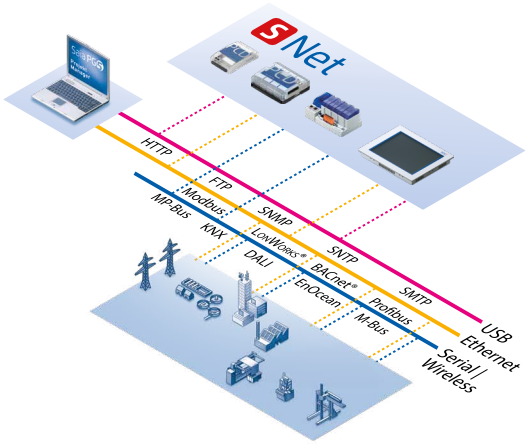
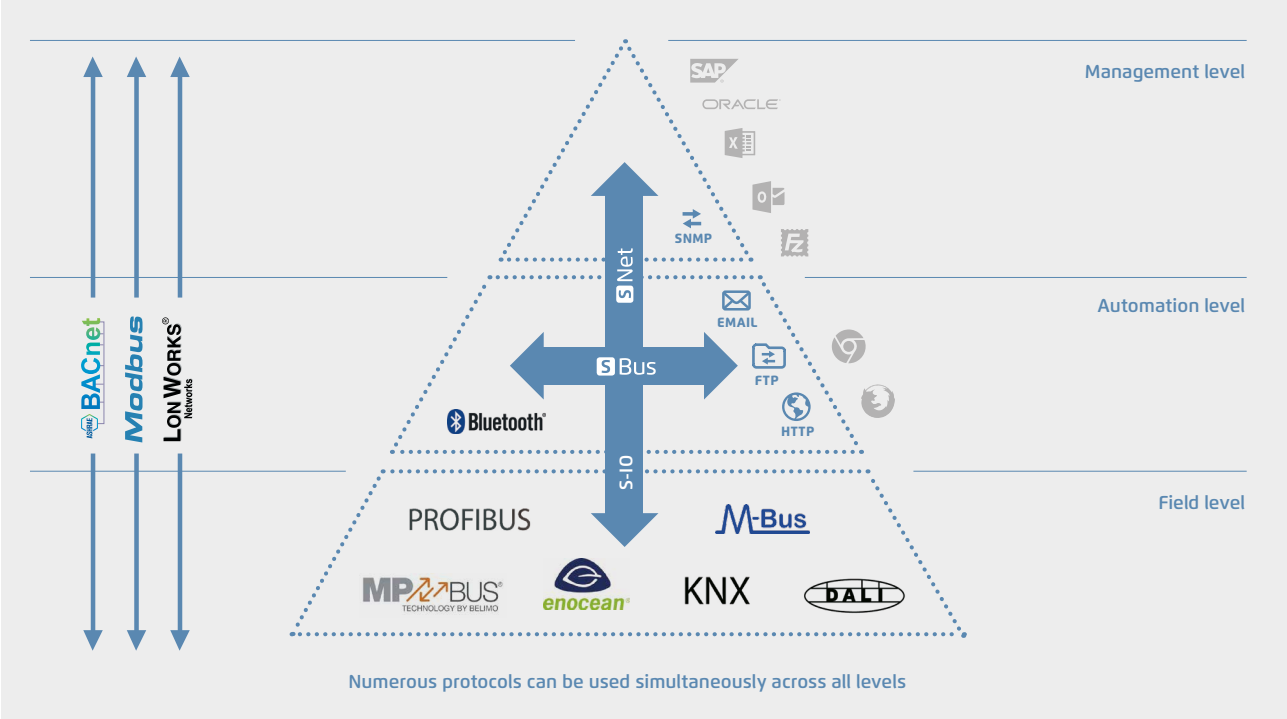
B2 Communication & Interaction

With Saia PCD devices, all common communication channels in properties are open. Interaction within a Saia PCD system is inherently guaranteed (S-Net). Interacting with external devices is easy. This enables total integration with all systems and building services. It is the basis on which the full optimisation of operational efficiency and reliability is built.



2.1 The basic features of Saia PCD® communication systems

Saia PCD systems provide communication protocols suitable for all levels of the automation pyramid to integrate a PCD into the communication infrastructure of a building. In addition to performing regulation and control tasks, the PCD is often used for connecting different systems from different building services. Regardless of the type of interface, it is recommended to use only standardised communication systems for heterogeneous systems. From experience, compatibility and sustainability are better solved using standard technologies rather than closed solutions from a single manufacturer. The following diagram illustrates the essential differences between communication systems, from the field to the management level.



IP-based protocols

IP-based protocols are mainly used for connecting controllers to management systems. IP protocols are also used to exchange data between automation devices and with local control devices. For example, BACnet is very good for communicating between automation devices and the management system. Web and IT services such as DHCP, DNS, SNTP, SNMP and SMTP (emails) are reliable tools in the integration of automation devices into the IT infrastructure. Web-based visualisations with suitable web servers and a CGI-bin interface in the automation device also provide a sustainable basis for operation and service over the entire service life of a system.

BACnet
LonWorks®
S Bus
Modbus
SNMP FTP HTTP EMAIL

Serial protocols with standard interfaces

Field components mainly use serial protocols equipped with standardised interfaces such as RS-232, RS-485 or RS-422. Despite the low baud rate, these interfaces have the advantage over Ethernet as they are easy to install. Cable and infrastructure components such as repeaters are cheaper than a complete IT infrastructure. Field bus systems are also easier to service and maintain.

Modbus
S Bus
PROFIBUS

Dedicated communication systems

It is practical to use a dedicated hardware interface for certain field devices. These systems are optimised for particular tasks. DALI is suitable for controlling lighting for example, and M-Bus is designed for connecting meters. However, these systems should not be used for communication between automation stations.

DALI
KNX
enocean
MP-BUS
M-Bus

Saia PCD® systems

Saia PCD systems offer solutions for almost all conventional building automation system protocols. Depending on the protocol and interface, they are supplied with the Saia PCD operating system or can be installed in the application program. Saia PCD controllers can therefore also be used as gateways between building services and plant which would otherwise remain separate.

Onboard protocols

Saia PCD systems are based on SBC's proprietary Saia PCD COSinus operating system. The operating system makes certain protocols directly available, in particular Web and IT services as well as S-Net. These protocols can be used on every Saia PCD controller. Depending on the protocol, FBox libraries are available in the application program.

S Net
S Bus
Modbus
PROFIBUS
SNMP FTP HTTP EMAIL

Communication options as an operating system expansion

For many protocols it is worth offering them as an option, particularly if the protocols are not required globally in every application and require a large amount of memory in the controller. For example, BACnet® are available to expand the operating system. These are software components which are used as integral components of the operating system, which differentiates them from gateways.

ASHRAE BACnet

Communication drivers in the application program

At the core of every Saia PCD is a PLC controller. The application program can be fully configured to enable numerous infrastructure automation protocols to be integrated direct into the application program. This provides almost limitless flexibility.

DALI
KNX
enocean
MP-BUS MP-BUS COMPATIBLE
M-Bus

2.2 An overview of Saia PCD®communication systems

	Fully modular										Compact modular				pWeb Panel	
	PCD3					RIO		PCD2			PCD1				PCD7	
I/O data points	**PCD3.M3160**	**PCD3.M3360**	**PCD3.M5360**	**PCD3.M5560**	**PCD3.M6860/M6880**	**PCD3.T665**	**PCD3.T666/T668**	**PCD2.M4160**	**PCD2.M4560**	**PCD2.M5540**	**PCD1.M2120/M2160**	**PCD1.M0160E0**	**PCD1.M2110R1**	**PCD1.M2220-C15**	**PCD7.D410VT5F**	**PCD7.D412DT5F**
Onboard (data points)	–	–	–	–	–	–	–	4	4	–	18	18	24	7	–	–
Onboard I/O slots [1]	4	4	4	4	4	4	4	4	4	8	2	–	1	2	–	–
Optional I/O slots using expansion modules [1]	–	60	60	60	60	3	3	–	60	56	–	–	–	–	–	–
Maximum number of I/Os [1]	64	1023	1023	1023	1023	256	256	64	1023	1023	50	18	40	50	–	–
Maximum number of interfaces (incl. PGU, USB, Ethernet)	11	11	13	13	12	2	11	6	10	15	8	4	6	8	4	4
Onboard interfaces																
RS-232, PGU up to 115 kBit/s (Port #0)	–	–	●	●	–	–	–	●	●	●	–	–	–	–	–	–
USB 1.1 device, PGU	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Ethernet TCP/IP 10/100 MBit Fullduplex, autosensing/crossing	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1
RS-485 up to 115 kBit/s or	●	●	–	–	●	–	●	–	–	–	●	●	●	●	●	●
Profi S-Net up to 187.5 kBit/s	●	●	●	–	●	–	–	–	–	–	●	●	●	●	–	–
RS-422/485 up to 115 kBit/s (Port #3) or	–	–	●	–	–	–	–	–	–	–	–	–	–	–	–	–
RS-485 up to 115 kBit/s electrically isolated (Port #3) or	–	–	–	●	–	–	–	●	●	●	–	–	–	–	–	–
Profi DP slave, Profi S-Net up to 1.5 MBit/s (Port #10)	–	–	–	●	–	–	–	●	●	●	–	–	–	–	–	–
Optional interfaces																
Slot C, Profibus DP master 12 MBit/s	–	–	–	–	–	–	–	–	●	●	–	–	–	–	–	–
BACnet® IP (with PCDx.R56x modules) [2]	●	●	●	●	●	–	–	●	●	●	●	●	●	●	●	●
BACnet® MS/TP [3] (with PCDx.R56x and PCDx.F215x modules)	●	●	●	●	●	–	–	●	●	●	●	–	●	●	–	–
Modbus RTU serial or IP	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Slot for PCD7.F1xxS (A1/A2)	–	–	–	–	–	–	–	1	1	2	1	1	1	–	1	1
I/O slot #0 for PCD3.F1xx																
▸ RS-232 (RTS/CTS, DTR/DSR, CD, RI) [5] PCD3.F121	●	●	●	●	●	–	●	–	–	–	–	–	–	–	–	–
▸ RS-485/RS-422 elec. connected [5] PCD3.F110	●	●	●	●	●	–	●	–	–	–	–	–	–	–	–	–
▸ RS-485/RS-422 elec. isolated [6] PCD3.F150	●	●	●	●	●	–	●	–	–	–	–	–	–	–	–	–
▸ Belimo MP Bus [5] PCD3.F180	●	●	●	●	●	–	●	–	–	–	–	–	–	–	–	–
I/O slot #0… #3 for PCD3																
▸ PCD3.F210 RS-485/422 [5] + opt. PCD7.F1xxS	4	4	4	4	4	–	–	–	–	–	–	–	–	–	–	–
▸ PCD3.F215 BACnet MS/TP...[5] + opt. PCD7.F1xxS	4	4	4	4	4	–	–	–	–	–	–	–	–	–	–	–
▸ PCD3.F221 RS-232 full [5] + opt. PCD7.F1xxS	4	4	4	4	4	–	–	–	–	–	–	–	–	–	–	–
▸ PCD3.F261 DALI incl. Bus power supply [6]	4	4	4	4	4	–	4	–	–	–	–	–	–	–	–	–
▸ PCD3.F27x M-Bus Master [5]	4	4	4	4	4	–	4	–	–	–	–	–	–	–	–	–
▸ PCD3.F281 Belimo MP Bus + opt. PCD7.F1xxS [5]	4	4	4	4	4	–	–	–	–	–	–	–	–	–	–	–
I/O slot #0… #3 for PCD2 and slot #0… #1 for PCD1 and																
▸ PCD2.F2100 RS-485/422 [5] + opt. PCD7.F1xxS	–	–	–	–	–	–	–	2	4	4	2	–	1	2	–	–
▸ PCD2.F2150 BACnet MS/TP...[5] + opt. PCD7.F1xxS	–	–	–	–	–	–	–	2	4	4	2	–	1	2	–	–
▸ PCD2.F2210 RS-232 full [5] + opt. PCD7.F1xxS	–	–	–	–	–	–	–	2	4	4	2	–	1	2	–	–
▸ PCD2.F2610 DALI incl. Bus power supply [6]	–	–	–	–	–	–	–	2	4	4	2	–	1	2	–	–
▸ PCD2.F27x0 M-Bus Master [5]	–	–	–	–	–	–	–	2	4	4	2	–	1	2	–	–
▸ PCD2.F2810 Belimo MP Bus [5] + opt. PCD7.F1xxS	–	–	–	–	–	–	–	2	4	4	2	–	1	2	–	–
Slots for modem (A1/A2)	–	–	–	–	–	–	–	–	–	2	–	–	–	–	–	–
Using an external modem via RS-232 interfaces	●	●	●	●	●	–	–	●	●	●	●	●	●	●	●	●

	Compact		
	PCD1 E-Line programmable RIO [7]		
I/O data points	**PCD1.G1100-C15**	**PCD1.F2611-C15**	**PCD1.W5300-C15**
Onboard (data points)	8	4	8
Maximum number of I/Os [1]	8	4	8
Maximum number of interfaces (incl. PGU)	2	3	2
Onboard interfaces			
RS-485, S-Bus, PGU up to 115 kBit/s (Port #0)	●	●	●
USB 1.1 device, PGU	●	●	●
RS-485 up to 115 kBit/s (Port #2)	–	●[8]	–
Optional interfaces			
DALI-Master		●	

[1] I/O slots can be fitted with I/O modules as required (see pages 21 and 29). The number of data points processed by a PLC depends on the number of I/O data points per module. A max. 16 data points per module are possible. A PCD can therefore process a maximum number of data points of 64 I/O slots × 16 data points/slot = 1024 I/O data points.

[2] A PCDx.R56x memory module is always required to use BACnet®. Controllers support BACnet MS/TP using optional PCD2.F2150 or PCD3.F215 communication modules.

