personnel in order to prevent the possibility of a malfunctioning of the power supply. It is recommended to carry out servicing every 6 months and to evaluate control panel of the system in order to check possible alarms during tests.

- Check the connections of the 230 V~ supplying lines
- Check the connections of the alarm indication lines and related shields
- Check the battery connections, they have to be well tightened and there must be no oxidation
- Check the output Voltage on the charge (see electrical specifications)

Although the power supply is equipped with a self-diagnosis system carrying out a periodical control of the battery and indicating possible failures, it is suggested to manually check the battery every six months.

- Disconnect the battery and check if the voltage of the power supply is within the values shown.
- After re-connecting the battery, disconnect the primary supplying and check if the battery can maintain the Voltage on the higher 23 V --- charge. On the contrary, replace battery immediately.
- Check presence of related alarms during tests.

CONTROL BOARD SYNOPTIC LEDs

The DL1 LED shows the failures:

In case of contemporary presence of more alarms, the LED indication follows the priority shown in the tab. 6

Priority	DL1	ALARM
1	Slow flashing (1 Hz)	Battery disconnected
2	Quick flashing (4 Hz)	Battery resistance > 1 ohm
3	On fix	Fuse F1 (battery) interrupted
4	Off	None of previous failures

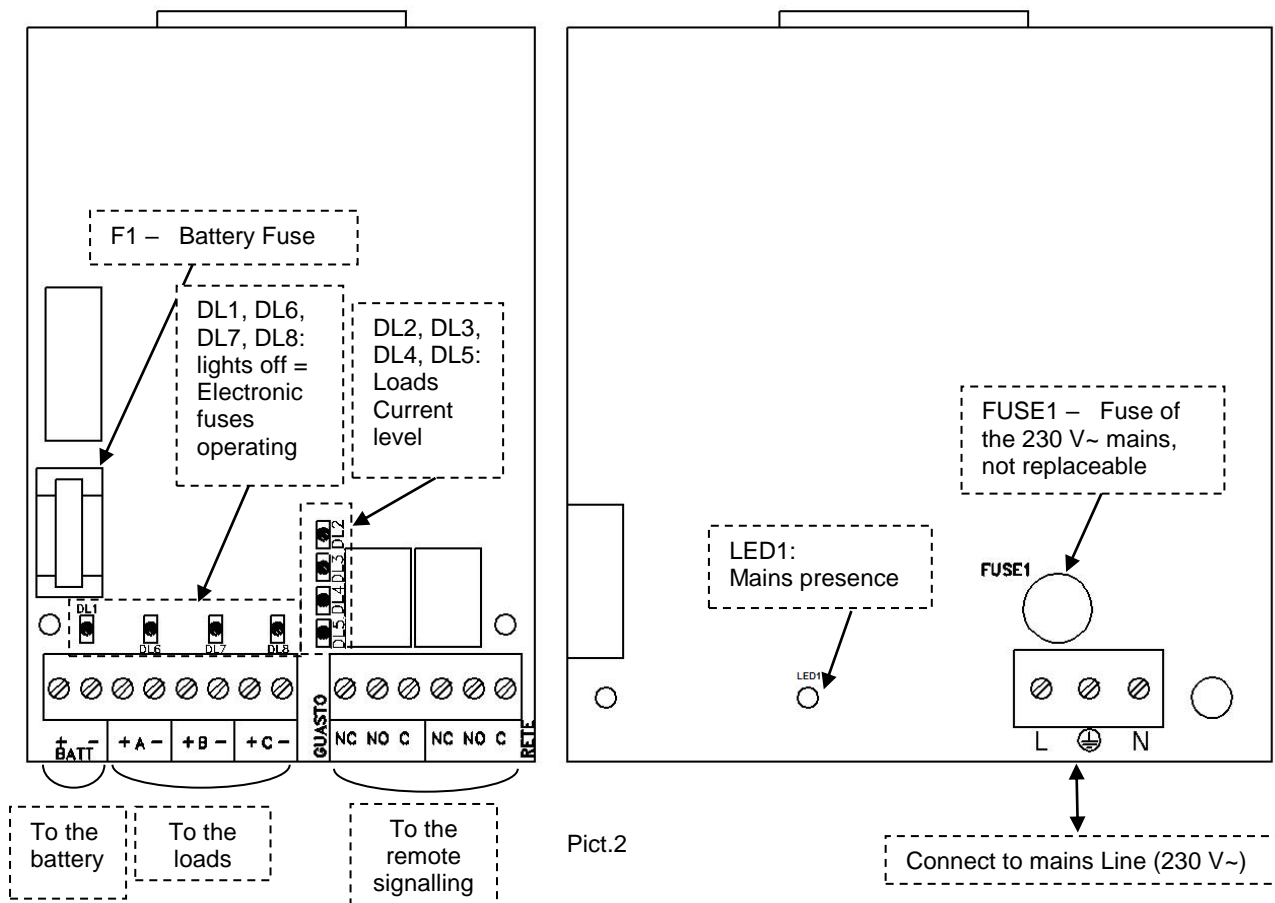
Tab 6

LEDs DL2, DL3, DL4 and DL5 show the current used by the outputs:

