A1 ▷ Automation stations
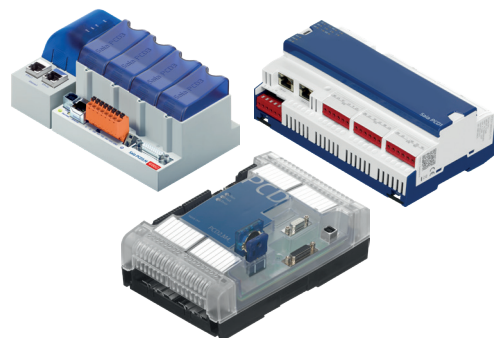
Programmable for measuring, regulation and control devices. Modular series consisting of industrial quality CPU, I/O and communication modules with a service life that will last for decades.
The application software can be simply and reliably adapted and expanded throughout its service life.
It can be used for all device series (Saia PCD1, 2 and 3).

Application Hardware
Saia PCD® COSinus

Automation stations

1

Operation and monitoring

2

Room controllers

3

Consumer data acquisition
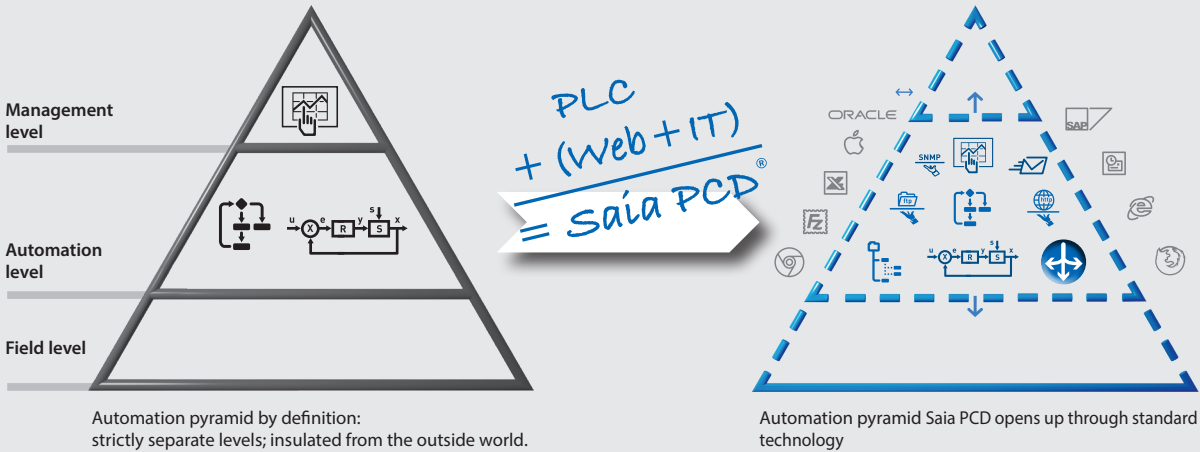
4

Switch cabinet components

5

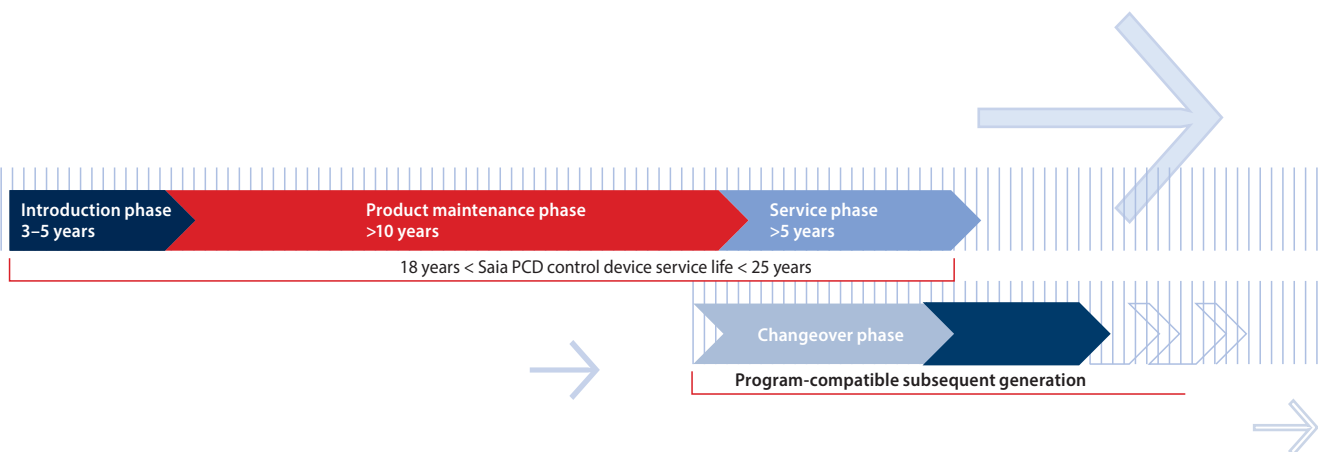# 1.1 Saia PCD® System description
PLC + (Web + IT) = Saia PCD®

Saia PCDs combine PLC functionality with innovative web and IT technology in an industrial quality system.
The basic equation Saia PCD® = PLC + (web + IT) means that the conventional automation pyramid is becoming an open, transparent structure.

Automation pyramid by definition:
strictly separate levels; insulated from the outside world.

Automation pyramid Saia PCD opens up through standard technology

The Saia PCD system with its open technology stands for total transparency, combinability and openness. This applies between all the levels of the automation pyramid, the automation world and the actual operating environment of the user. To achieve this, all Saia PCD control and regulation devices generally include comprehensive web + IT functions. These functions do not require additional hardware and form an integral part of every device. Machines and systems can therefore be very easily integrated into the existing IT infrastructure.

The service life of Saia PCD®: Compatibility and portability guaranteed for all device types across generations.

We develop our products to provide customers with direct added value that enables them to generate sustainable revenue. This requires products with a long service life and flawless and reliable operation. Previously installed products must always be able to adapt to changing needs. Existing investments should not always be made obsolete by unwanted, forced innovations and incompatibilities. This is why we attach such great importance to PLC-based technology with its sustained customer benefit and ease of upgrade. Our company has remained true to these values for over 50 years. Moreover, we only use components that comply with industrial standards and which have a service life of at least 20 years.
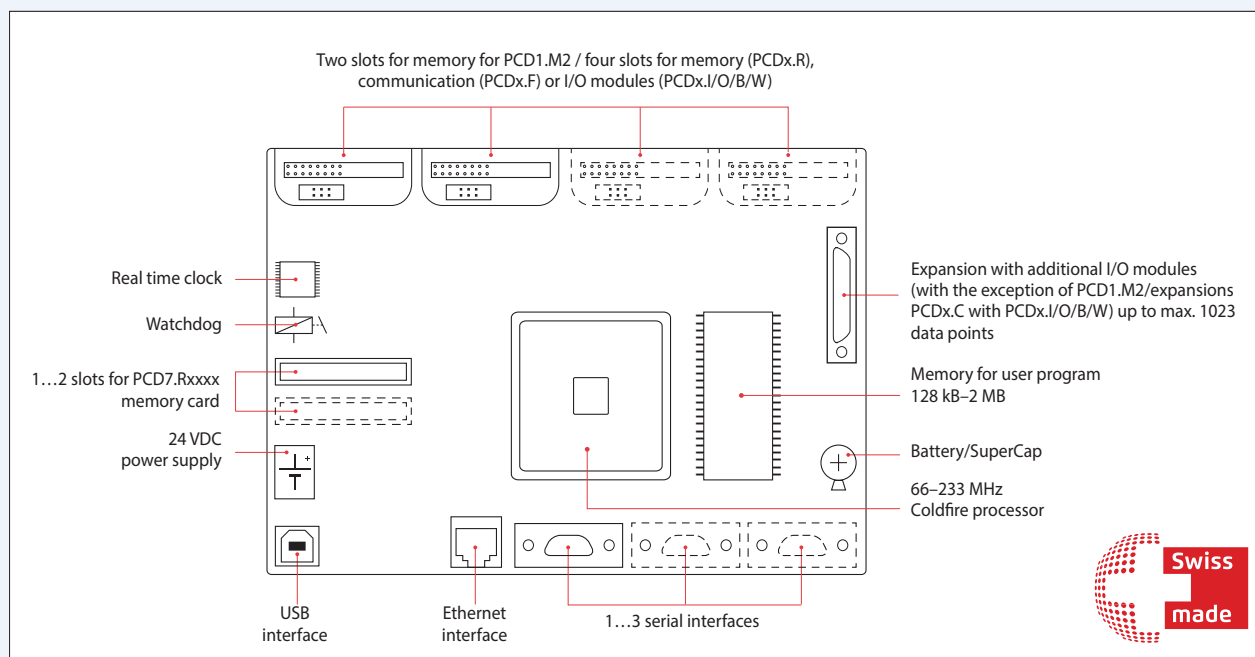

Introduction phase
3–5 years

Product maintenance phase
>10 years

Service phase
>5 years

18 years < Saia PCD control device service life < 25 years

Changeover phase

Program-compatible subsequent generation

Standards

Saia PCD controllers comply with the IEC EN 61131-2 standard in terms of design and production quality. This standard defines in 150 pages how electronic items should be developed and produced to meet PLC quality standards. All the important topics for the applications are covered: From the environmental conditions (temperature, humidity, vibration), to functionality (fluctuations in the power supply, interruptions) and electromagnetic compliance depending on the area of application.

As application settings often fail to behave in accordance with the standards, our SBC control technology is more robust against interference than required by the CE standard. The majority of Saia PCDs are also approved for maritime applications, where increased demands are made on the devices.

The quality and robustness of the Saia PCD control technology is also evident in MTBF values, in the rates of returns from the field and in the feedback from our regular customer satisfaction surveys. See page 18 for more information on this topic.

Basic configuration of the Saia PCD® CPU modules

Two slots for memory for PCD1.M2 / four slots for memory (PCDx.R), communication (PCDx.F) or I/O modules (PCDx.I/O/B/W)

Real time clock

Watchdog

1…2 slots for PCD7.Rxxxx memory card

24 VDC power supply

USB interface

Ethernet interface

1…3 serial interfaces

Expansion with additional I/O modules (with the exception of PCD1.M2/expansions PCDx.C with PCDx.I/O/B/W) up to max. 1023 data points

Memory for user program 128 kB–2 MB

Battery/SuperCap

66–233 MHz Coldfire processor

Swiss made

▲ Overview of the core elements of a Saia PCD controller

Saia PCD® hardware:

Common properties
▸ USB interface for configuration, programming and commissioning
▸ Ethernet interface with all the important web/IT protocols, including those for PG5 communication
▸ At least one onboard serial interface (Saia PCD3.M5/6: 3×)
▸ 24 VDC power supply
▸ Data remanence through battery and/or SuperCap
▸ Watchdog and fast interrupt inputs on the main CPU
▸ Slots for intelligent communication or memory modules
▸ Can be expanded in a modular way (except for Saia PCD1.M) up to 1023 data points

Saia PCD® COSinus – Control Operating System

We developed the core of the Saia PCD operating systems between 2001 and 2003 as part of a European cooperation project with Philips and Nokia. We then expanded the core and focused on an operating system for advanced, industry-quality measuring, control and regulation devices. A dedicated operating system for ICA technology – a control operating system (COS). Developed in-house and with all aspects fully covered.

► Saia PCD COSinus connects user programs and various hardware
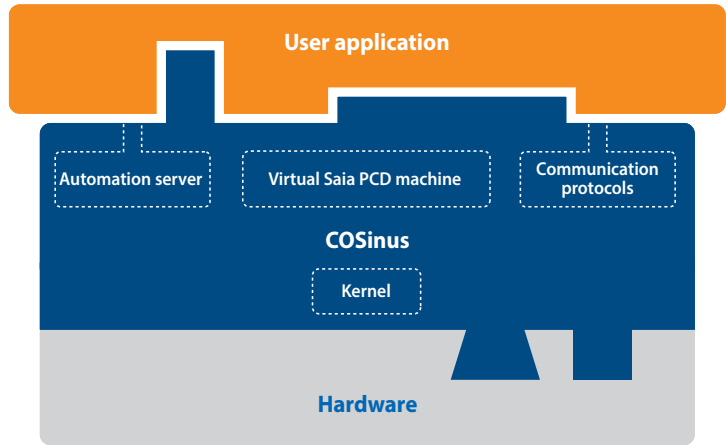
The main components of Saia PCD® COSinus

1 **Multi-tasking kernel:** Abstracts the hardware, incl. I/Os and communication interfaces, provides basic multi-tasking functionality on which the program processing of Saia PCD programming is also based.

2 **Virtual Saia PCD machine:** This is the logic machine that executes the PG5 programs. The virtual Saia PCD code is interpreted and guarantees that programs are always executed in a consistent manner on different PCD controllers. The three hubs of the PG5 application program are the following:
   ▸ **Media:** Memory of the virtual PCD machine such as registers, flags, meters, etc.
   ▸ **Program execution:** Program and organisation blocks, text, monitoring, error processing, memory management, etc.
   ▸ **System functions:** Access to the hardware, I/Os, interfaces and drivers

3 **Automation Server:** The Automation Server includes widely used web/IT technologies and ensures data exchange between users and automation solutions with no proprietary hardware or software required.

4 **Communication protocols:** Various field and automation protocols such as BACnet®, Lon, Profibus, Modbus, DALI, M-Bus, and many others.

Why COSinus?

The control operating system (COS) ensures that customers' application software will always operate on all platforms, is portable across device generations and expandable over several decades. Hardware and the Windows® programming tools may change, but the customer will not have to modify the application code. The hardware, software tool and application software can be compared to the sides of a triangle. If hardware and/or software changes, the angles must adjust for the application software to remain unchanged. We expanded the abbreviation COS to the name COSinus due to the trigonometric relationships in triangles.


Saia PCD® COSinus
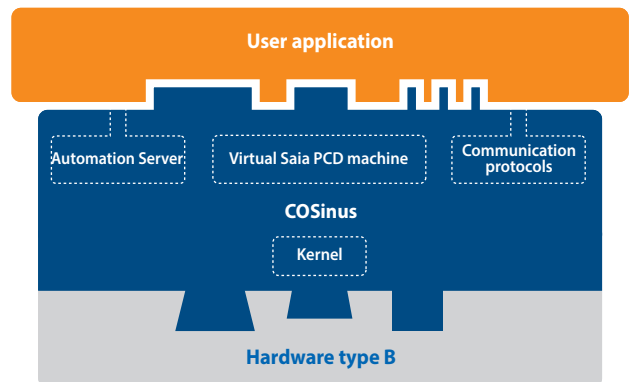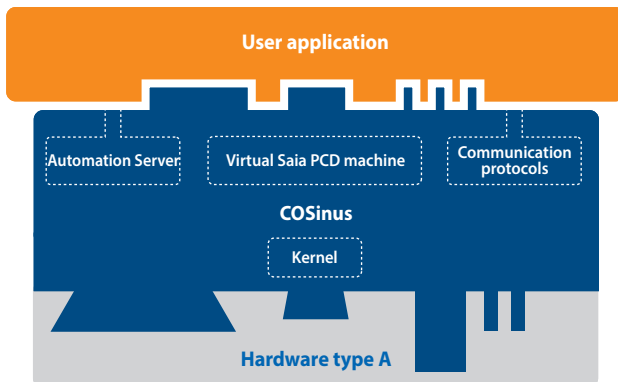
▲ The COSinus operating system always provides the application with the same infrastructure, regardless of the underlying hardware and processor. The key to this is the Saia virtual machine. It ensures that an application program created with PG5 works on all PCDs across generations.

Execution of the user program

The user program consists of one or more organisation blocks that are executed by the PCD Interpreter. Each user program has at least one cyclical organisation block, COB, the COB0.
The PCDs are mono-processor systems. Saia PCD 1, 2, 3 control and regulation devices have a main processor that processes all the tasks. The user program has a special role here and is processed as a core task. In addition to the user program, any communication tasks and server functions (web, FTP) are processed. The CPU capacity is allocated accordingly. The cycle time for the user program not only depends on the length of the program itself, but also on the simultaneous additional load.

Examples:
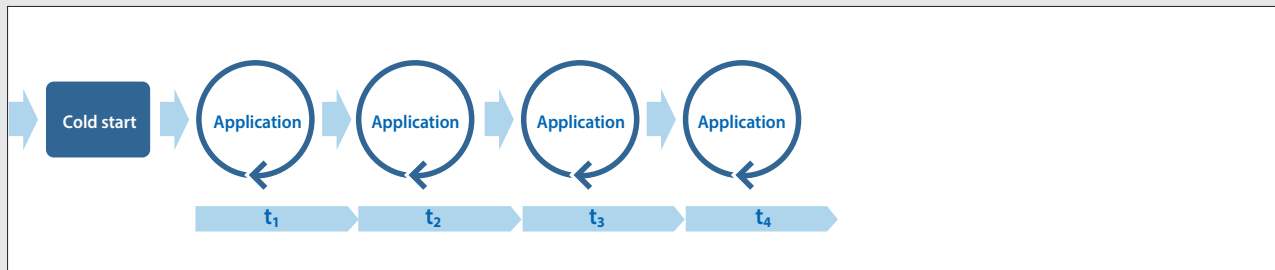
▲ Cycle time with no additional communication
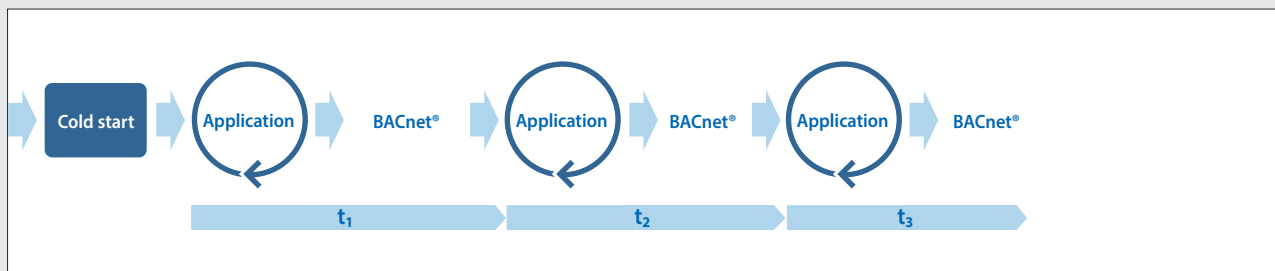
▲ Cycle time with BACnet® communication
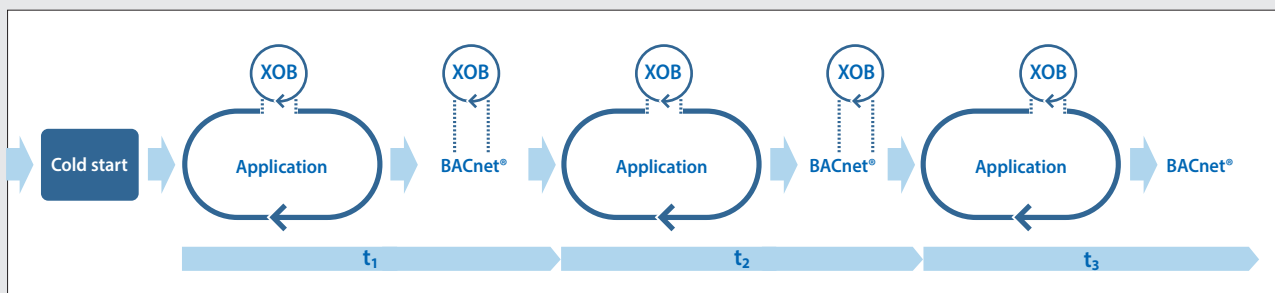
▲ Cycle time with BACnet® communication and interrupt (XOB)

The more communication takes place, the longer the cycle time (t_x), which may result in variations in the cycle time. If this variation in the cycle time is not required, for example because regulation must take place in a fixed time period and ideally without jitters, make sure that this part of the program is executed in an XOB. The priority of the XOBs is higher than that of the COBs and higher than many other operating system tasks. The above example shows that a periodic XOB interrupts the cyclic program and the execution of the BACnet® task.

! The COSinus operating system ensures that all tasks are processed. An intelligent load balance must be maintained between the user program and communication. This actually occurs in planning practice. It is only problematic if the contractor uses a lower performing Saia PCD CPU than planned to save money or is "saving" on CPUs by concentrating tasks on one CPU.

The main XOBs and their priority levels

Priority 4
▶ XOB 0:   Network out

Priority 3
▶ XOB 7:   System overload – displayed if the interrupt XOB queue
                    is overflowing
▶ XOB 13:   Error flag – displayed in the event of communication
                    or calculation errors or an invalid instruction

Priority 2
▶ XOB 16:   Cold start
▶ XOBs 14, 15:   Periodic XOBs
▶ XOBs 20…25: Interrupts

Priority 1
▶ XOB 2:   Battery failure
▶ XOB 10:   Nesting depth exceeded when PB/FBs are displayed
▶ XOB 12:   Index register overflow

Data types and program blocks*

Register (32 bit)	16,384
Flags (1 bit):	16,384

Timers (31 bit) and meters (31 bit): 1600
(Partitioning configurable)

Cyclical organisation blocks COB:	0…31
"Exception" organisation blocks (XOB):	0…31

|	
Program blocks (PB):	1000
Function blocks (FB):	2000
Text/data blocks DB:	8192
Sequential blocks (SB):	96

You can find a full list in the PG5 help section.

* This information is dependent on the hardware and the
 COSinus version.

Saia PCD® Opcode

Saia PG5® generates a platform-independent opcode that is interpreted by the Saia PCD. As a result, the same program runs on different platforms. This also enables the user program to be updated with a flash card as the operating system of the Saia PCD performs the necessary actions to copy and execute the program from the flash card to the memory.
Code that is generated (= compiled) and optimised for the specific platform will of course run faster. This compiler is not integrated into the PC tool (Saia PG5®). Saia PCD COSinus knows how this code should be implemented into the relevant hardware most effectively. The program is compiled when it is loaded into the Saia PCD.

Editing

PCD opcode

Saia PG5® Software tool

Download

Compiler

Execution

Saia PCD CPU
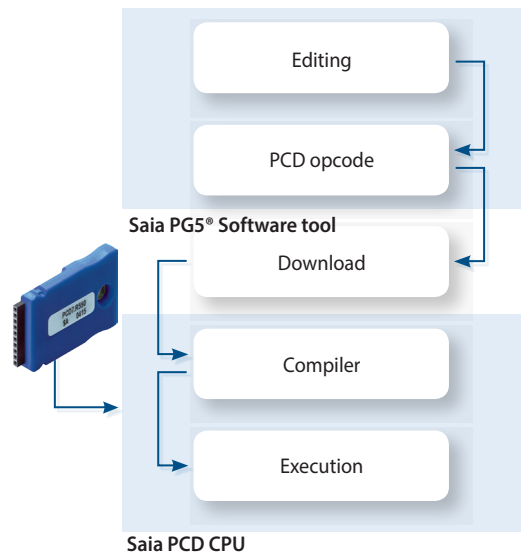
Automation server

The Automation Server is part of the COSinus operating system. It includes widespread web/IT technologies and ensures data exchange between users and automation solutions with no proprietary hardware or software required.
Specifically adjusted automation functions and objects form the relevant counterpart in the controller application. The web/IT functions can therefore be optimally and seamlessly integrated into the automation device and used efficiently.
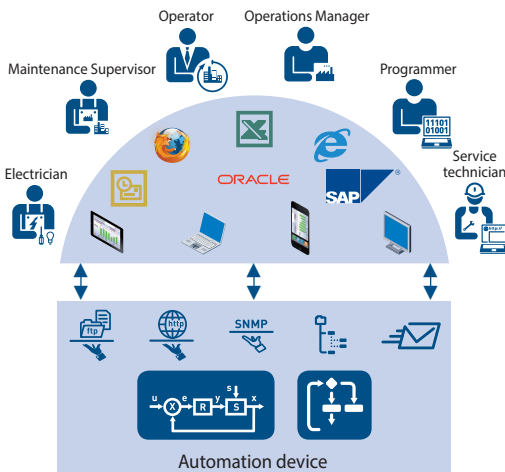
▲ Target group-oriented data output

Automation Server components

Web server:
The system and process are visualised in the form of web pages and can be requested from the web server via browsers such as Internet Explorer, Firefox, etc.

File system:
Process data, records, etc. are stored in easy-to-access files. Standard formats make it easy to process them further, e.g. with Microsoft Excel

FTP server
Load files into the automation device over the network using FTP, or export files from it.

Email:
Critical system statuses, alarms and log data can be sent by email.

SNMP:
Messages and alarms are transmitted in accordance with IT standards. Access to automation data using the IT management system.

...   SNTP, DHCP, DNS . . .

Memory management in the Saia PCD® systems

A user program may contain various data types. This includes data that is relevant for a fast regulation process and data records that must be collected over a long period or saved permanently. All these data types have different requirements in terms of hardware. For example, a regulation-relevant process requires a fast memory to calculate and provide current values. However, historical data records require sufficient remanent mass memory to cover a long period of time.

If a user program function is placed in PG5, various memory areas are required in the system. These areas can basically be divided into 3 groups. The parameter group controls the behaviour of the FBox that is processed in the user program. Defined statuses of the parameters result in responses in the FBox. Using the example of the HDLog function, the log data of the associated parameters is written to the file system in an Excel-compatible file format. Various templates are provided in the Web Editor to visualise this file in the web application.

These can be easily connected to the FBox using a range of parameters. As the visualisa-
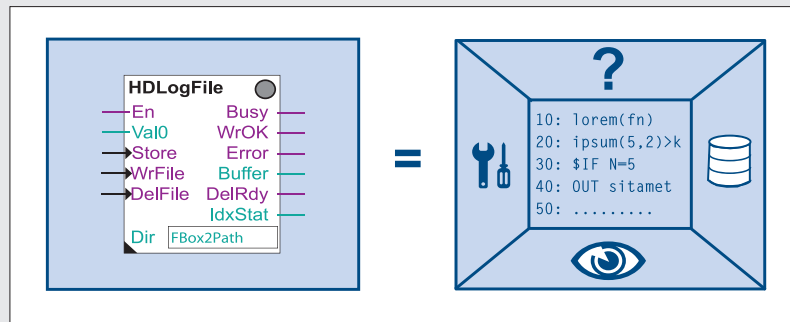
▲ Saia PG5® FBox shown as an object in the Saia PG5® Fupla engineering environment. To the right you can see which functions belong to the object.

tion pages only change when the Saia PG5® project is created, these are stored in the file system.

Memory areas of the Saia PCD® systems
A distinction is made between two key memory areas.
The user memory, which ensures fast access for reading and writing, contains time-critical content such as media and the program code executed by the CPU. However, this memory is not a programmable read-only memory (PROM) and is buffered by a battery.
The flash memory, on the other hand, permanently saves data and provides space for historical data records or data that will not change during the operation of the system. The backup of the user application can be stored in a file system, which means that the processing of teh program is guaranteed.
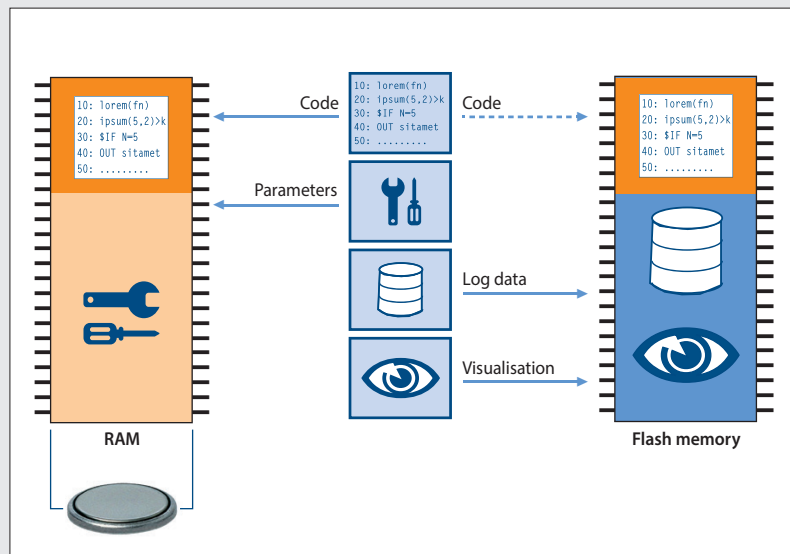
▲ This is how the functions of a memory area belonging to the Saia PG5® FBox are mapped.

Memory management of the Saia PCD® systems with COSinus operating system

Automation devices with integrated µSD card

The automation devices Saia PCD3 Plus, Saia PCD1.M2 and the programmable panel are provided with an onboard µSD flash card. When loading a user application with Saia PG5®, all the necessary files in the internal flash memory are stored on the µSD card. If the operating voltage is connected to the automation device and there is no executable program in the user memory, COSinus attempts to load a valid program from the µSD card on startup.

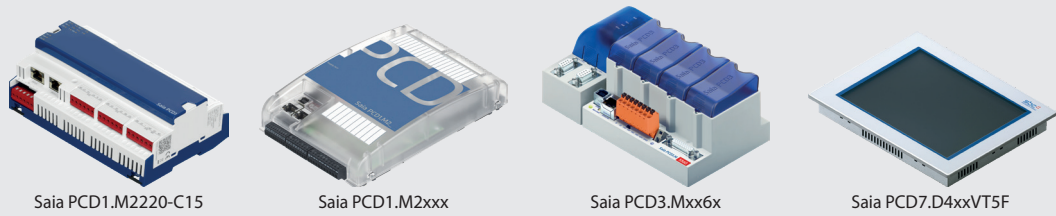Saia PCD1.M2220-C15   Saia PCD1.M2xxx   Saia PCD3.Mxx6x   Saia PCD7.D4xxVT5F

Automation devices with no integrated onboard flash

In the case of automation devices with no integrated µSD card and which are equipped with the COSinus system, the user application is copied direct to the user memory from Saia PG5®. If no valid program is detected in the user program when the controller is started up, a search is executed for a backup program in the onboard flash or an optional memory module.

Saia PCD2.M554x   Saia PCD3.Mxx4x   Saia PCD3.M3xxx   Saia PCD3.Compact
Saia PCD3.Wide Area Controller

MicroSD flash card

| Configuration |
| RIO application |
| User program |
| SRAM data |

File system

PCD1.M2xxx
PCD3.Mxx6x
PCD7.D4xxVT5F

load as required

RAM

DRAM   SRAM   Media (R, T, F)

PCD2.M5xxx
PCD3.M3xxx
PCD3.M554x
PCD3.Compact
PCD3.WAC

RAM

DRAM

SRAM
User program ROM TEXT/DB
RAM TEXT/DB
Media (R, T, F)

Save if required

Onboard flash

SRAM
User program ROM TEXT/DB
RAM TEXT/DB
Media (R, T, F)

File system

▲ Loading of the user program from Saia PG5® onto Saia PCD automation devices and allocation of different data between the storage media.

Memory expansion and resources of the Saia PCD® systems

Memory allocation of PCD1.M2xx0

RAM
▶ User program: 512 kByte … 1 MByte
▶ DB/text: 128 kByte … 1 MByte

Flash memory
▶ File system 8 … 128 Mbytes
  (maximum of 900 … 2,500 files
  or 225 … 625 directories)

Flash memory expansions
▶ 1 expansion module

| User memory | 1024 kB | 1024 kB |

| µSD flash | | 8–128 MB File system | |

Flash ROM expansions — Expansion device (max. 1)
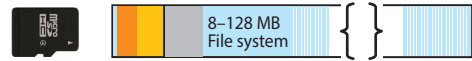
Memory allocation of PCD3.Mxx6x

RAM
▶ User program: 2 Mbyte
▶ DB/text: 1 Mbyte

Flash memory
▶ File system 128 Mbytes
  (maximum of 2,500 files or 625 directories)

Flash memory expansions
▶ 4 expansion modules

| User memory | 2048 kB | 1024 kB |

| µSD flash | | 8–128 MB File system |

Flash ROM expansions

Memory allocation of PCD3.Mxxxx

RAM
▶ User program and DB/text
  1024 kbytes

Flash memory
▶ Backup memory 1024 kbytes

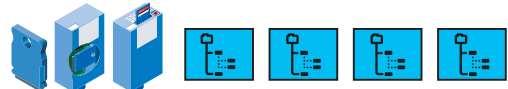### Flash memory expansions
▶ 4 expansion modules

| User memory | 1024 kB |

Flash ROM expansions

Memory allocation of PCD2.M5xx0

RAM
▶ User program and DB/text
  1024 kbytes

Flash memory
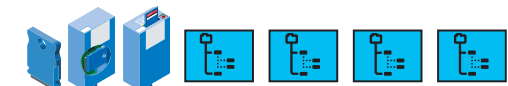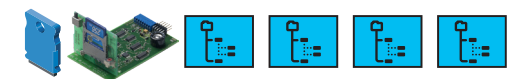▶ Backup memory 1024 kbytes

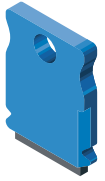### Flash memory expansions
▶ 4 expansion modules

| User memory | 1024 kB |

Flash ROM expansions

The system backup – entire automation project

The application's system backup contains all the vital information and data that must be available to process the application. This enables users to easily and securely reset the controller to a saved and known state.

With the system backup function of the Saia PCD COSinus operating system, it is also possible to fully duplicate a system and copy it to an identical piece of hardware with no additional adjustments required (copy/paste).

The system backup can be created in the office on a Saia PCD memory module using an automation device of identical construction. Any technician (without training, a manual or software tools) can then perform a system restore or a system update direct on site should any changes be applied – totally within the meaning of lean automation.
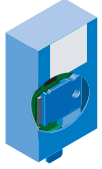
Creating a system backup

A system backup can also be created by the licence-freeSaia PG5® software tool "Online Configurator".

The system can be backed up either on the internal flash memory module or on an optional memory module Saia PCD7.Rxxx.

Using a system backup

No dedicated software tools are required to restore a system backup. This only requires an optional Saia PCD7.Rxxx memory module that contains a system backup for the target controller.

Press and hold the run/stop button for 3 seconds to restore the application contained in the backup memory module. The COSinus operating system automatically looks for a system backup of the application in all the storage media connected to the automation device.

If a valid system backup of the operating system is found, it is "automatically" loaded into the user memory. The automation device restarts.

▲ Memory media for external backups
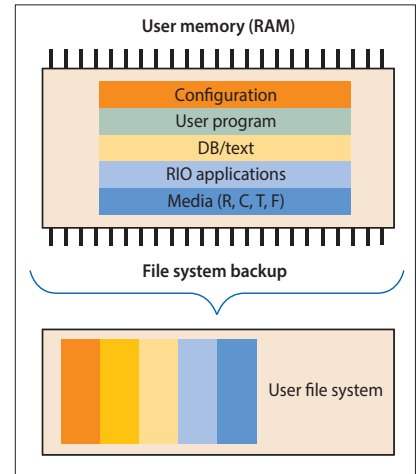
▲ Content of a system backup created on an external module with a file system
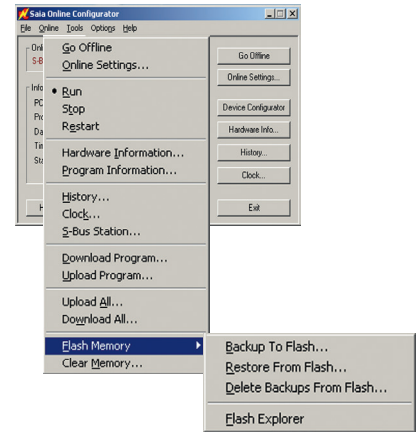
▲ Creation of a system backup with the Online Configurator

Expansion options of the user file system

Saia PCD systems can be expanded by at least 1 to a maximum of 4 external memory modules that contain a user system. An external file system is ideal as a backup for the entire user application and enables users to save trend data, alarms and event lists, as well as log files defined by the user. An external file system may contain up to 900 files or 225 directories.

PCD3.R600 and PCD2.R6000
Module holder for SD flash memory cards
with 512 and 1024 MB

PCD7.R-SD512 / PCD7.R-SD1024
SD flash memory cards
with 512 MB / 1024 MB

512 MB
1024 MB
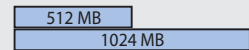
PCD7.R610 with PCD7.R-MSD1024
Basic module with Micro SD flash card
with 1024 MB

1024 MB
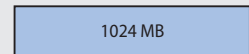
PCD7.R582 Lon over IP
128 MB for file system and firmware expansion for Lon over IP with Lon configuration files
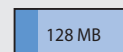
128 MB

PCD7.R562 BACnet®
128 MB for file system and firmware expansion for BACnet® configuration files with BACnet® applications

128 MB

FAQs for the design of automation systems

FAQ
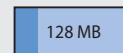
Can third-party local I/Os be connected via S-Bus?

In the manual we have excluded these for the Saia PCD controllers. SBC S-Bus is a proprietary protocol that is essentially designed for communication with engineering and debugging tools, to connect the management level or process control systems and for PCD to PCD communication. It is not suitable or approved for the connection of local I/Os from different manufacturers. I/Os from third-party manufacturers should be integrated professionally and safely using one of the many manufacturer-independent field bus systems.

Can the Saia PCD controllers connect direct to the Internet?

When Saia PCD controllers are connected direct to the Internet, they are also a potential target of cyber attacks. Appropriate protective measures must always be taken to guarantee secure operation.
PCD controllers include simple, integrated protection features. However, secure operation on the Internet is only ensured if external routers are used with a firewall and encrypted VPN connections. For more information, please refer to our support site: http://sbc.do/Me4r-LqwE

How do I connect a third-party device to the PCD if the protocol is not supported in the PCD firmware and there is not a corresponding FBox library either?

One of the greatest strengths of the Saia PCD is that, in addition to the numerous "off the shelf" communication protocols available, users themselves can implement any protocol required in the user program. This is possible via a serial interface and also via Ethernet.
You can find PG5 example programs on our support site on this topic.

What is the difference between centralised and decentralised I/Os?

When remote I/Os are accessed, a communications task always has to run. This task interrupts the processing of the actual ICA task, thus extending the cycle time (page 11). If cycle time is important and critical, it is more efficient to use central I/Os.

How many central I/Os per Saia PCD®?

