Industrial PC
IPC191i5 (Linux OS)

General
Operating, Maintenance and Installation Manual

Hardware Platform
Gateway

Table of Contents

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.

It is to be noted that the gateway (IPC191i5) has not been protected against lightning and the operator should, if desired, take appropriate protective precautions.
Our RS-232 isolator provides efficient protection of your data and equipment against external influences. We will be pleased to draw up a non-binding offer for you.

All trademarks and brand names contained in this user manual are for identification purposes only and can be owned by their respective holders.

Finally we want to draw your attention to the fact that any warranties with respect to the industrial PC 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 (1HE) in a 19" rack. A free floating or unilateral mounting may cause defects.

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2 Hardware Description

2.1 General

As hardware platform for the gateway a 19" industrial PC is used. This solution offers a high degree of flexibility, performance and reliability. This model is characterized by a very high output and energy efficiency.

Mounting and intensive tests of the industrial PC are done in our company. Before and after a 48 hour burn-in test each device must run through a complete function test.

The housing has an excellent air flow for maximum heat dissipation.

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

The industrial PC consists of a 19" chassis (1U) with two PCIe slots (16 x and 1 x) which enable installation of two PCIe cards.

The mains power supply are 90 – 264 V AC, 130 – 367 V DC auto range, optional 10 – 36 V DC power supply (others on request). The basic system can be extended with corresponding PCIe cards as required.
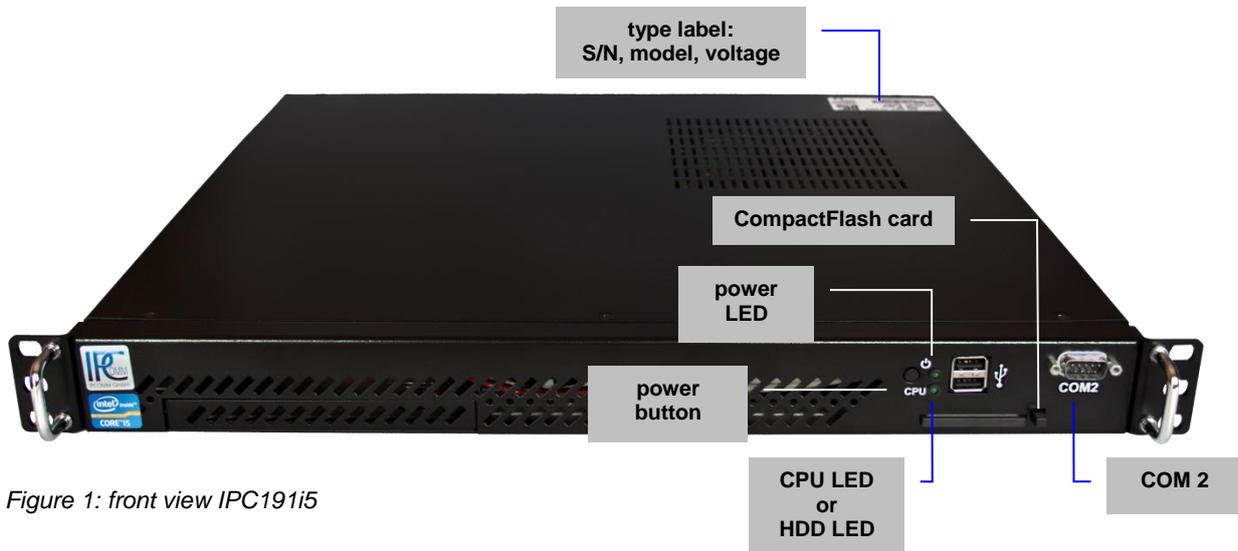
Figure 1: front view IPC191i5

