

APT4015A(x)

Panel computer

Operation manual

Version 1.00



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Revision history

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Revision	Date	Changes author	Changes
100	30. 08. 2017	Rott O.	New document.

Related documentation

1. **APT Flash Loader** – User's guide
file: apt-flash-loader_g_en_xxx.pdf
2. **TouchDet** – environment for visualisation and monitoring – Operation manual
file: touchdet_g_en_xxx.pdf
3. Application note AP0016 – Principles of RS485 interface usage
file: ap0016_en_xx.pdf
4. Application note AP0037 – Principles of Ethernet network usage
file: ap0037_en_xx.pdf
5. www.msc-technologies.eu – MSC Q7-BT processor core producer
6. www.microchip.com – producer of the resistive panel controller AR110
7. www.kernel.org – The Linux Kernel Archives
8. wiki.debian.org – Wikipedia for Debian

1 Introduction

APT4015A(x) is a panel computer built on a PC platform. It is intended to be built-in into switchboard front panel.

The panel computer **APT4015A(x)** contains the main processor module with the processor Intel® Atom™ (hereinafter referred to as the main CPU).

- Properties**
- CPU Intel® Atom™ E3815, Single core, 1.46 GHz
 - 2 GB DDR3L RAM
 - 4 GB SATA SLC eMMC
 - TFT LCD 15,6" interface (1366 × 768), LED backlight
 - Resistive touch panel
 - 1× slot miniPCIe for mSATA
 - 1× RS485 interface (galvanic isolation)
 - 1× RS232 interface without galvanic isolation
 - 2× USB with A-type USB connector
 - 2× Ethernet interface 1 Gbps, connector RJ45
 - Nominal power supply voltage 24 V DC

The panel computer is designed to work within the whole operating temperature range right after startup, without the need of tempering.

To avoid damage of electronics the computer switches automatically off whenever critical temperature inside the system is reached.

On panel computer can run most of available operating systems. Please contact AMiT technical support for information about current OS versions and support for the OS launch.

2 Technical parameters

CPU	CPU	Intel® Atom™ E3815, Single core, 1.46 GHz
	RAM	2 GB, DDR3L SDRAM
	FLASH memory	4 GB eMMC

Display	LCD display	(1366 × 768) pixels, 15.6", 262k colours
	Brightness, contrast	Typically 300 cd/m ² , typically 500:1
	Viewing angles	Typically 140° horizontally, 120° vertically
	Backlight	LED
	Backlight lifetime	50 000 hours ¹⁾

Note ¹⁾ Luminosity drop to 50 %, Ta = 25 °C.

Touch panel	Type	Resistive
	Number of touches	Unspecified
	Touching strength	Unspecified
	Resistance to chemicals	Unspecified

Note The touch panel is intended to be operated by fingers or a tool without sharp edges or by gloved fingers.

mSATA	Quantity	1
	Type	miniPCIe ²⁾
	Capacity	Depending on the mSATA disk applied ²⁾
	mSATA disk capacity	8 GB to 512 GB

Note ²⁾ Support only mSATA. mSATA disk is not included.

SD card	Quantity	1
	Type	Micro SD (HC)
	Capacity	Depending on the SD card applied ³⁾
	Memory card capacity range	2 GB to 128 GB

Note ³⁾ Micro SD card is not included.

RS485	Quantity	1
	Operation indication	No
	Overvoltage protection	Transil 600 W
	Galvanic separation	Yes
	Insulation strength	500 V AC / 1 minute ⁴⁾
	Terminating resistor	120 Ω ⁵⁾
	Recommended cabling	Shielded cable
	Idle status definition ⁵⁾ to +5 V to 0 V	820 Ω on the station 820 Ω on the station
	Maximum number of stations	32
	Connection point	WAGO 231-303/102-000
	Wire cross-section	0.08 mm ² to 2.5 mm ²

Note ⁴⁾ Insulation must not be used for separation of dangerous voltages

⁵⁾ The idle status definition and termination are connected simultaneously.

RS232	Quantity	1
	Operation indication	No
	Galvanic isolation	No
	Recommended cabling	Shielded cable
	Logical level 0 (input)	-30 V to +0.6 V
	Logical level 1 (input)	+2.4 V to +30 V
	Connection point	D-sub DE-9 plug, connector fixing by UNC4-40 thread bolt

Ethernet	Quantity	2 ⁶⁾
	Operation indication	LED (LNK and ACT)
	Galvanic isolation	Yes
	Insulation strength	1000 V AC / 1 minute ⁷⁾
	Transmission speed	1 Gbps
	Connection point	Connector RJ45, according to IEEE802.3

Note ⁶⁾ When using TouchDet (see chapter 9.2 “APT4015AT – TouchDet”), the user may only configure 1 IP address. Interfaces works as a switch.

⁷⁾ Insulation must not be used for separation of dangerous voltages

USB	Quantity	2
	Type	USB 2.0 type A
	Operation indication	No
	Galvanic isolation	No
	Transmission speed	12 Mbps / 480 Mbps
	Recommended cabling	Shielded USB cable
	Connection point	2× USB connector, type A

Power supply	Rated supply voltages	24 V DC
	Supply voltage range	16.8 V DC to 33.6 V DC
	Maximum power consumption	1 A at 24 V DC 1.3 A at 16.8 V DC
	Power dissipation (typical)	12 W
	Starting peak current	430 A / < 10 μs
	Galvanic isolation	No
	Connection point	WAGO 231-302/102-000
	Wire cross-section	0.75 mm ² to 2.5 mm ²
	Power supply	The device must not be powered from the DC distribution network of the building ⁸⁾

Note ⁸⁾ For more details, see chapter 8.3 “Installation principles”, paragraph “Power supply”.

Mechanics	Mechanical design	Duralumin panel, metal cover
	Colour – front panel	Black RAL 9005, fine matte
	– rear cover	Black RAL 9005, soft matte
	Assembly	Into switchboard front panel
	Ingress protection rate	Front panel IP54 ⁹⁾ Rear cover IP20
	Weight – netto	4.00 kg ± 5 %
	– brutto	5.00 kg ± 5 %
	Dimensions (w x h x d)	(420 × 254 × 66) mm
Package dimensions (w × h × d)	(480 × 340 × 135) mm	

Note ⁹⁾ Follow the assembly instructions, see chapter 8.1 “Assembly instructions”.

Temperatures	Range of working temperatures	0 °C to 50 °C
	Storage temperature range	-30 °C to 70 °C

Note The device is functional within the whole range of operating temperatures immediately after startup.

Other	Maximum ambient humidity	< 90 % non-condensing
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Software equipment	Operating system	See chapter 9 "Software equipment"
	Application software	See chapter 9 "Software equipment"

Components with limited lifetime	LCD backlight	Expected lifetime 20,000 hours ¹⁰⁾
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Note ¹⁰⁾ Luminosity drop to 50 %.

2.1 Dimensions

All dimensions are stated in mm.

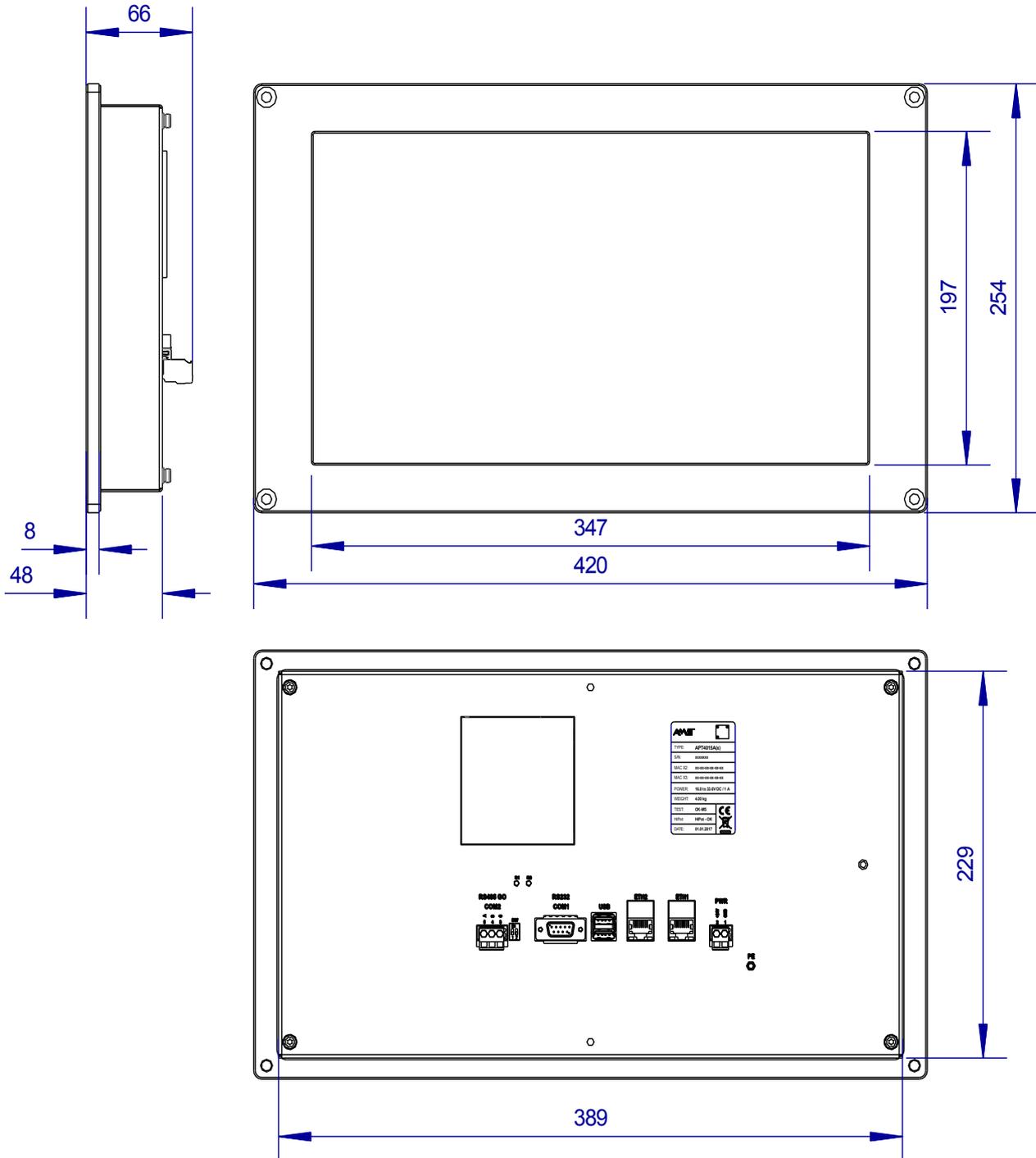


Fig. 1 – **APT4015A(x)** dimensions

2.2 Recommended drawing symbol

The following drawing symbol is recommended for the panel computer **APT4015A(x)**. Only part of it will be visible in following examples.