The I/O capacity of a Saia PCD automation station depends on the maximum number of pluggable I/O modules, i.e. 64 modules for the Saia PCD2 and Saia PCD3 series. Each module requires 16 bits. This gives a maximum of 1024 binary signals overall. Each Saia PCD CPU in this system catalogue can read all 1024 binary signals in under 10 msec and make them available to the user program logic. For calculation purposes, assume a value of 0.01 msec per binary I/O and 0.03 msec per analogue value.

In practice, the number of I/Os is limited by the cycle time required for the user program (see explanation page 11). If the Saia PG5® IL Editor is used to write a resource-efficient user program in text form, the 64 I/O slots of the Saia PCD automation station will be fully usable. The cycle time will certainly be well below 100 msec.

If the graphic software engineering tool Saia PG5® Fupla and prefabricated system templates (Saia PG5® DDC Suite) are used to create the application software, then only half the 64 possible I/O modules should be equipped for a cycle time of <100 msec. Additional communication and data processing tasks will further increase cycle time.

In the case of fully graphic software engineering for control-intensive applications combined with additional tasks (e.g., BACnet®, gateway, management functions), it is inadvisable to use more than 300 I/Os per automation station.

How does communication influence the application cycle time?

If the PCD is set as the server (master station), it has little or no control over its partner stations. Should these partner stations send large amounts of data simultaneously, the PCD MUST receive them. The receiving/processing of these data packages will take priority over the application cycle time. The cycle time may consequently be increased depending on the workload. The PCD processing time may be significantly increased if several partner stations send large volumes of data simultaneously.

The impact will be minimal if the PCD is set as client (slave station).

The figures below are based on a PCD3.M5340 with a program cycle time of 100 ms, excluding additional communication.

Web server Displaying a page on a micro browser panel or PC does not have a major impact. Loading a large file such as a Java applet or an offline trend during the transfer can increase cycle time by 40…50%. The same applies when large files are transferred via FTP.

S-Bus or Modbus communication via Ethernet: Each partner station running under full load increases the cycle time by approx. 8%.

Serial S-Bus: Each slave-type communication at 38.4 kbit/s increases the cycle time by 5% (port #2). In the case of PCDx.F2xx modules, the increase is approx. 17%.

At 115 Kbits the cycle time is approximately 20% higher. *Modbus RTU:* A client at 115 kbit/s increases the cycle time by about 11% (port #2). In the case of PCDx.F2xx modules, the increase is approx. 45%.

What exactly does MTBF mean? Where can I find the MTBF values for Saia PCD® controllers?

MTBF stands for Mean Time Between Failures. The time referred to is the period of operation between two consecutive failures of a unit (module, device or system). The higher the MTBF value, the more "reliable" the device. On average, a device with a MTBF of 100 hours will fail more often than a similar device with a MTBF of 1,000 hours. The MTBF value can be calculated in purely mathematical terms or based on empirical values.

Please bear in mind that the MTBF value of the overall installation depends on the values of the individual switch cabinet components.

An overview of the MTBF values of the PCD controllers is included on our **support site.**

The return rate is of greater relevance in practice. We analyse all the devices that return from the field. The return rates of the current PCD controllers during the warranty period (30 months) are as follows:

- ▶ PCD2.M5xxx: 0.94%
- ▶ PCD3.M5xxx: 0.99%
- ▶ PCD3.M3xxx: 1.14%

What part of the memory will be lost if the battery fails, and how does the PDC react?

In theory, the user memory of the PCD, which contains the content of the media such as registers, counters, meters, flags, and the writeable part of the DB and text elements, will be lost in the event of a failure of the power supply with a battery that is also weak or defective. We now have to distinguish between two different types of PCDs. Controllers equipped with an internal micro SD card store the user program and associated initial values of the media in a system partition. Should the user memory be lost with no backup, the data will be reloaded into the user memory and the program will be processed again with the parameters that were defined at the time of the download in PG5.

Controllers with no internal file system require a backup containing the user program and associated media. This backup can be created using PG5 when downloading the application. As a general rule, there should be a backup of the PCD of the last download of an application to an external file system of the PCD to restore the program and media content in the event of an empty memory.

If a backup of the application of a PCD is available and the content of the user memory is not feasible, the application will be restored from the point at which the backup was created.

1.2 PCD3 – modular cartridge construction

1.2.1 Overview of fully programmable controllers Saia PCD3 device series

Saia PCD3.Mxxxx controllers

Base units with 4 slots for I/O modules

▸ PCD3.Mxx60 High Power CPU
▸ PCD3.M5xxx Standard CPU
▸ PCD3.M3xxx Minimum Basic CPU

Up to 5 integrated communication interfaces that can be expanded by up to 13 communication interfaces using plug-in modules. Integrated Automation Server in all CPUs.

Saia PCD3.Txxx remote I/O stations RIOs

Remote peripheral nodes

▸ PCD3.T66x   Smart Ethernet RIO

Saia PCD3.Cxxx module holder for I/O expansion

Module holder for I/O modules

▸ PCD3.C100   4 I/O slots
▸ PCD3.C110   2 I/O slots
▸ PCD3.C200   4 I/O slots with 24 VDC power supply

Expandable up to 1023 I/Os

Saia PCD3 input/output modules in cassette design

Modules with various functions with plug-in terminals

▸ PCD3.Axxx   Digital output modules
▸ PCD3.Bxxx   Combined digital input/output modules
▸ PCD3.Exxx   Digital input modules
▸ PCD3.Wxxx   Analogue input/output modules

Saia PCD3 interface modules

Plug-in modules to expand the communication interfaces
(up to 4 modules or 8 interfaces)

▸ PCD3.F1xx   1 serial interface RS-232, RS-422/485
▸ PCD3.F2xx   2 serial interfaces RS-232, RS-422/RS-485 BACnet® MSTP, DALI,
                   M-Bus, Belimo MP-Bus
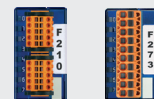
Saia PCD3 memory modules

Plug-in memory modules for data and program backup

▸ PCD3.R5xx   Flash memory module for slots 0…3
▸ PCD3.R6xx   Basic module for SD flash card for slots 0…3
▸ PCD7.R-SD   SD Flash cards for PCD3.R6xx
▸ PCD7.R5xx   Flash memory module for slots M1 and M2
▸ PCD7.R610   Basic module for micro SD flash card
▸ PCD7.R-MSD   Micro SD flash cards for PCD7.R610

Consumables and accessories for Saia PCD3 controllers

Batteries, terminals, system cables, labelling accessories…
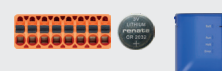
Design of Saia PCD3 controllers

The CPU has been incorporated into the back panel of the device, unlike comparable systems. Its capacity can be increased individually with plug-in communication modules and/or intelligent I/O modules. These have a direct, very fast bus connection to the CPU.

PCD3.Mxxxxx base unit

Base unit with CPU and 4 slots for I/O modules, communication or other specific modules (e.g. PCD3.Hxxx counter modules)

Device design

Memory modules

Battery module

4 slots for I/O modules, communication modules or other intelligent modules

Fast serial bus (SPI) for running up to 4 intelligent modules

I/O bus for standard modules

Ground connection for I/O modules

RUN/STOP switch

RS-232 PGU (Port 0)

RS-422/485 (Port 3 or 10)

RUN/STOP LED indicator

USB connection

Ethernet connection

24 VDC power supply, RS-485 interface (Port 2),Watchdog relay, interrupt inputs

Earth connection

Expansion connection for I/O module holder

The CPU is incorporated into the back panel. An additional 4 I/O modules can therefore be inserted into the same area.

With the left expansion, the Standard (PCD3.M5/M6xxx) and High Power (PCD3.Mxx60) CPU types have slots for a battery holder module with LED indicators, a run/stop switch, two slots for flash memory modules and two additional communication interfaces. The LED indicators on the battery module display the status of the CPU and battery and any errors in the application. The battery also protects the data in the event of an interruption to the power supply. It can be replaced during operation while under power. The configuration, programs and data can be transferred from one controller to another using the plug-in flash memory modules. No programming tool is required for this.

Dimensions

PCD3.M5xx0/M6xx0

180 × 100.5 × 139 mm (W × H × D)
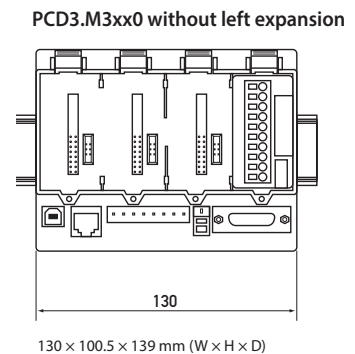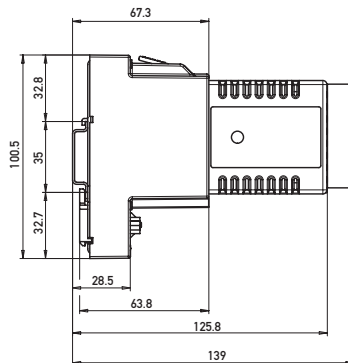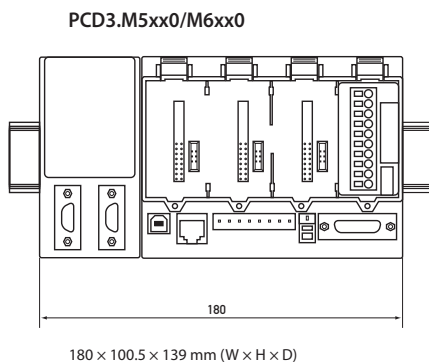
▲ Standard and High Power CPU with slots for battery and memory modules, run/stop switch and additional interfaces

PCD3.M3xx0 without left expansion

130 × 100.5 × 139 mm (W × H × D)

▲ Minimum Basic CPU without battery module. PCD3.Rxxx memory modules are plugged into an I/O slot.

Saia PCD3.Cxxx module holder

I/O expansion module holders are available in either a 2- or 4-slot version. This enables users to expand the PCD3 controllers to a max. 64 I/O modules or a max. 1023 I/Os.

Device design

4 slots for I/O modules

Ground connection for I/O modules

I/O bus for standard modules

Terminal for CPU or I/O module holder

LED indicator for internal 5 V supply voltage

Power

Ground connection

24 VDC power supply terminal

Expansion connection for I/O module holder

Saia PCD3.C 200
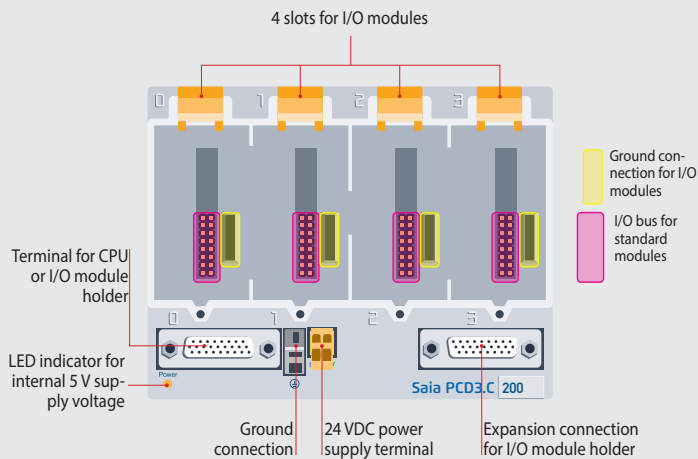
All standard I/O modules can be used in the expansion module holders. Communication modules or other intelligent modules can only be used in the slots of the Basic CPU.

Available types

▸ PCD3.C100 Expansion module holder with 4 I/O slots
▸ PCD3.C110 Expansion module holder with 2 I/O slots
▸ PCD3.C200 Expansion module holder with 4 I/O slots and terminal connectors for 24 VDC power supply for all connected I/O modules, plus any downstream PCD3.C1xx module holders

PCD3.C100/200 with 4 I/O slots

130
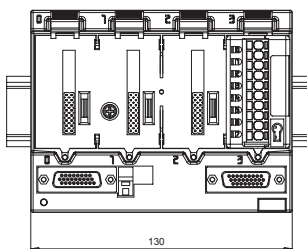
PCD3.C110 with 2 I/O slots

66
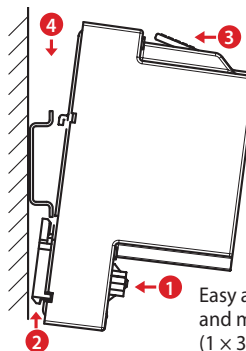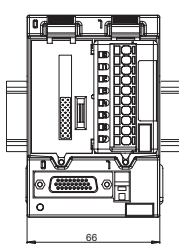
Easy assembly of the CPUs and module holders on DIN rail (1 × 35 mm)

System expansion up to 1023 I/O
Single- and multiple-row mounting of the module holders

PCD3.M5540 CPU incl. 4 I/O slots

PCD3.C100 I/O module holder 4 slots

Saia PCD3.M

Saia PCD3.C 100

PCD3.K106 or PCD3.K116 Extension cable for multi-row mounting

Saia PCD3.C 100

Saia PCD3.C 200

Extension plug PCD3.K010

PCD3.K1xx Extension cable for multiple-row mounting
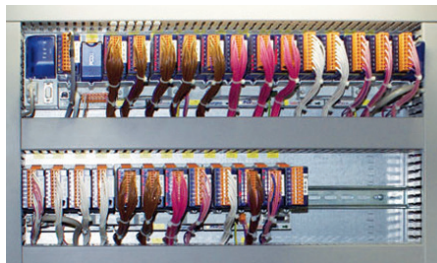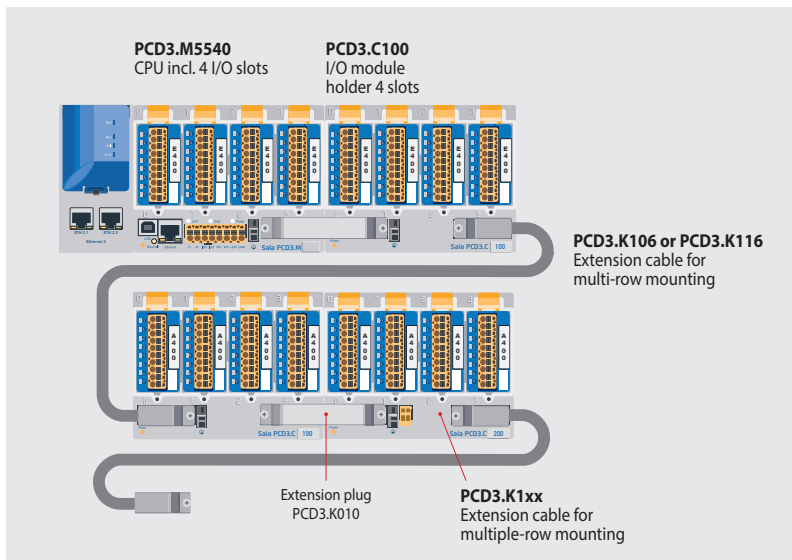
PCD3 in multiple-row mounting in the switch cabinet

Extension plug and cables

▸ PCD3.K010 Extension plug
▸ PCD3.K106 Extension cable 0.7 m
▸ PCD3.K116 Extension cable 1.2 m

Saia PCD3.Mxx60 controllers
High-performance CPU for any requirement

The fast processor and increased system resources provide the High Power CPU with sufficient power reserves to process the most demanding control and communication tasks.

System properties

▸ Up to 1023 inputs/outputs
  Can be expanded remotely with RIO PCD3.T66x
▸ Up to 13 communication interfaces
▸ Onboard USB and Ethernet interface
▸ 2 Ethernet interfaces (PCD3.M6860 only)
▸ Fast program processing (0.1 µs for bit operations)
▸ Large onboard memory for programs (2 MB) and data
  (128 MB file system)
▸ Memory with SD flash cards can be expanded up to 4 GB
▸ Automation Server for integration in Web/IT systems

Automation Server integrated in the base unit

Types

▸ **PCD3.M5360** CPU basic module with Ethernet TCP/IP,
  2 MB of program memory

▸ **PCD3.M5560** CPU basic module with Ethernet TCP/IP,
  2 MB of program memory, Profibus-DP-Slave

▸ **PCD3.M6560** CPU basic module with Ethernet TCP/IP and
  Profibus-DP Master 12 Mbits,
  2 MB of program memory

▸ **PCD3.M6860** CPU basic module with 2 Ethernet TCP/IP,
  2 MB of program memory
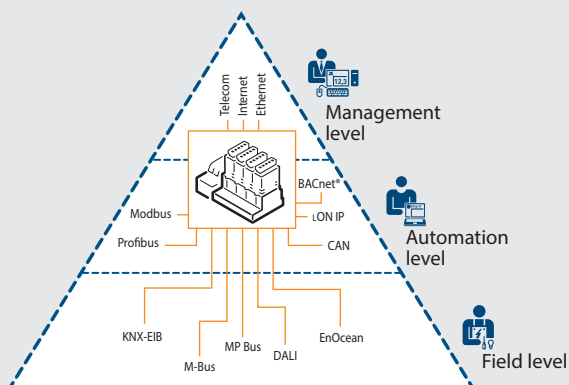
The Saia PCD3 Power CPU has sufficient system resources to operate up to 13 communication interfaces in the same device. Even the most demanding tasks, such as simultaneous communication via BACnet® and Lon IP, are handled reliably.
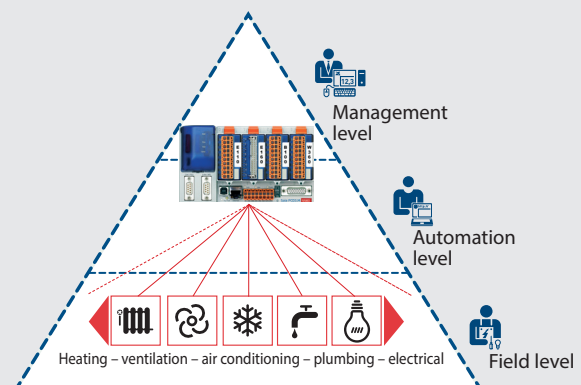
The generous memory resources (4 GB) of the new PCD3 Power CPU enable users to record/monitor, archive and control the data and statuses of all plants in the Saia PCD, even with no computer equipment and control system software. Applications for the various plants (HVAC) can be created easily using the graphic PG5 engineering tool and application-specific software libraries.

Saia PCD3.Mxx60 controllers

High-performance CPU
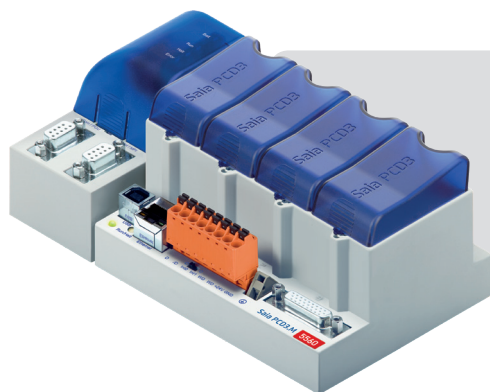
1023	I/O
up to 4.2 GB	File system
2 MB	Program
0.1/0.3 µs bit/word	CPU speed

Technical Data	PCD3.M5360	PCD3.M5560	PCD3.M6560	PCD3.M6860
	Power	Power DP Slave	Power DP Master	Power 2 × Ethernet
Number of inputs/outputs	1023			
or I/O module slots	64			
I/O expansion connection for PCD3.Cxxx module holder	Yes			
Processing time [µs] bit operation	0.1…0.8 µs			
word operation	0.3 µs			
Real-time clock (RTC)	Yes			

Onboard memory

Program memory, DB/text (flash)	2 MB
User memory, DB/text (RAM)	1 MB
Flash memory (S-RIO, configuration and backup)	128 MB
User flash file system (INTFLASH)	128 MB
Data backup	1…3 years with lithium battery

Onboard interfaces

	PCD3.M5360	PCD3.M5560	PCD3.M6560	PCD3.M6860
USB 1.1	Yes			
Ethernet 10/100 Mbits, full-duplex, auto-sensing/auto-crossing	Yes			2×
RS-232 on D-Sub connector (PGU/Port 0)	up to 115 kbits			No
RS-485 on terminal block (Port 2) or RS-485 Profibus-DP Slave, Profi S-Net on terminal block (Port 2)	up to 115 kbits up to 187.5 kbits	up to 115 kbits No	up to 115 kbits up to 187.5 kbits	
RS-485 on D-Sub connector (Port 3)* or Profibus-DP Slave, Profi S-Net on D-Sub connector (Port 10)* or Profibus-DP Master on D-Sub connector (Port 10)*	Up to 115 kbits [1] No No	Up to 115 kbits [2] Up to 1.5 Mbits [2] No	No No up to 12 Mbits [2]	No No No

*   can be used as an alternative
[1]   electrically connected
[2]   electrically isolated

Options

The data memory can be expanded to 4 GB with flash memory modules (with file system).

Optional data interfaces

I/O slot 0	PCD3.F1xx modules for RS-232, RS-422, RS-485 and Belimo MP-Bus
I/O slot 0…3 up to 4 modules or 8 interfaces:	PCD3.F2xx modules for RS-232, RS-422, RS-485, BACnet® MS/TP, Belimo MP-Bus, DALI and M-Bus

General specifications

Supply voltage (in accordance with EN/IEC 61131-2)	24 VDC, −20/+25% max. incl. 5% ripple or 19 VAC ±15% two-way rectified (18 VDC)
Power consumption	typically 15 W for 64 I/Os
Capacity 5 V/+V (24 V) internal	max. 600 mA/100 mA

Saia PCD3.M5x40 controllers

The standard CPU for many applications
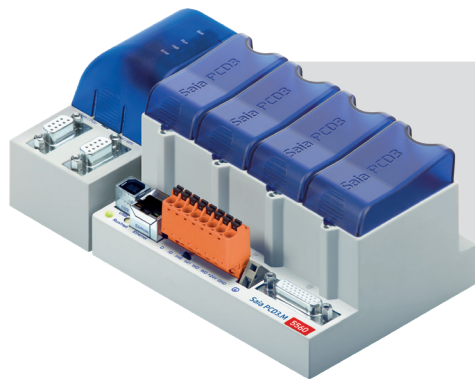
1023	I/O
up to 4 GB	File system
1 MB	Program
0.3/0.9 μs bit/word	CPU speed

Automation Server integrated in the base unit

## Types

▸ PCD3.M5340 CPU basic module with Ethernet TCP/IP, 1 MB program memory

▸ PCD3.M5540 CPU basic module with Ethernet TCP/IP and Profibus-DP Slave 1.5 Mbits, 1 MB program memory

Technical Data	PCD3.M5340	PCD3.M5540
	Standard	Standard
Number of inputs/outputs	1023	
or I/O module slots	64	
I/O expansion connection for PCD3.Cxxx module holder	Yes	
Processing times [μs] bit operation	0.3…1.5 μs	
word operation	0.9 μs	
Real-time clock (RTC)	Yes	

Onboard memory

Main memory (RAM) for program and DB/TEXT	1 MB	
Flash memory (S-RIO, configuration and backup)	2 MB	
User flash file system (INTFLASH)	No	
Data backup	1…3 years with lithium battery	

Onboard interfaces

USB 1.1	Yes	
Ethernet 10/100 Mbits, full-duplex, auto-sensing/auto-crossing	Yes	
RS-232 on D-Sub connector (PGU/Port 0)	up to 115 kbits	
RS-485 on terminal block (Port 2) or RS-485 Profibus-DP Slave, Profi S-Net on terminal block (Port 2)	up to 115 kbits / up to 187.5 kbits	up to 115 kbits No
RS-422/485 (electrically connected) on D-Sub connector (Port 3) *	up to 115 kbits	No
RS-485 (electrically isolated) on D-Sub connector (Port 3) *	No	up to 115 kbits
Profibus-DP Slave, Profi S-Net on D-Sub connector (Port 10) *	No	up to 1.5 Mbits

* can be used as an alternative

Options

The data memory can be expanded to 4 GB with flash memory modules (with file system).

Optional data interfaces

I/O slot 0	PCD3.F1xx modules for RS-232, RS-422, RS-485 and Belimo MP-Bus
I/O slot 0…3 up to 4 modules or 8 interfaces:	PCD3.F2xx modules for RS-232, RS-422, RS-485, BACnet® MS/TP, Belimo MP-Bus, DALI and M-Bus

General specifications

Supply voltage (in accordance with EN/IEC 131-2)	24 VDC, –20/+25% max. incl. 5% ripple or 19 VAC ±15% two-way rectified (18 VDC)
Power consumption	typically 15 W for 64 I/Os
Capacity 5 V/+V (24 V) internal	max. 600 mA/100 mA

Saia PCD3.M3xx0 controllers

The base CPU for simple applications
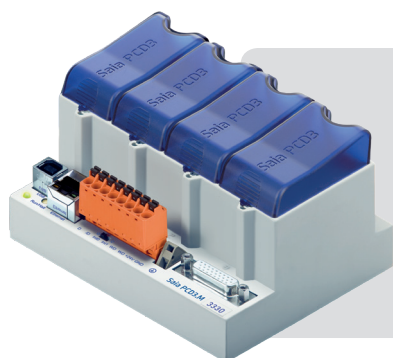
1023	I/O
up to 4 GB	File system
512 kByte	Program
0.3/0.9 µs	CPU speed
0.1/0.3 µs bit/word	CPU speed Basic Power

ftp http SNMP @ SD

Automation Server
integrated in the base unit

Types

▸ PCD3.M3120 CPU basic module with Ethernet TCP/IP, 64 I/Os, 128 kByte of program memory
▸ PCD3.M3160 CPU basic module with Ethernet TCP/IP, 64 I/Os, 512 kByte of program memory
▸ PCD3.M3330 CPU basic module with Ethernet TCP/IP, 1023 I/Os, 512 kByte of program memory
▸ PCD3.M3360 CPU basic module with Ethernet TCP/IP, 1023 I/Os, 512 kByte of program memory

Technical Data	PCD3.M3120	PCD3.M3330	PCD3.M3160	PCD3.M3360
	Basic	**Basic**	**Basic Power**	**Basic Power**
Number of inputs/outputs	64	1023	64	1023
or I/O module slots	4	64	4	64
I/O expansion connection for PCD3.Cxxx module holder	No	Yes	No	Yes
Processing times [µs] bit operation word operation	0.3…1.5 µs 0.9 µs		0.1…0.8 µs 0.3 µs	
Real-time clock (RTC)	Yes			

Onboard memory

Main memory (RAM) for program and DB/text	128 kByte	512 kByte	No	
Program memory, DB/text (FLASH)	No		512 kByte	
Working memory, DB/text (RAM)	No		128 kByte	
Flash memory (S-RIO, configuration and backup)	2 MByte		128 MByte	
User flash file system (INTFLASH)	No		128 MByte	
Data backup	4 hours with SuperCap			

Onboard interfaces

USB 1.1	Yes
Ethernet 10/100 Mbits, full-duplex, auto-sensing/auto-crossing	Yes
RS-485 on terminal block (Port 2) or RS-485 Profibus-DP Slave, Profi-S-Net on terminal block (Port 2)	up to 115 kbits up to 187.5 kbits

Options

The data memory can be expanded to 4 GB with flash memory modules (with file system).

### Optional data interfaces

I/O slot 0	PCD3.F1xx modules for RS-232, RS-422, RS-485 and Belimo MP-Bus
I/O slot 0…3 - up to 4 modules or 8 interfaces:	PCD3.F2xx modules for RS-232, RS-422, RS-485, BACnet® MS/TP, Belimo MP-Bus, DALI and M-Bus

General specifications

Supply voltage (in accordance with EN/IEC 61131-2)	24 VDC, −20/+25% max. incl. 5% ripple or 19 VAC ±15% two-way rectified (18 VDC)
Power consumption	typically 15 W for 64 I/Os
Capacity 5 V/+V (24 V) internal	max. 600 mA/100 mA

Saia PCD3 input and output modules in cassette design

The functions of the Saia PCD3 can be expanded as required using a wide range of plug-in I/O modules and can be adapted to specific requirements. This not only ensures that a project can be implemented quickly, but also provides the option of expanding or modifying the system at any time.

System properties

▸ Numerous variants available
▸ Slot direct in the Saia PCD3 basic CPU or in the module holder
▸ Full integration in the Saia PCD3 housing
▸ Stable cartridge construction
▸ Connection to the I/O level via plug-in spring terminal blocks or ribbon cables and adapters
▸ I/O terminal blocks are supplied as standard
▸ No tools required for replacing modules

Nameplate with connection description

Plug-in terminals

LED for status indication

Module type

Label holder

Insertion of I/O modules

PCD3 with 4 module positions

Clips

Guideway

Additional safeguard with screw

Label holder
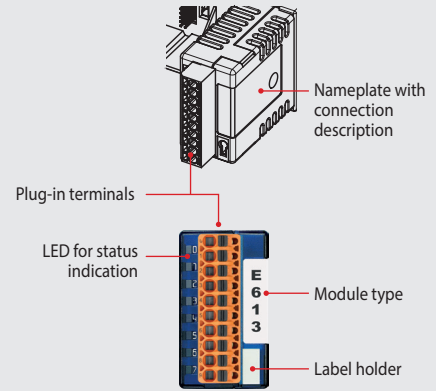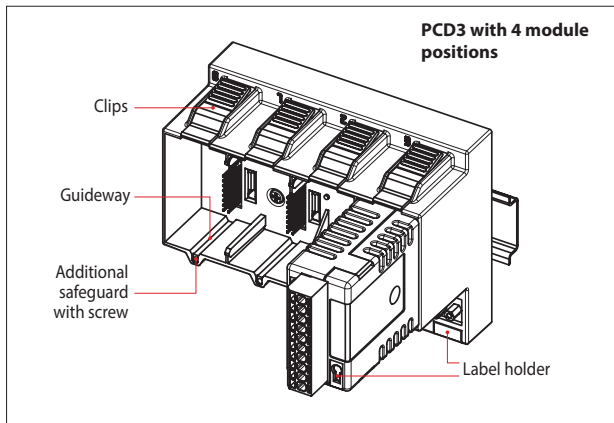
▲ Simple exchange of I/O modules

Over 50 modules available with different functionalities

Types

▸ **PCD3.Axxx**   Digital output modules
▸ **PCD3.Bxxx**   Combined digital input/output modules
▸ **PCD3.Exxx**   Digital input modules
▸ **PCD3.Fxxx**   Communication modules
▸ **PCD3.Hxxx**   Fast counter modules
▸ **PCD3.Rxxx**   Memory modules
▸ **PCD3.Wxxx**   Analogue input/output modules

Connecting plugs/terminals
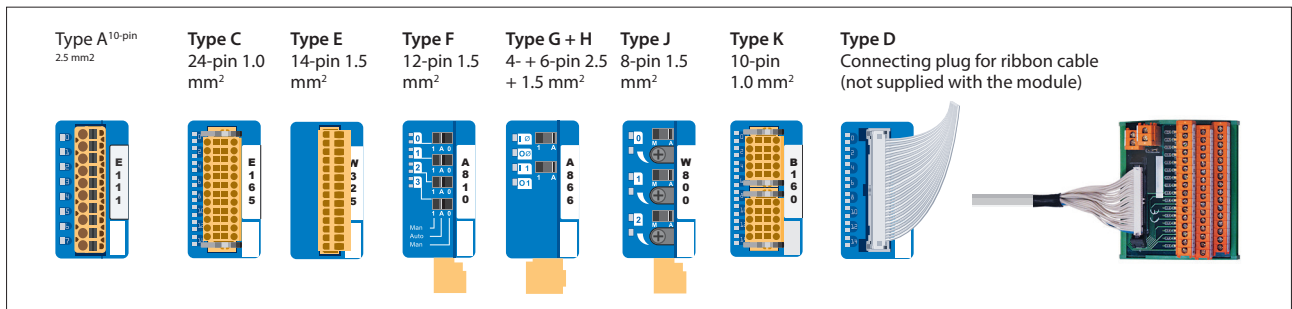
Type A 10-pin
2.5 mm2

Type C
24-pin 1.0 mm^2

Type E
14-pin 1.5 mm^2

Type F
12-pin 1.5 mm^2

Type G + H
4- + 6-pin 2.5 + 1.5 mm^2

Type J
8-pin 1.5 mm^2

Type K
10-pin 1.0 mm^2

Type D
Connecting plug for ribbon cable (not supplied with the module)

▲ Spare terminals, ribbon connectors with system cables and separate terminals are ordered as accessories.

Saia PCD3 digital input and output modules

The digital I/O modules can be easily plugged into the Saia PCD3 Basis CPU or an appropriate module holder. In addition to inputs for various voltage levels, digital outputs are provided with both transistor construction and as mechanical relays. This means that electrical isolation from the switching electrical circuit can be achieved easily and reliably.

Digital input modules

Type	Number of inputs	Input voltage	Output switching capacity DC AC		Input delay	Electrical isolation	Internal current draw 5 V-Bus [1] + V-Bus [2]		I/O connector type [3]
PCD3.E110	8	15…30 VDC	---	---	8 ms	---	24 mA	---	A
PCD3.E111	8	15…30 VDC			0.2 ms		24 mA		A
PCD3.E160	16	15…30 VDC	---	---	8 ms	---	10 mA	---	D
PCD3.E161	16	15…30 VDC			0.2 ms		10 mA		D
PCD3.E165	16	15…30 VDC	---	---	8 ms	---	10 mA	---	C
PCD3.E166	16	15…30 VDC			0.2 ms		10 mA		C
PCD3.E500	6	80…250 VAC	---	---	20 ms	●	1 mA	---	A
PCD3.E610	8	15…30 VDC	---	---	10 ms	●	24 mA	---	A
PCD3.E613	8	30…60 VDC			9 ms	●	24 mA		A

Digital output modules

Type	Number of outputs	Input voltage	Output switching capacity DC AC		Input delay	Electrical isolation	Internal current draw 5 V-Bus [1] + V-Bus [2]		I/O connector type [3]
PCD3.A200	4, relay (make)*	---	2 A/50 VDC	2 A/250 VAC	---	●	15 mA	---	A
PCD3.A210	4, relay (break)*		2 A/50 VDC	2 A/250 VAC		●	15 mA		A
PCD3.A220	6, relay (make)	---	2 A/50 VDC	2 A/250 VAC	---	●	20 mA	---	A
PCD3.A251	8, relay (6 changeover + 2 make)	---	2 A/50 VDC	2 A/48 VAC	---	●	25 mA	---	C
PCD3.A300	6, transistor	---	2 A/10…32 VDC	---	---	---	20 mA	---	A
PCD3.A400	8, transistor	---	0.5 A/5…32 VDC	---	---	---	25 mA	---	A
PCD3.A410	8, transistor	---	0.5 A/5…32 VDC	---	---	●	24 mA	---	A
PCD3.A460	16, transistor	---	0.5 A/10…32 VDC	---	---	---	10 mA	---	D
PCD3.A465	16, transistor		0.5 A/10…32 VDC				10 mA		C
PCD3.A810 Manual operation	4, relay (2 changeover + 2 make)	---	2 A/50 VDC 2 A/50 VDC	5 A/250 VAC 6 A/250 VAC	---	● ●	40 mA	---	F

* with contact protection

Digital input/output modules

Type	Number of I/Os	Input voltage	Output switching capacity DC	AC	Input delay	Electrical isolation	Internal current draw 5 V-Bus [1] + V-Bus [2]		I/O connector type [3]
PCD3.A860 Light and shade	2 Out, relay (make) 2 In	15…30 VDC	---	12 A/250 VAC	8 ms	●	18 mA	---	G H
PCD3.B100	2 In + 2 Out + 4 selectable In or Out	I: 15…32 VDC	0.5 A/5…32 VDC	---	8 ms	---	25 mA	---	A
PCD3.B160	16 I/O (configurable)	I: 24 VDC	0.25 A/18…30 VDC	---	8 ms or 0.2 ms	---	120 mA	---	2× K

Fast counter modules

Type	Number of counters	Inputs per counter	Outputs per counter	Counting range	Selectable digital filter	Current draw 5 V-Bus [1] + V-Bus [2]		I/O connector type [3]
PCD3.H112	2	2 Inp. + 1 configurable Inp.	1 CCO	0…16 777 215 (24 Bit)	10 kHz…150 kHz	50 mA	4 mA	K
PCD3.H114	4	2 Inp. + 1 configurable Inp.	1 CCO	0…16 777 215 (24 Bit)	10 kHz…150 kHz	50 mA	4 mA	2× K

Overview of the internal bus capacity of the module holders

Capacity	PCD3.Mxxx0	PCD3.Txxx	PCD3.C200
[1] Internal 5V	600 mA	600 mA	1500 mA
[2] Internal +V (24 V)	100 mA	100 mA	200 mA

The electrical requirement of the internal +5V and +V bus for the I/O modules is calculated in the PG5 2.0 Device Configurator.

[3] Plug-in terminal blocks are included with I/O modules.
  Spare terminals, ribbon connectors with system cables and separate terminals are ordered as accessories
  (see pages 34 and 169).

Saia PCD3 analogue input and output modules

The numerous analogue modules allow complex control tasks or measurements to be performed. The resolution is between 8 and 16 bits, depending on the speed of the AD converter. The digitised values can be further processed direct in the project in the Saia PCD3. The large number of different modules means that suitable modules are available for almost any requirement.