Figure 2 shows the reverse side of our Industrial PC. The pin assignments vary according to execution. Overview of the different models can be found in chapter 3 'Overview of Variants / Interface Configuration'.
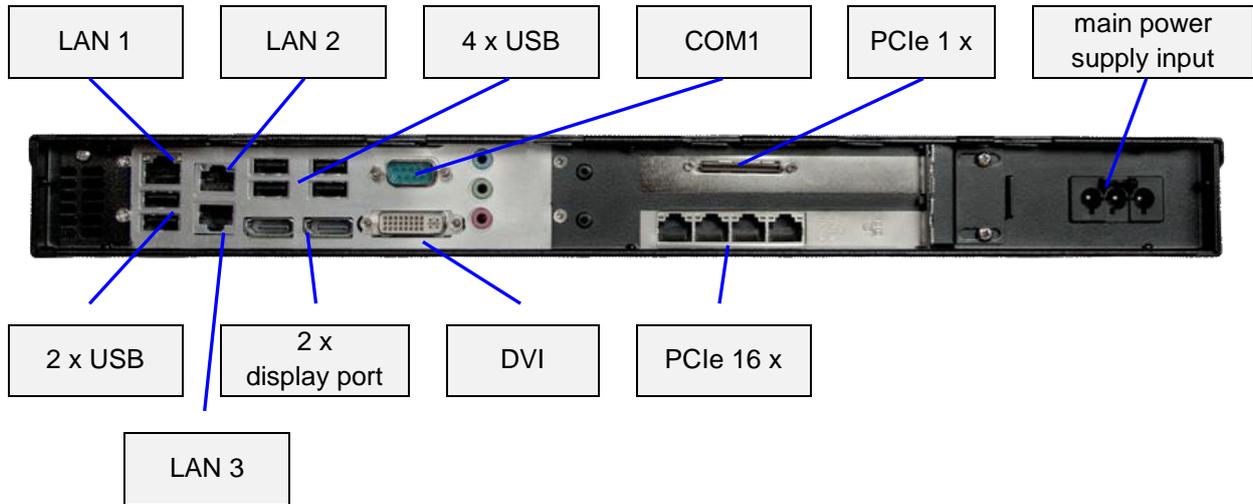
Figure 2: overview interfaces

Figure 3: 8-Port DB9 male connector cable (optional: DB25 male/female)

2.2   Hardware Components

2.2.1   Mainboard

The Mini-ITX mainboard is an ultra-compact x86 platform with four integrated network interfaces and all other necessary interfaces. Its heart consists of a highly energy-efficient Intel i5 mobile processor. The mainboard provides two SODIMM slots for DDRIII memory modules and supports up to 8 GB system memory.

Further interfaces:

- 3 x RS-232 (2 x outward and usable)
- 6 x SATA
- 3 x LAN 10/100/1000 Mbps BaseT (RJ45)
- DVI
- 2 x display port
- USB
- PCIe 16 x
- PCIe 1 x

2.2.2   Onboard RS-232 Interfaces

The installed mainboard provides three serial interfaces. Two interfaces (COM1 and COM2) are outward and usable. COM3 interface is active but reserved for internal purpose and cannot be used for communication.

COM1 – COM2

<table>
<tr><td rowspan="11">SERIAL PORT
RS-232 DTE
DB9 male connector</td><td>Pin</td><td>Direction</td><td colspan="2">Description</td></tr>
<tr><td>1</td><td>INPUT</td><td>DCD</td><td>Data Carrier Detect</td></tr>
<tr><td>2</td><td>INPUT</td><td>RXD</td><td>Receive Data</td></tr>
<tr><td>3</td><td>OUTPUT</td><td>TXD</td><td>Transmit Data</td></tr>
<tr><td>4</td><td>OUTPUT</td><td>DTR</td><td>Data Terminal Ready</td></tr>
<tr><td>5</td><td></td><td>GND</td><td>Ground</td></tr>
<tr><td>6</td><td>INPUT</td><td>DSR</td><td>Data Set Ready</td></tr>
<tr><td>7</td><td>OUTPUT</td><td>RTS</td><td>Request To Send</td></tr>
<tr><td>8</td><td>INPUT</td><td>CTS</td><td>Clear To Send</td></tr>
<tr><td>9</td><td>INPUT</td><td>RI</td><td>Ring Indicator</td></tr>
</table>

Figure 4: pin assignment of DB9 9-PIN DTE RS-232 interface (mainboard) COM1-COM2

Note: 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 and climatic and mechanical requirements in compliance with the standard IEC 61850-3.

