SIEMENS

SIMATIC IOT
SIMATIC IOT2050

Operating Instructions

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Preface

These operating instructions contain all the information you need for commissioning and operation of a device in the SIMATIC IOT2000 family.

It is intended both for programming and testing personnel who commission the device and connect it with other units (automation systems, programming devices), as well as for service and maintenance personnel who install add-ons or carry out fault/error analyses.

Basic knowledge requirements

Knowledge of personal computers, operating systems and programming is required to understand this manual. General knowledge in the field automation control engineering is recommended.

Scope of validity of this document

These operating instructions apply to the IOT2050 devices of the device family SIMATIC IOT2000.

- 6ES7647-0BA00-0YA2
- 6ES7647-0BA00-1YA2

Scope of this documentation

The device documentation comprises:

- Product information, for example, "Important notes on your device"
- Quick Install Guide SIMATIC IOT2050
- SIMATIC IOT2050 operating instructions in German, English and Chinese

Conventions

The following generic terms are used in this documentation:

Generic term	Specific name
Device	IOT2050 device
Arduino shield	ARDUINO UNO (Rev3)

Figures

This manual contains figures of the described devices. The supplied device may differ in some details from the figures. Within some of the figures, one device is used to represent all devices.

History

The following editions of these operating instructions have been published:

Edition	Comment
03/2020	First edition
09/2021	Updated X60-USB1 as USB 3.0 type A.
10/2022	Added Description for UKCA certification.

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Overview

1

1.1 Product description

The devices of the SIMATIC IOT family offer a robust, compact and flexible solution with a focus on the IOT environment and round off the SIMATIC IPC product range in the lower output range.

Features

- High degree of ruggedness
- Compact design
- External RS232/RS422/RS485, Ethernet, DP and USB interfaces
- Internal interfaces for Arduino Shield and Mini PCIe card
- Freely programmable interfaces
- Maintenance-free

Configuration

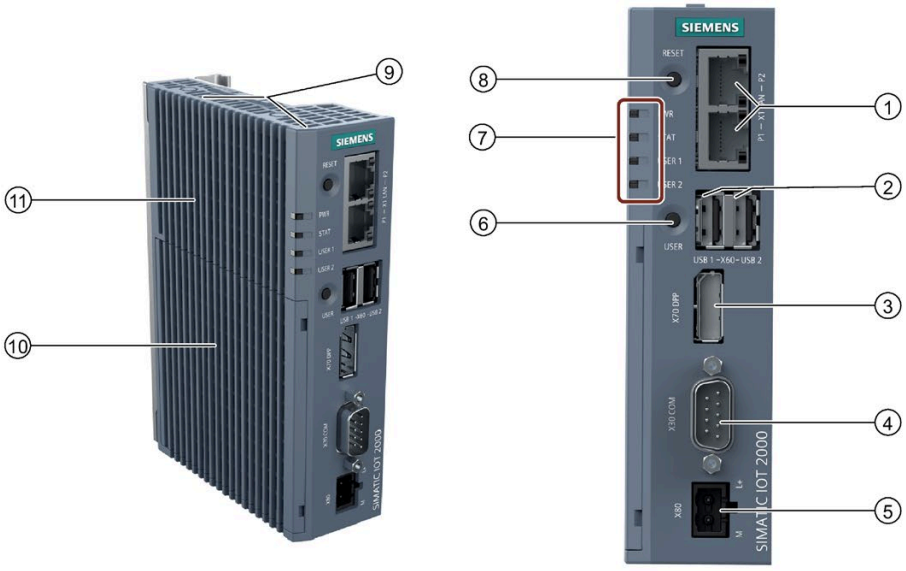
Depending on the industrial area of application, the following SIMATIC IOT devices are available with the following features:

	6ES7647-0BA00-0YA2	**6ES7647-0BA00-1YA2**
Processor	TI SOC AM6528 GP Dual Core	TI SOC AM6548 HS Quad Core with High Security possibility
RAM	1 GB RAM (DDR4)	2 GB RAM (DDR4)
eMMC	No	16 G
Battery-buffered real-time clock	No	Yes

1.2 Structure of the devices

1.2.1 SIMATIC IOT2050

The following figures show the configuration and interfaces of the SIMATIC IOT2050.



① Ethernet interfaces 100/1000 Mbps ⑥ USER button, programmable

② For MLFB 6ES7647-0BA00-0YA2 (FS02),
MLFB 6ES7647-0BA00-1YA2 (FS04):
- X60-USB1: USB3.0 Type A
- X60-USB2: USB2.0 Type A

For MLFB 6ES7647-0BA00-0YA2 (FS01),
MLFB 6ES7647-0BA00-1YA2 (FS01 ~ FS03):
- X60-USB1/X60-USB2: USB2.0 Type A

③ DisplayPort 1.1 A
④ COM interface (RS232/422/485)
⑤ Power supply connector
⑦ LED display, see section "Motherboard (Page 51)"
⑧ RESET button for the CPU
⑨ Markings for mini PCIe installation accessory
⑩ Shield cover
⑪ Top housing

1.3 Accessories

This chapter contains the scope of accessories valid at the time these operating instructions were written. The following accessories are not included in the scope of delivery and can be ordered separately. Additional accessories can be found on the Internet at: Industry mall ((https://mall.industry.siemens.com/))

Name	Specification	Order number
DisplayPort line	3 m long	6AV7860-0DH30-0AA0
	5 m long	6AV7860-0DH50-0AA0
Arduino Shield	SIMATIC IOT2000 Input/Output Module, 5 x DI, 2 x AI, 2 x DO	6ES7647-0KA01-0AA2
	SIMATIC IOT2000 Input Module Sink/Source, 10 x DI	6ES7647-0KA02-0AA2

Safety instructions 2

2.1 General safety instructions

⚠ WARNING

Life-threatening voltages are present with an open control cabinet

When you install the device in a control cabinet, some areas or components in the open control cabinet might be carrying life-threatening voltages.

If you touch these areas or components, you might be killed by electric shock.

Switch off the power supply to the cabinet before opening it.

System expansions

NOTICE

Damage through system expansions

Device and system expansions might be faulty and can affect the entire machine or plant.

The installation of expansions can damage the device, machine or plant. Device and system expansions might violate safety rules and regulations regarding radio interference suppression. If you install or exchange system expansions and damage your device, the warranty becomes void.

Note the following for system expansions:

- Only install system expansion devices designed for this device. Contact your technical support team or where you purchased your PC to find out which system expansion devices can safely be installed.
- Observe the information on electromagnetic compatibility (Page 47).

⚠ WARNING

Risk of fire through expansion cards

Expansion cards generate additional heat. The device may overheat and cause a fire.

Note the following:

- Observe the safety and installation instructions for the expansion cards.

NOTICE

Use in the scope of application for the UL61010-2-201

When the device is used in the area of Industrial Control Equipment in accordance with UL61010-2-201, note that the device is classified as "Open equipment".

Open equipment must be installed within an enclosure which protects you from hazards, including mechanical hazards, electrical shock and spread of fire.

If the device is used in a manner not specified by the manufacturer, the approval is lost and the protection associated with it may be impaired.

Note

Limitation of liability

All technical specifications and approvals of the device only apply if you use expansion components that have a valid CE approval (CE mark). The installation conditions for expansion components in the associated documentation must be observed.

UL approval of the device only applies when the UL-approved components are used according to their "Conditions of Acceptability".

We are not liable for functional limitations caused by using of third-party devices or components.

NOTICE

The approvals are voided if certain modifications are made

The device approvals are voided if the following modifications are made:

- The enclosure was physically modified, for example, openings were created to make LEDs on a plug-in card in the device visible.
- Cables are routed from the inside out of the device or from the outside into the device, for example, to connect sensors or displays.

Battery and rechargeable battery

⚠ WARNING

Risk of explosion and release of harmful substances

Improper handling of lithium batteries can result in an explosion of the batteries.

Explosion of the batteries and the released pollutants can cause severe physical injury. Worn batteries jeopardize the function of the device.

Note the following when handling lithium batteries:

- Replace used batteries in good time; see the section "Replacing the backup battery" in the operating instructions.
- Replace the lithium battery only with an identical battery or types recommended by the manufacturer (article number: A5E44491494).
- Do not throw lithium batteries into fire, do not solder on the cell body, do not recharge, do not open, do not short-circuit, do not reverse polarity, do not heat above 100°C and protect from direct sunlight, moisture and condensation.

Strong high-frequency radiation

NOTICE

Observe immunity to RF radiation

The device has an increased immunity to RF radiation according to the specifications on electromagnetic compatibility in the technical specifications.

Radiation exposure in excess of the specified immunity limits can impair device functions, result in malfunctions and therefore injuries or damages.

Read the information on immunity to RF radiation in the technical specifications.

ESD Guideline

Electrostatic sensitive devices can be labeled with an appropriate symbol.

NOTICE

Electrostatic sensitive devices (ESD)

When you touch electrostatic sensitive components, you can destroy them through voltages that are far below the human perception threshold.

If you work with components that can be destroyed by electrostatic discharge, observe the ESD Guideline.

2.2 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit (https://www.siemens.com/industrialsecurity).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customers' exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed visit (https://www.siemens.com/cert).

2.3 Data protection

Siemens observes the data protection guidelines, especially the requirements regarding data minimization (privacy by design). This means the following for this SIMATIC product: The product does not process / save any personal information, but only technical functional data (e.g. time stamps). If the user links this data to other data (e.g. shift plans) or if the user saves personal information on the same medium (e.g. hard disk) and therefore creates a personal reference in the process, the user has to ensure meeting the guidelines regarding data protection.

2.4 Notes on use

NOTICE
Possible functional restrictions in case of non-validated plant operation The device is tested and certified based on the technical standards. In rare cases, functional restrictions can occur during plant operation. Validate the correct functioning of the plant to avoid functional restrictions.

Note

Use in an industrial environment without additional protective measures

This device is designed for use in a normal industrial environment according to IEC 60721-3-3.

Disclaimer

Please note that the following list of recommended risk-minimizing security measures is not intended to be exhaustive. Thus, please consult your security expert for final assessment and configuration. Further, as already mentioned in IndustrialSecurity (https://www.siemens.com/industrialsecurity).

Please note (i) that you are responsible for preventing unauthorized access to your plants, systems, machines, and networks, and (ii) that you should only connect such systems, machines, and components to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place. Since you are solely responsible for the conception, implementation, and maintenance of a holistic, state-of-the-art security concept to protect your enterprise, factories/plants, systems, machines, and networks (including the products) against cyberthreats, you are liable for any damage caused by implementing no or insufficient security measures.

Security notification

- Follows the general security rules for networks.
- Install hardware firewall before connecting to internet. Install software firewall on the device and open necessary ports only.
- Deploy DLP (data leakage protection) over your system to protect sensitive data.
- Install the device in cabinets, separated rooms or controlled areas. Restrict the access to the device with lock if possible.
- Only authorized personal can access the device.
- Only access secured wireless networks using secured software/hardware components.
- Use separate accounts for admin tasks and user tasks.
- Only enable the debug functionality (for example, TCF) when necessary.
- Always integrate security updates from latest example image or official upstream.
- Only install software components from trusted sources.
- Change the system password regularly.
- The device can be identified by collecting MAC/UID information from the system.
- When Secure Boot is not enabled, set SPI flash in write protected state through "Jumper" and lock flash in bootloader while the device is in normal operation.