Analogue input modules

Type	Total Channels	Signal ranges/description	Resolution	Electrical isolation	Internal current draw 5 V-Bus [1]	+ V-Bus [2]	I/O connector type [3]
PCD3.W200	8 In	0…+10 V	10 Bit		8 mA	5 mA	A
PCD3.W210	8 In	0…20 mA [4]	10 Bit		8 mA	5 mA	A
PCD3.W220	8 In	Pt1000: −50 °C…400 °C/Ni1000: −50 °C…+200 °C	10 Bit	---	8 mA	16 mA	A
PCD3.W220Z03	8 In	NTC 10 temperature sensor	10 Bit		8 mA	16 mA	A
PCD3.W220Z12	4 In +4 In	4 In: 0…10 V 4 In: Pt1000: −50 °C…400 °C/Ni1000: −50 °C…+200 °C	10 Bit		8 mA	11 mA	A
PCD3.W300	8 In	0…+10 V	12 Bit		8 mA	5 mA	A
PCD3.W310	8 In	0…20 mA [4]	12 Bit		8 mA	5 mA	A
PCD3.W340	8 In	0…+10 V/0…20 mA 4) Pt1000: −50 °C…400 °C/Ni1000: −50 °C…+200 °C	12 Bit		8 mA	20 mA	A
PCD3.W350	8 In	Pt100: −50 °C…+600 °C/Ni100: −50 °C…+250 °C	12 Bit	---	8 mA	30 mA	A
PCD3.W360	8 In	Pt1000: −50 °C…+150 °C	12 Bit		8 mA	20 mA	A
PCD3.W380	8 In	−10 V…+10 V, −20 mA…+20 mA, Pt/Ni1000, Ni1000 L&S, NTC10k/NTC20k (configuration using software)	13 Bit		25 mA	25 mA	2× K
PCD3.W305	7 In	0…+10 V	12 Bit	●	60 mA	0 mA	I
PCD3.W315	7 In	0…20 mA [4]	12 Bit	●	60 mA	0 mA	I
PCD3.W325	7 In	−10 V…+10 V	12 Bit	●	60 mA	0 mA	I
PCD3.W720	2 In	Weighing module with 2 systems for up to 6 weighing cells	≤18 Bit	---	60 mA	100 mA	I
PCD3.W745	4 In	Temperature module for TC type J, K and 4-wire Pt/Ni 100/1000	16 Bit	●	200 mA	0 mA	[6]

Analogue output modules

Type	Number of channels	Signal ranges/description	Resolution	Electrical isolation	Internal current draw 5 V-Bus [1]	+ V-Bus [2]	I/O connector type [3]
PCD3.W400	4 Out	0…+10 V	8 Bit	---	1 mA	30 mA	A
PCD3.W410	4 Out	0…+10 V/0…20 mA/4…20 mA jumper-selectable	8 Bit		1 mA	30 mA	A
PCD3.W600	4 Out	0…+10 V	12 Bit	---	4 mA	20 mA	A
PCD3.W610	4 Out	0…+10 V/−10 V…+10 V/0…20 mA/4…20 mA jumper-selectable	12 Bit		110 mA	0 mA	A
PCD3.W605	6 Out	0…+10 V	10 Bit	●	110 mA	0 mA	I
PCD3.W615	4 Out	0…20 mA/4…20 mA parameters can be set	10 Bit	●	55 mA	0 mA	I
PCD3.W625	6 Out	−10 V…+10 V	10 Bit	●	110 mA	0 mA	I
PCD3.W800	4 Out, 3 of which are manually operated	0…+10 V, short circuit-proofed	10 Bit	---	45 mA	35 mA [5]	J

Analogue input/output modules

Type	Number of channels	Signal ranges/description		Resolution	Electrical isolation	Internal current draw 5 V-Bus [1]	+ V-Bus [2]	I/O connector type [3]
PCD3.W525	4 In +	**In:**	0…10 V, 0(4)…20 mA, Pt1000, Pt500 or Ni1000 (selectable via DIP switch)	In: 14 Bit	●	40 mA	0 mA	I
	2 Out	**Out:**	0…10 V or 0(4)…20 mA (selectable via software)	Out: 12 Bit				

Manual control modules

PCD3.A810
Relay outputs, 2 change-over and 2 make

PCD3.A860
Light and shade 2 relay outputs and 2 inputs

PCD3.W800
4 analogue outputs (3 of these operable)

Overview of the internal bus capacity of the module holders

Capacity	PCD3.Mxxx0	PCD3.Txxx	PCD3.C200
[1] Internal 5V	600 mA	600 mA	1500 mA
[2] Internal +V (24 V)	100 mA	100 mA	200 mA

The electrical requirement of the internal +5V and +V bus for the I/O modules is calculated in the PG5 Device Configurator.

[3] Plug-in I/O terminal blocks are included with I/O modules. Spare terminals, ribbon connectors with system cables and separate terminals are ordered as accessories (see pages 34 and 169).
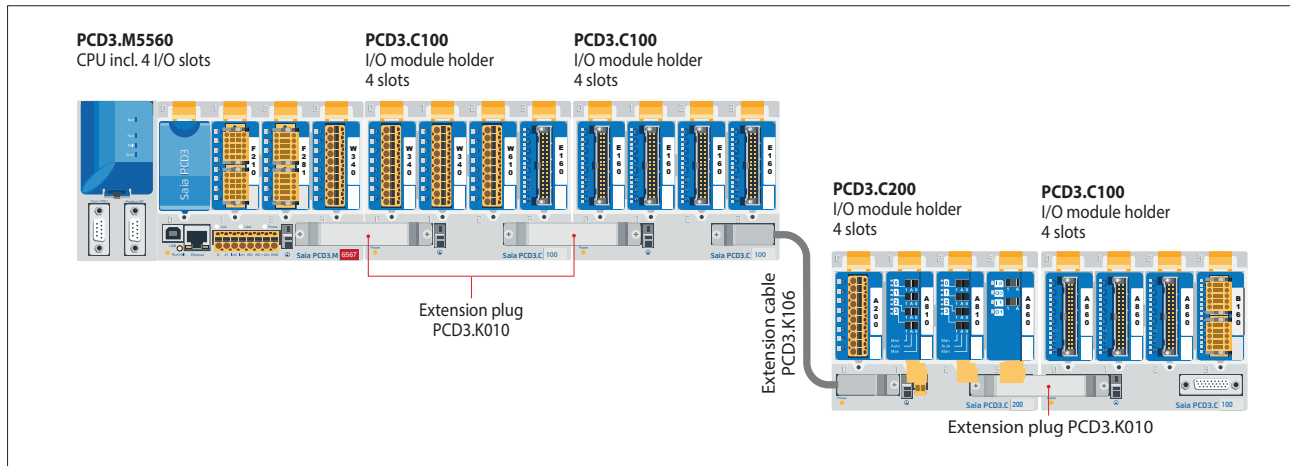
[4] 4…20 mA via user program

[5] At 100% output value and 3 kΩ load

[6] With soldered spring terminal block

Information for project planning with PCD3 module holders

The internal load current taken by the I/O modules from the +5V and +V (24V) supply must not exceed the maximum supply current specified for the CPUs, RIOs or PCD3.C200 module holders.

Example calculation for the current consumption of the internal +5V and +V (24V) bus of the I/O modules

PCD3.M5560
CPU incl. 4 I/O slots

PCD3.C100
I/O module holder
4 slots

PCD3.C100
I/O module holder
4 slots

PCD3.C200
I/O module holder
4 slots

PCD3.C100
I/O module holder
4 slots

Extension plug
PCD3.K010

Extension cable
PCD3.K106

Extension plug PCD3.K010

Consumption M5540 + C100 + C100

Module	Internal 5V	Internal +V (24V)
Not used		
F210	110 mA	
F281	90 mA	15 mA
W340	8 mA	20 mA
Total M5540	**208 mA**	**35 mA**
W340	8 mA	20 mA
W340	8 mA	20 mA
W610	110 mA	0 mA
E160	10 mA	
Total C100	**136 mA**	**40 mA**
E160	10 mA	
E160	10 mA	
E160	10 mA	
E160	10 mA	
Total C100	**40 mA**	**0**
Total M5540	**384 mA**	**75 mA**

Consumption C200 + C100

Module	Internal 5V	Internal +V (24V)
A200	15 mA	
A810	40 mA	
A810	40 mA	
A860	18 mA	
Total C200	**113 mA**	
A460	10 mA	
A460	10 mA	
A460	10 mA	
W380	25 mA	25 mA
Total C100	**55 mA**	**25 mA**
Total C200	**168 mA**	**25 mA**

Capacity	PCD3.M5560	PCD3.C200
Internal 5V	600 mA	1500 mA
Internal +V (24V)	100 mA	200 mA

The calculation example shows that internal capacity is maintained in the CPU basic module PCD3.M5540 and the holder module PCD3.C200. The CPU basic module has a sufficient reserve to receive an additional communication module in the empty slot 0. The holder module PCD3.C200 also has sufficient reserves to connect an additional PCD3.C100 or PCD3.C110 holder module. The power consumption of the internal +5V and +V (24 V) bus for the I/O modules is automatically calculated in the PG5 2.0 Device Configurator.

**!**   **The following aspects should be considered when planning PCD3 applications:**

▶ In keeping with lean automation, it is recommended to leave the first slot in the CPU basic module free for any subsequent expansions. Both single I/O modules and communication modules can be used in this slot.

▶ The total length of the I/O bus is limited by technical factors; the shorter, the better.

The PCD3.C200 is used to extend the I/O bus or for the internal power supply (+5V and +V (24V)) to a module segment. Please note the following rules:

▶ Do not use more than six PCD3.C200s in a single configuration, or the time delay will exceed the I/O access time.

▶ Use a maximum of five PCD3.K106/116 cables.

▶ Insert a PCD3.C200 after each cable (at the start of a row). Exception: In a small configuration with no more than 3 PCD3.C1xxs, these can be supplied from the PCD3.Mxxx. A PCD3.C200 is not required.

▶ If an application is mounted in a single row (max. 15 module holders), then after five PCD3.C100 a PCD3.C200 must be used to amplify the bus signal (unless the configuration ends with the fifth PCD3.C100).

▶ If the application is mounted in multiple rows, the restricted length of cable means that only three module holders (1× PCD3.C200 and 2× PCD3.C100) may be mounted in one row.

# Saia PCD3 power supply and connection concept

External power supply

A two-way rectified supply can be used for most modules.
The following modules must be connected to smoothed 24 VDC:
PCD3. H1xx, H2xx, H3xx, PCD7.D2xx

It is generally recommended to use robust
and interference-resistant SBC power supply
units with 24 VDC output. See Chapter 5.1
for available types.

!
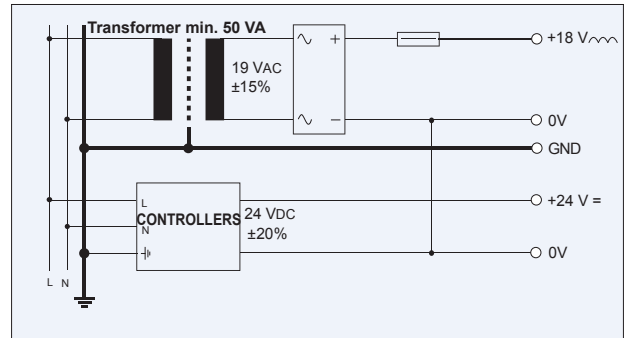
Grounding and connection plan

▸ The zero potential (GND) of the 24 V supply is connected to the
  GND and the controller's grounding terminal. If possible, this
  should be connected to the ground bar with a short wire (<25 cm)
  with a cross section of 1.5 mm². The same applies to the negative
  connection to the PCD3.F1xx or the interrupt terminal.

▸ Any shielding of analogue signals or communication cables
  should also be brought to the same grounding potential,
  either via a negative terminal or via the ground bar.

▸ All negative connections are linked internally. For flawless
  operation, these connections should be reinforced externally
 by short wires with a cross section of 1.5 mm2.

!
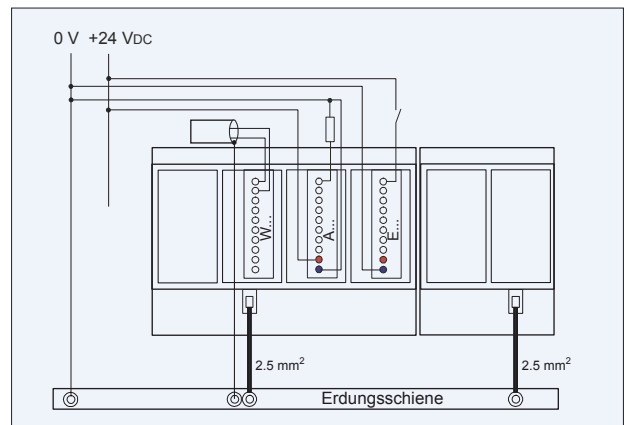
Grounding and connection concept analogue inputs that are not electrically isolated (PCD3.W2x0, PCD3.W3x0)

Signal sources (such as temperature sensors) should be connected direct to the input module wherever possible.

To obtain optimum measurement results, avoid connection to a ground bar. Additional external GND connections to the sensor signals may
result in equalising currents which distort the measurement.

If shielded cables are used, the shielding should be continued to a ground bar.
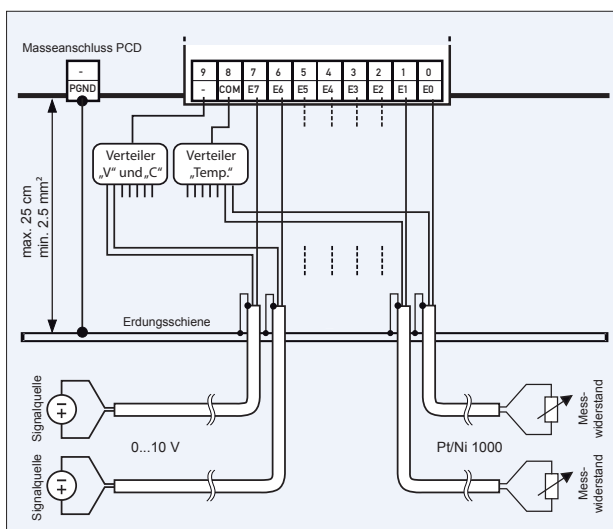
Connection concept for PCD3.W3x0
The reference potential of voltage and current inputs must be
wired to a common GND distributor at the "–" terminal. Tempera-
ture sensors must be wired to a common GND distributor at the
"COM" terminal. The module PCD3.W380 has a 2-wire connection
for the inputs and requires no external GND distributor.
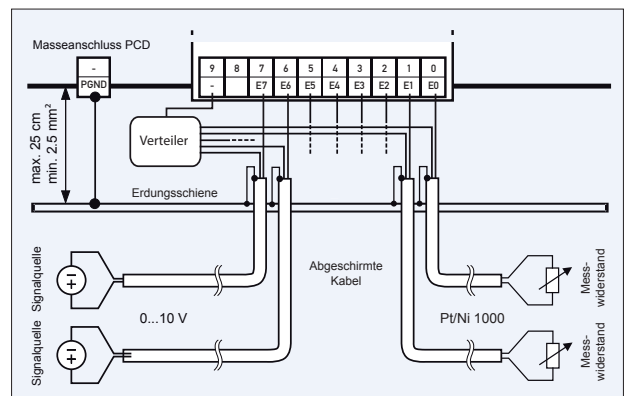
Connection concept for PCD3.W2x0
The reference potential of signal sources must be wired to a
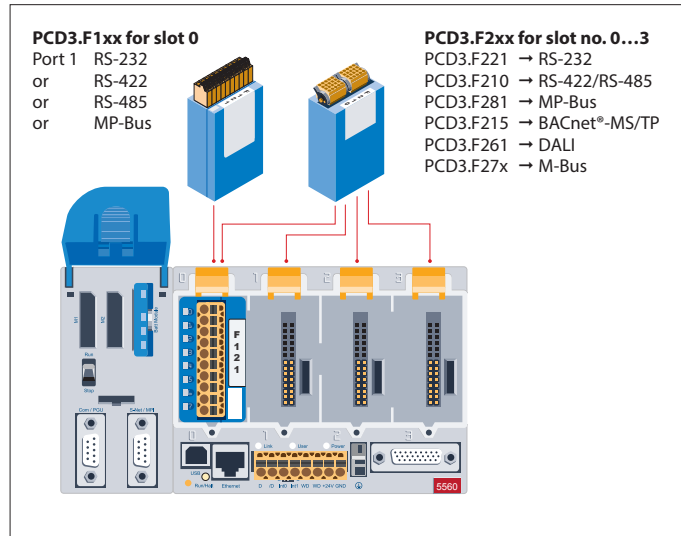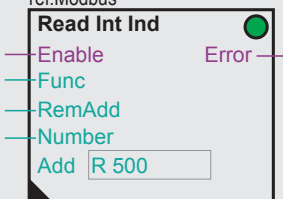common GND distributor at the "–" terminal

Communication interfaces of Saia PCD3.Mxxxx controllers

In addition to the interfaces that the Saia PCD3 has onboard, the interface functions can also be expanded using various slots. Numerous protocols are therefore supported by the PCD3. For the majority of protocols, the physical bus specifications are offered as a plug-in module. If this is not the case, the bus can be connected via an external converter.

Protocols supported by PCD3.Mxxxx via FBoxes

- Modem communication with the PCD
- S-Bus
- Modbus
- JCI N2-Bus
- KNX® S-Mode/EIB (with external converter)

- DALI
- EnOcean (with external converter)
- M-Bus
- BACnet® MS/TP
- HMI editor applications with PCD7.Dxxx text terminals (RS-232 only)

ref:Modbus

Read Int Ind
- Enable   Error
- Func
- RemAdd
- Number
- Add   R 500

PCD3.F1xx for slot 0
Port 1   RS-232
or   RS-422
or   RS-485
or   MP-Bus

PCD3.F2xx for slot no. 0…3
PCD3.F221 → RS-232
PCD3.F210 → RS-422/RS-485
PCD3.F281 → MP-Bus
PCD3.F215 → BACnet®-MS/TP
PCD3.F261 → DALI
PCD3.F27x → M-Bus

Fully programmable physical interfaces

Module	Specifications	Slot	Electrical isolation	Internal current draw 5V +V (24 V)		I/O connector type [1]
PCD3.F110	RS-422 with RTS/CTS or RS-485 [2]	I/O 0	---	40 mA	---	A
PCD3.F121	RS-232 with RTS/CTS, DTR/DSR, DCD	I/O 0	---	15 mA	---	A
PCD3.F150	RS-485 [2]	I/O 0	●	130 mA	---	A
PCD3.F210	RS-422/RS-485 [2], plus PCD7.F1xxS as option	I/O 0…3	---	110 mA	---	2× K
PCD3.F221	RS-232 plus PCD7.F1xxS as option	I/O 0…3	---	90 mA	---	2× K

Physical interfaces for specific protocols

Module	Specifications	Slot	Electrical isolation	Internal current draw 5V +V (24 V)		I/O connector type [1]
PCD3.F180	Belimo MP-Bus, for connecting up to 8 drives on one line	I/O 0	---	15 mA	15 mA	A
PCD3.F215	BACnet® MS/TP or freely programmable	I/O 0…3	---	110 mA	---	2× K
PCD3.F240	LonWorks® interface module exclusively for PCD3.M5x6x	I/O 0…3	---	90 mA	---	A9
PCD3.F261	DALI	I/O 0…3	---	90 mA	---	A
PCD3.F270	M-Bus 240 nodes	I/O 0…3	---	70 mA	8 mA	A
PCD3.F271	M-Bus 20 nodes	I/O 0…3	---	70 mA	8 mA	A
PCD3.F272	M-Bus 60 nodes	I/O 0…3	---	70 mA	8 mA	A
PCD3.F281	Belimo MP-Bus with slot for PCD7.F1xxS modules	I/O 0…3	---	90 mA	15 mA	2× K

System properties required for PCD3.Fxxx modules:

The PCD3 system has a processor that serves both the application and the serial ports. To determine the maximum communication capacity for each PCD3.M5xx0 system, consult the information and examples provided in the manual 26-789 for PCD3.M5xx0.

Interface modules for optional insertion in PCD3.F2xx modules

Module	Specifications
PCD7.F110S	RS-422 with RTS/CTS or RS-485 [2] (electrically connected)
PCD7.F121S	RS-232 with RTS/CTS, DTR/DSR, DCD, suitable for modem, EIB connection
PCD7.F150S	RS-485 [2] (electrically isolated)d
PCD7.F180S	Belimo® MP-Bus for connecting up to 8 drives on one line

[1] Plug-in I/O terminal blocks are included with I/O modules. Spare terminals, ribbon connectors with system cables and separate terminals are ordered as accessories (see pages 34 and 169).

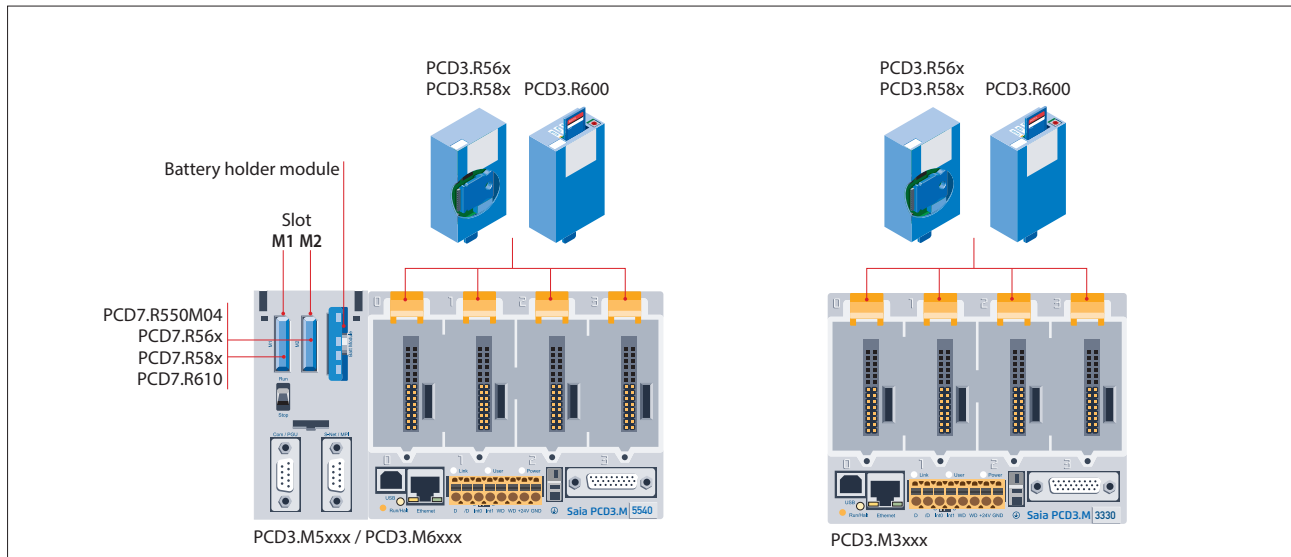[2] with termination resistors that can be activated.

Memory modules of Saia PCD3.Mxxxx controllers

In addition to the onboard memory contained in the base units, PCD3 controllers can also be expanded in a modular way with various flash memory modules for programs and data. The various communication protocols where the firmware is installed on the flash cards can also be used by simply inserting the relevant card.

More information on memory management and construction can be found in Chapter 1.1 Saia PCD System description.

System properties

▸ Configuration, programs and data can be transferred from one CPU to another
▸ Two slots (M1 and M2) for memory cards
▸ Additional memory cards can be inserted in the I/O slots using I/O adapters
▸ Memory can be expanded by up to 4 GB

PCD3.M5xxx / PCD3.M6xxx   PCD3.M3xxx

Flash memory with file system, program and data backup, BACnet® for M1/M2 slot

Type	Description	Slot
PCD7.R550M04	4 MB flash card with file system	M1 & M2
PCD7.R562	Flash card with BACnet® and 128 MB file system	M1 & M2
PCD7.R582	Flash card with Lon IP and 128 MB file system	M1 & M2
PCD7.R610	Basic module for Micro SD flash cards	M1 & M2
PCD7.R-MSD1024	Micro SD flash card 1024 MB, PCD formatted	PCD7.R610

PCD7.R550M04
PCD7.R56x
PCD7.R58x

PCD7.R610

Plug-in flash modules for I/O module slots for all PCD3.Mxxx0s

Type	Description	Slot
PCD3.R562	Flash card with BACnet® and 128 MB file system	I/O 0…3

PCD3.R56x

Saia PCD3 basic module for SD flash cards with file system

| Type	Description	Slot
PCD3.R600	Basic module with slot for SD flash cards (Up to 4 modules in I/O slots 0 to 3 on a CPU)	I/O 0…3
PCD7.R-SD512	SD flash card, 512 MB with file system	---
PCD7.R-SD1024	SD flash card, 1024 MB with file system	---

PCD3.R600

Spare parts (battery and battery holder module) see consumables and accessories (see pages 34 and 169).

Consumables and accessories for Saia PCD3 controllers

Labelling accessories

① (4 310 8686 0)

② (4 329 4819 1)

③

④
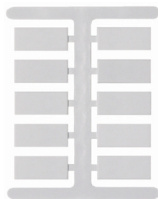
Addressing and labelling of I/O modules and module holders

I/O module slots in the module holder are labelled with numbers:

▶ 0…3 (PCD3.Mxxxx /T66x/C100, C200)
▶ 0…1 (PCD3.C110)

The provided inscription labels **②** can either be used for additional labelling of the module holders or for the I/O modules themselves. They are blank and, depending on requirements, may either be labelled by hand or by using pre-printed adhesive strips **①**.
The circuit diagram **③** printed on the side of each I/O module makes wiring easier and also helps during commissioning. Sufficient space **④** is available on the other side of the cassette for the user to add custom-ised labelling with the self-adhesive labels supplied.
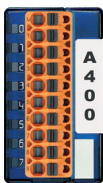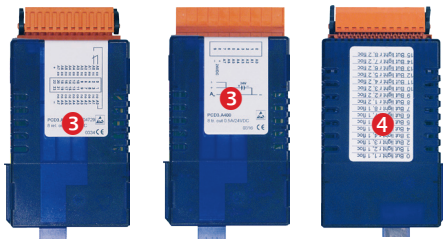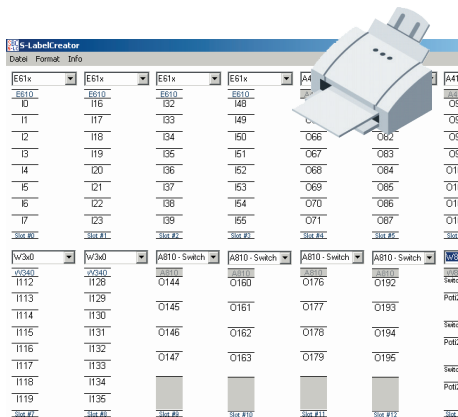

Without clip

With clip

Order type
⑤ (4 310 8723 0)

Additional labelling on the front **⑤**

The PCD3 modules can also be labelled on the front panel.
Neutral labels with a snap-on cover (clip) are available for this purpose.

Fast labelling of I/O modules with the LabelEditor

The LabelEditor is included in the PG5 Controls Suite Device Configurator. This software tool is used to label PCD3 label clips efficiently.

EPLAN macros

EPLAN macros are available for project planning and engineering

ePLAN electric P8

The EPLAN® electric P8 macros are available on the support site.

The macros and article data are also provided on the EPLAN® data portal.

ePLAN data portal

Download: www.sbc-support.com

Automation stations — 1

Operation and monitoring — 2

Room controllers — 3

Consumer data acquisition — 4

Switch cabinet components — 5

# Consumables and accessories for Saia PCD3.Mxxxx controllers

Saia PCD3 battery and battery holder module

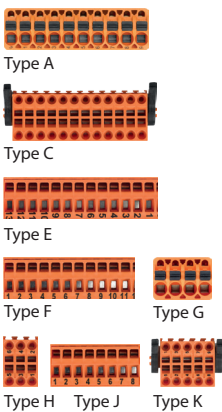| Type	Description
PCD3.R010	Battery kit for PCD3.M3xxx Basic CPU (battery module for slot #3 incl. lithium battery CR2032)
4 639 4898 0	Battery holder module (for PCD3.M5xxx)
4 507 4817 0	Lithium battery for PCD Base CPU

Saia PCD3 housing covers

Type	Description
410474930	Cover for PCD3.M5xxx and M6xxx
PCD3.E009	Empty module housing for unused PCD3 I/O slots
410475150	Slot cover for unused PCD3 I/O slots
410475020	Slot cover for unused PCD3 I/O slots without SBC logo
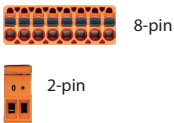
8-pin

2-pin

Saia PCD3 plug-in screw terminal blocks for basic modules and module holders

Type	Description	
440549950	8-pin spring terminal block	for power supply to PCD3.Mxxx0
440549520	Screw terminal	2-pin for supply PCD3.C200

Type A

Type C

Type E

Saia PCD3 plug-in terminal blocks and labelling for I/O modules

| Type	Description		
440549540	Plug-in I/O spring terminal block	10 - pin for wires up to 2.5 mm^2	type A
440549560	Plug-in I/O spring terminal block	24 - pin for wires up to 1.0 mm^2	type C
440549980	Plug-in I/O spring terminal block	14 - pin for wires up to 1.5 mm^2	type E
440549360	Plug-in I/O spring terminal block	12 - pin for PCD3.A810 for wires up to 1.5 mm^2	type F
440550270	Plug-in I/O spring terminal block	4 - pin for PCD3.A860 for wires up to 2.5 mm^2	type G
440550280	Plug-in I/O spring terminal block	6 - pin for PCD3.A860 for wires up to 1.0 mm^2	type H
440551130	Plug-in I/O spring terminal block	9 - pin for PCD3.F240 for wires up to 2.5 mm^2	type A9
440549340	Plug-in I/O spring terminal block	8 - pin for PCD3.W800 for wires up to 1.5 mm^2	type J
440550480	Plug-in I/O spring terminal block	10 - pin for wires up to 1.0 mm^2	type K
431087230	Set of 10 units: Transparent snap-on label holder including neutral inscription labels (2× DIN A4)		
432948191	Set of 10 units: Snap-on inscription carrier for modules		
431086860	Set of 10 units: Pre-printed self-adhesive strips for snap-on label holder		

Type F   Type G

Type H   Type J   Type K

Type D

System cables and "ribbon screw terminal" adapters (see Chapter 5.10 for details)

Type	Description
System cables for digital modules with 16 I/Os	
PCD2.K221	Sheathed, round cable with 32 strands of 0.25 mm^2, 1.5 m long, PCD side 34-pin ribbon cable connector type D, process side: strand ends free, colour coded
PCD2.K223	Sheathed, round cable with 32 strands of 0.25 mm^2, 3.0 m long, PCD side 34-pin ribbon cable connector type D, process side: strand ends free, colour coded
System cables for adapters PCD2.K520/..K521/..K525	
PCD2.K231	Sheathed, half-round cable with 34 strands, each 0.09 mm^2, 1.0 m long, 34-pin ribbon connector at both ends type D
PCD2.K232	Sheathed, half-round cable with 34 strands, each 0.09 mm^2, 2.0 m long, 34-pin ribbon connector at both ends type D
System cables for 2 adapters PCD2.K510/..K511 or 1 adapter and relay interface PCD2.K551	
PCD2.K241	Sheathed, half-round cable with 34 strands, each 0.09 mm^2, 1.0 m long, PCD side 34-pin ribbon connector type D, process side two 16-pin ribbon connector
PCD2.K242	Sheathed, half-round cable with 34 strands, each 0.09 mm^2, 2.0 m long, PCD side 34-pin ribbon connector type D, process side two 16-pin ribbon connectors

PCD2.K23x

"Ribbon/screw terminal" adapters

| Type	Description
PCD2.K510	for 8 inputs/outputs, with 20 screw terminals without LED
PCD2.K511	for 8 inputs/outputs, with 20 screw terminals and LED (for source operation only)
PCD2.K520	for 16 inputs/outputs, with 20 screw terminals without LED
PCD2.K521	for 16 inputs/outputs, with 20 screw terminals and LED (for source operation only)
PCD2.K525	for 16 inputs/outputs, with 3 × 16 screw terminals and LED (for source operation only)
PCD2.K551	Relay interface for 8 PCD transistor outputs with 24 screw terminals and LED
PCD2.K552	Relay interface for 8 PCD transistor outputs with 24 screw terminals, LED and manual control mode (on-off auto switch) and 1 output as feedback for manual control

PCD2.K525
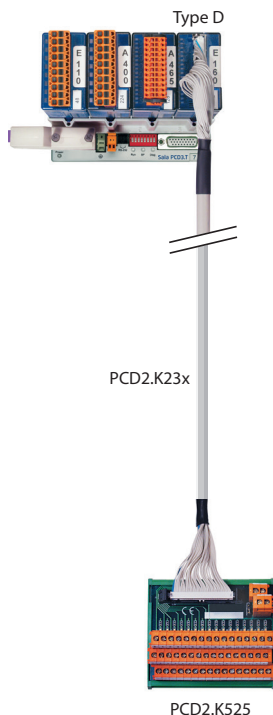
1.2.2 Saia PCD3.T66x remote I/O stations

The Smart RIOs are more than just another Ethernet remote I/O system. They can be programmed like a PLC and are therefore the ideal solution for distributed automation in line with the lean philosophy. Smart RIOs can be equipped with PCD3 I/O modules and expanded with PCD3 I/O module holders up to 256 I/Os per RIO station.

Design of Saia PCD3.T66x: Smart RIO head station with 4 slots for I/O modules
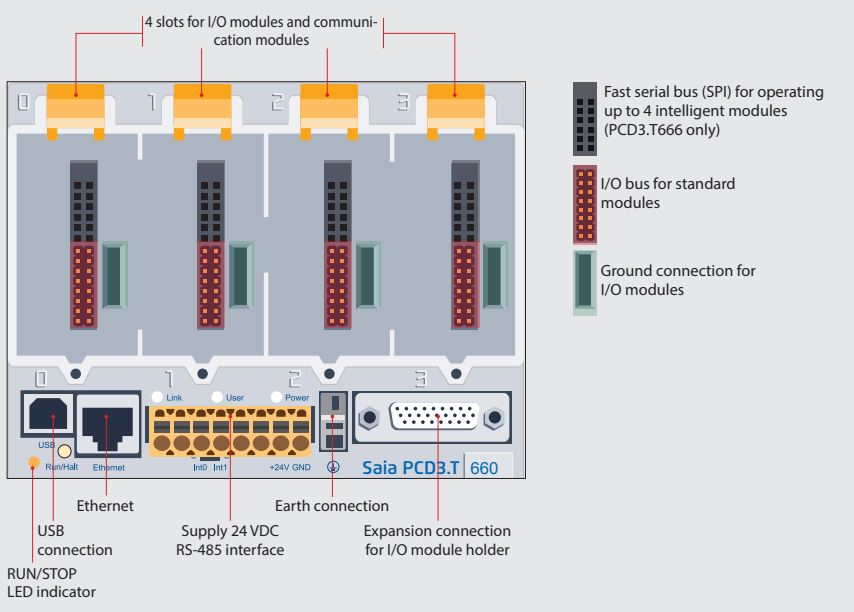
Dimensions
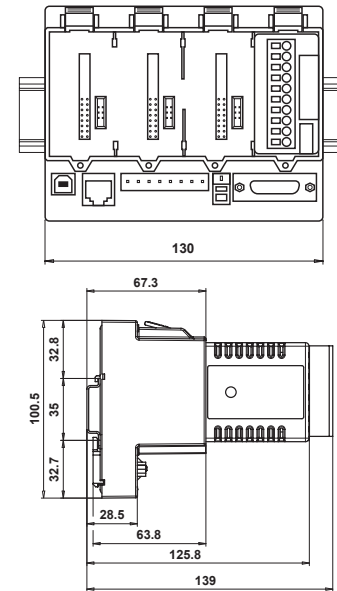
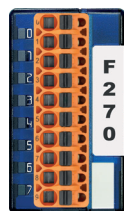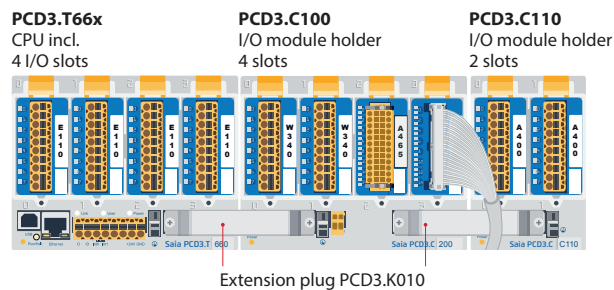## System properties

▸ Can be used as a simple remote I/O station or an intelligent programmable I/O station.

▸ Can be programmed with PG5. Important or time-critical tasks can be processed direct in the RIO.

▸ The RIO user programs are managed centrally in the Smart RIO Manager (PCD) and distributed to the RIOs automatically.

▸ Data exchange with efficient Ether S-IO protocol. Simple configuration with the RIO network configurator.

▸ Cross-communication with other PCD systems using Ether S-Bus (FBoxes).

▸ Intelligent communication modules (M-Bus, DALI) are supported with PCD3.T666.

▸ Other communication protocols (e.g. Modbus) via Ethernet TCP/IP and with PCD3.T666, also via the onboard RS-485 interface.

▸ Integrated Automation Server

I/O modules

The standard I/O modules of the PCD3 series can be used. For more information and types, see Chapter "Saia PCD3 input and output modules in cassette design" on page 26.

I/O extensions up to 256 I/O per RIO station

PCD3.T66x
CPU incl.
4 I/O slots

PCD3.C100
I/O module holder
4 slots

PCD3.C110
I/O module holder
2 slots

Extension plug PCD3.K010

Order details

Smart RIO

PCD3.T665	Smart-RIO, Ether S-IO data exchange, programmable, 32 kByte program memory
PCD3.T666	Smart RIO, Ether S-IO data exchange, programmable, 128 kByte program memory, serial interfaces

I/O module holder

PCD3.C100	Expansion module holder with 4 I/O slots
PCD3.C110	Expansion module holder with 2 I/O slots
PCD3.C200	Expansion module holder with 4 I/O slots and terminals for 24 VDC power supply

Distributed automation system design with Smart RIO

Smart Automation Manager

As Smart Automation Managers, PCD1.M21x0, PCD2.M5, PCD3.M2/3/5 CPUs and the programmable micro browser panel PCD7.D4xxxT5F can be used

Standard network components (e.g. Q.NET-5TX / 8TX) can be used to set up the Ethernet network

Smart RIOs PCD3.T66x

The maximum number of RIOs per Manager depends on the type of Manager used

The Smart RIOs can be used both as simple remote I/O stations and as intelligent programmable RIO stations.

Central program management in the Manager

Smart Automation Manager
Configuration & user program
M + S1, S2, S3, S4

Ethernet

Smart Automation Stations

S1 S2 S3 S4

The application programs are centrally managed by the Smart Automation Manager and distributed to the Smart RIOs. If hardware is replaced, the programs and the configuration are reloaded automatically.

