

IPC191X1

Gateway hardware with Linux OS

General Operating-, Maintenance- and Installation Manual



IPCOMM GmbH

Walter-Bouhon-Straße 4
90427 Nuremberg
Germany

Phone: +49 911 18 07 91-0
Fax: +49 911 18 07 91-10
Web: <https://www.ipcomm.de>
Email: info@ipcomm.de

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1 Introduction

All technical information, descriptions and illustrations contained in this 'Operating, Maintenance and Installation Manual' remain our property and shall not be used otherwise than for operating this system, nor shall they be copied, reproduced or passed on to third parties or brought to their notice without our prior written consent.

The information represented in this manual is in keeping with current standards and is subject to later alterations.

This manual contains important instructions referring to safe installation, commissioning, operation and maintenance.

Read this manual carefully before starting up the gateway and observe the instructions.

In order to comply with the guidelines for electro-magnetic compatibility in industrial PCs (or other variants) only CE-certified components are used in compliance with project-specific requirements.

Finally we want to draw your attention to the fact that any warranties with respect to the gateway hardware will be invalid in the event that:

- Operation, servicing and maintenance are not carried out accurately according to the instructions; repairs are not carried out by our personnel or without our prior written consent.
- Commissioning is not carried out by our personnel or we have not given our approval for the commissioning or the commissioning is carried out by untrained personnel.
- The unit is used inadequately, incorrectly, negligently or inappropriately or for a purpose other than that originally intended.
- The serial number is removed from the product.

For your protection, observe the following safety precautions when setting up your equipment:

- Follow all cautions and instructions marked on the equipment.
- Ensure that the voltage and frequency of your power source match the voltage and frequency inscribed on the equipment's electrical rating label.
- Never push objects of any kind through openings in the equipment. Dangerous voltages may be present. Conductive foreign objects could produce a short circuit that could cause fire, electric shock, or damage to your equipment.
- The industrial PC must be mounted on an equipment carrier (1U) in a 19" rack. A free floating or unilateral mounting may cause defects.
- It is imperative to ensure a consequent strain relief to avoid damage to the connector of the '8-port DB9-male connector cable'.

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2 Hardware Description

2.1 General

As hardware platform for the protocol converter a 19" industrial PC is used. This solution offers a high degree of flexibility, performance and reliability.

Important for the selection of our components are particular items like quality, availability and a high durability.

Mounting and intensive tests of the gateway hardware are done in our company. Each device runs through an intensive function test. This function test includes a burn-in test with full communication of all interfaces (min. 48 hours). Drops of communication, transmission errors and every important component with regard to function, temperature, voltages etc. are monitored. Hundreds of restarts are executed whereby a connection to all interfaces is established at each reboot.

Quality assurance is done according to the four-eye principle. Each device passes a number of quality inspections.

2.2 IEC 61850-3; EN 61850-3

The special requirements of the IEC 61850-3 standard for electromagnetic compatibility and power supply are fulfilled by this hardware model, provided that signal cables with a maximum length of 10 meters are used.