Installing and connecting the device

3

3.1 Preparing for installation

3.1.1 Checking the delivery

Procedure

1. When accepting a delivery, please check the packaging for visible transport damage.

   If any transport damage is present at the time of delivery, lodge a complaint at the shipping company in charge. Have the shipper confirm the transport damage immediately.

2. Unpack the device at its installation location.
3. Keep the original packaging in case you have to transport the unit again.

   Note

   Damage to the device during transport and storage

   If a device is transported or stored without packaging, shocks, vibrations, pressure and moisture may impact the unprotected unit. A damaged packaging indicates that ambient conditions have already had a massive impact on the device.

   The device might be damaged.

   Do not dispose of the original packaging. Pack the device during transportation and storage.

4. Check the contents of the packaging and any accessories you may have ordered for completeness and damage.
   - Device
   - DC connecting terminal, already plugged into the device.
   - One mounting accessory kit including: 1 x Rail clamp, 2 x mounting brackets and screws.

5. If the contents of the packaging are incomplete, damaged or do not match your order, inform the responsible delivery service immediately.

⚠ WARNING

Electric shock and fire hazard due to damaged device

A damaged device can be under hazardous voltage and trigger a fire in the machine or plant. A damaged device has unpredictable properties and states.

Death or serious injury could occur.

Make sure that the damaged device is not inadvertently installed and put into operation. Label the damaged device and keep it locked away. Send off the device for immediate repair.

NOTICE

Damage from condensation

If the device is subjected to low temperatures or extreme fluctuations in temperature during transportation, for example in cold weather, moisture could build up on or inside the device (condensation).

Moisture causes a short circuit in electrical circuits and damages the device.

In order to prevent damage to the device, proceed as follows:

- Store the device in a dry place.
- Bring the device to room temperature before starting it up.
- Do not expose the device to direct heat radiation from a heating device.
- If condensation develops, wait approximately 12 hours or until the device is completely dry before switching it on.

6. Keep the enclosed documentation in a safe place. You need the documentation when you commission the device for the first time.
7. Write down the identification data of the device.

3.1.2 Identification data of the device

The device can be clearly identified with the help of this identification data in case of repairs or theft.

You can find this information on the rating plate. The following illustration shows an example.

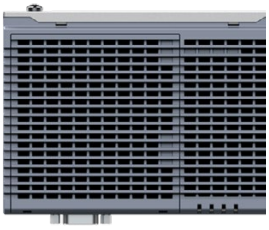
Example rating plate:	**Enter the identification data in the table below:**	
	Order number	6ES ...
	Serial number	S V
	Production version	FS
	All existing Ethernet addresses (MAC)	

3.1.3 Permitted mounting positions and mounting types

The device can be mounted horizontally or vertically on a DIN rail or to a wall.

Vertical mounting position, preferred

Horizontal mounting position

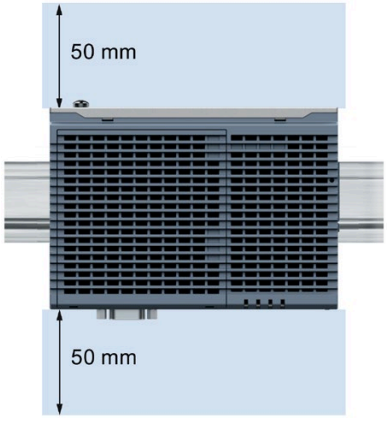


Consider the permitted temperature range for operation that depends on the mounting position in accordance with the "Technical specifications" section.

Clearances

Ensure that the following clearances measurements to another component or to a wall of a housing are complied with:

- Below the device: ≥ 50 mm
- Above the device: ≥ 50 mm



3.2 Mounting the device

3.2.1 Mounting instructions

Note the following:

- The device is approved for indoor operation only.
- For installation in a cabinet, observe the SIMATIC setup guidelines (http://support.automation.siemens.com/WW/view/de/1064706) as well as the relevant DIN/VDE requirements or the applicable country-specific regulations.
- When the device is used in the area of Industrial Control Equipment in accordance with UL61010-2-201, note that the device is classified as "Open equipment".
- Install all the expansions in the device before mounting the device on a DIN rail or a wall, see section "Expand device (Page 29)".
- Siemens recommends you use 0.6 Nm tightening torque to install the mounting clamps and brackets.

Fasten securely

NOTICE
Insufficient load carrying capacity If the mounting surface for wall mounting does not have an enough load-bearing capacity, the device may fall and be damaged. Ensure that the mounting surface on the wall can bear four times the total weight of the device, including fixing elements.

NOTICE
Incorrect fixing elements If you use anchors and screws other than those specified below for wall mounting, safe mounting is not guaranteed. The device can fall and may be damaged. Only use the anchors and screws specified in the following table.

Material	Bore diameter	Fixing element
Concrete	Select according to the specification of the mounting elements used	• Anchor, ∅ 6 mm, 40 mm long • Screw, ∅ 4 mm, 40 mm long
Plasterboard, (at least 13 mm thick)		Toggle plug, ∅ 12 mm, 50 mm long
Metal, (at least 2 mm thick)		• Screw M4 × 15 • M4 nut

3.2.2 Mounting on DIN rails

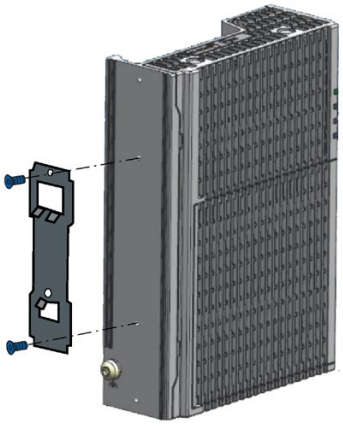
3.2.2.1 Secure the mounting clips

Requirement

- The DIN rail is installed at the installation site (35 mm standard profile).
- Mounting bracket and mounting clamps
- Two screws
- T8 screwdriver

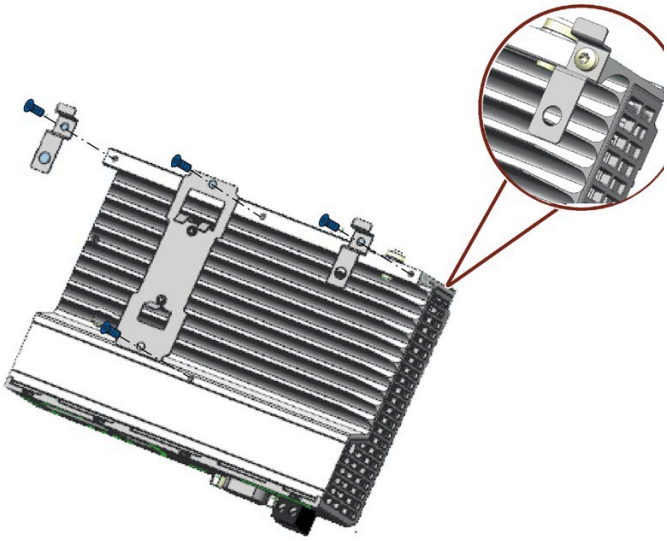
Secure the mounting clips for vertical mounting

1. Lay the rail clamp on the rear of the device.
2. Fasten the rail clamp with the supplied screws.



Secure the mounting clips for horizontal mounting

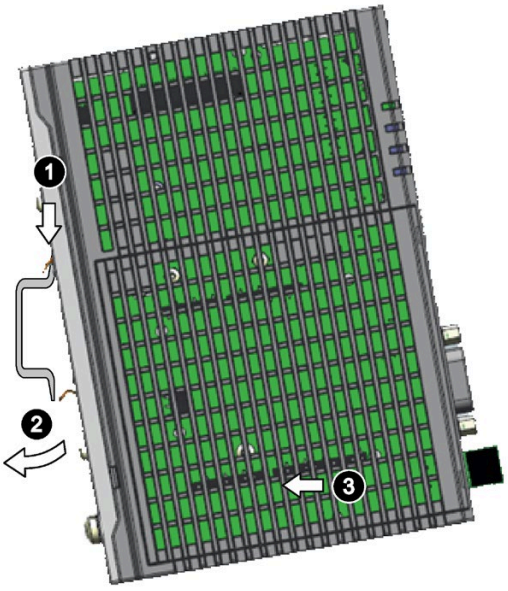
1. Lay the rail clamp on the rear of the device.
2. Fasten the rail clamp with the two supplied screws.
3. Lay the brackets on the rear of the device. Align the bracket edge with the device edge.
4. Fasten the brackets with the supplied screws.



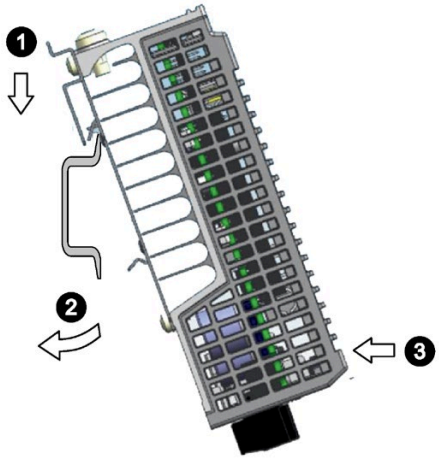
3.2.2.2 Mounting on DIN rails

Mounting

1. Place the device and rail clamp on the upper edge of the standard profile rail at the position shown and push the device down.
2. Swing the rail clamp of the device from below through the standard profile rail.
3. Push the device in the direction of the standard profile rail. You will hear the device click into place.



Vertical



Horizontal

Removing

1. Push down the device until it is released by the rail clamp.
2. Swing the device out of the standard profile rail.
3. Lift the device up and off.

3.2.3 Wall mounting

3.2.3.1 Vertical wall mounting

The device is suitable for horizontal or vertical wall mounting.

Note

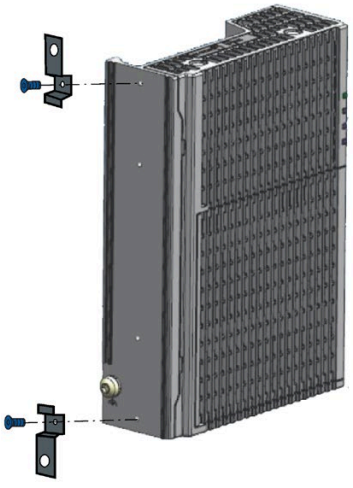
The device must be installed on the plate of an enclosure.

Requirement

- Two mounting brackets
- Two screws
- T8 screwdriver

Procedure for mounting

1. Lay the mounting brackets on the rear of the device.
2. Fasten the brackets with supplied screws.
3. Mark the bore holes, drill the required holes in the wall and fasten the device to the wall using two screws.



3.2.3.2 Horizontal wall mounting

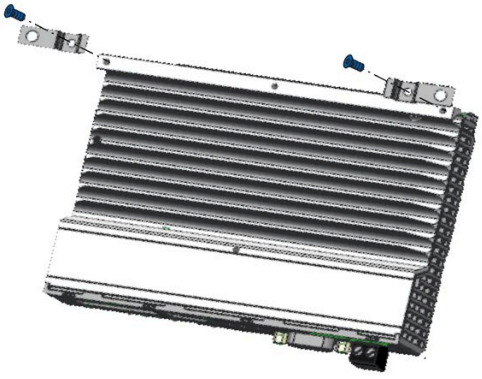
The device is suitable for horizontal or vertical wall mounting.