The Manager must have sufficient memory resources to save the RIO programs. The onboard program memory and the plug-in flash memory modules PCD7.Rxxx and PCD3.Rxxx can be used for this.

Data transfer with Ether S-IO protocol

Simple configuration of the data transfer in the RIO network configurator

Data transfer cycle times

Number of RIOs	Minimum data transfer cycle time
10	50 ms
20	100 ms
40	200 ms
80	400 ms
128	800 ms

2 different transfer cycle times can be set per RIO station:
– Short cycle time for high-priority data
– Normal cycle time for low-priority or slow data

The exchange of data can be easily configured in PG5 with the RIO network configurator. The configured exchange of data between RIO and the Manager is processed automatically by the operating system. No user program is required for this. The Manager sends the data to the Smart RIOs on a cyclical basis with broadcast or unicast telegrams. The RIOs also send their data or statuses of their inputs to the RIO Manager on a cyclical basis.

Technical Data

Property		PCD3.T665	PCD3.T666
Number of inputs/outputs		64 in base unit, expandable to 256	
I/O module slots		4 in base unit, expandable to 16	
I/O modules supported		PCD3.Exxx, PCD3.Axxx, PCD3.Bxxx, PCD3.Wxxx	
max. number of RIO stations		128	
Protocol for data transfer		Ether S-IO	
Ethernet connection		10/100 Mbits, full-duplex, auto-sensing, auto-crossing	
Default IP configuration		IP address: 192.168.10.100 Subnet mask: 255.255.255.0 Default gateway: 0.0.0.0	
USB interface for configuration and diagnostics		Yes	
Program memory		32 kByte	128 kByte
Web server for configuration and diagnostics		Yes	
Web server for user pages		Yes	
Onboard file system for web pages and data		512 kByte	
BACnet® or LONWORKS®		No	No
Onboard interrupt inputs		2	
Onboard RS-485 interface		No	Yes
Special modules	for I/O slot 0 only	---	PCD3.F1xx
	for I/O slots 0…3 (up to 4 modules)	PCD3.H1xx --- ---	PCD3.H1xx counter PCD3.F26x DALI PCD3.F27x M-Bus
S-Web alarming/trending		No	No
Watchdog		No	
Real-time clock		No	
Software clock (not battery-powered)		yes, synchronised by the Manager	
Battery		No	

Smart Automation Manager (master station)

max. 16 RIO stations	PCD3.M2130, PCD3.M2330
max. 32 RIO stations	PCD1.M212x, PCD3.M3120, PCD3.M3160, PCD3.M3330, PCD3.M3360
max. 64 RIO stations	PCD1.M2160, PCD2.M4160, PCD3.M5340, PCD3.M5540, PCD3.M6x40, PCD7.D457VT5F, PCD7.D410VT5F, PCD7.D412DT5F
max. 128 RIO stations	PCD2.M4560, PCD3.M5360, PCD3.M5560, PCD3.M6560, PCD3.M6860

General data

Supply voltage	24 VDC ±20% smoothed or 19 VAC ±15% two-way rectified
Capacity of 5 V bus / +V bus (24 V)	max. 600 mA/100 mA
Ambient temperature	0…+55 °C or 0…+40 °C (depending on mounting position)
Storage temperature	−20…+70 °C
Relative humidity	30…95% RH with no condensation
Mechanical strength	in accordance with EN/IEC 61131-2

System properties/limits and recommendations for lean automation

In the case of lean automation, it is inefficient to exploit the specified limits or max. number of stations per Manager and max. number of I/Os per RIO. The following points should be considered:

▸ The load on the RIO Manager increases with the rising number of RIO stations. This has an impact on the overall application in the RIO Manager.

▸ If there is a large number of RIOs, a sufficiently large volume of PCD media must be reserved on the Manager for the data transfer.

▸ With the increased number of RIO stations, the build and download process in PG5 is extended accordingly. Likewise, the start-up behaviour of the Manager or the entire RIO network is proportionately longer.

Recommendation: 20 Smart RIOs per Manager is an effective configuration for efficient and flawless operation and easy commissioning and support.
The Smart RIOs do not have a battery. In the event of an interruption to the power supply, all the data in the RAM memory (registers, flags, DBs/text) will be lost. Data and parameters that are remanent must either be transferred by the Manager or stored in the RIO's flash file system. If this is not possible, it is recommended to use a normal controller instead of a Smart RIO.
The user programs are stored in the flash memory of the RIOs and are retained in the event of an interruption to the power supply.

1.2.4 Saia PCD3.M2130V6 Compact

The PCD3 Compact combines high functionality in confined spaces. With its compact dimensions, it can fit into the smallest switch cabinets. This makes it ideal for upgrading existing installations. It includes all the features of PCD3 technology and also has I/Os directly onboard.


System properties
- Fully programmable with PG5
- Compact dimensions: 130 × 140 × 74 mm (W × H × D)
- Integral interfaces USB, Ethernet and RS-485
- Slot A for optional PCD7.F1xxS serial communication modules
- 38 inputs/outputs contained in the base unit
- Replaceable lithium battery
- Configurable analogue inputs for voltage, current and temperature
- Expandable with PCD3.C200 or PCD3.C110 I/O module holder
- Remote I/O expansion with remote I/O PCD3.T66x (Ethernet)

Automation Server integrated in the base unit
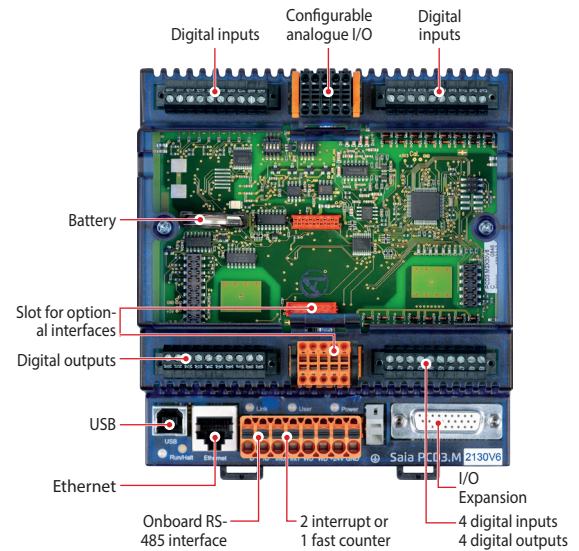
Onboard inputs/outputs

Type	Number	Input voltage	Signal ranges	Switching capacity VDC	Resolution	I/O connector type
Digital inputs	20	15…30 VDC	---	---	---	Plug-in screw terminals or push-in terminals with LED (optional)
Digital outputs transistor	12	---	---	0.5 A/ 5…32 VDC	---	Plug-in screw terminals or push-in terminals with LED (optional)
Analogue configurable inputs	4	---	−10 V…+10 V / 0…20 mA, Pt/ Ni1000, Ni1000 L&S, resistance 0…2500 Ω	---	13 bit / 12 bit	Plug-in spring terminals
Analogue outputs	2	---	0…10 V	---	12 Bit	Plug-in spring terminals

Dimensions
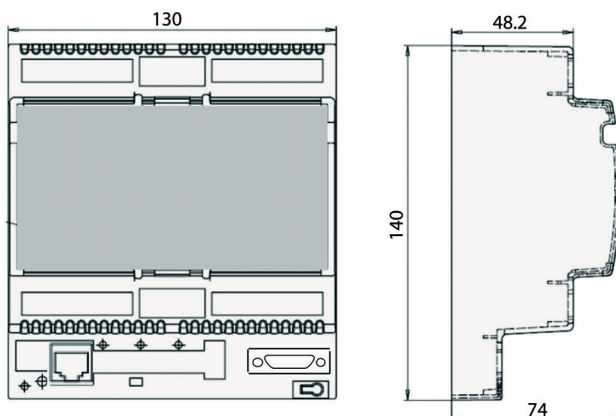
Saia PCD3 Compact Controller
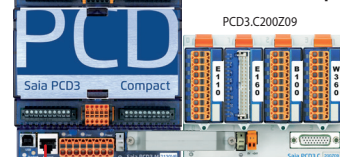
I/O bus connector PCD3.K010 — Up to 64 local data points

Up to 256 remote data points per RIO node

Remote expansion with PCD3.T66x RIOs via Ethernet or Ether S-Net

I/O bus extension cable PCD3.K106 | PCD3.K116

Up to 256 remote data points per RIO node

Performance overview and accessories

Power supply

Type	Description
Supply voltage (in accordance with EN/IEC 61131-2)	24 VDC −20 / +25% incl. 5% ripple
Current draw / input power	Type 175 mA / 4.2 W max. 500 mA / 12 W
Capacity 5 V/+V internal	max. 600 mA / 100 mA
Reclosing (in accordance with EN / IEC 61131-2)	≤ 10 ms for interval ≥ 1 s
Watchdog relay, make contact	48 VAC or VDC, 1 A

Communication interfaces to field level options in slot A

PCD7.F110S	RS-422 with RTS/CTS or RS-485 [1] electrically connected Suitable for Modbus, S-Bus, EnOcean, etc.
PCD7.F121S	RS-232 with RTS/CTS, DTR/DSR, DCD, suitable for modem, EIB, DALI connection.
PCD7.F150S	RS-485 [1] (electrically isolated)
PCD7.F180S	Belimo® MP-Bus, for connecting up to 8 drives on one line

[1] with line termination resistors that can be activated.

I/O expansions

Type	Description	Capacity
PCD3.C110Z09	2 module slots (connection with PCD3.K010 connector or with PCD3.K106/K116 cable)	0 mA
PCD3.C200Z09	4 module slots, with 24 VDC supply (connection with PCD3.K010 connector or with PCD3.K106/K116 cable)	1500 mA / 200 mA (5 V / +V)
PCD3.C110	2 module slots (connection with PCD3.K106/K116 cable only)	0 mA
PCD3.C200	4 module slots, with 24 VDC supply (connection with PCD3.K106/K116 cable only)	1500 mA / 200 mA (5 V / +V)

I/O modules see pages 27 and 28

Order details

| Type	Description
PCD3.M2130V6	Base units with 38 I/Os (supplied with plug-in screw terminals) CPU with 512 kByte user program, backup with onboard flash memory, 1 MB file system, USB port for programming with PG5, RS-485 interface, 2 interrupt inputs, integrated web and FTP server, 1 port (slot A) for PCD7.F1xxS communication modules, lithium battery for data backup for 1…3 years, Ethernet TCP/IP interface
440550660	Optional: Pluggable 10-pin "push-in" terminal block with LEDs for digital I/Os

1.2.5 Saia PCD3.M2330A4Tx Wide Area Controller

Saia PCD3 Wide Area Controllers are fully programmable, industrial control and automation devices with web, IT and telecommunications functions. Its potential uses therefore extend much further than those of classic RTU stations, which are normally only suitable for alarm monitoring with remote alarms and data logging. The PCD3 Wide Area Controller is also suitable for sophisticated control tasks.

System properties

▸ Fully programmable with PG5

▸ Compact dimensions: 130 × 140 × 74 mm (W × H × D) (without antenna)

▸ Management of historical data with up to 1 GB flash memory

▸ Integral telecommunications interface (PSTN, GSM/GPRS)

▸ Constantly accessible owing to redundant communication

▸ 14 inputs/outputs contained in the base unit
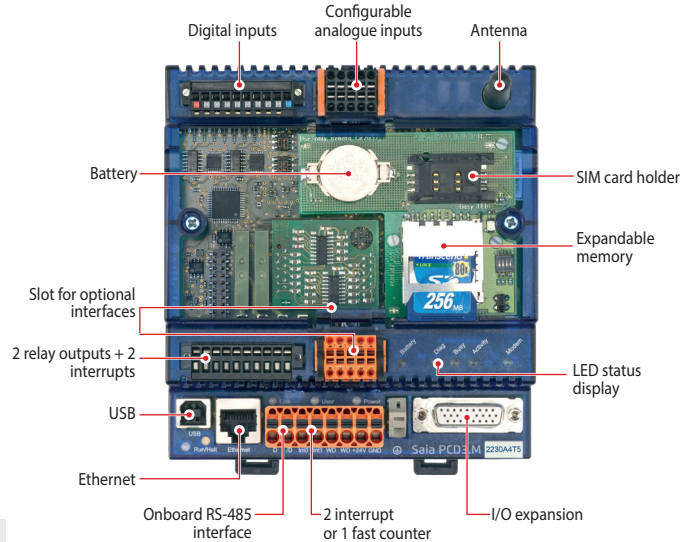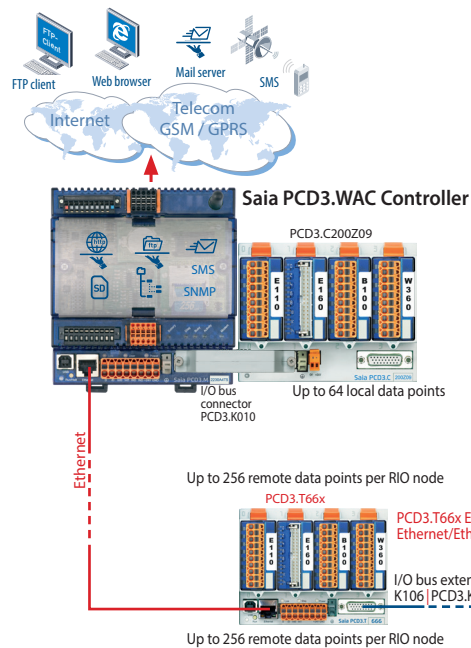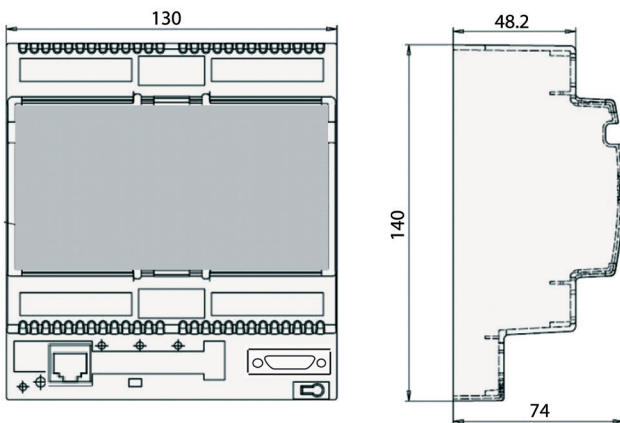

Automation Server integrated in the base unit

Onboard inputs/outputs

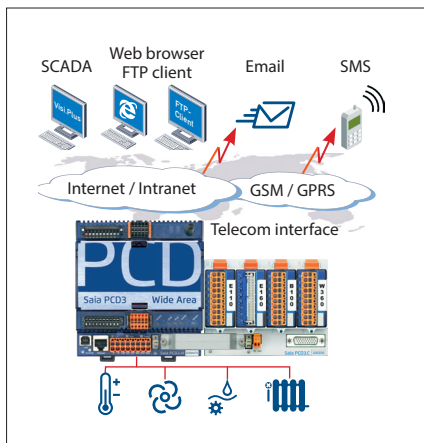| I/O data points	Properties
8 digital inputs + 2 interrupts	15…30 VDC
2 relay outputs	DC 2 A/50 V, AC 6 A/250 V
4 configurable analogue inputs	−10…+10 VDC, 0…±20 mA, Pt/Ni1000, Ni1000 L&S, 0…2500 Ω

Onboard interfaces

Interface	Transmission rate
RS-485 (serial) on terminal block for free protocols or Profi S-Net / Profibus-DP Slave	≤ 115.2 kbits ≤ 187.5 kbits
Ethernet TCP/IP	10/100 Mbits
USB 1.1 (PGU)	

Dimensions

Saia PCD3.WAC Controller

PCD3.C200Z09

Up to 64 local data points

I/O bus connector PCD3.K010

Up to 256 remote data points per RIO node

PCD3.T66x

PCD3.T66x Ethernet RIOs via Ethernet/Ether S-Net

I/O bus extension cable PCD3. K106 | PCD3.K116

Up to 256 remote data points per RIO node

Examples of applications

PCD3.WAC as an RTU controller

Send SMS messages and emails through the GSM/GPRS network. Use the PCD3. WAC with local I/Os to send messages, statuses or alarms to the SCADA system or to the end user via email and SMS.

Via integrated web and FTP servers can link external stations easily over Intranet and Internet. The integrated web server also permits access to external stations via standard web browsers.
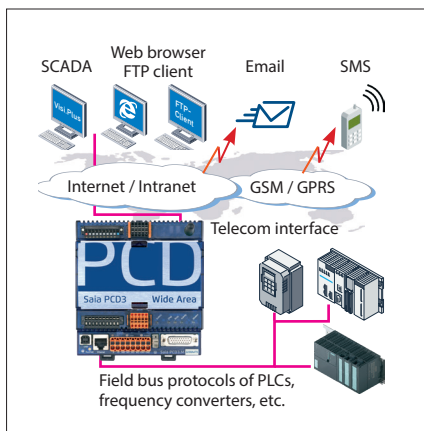
WAC communications gateway

The Saia PCD3.WAC can be used for non-SBC systems as a communications gateway to Internet or Intranet applications with integrated protocols such as FTP, HTTP or using open data modes, Ethernet or a serial interface.

Many field bus protocols are supported at the field level, such as Modbus TCP/RTU/ASCII, EIB, M-Bus, etc.
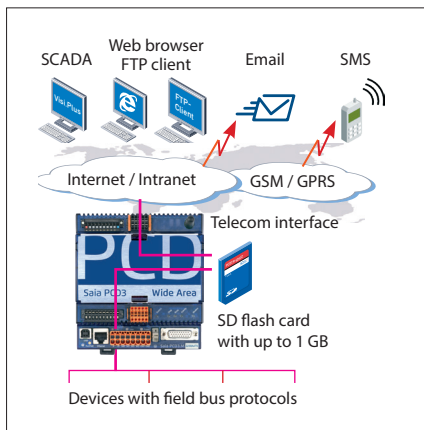
Ready for data management:

With up to 1 GB of memory, the Saia PCD3.WAC has enough memory to store data received from the field level over a long period. These data can be processed directly by the Saia PCD and then transferred to the management or upstream monitoring systems by email, FTP, HTTP or data communication. This makes the Saia PCD3 Wide Area Controller independent of management stations and therefore suitable as a data concentrator.

Remote operation and control have various applications for taking measurements, monitoring the status of systems and the relevant transfer of data.
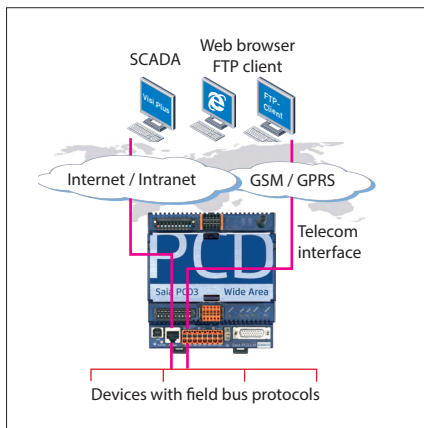
Permanently available owing to redundant communication

Bridging geographical distances is often a requirement for systems with a large number of distributed stations. With integrated telecommunications interfaces (GSM/GPRS, PSTN or ISDN) and an Ethernet interface, the Wide Area Controller is permanently available via its telecommunications interface and Ethernet port. Redundant communication paths (telecommunications or Ethernet interface) increase the reliability and availability of the system.

Performance overview, ordering information and accessories

Processor technology

RAM as program memory	512 kByte
Backup memory (flash)	512 kByte
Memory for file system (flash)	1 MB (onboard)
PCD media	8192 flags, 16,384 × 32-bit register

Telecom communication interface (alternatively integrated interfaces)

GSM / GPRS / SMS – sending and receiving

Internet and Intranet protocols

HTTP server	Visualisation with web browser and web panel
FTP Server	Easy data exchange
TCP/IP-PPP point-to-point protocol	Efficient communication
SMTP client	Sending emails with files (e.g. log files) as attachments
DHCP and DNS client	Easy integration in IP networks
SNTP client	Synchronisation of the internal clock
SNMP agent	Network management

Field level protocols

Serial S-Bus, Ether S-Bus and Profi S-Bus
MODBUS RTU or TCP EIB M-Bus IEC 870-5-101/103/104
For other protocols please refer to Chapter B2

Order type

PCD3.M2330A4T5	with GSM/GPRS modem (without antenna)

Additional data storage

Slot for SD flash cards	SBC SD card with up to 1 GB file system
Data files up to 900 files with file system	Download and upload via ftp
PCD7.R-SD512	SBC SD flash card, 512 MB with file system
PCD7.R-SD1024	SBC SD flash card, 1024 MB with file system

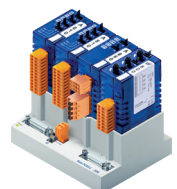**Communication interfaces for slot A**

PCD7.F110S	RS-422 with RTS/CTS or RS-485 [1] electrically connected Suitable for Modbus, S-Bus, EnOcean, etc.
PCD7.F121S	RS-232 with RTS/CTS, DTR/DSR, DCD, suitable for modem, EIB, DALI connection
PCD7.F150S	RS-485 [1] (electrically isolated)
PCD7.F180S	Belimo® MP-Bus, for connecting up to 8 drives on one line

[1] with line termination resistors that can be activated.

I/O expansions

PCD3.C110Z09	2 module slots (connection with PCD3.K010 connector or with PCD3.K106/K116 cable)	0 mA
PCD3.C200Z09	4 module slots, with 24 VDC supply (connection with PCD3.K010 connector or with PCD3.K106/K116 cable)	1500 mA / 200 mA (5 V / +V)
PCD3.C110	2 module slots (connection with PCD3.K106/K116 cable only)	0 mA
PCD3.C200	4 module slots, with 24 VDC supply (connection with PCD3.K106/K116 cable only)	1500 mA / 200 mA (5 V / +V)

I/O modules see pages 27 and 28

1.3 Standby System

With the PCD3.M6880 standby controllers, redundant automation solutions can be achieved.
This helps to ensure uninterrupted operation of systems and processes.

1.3.1 PCD3.M6880

**Modular PCD3 standby controller with 2 Ethernet TCP/IP ports and
a coprocessor for standby operation.**

Page 47

1.3.2 PCD3.T668

**Smart RIO for standby system,
for connection to the PCD3.M6880 CPU1.**

49

Automation
stations

1

Operation
and monitoring

2

Room controllers

3

Consumer
data acquisition

4

Switch cabinet
components

5

Standby System Overview

Introduction

The PCD3.M6880 Standby Controllers are for creating redundant automation solutions, to ensure the uninterrupted operation of systems and processes.

Standby (redundant automation) systems from SBC have the following characteristics:

▸ Based on the modular and robust PCD3 family, using standard modules.

▸ Simple system architecture to reduce costs.

▸ Standby processors with shared Ethernet Remote I/Os avoids the duplication of the inputs/outputs and the sensors/actuators.

▸ Programmable remote I/Os create intelligent decentralized nodes to provide additional reliability.

▸ The network uses standard Ethernet components, and can run over a standard Ethernet TCP/IP network along with other services.

▸ Easy engineering and commissioning, using the PG5 Project Manager to automatically generate the project.

▸ Uninterrupted switching from Standby to Active device.

▸ Standby controllers contain two processors. One processor runs the redundant program and monitors the active PCD. The second independent processor runs other non-redundant processes. This significantly increases the performance and flexibility of the system.

▸ Comprehensive diagnostic features to aid commissioning and fault finding.
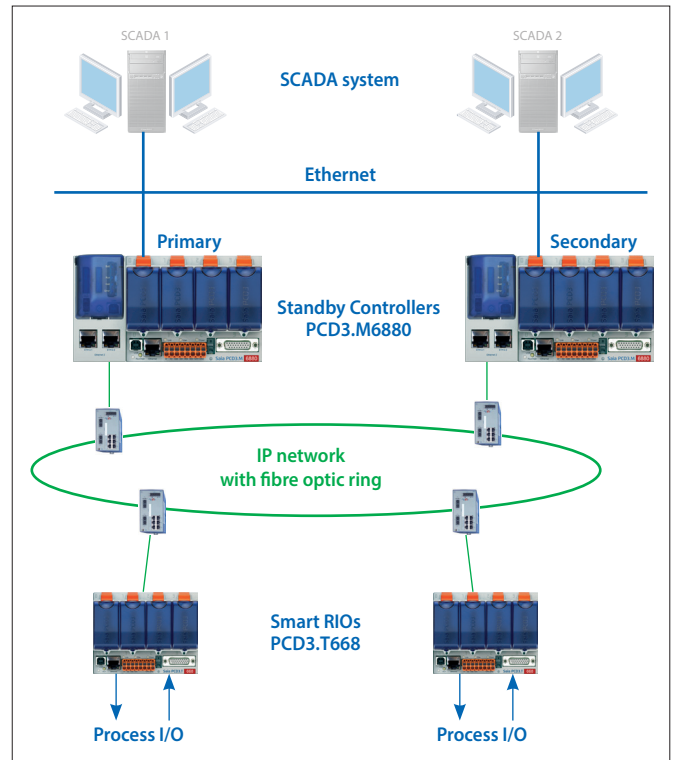
Typical layout of a redundancy system with two PCD3.M6880 Standby devices and PCD3.T668 Ethernet Smart RIOs.

Terminology

The following definitions will provide a better understanding of the properties and operating principles:

Standby Controller	The PCD3.M6880 controller which supports the standby feature.
Primary PCD	The PCD which becomes the active device by default when the system is powered up, depending on the configuration.
Secondary PCD	The PCD which becomes the standby device on power up, and only takes over active control in the event of a fault on the active device.
Active PCD	The PCD whose CPU1 is in Active Mode, running the redundant program and controlling the inputs/outputs (PCD3.T668 RIOs).
Standby PCD	The PCD whose CPU1 is in Standby mode. It does not run the redundant program and the outputs (PCD3.T668 RIOs) are not controlled by this device.
Main CPU	CPU0 of the Primary or the Secondary PCD, which runs the non-redundant program. This program may be different on the Primary and Secondary devices.
Redundant CPU	CPU1 of the Primary or Secondary PCD, which contains the Redundant program. This program must be the same on the primary and Secondary devices. This CPU is either in Active mode and running the Redundant program, or in Standby mode and monitoring the Active PCD.

Redundant control solutions are created using two PCD3.M6880 Standby Controllers. The input/outputs (process signals) are connected and controlled via PCD3.T668 Ethernet smart RIOs. The RIO stations are connected to both controllers via an Ethernet connection. This means there is no need to have duplicate inputs, outputs, sensors and actuators. The two PCDs (primary and secondary) monitor each other. If the active PCD fails, the standby PCD takes over processing and control of the connected RIO stations. The process image (I/O) and the internal PCD media (F, R, T, C, DB) - the synchronization data - are continuously transferred from the active PCD to the standby PCD via the Ethernet connection. This ensures uninterrupted switching from the active to the standby PCD.

The Redundant CPU1 has two independent Ethernet interfaces. The ETH 2.x interface is reserved exclusively for operating the PCD3.T668 RIO stations. The PCDs also synchronize their process data via the same interface. For security reasons, we recommend setting up this network as a ring structure with specific network components from third-party providers. We have had good experiences with the industrial Ethernet switches from Hirschmann.

Ethernet 2
(2 port switch)

The ETH 1 interface on CPU0 is available for connecting and operating other systems and devices. For example, SCADA systems can be connected via this interface. SBC does not provide its own SCADA system for redundant automation solutions, but almost any system can be used. A single SCADA system, or an additional redundant SCADA system can be used if it supports redundant controllers. The PCD3.M6880 controllers provide detailed status and diagnostic information which can be evaluated by the SCADA systems.


Ethernet 1

Ordering Information

| Type	Description	Weight
PCD3.M6880	Modular PCD3 standby controller with 2 Ethernet TCP/IP ports and a coprocessor for standby operation.	820 g
PCD3.T668	Smart RIO for standby system, for connection to the PCD3.M6880 CPU1.	480 g

Designing the System

Redundant automation solutions can be achieved with various network topologies.

Physically separating the management network (SCADA systems) and the network for the remote I/Os is recommended. We also recommend setting up the remote I/O network in a ring structure using fibre-optic network components. This significantly increases the performance, security and, above all, the network availability and thus the system reliability. Standard devices from third-party providers can be used for the network components (switches). We have had good experiences with the switches (RS30) from Hirschmann. However, the networks can also be set up with standard components in a star structure. A shared physical network for the remote I/Os and management systems is also possible, but availability of the system will be reduced accordingly.
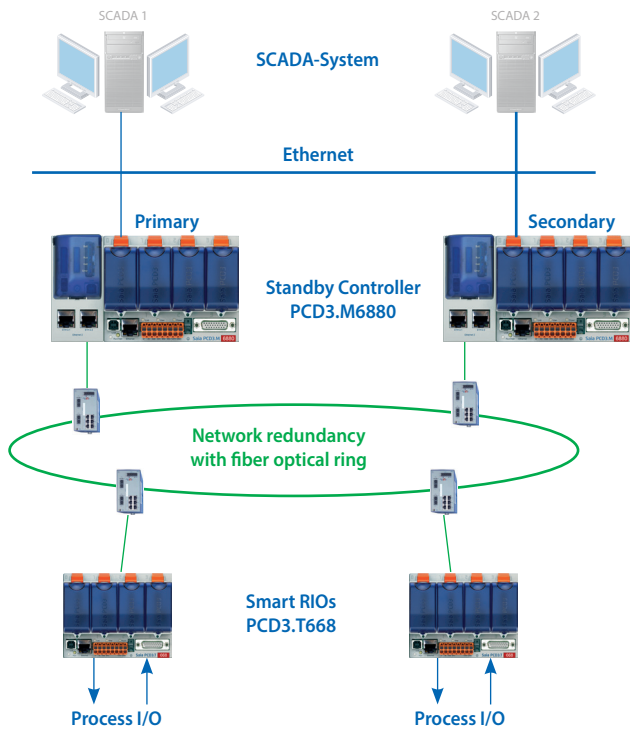
Recommended network topology with physically separate networks and a fibre-optic ring
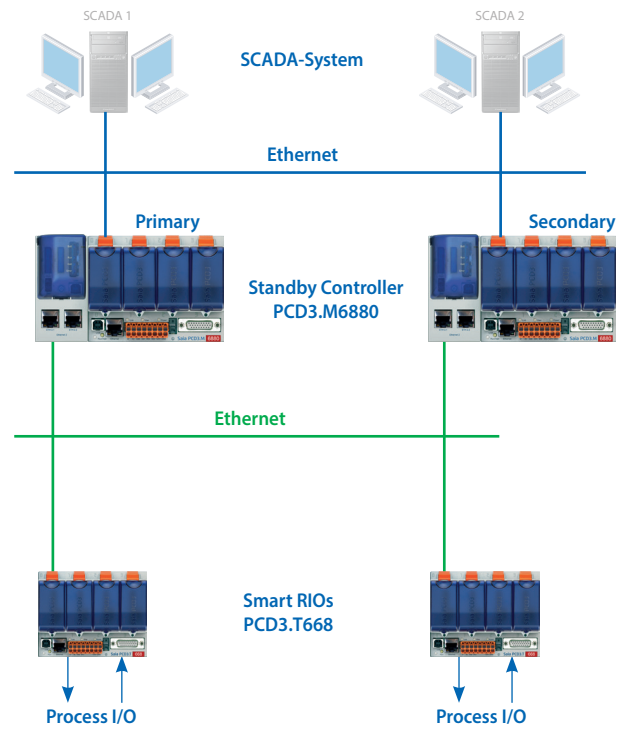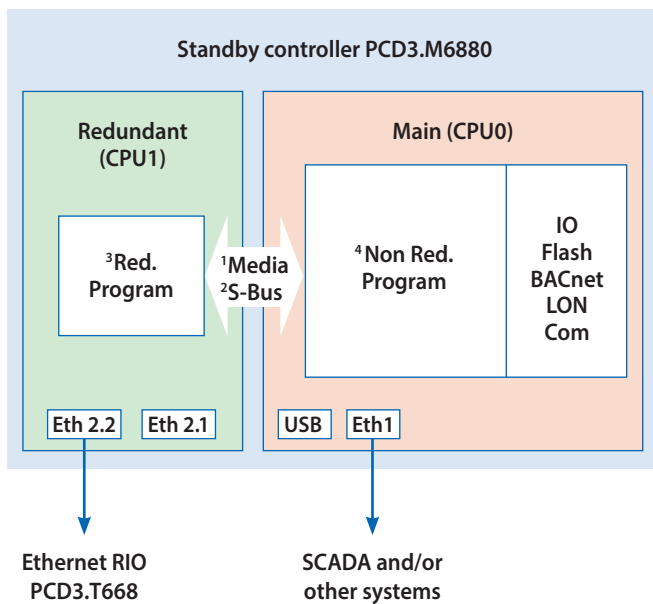

Physically separate networks in a star topology with standard components
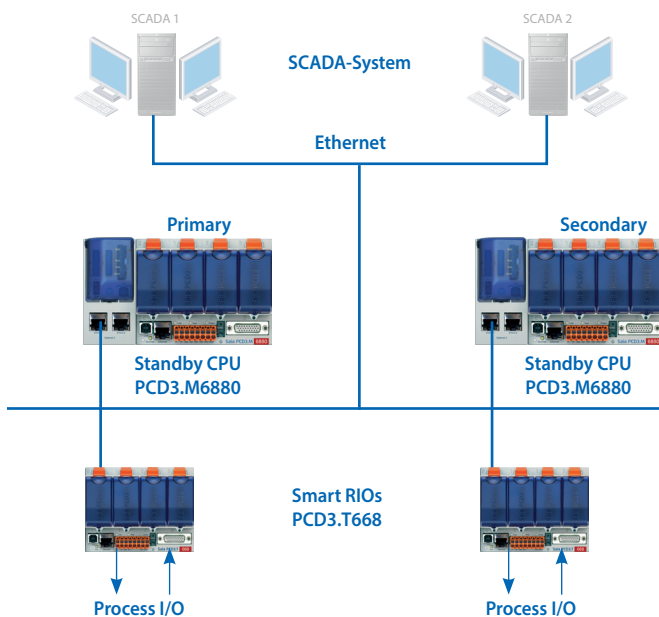
Shared physical network in a star topology with standard components

1.3.1 PCD3.M6880 Standby Controller
Architecture of the PCD3.M6880

Standby controller PCD3.M6880

Redundant (CPU1)	Main (CPU0)

[3]Red. Program   [1]Media [2]S-Bus   [4]Non Red. Program   IO Flash BACnet LON Com

Eth 2.2 Eth 2.1   USB Eth1

Ethernet RIO PCD3.T668

SCADA and/or other systems

PCD3.M6880

[1] Data Media Transfer (Exchange Range or/and CSF/FBox)

[2] S-Bus GWY CPU0 to CPU1 (2 different S-Bus address)

[3] Redundant program on CPU1 runs only if active. Same program on both PCDs.

[4] Non-redundant program can be different in both PCDs.

The PCD3.M6880 standby controller has two independent processors (CPU0 and CPU1). Both processors have their own independent PCD media (F, R, T, C, DB/TX).

The redundant CPU1 runs the redundant user program and controls the shared inputs/outputs of the PCD3.T668 remote I/Os. The redundant programs in the primary and secondary PCD3.M6880s are identical. During normal operation, only the active PCD runs the redundant program. CPU1's internal used PCD media (F, R, T, C, DB/TX) are transferred from the active to the standby PCD via the Ethernet interface 2 (ETH2.x). In the event of a fault, the standby PCD takes over operation without interruption, and runs the redundant program using the last process image from the active PCD.

Depending on requirements, the user programs of the main CPU0 can be different in the primary and secondary PCD3.M6880. CPU0 has the same capabilities as a standard PCD (e.g. PCD3.M5560). Local I/Os in the PCD's slots, and the I/O expansion modules, are controlled by CPU0. External systems and devices (SCADA systems, web browsers and other external devices) communicate only with CPU0. CPU0's internal PCD media (F, R, T, C, DB) are not synchronized between the active and standby PCD.

CPU1's program cannot directly access the local IOs or CPU0's media (and vice versa). Data is exchanged between CPU0 and CPU1 using a data exchange mechanism. The data to be exchanged (PCD media) are define in global symbol files. This data is automatically exchanged between CPU0 and CPU1 on each program cycle.

Saia PCD3.M6880 controllers

High Power Standby Controller
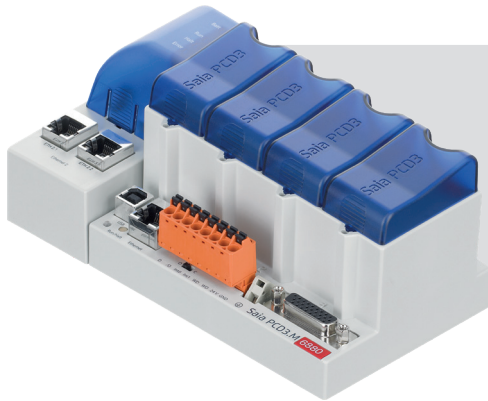
1.023	I/O
up to 4.2 GB	File system
2 MB	Program
0.1/0.3 µs bit/word	CPU speed

Property/function	PCD3.M6880	
	Main CPU0	Redundant CPU1
Number of inputs/outputs	1023	—
or I/O-module slots	64	—
I/O expansion connection for PCD3.C module holder	Yes	—
Processing time [µs] bit operation	0.1…0.8 µs	
word operation	0.3 µs	
Real time clock (RTC)	Yes	

On-Board memory

Program memory, DB/TEXT (Flash)	2 MByte	
User memory, DB/TEXT (RAM)	1 MByte	128 KByte
Flash memory (Program, S-RIO and configuration)	128 MByte	
User flash file system (INTFLASH)	128 MByte	—
PCD media:		
Register	16384	16384
Flag	16384	16384
DB/TEXT	8192	8192

On-Board interfaces

USB 1.1	Yes	No
Ethernet 10/100 Mbit/s, full-duplex, auto-sensing/auto-crossing	ETH1	ETH2.x (2 port switch)
RS-485 on terminal block (Port 2) or RS-485 Profibus-DP Slave, Profi-S-Net on terminal block (Port 2)	up to 115 kbit/s up to 187.5 kbit/s	—

Optional communication interfaces

I/O slot 0: PCD3.F1xx modules for RS-232, RS-422, RS-485 and Belimo MP-Bus	Yes	No
I/O slot 0…3 up to 4 modules or 8 interfaces: PCD3.F2xx modules for RS-232, RS-422, RS-485, BACnet® MS/TP, Belimo MP-Bus, DALI and M-Bus	Yes	No

## Other features

Communication protocols/systems (BACnet, Modbus, LONWORKS®, DALI, M-Bus…)	As PCD3.M6860 without 2nd Ethernet	No
Automation server (web server, FTP server, e-mail, SNMP, flash file system…)	Yes	No
Connection and operation of PCD3.T668 remote I/O Number of supported RIO stations	No —	Yes 64
Connection and operation of PCD3.T665/T666 remote I/O Number of supported RIO stations	Yes 64	No —
Access to the I/O slots in the basic housing as well as to the PCD3.Cxxx I/O terminal bases	Yes	No

Switchover Criteria

Each of the Standby PCDs (CPU1) sends a „Keep Alive" telegram to its partner for supervision.