2.3 Front View

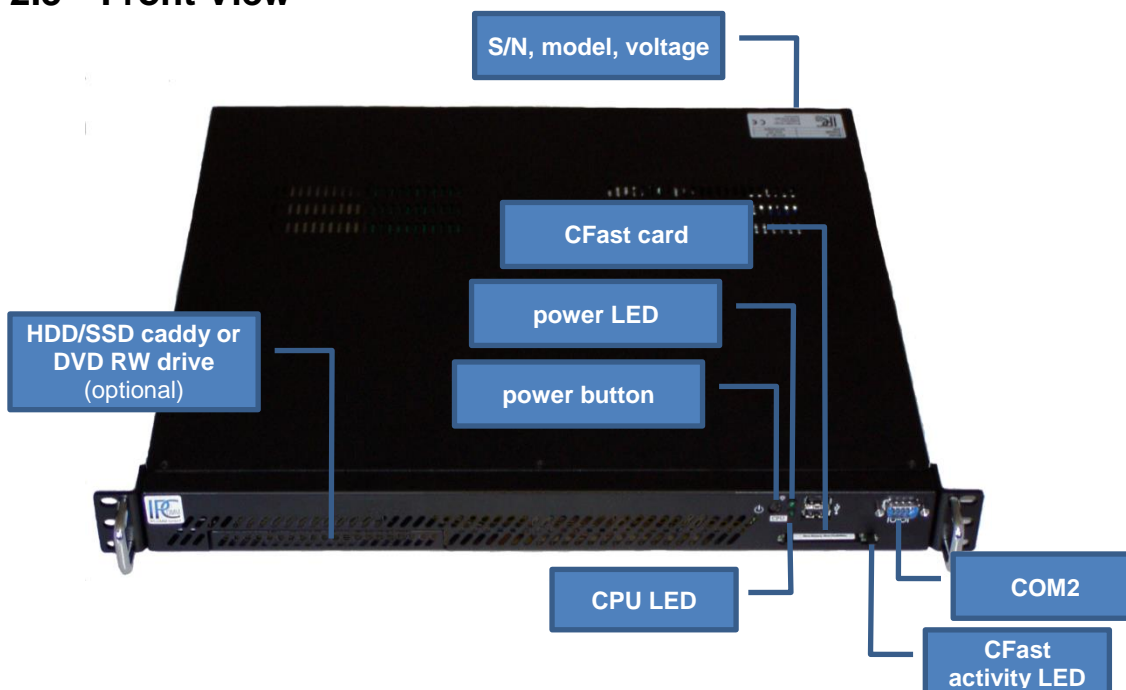


Figure 1: IPC191X1 front view

2.4 Rear View

Figure 2 shows the reverse side of the device. The PCIe card varies depending on the model. An overview of the different models can be found in chapter 3 “Overview of Variants / Interface Configuration”.

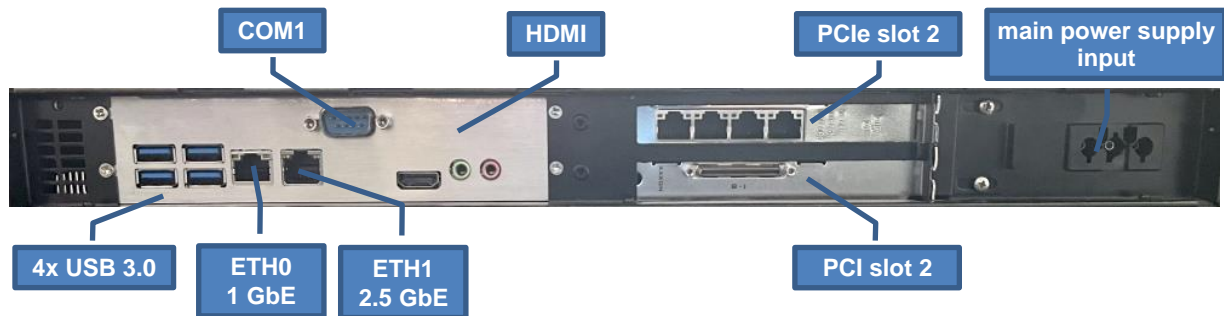


Figure 2: interface overview

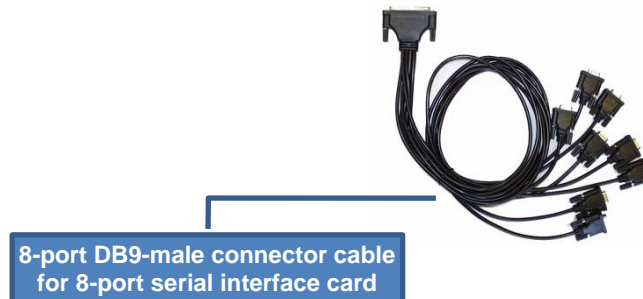


Figure 3: 8-port DB9 male connector cable for 8-port serial interface card

Attention! It is imperative to ensure a consequent strain relief to avoid damage to the connector, see figure above!

2.5 Hardware Components

The IPC191X1 consists of a 19" housing (1U) with industrial motherboard, integrated network interfaces, and all other required interfaces. The basic system can be expanded with appropriate PCIe plug-in cards.

The CPU must be actively cooled. Only if critical system temperatures are reached, two additional housing fans are switch on automatically.

2.5.1 Mainboard

The Mini-ITX Mainboard is an ultra-compact x86 platform. Its heart consists of an active cooled Intel® six-core processor. The mainboard provides two DIMM slots for DDR4 memory module and supports up to 64 GB system memory. Two Ethernet and two serial interfaces are also available. The gateway can be expanded with two PCI Express cards.