Requirement

- Two mounting brackets
- Two screws
- T8 screwdriver

Procedure for mounting

1. Lay the mounting brackets on the rear of the device.
2. Fasten the brackets with supplied screws.
3. Mark the bore holes, drill the required holes in the wall and fasten the device to the wall using two screws.



3.3 Connecting the device

3.3.1 Notes on connecting

⚠ WARNING

Risk of lightning strikes

A lightning flash may enter the mains cables and data transmission cables and jump to a person.

Death, serious injury and burns can be caused by lightning.

Take the following precautions:

- Disconnect the device from the power supply in good time when a thunderstorm is approaching.
- Do not touch mains cables and data transmission cables during a thunderstorm.
- Keep an enough distance from electric cables, distributors, systems, etc.

⚠ CAUTION

Use copper cables at connectors with terminal connections

Use copper (Cu) cables for all supply lines that are connected to the device with terminals, e.g. 24 VDC power supply cables to the 24 VDC power supply connectors.

Utiliser des câbles en cuivre sur les connexions à bornes

Utilisez des câbles en cuivre (Cu) pour tous les câbles d'alimentation qui sont raccordés à l'appareil par des bornes, par exemple les câbles d'alimentation 24 V CC sur le connecteur d'alimentation 24 V CC.

NOTICE

Fault caused by I/O devices

The connection of I/O devices can cause faults in the device.

The result might be personal injury and damage to the machine or plant.

Note the following when connecting I/O devices:

- Read the documentation of the I/O devices. Follow all instructions in the documentation.
- Only connect I/O devices which are approved for industrial applications in accordance with EN 61000-6-2 and IEC 61000-6-2.
- I/O devices that are not hotplug-capable may only be connected after the device has been disconnected from the power supply.

NOTICE

Damage through regenerative feedback

Regenerative feedback of voltage to ground by a connected or installed component can damage the device.

Connected or built-in I/Os, for example, a USB drive, are not permitted to supply any voltage to the device. Regenerative feedback is generally not permitted.

NOTICE

Ferrite required at USB cables

The interference immunity of the device according to the data in the technical specifications is only guaranteed when the cables at USB and micro USB ports are equipped with a ferrite magnet. Use only USB cables equipped with a ferrite magnet.

3.3.2 Connecting the function earth

A connected function earth discharges electrical charges from the metal enclosure.

The function earth also improves the discharge of interference generated by external power cables, signal cables or cables for I/O modules to ground.

The connection for the function earth is labeled with the following symbol:

WARNING

Electric shock and risk of fire

High voltage may be present in a defective device, which can cause fire or an electric shock if touched. This can result in death and serious injury.

- Connect the device to the function earth before you put it into operation.
- The function earth terminal on the device must be connected to the function earth of the control cabinet or system in which the device is installed.
- Never operate the device without function earth.
- If a device is defective, remove it from operation without delay and label it accordingly.

Requirement

- T20 screwdriver
- Cable lug for M4
- Function earth with minimum cross-section of 2.5 mm^2 copper cable

Procedure

1. Clamp the cable lug on the function earth.
2. Firmly attach the cable lug to the function earth connection on the device using the M4 thread with the torque of 1 Nm (see part labeled).
3. Connect the function earth to the protective conductor connection of the cabinet or the plant in which the device is installed.

3.3.3 Connecting the power supply

Note

The device should only be connected to a 12 to 24 V DC power supply which meets the requirements of safe extra low voltage (SELV) according to IEC/EN/DIN EN/UL 61010-1.

Note

The power supply must be adapted to the input data of the device, see chapter "General technical specifications (Page 47)".

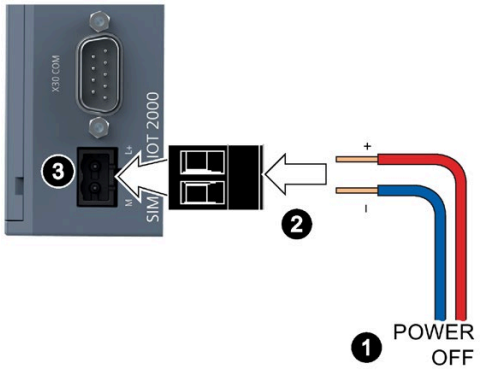
If there are voltage peaks on power supply lines, use a protective device in the form of a varistor (MOV) UMOV = U-rated x 1.2 (BLITZDUCTOR BVT AVD 24 (918 422) or compatible).

Requirement

- You are using the supplied terminal.
- A two-core cable meet the following requirements:
  - a copper (Cu) cable with cross-section of 0.75 mm^2 to 2.5 mm^2
  - rated temperature 70 °C
- A slotted screwdriver with a 3 mm blade.

Procedure

1. Switch off the power supply.
2. Connect the lines to the connecting terminal with a torque of 0.56 Nm (5lb-in).
3. Connect the connecting terminal to the connection for the power supply.



Software and commissioning

4

Operating system and software for the SIMATIC IOT devices are freely programmable and are loaded from the Micro SD/eMMC card when the device is booted.

For SIMATIC IOT2050 6ES7647-0BA00-1YA2: The device is capable of "Secure Boot", which means it only boots from trusted contents if enabled.

Additional information on the software topics, "Secure Boot", commissioning and Micro SD image is available in the SIMATIC IOT2000 Forum.

General information on commissioning

CAUTION

Danger of burns

The device surface can reach over 70 °C. You may get burned without any protection when touching it.

Don't directly touch the device during its operation. Always wear protective gloves before touching the device.

La surface de l'appareil peut atteindre une température supérieure à 70 °C. Vous risquez de vous brûler au contact de l'appareil si vous ne portez pas de gants de protection.

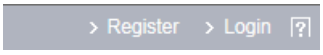
Évitez le contact direct avec l'appareil pendant son fonctionnement. Portez toujours des gants de protection avant de toucher l'appareil.

SIMATIC IOT2000 Forum

To use the SIMATIC IOT2000 Forum, you need a login for online support.

Follow these steps to participate in the Technical Forum:

1. Open the website "Technical Forum (http://www.siemens.com/automation/forum)".
2. If you do not yet have a login for online support, click "Register" at the top right of the window and follow the registration instructions.

   During registration, you enter an alias for the forum, for example. This alias is the pseudonym under which other users can see you and talk to you in the forum.

   You will receive a confirmation e-mail after registering successfully.

Expand device

5

5.1 Insert Micro SD card/Nano SIM card

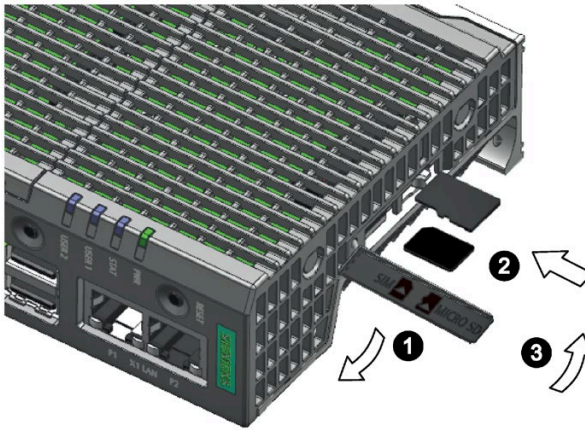
Requirement

- The device is disconnected from the power supply.
- Micro SD card or Nano SIM card that is suitable for industrial use.

Installation

NOTICE
Inserting a memory card If you are using the Micro SD card/Nano SIM card in a device installed in a system, you must observe the safety regulations for work on electrical systems. Carefully insert the Micro SD card/Nano SIM card into the card holder without applying excess force.

1. Open the card cover on the bottom.
2. Push the Micro SD card/Nano SIM card correctly into the supporting frame. The contacts of the Micro SD card/Nano SIM card must point in the direction of the motherboard.
3. Push the card cover back.



5.2 Install Arduino shield

Requirement

- The device is disconnected from the power supply.
- An Arduino shield

Procedure

NOTICE

Install Arduino shield

Ensure that the Arduino shield is inserted in its correct orientation. Ensure that the contact pins of the Arduino shield connect correctly with the terminal strips of the motherboard.

Arduino shield with operator control or display elements

Some Arduino shields have operator control and display elements. The device loses its approval certificates if you drill or mill openings in the cover in order to make the operator control or display elements of the Arduino shield accessible or visible from outside. In this case, the customer is responsible for the re-approval of the device.

Note

Power consumption

If the power consumption of the Arduino shield is too high, the device will be damaged.

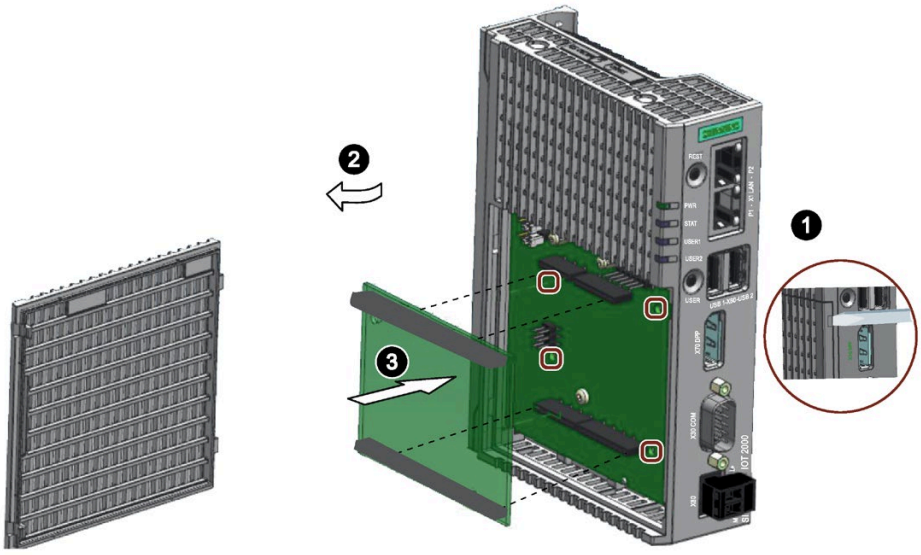
Note the information in section "Technical specifications (Page 47)".

Ambient temperature

The temperature in the housing of the device can be up to 30 °C above the maximum permissible ambient temperature of the device.

Make sure that the maximum permissible ambient temperature of the Arduino shield is specified accordingly.

1. Loosen the shield cover. Carefully press with the blade of a flat-blade screwdriver in the marked recesses and carefully pull on the appropriate place on the shield cover.



2. Remove the shield cover.
3. Insert the Arduino shield into the motherboard. Ensure that the contact pins of the Arduino shield fit perfectly on the contact strips of the motherboard and that the components of the Arduino shield do not touch the components of the motherboard.

   Note: Customize the shield cover according to the Arduino shield.

Note

Only use fixing elements made from plastic.

You can use the four boreholes in the motherboard to additionally fasten the Arduino shield on the motherboard. The boreholes are shown in the figure above. Only use fixing elements made from plastic, not metallic or conductive materials.

5.3 Install Mini PCIe card

You can install a Mini PCIe card in a IOT2050.

Note

Power consumption

If the power consumption of the Mini PCIe card is too high, the device will be damaged.

Note the information in section "Technical specifications (Page 47)".

Ambient temperature

The temperature in the housing of the device can be up to 30 °C above the maximum permissible ambient temperature of the device.

Make sure that the maximum permissible ambient temperature of the Mini PCIe- card is specified accordingly.

CAUTION

Risk of burns due to hot components

The motherboard and internal components can get hot during operation. Motherboard and internal components will only cool down slowly after the device has been switched off.

To avoid getting burned, wait a while after switching off the power supply. Be very careful when opening the enclosure and removing the motherboard.

5.3.1 Installing Mini PCIe card

Requirement

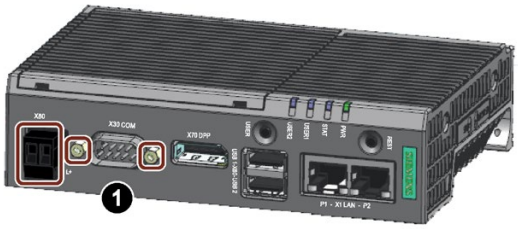
- The device is disconnected from the power supply.
- A Mini PCIe card
- Two M2 screws (supplied in accessory kit)

Procedure

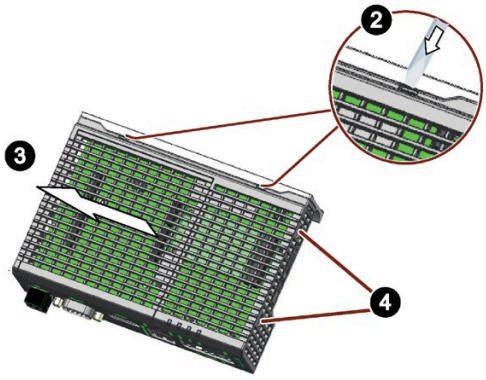
The following example describes the installation of a Mini PCIe card, including mounting of the antenna jacks. If the Mini PCIe card you install doesn't have an antenna, the work steps 4, 7 and 8 are not required.

Then follow these steps:

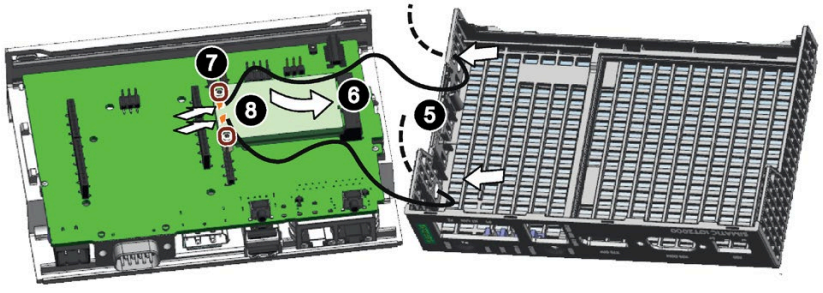
1. Remove the power plug and marked screws.



2. Loosen the top housing. Carefully press with the blade of a flat-blade screwdriver in the marked recesses and carefully pull on the appropriate place on the top housing of the enclosure.
3. Remove the top housing of the enclosure.
4. Drill two holes with a corresponding diameter at the marking shown for mini PCIe installation accessory.

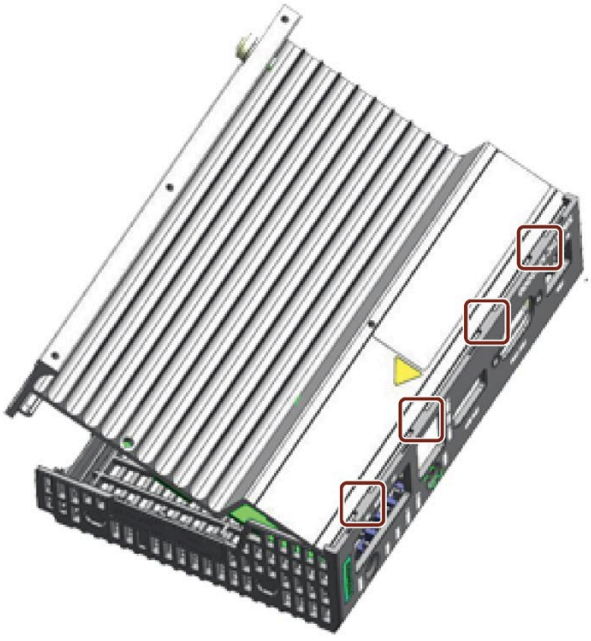


5. Insert the Mini PCIe card in the Mini PCIe interface on the motherboard as illustrated.
6. Fix the mini PCIe card with two M2 screws.
7. Connect the cables of mini PCIe installation accessory to the Mini PCIe card.
8. Get the cable of mini PCIe installation accessory out of the housing through the whole drilled in step 4.

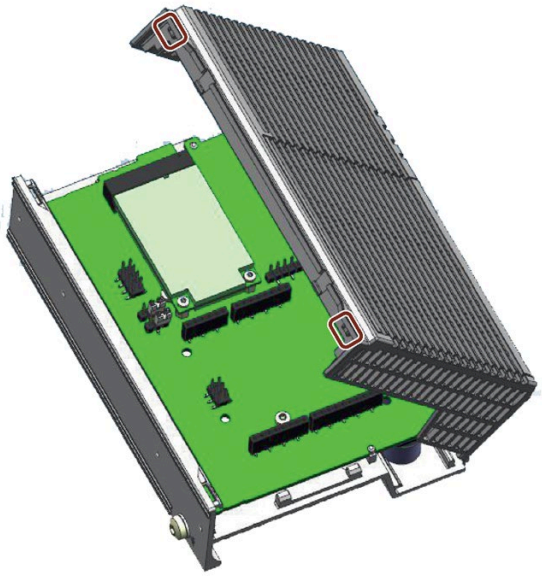


Installing the top housing

1. Align the bottom of the top housing to the heatsink edge. Make sure the marked hooks hooked the heatsink. Carefully insert the COM interface into the top housing.



2. Insert the two plastic clips of top housing into the clip holes on heatsink.



3. Press the top housing to fix the clips.

Then install power plug and screws for COM interface.

5.3.2 Installing half-size Mini PCIe card

Requirement

- The device is disconnected from the power supply.
- A half-size Mini PCIe card
- One M2 screw

Procedure

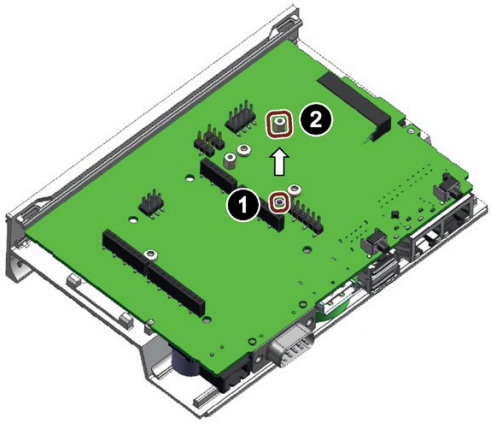
You can install the half-size Mini PCIe card by two ways.

- Expand the length of half-size Mini PCIe card with a expansion card. Then follow the procedure in Installing Mini PCIe card (Page 32)
- Install the half-size Mini PCIe cards directly.

The following example describes the installation of a half-size Mini PCIe card, including mounting of the antenna jacks. If the Mini PCIe card you install doesn't have an antenna, the work steps 5 and 6 are not required.

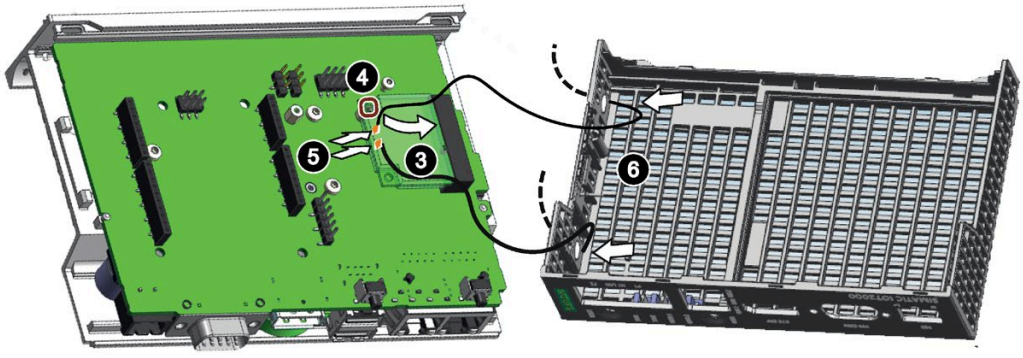
Follow steps 1 to 4 as described in Installing Mini PCIe card (Page 32) to open the top housing with shield cover. Then the following steps:

1. Remove one standoff for Mini PCIe card from motherboard.
2. Install the standoff to the place as shown in the picture.



3. Insert the half-size Mini PCIe card in the Mini PCIe interface on the motherboard as illustrated.
4. Fix the mini PCIe card with one M2 screw.

5. Connect the cables of mini PCIe installation accessory to the Mini PCIe card.
6. Get the cable of mini PCIe installation accessory out of the housing.



Then install the top housing (Page 32).

Maintaining and repairing the device

6

6.1 Maintenance

To retain a high level of system availability, or devices with a back-up battery, we recommend the preventative replacement of the back-up battery at replacement intervals of 5 years.

6.2 Repair information

Carrying out repairs

Only qualified personnel are permitted to repair the device. Contact your local representative, see section "Service and support (Page 61)".

⚠ WARNING

Unauthorized opening and improper repairs on the device may result in substantial damage to equipment or endanger the user.

- Always disconnect the power plug before you open the device.
- Only install system expansion devices designed for this device. If you install other expansion devices, you may damage the device or violate the safety requirements and regulations on RF suppression. Contact your technical support team or where you purchased your PC to find out which system expansion devices may safely be installed.

If you install or exchange system expansions and damage your device, the warranty becomes void.

⚠ CAUTION

Electrostatic sensitive devices (ESD)

The device contains electronic components which are destroyed by electrostatic charges. This can result in malfunctions and damage to the machine or plant.

Make sure you take precautionary measures even when you open the device, for example, when opening device doors, device covers or the housing cover. For more information, refer to the chapter "ESD Guideline"

Limitation of liability

All technical specifications and approvals of the device only apply if you use expansion components that have a valid CE approval (CE mark). The installation instructions for expansion components in the associated documentation must be observed.

UL approval of the device only applies when the UL-approved components are used according to their "Conditions of Acceptability".

We are not liable for functional limitations caused by using third-party devices or components.

6.3 Replacing the backup battery (For 6ES7647-0BA00-1YA2 only)

This chapter applies to the device 6ES7647-0BA00-1YA2, which has a back-up battery.

Prior to replacement

⚠ WARNING

Risk of explosion and release of harmful substances

Improper handling of lithium batteries can result in an explosion of the batteries.

Explosion of the batteries and the released pollutants can cause severe physical injury. Worn batteries jeopardize the function of the device.

Note the following when handling lithium batteries:

- Replace the battery every 5 years.
- Replace the lithium battery only with the type recommended by the manufacturer.
  The article number is A5E44491494.
- Do not throw lithium batteries into fire, do not solder on the cell body, do not recharge, do not open, do not short-circuit, do not reverse polarity, do not heat above 100°C and protect from direct sunlight, moisture and condensation.

NOTICE

Disposal of batteries and rechargeable batteries

Batteries and rechargeable batteries do not belong in domestic garbage. The user is legally obliged to return used batteries and rechargeable batteries.

Used batteries and rechargeable batteries pollute the environment as special waste. You as a user are liable to prosecution if you do not properly dispose of batteries and rechargeable batteries.

Please observe the following when disposing of batteries and rechargeable batteries:

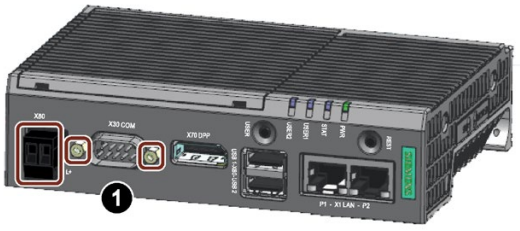
- Dispose of used batteries and rechargeable batteries separately as hazardous waste in accordance with local regulations.
- You can return used batteries and rechargeable batteries to public collection points and wherever batteries or rechargeable batteries of the type in question are sold.
- Label the battery container "Used batteries and rechargeable batteries".

Requirement

- The device is disconnected from the power supply.
- A replacement battery with the article number A5E44491494 is available.

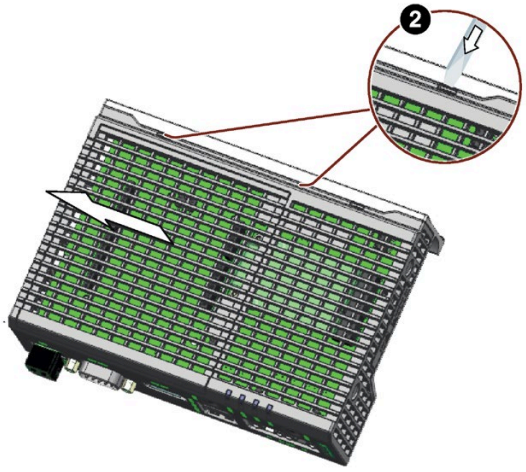
Procedure

1. Remove the power plug and marked screws.

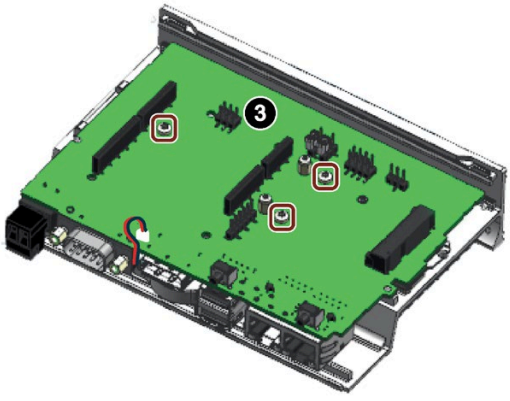


2. Loosen the top housing. Carefully press with the blade of a flat-blade screwdriver in the marked recesses and carefully pull on the appropriate place on the top housing of the enclosure.

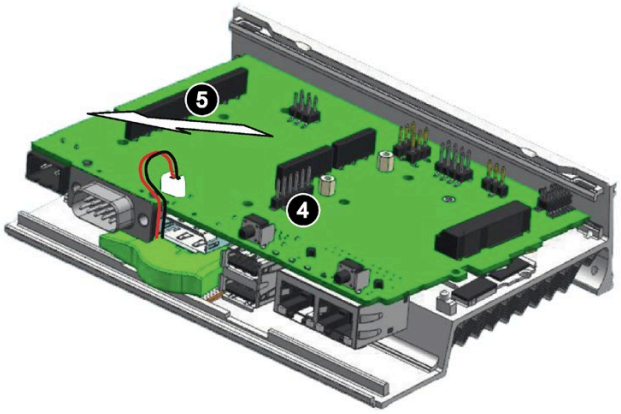
   Remove the top housing of the enclosure.



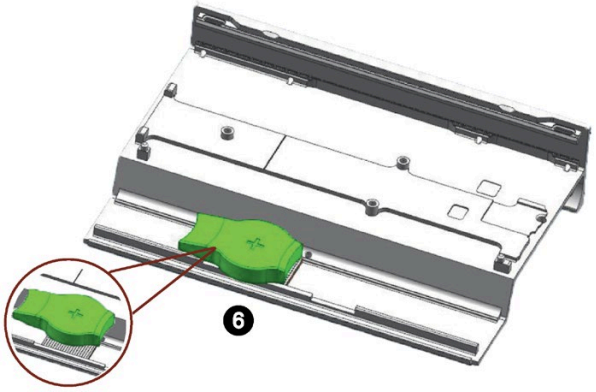
3. Remove the marked screws on the motherboard.



4. Unplug the battery cable from the motherboard.
5. Remove the motherboard.



6. Remove the battery.
   Paste the lock tape on the battery and then paste it on the device housing.
   Plug in the battery cable on the motherboard.



Then install the motherboard again and install the top housing (Page 32).

6.4 Recycling and disposal

Due to the low levels of pollutants in the devices described in these operating instructions, they can be recycled.

Contact a certified disposal service company for electronic scrap for environmentally sound recycling and disposal of your old devices, and dispose of the device according to the relevant regulations in your country.

Certificates and approvals

7

NOTICE
The approvals are voided if certain modifications are made The device approvals are voided if the following modifications are made: • An Arduino shield or a Mini PCIe card was installed. • The enclosure was physically modified, for example, openings were created to make LEDs on a plug-in card in the device visible. • Cables are routed from the inside out of the device or from the outside into the device, for example, to connect sensors or displays.

CE

The device meets the guidelines listed in the following sections.

EU Declaration of Conformity

The associated declaration of conformity is available on the Internet at the following address: EC Declaration of Conformity, UL approval Canada/USA (http://support.automation.siemens.com/WW/view/en/48958203).

UKCA

The device complies with the designated British standards (BS) for IPC published in the official consolidated list of the British Government. The device meets the requirements and protection targets of the following regulations and related amendments:

- Electromagnetic Compatibility Regulations 2016 (EMC)
- Regulations on the restriction of the use of certain hazardous substances in electrical and electronic equipment 2012 (RoHS).

UK Declarations of Conformity for the respective authorities are available from:

Siemens AG
Digital Industries
Factory Automation
DI FA TI COS TT
P.O. Box 1963
D-92209 Amberg

The UK Declaration of Conformity is also available for download from the Siemens Industry Online Support website under the keyword "Declaration of Conformity".

ISO 9001 certificate

The Siemens quality management system for all production processes (development, production and sales) meets the requirements of GB/T 19001-2008/ISO 9001:2015, ISO 14001:2015 + Cor. 1:2009 and BS OHSAS 18001:2007.

Certificate registration no.01 100 1430201, 01 104 1430201 and 01 113 1430201.

Software license agreements

If the device is supplied with preinstalled software, you must observe the corresponding license agreements.

UL approval

The following approvals are available for the device:

- Underwriters Laboratories (UL) in accordance with standard UL61010-2-201 (IND.CONT.EQ), File E472609
- Canadian National Standard CSA-C22.2 No. 61010-2-201

FCC and Canada

USA	
Federal Communications Commission Radio Frequency Interference Statement	This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
Shielded Cables	Shielded cables must be used with this equipment to maintain compliance with FCC regulations.
Modifications	Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.
Conditions of Operations	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CANADA	
Canadian Notice	This Class A digital apparatus complies with Canadian ICES-003 (A).
Avis Canadien	Cet appareil numérique de la classe A est conforme à la norme NMB-003 (A) du Canada.

Responsible party for Supplier's Declaration of Conformity

Siemens Industry, Inc.

Digital Factory - Factory Automation

5300 Triangle Parkway, Suite 100

Norcross, GA 30092

USA

Mail to: (amps.automation@siemens.com)

RCM AUSTRALIA/NEW ZEALAND

This product meets the requirements of the standard EN 61000-6-4:2007 Generic standards – Emission standard for industrial environments.

Identification for Eurasion Customs Union

- EAC (Eurasian Conformity)
- Customs union of Russia, Belarus and Kazakhstan
- Declaration of conformity according to Technical Regulations of the Customs Union (TR CU)

Korea Certification

This product satisfies the requirement of the Korean Certification (KC Mark).

이 기기는 업무용(A 급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며 가정 외의 지역에서 사용하는 것을 목적으로 합니다.

WEEE label (European Union)

Disposal instructions, observe the local regulations and the section "Recycling and disposal (Page 40) ".

7.1 Directives and declarations

7.1.1 Notes on CE marking

Electromagnetic compatibility

This product meets the requirements of EU Directive 2014/30/EU "Electromagnetic Compatibility".

The device is designed for the following areas of application corresponding to the CE marking:

Scope of application	Requirements for	
	Interference emission	Immunity to interference
Industrial area	EN 61000-6-4:2007 +A1:2011	EN 61000-6-2:2005

7.1.2 ESD guideline

What does ESD mean?

An electronic module is equipped with highly integrated components. Due to their design, electronic components are highly sensitive to overvoltage and thus to the discharge of static electricity. Such electronic components or modules are labeled as electrostatic sensitive devices.

The following abbreviations are commonly used for electrostatic sensitive devices:

- ESD – Electrostatic sensitive device
- ESD – Electrostatic Sensitive Device as a common international designation

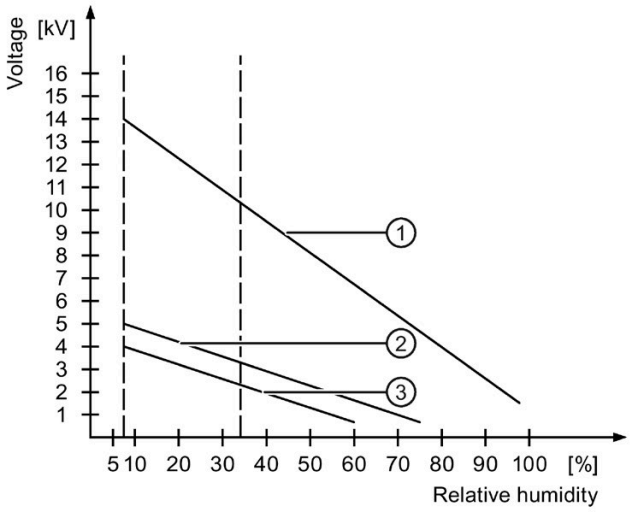
Electrostatic sensitive devices can be labeled with an appropriate symbol.

NOTICE
Damage to ESD from touch Electrostatic sensitive devices, ESD, can be destroyed by voltages which are far below the human perception limit. If you touch a component or electrical connection of a module without discharging any electrostatic energy, these voltages may arise. The damage to a module by an overvoltage can often not be immediately detected and only becomes evident after an extended period of operation. The consequences are incalculable and range from unforeseeable malfunctions to a total failure of the machine or system. Avoid touching components directly. Make sure that persons, the workstation and the packaging are properly grounded.

Charge

Every person without a conductive connection to the electrical potential of his/her surroundings can be electrostatically charged.

The material with which this person comes into contact is of particular significance. The figure shows the maximum electrostatic voltages with which a person is charged, depending on humidity and material. These values conform to the specifications of IEC 61000-4-2.



① Synthetic materials

② Wool

③ Antistatic materials such as wood or concrete

NOTICE
Grounding measures There is no equipotential bonding without grounding. An electrostatic charge is not discharged and may damage the ESD. Protect yourself against discharge of static electricity. When working with electrostatic sensitive devices, make sure that the person and the workplace are properly grounded.

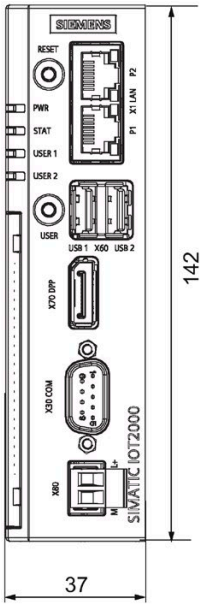
Protective measures against discharge of static electricity

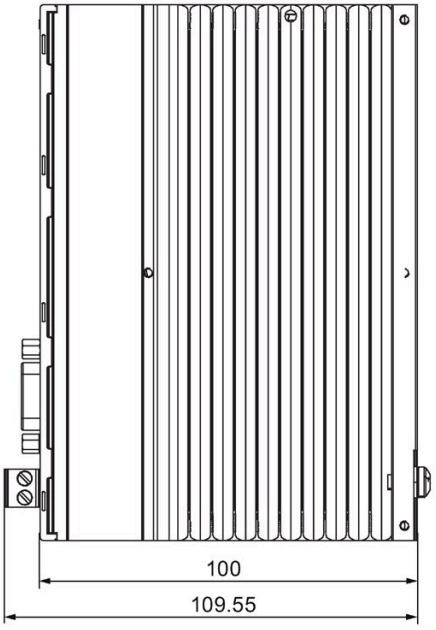
- Disconnect the power supply before you install or remove modules which are sensitive to ESD.
- Pay attention to good grounding:
  - When handling electrostatical sensitive devices, make sure that persons, the workstation and devices, tools and packaging used are properly grounded. This way you avoid static discharge.
- Avoid direct contact:
  - As a general rule, do not touch electrostatic sensitive devices, except in the case of unavoidable maintenance work.
  - Hold the modules at their edge so that you do not touch the connector pins or conductor paths. This way, the discharge energy does not reach and damage the sensitive components.
  - Discharge your body electrostatically before you take a measurement at a module. Do so by touching grounded metallic parts. Always use grounded measuring instruments.

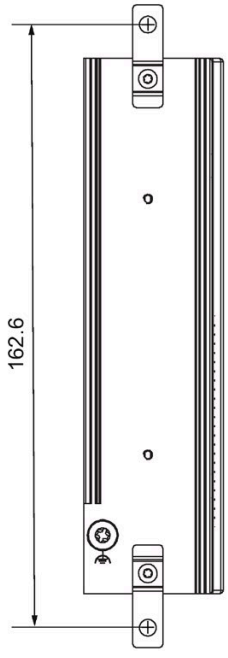
Dimension drawings

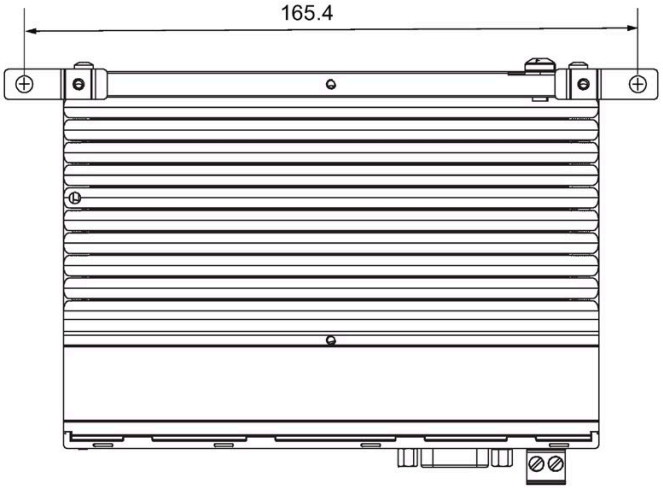
8

The following figures show the dimension drawings of the type IOT2050.









All dimensions in mm.

Technical specifications

9

9.1 General technical specifications

General technical specifications

Order number	See order documents
Weight without mounting brackets	• 6ES7647-0BA00-0YA2: approx. 330 g • 6ES7647-0BA00-1YA2: approx. 340 g
Power supply [1]	DC 12 to 24 V, no galvanic isolation
Brief voltage interruption in accordance with Namur	Up to 5 ms buffer time at 24 V DC and full load [2] Max. 10 events per hour; recovery time at least 10 s
Current consumption	Max. 1.7 A
Noise emission	< 40 dB(A) according to DIN 45635-1
Degree of protection	IP20 according to IEC 60529
Protection class	Protection class III in accordance with IEC 61140
Degree of pollution	Device is designed for environments with pollution degree 2
Quality assurance	In accordance with ISO 9001

[1] The device should only be connected to a power supply which meets the requirements of safe extra low voltage (SELV) according to IEC/EN/DIN EN/UL 61010-1.

[2] In the event of low supply voltage, the buffer time is reduced

Electromagnetic compatibility

Immunity with regard to conducted interference on the supply lines	± 2 kV according to IEC 61000-4-4; burst ± 1 kV according to IEC 61000-4-5; asymmetrical surge
Noise immunity on signal lines	± 1 kV according to IEC 61000-4-4; burst; length < 30 m ± 2 kV according to IEC 61000-4-4; burst; length > 30 m ± 2 kV according to IEC 61000-4-5; surge; length > 30 m
Immunity to discharges of static electricity	± 4 kV contact discharge in accordance with IEC 61000-4-2 ± 8 kV air discharge in accordance with IEC 61000-4-2
Immunity to RF interference	10 V/m, 80 MHz to 1 GHz, 80% AM in accordance with IEC 61000-4-3 3 V/m, 1.4 to 6 GHz, 80% AM in accordance with IEC 61000-4-3 10 V, 150 KHz to 80 MHz, 80% AM in accordance with IEC 61000-4-6

If there are voltage peaks on power supply lines, use a protective device in the form of a varistor (MOV) UMOV = U-rated x 1.2 (BLITZDUCTOR BVT AVD 24 (918 422) or compatible).

Motherboard

Processor	• 6ES7647-0BA00-0YA2: TI Sitara AM6528 GP, 1000 MHz • 6ES7647-0BA00-1YA2: TI Sitara AM6548 HS, 1000 MHz
RAM	• 6ES7647-0BA00-0YA2: 1 GB • 6ES7647-0BA00-1YA2: 2 GB
BIOS SPI Flash	16 MB
Micro SD	Slot for one Micro SD card
Nano SIM card	Slot for one Nano SIM card
EMMC	• 6ES7647-0BA00-0YA2: No • 6ES7647-0BA00-1YA2: 16 GB
Expansion slots	1 x Arduino shield
	1 x mini PCIe for PCIe cards 30 x 50.59 mm or 30 x 26.8 mm via adapter

Interfaces

All devices of the type SIMATIC IOT2050	
USB Type A, X60	For MLFB 6ES7647-0BA00-0YA2 (FS02), MLFB 6ES7647-0BA00-1YA2 (FS04): 1 xUSB 2.0 host max.2.5W/500mA 1 xUSB 3.0 host max.4.5W/900mA
	For MLFB 6ES7647-0BA00-0YA2 (FS01), MLFB 6ES7647-0BA00-1YA2 (FS01 ~ FS03): 2 xUSB 2.0 host max.2.5W/500mA
DisplayPort, X70	DisplayPort interface (DP)
LAN interface P1 - X1 LAN - P2, RJ45 [1]	1 GB LAN port
COM X30	• RS232 [2], max. 115 Kbps, D-sub connector, 9-pin • RS422 [2] [3], max. 115 Kbps, D-sub connector, 9-pin • RS485 [2] [3], max. 115 Kbps, D-sub connector, 9-pin

[1] For unique labeling, the LAN interfaces are numbered on the enclosure. The numbering by the operating system can differ.

Siemens recommends you use shielded ethernet cables.

[2] You can use any COM port as an RS232, RS422 or RS485 interface through the software-controlled interface parameter assignment.

[3] Termination can be set with the software.

Additional information on parameter assignment is available in the SIMATIC IOT2000-Forum, see section "Software and commissioning (Page 28)".

9.2 Ambient conditions

Climatic ambient conditions

The temperature values have been checked in accordance with IEC 60068-2-1, IEC 60068-2-2 and IEC 60068-2-14. Permitted mounting positions, see section "Permitted mounting positions and mounting types (Page 17)".

Ambient temperature	
• Operation	Rail mounting • Vertical: 0 to 50 °C * • Horizontal: 0 to 40 °C * Wall mounting • Vertical: 0 to 45 °C * • Horizontal: 0 to 40 °C *
• Storage/transport	-20 to 70 °C
Gradient	
• Operation	Max. 10 °C/h
• Storage	20 °C/h, no condensation
Relative humidity, tested in accordance with IEC 60068-2-78, IEC 60068-2-30	
• Operation	5 to 85% at 30°C, no condensation
• Storage/transport	5 to 95 % at 25/55 °C, no condensation
Atmospheric pressure, Altitude	
• Operation	1080 to 795 hPa, corresponds to an elevation of -1000 m to 2000 m
• Storage/transport	1080 to 660 hPa, corresponds to an elevation of -1000 to 3500 m

* Also note the following section "Power consumption of the components".

Mechanical ambient conditions

Vibration resistance, tested in accordance with IEC 60068-2-6	
• Operation	Vibration load 1g, 10 cycles per axle: • 5 to 8.4 Hz, deflection 3.5 mm • 8.4 to 200 Hz, acceleration 9.8 m/s^2
• Storage/transport	• 5 to 8.4 Hz: Deflection 3.5 mm • 8.4 Hz to 500 Hz: Acceleration 9.8 m/s^2
Impact resistance, tested in accordance with IEC 60068-2-27	
• Operation	150 m/s^2, 11 ms
• Storage/transport	250 m/s^2, 6 ms

9.3 Power demand of the components

Maximum power consumption of the auxiliary components

For the ambient temperature for permitted mounting position, refer to Ambient conditions (Page 49).

Auxiliary components	Maximum permitted power consumption			Maximum total power
	+5 V	+3.3 V	+1.5 V	
All components				6.5 W
Arduino shield				Permitted power distribution: • Arduino shield: 4 W, USB: 2.5 W • Arduino shield: 2 W, USB: 4.5 W • Mini PCIe card: 2 W; USB: 2.5 W; Arduino shield: 2 W
Mini PCIe card	--	1.5 A [1]	0.3 A [2]	
USB 2.0 high current	500 mA	--	--	
USB 3.0 high current	900 mA	--	--	

[1] May amount to maximum 3.0 A for up to 100 ms at start-stop torque of device

[2] May amount to maximum 1.2 A for up to 100 ms at start-stop torque of device

Note

Device can overheat!

The power supply cannot make unlimited power available. The auxiliary components consume energy and produce heat.

The device may overheat. The device and the auxiliary components may be damaged.

9.4 Direct current supply (DC)

Technical specifications

Input voltage	DC 12 to 24 V
Power consumption	max. 24 W

Typical power consumption

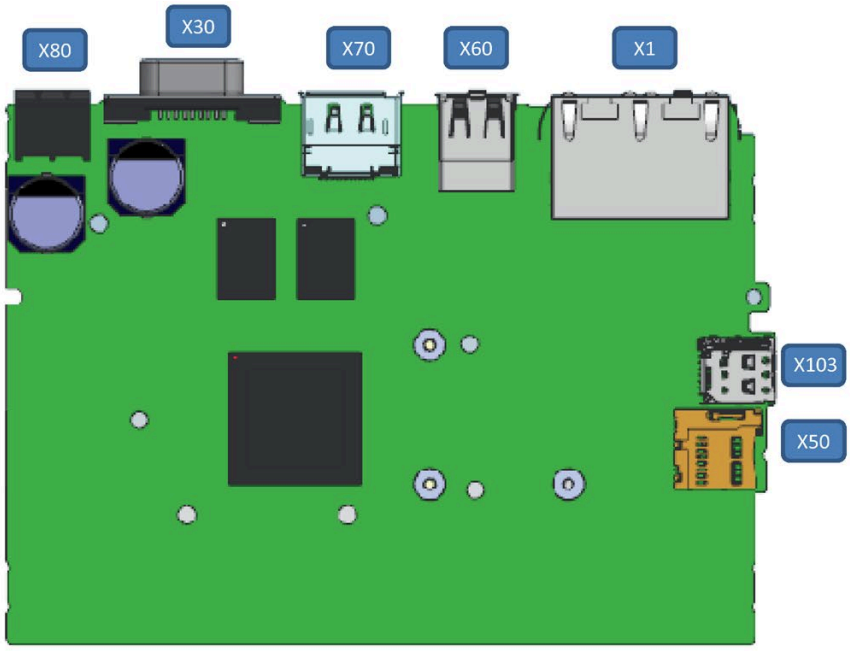
	Power consumption (at a rated voltage of 24 V)
Basic device	12 W
Arduino shields	See section "Power demand of the components (Page 50)"
USB ports	
Expansion cards	

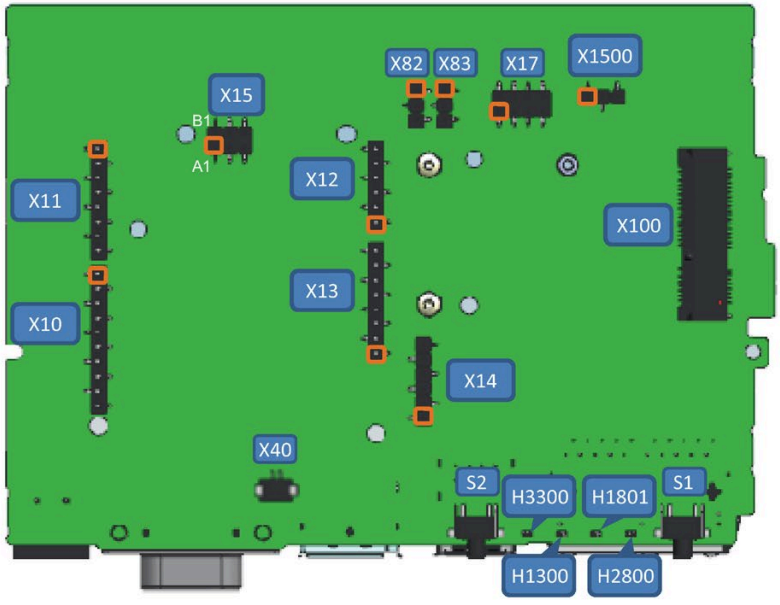
Hardware descriptions

10

10.1 Motherboard

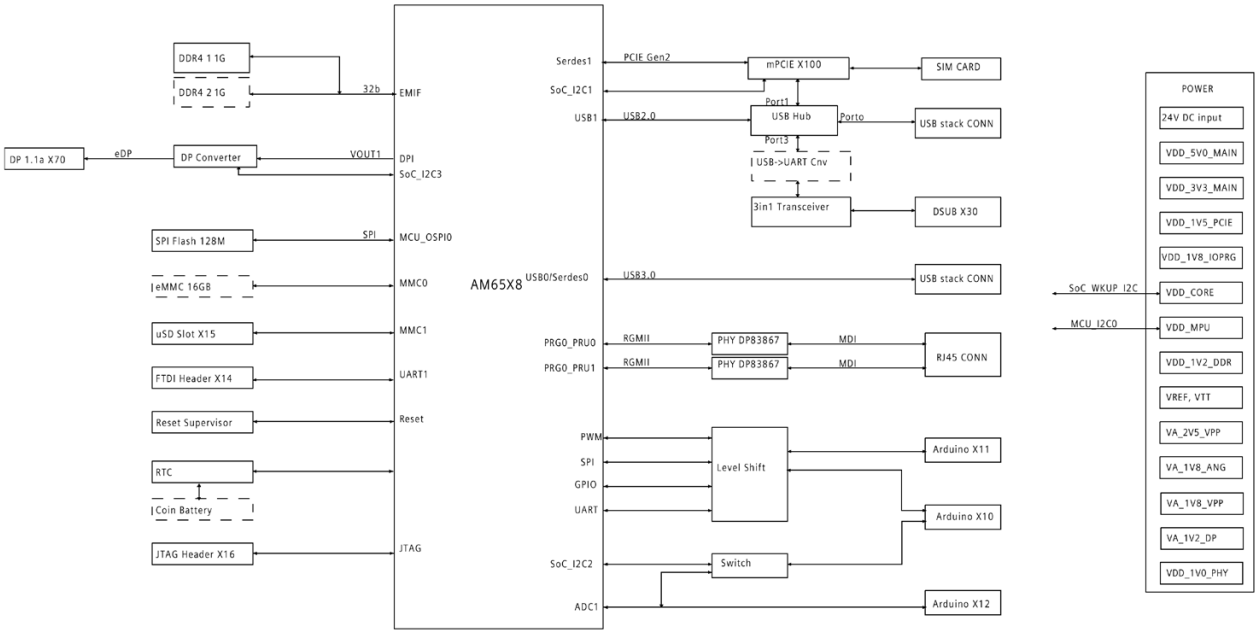
The following figures show the motherboard of the SIMATIC IOT2050.





Pin 1

The following figures show the diagram.



Note: the parts in dash rectangles are only available for advanced versions.

Component/interface	Description / inscription		Meaning, comment
H2800	LEDs	PWR	Power (green)
H1801		STAT	OS is running (Green Blink). OS is not running (Red blink).
H1300		USER1	User LED (green/red/orange), programmable
H3300		USER2	User LED (green/red/orange), programmable
S1	RESET		For a reset of the CPU
S2	USER		Status can be queried with programming
X1	Ethernet 1 and Ethernet 2		
X30	COM D-Sub9		
X60	USB A Host		X60-USB1: USB3.0 Type A X60-USB2: USB2.0 Type A
X70	DisplayPort		
X14	UART Debug		
X40	Battery-Con		
X50	µSD slot		
X11, X13	Arduino, 8-pin (2x)		
X10	Arduino, 10-pin		
X12	Arduino, 6-pin		
X15	ICSP		Part of Arduino Interface
X17	DediProg Connector		
X80	Power supply		

Component/interface	Description / inscription	Meaning, comment
X83	Jumper, 3 pin, SMD	Jumper defines IO voltage for Arduino shield: • Jumper on pins 1-2: 5 V • Jumper on pins 2-3: 3.3 V
X1500	Jumper, 3 pin, SMD	Jumper defines Flash write protection enable or disable: • Jumper on pins 1-2: write protection enable • Jumper on pins 2-3: write protection disable **Note**: When Secure Boot is not enabled, set the flash write protection jumper should be in write protection enabled state (pins 1-2) and lock flash in bootloader during normal operation.
X100	MiniPCIe Connector	
X103	Nano SIM Connector	
X82	VIN Separation (power supply, 24 V DC)	Jumper defines VIN connection to the Arduino shield: • Jumper on pins 1-2: VIN is connected to the Arduino shield • Jumper on pins 2-3: VIN is not connected to the Arduino shield

10.2 External Interfaces

10.2.1 Power supply

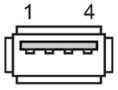
Plug connector, 2-pin

Name of interface on the device: X80

Pin	Assignment
1	GND (M)
2	+12 to 24 V DC (L+)

10.2.2 USB

USB socket type A



Name of interface on the device: X60 - USB2.0

-Pin	Assignment
1	+5 VDC, out (max. 500 mA)
2	USB-DN
3	USB-DP
4	GND

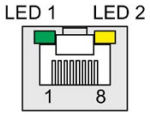
Name of interface on the device: X60 - USB3.0

-Pin	Assignment
1	+5 VDC, out (max. 900 mA)
2	USB-DN
3	USB-DP
4	GND
5	SSRX-
6	SSRX+
7	GND
8	SSTX-
9	SSTX+

10.2.3 Ethernet port

RJ45 socket

Name of interface on the device: P1 - X1 LAN - P2



Pin	Short description	Meaning
1	BI_DA+	Bidirectional data A+, input/output
2	BI_DA–	Bidirectional data A–, input/output
3	BI_DB+	Bidirectional data B+, input/output
4	BI_DC+	Bidirectional data C+, input/output
5	BI_DC–	Bidirectional data C–, input/output
6	BI_DB–	Bidirectional data B–, input/output

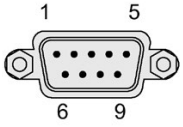
Pin	Short description	Meaning
7	BI_DD+	Bidirectional data D+, input/output
8	BI_DD–	Bidirectional data D–, input/output

LED	Meaning	Status	Meaning of the status
LED 1	Connection status	OFF	No data transmission
		Green flashing	Data transfer active
LED 2	Data transmission rate	OFF	Reserved
		Yellow	100 Mbps
		Green	1000 Mbps

10.2.4 Serial port

D-sub socket, 9-pin, with screw lock

Name of interface on the device: X30 COM



RS 232
RS 422
RS 485

Assignment RS 232

Pin	Short description	Meaning
1	DCD	Data carrier detect (I)
2	RxD	Received data (I)
3	TxD	Transmitted data (O)
4	DTR	Data terminal ready (O)
5	M	Ground
6	DSR	Data set ready (I)
7	RTS	Request to send (O)
8	CTS	Clear to send (I)
9	RI	Incoming call (I)

Assignment RS 422

Pin	Short description	Meaning
1	TX-	Transmitted data - (O) for full-duplex mode
2	TX+	Transmitted data + (O) for full-duplex mode
3	RX+	Receive data + (I) for full-duplex mode
4	RX-	Receive data - (I) for full-duplex mode

Pin	Short description	Meaning
5	M	Signal ground
6	nc	
7	nc	
8	nc	
9	nc	

Assignment RS 485

Pin	Short description	Meaning
1	Data-	Transmit / receive data - (I/O) for half-duplex mode
2	Data+	Transmit / receive data+ (I/O) for half-duplex mode
3	nc	
4	nc	
5	M	Signal ground
6	nc	
7	nc	
8	nc	
9	nc	

10.3 Internal interfaces

10.3.1 Arduino shield interfaces

The tables below show the pin assignment of the interfaces of the Arduino shield, depending on the operating mode.

The position of the interfaces and Pin 1 of the respective interface is available in section "Motherboard (Page 51)".

X10

Pin	Operating mode						
	DIGITAL	ANALOG	POWER	SERIAL	SPI	I2C	PWM
1	8						X
2	9						X
3	10				SS		
4	11				MOSI		
5	12				MISO		
6	13				SCK		
7			GND				
8							

Pin	Operating mode						
9						SDA	
10						SCL	

X11

Pin	Operating mode						
	DIGITAL	**ANALOG**	**POWER**	**SERIAL**	**SPI**	**I2C**	**PWM**
1	0			UART_Rx			
2	1			UART_Tx			
3	2			UART_CTS			
4	3			UART_RTS			
5	4						X
6	5						X
7	6						X
8	7						X

X12

Pin	Operating mode						
	DIGITAL	**ANALOG**	**POWER**	**SERIAL**	**SPI**	**I2C**	**PWM**
1	14	A0					
2	15	A1					
3	16	A2					
4	17	A3					
5	18	A4				SDA	
6	19	A5				SCL	

X13

Pin	Operating mode						
	DIGITAL	**ANALOG**	**POWER**	**SERIAL**	**SPI**	**I2C**	**PWM**
1							
2			IOREF				
3			RESET				
4			3.3 V				
5			5 V				
6			GND				
7			GND				
8			VIN				

X15 (ICSP)

Pin	Operating mode						
	DIGITAL	**ANALOG**	**POWER**	**SERIAL**	**SPI**	**I2C**	**PWM**
A1	12				MISO		
B1			5 V				
A2	13				SCK		
B2	11				MOSI		
A3			RESET				
B3			GND				

10.3.2 UART Debug

X14

Pin	Assignment
1	GND
2	RTS_N
3	n. c.
4	RxD
5	TxD
6	CTS_N

10.3.3 Mini PCIe interface

X100

Pin	Signal Name	Pin	Signal Name
51		52	+3.3 V_{aux}
49		50	GND
47	ANTCTRL3	48	+1.5 V / ANTCTRL1
45	ANTCTRL2	46	
43	GND	44	
41	+3.3V_{aux}	42	
39	+3.3V_{aux}	40	GND
37	GND	38	USB_D+
35	GND	36	USB_D-
33	PETp0	34	GND
31	PETn0	32	SMB_DATA
29	GND	30	SMB_CLK
27	GND	28	+1.5V / ANTCTRL0
25	PERp0	26	GND
23	PERn0	24	+3.3V_{aux}

Pin	Signal Name	Pin	Signal Name
21	GND	22	PERST#
19		20	W_DISABLE1#
17		18	GND
Mechanical Key			
15	GND	16	
13	REFCLK+	14	UIM_RESET
11	REFCLK-	12	UIM_CLK
9	GND	10	UIM_DATA
7		8	UIM_PWR
5		6	1.5 V
3		4	GND
1	WAKE#	2	3.3 V_{aux}

10.3.4 Micro SD interface

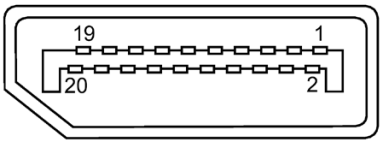
X50

Pin	Abbreviation	Function
1	Dat2	Data line bit 2
2	Dat3	Card Detect / data line bit 3
3	CMD	Command Line
4	Vdd	Voltage supply 2.7–3.6 V
5	Clk	Clock input
6	GND	Signal Ground
7	Dat0	Data line bit 0
8	Dat1	Data line bit 1

10.3.5 DisplayPort 1.1A

X70

DisplayPort interface



Pin no.	Abbreviation	Function	Input/output
1	Lane 0_P	Lane 0+	Input
2	GND	Ground	-
3	Lane 0_N	Lane 0-	Input
4	Lane 1_P	Lane 1+	Input
5	GND	Ground	-

DisplayPort interface			
6	Lane 1_N	Lane 1-	Input
7			
8	GND	Ground	-
9			
10			
11	GND	Ground	-
12			
13	CONFIG1	Connected to ground	-
14	CONFIG2	Connected to ground	-
15	AUX CH_P	Auxiliary channel+	Bidirectional
16	GND	Ground	-
17	AUX CH_N	Auxiliary channel-	Bidirectional
18	Hot plug	Hot Plug Detect	output
19	Return	Return for power Connected to ground	-
20	DP_PWR	Power for connector (3.3 V 500 mA)	power out

Technical support

A

A.1 Service and support

You can find additional information and support for the products described on the Internet at the following addresses:

- SIMATIC IOT2000 (www.siemens.com/iot2000)
- Technical support (https://support.industry.siemens.com)
- After Sales Information System SIMATIC IPC/PG (http://www.siemens.com/asis)
- SIMATIC Documentation Collection (http://www.siemens.com/simatic-tech-doku-portal)
- Your local representative (https://www.automation.siemens.com/aspa_app)
- Training center (https://www.sitrain-learning.siemens.com/PLG/?AppLang=en)
- Industry Mall (https://mall.industry.siemens.com/)

When contacting your local representative or Technical Support, please have the following information at hand:

- MLFB of the device
- BIOS version for industrial PC or image version of the device
- Other installed hardware
- Other installed software

Tools & downloads

Please check regularly if updates and hotfixes are available for download to your device. The download area is available on the Internet at the following link:

After Sales Information System SIMATIC IPC/PG (http://www.siemens.com/asis)

A.2 Troubleshooting

Error pattern	Possible cause	Possible remedy
Host monitor flashes black for a few seconds when you insert the DC connecting terminal to the device.	You turned the switch on before you connect the DC connecting terminal.	Avoid turning on/off the device by plugging /unplugging the DC connecting terminal. Use a external switch to control the power of the device.
User button can't work when Arduino shield reset pin is working.	User button and Arduino interface reset pin can't work at same time.	Avoid using user button and Arduino interface reset pin at the same time.

Markings and symbols

B

B.1 Overview

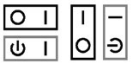
The following tables show all the symbols which may be found on your SIMATIC industrial PC, SIMATIC industrial monitor or SIMATIC Field PG in addition to the symbols which are explained in the operating instructions.

The symbols on your device may vary in some details from the symbols shown in the following tables.

B.2 Safety

Symbol	Meaning		Symbol	Meaning
	Warning, observe the supplied documentation.			Lock is closed
	Attention, radio equipment			Lock is open
	Disconnect the power plug before opening			Opening for Kensington lock
	Attention ESD (Electrostatic sensitive device)			Warning of hot surface

B.3 Operator controls

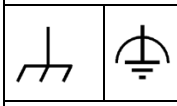
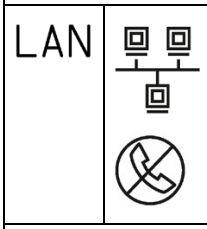
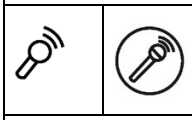
Symbol	Meaning		Symbol	Meaning
	On/off switch, without electrical isolation			Eject CD/DVD
	On/off switch, without electrical isolation			

B.4 Certificates, approvals and markings

The following table shows symbols relating to certificates, approvals and markings which may be on the device. You can find more information in the operating instructions for your device:

Symbol	Meaning		Symbol	Meaning
	Approved for Australia and New Zealand			Marking for the Eurasian Customs Union
	Approved for China			Test mark of Factory Mutual Research
	CE markings for European countries			Marking of Federal Communications Commission for the USA
	EFUP (Environment Friendly Use Period) marking for China			Approved for Korea
	Test mark of the Underwriters Laboratories			Disposal information, observe the local regulations.
	Approval for India			

B.5 Interfaces

Symbol	Meaning		Symbol	Meaning
	Connection to the power supply			PS/2 mouse interface
	Protective conductor terminal			PS/2 keyboard-interface
	Connection for functional earthing (equipotential bonding line)			Multimedia Card Reader
	DisplayPort interface			Smart Card Reader
	DVI-D interface			Line In
	LAN interface, not approved for connecting WAN or telephone			Line Out
	Serial port			Microphone input
	USB port			Universal Audio Jack
	USB 2.0 high-speed port			Headphone output
	USB 3.0 super-speed port			
	USB 3.1 SuperSpeedPlus interface			

List of abbreviations

C

ACPI	Advanced Configuration and Power Interface	
BIOS	Basic Input Output System	
CE	Communauté Européenne	
COM	Communications Port	Term for the serial interface
CPU	Central Processing Unit	CPU
CSA	Canadian Standards Association	Canadian organization for tests and certifications according to national or binational standards
CTS	Clear To Send	Clear to send
DC	Direct Current	DC current
DCD	Data Carrier Detect	Data carrier signal detection
DQS	Deutsche Gesellschaft zur Zertifizierung von Qualitätsmanagement mBH	
DSR	Data Set Ready	Ready for operation
DTR	Data Terminal Ready	Data terminal is ready
ESD	Components sensitive to electrostatic charge	
EN	European standard	
ESD	Electrostatic Sensitive Device	Electrostatic Sensitive Devices
	Electrostatic discharge	Electrostatic discharge
GND	Ground	Chassis ground
IDE	Integrated Device Electronics	
IEC	International Electronical Commission	
LAN	Local Area Network	Computer network that is limited to a local area.
LED	Light Emitting Diode	Light emitting diode
LPS	Limited Power Source	
MAC	Media access control	Media access control
MLFB	Machine-readable product designation	
PC	Personal computer	
PCIe	Peripheral Component Interconnect express	High-speed serial, differential full-duplex PtP interface with high data rate.
PG	Programming device	
RI	Ring Input	Incoming call
RTS	Request to send	Request to send
RxD	Receive Data	Data transfer signal
SELV	Safety Extra Low Voltage	Safety extra low voltage
UEFI	Unified Extensible Firmware Interface	

UL	Underwriters Laboratories Inc.	US organization for testing and certification according to national or binational standards.
USB	Universal Serial Bus	

Glossary

CE marking

Communauté **E**uropéene: The CE symbol confirms the conformity of the product with all applicable EC directives such as the EMC Directive.

COM interface

The COM interface is a serial V.24 interface. The interface is suitable for asynchronous data transfer.

Debian

Debian is a Linux distribution composed of free and open-source software. Debian systems currently use the Linux kernel or the FreeBSD kernel. Linux is a piece of software started by Linus Torvalds and supported by thousands of programmers worldwide. FreeBSD is an operating system including a kernel and other software.

Distribution framework

Exemplary reference distribution "Debian" of Embedded Linux (see "Debian" and "ISAR").

Drivers

Program parts of the operating system. They adapt user program data to the specific formats required by I/O devices such as hard disk, printers, and monitors.

Embedded Linux

Linux for industrial, embedded systems (see "Debian").

ESD Guideline

Guideline for using electrostatic sensitive components.

Ethernet

Local network (bus structure) for text and data communication with a transfer rate of 100/1000 Mbps.

Interface

- Physical interconnection (cable) of hardware elements such as PLCs, PCs, programming devices, printers or monitors.
- Interface for interactive software applications.

LAN

Local **A**rea **N**etwork: LAN is a local network that consists of a group of computers and other devices that are distributed across a relatively restricted range and are linked with communication cables. The devices connected to a LAN are called nodes. The purpose of networks is the mutual use of files, printers or other resources.

Module

Modules are plug-in units for PLCs, programming devices or PCs. They are available as local modules, expansion modules, interfaces or mass storage (Mass storage module).

Motherboard

The motherboard is the core of the computer. Here, data are processed and stored, and interfaces and device I/Os are controlled and managed.

Operating system

Generic term which describes all functions for controlling and monitoring user program execution, distribution of system resources to the user programs and the operating mode in cooperation with the hardware (for example, Windows 7 Ultimate).

Reset

Hardware reset: Reset/restart of the PC using a button/switch.

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