The STANDBY PCD switches to ACTIVE when:

▸ No Keep Alive telegram has been received within the „Keep alive timeout" period defined with the Redundant CPU's Device Configu-
  rator. The "Keep Alive Timeout" can be adjusted between 100…500 ms. By this the max. switchover latency is <100…500 ms.

▸ The ACTIVE PCD's state is not RUN or STOP (stops sending Keep Alive).

▸ A manual Switchover command is executed. This is only possible if the Primary device does not have priority, the „Primary device has
  priority" option must be „No".
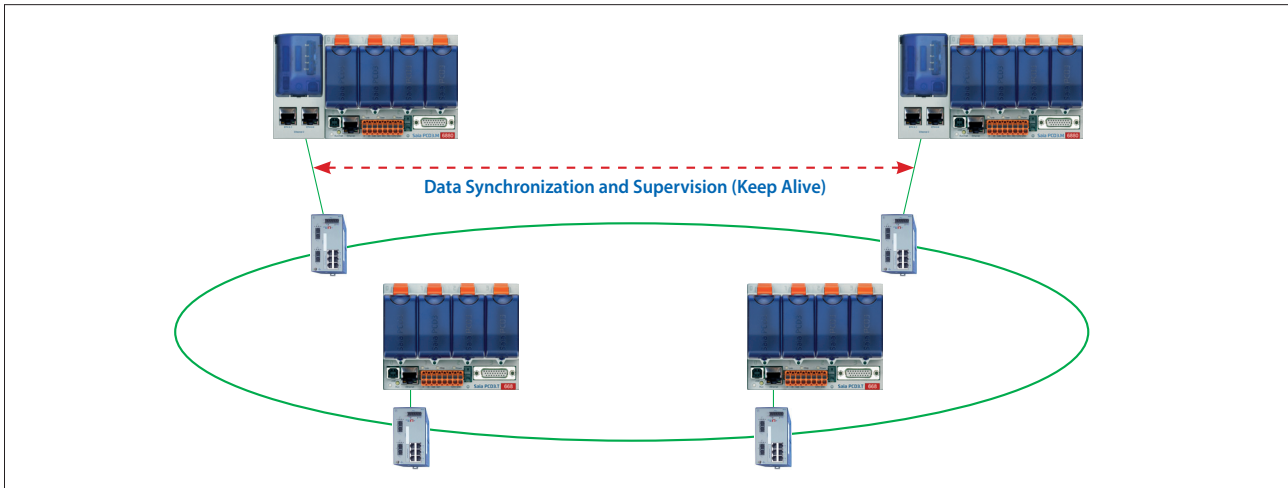
Data Synchronisation and Program Cycle:

The used PCD medias (R, F, T/C, DB/TX) in the redundant CPU1 are cyclically synchronized between the active and the standby PCD. The synchronization time for all PCD media is normally less than 200 ms. This time is reduced accordingly if only a part of the PCD media is used. The total program cycle time is calculated as follows:

Total cycle time = program execution time + data synchronization time

The max. value for a large application can be calculated as follows: 100 ms + 200 ms = 300 ms max.
For smaller applications where less PCD media are used the cycle time is reduced correspondingly.

1.3.2   PCD3.T668 Standby RIO
Architecture of the PCD3.T668

The PCD3.T668 remote I/Os are exclusively for use with the PCD3.M6880 Standby Controllers. With the exception of the redundancy function, they support the same properties/functions as the PCD3.T666 remote I/O station. The PCD.T665 and PCD3.T666 standard remote I/Os cannot be used with Standby Controllers.

▸ Can be used as a simple local I/O station or an intelligent programmable
  I/O station

▸ Can be programmed with the PG5. Important or timecritical tasks can be
  processed directly in the RIO

▸ The RIO's user programs are managed centrally by the Smart RIO Manager
  (PCD) and downloaded to the RIOs automatically

▸ Data exchange uses the efficient Ether-S-IO protocol. Simple configuration
  with the RIO Network Configurator

▸ Cross-communication with other PCD systems using Ether-S-Bus (FBoxes)

▸ Intelligent communication modules (e.g. M-Bus, DALI) are supported

▸ Other communication protocols (e.g. Modbus) via Ethernet TCP/IP and
  also by the onboard RS-485 interface

▸ Integrated Web Server

Technical data

Property		PCD3.T668
Number of inputs/outputs		64 in base unit, extensible to 256
I/O-module slots		4 in base unit, extensible to 16
I/O-modules supported		PCD3.Exxx, PCD3.Axxx, PCD3.Bxxx, PCD3.Wxxx
Max. number of RIO stations		128
Protocol for data transfer		Ether-S-IO
Ethernet connection		10/100 Mbit/s, full-duplex, auto-sensing, auto-crossing
Default IP configuration		IP address: 192.168.10.100 Subnet mask: 255.255.255.0 Default gateway: 0.0.0.0
USB port for configuration and diagnostics		yes
Program memory		128 kByte
Web server for configuration and diagnostics		yes
Web server for user pages		yes
On-Board file system for web pages and data		512 kByte
BACnet® or LonWorks®		no
On-Board interrupt inputs		2
On-Board RS-485 interface		yes
Special modules	for I/O-slot 0 only	PCD3.F1xx
	for I/O-slots 0…3 (up to 4 modules)	PCD3.H1xx counter PCD3.F26x DALI PCD3.F27x M-Bus
S-Web alarming/trending		no
Watchdog		no
Real-time clock		no
Software clock (not battery-powered)		yes, synchronized by the Manager
Battery		no

General data

Supply voltage	24 VDC ±20 % smoothed or 19 VAC ±15 % full-wave rectified
Capacity of 5 V bus / 24 V bus	max. 650 mA/100 mA
Ambient temperature	0…+55 °C or 0…+40 °C (depending on mounting position)
Storage temperature	–20…+70 °C
Relative humidity	30…95 % RH with no condensation
Mechanical strength	according to EN/IEC 61131-2

System properties/limits and recommendations for lean automation

With lean automation, it is not recommended to make full use of the specified limits with regard to the maximum number of stations per Manager and the maximum number of I/Os per RIO. The following points should be taken into account:

▸ The load on the RIO Manager increases with the rising number of RIO stations. This has an impact on the overall application in the RIO Manager.

▸ If there is a large number of RIOs, a sufficiently large amount of PCD media must be reserved on the Manager for the data transfer.

▸ With a rising number of RIO stations, the build and download process in PG5 is lengthened accordingly. Likewise, the start-up behavior of the Manager or the entire RIO network is proportionately longer.

Recommendations: 20 Smart RIOs per Manager is a sensible configuration for efficient and problem-free operation, and simple commissioning and support.

The Smart RIOs do not have a battery. In the event of an interruption to the power supply, all the data in the RAM memory (registers, flags, DBs/text) will be lost. Data and parameters that are to remain must either be transferred by the Manager or stored in the RIO's flash file system. If this is not possible, the use of a normal controller in place of a Smart RIO is recommended. The user programs are stored in the flash memory of the RIOs and are retained in the event of an interruption to the power supply.

1.4 PCD2 – modular, expandable, compact CPU

Overview of fully programmable controllers Saia PCD2 device series

Saia PCD2 controllers

Base unit with 4 slots for I/O modules
▸ PCD2.M4160   Basic 64 I/Os
▸ PCD2.M4560   Extended 1023 I/Os

Base unit with 8 slots for I/O modules
▸ PCD2.M5540   Expanded with Ethernet switch

Up to 4 integrated communication interfaces. With plug-in modules expandable up to max.15 communication interfaces. Integrated Automation Server in all CPUs.

Saia PCD2 module holder for I/O expansion

Module holder for I/O modules
▸ PCD2.C1000   4 I/O slots
▸ PCD2.C2000   8 I/O slots

Expandable up to 1023 I/Os

Saia PCD2 input/output modules

Modules with various functions with plug-in terminals
▸ PCD2.Exxx   Digital input modules
▸ PCD2.Axxx   Digital output modules
▸ PCD2.Bxxx   Digital input/output modules
▸ PCD2.Wxxx   Analogue input/output modules
▸ PCD2.Gxxx   Combined input/output modules

Saia PCD2 interface modules

Plug-in modules to expand the communication interfaces
(up to 4 modules or 8 interfaces)
▸ PCD7.F1xxS   1 serial interface RS-232, RS-422/485, Belimo MP-Bus
▸ PCD2.F2xxx   2 serial interfaces RS-232, RS-422/RS-485
▸ PCD2.F2150   BACnet® MSTP
▸ PCD2.F2400   LonWorks®
▸ PCD2.F2610   DALI
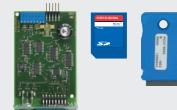▸ PCD2.F27x0   M-Bus
▸ PCD2.F2180   Belimo MP-Bus

Saia PCD2 memory modules

Plug-in memory modules for data and program backup
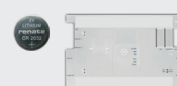▸ PCD2.R6xx Basic module for SD flash cards for slots 0…3
▸ PCD7.R-SD SD flash cards for PCD3.R6xx
▸ PCD7.R5xx   Flash memory modules for slots M1 & M2
▸ PCD7.R610   Flash memory modules for slot M1 & M2
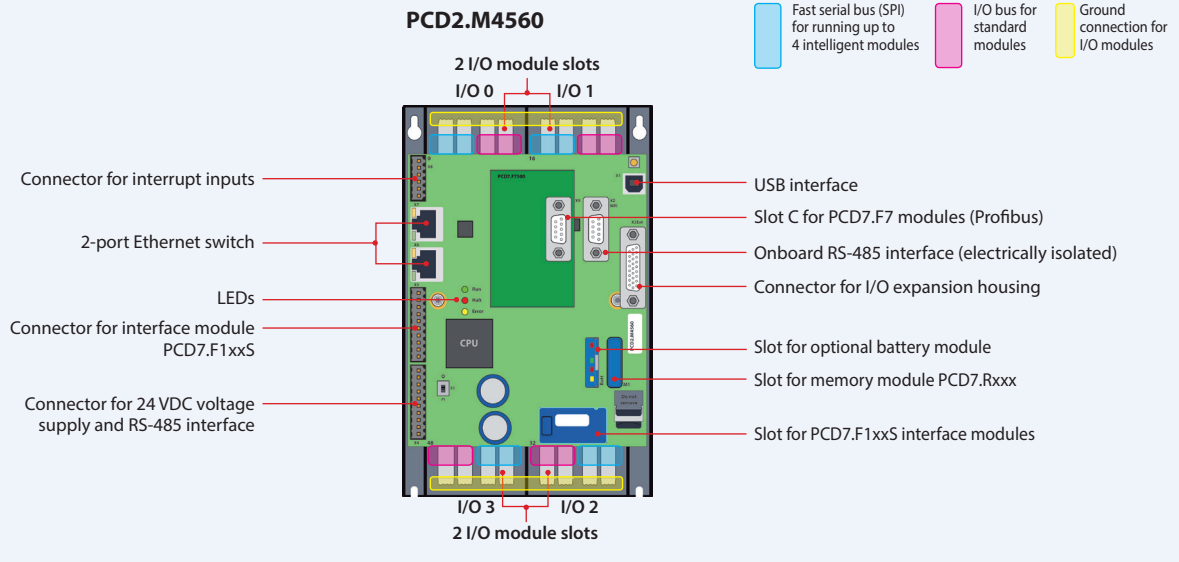
Consumables and accessories for Saia PCD2 controllers

Housing covers, plug-in screw terminal blocks, I/O bus connection,
battery, system cables and adapters

Saia PCD2.M4xx controllers

The PCD2.M4x60 controller is based on a flat, space-saving housing design that has already been successfully used in the OEM and project business for many years. This modular, fully programmable CPU is suitable for both small and large applications, for example in machine controllers, building automation and infrastructure automation. The modular CPU is powerful, compact and can be expanded with up to 1,023 local data points Generous memory resources and sufficient CPU power for demanding communication tasks with up to 14 interfaces (BACnet, LONWORKS®, Profibus, M-Bus, Modbus, DALI, etc.).
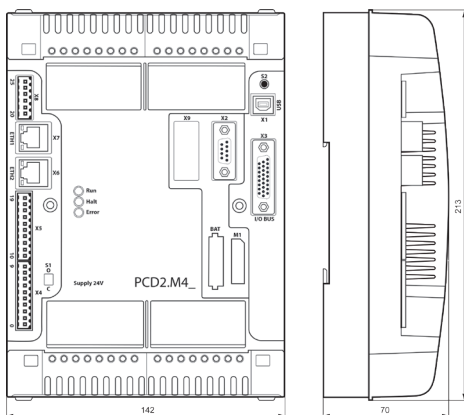

PCD2.M4560

2 I/O module slots
I/O 0 — I/O 1

Fast serial bus (SPI) for running up to 4 intelligent modules

I/O bus for standard modules

Ground connection for I/O modules

Connector for interrupt inputs

2-port Ethernet switch

LEDs

Connector for interface module PCD7.F1xxS

Connector for 24 VDC voltage supply and RS-485 interface

USB interface

Slot C for PCD7.F7 modules (Profibus)

Onboard RS-485 interface (electrically isolated)

Connector for I/O expansion housing

Slot for optional battery module

Slot for memory module PCD7.Rxxx

Slot for PCD7.F1xxS interface modules

I/O 3 — I/O 2
2 I/O module slots

System properties

▸ Up to 14 communication interfaces
▸ 4 slots for PCD2 I/O modules in base unit
▸ Up to 64 inputs/outputs in base unit, can be expanded locally to up to 1,023 I/O
▸ Automation Server onboard
▸ Large onboard memory for programs (2 MB) and data (128 MB)
▸ Memory with SD flash cards can be expanded up to 4 GB
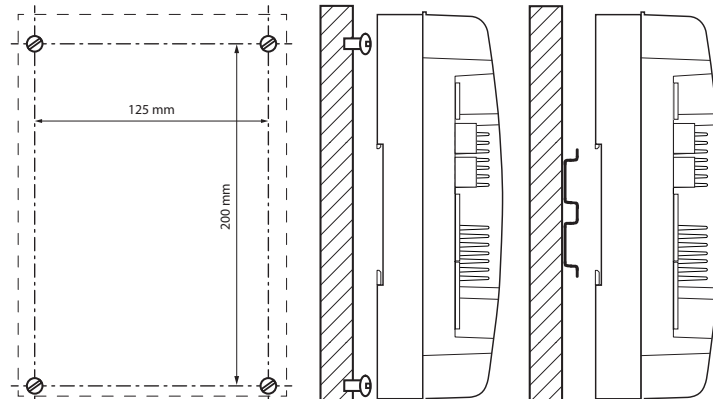▸ Battery-free with FRAM technology – protects PCD media (R, F, DB/TEXT) from loss even in a de-energised state

ftp	http	SNMP	@		SD

Automation Server integrated in base unit

Dimensions

Compact mass:
142 × 213 × 49 mm

Mounting

125 mm

200 mm

Screw diameter: less than Ø 4.9
Screw head diameter: less than Ø 8.0

Technical data and ordering information for PCD2.M4xxx controllers

Technical overview

Technical data		PCD2.M4160	PCD2.M4560
Number of digital inputs onboard		4 digital inputs (24 V, 4× interrupt)	
Number of digital inputs/outputs in the base unit resp. I/O module slots in the base unit		64 4	
Number of digital inputs/outputs expandable with PCD2.C2000 and PCD2.C1000 module holders resp. I/O module slots			960 60
Processing time [µs]	Bit operation Word operation	0.1…0.8 µs 0.3 µs	
Real-time clock (RTC)		Yes	
Supercap to support real-time clock		< 10 days	
Slot for optional battery holder module Order number 4 639 4898 0		Yes, to support real-time clock for < 3 years	

Onboard memory

	PCD2.M4160	PCD2.M4560
Program memory, DB/text (flash)	512 kB	2 MB
User memory, DB/text (RAM)	128 kB	1 MB
Flash memory (S-RIO, configuration and backup)	128 MB	128 MB
User flash file system (INTFLASH)	8 MB	128 MB
Data backup with FRAM technology (the data is retained in a de-energised state)	for R, F, DB, TEXT	for R, F, DB, TEXT

Onboard interfaces

	PCD2.M4160	PCD2.M4560
USB 1.1	≤ 12 Mbit/s	
Ethernet, 2-port switch	≤ 10/100 Mbit/s, full duplex, auto-sensing/auto-crossing	
RS-485 on terminal block (port 0)	≤ 115.2 kbit/s	
RS-485 free protocols on D-Sub connector (port 2) or RS-485 Profibus-DP Slave, Profi-S-Net on D-Sub connector (port 10)	No	≤ 115.2 kbit/s ≤ 1.5 Mbit/s (elec. isolated)

Additional interfaces

	PCD2.M4160	PCD2.M4560
PCD2.F2xxx modules for RS-232, RS-422, RS-485, BACnet MS/TP, Belimo MP-Bus, DALI and M-Bus	I/O slot 0…1 2 modules	I/O slot 0…3 4 modules
Slot A for PCD7.F1xxS modules	Yes	
Slot C for Profibus module PCD7.F7500	No	Yes

General data

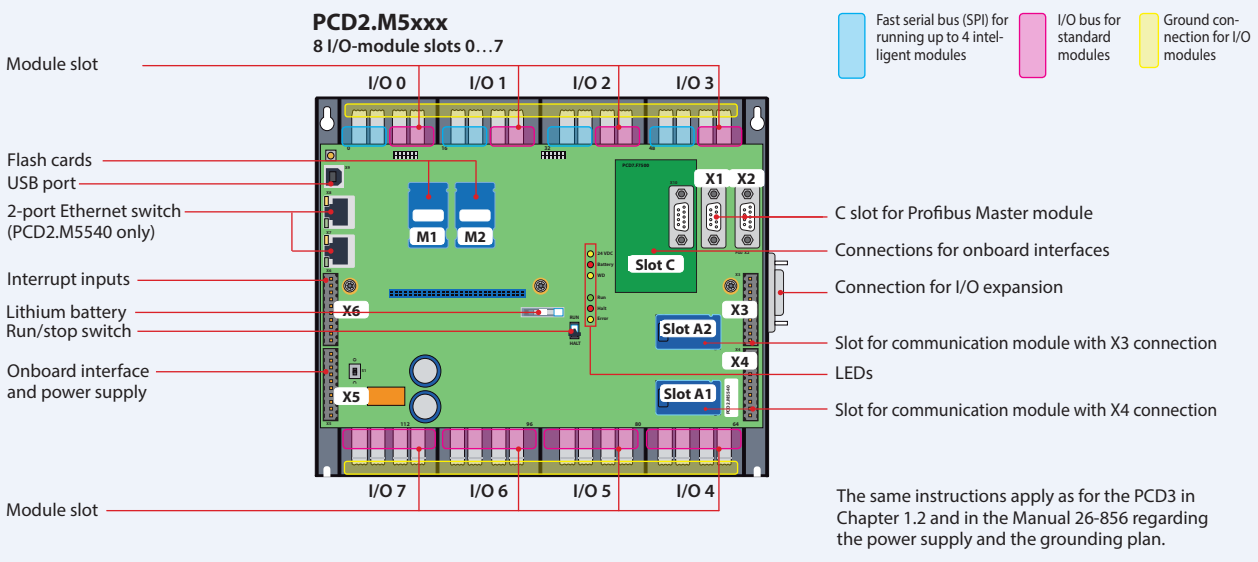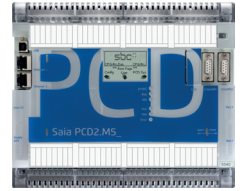|	
Supply voltage (in accordance with EN/IEC 61131-2)	24 VDC, −20/+25% max. incl. 5% ripple
Power consumption	typically 15 W for 64 I/Os
Load capacity 5 V/+ V internal	max. 800 mA/250 mA

Ordering information

Type	Description
PCD2.M4160	PCD2 processor unit with Ethernet TCP/IP, 512 kbytes program memory, 64 I/Os
PCD2.M4560	PCD2 processor unit with Ethernet TCP/IP, 2 MB program memory, 1,023 I/Os

◆ Accessories, e.g. connectors, covers, etc. are described in the last page of this chapter.

◆ Details can be found in the manual 27-645.

Saia PCD2.M5xxx controllers

Due to its flat housing design, the Saia PCD2.M5xxx is ideal for space-saving applications. The powerful CPU enables the control and regulation functions of complex applications with up to 1023 central data points. This allows the PCD2 to be expanded for Lon IP® or BACnet®-compatible controller using plug-in memory modules. The PCD2 has communication interfaces such as USB, Ethernet, RS-485 and onboard Automation Server.
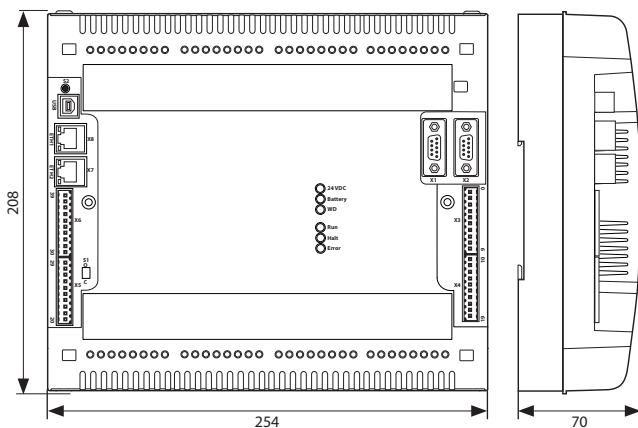

PCD2.M5xxx
8 I/O-module slots 0…7

Module slot

Flash cards
USB port
2-port Ethernet switch (PCD2.M5540 only)
Interrupt inputs
Lithium battery
Run/stop switch
Onboard interface and power supply

Module slot

Fast serial bus (SPI) for running up to 4 intelligent modules
I/O bus for standard modules
Ground connection for I/O modules

C slot for Profibus Master module
Connections for onboard interfaces
Connection for I/O expansion
Slot for communication module with X3 connection
LEDs
Slot for communication module with X4 connection

The same instructions apply as for the PCD3 in Chapter 1.2 and in the Manual 26-856 regarding the power supply and the grounding plan.

System properties

▸ Up to 15 communication interfaces (RS-232, RS-485, etc.)
▸ 8 I/O slots that can be expanded using module holders to max. 64 slots (1023 central data points)
▸ Remote I/O expansion with RIO PCD3.T66x (Ethernet)
▸ 1 MB of program memory
▸ Automation Server Onboard

▸ Data memory with flash memory modules that can be expanded to 4 GB
▸ 6 fast interrupt/counter inputs on the CPU
▸ Compatible with all PCD3 module holders

Onboard interfaces of the Saia PCD2.M5xxx

Type	Connection	Port	Transmission rate
RS-232 (serial) or	X2 (D-Sub)	0	≤ 115.2 kbit/s
RS-485 (serial)	X5 (terminal)	0	≤ 115.2 kbit/s
RS-485 (serial) for free protocols or	X1 (D-Sub)	3	≤ 115.2 kbit/s
Profi S-Net / Profibus DP Slave	X1 (D-Sub)	10	≤ 1.5 Mbit/s
Ethernet (2-port switch) (PCD2.M5540 only)	Ethernet	9	10/100 Mbit/s
USB 1.1 (PGU)	USB	---	≤ 12 Mbit/s

Dimensions

Mounting
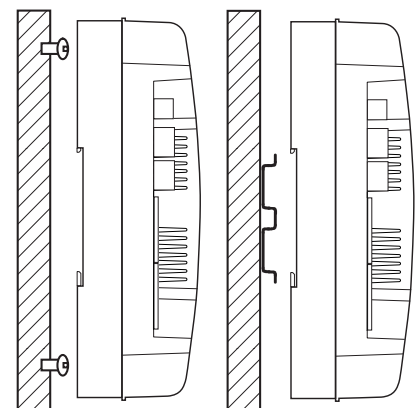
Technical data and ordering information for PCD2.M5xxx controllers

ftp	http	SNMP	@		SD	**Automation Server** integrated into the base unit

Technical overview

Technical data

Number of onboard digital inputs/outputs	6 digital inputs (24 V, 4 × interrupt) 2 digital outputs (2 × PWM, 24 V 100 mA)
Number of digital inputs/outputs in the base unit or I/O module slots in the base unit	128 8
Number of digital inputs/outputs with 7 PCD2.C2000 module holders or I/O module slots	896 56
Processing times [µs] bit operation word operation	0.3…1.5 µs 0.9 µs
Real-time clock (RTC)	Yes

Onboard memory

Main memory (RAM) for program and DB/Text	1 MB
Flash memory (S-RIO, configuration and backup)	2 MB
User flash file system (INTFLASH)	No
Data backup	1…3 years with lithium battery

Onboard communication interfaces

RS-232, RS-485 / PGU	≤ 115 kbit/s
RS-485 Profibus DP–Slave, Profi S-Net (S-IO, S-Bus)	≤ 1.5 Mbit/s
USB 1.1 (PGU)	≤ 12 Mbit/s
Ethernet, 2-port switch (PCD2.M5540 only)	≤ 10/100 Mbit/s (full duplex, auto-sensing/auto-crossing)

General specifications

|	
Supply voltage (in accordance with EN/IEC 61131-2)	24 VDC, –20/+25% max. incl. 5% ripple
Load capacity 5 V / + V internal	max. 1400 mA / 800 mA
Automation Server	Flash memory, file system, FTP and web server, email, SNMP

Order details

Type	Description
PCD2.M5540	Programmable controller, 1024 kByte of RAM, Ethernet interface

Additional accessories, e.g. connectors, covers, etc. are described on the last page of this Chapter.
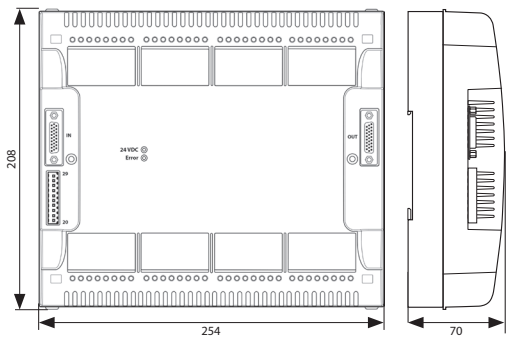
Saia PCD2.Cxxxx module holder

Up to 8 Saia PCD2.C1000 or Saia PCD2.C2000 module holders can be connected to the Saia PCD2.M4x60 (7 with PCD2.M5xxx). This makes it possible to connect up to 64 I/O modules or 1023 digital I/Os. A module holder has space for 4/8 I/O modules. In addition to Saia PCD2.Cxxxx module holders, all Saia PCD3 module holders can also be connected.
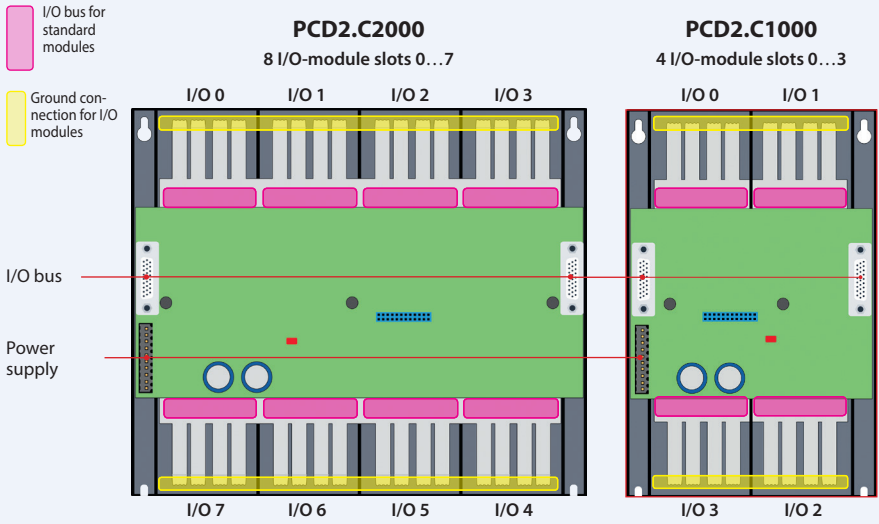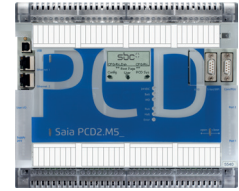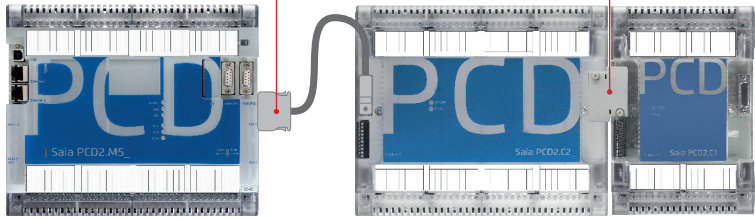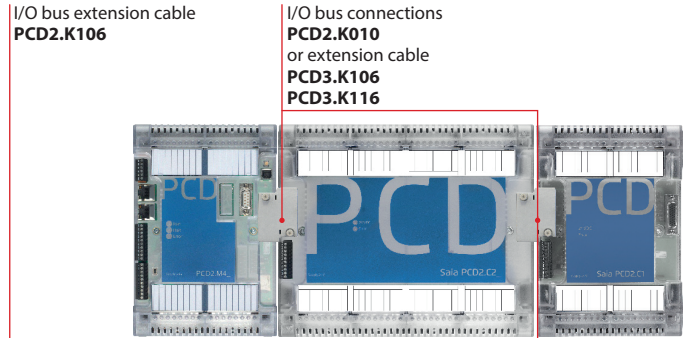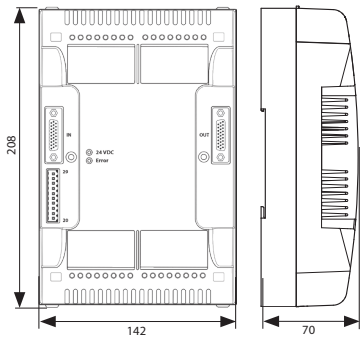

System properties

▸ Up to 1023 central data points
▸ Numerous module variants can be plugged in
▸ Mounting is quick and easy
▸ Can be combined with Saia PCD3.Cxxx module holders
▸ Connections for a power supply on each module holder
▸ Can be connected below or next to each other

Dimensions PCD2.C2000

Dimensions PCD2.C1000

I/O bus extension cable
PCD2.K106

I/O bus connections
PCD2.K010
or extension cable
PCD3.K106
PCD3.K116

PCD2.M5x40 to PCD2.Cx000	PCD2.M4x60 to PCD2.Cx000	PCD2.Cx000 to PCD2.Cx000
PCD2.K106	PCD2.K010 PCD3.K106 PCD3.K116	PCD2.K010 PCD3.K106 PCD3.K116

Saia PCD2 I/O module holder

Type	Description
PCD2.C1000	Expansion module holder with 4 I/O slots
PCD2.C2000	Expansion module holder with 8 I/O slots
PCD2.K010	I/O bus connector
PCD2.K106	I/O bus extension cable length 0.9 m (connection between PCD2.M5xxx and PCD2.Cxxxx)
PCD3.K106	I/O bus extension cable length 0.7 m (connection between two module holders)
PCD3.K116	I/O bus extension cable length 1.2 m (connection between two module holders)

No more than 5 extension cables may be used for this.

Overview of Saia PCD2 plug-in I/O modules

The functions of the Saia PCD2 can be expanded as required using a wide range of plug-in I/O modules and adapted to specific needs. This not only ensures that a project can be implemented quickly, but also provides the option of expanding the system at any time during operation.
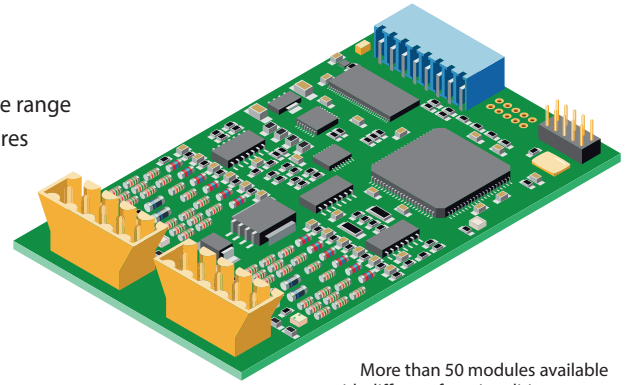
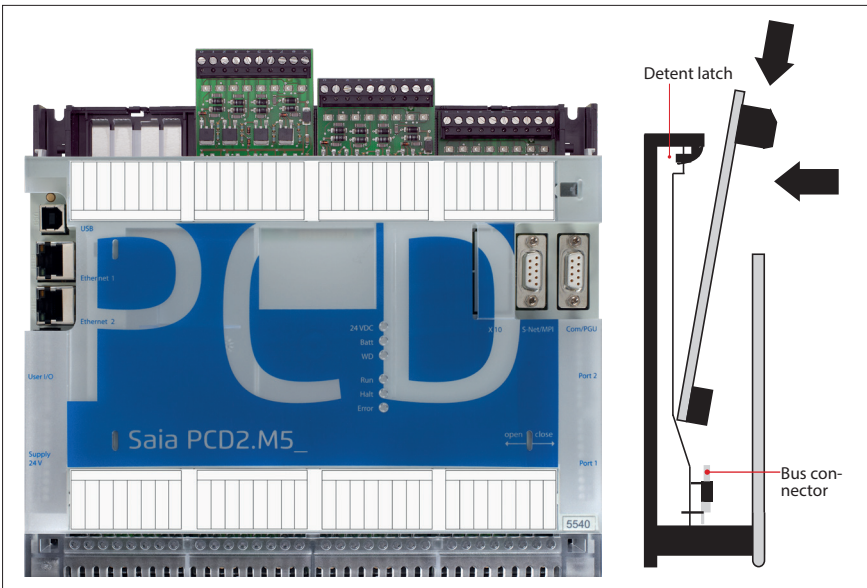More than 50 modules available with different functionalities

System properties

▸ Numerous variants available
▸ Slot direct in the Saia PCD2.M4x60, PCD2.M5540, PCD1.M2xxx or on the module holder
▸ Full integration into the Saia PCD2 housing
▸ Compact design
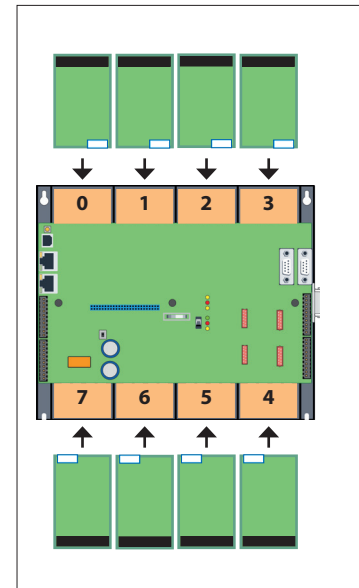▸ Up to 16 I/Os per module
▸ Modules with an input delay of 0.2 ms

General type key

PCD2.Axxx	Digital output modules
PCD2.Bxxx	Combined digital input/output modules
PCD2.Exxx	Digital input modules
PCD2.Fxxx	Communication modules
PCD2.Hxxx	Fast counter modules
PCD2.Rxxx	Memory modules
PCD2.Wxxx	Analogue input/output modules

Insertion into housing

Detent latch

Saia PCD2.M5_

Bus con-nector

Slots for I/O modules

Differences between the terminals of the I/O modules

Type K 2 × 5-pin plug	**Type L** 10-pin terminal plug-in	**Type M** 14-pin plug-in terminal	**Type N** 20-pin terminal	**Type O** 34-pin flat cable	**Type P** 14-pin terminal plug-in	**Type R** 17-pin terminal
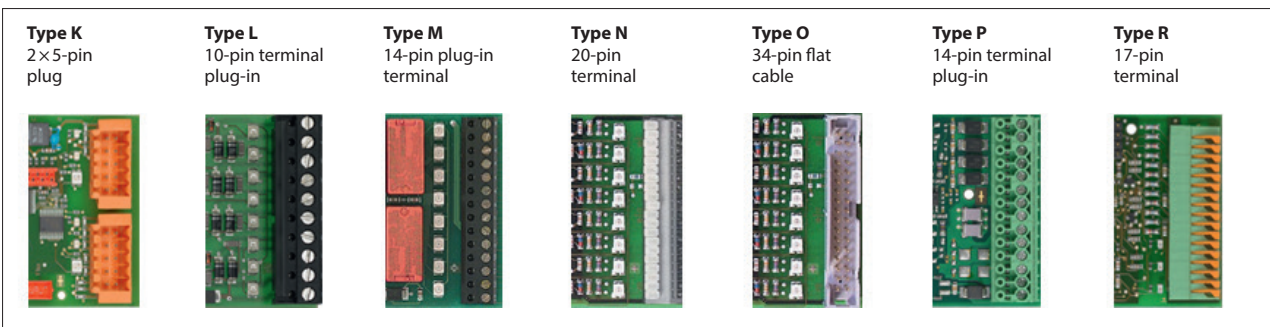
The screw terminal blocks and connectors can also be ordered individually as accessories.