Additional interfaces:

- 1x Ethernet interface up to 1 Gbps BaseT (RJ45)
- 1x Ethernet interface up to 2.5 Gbps BaseT (RJ45)
- 2x RS-232 (DB9)
- 1x SATA
- USB 2.0 and USB 3.0 ports
- 2x PCIe x8
- HDMI
- Keyboard and mouse via USB

2.5.2 RS-232 Interfaces

The installed mainboard provides two integrated serial interfaces.

COM 2 front side and COM1 rear side

Pin	Direction	Description
1	INPUT	DCD Data Carrier Detect
2	INPUT	RXD Receive Data
3	OUTPUT	TXD Transmit Data
4	OUTPUT	DTR Data Terminal Ready
5		GND Ground
6	INPUT	DSR Data Set Ready
7	OUTPUT	RTS Request To Send
8	INPUT	CTS Clear To Send
9	INPUT	RI Ring Indicator

**SERIAL PORT
RS232 DTE
DB9 male connector**

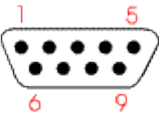


Figure 4: pin assignment of DB9 DTE RS-232 interfaces

2.5.3 8/16-Port RS-232 Serial Interface

8-port or 16-port serial interface cards can be installed in each IPC191X1. The following pin assignment is realized with an 8-port DB9 male connector cable (see Figure 3).

Pin	Direction	Description
1	INPUT	DCD Data Carrier Detect
2	INPUT	RXD Receive Data
3	OUTPUT	TXD Transmit Data
4	OUTPUT	DTR Data Terminal Ready
5		GND Ground
6	INPUT	DSR Data Set Ready
7	OUTPUT	RTS Request To Send
8	INPUT	CTS Clear To Send
9		

Figure 5: pin assignment of DB9 serial interface

2.5.4 Protecting RS-232 Interfaces according to IEC 61850-3 / EN 61850

For the adequate protection against the impact of switching interferences (Burst) and surge voltage, we recommend the use of our 4 kV isolated RS-232 isolator. The used RS-232 transceivers have ESD protection up to 15 kV. The isolator was tested according to EMC guidelines, climatic and mechanical requirements in compliance with the standard IEC 61850-3.

2.5.5 Ethernet Interfaces

The industrial PC features two Ethernet interfaces (RJ45) interfaces with link and activity LEDs. ETH0 supports up to 1 GBit and ETH1 up to 2.5 GBit Base-T.



Figure 6: RJ45 network interface

Additional interfaces with 10/100/1000 Mbps BaseT can be realized on request. The IPC191X1 can be equipped with up to 10 Ethernet interfaces.

2.5.6 CFast Memory Card

The CFast card serves as a mass storage device, i.e. for storing the operating system, the applications and configuration data. As a result the disadvantages involved with the use of a rotating hard disk are avoided, thus improving the reliability of the system substantially since a CFast has an MTBF of at least 4,000,000 hours.

The CFast adapter is simply connected to the SATA bus of the mainboard and treated just like a hard disk.

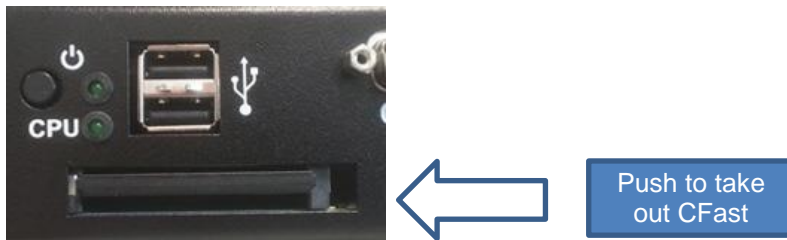


Figure 7: CFast adapter

When the power supply is switched off the CFast card with the entire software can simply be taken out or inserted enabling a quick change to different hardware.

2.5.7 Lithium Battery

The BIOS settings of the system are stored on a battery-backed CMOS. The long-life lithium battery has normally a lifetime of at least 5 years.

If the CMOS battery is empty and the CMOS information has been deleted, the CMOS-RAM is programmed by the BIOS with default settings.

The converter can be operated faultlessly even if the CMOS RAM is not provided by the battery. After the battery has been changed only time and date must be input.

To open the housing, loosen 6 screws from the top cover using a T10 size Torx screwdriver.

