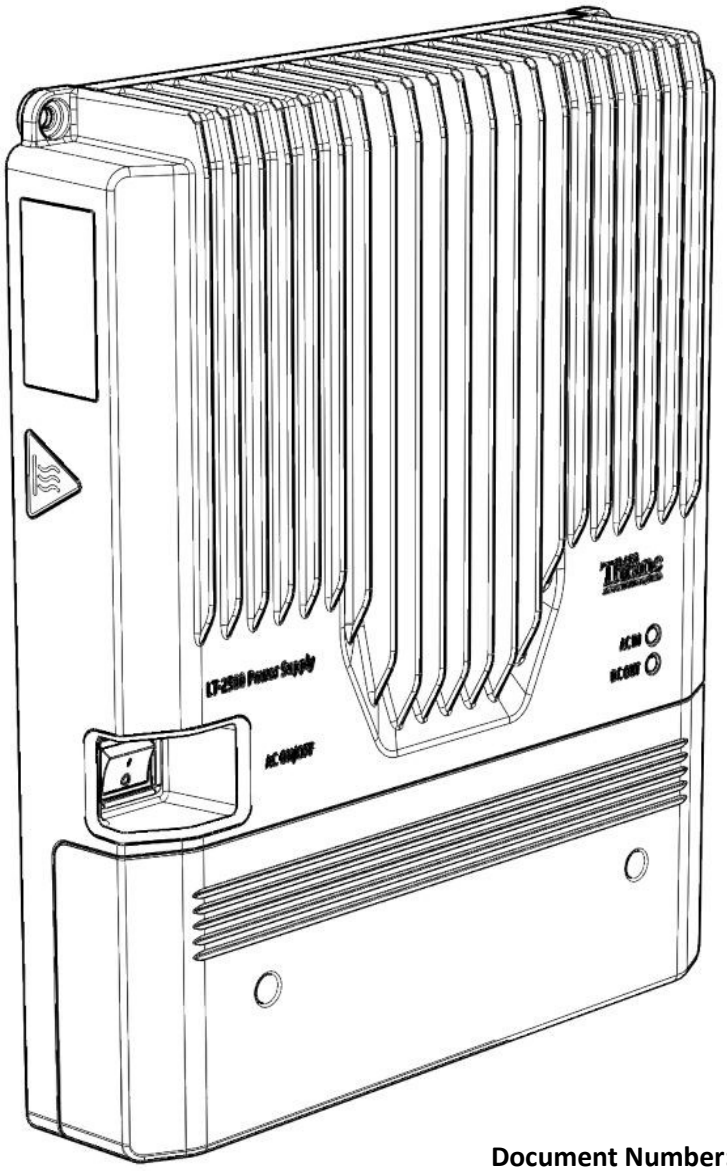
User & Installation Manual

LT-2500 AC/DC Power Supply



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LARS Thrane communication systems

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Disposal

Old electrical and electronic equipment marked with this symbol can contain substances hazardous to human beings and the environment. Never dispose these items together with unsorted municipal waste (household waste). In order to protect the environment and ensure the correct recycling of old equipment as well as the re-utilization of individual components, use either public collection or private collection by the local distributor of old electrical and electronic equipment marked with this symbol. Contact the local distributor or dealer for information about what type of return system to use.

The equipment described in this manual is intended for use on commercial marine and leisure vessels.

Safety Instructions for Installer & Operator

The following safety instructions must be observed during all phases of operation, installation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the equipment.

Lars Thrane A/S assumes no liability for the customer's failure to comply with these requirements.

Instructions for the Installer

WARNING - Product installation

To ensure correct performance of this equipment, it is strongly recommended that professionals with expertise, properly trained, and likewise authorized within the industry is completing the installation.

WARNING - Turn off power switch

Turn off the *Mains* AC power switch before installing the equipment described in this manual. Do not connect or disconnect equipment when the *Universal Mains* VAC power switch is on.

WARNING - AC Input Power

The input voltage is: 115-240 VAC.

WARNING - Overcurrent protective

Overcurrent protective devices used as safeguard (specific to IEC 62368-1) - Lars Thrane A/S has the responsibility of use of non-IEC approved fuses in the equipment.

WARNING - Explosive atmosphere

Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite hazard.

WARNING - Compass safe distance

The compass safe distance for standard and steering compasses is 0.7 m (2.3 ft) and 0.6 m (2.0 ft) respectively. Observe these distances to prevent interference to a magnetic compass.

Instructions for the Operator

WARNING - Do not disassemble

Do not disassemble or modify this equipment. Fire, electrical shock, or serious injury can result.

WARNING - Keep away from live circuits

Operational personnel must not remove product enclosure. Do not service the equipment with the *Mains* AC connected. Always disconnect and discharge unit, cable and circuits before touching them.

WARNING - Permanent watch

In case of smoke or water leaks into the equipment, immediately turn off the power. Continued use of the equipment can cause fire or electrical shock. Keep access and permanent watch of the equipment in order to prevent any unwanted escalation.

WARNING - Hot Surface

The surface temperature of the product may be hot when the product is turned on and powering other products. Be careful and DO NOT TOUCH the product when in use, risk of burns.

If the safety precautions and warnings on this page are not followed, warranty will be void.

Required information for the reader

Throughout this document, essential information will be presented to the reader. The following text (emphasized) has the following meaning and/or implication:

WARNING: A 'Warning' is an Operation or Service procedure that, if not avoided, may cause a hazard situation, which could result in personnel death or serious injury.

IMPORTANT: Text marked 'Important' provides essential information to the reader and is key information to the user for the equipment to work properly. Damage to the equipment can occur if instructions are not followed.

NOTE: A 'Note' provides essential information to the reader.

About this manual

Intended readers

This is a User & Installation Manual for LT-2500 AC/DC Power Supply. The manual is primarily intended for installers and service personnel.

Personnel installing or servicing the system should be professionals with technical expertise, properly trained, and likewise authorized.

All safety instructions and guidelines in this manual must be observed. The safety instructions are listed in the beginning of the manual. The guidelines are to be found in the separate chapters, where they are needed.

Record of Revisions

Rev.	Description	Release Date	Initials
1.00	Original document.	October 5	PT

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Introduction

Congratulations on your purchase of the LT-2500 AC/DC Power Supply!

The LT-2500 AC/DC Power Supply is a 500 watt power supply from Lars Thrane A/S. The LT-2500 AC/DC Power Supply is designed for the professional market (deep sea, fishing, and workboats) but can be used for the leisure market as well. The LT-2500 AC/DC Power Supply meets all standards and certification requirements needed for worldwide maritime equipment.

Features

- 500 watt AC/DC Power Supply
- Input: 115-240 VAC + 24 VDC (battery)
- Output: 28 VDC (up to 18 A)
- AC On/Off button
- Seamless handover between AC and BATTERY
- LED status indicators: AC IN, DC OUT
- Fuse protection for AC and BATTERY
- No forced cooling required
- AC Alarm discrete output
- Overload protection
- Thermal overload protection
- Short circuit protection
- Reverse polarity protection
- Maritime CE / IEC 60945 Certified

Application and Limitations

- The LT-2500 AC/DC Power Supply shall be installed according to manufacturer's User & Installation Manual

Unpacking (in-the-box)

Unpack the LT-2500 AC/DC Power Supply (Order No.: 90-104581) and check that the following items are present in the box:

- 51-104446 LT-2500 AC/DC Power Supply
- 4 x 25mm Wood Screw Stainless steel A4
- 1 x 91-104868 Fuse AC (10 A) - *spare*
- 2 x 91-104869 Fuse DC (25 A) - *spare*
- 1 x Unit Test Sheet
- 1 x 95-105025 LT-2500 User & Installation Manual

Inspection

Inspect the shipping cartons and/or wooden box immediately upon receipt for evidence of damage during transport. If the shipping material is severely damaged or water stained, request that the carrier's agent is present when opening the cartons and/or wooden box. Save all box packing material for future use.

After unpacking the system and opening the cartons, inspect it thoroughly for hidden damage and loose components or fittings. If the contents are incomplete, if there is mechanical damage or defect, or if the system does not work properly, notify your distributor.

WARNING: To avoid electric shock, do not turn on the LT-2500 AC/DC Power Supply if there is any sign of shipping damage to any part of a unit or the outer cover. Read the Safety Instructions at the front of this manual before installing or operating the system.