Saia PCD2 digital input and output modules

The digital I/O modules can be easily plugged into Saia PCD2 and Saia PCD1 base units or a suitable I/O module holder.
In addition to inputs for various voltage levels, digital outputs are provided with both transistor construction and as mechanical relays.
This means that electrical isolation from the switching electrical circuit can be achieved easily and reliably.

Digital input modules

Type	Number of inputs	Input voltage	Switching capacity DC	AC	Input filter	Electrical isolation	Current draw 5V-Bus [1]	+V-Bus [2]	I/O connector type [3]
PCD2.E110	8	15…30 VDC	---	---	8 ms	---	24 mA	---	L
PCD2.E111	8	15…30 VDC			0.2 ms		24 mA		L
PCD2.E160	16	15…30 VDC	---	---	8 ms	---	72 mA	---	O
PCD2.E161	16	15…30 VDC			0.2 ms		72 mA		O
PCD2.E165	16	15…30 VDC			8 ms		72 mA		N
PCD2.E166	16	15…30 VDC			0.2 ms		72 mA		N
PCD2.E500	6	80…250 VAC	---	---	20 ms	●	1 mA	---	L
PCD2.E610	8	15…30 VDC	---	---	10 ms	●	24 mA	---	L
PCD2.E611	8	15…30 VDC			0.2 ms	●	24 mA		L
PCD2.E613	8	30…60 VDC			9 ms	●	24 mA		L

Digital output modules

Type	Number of outputs	Input voltage	Switching capacity DC	AC	Input filter	Electrical isolation	Current draw 5V-Bus [1]	+V-Bus [2]	I/O connector type [3]
PCD2.A200	4, relay (make with contact protection)	---	2 A/50 VDC	2 A/250 VAC	---	●	15 mA	---	L
PCD2.A210	4, relay (break with contact protection)		2 A/50 VDC	2 A/250 VAC		●	15 mA		L
PCD2.A220	6, relay (make)	---	2 A/50 VDC	2 A/250 VAC	---	●	20 mA	---	L
PCD2.A250	8, relay (make)	---	2 A/50 VDC	2 A/48 VAC	---	●	25 mA	---	M
PCD2.A300	6, transistor	---	2 A/10…32 VDC	---	---	---	20 mA	---	L
PCD2.A400	8, transistor	---	0.5 A/5…32 VDC	---	---	---	25 mA	---	L
PCD2.A410	8, transistor	---	0.5 A/5…32 VDC	---	---	●	24 mA	---	L
PCD2.A460	16, transistor (with short circuit protection)	---	0.5 A/10…32 VDC	---	---	---	74 mA	---	O
PCD2.A465	16, transistor (with short circuit protection)	---	0.5 A/10…32 VDC	---	---	---	74 mA	---	N

Digital input/output modules

Type	Number of I/Os	Input voltage	Switching capacity DC	AC	Input filter	Electrical isolation	Current draw 5V-Bus [1]	+V-Bus [2]	I/O connector type [3]
PCD2.B100	2 In + 2 Out + 4 selectable In or Out	15…32 VDC	0.5 A/5…32 VDC	---	8 ms	---	25 mA	---	L
PCD2.B160	16 I/O (in blocks of 4 configurable)	24 VDC	0.25 A/18…30 VDC	---	8 ms or 0.2 ms	---	120 mA	---	2× K

Fast counter modules

Type	Number of counters	Inputs per counter	Outputs per counter	Counting range	Selectable digital filter	Current draw 5V-Bus [1]	+V-Bus [2]	I/O connector type [3]
PCD2.H112	2	2 In + 1 configurable In	1 CCO	0…16 777 215 (24 bit)	10 kHz…150 kHz	50 mA	4 mA	K
PCD2.H114	4	2 In + 1 configurable In	1 CCO	0…16 777 215 (24 bit)	10 kHz…150 kHz	50 mA	4 mA	2× K

! The internal load current drawn by the I/O modules from the +5V and +V bus supply must not exceed the maximum supply current specified for the PCD2.M4x60, PCD2.M5540, PCD2.Cxxxx and PCD1.M2xxx.

Overview of the internal bus capacity of the module holders

Capacity	PCD1.M2xxx	PCD2.M4x60	PCD2.M5540	PCD2.C1000	PCD2.C2000
[1] Internal 5V bus	500 mA	800 mA	1400 mA	1400 mA	1400 mA
[2] Internal +V (24 V)	200 mA	250 mA	800 mA	800 mA	800 mA

The electrical requirement of the internal +5V and +V bus for the I/O modules is calculated in the PG5 2.1 Device Configurator.

[3] Plug-in I/O terminal blocks are supplied with I/O modules. Spare terminals, ribbon connectors with system cables and separate terminals are ordered as accessories (see pages 63 and 169).

More information on counting modules, stepper motor control and positioning modules

http://sbc.do/fkwy2HYe

Saia PCD2 analogue input and output modules

The numerous analogue modules allow complex control tasks or measurements. Depending on the speed of the AD converter, the resolution is between 8 and 16 bits. The digitised values can be processed further direct in the project in the PCD2 and PCD1. The large number of different modules means that the most suitable module is available for almost any requirement.
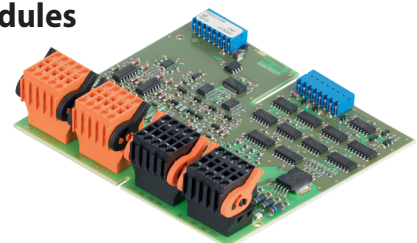
Analogue input modules

Type / Order no.	Number of channels	Signal range	Resolution	Electrical isolation	Current draw 5V-Bus [1]	+V-Bus [2]	I/O connector type [3]
PCD2.W200	8 In	0…+10 V	10 bits	---	8 mA	5 mA	L
PCD2.W210	8 In	0…20 mA (4…20 mA via user program)	10 bits		8 mA	5 mA	L
PCD2.W220	8 In	Pt1000: −50 °C…400 °C/Ni1000: −50 °C…+200 °C	10 bits		8 mA	16 mA	L
PCD2.W220Z02	8 In	NTC 10 temperature sensor	10 bits		8 mA	16 mA	L
PCD2.W220Z12	4 In + 4 In	4 I: 0…10 V and 4 I: Pt1000: −50 °C…400 °C/Ni1000: −50 °C…+200 °C	10 bits		8 mA	11 mA	L
PCD2.W300	8 In	0…+10 V	12 bits	---	8 mA	5 mA	L
PCD2.W310	8 In	0…20 mA (4…20 mA via user program)	12 bits		8 mA	5 mA	L
PCD2.W340	8 In	0…+10 V/0…20 mA (4…20 mA via user program) Pt1000: −50 °C…400 °C/Ni1000: −50 °C…+200 °C	12 bits		8 mA	20 mA	L
PCD2.W350	8 In	Pt100: −50 °C…+600 °C/Ni100: −50 °C…+250 °C	12 bits		8 mA	30 mA	L
PCD2.W360	8 In	Pt1000: −50 °C…+150 °C	12 bits		8 mA	20 mA	L
PCD2.W380	8 In	0−10 V…+10 V, −20 mA…+20 mA, Pt/Ni1000, Ni1000 L&S, NTC10k/NTC20k (configuration via software)	13 bits		25 mA	25 mA	2× K
PCD2.W305	7 In	0…+10 V	12 bits	●	60 mA	0 mA	P
PCD2.W315	7 In	0…20 mA (4…20 mA via user program)	12 bits	●	60 mA	0 mA	P
PCD2.W325	7 In	−10 V…+10 V	12 bits	●	60 mA	0 mA	P
PCD2.W720	2 In	Weighing module with 2 systems for up to 6 weighing cells	≤ 18 bits	---	60 mA	100 mA	P
PCD2.W745	4 In	Temperature module for TC type J, K and 4-wire Pt/Ni 100/1000	16 bits	●	200 mA	0 mA	R

Analogue output modules

Type Order no.	Number of channels	Signal range	Resolution	Electrical isolation	Current draw 5V-Bus [1]	+V-Bus [2]	I/O connector type [3]
PCD2.W400	4 Out	0…+10 V	8 bits	---	1 mA	30 mA	L
PCD2.W410	4 Out	0…+10 V/0…20 mA/4…20 mA jumper-selectable	8 bits		1 mA	30 mA	L
PCD2.W600	4 Out	0…+10 V	12 bits	---	4 mA	20 mA	L
PCD2.W610	4 Out	0…+10 V/−10 V…+10 V/0…20 mA/4…20 mA selectable with jumper	12 bits		110 mA	0 mA	L
PCD2.W605	6 Out	0…+10 V	10 bits	●	110 mA	0 mA	P
PCD2.W615	4 Out	0…20 mA/4…20 mA, configurable	10 bits	●	55 mA	0 mA	P
PCD2.W625	6 Out	−10 V…+10 V	10 bits	●	110 mA	0 mA	P

Analogue input/output modules

Type / Order no.	Number of channels	Signal range	Resolution	Electrical isolation	Current draw 5V-Bus [1]	+V-Bus [2]	I/O connector type [3]
PCD2.W525	4 In +	I: I:0…10 V, 0(4)…20 mA, Pt 1000, Pt 500 or Ni 1000 (selectable by DIP switch)	In: 14 bits	●	40 mA	0 mA	P
	2 Out	O: 0…10 V or 0(4)…20 mA (selectable by software)	Out: 12 bits				

Saia PCD2 mixed digital and analogue input and output modules

With the multi-function I/O module PCD2.G200 a total of 24 digital and analogue inputs and outputs is achieved. Thus, the need for additional module holders can be avoided, and sophisticated small applications can be implemented cost-effectively.

Multifunctional input/output modules

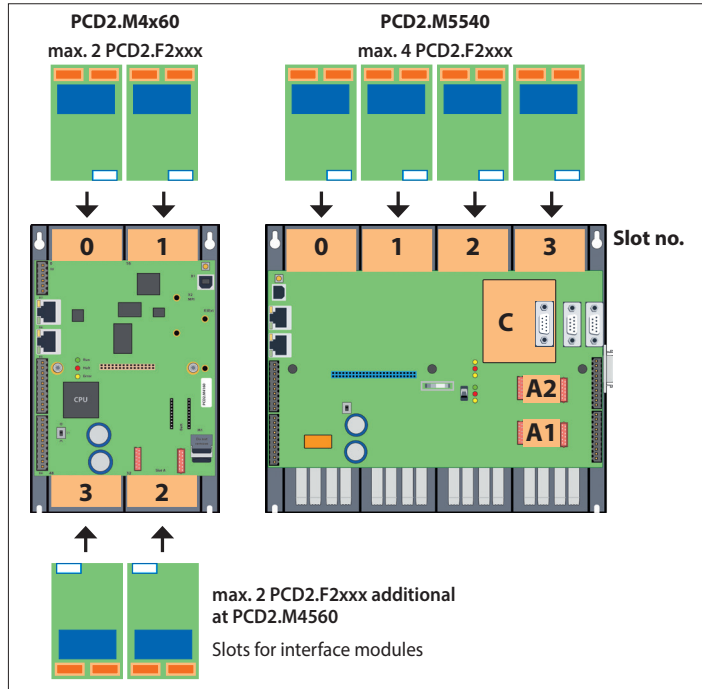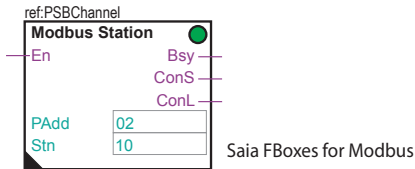| Type / Order no.	Number of channels	Signal range	Resolution	Input filter	Electrical isolation	Current draw 5V-Bus [1] +V-Bus [2]		I/O connector type [3]
PCD2.G200	4 In	Digital: 15…30 VDC		8 ms	---	12 mA	35 mA	KB black
	4 Out	Digital: 0.5 A/10…32 VDC			---			KB black
	2 In	Analogue: 0…10 V	12 bits	10 ms	---			K orange
	2 In	Analogue: Pt1000 or Ni1000	12 bits	20 ms				
	4 In	Analogue: Universal, 0…10 V, 0…20 mA, Ni/Pt1000 (selectable via DIP switch)	12 bits	10 ms Ni/Pt 20 ms				
	8 Out	Analogue: 0…10 V	10 bits		---			K orange

[1] [2] [3] See page 58

Communication interfaces of the Saia PCD2 controllers

In addition to the onboard interfaces of Saia PCD2, the interface functions can also be expanded in a modular way with various slots. The PCD2 series therefore supports numerous protocols. The physical bus specifications are available for most protocols as a plug-in module. If this is not the case, the bus can be connected via an external converter.

Protocols supported by the PCD2.M4x60, PCD2.M5540 via FBoxes

▶ Modem communication with the PCD
▶ HMI editor applications with PCD7.Dxxx text terminals
▶ Serial S-Net (S-Bus)
▶ Modbus
▶ JCI N2-Bus
▶ KNX® S-Mode/EIB (with external converter)
▶ DALI
▶ EnOcean (with external converter)
▶ M-Bus
▶ BACnet®

ref:PSBChannel

Saia FBoxes for Modbus

PCD2.M4x60 max. 2 PCD2.F2xxx
PCD2.M5540 max. 4 PCD2.F2xxx
Slot no.

max. 2 PCD2.F2xxx additional at PCD2.M4560
Slots for interface modules

Physical interfaces that can be fully programmed

PCD7.F150S

PCD2.F2150 with PCD7.F150S

Module	Specifications	Electrical isolation	Current draw 5V-Bus	+V-Bus	Slot	I/O connector type [1]
PCD7.F110S	RS-422 with RTS/CTS or RS-485 [2]	---	40 mA	---	A1 / A2	
PCD7.F121S	RS-232 with RTC/CTS, DTR/DSR, DCD, suitable for modem or EIB connection	---	15 mA	---	A1 / A2	
PCD7.F150S	RS-485 [2]	●	130 mA	---	A1 / A2	
PCD2.F2100	RS-422/RS-485 [2], plus PCD7.F1xxS as an option	---	110 mA	---	I/O 0-3	2× K
PCD2.F2210	RS-232 plus PCD7.F1xxS as option	---	90 mA	---	I/O 0-3	2× K

Physical interfaces for specific protocols

PCD2.F2210

PCD2.F2150

PCD2.F2810

Module	Specifications	Electrical isolation	Current draw 5V-Bus	+V-Bus	Slot	I/O connector type [1]
PCD7.F180S	Belimo MP-Bus, for connecting up to 8 drives on one line	---	15 mA	15 mA	A1 / A2	
PCD2.F2150	BACnet® MS/TP or fully programmable	---	110 mA	---	I/O 0-3	2× K
PCD2.F2400	LonWorks® interface module [3]	---	90 mA	---	I/O 0-3	L9
PCD2.F2610	DALI	---	90 mA	---	I/O 0-3	L
PCD2.F2700	M-Bus 240 nodes	---	70 mA	8 mA	I/O 0-3	L
PCD2.F2710	M-Bus 20 nodes	---	70 mA	8 mA	I/O 0-3	L
PCD2.F2720	M-Bus 60 nodes	---	70 mA	8 mA	I/O 0-3	L
PCD2.F2810	Belimo MP-Bus with base for PCD7.F1xxS modules	---	90 mA	15 mA	I/O 0-3	2× K
PCD7.F7500	Profibus DP Master	---	200 mA	---	C	

[1] Plug-in I/O terminal blocks are included with I/O modules. Spare terminals, ribbon connectors with system cables and separate terminals are ordered as accessories (see pages 63 and 169).
[2] with line termination resistors that can be activated.
[3] For 254 network variables, with base for PCD7.F1xxS modules.

System properties of PCD2.F2xxx modules

The following points must be noted when using the PCD2.F2xxx interface modules:

▶ Up to 4 PCD2.F2xxx modules (8 interfaces) can be used in slots 0…3 for each PCD2 system.
▶ The PCD2 system has a processor to process both the application and the serial interfaces. Processing of the interface modules requires the appropriate CPU capacity.
▶ Consult the information and examples provided in the Manual 26-856 for PCD2.M5 to determine the maximum communication capacity for each PCD2.M5 system.

Memory modules of the Saia PCD2 controllers

The functions of the Saia PCD2 can be expanded using flash memory. Memory cards with file systems and data backup are available for this task. The various protocols whose firmware is installed on the flash cards can also be used by simply inserting the relevant card. The controller therefore becomes BACnet® or Lᴏɴ IP compatible. More information to memory management and structure is contained in Chapter 1.1 Saia PCD System Description.
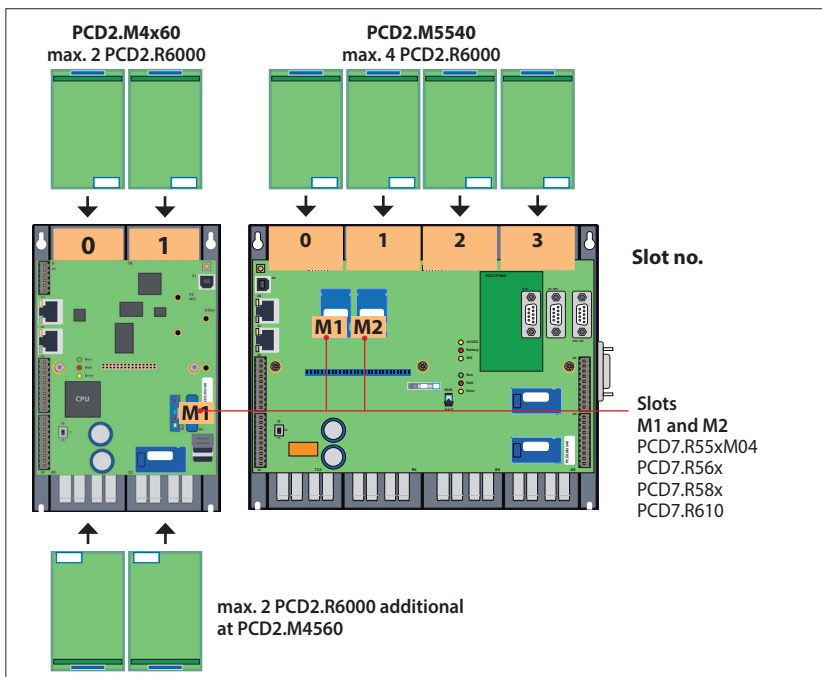
System properties

Onboard user memory:
▸ 1024 kByte RAM for program + DB/text
▸ 2 MB flash memory (S-RIO, configuration and backup)

Expansion options:
▸ Two slots (M1 and M2) for memory cards integrated into the CPU
▸ Additional SD memory cards can be inserted in the I/O slots 0 to 3 using adapters

Slots for memory modules

Flash memory with file system, program and data backup, BACnet®

Type	Description	Slot
PCD7.R550M04	4 MB flash card with file system	M1 & M2
PCD7.R562	Flash card with BACnet® and 128 MB file system	M1 & M2
PCD7.R582	Flash card with Lᴏɴ IP and 128 MB file system	M1 & M2
PCD7.R610	Holder module for micro SD card	M1 & M2
PCD7.R-MSD1024	MicroSD memory card 1 GB, PCD formatted	PCD7.R610

PCD7.R55xM04

PCD7.R610

PCD2 SD flash memory cards for I/O slots

Type	Description	PCD2.M4160 Slot	PCD2.M4560 PCD2.M5540 Slot
PCD2.R6000	Basic module with slot for SD flash memory cards (up to 4 modules in I/O slots 0 to 3 on a CPU)	E/A 0–1	E/A 0–3
PCD7.R-SD512	SD flash memory card, 512 MB with file system	---	---
PCD7.R-SD1024	SD flash memory card, 1024 MB with file system	---	---
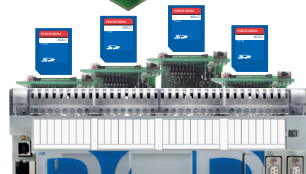
Battery for data backup

Type	Description
463948980	Battery holder module for PCD2. M4x60
450748170	Lithium battery for PCD processor unit (RENATA button battery type CR 2032)

### System properties of PCD7.R5xx modules
▸ Only one BACnet® or one Lᴏɴ IP module can be operated per PCD2.M5xxx.

Consumables and accessories for Saia PCD2 controllers

Fast labelling of I/O modules with the Saia LabelEditor

The software tool efficiently labels the PCD2 labelling strip. The user can enter the unique data point text in the tool. This can then be printed out on A4 paper. The user selects appropriate distance formats for the various types of PCD2 modules. The text entered can be saved as templates and reused.

SBC Label Editor is delivered with the PG5 Controls Suite.
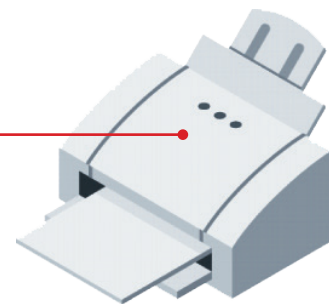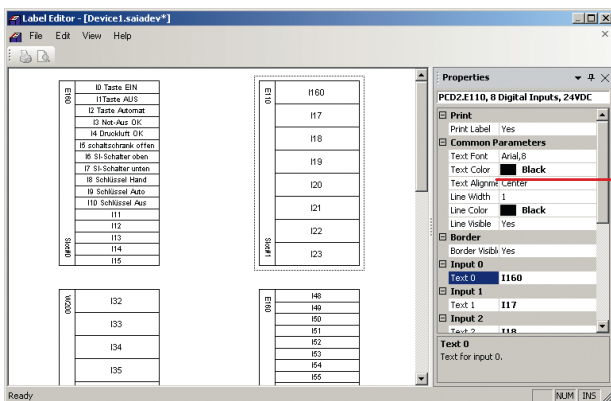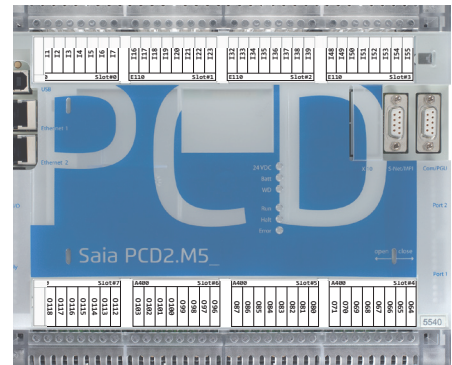
EPLAN macros

EPLAN macros are available for project planning and engineering

The EPLAN® electric P8 macros are available on the support site.

The macros and article data are also available on the EPLAN® data portal.

Download: www.sbc-support.com

Consumables and accessories for Saia PCD2 controllers

Saia PCD2 housing covers

Type	Description
410477190	Cover for PCD2.M5x40 without logo (neutral housing cover)
410477580	Cover for PCD2.C1000 without logo (neutral housing cover)
410477200	Cover for PCD2.C2000 without logo (neutral housing cover)

Saia PCD2 plug-in screw terminal blocks for onboard I/Os

Type	Description
440549160	Plug-in screw terminal block, 10-pin, labelling 0… 9
440549170	Plug-in screw terminal block, 10-pin, labelling 10…19
440549180	Plug-in screw terminal block, 10-pole, labelling 20…29
440549190	Plug-in screw terminal block, 10-pole, labelling 30…39

Plug-in screw terminal blocks and connectors for Saia PCD2 I/O modules

Type	Description
440551090	Plug-in screw terminal block, 9-pin (type L9) for PCD2.F2400, for wires up to 1.5 mm²
440548470	Plug-in screw terminal block, 10-pin (type L) for wires up to 1.5 mm², labelling 0…9
440548690	Plug-in screw terminal block, 14-pin (type M) for wires up to 0.6 mm²
440550480	Plug-in spring terminal block 2 × 5-pin (type K) for wires up to 1.0 mm², orange
440550540	Plug-in spring terminal block 2 × 5-pin (type KB) for wires up to 1.0 mm², black

I/O bus connection

Type	Description
PCD2.K010	I/O bus connector
PCD2.K106	I/O bus extension cable

Battery

Type	Description
463948980	Battery carrier module for PCD2. M4x60
450748170	Lithium battery for PCD2.M5540

System cables for digital modules with 16 I/Os[1]

PCD2.K221	Sheathed, round cable with 32 strands, each 0.25 mm², 1.5 m long, PCD side: 34-pin ribbon connector type D, process side: strand ends free, colour coded
PCD2.K223	Sheathed, round cable with 32 strands, each 0.25 mm², 3.0 m long, PCD side: 34-pin ribbon connector type D, process side: strand ends free, colour coded

### System cables for adapters PCD2.K520/…K521/…K525[1]

PCD2.K231	Sheathed, half-round cable with 34 strands, each 0.09 mm², 1.0 m long, with 34-pin ribbon connector type D at both ends
PCD2.K232	Sheathed, half-round cable with 34 strands, each 0.09 mm², 2.0 m long, with 34-pin ribbon connector type D at both ends

System cables for 2 adapters PCD2.K510/…K511 or 1 adapter and relay interface PCD2.K551[1]

PCD2.K241	Sheathed, half-round cable with 34 strands, each 0.09 mm², 1.0 m long, PCD side 34-pin ribbon connector type D, process side: two 16-pin ribbon connectors
PCD2.K242	Sheathed, half-round cable with 34 strands, each 0.09 mm², 2.0 m long, PCD side 34-pin ribbon connector type D, process side: two 16-pin ribbon connectors

"Ribbon connector ←→ screw terminal" adapters

PCD2.K510	for 8 inputs/outputs, with 20 screw terminals, without LED
PCD2.K511	for 8 inputs/outputs, with 20 screw terminals and LED (for source operation only)
PCD2.K520	for 16 inputs/outputs, with 20 screw terminals, without LED
PCD2.K521	for 16 inputs/outputs, with 20 screw terminals and LED (for source operation only)
PCD2.K525	for 16 inputs/outputs, with 3 × 16 screw terminals and LED (for source operation only)
PCD2.K551	Relay interface for 8 PCD transistor outputs with 24 screw terminals and LED
PCD2.K552	Relay interface for 8 PCD transistor outputs with 24 screw terminals, LED and manual control mode (switch on-off-auto) and 1 output as feedback for the manual control mode
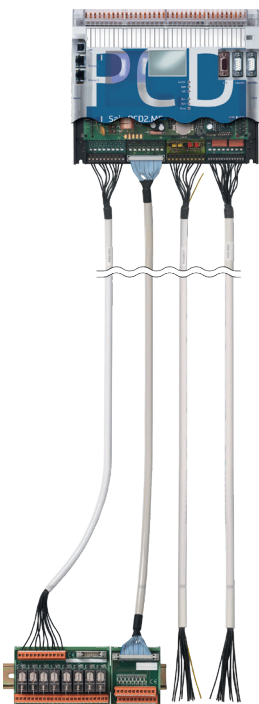
[1] For details, see Chapter 5.10

1.5 PCD1 – modular, expandable, compact CPU

The Saia PCD1 systems are the smallest programmable Saia PCD controllers in a flat design. Along with the standard communication interfaces, integrated data memory and web/IT functionality, all controllers also have at least 18 integrated I/Os. The PCD1 controllers are ideally suited to small-scale automation tasks, whose challenges and tasks can be successfully processed by the powerful CPU.

The many communication options are another advantage: Ethernet TCP/IP, USB port, the onboard RS-485 interface and the expansion options with BACnet® or Lon IP, for instance, are a small sample of the performance capability of PCD1.

1.5.1 Saia PCD1.M2 series
Saia PCD1.M2xxx are compact and may be expanded via modules.

Types
▶ PCD1.M2160   with Ethernet TCP/IP and expanded memory
▶ PCD1.M2120   with Ethernet TCP/IP

18 integrated I/Os
2 free I/O slots

1.5.2 Saia PCD1.Room (PCD1.M2110R1)
Saia PCD1.Room is for applications in the field of room automation and HeaVAC.

Type
▶ PCD1.M2110R1 with Ethernet TCP/IP
  for room automation applications

24 integrated I/Os
1 free I/O slot

Saia PCD E-Controller (PCD1.M0160E0)
The E-controller in compact design includes in the default delivery condition S-Monitoring (energy)-functionalities, which can be customized with Saia PG5

Type: PCD1.M0160E0 with S-Monitoring function
▶ 18 integrated E/As
▶ no free I/O slots

Saia PCD1.M2220-C15
The E-Line control is ideally suited by the compact design for installation in an electrical sub-distribution. It can be used for example for the other E-Line modules as zoning / master station.

Type: PCD1.M2220-C15 E-Line CPU with Ethernet, 512kB
▶ integriatede I/Os (4 DI, 2AI, 1 WD)
▶ two free I/O Slots
▶ a variety of communication options

1.5.1 Saia PCD1.M2xxx controller

The Saia PCD1.M2xxx series is a compact controller with onboard I/Os and in addition two free I/O slots for plug-in or communication interface modules. The Web/IT functionality, the onboard memory, the range of standard communication interfaces and the expansion options offer ideal solutions for small to medium systems.

Device design

2 free slots with SPI (high-speed serial Bus) for I/O or communication modules

IO0   IO1

Voltage supply 24 VDC Watchdog relay RS-485 interface

Slot for communication interfaces

Battery

Operating LEDs
RUN/STOP button
USB port

Ethernet connection (2-port switch)

X3

Slot A

X2   X1   X0

M1 — Slot for memory modules

Terminals for integrated inputs and outputs

Terminals for optional connection (slot A)

System properties

▸ Up to 50 inputs/outputs
   May be expanded remotely with RIO PCD3.T66x
▸ Up to 8 communication interfaces
▸ USB and Ethernet interface onboard
▸ Large onboard memory for programs (up to 1 MB) and data (up to 128 MB file system)
▸ Automation Server for integration into Web/IT systems

| ftp | http | SNMP | @ | | SD | **Automation Server** integrated in the base unit |

Types

▸ **PCD1.M2160** with Ethernet TCP/IP and expanded memory
▸ **PCD1.M2120** with Ethernet TCP/IP

Mounting
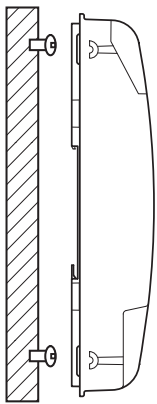
on a level surface
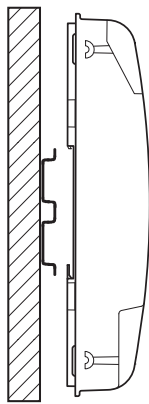
on two DIN rails
(2 × 35 mm
 in accordance with
 DIN EN 60715 TH35)

Dimensions

226

142   49

Compact mass:
142 × 226 × 49 mm

Power supply and connection concept

0 V +24 VDC

PCD2.Exxx   PCD2.Axxx

CPU

X3
33
Supply
30

X2   X1   X0

1.5 mm² / max. 25 cm
Ground bar
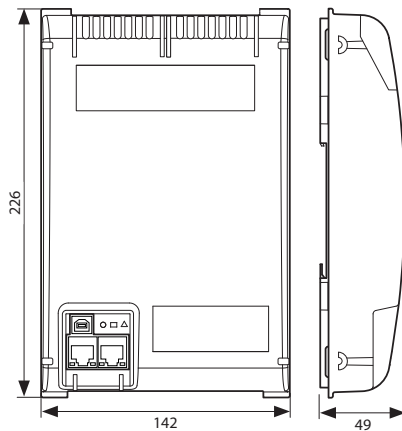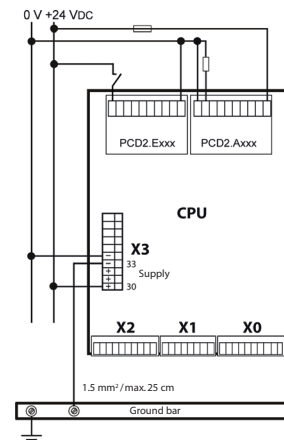
Additional information is provided in the Chapter Saia PCD3 power supply and connection concept, and in the Manual 26-875.

Overview Saia PCD1.M2xxx

Technical data

Memory and file system	Types:	PCD1.M2160	PCD1.M2120
Program memory, DB/Text (Flash)		1 MB	512 kByte
User memory, DB/Text (RAM)		1 MB	128 kByte
Onboard user flash file system		128 MB	8 MB

Integrated communication			
Ethernet connection (2-port switch) 10/100 Mbit/s, full-duplex, auto-sensing, auto-crossing		Yes	Yes
USB port USB 1.1 device 12 Mbit/s		Yes	Yes
RS-485 (terminal X3), up to 115 kbit/s		Yes	Yes

General specifications

Operating voltage	24 VDC, −20/+25 % max. inkl. 5% ripple (in accordance with EN/IEC 61131-2)
Battery for data backup (replaceable)	Lithium battery with a service life of 1 to 3 years
Operating temperature:	0…55 °C
Dimensions (W × H × D)	142 × 226 × 49 mm
Mounting location	2× DIN rails in accordance with DIN EN60715 TH35 (2 × 35 mm) or on a flat surface
Protection type	IP 20
Capacity 5 V/+V (24 V) internal	max. 500 mA/200 mA
Power consumption	typically 12 W

Onboard inputs/outputs

Inputs:

6 Digital inputs (4 + 2 interrupts)	15…30 VDC, 3 ms input filter (0.2 ms for the interrupts)	Terminal X1
2 Analogue inputs, selectable via DIP switch	−10…+10 VDC, 0…±20 mA, Pt1000, Ni1000, Ni1000 L&S, 0…2.5 kΩ, 12 bit resolution	Terminal X1

Outputs:

4 Digital outputs	24 VDC / 0.5 A	Terminal X0
1 PWM output	24 VDC / 0.2 A	Terminal X0

selectable/configurable via PG5

|		
4 Digital inputs or outputs	24 VDC / data as digital inputs or outputs Outputs:	Terminal X0
1 Watchdog relay or make contact	48 VAC or VDC, 1 A With DC switching voltage a free-wheeling diode should be connected in parallel to the load	Terminal X3

Analogue output module Saia PCD7.W600

This module has 4 analogue outputs 0 to +10 V with a 12-bit resolution and has been specifically developed for the new PCD1 CPUs (PCD1.M2xxx, PCD1.M0160E0, PCD1.M2110R1). It can be plugged into slot A of the PCD1 CPU like the PCD7.F1xxS communication module.

Plug-in I/O modules for slots I/O 0 and I/O 1

The modules listed in the PCD2.M5 series (Chapter 1.4) are also used for the Saia PCD1 series.

I/O 0   I/O 1

Detent latch   Bus connector
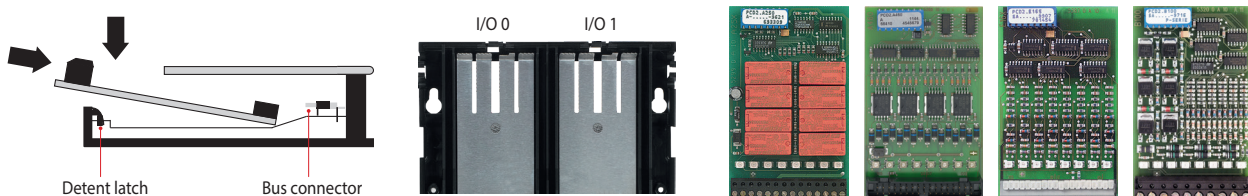
Saia PCD1.M2xxx interface options

In addition to the onboard interfaces, the interface functions can also be expanded in a modular way using the various slots. Numerous protocols are therefore supported by the Saia PCD1.M2 series. Detailed information and an overview is contained in the Chapter BA communication systems.
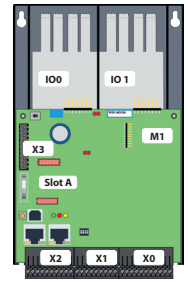
Communication		Electrical isolation	Internal current consumption 5V	+V (24 V)	Slot	I/O connector type [1]
PCD7.F110S	RS-485/RS-422	---	40 mA	–	Slot A	
PCD7.F121S	RS-232 with RTC/CTS, DTR/DSR, DCD suitable for modem, EIB connection	---	15 mA	–	Slot A	
PCD7.F150S	RS-485 with termination resistors that can be activated	●	130 mA	–	Slot A	
PCD7.F180S	Belimo MP-Bus, for connecting up to 8 drives on one line	---	15 mA	15 mA	Slot A	
PCD2.F2100	RS-422/RS-485 plus PCD7.F1xxS as option	---	110 mA	–	IO 0/1	2× K
PCD2.F2150	BACnet® MS/TP RS-485 plus PCD7.F1xxS as an option	---	110 mA	–	IO 0/1	2× K
PCD2.F2210	RS-232 plus PCD7.F1xxS as an option	---	90 Ma	–	IO 0/1	2× K
PCD2.F2400	LONWORKS® interface module	---	90 Ma	–	IO 0/1	L9
PCD2.F2610	DALI Master for up to 64 DALI devices	---	90 Ma	–	IO 0/1	L
PCD2.F27x0	M-Bus master with 2 M-Bus interfaces	---	70 mA	8 mA	IO 0/1	L
PCD2.F2810	Belimo MP-Bus plus PCD7.F1xxS as an option	---	90 Ma	15 mA	IO 0/1	2× K

[1] Plug-in I/O terminal blocks are included with I/O modules.   Spare terminals, ribbon connectors with system cables and separate terminals are ordered as accessories.

System properties of PCD2.F2xxx modules

The following points must be noted when using the PCD2.F2xxx interface modules:

▸ Max. 2 modules PCD2.F2xxx (4 interfaces) can be used in slots I/O 0/1 per PCD1.M2 system.
▸ Consult the information and examples provided in the Manual 26-875 for PCD1.M2 to determine the maximum communication capacity for each PCD1.M2 system.

Memory modules

The onboard memory of the Saia PCD1.M2xxx can be expanded using a Saia PCD7.Rxxx module in slot M1. In addition, the Saia PCD1.M21x0 can be expanded with BACnet® IP or LON IP.

Additional information about the memory management and structure is contained in the Chapter Saia PCD System Description.

Memory expansion and communication

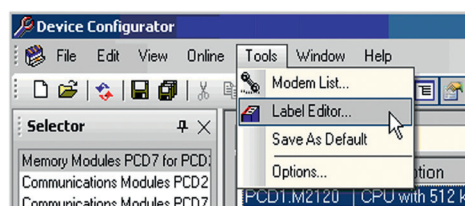| PCD7.R550M04	Flash memory module with a 4 MB file system (for user program backup, web pages, etc.)	M1
PCD7.R562	Flash memory module for BACnet® firmware with 128 MB file system	M1
PCD7.R582	Flash memory module for LON IP firmware with 128 MB file system	M1
PCD7.R610	Basic module for Micro SD flash card	M1
PCD7.R-MSD1024	Micro SD flash card 1024 MB, PCD formatted	PCD7.R610

PCD7.R550M04

PCD7.R610

Accessories and consumables for Saia PCD1.M2xxx

Labelling

The self-adhesive labels can be printed direct with
the SBC LabelEditor from the PG5 Device Configurator

EPLAN macros

EPLAN macros are available for project planning
and engineering.