2.2.3   8-Port RS-232 Serial Interface Card
(RS-232 interface for remote communication)

Depending on the model each IPC191i5 can be equipped with up to two 8-port serial interface cards. The following pin assignment is realized with an 8-port DB9 male connector cable (see Figure 3). Other cables (e.g. DB25) are possible on request.

<table>
<tr><td rowspan="10">SERIAL PORT
RS-232 DTE
DB9 male connector</td><td>Pin</td><td>Direction</td><td colspan="2">Description</td></tr>
<tr><td>1</td><td>INPUT</td><td>DCD</td><td>Data Carrier Detect</td></tr>
<tr><td>2</td><td>INPUT</td><td>RXD</td><td>Receive Data</td></tr>
<tr><td>3</td><td>OUTPUT</td><td>TXD</td><td>Transmit Data</td></tr>
<tr><td>4</td><td>OUTPUT</td><td>DTR</td><td>Data Terminal Ready</td></tr>
<tr><td>5</td><td></td><td>GND</td><td>Ground</td></tr>
<tr><td>6</td><td>INPUT</td><td>DSR</td><td>Data Set Ready</td></tr>
<tr><td>7</td><td>OUTPUT</td><td>RTS</td><td>Request To Send</td></tr>
<tr><td>8</td><td>INPUT</td><td>CTS</td><td>Clear To Send</td></tr>
<tr><td>9</td><td></td><td></td><td></td></tr>
</table>

Figure 5: pin assignment of DB9 interface at serial interface card

See note chapter 2.2.2

2.2.4 4-Port RS-232 Serial Interface Card
(RS-232 interface for remote communication)

Depending on the model each IPC191i5 can be equipped with up to two 4-port serial interface cards.
RJ45 DB9 cables are supplied on request.

SERIAL PORT RS-232 DTE RJ45	Pin	Direction	Description	
	1	INPUT	DSR	Data Set Ready
	2	OUTPUT	RTS	Request To Send
	3		GND	Ground
	4	OUTPUT	TXD	Transmit Data
	5	INPUT	RXD	Receive Data
	6	INPUT	DCD	Data Carrier Detect
	7	INPUT	CTS	Clear To Send
	8	OUTPUT	DTR	Data Terminal Ready

Figure 6: pin assignment of RJ45 interface at serial interface card

See note chapter 2.2.2

2.2.5 Ethernet Interfaces

The industrial PC features three 10/100/1000 Mbps BaseT (RJ45) interfaces. Further interfaces with
10/100 Mbps or 10/100/1000 Mbps BaseT via PCIe are possible on request (up to 11 interfaces per
device).
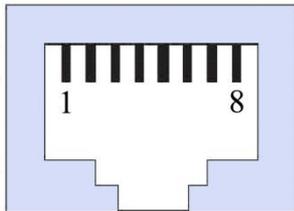
Figure 7: RJ45 network interface

2.2.6   CompactFlash

The industrial CompactFlash card serves as a mass storage device 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. The CompactFlash has an MTBF of at least 1,000,000 hours.

The CompactFlash adapter is simply connected to the SATA port of the mainboard and treated just like a hard disk by the operating system.


press to eject CompactFlash
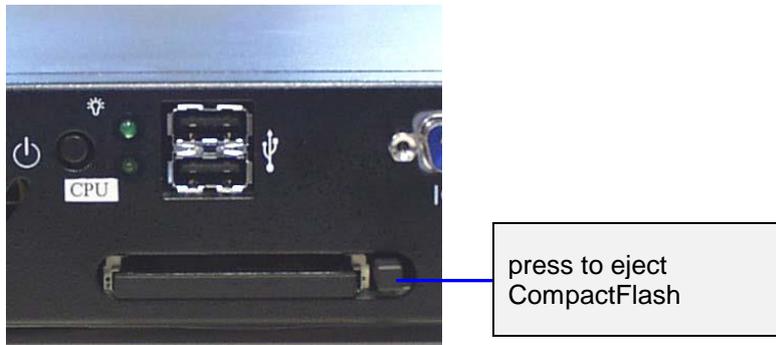
Figure 8: CompactFlash adapter

When the power supply is switched off the CompactFlash card can simply be inserted or removed. That allows a quick change of the data medium.