Accessories

The following parts are not included in the box and must be ordered separately:

- 91-105026 Cable Strip Interface (incl. 3 x screws)

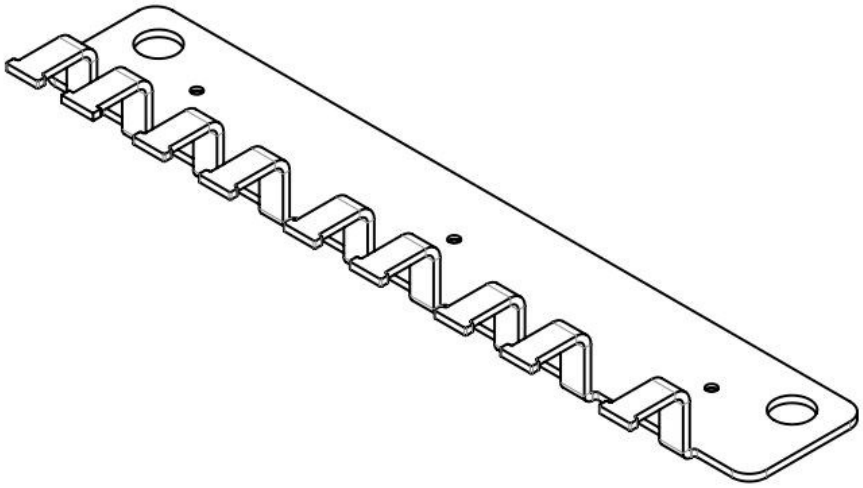

Figure 1: Cable Strip Interface

3 x mounting screws (M3x10 Pozi Flat Countersunk Screw) are delivered together with the cable strip interface.

System Overview

The LT-2500 AC/DC Power Supply is a standalone Power Supply by Lars Thrane A/S. A view of the LT-2500 AC/DC Power Supply is illustrated in Figure 2.

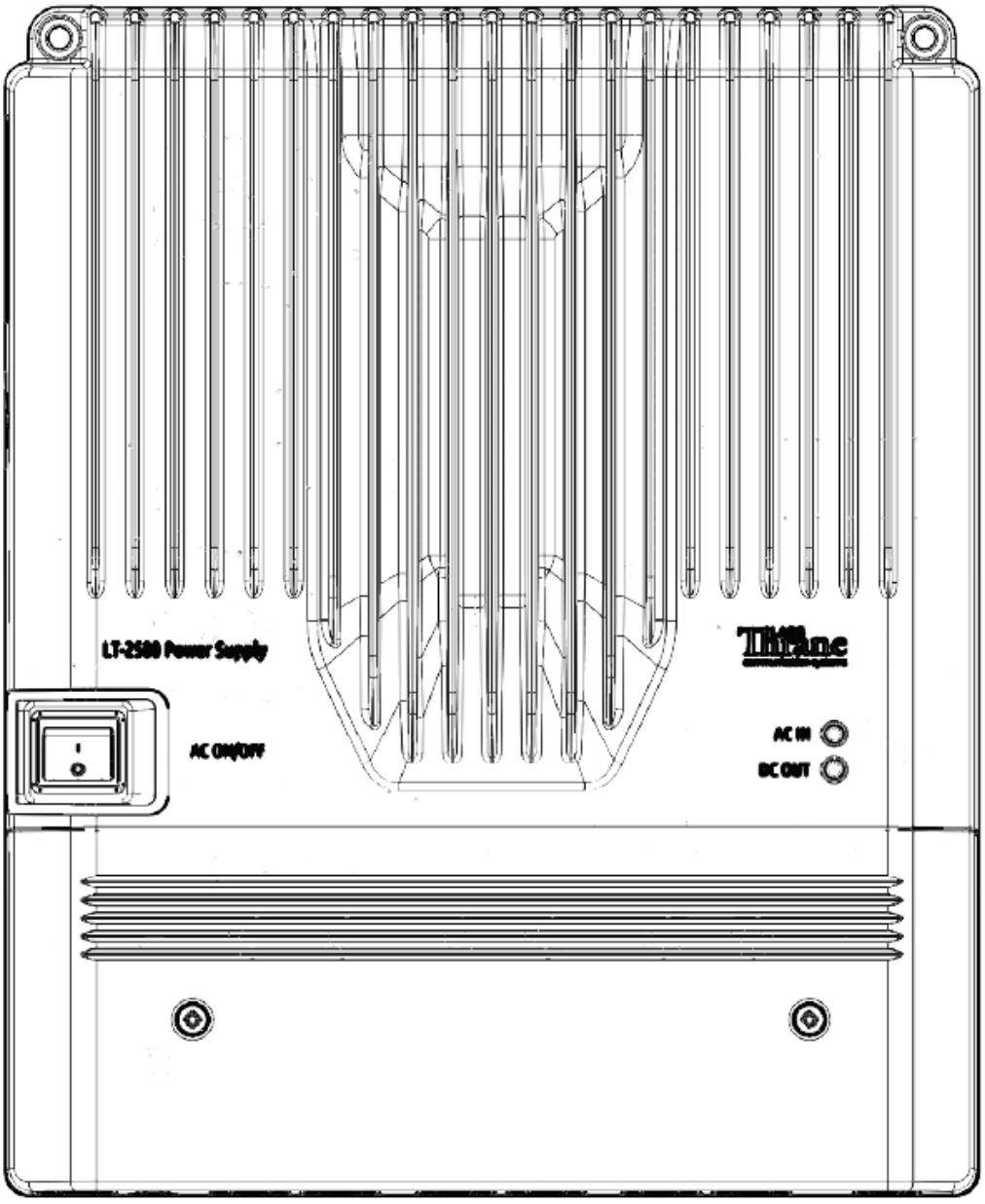

Figure 2: LT-2500 AC/DC Power Supply

Installation and Mounting

The LT-2500 AC/DC Power Supply is designed for indoor use and mounting. See the specifications in *App. A - Specifications* on page 23.

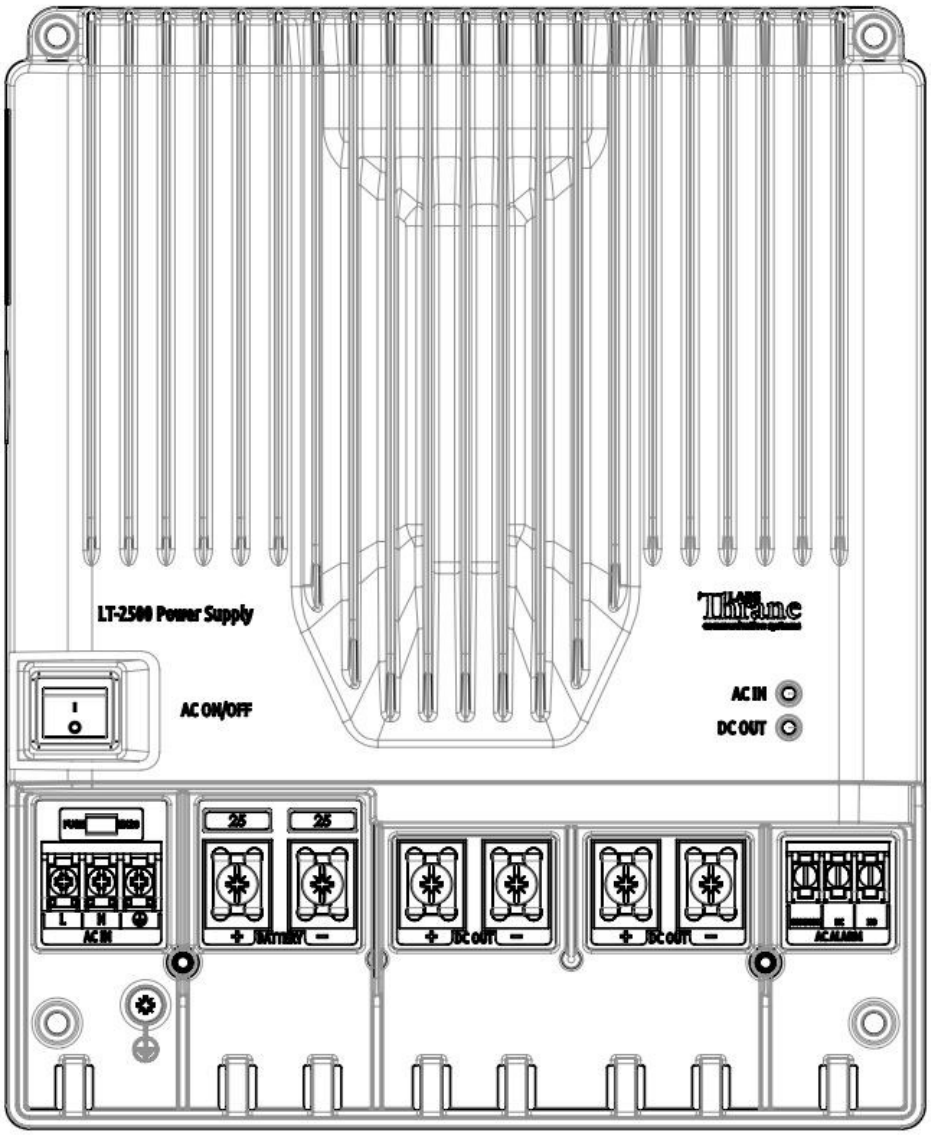

Figure 3: LT-2500 AC/DC Power Supply (without lid)

The LT-2500 AC/DC Power Supply has the following interfaces:

- AC IN (input) L (Live), N (Neutral) and GND
- BATTERY (input) + / –
- DC OUT (output) + / – (parallel output)
- AC ALARM (output) Common, NC (Normal Closed), NO (Normal Open)
- Earth GND Chassis Ground

The interfaces are illustrated in Figure 3 on page 6. The Interfaces are further described in *Interfaces* on page 13.