The EPLAN® electric P8 macros are available
on the support site.

The macros and article data are also provided
on the EPLAN® data portal.

Battery for data backup

Type	Description
450748170	Lithium battery for PCD processor unit (RENATA button battery type CR 2032)

Plug-in screw terminal block

440550890	Plug-in screw terminal block, 11-pin, labelling 0…10	Terminal X0
440550870	Plug-in screw terminal block, 9-pin, labelling 11…19	Terminal X1
440550880	Plug-in screw terminal block, 10-pin, labelling 20…29	Terminal X2
440549190	Plug-in screw terminal block, 10-pin, labelling 30…39	Terminal X3

Cover

410477590	Housing cover for PCD1.M2xxx without logo on-site with an overlay that can be individually designed

Range of uses

▸ For small and medium systems
▸ Modernisation and expansion of existing systems through, for example, the compact construction
▸ Versatile interface options, including to existing systems as a gateway, for example: optimisation of a cooling system
  by setting all the free parameters
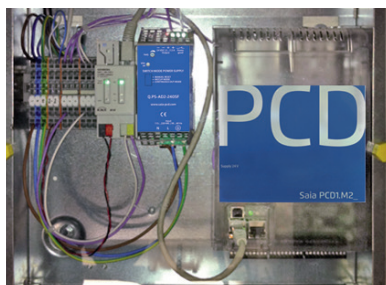
Connection to an existing EIB/KNX installation
providing conference rooms with a web connection

Use as communication interface
with M-Bus in a district heating
network

1 Automation stations
2 Operation and monitoring
3 Room controllers
4 Consumer data acquisition
5 Switch cabinet components

1.5.2 Saia PCD1.Room (PCD1.M2110R1)

Saia PCD1.Room (PCD1.M2110R1) is a programmable room controller for complex solutions with many communication options. In addition to the I/Os that are already integrated, the controller has a free I/O slot for individual expansion with inputs/outputs or communication options. Web/IT functions for mobile operation, for instance, are also already onboard. Furthermore, Saia PCD1.Room offers various possibilities for integrating other systems in the room using standard communication interfaces. (Energy) efficient and individual room automation can be easily implemented as a result. The controller also provides a good basis for achieving the energy efficiency classes in accordance with EN 15232:2012.

Device design with connection example

DALI
Expansion options I/O or communication module e.g. DALI (PCD2.F2610)

enocean
1× serial communication RS-485: e.g. connection external receiver EnOcean

1× make contact 48 VAC e.g. switching contact

Power supply 24 VDC

USB port

Ethernet connection (2-port switch) e.g. to the Internet (remote control via browser is possible as a result)

2× analogue outputs: 0…10 VDC, 0(4)…20 mA e.g.
– Volume flow control
– Adjust temperature setpoint

4× analogue inputs: 0…10 VDC, 0(4)…20 mA, Pt500, Pt1000, Ni1000 e.g.
– Air quality measurement
– Precipitation detection

1× optional terminals for serial communication depending on the PCD7.F1xxS module e.g.
– MP-Bus (with PCD7.F180S) for Belimo actuating drives.

MP BUS

2× analogue inputs:
– 10…+10 VDC, 0…+/–20 mA, Pt1000, Ni1000, Ni1000 L&S, 0…2.5 kΩ e.g.
– Brightness measurement
– Air temperature measurement

6× digital inputs: 15…30 VDC e.g.
– Presence detection
– Window monitoring

4× Digital inputs/outputs (selectable) 24 VDC e.g.
– Dewpoint monitoring
– Time switch program

5× digital outputs: 24 VDC e.g.
– Signal presence
– Switch/set binary output

Lighting, sun protection and individual room regulation can be optimally coordinated with one another with this controller. This example showing possible assignments was compiled based on applications in accordance with the VDI 3813 list of room automation functions and the DIN EN 15232 list of building automation functions.

! The Smart RIO Manager function is <u>not</u> supported!

Mounting
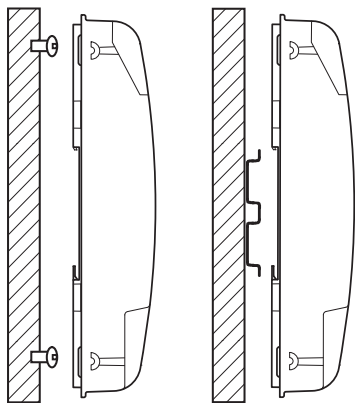
on a level surface

on two DIN rails (2 × 35 mm in accordance with DIN EN 60715 TH35)

Dimensions

226

142

49

Compact mass: 142 × 226 × 49 mm

Power supply and connection concept

0 V +24 VDC

13 12
PCD2.W525

CPU

X3
33
Supply
30

X2   X1   X0

1.5 mm² / max. 25 cm

Ground bar
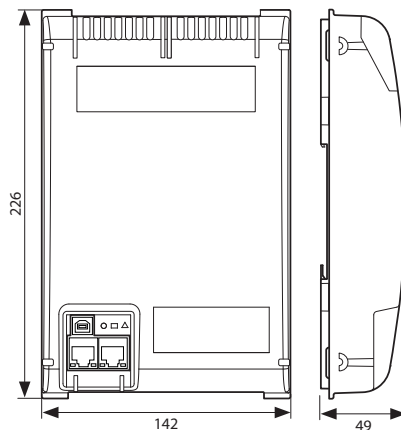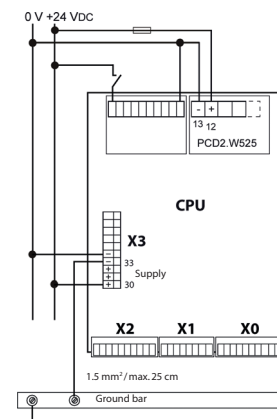
Further information is provided in the Chapter Saia PCD3 power supply and connection concept, and in the Manual 26-875.

Overview of Saia PCD1.Room (PCD1.M2110R1)

Technical data

Memory and file system	Type:	PCD1.M2110R1
Program memory, DB/text (Flash)		256 kByte
User memory, DB/text (RAM)		128 kByte
Onboard user flash file system		8 MB

Integrated communication	
Ethernet connection (2-port switch) – 10/100 Mbit/s, full-duplex, auto-sensing, auto-crossing	yes
USB port – USB 1.1 device 12 Mbit/s	yes
RS-485 – (terminal X3), up to 115 kbit/s	yes

General specifications

Operating voltage	24 VDC, −20/+25 % max. inkl. 5% ripple (in accordance with EN/IEC 61131-2)
Battery for data backup (replaceable)	Lithium battery with a service life of 1 to 3 years
Operating temperature:	0…55 °C
Dimensions (W × H × D)	142 × 226 × 49 mm
Mounting location	2× DIN rails in accordance with DIN EN60715 TH35 (2 × 35 mm) or on a smooth surface
Protection type	IP 20
Capacity 5 V/+V (24 V) internal	max. 500 mA/200 mA
Power consumption	typically 12 W
Automation Server	Flash memory, file system, FTP and web server, email, SNMP

Automation Server
Integrated
into the base unit

Onboard inputs/outputs

Inputs:

6	Digital inputs (4 + 2 interrupts)	15…30 VDC, 3 ms / 0.2 ms input filter	Terminal X1
2	Analogue inputs, selectable via DIP switch	−10…+10 VDC, 0…±20 mA, Pt1000, Ni1000, Ni1000 L&S, 0…2.5 kΩ, 12 bit resolution	Terminal X1
4	Analogue inputs, selectable via DIP switch	0…10 VDC, 0(4)…20 mA, Pt1000, Pt 500, Ni1000, 14 bit resolution	IO 1

Outputs:

4	Digital outputs	24 VDC / 0.5 A	Terminal X0
1	PWM output	24 VDC / 0.2 A	Terminal X0
2	Analogue outputs, selectable via PG5	0…10 VDC or 0(4)…20 mA, 12 bit resolution	IO 1

selectable/configurable via PG5

4	Digital inputs or outputs	24 VDC / data as digital inputs or digital outputs	Terminal X0
1	Watchdog relay or as make contact	48 VAC or VDC, 1 A With DC switching voltage a free-wheeling diode should be connected in parallel to the load	Terminal X3

Analogue output module Saia PCD7.W600

This module has 4 analogue outputs 0 to +10 V with a 12-bit resolution and has been developed specifically for use with the new PCD1 CPUs (PCD1.M2xx0, PCD1.M0160E0, PCD1.M2110R1). It can be plugged into slot A of the PCD1 CPU like the PCD7.F1xxS communication module.

Plug-in I/O modules for slot I/O 0

The modules listed in the PCD2.M5 series (Chapter 1.4) are also used for the Saia PCD1 series.

I/O 0 I/O 1

Detent latch   Bus connector

! Only a PCD2.W525 module that is already supplied with the controller in the default setup functions in slot I/O 1. If the module is removed, the controller will go to Stop!

Saia PCD1.Room (PCD1.M2110R1) interface options

In addition to the onboard interfaces, the interface functions can also be expanded in a modular way using the various slots. Numerous protocols are therefore supported by the Saia PCD1.M2110R1. A detailed list of all the protocols can be found in the Chapter BA communication systems.
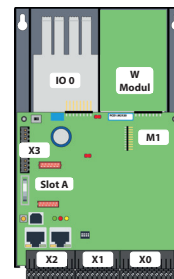
Communication		Electrical isolation	Internal current consumption 5V +V (24 V)		Slot	I/O connector type [1]
PCD7.F110S	RS-422 avec RTS/CTS ou RS-485 [2]	---	40 mA	–	Slot A	
PCD7.F121S	RS-232 with RTC/CTS, DTR/DSR, DCD, suitable for modem or EIB connection	---	15 mA	–	Slot A	
PCD7.F150S	RS-485 [2]	●	130 mA	–	Slot A	
PCD7.F180S	Belimo MP-Bus, for connecting up to 8 drives on one line	---	15 mA	15 mA	Slot A	
PCD2.F2100	RS-422/RS-485 [2], plus PCD7.F1xxS en option	---	110 mA	–	IO 0/1	2× K
PCD2.F2150	BACnet® MS/TP RS-485 plus PCD7.F1xxS as an option	---	110 mA	–	IO 0/1	2× K
PCD2.F2210	RS-232 plus PCD7.F1xxS as an option	---	90 Ma	–	IO 0/1	2× K
PCD2.F2400	LONWORKS® interface module	---	90 Ma	–	IO 0/1	L9
PCD2.F2610	DALI master for up to 64 DALI devices	---	90 Ma	–	IO 0/1	L
PCD2.F27x0	M-Bus master with 2 M-Bus interfaces	---	70 mA	8 mA	IO 0/1	L
PCD2.F2810	Belimo MP-Bus plus PCD7.F1xxS as an option	---	90 Ma	15 mA	IO 0/1	2× K

[1] Plug-in I/O terminal blocks are supplied with I/O modules.
 Spare terminals, ribbon connectors with system cables and separate terminals are ordered as accessories.
[2] with line termination resistors that can be activated.

System properties of PCD2.F2xxx modules

The following points must be noted when using the PCD2.F2xxx interface modules:

▶ Per PCD1.M2110R1 Room Edition a max. of 1 module PCD2.F2xxx (2 interfaces) can be used with slot I/O0.

▶ Consult the information and examples provided in the Manual 27-619 for PCD1.M2110R1 to determine the maximum communication capacity for each PCD1.M2 system.

Memory modules

The onboard memory can be expanded using a PCD7.Rxxx module in slot M1. In addition, BACnet® IP or LON IP can be activated.

Additional information about the memory management and structure is contained in the Chapter Saia PCD System description.

Memory expansion and communication

PCD7.R550M04	Flash memory module with a 4 MB file system (for user program backup, web pages, etc.)	M1
PCD7.R562	Flash memory module for BACnet® firmware with 128 MB file system	M1
PCD7.R582	Flash memory module for LON IP firmware with 128 MB file system	M1
PCD7.R610	Basic module for Micro SD flash card	M1
PCD7.R-MSD1024	Micro SD flash card 1024 MB, PCD formatted	PCD7.R610

PCD7.R550M04

PCD7.R610

Accessories and consumables for Saia PCD1.Room (PCD1.M2110R1)

Labelling

The self-adhesive labels can be printed direct with the SBC LabelEditor from the PG5 Device Configurator

EPLAN macros

EPLAN macros are available for project planning and engineering

The EPLAN® electric P8 macros are available on the support site.

The macros and article data are also provided on the EPLAN® data portal.

Battery for data backup

Type	Description
450748170	Lithium battery for PCD processor unit (RENATA button battery type CR 2032)

Plug-in screw terminal block

440550890	Plug-in screw terminal block, 11-pin, labelling 0…10	Terminal X0
440550870	Plug-in screw terminal block, 9-pin, labelling 11…19	Terminal X1
440550880	Plug-in screw terminal block, 10-pin, labelling 20…29	Terminal X2

Cover

410477590	Housing cover for PCD1.M2xxx without SBC logo on-site with an overlay that can be individually designed
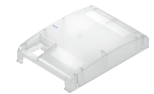
Range of uses:

Applications
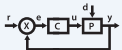
Options for programmable applications:

▸ Radiators
▸ Fan coil applications
▸ Cooling ceiling
▸ VAV – variable air volume
▸ Air quality control
▸ Signal contacts (occupancy control, presence detection, window monitoring)
▸ Lighting control
▸ Blind control
▸ etc.

Room control units

Connection options via the following:

▸ Analogue signals (onboard)
▸ S-Bus (onboard)
▸ Modbus (onboard)
▸ Internet access, web server (onboard)
▸ BACnet® with PCD7.R56x (slot M1)
▸ BACnet® MS/TP with PCD2.F2150 (slot I/O 0)
▸ Lon IP with PCD7.R58x (slot M1)
▸ Lon FTT10 with PCD2.F2400 (slot I/O 0)
▸ KNX over IP (IP onboard)
▸ KNX TP with an external coupler
▸ EnOcean with external receiver
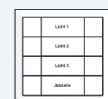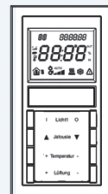
! Applications must take the exact number of I/Os into account. Coupling relays (e.g.: PCD7.L252) or El-Line-RIO (S-Bus) required. The S-Bus stations are limited to a maximum of 10 units per PCD1.Room. The same applies to Modbus stations (total of 10 units).

1.6 PCD1 E-Line
Compact design for electrical distributors

E Line

Overview of Saia PCD E-Line device series

1.6.1 PCD1 E-Line system overview

Description of the basic structure and system of the PCD1 E-Line series

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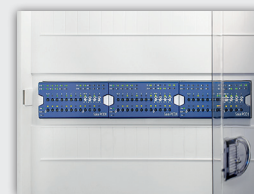
1.6.2 PCD1 controller for E-Line

The E-Controller for installation in electrical distributors is the ideal controller as a master and Ethernet interface for the Saia PCD1 E-Line
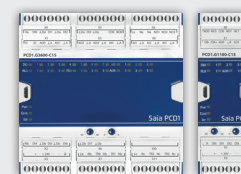
▶ PCD1.M2220-C15
▶ additional Saia PCD controllers

1.6.3 PCD1 E-Line full programmable modules

Programmable modules for specific applications

▶ PCD1.G1100-C15   Light and shade module
▶ PCD1.G360x-C15   Room module
▶ PCD1.F2611-C15   DALI module and add. RS-485
▶ PCD1.W5300-C15   Analogue module

1.6.4 PCD1 E-Line input and output modules

I/O modules with override operating level

▶ S-Series
▶ L-Series

1.6.5 E-Line system components

Extension of the communication options

▶ Power supplies
▶ PQA Power Quality Manager

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1 Automation stations

2 Operation and monitoring

3 Room controllers

4 Consumer data acquisition

5 Switch cabinet components

1.6.1 PCD1 E-Line system overview

The Saia PCD1 E-Line series was specifically developed for installation in electrical sub-distributors. The compact design enables automation in confined spaces. The two-wire bus connection between individual modules enables both centralised and decentralised automation over a distance of up to 1000 m. The modules are designed and produced in accordance with IEC 61131-2 to industrial quality. The extensive programmability and integration of Web+IT technologies enables effective automation over the entire service life of plants and properties.

Ethernet

RS-485

Saia Visi.Plus

Control system
Visualisation and control of the connected components is an important aspect of automation. The web server can directly undertake the tasks of the control system for this purpose for small applications. For more complex projects, data is transferred to a control system via standard communication protocols such as BACnet. The Saia Visi.Plus® control system is suitable for this.
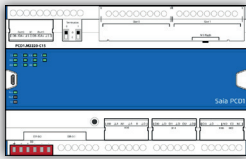
Controller
The Saia PCD controller functions as a master for the attached modules. Here it can undertake more complex controls and form the interface to the control level. The integrated automation server and the Web+IT functions can be directly used here to visualise the control via a web panel or browser. Saia PCD is the ideal interface for other plants thanks to the support of numerous protocols such as BACnet, Lon, Modbus, etc.
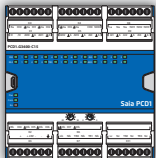
Programmable I/O modules
The programmable I/O modules of the Saia PCD1 E-Line series with Saia PG5® enable the autonomous and safe operation of the modules even if communication to the master station is interrupted.
The local function of a room, for example, is therefore guaranteed at any time. The modules are programmed with Saia PG5® via the master controller or directly via USB.
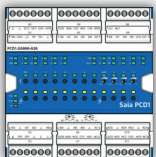
I/O modules
The PCD1 E-Line I/O modules enable centralised automation in the control cabinet and the decentralised distribution of the components through the bus connection. They can be commissioned quickly using the implemented override operation.
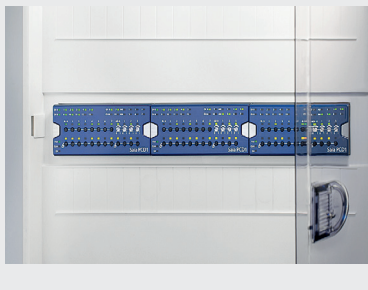
System Accessories
Power supplies and Network Analyzers are offered as a supplement for installation in the electrical distribution.
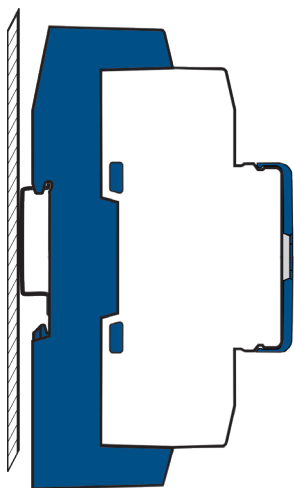
General properties of the Saia PCD1 E-Line modules

Mounting in the sub-distributor

The E-Line design enables the modules to be mounted in standard electrical sub-distributors. This significantly reduces the complexity of the mounting compared to automation control cabinets.
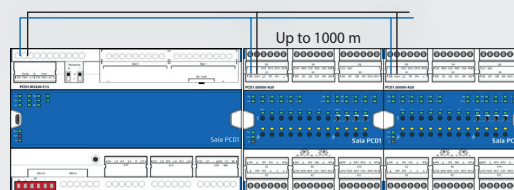
Bus topology

Communication with the S-Bus protocol is optimised for speed and creates a reliable connection up to 1000 m. The modules can be used as local or remote modules.

Up to 1000 m

Bus wiring

DB- and /DA+ terminals must be used for exchanging data between the modules. The bus is through-wired to a terminal to ensure the exchange between modules to avoid an interruption in the bus connection.
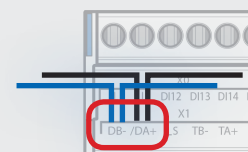
! Flexible cables with a cross section of no more than 0.75 mm² are permissible for bus wiring. 1.5 mm² on maximum applies for the overall terminal.

Mounting

on DIN rails 35 mm
(in accordance with DIN EN 60715) TH35

Product number key (ASN key)

Some main features of the E-Line modules can be identified immediately using the product number key. For example, if a module is fully programmable (5 at the end) or suitable for RIO mode (a 0).
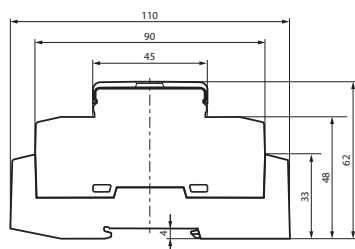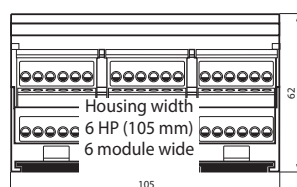
Example:
PCD1.Gxxxx-C15

0: not programmable
5: programmable

1: with LED for I/O
2: with LED and man. override op.
3: with LED and display

A: 24 VDC
C: 24 VDC / VAC
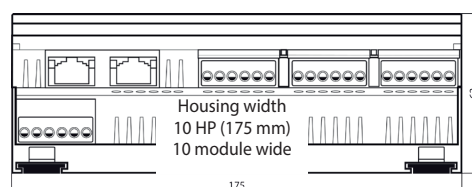F: 230 VAC
J: 110…230 VAC

Dimensions

Compatible with electrical control cabinets (in accordance with DIN 43880, size 2 × 55 mm)
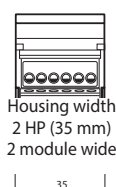
Housing width
2 HP (35 mm)
2 module wide

Housing width
6 HP (105 mm)
6 module wide

Housing width
10 HP (175 mm)
10 module wide

Accessories and consumables*

EPLAN macros

EPLAN macros are available for project planning and engineering

The EPLAN® electric P8 macros are available on the support site.

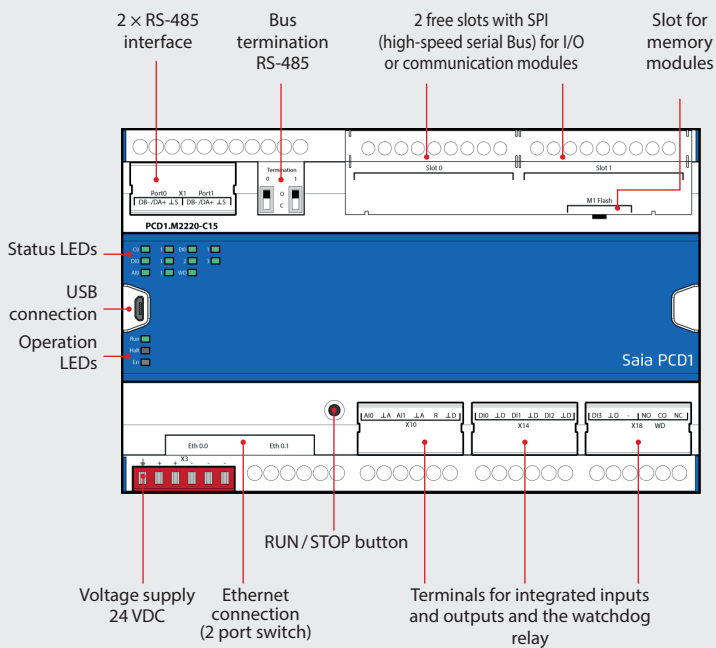The macros and article data are also provided on the EPLAN® data portal.

ePLAN®
data portal

*In preparation

ePLAN®
electric P8

1.6.2 PCD1 E-Line controller

The Saia PCD1 E-Line CPU series was specifically developed for installation in electrical sub-distributors. The compact design enables automation in confined spaces. The E-Line CPU is designed and produced to industrial quality in accordance with IEC 61131-2. The extensive programmability and integration of web+IT technologies enables effective automation over the entire service life of plants and properties. The Saia PCD E-Line CPU is the ideal interface for other plants owing to the support of numerous protocols such as BACnet, Lon, Modbus, etc. It is also ideal to achieve (energy-) efficient and individual room automation. It also provides a good basis to achieve the energy efficiency classes in accordance with EN 15232:2012.

Device design

2 × RS-485 interface

Bus termination RS-485

2 free slots with SPI (high-speed serial Bus) for I/O or communication modules

Slot for memory modules

Status LEDs

USB connection

Operation LEDs

RUN / STOP button

Voltage supply 24 VDC

Ethernet connection (2 port switch)

Terminals for integrated inputs and outputs and the watchdog relay

Features

▸ 4 digital inputs
▸ 2 analogue inputs, individually configurable via software
▸ 1 Watchdog relay/changeover contact
▸ Electrical isolation between supply, bus and I/Os
▸ Pluggable terminal blocks protected by flaps
▸ Status LEDs on the front
▸ Ethernet switch, 2× RS-485 and USB interface
▸ Large onboard memory for data (up to 128 MByte file system)
▸ Automation server for integration in web+IT systems
▸ Freely programmable with Saia PG5®
▸ FRAM technology

| ftp | http | SNMP | @ | | SD | **Automation Server** integrated in the base unit |

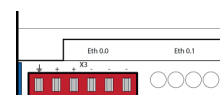## Dimensions and installation
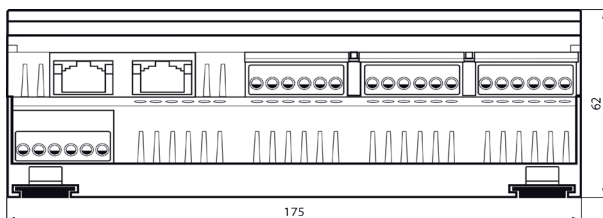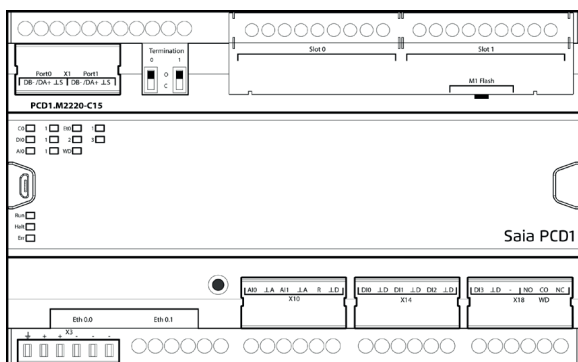
Housing width 10 HP (175 mm)
Compatible with electrical control cabinets
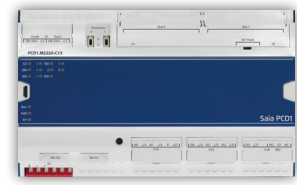(in accordance with DIN 43880, size 2 × 55 mm)
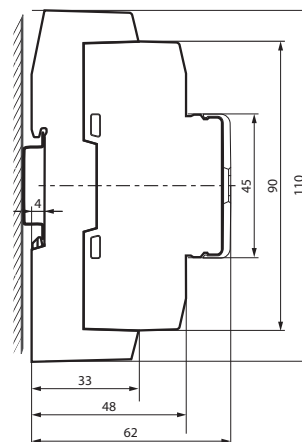
on DIN rails 35 mm
(in accordance with DIN EN 60715 TH35)

Connection concept

The device is supplied by a 24 VDC or AC voltage supply.

Overview Saia PCD1.M2220-C15

PCD1.M2220-C15

Technical data

Memory and file system	
Program memory, DB/Text (Flash)	512 kByte
User memory, DB/Text (RAM)	128 kByte
Onboard user flash file system	128 MB
Integrated communication	
Ethernet connection (2-port switch)	Yes
10/100 Mbit/s, full-duplex, auto-sensing, auto-crossing	Yes
Service interface: Micro USB	Yes
RS-485, up to 115 kbit/s	Yes

## General specifications

Operating voltage	Nominal 24 VAC (50 Hz) or DC, 24 VDC, −20/+25 % incl. 5% ripple, 24 VAC, −15 %/+15% (in accordance with EN/IEC 61131-2)
Operating temperature:	0…55 °C
Dimensions (W × H × D)	175 × 110 × 62 mm
Mounting location	2 × DIN rails in accordance with DIN EN60715 TH35 (2 × 35 mm) or on a flat surface
Power consumption	typically 6.5 W

Onboard inputs/outputs

Inputs		Terminal
4 Digital inputs	24 VAC / VDC source operation (positive switching) or sink operation	X14 + X18
2 Analogue inputs, selectable via "Device Configurator"	−10…+10 VDC, Pt1000, Ni1000, Ni1000 L&S, 0…2.5 kΩ, 0…7.5 kΩ, 0…300 kΩ (NTC10k and NTC20k), 12 bit resolution	X10
Outputs		
1 Watchdog relay or change-over contact	48 VAC or VDC, 1 A With DC switching voltage a free-wheeling diode should be connected in parallel to the load	X18

Plug-in I/O modules for slots I/O 0 and I/O 1
The modules listed in the PCD2.M4 and PCD2.M5 series (Chapter 1.4) are also used for the E-Line CPUs.

Detent latch   Bus connector
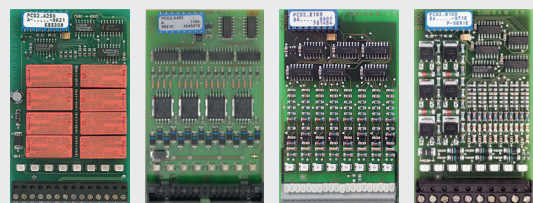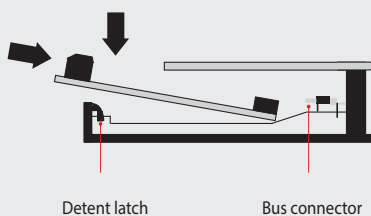
PCD1.M2220-C15 interface options

In addition to the onboard interfaces, the interface functions can also be expanded in a modular way using the various slots. Numerous protocols are therefore supported by the Saia PCD1.M2220-C15. Detailed information and an overview is contained in the Chapter BA communication systems.

Communication		Electrical isolation	Internal current consumption 5V +V (24 V)		Slot	I/O connector type [1]
PCD7.F110S	RS-422 with RTS/CTS or RS-485 [2]	---	40 mA	–	Slot A [3]	
PCD7.F121S	RS-232 with RTC/CTS, DTR/DSR, DCD, suitable for modem or EIB connection	---	15 mA	–	Slot A [3]	
PCD7.F150S	RS-485 [2]	●	130 mA	–	Slot A [3]	
PCD7.F180S	Belimo MP-Bus, for connecting up to 8 drives on one line	---	15 mA	15 mA	Slot A [3]	
PCD2.F2100	RS-422/RS-485 [2], plus PCD7.F1xxS en option	---	110 mA	–	IO 0/1	2× K
PCD2.F2150	BACnet® MS/TP RS-485 plus PCD7.F1xxS as an option	---	110 mA	–	IO 0/1	2× K
PCD2.F2210	RS-232 plus PCD7.F1xxS as an option	---	90 Ma	–	IO 0/1	2× K
PCD2.F2400	LONWORKS® interface module	---	90 Ma	–	IO 0/1	L9
PCD2.F2610	DALI master for up to 64 DALI devices	---	90 Ma	–	IO 0/1	L
PCD2.F27x0	M-Bus master with 2 M-Bus interfaces	---	70 mA	8 mA	IO 0/1	L
PCD2.F2810	Belimo MP-Bus plus PCD7.F1xxS as an option	---	90 Ma	15 mA	IO 0/1	2× K

[1] Plug-in I/O terminal blocks are supplied with I/O modules.
   Spare terminals, ribbon connectors with system cables and separate terminals are ordered as accessories.
[2] with line termination resistors that can be activated.
[3] On slot A of the PCD2 communication cards PCD2.Fxxxx.
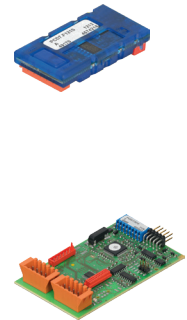
System properties of PCD2.F2xxx modules

The following points must be noted when using the PCD2.F2xxx interface modules:
▸ Max. 2 modules PCD2.F2xxx (4 interfaces) can be used in slots I/O 0/1 per PCD1.M2220-C15.

Memory modules

The onboard memory of the E-Line CPU can be expanded using a Saia PCD7.Rxxx module in slot M1.
In addition, the controller can be expanded with BACnet® IP or LON IP.

Additional information about the memory management and structure is contained in the chapter Saia PCD System Description.

Memory expansion and communication

PCD7.R550M04	Flash memory module with a 4 MB file system (for user program backup, web pages, etc.)	M1
PCD7.R562	Flash memory module for BACnet® firmware with 128 MB file system	M1
PCD7.R582	Flash memory module for LON IP firmware with 128 MB file system	M1
PCD7.R610	Basic module for Micro SD flash card	M1
PCD7.R-MSD1024	Micro SD flash card 1024 MB, PCD formatted	PCD7.R610

PCD7.R55xM04

PCD7.R610

System design with PCD1 E-Line modules and Saia PCD® controllers
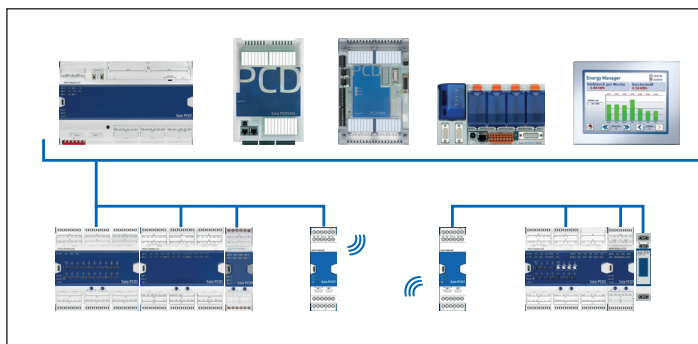
The PCD1.M0/PCD1.M2 controllers and PCD2.M5-, PCD3.M3/5/6 CPUs as well as the programmable Micro Browser panel PCD7.D4xxxT5F can be used as head-end stations.
Here, the controller can process higher-level control processes and gather, process and visualise data and form the interface to the control level.

# 1.6.3 PCD1 E-Line fully programmable modules

The Saia PCD1 E-Line fully programmable modules are for specific applications. For example for room automation, zone control and decentralised automation. The modules are freely programmed using the Saia PG5® tool. The Saia PCD1 E-Line series enables autonomous and safe operation of the modules even if communication to the master station is interrupted. The local function of a room, for example, is therefore guaranteed at any time.

System properties

‣ Freely programmable modules for specific applications
‣ Galvanic isolation between supply, bus and I/Os
‣ Pluggable terminal blocks protected by covers
‣ Status LEDs on the front
‣ RS-485 and USB interface
‣ Industrial quality
‣ Each wire is a connection

Connection concept

The modules are supplied with a 24 VDC or AC voltage supply. Supply to the modules is below.
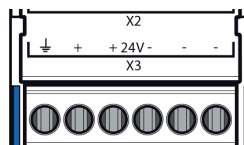
Bus topology and applications

Level controllers for all rooms on the same floor

RS-485

Backbone
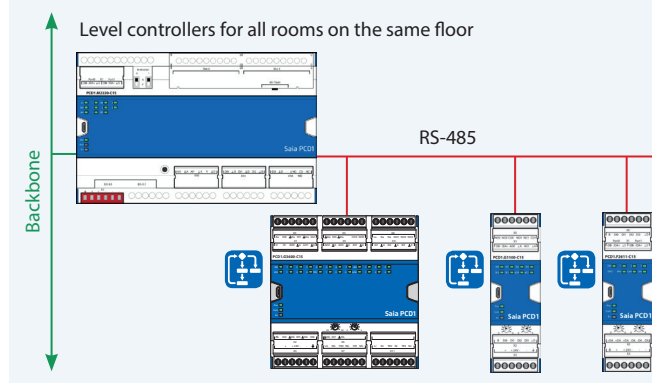
All the modules are freely programmable and can be operated as "standalone". Data is exchanged between them via the RS-485 connection and a terminal, e.g. a level controller.

Thanks to the options with the autonomous functions, the modules are ideally suitable for:
‣ Room automation
‣ Zone control
‣ Decentralised automation

LED

The currently active statuses are displayed on the respective LEDs for the inputs and outputs.
The same applies to the voltage supply, communication and errors.

PCD1.G1100-C

DI0	DI1	DI2
RL0	RL1	AO0

Pwr
Com
Err
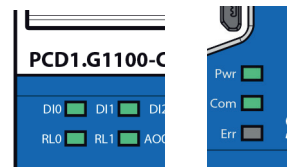
## Commissioning with the smartphone

E-Line App

SBC E-Line app

The E-Line modules have a Micro-USB interface.
Various services for commissioning and service are available using a suitable end device (for example, Samsung Galaxy S4) and the SBC E-Line app. For example, the connections can be tested without a loaded program.
The E-Line app can also be used by using a link via the Micro-USB connection to the module with the end device.

USB   USB

! More details on which end devices are supported by this technology and app can be found on our support page at www.sbc-support.com.
A USB OTG (on to go) cable is required for connecting via USB.

Programming

The modules are programmed with Saia PG5® via a master controller or directly via Micro-USB. This enables additional options for commissioning and during operation.
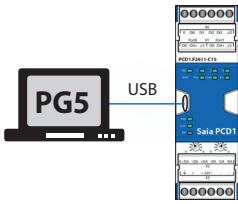
Programming direct via USB

E-Line modules have a Micro-USB connection at the front of the module. For example, the user program for the related module or a firmware update for the module can be loaded via the direct connection of the PC to the module via USB.
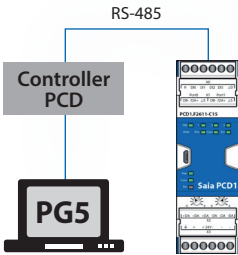
Programming via a master controller (PCDx.Mxxxx)

The master controller connected to the freely programmable E-Line modules uses the RS-485 bus (S-Bus), to load the user program or a firmware update on the corresponding modules.
Here the master controller is used as a gateway.

The modules are programmed with Saia PG5® using FBoxes or IL.
A range of FBoxes is therefore available to simplify engineering.