Condition	LED Status			
	DL5	DL4	DL3	DL2
$I < 0,3 \text{ A}$	OFF	OFF	OFF	OFF
$I < 0,625 \text{ A}$	SLOW FLASH	OFF	OFF	OFF
$0,625 \text{ A} < I < 1,25 \text{ A}$	ON	OFF	OFF	OFF
$1,25 \text{ A} < I < 1,875 \text{ A}$	ON	SLOW FLASH	OFF	OFF
$1,875 \text{ A} < I < 2,5 \text{ A}$	ON	ON	OFF	OFF
$2,5 \text{ A} < I < 3,125 \text{ A}$	ON	ON	SLOW FLASH	OFF
$3,125 \text{ A} < I < 3,75 \text{ A}$	ON	ON	ON	OFF
$3,75 \text{ A} < I < 4,375 \text{ A}$	ON	ON	ON	SLOW FLASH
$4,375 \text{ A} < I < 5 \text{ A}$	ON	ON	ON	ON
OVERLOAD $I > 5 \text{ A}$	SLOW FLASH	SLOW FLASH	SLOW FLASH	SLOW FLASH

Note: SLOW FLASH = 1 Hz

Tab 7



Pict.2

CABLE CONNECTION:

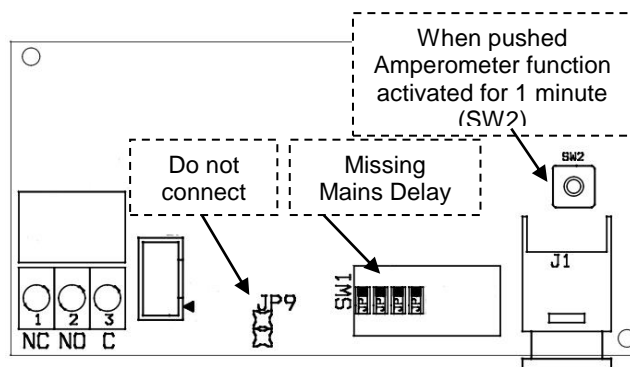
- + - BATT: connect to the backup battery.
- + - A: connect to the load. MAX 2 A
- + - B: connect to the load. MAX 2 A
- + - C: connect to the load. MAX 2 A

MANUFACTURER DECLARATIONS

Statement of the Manufacturer:

The design has been developed according to the internal quality system observing all the rules aimed to reach an adequate design of all the elements of the product.

All components of the product have been selected for the expected purposes and their characteristics are assured when the external environmental conditions correspond to the conditions required by class 3K5 of EN 60721-3-3:1995



Pict. 3



1293

Venitem s.r.l. Via del Lavoro, 10 - 30030 Salzano (VE)

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DoP N° 1293 - CPR - 0587

EN54-4 ; EN12101-10

TUL500EN - Power supply unit for fire detection, fire alarm systems, smoke and heat control systems for building

Other technical data: see supplier's technical dossier

EN54-4 Essential characteristics	Performance
Operation reliability	Pass
Performance of power supply	Pass
Durability of operational reliability and response delay, temperature resistance	Pass
Durability of operational reliability and response delay, vibration resistance	Pass
Durability of operational reliability and response delay, electrical stability	Pass
Durability of operational reliability and response delay, humidity resistance	Pass
EN 12101-10	
Functional class PN-EN 12101-10:2007	A
Environmental class PN-EN 12101-10:2007	1
Interruption time	0 s
Batteries max capacity	17 Ah
Max current for charges without battery recharging (Imax.b)	5 A
Mains Supplying Voltage	230 V~ +10% / -15%
Output voltage	27,6 V=== (20 V=== ÷ 30 V===)

DoP available on site www.venitem.com



Wasting

This product must be wasted in appropriate wheelie-bin for electric and electronic materials.

Do not put in wheelie-bin for other kind of waste.

[illegible]

MA-AL-T500-01-07 Manual TUL500EN eng rev7