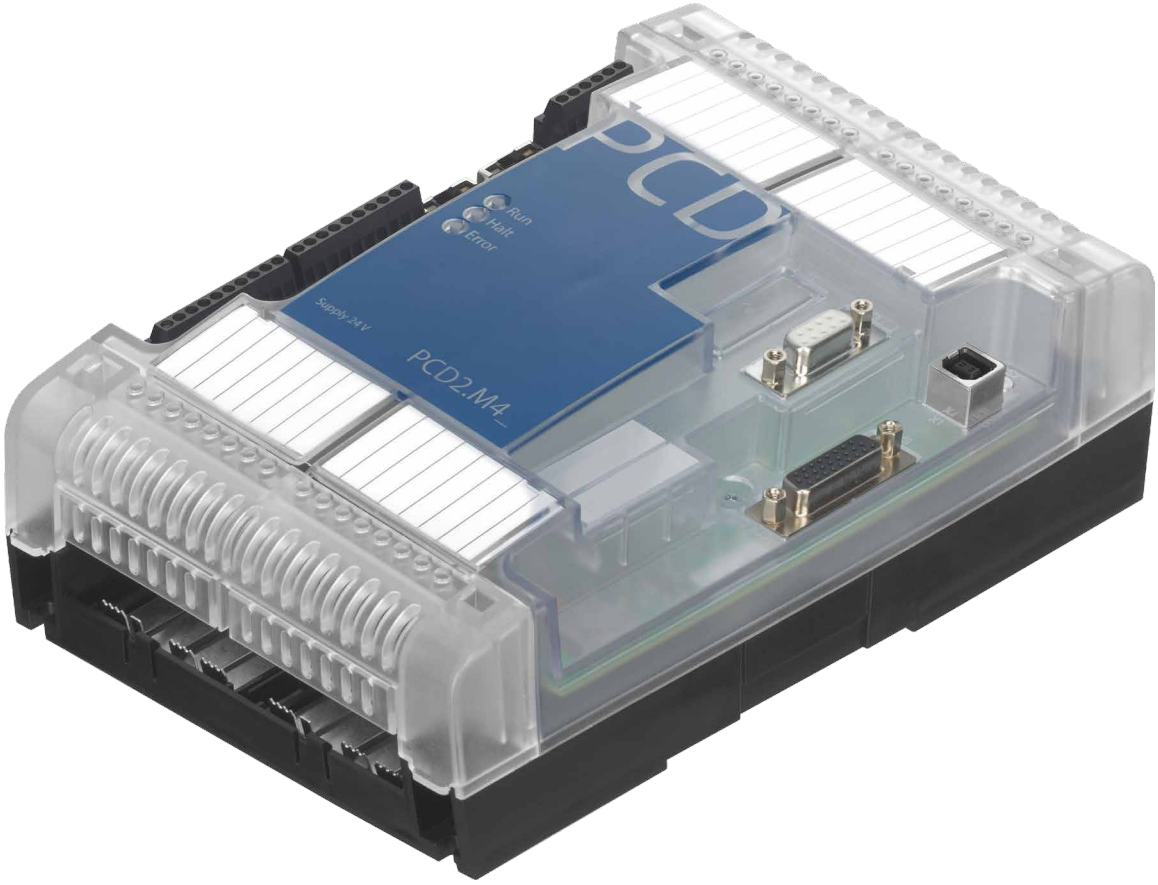
SAIA BURGESS CONTROLS



PCD2.M4160, PCD2.M4560

User Manual

Document 27-648 | Edition ENG04 | 2017-03-08

0

0

0

0.1 Document History

Version	Changes	Published	Comments
ENG01	2015-10-20	2015-10-26	First edition
ENG02	2016-08-17	2016-08-17	- Power supply - Mounting with screws and DIN-rails
ENG03	2016-09-01	2016-09-02	- New pictures for mounting with screws
ENG04	2016-12-12	-	- Restrictions on communication port Slot 'A'
ENG04	2017-03-08	2017-03-08	- Chap. 10.3 Module internal counter - new

0.2 Trademarks

Saia PCD® is a registered trademark of Saia-Burgess Controls AG.

Technical changes are subject to the state of technology.

Published in Switzerland

1 Graphical Overview

The graphical overview shows some of the main topics covered in the Operating Manual of the PCD2.M4160 and PCD2.M4560.

By clicking on the highlighted components and/or connections, you can jump directly to the corresponding chapter in the document.
The numbers separated by dots indicate the relevant chapter numbers.

2 Important notes

2.1 Prerequisites

The PCD2.M4x60 must be used with the PG5 Suite v2.2.050 or higher.

2.2 Instructions for connecting 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. For secure operation, appropriate protective measures must always be taken.
PCD controllers include simple, built-in 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:
www.sbc-support.com/security

3 Versions overview

	PCD2.M4160	PCD2.M4560
Number of onboard digital inputs	4 digital inputs (24 V, configurable: Normal, Interrupt, Counter)	
Number of digital inputs/outputs in the base unit	64	
Or I/O module slots in the base unit	4	
Number of digital inputs/outputs with PCD2.C1000/PCD2.C2000 module holders	–	1023
or I/O module slots	–	60
Processing times [µs]	Bit-Operation 0.1…0.8 µs Word-Operation 0.3 µs	
Real-time clock (RTC)	Yes	
Supercap to support the real-time clock	> 10 days	
Slot for optional battery module Order article number: 4 639 4898 0	Yes, to support the real-time clock for > 3 years	

Onboard memory

Program memory, DB/TEXT (Flash)	512kByte	2MByte
Working memory, DB/TEXT (RAM)	128Kbyte	1Mbyte
Flash memory (S-RIO, Konfiguration und Backup)	128Mbyte	128Mbyte
User flash file system (INTFLASH)	8Mbyte	128MByte
Data backup with FRAM technology (the data will remain when system is unpowered)	for R, F, DB, TEXT	for R, F, DB, TEXT

Onboard communication interfaces

USB 1.1	<= 12Mbit/s	
Ethernet, 2 Port Switch	10/100 MBit/s, fullduplex, autosensing/crossing	
RS-485 on terminal block (Port 0)	<= 115.2 kbit/s	
RS-485 free protocol on D-Sub connector (Port 2) or RS-485 Profibus DP Slave, Profi-S-Net D-Sub connector (Port 10)	No	<= 115.2 kBit/s <= 1.5 Mbit/s (galv. sep.)

