

PSH150

10kV Isolation Programmable Power Supply

User Manual



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1 Product description

⚠ Use latest device Documentation, Software and Firmware to ensure reliable operation of the system (downloadable from www.nextys.com).

PSH150 is an advanced DIN rail 1-phase input, 150W SMPS (Switched Mode Power Supply) with a distinctive feature: **10kV isolation between primary and secondary.**

This allows it to be used in energy management, telecom, renewable energy and other demanding applications.

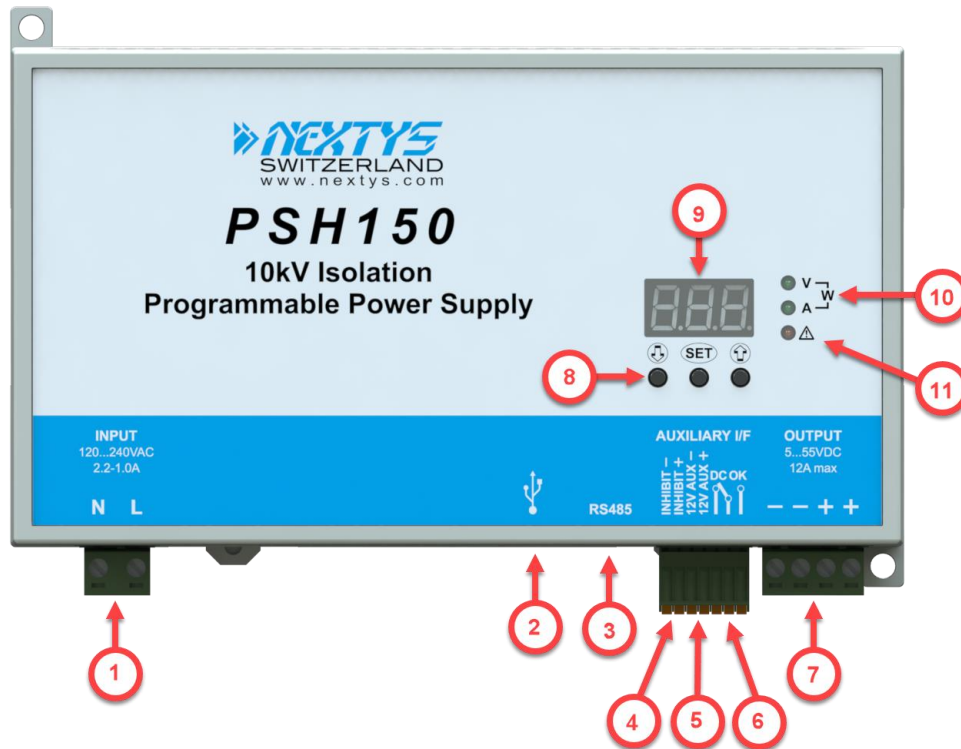


Figure 1: Front panel view

1. **AC input:** 2 poles are provided for input connection. This must be connected to the AC or DC line source. Voltage range is 90...277Vac or 110...400Vdc.
2. **Modbus over USB:** Used to connect a device running **POWERMASTER** or custom application. Firmware update is also possible.
3. **Modbus over RS-485:** Used to connect a device running **POWERMASTER** or custom application. Firmware update is also possible.
4. **INHIBIT input:** A voltage between 5Vdc and 30Vdc applied to this input activates the inhibit function (§3.3).
5. **Auxiliary 12Vdc output:** This output provides a regulated 12Vdc output with 100mA maximum output current. This output is short circuit protected (§3.2).
6. **DC-OK dry contact:** normally open and normally closed relay contacts are available; the relay closes when the output voltage is >90% of the programmed output voltage value.
7. **DC Output:** 4 poles are provided for output connection; it must be connected to the load. The output voltage is adjustable between 5...55Vdc. (§3.1)
8. **Control keys:** 3 push buttons are provided to navigate through menus and to select various functions.
9. **Display:** 3-digits LED display providing information about the device status (§3.4).
10. **Units LEDs:** 2 green LEDs are used to indicate the actual measurement indicated on the display (§3.4.1).
11. **Alarm LED:** blinking when there is an alarm; the relevant alarm code is indicated on the display (§3.4.3).

2 Features and benefits

- Class II wiring (PE connection not required)
- 10kVac primary to secondary isolation (suitable for energy management applications)
- Wide output voltage range 5...55Vdc, user settable
- Auxiliary 12V/100mA power supply
- High efficiency and compact size
- Remote ON/OFF or other remote control functions possible through INHIBIT input
- Modbus over RS-485 or USB interfaces for control and monitoring
- Multiple protections
- Can be paralleled for power or redundancy (integrated ORing circuitry)
- Can be used as battery charger
- Up to 50°C operating temperature with no derating
- Wall mount fixing possible
- Suitable for **POWERMASTER** software (available for Windows and Android)

Embedded user interface:

- 3 keys and 3 digits 7-segments LED display
- Allows online device configuration
- Displays the PSH150 status and alarms

Free PC and Android application **POWERMASTER** used for:

- Connection through Modbus
- Remote monitoring and configuration
- Firmware upgrade
- Same functionalities of the embedded used interface with the ease of the PC benefits

3 Functional description

PSH150 includes a 1 phase SMPS module with PFC and class II wiring. A converter located on the secondary side allows the supply of a programmable voltage (5 to 55V), with user settable current limitation. The output is provided with an active ORing circuit that allows the parallel connection for redundancy of several units without the need of an external redundancy module.

An auxiliary power supply of 12V/100mA is available.

An external INHIBIT signal can be applied for controlling the output status.

A multifunctional display shows the output parameters and 3 keys can be used for programming the unit. A dry contact (relay) is related to “DC-OK” status.

RS485 and USB ports are available for remote monitoring and setup.