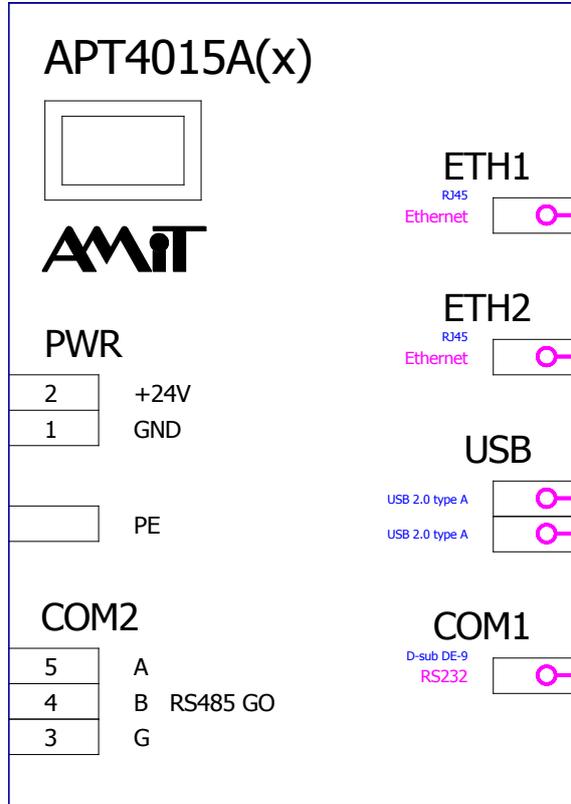


Fig. 2 – Drawing symbol **APT4015A(x)**

2.3 Block diagram

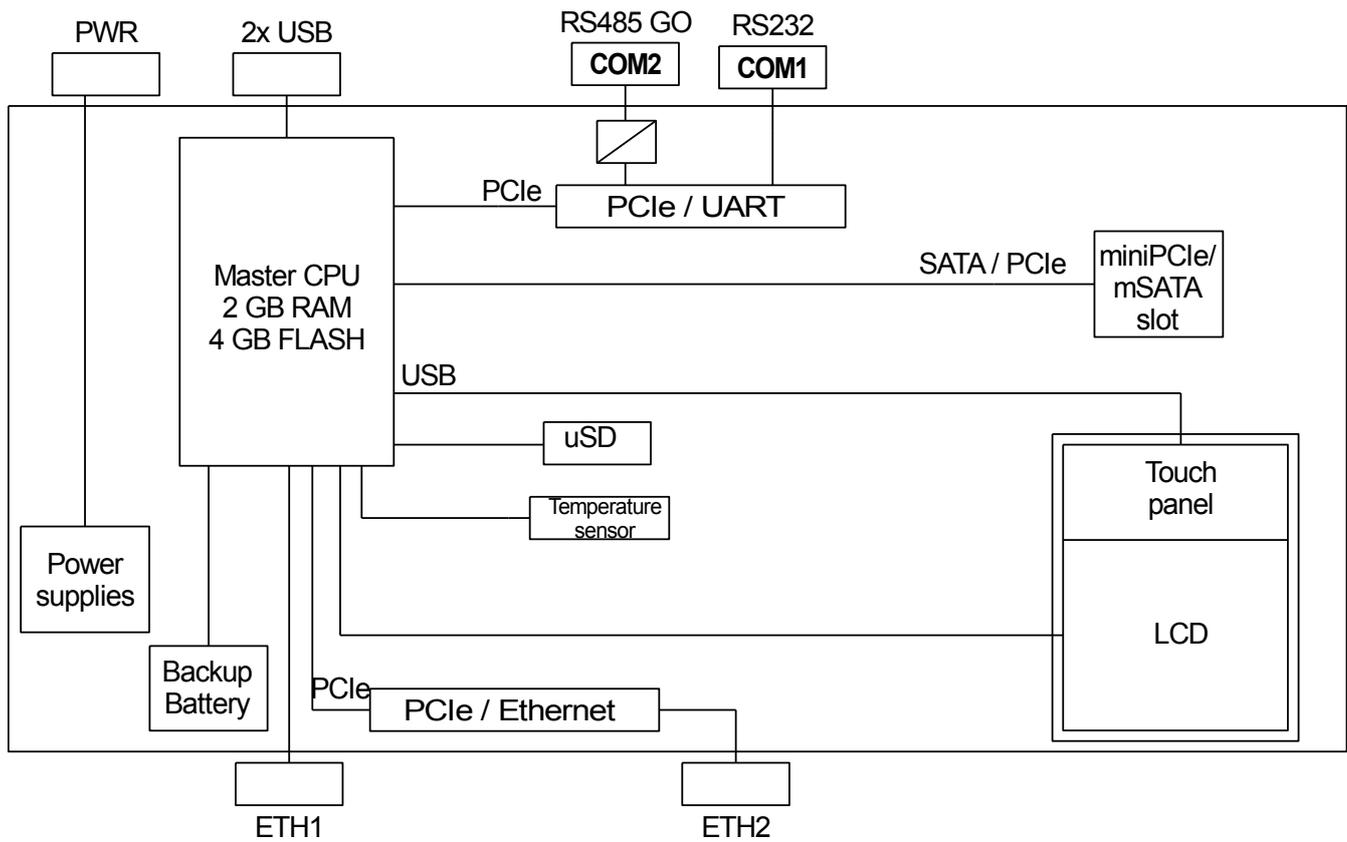


Fig. 3 – Block diagram **APT40105A(x)**

3 Product marking

The panel computer **APT4015A(x)** features a type label on the back cover.

For label location, see “Fig. 4 – The location of labels on the panel computer cover”.

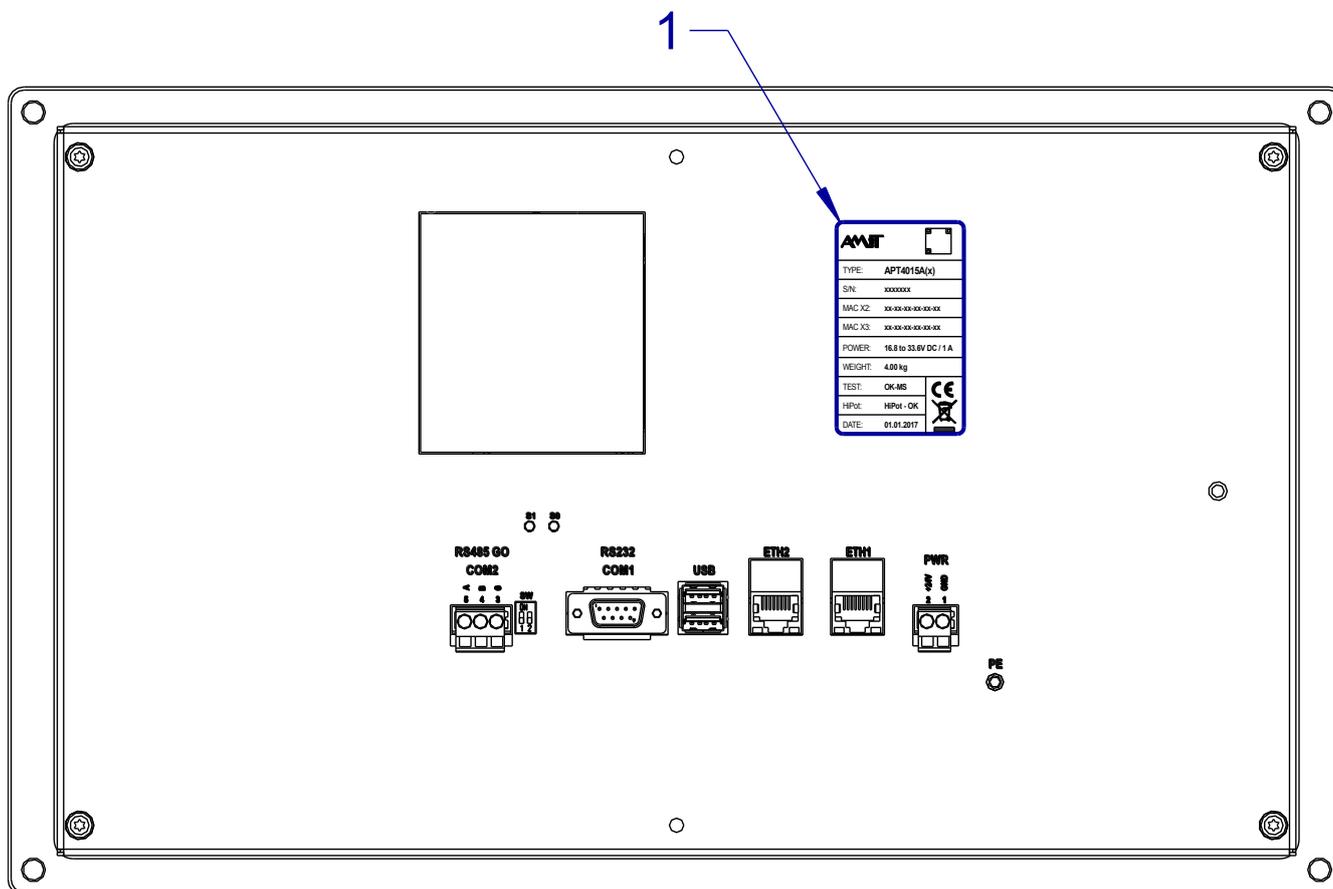


Fig. 4 – The location of labels on the panel computer cover

<i>Legend</i>	Number	Description
	1	Type label

3.1 Producer type label

The panel computer has a type label from the manufacturer attached to its back cover. The information is summarized in a table. For a label sample, see “Fig. 5 – Example of an AMiT type label”.

Description	Data	Note
–	Logo AMiT	Producer logo
–	QR code	Producer QR code
TYPE	APT4015Ax	Product type designation
S/N	xxxxxxx	Serial number
MAC ETH1	xx-xx-xx-xx-xx-xx	ETH1 interface MAC address
MAC ETH2	xx-xx-xx-xx-xx-xx	ETH2 interface MAC address
POWER	16.8 to 33.6 V DC / 0.75 A	Power supply voltage / Consumption
WEIGHT	2.00 kg	Weight
TEST	OK-xx	Routine testing result
HiPot	HiPot - OK	HiPot test result
Date	dd.mm.yyyy	Production date
–	Logo CE	The product is in compliance with EU legislation and directives
–	Crossed out dustbin logo	Disposal of the product is a subject to regulations on the disposal of electronic waste

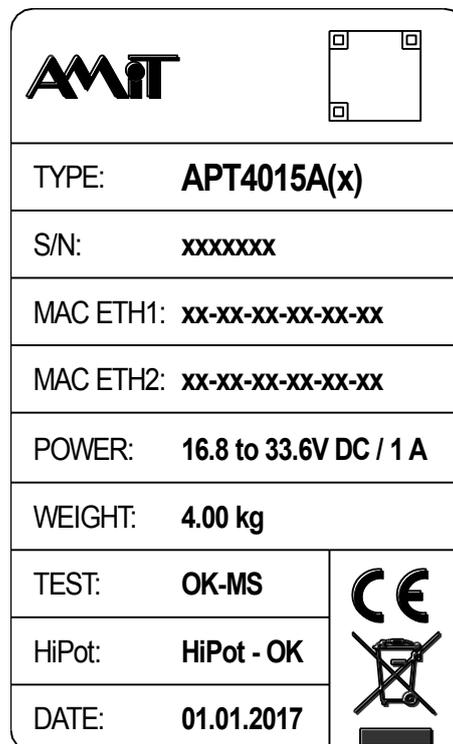


Fig. 5 – Example of an AMiT type label

4 Conformity assessment

The equipment meets the requirements of NV616/2016. The compliance assessment with NV117/2016 has been performed in accordance with harmonized standard EN 61326 – NV18 1 ed 2.

Tested in accordance with standard	Certificate type	Class
EN 55011:2009	Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement	Complies, A ¹¹⁾
EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test	Complies (8 kV)
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test	Complies
EN 61000-4-4:2006	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test, power supply	Complies (±2 kV)
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test, power supply	Complies (±2 kV)
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test, Ethernet, RS485	Complies (±2 kV) ¹²⁾
EN 61000-4-6:2014	Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields	Complies (3 V)

¹¹⁾ This is a class A device. This device can cause some radio disturbances in the internal environment. In such case the user can be requested to take the appropriate measures.

¹²⁾ Circuitry cabling, which is different than power supply cabling and longer than 30 m, must be performed by shielded cables.

4.1 Other tests

Tested in accordance with standard	Certificate type	Classification
EN 61000-4-29:2000	Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on DC input power port – Immunity test	Complies
EN 60068-2-1:2007	Environmental testing – Part 2-1: Tests – Test A: Cold	Complies
EN 60068-2-2:2007	Environmental Impact Testing – Part 2-2: Tests – Test B: Dry heat	Complies

5 Power supply

The panel computer **APT4015A(x)** can only be powered with a DC source.

The power source must comply to all requirements specified in chapter 2 “Technical parameters”.

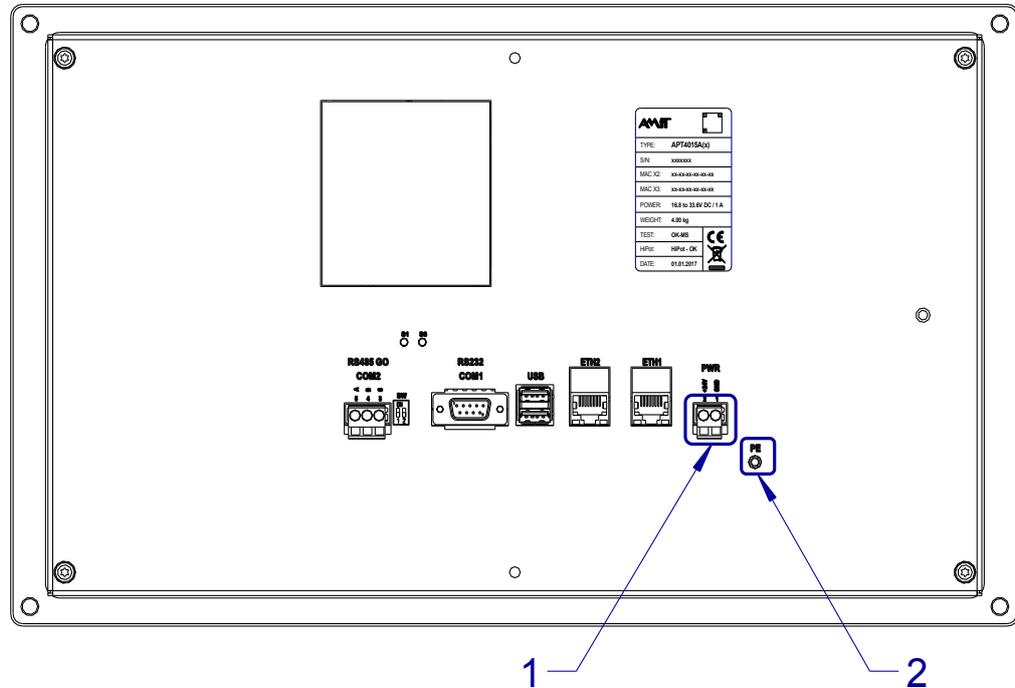


Fig. 6 – Power supply connector location

Legend	Number	Description
	1	Power supply connector
	2	Earthing screw PE

Connector wiring	Terminal	Signal	Description
	1	GND	Power supply Ground
	2	+24V	Power supply +24 V DC

Note GND and PE are galvanically interconnected within the panel computer. PE has its own separate terminal on the cover.

5.1 Panel computer start up and shut down

Startup and shutdown of the panel computer **APT4015A(x)** is performed by connecting or disconnecting the voltage to/from the power supply PWR connector.

6 Processor module

The panel computer **APT4015A(x)** contains a processor module MSC Q7-BT-15-2201.

Core The core is based on the processor Intel® Atom™ E3815 Single-core.

Memory The module memory device is memory type eMMC. Therefore, when keeping the memory lifetime in mind it is recommended to minimize the number of writing cycles.

7 Communication interface and peripherals

The panel computer **APT4015A(x)** contains the following communication interfaces and peripherals:

- RS232
- RS485
- Ethernet
- USB
- Touch panel
- Backup battery
- mSATA
- Micro SD card

7.1 RS232 (COM1)

The panel computer of the **APT4015A(x)** series contains one RS232 interface. Interface is not galvanically isolated.

The RS232 interface is implemented by the circuit of dual UART Exar XR17V352 (PCI ID: 13A8:0352) and connected to the first interface of this circuit. Specific mapping of this interface on a logical device depends on the operation system applied. In OS Linux, it is usually device dev/tty/S4.