2.2.7   CMOS Lithium Battery

The battery-backed CMOS stores the BIOS system settings. The long-life lithium battery has normally a lifetime of at least six 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.

Remove six screws on the top to open the housing. The battery holder is soldered in the mainboard and well visible.

Attention! Open-frame power supply units 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.

Battery replacement must be carried out by qualified specialists.

Caution! Incorrect replacement might cause the danger of explosion. Replace the battery exclusively by the same type
(Manufacturer: Panasonic / model label: CR-2032).
Used batteries are to be disposed absolutely in accordance with the manufacturer's instructions.

Please pay attention to the correct polarity!

2.2.8 CPU LED

The CPU LED shows the states of conversion software and operating system.

Following figure shows all possible indications:
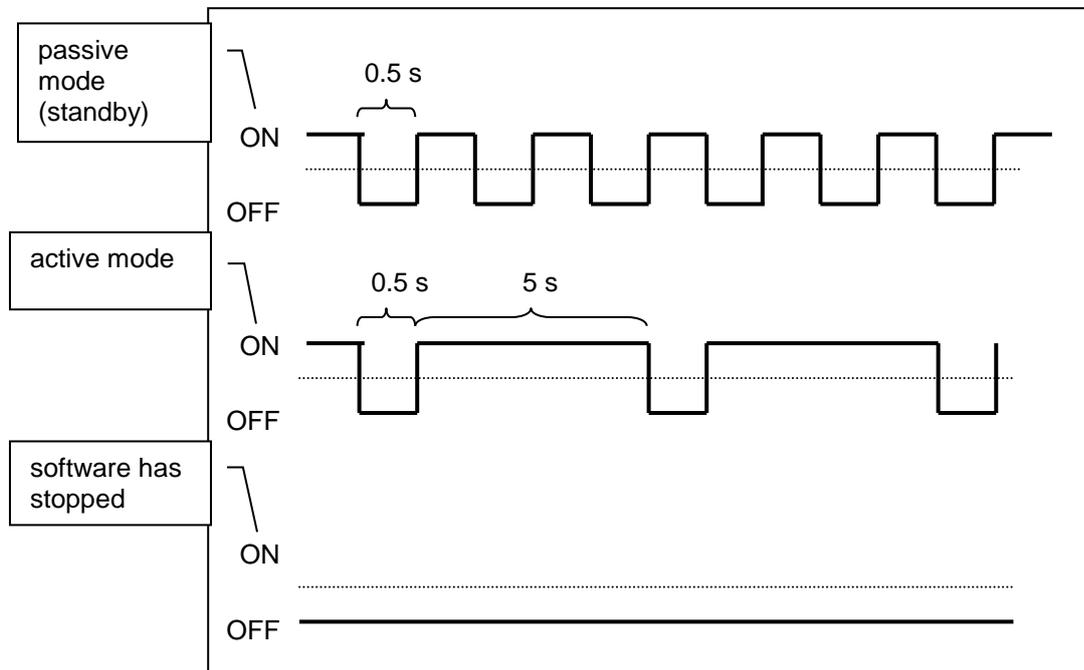
Figure 9: CPU LED indications

2.2.9 Power Supply

Power supplies with different input voltages can be used in the IPC191i5. 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).