Attention! Open-frame power supplies are used. Because of this, the process should be carried out only by experienced electronic engineers.

- The device must be completely disconnected from any power supply.
- Before opening please push the power button (without electricity supply) several times to eliminate residual voltages of the power supply.

When replacing the battery, charge transfers to the circuit board and components must be avoided and ESD protection measures, such as the use of a grounding wrist strap, are therefore required. The operation may only be performed on a grounded and conductive surface.

The battery is attached to the case with a double-sided adhesive dot. This must be carefully detached and can then be pulled off the mainboard with the two-pin cable and connector (JST-PH 2.0 mm).

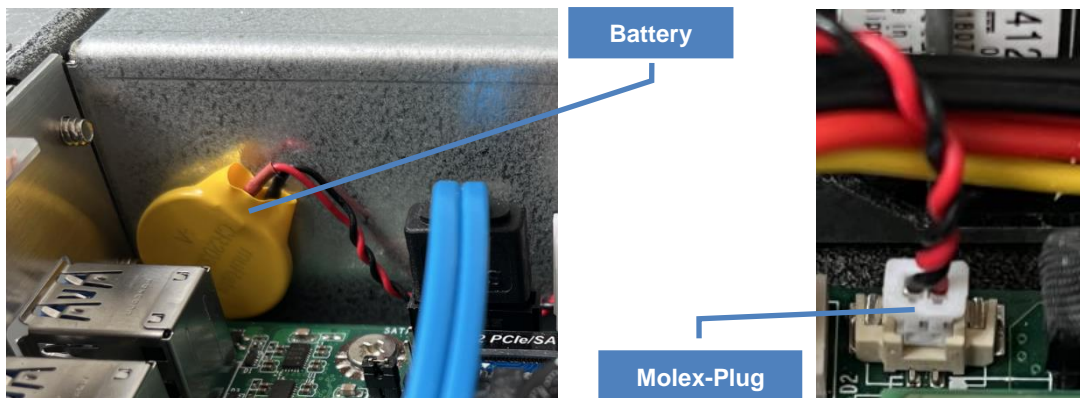


Figure 8: battery

Attention!

- Battery replacement must be carried out by qualified specialists.
- Replace the battery exclusively by the same type **(Manganese Dioxide Lithium Button Cell 3 V DC, CR2032)**.
- The battery is not rechargeable.
- When replacing, pay attention to the polarity of the battery.
- Batteries must not be disposed of with household waste or incinerated. At the end of its service life, the battery must be taken to a collection point for the recycling of electrical and electronic equipment in accordance with the ElektroG or the EU RoHS directive.
- There is a risk of explosion if the battery is handled improperly!

2.5.8 CPU LED

The CPU LED shows the states of conversion software and operating system. Following figure shows all possible indications:

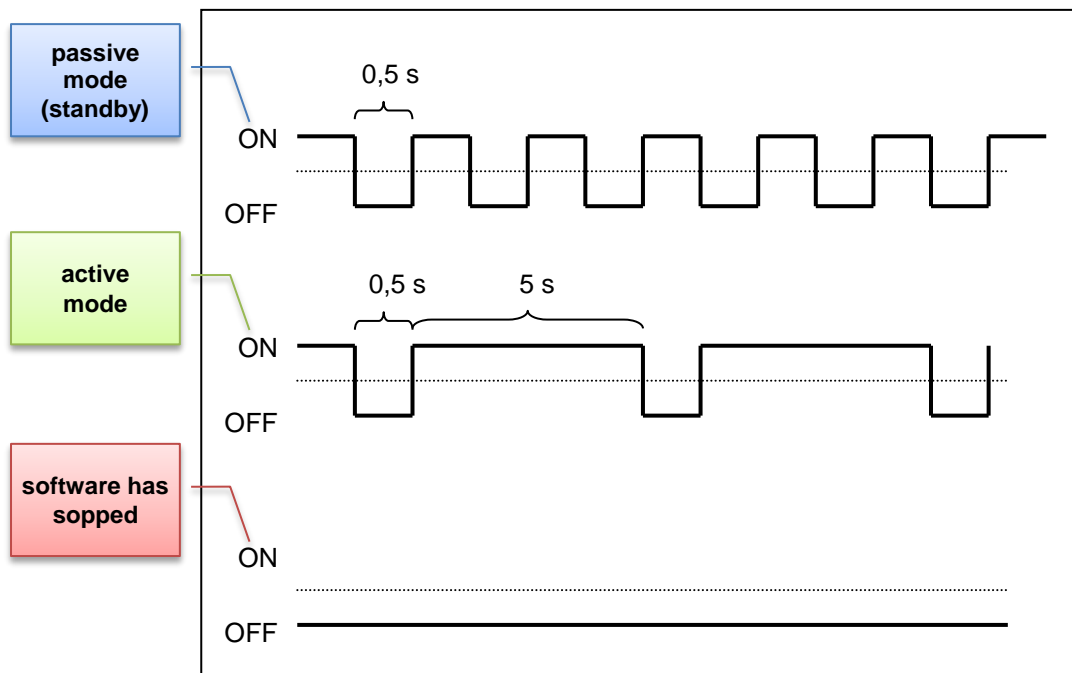


Figure 9: CPU LED indications

2.5.9 Power Supply

Power supplies with different input voltages can be used in the IPC191X1. Please pay attention to the correct polarity and input voltage. The input voltage of the respective device is labeled on top of the housing (see Figure 1).

- The standard power supply is 115 / 230 V AC (90 - 264 V AC)
- Power supply 12 / 24 V DC (9 - 32 V DC)
- Power supply 48 / 60 / 110 V DC (30 - 120 V DC)
- Other voltages on request

Attention! Please check the silver product label to verify the correct input voltage before operating the unit.

2.5.9.1 AC Power Supply

By using AC voltages a specific power supply cable (see figure below) is supplied. Please use this cable exclusively:



Figure 10: power cable

2.5.9.2 DC Power Supply

By using DC voltages only a male connector is supplied. This connector has to be used. By connecting the cable with the male connector the correct polarity must be kept. The wire cross-section must be at least 1.5 mm².

Attention! Please observe the yellow instruction label for the correct connection of the DC voltage supply.



Figure 11: DC voltage connection at the power supply

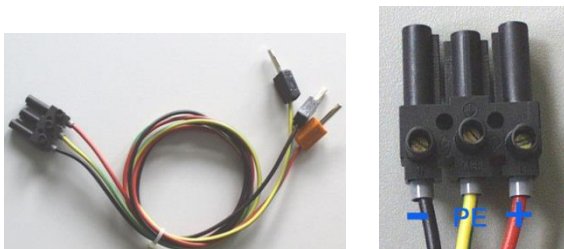


Figure 12: DC power cable (example - not included in the scope of delivery)

3 Overview of Variants / Interface Configuration

The following tables represent the configuration of the individual interfaces of miscellaneous variants.

3.1 Variant L

The device variant L corresponds to the part number HP.X1L.xyz**0-0**.x (see nomenclature).

Assembly	Linux Device	I/O port	IRQ	Label	Connector
Mainboard	ttyS0	3F8	4	COM1 (Chassis rear)	DB9ST
	ttyS1	2F8	3	COM2 (Chassis front)	DB9ST
	eth0	PCIe (Onboard)	Auto	ETH0	RJ45
	eth1	PCIe (Onboard)	Auto	ETH1	RJ45

Table 1: variant L

3.2 Variant A

The device variant A corresponds to the part number HP.X1L.xyz**1-0**.x (see nomenclature).

Assembly	Linux Device	I/O port	IRQ	Label	Connector
Mainboard	ttyS0	3F8	4	COM1 (Chassis rear)	DB9ST
	ttyS1	2F8	3	COM2 (Chassis front)	DB9ST
	eth0	PCIe (Onboard)	Auto	ETH0	RJ45
	eth1	PCIe (Onboard)	Auto	ETH1	RJ45
UART Adapter 8x	ttyS4	PCIe (Slot 1)	Auto	COM5	DB9ST
	ttyS5	PCIe (Slot 1)	Auto	COM6	DB9ST
	ttyS6	PCIe (Slot 1)	Auto	COM7	DB9ST
	ttyS7	PCIe (Slot 1)	Auto	COM8	DB9ST
	ttyS8	PCIe (Slot 1)	Auto	COM9	DB9ST
	ttyS9	PCIe (Slot 1)	Auto	COM10	DB9ST
	ttyS10	PCIe (Slot 1)	Auto	COM11	DB9ST
	ttyS11	PCIe (Slot 1)	Auto	COM12	DB9ST

Table 2: variant A

3.3 Variant B

The device variant B corresponds to the part number HP.X1L.xyz**9-0**.x (see nomenclature).