Optional communication interfaces

PCD2.F2xxx Module for RS-232, RS-422, RS-485, BACnet® MS/TP, Belimo MP-Bus, DALI und M-Bus	I/O slot 0..1 2 Modules	I/O Slot 0..3 4 Modules
Slot A for PCD7.F1xxx Module	yes	
Slot C for Profibus Module PCD7.F7500 (Port 8)	No	yes

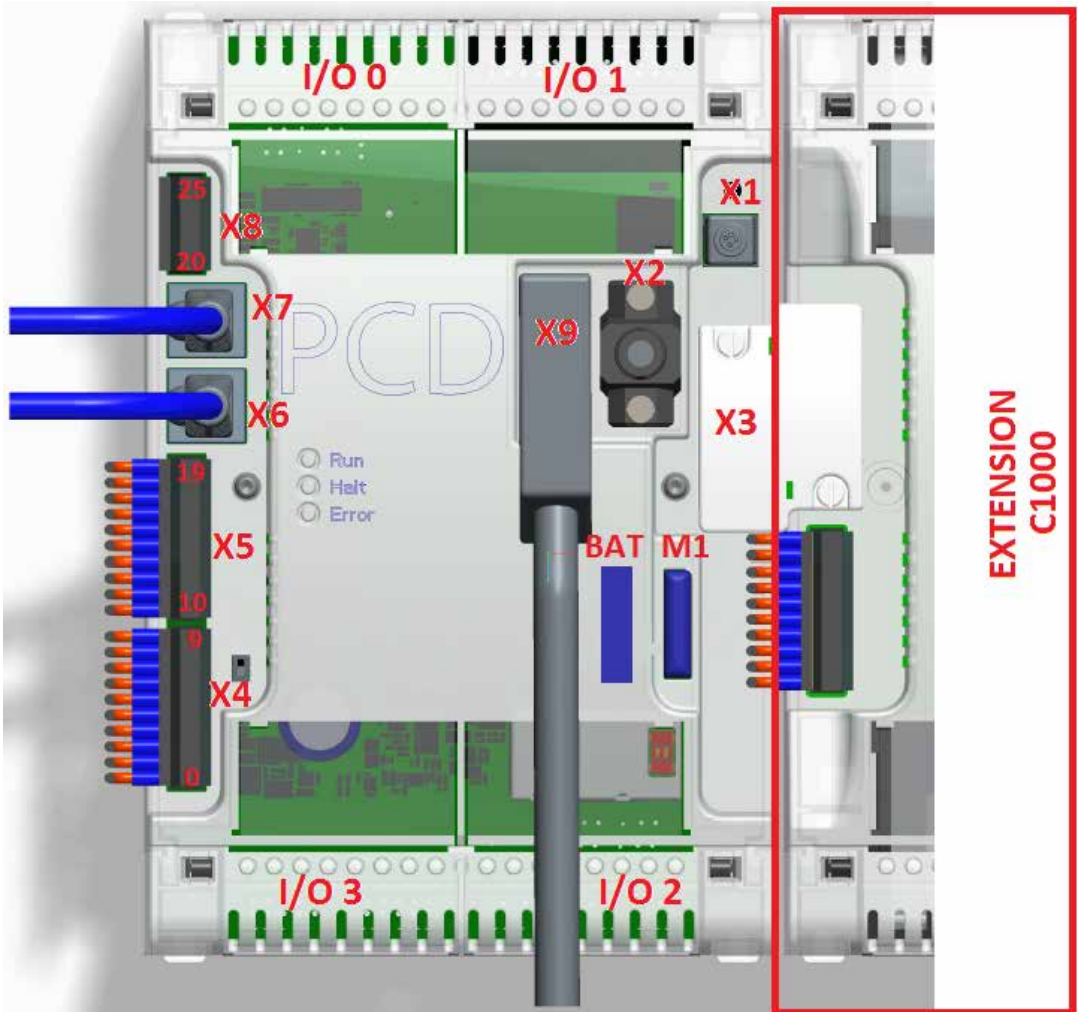
General specifications

Supply voltages (in accordance with EN/IEC 61131-2)	24 VDC –20/+25% max. incl. 5% ripple ±15%
Power consumption	Typ. 15 W with 64 I/O
Load capacity 5 V/ +V intern	max. 800 mA/250 mA

Order details

PCD2.M4160	PCD2 processor unit with Ethernet-TCP/IP, 512 kB program memory, 64 I/O
PCD2.M4560	PCD2 processor unit with Ethernet-TCP/IP, 2 MB program memory, 1023 I/O

4 System overview



4.1 X1 – USB Device

USB device 1.1 on type ‘B’ connector.

4.2 X2 – Isolated RS-485 / MPI

SUBD 9p connector

S-Net/MPI/RS-485		
D-Sub pin	**signal**	**Explanation**
1	PGND	GND
2	GND	0 V of 24 V supply
3	RxD/TxD-P[1]) B (red)	Receive/transmit data positive
4	RTS/CNTR-P	Control signal for repeater (direction control)
5	SGND[1])	Date communication potential (earth to 5 V)
6	+5V [1)]	Supply voltage to P line termination resistors
7	MPI24V	Output voltage plus 24 V
8	RxD/TxD-N[1]) A (green)	Receive/send data negative
9	not used	

4.3 X3 – I/O Extension port

SUBD 26p for I/O Bus extension cables.

Only the I/O extensions with integrated power supply are compatible (PCD2.C1000, PCD2.C2000,..)

4.4 X4 – Power supply / S-Bus / Watchdog

Connector inscription	9	8	7	6	5	4	3	2	1	0
Signal	D	/D	–	WD	WD	–	–	+	+	+

Details of the power supply are in Chapter 5 (power supply).

4.5 X5 – Communication port Slot 'A'

	PCD7.F121S [1)2)3)]	PCD7.F110S		PCD7.F180S	PCD7.F150S	PCD7.W600 [3)4)]
	RS-232	RS-485	RS-422	Belimo	RS-485, isol.	4xAO (0..+10 V)
10	PGND	PGND	PGND	PGND	PGND	PGND
11	TxD	Rx-Tx	Tx	MP	Rx-Tx	A0+
12	RxD	/Rx-/Tx	/Tx	„MFT“	/Rx-/Tx	A0-
13	RTS		Rx	„IN“		A1+
14	CTS		/Rx			A1-
15	PGND	PGND	PGND	PGND	PGND	PGND
16	DTR [2)]		RTS			A2+
17	DSR [2)]		/RTS			A2-
18	COM		CTS		SGND*	A3+
19	DCD [1)]		/CTS			A3-

* SGND is signal return for Rx-Tx-/Rx-/Tx signals and is isolated from PGND.
4) The plug-in module PCD7.W600 (4 analogue outputs) is described in the manual 27-634_ENG.

Please refer to the PCD7.F1xxS module descriptions in chapter 12 Communication Ports.

Note	HW version	Restrictions
1)	**rev. A**	The signal "DCD" for modem communication is not supported.
2)	**rev. B**	- Issue with "DTR" signal, RS-232 full protocoll with handshake on DTR-DSR-signals not supported. - Modems are supported (without DTR signal).
3)	**rev. C and higher**	- RS-232 full protocoll issue is corrected. - Modems and PCD7.W600 are fully supported.

4.6 X6 / X7 – Dual Ethernet (Switch)

Dual Ethernet port with integrated switch 10/100M.

4.7 X8 – Digital interruptive inputs

Four digital inputs configurable interruptive functions.

Connector inscription	25	24	23	22	21	20
Signal	DI_IX3	DI_IX2	DI_IX1	DI_IX0	–	–

4.8 X9 – Communication port Slot 'C'

A hole is foreseen in the housing for the SUBD connector of module PCD2.F7500.

4.9 M1 – Memory Slot

Slot for memory modules like PCD7.R610 for example.

4.10 BAT – Battery module slot

Slot for PCD3 battery module.

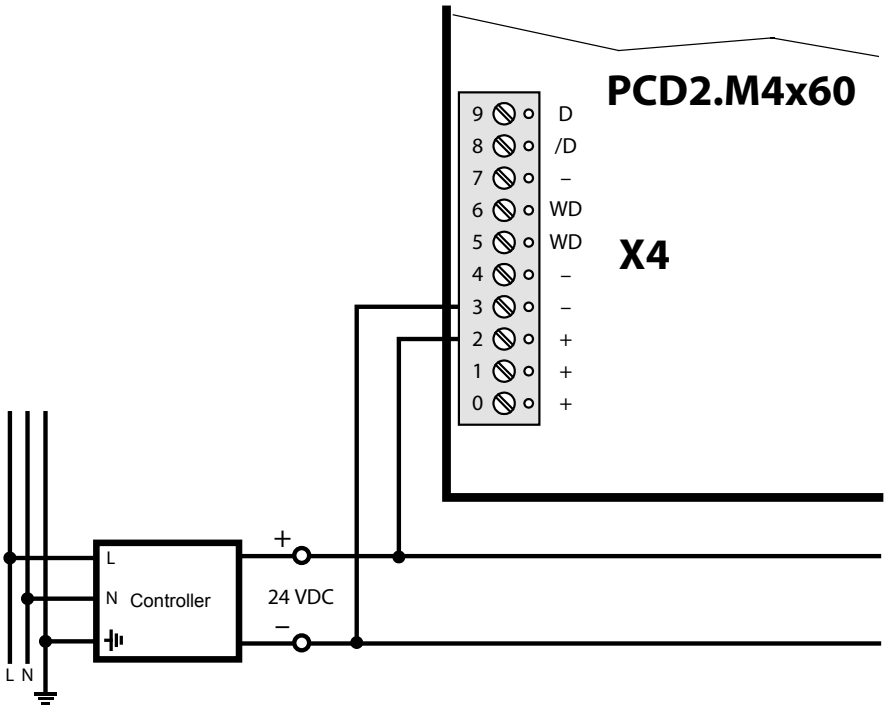
5 Power supply

Supply voltage: 24 VDC -20% .. +25%

Power consumption: Typically 15 W

Capacity of internal 5V / V+ bus: 800 mA / 250 mA

Connection terminals



6 LED behaviour

Three LEDs (green, red and yellow) show the possible operating statuses of the CPU as set out in the following table:

Meaning	Run	Stop	Error(s)
Form	●	■	△
Colour	green	red	yellow
Run	●	□	△
Run conditional	●/○	□	△
Run with error	●	□	▲
Run conditional with errors	●/○	□	▲
Stop	○	□	△
Stop with errors	○	□	▲
Halt	○	■	△
System diagnostics	●/○	■/□	▲/△
Battery fault	○	□	▲/△

Key:
- ○ LED off
- ● LED on
- ●/○ LED blinks

6

7 Run / Stop button

A push button is placed near the USB connector (X1).

The operating mode can be changed during operation or during power-up.

If the button is pressed in Run mode for longer than ½ second and less than 3 seconds, the controller switches to Stop mode and vice versa.

If the button is pressed for longer than 3 seconds, the last saved user program is loaded from the flash memory.

8 I/O Bus slots and I/O extension port

8.1 PCD2.M4160

Four I/O Slots available in the PCD, addresses from 0 to 63.

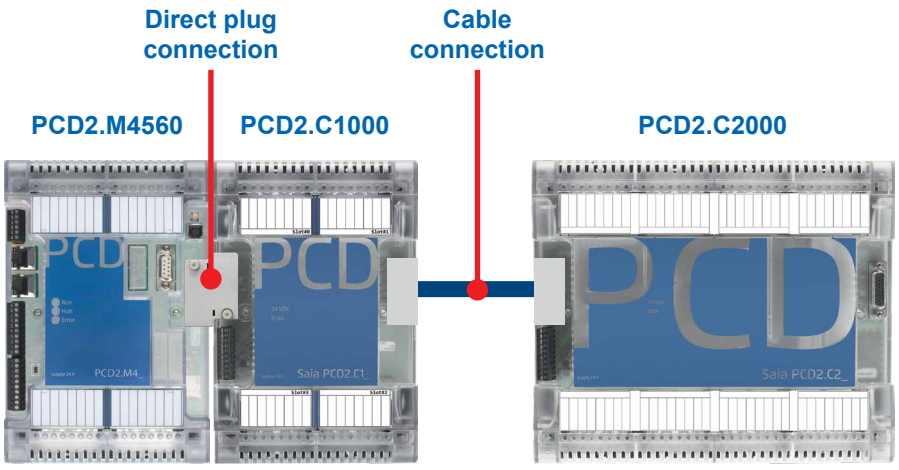
The communication modules (PCD2.Fxxx) or memory modules (PCD2.Rxxxx) can be connected in slots 0 or 1, but not in slots 2 or 3.

8.2 PCD2.M4560

Four I/O Slots available in the PCD, addresses from 0 to 63.

The communication modules (PCD2.Fxxx) or memory modules (PCD2.Rxxxx) can be connected in the four I/O slots of the PCD.

The extensions PCD2.C1000 or PCD2.C2000 can be chained up to address 1023 (including the 64 addresses available in the PCD itself. That means 64 I/O modules can be connected to the system.



9 Data retention, Real time clock and battery module slot

9.1 Usage of optional battery module

The slot for the PCD3 battery module will be unused for the most of applications. This option will be used only for customers they need to keep the real time clock up to date when the system stays unpowered more than 10 days.

For an unpowered duration up to 10 days, the real time clock stays alive by a super-capacitor.

9.2 User program data

The user program medias (registers, flags, etc.) are stored in a non-volatile memory. That means the information is not lost when the system is unpowered and even if the system has no battery module plugged.

10 Digital interruptive inputs

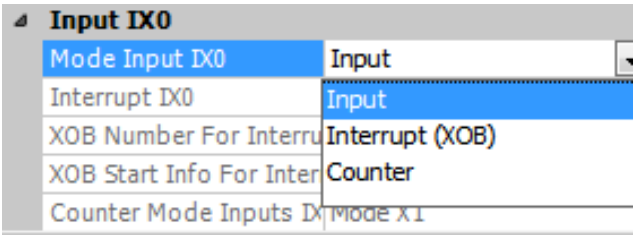
Digital inputs respecting standard IEC 61131-2:

Voltage input lower than 5V is considered as state “low” and voltage higher than 15V is considered as state “high”.

Maximum input voltage = 30V.

10.1 Usage in normal digital inputs

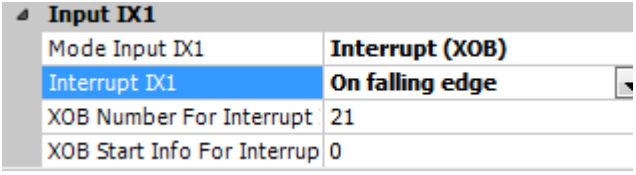
To use the digital inputs as normal inputs, choose the mode “Input” in the device configurator.



10.2 Interruptive inputs

To use the digital inputs as interruptive inputs, choose the mode “Interrupt”. The interrupts can be triggered on rising edge, falling edge or both.

A XOB is called when an interrupt is detected. The XOB number is configured by default at XOB 20 for input 0 up to XOB23 for Input 3.



10.3 Onboard Counter

10.3.1 Introduction

The four Interrupt Inputs can be used as two independent On board Counters. This On board Counter is counting independent of the CPU Cycle.

On the PCD1.M22_ the Onboard Interrupts and the Onboard Counter are using the same Inputs. These Functions can’t be used in parallel.

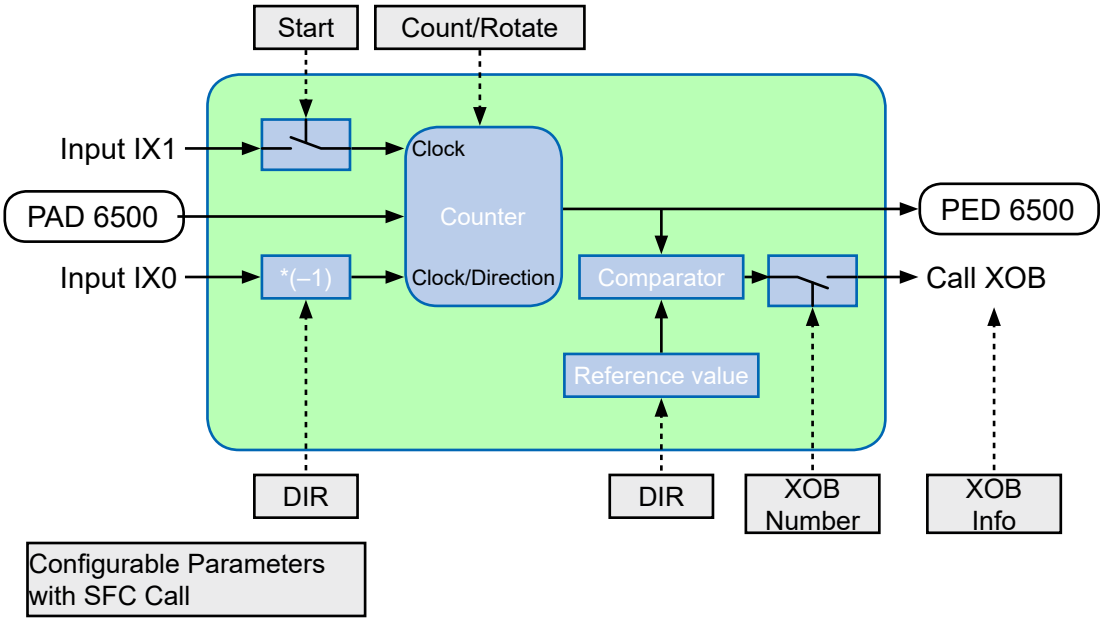
The onboard Counter is able to count bidirectional.

The Overflow handling is configurable. If a configurable reference Value is reached, it is possible to call a Process Alarm XOB.

The max counter Frequency is limited to 1 kHz.

10.3.2 Function Description

10.3.2.1 Function Block Diagram



10

10.3.2.2 Function Description

To configure, to start and stop the Onboard Counter there exist a system call (BOARDCNT). For the configuration and to start the Counter only a single call of the system call is necessary. The Counter value can be read with a direct periphery access on address 65’000 / 65004. The Value of the Counter can be set at any time with a direct periphery write access to address 65’000 (Counter 0) or 65004 (Counter1).

- On a startup, the Counter is preset to 0.
- If the PCD goes to halt the counter is stopped.
- To change the Counter Parameter, the counter must be stopped.

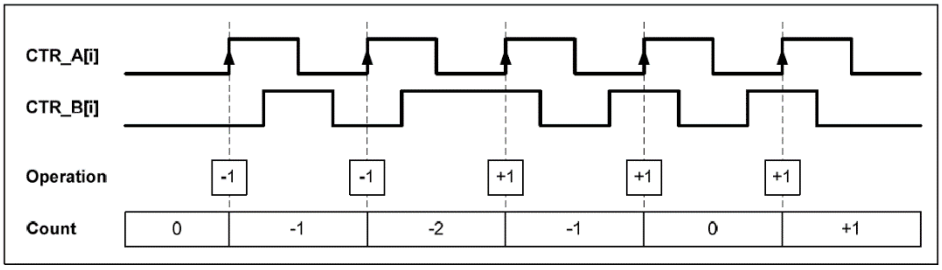
ROTATE: In the Rotate Mode the counter counts up to the Reference Value (Parameter Ref) and starts then from 0. Or it counts down to 0 and starts with the Reference Value. In “normal” Mode theCountingRangeis from 0 to 0xFFFF'FFFF.

10.3.2.3 Counter Mode Description

The Counter Mode is confugured in the IO-Configuration (On Board IO's Inputs / Interrupts / Counter / Watchdog)

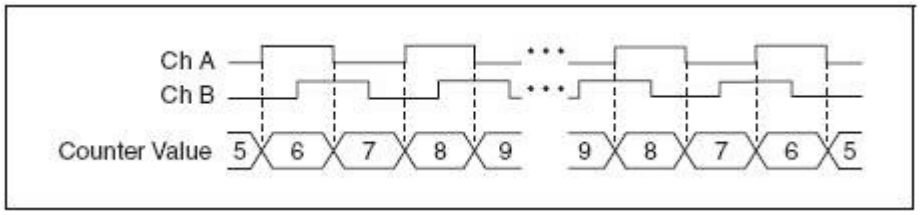
X1 Encoding

In this mode, the counter is set on every positive edge of A and counts up or down depending on the B state.



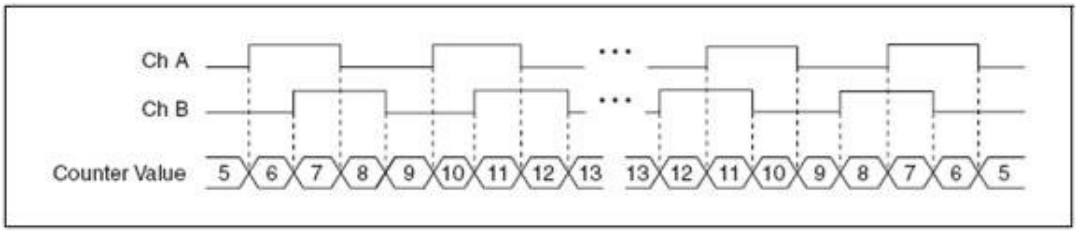
X2 Encoding

The same behavior holds for X2 encoding except the counter increments or decrements on each edge of channel A, depending on which channel leads the other. Each cycle results in two increments or decrements, as shown in Figure.



X4 Encoding

The counter increments or decrements similarly on each edge of channels A and B for X4 encoding. Whether the counter increments or decrements depends on which channel leads the other. Each cycle results in four increments or decrements, as shown in Figure.



10

10.3.2.4 System Function Parameters

With the System Function Library Number 17 Function Number 1 it is possible to start / stop and Configure the OnBoard Counter. The following table displays the Parameters

Parameter	Declaration	Type	Range	Description
COUNT_NUM	Input	R K Wert	0	0: Counter 0 1: Counter 1
START/STOP	Input	F	TRUE / FALSE	Start or Stop the Counter
CONT	Input	F	TRUE / FALSE	True: Continuous counting False: Counting until the ref value is reached
ROTATE	Input	F	TRUE / FALSE	True: Overflow handling, see description Rotate False: No Overflow handling
DIR	Input	F	TRUE / FALSE	Only in Mode X0 and X1 True: Input IX0 is inverted False: Input IX0 is not inverted
REF_OUT	Input	F	TRUE / FALSE	This Functionality is not supported (set Always to FALSE)
PULSE_OUT	Input	F	TRUE / FALSE	This Functionality is not supported (set Always to FALSE)
REF	Input	R K Wert	xxx [1]	Maximum Value or Reference Value
XOB_NBR	Input	R K Wert	0 32…63	0: No XOB call if Counter Value is equal Ref Value 32…63: XOB is called if the Counter reaches the Ref Value
XOB_INFO	Input	R K Wert	YYYY[2]	This Value can be read in the XOB local data.
RET_VAL	Output	R	ZZZZ[3]	Error and status message: 0: Counter started 1: Counter already running (called when START=TRUE) -2: COUNT_NUM is invalid (0) -3: XOB_NBR is invalid -4: Counter Inputs are configured as Interrupts -5: Configuration with COUNT = TRUE, ROTATE=TRUE, and REF = 0
REF_REACHED	Output	F	TRUE / FALSE	This Flag is set if the Ref Value was reached. The Flag will be reset after the call.

1) 4 Byte Range from 0x0000'0000 to 0xFFFF'FFFF.

2) 2 Byte Range from 0x0000 to 0xFFFF.

3) Integer Range from -32768 to +32767.

11 Watchdog relay

PCD2.M4_ CPUs have a hardware watchdog as standard equipment. The watchdog relay is at Pins 5 and 6 at Plug X4.

Functional description

As soon as the watchdog relay is called at the address O 255 by a switch on/off frequency of < 200ms (or other value configured in device configurator), the relay contact closes. It remains closed until the pulse time exceeds the configured value.

Example of an instruction list (IL) sequence:

Label	Command	Operand	Comment
	COB	0	; or 1 … 15
		0	
	STL	WD_Flag	; invert the help flag
	OUT	WD_Flag	
	OUT	O 255	; Output 255 blinking
	ECOB		

With this code the watchdog triggers even for (continuous) loops that are due to programming. Regarding user program cycle time, please note the following:

With cycle times longer than 200 ms, the code sequence must be repeated multiple times in the user program in order to prevent the watchdog triggering during RUN.

12 Communication ports

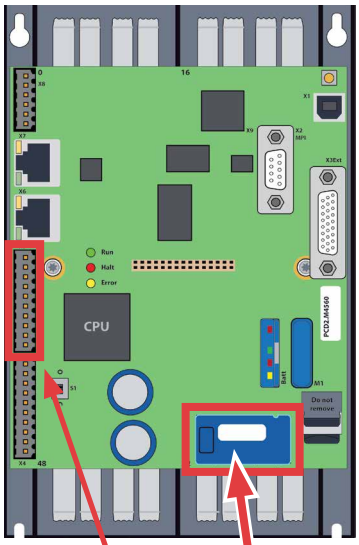
12.1 Baudrates

Baudrate	Port 0 RS485 on board	Port 1 Slot 'A'	Isolated RS485	
			Port 2	Port 10
			free protocol S-Bus	Profi S-Net
110	X	X	–	–
300	X	X	–	–
600	X	X	–	–
1'200	X	X	X	–
2'400	X	X	X	–
4'800	X	X	X	–
9'600	X	X	X	–
19'200	X	X	X	–
38'400	X	X	X	–
57'600	X	X	X	–
93'750	–	–	–	X
115'200	X	X	X	-
187'500	–	–	–	X
500'000	–	–	–	X
1'500'000	–	–	–	X

Slot 'C' (port 8) is dedicated to the module Profibus-DP Master PCD7.F7500.
Please refer to user manual of PCD2.M5.

12.2 Slot A (Port #1) terminal block X5

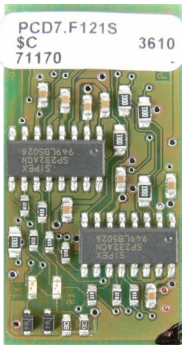
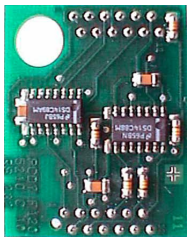
Only PCD7.F1xxs modules are supported on the PCD2.M4x60.



Older interface modules without “S” at the end of the product designation (e.g. PCD7.F110) are not compatible with PCD2.M4x60.

12

Overview of the interface types:

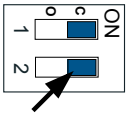
PCD7.F1xxS with housing, 2012 or later	PCD7.F1xxS previous design	PCD7.F1xx not compatible with PCD1.M2_
		

Important: PCD7.F1xxS devices with hardware version A are not compatible with earlier PCDs (PCD1.M1xx/PCD2.M1xx/PCD2.M48x/PCS1) from NT- based PCD systems.

12.2.1 RS-485/RS-422
PCD7.F110S Serial Interface Module

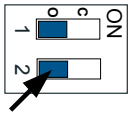
Termination resistors can be connected (CLOSED) or disconnected (OPEN) with slide switchs.

PCD7.F110S **RS-485 termination**



Close, terminated, closed

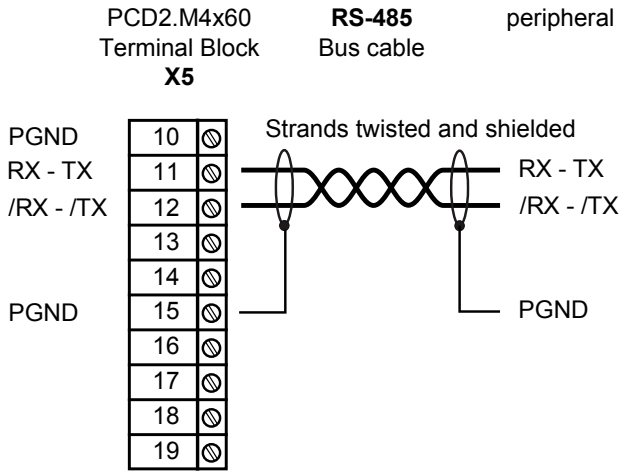
Slide

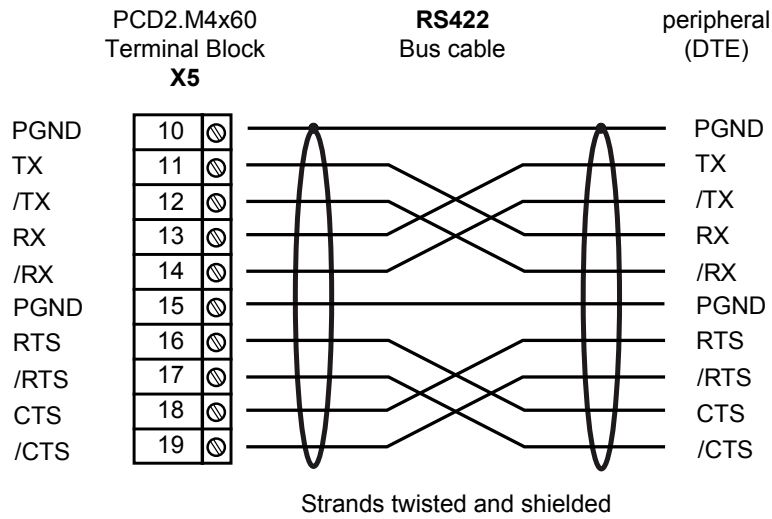


Open, not terminated, open (factory setting)

Slide

Plug assignment:





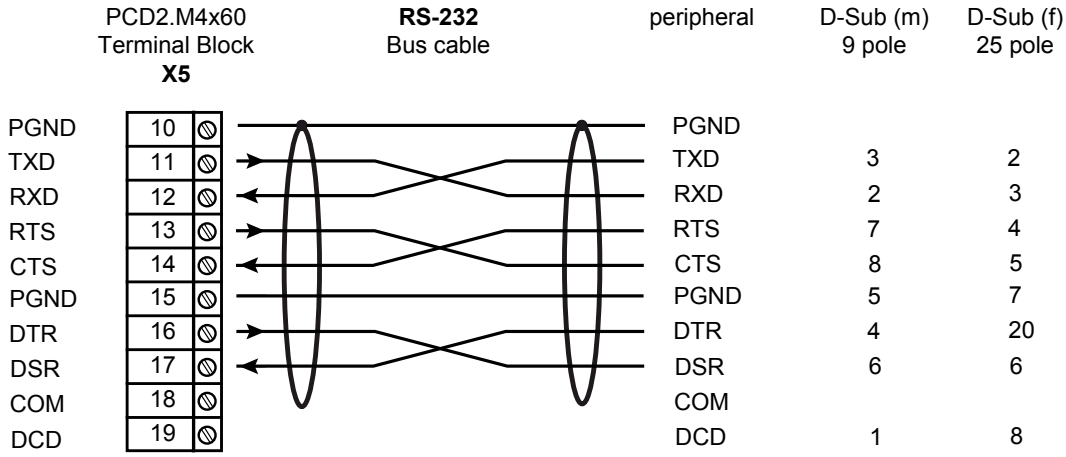
For more details see the Manual 26-740 “Installation components for RS-485 Networks”.

12.2.2 RS-232 up to 115 kBit/s, suitable for Modem Connection PCD7.F121S Serial Interface Module

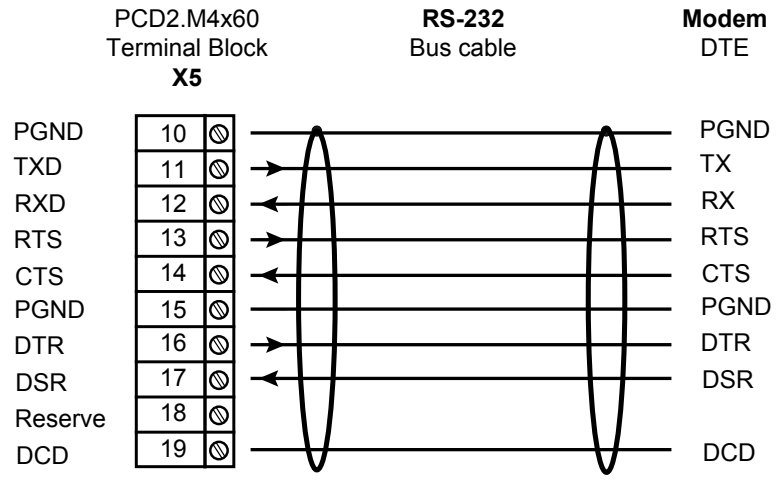
PCD7.F121S

HW version PCD2.M4x60	Restrictions
rev. A	The signal "DCD" for modem communication is not supported.
rev. B	- Issue with "DTR" signal, RS-232 full protocoll with handshake on DTR-DSR-signals not supported. - Modems are supported (without DTR signal).
rev. C and higher	- RS-232 full protocoll issue is corrected. - Modems and PCD7.W600 are fully supported.

Standard Cabling:



Cabling for Modem connection:

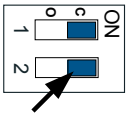


12

12.2.3 RS-485 electrical isolation
PCD7.F150S Serial Interface Module

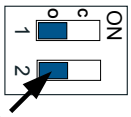
Electrical isolation is achieved with three optocouplers and a DC/DC converter. Data signals are protected against overvoltage with an anti-surge diode (10 V). Termination resistors can be connected (CLOSED) or disconnected (OPEN) with slide switchs.

PCD7.F150S **RS-485 termination**



Slide

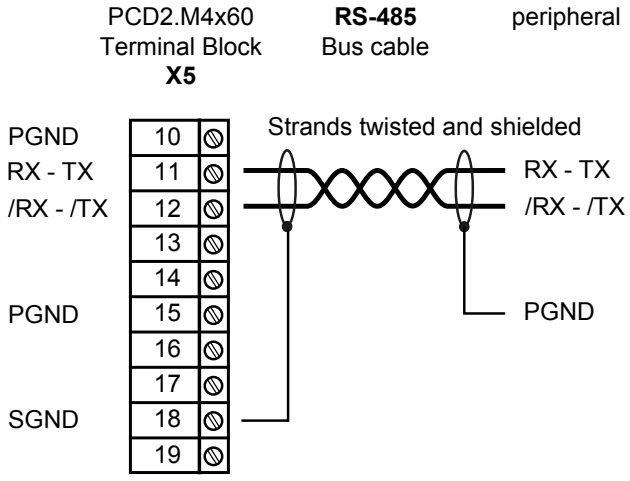
Close, terminated, closed



Slide

Open, not terminated, open (factory setting)

Cabling:



With the use of this module, the permissible ambient temperature is reduced by 5°C.

For more details see in the Manual 26-740, Installation components for RS-485 Networks.

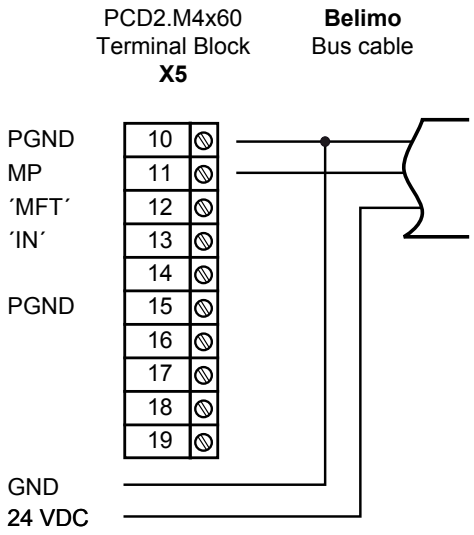
12

12.2.4 Belimo MP-Bus
PCD7.F180S Serial Interface Module

Up to 8 actuators and sensors can be connected.

PCD7.F180S

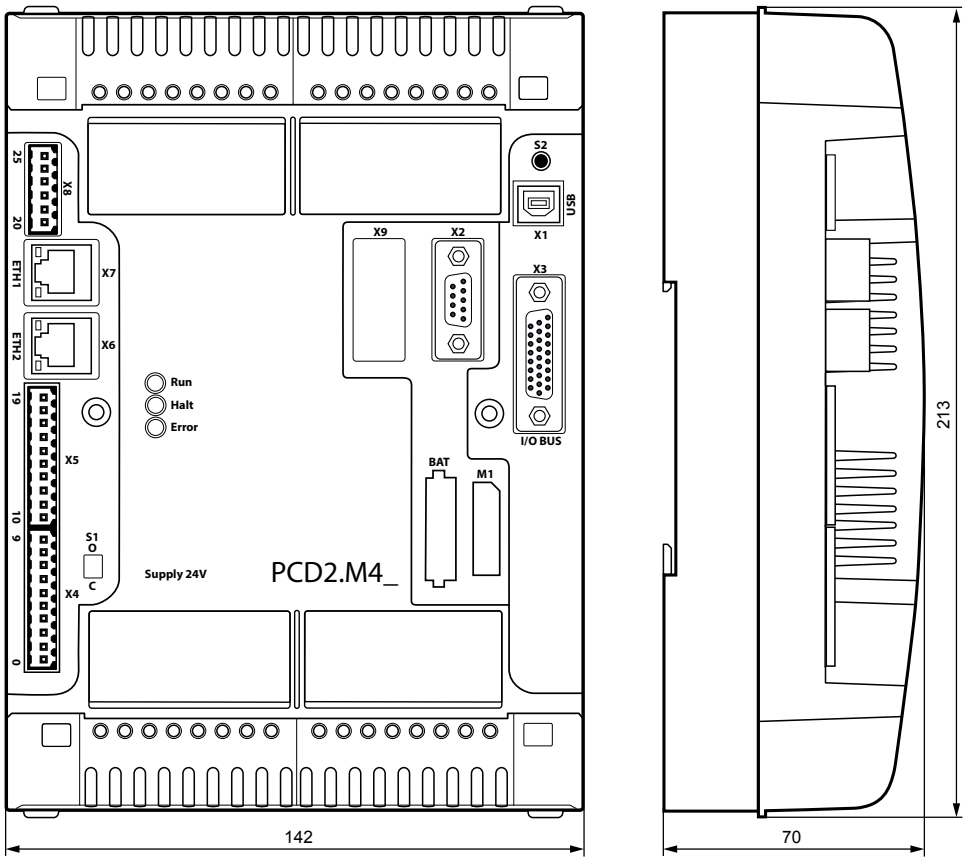
Cabling PCD2.M4x60 :



Cabling MP-Bus device

10	PGND	Earth connection, MP string
11	MP	Multi Point The MP bus is the Belimo master-slave bus. Up to 8 slaves can be attached to one master device. They are: - MFT(2) flap drives - MFT(2) valve drives - MFT fire protection flap drives - VAV compact controller NMV-D2M
12	“MFT“	MFT programming device (MP bus internal)
13	“IN“	MFT programming device recognition (input 10 kΩ, Z5V1)
15	PGND	Earth connection, MFT programming unit

13 Dimensions



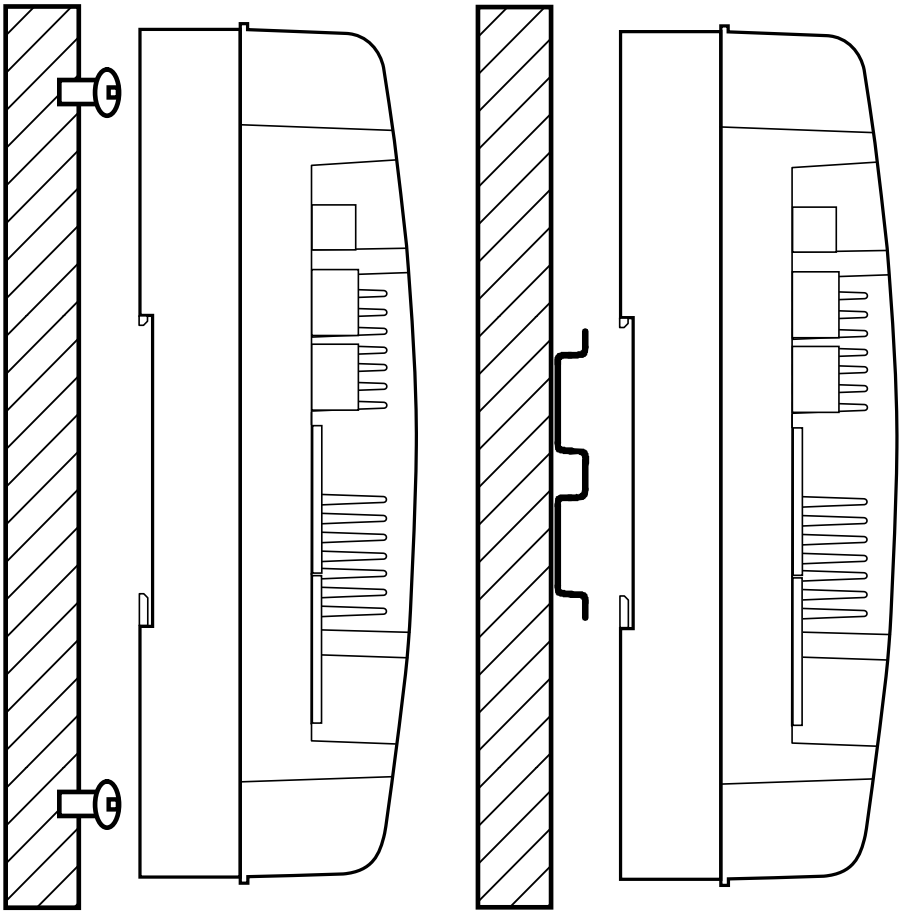
13

14 Mounting

There are 2 different types of installation:

mounted with screws

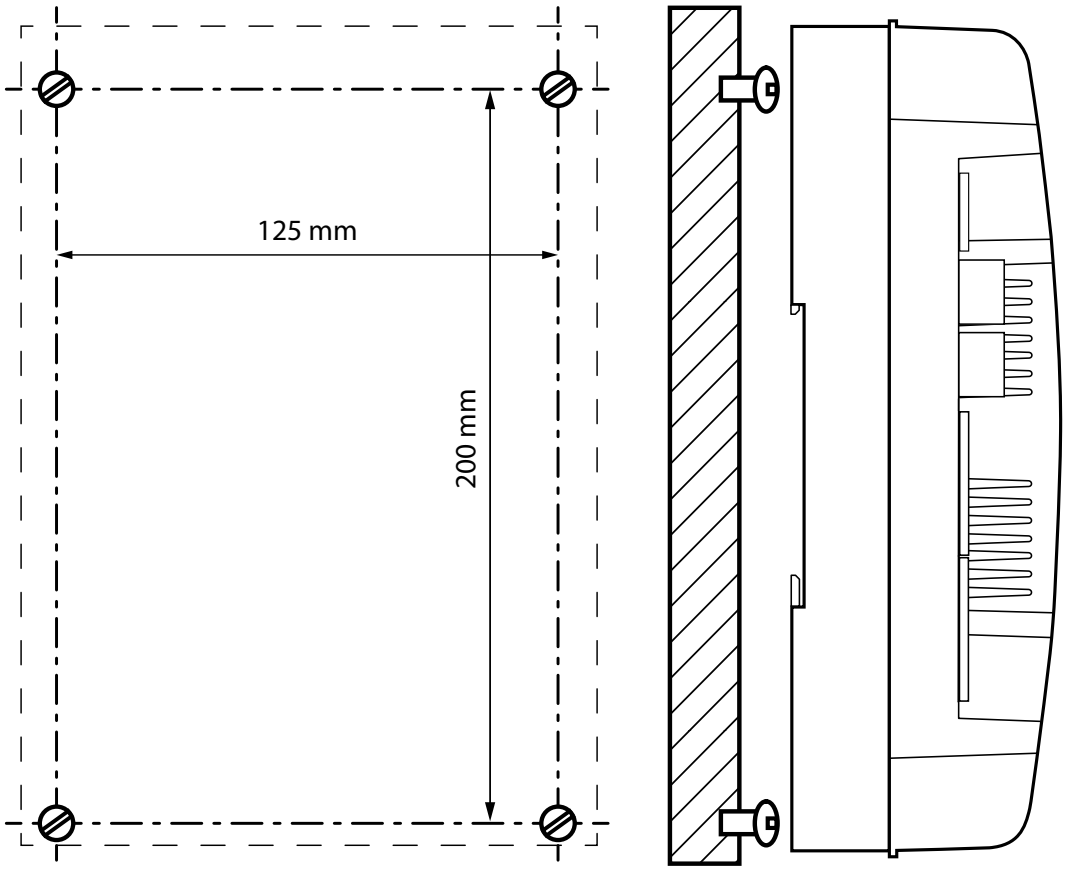
snapped on 2 DIN rails



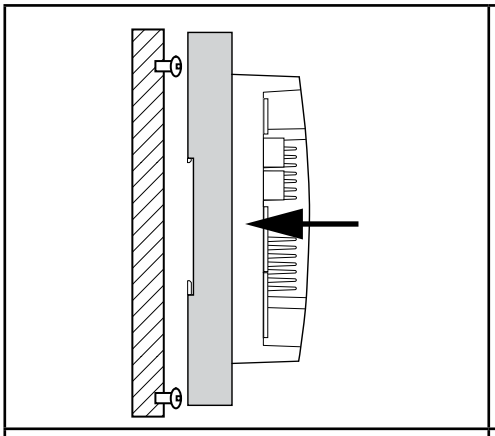
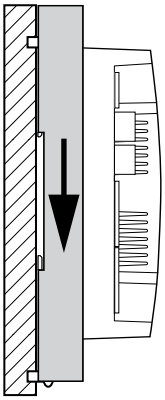
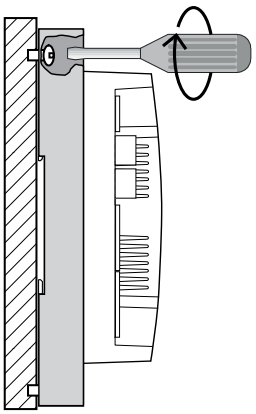
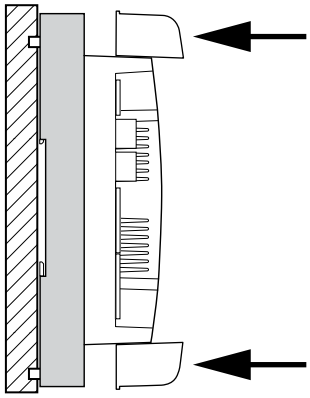
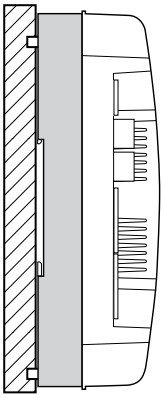
14.1 Mounting with screws

Screw diameter: less than Ø 4.9

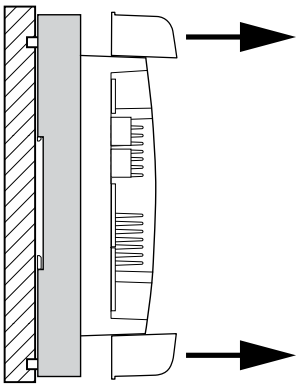
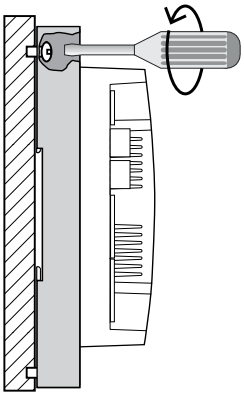
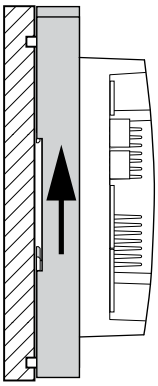
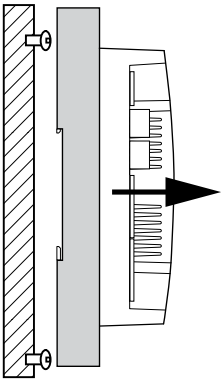
Screw head diameter: less than Ø 8.0



14.1.1 Mounting the PCD2.M4x60:

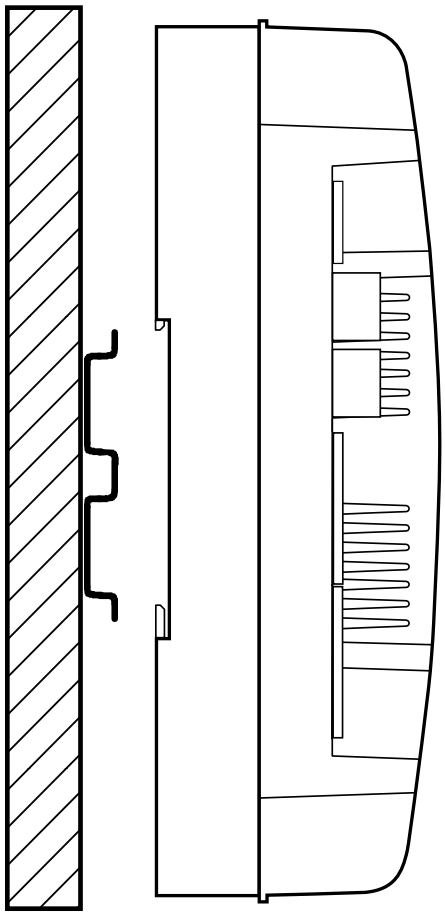
		
Step 1 Fit the base plate over the screw heads and press gently to the wall	Step 2 Slide bottom panel downwards	Step 3 Tighten the screws
		
Step 4 Snap lid onto base plate	Fixed	

14.1.2 Dismounting the PCD2.M4x60:

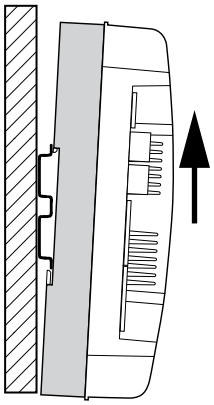
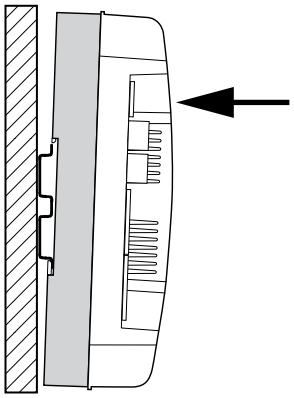
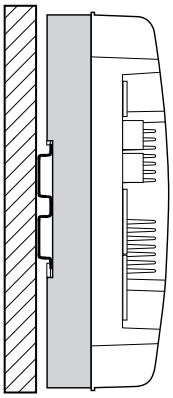
			
Step 1 Remove the cover	Step 2 Loosen the screws	Step 3 Push the base plate upwards	Step 4 Lift the base plate

14

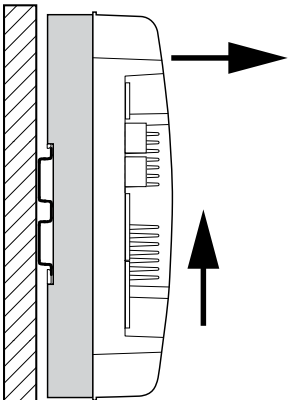
14.2 DIN rail mounting



14.2.1 Mounting the PCD2.M4x60:

		
Step 1	Step 2	Fixed
Press the bottom of the module to the wall and slide it slowly upwards until it stops at the lower DIN rail	Now press the upper half towards of the wall until it snaps	

14.2.2 Dismounting the PCD2.M4x60:


Press the module upwards and simultaneously pull the upper half of the module from the wall

14

A Annex

A.1 Icons

	In manuals, this symbol refers the reader to further information in this manual or other manuals or technical information documents. As a rule there is no direct link to such documents.
	This symbol warns the reader of the risk to components from electrostatic discharges caused by touch. Recommendation: Before coming into contact with electrical components, you should at least touch the system's negative pole (cabinet of PGU connector). However, it is better to use a grounding wrist strap with its cable permanently attached to the system's negative pole.
	This sign accompanies instructions that must always be followed.

A.2 Contact

Saia-Burgess Controls AG
Bahnhofstrasse 18
3280 Murten, Switzerland

Phone central ..... +41 26 580 30 00
Phone Saia-PCD Support ..... +41 26 580 31 00
Fax ..... +41 26 580 34 99

Email support: ..... support@saia-pcd.com
Supportsite: ..... www.sbc-support.com
SBC site: ..... www.saia-pcd.com

International Represetatives &
SBC Sales Companies: ..... www.saia-pcd.com/contact

Postal address for returns from customers of the Swiss Sales office

Saia-Burgess Controls AG
Service Après-Vente
Bahnhofstrasse 18
3280 Murten, Switzerland

A