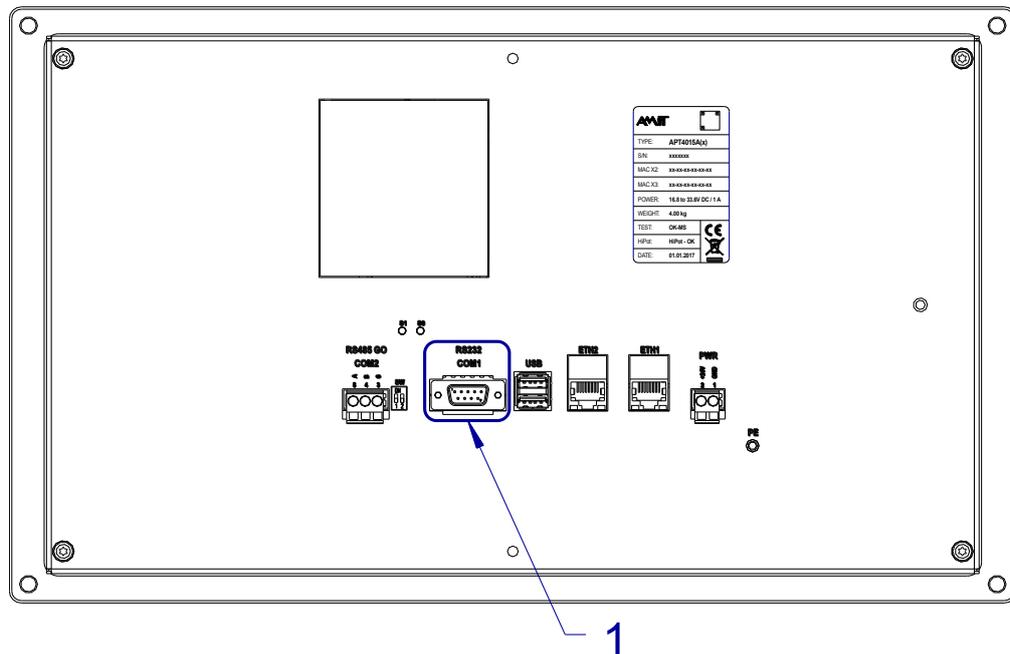
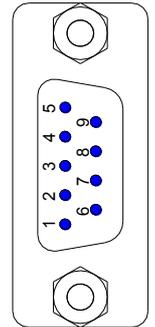


Fig. 7 – RS232 connector location

Legend	Number	Description
	1	RS232 connector, COM1

Connector wiring Connector type: D-sub DE-9, plug

Pin	Signal	Description
1	DCD	RS232, signal DCD – input
2	RxD	RS232, signal RxD – input
3	TxD	RS232, signal TxD – output
4	DTR	RS232, signal DTR – output
5	GND	RS232, ground
6	DSR	RS232, signal DSR – input
7	RTS	RS232, signal RTS – output
8	CTS	RS232, signal CTS – input
9	RI	RS232, signal RI – input



The items **Signal** and **Description** correspond to the signals on the panel computer **APT4015A(x)**.

7.2 RS485 (COM2)

The panel computer of the **APT4015A(x)** series contains one RS485 interface. The interface is galvanically isolated from the remaining electronics. The interface can be also used for connection of multiple stations (up to 32 on one segment).

The RS485 interface is implemented by the circuit of dual UART Exar XR17V352 (PCI ID: 13A8:0352) and connected to the second interface of this circuit. Specific mapping of this interface on a logical device depends on the operation system applied. In OS Linux, it is usually device dev/tty/S5.

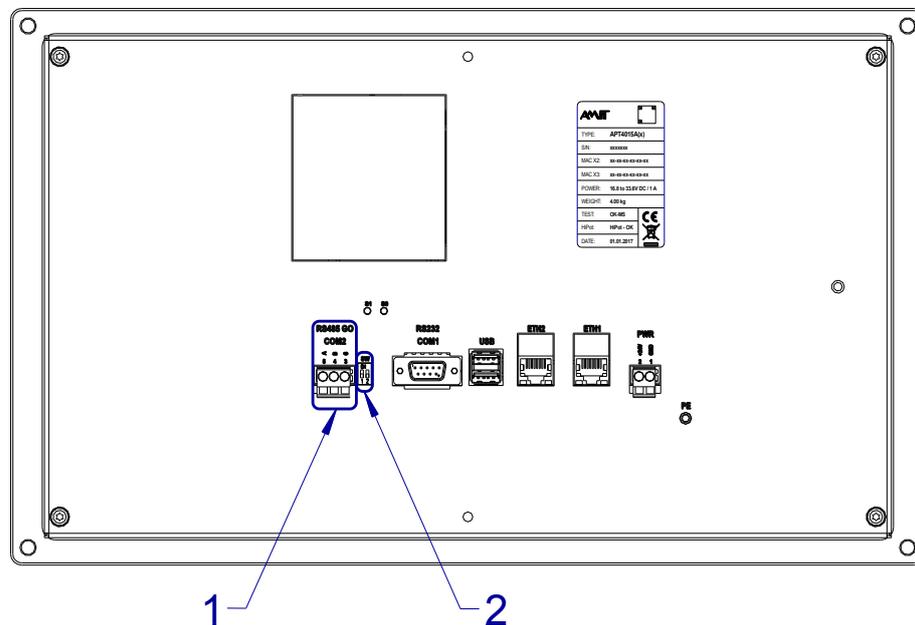


Fig. 8 – Location of galvanically isolated RS485 connector

Legend

Number	Description
1	RS485 connector, COM2
2	RS485 line termination, COM2

Connector wiring	Terminal	Signal	Description
	5	A	Galvanically isolated RS485, signal A
	4	B	Galvanically isolated RS485, signal B
	3	G	Galvanically isolated RS485 interface, ground

Each station in RS485 network must have a terminating resistor and idle status definition set properly. DIP switches located near the RS485 interface connector are used for termination setting.

Description of the switch	Both switches	Description
	ON	Terminal station – idle states and wires termination are active.
	OFF	Intermediate station – idle states and wires termination are inactive.

More information about the RS485 interface use is available in application note AP0016 – Principles of RS485 interface usage.

7.3 Ethernet

The panel computer of the series **APT4015A(x)** is equipped with two Ethernet interfaces with a connector type RJ45.

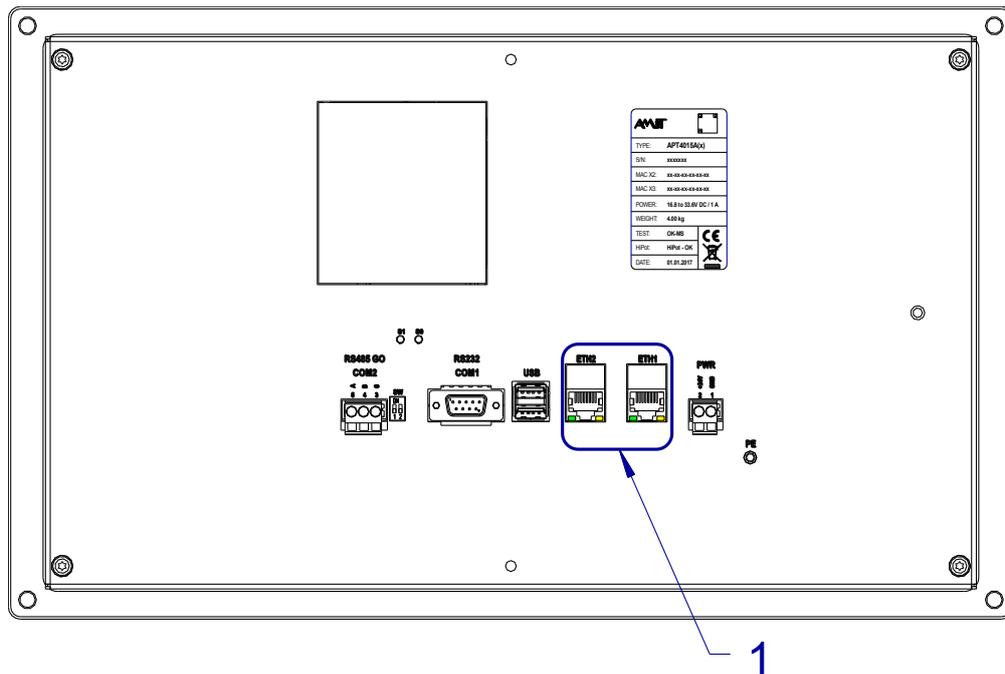


Fig. 9 – Location of Ethernet connectors

Legend	Number	Description
	1	2× Ethernet, indication LED

Status indication Ethernet activity is indicated by LEDs (yellow and green) directly on Ethernet interface connector.

LEDs description	LED	Colour	Description
	LNK	Green	Ethernet connection
	ACT	Yellow	Data receiving or transmitting

More information is available in application note AP0037 – Principles of Ethernet network usage.

Note Ethernet galvanic isolation must not be used for dangerous voltage separation.

7.3.1 Connector RJ45

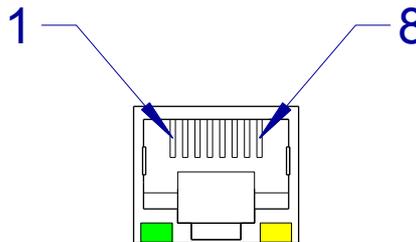


Fig. 10 – Ethernet wires layout in RJ45 connector.

Note The next picture presents a front view on the connector in the panel computer.

The meaning of wires for infrastructure with communication speed 10/100 Mbps.

Pin	Signal	Description
1	Tx+	Data transmission, signal +
2	Tx-	Data transmission, signal -
3	Rx+	Data reception, signal +
4	–	Not used
5	–	Not used
6	Rx-	Data reception, signal -
7	–	Not used
8	–	Not used

The meaning of wires for infrastructure with communication speed 1,000 Mbps.

Pin	Signal	Description
1	BI_DA+	Communication pair A, signal +
2	BI_DA-	Communication pair A, signal -
3	BI_DB+	Communication pair B, signal +
4	BI_DC+	Communication pair C, signal +
5	BI_DC-	Communication pair C, signal -
6	BI_DB-	Communication pair B, signal -
7	BI_DD+	Communication pair D, signal +
8	BI_DD-	Communication pair D, signal -

7.4 USB

The panel computer **APT4015A(x)** contains 2 interfaces type USB host that connect through USB type A connectors. It is a standard interface for personal computers.

The connectors are located on the back cover of the panel computer **APT4015A(x)**.

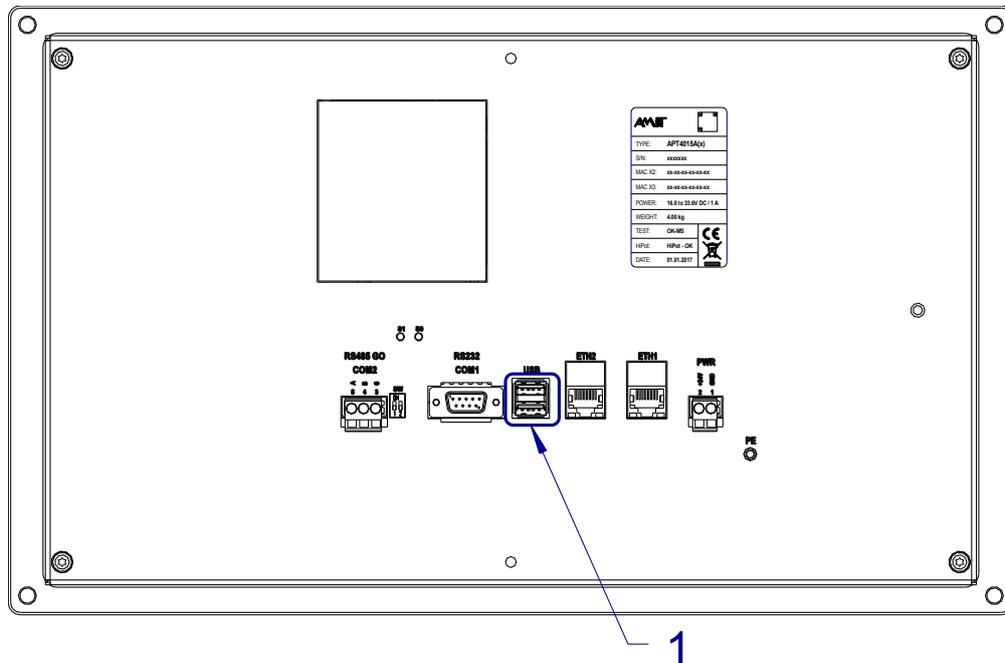


Fig. 11 – Location of USB connectors

Legend	Number	Description
	1	2× USB

7.5 Touch panel

Resistive touch panel The panel computer **APT4015A(x)** uses a 4-wire resistive touch screen panel with an **AR1100** controller.

The communication protocol and information about available drivers for various operating systems can be obtained at AMIT technical support or directly at manufacturer of the resistive panel controller – www.microchip.com.

7.6 mSATA

The panel computer of the series **APT4015A(x)** is equipped with a miniPCIe slot for the possibility to install an mSATA disk (or another extension).

The panel computer comes without the mSATA drive. The miniPCIe slot is accessible after the disassembly of the panel computer cover.

7.6.1 mSATA replacement procedure

The process of replacing an mSATA disk consists of the following steps:

- remove the case cover,
- disconnect PE,
- install the mSATA disk,
- reconnect PE,
- put the case cover back.

Required tools Cross-tip screwdriver type PH2

Case cover removal

Remove the 6 M4 screws on the back cover of the panel computer.

Remove the back cover of the panel computer.

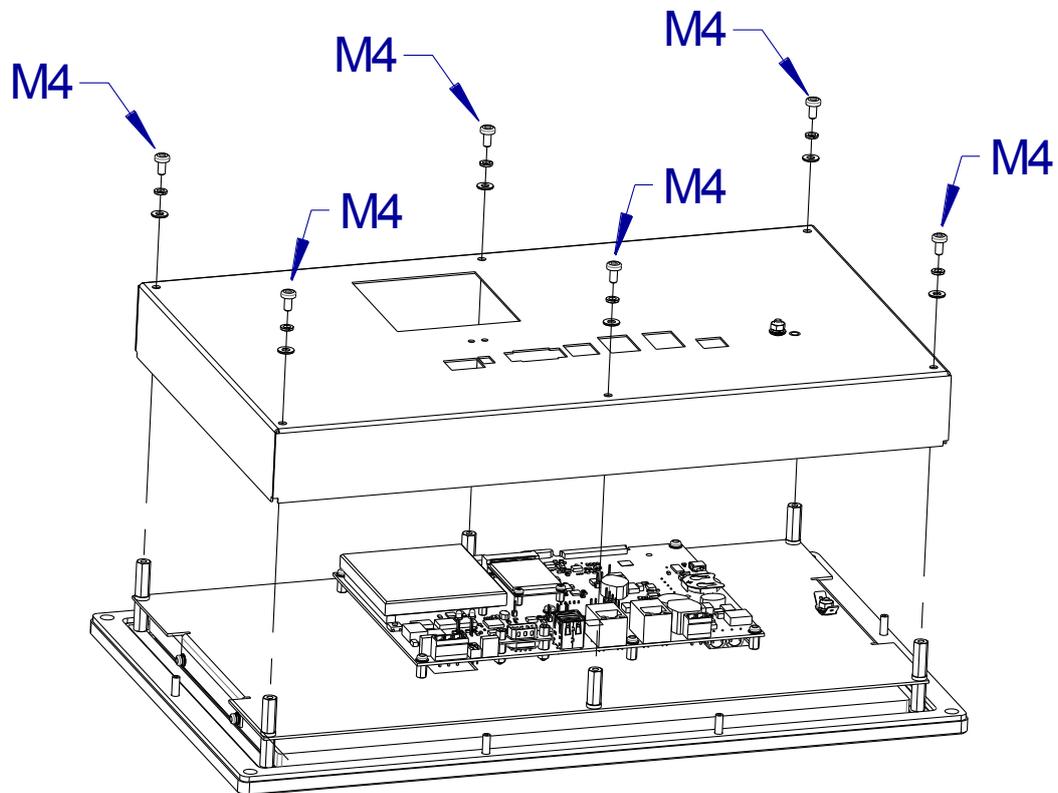


Fig. 12 – Case cover removal

Disconnect PE

The panel computer cover is connected with an internal part of the green-yellow protective earthing conductor PE.

Disconnect faston connector on the yellow-green PE protective conductor.

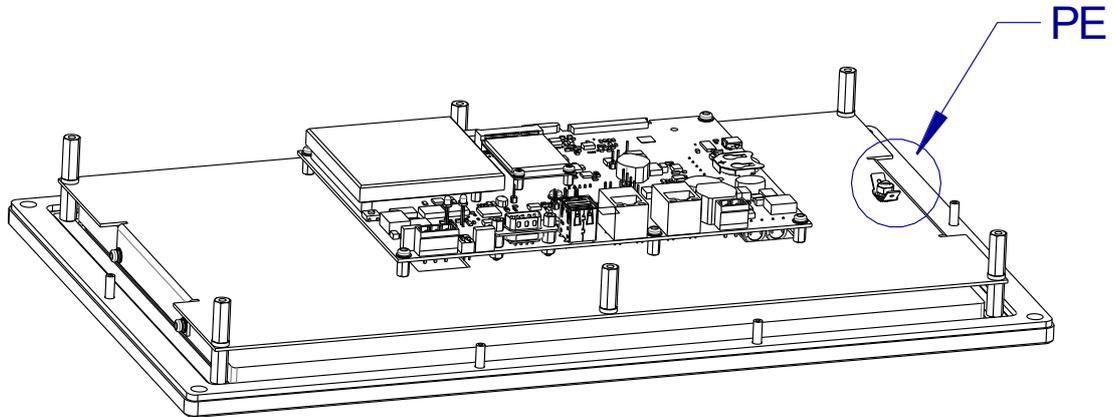


Fig. 13 – Disconnecting PE

Install the mSATA disk

Slide the mSATA disk into the miniPCle slot in a 30 ° degree angle and then click it in.

Fasten the mSATA disk using two M2.5 screws.

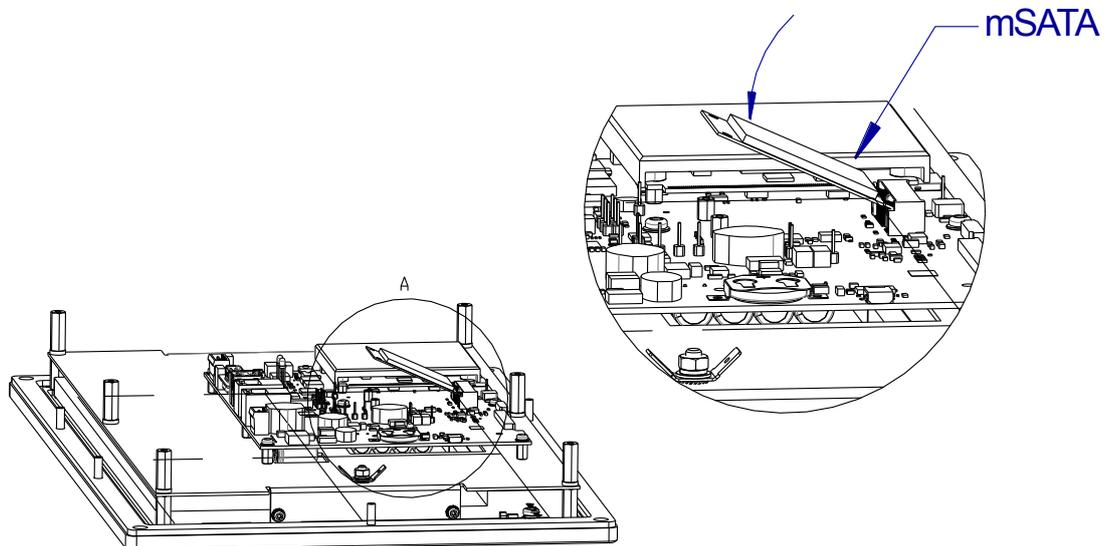


Fig. 14 – mSATA disk installation (side view)

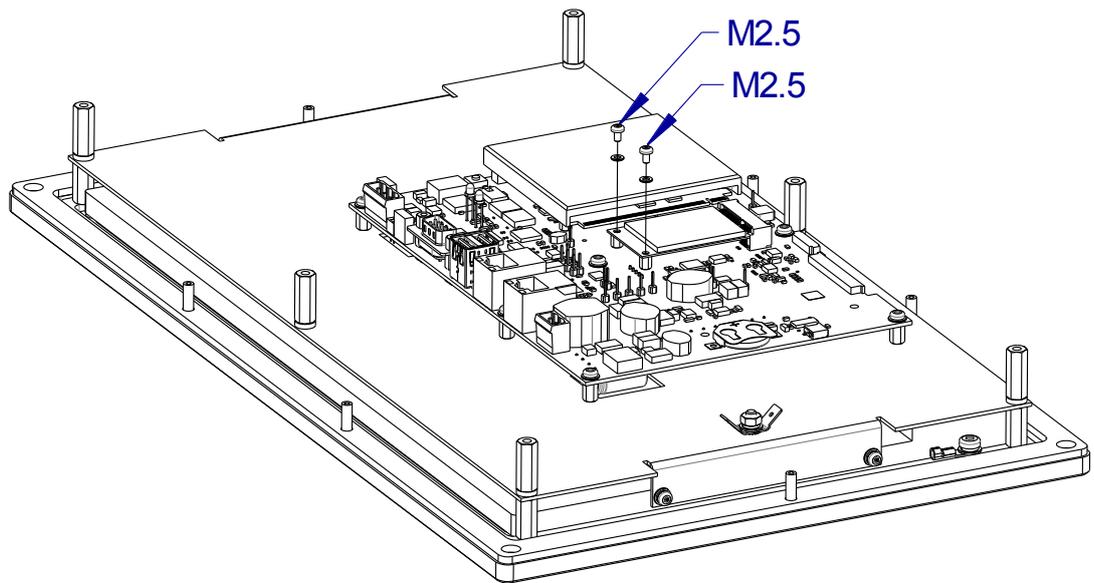


Fig. 15 – Fastening the mSATA disk

Connect PE

Connect the free ending of the green-yellow protective conductor PE to the faston connector.

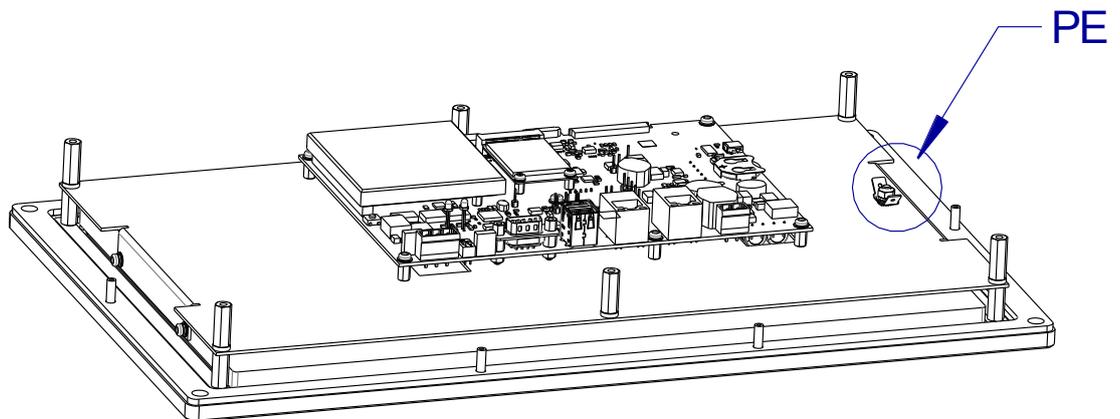


Fig. 16 – Connecting PE

Mounting cover

Slide the back cover onto the panel computer.

Screw on the 6 M4 screws on the back case cover of the panel computer.

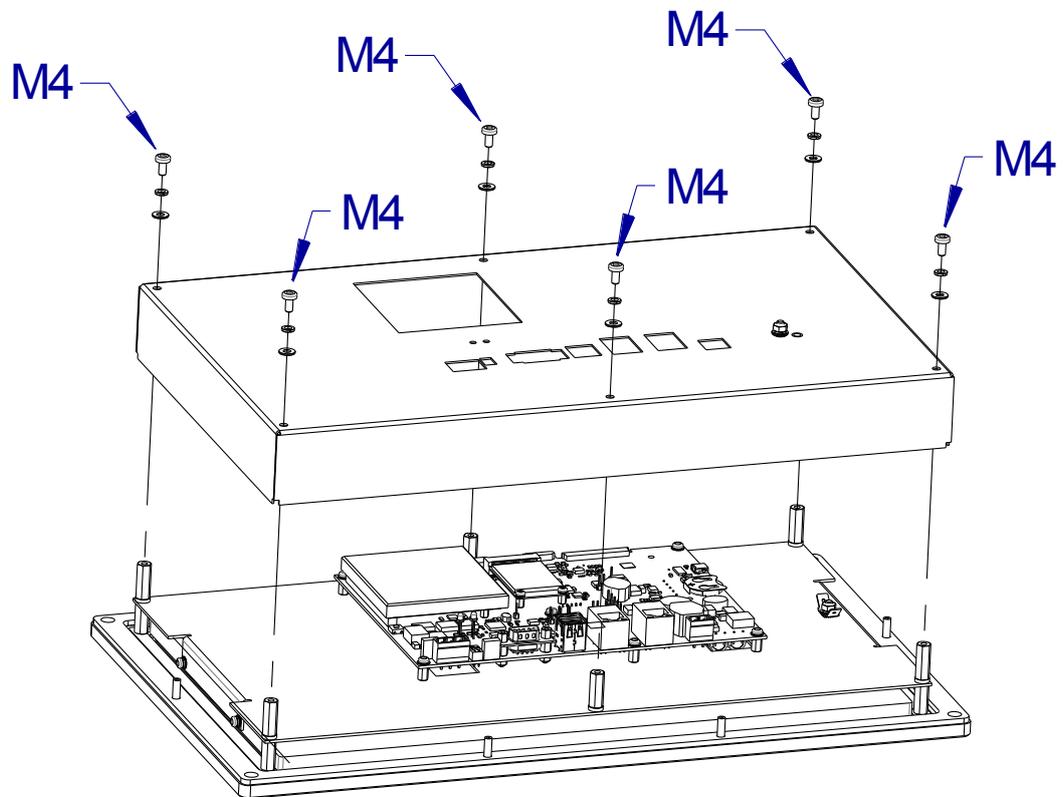


Fig. 17 – Putting back the cover

7.7 SD card

The panel computer of the series **APT4015A(x)** features a Micro SD card slot.

The panel computer comes without an SD card. The SD card slot is accessible after the disassembly of the panel computer cover.

7.7.1 SD card replacement procedure

The process of replacing an SD card consists of the following steps:

- remove the case cover,
- disconnect PE,
- install the SD card,
- reconnect PE,
- put the case cover back.

Required tools Cross-tip screwdriver type PH2

Casing removal

Remove the 6 M4 screws on the back case cover of the panel computer.
 Remove the back cover of the panel computer.