Assembly	Linux Device	I/O port	IRQ	Label	Connector
Mainboard	ttyS0	3F8	4	COM1 (Chassis rear)	DB9ST
	ttyS1	2F8	3	COM2 (Chassis front)	DB9ST
	eth0	PCIe (Onboard)	Auto	ETH0	RJ45
	eth1	PCIe (Onboard)	Auto	ETH1	RJ45
UART Adapter 16x	ttyS4	PCIe (Slot 1)	Auto	COM5	DB9ST
	ttyS5	PCIe (Slot 1)	Auto	COM6	DB9ST
	ttyS6	PCIe (Slot 1)	Auto	COM7	DB9ST
	ttyS7	PCIe (Slot 1)	Auto	COM8	DB9ST
	ttyS8	PCIe (Slot 1)	Auto	COM9	DB9ST
	ttyS9	PCIe (Slot 1)	Auto	COM10	DB9ST
	ttyS10	PCIe (Slot 1)	Auto	COM11	DB9ST
	ttyS11	PCIe (Slot 1)	Auto	COM12	DB9ST
	ttyS12	PCIe (Slot 1)	Auto	COM13	DB9ST
	ttyS13	PCIe (Slot 1)	Auto	COM14	DB9ST
	ttyS14	PCIe (Slot 1)	Auto	COM15	DB9ST
	ttyS15	PCIe (Slot 1)	Auto	COM16	DB9ST
	ttyS16	PCIe (Slot 1)	Auto	COM17	DB9ST
	ttyS17	PCIe (Slot 1)	Auto	COM18	DB9ST
	ttyS18	PCIe (Slot 1)	Auto	COM19	DB9ST
	ttyS19	PCIe (Slot 1)	Auto	COM20	DB9ST

Table 3: variant B

3.4 Variant E4

The device variant E4 corresponds to the part number HP.X1L.xyz**2-0**.x (see nomenclature).

Assembly	Linux Device	I/O port	IRQ	Label	Connector
Mainboard	ttyS0	3F8	4	COM1 (Chassis rear)	DB9ST
	ttyS1	2F8	3	COM2 (Chassis front)	DB9ST
	eth0	PCIe (Onboard)	Auto	ETH0	RJ45
	eth1	PCIe (Onboard)	Auto	ETH1	RJ45
Ethernet Adapter 4x	eth2	PCIe (Slot 2)	Auto	ETH2	RJ45
	eth3	PCIe (Slot 2)	Auto	ETH3	RJ45
	eth4	PCIe (Slot 2)	Auto	ETH4	RJ45
	eth5	PCIe (Slot 2)	Auto	ETH5	RJ45

Table 4: variant E4

3.5 Variant E8

The device variant E8 corresponds to the part number HP.X1L.xyz2-2.x (see nomenclature).

Assembly	Linux Device	I/O port	IRQ	Label	Connector
Mainboard	ttyS0	3F8	4	COM1 (Chassis rear)	DB9ST
	ttyS1	2F8	3	COM2 (Chassis front)	DB9ST
	eth0	PCIe (Onboard)	Auto	ETH0	RJ45
	eth1	PCIe (Onboard)	Auto	ETH1	RJ45
Ethernet Adapter 4x	eth2	PCIe (Slot 2)	Auto	ETH2	RJ45
	eth3	PCIe (Slot 2)	Auto	ETH3	RJ45
	eth4	PCIe (Slot 2)	Auto	ETH4	RJ45
	eth5	PCIe (Slot 2)	Auto	ETH5	RJ45
Ethernet Adapter 4x	eth6	PCIe (Slot 1)	Auto	ETH6	RJ45
	eth7	PCIe (Slot 1)	Auto	ETH7	RJ45
	eth8	PCIe (Slot 1)	Auto	ETH8	RJ45
	eth9	PCIe (Slot 1)	Auto	ETH9	RJ45

Table 5: variant E8

3.6 Variant E4M

The device variant E4M corresponds to the part number HP.X1L.xyz1-2.x (see nomenclature).