Controller	Memory module	max. free I/O slots
PCD3.M3xx0	PCD3.R562	3
PCD3.M5xx0 PCD2.M5xx0 PCD2.M4560	PCD7.R562	4
PCD2.M4160 PCD1.M2xx0	PCD7.R562	2
PCD1.Mxxx0	PCD7.R562	---
PCD1.Room	PCD7.R562	1

[5] Electrically connected

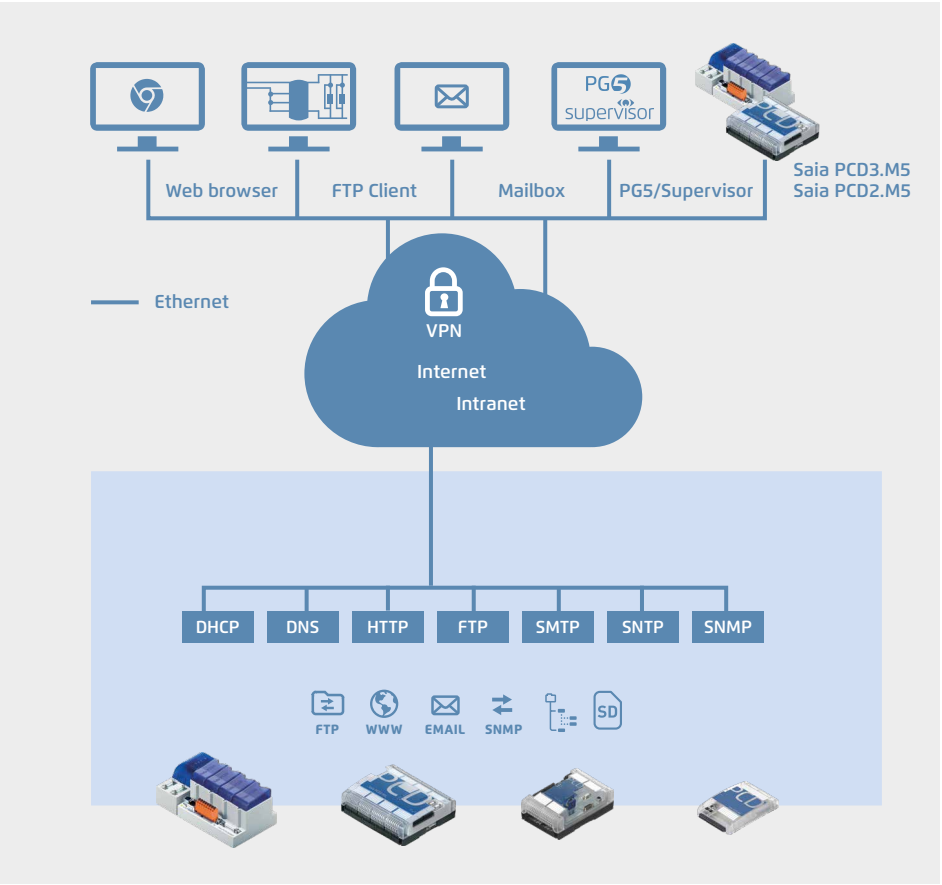
[6] Electrically isolated

[7] Programmable E-Line modules are optimised for your application and therefore do not have all the functions of a Saia PCD system available with the COSinus operating system. For specifications on the program memory and available PLC media (flags, registers, etc.), see data sheet.

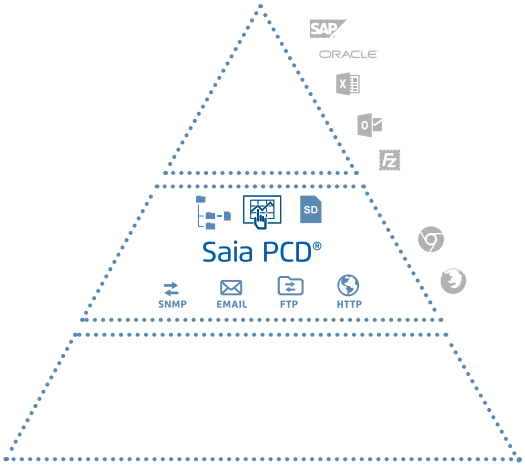
[8] The second onboard RS-485 interface supports "Mode C" with no interpreted text, for example EnOcean, …

2.3 Web and IT protocols for integration into IT infrastructures

All Saia PCD controllers have an integrated automation server with open standard Web/IT interfaces. Saia PCD are easy to integrate into existing software infrastructures with no additional outlay required using the standard communication protocols. Specific drivers or systems are not required. Standard tools such as web browsers, FTP clients and SNMP managers, etc., are used to access the data in the PCD controllers.



An overview of Web/IT protocols supported by the automation server. Access is provided via the Ethernet interface or via serial interfaces using the PPP protocol.

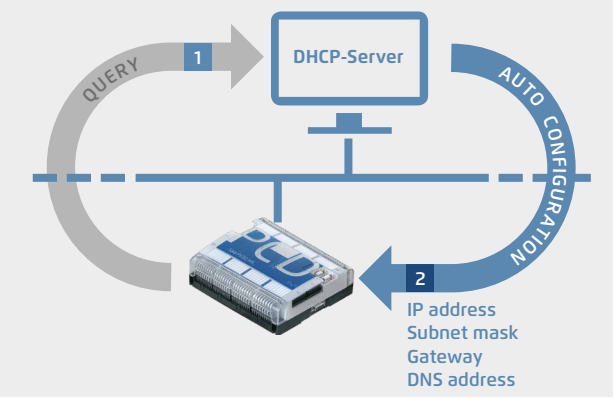


The standard Web/IT protocols enable Saia PCD systems to be universally integrated across all levels in existing IT infrastructures with no additional outlay required.

DHCP: Dynamic Host Configuration Protocol

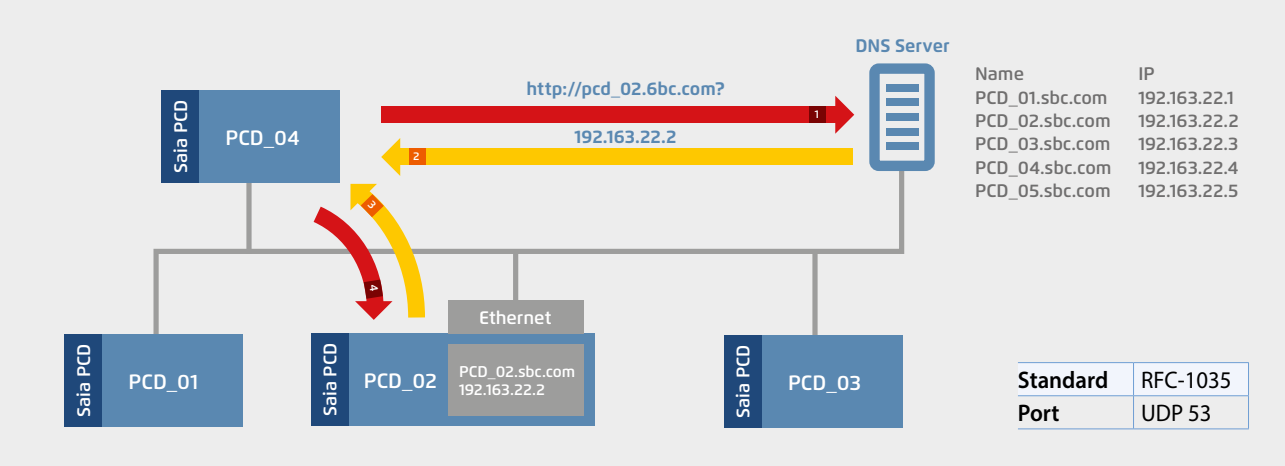
Protocols for automatically configuring the Ethernet communication. It is no longer necessary to enter the communication parameters manually as they are assigned directly from a central server.
A DHCP client automatically receives the IP address, subnet mask, gateway and DNS address parameters on request. The devices in the existing network are integrated automatically.
The devices are integrated in the existing network with no knowledge of the network parameters. Service personnel can also exchange devices with no technical background or knowledge of the specific network data required.

Standard	RFC-2131
Port	UDP 68 for client
Assigned attributes	IP address subnet mask standard gateway (optional) DNS address (optional)



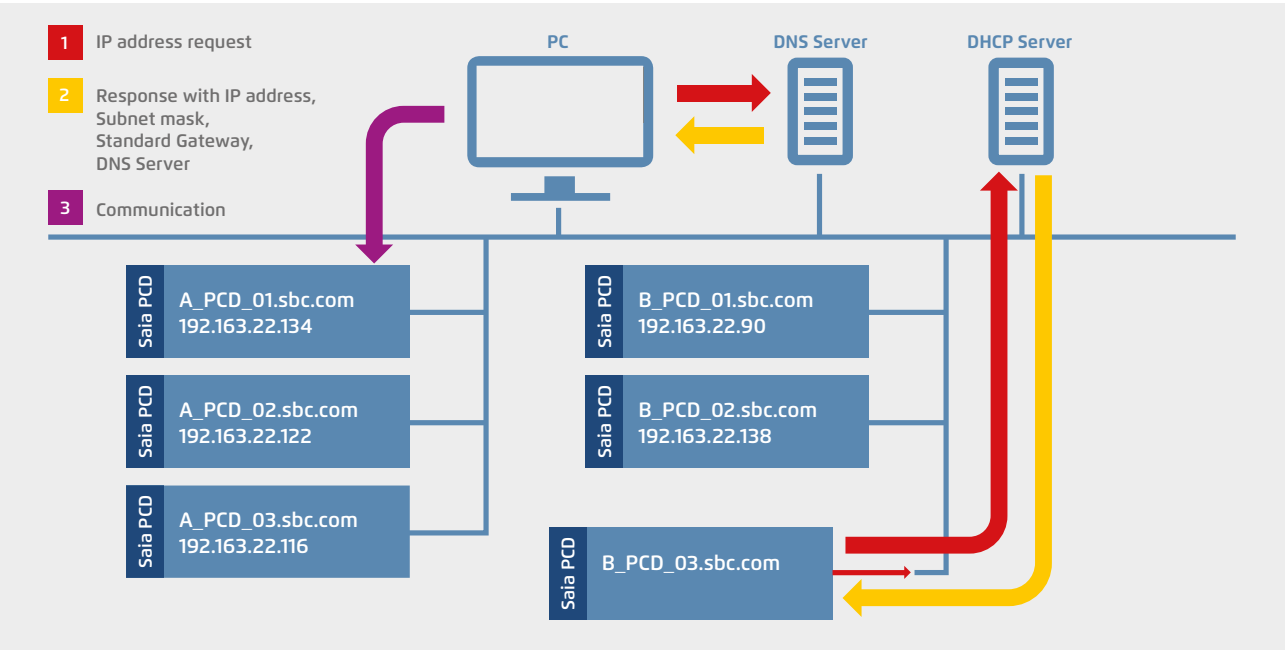
DNS: Domain Name System

Access to the controllers using set naming conventions. When establishing communication between two controllers, there is no need to know the IP address of the target controller, only its name. The IP address can be requested from a DNS server using this name. Devices are no longer controlled using meaningless IP addresses. The structure and availability of individual networks is specified once, and need not be constantly adjusted in accordance with the available IP addresses. This makes the systems easier and more intuitive to use. Networks involving several participants can be documented more clearly.



Examples using DHCP and DNS

Integrating devices into networks is easy. A DHCP client automatically receives the network parameters from a DHCP server. This means that controllers can be integrated into existing networks with no knowledge of the network parameters required. The controller is simply accessed using the name.



Configuration

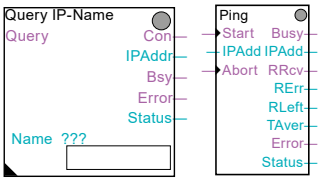
Basic activation and configuration of DHCP/ DNS in the PG5 device configurator.

DHCP Client Protocol	
DHCP Client Enabled	Yes
Automatic Gateway IP Setting	No
Automatic DNS IP Setting	No
DHCP Server IP to Reject 1	0.0.0.0
DHCP Server IP to Reject 2	0.0.0.0
Host Name	
Fully Qualified Domain Name	

DNS Client Protocol	
DNS Client Enabled	Yes
DHCP Information Enabled	No
Primary DNS Server IP Address	0.0.0.0
Secondary DNS Server IP Address	0.0.0.0
Response Timeout [ms]	1000

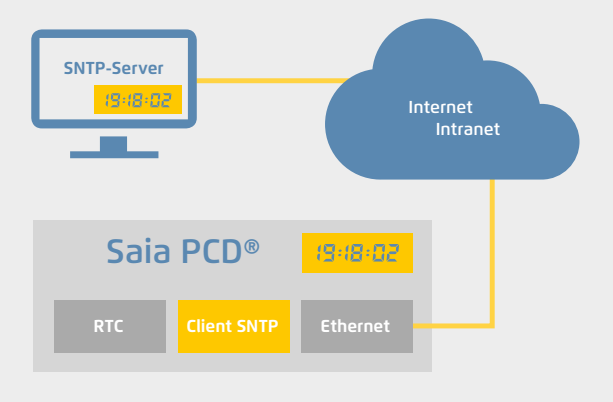
FBoxes

Specific network administration FBoxes can be used to distribute the DNS names of other stations via the application program and verify communication with the PING FBox.



SNTP: Simple Network Time Protocol

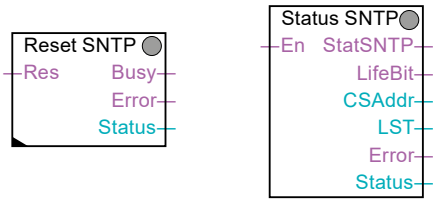
The Simple Network Time Protocol is a standard used to synchronise the time across several devices in IP networks. The protocol enables the transmission of the current time of servers in the Internet or Intranet.
Sophisticated algorithms ensure that the different run times are balanced out across a network.
The internal system clocks (RTC) and the changeovers between summertime and wintertime are synchronised automatically for all network participants at the same time.



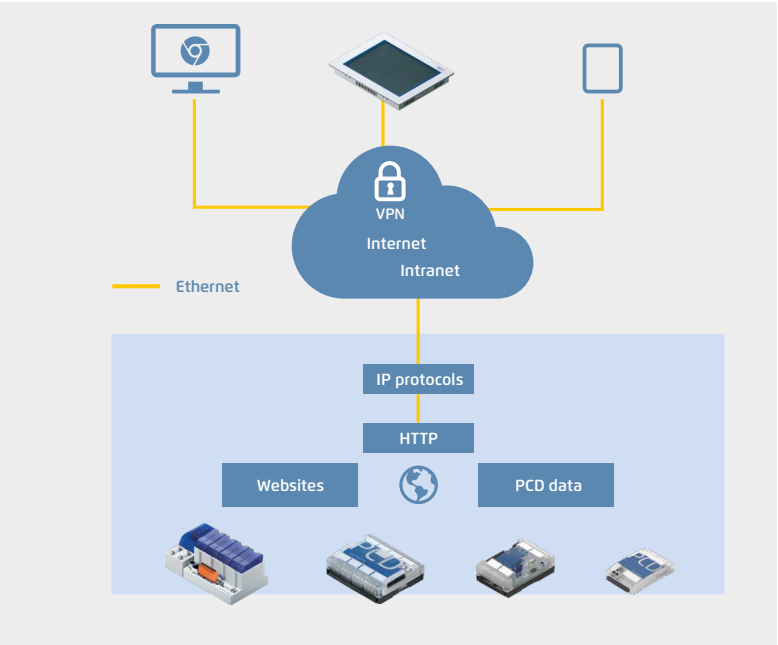
Standard	RFC-2030
Port	UDP 123
SNTP mode	Unicast point-to-point (SNTP client initiates a time request) Broadcast point-to-point (the time is sent from the NTP server simultaneously to all clients)
Time format	UTC (Greenwich Mean Time), adjustable time zone
Timing accuracy	500 ms for Unicast point-to-point 1 s for Broadcast point-to-point (without run time correction)
Request interval	10 s
Interfaces	Ethernet or serial RS-232 via PPP

FBoxes

The status of the SNTP function can be read and/or reset using specific FBoxes.



HTTP: Protocol for accessing the PCD Web Server



Hypertext Transfer Protocol (HTTP) is a protocol used for transferring data over a network. With Saia PCD, the protocol is used for accessing the PCD web server.

PG5 device configurator settings

- Activating/deactivating the HTTP port
- Advanced settings (buffer, sessions, keep alive timeout, etc.)