2.2.9.1 AC Power Supply

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

Figure 10: power cable

2.2.9.2 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 mm^2.
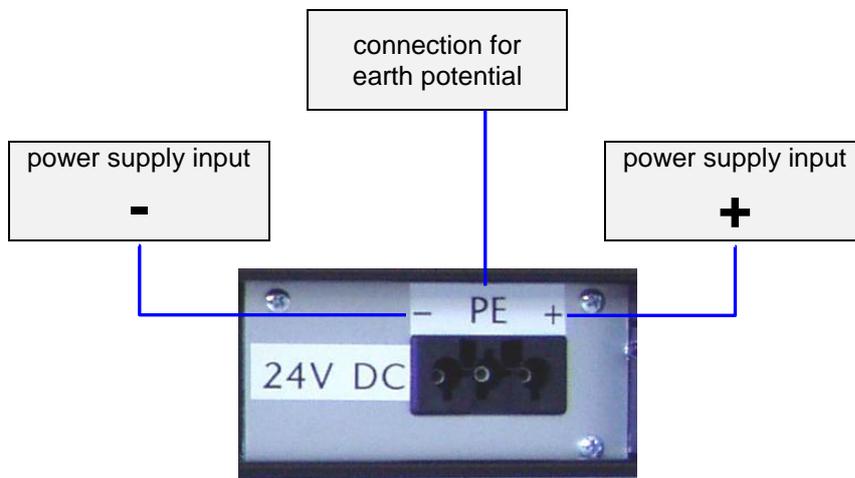
Figure 11: DC voltage connection at power supply
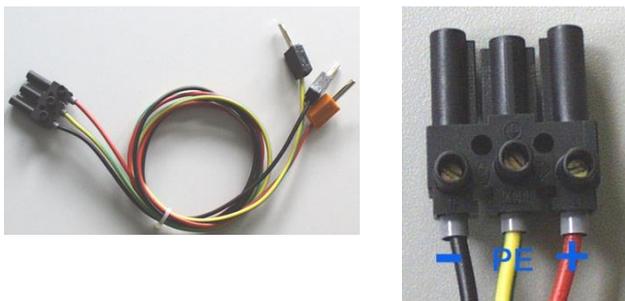
Figure 12: DC power cable (example – not part of the scope of delivery)

3 Overview of Variants / Interface Configuration

The following tables represent the configuration of the individual interfaces of miscellaneous variants.
Further variants are available on request.

3.1 Variant A

Assembly	Linux Device	I/O Port	IRQ	Label	Connector
mainboard	ttyS0	3F8	4	COM1 (chassis rear)	DB9ST
	ttyS1	2F8	3	COM2 (chassis front)	DB9ST
	ttyS2	3E8	7	CPU (diagnosis)	NOT connected
	ttyS3	2E8	10	NOT connected	NOT connected
	eth0	PCIe (onboard)	auto	LAN1	RJ45
	eth1	PCIe (onboard)	auto	LAN2	RJ45
	eth2	PCIe (onboard)	auto	LAN3	RJ45
UART adapter 8x	ttyMUE0	PCIe 1x	auto	COM5	DB9ST
	ttyMUE1	PCIe 1x	auto	COM6	DB9ST
	ttyMUE2	PCIe 1x	auto	COM7	DB9ST
	ttyMUE3	PCIe 1x	auto	COM8	DB9ST
	ttyMUE4	PCIe 1x	auto	COM9	DB9ST
	ttyMUE5	PCIe 1x	auto	COM10	DB9ST
	ttyMUE6	PCIe 1x	auto	COM11	DB9ST
	ttyMUE7	PCIe 1x	auto	COM12	DB9ST