The LT-2500 AC/DC Power Supply must be fastened using four screws to a rigid structure (e.g. 4 x 25mm wood screws). The Cable Cover Lid must be removed before all 4 mounting holes are accessible. The hole pattern (incl. dimensions) is illustrated in *App. C - Outline Drawing: LT-2500 AC/DC Power Supply (mounting holes)* on page 27.

Before connecting the cables to the input and output interfaces, the Cable Cover Lid must be removed. This is illustrated in *Removing the Cable Cover Lid* on page 8.

Mounting and installation requirements:

For optimum system performance, the following guidelines on where to install and mount the LT-2500 AC/DC Power Supply must be followed. It is recommended to install the unit in a location which fulfills these requirements:

- Mount the unit by fastening the 4 wood screws (or equivalent machine screws)
- Mount the unit indoors (not exposed to direct water)
- Mount the unit on a rigid structure with a minimum of exposure to vibration and shock
- Mount the unit either horizontally (cable facing downwards) or vertically (with the Cable Cover lid facing upwards)
- Mount the unit in an area with an ambient temperature between -25°C to +55°C (-13°F to +131°F)

IMPORTANT: Make sure to install the LT-2500 AC/DC Power Supply in accordance with all installation guidance and requirements listed in this User & Installation Manual.

Removing the Cable Cover Lid

The Cable Cover Lid must be removed before the cables can be attached to the connectors. *Figure 4* and *Figure 5* illustrate the Cable Cover Lid mounted and removed.

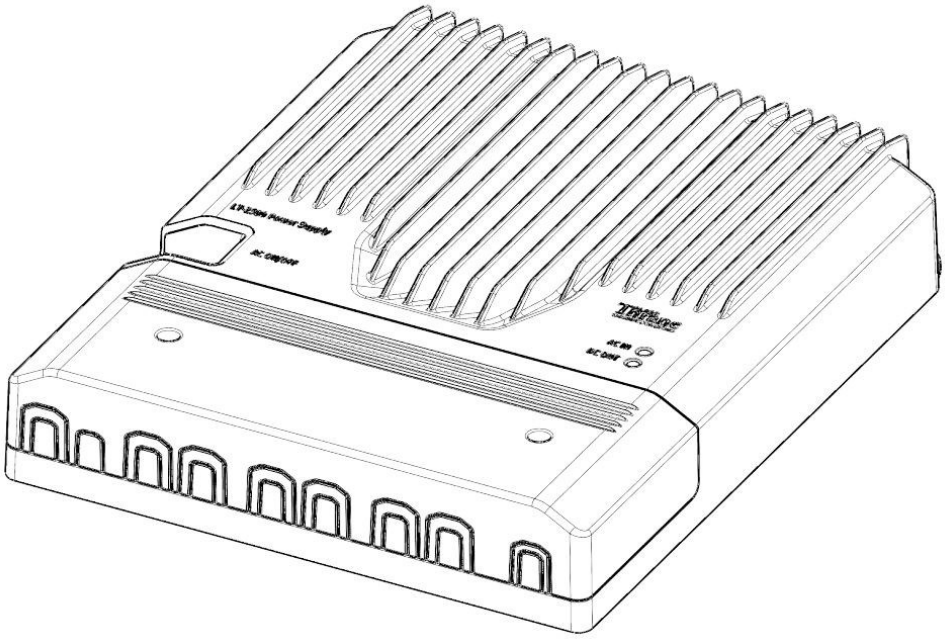

Figure 4: Cabler Cover Lid mounted

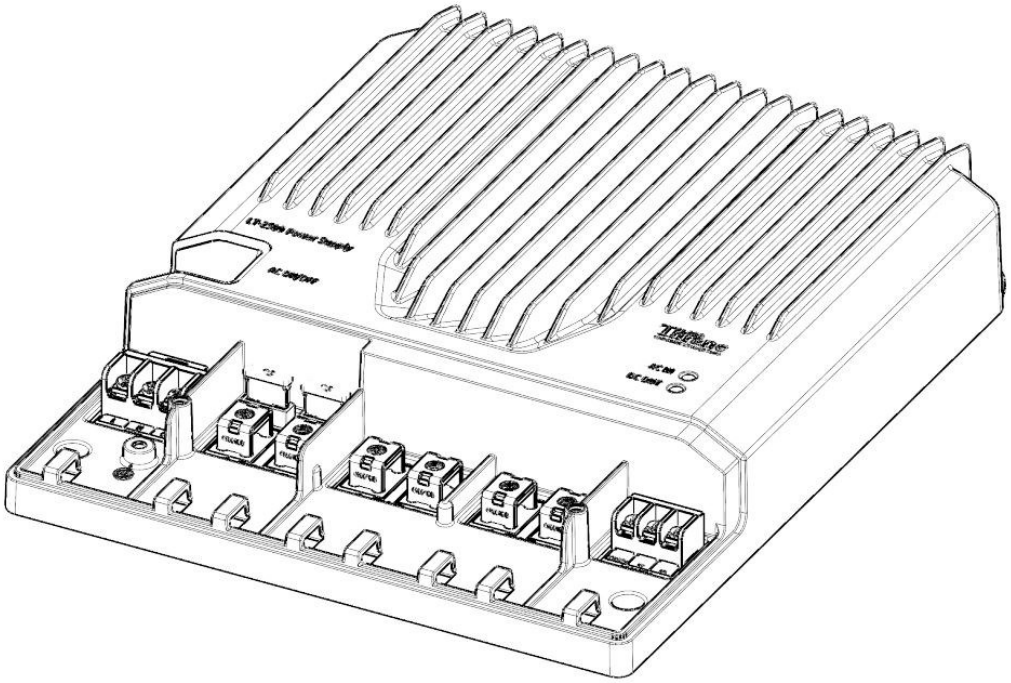

Figure 5: Cable Cover Lid removed

The Cable Cover Lid must be removed using a screwdriver with pozidriv or Philips. After connecting the cables, it is important to mount the Cable Cover Lid before external *Mains* AC voltage (115 - 240 VAC) is applied to the power supply.

Fasten the cables

Figure 6 below illustrates the LT-2500 AC/DC Power Supply with the Cable Cover Lid removed and cables fastened to the connector blocks using cable lugs. Also, the cables have been fixed to the mechanics of the power supply using a cable strip. The Cable Cover Lid mounted is illustrated in *Figure 7*.