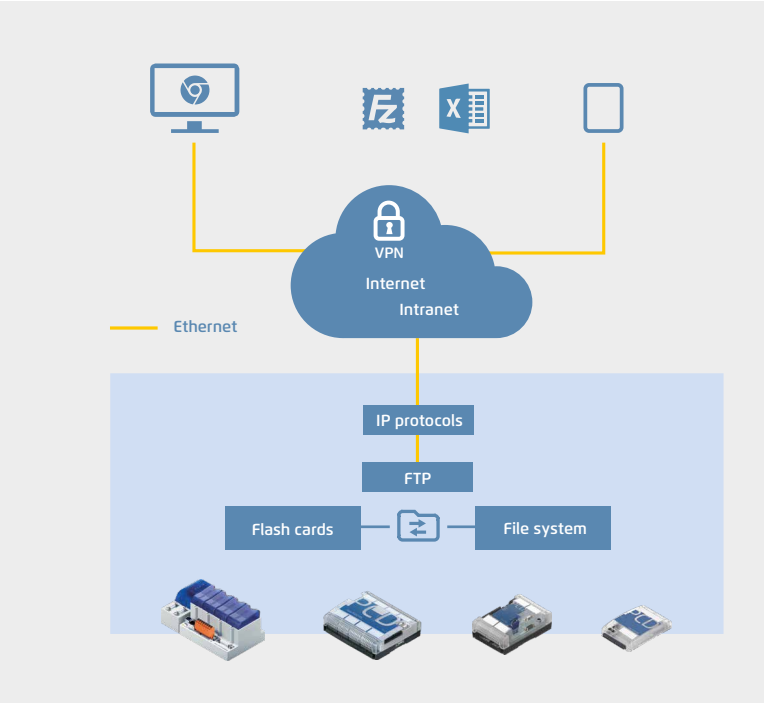
HTTP Direct / First Listener	
HTTP TCP/IP Port Enabled	Yes
TCP Port Number	80
+ Advanced Parameters	Hide
HTTP Direct / Second Listener	
HTTP TCP/IP Port Enabled	Yes
TCP Port Number	81
+ Advanced Parameters	Hide

Technical data

HTTP standard	1.0 and 1.1 (RFC 2616)
2 adjustable listener ports	Standard 80 and 81
Number of sessions	8 parallel with keep alive (standard setting, max. 32 adjustable)
Interfaces	Ethernet, serial RS-232 with PPP, the HTTP protocol can also be encapsulated in the S-Bus and therefore used via other interfaces such as USB. Please refer to chapter B3 S-Web technology for details

FTP: Protocol for transferring files

The File Transfer Protocol (FTP) is used to load files into or read files from PCD devices via the network. Files (websites, log data, documents, etc.) are saved in the file system of the PCD devices. User groups and passwords can be set up to protect access to the FTP server and individual files (e.g. read only).



PG5 device configurator settings

- Activating/deactivating the FTP server
- Configuring port numbers (standard port: 21), user and access rights
- Advanced settings (no. of connections, timeout, etc.)

FTP Server	
FTP Server Enabled	Yes
TCP Port Number	21
User Name 1	
User Name 2	
+ Advanced Parameters	Hide

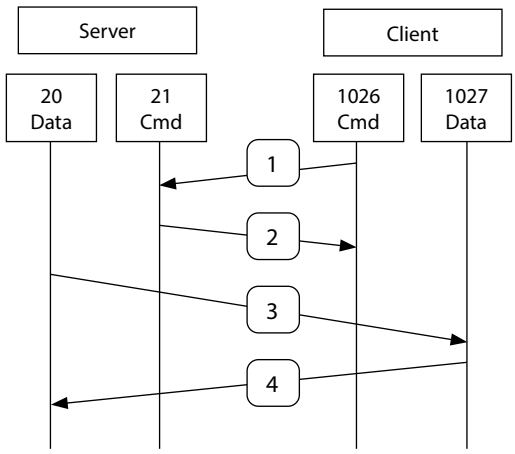
Technical data

FTP standard	RFC 959
Standard port number	21 (can be set) plus dynamic port (> 1023) for data
Connection mode	PCD devices only support the active FTP mode
Number of FTP connections per PCD	Standard 3 (max. 5 adjustable)
Interfaces	Ethernet, serial RS-232 with PPP

Active/passive FTP mode

PCD devices only support the active connection mode! The client establishes a connection to server port 21 and provides the server with the port number for the data channel. Unlike in passive mode (here the port for the data channel is always 20), this port number is not specified and can be in the range > 1023. This often causes problems with firewalls, as these port numbers are not approved.

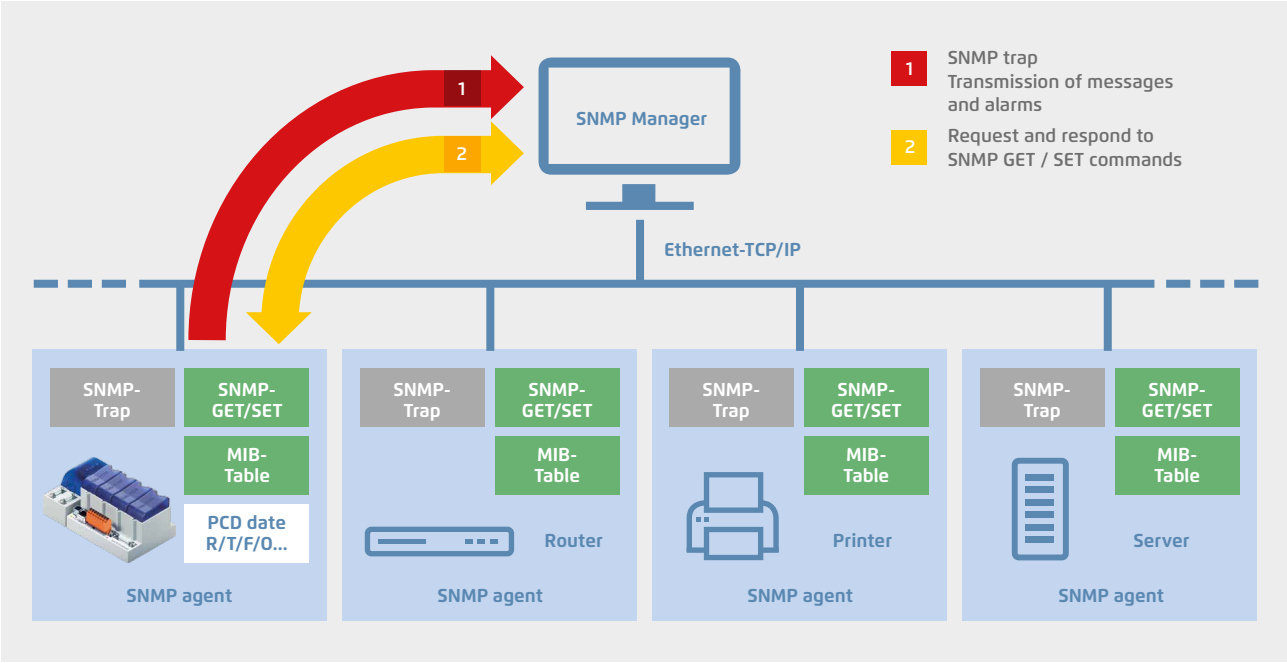
Another means of transferring files is to use FTP CGI (Common Gateway Interface) interfaces in the web server. If the respective syntax is known, it is also possible to transfer data between a web client and PCD devices via this interface. For more information on this please refer to Chapter B3 S-Web.



SNMP: Simple Network Management Protocol

The Simple Network Management Protocol was developed to be able to monitor and control network elements such as routers, servers, switches or even Saia PCD (agents) from a central station. The SNMP manager software generally runs on a server. It monitors and controls the SNMP agents. The SNMP manager reads and sends data from agents using SET and GET commands. The SNMP agent can also send "trap" messages to the SNMP manager unrequested. This allows faults to be reported immediately, for example.

The Saia PCD MIB has been specified for Saia PCD with SNMP support. It includes all resources which can be requested and changed using SNMP. It is possible to access all PCD media (inputs/outputs, registers, flags, DBs, etc.). In the MIB file, the programmer is able to restrict access to selected areas only.
The MIB II standards for managing the TCP/IP functions defined in accordance with RFC1213 are also supported.



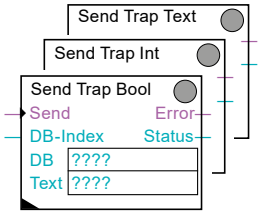
Configuration

Simple activation and configuration of the SNMP functionality in the PG5 device configurator. Up to 3 SNMP trap receivers can be configured. The data fields to which the SNMP manager has access are also configured here.

SNMP (Simple Network Management Protocol)	
SNMP Enable	**Yes**
sysContact Message	Saia Burgess Controls AG
sysLocation Message	CH-3280 Murten
Life Trap Interval [ms]	0
Trap 1 Port Number	0
Trap 1 IP Address	**172.23.14.141**
Trap 2 Port Number	0
Trap 2 IP Address	**172.23.14.192**
Trap 3 Port Number	0
Trap 3 IP Address	0.0.0.0
+ Advanced Parameters	Hide

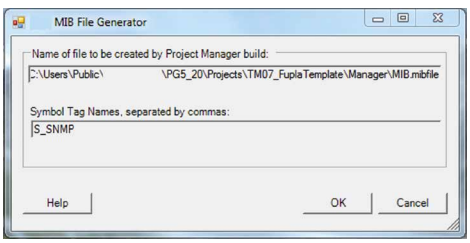
FBoxes

Trap messages with integer or Boolean data or text information can be conveniently sent to the trap receivers using FBoxes.



SBC MIB File Generator

The MIB file contains pre-defined SNMP strings for accessing the PCD data (register, flag, DB, etc.) with the SNMP manager. The MIB files can be generated with project-specific symbol names using the MIB file generator (available with PG5 V2.1).

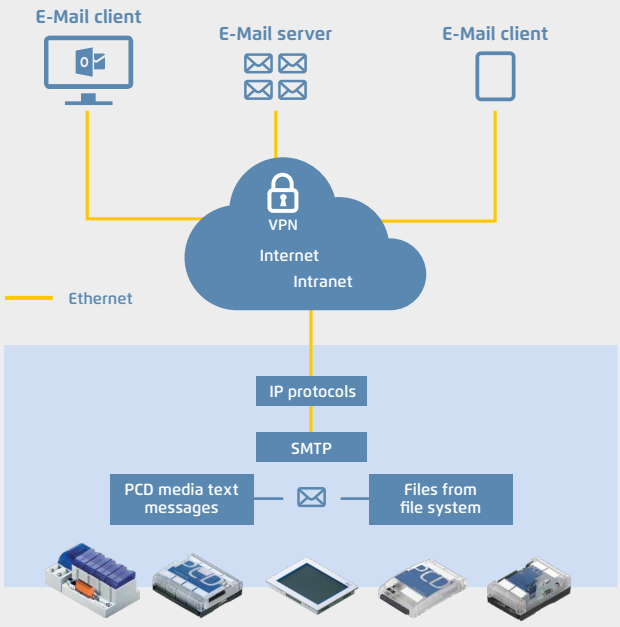


Technical Data

SNMP Standard	V1 and V2c (RFC 1157)
	MIB II standard in accordance with RFC 1213 is supported
Standard Ports	#161 and #162

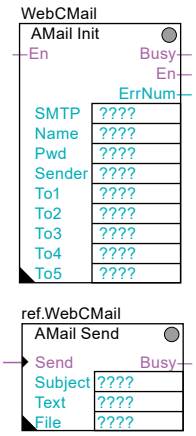
SMTP: Protocol for sending emails

The email function and integrated SMTP client (Simple Mail Transfer Protocol) can be used to send PCD device process and system information to an email server. This enables alarm, service and status messages, log data or any form of process information to be sent via email to a control centre or service personnel.



FBoxes

FBoxes are available for sending emails using the application program. The email function is configured (mail server, port number, user and password, etc.) via these F boxes. It is also possible to send file attachments (e.g. log data) of up to 1 MByte.

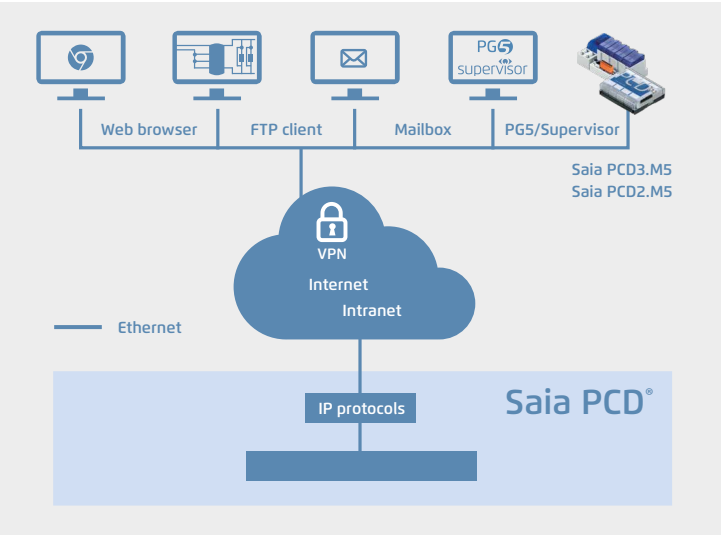


Technical Data

SMTP Standard	RFC 821, 822
Standard port number	25 (adjustable) + 587
Server authentication	"AUTH LOGIN" or "AUTH PLAIN" in accordance with RFC 2595 (unencrypted transmission of password)
Email format	Text or HTML
Interfaces	Ethernet, serial RS-232 with PPP

PPP: Point-to-point protocol

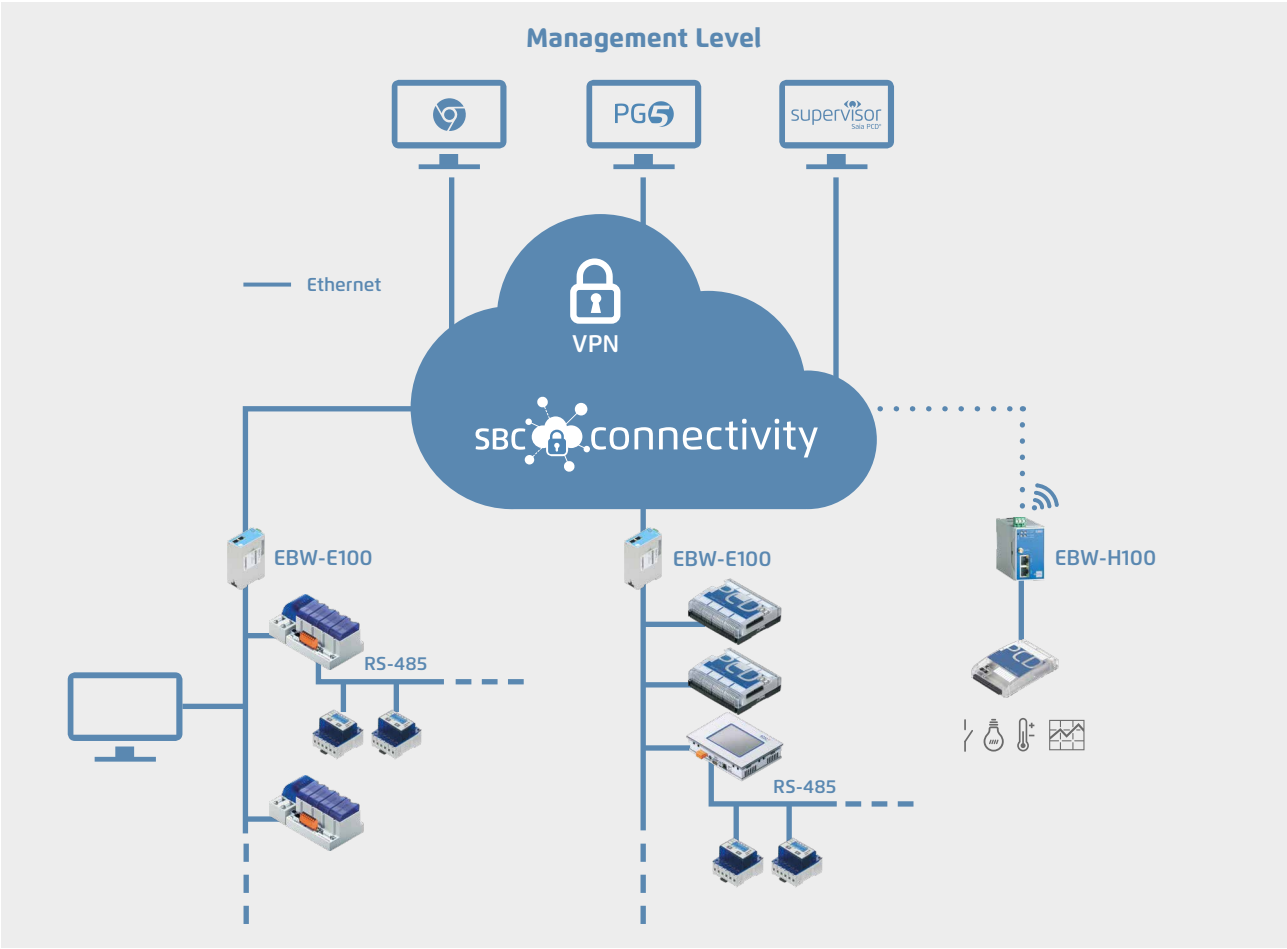
This is a protocol established along a communication route from one point (location) to another. PPP is a protocol that is mainly used to transport TCP/IP protocols via a serial cable or modem connection. CHAP (Challenge Authentication Protocol) was introduced to meet the greater security requirements when dialling into company networks or systems with critical tasks.
The user has access to the web and FTP server via a telecom interface (PSTN, ISDN, GSM/GPRS) in the Saia PCD controller. This also applies to applications with more economical devices and no Ethernet connection.



