

Shaping the power of the future

Installation Guide

PowerShaper Indoor Grid tied energy storage system



System safety and environmental precautions

Product warranty becomes invalid if following precautions are not followed during handling, storage, installation, commissioning and operation of Pixii energy storage systems.

General precautions



Although this system incorporates protective circuits and other security features, it may still be destroyed, damaged, work poorly or shorten its lifetime if exposed to improper handling during transportation, installation or operation. Always handle the system with care, use proper lifting techniques, do not roll, climb or drill holes in the cabinet or enclosure.



Opening the equipment may cause serious injury even when the AC power is disconnected. Dangerous voltage may be present inside, as system can be still running from batteries or capacitors may still be charged.

Environmental precautions



Some devices can reach high temperatures during normal operation. It is very important to ensure that airflow through equipment is not blocked, filters are in good condition and fans can rotate freely. If other equipment is installed in close proximity, secure that inlets and outlets are not blocked.



Electronic devices installed in the energy storage system are designed for indoor environment with pollution degree 2. When installed in an outdoor enclosure (open or closed loop heat management system), it is important to ensure, that the enclosure is closed and sealed during normal operation, to avoid external air with increased level of humidity and dust from entering. In addition, in open loop systems, filters maintenance must be properly planned. In case of indoor systems, operating environment must be of pollution degree 2, without increased level of dust and humidity.



Installer is responsible to protect system against current surges, over-voltages, etc. caused by lightning, electrostatic discharges, etc. To avoid system damage, it is mandatory to always install proper SPDs.

Installation precautions



Read carefully user documentation before installation and using this equipment. Follow all commands, always use recommended tools and torque values as described. Commissioning and configuration of equipment should be done only by Pixii personnel or by other authorized and qualified persons.



For safety reason, before you start installation, ensure all external power sources are disconnected, as well as internal battery and load fuses/breakers. To avoid injuries caused by high leakage/touch current you must always start installation by connecting earthing wire (PE), before you connect other AC input wires (phases, neutral).

If system contains batteries, they represent major energy hazard. To avoid short circuit on batteries, do not operate with full metallic tools close to battery poles. Be careful also about other objects (rings, watches, necklaces, etc.).



All Pixii devices are certified according to international safety, environmental and EMC standards. If any other devices will be installed inside this product, it might influence parameters and violate original approvals. Installer is responsible that during installation environmental properties of this device are not impaired and installation is according to local regulations.

Battery safety and environmental precautions

For safety reasons, installers are responsible for familiarizing themselves with the contents of battery installation manual and all warnings before performing installation. Failure to observe the precautions described in this section can cause serious injury to persons or damage to property.

General precautions

The voltage of this battery module is strong enough to cause electric shock.

- Do not disassemble the battery module.
- Do not touch the battery module with wet hands.
- Do not expose the battery module to moisture or liquids.
- Keep the battery module away from children and animals.



The battery module may explode.

- Do not subject the battery module to strong impacts.
- Do not crush or puncture the battery module.
- Do not dispose of the battery module in a fire.



Keep the battery module away from open flame or ignition sources.

- Do not expose the battery module to temperatures in excess of 60°C.
- Do not place the battery module near a heat source, such as a fireplace.
- Do not expose the battery module to direct sunlight.
- Do not allow the battery connectors to touch conductive objects such as wires.



Risks of damage to the battery module.

- Do not allow the battery module to get in contact with liquids.
- Do not subject the battery module to high pressures.
- Do not place any objects on top of the battery module.



Environmental precautions

The battery module may leak corrosive electrolyte. Avoid contact with the leaking liquid or gas. Electrolyte is corrosive and contact may cause skin irritation and chemical burns.



The battery module should not be disposed of with household waste at the end of its working life.



The battery module should be disposed of at a proper facility for environmentally safe recycling



Installation precautions

Read the battery installation manual before installing and operating the battery module.

- Disconnect the charging source prior to connecting or disconnecting battery terminals.
- Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance.



Wear appropriate personal protective equipment when dealing with the battery module.

- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.



The battery module is heavy enough to cause severe injury.



Response to emergency situations

While the battery module comprises multiple battery cells that are designed to prevent hazards resulting from failures, Pixii can not guarantee their absolute safety.

In the event that hazardous quantities of electrolyte are released, or in case of smoke, or fire, leave the battery room and contact the fire brigade.

Leaking batteries

If the battery module leaks electrolyte, avoid contact with the leaking liquid or gas. Electrolyte is corrosive and contact may cause skin irritation and chemical burns. If one is exposed to the leaked substance, do these actions:

Inhalation:

Evacuate the contaminated area, and seek medical attention immediately.

Eye contact:

Rinse eyes with flowing water for 15 minutes, and seek medical attention immediately.

Skin contact:

Wash the affected area thoroughly with soap and water, and seek medical attention immediately.

Ingestion:

Induce vomiting, and seek medical attention immediately

Rinse mouth and wash around the mouth with water.

Burns:

If burns are caused, treat them accordingly. Likewise, immediate medical attention shall be obtained.

Fire

In case of a fire, make sure that an ABC or carbon dioxide extinguisher is nearby. If a fire breaks out where the battery module is installed, do these actions:

1. Extinguish the fire before the battery module catches fire.
2. If the battery module has caught fire, do not try to extinguish the fire. Evacuate people immediately.



!!! Warning !!!

The battery module may catch fire when heated above 150°C.

If the battery catches fire, it will produce noxious and poisonous gases. Do not approach.

Wet batteries

If the battery module is wet or submerged in water, do not try to access it. Contact Pixii or your distributor for technical assistance.

Damaged batteries

Damaged batteries are dangerous and must be handled with extreme caution. They are not fit for use and may pose a danger to people or property. If the battery module seems to be damaged, pack it in its original container, and then return it to Pixii or your distributor.



!!! Caution !!!

Damaged batteries may leak electrolyte or produce flammable gas. If you suspect such damage, immediately contact Pixii for advice and information.

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1 Introduction

This document describe step by step installation, commissioning and start-up of energy storage system. Read it carefully and follow all recommendations to be sure system is running in correct environment under good conditions and installation reached all safety requirements.

1.1 Recommended tools and torque

	Tool
W	Wrench
PZ2	Pozidriv screwdriver
Flat	Flat screwdriver
T-W	Torque wrench
T-PZ2	Torque Pozidriv screwdriver

	Type & Size	Torque	
T1	TERMINAL BLOCK OTL 50 - Y/G	1.5 - 2.5mm ²	1.5 Nm
		4 - 10mm ²	5.0 Nm
		16 - 50mm ²	10.0 Nm
T2	AC Mains input MCB (1-50mm ²)	3.5 Nm	
T3	Polarium batteries (DC cables)	15.0 Nm	
T4	Shoto batteries (DC cables)	6.0 Nm	
T4	M6 self tapping screw	9.8 Nm	
T5	M6 Hex screw (Protective bonding)	6.0 Nm	
T6	WDU 2.5 Terminals (Emergency switch)	0.4 - 0.8 Nm	
T7	DLD 2.5 Terminals (Relays, Modbus)	0.4 - 0.6 Nm	

Table 1. Recommended tools and torques

1.2 Thermal management system (TMS)

Cabinet thermal management system provides appropriate thermal conditions inside the cabinet.

Solution is integrated on the cabinet door with controlled air flow inside the cabinet.

Fan TMS using free cooling principle which is open loop system. Outside cold air is pulled into the battery section through the two inlet fans and hot air is pushed out through the top rear side of the cabinet.

Two inlet fans mounted on the door are cooling the batteries, while the modules on the top are self-cooling and suck cold air with their own small fans through the ventilation on the top of the door.

With moderate ambient temperatures or low power dissipation the fans will be running at low speed. As the ambient temperature or internal power dissipation increases the fans speed will increase.

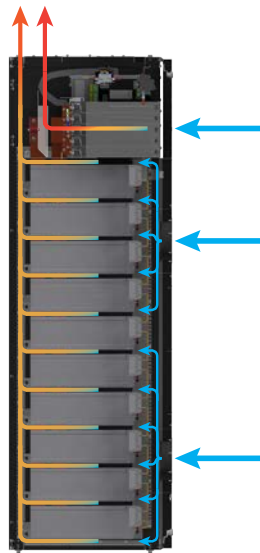


Figure 1.1 Indoor cabinet air flow diagram (side view)

1.3 Installation block diagram

1.3.1 Behind the meter

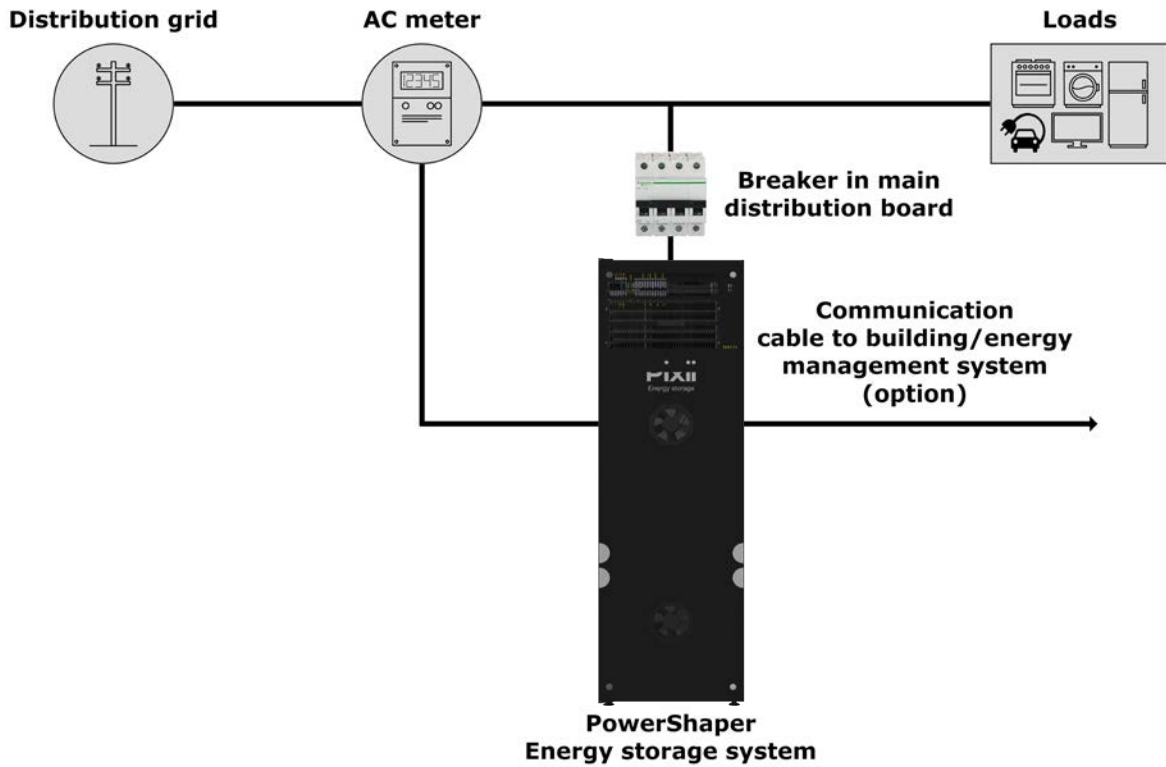


Figure 1.2 Single line installation block diagram - behind the meter

1.3.2 In front of the meter

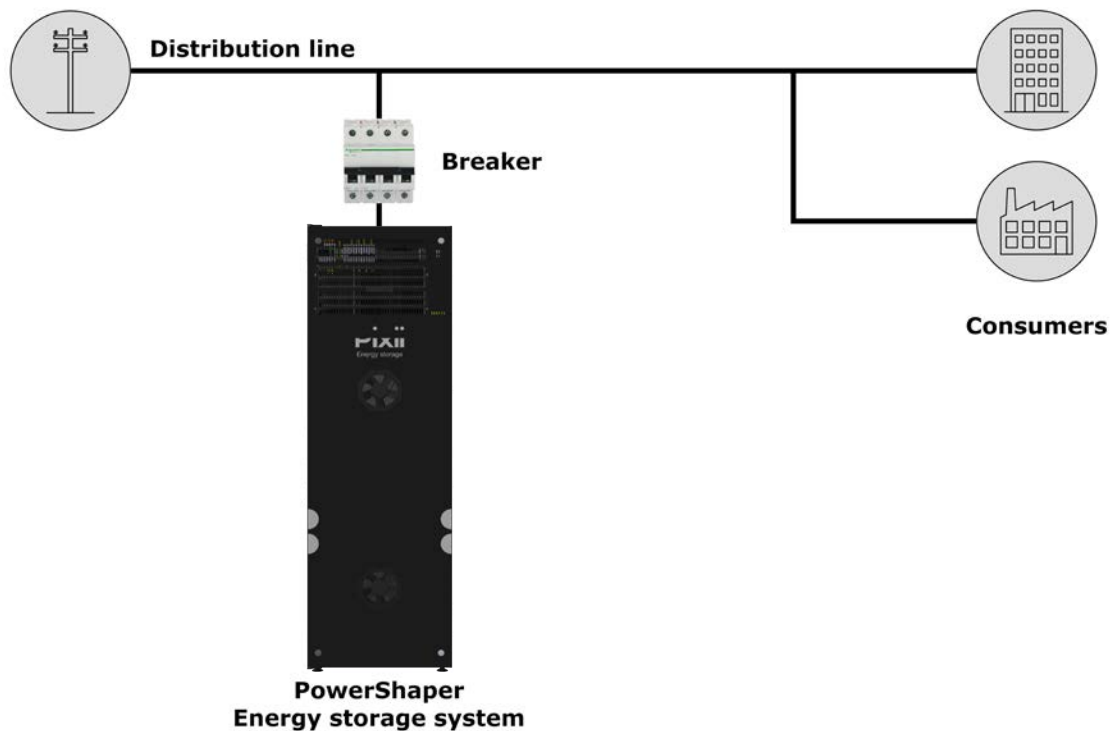


Figure 1.3 Single line installation block diagram - in front of the meter

1.4 System ratings

1.4.1 Electrical specifications

The PowerShaper consist of modular converters, each of them providing transformers with Reinforced insulation between AC side and the DC side.

AC Mains Type	TN
Max. Active Power (charge and discharge)	50kW ^{1,3} /40kW ²
Max. Apparent Power (charge and discharge)	50kVA ^{1,3} /40kVA ²
AC voltage	400/230V, 3Ph+N+PE
Max. AC current	83Arms, 3Ph+N+PE
Nominal AC current	72Arms, 3Ph+N+PE
Frequency range	45Hz to 66Hz
Cos φ range	0.5 inductively to 0.5 capacitively
Protective class	Class I
Overvoltage category	OVC III
Max. short circuit current	10kA
Type of short-circuit protective device	MCB
Max. Energy	48kWh ¹ /103.2kWh ² /51.2kWh ³
Max. DC voltage	44V to 58V
Max. DC current	1000A

Type of the battery	¹ Polarium SLB48-100	² Polarium SLB48-250	³ Shoto SDA10-48400
Nominal capacity	100Ah	250Ah	100Ah
Nominal energy	4.8kWh	12.9kWh	5.12kWh
Operating voltage	39V-54.75V	35V-58.8V	40V-57.7V
Max. charge/discharge current	100A		

Voltage fluctuations and flicker:

	P_{st}	P_{lt}	Z
Measured using Z_{test}	0,645	0,603	0,013 Ω +j0,002 Ω
Maximum permissible network impedance, Z_{max}	-	-	0,093 Ω +j0,093 Ω

Table 2. Electrical specifications

1.4.2 Environmental specifications

Type of cabinet	Indoor
Operating temperatures	+5°C to +40°C
Humidity	5% to 85% RH (non-condensing)
Storage and transportation temperatures	-30°C to +60°C*
Storage and transportation humidity	5% to 55% RH (non-condensing)
Storage (less than 12 months)	State of Charge (SoC): 85%
Acoustic noise (maximum)	<50dBA at 1m distance
Maximum altitude	2000m
Ingress protection rating	IP20
Pollution degree	2
Wet locations	No
Current (inrush)	25A _{peak}
Maximum output fault current	200A _{peak} /1ms
Inverter topology	Isolated
Env. cat. (IEC 62477-1)	Indoor conditioned

Table 3. Environmental specifications

* Without batteries installed.

1.4.3 Mechanical specifications

Height (feet included)	1991mm
Width	598mm
Depth	651mm
Weight (without modules and batteries)	150 kg
Module	2 kg
Shoto 3U battery	43 kg
Polarium 3U battery	38 kg
Polarium 4U battery (250Ah)	64 kg
Extension kit for 4U batteries	15 kg

Table 4. Dimensions and weights

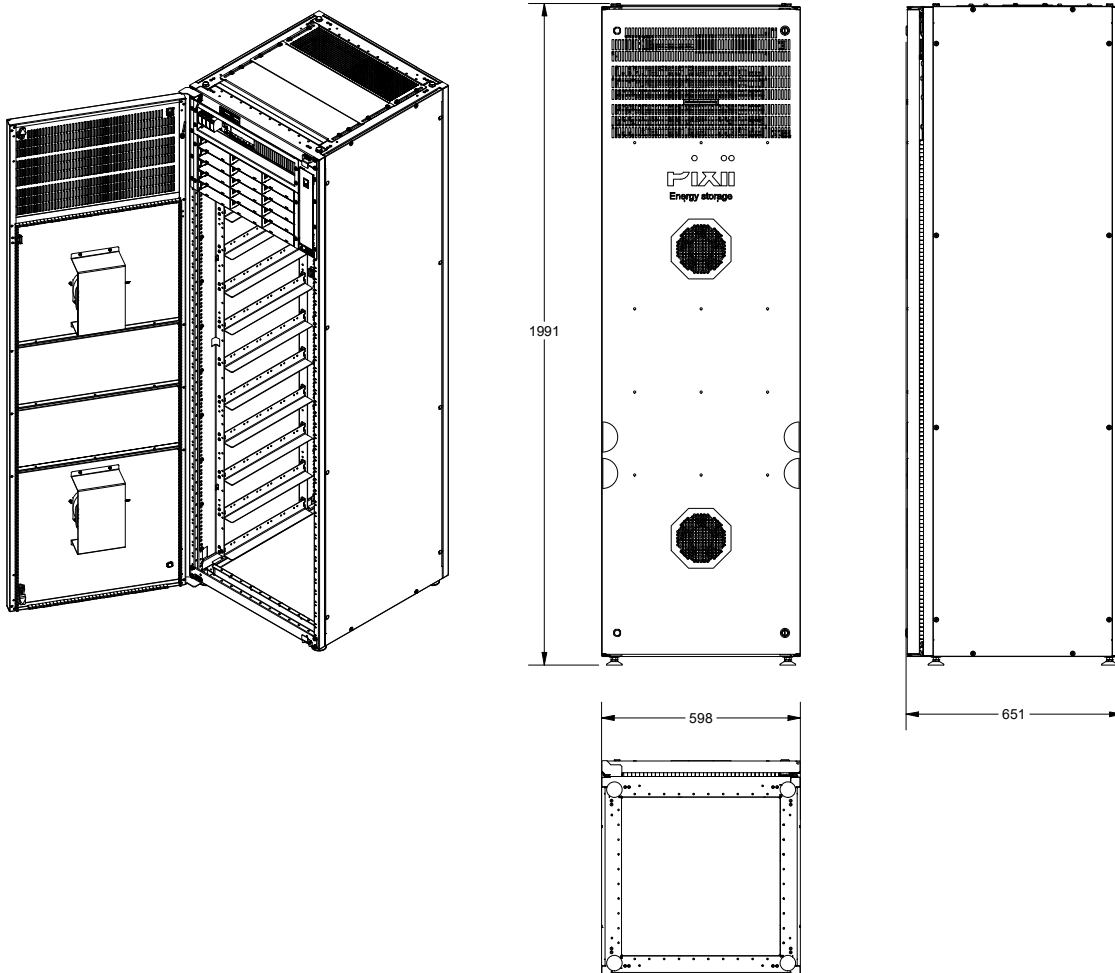


Figure 1.4 Mechanical specification

1.4.4 Fuse list

	Type	Manufacturer	Manufacturer part number
-FC1	100A 4-pole C-curve	Schneider	A9N18480
-FC13	10A 6.3x32mm fast 10kA	Eaton	BK-AHC-10-R
-FC20	10A 6.4x32mm fast 10kA	Bussmann	ABC-10-R
-FC21	10A 6.4x32mm fast 10kA	Bussmann	ABC-10-R
-F201	0,5A 5x20mm slow	Littelfuse	0477.500MXP
-F202	3,15A 5x20mm slow	Littelfuse	04773.15MXP
-F203	3,15A 5x20mm slow	Littelfuse	04773.15MXP

Table 5. Fuse list

NOTE:

Please consult replacement of any fuse or circuit breaker with Pixii first.

1.5 Anti-islanding

The PowerShaper incorporates both passive and active anti-islanding functionality. The passive methods included are under/over voltage, under/over frequency and rate of change of frequency detection. The active anti-islanding functionality uses the frequency shift method based on feedback from frequency variation in combination with a small reactive power perturbation. The active anti-islanding function may be disabled for grid codes not accepting such means of islanding detection.

2 Preparing installation site

2.1 Pre-installation steps

1. Organize installation site

- Mounting base strong enough to carry weight of fully equipped system (see *Table 4*)
- Clearances for cabinet access

	Minimum distance	Suggested distance
Front	70cm	100cm
Rear	10cm	25cm
Top	50cm	90cm
Sides	0	0

NOTE:

It is strictly required to follow local regulations if separation distances larger than the table above are required.

NOTE:

The energy storage system is installed indoor, automatic sprinkler system is highly recommended and sometimes required. Local regulations must be adhered to.

2. Prepare installation tools

- Use insulated tools suitable for electrical installations
- Recommended tools list is in chapter "Tool" on page 8

3. Prepare AC Mains supply

- Correct type of AC Mains supply (TN-S)
- Correct rating of AC input cables and external fuses
- AC Mains supply meter

2.2 Recommended upstream breaker and input cable

To reach stable system operation, it is very important to use proper input cable and upstream breaker. Recommended values for different types of networks can be found in table below.

AC Mains Type	Number of Power Shelves	Maximum current	Upstream breaker	Input cable
230/400Vac 3-phase, TN-S network 5-wire system	5	83A	100A C-curve	35mm ² - 50mm ² (CU)
230/400Vac 3-phase, TT network 4-wire system				

!!! WARNING !!!

System is designed to operate on 1-phase or 3-phase networks. It is strictly forbidden to connect multiple single-phases to the system.

CAUTION:

For TT-networks, the installation of an RCD is required.

NOTE:

If different number of power shelves or breaker with lower rating needs to be used from any reason, discuss possibilities with Pixii.

NOTE:

Breaking capacity of input breaker installed in system is 10kA, upstream breaker breaking capacity must correspond to AC grid conditions at the point of installation.

NOTE:

Cable type, upstream breaker and RCD depends on local conditions and regulations.

2.3 Mains input metering

To secure correct operation, system must have actual readings from mains input AC meter. Therefore compatible meter must be installed on site. Measured values are important to perform autonomous operation functionality such as peak shaving and others. Pixii system has support for communicating with 2 different types of meters.

NOTE:

Measured data are used at the customer's own risk. The distribution company or Pixii is not responsible for any losses resulting from its use, including losses due to errors or omissions in the data.

2.3.1 AMS energy meter

AMS meter allows for monitoring consumption and production down to a few second intervals through the HAN-port (M-Bus) according to Norwegian HAN-port specification. The HAN-port is closed by default. Contact your local network company to open it. Before opening the HAN-port, the network company will first ask some questions related to securing the gate for privacy reasons. For connecting to the HAN-port a standard Ethernet cable with RJ45 connectors is required. Maximum practical distance at highest speed is 350 meters.

Supported AC Meters

- Aidon
- Kamstrup
- Nuri

2.3.2 Industrial grade energy meter

The Pixii system has support for an energy meters from different manufacturers. Depending on type of the meter, external measuring transformers may be required. Currently, communication via Modbus/RTU (RS485) is supported. This means that a cable (2-wire at least) needs to be connected from the meter to the controller in the system. Maximum practical distance is 300 meters.

Supported AC Meters

- Phoenix Contact:
 - » EEM-EM357
 - » EEM-EM355
 - » EEM-MA370-R
 - » EEM-MA371-R
- Schneider:
 - » iEM 31xx series
 - » iEM 32xx series
 - » iEM 33xx series
- Acuvim II series | Accuenergy (Modbus/TCP available)
- Janitza:
 - » B23 312-10J
 - » B24 312-10J
 - » UMG series

3 Mechanical installation

3.1 Preparing site for installation

To secure correct system operation, cabinet must be properly fixed to solid horizontal leveled surface.

3.2 Positioning

!!! WARNING !!!

Do NOT use any other technique to lift the cabinet because of imminent damage.

Never lift cabinet with opened door.

Do NOT lift cabinet with installed modules and batteries.

3.2.1 Moving

Move the cabinet on pallet using forklift near its position and lay down on the floor manually.

!!! WARNING !!!

Construction of the cabinet may be heavy and unbalanced. It is strictly recommended to moving the cabinet in two persons.

3.2.2 Lifting (Optional)

NOTE:

Lifting lugs are optional equipment and must be ordered separately.

- Mount attached lifting lugs with M10x16 bolt and M10 plain washer (see *Figure 3.1*).
- Fix chains or straps (minimum length 1 meter) to all lifting lugs (see *Figure 3.2*), securely lift and move system to the desired position.
- By twisting cabinet feet adjust correct position (see *Figure 3.3*).

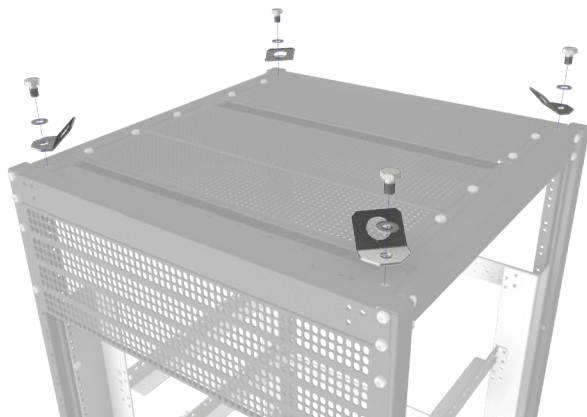


Figure 3.1 Mount lifting lugs



Figure 3.2 Fix chains or straps



Figure 3.3 Adjusting the feet

NOTE:

Remove lifting lugs after positioning the cabinet.

4 Electrical installation

For safety reason, before you start installation, ensure all external power sources are disconnected, as well as internal battery and load fuses/breakers. To avoid injuries caused by high leakage/touch current you must always start installation by connecting earthing wire (PE), before you connect other AC input wires (phases, neutral).

4.1 Preparation

Remove the front cover by releasing 4x M6x10 torx screws.



Figure 4.1 Removing the front cover

NOTE:

Keep fixings and cover at safe place, as you need them later!

4.2 Protective bonding

It is necessary to interconnect cabinet chassis with main earthing point, to ensure equal potential throughout the installation thus preventing a hazardous potential difference occurring between such parts in the event of a fault.

Connect bonding cable from main earthing point to the cabinet bonding point (two options on the left side of the roof) with M6 lug.

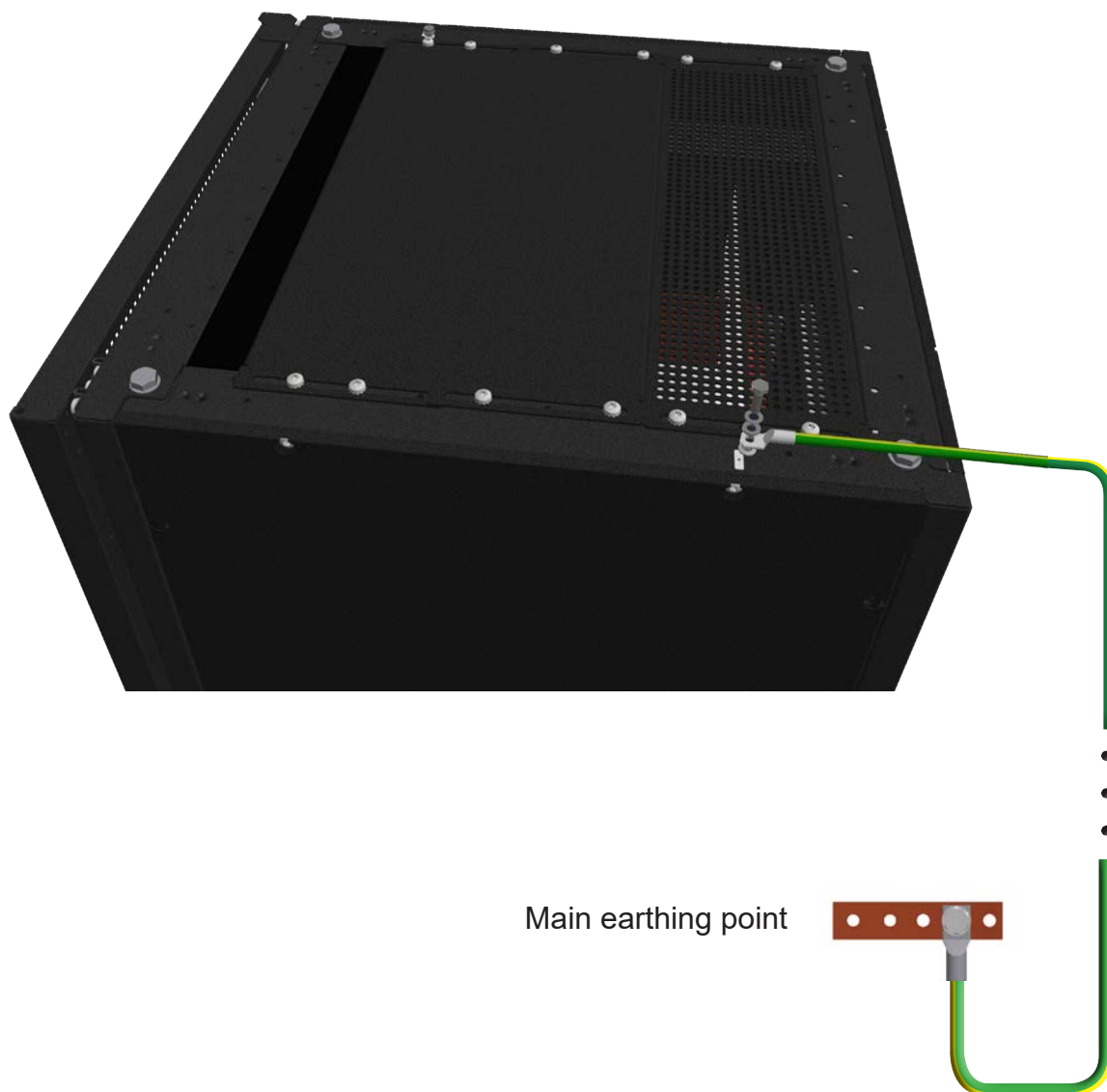


Figure 4.2 Protective bonding

NOTE:

Do NOT interconnect bonding busbars in multiple cabinets in multicabinet installation. Connect separate bonding cable to each cabinet in multicabinet installation.

4.3 AC Mains Connection

4.3.1 TN-S/TT (230/400Vac) network

- Connect PE wire to terminals X1. Use torque T1.
 - Conductor (CU) 1.5mm² - 50mm².
- Connect phase wires (L1, L2, L3) and neutral wire (N) to MCB FC1. Use torque T2.
 - Conductor (CU) 1.0mm² - 50mm².

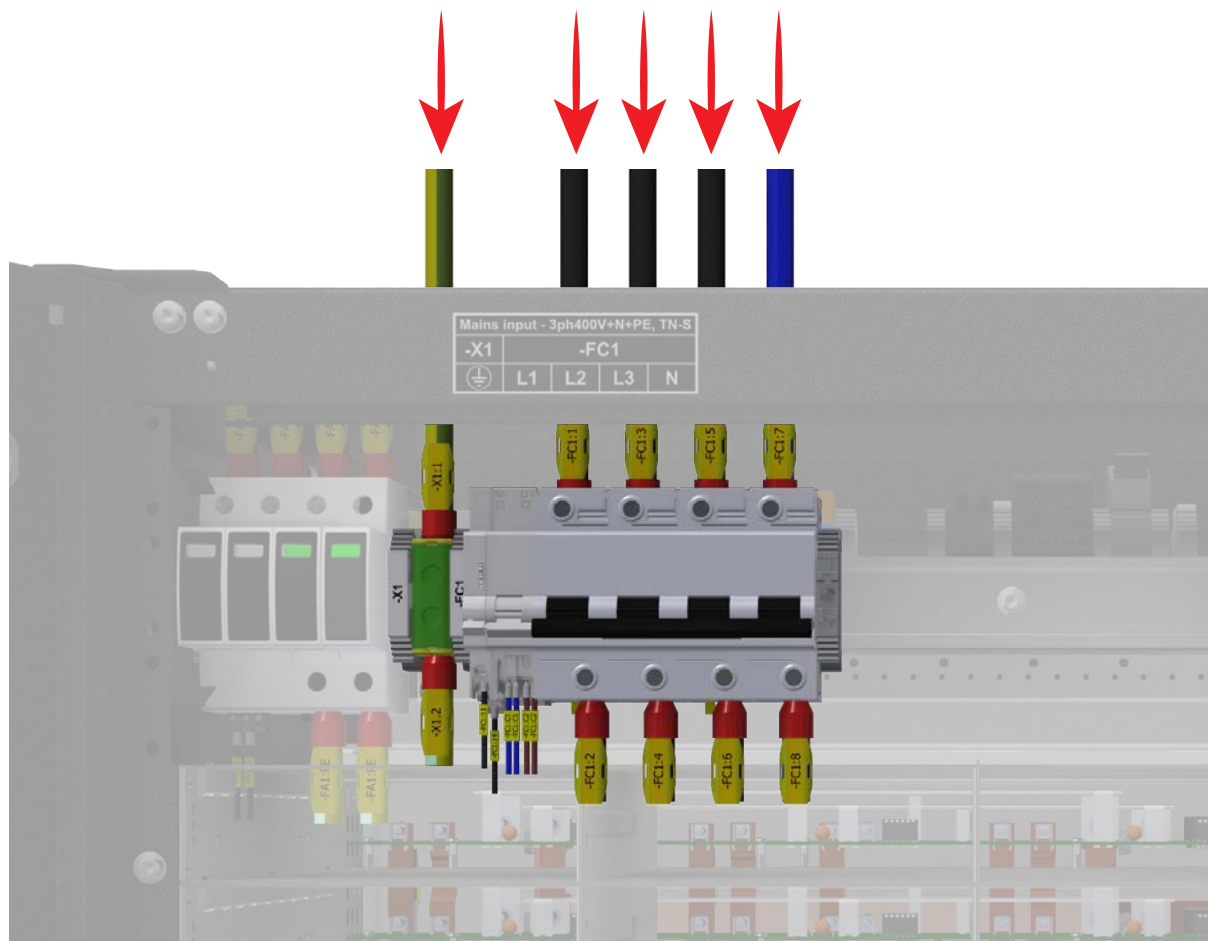


Figure 4.3 Mains connection

4.4 Emergency disconnect switch

Pixii system contains emergency trip device, which in case of emergency can disconnect whole system from the grid. For correct function, external switch with normally open contact and 230Vac backup power supply is required. Connect phase wire to the terminal -X5:1 and neutral wire to the terminal -X5:3. If 230Vac will be present on the terminal -X5, system will disconnect. Placement of external emergency switch depends on local regulations.

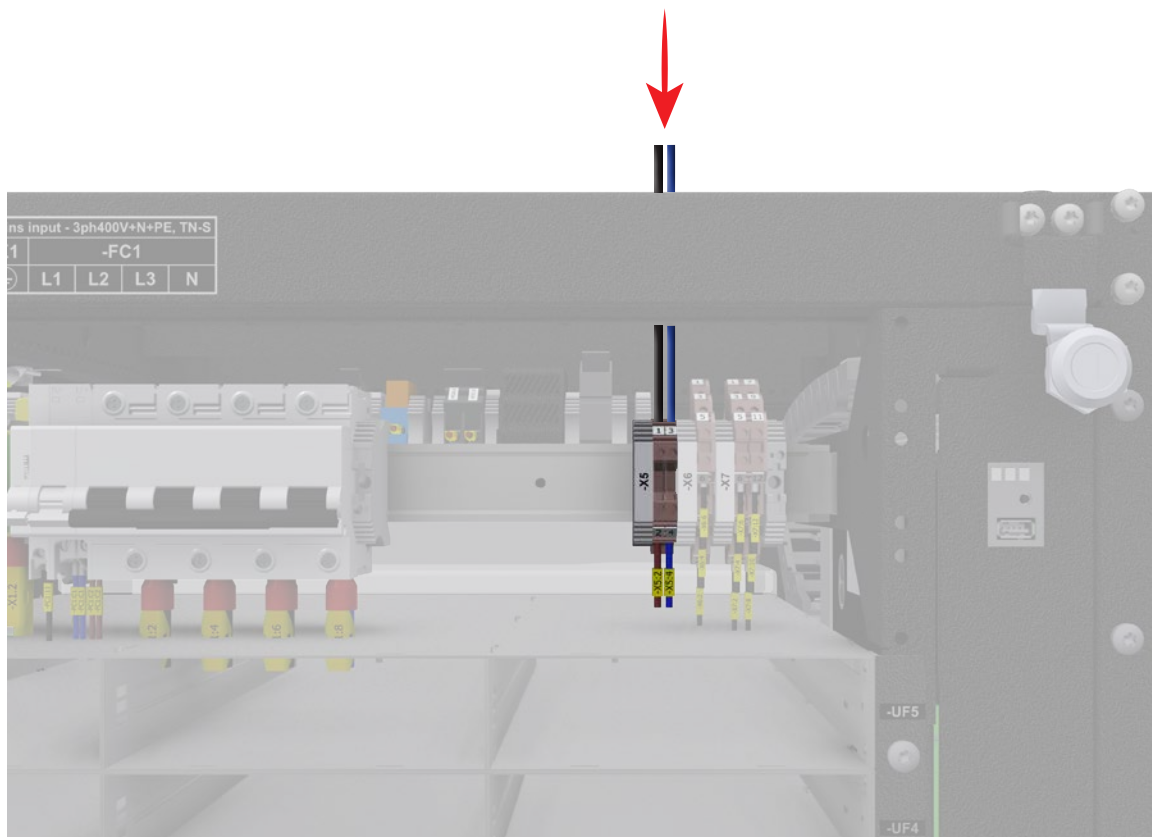


Figure 4.4 Emergency disconnect switch terminals -X5

4.5 Custom alarm connection

Each Gateway is equipped with 2 alarm relays for customer alarm functions. All relays are configurable through the software. It could be added different alarm/warning to each of them. For more informations, see document DN 14070 (*14070_Pixii PowerShaper Notifications*)

For multicabinet solution, alarm relays could be connected together in series, to signalize as a one alarm for the group of cabinet, or it could be connected separately to signalize alarm for each cabinet in the group.

All relays contacts are accessible on connector terminals -X7.



Figure 4.5 Customer alarm connector terminals -X7

4.5.1 Separate alarm

Connect each cabinet to the customer alarm box to ensure finding specific failure.

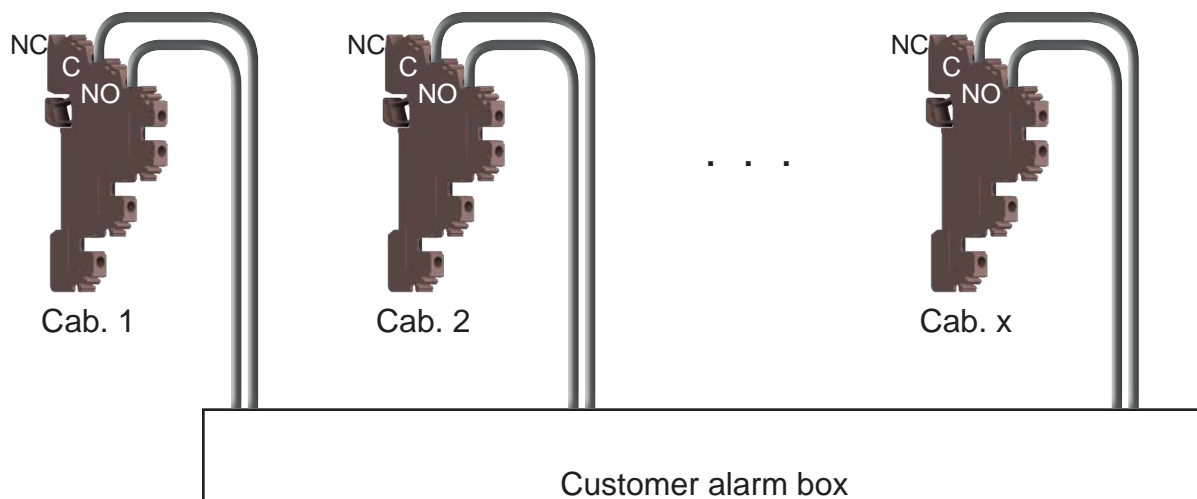


Figure 4.6 Separate alarm

4.5.2 Common alarm

Interconnect cabinets in series and then connect to the customer alarm box. This configuration will be signaling the alarm for whole arrangement.

Alternative 1 (Serial connection of NC-C)

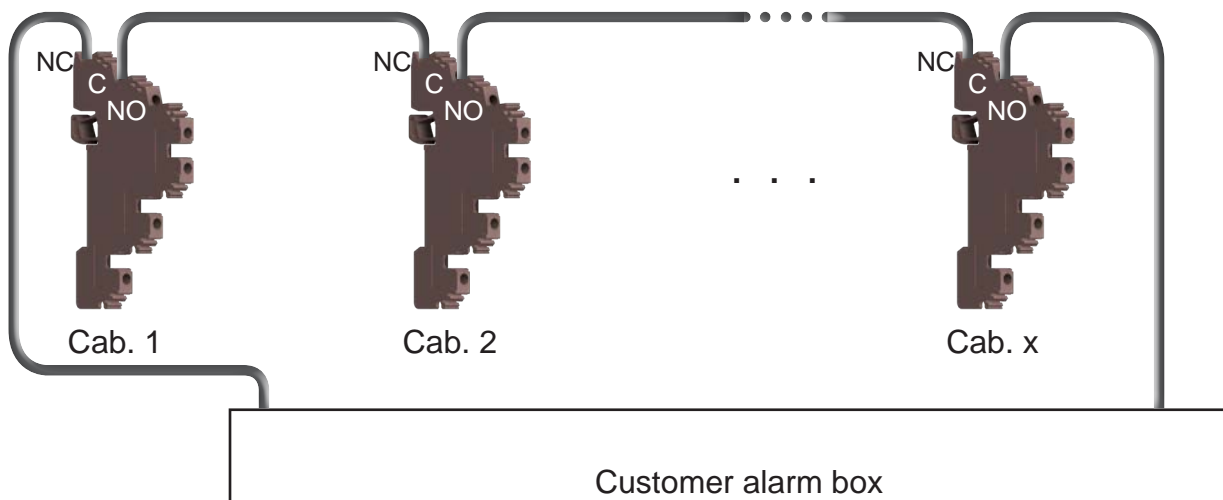


Figure 4.7 Common alarm (Serial)

Alternative 2 (Parallel connection NO-C)

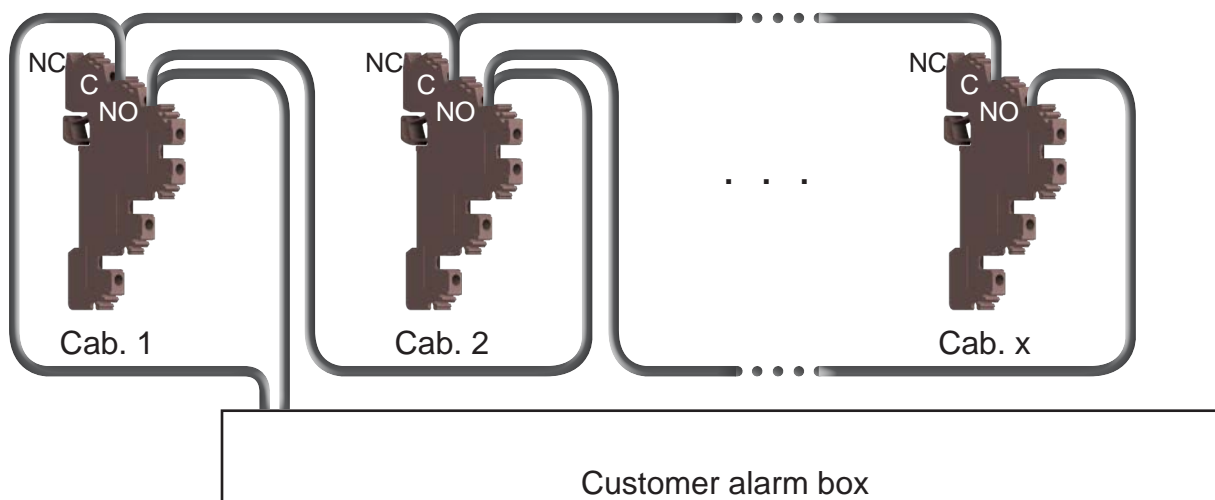


Figure 4.8 Common alarm (Parallel)

4.6 External communication

Pixii system is fully configurable through web interface. Therefore a network connection to controller is required. This can be done in different ways, depending on what type of network is present on site. The system has a Wi-Fi Access Point that can be activated to access the web interface for configuration and monitoring when at the site.

4.6.1 Wi-Fi Access Point

The Wi-Fi Access Point is disabled by default. It may be enabled or disabled by pressing the button found at the upper right hand side (marked by "PB1").

Enable

- Press the button for a duration of between 50ms and maximum of 2 seconds.
- The green led will then blink 2 seconds on and 0.5 seconds off.

Disable

- Press the button for a duration of between 50ms and maximum of 2 seconds.
- The green led will then be lit steady.

The SSID and password are printed on the right side of the controller.

The web page is accessible at <https://10.42.0.1>.

4.6.2 Ethernet connection

- Route RJ45 network cable from the top, using the glands between the adjustable covers.
- Connect ethernet cable to the connector -X20.

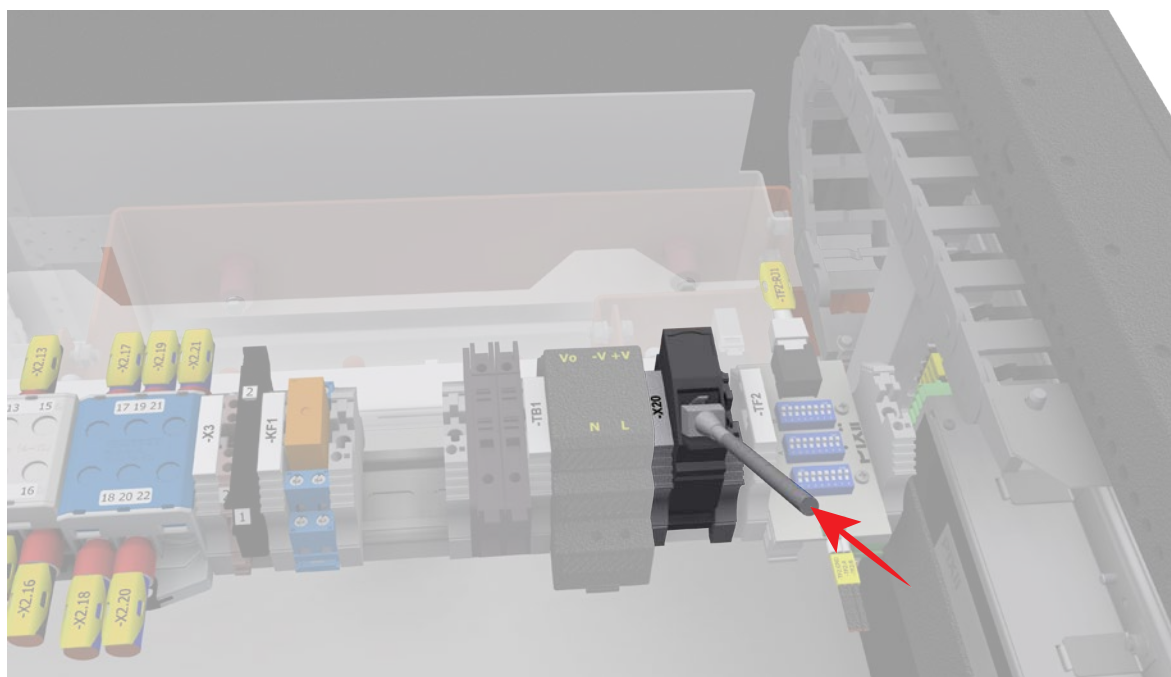


Figure 4.9 Network cable connection

4.7 AC meter connection

AC meters from various manufacturers can be used during installation. In next chapters will be described most common ways how to connect it to Pixii system.

4.7.1 AMS energy meter

Pixii controller is not equipped with M-Bus port, therefore USB to M-Bus converter (optional kit) needs to be used. Connect it to free USB port on Pixii controller and connect Ethernet cable to RJ45 connector on converter. On meter side are 2 possible options for connecting communication cable. If only Pixii controller will be connected to AC meter, connect Ethernet cable directly to RJ45 connector on meter. Otherwise connect short cable with RJ45 splitter to AC meter and then to splitter connect Ethernet cable from Pixii controller.

4.7.2 Industrial grade energy meter

Modbus/RTU

All supported AC meters are equipped with RS485 port for communication. Therefore 2-wire bus must be wired to the terminal -X6.

- Wire A(D+) - Connect cable (0.5mm²) to the terminal -X6:1
- Wire B(D-) - Connect cable (0.5mm²) to the terminal -X6:3

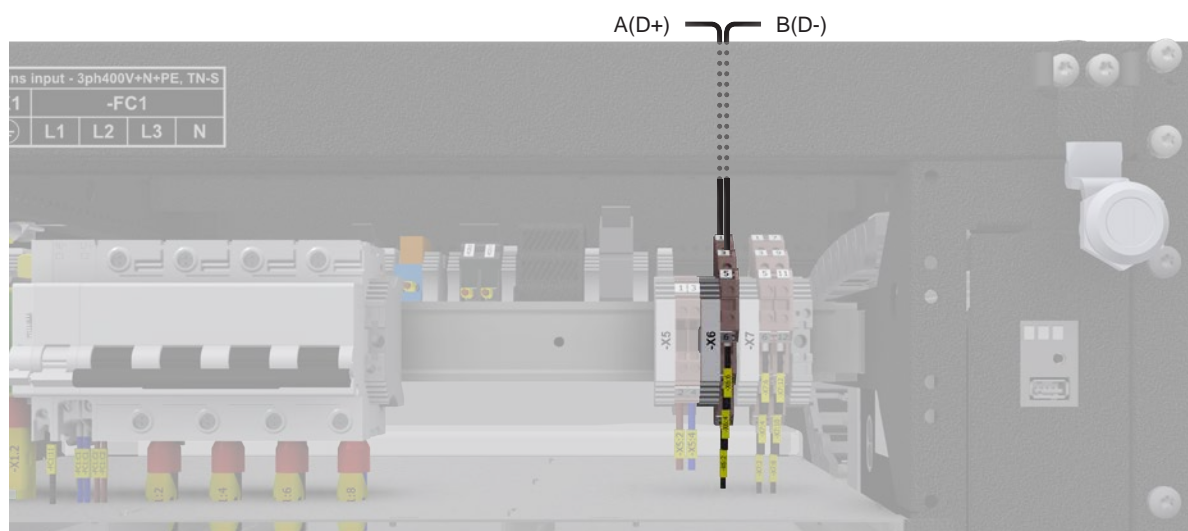


Figure 4.10 Industrial AC meter connection

Modbus/TCP

All supported AC meters are equipped with RJ45 port for communication. Therefore ethernet cable must be connected between the meter and the switch. Pixii controller must be connected with ethernet cable to the same switch as the meter to ensure the correct communication.

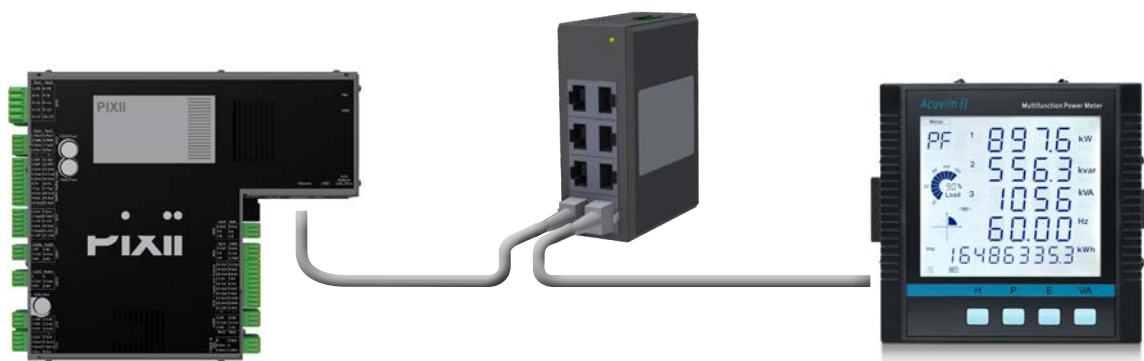


Figure 4.11 Modbus/TCP connection

NOTE:

Pictures above are showing only examples of AC meters.

4.8 Installing batteries

The indoor energy storage system is capable of operating with different types of batteries (3U, 4U) from various manufacturers (Polarium, Shoto). In case of using batteries exceeding a depth of 550mm, an additional extension kit (14942_ KIT Indoor cabinet extension H2m D100mm) must be installed on the rear side of the cabinet. Follow separate installation instructions (15311_Installation Guide _Indoor cabinet extension kit) to mount the extension kit.

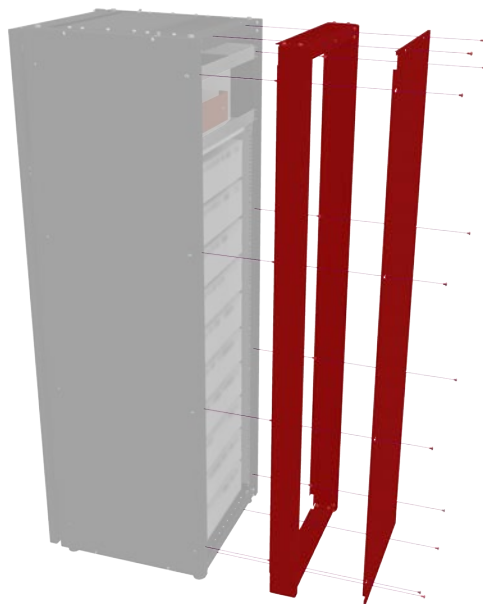


Figure 4.12 Extension kit

4.8.1 Polarium

Cabinets are default prepared for 3U batteries (up to 10pcs) from factory, with 148mm spacing between battery supports. It is possible to use 4U batteries (up to 8pcs) as well, but the battery support brackets spacing must be adjusted to 185mm and the rear extension kit must be installed. Bottom battery position is the same for both options.

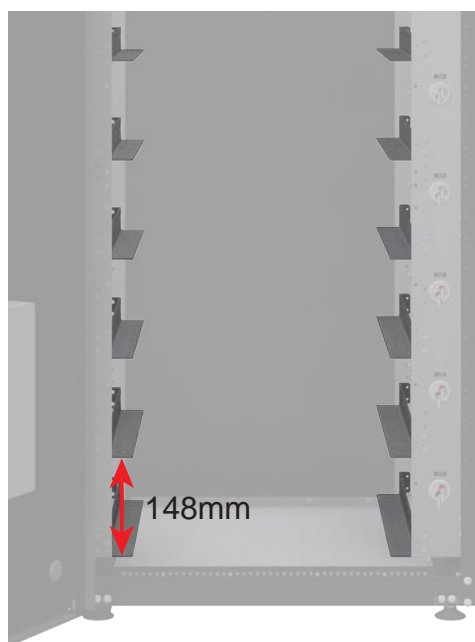


Figure 4.13 3U battery option

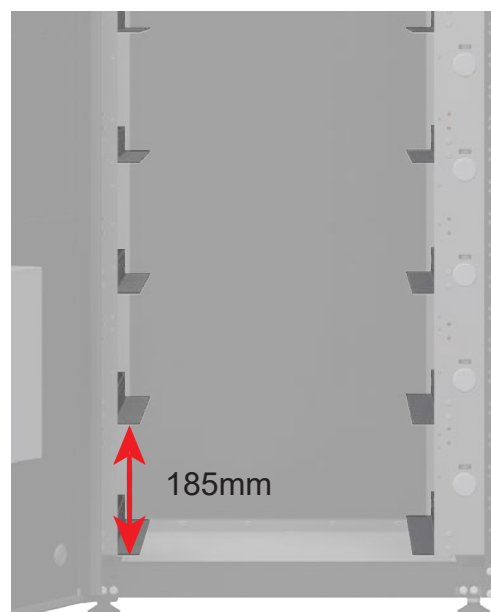


Figure 4.14 4U battery option

NOTE:

Rear battery extension kit must be installed, if 4U batteries are going to be used.

Using different models of battery modules together is not permitted. Be very careful during installation, because of the high weight of the battery. It's strictly recommended, that batteries are installed by 2 persons. Batteries must be installed in order from bottom to top (see *Figure 4.15*). Place each battery back side at the rails and slowly slide them in correct position. Fix each battery with at least 2x M6 (depending on the accessible holes on the mounting brackets) self tapping screws (see *Figure 4.16*), using torque T4.



Figure 4.15 Battery positions

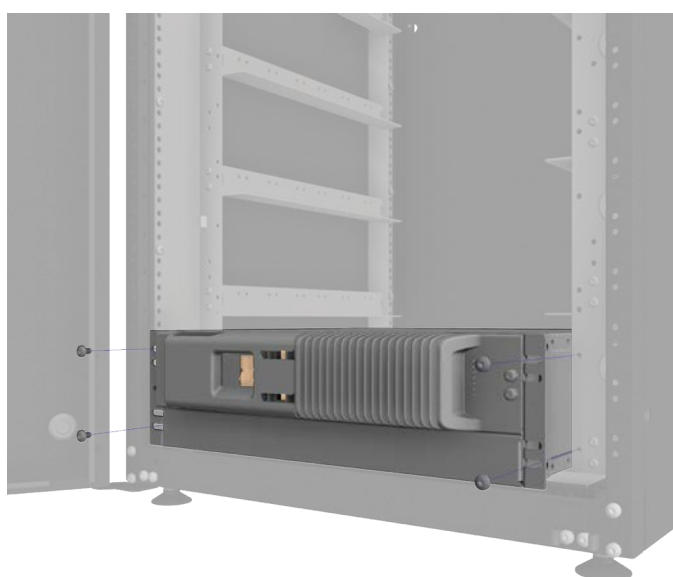


Figure 4.16 Battery installation

NOTE:

Empty battery positions (if any) must be covered by blank panels to obtain correct air flow inside the cabinet.

Battery connection

Each battery module contains an internal Battery Management System (BMS) and a breaker to secure safe operation. Before connecting the batteries, check once again that all batteries are the same type. If the check was successful, start connecting the batteries.

Power cabling:

1. Connect the positive cable (red, marked -GB1:+) to the bottom battery positive terminal.
2. Connect the negative cable (black, marked -GB1:-) to the bottom battery negative terminal.
3. Repeat step 1 and 2 to connect all other batteries (GB2-GB10) installed in the system.

Communication cabling:

1. Interconnect battery -GB1 with Gateway using pre-installed RJ45 cable.
2. Connect each battery module to those adjacent to it using an intra-rack RJ45 communication cable. For connection use Modbus ports on batteries.
3. Fix cables to avoid contact with fans, heaters and other equipment mounted on door if needed.
4. Repeat step 1 and 2 to connect all other batteries (GB2-GB10) installed in the system.
5. To the last position in -GB10 Battery put End termination plug.

NOTE:

Do NOT power ON batteries at this stage of installation.

NOTE:

If pre-assembled battery cables are NOT long enough, pull them gently while holding the cable gland in its position.

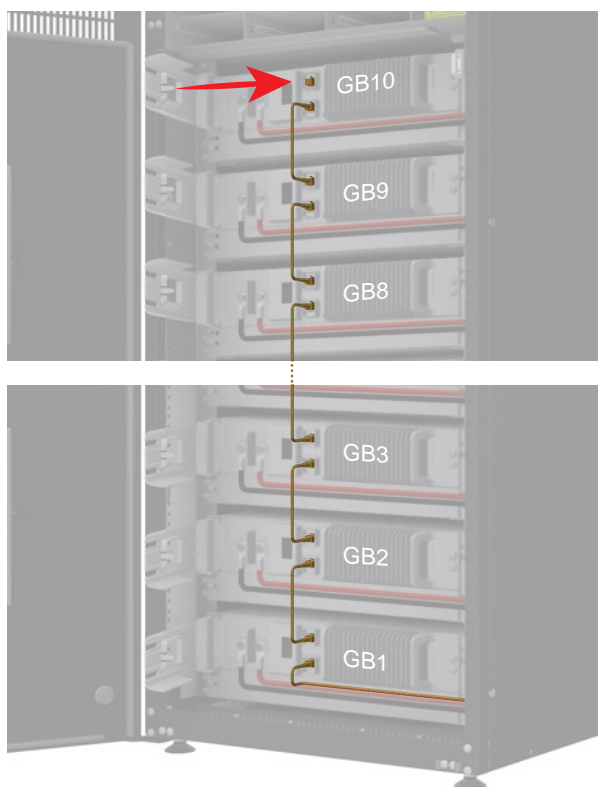


Figure 4.17 Battery communication cables



Figure 4.18 Battery cables

NOTE:

For connection of DC battery cables use appropriate torque from chapter "1.1 Recommended tools and torque" on page 8, or follow manufacturer installation documentation.

NOTE:

Insert termination plug to the last unused Modbus port. See details in Figure 4.17

NOTE:

Ensure, that battery cables are not in/not colliding with air gap between the batteries. It could cause overheating problems.

4.8.2 Shoto

NOTE:

Mount back bottom cover plate before installing the batteries. See chapter "3.2 Bottom cover plate" on page 21.

Cabinets are default prepared for 3U batteries (up to 10pcs) from factory, with 148mm spacing between battery supports.

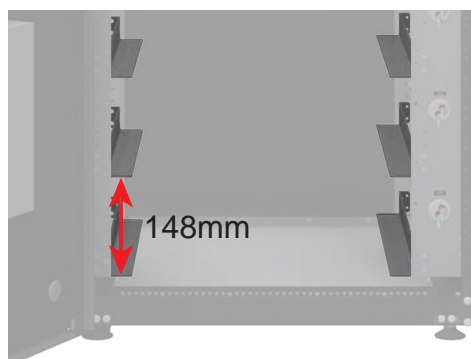


Figure 4.19 3U battery option

Using different models of battery modules together is not permitted. Be very careful during installation, because of the high weight of the battery. It's strictly recommended, that batteries are installed by 2 persons. Batteries must be installed in order from bottom to top (see Figure 4.20). Place each battery back side at the rails and slowly slide them in correct position. Fix each battery with at least 2x M6 (depending on the accessible holes on the mounting brackets) self tapping screws (see Figure 4.21), using torque T4.



Figure 4.20 Battery positions

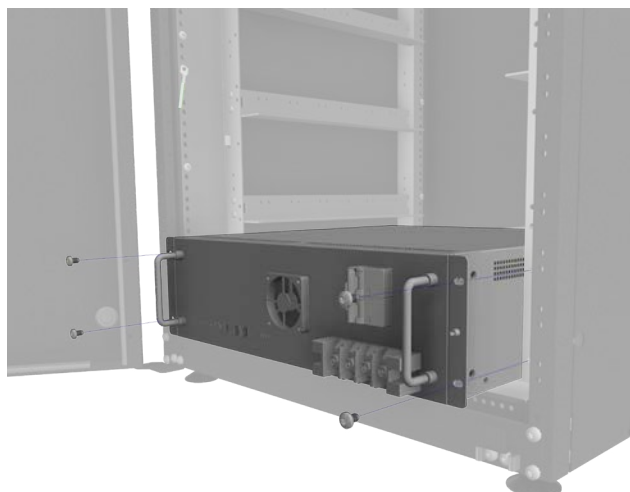


Figure 4.21 Battery installation

NOTE:

Empty battery positions, if any, must be covered by blank panels to obtain correct air flow inside the cabinet.

NOTE:

Use attached self tapping screws for fixing batteries to the battery shelves.

Battery connection

Each battery module contains an internal Battery Management System (BMS) and a breaker to secure safe operation. Before connecting the batteries, check once again that all batteries are the same type. If the check was successful, start connecting the batteries.

1. Connect each battery module to those adjacent to it using an intra-rack RJ45 communication cable. For connection use Modbus ports on batteries (see *Figure 4.22*).
2. Interconnect connector -X21 with the bottom battery Modbus port using attached RJ45 communication cable (see *Figure 4.22*).
3. Fix cables to avoid contact with fans, heaters and other equipment mounted on door if needed.
4. Connect the positive cable (red, marked -GB1:+) to the bottom battery positive terminal.
5. Connect the negative cable (black, marked -GB1:-) to the bottom battery negative terminal.
6. Repeat step 4 and 5 to connect all other batteries installed in the system (see *Figure 4.23*).

NOTE:

Do NOT power ON batteries at this stage of installation.



Figure 4.22 Battery communication cables



Figure 4.23 Battery cables

NOTE:

For connection of DC battery cables use appropriate torque from chapter "1.1 Recommended tools and torque" on page 8, or follow manufacturer installation documentation.

NOTE:

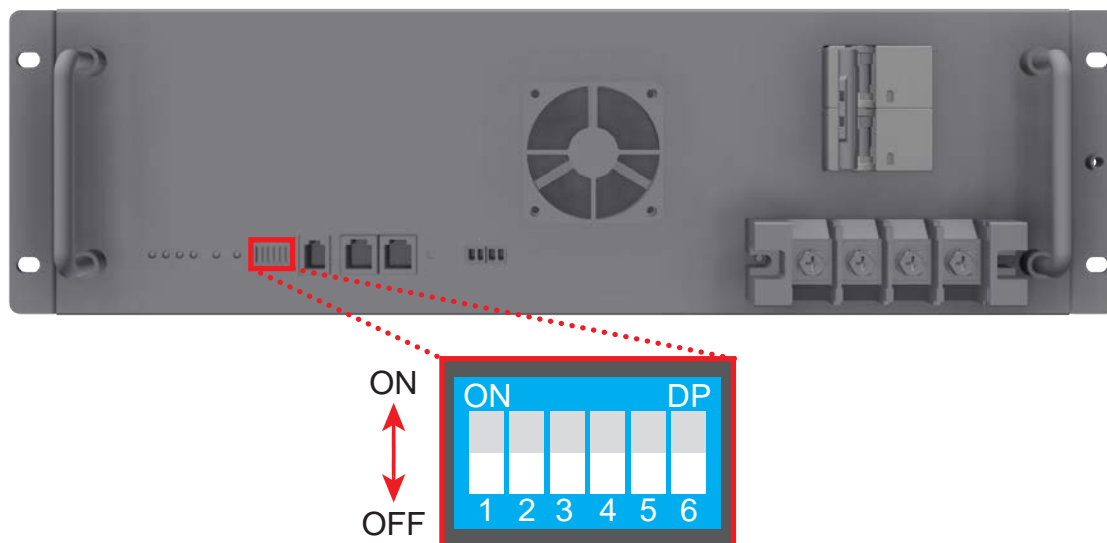
Ensure, that battery cables are NOT colliding with battery breakers above the battery terminals.

NOTE:

Ensure, that battery cables are not in/not colliding with air gap between the batteries. It could cause overheating problems.

Configuration

For the correct function of Shoto batteries, set the dial switch on the front panel of each battery. There are 4 numerals (1-4) to set the code which can be used to address the battery. The code is assigned as follows:



Address NO	Code switch 1	Code switch 2	Code switch 3	Code switch 4
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

Table 6. Code switch address

NOTE:

Start addressing the batteries from first battery #1 at the bottom and continue to the top.

NOTE:

After complete installation of batteries, do NOT forget to mount all covers back.

4.8.3 Battery Com converter

Proper configuration of converter (-TF1) is necessary to secure the correct communication with various type of batteries. Follow the tables below to set the DIP switches in the right positions.



Figure 4.24 Battery Com converter (-TF1)

	GND	A	B
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	OFF	OFF
4	OFF	OFF	OFF
5	OFF	OFF	OFF
6	OFF	OFF	OFF
7	OFF	ON	OFF
8	ON	OFF	OFF

Shoto batteries configuration table

	GND	A	B
1	OFF	OFF	OFF
2	OFF	OFF	OFF
3	OFF	OFF	OFF
4	OFF	ON	OFF
5	OFF	OFF	ON
6	ON	OFF	OFF
7	OFF	OFF	OFF
8	OFF	OFF	OFF

Polarium batteries configuration table

4.9 Power modules

The last step in the system installation is to install Pixii modules. Each power shelf contains 3 positions for modules. Each position is wired to different phase, starting with L1 from the left. To secure correct 3-phase operation, all 3 modules must be installed in every used shelf. The controller will identify the position of each inserted module, therefore it is not critical in which order the modules are inserted or removed. There is a label located next to the power shelves describing the module positions. It is recommended to start inserting modules from shelf -UF1 position 1.1.

4.9.1 Installing module

1. Place the module in the shelf and slide in.
2. Using the module handle, push firmly until the unit is properly connected and the ratchet on the left side lock the module in position.

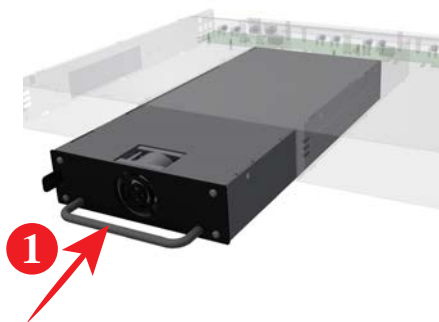


Figure 4.25 Slide the module in



Figure 4.26 Push firmly until the ratchet lock the module

NOTE:

If the module does not fit easily, do not use that power shelf and contact supplier for repair.

4.9.2 Removing module

1. Push the ratchet on the left side to unlock the module.
2. Pull out the module using the handle while holding the ratchet.
3. Replace with a new module or blind panel.



Figure 4.27 Unlock the ratchet

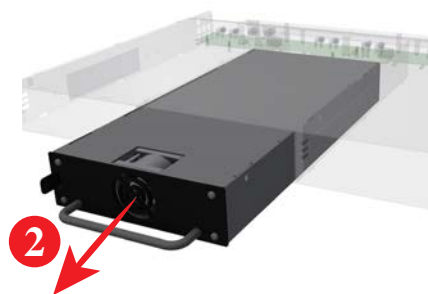


Figure 4.28 Pull the module out

WARNING:

Do NOT touch connectors on the module rear side, there is risk of electric shock because of accumulated energy inside.

NOTE:

Empty positions must be covered with blank panels to obtain correct airflow.

4.10 System label

Pixii system is marked with 2 system labels. One label is located on the outside of the cabinet (right hand side seen from the front), and one is located inside the cabinet on the left side of the battery racks.

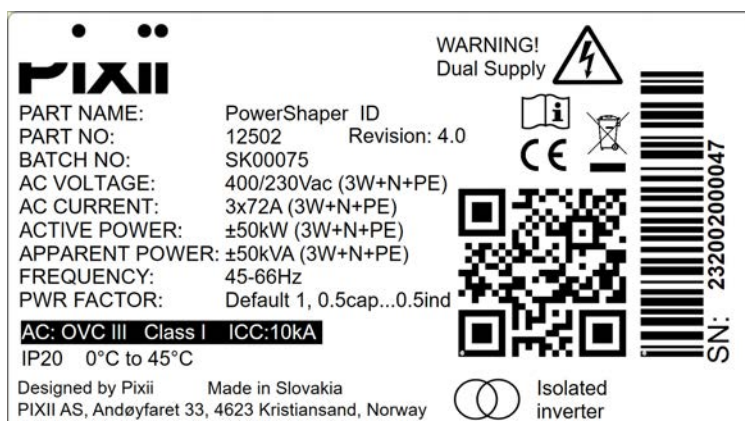


Figure 4.29 System label

4.11 Finalization

After successful installation, mount plastic cover back following steps in chapter "4.1 Preparation" on page 18.

5 Commissioning procedure

For proper commissioning of the system, see separate procedure DN 14606 (14606 - Commissioning procedure - Power cabinets).

6 Maintenance

To ensure that the system lifetime will be reached, regular inspections of the system are required. To be within warranty terms of the product the owner must follow the complete maintenance procedure. This procedure can be adapted based on local conditions and regulations. Only authorized and qualified persons are allowed to perform system maintenance. These persons must be familiar with the system and must follow all precautions described in this manual. Below is a non-exhaustive list of points for general consideration. Do not limit the evaluation to only those points.

NOTE:

For repair and replacement use only original Pixii parts and in accordance with technical specification provided by Pixii. Use of non-original parts may void the warranty provided by Pixii.

6.1 System

- Remove all objects around cabinet that can block air flow.
- Check for physical damage on the cabinet body. Repair scratches with paint. If the cabinet body has severe damage, like deformation or holes, the system should immediately be taken out of operation and replaced with a new cabinet.
- Check the door hinges and apply oil or grease if needed.
- Check the batteries, look for possible leakage and mechanical damage.
- Check that all accessible cables are not mechanically damaged.
- Check that the mains input cable well tightened (Torque table is in chapter "1.1 Recommended tools and torque" on page 8).

• ••
PIXII