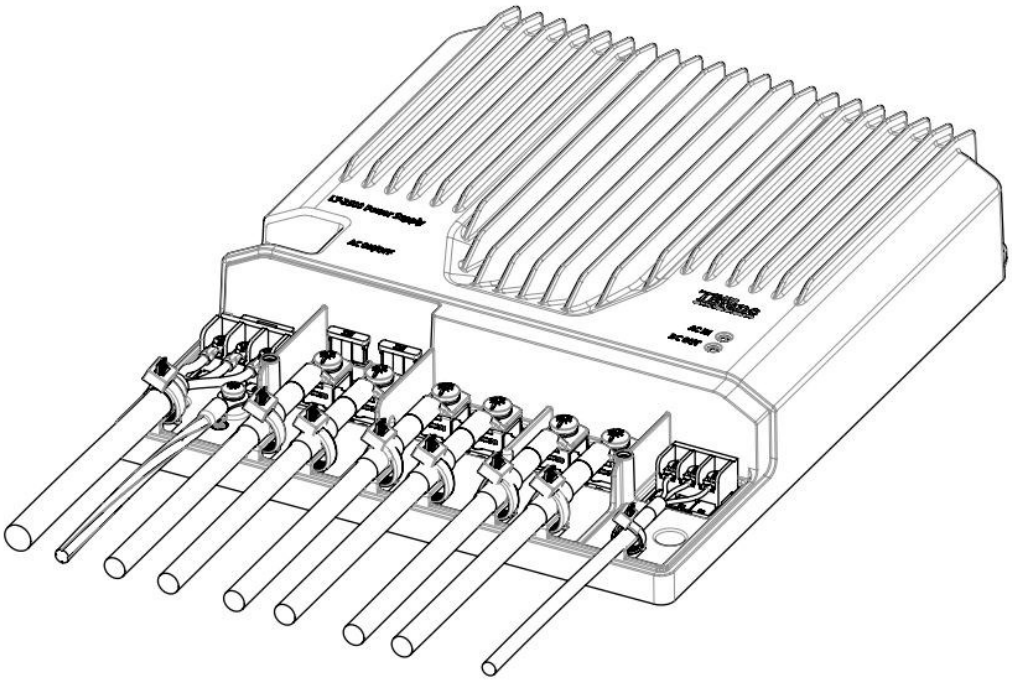

Figure 6: Fasten the cables

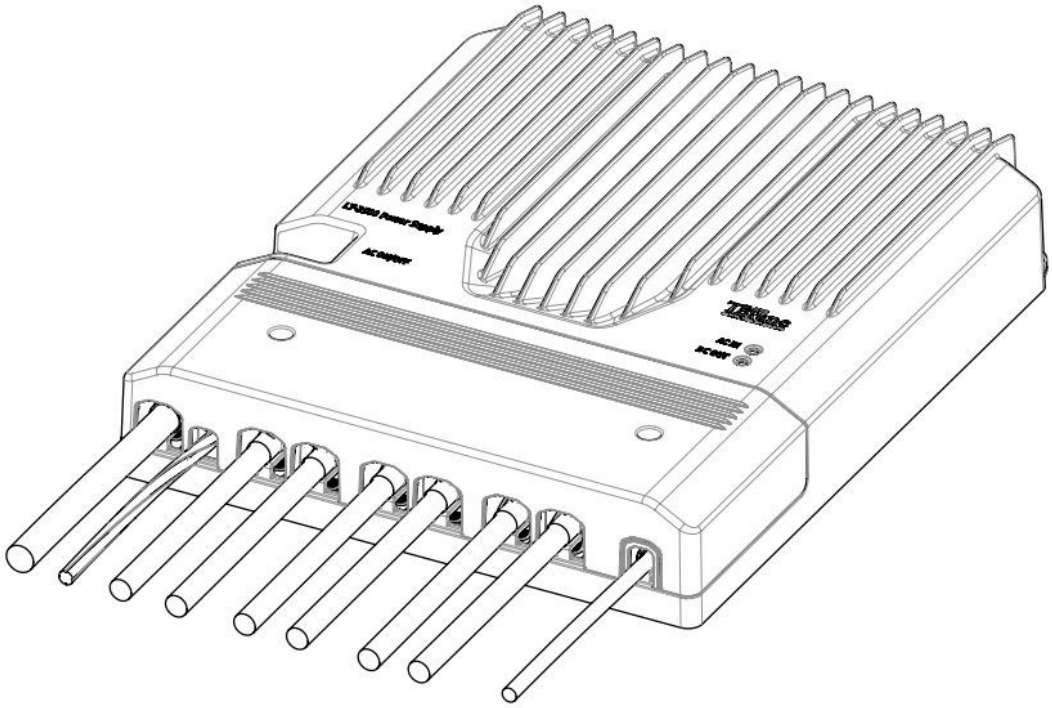

Figure 7: Fasten the cables

If it is necessary to secure the cables even better, it is possible to mount the 91-105026 Cable Strip Interface. The mounting of the Cable Strip Interface is illustrated in *Mounting the Cable Strip Interface* on page 12.

IMPORTANT: The Cable Cover Lid is designed so that it is possible to break off only the required pieces of plastic (2 options) to run through the cable and nothing else. Especially for the AC conducting cables, it is important to break off only the plastic parts required to limit any additional space for penetrating parts. This is to avoid any hazards in relation to the 115 to 240 VAC conductive cables and connectors.

Mounting the Cable Strip Interface

The mounting of the Cable Strip Interface is illustrated in *Figure 8* and *Figure 9*. 3 x M3x10 Pozi Flat Countersunk Screw DIN 965A must be used (provided with the Cable Strip interface).

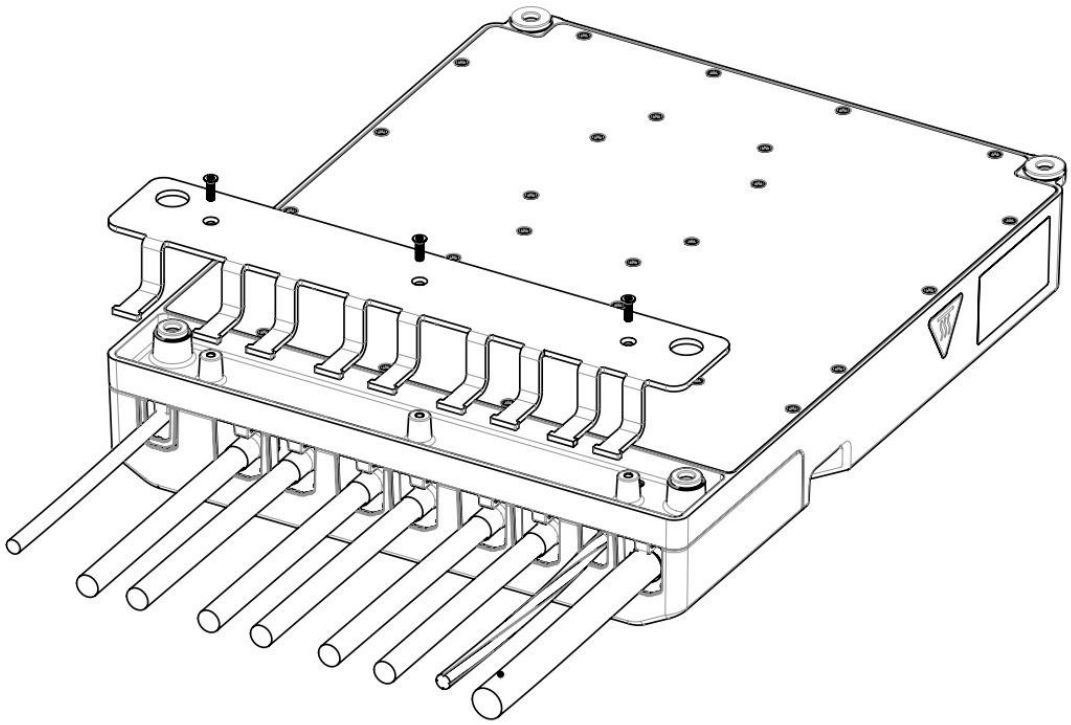

Figure 8: Mounting the Cable Strip Interface

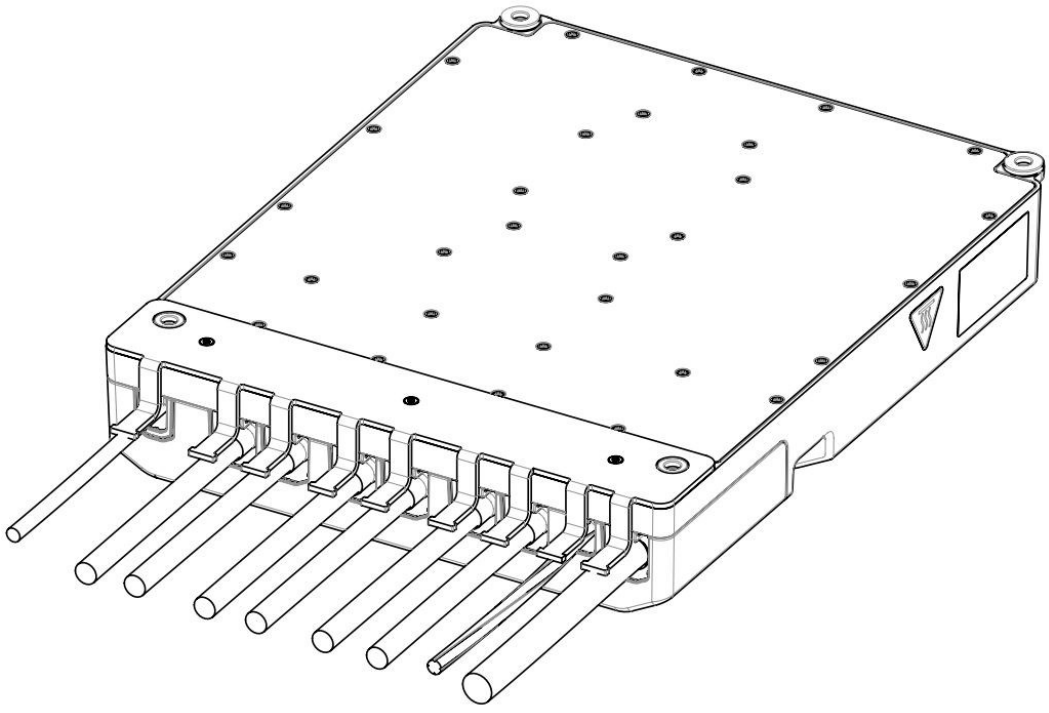

Figure 9: Mounting the Cable Strip Interface

Interfaces (wiring)

In this section we will describe and emphasize all relevant information related to the interfaces of this power supply that the professional and technical skilled person must be aware of to install the product safely and in accordingly with the standards and specifications.