Standard	RFC-1661
Authentication	PAP, CHAP and MS CHAP
Simultaneous PPP connections	Only one PPP connection (client or server) can be active per Saia PCD® controller.
PPP via Ethernet	No

2.4 Wide Area Automation with Saia PCD®

Spanning geographical distances with a larger number of substations often places significant demands on a system. The integrated automation server can be used to combine geographically distributed systems easily using the Internet and Intranet. This allows the systems to be monitored and controlled remotely. It is possible to access the controllers directly during commissioning or servicing.



Networks for Wide Area Automated Systems

PCD controllers support the connection to the WAN (Wide Area Network) via all established telecommunication technologies. The IP-based protocols (automation servers) are used to connect direct to the Internet either wired via Ethernet interfaces and DSL broadband routers or wirelessly with GPRS/UMTS routers. Non-IP based connections with analogue, digital (ISDN) or GSM modems are also supported.

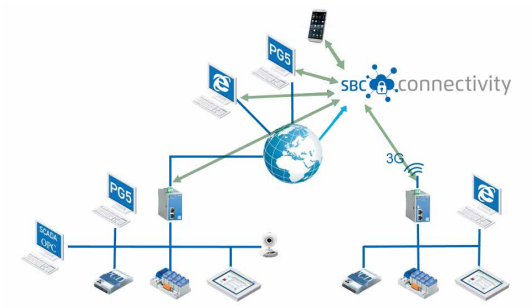
Protocols and services

The WEB/IT protocols are used to support access to the automation server functions (web/FTP server, email, SNMP, etc.).
The S-Bus protocol enables communication with the PG5 programming device, the SBC OPC server or Saia PCD® Supervisor.
S-Bus is also used to exchange data between PCD controllers via the WAN.
Other IP-based protocols such as Modbus TCP and BACnet® are also supported.

Connection of Saia PCD® controllers to the Internet

When Saia PCD controllers are connected directly to the internet, they are also a potential target of cyber attacks.
Appropriate protective measures must always be taken to ensure secure operation.
Saia PCD PCD controllers include simple, integrated protection features. However, secure operation on the internet is only ensured if external routers, like the industrial Routers EBW-E100 and EBW-H100 are used with a firewall and encrypted VPN connections.
For more information, please refer to our support site: http://sbc.do/Me4rLqwE

Saia PCD® secure on Internet with VPN-Routers and "SBC Connectivity Portal"



With the "SBC Connectivity Service", you will get your own encrypted VPN. In just a few steps, you'll integrate locally connected PCD controllers, Web panels MB as well as PCs, tablets or smartphones. All your devices can be accessed across all networks and addressed at any time with this.

The necessary certificates are generated and assigned to the EBW router by the "SBC Connectivity Portal" directly. The routers get the complete VPN configuration transmitted automatically using a quick start wizard. It couldn't be simpler and more comfortable!

With the "SBC Connectivity service" you have your VPN under complete control - with minimum investment. It starts to pay off with the first device already. Furthermore, the new web proxy enables secure access to web services in your VPN without a licence.

Keys features:

- Allows a M2M communication between systems located on different sites
- Provides a secure data transmission
- No needs of public IP address
- Doesn't require deep IT knowledge

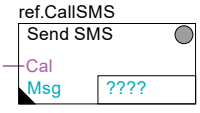
Of course, the EBW industry routers could also be used independently of «SBC Connectivity Portal», for example for a point to point connection.

Products for Wide Area Automation

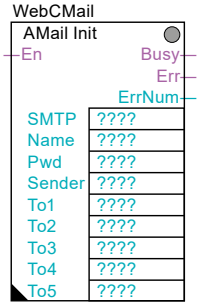
Q.NET-CON	Annual license for one VPN connection on the "SBC Connectivity Service" portal	SBC connectivity
Q.NET-EBW-E100	Industrial LAN router for VPN connection	
Q.NET-EBW-H100	Industrial 3G/HSPA Router for VPN connection	
PCD7.K840	Antenna with magnetic foot GSM/UMTS (700/800/850/900/1'700/1'800/1'900/2'100/2'600 MHz) Height 7,2 cm · Diameter 3,1 cm · Cable 3 m · Connector SAM (male) · Protection class IP65	

FBoxes for modem communication and sending emails

Communication via GSM, PSTN or ISDN modems is supported via a comprehensive FBox library.
SMS messages can be sent and received.



FBoxes are available for sending emails using the application program.
Alarm, status and text messages can be sent.
Sending file attachments (e.g. log data) is also supported.



*In preparation, see Chapter C1 "Product status"

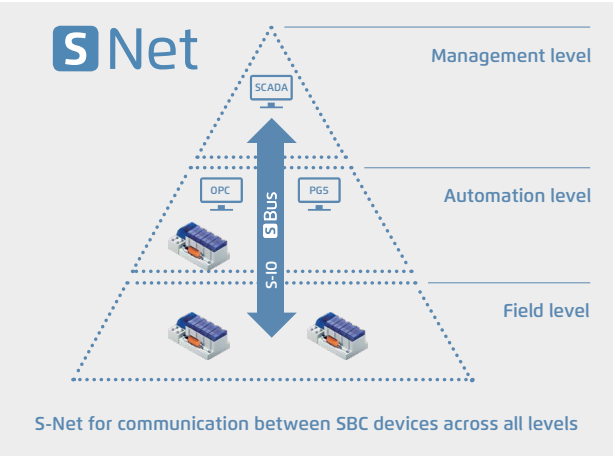
2.5 S-Net for communicating between Saia PCD® devices

2.5.1 The basic features of S-Net

S-Net incorporates the S-Bus and S-I/O system protocols for communicating between SBC devices. Both protocols are optimised for SBC devices and compared to other standard protocols (e.g. Modbus) offer more functionality and can be used more simply and efficiently in the application.

S-Bus supports all services and functions regarding the exchange of data, programming, commissioning and service of Saia PCD controllers. The S-Bus protocol does not depend on the physical aspects and can be used on Ethernet, USB, Profibus-FDL and serial interfaces (RS-232, RS-422, RS-485).

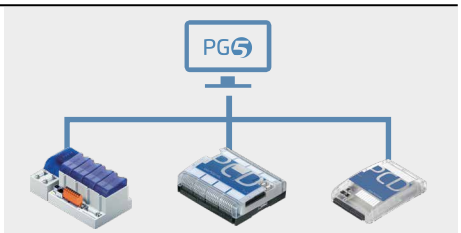
The **S-IO** protocol supports the operation of SBC remote I/O stations with Ethernet (PCD3.T66x).



S-Net for communication between SBC devices across all levels

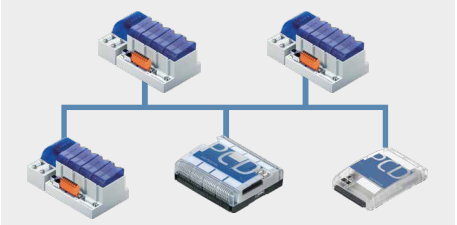
Services and functions using S-Bus

Programming and commissioning
S-Bus is the programming device system protocol. It supports all programming, commissioning and diagnostic functions.

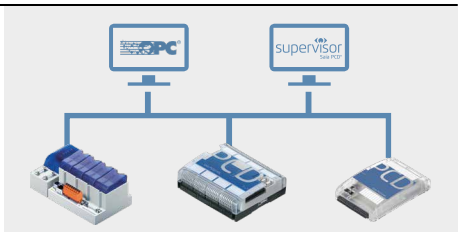


Access with the programming device via Ethernet, USB or serial interface

Exchanging data between PCD controllers
S-Bus supports the transmission of all PCD media (register, flags, timer/counter, database and text) and is optimised for the exchange of data between PCD controllers, whereby Ethernet and Profibus allow multi-master operation.
Serial interfaces (RS-232, RS-422, RS-485) enable "single"-master slave mode or S-Bus master multiple slave mode.

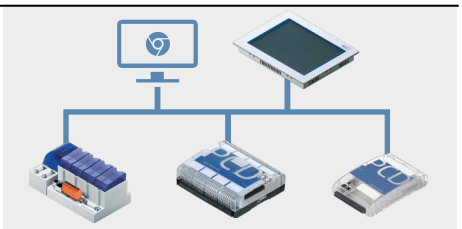

Exchanging data between PCD controllers via Ethernet, Profibus or serial interfaces

Visualisation with OPC servers and SCADA systems
S-Bus together with an OPC Server or the SBC.Net-Suite supports access (reading and writing) to all PCD data with a Windows SCADA system.



Connecting to SCADA systems via Ethernet, USB, Profibus or serial interfaces

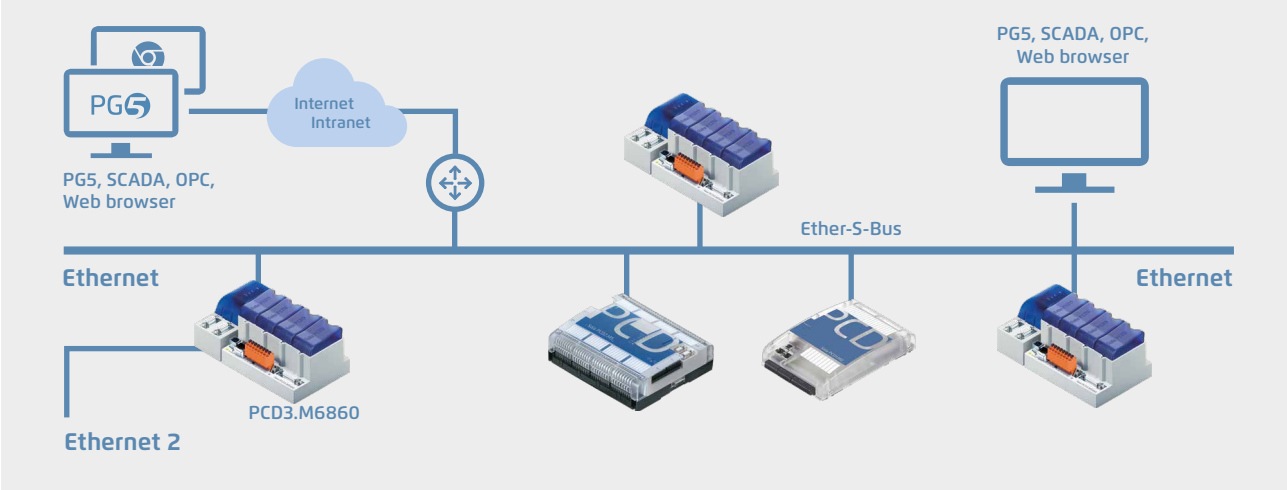
Visualisation with web browsers
S-Bus supports HTTP protocol transmission. This also allows websites to be transmitted together with "SBC Web.Connect" via USB and serial interfaces and displayed on a Windows PC with the standard web browser or a micro browser web panel.


Access to the PCD web server is also possible via USB and Serial interfaces

2.5.2 Ether S-Net: S-Bus and S-IO protocol with Ethernet

The Ether S-Bus and Ether S-IO protocols support the operation of Saia PCD controllers and Smart RIOs on Ethernet. The PCD devices can be integrated and operated in a standard Ethernet network (along with other devices). Multi-protocol operation is supported on the same connector and cable. That means that all IP protocols (e.g. access to the automation server) can be used in parallel with S-Bus and/or S-IO.

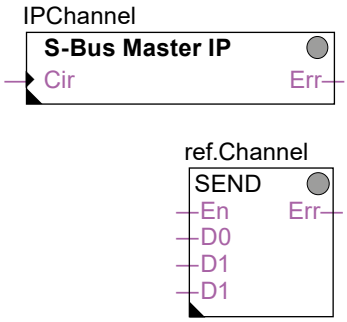
Ether S-Bus for operating PCD controllers with Ethernet



Ether S-Bus protocol in the multi-master operation on a standard Ethernet network

Properties, functions

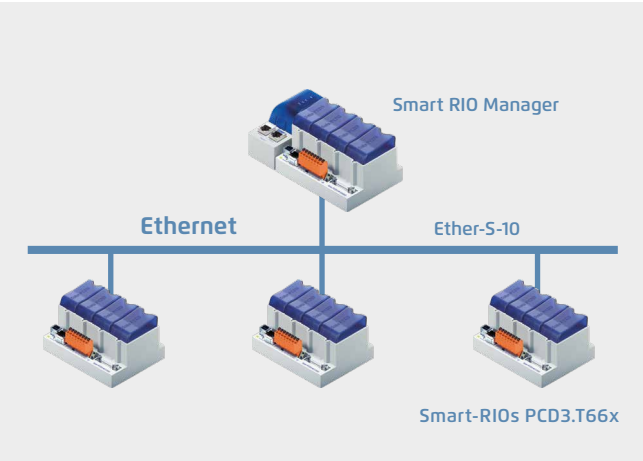
- Ether S-Bus supports communication between
  - PCD controllers in multi-master operation
  - a PCD controller and the PG5 programming device
  - a PCD controller and the OPC server or SCADA system with Ether S-Bus drivers
  - a PCD controller (PCD WebServer) and web browser with Web Connect software
- Programming the data transfer between PCD controllers with FBoxes for cyclic or event-controlled data transfer
- Multi-protocol operation on the same Ethernet connection (e.g. Ether S-Bus, Ether S-IO and other protocols such as Modbus TCP)
- Gateway function for gateways (Ether S-Net ↔ Serial S-Net, Ether S-Net 1 ↔ Ether S-Net 2, Ether S-Net ↔ Profi S-Net)
- The PCD3.M6860 CPU can be used to construct separate networks or redundant Ethernet networks
- The network can be constructed using standard Ethernet components
- IP protocol: UDP
- Port number: 5050 (a firewall may require this port to be activated)



Ether S-IO for operating Smart RIOs PCD3.T66x

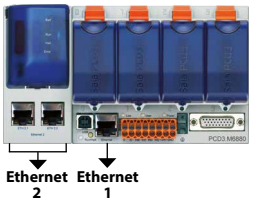
Properties, functions

- Ether S-IO supports the exchange of data between Smart RIO Manager and the Smart RIOs. Ether S-Bus is used to transfer the configuration and all programs
- It uses broadcast or unicast telegrams (adjustable)
- The data transfer is configured by the RIO network configurator
- Multi-protocol operation is supported
- The network can be constructed using standard Ethernet components
- IP protocol: UDP
- Port number: 6060



Ether S-IO protocol for operating Smart RIOs with Ethernet

Constructing Ethernet networks separately or redundantly with PCD3.M6860



The PCD3.M6860 CPU has two independent Ethernet interfaces which are used to construct physically separate networks (e.g. company or automated system networks) or redundant networks.
The second interface has an additional 2-port switch.