3.2 Variant E2M

Assembly	Linux Device	I/O Port	IRQ	Label	Connector
mainboard	ttyS0	3F8	4	COM1 (chassis rear)	DB9ST
	ttyS1	2F8	3	COM2 (chassis front)	DB9ST
	ttyS2	3E8	7	CPU (diagnosis)	NOT connected
	ttyS3	2E8	10	NOT connected	NOT connected
	eth0	PCIe (onboard)	auto	LAN1	RJ45
	eth1	PCIe (onboard)	auto	LAN2	RJ45
	eth2	PCIe (onboard)	auto	LAN3	RJ45
Ethernet adapter 2x	eth3	PCIe (PCIe 16x)	auto	LAN5	RJ45
	eth4	PCeI (PCIe 16x)	auto	LAN6	RJ45
UART adapter 8x	ttyMUE0	PCIe 1x	auto	COM5	DB9ST
	ttyMUE1	PCIe 1x	auto	COM6	DB9ST
	ttyMUE2	PCIe 1x	auto	COM7	DB9ST
	ttyMUE3	PCIe 1x	auto	COM8	DB9ST
	ttyMUE4	PCIe 1x	auto	COM9	DB9ST
	ttyMUE5	PCIe 1x	auto	COM10	DB9ST
	ttyMUE6	PCIe 1x	auto	COM11	DB9ST
	ttyMUE7	PCIe 1x	auto	COM12	DB9ST

Subject to alterations

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3.3   Variant E4M

Assembly	Linux Device	I/O Port	IRQ	Label	Connector
mainboard	ttyS0	3F8	4	COM1 (chassis rear)	DB9ST
	ttyS1	2F8	3	COM2 (chassis front)	DB9ST
	ttyS2	3E8	7	CPU (diagnosis)	NOT connected
	ttyS3	2E8	10	NOT connected	NOT connected
	eth0	PCIe (onboard)	auto	LAN1	RJ45
	eth1	PCIe (onboard)	auto	LAN2	RJ45
	eth2	PCIe (onboard)	auto	LAN3	RJ45
Ethernet adapter 4x	eth3	PCIe (PCIe 16x)	auto	LAN4	RJ45
	eth4	PCIe (PCIe 16x)	auto	LAN5	RJ45
	eth5	PCIe (PCIe 16x)	auto	LAN6	RJ45
	eth6	PCIe (PCIe 16x)	auto	LAN7	RJ45
UART Adapter 8x	ttyMUE0	PCIe 1x	auto	COM5	DB9ST
	ttyMUE1	PCIe 1x	auto	COM6	DB9ST
	ttyMUE2	PCIe 1x	auto	COM7	DB9ST
	ttyMUE3	PCIe 1x	auto	COM8	DB9ST
	ttyMUE4	PCIe 1x	auto	COM9	DB9ST
	ttyMUE5	PCIe 1x	auto	COM10	DB9ST
	ttyMUE6	PCIe 1x	auto	COM11	DB9ST
	ttyMUE7	PCIe 1x	auto	COM12	DB9ST

3.4   Variant L

Assembly	Linux Device	I/O Port	IRQ	Label	Connector
mainboard	ttyS0	3F8	4	COM1 (chassis rear)	DB9ST
	ttyS1	2F8	3	COM2 (chassis front)	DB9ST
	ttyS2	3E8	7	CPU (diagnosis)	NOT connected
	ttyS3	2E8	10	NOT connected	NOT connected
	eth0	PCIe (onboard)	auto	LAN1	RJ45
	eth1	PCIe (onboard)	auto	LAN2	RJ45
	eth2	PCIe (onboard)	auto	LAN3	RJ45

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4 Technical Data

Chassis
- 19" rack mount chassis (1U)
- Dual PCIe riser card
- Excellent air flow for maximum heat dissipation with ball bearing mounted industrial fans

Power Supply AC
- Fanless
- 90 – 264 V AC, 130 – 367 V DC auto range
- Input frequency: 47 – 63 Hz
- Hold up time: > 41 ms at 115 V AC and full load
- Switch-on delay: 100 - 550 ms
- Switch-off delay: 1 ms
- Power consumption: max. 100 W (depending on the used type)
- CE, UL 60950-1, EN 60950-1

Power Supply DC (optional)
- Fanless
- 10 – 36 V DC
- Hold up time: > 2 ms
- Switch-on delay: 100…500 ms
- Switch-off delay: 1 ms
- Power consumption: max. 100 W (depending on the used type)
- CE, UL 60950-1, EN 60950-1