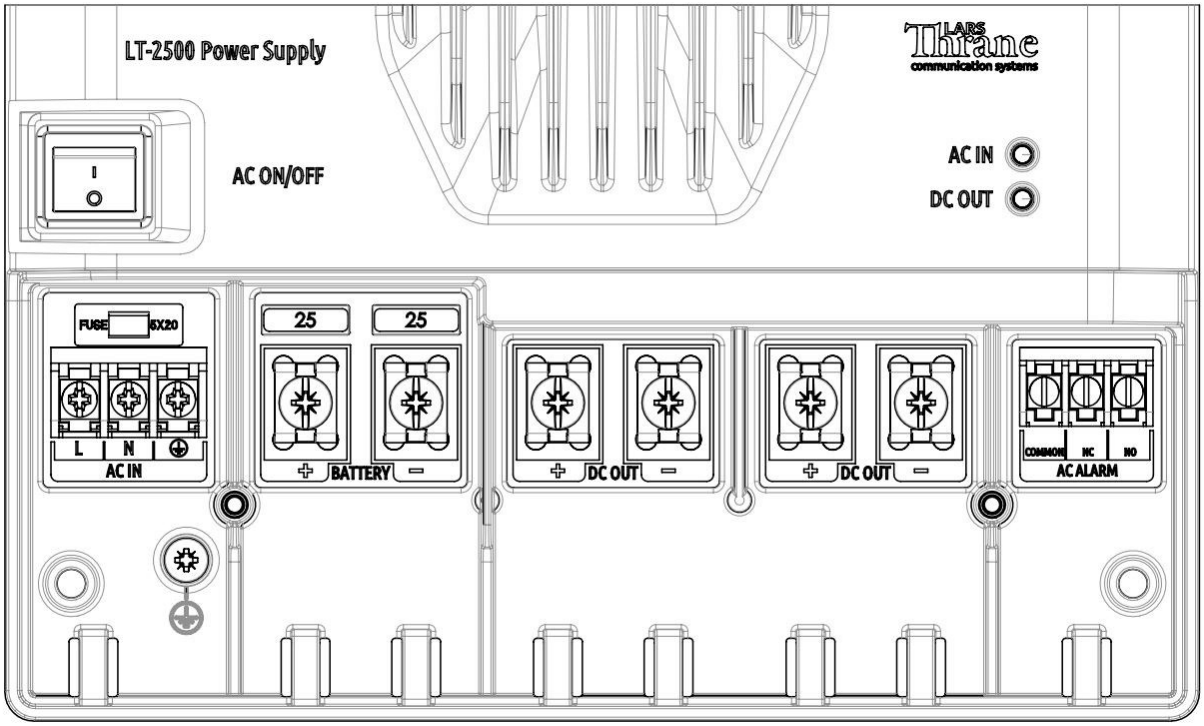

Figure 10: Interfaces (wiring, button, and LED)

The following interfaces will be described in further details in this section:

- AC IN (Input)
- BATTERY (Input)
- DC OUT (Output)
- AC ALARM (Output)
- GNDC (Chassis Ground)

In section *Interfaces (human)* on page 18, the human interfaces are explained in further details:

- AC ON/OFF button
- AC IN & DC OUT LED Status

AC IN (input)

The AC IN interface consists of the connector block illustrated in *Figure 11*.

The AC IN interface is the primary input power interface for the power supply. The AC/DC converter will transform the *Mains* AC to DC power under normal operation conditions.

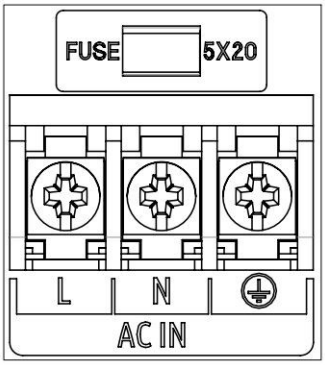

Figure 11: AC IN Connector Block

L (Line) is the live wire carrying voltage from the power source, N (Neutral) is the return path to complete the circuit, and GND (Ground) is the safety ground wire connected to the earth and the device's chassis to prevent electric shock.

The power supply AC IN interface has the following specifications:

- Input Voltage: 115-240 VAC
- Input Frequency: 47-63 Hz
- Input Current: 5.2A @115 VAC, 2.8A @240 VAC

It is recommended to mount the cables with either spikes or cable lugs. The maximum AC wire cross section is 2.5 mm^2. Use a screwdriver with pozidriv or Philips.

The AC IN interface is protected by a cartridge fuse 250V 5X20mm 10A (Type: F10AL250V P).

Mfr.: Littlefuse, Mfr. P/N: 0617010.MXP

WARNING: During installation of the LT-2500 AC/DC Power Supply and when connecting the AC cables from the *Mains* AC power source, it is important that this external power source is turned off and that the AC ON/OFF button is in the off position ‘0’.

BATTERY (input)

The Battery interface consists of the connector block illustrated in *Figure 12*.

The BATTERY interface is the secondary input power interface for the power supply. If the AC IN interface loses power, the built-in relay will seamlessly change to the BATTERY interface to be able to continue delivering of power on the DC OUT interface. This change from AC IN to BATTERY will happen seamlessly - the DC OUT interface will not drop in either power or voltage.

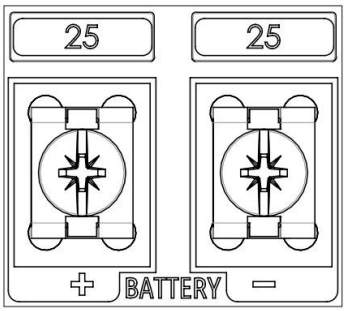

Figure 12: Battery Connector Block

The power supply BATTERY interface has the following specifications:

- Input Voltage: 24 VDC

It is recommended to mount the cables with either spikes or cable lugs. The maximum DC wire cross section is 50 mm^2. Use a screwdriver with pozidriv (PZ2) or Philips.

Screw used for this terminal: M6x10 BN1435 (maximum torque: 20 lbtf. In. / 2.3 Nm.).

The BATTERY interface is protected by 2 x Fuse Auto 25A 32VDC Blade.

Mfr.: Littlefuse, Mfr. P/N: 0287025.PXCN.

NOTE: The DC OUT will not be a 'regulated' output when the power source is coming from the BATTERY input.

DC OUT (output)

The DC OUT interface consists of two connector blocks as illustrated in *Figure 13*.

The DC OUT interface is the output power interface from the power supply. The DC OUT interface will under normal operating conditions receive its power from the AC/DC converter, if the AC power source is available. Otherwise, the DC OUT interface will receive its power from the BATTERY interface. Only when the power comes from the AC/DC converter, the power output is 28 VDC (regulated).

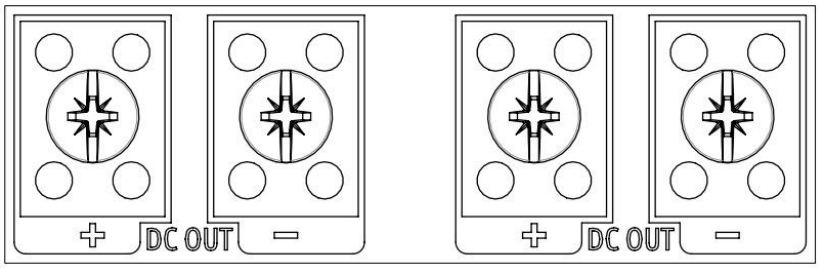

Figure 13: DC OUT Connector Blocks

The power supply DC OUT interface has the following specifications:

- Output Voltage: 28 VDC
- Output Current: 18 A

It is recommended to mount the cables with either spikes or cable lugs. The maximum DC wire cross section is 50 mm^2. Use a screwdriver with pozidriv (PZ2) or Philips.

Screw used for this terminal: M6x10 BN1435 (maximum torque: 20 lbtf. In. / 2.3 Nm.).

NOTE: The power supply can deliver up to 500 watt continuous power on the two DC OUT interfaces (connected in parallel).

AC Alarm (output)

The AC ALARM interface consists of the connector block as illustrated in *Figure 14*.

The AC ALARM has the following connections: Common, Normal Closed (NC), and Normal Open (NO). Common should be connected to NC under normal operation conditions.

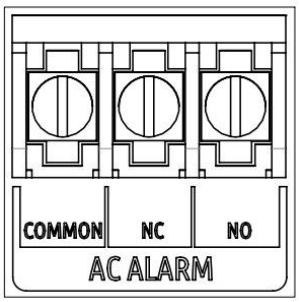

Figure 14: AC ALARM connector block

The purpose of the AC ALARM is to signal (discrete) when the AC IN power is not available to the power supply. The Relay diagram is illustrated *Figure 15*.

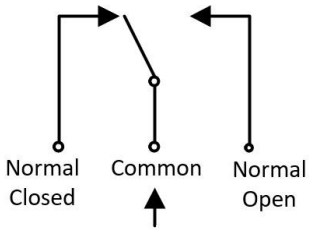

Figure 15: Relay Diagram

Relay Specifications:

- Load: 28V / 6A
- COMMON, NO, NC isolation to DC in/out > 1000 VAC
- COMMON, NO, NC isolation to AC in > 3000 VAC
- Galvanic isolated AC ALARM output

It is recommended to mount the cables with either spikes or cable lugs. The maximum wire cross section is 2.5 mm^2. Use a screwdriver with pozidriv or Philips.

GNDC (Chassis Ground)

The power supply Ground is located close to the AC IN interface, see *Figure 3*. The chassis connector must be connected to Vessel Chassis Ground (GNDC). Use a screwdriver with pozidriv or Philips.

Figure 16: Chassis Ground (GNDC)

Interfaces (human)

AC ON/OFF button

The AC ON/OFF button is illustrated in *Figure 17* below.

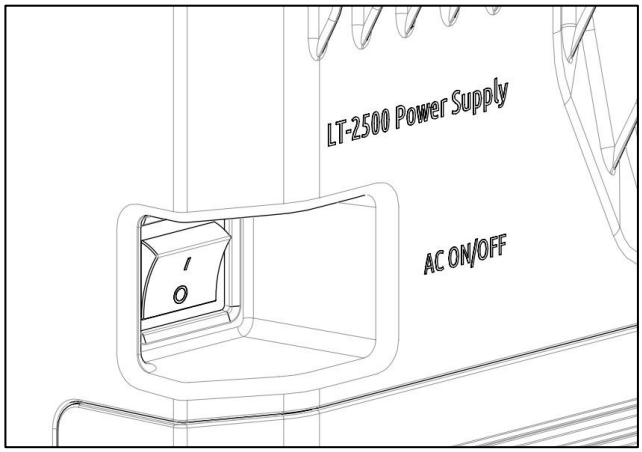

Figure 17: AC ON/OFF Button

The AC ON/OFF button is located on the left side of the LT-2500 AC/DC Power Supply and red colored. The OFF position is marked with the symbol '0'. The ON position is marked with the symbol '1'.

If the button is set in the OFF position, then AC IN is disconnected from the power supply and the AC/DC converter is not operational. In this situation, DC OUT is only available if BATTERY is connected to the power supply. If DC OUT is supplied from the BATTERY, then DC OUT will be equal to the BATTERY voltage level (not regulated).

If the button is set in the ON position, then AC IN is supplied to the AC/DC converter and the power supply should be normal operating and provide DC OUT of nominal 28 VDC (regulated).

NOTE: Under normal operation the AC ON/OFF button should always be configured in the ON position.

AC IN & DC OUT LED Status

The AC IN & DC OUT LEDs are illustrated in *Figure 18* below.

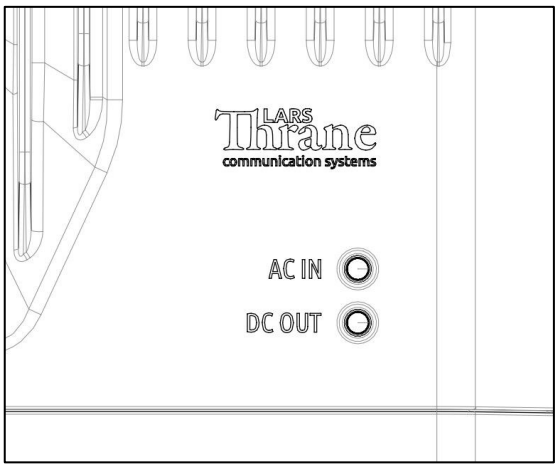

Figure 18: AC IN & DC OUT LEDs

The AC IN & DC OUT LEDs are located on the right side of the LT-2500 AC/DC Power Supply. Both LEDs can only light with a green color. A detailed description and status of the LEDs can be found in *Table 1* below. This table reflects the scenario where the LEDs are fully functional and AC and DC fuses are not damaged. AC Mains and BATTERY as indicated in the columns.

AC IN & DC OUT LED Status						
LED Light		AC IN	Battery	AC ON/OFF button	Description	Problem
AC IN	DC OUT					
●	●	√	√	ON	All good. DC OUT supplied from AC IN.	
○	●	√	√		AC/DC converter not working. DC OUT supplied from BATTERY.	Power supply must be checked.
○	●	√	√	OFF	All good. DC OUT supplied from BATTERY. AC ON/OFF button must be swiched on for normal operation.	

AC IN & DC OUT LED Status (AC IN only)						
LED Light		AC IN	Battery	AC ON/OFF button	Description	Problem
AC IN	DC OUT					
●	●	√		ON	All good. DC OUT Supplied from AC IN.	
○	○	√			AC/DC converter is not working.	Power supply must be checked.
○	○	√		OFF	All good. No DC OUT. AC ON/OFF button must be swithed on for DC OUT.	

Table 1: AC IN & DC OUT LED Status

NOTE: The seamless switching from AC IN to Battery can be tested by toggling the AC ON/OFF button from on to off. The AC IN LED light will turn off. The DC OUT LED light must stay on, if Battery is connected and the built-in relay is working properly.

Wiring Diagram

The purpose of this section is to make a simple illustration overview of the power supply and its interfaces to other equipment onboard the vessel. The details of each interface must be found in *Interfaces (wiring)* on page 13.

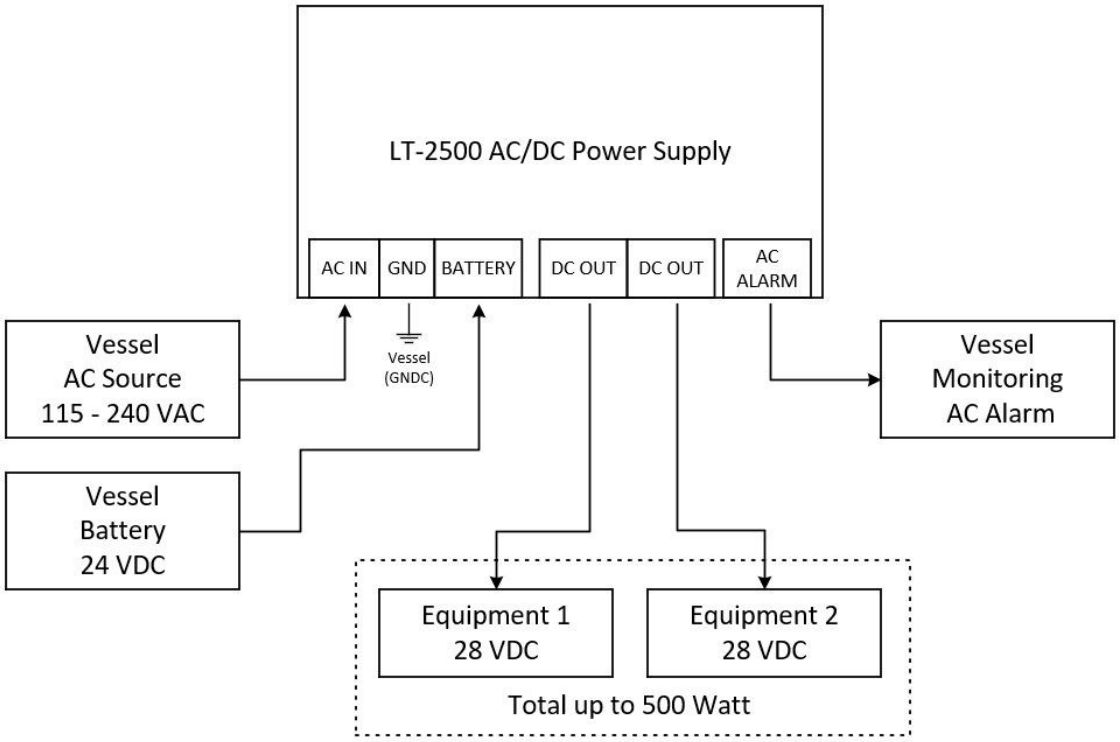

Figure 19: Wiring Diagram (example)

The LT-2500 AC/DC Power Supply can deliver up to 500 Watt (28 VDC / 18 A) combined on the two DC OUT interfaces. If equipment is only connected to one DC Out interface, then this interface can deliver up to 500 Watt.

If the LT-2500 AC/DC Power Supply is used for powering GMDSS or other critical equipment onboard the vessel, then it is important to connect batteries to the power supply in case the *Mains* AC power source is not available in critical situations.

The LT-2500 AC/DC Power Supply will switch from AC IN to BATTERY automatically, if the AC IN disappears (hot-swap).