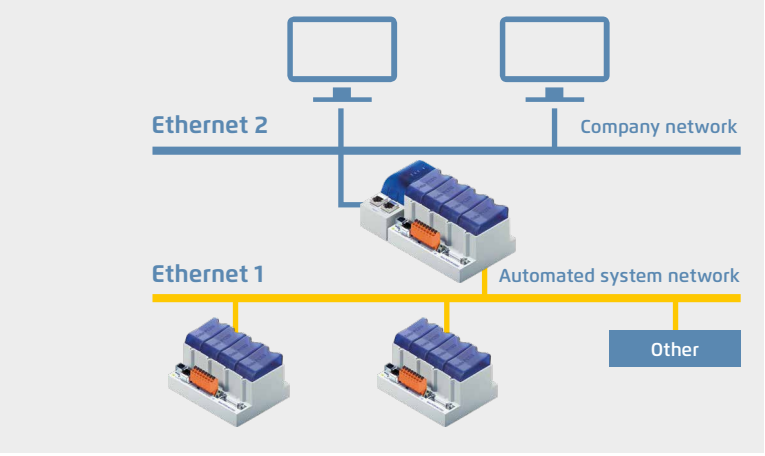
Properties, functions

- The technical data of the PCD3.M6860 are identical to those of a PCD3.M5560, apart from the second Ethernet interface (instead of the serial interfaces)
- The Ethernet interfaces are separate and both have an independent IP configuration. The IP addresses must not be in the same subnet. IP routing between the two interfaces is not supported.
- All IP protocols are supported on both interfaces. This enables access to the automation server and the PCD data via both interfaces. Access to the PG5 programming tool is also supported on both interfaces.
- BACnet is only supported on one interface (1 or 2)
- The S-Bus gateway function between the two Ethernet interfaces is also supported

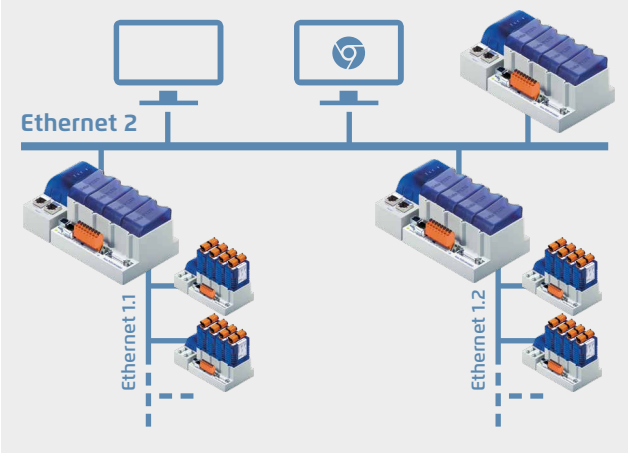
Separating Ethernet networks

It is worth physically separating networks when:

- The automation devices and the standard IT devices (PC, server, etc.) must not be operated on the same network for security reasons. In this instance, the PCD3.M6860 functions like a "firewall" as only S-Bus telegrams can be transmitted from one interface to another. Other IP telegrams are not routed.
- The data traffic cannot take place in the same physical network for performance reasons
- The infrastructure (e.g. network cabling) must be isolated



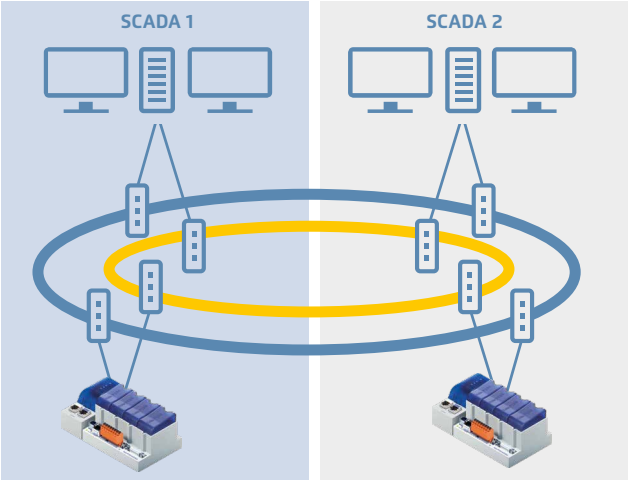
The automated system and company networks are physically separate



The automation network can be divided into several physical networks for improved structuring and an increase in availability and performance.

Constructing redundant Ethernet networks

Network redundancy is often required by systems with high demands placed on them in terms of operational availability, such as tunnel controllers in traffic technology or on ships, for example. The two Ethernet connections provide the PCD3.M6860 with connection redundancy. Standard components (switches and cables) can be used to construct two separate, redundant networks. The networks and choice of interfaces are monitored by the application program.
The network availability can be expanded further by creating a fibre optic ring combined with specific switches and fibre optic cables. The switches automatically identify any interruptions in the ring and reroute the data traffic accordingly.



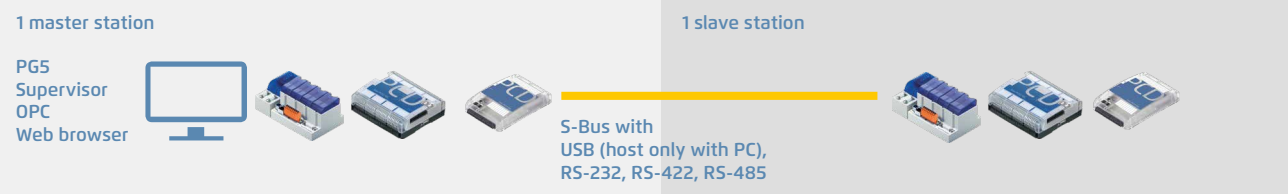
Highly available Ethernet with two fibre optic rings. In the event of an interruption, the switches automatically reroute the data traffic via the ring, which is still functioning. A defective switch or ring can be detected in the application program and the data traffic transmitted via the second ring or second interface.

2.5.3 Serial S-Net: S-Bus on USB and serial interfaces, RS-232, RS-422/485

The S-Bus protocol can be used on the USB and serial interfaces for communicating with Saia PCD controllers. This makes it possible to construct very simple, economical communication links and networks. Point-to-point (USB, RS-232) and 1:n communication relationships are supported in the RS-485 network in the master-slave operation.
S-Bus supports communication between

- PCD controllers in the master-slave (1:n) operation
- a PCD controller and the PG5 programming device
- PCD control and OPC server or SCADA system with S-Bus drivers
- a PCD controller (PCD WebServer) and web browser with Web Connect software

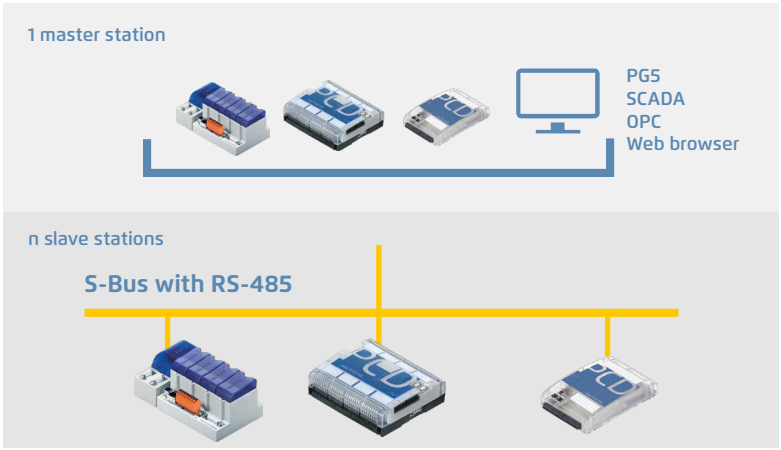
Point-to-point communication relationship with S-Bus



Properties, functions

- Interfaces: USB, RS-232, RS-422, RS-485 (can be used simultaneously on several interfaces)
- Baud rate: up to 12 MBit/s (USB standard 1.1)
- Communication relationship: Master-slave
- Exchange of data with a SCADA system with the SBC OPC server or an S-Bus driver
- Supports communication via modem (PSTN, ISDN, GSM) to RS-232 interface

1:n master-slave communication relationships in the RS-485 network with S-Bus



Properties, functions

- Interfaces: RS-485 (can be used simultaneously on several interfaces)
- Baud rate: up to 115 kBit/s
- Bus cable: 2-wire, twisted and shielded (min. 2 × 0.5 mm^2)
- Bus length: max. 1200 m per segment
- Number of stations: max. 32 per segment, total max. 255
- Number of segments: max. 8, connected to each other via RS-485
- Communication relationship: Master-slave (only 1 master)
- Programming the data transfer between PCD controllers with FBoxes for cyclic or event-controlled data transfer
- Exchange of data with a SCADA system along with the SBC OPC server or an S-Bus driver

Note

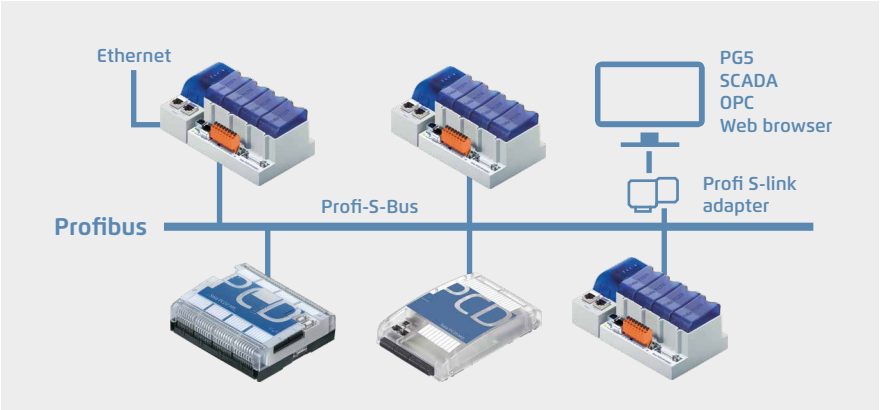
The S-Bus protocol is also suitable for constructing multi-point wireless networks with external wireless modems. The wireless modems are connected to the RS-232 interface. The control cables can be used to control the wireless modem transmitters. Further information on this is contained in reference manual 26-739.

The proprietary S-Bus is designed for communicating with the Saia PG5® engineering tool, connecting to the management level/process control systems and for PCD ↔ PCD communication. It is not suitable or approved for connecting the field devices of other manufacturers. An open, manufacturer-independent field bus (e.g. Profibus, Modbus, etc.) is the correct solution for this.

2.5.4 Profi S-Net: S-Bus and S-IO protocols on Profibus FDL

The Profi S-Bus and Profi S-IO protocols support the operation of Saia PCD controllers on the Profibus FDL network. The protocols can be operated up to 1.5 MBit/s via the RS-485 interfaces integrated in the base unit. This enables economic and fast communication networks in multi-master operation. Multi-protocol operation is supported on the same connector and cable. The same selection of the bus parameters (baud rate, timing, etc.) enables the PCD devices to be operated along with devices from other manufacturers on one Profibus DP network.

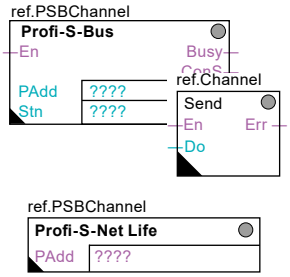
Profi S-Bus for operating PCD controllers on Profibus FDL networks



Profi S-Bus protocol in multi-master operation on a standard Profibus network.

Properties and functions

- Profi S-Bus supports the communication between
  - PCD controllers in multi-master operation
  - a PCD controller and the PG5 programming device (via Profi S-Link)
  - PCD control and OPC server or SCADA system with Profi S-Bus driver (via Profi S-Link)
  - a PCD controller (PCD Web Server) and web browser with Web Connect software (via Profi S-Link)
- Multi-protocol operation on the same Profibus network (e.g. Profi S-Bus mixed with other Profibus DP devices)
- Gateway function for gateways (Profi S-Bus ↔ Serial S-Bus, Profi S-Bus ↔ Ether S-Bus)
- Programming the exchange of data between PCD controllers with FBoxes for cyclic or event-controlled data transfer – baud rate: up to 1.5 MBit/s
- Network infrastructure and topology: in accordance with the Profibus specification



2.5.5 Profibus DP
Integrating machines and industrial environments

PROFIBUS

Profibus in building automation systems

In accordance with EN 50170, Profibus is the internationally standardised bus for industry and building automation systems. Profibus opens up the world of standardised network communication for a wide range of applications between different manufacturers:

- Profibus is open and not bound to a specific manufacturer
- PNO, the Profibus user organisation, maintains a qualified certification system and assesses Profibus products in terms of compliance with standards and interoperability
- Profibus DP, the up to 12 MBit/s network protocol for the field level in automated production is also used in building automation systems owing to the wide range of accessories

Profibus DP with Saia PCD®

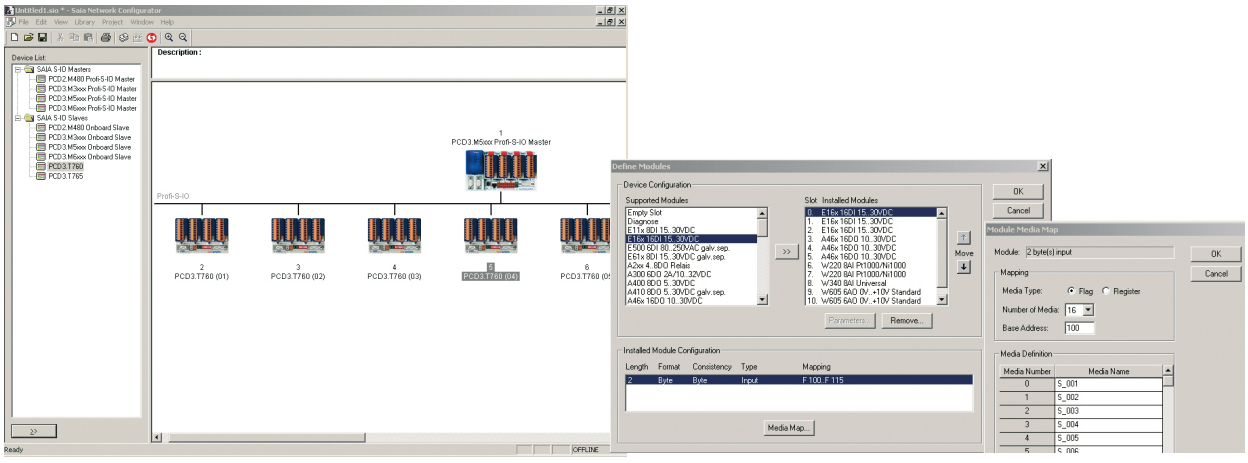
Saia PCD controllers are available with Profibus DP slave connections. Version DP V0 is supported. The diverse communication properties of Saia PCD controllers makes them ideal for use as communication gateways, e.g. Ethernet Profibus, BACnet – Profibus, etc.