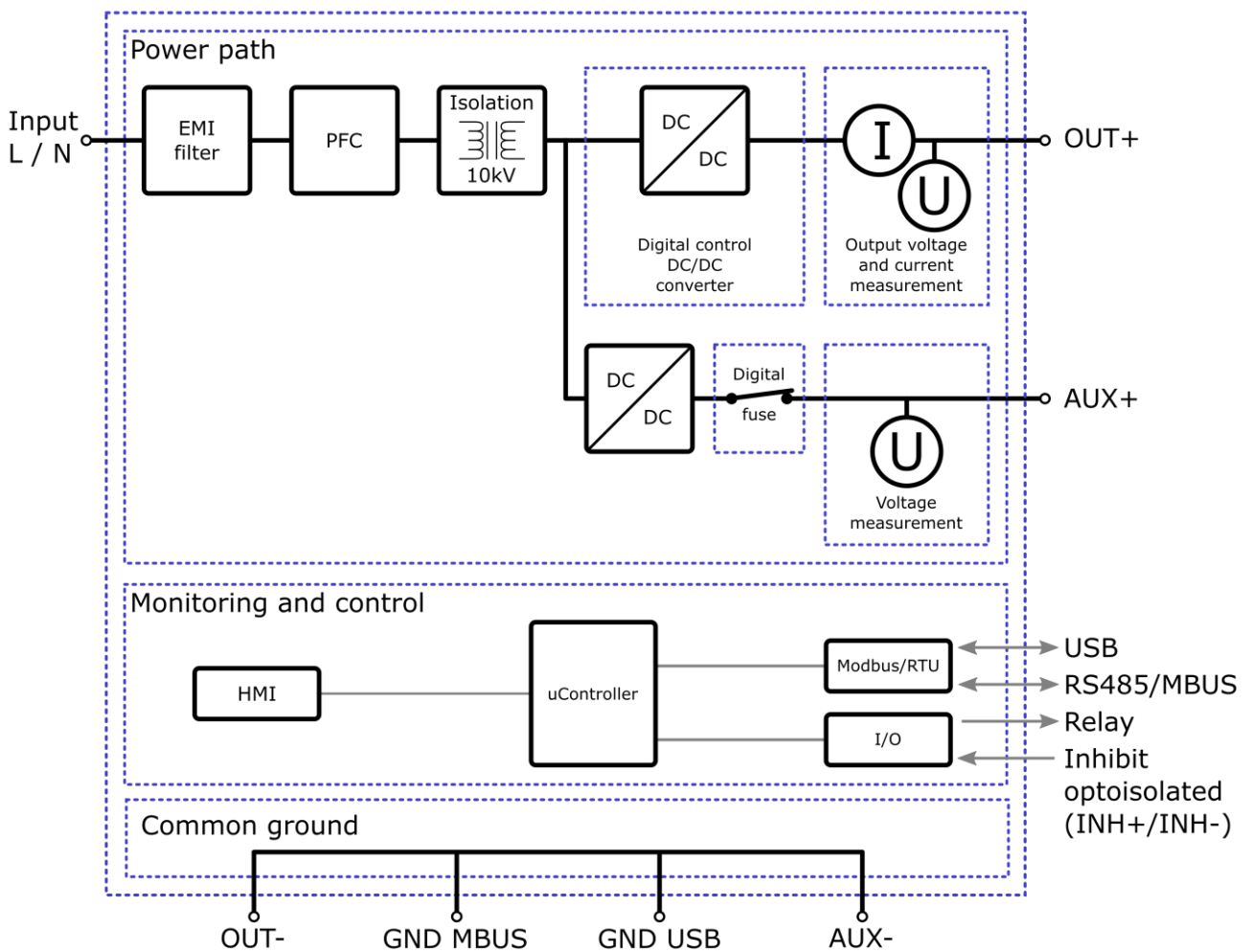


Figure 2: PSH150 simplified block diagram

3.1 Main DC output

PSH150 provides a DC output programmable from 5Vdc to 55Vdc with up to 12A output current and a maximum output power of 150W. The maximum output current varies according to the programmed output voltage and to the ambient temperature; in Figure 3 and Figure 4 the current and power derating curves are reported.

The user can limit the maximum current furthermore using the maximum output current setting.