Mainboard
- Intel Core i5 Mobile Dual-Core CPU 2,5 GHz with excellent performance and energy efficiency (others, also Quad-Core CPU's on request)
- DDR3 RAM max. 8 GB (16 GB with another CPU possible on request)
- SATA interfaces
- 2 serial interfaces outward
- 3 x RJ45 10/100/1000 BaseT LAN interfaces onboard (further over PCIe on request)
- 8 x USB 2.0 outward (further on request)
- RAID SATA functionality (RAID Level 0/1)

Serial Cards
- Up to 32 RS-232 interfaces
- DB9 male connector, optional RJ45, DB25 (male, female)
- Baud rate 50 bps to 921,600 bps
- 15 KV ESD protection

Diagnostics
- Power LED
- LED to show different software conditions

Additional Functions
- Battery buffered real-time clock (RTC)
- Reset

Mass Storage CF
- Rugged CompactFlash, industrial – grade
- Max. 16 GB capacity
- MTBF ≥ 1,000,000 hours
- No moving parts
- Shock: 1,000 G max.
- Removable flash card
- Bad Block Scanning/Handling
- Static Wear-Leveling System
- 6-Bit ECC
- 2,000,000 write/erase cycles
- Vibration: 15 G peak to peak max.
- Very short access time

Mass Storage SATA HDD Raid Level 1 or 0 possible (optional)
- Two server HDD for continuous operation
- Max. 2 TB
- MTBF ≥ 1,200,000 hours

Mass Storage SATA SSD, Raid Level 1 or 0 possible (optional)
- No moving parts
- Max. 128 GB
- Very short access time
- Very high write/read performance

Supported Operating Systems
- Linux

Optical Drive (optional)
- CD/DVD writer with slot-in technology

Video
- 1 x DVI interface, 2 x display port (VGA possible with an adapter)

Operating Environment
- Operating temperature: 0 °C to 45 °C
- Storage temperature: 0 °C to 60 °C
- Relative humidity: 5 % to 95 % not condensing

General
- All components are CE certified and tested according to type of test
  EN 61000-6-2: 2005
  EN 61000-6-3: 2007+ A1:2011+ AC:2012
  EN 61000-3-2: 2006 + A1:2009 + A2:2009
  EN 61000-3-3: 2008
  (The test report is available on request.)
- Height: 1 U
- Dimension (W x H x D): 19" x 1.75" x 15" (482.6 mm x 44.45 mm x 381 mm)
- Weight: approx. 6 kg (depending on the used type)