Saia PCD® systems with Profibus DP slave, onboard interface

Baud rate	Connection	Port	Electrically isolated	System
Up to 187.5 kBit/s	Terminal block	# 2	No	PCD3.M6880, PCD3.M6860, PCD3.M3x60, PCD1.M2xxx, PCD1.M0160E0
Up to 187.5 kBit/s	Terminal block	# 0	No	PCD2.M4160
Up to 1.5 MBit/s	D-sub connector	# 10	Yes	PCD3.M5560 PCD2.M4560, PCD2.M5540

Network configurators for Profibus

The PG5 programming tool contains convenient network configuration tools for all types of network. The user defines his variables, objects and network parameters with it.

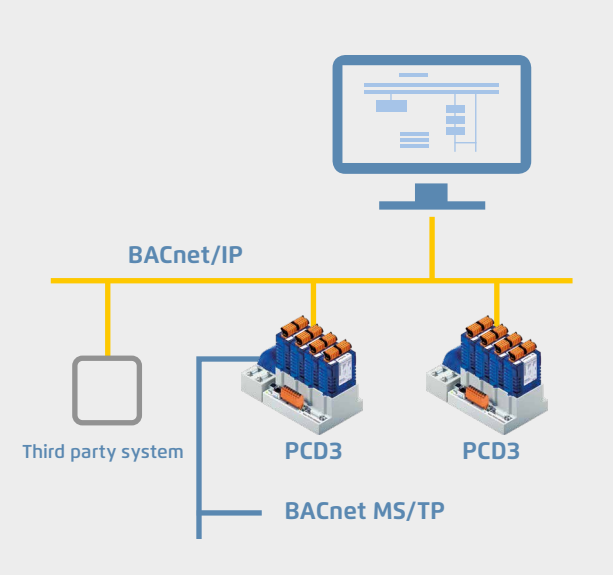


2.6 BA communication systems

2.6.1 BACnet®

The standard for building services

BACnet is a manufacturer-independent, globally standardised communication protocol which is well-established in building automation systems. BACnet is particularly suitable for heterogeneous structures involving automation stations of various manufacturers. The server/client architecture allows each of the BACnet devices to exchange data with one another without having to adjust to the parameterisation of the other devices.
BACnet is far more than a protocol for merely transferring data; BACnet itself defines important building automation functions, such as the recording of historic trends or the monitoring of values against set limit values, for example. Communication services (BIBBs, BACnet Interoperable Building Blocks), such as those for reading and writing content, event-controlled transmission following changes and the handling of alarms/information (events) are available.



PCD systems

BACnet is available for all classic PCD systems with the Saia PCD COSinus operating system as a communication option. The connection is usually direct via BACnet IP (Ethernet). BACnet MS/TP (RS-485) is also possible via a communication module.
BACnet always requires a BACnet option module for firmware expansion. A PCD7.R56x is used for memory slots M1 and M2 for PCD3.M5, PCD2.M5, PCD1.M2 and PCD1.M0 controllers. The PCD3.R562 module is available for I/O slots 0…3 for PCD3.M3 controllers with no M1/2 slots.
PCD2.M5 and PCD1.M2 controllers also require a PCD2.F2150 for connecting BACnet MS/TP, and PCD3 controllers require a PCD3.F215 communication interface. This module also provides controllers with no Ethernet with a BACnet interface. Controllers with Ethernet also take on the function of a BACnet IP MS/TP router. External gateways for connecting MS/TP devices direct to the management system or other BACnet IP devices, for example, are therefore no longer required.

Typical applications of a BACnet infrastructure

- Heating, climate and ventilation control
- Room automation
- Networking dispersed sites
- Recording energy data

BACnet certificates for PCD1, PCD2, PCD3 controllers; see www.sbc-support.com, Certificates, PCD

Recommendations/system limits

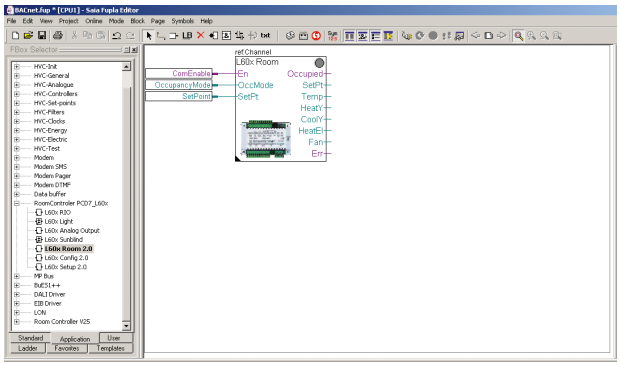
Type	Option	Interface	PG5 configuration, system limits
PCD3.M5560/M6xx0	1× PCD7.R562 4× PCD3.F215	IP MS/TP	Recommended for configurations of up to 1000 BACnet objects
PCD3.M5360	1× PCD7.R562 4× PCD3.F215	IP MS/TP	Recommended for configurations of up to 800 BACnet objects
PCD3.M3160 PCD3.M3360	1× PCD3.R562 3× PCD3.F215	IP MS/TP	Recommended for configurations of up to 500 BACnet objects
PCD2.M4160	1× PCD7.R562 2× PCD2.F2150	IP MS/TP	Recommended for configurations of up to 800 BACnet objects
PCD2.M4560 PCD2.M5540	1× PCD7.R562 4× PCD2.F2150	IP MS/TP	Recommended for configurations of up to 800 BACnet objects
PCD1.M0160E0	1× PCD7.R562	IP	Recommended for configurations of up to 800 BACnet objects
PCD1.M2xx0 PCD1.M2220-C15	1× PCD7.R562 2× PCD2.F2150	IP MS/TP	Recommended for configurations of up to 800 BACnet objects
PCD7.D410VT5F PCD7.D412DT5F	1× PCD7.R562	IP	Recommended for configurations of up to 250 BACnet objects

BACnet®

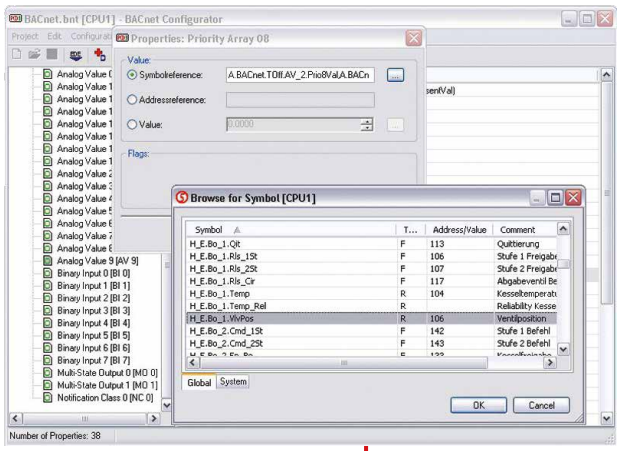
Efficient engineering through automatic generation
The application FBox libraries from DDC Suite v2.0 and Room Controller v2.0 and above make the system integrator even more efficient. An FBox parameter can be used to automatically generate a suitable BACnet® configuration when creating the application program. All the relevant settings are implemented within the application FBoxes.

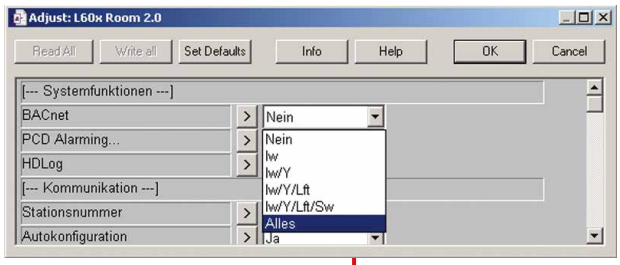
Fully programmable BACnet configuration
The application can be created as normal using the Saia PG5® Controls Suite.
The BACnet® configurator it contains allows the completely free parameterisation of all BACnet® objects. This makes it possible to solve all conceivable tasks.
Clearly structured dialogues make the parameterisation of schedules, trends and alarms easy to understand.

PG5 Fupla Editor



BACnet® configurator in the Saia PG5® Controls Suite





BACnet® Adjust Window

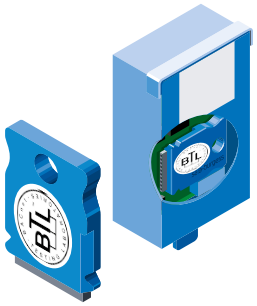
EDE file export for connecting the PCD to master SCADA systems.

Automatic creation of BACnet® objects and PCD resources using FBoxes and templates.

EDE file import for the simple creation of BACnet® clients

Order details

Type	Description
PCD7.R562	BACnet® optional module for PCD1.M0, PCD1.M2, PCD2.M5, PCD3.M5 and PCD3.M6 for M1 or M2 slots incl. 128 MB for program backup and file system
PCD3.R562	BACnet® optional module for PCD3.M3, PCD3.M5 and PCD3.M6 for I/O slot 0…3 incl. 128 MB for program backup and file system



2.6.2 Modbus

Modbus

Modbus is a communication protocol based on a master/slave or client/server architecture. It is widespread and supported by many manufacturers and devices. In many cases, Modbus is therefore the common denominator for transferring data between different devices and systems.

Modbus with Saia PCD®

Modbus comes in three forms:

- **Modbus ASCII** data are transmitted in ASCII format via serial interfaces (RS-232, RS-485).
- **Modbus RTU** data are transmitted in binary format via serial interfaces (RS-232, RS-485).
- **Modbus TCP** data are transferred in TCP/IP or UDP/IP packets via Ethernet.

The Modbus protocol is supported in the Saia PCD COSinus operating system by all Saia PCD1.M0_, Saia PCD1.M2_, Saia PCD2.M5_ and Saia PCD3 controllers. Client and server functionalities are available for all types of protocol. Ethernet interfaces and serial interfaces (RS-232 and/or RS-485) are already included in the PCD controller basic devices. Additional plug-in interface modules can be used to operate up to 9 serial Modbus interfaces per PCD system.

Supported Modbus function codes

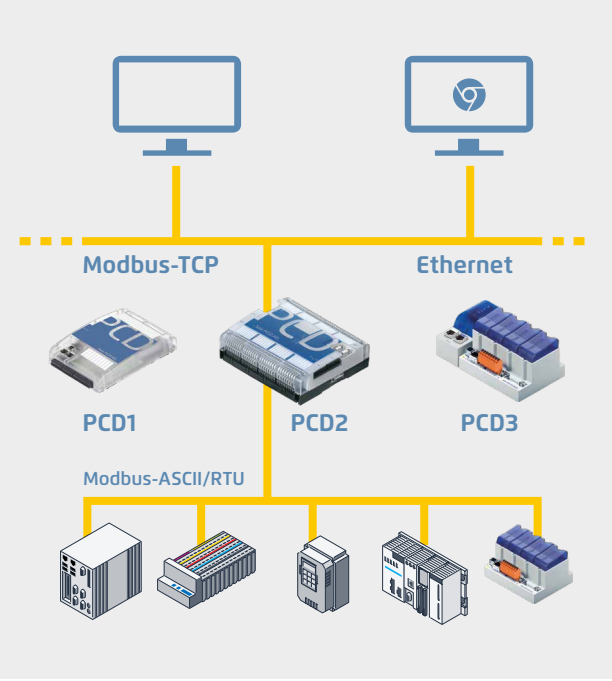
1 Read Coils
2 Read Discrete Inputs
3 Read Holding Registers
4 Read Input Registers
5 Write Single Coil
6 Write Multiple Coils
7 Write Single Holding Register
8 Write Multiple Holding Registers

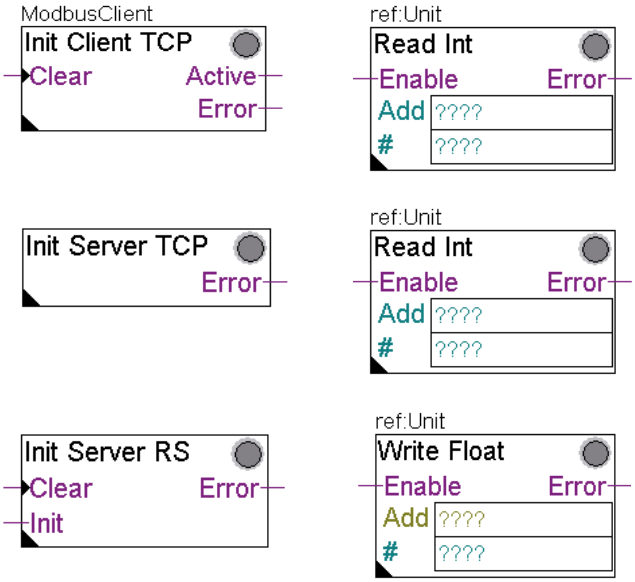
Media Mapping:	adjustable by the user
Mapping Areas:	max. 10 per UID
Number of servers:	max. 4 per PCD system
Number of unit IDs:	max. 10 per PCD system
Number of channels:	max. 10 per PCD system

Number of connections

Each Saia PCD system is able to establish up to a maximum of 26 connections. Of these, the Saia PCD controller is able to use a maximum of 10 for client connections. The remaining connections can be used as server connections to the same Saia PCD controller.

Application example





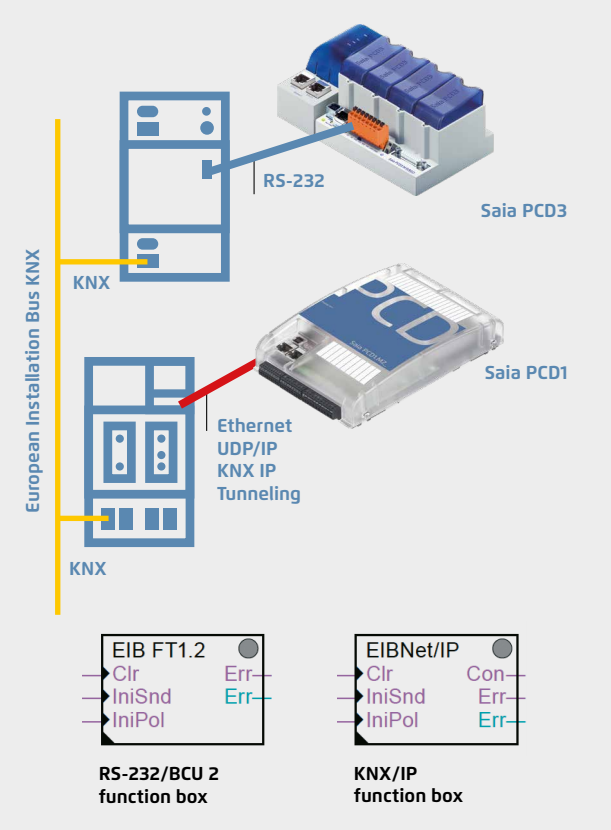
▲Convenient Fulpa FBoxes or CSF commands are available for configuring and programming the exchange of data.

◄ With the integrated automation server, external systems can also be easily linked to master Web+IT automation environments via Modbus.

2.6.3 KNX
Communication drivers for electrical systems and room automation

Communication drivers

An efficient networking of building services requires multi-service functions and components for communicating with external devices. The KNX communication driver is a PG5 FUPLA library with comprehensive function modules (FBoxes) for sending and receiving almost all KNX data types (DPT). Depending on which interface is available for accessing the KNX network (RS-232 or Ethernet), the selected components can be linked to Saia PCD systems.
The direct connection via Ethernet makes access to KNX data even quicker and more powerful.



Features

- Use of drivers for all SBC automation stations
- Simple communication connection with FUPLA modules
- Comprehensive support of KNX Data Point Types (DPT)
- The drivers support the simple restructuring of existing systems with KNX BCU1 on the KNX BCU2 interface
- Standard UDP/IP port: #3671
- Communication drivers for:
  - Serial KNX BCU-1 interfaces via RS-232 (not recommended for new products)
  - Serial KNX BCU-2 interfaces via RS-232
  - KNXnet/IP (EIBnet/IP) communication

Order details

Type	Description
PG5 EIB	PG5 KNX/EIB (KNX standard) communication library for Saia PCD® controllers for serial and IP-based communication

Components of other providers

Weinzierl KNX IP Interface 730 (www.weinzierl.de)	KNXnet/IP Gateway
Weinzierl KNX IP Router 750 (www.weinzierl.de)	KNXnet/IP incl. router use
ABB IPS/S2.1 EIB/KNX IP Interface (www.abb.com)	KNXnet/IP Gateway
ABB IPR/S2.1 EIB/KNX IP Router (www.abb.com)	KNXnet/IP incl. router use
Weinzierl KNX BAOS 870 (www.weinzierl.de)	Serial (RS-232) KNX interface with BCU-2 protocol

Ethernet Gateways

When planning, it is important to bear in mind that some Ethernet gateways only support one communication channel. Every PCD or service tool, ETS for example, therefore requires its own interface to the KNX Bus.

Serial converter

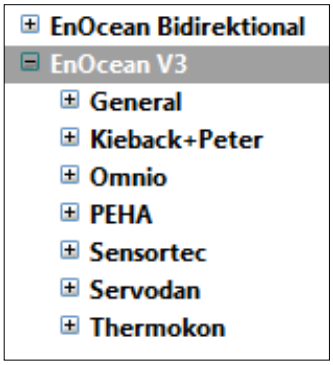
However, it is inadvisable to connect using BCU-1 protocols. The BCU-1 protocol can cause telegrams to be lost between the gateway and the controller.

2.6.4 EnOcean
Communication driver for wireless sensors and actuators

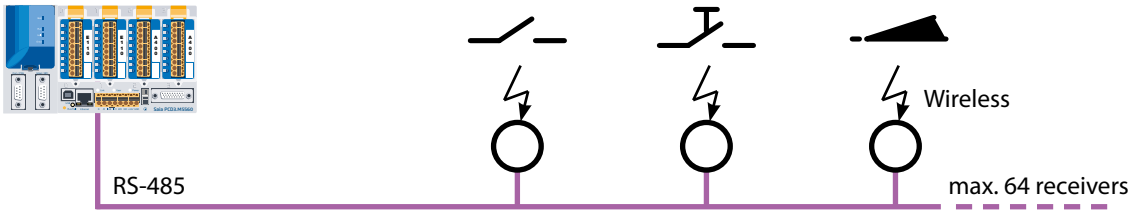
EnOcean is the inventor and manufacturer of the patented basic "self-powered wireless sensor technology". EnOcean was recognised as the first ISO/IEC wireless standard (ISO/IEC 14543-3-10) for optimised solutions with low energy consumption.
The "EnOcean alliance" is a manufacturers' interest group which, over time, has developed a wide range of self-powered components for building automation systems based on EnOcean technology, such as switches, sensors, actuators and gateways.

Communication drivers

The EnOcean components are connected to the Saia PCD controllers via external wireless gateways via serial RS-485 or IP interfaces. The FBox library provides communication modules for transmitting and receiving EnOcean telegrams.
Generic FBoxes are available for standard EnOcean devices. Device-specific FBoxes are available for a selection of manufacturer-specific devices such as room control units (PEHA Sensortec, Thermokon, etc.). Universal communication FBoxes also offer the option of processing any EnOcean telegram in the PLC program.



Connection diagram for the RS-485 wireless receiver



The number of transmitters per receiver is limited only by the distance and the reception quality.

Order details

Type	Description
PG5 – EnOcean V3	PG5 – EnOcean communication library for Saia PCD® controllers for serial (EVC mode) and IP-based communication.

Components from PEHA recommended (www.peha.de)

D450ANT	EnOcean wireless receiver with RS-485 interface (bidirectional), IP 20 casing with internal aerial

Other EnOcean components such as switches, hotel card switches, window contacts, radiator actuators…
are recommended by PEHA.

Components from Thermokon (www.thermokon.ch)

SRC65-RS-485E	EnOcean wireless receiver with RS-485 interface (unidirectional), IP65 casing with external antenna
STC65-RS-485E	EnOcean wireless receiver/transmitter with RS-485 interface (bidirectional), IP65 casing with external antenna

Sensortec components (www.sensortec.ch)

EOR700EVC	EnOcean wireless receiver with RS-485 interface (unidirectional), IP20 casing with internal antenna
EOR710EVC	EnOcean wireless receiver/transmitter with RS-485 interface (bidirectional), IP 20 casing with internal antenna

The number of required wireless gateways depends heavily on the structural conditions. Pillars and furniture can create "dead spots" and walls can dampen the wireless signal depending on their design. Additional information and a brief planning guide are contained in the EnOcean manual (see www.sbc-support.com) EnOcean V3 is the latest version. The FBox library "EnOcean bidirectional" is only to be used for existing projects.

2.6.5 M-Bus
field bus module for capturing consumption data

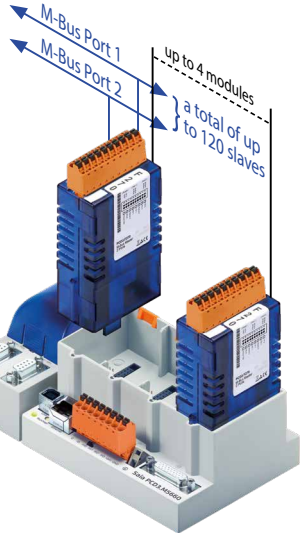
M-Bus master interface module

M-Bus (EN 1434-3) is an international standard for remote meter reading. The M-Bus connection is formed using the PCD2.F27x0 / PCD3.F27x communication modules in slots 0…1 on the PCD1.M2* and 0…3 on the PCD2.M5 and PCD3. This enables all volumes of water, heat or energy to be captured in an automation station. The measurement data is subsequently processed in an FBox library in the Saia PCD FUPLA.

The interface modules are fitted with a power supply and two separate M-Bus interfaces. Depending on the design, the integrated power supply is sufficient for up to 120 M-Bus standard slave modules whereby it can be distributed as required across the two ports.

The PCD2.F2710…F2720 and PCD3.F271…F272 master modules require the Engiby M-Bus library.

FBoxes for SBC energy meters with M-Bus are supported by the Engiby library.



M-Bus via serial interface

In PCD controllers, M-Bus is connected with no slot for M-Bus master modules via an external signal converter. RS-232 or RS-485 interfaces are used depending on the converter.

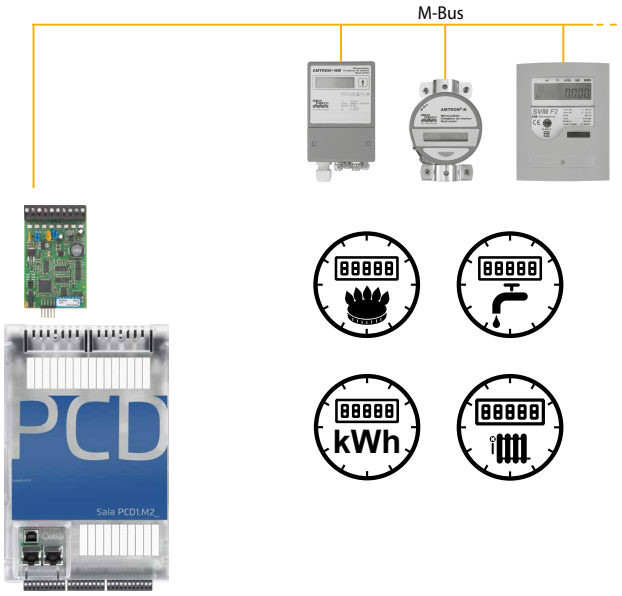
Driver settings

The respective PCD communication interface is specified in the M-Bus driver FBox in the Engiby library.

Note the converter interface parameters such as baud rate, timeout, etc.

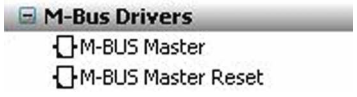
Secondary addressing

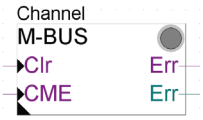
Secondary addressing is supported from Library Version 2.7.200 or higher for SBC energy meters and generic FBoxes. Primary addressing must be used for the product-specific FBoxes.



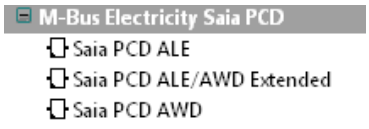
Application example: PCD1.M2120 with M-Bus activation.
* PCD1.M2110R1 slot 0 only

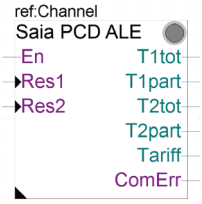
Driver licence free



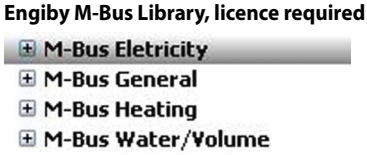


Saia Energy Meters licence free





Engiby M-Bus Library, licence required



PCD1/PCD2 ordering information

Type	Description	Weight
PCD2.F2700	M-Bus master interface for up to 240 slaves	60 g
PCD2.F2710	M-Bus master interface for up to 20 slaves	60 g
PCD2.F2720	M-Bus master interface for up to 60 slaves	60 g

PCD2.F27x0

PCD3 ordering information

Type	Description	Weight
PCD3.F270	M-Bus master interface for up to 240 slaves	80 g
PCD3.F271	M-Bus master interface for up to 20 slaves	80 g
PCD3.F272	M-Bus master interface for up to 60 slaves	80 g

PCD3.F27x

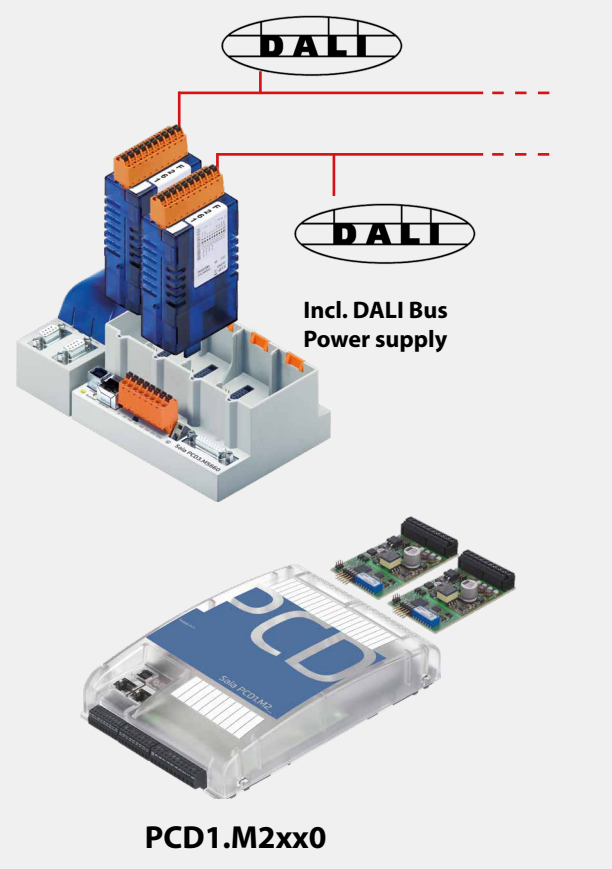
2.6.6 DALI
field bus module for lighting systems

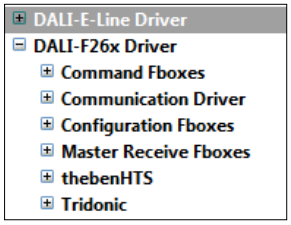
DALI master interface module

DALI is a communication system for lighting control, standardised in accordance with IEC 62386-101/102. Installation is easy. The DALI Bus simply needs 2 unshielded wires which can be threaded through the same cable along with the power supply, generally 230 V.
The light parameters are standardised. All upstream devices therefore have the same parameters for dimming, grouping and scenes, irrespective of the type of lighting.

The DALI master module includes the Bus power supply for up to 64 DALI participants. The extensive PG5 FBox library has function modules for commissioning, operating and servicing with the PLC program. External software tools or other components are not required.

Smaller DALI controls can be implemented with the PCD1.F2611-C15 E-Line DALI module. Detailed information about this small controller can be found in the E-Line chapter.





PG5 – DALI F26x FBox library

PCD3.F261

PCD2.F2610

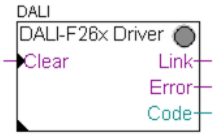
PCD1.F2611-C15

Order details

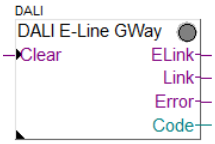
Type	Description	Application note	Weight
PG5 – DALI F26x	PG5 – DALI communication library for connecting DALI lighting control systems	–	–
PCD3.F261	DALI master interface for up to 64 DALI participants incl. bus power supply (200 mA/12…13.5 V)	PCD3.Mxxx0: I/O slot 0-3 PCD3.T666: I/O slot 0-3	80 g
PCD2.F2610	DALI master interface for up to 64 DALI participants incl. bus power supply (200 mA/12…13.5 V)	PCD1.M2110R1: I/O slot 0 PCD1.M2xx0: I/O slot 0-1 PCD2.M4160: I/O slot 0-1 PCD2.M4560: I/O slot 0-3 PCD2.M5xx0: I/O slot 0-3	60 g
PCD1.F2611-C15	DALI master interface for up to 64 DALI participants incl. bus power supply (160 mA/13…15.5 V)	–	130 g

Please observe the information for the PCD firmware version and the PG5 version on the support page.