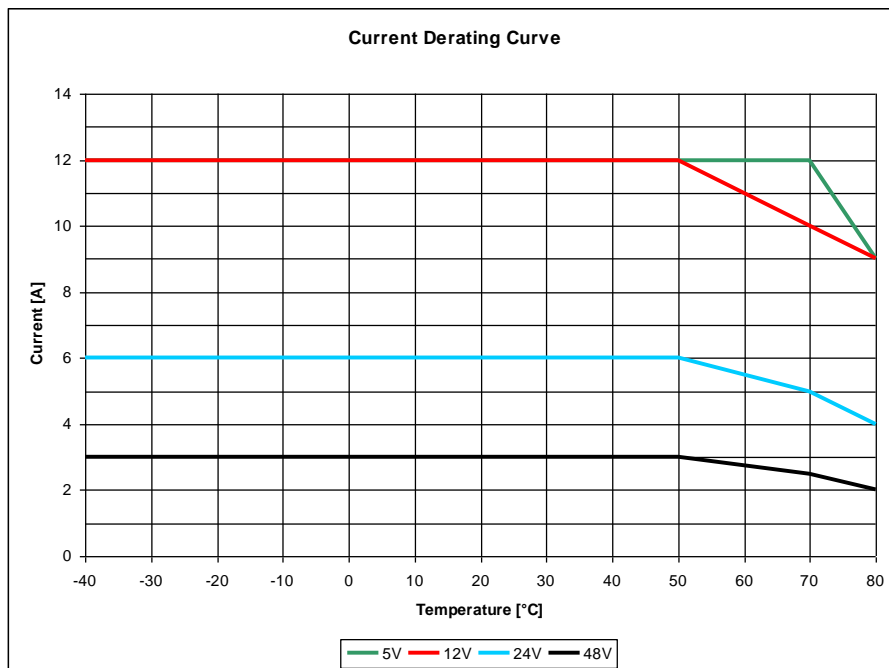


Figure 3: PSH150 current derating curves

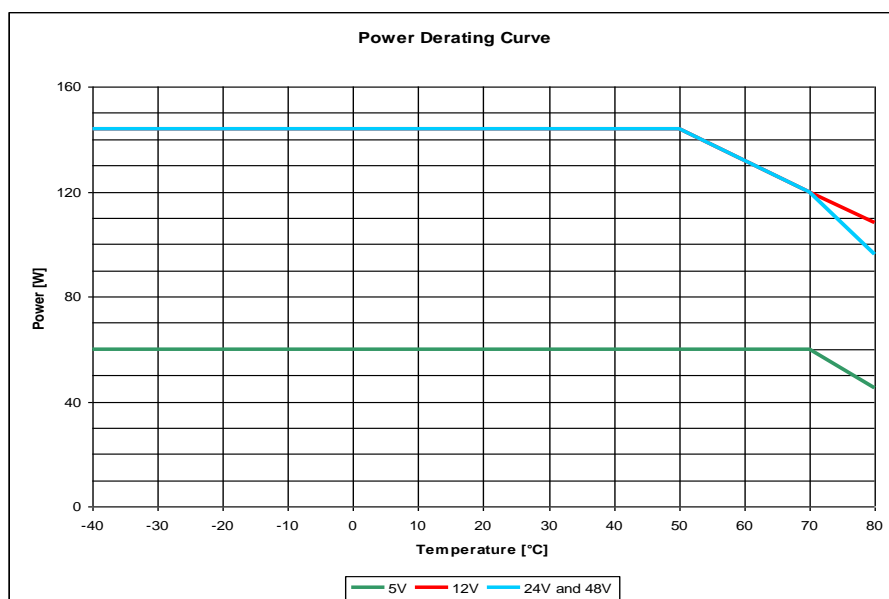


Figure 4: PSH150 power derating curves

The output is short circuit protected; in case of an output short circuit the output is switched off and an hiccup cycle is started. A “short circuit” alarm code is reported on the display (§3.4.3).

3.2 Auxiliary 12V output

PSH150 is provided with an auxiliary regulated 12V output with up to 100mA current capacity. This output is short circuit protected. The auxiliary output shares the same ground (negative terminal) with the main DC output.

3.3 INHIBIT input

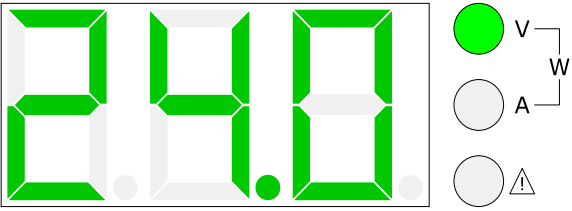
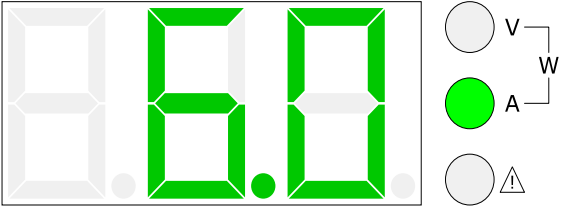
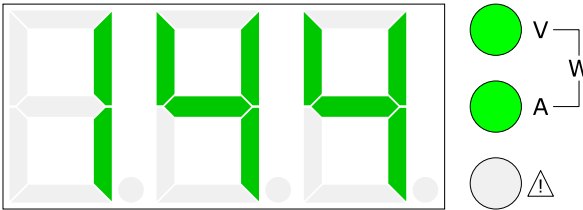
An **opto-isolated** input allows switching off the main DC output. The polarity of the input can be defined using the “*inhibit polarity*” (*POL*) field (§3.4.2). The controlling signal must have a voltage between 5Vdc and 30Vdc. The auxiliary 12V output is always active and can not be switched off.

3.4 Display interface

The PSH150 is provided with a 3-digits 7-segments LED display used to indicate the status and to navigate through the configuration/ set-up menus. During normal operation, the output parameters are reported (§3.4.1). Alarms and error codes are also reported on the display (§3.4.3)

3.4.1 Normal operation

During normal operation the output voltage, current and power are shown on the display. 2 green LEDs indicate which measurement is currently displayed. Every parameter is visible for 3 seconds, then the next measurement is shown.

 <p>The image shows a 3-digit 7-segment LED display displaying '24.0'. To the right of the display are three indicator LEDs: a lit green LED labeled 'V', an unlit LED labeled 'A', and an unlit LED with a warning triangle symbol. A bracket groups the 'V' and 'A' LEDs with a 'W' label.</p>	<p>Output voltage measurement:</p> <p>The display is indicating 24.0V. The “V” green LED is on, indicating voltage measurement.</p>
 <p>The image shows a 3-digit 7-segment LED display displaying '6.0'. To the right of the display are three indicator LEDs: an unlit LED labeled 'V', a lit green LED labeled 'A', and an unlit LED with a warning triangle symbol. A bracket groups the 'V' and 'A' LEDs with a 'W' label.</p>	<p>Output current measurement:</p> <p>The display is indicating 6.0A. The “A” green LED is on, indicating current measurement.</p>
 <p>The image shows a 3-digit 7-segment LED display displaying '144'. To the right of the display are three indicator LEDs: a lit green LED labeled 'V', a lit green LED labeled 'A', and an unlit LED with a warning triangle symbol. A bracket groups the 'V' and 'A' LEDs with a 'W' label.</p>	<p>Output power measurement:</p> <p>The display is indicating 144W. Both the “V” and “A” green LEDs are on, indicating power measurement.</p>

3.4.2 Menu navigation details

The layout of the menu is shown in Figure 5. The various options are selected with the 3 keys.