Assembly	Linux Device	I/O port	IRQ	Label	Connector
Mainboard	ttyS0	3F8	4	COM1 (Chassis rear)	DB9ST
	ttyS1	2F8	3	COM2 (Chassis front)	DB9ST
	eth0	PCIe (Onboard)	Auto	ETH0	RJ45
	eth1	PCIe (Onboard)	Auto	ETH1	RJ45
Ethernet Adapter 4x	eth2	PCIe (Slot 2)	Auto	ETH2	RJ45
	eth3	PCIe (Slot 2)	Auto	ETH3	RJ45
	eth4	PCIe (Slot 2)	Auto	ETH4	RJ45
	eth5	PCIe (Slot 2)	Auto	ETH5	RJ45
UART Adapter 8x	ttyS4	PCIe (Slot 1)	Auto	COM5	DB9ST
	ttyS5	PCIe (Slot 1)	Auto	COM6	DB9ST
	ttyS6	PCIe (Slot 1)	Auto	COM7	DB9ST
	ttyS7	PCIe (Slot 1)	Auto	COM8	DB9ST
	ttyS8	PCIe (Slot 1)	Auto	COM9	DB9ST
	ttyS9	PCIe (Slot 1)	Auto	COM10	DB9ST
	ttyS10	PCIe (Slot 1)	Auto	COM11	DB9ST
	ttyS11	PCIe (Slot 1)	Auto	COM12	DB9ST

Table 6: variant E4M

4 Technical Data Sheet

A technical data sheet for the individual hardware models is available separately to this document. In addition to pure technical data, the document also contains information on approval and applied standards (EMC). A current version of these can be found on our website under Hardware / IPC191X1 / Documentation:

- IPC191X1 <https://www.ipcomm.de/hardware/IPC191X1/en/sheet.html>

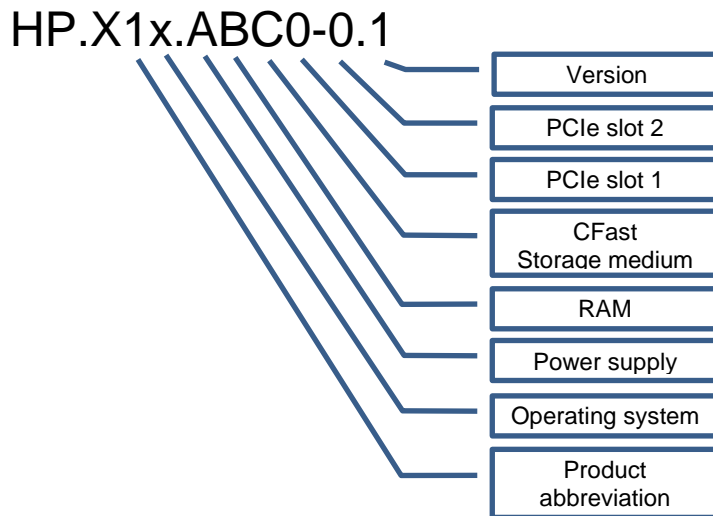
5 EU Declaration of Conformity

An EU Declaration of Conformity for the individual hardware models is available separately to this document. A current version of these can be found on our website under Hardware / IPC191X1 / Documentation:

- IPC191X1 <https://www.ipcomm.de/hardware/IPC191X1/en/sheet.html>

6 Nomenclature of the IPC191X1 Article Number

The IPC191X1 article number gives information about the equipment of the gateway.



Product Abbreviation

Value	Description
X1	IPC191X1

Power Supply

Value	Description
A	115 / 230 V AC (approx. 85 – 265 V AC)
B	12 / 24 V DC (approx. 9 – 32 V DC)
C	48 / 60 / 110 V DC (approx. 30 – 120 V DC)

CFAST / Storage Medium

Value	Description
F	4 GB
G	8 GB
H	16 GB
I	32 GB
J	64 GB
S	Special model (e.g. CFAST 4GB & SSD ~ 250GB)

Operating System

Value	Description
L	LINUX
S	Special model

RAM

Value	Description
I	16 GB

PCI Slot 1

Value	Description
0	Not equipped
1	8port RS-232 interface card
2	Ethernet 4port
9	16port RS-232 interface card

PCI Slot 2

Value	Description
0	Not equipped
1	8port RS-232 interface card
2	Ethernet 4port
9	16port RS-232 interface card

7 Dimensions IPC191X1 (CAD)