List of libraries that are supported:

PG5 standard FBox libraries

- Binary
- Blinker
- Block Control (no SB)
- Buffers
- Com.Text (not interpreted)
- Converter
- Counter
- DALI E-Line Driver (new)
- Data Block
- Data Buffer
- EIB Driver (partly)
- EnOcean (partly)
- Flip-Flop
- Floating Point (IEEE only)
- HVC (partly)
- Indirect
- Integer
- Ladder
- Move In/Out
- Modbus (E-Suite)
- Regulation (partly)
- Special, sys Info (partly)
- Timer
- PHC

In addition to these libraries, a new "E-Suite V2" library is available for specific applications that can be created with the Saia PCD1 E-Line modules.
An example for the electrical plant: Shade control, light dimming…
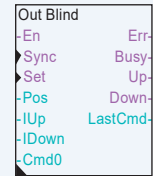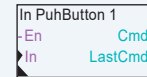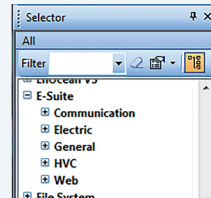
Program
Non-volatile memory (Flash memory)

Program blocks

COB	COB 0
XOB	XOB 10, 12, 13 and 16
PB/FB	100 with maximum hierarchy of 8

Data types

ROM Text/DB	50

Memory

Program memory	64 kBytes

The media
Volatile memory (RAM) without battery backup

Data types

Register	2000
Flag	2000
Timer/Counter	200

Memory

Memory (RAM) for 50 Text/DB	5 kBytes
Memory (EEPROM) for parameter (media) backup	256 Bytes
Cyclic synchronisation with PCD controller	Real-time clock (RTC)

Not all functions are available compared to a PCDx.Mxxxx controller. These modules do not have an automation server for example.
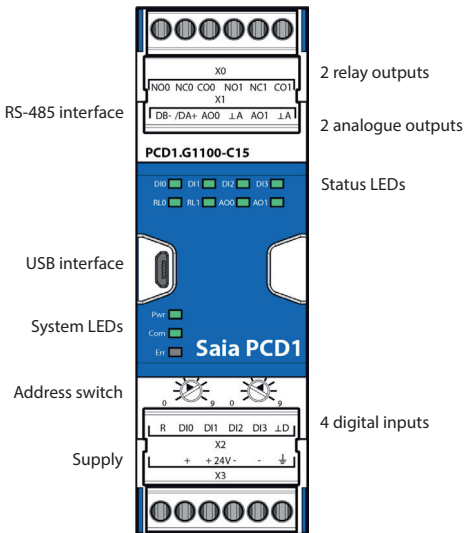
> **!** More details on which FBoxes are supported is available on our support page
> www.sbc-support.com

PCD1.G1100-C15 (light and shade module)

The freely programmable module with a housing width of 35 mm (2 HP) can be controlled via RS-485 and enables light and shade control. It has two analogue and two relay outputs and four digital inputs. The user can optionally use the relay for the direct switching of two light groups or control of window shading. The blinds or shading can be positioned and defects localised via the integrated load current measurement. The user can use the digital inputs to connect electrical sensors.

Device design

RS-485 interface — 2 relay outputs, 2 analogue outputs

PCD1.G1100-C15

Status LEDs — DI0 DI1 DI2 DI3 / RL0 RL1 AO0 AO1

USB interface

System LEDs — Pwr Com Err

Saia PCD1

Address switch

4 digital inputs

Supply

System properties

▶ 4 digital inputs
▶ 2 relays incl. current detection
▶ 2 analogue outputs
▶ Galvanic isolation between supply, bus and I/Os
▶ Pluggable terminal blocks protected by covers
▶ Status LEDs on the front
▶ RS-485 and USB interface
▶ Freely programmable with Saia PG5®

Technical Data

Interfaces

Communication interface	RS-485 with galvanic isolation Baud rate: 9,600, 19,200, 38,400, 57,600, 115,200 bps (autobauding)
Address switch for S-Bus address	Two rotary switches 0…9
Service interface	USB (Micro-USB)

General specifications

Supply voltage	Nominal 24 VAC (50 Hz) or VDC (in accordance with EN / IEC 61131-2) 24 VDC, −15 / +20% max., incl. 5% ripple 24 VAC, −15 / +10%
Electrically isolated	500 VDC between power supply and RS-485 and between current supply and inputs/outputs
Dimensions	Housing width 2 HP (35 mm), compatible with electrical control cabinet (in accordance with DIN 43880, size 2 × 55 mm)
Mounting type	DIN rail in accordance with DIN EN 60715 TH35 (1 × 35 mm)
Ambient temperature	Operation: 0…+55°C, without forced ventilation Storage: −40…+70°C
Power consumption	Typical 2 W

Inputs and outputs

Inputs

4 digital inputs	24 VAC / VDC

Outputs

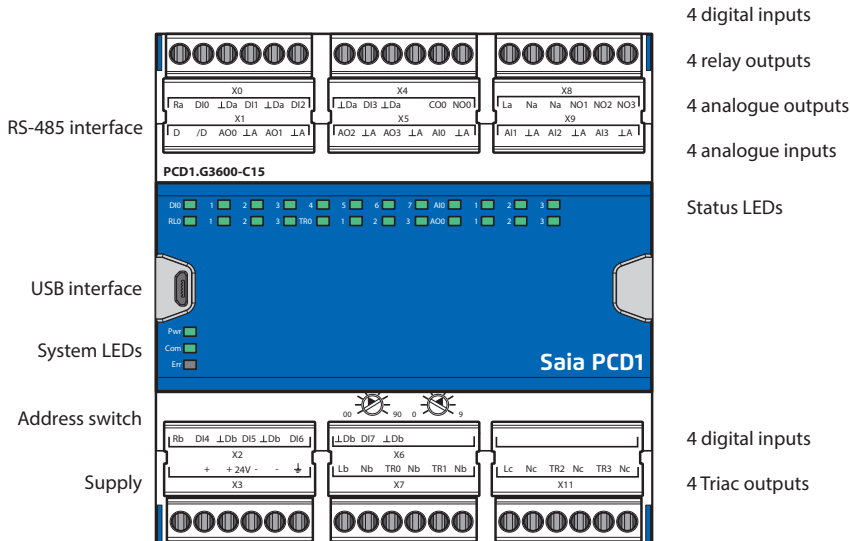| 2 analogue outputs	0…10 VDC, 12 bit resolution
2 relays (inrush)	250 VAC / 30 VDC 8 AAC (AC1) / 8 ADC (resistive load) Max. inrush current 15 A Current measurement ≥ 200 mA, resolution 100 mA

PCD1.G360x-C15 (room module)

The programmableroom module with a housing width of 105 mm (6 HP) can be controlled via RS-485.

For example, it allows individual room control with commonly found room automation components. It allows controller tasks from the HVAC and electrical plant areas to be combined. All relevant sensors for measuring temperature, humidity, CO_2, VOC and digital 24 VAC / VDC signals are detected via the diverse inputs. The Triac and 0…10 V outputs enable the silent setting of valves. Fan coil devices can also be directly controlled.

Device design

	4 digital inputs
	4 relay outputs
RS-485 interface	4 analogue outputs
	4 analogue inputs
	Status LEDs
USB interface	
System LEDs	
Address switch	
Supply	4 digital inputs
	4 Triac outputs
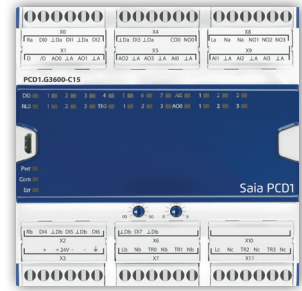
System properties

▸ 8 digital inputs
▸ 4 analogue inputs, individually configurable via software
▸ 4 analogue outputs
▸ 4 Triac outputs
▸ 4 relay outputs
▸ Galvanic isolation between supply, bus and I/Os
▸ Pluggable terminal blocks protected by covers
▸ Status LEDs at the front
▸ RS-485 and USB interface (for PCD1.G3601-C15 also 1× RS-485)
▸ Freely programmable with Saia PG5®

Technical Data

Interfaces

Communication interface	RS-485 with galvanic isolation Baud rate: 9,600, 19,200, 38,400, 57,600, 115,200 bps (autobauding)
Address switch for S-Bus address	Two rotary switches 0…9
Service interface	USB (Micro-USB)
Additional interface	RS-485 in SASI Mode C for PCD1.G3601-C15 (E-Suite, Modbus, EnOcean, PHC)

General specifications

Supply voltage	Nominal 24 VAC (50 Hz) or VDC (in accordance with EN / IEC 61131-2) 24 VDC, −15 / +20% max., incl. 5% ripple 24 VAC, −15 / +10%
Electrically isolated	500 VDC between current supply and RS-485 and between current supply and inputs/outputs
Dimensions	Housing width 6 HP (105 mm), compatible with electrical control cabinet (in accordance with DIN 43880, size 2 × 55 mm)
Mounting type	DIN rail in accordance with DIN EN 60715 TH35 (1 × 35 mm)
Ambient temperature	Operation: 0…+55°C without forced ventilation Storage: −40…+70°C
Power consumption	Typical 2 W

Inputs and outputs

Inputs	
8 digital inputs	24 VAC / VDC, 8 ms / 0.2 ms input filter
4 analogue inputs (adjustable via software)	0…10 V, ±10 V, ±20 mA (0…20 mA, 4…20 mA), Pt/Ni1000, Ni1000 L&S, 0…2,500 Ω, 0…7,500 Ω, 0 Ω…300 kΩ 12/13 bit resolution, depending on the measured values

Outputs	
4 analogue outputs	0…10 VDC, ±10 V, 12 bit resolution
1 relay (inrush)	250 VAC / 30 VDC 10 AAC (AC1) / 10 ADC (resistive load) Max. inrush current 65 A
3 relays	250 VAC / 30 VDC 6 AAC (AC1) / 6 ADC (resistive load) Max. inrush current 15 A
4 Triacs	24 VAC / 230 VAC, current load rating 1 A (AC)

Order details

Type	Description
PCD1.G3600-C15	E-Line room control module
PCD1.G3601-C15	E-Line room control module + aux. RS-485

Accessories

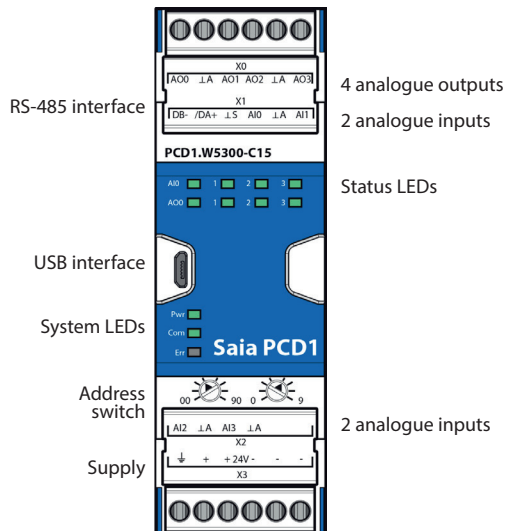| Type	Description
PCD1.K0206-005	E-Line cover and labeling set consisting of 5× covers (6HP=105mm) and Labelling sheets for installation in automation control cabinets

PCD1.W5300-C15 (analogue module)

The programmable analogue module with a housing width of 35 mm (2 HP) has four inputs and outputs. Each input and output is electrically separated and can be configured separately. Small and purely analogue tasks such as recording the room temperature and subsequent control of 0–10 V drives can therefore be realised.

Device design

RS-485 interface	4 analogue outputs
	2 analogue inputs
	Status LEDs
USB interface	
System LEDs	
Address switch	2 analogue inputs
Supply	

System properties

▶ 4 analogue inputs
▶ 4 analogue outputs
▶ Galvanic isolation between supply, bus and I/Os
▶ Pluggable terminal blocks protected by covers
▶ Status LEDs at the front
▶ RS-485 and USB interface
▶ Freely programmable with Saia PG5®

Technical Data

Interfaces

Communication interface	RS-485 with galvanic isolation Baud rate: 9,600, 19,200, 38,400, 57,600, 115,200 bps (autobauding)
Address switch for S-Bus address	Two rotary switches 0…9
Service interface	USB (Micro-USB)

General specifications

|	
Supply voltage	Nominal 24 VAC (50 Hz) or VDC (in accordance with EN / IEC 61131-2) 24 VDC, −15 / +20% max., incl. 5% ripple 24 VAC, −15 / +10%
Electrically isolated	500 VDC between power supply and RS-485 as well as between current supply and inputs/outputs
Dimensions	Housing width 2 HP (35 mm), compatible with electrical control cabinet (in accordance with DIN 43880, size 2 × 55 mm)
Mounting type	DIN rail in accordance with DIN EN 60715 TH35 (1 × 35 mm)
Ambient temperature	Operation: 0…+55°C, without forced ventilation Storage: −40…+70°C
Power consumption	Typical 2 W

Inputs and outputs

Inputs	
4 analogue inputs (adjustable via software)	0…10 V, ±10 V, ±20 mA (0…20 mA, 4…20 mA), Pt/Ni1000, Ni1000 L&S, 0…2500 Ω, 0…7500 Ω, 0 Ω…300 kΩ 12/13 bit resolution, depending on the measured values
Outputs	
4 analogue outputs	0…10 VDC, ±10 V, 12 bit resolution

PCD1.F2611-C15 (DALI module + add. RS-485)

The freely programmable module with a housing width of 35 mm (2 HP) can be controlled via RS-485 and enable the direct control of 64 DALI subscribers. It has the DALI line as well as four digital inputs. The user can implement the digital inputs to connect electrical sensors. The module is freely programmable and can also be used as a "standalone" DALI small controller. For example, smaller DALI lighting systems for enhanced individual rooms can therefore be implemented and subsequent linking to a higher level controller is no longer an obstacle.
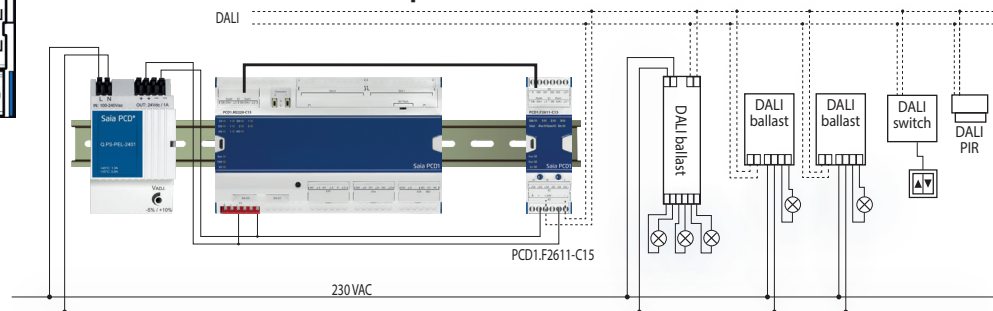
Device design
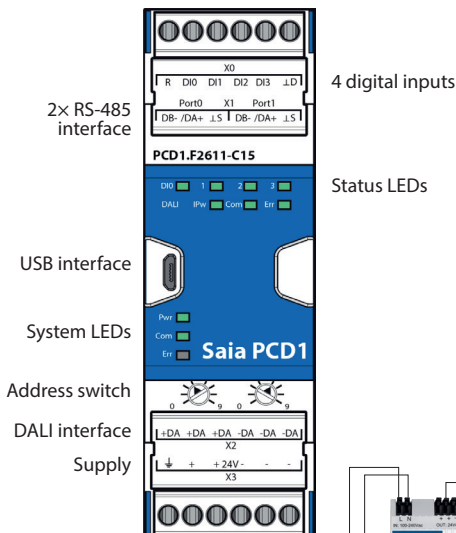
System properties

- S-Bus (RS-485) / DALI interface
- incl. DALI voltage supply (can be deactivated)
- Up to 64 DALI ballasts
- 4 digital inputs
- Galvanic isolation between supply, bus and I/Os
- Pluggable terminal blocks protected by covers
- Status LEDs on the front
- RS-485 and USB interface
- Freely programmable with Saia PG5®

Connection example

Technical Data

Interfaces

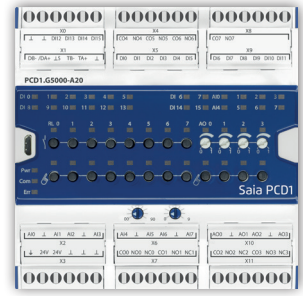|	
Communication interface	RS-485 with galvanic isolation Baud rate: 9,600, 19,200, 38,400, 57,600, 115,200 bps (autobauding)
Address switch for S-Bus address	Two rotary switches 0…9
Service interface	USB (Micro-USB)
DALI	incl. DALI voltage supply (can be deactivated) for up to 64 DALI subscribers 160 mA max. Output current basic insulation (1350 VAC)
Additional interface	RS-485 in SASI mode C (E-Suite, Modbus, EnOcean, PHC)

General specifications

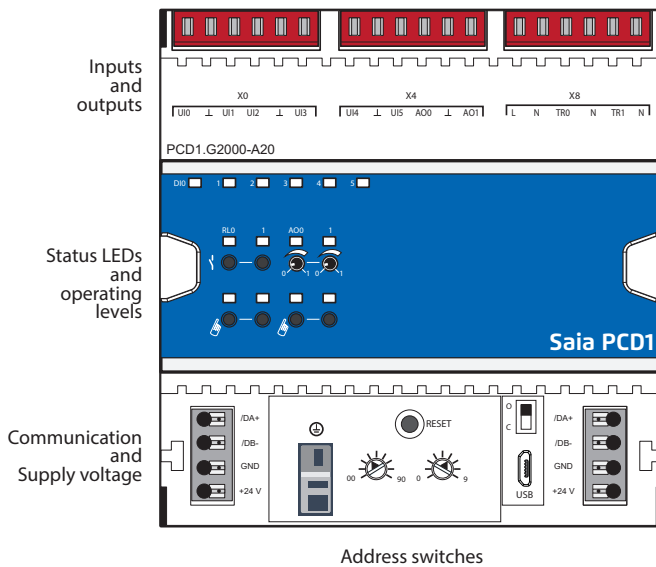|	
Supply voltage	Nominal 24 VAC (50 Hz) or VDC (in accordance with EN / IEC 61131-2) 24 VDC, –15 / +20% max., incl. 5% ripple 24 VAC, –15 / +10%
Electrically isolated	500 VDC between current supply and RS-485 and between current supply and inputs/outputs
Dimensions	Housing width 2 HP (35 mm), compatible with electrical cabinet (in accordance with DIN 43880, size 2 × 55 mm)
Mounting type	DIN rail in accordance with DIN EN 60715 TH35 (1 × 35 mm)
Ambient temperature	Operation: 0…+55°C without forced ventilation Storage: –40…+70°C
Power consumption	Typical 2 W

Inputs

4 digital inputs	24 VAC / VDC

1.6.4 PCD1 E-Line input and output modules

The remote I/O modules are controlled via RS-485 and enable decentralised automation using industrial quality components. The data point mix is specifically designed for applications in the HVAC sector. Moreover, the compact design enables the use of electrical distribution boxes alongside installations even in confined spaces. Commissioning and servicing are facilitated due to the local override operating level for each output. Remote maintenance is also possible using the optional access to the override operating level via the web interface in the Saia PCD controller. Programming is also very efficient and fast using a comprehensive FBox library with web templates.
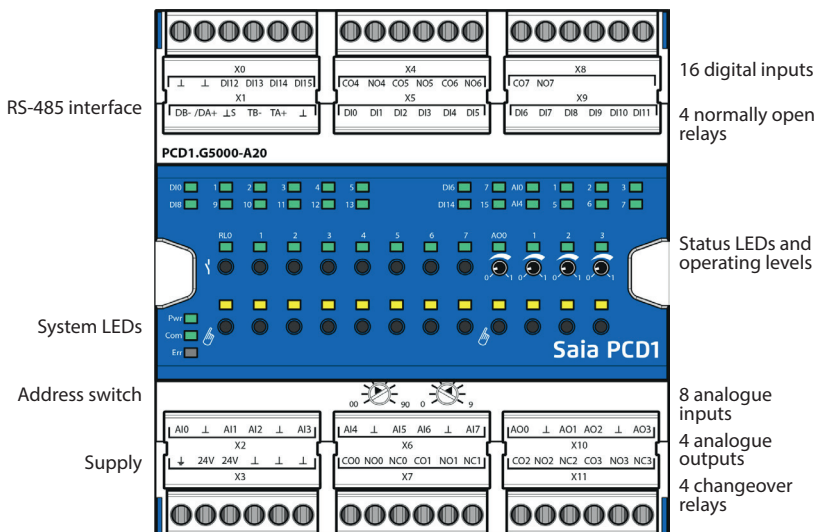

Device design – S-Serie

Inputs and outputs

Status LEDs and operating levels

Communication and Supply voltage

Address switches

System properties

▸ Optimised S-Bus protocol for fast data communication
▸ Local override operating level via web panel or buttons on the module
▸ Specific I/O mix suitable for HVAC systems
▸ Convenient programming using the FBox library and web templates
▸ Industrial quality in accordance with IEC EN 61131-2
▸ Pluggable terminal blocks protected by covers
▸ RS-485 interface
▸ Easy installation with connector bridge

Device design – L-Serie

RS-485 interface

System LEDs

Address switch

Supply

16 digital inputs

4 normally open relays

Status LEDs and operating levels

8 analogue inputs

4 analogue outputs

4 changeover relays

System properties

▸ Optimised S-Bus protocol for faster communication (4 × faster)
▸ Local override operating level via web panel or buttons on the module
▸ Specific I/O mix suitable for HVAC systems
▸ Convenient programming using the FBox library and web templates
▸ Industrial quality in accordance with IEC EN 61131-2
▸ Pluggable terminal blocks protected by covers
▸ Electrically isolated RS-485 interface
▸ High I/O density thanks to two-sided connection terminals

Manual or remote override operating level
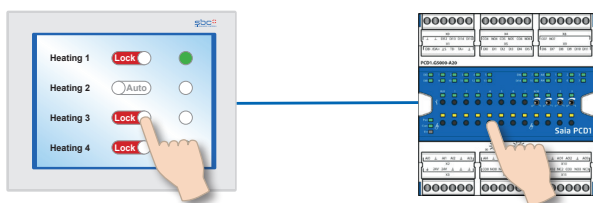
For modules with a manual override operating level, commissioning can occur independent of the master station.

The manual operating level can also be controlled remotely from a touch panel. If the bus line is disconnected, the module retains the manually set values. Traditional manual operating levels in the control cabinet door via potentiometers and switches can therefore be completely replaced.

Five security levels can be defined for the manual operating level:

1. Manual operation completely deactivted
2. Operation permitted only from the module
3. Operation permitted from the module and limited operation from the panel. If manual operation is activated at the module, it cannot be reset from the panel.
4. Unlimited operation from the panel and module.
5. Operation permitted only from "remote".

> **!** Depending on the application, manually set values may not be reset from the panel. This can therefore be deactivated or limited.
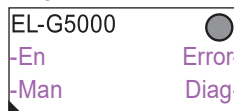
Bus wiring

S-Series : Easy and reliable installation through connector bridges for communication and supply voltage.

L-Series : Most modules are equipped with integrated terminating resistors that enable wiring without additional external components.

Programming

The modules are addressed and programmed via FBoxes.

Communication FBox:

▸ Data exchange for I/O via optimised S-Bus
▸ Configurable fall back state for bus interruption or timeout
▸ Direct generation of the symbols
▸ Reading and writing of the status of the override operating level
▸ Direct compatibility for web macros

Web templates:

▸ Web templates are available for the operation and visualisation of the override operating level

General technical data

Power supply

Supply voltage	24 VDC, −15 / +20% max., incl. 5% ripple (in accordance with EN / IEC 61131-2)
Electrically isolated	500 VDC between power supply and RS-485 and between inputs/outputs and RS-485 *
Power consumption max.	3 W
Interfaces	
Communication	RS-485 with galvanic isolation * / baud rate: 9,600, 19,200, 38,400, 57,600, 115,200 bps (autobauding)
Address switch for S-Bus	Two rotary switches 0…9
Terminating resistor	Integrated, can be activated via a wire jumper
General specifications	
Ambient temperature	Operation: 0…+55°C without forced ventilation / storage: −40…+70 °C
Terminals	Push-in spring-loaded terminals – max. 1.5 mm².
Width	6TE (105mm)
* Only for L-Series	

Technical data for inputs and outputs

Digital inputs

Input voltage	24 VDC, high active
Relay outputs	
Switching voltage max.	250 VAC / 30 VDC
Switching current max.	see below board, datasheet
Contact protection	n/a
Analogue inputs	
Resolution	12/13 bit resolution, depending on the measured values
Measured values	0…10 V, Pt/Ni1000, Ni1000 L&S, NTC, 0…2,500 Ω, 0…7,500 Ω, 0 Ω…300 kΩ can be set via FBoxes
Precision	0.3% at 25°C
Analogue outputs	
Resolution	10 bits
Signal range	0…10 V (10 mA max.)
Man. Override operation	Operation via buttons and potentiometer

S-Series

Type	Digital input (DI), universal input (UI)	Relay, triac, digital output (DO)	Analogue output	Manual override operation
PCD1.A1000-A20	–	10 DO 24 VDC, 0.5 A	–	Yes
PCD1.A2000-A20	–	6 relays 230 V, 16 A	–	Yes
PCD1.B1100-A20	4 DI	10 relays (6 NO, 4 CO)	–	Yes
PCD1.B1120-A20	16 DI	4 relays change over	–	Yes
PCD1.B5000-A20	6 DI 230 V	3 relays 230 V, 6 A	–	Yes
PCD1.B5010-A20	6 DI 24 VAC/DC	3 relays 230 V, 6 A	–	Yes
PCD1.E1000-A10	12 DI 24 VDC	–	–	–
PCD1.G2000-A20	6 UI	2 triacs 24…230 VAC, 1 A	2	Yes
PCD1.G2100-A10	8 UI	–	–	–
PCD1.G2200-A20	8 UI	–	4	Yes
PCD1.W5200-A20	–	–	8	Yes

L-Series

Type	Digital input	Relay (NO / changeover)	Analogue input	Analogue output	Manual override operation
PCD1.B1000-A20	4	10 (6 / 4), 4A	---	---	Yes
PCD1.B1010-A20	24	10 (6 / 4), 4A	---	---	Yes
PCD1.B1020-A20	16	4 (0 / 4), 4A	---	---	Yes
PCD1.G5000-A20	16	8 (4 / 4), 4A	8	4	Yes
PCD1.G5010-A20	12	4 (0 / 4), 4A	12	8	Yes
PCD1.G5020-A20	8	4 (0 / 4), 4A	16	4	Yes

Accesories

Type	Short text	Description	Weight
32304321-003-S	Terminal set – S+L-Serie	6-pin terminal. Set of 6 terminal blocks	40 g

Accessories

Type	Short text	Description	Weight
PCD1.K0206-005	E-Line Cover Set 5×6 HP*	E-Line cover and labelling set consisting of 5× covers (6 HP=105 mm) and labelling sheets for installation in automation control cabinets	365 g
PCD1.K0206-025	E-Line Cover Set 5×6 HP* w.h.	E-Line cover and labelling set w.h. consisting of 5× covers (6 HP =105 mm) with holes for the manual priority operating level and labelling sheets for installation in automation control cabinets	365 g

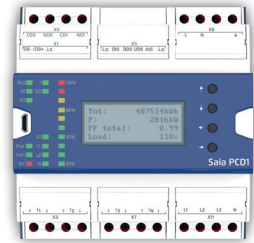* Horizontal pitch: 1 HP corresponds to 17.5 mm

Mounting and labelling in the automation control cabinet

The modules can be mounted in the standard automation control cabinet as well as mounting in the electrical sub-distributor. Covers are available for this for easy labelling. They also serve as contact protection for the buttons and terminals to prevent faulty operation.
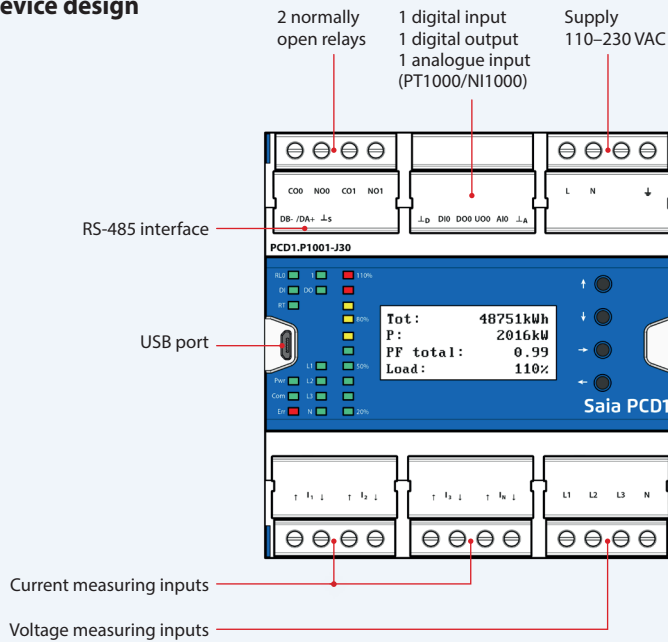
PCD1.P1001-J30
(Power Quality Analyzer)

The Power Quality Analyser (PQA) is a device to measure and check the quality of the power supply and is manufactured as an industrial grade DIN rail device. The compact E-Line design enables installation in restricted spaces in electrical distributor boxes. The extensive measurement options enable an analysis of any disturbances with cyclic/event-oriented data capture and automatic messaging if a measured variable is outside the tolerance limits. The integrated RS-485 interface is available in the S-Bus/Modbus and enables communication with a Saia PCD controller or other master devices. Programming is also very efficient and fast using a comprehensive FBox library with web templates.

Device design

2 normally open relays

1 digital input
1 digital output
1 analogue input
(PT1000/NI1000)

Supply
110–230 VAC

RS-485 interface

USB port

Current measuring inputs

Voltage measuring inputs

System properties
▸ Network analyser with 0.5% measurement accuracy
▸ Measurement of the 3 phases and neutral conductor
▸ Current measurement inputs for current converter connection
▸ Measurement data storage (event/cyclic) in internal memory
▸ 1.9 inch LCD
▸ Electrically isolated measuring inputs
▸ Temperature measuring input
▸ Electrically isolated RS-485 interface for S-Bus/Modbus (switchable)
▸ 105 mm wide DIN rail devices (6 modules)

General technical data

Power supply

Supply voltage	110–230 VAC, +15% –20%, 50/60 Hz
Electrically isolated	4,000 VAC between power supply and RS-485
Power consumption	Max.: 6 W typically: 1.5 W

Interface

Communications interface	RS-485 with electrical isolation Baud rate: 4,800, 9,600, 19,200, 38,400, 57,600, 115,200 bps
Bus protocol	S-Bus or Modbus interface: Selectable via LCD
Configuration	Parity: Selectable via LCD

Address	Address range:
	    S-Bus: 0 … 255
	    Modbus: 1 … 253
	    Selectable via LCD

Terminating resistor	Integrated, can be activated via the display and interface

General data

Ambient temperature	Operation: −25°C … +55°C Storage: −30°C … +70°C
Mounting type	Top-hat rail pursuant to DIN EN 60715 TH35 (1 × 35 mm)

Measurement accuracy

|	
Active energy/power	Resistive load: ± 0.5% (5 A CT); ± 1.0% (1 A CT) Inductive load: ± 0.6% (5 A CT); ± 1.0% (1 A CT)
Reactive energy/power	Resistive load: ± 1.0% (5 A CT); ± 1.0% (1 A CT) Inductive load: ± 1.0% (5 A CT); ± 1.0% (1 A CT)

! More details are in Chapter 4 "Consumer data acquisition" on page 142.

1.6.5 E-Line system components

Power units for installation in electrical distributor boxes

The compact Q.PS-PEL-240x power units with 24 VDC output voltage can be installed in a very restricted space and therefore the installation in cost-effective electrical distributor boxes in accordance with DIN 43880 is possible. They are therefore ideally suited for combining with the E-Line family. Modern push-in terminals enable efficient and fast wiring without the use of tools.

Input terminals
L N

Output terminals
+ + – –

Output voltage
OK LED

Setting of the
output voltage
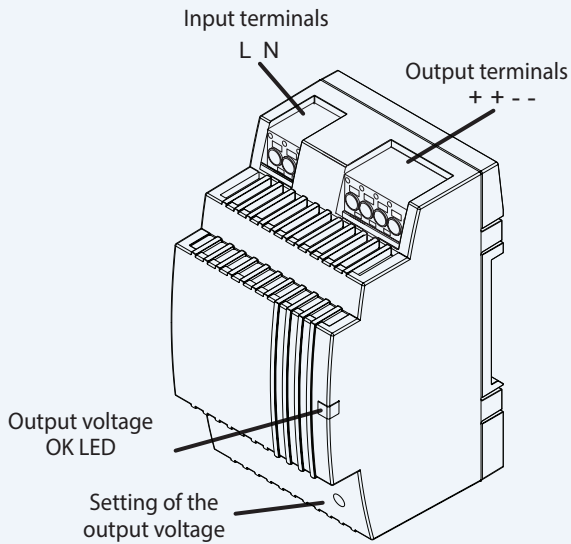
Power unit overview

Single phase 110/230 VAC
▶ Q.PS-PEL-2401: 24 VDC / up to 1.3 A
▶ Q.PS-PEL-2403: 24 VDC / up to 4.0 A

Standards and certifications

Compliant certifications
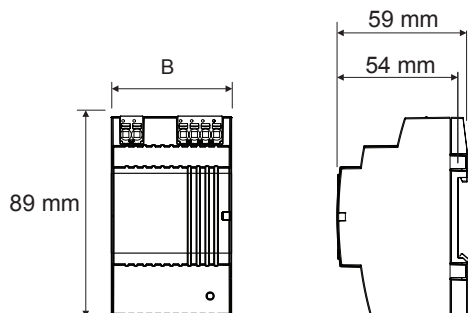▶ CE
▶ DNV GL (shipping approval)
▶ UL (cURus, cULus)
▶ EAC

Electrical safety
▶ EN61558
▶ EN60950 (SELV)

EMC
▶ EN61204-3
▶ Immunity pursuant to EN61000-6-2 (for the industrial sector)
▶ Emitted interference in accordance with EN61000-6-4 (for the domestic sector)

Dimensions

59 mm
54 mm
B
89 mm

Model	Q.PS-PEL-2401	Q.PS-PEL-2403
Width (W)	54 mm	90 mm

System properties

▶ Short-circuit protection and constant overload limiter
▶ Protection class II (in closed switch cabinet)
 → dual isolation
▶ Power failure bypass up to 100 ms
▶ LED for output voltage OK display
▶ Stabilised and adjustable output voltage for the conductor resistance compensation
▶ Parallel operation possible to increase max. output current
▶ IP20 housing for mounting on DIN rail

Mounting in the sub-distributor

The design of the Q.PS-PEL2-40x power units complies with the required standard dimensions according to DIN 43880. The power units can therefore be easily integrated in electrical distribution boxes and are ideally suited to supply the components of the E-Line family with voltage


Terminal technology

Push-in terminals for efficient and fast wiring without tools for single wire conductors with a cross section of up to 2.5 mm² or fine wire ferrules up to 1.5 mm². However fine wire conductors up to 2.5 mm² can also be connected directly by simply applying pressure (screwdriver).
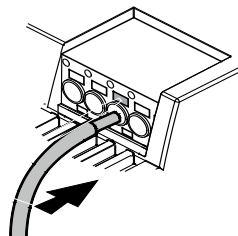
Installation information

Distance to adjacent parts:
Right/left: no minimum distance required
Top/bottom: min. 50 mm

50 mm
50 mm
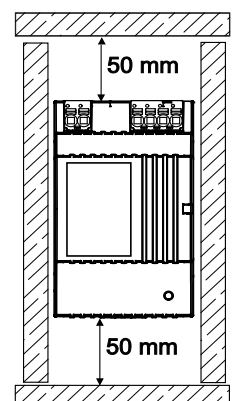
Technical data

Input data	Q.PS-PEL-2401	Q.PS-PEL-2403
Input voltage	100…240 VAC	
Permitted input voltage range	85…264 VAC	
Nominal frequency range	44…66 Hz	
Nominal input current for nominal load (110 / 230 VAC)	0.7 / 0.5 A	1.6 / 0.9 A
Internal input fuse	2 AT	4 AT
Recommended external pre-fuse	6 A, 10 A, 16 A, characteristics B, C	
Power failure bypass for nominal load (110 / 230 VAC)	10 / 80 ms	15 / 100 ms

Output data		
Output voltage (V_N)	24 VDC ± 2%	
Output voltage range (V_{ADJ})	22.8…26.4 VDC	
Output current (I_N) at ≤ 45°C	1.3 A	4 A
Output current (I_N) at ≤ 55°C	0.9 A	2.8 A
Current load rating for any installation system	max. 0.9 A	max. 2.4 A
Efficiency	typical 82%	typical 88%
Residual ripple (for nominal load)	≤ 100 mVpp	
Overload behaviour	Constant current (U/I characteristic curve)	
Short-circuit protection	Yes	
Overvoltage output protection	Yes (max. 30 VDC)	
Parallel connection	Yes	

Status		
Operating indicator	LED green	

Environment		
Ambient temperature (operation)	−25°C to +55°C (load reduction >45°C, 3%/°C)	
Storage temperature	−25°C to +80°C	
Permitted humidity	30–85% relative humidity, no condensation permitted	
Areas of use	Use in areas with contamination level 2	

Connection terminals		
Connections	Push-in	
Input/output terminals	Single wire and fine wire conductors up to max. 2.5 mm² / conductors with wire ferrules up to max. 1.5 mm²	

Output characteristics

Voltage/current characteristic curve for short-circuit and overload protection

Output characteristic curve (U/I characteristic curve)
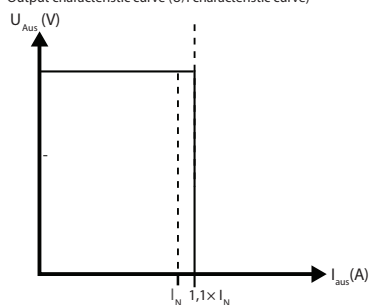
The current overload protection limits the current to a constant value of 1.1 × nominal current

Output derating curve

Q.PS-PEL-2401

Q.PS-PEL-2403