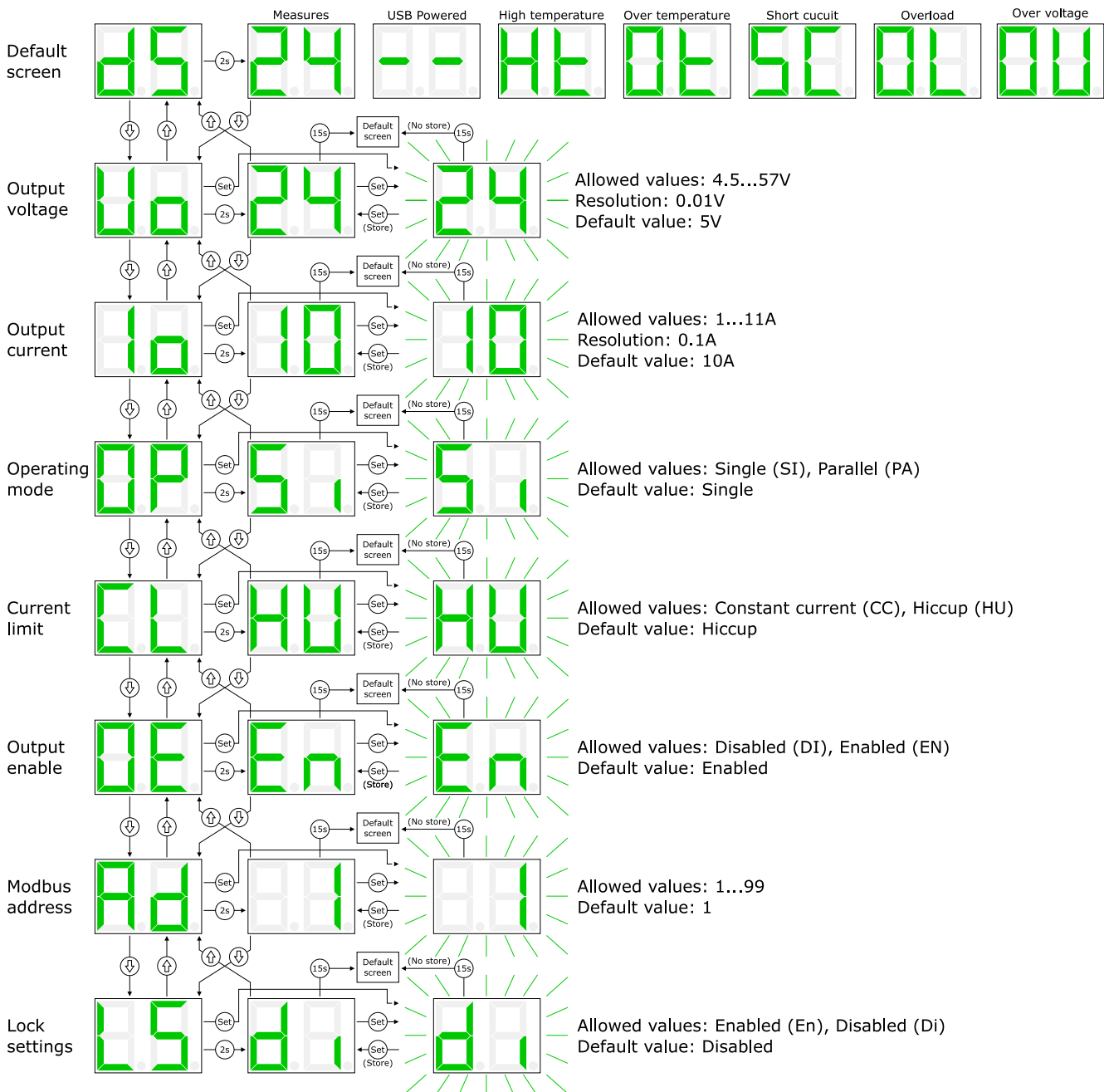


Figure 5: HMI

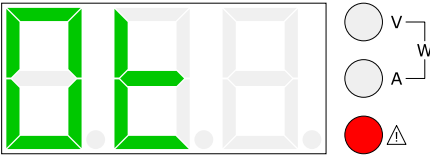
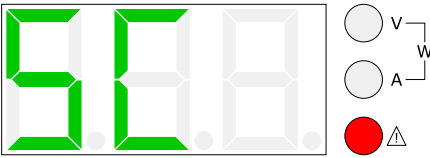
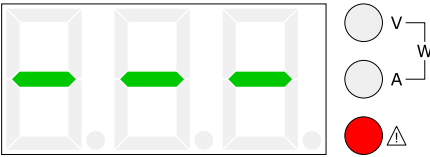

The locking/unlocking of the settings editing can be done using the field “Lock settings” (LS) field into the device’s menu (§3.4.2) or through the Modbus “Lock settings” field.

The locking/unlocking of the settings editing can also be done keeping pressed simultaneously the \uparrow (Up) and \downarrow (Down) buttons for at least 3 seconds. There are no notifications using this procedure.

When the lock is active, trying to edit a parameter using the device’s buttons shows a “SL” (Settings Locked) message for a couple of seconds. It is always possible to edit the setting through Modbus regardless the status of the lock.

3.4.3 Alarm codes

In case of internal or external faults an error code is reported on the display. When an error code is reported the “Alarm” red LED blinks at 1Hz rate.

Display code	Description	Behaviour
	Over-temperature protection The red LED blinks	The output is switched off until the internal temperature decreases to safe values
	Short circuit protection The red LED blinks	The output current is limited at the programmed value for 5 seconds, then the product switches off for 10 seconds. The cycle is repeated until the short circuit is removed
	Internal error, non recoverable The red LED blinks	The output is switched off. This error is caused by an unrecoverable internal fault
	USB power, no mains available	The product is powered through USB and the input mains is not present. The user can navigate through the menus. It can be used for firmware upgrade without the need of the input mains.

3.5 Parallel connection

Multiple PSH150 can be connected with the output in parallel for power increase and / or redundancy. In this mode of operation, the field “operating mode” (OP) shall be set to “Parallel” (PA).

The unit integrates an internal ORing circuit allowing paralleling several units for redundancy.

For proper operation the cable length connecting the units’ outputs to the load must have the same length and cross-section. For optimal current sharing it may be necessary to slightly adjust one of the two devices output voltage until the same current is delivered by the two units. It is recommended to limit the load power to 80% of the sum of the individual output power of the paralleled units.

3.6 Battery charger

PSH150 can charge batteries in CV (Constant Voltage) / CC (Constant Current) mode. This type of charging is suitable for Lead Acid and some Lithium batteries. For lithium batteries the user must check with the manufacturer if the battery supports this method of charging.

In CV/CC charging when a battery is nearly empty, constant current (“Maximum output current” setting) is used to charge it, making sure that charging current is lower than the maximal charging current that battery can accept. During charging the voltage of battery is slowly upping, when battery voltage reaches the maximum charging voltage (“Output voltage” setting) the charging current slowly reduces to 0A.

Battery must be connected to output. The “Output voltage” and the “Maximum output current” must be set with the values specified on the battery datasheet.

For example, for a standard 12V/30Ah lead acid battery the usual settings are:

Output voltage: 13.6V (float voltage)

Maximum output current: 3A...6A (corresponding to 10% to 20% of the nominal capacity)

3.7 Modbus Interface

PSH150 communicates through Modbus/RTU as specified on “[MODBUS over Serial Line](#)” and “[MODBUS APPLICATION PROTOCOL SPECIFICATION](#)” documents available on <http://www.modbus.org/>.

Table 1 contains the field types and Table 2 the mapped fields. For types bigger than 16bit, access all registers in one transaction (multiple register read or write) to ensure atomic operation.

Type	Modbus function codes		Description																						
	Read	Write																							
BIT	1,2	5,15	Single bit with value 0 or 1																						
SINT16	3,4	6,16	Signed 16 bit value (2's complement)																						
UINT16	3,4	6,16	Unsigned 16 bit value																						
SINT32	3	16	Signed 32 bit value (2's complement) Composed of 2 consecutive registers in big-endian order.																						
UINT32	3	16	Unsigned 32 bit value. Composed of 2 consecutive registers in big-endian order.																						
DATE	3	16	Time and date field. Composed of 4 Modbus registers as follows: <table border="1" data-bbox="651 927 1394 1240" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Address offset</th> <th>Byte</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0</td> <td>MSB</td> <td>Reserved, set to 0</td> </tr> <tr> <td>LSB</td> <td>Year-2000</td> </tr> <tr> <td rowspan="2">1</td> <td>MSB</td> <td>Month (1=January)</td> </tr> <tr> <td>LSB</td> <td>Day of the month</td> </tr> <tr> <td rowspan="2">2</td> <td>MSB</td> <td>Hour of the day (24h format)</td> </tr> <tr> <td>LSB</td> <td>Minutes</td> </tr> <tr> <td rowspan="2">3</td> <td>MSB</td> <td rowspan="2">Milliseconds</td> </tr> <tr> <td>LSB</td> </tr> </tbody> </table>	Address offset	Byte	Description	0	MSB	Reserved, set to 0	LSB	Year-2000	1	MSB	Month (1=January)	LSB	Day of the month	2	MSB	Hour of the day (24h format)	LSB	Minutes	3	MSB	Milliseconds	LSB
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	LSB	Minutes																							
3	MSB	Milliseconds																							
	LSB																								

Table 1: Modbus types

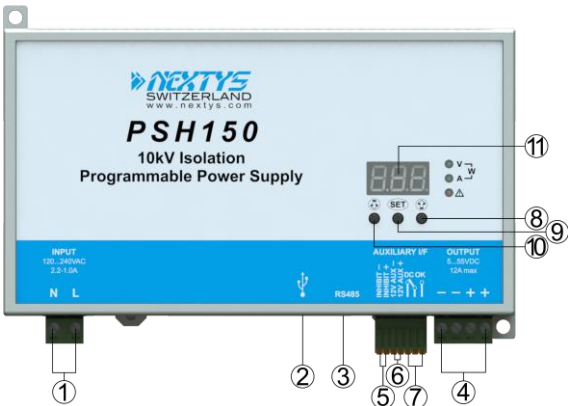
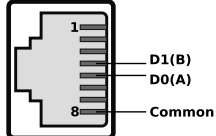
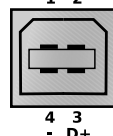
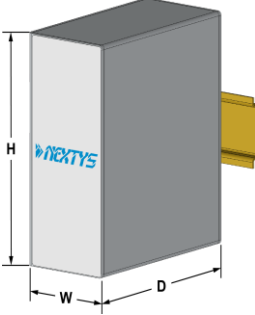
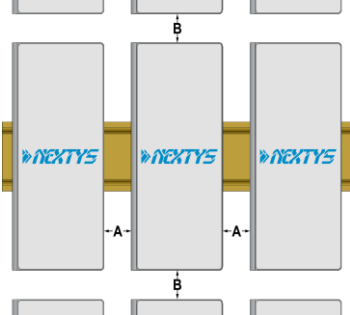
Address	Type	R/W	Unit	Min.	Max.	Description
<i>Common</i>						
0x0010	DATE	R/W			R/W	Real time clock.
<i>Settings</i>						
0x1000	UINT16	R/W	1	1	247	Modbus address.
0x1001	UINT16	R/W	1	1	5	Modbus baudrate 1: 9600 baud 2: 19200 baud 3: 38400 baud 4: 57600 baud 5: 115200 baud
0x1002	UINT16	R/W	1	1	3	Modbus parity 1: None 2: Even 3: Odd
0x1003	UINT16	R/W	1	1	2	Modbus stop bits
0x1010	UINT16	R/W	0.1V	5	55	Nominal output voltage
0x1011	UINT16	R/W	1	1	2	Inhibit polarity 1: Low 2: High
0x1012	UINT16	R/W	1	1	2	Operating mode 1: Single 2: Parallel