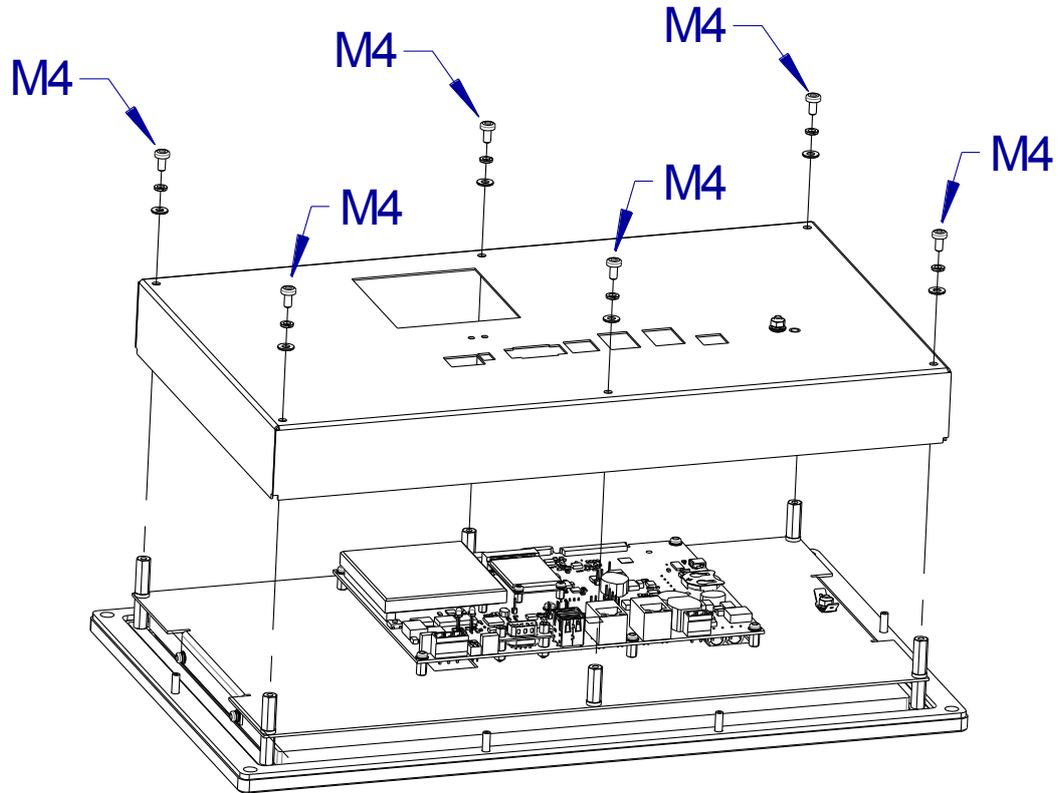


Fig. 18 – Case cover removal

Disconnect PE

The panel computer cover is connected with an internal part of the green-yellow protective earthing conductor PE.

Disconnect faston connector on the yellow-green PE protective conductor.

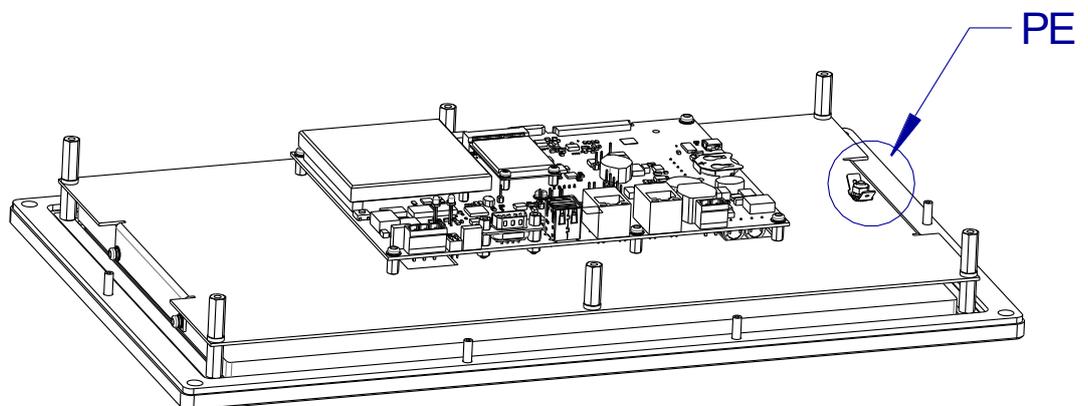


Fig. 19 – Disconnecting PE

Insert the SD card

Slide the SD card into the SD card slot.

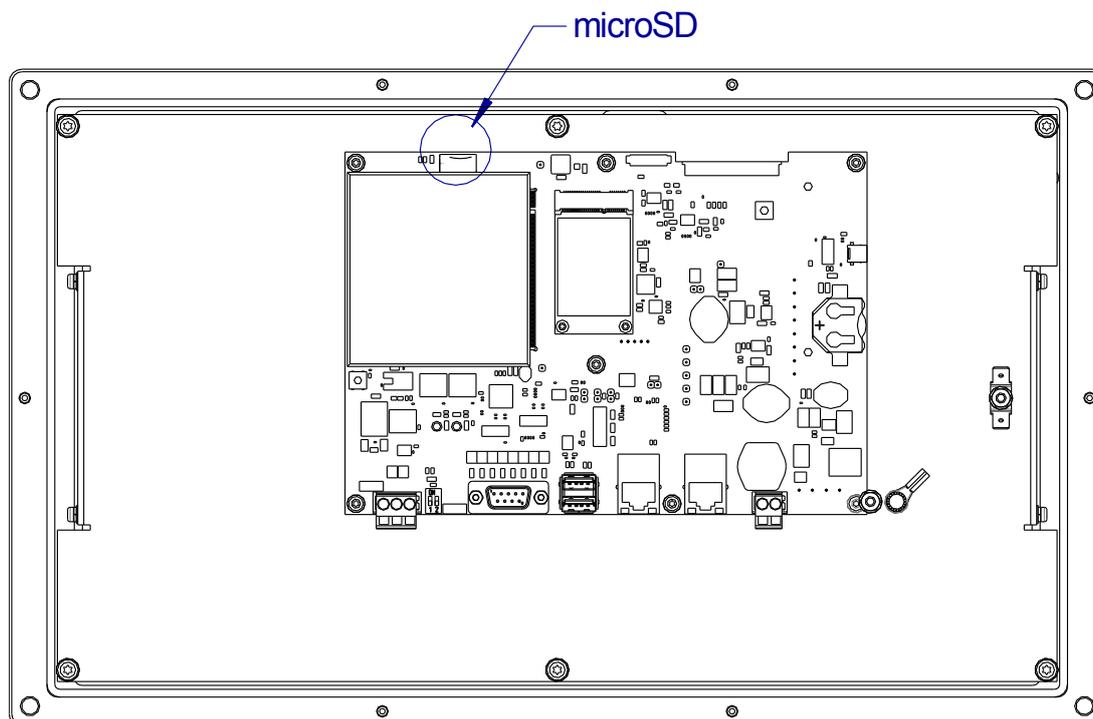


Fig. 20 – Inserting the SD card

Connect PE

Connect the free ending of the green-yellow protective conductor PE to the faston connector.

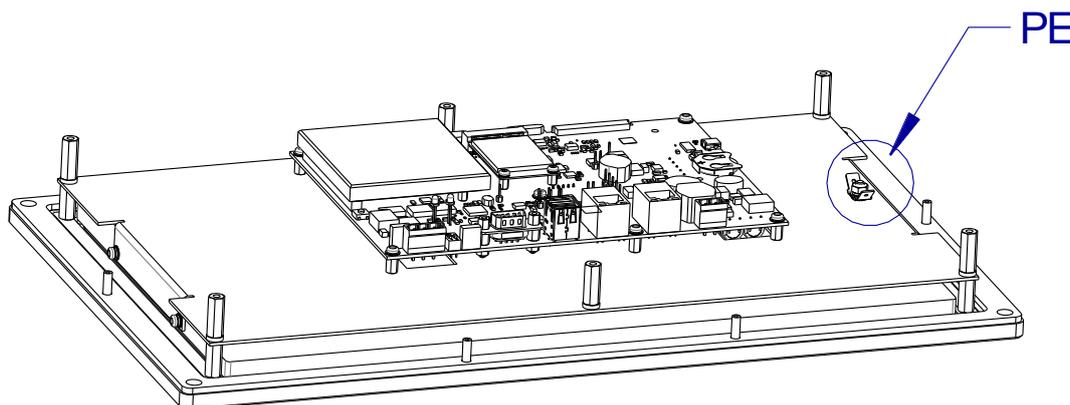


Fig. 21 – Connecting PE

Mounting cover

Slide the back cover onto the panel computer.

Screw on the 6 M4 screws on the back cover of the panel computer.

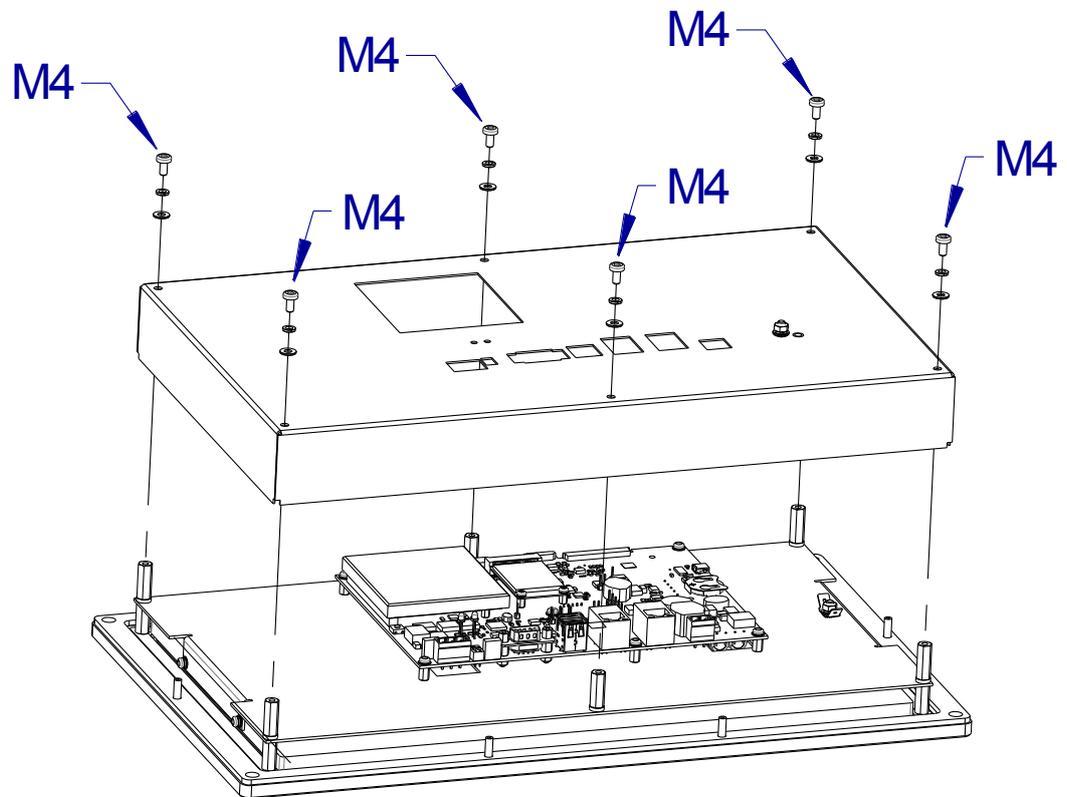


Fig. 22 – Putting back the cover

8 Mounting

8.1 Mounting instructions

The panel computer **APT4015A(x)** can be mounted into vertical position. To ensure proper cooling and access to the panel computer, we recommend to keep a free space of minimum 70 mm sidewise and 100 mm from the rear side around the surrounding equipment.

It is very important to ensure that ambient temperature does not exceed the allowed limits. At the same time, it is necessary to provide that any heat sources located nearby do not cause excesses of these maximum temperatures.

8.2 Mounting apertures

There are four M6 slots in the front panel and four M4 screws on the rear side of the front panel.

Assembly requires M6 screws with planar bearing head surface, with cross-section at least 9 mm (for example DIN 7985/A2 or DIN 7985TX/A2).

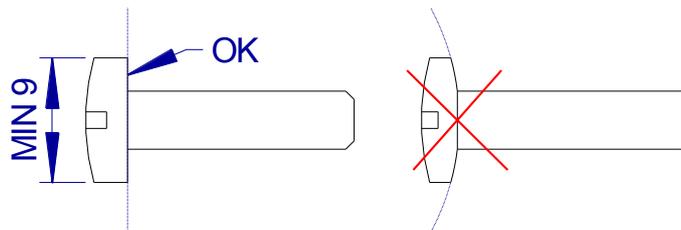


Fig. 23 – Assembly screws

The assembly screws on the rear side of the front panel can be unscrewed, and the device can be mounted only by means of M6 screws. If the device is not mounted using all screws, the declared ingress protection IP54 is not guaranteed.

Rubber gasket is glued onto the rear side of the front panel.

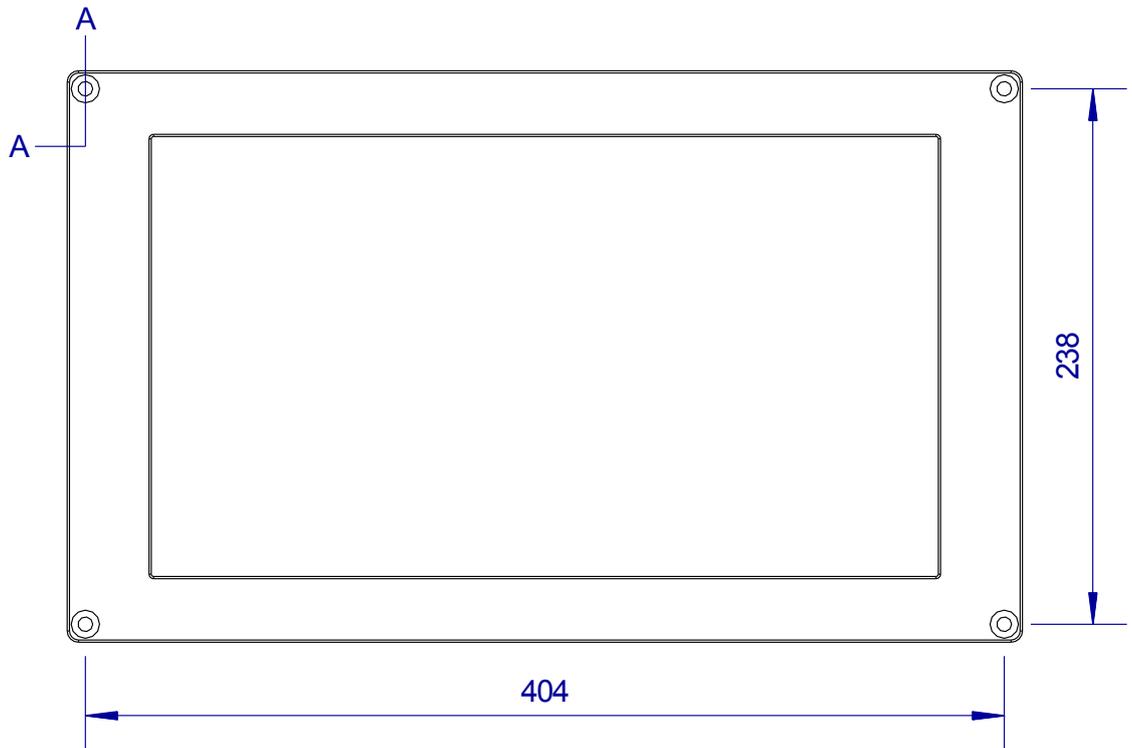


Fig. 24 – Location of assembly slots

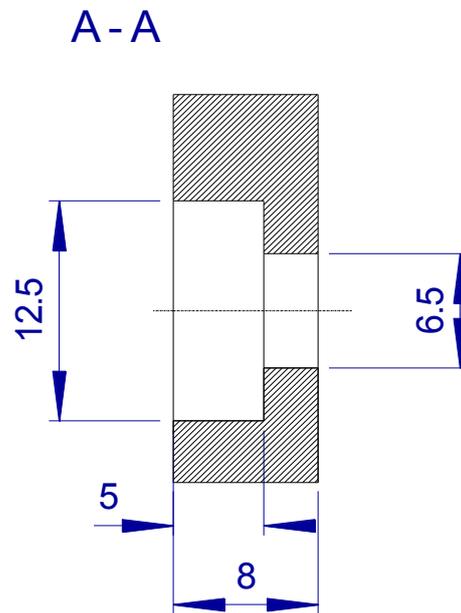


Fig. 25 – Profile of assembly slots

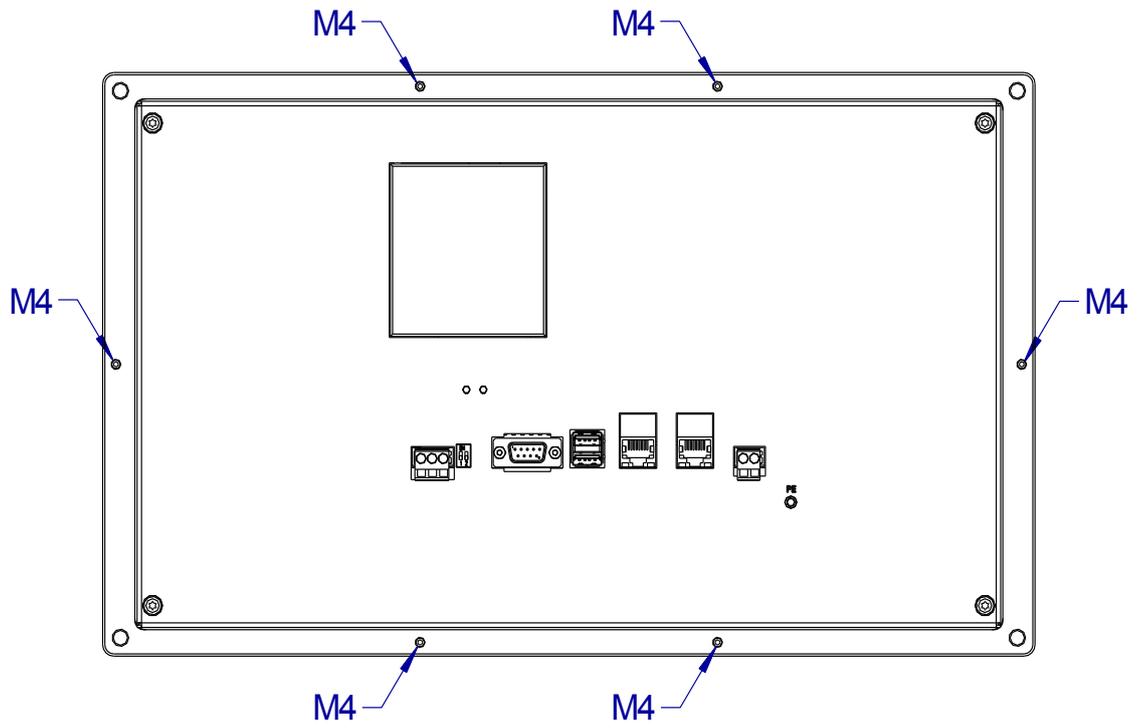


Fig. 26 – Position of assembly screws M4

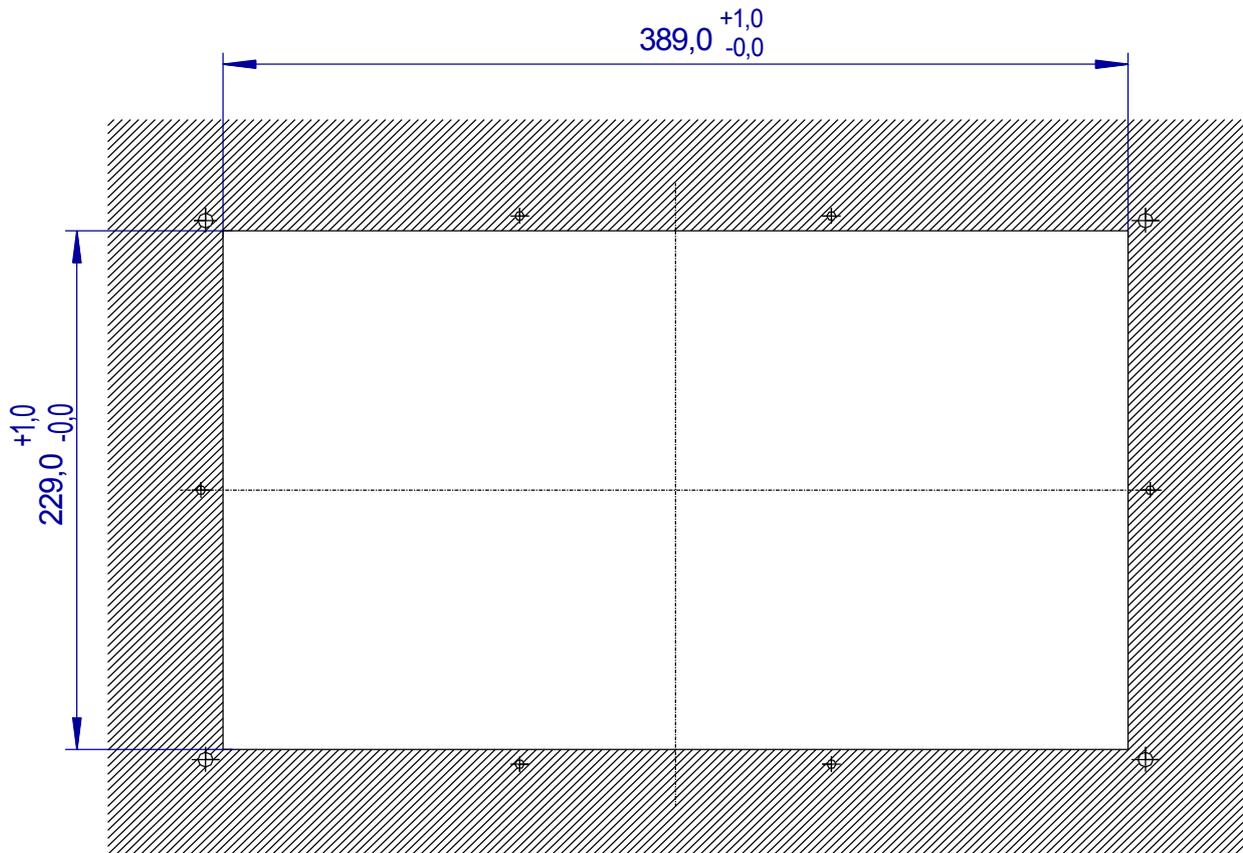


Fig. 27 – Assembly slot – dimensions

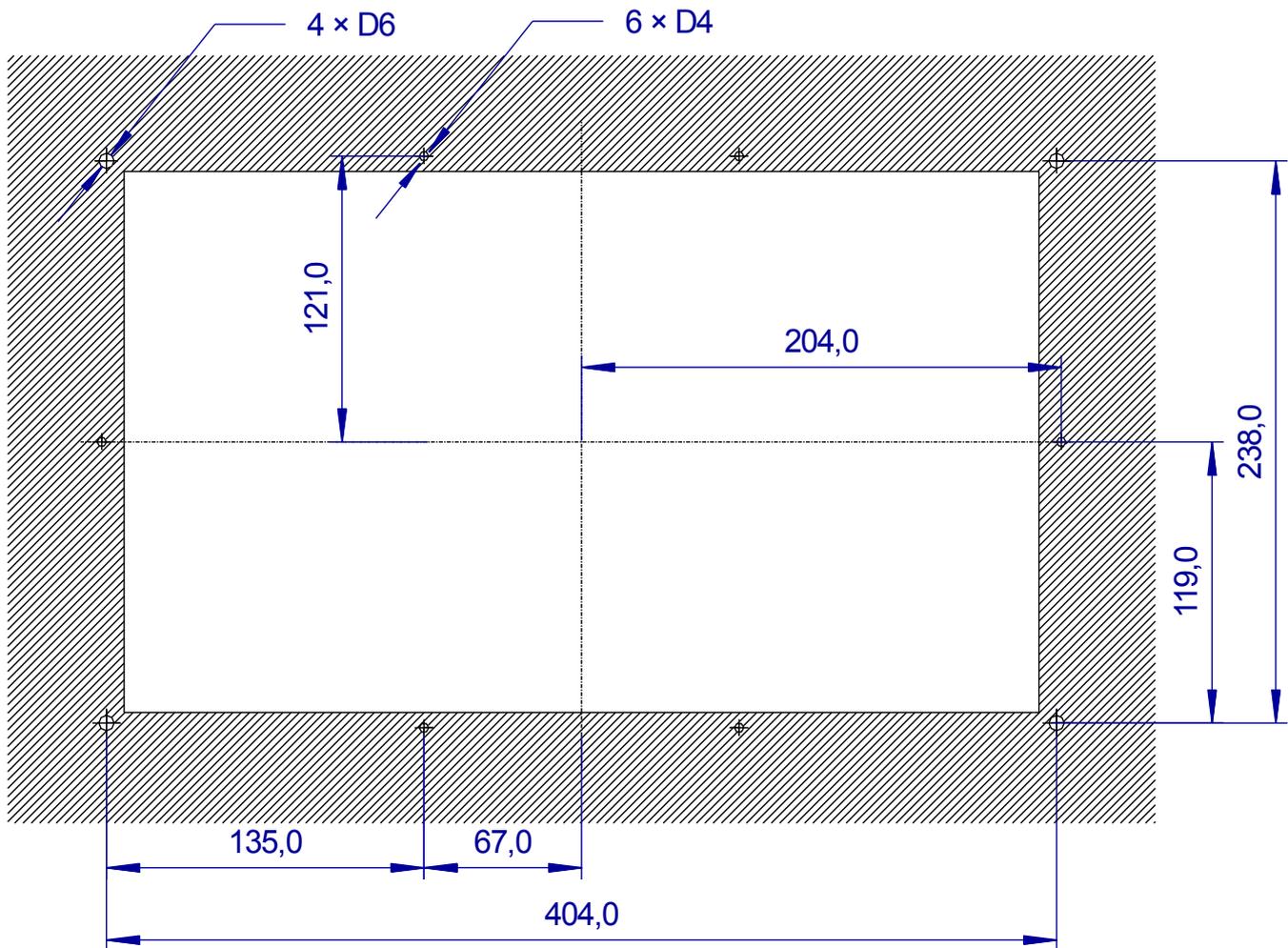


Fig. 28 – Assembly slot – assembly slots

8.3 Installation principles

Connecting to PE The negative power supply terminal (GND) in the device is connected with PE. It is necessary to connect the earthing screw to the switchboard PE.

Power supply The device must not be powered from DC distribution network of the building. Multiple devices may be powered from a single power supply source on the condition that this power supply source only powers devices of a similar type, located in a single building.

RS485 It is necessary to perform RS485 interface connection according to recommendations in application note *AP0016 – Principles of RS485 interface usage*.

RS232 It is sufficient to use an unshielded cable for service purposes or within the switchboard. Use the shielded cables for permanent use outside the switchboard frame. Connect the cable shielding to the switchboard's PE terminal immediately on the input. Cable length is limited to 30 m.

Ethernet It is sufficient to use an unshielded cable (patch cable) for service purposes or within the switchboard.

In case of permanent use outside the switchboard, it is necessary to perform connection of Ethernet network according to the recommendations presented in application note *AP0037 – Principles of Ethernet network usage*.

All cabling must be laid out carefully in order to avoid excessive connector pulling or connection prying.

Note All connections to PE must be performed with the least impedance possible. Technical parameters of the panel computer are guaranteed only in this connection configuration.

9 Software equipment

The panel computer **APT4015A(x)** comes in two variants which differ in their software equipment.