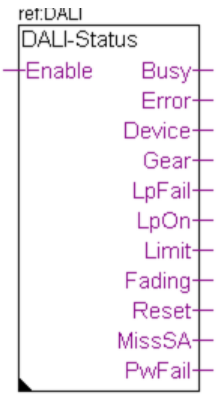
DALI communication library



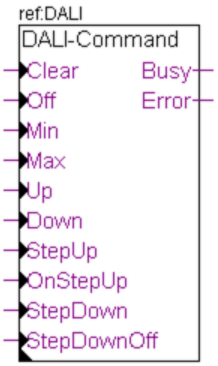
Driver module



E-Line gateway driver

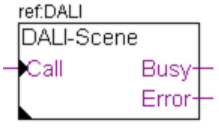


Status monitoring



Lighting control on/off, dimmable

Direct lighting control



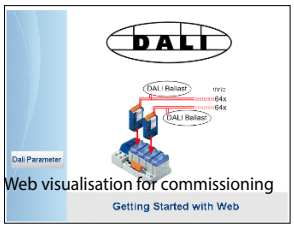
Scene controller

Commissioning and servicing made easy

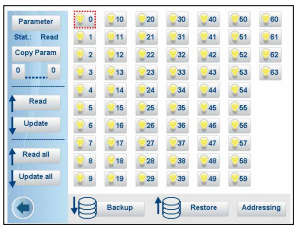
When initialising, the "DALI F26x Driver" FBox is positioned once only when the program starts. The "Configuration Manager" FBox then parameterises all the DALI participants on the bus. The FBox also provides predefined symbols for further use, e.g. in S-Web. The parameters can also be used securely in the PCD file system. The "Backup to Flash" FBox stores all DALI parameters in parallel in two files. This guarantees the retention of data in PCD systems with no batteries, e.g. in the Smart RIO PCD3.T666, required.

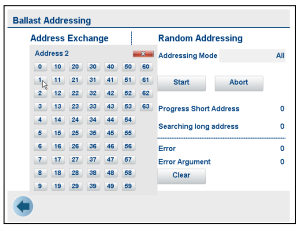
When commissioning DALI systems, it is usual to install all DALI participants then issue the addresses and set the parameters via the DALI commissioning software. The "Random addressing" and "Exchange addresses" modules are in the Saia PG5® – DALI library.

Parameterisation takes place after the addressing process using the "Configuration manager" FBox. Group and scene parameters can alternatively be set using the "Edit Groups" and "Edit Scene Levels" FBoxes to provide a better overview.



Web visualisation for commissioning





Operation

The "Send Command Inputs", "Send Command Online", "Send Power Control" and "Send Scene" FBoxes are available for transmitting DALI commands. These FBoxes cover all standard DALI commands.

The receipt of master telegrams is also supported by the "Receive Commands" and "Receive Raw" FBoxes. "Receive Raw" is useful for receiving non-standard telegrams. The raw data can then be processed further in the application program.

The lamp status can be requested using the "Read Status" FBox. The "Query numeric" FBox provides the application program with access to a further 21 DALI standard data points such as the current light level.

The "Read Memory" FBox is used to read any data from a DALI device. It is therefore possible to request brightness and presence information from one sensor, which would not be accessible with the DALI standard methods.

DALI controller with PCD1.F2611-C15:

There are also different FBoxes within the "DALI E-Line Driver" rubric for commissioning and operation for this interface.

The current DALI standard does not guarantee a genuine multi-master function. Multi-master capable products such as those of Tridonic, Osram or Zumtobel are either based on the new draft DALI extension E DIN 62386-103 (2011-08) or accept the loss of telegrams in bus collisions. Permanent polling, e.g. of the status, should therefore be avoided in "multi-master" projects. The maximum number of DALI master devices can be restricted to 8 units, for example, depending on the product and hardware manufacturer.

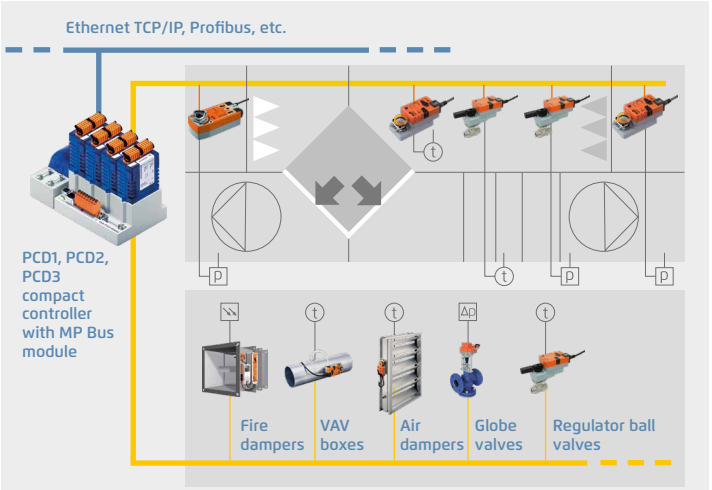
2.6.7 MP Bus
field bus module for Belimo MP Bus devices

MP BUS® TECHNOLOGY BY BELIMO

MP Bus master interface module

MP Bus is a Belimo communication system used to connect Belimo MP* field devices such as valve and shutter position drives or VAV controllers and room air sensors in building automation systems. Installation is easy. In addition to the 24 V AC/DC power supply, the MP Bus needs just one unshielded wire which can be run through the same cable.

Up to 8 drives can be attached to one communication channel. The total length of the mains cable depends on the diameter of the selected cable and the number and output of the connected drives**. A total length of approx. 100 m is usually reached. Since the length of the connection and the number of drives is limited, no other demands such as termination resistors or shielded cable are placed on the bus topology. In addition to the connected drives, sensors can be connected direct via a drive or MP Bus add-on modules. The extensive Saia PG5® FBox library has function modules for communicating with the PLC program. The drives are addressed using the communication driver FBox and can then exchange data with the application program via the respective FBoxes. The Belimo components are generally commissioned from the application program using the SBC FBoxes. Only a few components such as VAV controllers require additional Belimo parameterisation tools to adjust their operational parameters.



Application example: HVAC system with a PCD3.M5 and up to 64 MP Bus drive units on 8 MP interfaces

* MP is a Belimo designation. MP = multi-point
** For further information on the system layout, see the Belimo documentation, www.belimo.com

Overview

Automation station	Onboard; Slot A, A1 and A2				I/O slot #0…#3			
	MP Bus module	Total	Number of MP Bus		MP Bus module	Total	Number of MP Bus	
			Cables	Drives			Cables	Drives
PCD3.M3x60 / PCD3.M5x60 / PCD3.M6x60	–	–	–	–	PCD3.F21x, PCD3.F221	4	–	–
						+ PCD7.F180S	+ 4	+ 32
					PCD3.F281	4	4	32
						+ PCD7.F180S*	+ 2	+ 16
PCD2.M5540 / PCD2.M4560	PCD7.F180S	2	2	16	PCD2.F21x0, PCD2.F2210	4	–	–
						+ PCD7.F180S	+ 4	+ 32
					PCD2.F2810	4	4	32
						+ PCD7.F180S	+ 4	+ 32
PCD1.M2x20 / PCD1.M2x60 / PCD1.M2220-C15 / PCD2.M4160	PCD7.F180S	1	1	8	PCD2.F21x0, PCD2.F2210	2	–	–
						+ PCD7.F180S	+ 2	+ 16
					PCD2.F2810	2	2	16
						+ PCD7.F180S	+ 2	+ 16
PCD1.M2110R1 - Room	PCD7.F180S	1	1	8	PCD2.F21x0, PCD2.F2210	1	–	–
						+ PCD7.F180S	+ 1	+ 8
					PCD2.F2810	1	1	8
						+ PCD7.F180S	+ 1	+ 8
PCD1.M0160E0	PCD7.F180S	1	1	8	–	–	–	–

* With 4 PCD3.F281 only 2 additional PCD7.F180S can be used, because the load on +V would be too large

MP Bus | Function modules (FBox)

All Belimo MP drives can exchange data with the PCD application program via a suitable FBox from the MP Bus FBox library. The master communication FBox must be positioned once at the start of the application program. It controls the communication and fault recognition and creates ways of addressing the MP drives available for commissioning and service. Some MP drives also have an input for connecting sensors. R: Temperature sensor NI1000, PT1000…, U:voltage 0–32 V or 0–10 V and DI: Potential-free contact.

Type/performance categories	Sensors	MP Bus FBox
Communication drivers		MP Single
Ventilation applications **Damper drives with no safety function:** LM24A-MP (5 Nm), NM24A-MP (10 Nm), SM24A-MP (20 Nm), GM24A-MP (40 Nm) **Damper drives with safety function:** TF24-MFT (2 Nm), LF24-MFT2 (4 Nm), SF24A-MP (20 Nm) **Linear damper drives:** LH24A-MP100 / 200 / 300 (150 N), SH24A-MP100 / 200 / 300 (450 N) **Damper drives rotary:** LU24A-MP (3 Nm)	R, U, DI	MP Air
Safety applications **Drives for fire dampers:** BF24TL-T-ST (18 Nm), BFG24TL-T-ST (11 Nm) **Gateway for conventional fire damper drives:** BKN230-24-C-MP	Thermo-element	MP BS
Room and system applications **VAV compact controller:** LMV-D3-MP (5 Nm), NMV-D3-MP (10 Nm), SMV-D3-MP (20 Nm) **VAV compact controller linear:** LHV-D3-MP (150 N)	R, U, DI	MP VAV…
VAV universal controller: VRP-M	R, U, DI	VRP-M
Water applications **Lift drives with no emergency function:** LV24A-MP-TPC (500 N), LVC24A-MP-TPC (500 N), NV24A-MP-TPC (1000 N), NVC24A-MP-TPC (1000 N), SV24A-MP-TPC (1500 N), SVC24A-MP-TPC (1500 N), EV24A-MP-TPC (2500 N) **Lift drives with emergency function:** NVK24A-MP-TPC (1000 N), NVKC24A-MP-TPC (1000 N), AVK24A-MP-TPC (2000 N), adjustable closing point, adjustable emergency setting	R, U, DI	MP Linear
Drives for control ball valve with no emergency function: LR24A-MP (5 Nm), NR24A-MP (10 Nm), SR24A-MP (20 Nm) **Drives for control ball valve with emergency function:** TRF24-MFT* (2 Nm), LRF24-MP (4 Nm), NRF24A-MP (10 Nm) **Drives for butterfly valves with no emergency function:** SR24A-MP-5 (20 Nm), GR24A-MP-5/-7 (40 Nm)	R, U, DI	MP Air
Drives for 6-way control ball valve: LR24A-MP (5 Nm), NR24A-MP (10 Nm)	R, U, DI	MP 6 Way
Electronic pressure-independent control ball valve (EPIV): P6…W…E-MP*, EP0..R+MP*	U, DI	MP EPIV…
Belimo EnergyValve: EV..R+BAC, P6..W..EV-BAC	U, DI	Energy Valve P6
Rotary actuator: CQ24A-MPL (MP-Bus light)	—	MP MPL
Room sensors **Room combi-sensor, depending on design with temperature, CO_2, VOC and relative humidity:** MS24A R… MPX	R, DL, U (0–10 V)	MP THC24 MP THCV
Generic data transfer For reading and transmitting data points not contained in the device-specific FBox. This FBox is used as a functional extension for MP Bus FBoxes and can only be used with a device FBox specific to that device or a generic device FBox.		MP Generic MP PEEK MP POKE
Third party devices **FBoxes are available for the following third party MP Bus devices:** PTH sensor from wmag AG, Switzerland, UST-3, UST-5 from wmag AG, Switzerland. Each MP Bus device can also be connected via generic devices and peek/poke FBoxes in PCD application programs.		MP PTH MP UST-3 MP Generic MP PEEK MP POKE

* only active sensors and switches can be connected

2.6.8 Other drivers

Communication drivers from www.engiby.ch

Field bus, standard/universal interfaces

Modbus	The Modbus protocols allows the exchange of data with a wide range of industrial devices and many supervisors. The Modbus 2 library supports the following Modbus protocols: • ASCII + RTU over serial lines RS-232, 422 and 485 • TCP + UDP over Ethernet
M-Bus	With the M-Bus FBox driver library, the Saia PCD® acts as Master and is able to read the values from the meters, using either a PCD2/3.F27x module, or a M-Bus level converter.
DLMS	M-Bus library extension for DLMS protocol.
MQTT	Lightweight, publish-subscribe network protocol that transports messages between two devices over TCP/IP.
NG-Alarm	Allows the sending of SMS over Internet (TCP/IP, HTTP port).
3964(R) / RK512	The 3964(R) Driver allows data exchange with Siemens systems. It will allow direct access to the Saia PCD® media.
S-Bus with NG-Configurator (TCP/IP)	S-Bus driver for multi-master applications, for efficient configuration in MS Excel tables.
S-Bus with NG-Configurator (serial)	S-Bus driver for quick response time with priority, for efficient configuration in MS Excel tables.
KNX with NG-Configurator	KNX Configurator library for definition of KNX data points.
IEC 60870-5-101	Power plant/energy management.
IEC 60870-5-103	Switching station controller.
IEC 60870-5-104	Power plant/energy management.
ESPA 4.4.4	Send and receive Messages, forward and route Messages via SMS, pager or TAP.
Text Output	Configuration tool for transmitting formatted texts event triggered via serial interfaces, TCP/IP or UDP/IP. Also supports SMS.
Text Parser	Configuration tool for reading and analyzing PCD text input.
SNMP Traps	Alarm messages (Trap) to network Management Systems (NMS), Syslog messages and device-list to PING.

Controller/energy

ExControl	Light and shade functions with remote access via RS-232 or Ethernet.
APC Data Guard	Carel controllers with APC Data Guard protocol.
TRSII	WITnet concept, remote control. The Saia PCD® acts as master of the communication and the program is realized with FBoxes for Fupla.
COMSAB / York	SABROE compressor control units: – PROSAB II, UNISAB S / R / RT / RTH, UNISAB II The Saia PCD® is Master and supports Read and Write access to all variables.
Johnson N2	The Johnson N2 Driver allows data exchange with Johnson controllers of the TC-9100 and DX-9100 families.
Luxmate	Communication with lightning control BMS ZUMTOBEL.

Alarm / messages / access

NG-Alarm	Allows the sending of SMS over Internet. (TCP/IP, HTTP port).
Commend	Interphone system.
Fidelio / FIAS	Hotel management system.
Cerberus	Siemens-Cerberus alarm systems.
Tyco MX	Tyco MX 1000 and 4000 fire alarm system.
Securiton / SecuriPro	Fire and intrusion Alarm systems.
TechTalk	Access control system.

Pumps / Clock / Others

Wilo / EMB	The Wilo Driver allows communication over serial RS-485 line with pumps from Wilo (Germany) and EMB (Switzerland). The driver is available in form of an FBox family for Fupla.
Grundfos	The Grundfos Driver for the GENIbus protocol allows you to control Grundfos pumps over an RS-485 serial line.
ebmBUS	The ebmBUS Driver supports communication over serial RS-485 lines with ebm-Papst motors. The driver is available in form of an FBox family for Fupla.
Clock	Reception of time data for DCF77 and GPS.
Marksman	Road traffic counter.

Saia Burgess Controls communication drivers

P-Bus	Communication driver to Siemens P-Bus I/O level.
N2-Bus	Communication driver to JCI-N2 bus for connecting JCI master or slave systems.

For German-speaking customers: Communication drivers from Kindler Gebäudeautomation GmbH, www.kga.de

Danfoss KGA.Danfoss	FBox library for communicating with VLT 6000 / FC100 Danfoss® frequency inverters with the standard FC communication protocol.