Protection & Safety Mechanism

The LT-2500 AC/DC Power Supply is designed, tested, and certified to deliver 500 watt continuous power on the DC OUT interfaces within the specifications listed in this User & Installation Manual (e.g. environmental).

The LT-2500 AC/DC Power Supply is overload, current limited, reverse polarity, short circuit, and overvoltage protected.

In case of exceeding high temperature operation, the power supply has a thermal shutdown protection. Normal operation will continue after a cool down period.

Troubleshooting

In case the LT-2500 AC/DC Power Supply is not working as expected (e.g. there is no output power on the DC OUT interface), then check the following bullets below:

- ➔ Check that the power supply has *Mains* 115 -240 VAC available on the AC IN
- ➔ Check that the AC ON/OFF button is turned on
- ➔ Check that the AC Fuse (AC IN) has not blown
- ➔ Check that both LEDs AC IN and DC OUT is lit (green coloured)
- ➔ Check that both DC Fuses (BATTERY) have not blown
- ➔ Check that the power supply has 28 VDC available on DC OUT (no load)

- ➔ If BATTERY is connected:
  - Check that the power supply has 24 VDC available on the BATTERY
  - If the AC ON/OFF button is turned off, the DC OUT must still provide 24 VDC (from BATTERY)
  - LED AC IN and DC OUT must remain lit (green coloured)
  - Check that the power supply has 24 VDC available on DC OUT (no load)

- ➔ If BATTERY is <u>not</u> connected:
  - If the AC ON/OFF button is turned off, the DC OUT must be 0 VDC
  - LED AC IN remain lit (green coloured)
  - LED DC OUT should be off

NOTE: If it is not possible to identify the problem with the LT-2500 AC/DC Power Supply then please contact the distribution partner or dealer from where you have purchased the product. They will contact our support for remote assistance and/or create the Return Merchandise Authorization (RMA). It is important to receive a detailed error description and provide the serial number of the specific product.

Appendixes

App. A - Specifications

LT-2500 AC/DC Power Supply

Certification & standards	Maritime CE, IEC 60945
Vibration, operational	IEC 60945
Vibration, shock	IEC 60945
Power output: Operating mode, max	500 W (28VDC / 18A)
Weight	3.90 kg (8.60 lbs)
Dimensions	329.4 x 270.0 x 64.5 mm (12.97 x 10.63 x 2.54 in)
Temperature, operational	-25°C to +55°C (-13°F to +131°F)
IP rating, dust and water	IPX0
Interfaces	AC IN, GNDC, BATTERY, 2 x DC OUT, AC ALARM
Compass Safe Distance, std	0.7 m (2.3 ft)
Compass Safe Distance, steer	0.6 m (2.0 ft)
Warranty	2 years
Maintenance	None

App. B - Outline Drawing: LT-2500 AC/DC Power Supply

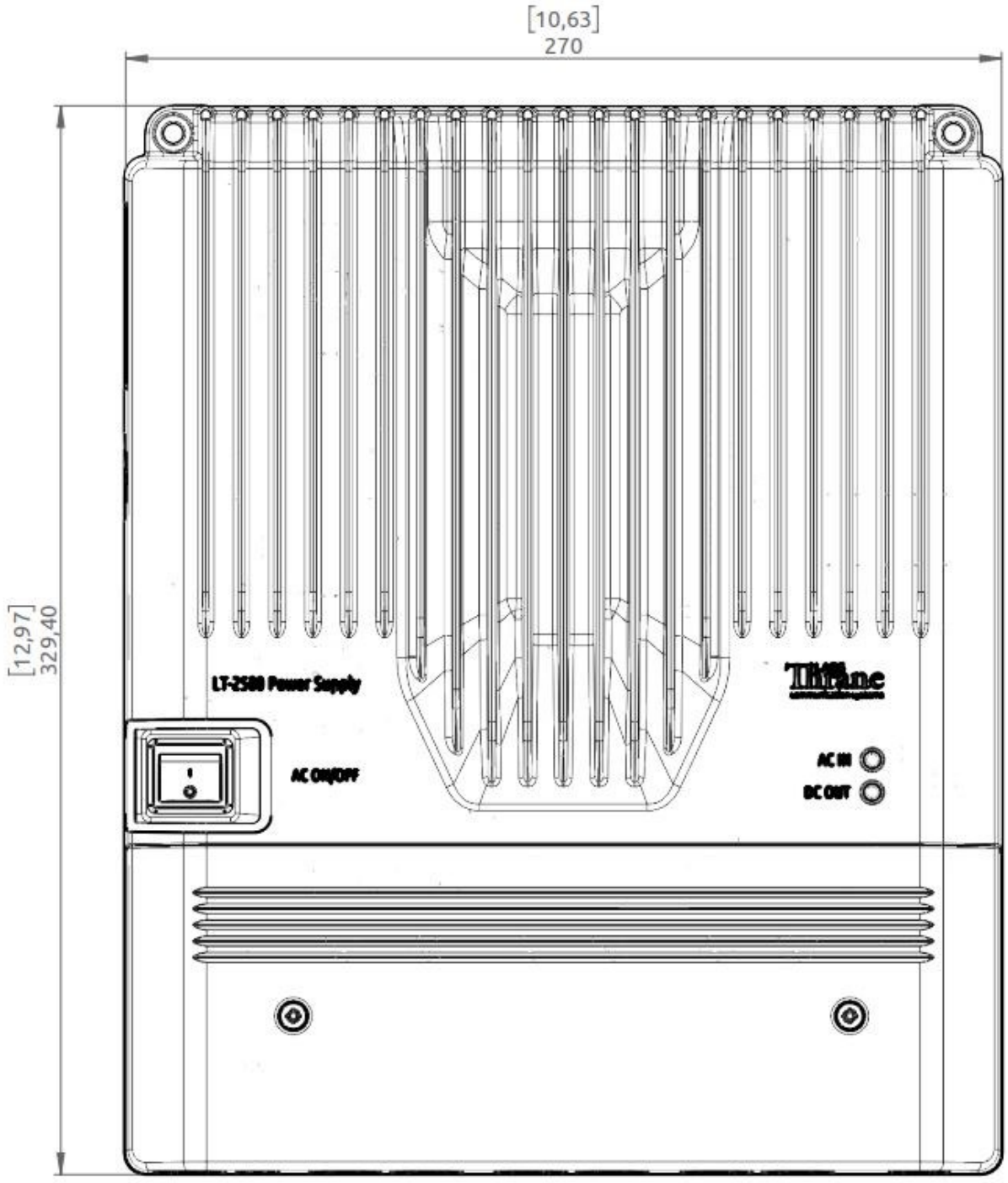

Figure 20: LT-2500 AC/DC Power Supply Outline Drawing

App. B - Outline Drawing: LT-2500 AC/DC Power Supply (continued)

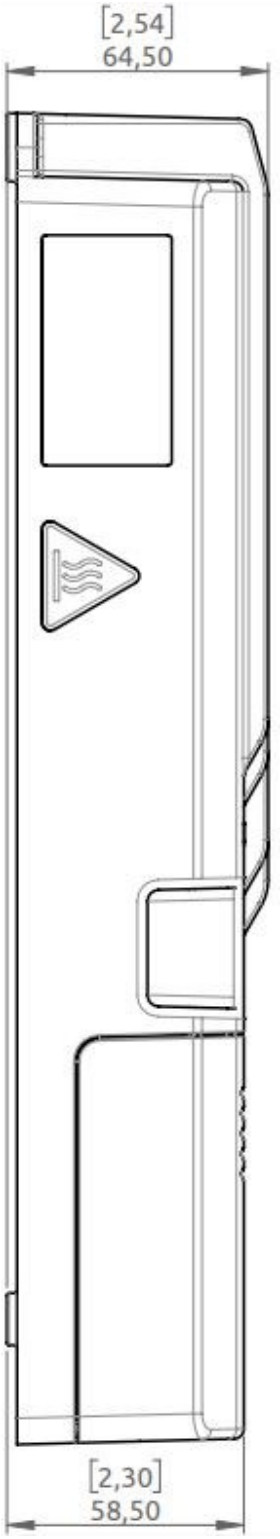

Figure 21: LT-2500 AC/DC Power Supply Outline Drawing

App. B - Outline Drawing: LT-2500 AC/DC Power Supply (continued)

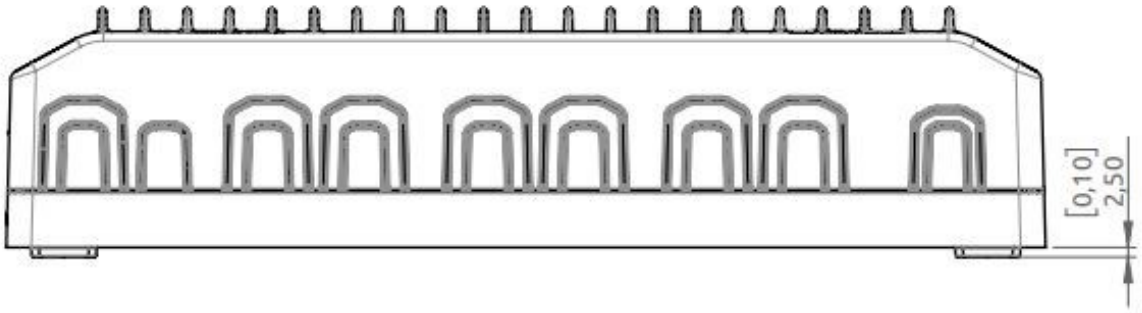

Figure 22: LT-2500 AC/DC Power Supply Outline Drawing

App. C - Outline Drawing: LT-2500 AC/DC Power Supply (mounting holes)

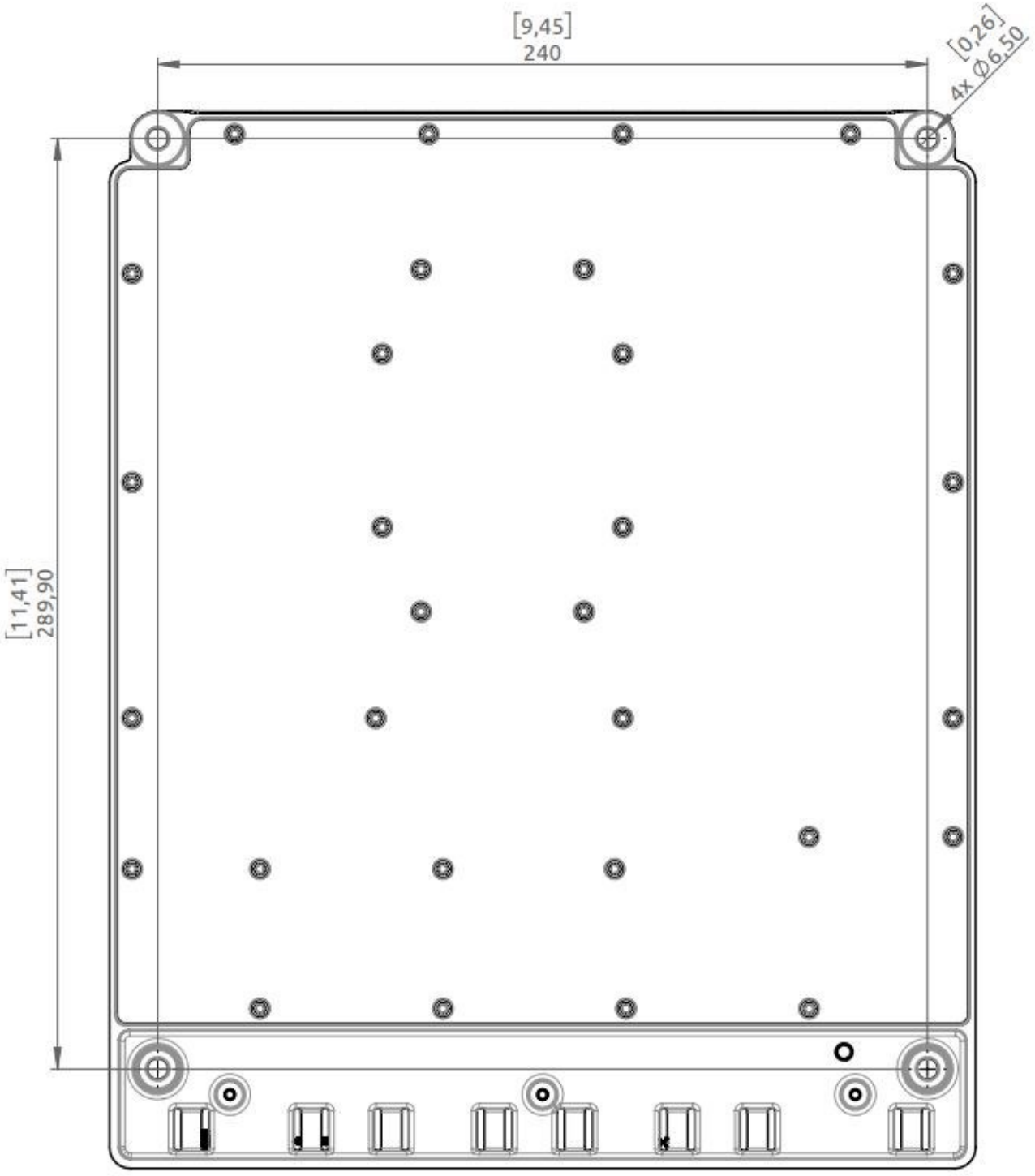

Figure 23: LT-2500 AC/DC Power Supply (mounting holes)

App. D - Outline Drawing: Cable Strip Interface

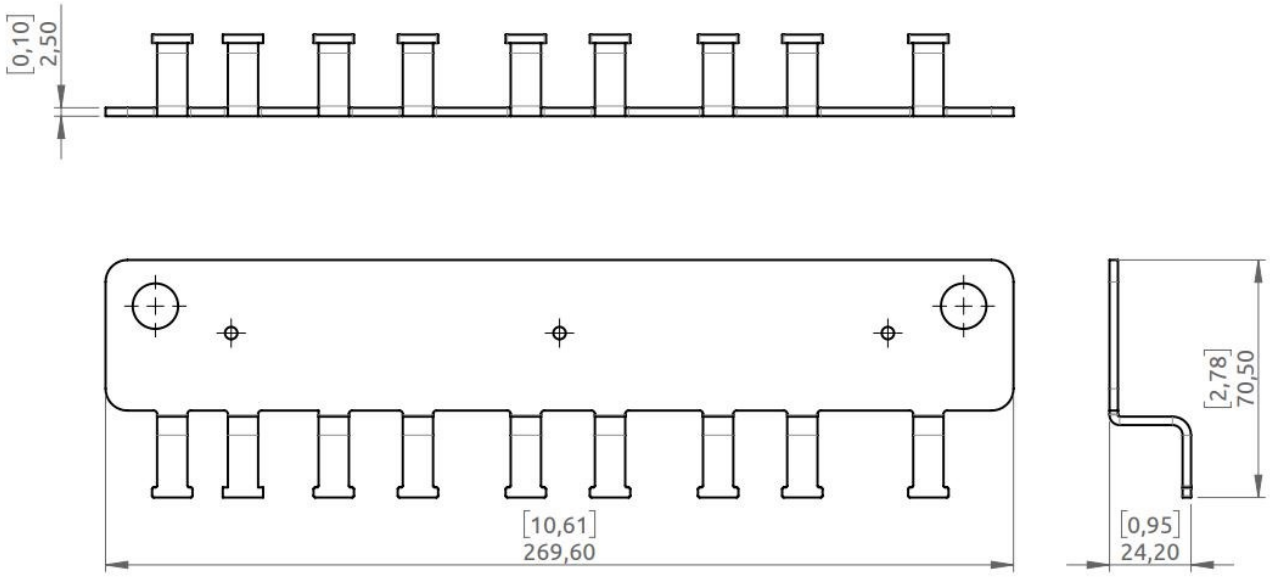

Figure 24: Cable Strip Interface

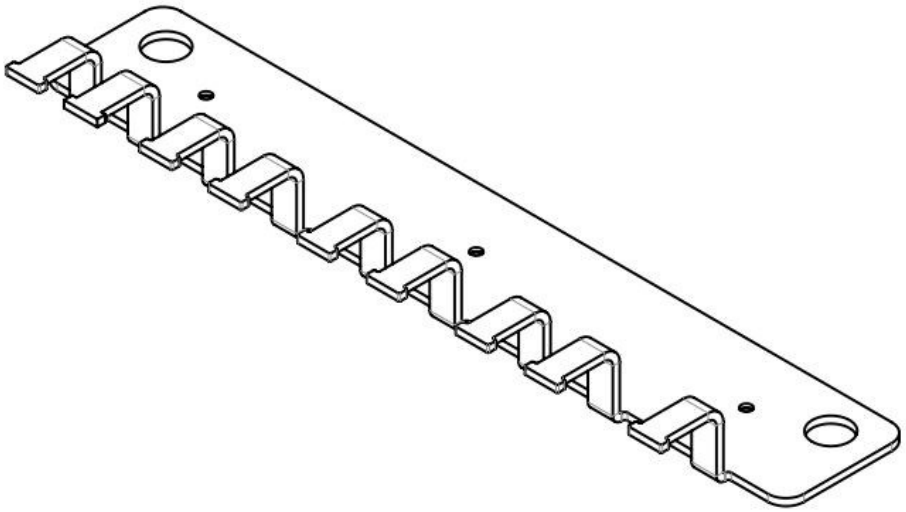

Figure 25: Cable Strip Interface

Lars Thrane A/S

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