Address	Type	R/W	Unit	Min.	Max.	Description
0x1013	UINT16	R/W	1	1	4	Display mode 1: Automatic 2: Voltage 3: Current 4: Power
0x1014	UINT16	R/W	1	0	1	Output enable 0: Disabled 1: Enabled
0x1015	UINT16	R/W	1	0	1	Auxiliary output enable 0: Disabled 1: Enabled
0x1016	UINT16	R/W	0.1A	0.1	12.5	Maximal output current
0x1017	UINT16	R/W	1	0	1	Lock settings 0: Disabled 1: Enabled
<i>Metering</i>						
0x2000	SINT16	R	0.1V	0	60	Output voltage
0x2001	SINT16	R	0.1A	0	15	Output current
0x2002	SINT16	R	0.1W	0	15	Output power
0x2003	SINT16	R	0.1V	0	60	Auxiliary voltage
0x2004	SINT16	R	0.1°C	-40	85	Internal temperature
<i>Commands</i>						
0x3000	BIT	W	1	0	1	Auxiliary output toggle once
<i>State</i>						
0x4000	BIT	R	1	0	1	DC OK
0x4001	BIT	R	1	0	1	Output short circuit
0x4002	BIT	R	1	0	1	Auxiliary output overload
0x4003	BIT	R	1	0	1	Inhibit signal
0x4004	BIT	R	1	0	1	USB powered
0x4005	BIT	R	1	0	1	Over temperature warning
0x4006	BIT	R	1	0	1	Over temperature error
0x4007	BIT	R	1	0	1	Internal error
0x4008	BIT	R	1	0	1	Output disabled
0x4009	BIT	R	1	0	1	Auxiliary output disabled

Table 2: Modbus fields

4 Installation

READ THIS CAREFULLY BEFORE INSTALLATION!	LEGGERE ATTENTAMENTE PRIMA DELL'INSTALLAZIONE!	A LIRE ATTENTIVEMENT AVANT L'INSTALLATION!
<p>Before operating, read this document thoroughly and retain it for future reference.</p> <p>Non-respect of these instructions may reduce performances and safety of the devices and cause danger for people and property.</p> <p>The products must be installed, operated, serviced and maintained by qualified personnel in compliance with applicable standards and regulations.</p> <p>Don't open the device, it does not contain replaceable components, the tripping of the internal fuse (if included) is caused by an internal failure.</p> <p>Don't repair or modify the device, if malfunction or failure should occur during operation, send unit to the factory for inspection. No responsibility is assumed by Nextys SA for any consequences deriving from the use of this material.</p>	<p>Prima dell'installazione, leggere attentamente questo documento istruzioni e conservarle per future consultazioni. L'inosservanza delle presenti istruzioni può compromettere le caratteristiche e la sicurezza dell'apparecchio e causare pericolo per le persone e le cose.</p> <p>Il prodotto deve essere installato, utilizzato e riparato da personale qualificato e nel rispetto delle normative vigenti. Non aprire il prodotto, esso non contiene componenti sostituibili, il guasto del fusibile interno (se previsto) è causato da un guasto interno. Non tentare di riparare o modificare il prodotto, se durante il funzionamento si verificano guasti o anomalie, inviarlo al produttore per il controllo.</p> <p>Nextys SA non si assume nessuna responsabilità per qualunque conseguenza derivante dall'uso di questo materiale.</p>	<p>Lisez ces instructions avant l'installation, conservez ce manuel pour référence future.</p> <p>Défaut de se conformer à ces instructions peut affecter les caractéristiques et la sécurité du dispositif de danger et de causer aux personnes ou aux biens.</p> <p>Les produits doivent être installés, exploités et entretenus par personnel qualifié et en conformité avec les règlements. N'ouvrez pas le produit, il ne contient aucune pièce réparable, le déclenchement du fusible interne (le cas échéant) est causé par un défaut interne. Ne pas essayer de réparer ou modifier le produit ; si des défaillances se produisent pendant le fonctionnement ou les dysfonctionnements, le retourner au fabricant pour inspection. Nextys SA n'assume aucune responsabilité des conséquences éventuelles découlant de l'utilisation des produits.</p>
CAUTION	ATTENZIONE	AVERTISSEMENT
<p>RISK OF BURNS, EXPLOSION, FIRE, ELECTRICAL SHOCK, PERSONAL INJURY.</p> <p>Never carry out work on live parts! Danger of fatal injury! The product's enclosure may be hot, allow time for cooling product before touching it. Do not allow liquids or foreign objects to enter into the products.</p> <p>To avoid sparks, do not connect or disconnect the device before having previously turned-off input power and wait for internal capacitors discharge (minimum 1 minute).</p>	<p>RISCHIO USTIONI, ESPLOSIONE, INCENDIO, SCOSSA, LESIONI GRAVI.</p> <p>Non effettuare mai operazioni sulle parti sotto tensione! Pericolo di lesioni letali! Il contenitore può scottare, lasciar quindi raffreddare il dispositivo prima di toccarlo. Non far entrare liquidi o oggetti estranei nel dispositivo.</p> <p>Per evitare scintille, non collegare o scollegare l'apparecchiatura prima di avere tolto tensione di ingresso e prima che sia avvenuta la scarica dei condensatori interni (min. 1 minuto).</p>	<p>RISQUE DE BRULURES, EXPLOSION, INCENDIE, ELECTROCUTION, DOMMAGE AUX PERSONNES.</p> <p>Ne jamais effectuer des opérations sur les parties sous tension! Danger de mort! Le récipient peut produire des brulures, le laisser refroidir avant de toucher l'appareil. Ne faites pas pénétrer des liquides ou des corps étrangers dans l'appareil. Pour éviter des étincelles, ne pas connecter ou déconnecter l'équipement jusqu'à ce que vous avez supprimé la tension d'entrée et avant qu'elle n'ait lieu de décharge des condensateurs internes (minimum 1 minute).</p>

Connections															
	<ol style="list-style-type: none"> AC input USB-B Type communication port RS-485 communication port DC output (load) INHIBIT Auxiliary 12Vdc DC OK dry contact UP button menu SET button menu DOWN button menu Display 														
<p>Input Connection:</p> <p>Single Phase</p> <ul style="list-style-type: none"> L = Line N = Neutral <p>Input DC</p> <ul style="list-style-type: none"> L = Positive DC N = Negative DC <p>Output Connection:</p> <ul style="list-style-type: none"> + = Positive DC - = Negative DC 	<p>Signaling:</p> <p>INHIBIT (5...30Vdc)</p> <ul style="list-style-type: none"> + = Positive DC - = Negative DC <p>12V AUX (12Vdc / 100mA)</p> <ul style="list-style-type: none"> 12V+ = Positive DC 12V- = Negative DC <p>Dry contact:</p> <ul style="list-style-type: none"> COM NO NC 														
<p>RS-485</p>  <ul style="list-style-type: none"> PIN4 = TX/RX D1 PIN5 = TX/RX D0 PIN8 = GND 	<p>USB-B Type</p>  <ul style="list-style-type: none"> 1 = VBUS (+5V) 2 = Data (D-) 3 = Data (D+) 4 = GND 														
Dimensions	Distances														
															
<table border="1"> <thead> <tr> <th>Dimension</th> <th>mm</th> </tr> </thead> <tbody> <tr> <td>W</td> <td>179.5</td> </tr> <tr> <td>D</td> <td>100.3</td> </tr> <tr> <td>H</td> <td>64.5</td> </tr> </tbody> </table>	Dimension	mm	W	179.5	D	100.3	H	64.5	<table border="1"> <thead> <tr> <th>Distance</th> <th>mm</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>20</td> </tr> <tr> <td>B</td> <td>50</td> </tr> </tbody> </table>	Distance	mm	A	20	B	50
Dimension	mm														
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D	100.3														
H	64.5														
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A	20														
B	50														

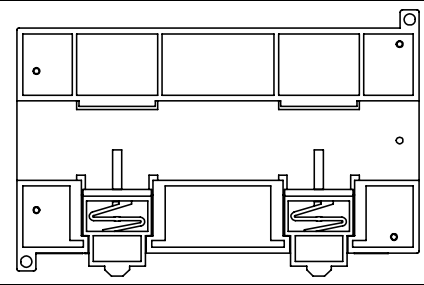
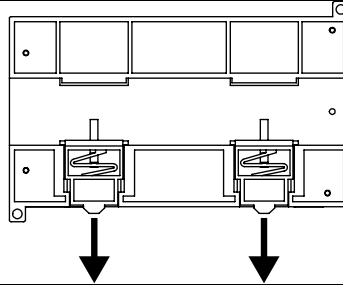
Mounting / Dismounting Instructions

For DIN rail fastening according to IEC 60715 TH35-7.5(-15)

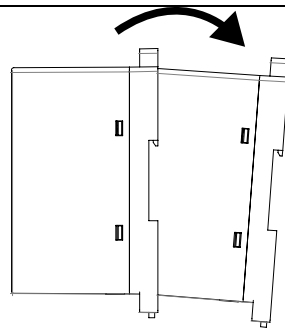
Mounting as shown in figure, with input terminals on lower side, with suitable cooling and maintaining a proper distance between adjacent devices as specified in the I.S. manual of each family.

DIN rail mounting:

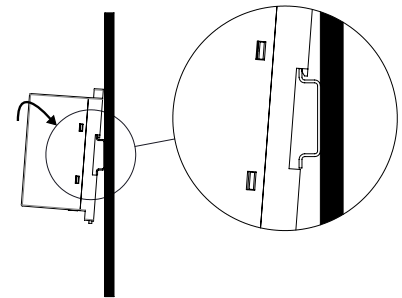
1. Pull down to release and unlock the slide clamps.
2. Tilt the unit slightly backwards.
3. Fit the unit over the top edge of the rail.
4. Slide it downward until it hits the stop.
5. Press toward top the two slide clamps for locking



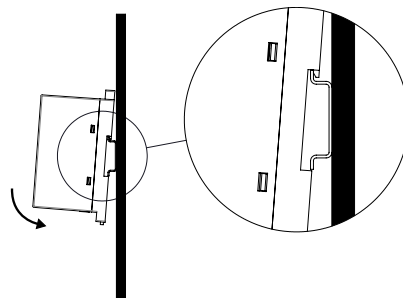
1



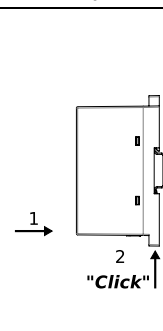
2



3



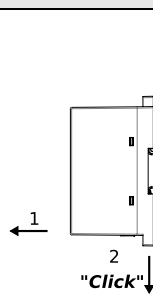
3



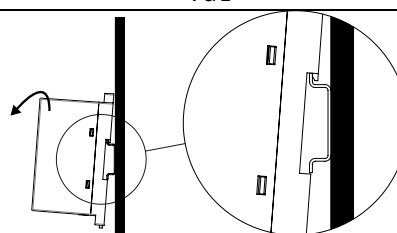
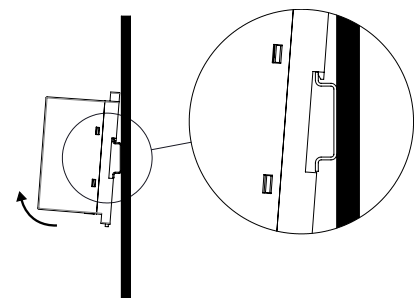
4 & 5

DIN rail dismounting:

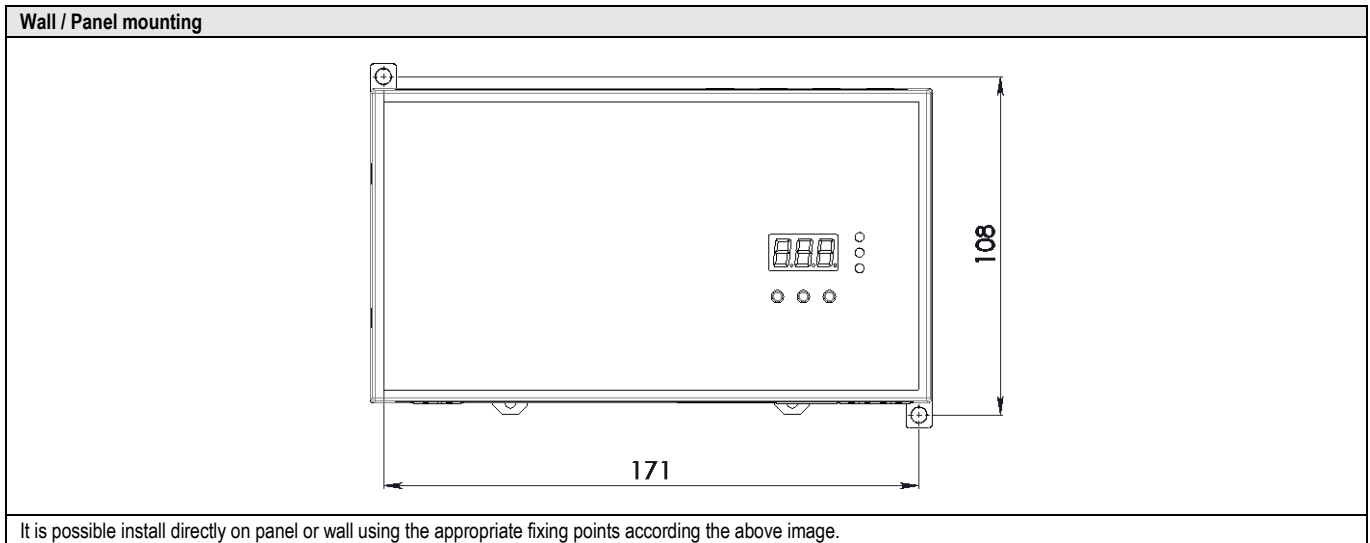
1. Pull down to release and unlock the slide clamps.
2. Tilt the unit upward
3. Unhook the unit from the rail

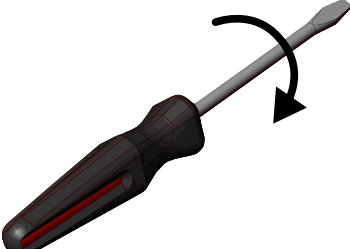
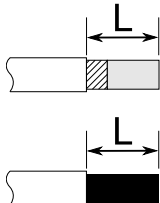


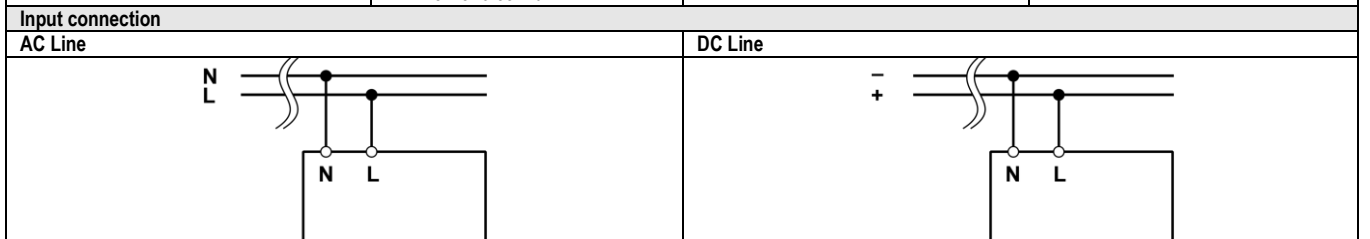
1 & 2



3



Recommended connecting cable			
	Recommended Tightening torque Input / output connections 0.5-0.6Nm 4.42-5.30 lbf in Auxiliary connections Insertion force per pole Max 3N or 0.674 lbf Withdrawal force per pole Min 1.5N or 0.337 lbf		Input / output connections Solid: 2.5mm ² / 12AWG Stranded: 2.5mm ² / 12AWG L: 6.0-7.5mm / 0.24-0.30in Auxiliary connections Solid: 0.5mm ² / 20AWG Stranded: 0.5mm ² / 20AWG L: 7.0-8.0mm / 0.27-0.315in



Input protection
 Fuses MCB 6A C curve
 For USA and Canada, use the fuse type closest to the European equivalent type.
Surge protection: it is strongly recommended to provide external surge arresters (SPD) according to local regulations.

Environment	
Operating temperature -40°C...70°C 5...95% r.H. non condensing Overtemperature protection	Derating See Figure 3 and Figure 4