<i>Software equipment variant</i>	Designation	Software equipment
	APT4015A	Linux/GNU operating system
	APT4015AT	TouchDet environment for monitoring and visualisation

9.1 APT4015A – Linux/GNU operating system

The Linux/GNU operating system is installed into the device during the manufacturing process. The customer may also use a USB stick to load the operating system by AMiT company into the device, the procedure to do so is described in chapter 9.1.2 “Launching the APT4015A panel computer panel computer”. The operating system image is available at www.amitotion.com.

9.1.1 Description of the supplied operating system

The distribution is designed to run in the read-only mode for protection of the file system against power cuts, but also to limit the amount of writing on the internal eMMC memory. It is necessary to switch to the mode enabling permanent writing before new packages are installed or before another permanent change in the file system. After the necessary actions, it is necessary to switch back to the read-only mode. This is performed by means of two system scripts *remountrw*, or more specifically *remountro*.

- Properties**
- Distribution Voyage (built on Debian 8 “jessie”, port amd64)
 - 64bit OS
 - SysVinit
 - Fluxbox window manager
 - Nodm display manager
 - Xorg – DRI2, SNA acceleration
 - Mesa / OpenGL
 - Libraries for HW accelerated processing of videos via VAAPI.
 - amit-rau (Resource Access Unification) auto-initialization of peripherals (i2c device, backlight). In the file system on the path /var/amit-rau.
 - Switching modes for permanent writing (*remountrw*) and read-only (*remountro*).

Touch panel

The system contains a utility called `xinput_calibrator` to calibrate the touch panel within Xorg. Calibration data is stored on the level of the file system. In case of calibration, it is necessary to perform the following:

```
remountrw
xinput_calibrator --output-filename /usr/share/X11/xorg.conf.d/99-
calibration.conf
remountro
```

Backlight

Backlight is controlled by PWM and its level can be regulated by setting of values corresponding with PWM intervals. Integral values are from the interval 0 (0 %) to 255 (100 %).

More information:

www.kernel.org/doc/Documentation/ABI/stable/sysfs-class-backlight

Reading `cat /var/amit-rau/backlight/actual_brightness`

Settings `echo 200 > /var/amit-rau/backlight/brightness`

Temperature sensor

The sensor reads the internal temperature of the unit. The data is in thousandths of degrees Celsius.

```
cat /var/amit-rau/devices/thermometer/temp1_input
```

User LEDs

The panel computer has two user-controlled LEDs on the rear cover. They are designated as S0 and S1. The LEDs are connected to pins 2 and 3 (numbered from 0) of a GPIO expander that has a base address 248 in the system. After adding the offset of LED S0 (2) and LED S1 (3), the resulting number is GPIO $248 + 2 = 250$ or more specifically $248 + 3 = 251$. In the system, the LED S0 then acts as GPIO 250 and S1 as 251.

For controls, it is necessary to first export the relevant GPIO and subsequently switch to the output mode. Then, the user may set the levels by writing into the value file. Writing 0 makes the LED turn off, writing numbers larger than 0 makes the LED turn on. Example:

```
echo 250 > /sys/class/gpio/export
echo out > /sys/class/gpio/gpio250/direction
echo 1 > /sys/class/gpio/gpio250/value
echo 0 > /sys/class/gpio/gpio250/value
```

More information:

www.kernel.org/doc/Documentation/gpio/sysfs.txt

Ethernet

The panel computer has two Ethernet interfaces:

- The connector ETH1 is mapped as a device eth1
- The connector ETH2 is mapped as a device eth2

In default settings, both interfaces are set to the IP address assigned using the DHCP server. In order to change the settings, it is necessary to modify the file `/etc/network/interfaces`.

More information:

wiki.debian.org/NetworkConfiguration

Serial interfaces

The panel computer has two serial interfaces:

- RS232 mapped as a device `/dev/ttyS4`,
- RS485 mapped as a device `/dev/ttyS5`.

The RS485 interface is set in the default settings for manual direction control (see below).

RS485 Manual direction control

In RS485, transmission activation on the serial interface is controlled by the DTR signal. If DTR is in log. 0, the unit does not transmit, but only receives. If DTR is in log. 1, the unit transmits. This setting is default after the unit startup.

RS485 Automatic direction control

The applied kernel 3.14.18-amit6 allows automatic control of the DTR signal, if this function is turned on by the command:

```
set-serial-signals --port=/dev/ttyS5 --rs485=en,dtr,inv
```

The interface is then set in the mode RS 485 (with automatic control of the DTR signal) and any further application that opens the port needs not control the DTR signal manually. The transmitter is activated automatically during transmission; when there is no transmission, the transmitter is off and the unit only receives data.

9.1.2 Launching the APT4015A panel computer

Installation of the GNU/Linux operating system on the panel computer **APT4015A** is performed using a USB FLASH drive. Launching the panel computer **APT4015A** completely consists of the following steps:

- creating a USB FLASH drive for installing the operating system,
- installation of the operating system,

Equipment Notebook

USB flash with minimum capacity of 4 GB

Creating a USB FLASH drive for installing the operating system

This chapter contains the procedure of creation of a bootable USB FLASH drive that will be used for installation of an operating system into the panel computer. All data on this USB FLASH drive will be deleted by this operation.

This installation medium is created by means of a tool called **apt-flash-loader**. More information about this tool and its use is available in the operation manual “`apt-flash-loader_g_en_xxx.pdf`”.

In order to create the FLASH drive, the user also needs a file with the operating system image; the AMiT technical support provides this image.

- Procedure**
- Connect the USB flash drive to any USB port on the PC.
 - Unpack all content of `apt-flash-loader_xxx` to the USB drive.

- Run the script *bootinst.bat* from the directory *slax\boot* on the USB flash drive.
- The script asks the user whether the user wants to make the USB flash drive bootable and rewrite MBR. Confirm with any key.
- Rename the file with the operating system image to *nanoetx.img.gz*.
- Copy the file *nanoetx.img.gz* to the folder *image* on the USB drive.
- Safely remove the USB drive from the USB port of the laptop.

Installation of operating system

Using the already prepared USB FLASH drive for operating system installation, the user loads the system into the panel computer with the following procedure:

- Procedure**
- Turn off the panel computer power supply.
 - Slide the USB flash drive to any USB port on the panel computer.
 - Connect a USB keyboard to the panel computer.
 - Turn on the panel computer power supply.
 - Wait for the boot-up menu with the option “Load image” to open.
 - Select the option “Load image”. Then the operating system is installed.
 - Wait a few minutes until the message “*Image successfully loaded, press ENTER to continue*” is displayed (there is no need to press “**ENTER**”).
 - Remove the USB FLASH drive from the USB port.
 - Switch the power supply to the panel computer off and on again.

9.1.3 Factory setting restoring

The factory setting of the unit with the operating system GNU/Linux is refreshed by completely launching the operating system according to the aforementioned procedure in chapter 9.1.2 “Launching the APT4015A panel computer panel computer”.

This action deletes all data saved on the unit's drive!

9.2 APT4015AT – TouchDet

The TouchDet environment for monitoring and visualisation is loaded into the device in the manufacturing process together with the operating system GNU/Linux. However, the customer may load the visualisation SW (after purchasing the licence) including the operating system into the device using the USB stick in a procedure described in chapter 9.1.2 “Launching the APT4015A panel computer panel computer”.

The visualisation SW is described in more detail in its actual documentation file *touchdet_g_en_xxx.pdf*.

10 Factory settings

RS485 Configuration switches that activate the termination and idle state definition are *configuration* in the ON position.

Ethernet factory settings

See chapter 9 “Software equipment”.

11 Ordering information and the package content

Panel computer	APT4015A	Complete set, see chapter 11.1 "Package contents"
	APT4015AT	Complete set, see chapter 11.1 "Package contents"
Other	MSATA SSD 128GB/I ¹³⁾	mSATA SSD 128 GB MLC, 114 TBW, -40 °C to +85 °C
	MSATA SSD 128GB ¹³⁾	mSATA SSD 128 GB MLC, 114 TBW, 0 °C to +70 °C
	B-CR2032	Lithium battery 3 V, 200 mAh

Note ¹³⁾ Other available capacity upon request.

11.1 Package contents

APT4015A	Part	Quantity
	Panel computer	1
	Insulation testing protocol	1
	Connector WAGO 231-303/102-000	1
	Connector WAGO 231-302/102-000	1
	Lithium battery 3 V, 200 mAh	1

APT4015AT	Part	Quantity
	Panel computer	1
	Insulation testing protocol	1
	Connector WAGO 231-303/102-000	1
	Connector WAGO 231-302/102-000	1
	Lithium battery 3 V, 200 mAh	1

12 Packaging

Front panel protection The display area including the front panel is covered with a film that protects the surface from scratches and dirt. We recommend to keep the film on the product during assembly and remove it before using the product.

Packing The panel computer comes wrapped in anti-static foil.

Box The panel computer is stored in a paper box and is protected against impacts with special pads. Package dimensions are listed in chapter Technical parameters.

Label Sticker on the box contains following information:

Item	Description
TYPE	APT4015A(x)
NETTO	2.00 kg
BRUTTO	2.50 kg
QTY	1 pc
S/N	Serial number
AMiT logo	–
QR code	–
CE sign	–

TYPE	APT4015A(x)	  
NETTO	4.00 kg	
BRUTTO	5.00 kg	
QTY	1 PC	
S/N	ABCD	

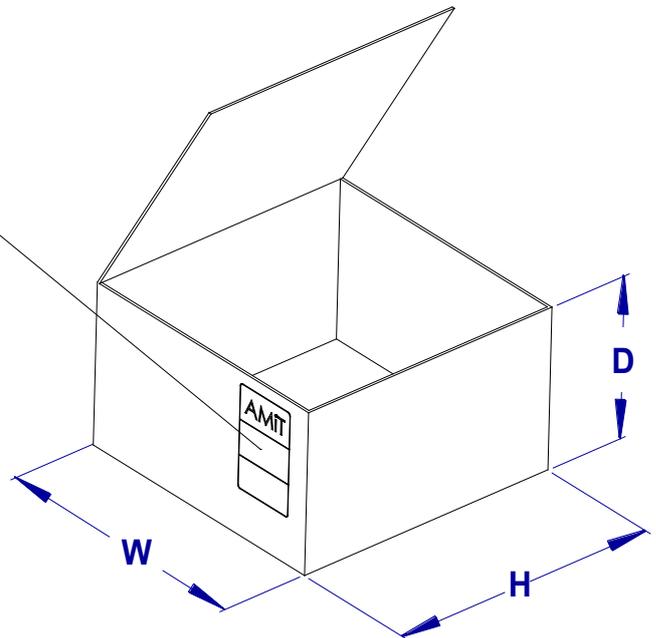


Fig. 29 – Box dimensions and label design

13 Storing

To prevent damage of the device, follow these rules.

Product in a package The product in original packaging must be stored under the conditions specified in chapter Technical parameters. The product must not come into contact with water, oil or any other liquids that could damage the packaging.

The box with the device can be stored in any position. If the boxes are stored on top of each other, the weight bearing on the top side of the box must not exceed **15 kg**. All load must be evenly spread over the entire upper side of the box.

Product without package Unpacked product must be stored only under the conditions specified in chapter Technical parameters. Product may not come into contact with water or any other liquids, and must be placed in a clean environment without excessive dust, sawdust, etc.

The product can be placed only on surface, that will not cause damage to it (for example soft fabrics, bubble wrap, soft protective rubber pad, etc.).

Product connectors or its display area must not rely on anything.

14 Maintenance

14.1 Backup battery

The panel computer of the series **APT4015A(x)** features a slot for a backup battery. The battery is designed to backup the real time clock circuit. The battery slot is accessible after the disassembly of the panel computer cover.

14.1.1 Battery replacement procedure

Battery replacement process consists of the following steps:

- remove the case cover,
- disconnect PE,
- replace battery,
- reconnect PE,
- put the case cover back.

Required tools Cross-tip screwdriver type PH2

Casing removal

Remove the 6 M4 screws on the back cover of the panel computer.

Remove the back cover of the panel computer.

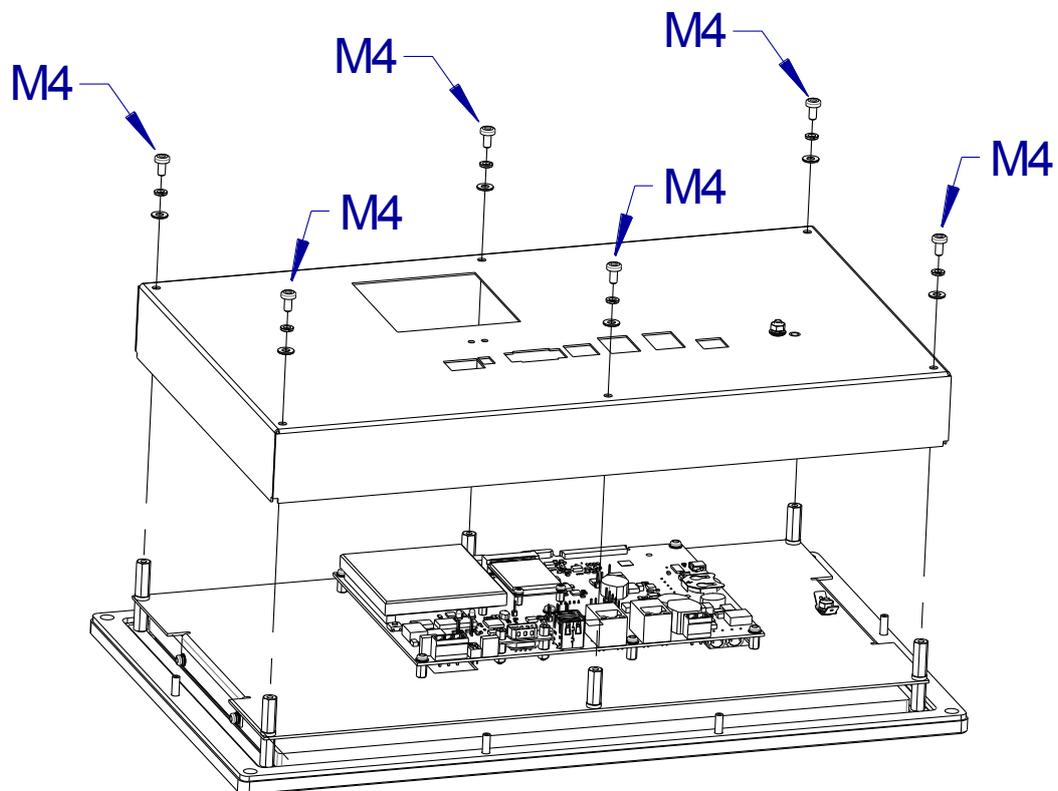


Fig. 30 – Case cover removal

Disconnect PE

The panel computer cover is connected with an internal part of the green-yellow protective earthing conductor PE.

Disconnect faston connector on the yellow-green PE protective conductor.

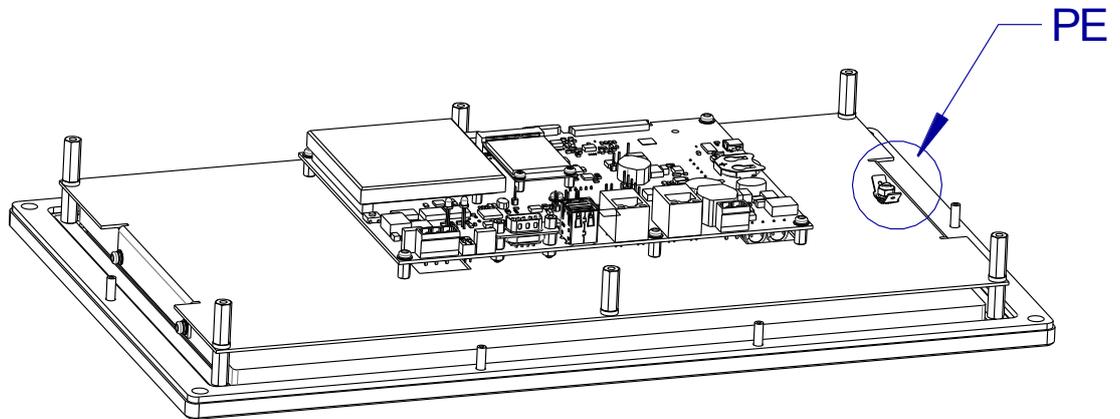


Fig. 31 – Disconnecting PE

Battery replacement

Remove the old battery.

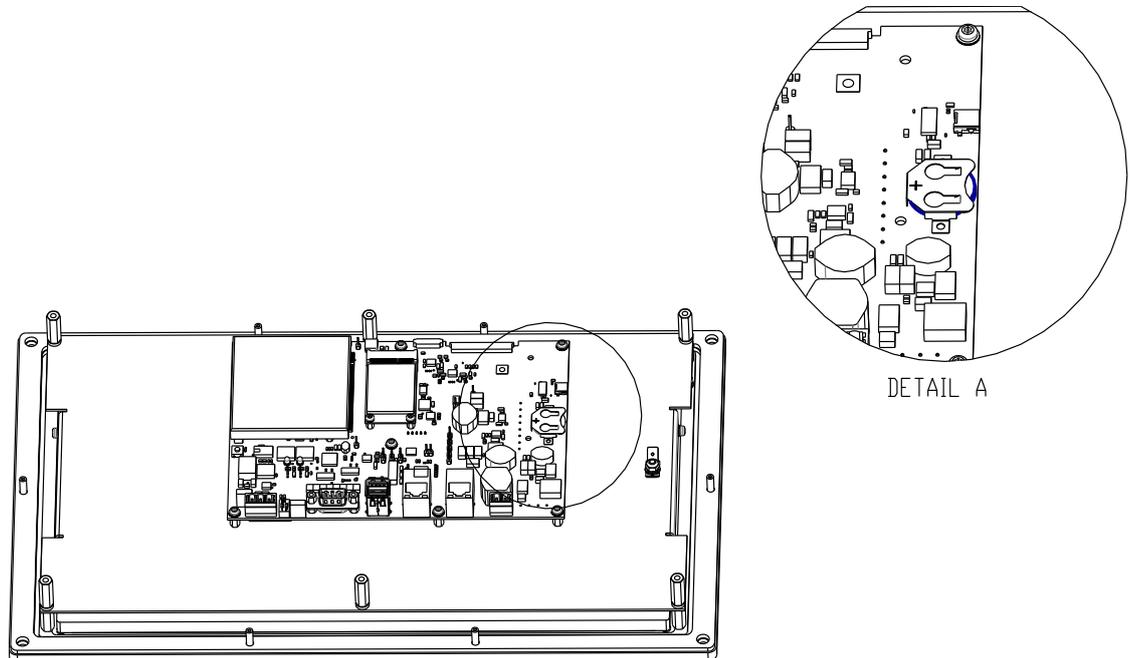


Fig. 32 – Battery location

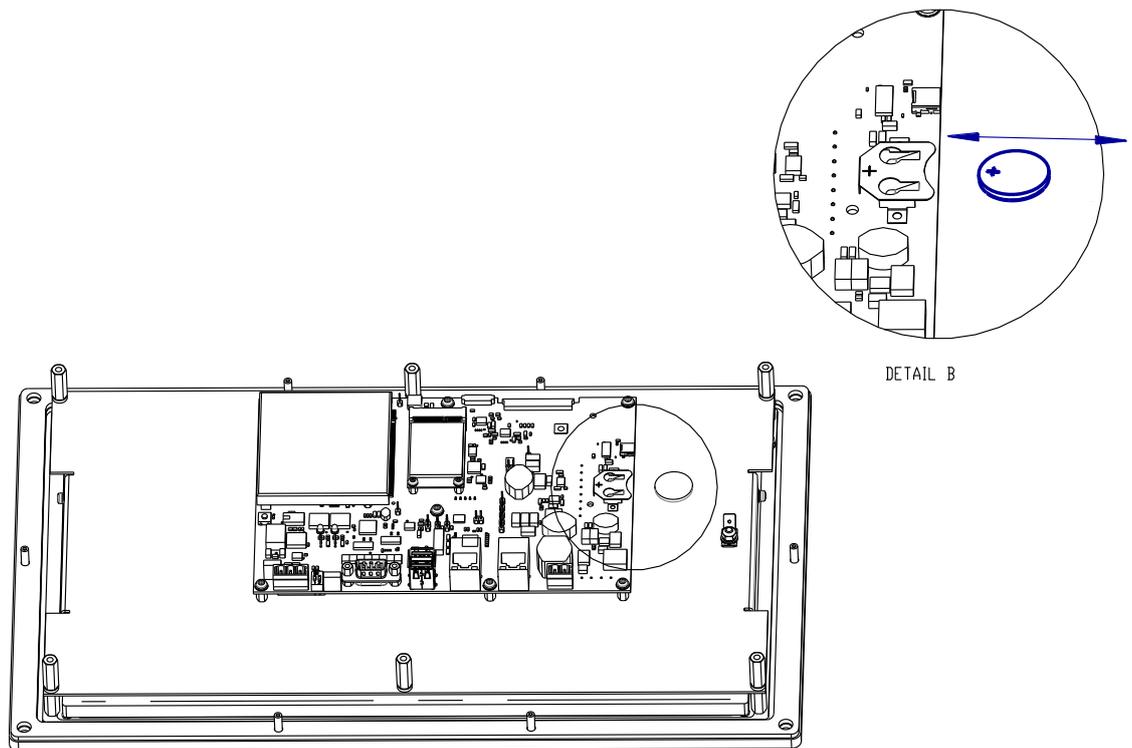


Fig. 33 – Battery removal

Slide a new battery into the battery holder.

Pay attention to correct polarity. The positive pole must be at the top.

Connect PE

Connect the free ending of the green-yellow protective conductor PE to the faston connector.

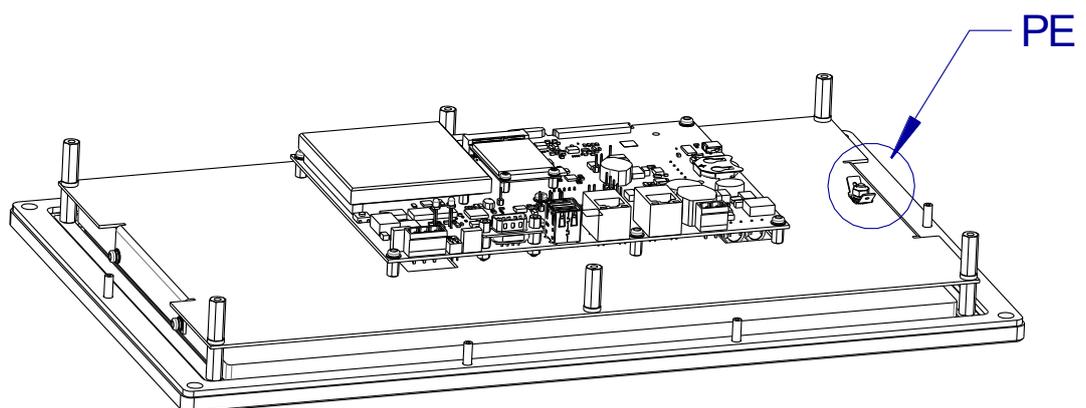


Fig. 34 – Connecting PE

Mounting cover

Slide the back cover onto the panel computer.

Screw on the 6 M4 screws on the back cover of the panel computer.

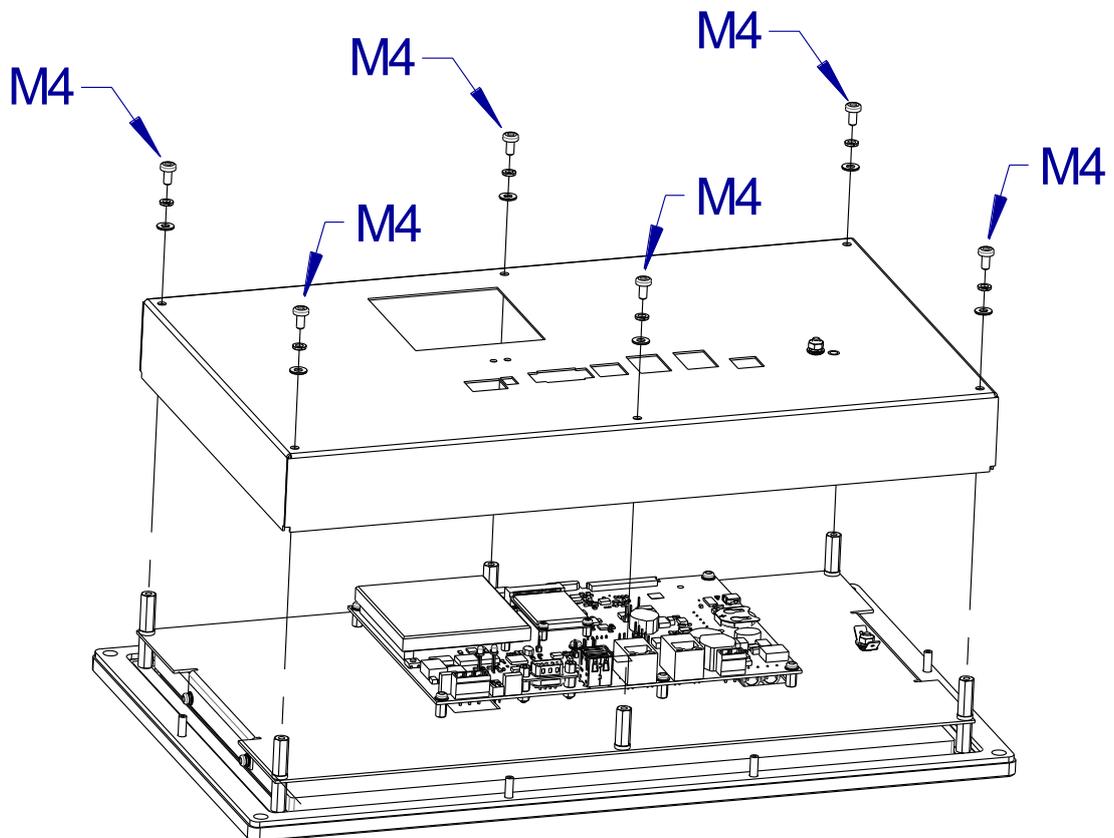


Fig. 35 – Putting back the cover

14.2 Cleaning

Depending on purity of the place where the panel computer is installed, the dust and dirt is to be removed occasionally from the device.

Cleaning intervals must be determined by the device designer.

Depending on the degree of pollution, following types of cleaning are distinguished:

Cleaning front side surface Cleaning of front panel and touch screen area should be made by dry or moisten cloth. Use only such cleaning agents to avoid scratching of touch screen or front panel.

Cleaning disassembled electronics Depending on the environment, cleaning without panel computer disassembly can be insufficient.

In this case equipment can be cleaned by dry soft brush or vacuum cleaner, only when turned-off and disassembled.

Cleaning should be planned in conjunction with the replacement of the backup battery, SD card or mSATA disk so as to limit the number of panel computer disassembly / assembly cycles.

15 Waste disposal

Electronics disposal Disposal of the device is subject to the rules on the disposal of electrical waste and electronic equipment. The device must not be disposed of in municipal waste. It must be submitted to designated sites and recycled.

Battery disposal The device contains a lithium battery. The battery is a hazardous waste. Therefore, it must be delivered to places specified for that purpose. Disposal of worn-out batteries and accumulators must not be in contrary to valid regulations.