Assembled by IPCOMM GmbH/Germany

5 IPC191 CAD-Chart

483

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10

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432

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25

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456,42
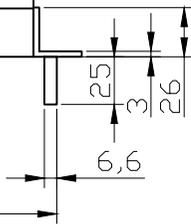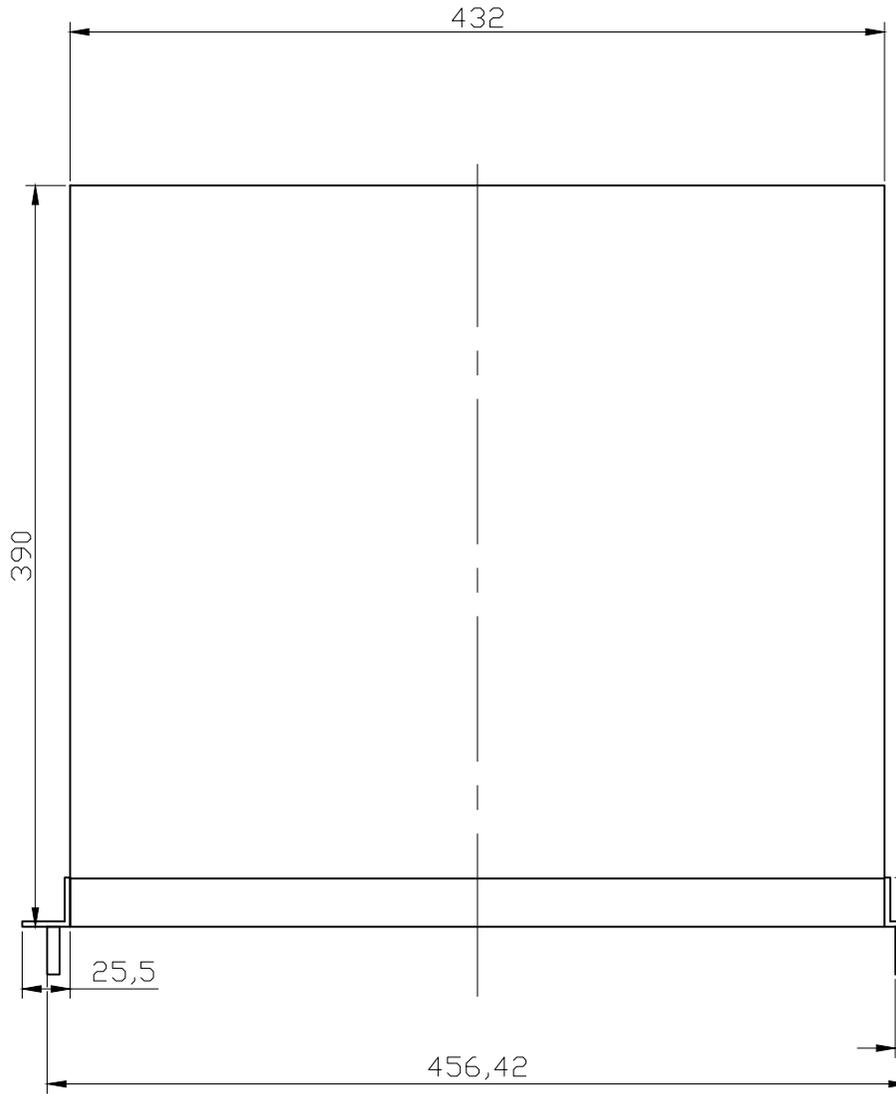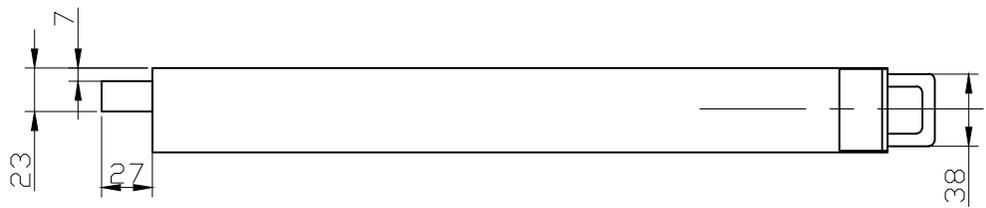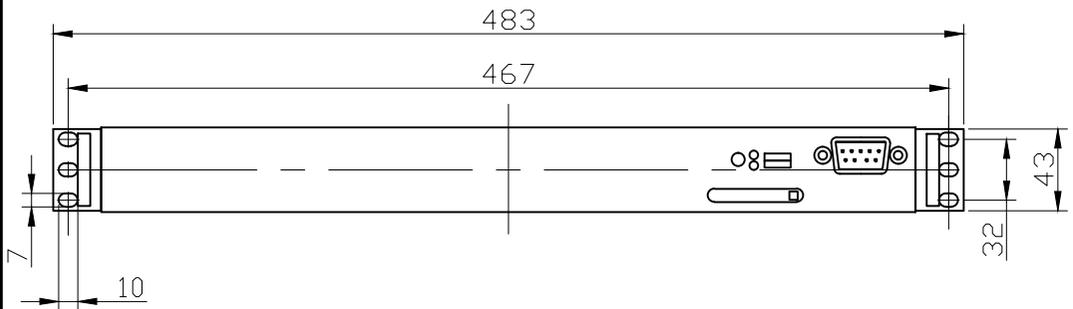
Subject to change without prior notice

General tolerance		Scale: 1 : 4	
	Date	Name	
Designer	11.05.09	M. Ostapovski	IPC191 19"
Checked			
Standard			
IPCOMM GmbH		V 1.0	Page 1
			Pg.
Origin:		Repl. for:	Replaced through: