



Controls

PCD4 PLC based controllers

The process control device for tasks with a broad requirement profile

Manual

Powerful functions – already integrated in base unit

- **Up to 510/2048 inputs/outputs:** Modular structure with up to 32 sockets for digital, analogue, counting, measuring and/or motion control modules
  - up to 510 central inputs/outputs
  - up to 2048 local inputs/outputs (e.g. PROFIBUS DP)
- **Up to 1 MByte user memory:** For programs, text and data blocks. 1 MByte flash memory as option for ease of down/uploading program modifications and backups.
- **Up to 6 serial data ports:** Can be fitted with a choice of RS 232, RS 422, RS 485 or TTY/current loop 20 mA.
- **Field bus connections:** Can be fitted with a choice of PROFIBUS FMS, PROFIBUS DP as master or slave and Ethernet-TCP/IP.
- **Standard inputs:** Fast counters and interrupt inputs directly on CPU of controller (only PCD4.M170).

High performance operating system and efficient programming tools

- **Efficient programming with PG5** due to its many programming languages, such as IL, FUPLA, GRAFTEC etc. and its diagnostic and other add-on tools. An efficient instruction set, comprehensive FBox libraries and a structure that complies with IEC 1131-3 simplify the editing of transparent programs.
- **Portability of user programs** due to harmonized system resources and the integral SAIA®S-Bus, user programs are transferable across the entire PCD family (PCD1 up to PCD6) and capable of running.
- **Short reaction times** due to direct accessing of I/O signals, without the passing through a process map (image).
- **Flexible network integration** due to through communications and programming via Ethernet-TCP/IP to the connected field bus stations PROFIBUS DP or FMS.

The adaptive controller platform

The PCD4 series is an extremely flexible system. From the minimum system with the simplest processor, one serial interface, a low-cost power supply module and 2 I/O modules, through to the fully equipped system with up to 52 I/O and function modules, processor module ..M170, up to 6 independent serial interfaces or SAIA®S-Bus, PROFIBUS FMS/DP or Ethernet-TCP/IP network connections. The system can be assembled in one go, or expanded in stages.

All modules are in the form of equal sized cassettes. Cassette modules are plugged into the appropriate bus modules. The bus modules are in turn snapped onto mounting rails and connected together to form the system bus. Connections to the external process are wired to the bus modules, which means that cassette modules can be inserted or removed without affecting the wiring.

SAIA®S-Bus (RS 485)

The efficient protocol for this master-slave network is supported by every PCD both as master and as slave. Economical design across a serial RS 485 data port.

Pages 8/9

Combined bus module PCD4.C340

with sockets for processor module, power supply module, 4 I/O modules and 3 sockets for serial data ports.

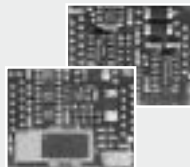
Page 7

Serial data ports

sockets A1, A2, A3 on PCD4.C340

up to 3 serial data ports as RS 422/RS 485, RS 485 electrically isolated, RS 232 for modem or TTY/ current loop 20 mA.

Pages 8/9



Flexible and modular I/O level using bus modules

The I/O bus modules with 2 or 6 module sockets allow expansion up to 510 inputs/outputs or 32 I/O modules.

Page 7

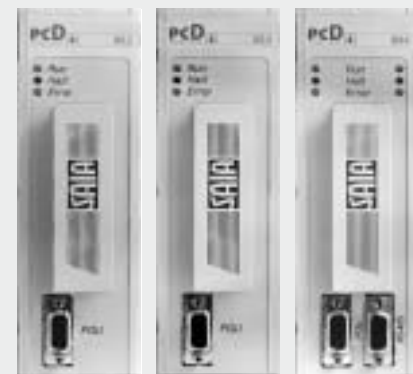
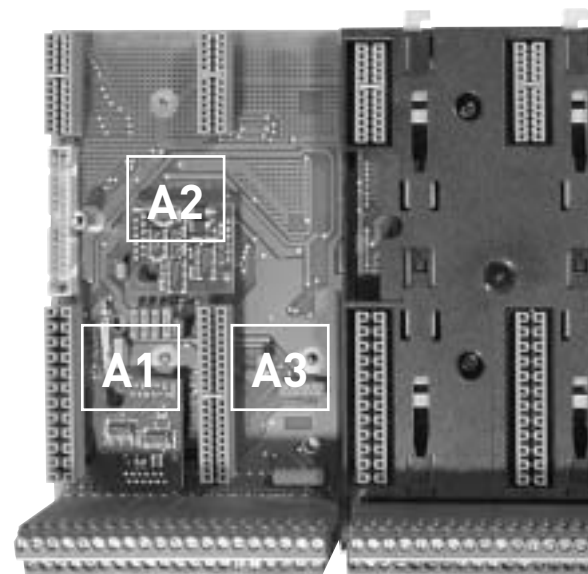
Power supply modules

Page 10



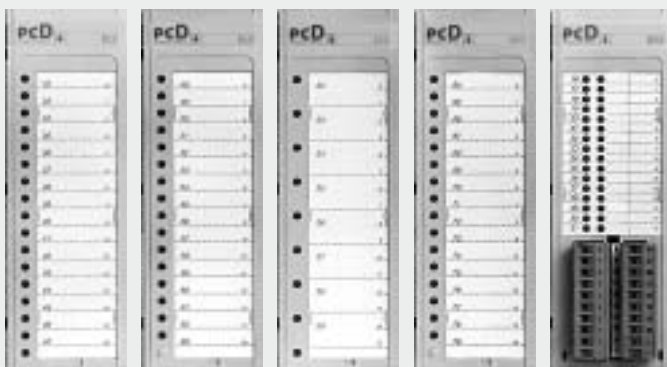
Processor and public memory modules

Page 6



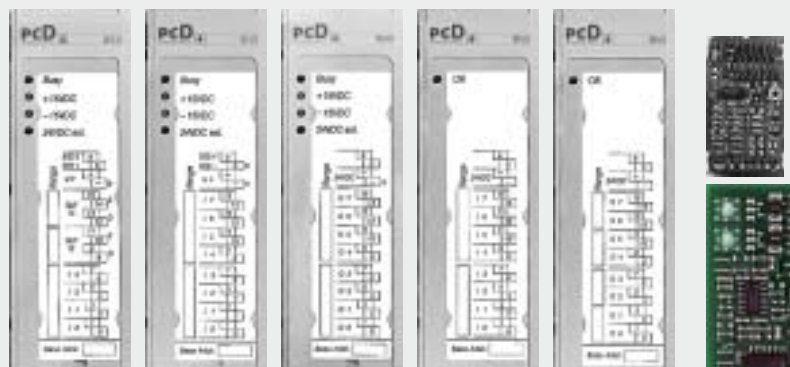
Digital input/output modules

Pages 11–13



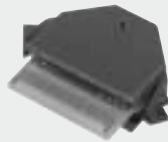
Analogue input/output modules

Pages 14–16



up to 428 KBytes
user memory as
RAM or EPROM
Page 5

Processor module PCD4.M170



User memory

1 MByte RAM and plug-on flash card for saving
user memory.

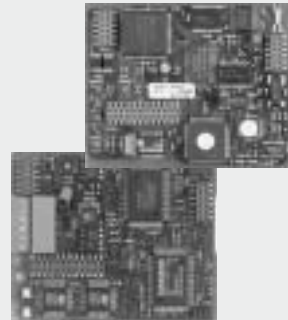
Pages 4/5

Field bus connections

sockets B1 and/or B2

PROFIBUS FMS/DP: For both networks
various modules are available as master
or slave, also with additional RS 485 serial
data port.

Pages 8/9



Ethernet-TCP/IP

socket B2

Intelligent co-processor module with fast
dual-port RAM interface to the CPU, Ethernet
10 Base-T/100 Base-TX. SAIA®S-Bus with UDP/IP
for PG5⇌PCD communication and PCD⇌PCD
multimaster communication. Transmission and
receipt of TCP and UDP data packages for
communication with any choice of system.

Pages 8/9

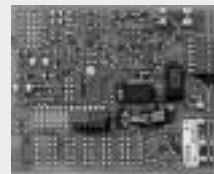


Serial data ports

socket B2

2 × RS 232 or RS 232 for modem, RS 232 and
RS 422/RS 485

Pages 8/9

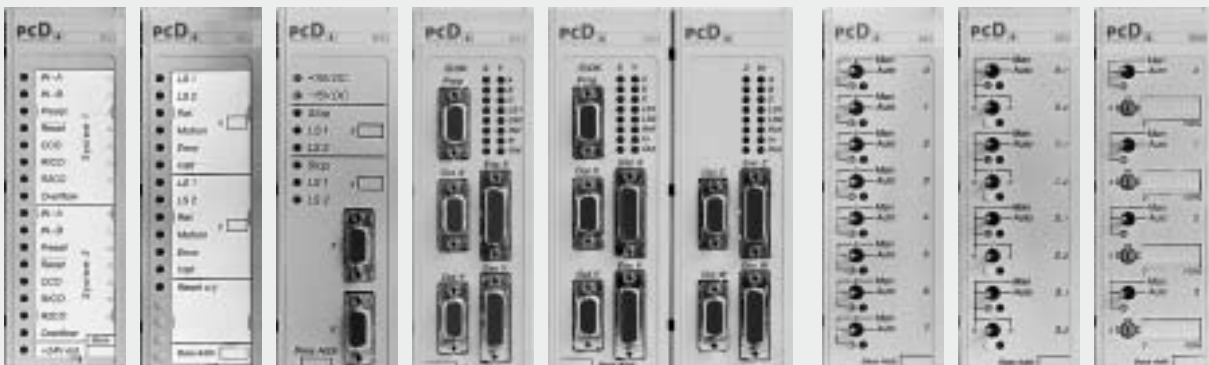


Counting, measuring and motion control modules

Pages 18–20

Manual operation modules

Page 17



Manual PCD4

SAIA®Programmable Control Devices



Saia-Burgess Controls Ltd.. All rights reserved
HB-PCD4 26/734 E9, Chapter 5.1 07.2003

Subject to technical changes

Chronology

Reliability and safety of electronic controllers

Anlagen- bzw. Maschinenbauer

Saia-Burgess Controls Ltd. is a company which devotes the greatest care to the design, development and manufacture of its products:

- state-of-the-art technology
- compliance with standards
- ISO 9001 certification
- international approvals: e.g. Germanischer Lloyd, United Laboratories (UL), Det Norske Veritas, CE mark ...
- choice of high-quality componentry
- quality control checks at various stages of production
- in-circuit tests
- run-in (burn-in at 85°C for 48h)

Despite every care, the excellent quality which results from this does have its limits. It is therefore necessary, for example, to reckon with the natural failure of components. For this reason Saia-Burgess Controls Ltd. provides a guarantee according to the "General terms and conditions of supply".

The plant engineer must in turn also contribute his share to the reliable operation of an installation. He is therefore responsible for ensuring that controller use conforms to the technical data and that no excessive stresses are placed on it, e.g. with regard to temperature ranges, overvoltages and noise fields or mechanical stresses.

In addition, the plant engineer is also responsible for ensuring that a faulty product in no case leads to personal injury or even death, nor to the damage or destruction of property. The relevant safety regulations should always be observed. Dangerous faults must be recognized by additional measures and any consequences prevented. For example, outputs which are important for safety should lead back to inputs and be monitored from software. Consistent use should be made of the diagnostic elements of the PCD, such as the watchdog, exception organization blocks (XOB) and test or diagnostic instructions.

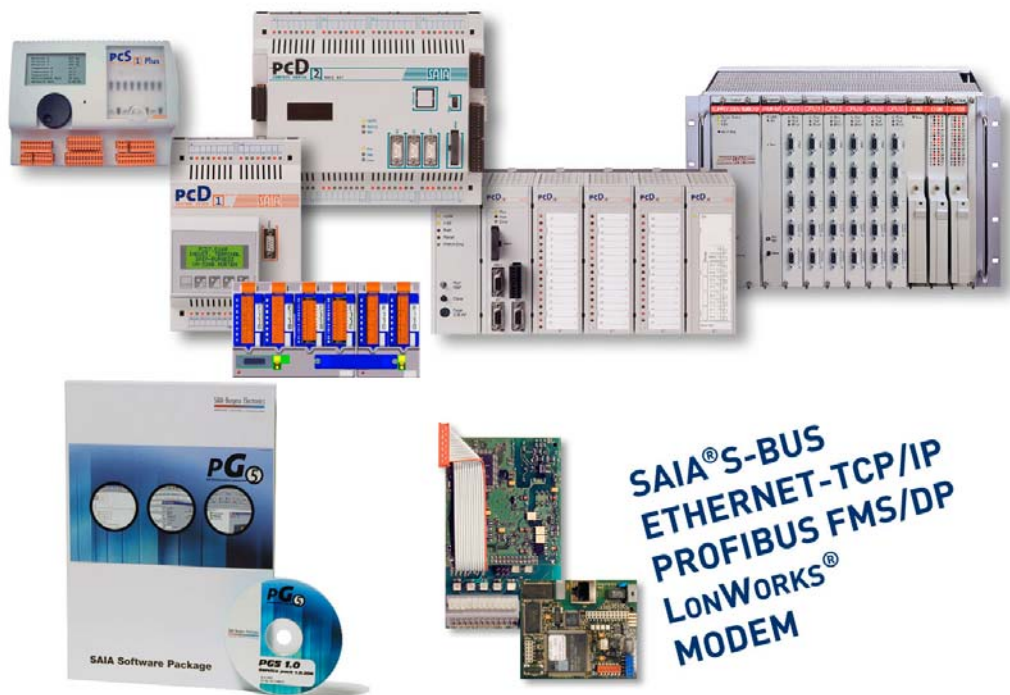
If all these points are taken into consideration, the SAIA PCD will provide you with a modern, safe programmable controller to control, regulate and monitor your installation with reliability for many years.

1 Read me

1.1 About ourselves

Saia-Burgess Controls Ltd (SBC) is a medium-sized European controls technology company. SBC is committed to the values, standards and culture of PLC engineering.

All hardware, operating systems, software tools, CPUs, interfaces, etc. have been developed by SBC itself and are marketed as embedded controls.



With full technical knowledge of all system elements and with quality-oriented business processes, SBC is equipped to provide unique, custom solutions regarding range of use, functionality, openness, flexibility, reliability and price. These core competencies, combined with innovative strength, a broad product range and a readiness to implement special customer requests rapidly, have made SBC the attractive, competitive partner of choice for a large number of international customers.

1.2 Product and documentation concept

The **SAIA® PCD product range** is rigorously modular in structure. It demonstrates a clear hierarchy of systems, sub-systems, functions and diverse accessories. Fully developed software tools allow the efficient creation of user programs.

All SAIA® PCD systems (up to PCD6) work with the same operating system. The PCD systems communicate easily with each other and PCD user programs run on all systems.

PCDn xx7 series controllers have a special operating system. This enables them to be programmed with Siemens® STEP®7 and to communicate readily with the corresponding systems of other manufacturers.

SAIA® PCD customer documentation comprises pre-sales and after-sales documents that complement each other. As a rule, they are published in three language versions (German, English, French).



Technical information

Manuals

References

Technical Information (TI) documents offer overviews of a system (e.g. the SAIA® PCD operating system OS), sub-system (e.g. PCD2) or product family with common features (e.g. digital I/O modules, etc.).

TIs have been designed as pre-sales documents. They describe the system or product features and contain all the selection criteria necessary for a preliminary project. They offer the prospective customer more information than a normal brochure.

TIs are available free-of-charge as brochures or in electronic form (on CD for a token fee or free of charge via Internet <http://www.sbc-support.ch>).

Manuals are after-sales documents. They contain all the detailed information and application examples necessary for the efficient realization of a project. Manuals are available to the SAIA® PCD customer in electronic form on CD (for a token fee) and free of charge via Internet <http://www.sbc-support.ch>.

References describe projects that have been successfully realized with SAIA® PCDs (after-sales). The solutions outlined in them will provide many ideas for the use of SAIA® PCDs in similar projects (pre-sales, closing the loop with the TI). References are available free-of-charge as brochures or in electronic form (on CD or via Internet <http://www.sbc-support.ch>). Please read also our Controls News published on internet side: <http://www.controls-news.ch>.

P documentation (P = preliminary) describes new or extensively redeveloped products. After extensive internal testing of function and integration, these products are supplied to external commercial partners for field trials under more difficult conditions. P documentation is provided for these field trials. Improvements suggested by these external partners influence the definitive documentation. P documents can be requested as PDF files and some are available free-of-charge via Internet <http://www.sbc-support.ch>.

1.3 Technical support

Any questions that you cannot answer by referring to the documentation will be dealt with promptly and reliably for you by the SAIA® PCD Support Team. The team is based in Switzerland and can be reached by telephoning **++41 26 672 71 11** or by E-Mail pcdsupport@saia-burgess.com.

The addresses of Saia-Burgess sales companies and agents for other sales areas can be found under <http://www.saia-burgess.com>.

1.4 Workshops, training literature

Interesting, informative SAIA®PCD workshops offer technically qualified people the opportunity to make valuable contacts and extend their technical knowledge of the PCD, taking home with them both the training literature and the solutions produced collaboratively during the workshop.

Workshops are your route to joining the large group of enthusiastic SAIA®PCD users.

Current workshop programs are among a wealth of other useful information to be found under <http://www.sbc-support.ch/>

1.5 Navigation in electronic-based PDF documents

To navigate in PDF documents, press the "hand tool (H)" button.



1.5.1 Structure of PCD manuals

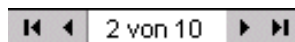
PCD manuals comprise a "General section" and the chapter sections or sub-sections. These in turn comprise a number of document modules. The latter are uniquely identified with their own number, version details and issue date. This is necessary because many document modules are used in more than one manual. Blue web links, e.g. <http://www.sbc-support.ch/> serve to establish an Internet connection.

1.5.2 Navigation

Navigation is via bookmarks. Clicking the mouse on "+" will display ancillary bookmarks.

The pictograms offer further navigation possibilities (after clicking the mouse on the appropriate index card), as do the "Contents lists" of individual chapters.

(Scrolling with the arrow keys takes a little longer. They are practical for going to the title page or to the back page, which has the ordering information and addresses with blue web links.)



or



A mouse click on the desired chapter heading will take you to the beginning of that chapter. From there, it is best to use the arrow keys for scrolling, or the links identified by blue key words.

Right-clicking once on the mouse will open a menu with various options (e.g. "Go to previous view"). Normally, bookmarks will be a faster way of arriving at the starting point or any new destination (e.g. another chapter).

1.5.3 Summary of navigational aids

- Bookmarks (on left margin of screen, outside the document)
- Any pictograms (after clicking mouse on index card)
- Contents lists with links to topics required
- Blue web links, for establishing Internet connections quickly
- Key words marked blue, for accessing more detailed information (within any one chapter section or subsection)

1.6 Icons



In manuals, this symbol refers the reader to further information in other manuals or technical information documents (e.g. "For details see TI 26/365").
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: at least touch the Minus of the system (cabinet of PGU connector) before coming in contact with the electronic parts. Better is to use a grounding wrist strap with its cable attached to the Minus of the system.



The caution sign accompanies instructions that must always be followed.

Contents

	Page
1. The modular system structure of the PCD4 series	
1.1 Block diagram	1-2
1.2 System information	1-4
2. The mechanical structure of the PCD4 series	
2.1 Arrangement of the bus modules	2-3
2.2 PCD4 assembly in one row for maximum of 256 I/O	2-4
2.3 PCD4 assembly in two rows for maximum of 256 I/O	2-5
2.4 PCD4 assembly for a maximum of 512 I/O	2-6
2.5 Addressing input and output modules	2-8
2.6 Coding the module edge connectors	2-10
3. The bus modules of the PCD4 series	
3.1 Bus modules PCD4.C1x0 for supply and processor	3-3
3.2 Screw terminal assignments of the PCD4.C1x0 bus modules for supply and processor	3-5
3.3 Screw terminal assignments of the PCD4.C1x0 bus modules for communication interfaces	3-6
3.3.1 Interface RS 232	3-6
3.3.2 Interface 20 mA current loop	3-9
3.3.3 Interface RS 422	3-11
3.3.4 Interface RS 485	3-12
3.4 Bus module PCD4.C340 for supply, processor, 4 I/O modules and 3 serial interfaces	3-15
3.4.1 RS 422 / RS 485 with module PCD7.F110	3-18
3.4.2 RS 232 with module PCD7.F120	3-20
3.4.3 20 mA current loop with module PCD7.F130	3-21
3.4.4 RS 485, electrically isolated, with PCD7.F150	3-23
3.5 Bus modules PCD4.C2x0 for input/output modules	3-24
3.6 Bus module PCD4.C225 for coupling the PCD4 I/O modules in expansion to a PCD2.M...	3-25

		Page
3.7	Power supply and connection plan	3-27
3.7.1	External power supply	3-27
3.7.2	Grounding plan	3-29
3.7.3	Connection plan	3-30
3.8	Quick guide to handling the PCD4	3-32
3.8.1	Bus module assembly	3-32
3.8.2	Entering a lamp flasher program	3-34
3.8.3	Outputting texts to the PCD7.D202 terminal via the RS 232 serial interface	3-35
4.	The earlier processor modules of the PCD4 series	
4.1	Points common to all processor modules	4-2
4.1.1	General	4-2
4.1.2	Shared characteristics	4-3
4.1.3	Operating states of the processor module	4-4
4.1.4	"RESET OUTPUT" - "ENABLE" jumper	4-5
4.1.5	"HALT/CLEAR" - "ENABLE" jumper	4-6
4.1.6	The "EXTERNAL RESET" function	4-6
4.1.7	The firmware	4-7
4.1.8	The PGU serial interface	4-7
4.2	The processor modules PCD4.M110 and PCD4.M1x5 with 1 processor	4-9
4.2.1	Front panel and board layout	4-9
4.2.2	Processor module PCD4.M110	4-10
4.2.3	Interfaces of processor module PCD4.M125	4-10
4.2.4	Interfaces of processor module PCD4.M145	4-11
4.3	The processor module PCD4.M445 with 2 processors and an additional PROFIBUS-FMS co-processor	4-13
4.3.1	Front panel and board layout	4-13
4.3.2	Block diagram	4-15
4.3.3	Serial interfaces of the PCD4.M445 processor	4-16
4.3.4	The PROFIBUS-FMS interface	4-17
4.3.5	PROFIBUS-FMS utilities and data types	4-17
4.3.6	SAIA® PCD PROFIBUS configurator	4-18
4.3.7	PROFIBUS-FMS connection	4-18
4.4	Summary of bus and processor module combinations	4-22

5. CPU options[Contents chapter 5.1](#)**6. The public memory modules PCD7.R...**

6.1	Common specifications	6-2
6.2	The battery	6-3
6.3	PCD7.R110 with user memory up to 256 KBytes	6-4
6.4	PCD7.R310 with user memory up to 428 KBytes	6-6

7. The power supply modules PCD4.N2..

7.1	General	7-1
7.2	Use of the "Watch Dog"	7-5
7.3	Power requirements of the PCD4 modules	7-6

8. Digital input/output modules

8.1	PCD4.E110/E111 (without electrical isolation) Module with 16 digital inputs	8-3
8.2	PCD4.E600/E601 (with electrical isolation) Module with 16 digital inputs	8-7
8.3	PCD4.A200 (with contact protection) Output module with 8 relay contacts, "normally. open"	8-9
8.4	PCD4.A250 (without contact protection) Output module with 16 relay contacts, "normally. open"	8-15
8.5	PCD4.A350 (with electrical isolation) Module with 8 digital outputs, 24 VDC / 2 A	8-21
8.6	PCD4.A400 (without electrical isolation) Module with 16 digital outputs, 0.5 A	8-25
8.7	PCD4.A410 (with electrical isolation) Module with 16 digital outputs, 0.5 A	8-27
8.8	PCD4.B900/B901 (without electrical isolation) Digital I/O module, with 16 inputs and 16 outputs	8-29

9. Analogue input/output modules

9.1	PCD4.W100 Analogue input/output module, 6 channels (4I + 2O), 12 bit resolution	9-3
9.2	PCD4.W300 Analogue input module, 8 channels, 12 bit resolution and sign bit	9-19
9.3	PCD4.W400 Analogue output module, 8 channels, 8 bit resolution	9-35
9.4	PCD4.W500 (with galvanic isolation) Analogue input module, 8 channels, 12/15 bit resolution	9-41
9.5	PCD4.W600 (with galvanic isolation) Analogue output module, 8 channels, 12 bit resolution	9-45

10. Manual Operation modules

10.1	PCD4.A810 Digital output module with manual overrides, 1 level	10-3
10.2	PCD4.A820 Digital output module with manual overrides, 2 levels	10-13
10.3	PCD4.W800 Analogue output module with manual overrides	10-25

11. Fast counter and positioning modules**12. Dimensions of the PCD4****13. PCD4 - Hardware type designations**

1. The modular system structure of the PCD4 series

The modular design of PCD4 series offers great flexibility. Within addressing limits, a range of processor and memory modules, power supplies, digital I/O modules, analogue I/O modules, fast counter modules and DC and stepper motor controllers can be combined to satisfy almost any application.

The system can be built up in stages : from the minimal system, with one processor, one serial interface and a power supply, to the full system with two processors, four serial interfaces, 32 add-on modules and a S-Bus or a PROFIBUS connection.

All modules are produced in the form of cartridges with the same dimensions. Each cartridge is plugged into a bus module. The bus modules are snapped onto mounting rails, and connect electrically to form the PCD4 bus.

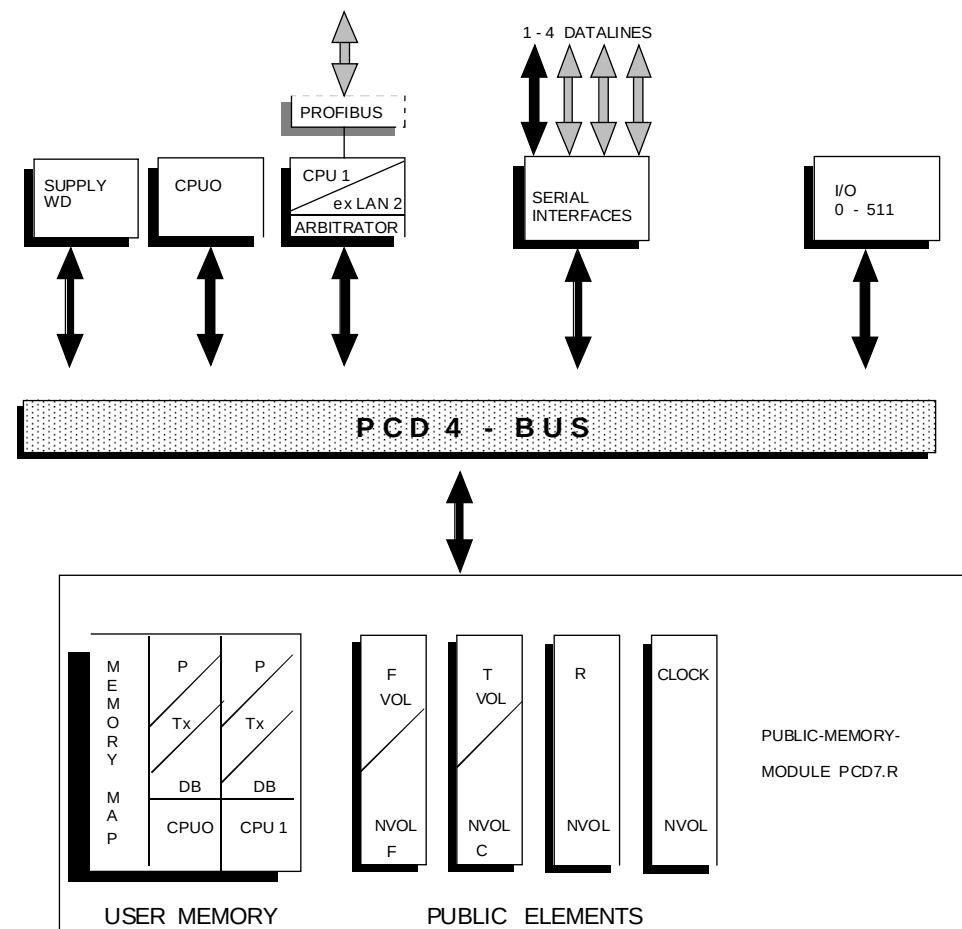
Apart from mechanical design, the PCD4 differs from the PCD1- PCD2 and PCD6 series in only four areas :

	PCD1	PCD2	PCD4	PCD6
Max. Inputs/Outputs	64	256	512	5120
Number of CPU's	1	1	1 or 2	1 to 6
Nb. of serial interfaces	1 to 2	1 to 4	1 to 4	5 to 30
User memory	17 to 140 KBytes	32 to 640 KBytes	64 to 428 KBytes	256 KB to 1 MBytes

The PCD4 has the same number of flags (8192), timers/counters (1600), registers (4096), program blocks, texts and data blocks as the PCD6 series. The instruction sets are identical, and the same programming tools are used for all series.

1.1 Block diagram

The following block diagram shows the internal structure of the PCD4 system :



P Program
TX Text
DB Data blocks

F Flags
T Timers
C Counters
R Registers

CLOCK Date-time
VOL Volatile
NVOL Non-volatile

The **power supply module** supplies the voltages for the internal electronics. The supervisory "Watch dog" timer (WD) is also located in this module.

The **memory module**, which is plugged into the **processor module**, contains the memory for user programs, texts and data blocks in the form of RAM or EPROM, with the necessary memory map. It also holds all shared resources : flags, timers, counters, data registers and the real-time clock.

As the diagram shows, the 8192 flags (F) can be defined as volatile (VOL) or non-volatile (NVOL) flags, as desired. The user can also select which of the 1600 x 32-bit timer/counters will be timers (T) and which will be counters (C) in accordance with his requirements. The timers are always volatile, the counters are always non-volatile. The 4096 x 32 bit data registers (R) are always non-volatile. Flags, timers, counters and registers can be accessed by both processors, if present.

The user memory for programs, texts and data blocks (P / TX / DB) on the memory module is battery-backed in the RAM version. The "Configure" programming utility carries out the allocation of memory for user program and text for one or two processors, according to the application.

The PCD4 bus, formed by the bus modules, extends through the whole system as the block diagram shows. This bus provides the data path between all system components and is used by the processors and all add-on I/O modules. The internal power is also supplied via this bus.

The positions to the right of the processor module can be fitted with **I/O modules** for digital and analogue signals, or with special modules such as the fast counters or stepper motor controllers.

1.2 System information

Processor module	With 1 or 2 processors for 1 bit or word processing and communication. Or with 1 processor and a co-processor for connection to the PROFIBUS-FMS network.
Processing time	Approx. 4 μ s per bit instruction (read directly, without a process copy).
User memory	Either battery-backed RAM, or EPROM memory. Total 64K x 32 bits. This allows 64K of user program lines or 256K of text characters, or a mixture of both, and additional 172 KByte RAM for TX and DB.
Number of I/Os	Max. 512 in up to 32 modules (each module has 8 or 16 I/Os)
Serial interfaces	1 to 4 independent serial channels
Serial interface types	RS 232, RS 422 or RS 485 as well as 20mA current loop. Serial interface 0 is always RS232, since it is used for connection to the programming unit.
Flags	8192 x 1 bit (divided between volatile and non-volatile)
Timers/counters	1600 x 31 bits, programmable division. (timers are always volatile, counters are non-volatile.
Timebase for timers	Programmable from 10ms to 10 seconds
Data registers	4096 x 32 bits (non-volatile), can be loaded by the user program, or via the programming unit from/to diskette. Additional max. 32K registers in data blocks if the user memory (RAM or EPROM) is used.
Data formats	Decimal, hexadecimal, BCD, binary or floating point (exponential representation)
Index register	17 x 13 bits per processor (1 for each COB and 1 for all XOBs)

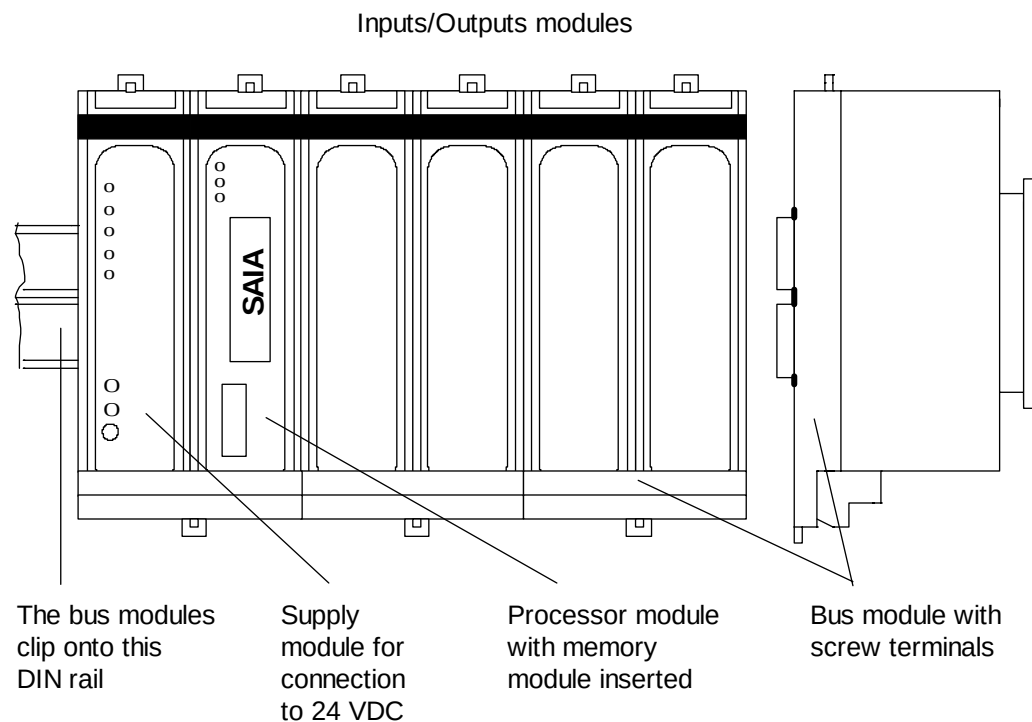
Cyclic Organization Blocks (COB)	16 per processor
Exception Organization Blocks (XOB)	Up to 32 per processor
Program Blocks (PB)	300 per processor
Function Blocks (FB)	1000 per processor, with run-time parameters
Sequential Blocks (SB)	32 per processor (for GRAFTEC programming with 2000 steps and 2000 transitions with up to 32 active parallel branches)
Texts (TX) and data blocks (DB)	8000 per processor, with up to 3 levels of sub-texts
Special texts	For output of date, time, logic states, contents of registers and counters in various formats (also with decimal point), addressed directly or indirectly.
Date/time (hardware clock)	Week, day of week, year, month, date, hour, minute, second. Precision : Better than 60s/month Battery power reserve : 2 months
Operating temperature	0...55°C (below modules)
Resistance to interference of digital I/Os and power supply	In accordance with IEC 801-4 Class III (4000 V)
Supply voltages (nominal)	For supply module : 24 VDC For I/Os 24 VDC

Notes :

2. The mechanical structure of the PCD4 series

As the following diagrams show, the clip-on bus modules are connected together to form the backbone and bus of the PCD4.

The cartridge-style power supply, processor and I/O modules are plugged into these bus modules.

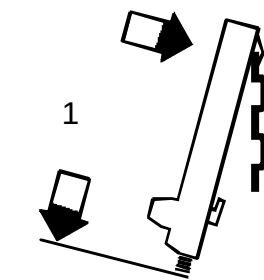
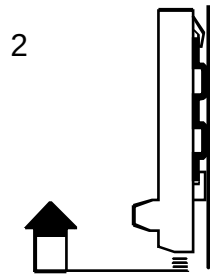
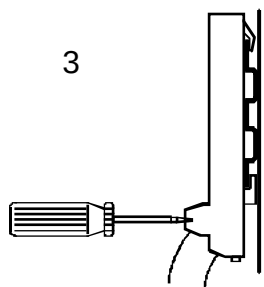


A double mounting rail (35 mm, DIN/EN 50022) is used to support the bus modules. The required number of bus modules are snapped onto this rail and connected together electrically and mechanically (see drawing on next page). External connections should be wired next, using the screw terminals.

After completion of assembly and wiring, insert and fasten the supply module, the processor module and up to 32 add-on I/O or special modules.

The sequence of assembly is shown in these diagrams :

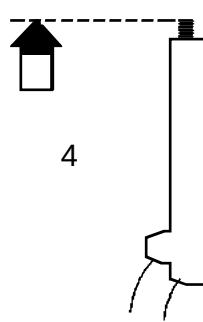
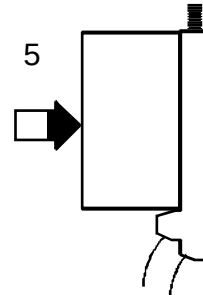
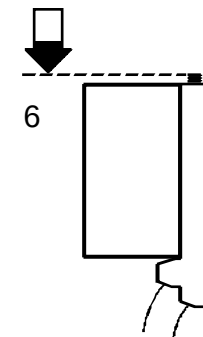
Assembly PCD4



1. Pull the retaining clip down and slot the bus module onto the DIN rail

2. Push the retaining clip upwards

3. Connect the wires with a no. 1 screwdriver

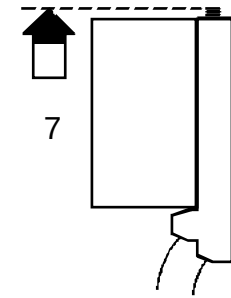
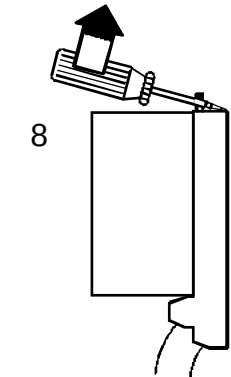
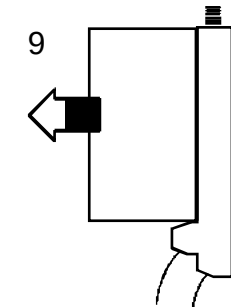


4. Pull up the module retaining clip

5. Insert the module

6. Push the module retaining clip downwards

Disassembly PCD4



7/8. Pull up the module retaining clip using a no. 1 screwdriver

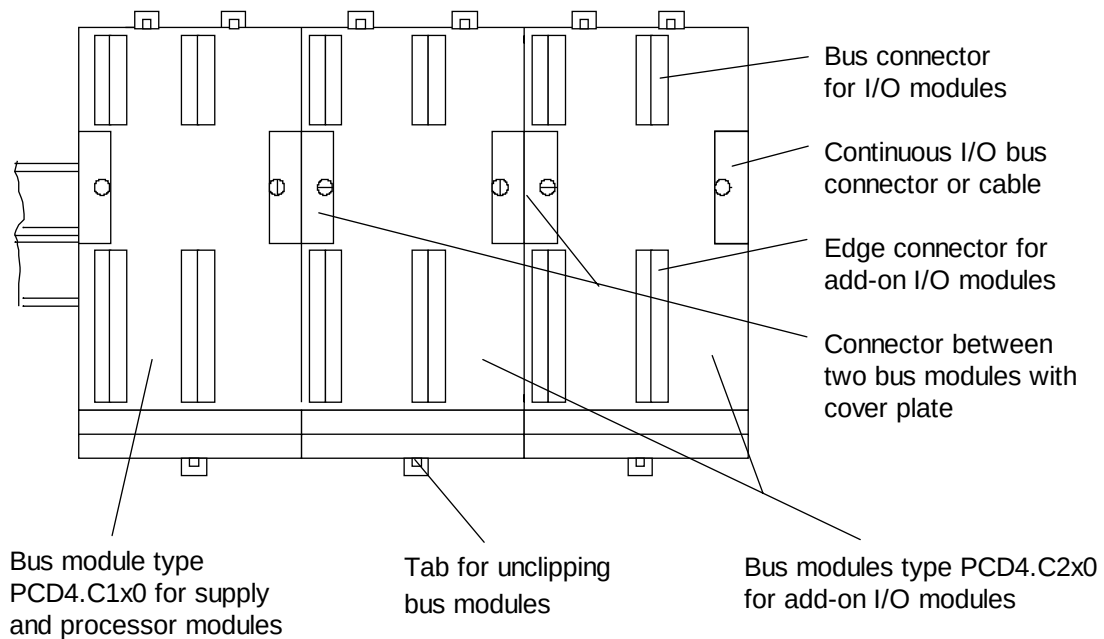
9. Unplug the module



Important note : (risk of damage)

Modules must never be inserted onto or removed from the bus module when the supply voltage is present !

2.1 Arrangement of the bus modules

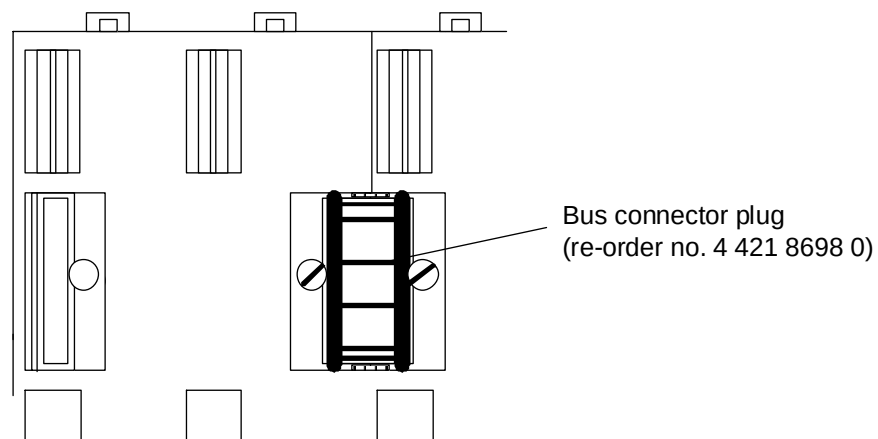


The bus modules for the supply and processor modules must each be installed on the left side of every assembled PCD4 (PCD4.C1x0 or ..C340). The I/O bus modules (PCD4.C2x0) are placed on the right.

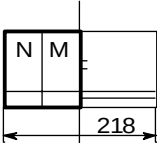
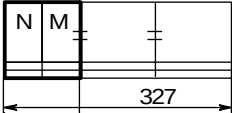
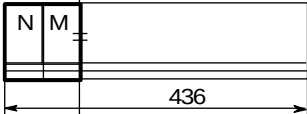
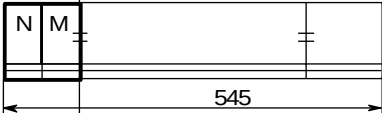
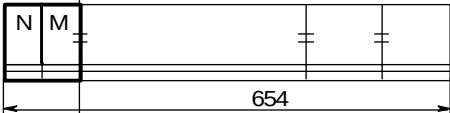
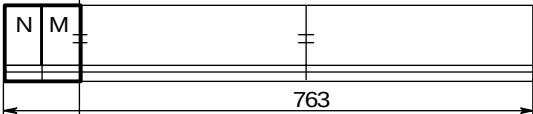
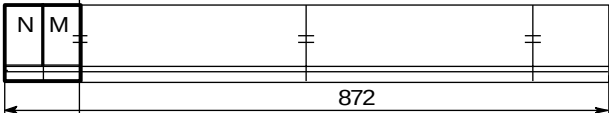
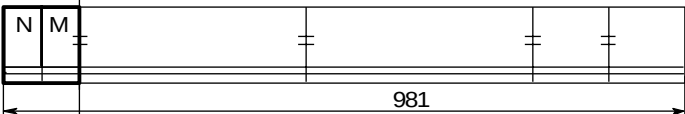
To unclip and remove a bus module, the lower tab must be pulled downwards.

Connection between bus modules is via connector plugs and the accessories which accompany every bus module (re-order with no. 4 421 8698 0).

After insertion of the bus connector, the cover plate (supplied as an accessory) should be screwed down with two screws. This metal cover protects the bus and ensures good mass distribution throughout the system.



2.2 PCD4 assembly in one row for a maximum of 256 I/O ^{*)}

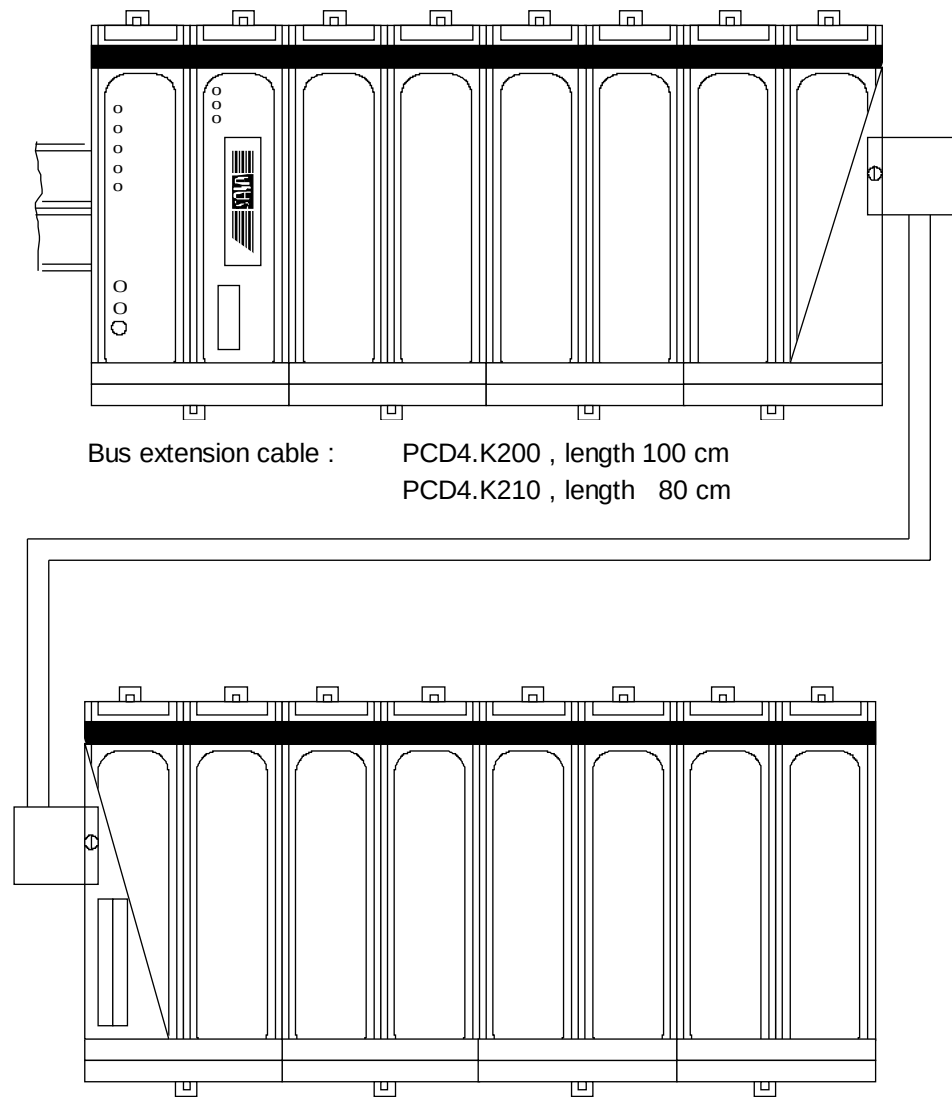
	Number of I/O modules	Address range
	2	0 to 31
	4	0 to 63
	6	0 to 95
	8	0 to 127
	10	0 to 159
	12	0 to 191
	14	0 to 223
	16	0 to 254

The PCD4 series allows from 2 to 16 add-on I/O modules to be arranged in one row. For this purpose, bus modules with sites for either 2 add-on modules (PCD4.C220) or 6 add-on modules (PCD4.C260) are available. If possible, the above combinations should be used.

Note that the fewest possible bus connectors should be used. **The upper limit is around 5 connectors.** This includes the connecting cable in case of assembly in two rows, see next page.

^{*)} This number can be doubled by use of the digital ..B900 modules (16 inputs + 16 outputs).

2.3 PCD4 assembly in two rows for a maximum of 256 I/O ^{*)}



If there is insufficient space for all I/O modules in one row, they can be arranged in a second row above or below the row which contains the processor module.

The bus extension cable PCD4.K200 or ..K210 is required for extending the bus. This is fitted into the bus connector and secured with a screw.

Since it is well screened, the bus extension cable can be layed in the cable channel of the installation wiring. The length of the bus extension cable must not be changed.

Addressing the I/O modules continues via the bus extension cable in the same way, as if they were assembled in one row.

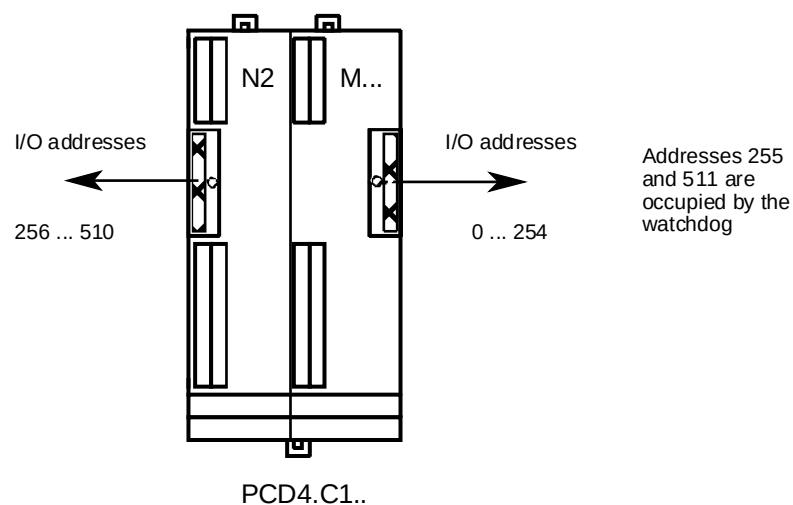
^{*)} This number can be doubled by use of the digital ..B900 modules (16 inputs + 16 outputs).

2.4 PCD4 assembly for a maximum of 512 I/O ^{*)}

While paying attention to the internal power requirements placed on the power supply module, it is possible to add a maximum of 32 I/O modules, providing 512 I/Os (or more with ..B900 modules).

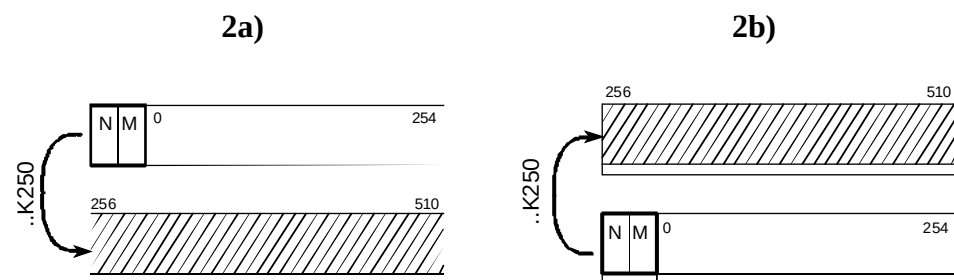
Addressing from the basic package (consisting of N2.. and M.. to ..C1x0 or ..C340 modules) is done on two sides :

- right bus connector addresses   0 to 254
- left bus connector addresses   256 to 510



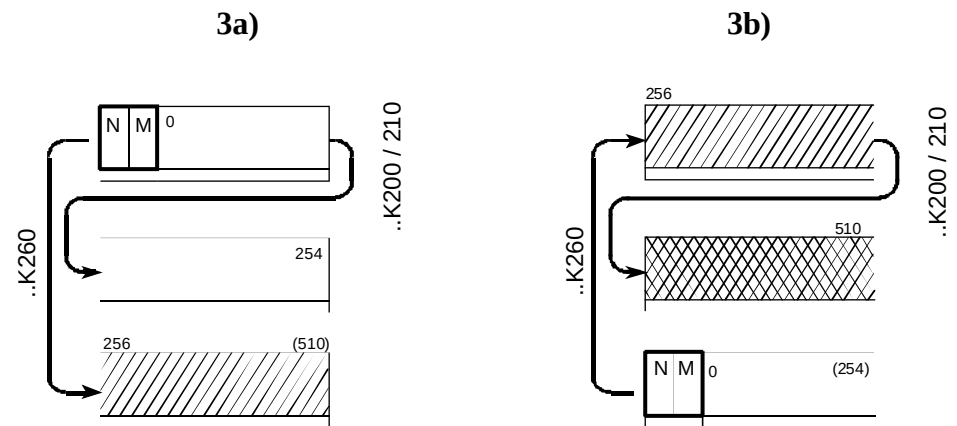
With the help of two additional bus cables, the following assemblies can be constructed in two to four rows :

- In 2 rows :

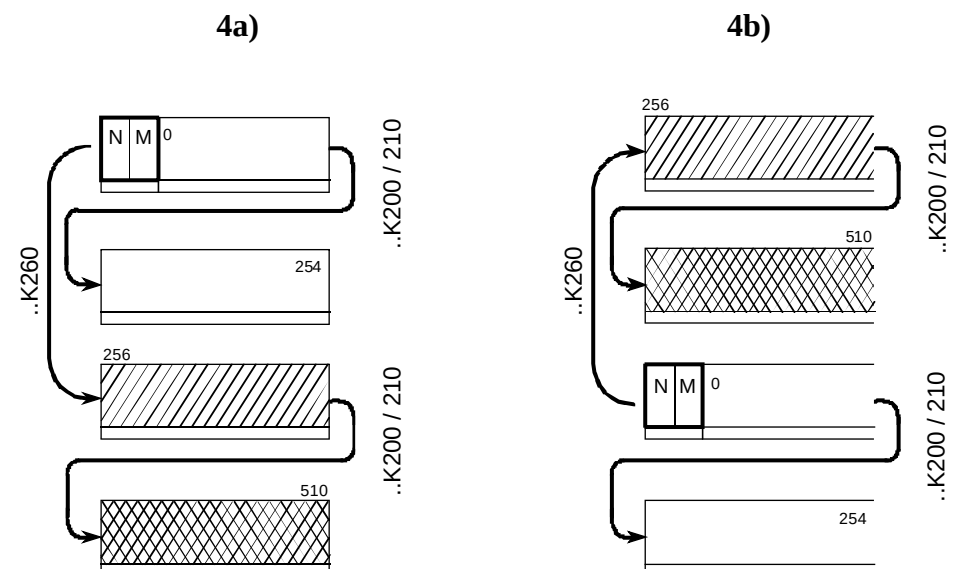


^{*)} The maximum number of I/O modules is limited by internal power requirements. The table in chapter 7 "Power Supply Modules" must be consulted.

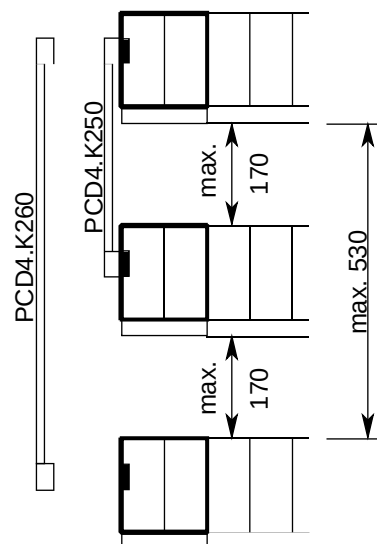
- In 3 rows :



- In 4 rows :



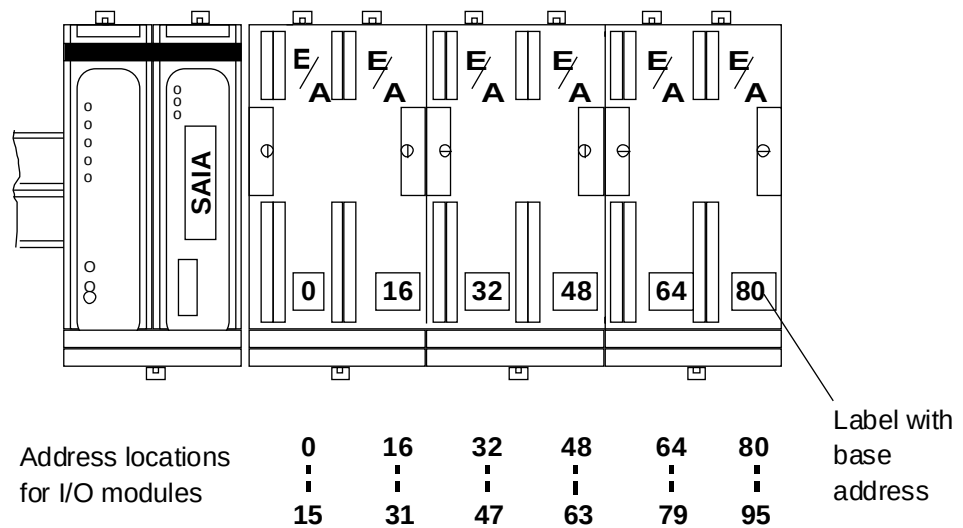
The following spacing should be observed between rows of modules :



Remarks :

- Maximum length of 2.5 m between the CPU and the last I/O module.
- Maximum 5 interconnections

2.5 Addressing input and output modules



Each add-on I/O module reserves 16 addresses. Starting with the base address 0 (zero) at the first module position to the right of the processor module, the addresses increase towards the right in steps of 16. The same also applies for modules which occupy only 8 addresses. If modules with 8 addresses are used, 8 addresses are lost for each module.

If the bus extension cable is used to form a second row of modules, addressing continues similarly in the second row.

It is recommended that the sticky labels with base address 0, 16, 32, etc. are applied to the bus modules for each module position, so that each I/O module can be easily labelled.

As shown in the preceding section, cables ..K250 and ..K260 can be used to expand addressing from 256 to 510.

Caution : Since the Watch Dog (see chapter 7.2) uses addresses 255 and 511, only digital I/O modules may be inserted in these fields.



Analogue modules (types ..W) and counting or positioning modules (types ..H) cannot be run in the addresses ranges 240 to 255 and 496 to 511.

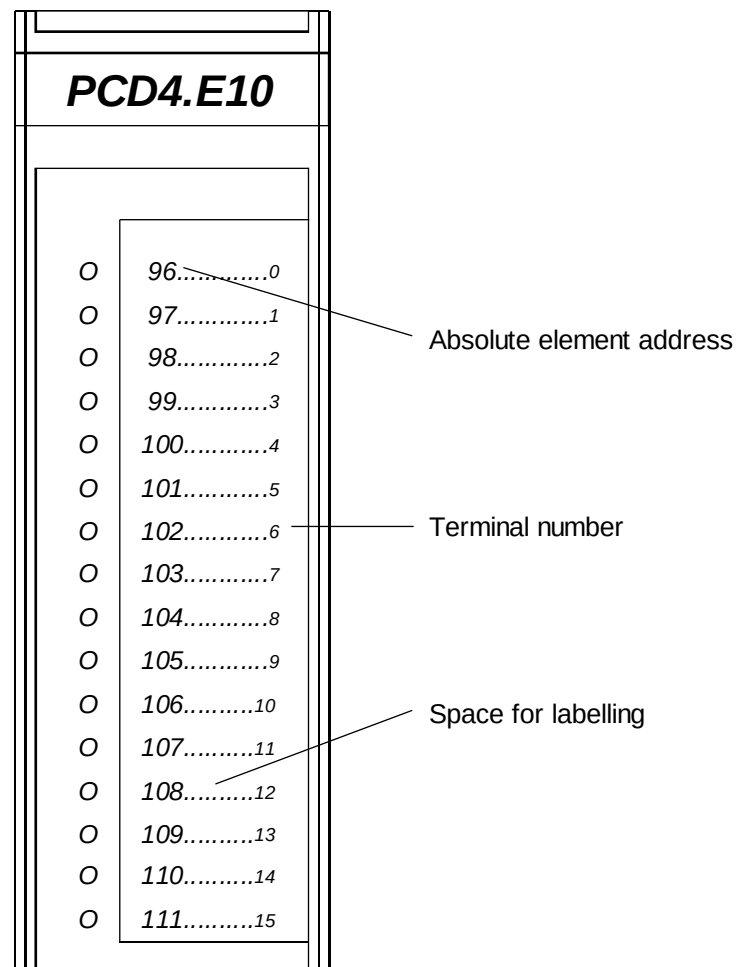
The numbered labels, which accompany the modules, serve to identify the I/O modules by address location. These labels slide onto the front of each module. On the left is the absolute address (belonging to the LED); on the right is the terminal number. (The terminal numbers are the same for every I/O module).

After each address, a blank space is provided for writing the associated I/O name or reference. Analogue and other special modules have different labels.

Sticky labels for the base addresses on the bus modules and front plates for the digital I/O modules for addresses 0...127 are supplied as accessories with every PCD4.C1x0 or PCD4.C340 bus module.

Other sets are available :

4'310'8567'0	for addresses	0 ... 127
4'310'8568'0	for addresses	128 ... 255
4'310'8569'0	for addresses	256 ... 511
4'310'8570'0	for ..W and ..H modules	



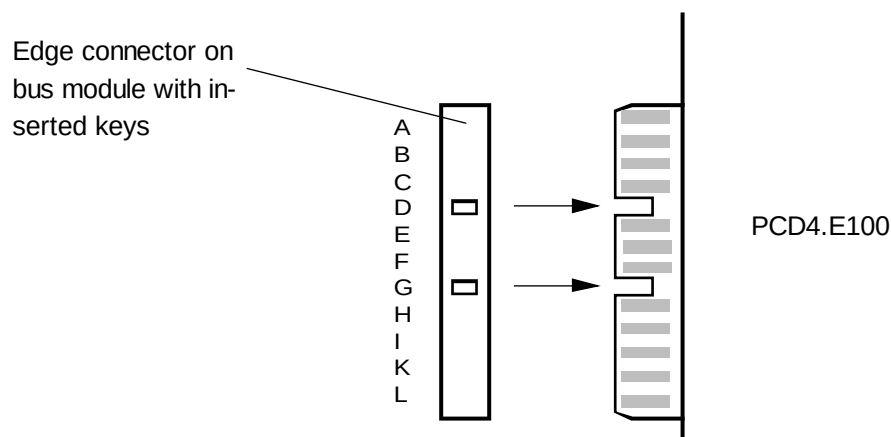
2.6 Coding the module edge connectors

To prevent the insertion of the wrong plug-in module, the edge connectors on the bus modules can be specially keyed. Each module type has an identification key in the form of slots cut into the edge connector, according to the following table :

C1x0 / C340		C2x0 / C340																			
		Inputs				Outputs						Function modules									
N	M	E	E	E	B	A	A	A	A	A	A	W	W	W	W	W	W	H	H	H	H
2	x	1	1	6	9	2	2	3	4	8	8	1	3	4	5	6	8	1	2	3	4
x	x	0	1	0	0	0	5	5	x	1	2	0	0	0	0	0	0	2	x	x	x
0	x	x	x	x	x	0	0	0	0	0	0	0	0	0	0	0	0	0	x	x	0
A										x								x	x		x
B											x									x	
C												x	x	x	x	x	x	x			
D		x	x	x	x																
E						x	x	x	x	x	x	x									
F	(x)														x						x
G		x			x			x									x		x	x	
H	(x)						x									x					
I			x			x							x								
K				x					x												
L																					

Keys are already inserted for the power supply and processor modules on the bus module PCD4.C1x0 or ..C340.

For the I/O modules, the keys should be located according to the above table.



Connecting terminals to I/O addresses

Terminals	Addresses for the modules PCD4.E110 / E600 / A400 / B900							
0	0	16	32	48	64	80	96	112
1	1	17	33	49	65	81	97	113
2	2	18	34	50	66	82	98	114
3	3	19	35	51	67	83	99	115
4	4	20	36	52	68	84	100	116
5	5	21	37	53	69	85	101	117
6	6	22	38	54	70	86	102	118
7	7	23	39	55	71	87	103	119
8	8	24	40	56	72	88	104	120
9	9	25	41	57	73	89	105	121
10	10	26	42	58	74	90	106	122
11	11	27	43	59	75	91	107	123
12	12	28	44	60	76	92	108	124
13	13	29	45	61	77	93	109	125
14	14	30	46	62	78	94	110	126
15	15	31	47	63	79	95	111	127

Terminals	Addresses for the modules PCD4.E110 / E600 / A400 / B900							
0	128	144	160	176	192	208	224	240
1	129	145	161	177	193	209	225	241
2	130	146	162	178	194	210	226	242
3	131	147	163	179	195	211	227	243
4	132	148	164	180	196	212	228	244
5	133	149	165	181	197	213	229	245
6	134	150	166	182	198	214	230	246
7	135	151	167	183	199	215	231	247
8	136	152	168	184	200	216	232	248
9	137	153	169	185	201	217	233	249
10	138	154	170	186	202	218	234	250
11	239	155	171	187	203	219	235	251
12	140	156	172	188	204	220	236	252
13	141	157	173	189	205	221	237	253
14	142	158	174	190	206	222	238	254
15	143	159	175	191	207	223	239	255

Connecting terminals to I/O addresses

Terminals	Addresses for the modules PCD4.A200 / A350							
0 } 1 }	0 0 +	16 16 +	32 32 +	48 48 +	64 64 +	80 80 +	96 96 +	112 112 +
2 } 3 }	1 1 +	17 17 +	33 33 +	49 49 +	65 65 +	81 81 +	97 97 +	113 113 +
4 } 5 }	2 2 +	18 18 +	34 34 +	50 50 +	66 66 +	82 82 +	98 98 +	114 114 +
6 } 7 }	3 3 +	19 19 +	35 35 +	51 51 +	67 67 +	83 83 +	99 99 +	115 115 +
8 } 9 }	4 4 +	20 20 +	36 36 +	52 52 +	68 68 +	84 84 +	100 100 +	116 116 +
10 } 11 }	5 5 +	21 21 +	37 37 +	53 53 +	69 69 +	85 85 +	101 101 +	117 117 +
12 } 13 }	6 6 +	22 22 +	38 38 +	54 54 +	70 70 +	86 86 +	102 102 +	118 118 +
14 } 15 }	7 7 +	23 23 +	39 39 +	55 55 +	71 71 +	87 87 +	103 103 +	119 119 +

Terminals	Addresses for the modules PCD4.A200 / A350							
0 } 1 }	128 128 +	144 144 +	160 160 +	176 176 +	192 192 +	208 208 +	224 224 +	240 240 +
2 } 3 }	129 129 +	145 145 +	161 161 +	177 177 +	193 193 +	209 209 +	225 225 +	241 241 +
4 } 5 }	130 130 +	146 146 +	162 162 +	178 178 +	194 194 +	210 210 +	226 226 +	242 242 +
6 } 7 }	131 131 +	147 147 +	163 163 +	179 179 +	195 195 +	211 211 +	227 227 +	243 243 +
8 } 9 }	132 132 +	148 148 +	164 164 +	180 180 +	196 196 +	212 212 +	228 228 +	244 244 +
10 } 11 }	133 133 +	149 149 +	165 165 +	181 181 +	197 197 +	213 213 +	229 229 +	245 245 +
12 } 13 }	134 134 +	150 150 +	166 166 +	182 182 +	198 198 +	214 214 +	230 230 +	246 246 +
14 } 15 }	135 135 +	151 151 +	167 167 +	183 183 +	199 199 +	215 215 +	231 231 +	247 247 +

3. The bus modules of the PCD4 series

As previously stated, the bus modules and connections to the plug-in modules form the basic mechanical structure, electrical data paths and the power connection for all system components (PCD4 bus).

The I/O bus modules (PCD4.C2x0) are relatively simply organized : each has connectors for addressing and I/O data exchange, plus the screw terminals for individual inputs/outputs and the power supply for output elements (transistors, relays).

The bus modules for the power supply and the processors (PCD4.C1x0 and PCD4.C340) are slightly different, because in addition to the connections to the bus and the screw terminals for the main supply, they also carry the drivers and terminals for the serial interfaces nos. 1, 2 and 3.

Notes :

3.1 Bus modules PCD4.C1x0 for supply and processor

These are always the width of two module units. The various types differ in the number and types of serial interface.

For serial interfaces no. 1, 2 and 3 the electronics (UART) are in the processor module. But the drivers for these interfaces are contained in the bus module. A series of various bus modules is offered, according to the interface type (RS 232, RS 422 / RS 485, 20 mA current loop) and number of interfaces.

Note : The RS 232 serial interface is a 9-pin D-type connector (female) on the front panel of each processor module. The electronics (UART) of this interface is contained on the CPU card 0. This interface is not connected to the bus modules. During commissioning the PGU connector is used with the programming unit. Upon completion of the commissioning phase then the PGU connector can be used for a general purpose interface (channel 0).

PCD4.C100	Simplest bus module of the C1x0 series, without serial interfaces no. 1, 2 or 3 (unequipped).
PCD4.C110	Bus module with 1 serial interface no. 1 : 20 mA current loop - on screw terminals 10 ... 17 no. 2 and 3 : unequipped
PCD4.C120	Bus module with 3 serial interfaces no. 1 : RS 232 - on screw terminals 10 ... 17 no. 2 : 20 mA current loop - on screw terminals 20 ... 27 no. 3 : 20 mA current loop - on screw terminals 30 ... 37
PCD4.C130	Bus module with 3 serial interfaces no. 1 : RS 422 / RS 485 - on screw terminals 10 ... 17 no. 2 : RS 422 - on screw terminals 20 ... 27 no. 3 : RS 232 - on screw terminals 30, 31 and 34, 35

PCD4.C340 Bus module for supply, processor and 4 I/O modules.
The interfaces can be fitted as desired with the pluggable interface modules :

- PCD7.F110 → RS 422 / RS 485
- PCD7.F120 → RS 232
- PCD7.F130 → 20 mA current loop
- PCD7.F150 → RS 485 electrically isolated

See description of the module in the chapter 3.4

Terminals (for all bus modules)

All screw terminals of the bus modules are provided for the following wire sections :

	<u>1st HW version</u>	<u>from Q4 / 1994</u>
- Rigid wires	1 x 2.5 mm ² 2 x 0.75 mm ²	1 x 0.5 ... 4 mm ²
- Flexible wires with ferrules	1 x 1.5 mm ² 2 x 0.5 mm ²	1 x 0.5 ... 2.5 mm ²
- Tightening torque	0.5 Nm	0.5 Nm

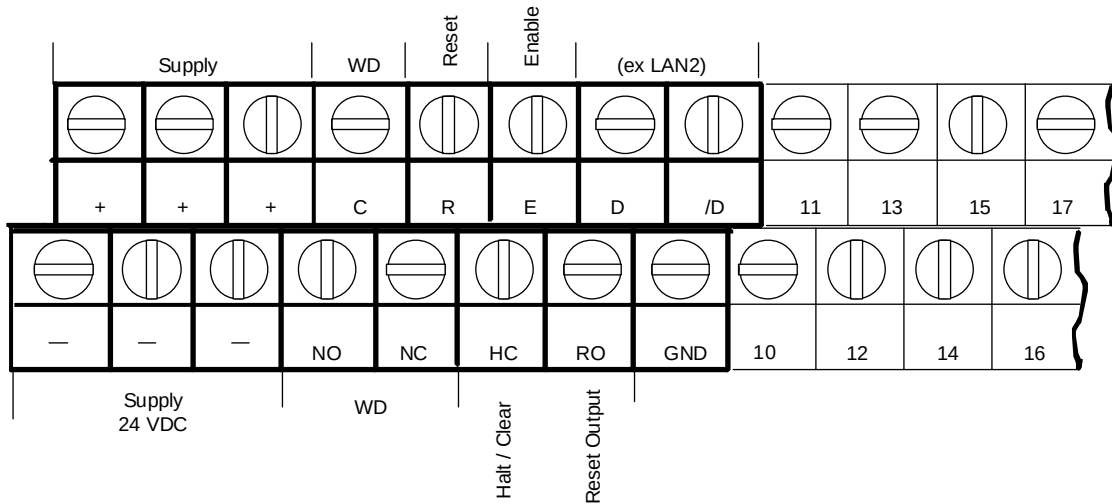
The terminals and the PCB connectors generally have a rated current of 2 A. For the PCD4.A400 and ..B900 modules, the exceptions to this are noted.

UL and C-UL requirements

Wire data	Temperature :	60/75°C
	Copper wire only	
	Tightening torque :	0.5 Nm

3.2 Screw terminal assignments of the PCD4.C1x0 bus modules for supply and processor

Supply, Watch Dog, Reset



Supply

+	+ 24 V	Supply voltage for the PCD4 system
-	0 V, GND	(for details see PCD4.N2..)

Watch Dog (WD)

C	Common	Switch contact of the WD relay
NC	Normally closed	(for details see PCD4.N2..)
NO	Normally open	

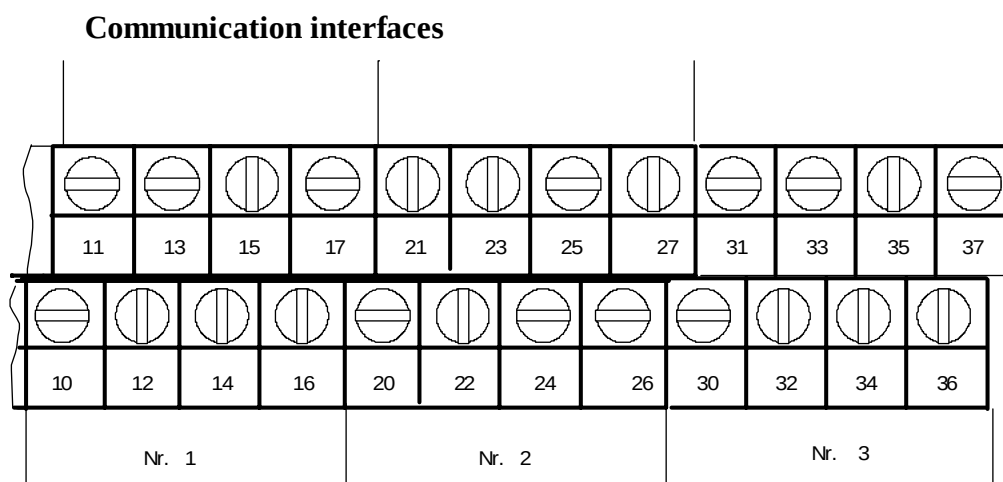
External Reset

R	External Reset	(for details see 4.1.6)

CPU (Processor)

E	Enable	} Define the behaviour of the system when reset (for details see 4.1.4 and 4.1.5)
RO	Reset Output	
HC	Halt/Clear	

3.3 Screw terminal assignments of the PCD4.C1x0 bus modules for communication interfaces



Connection of serial interfaces

Each serial interface uses 8 terminals :

- Interface no. 1 :   Terminals 10 ... 17   (x = 1)
- Interface no. 2 :   Terminals 20 ... 27   (x = 2)
- Interface no. 3 :   Terminals 30 ... 37   (x = 3)

3.3.1 Interface RS 232

Terminal x0 :	TX	Transmit Data
Terminal x1 :	RX	Receive Data
*) Terminal x2 :	DTR	Data Terminal Ready
*) Terminal x3 :	DSR	Data Set Ready
Terminal x4 :	RTS	Request To Send
Terminal x5 :	CTS	Clear To Send
*) Terminal x6 :	RSV	Reserve
*) Terminal x7 :	DCD	Data Carrier Detect

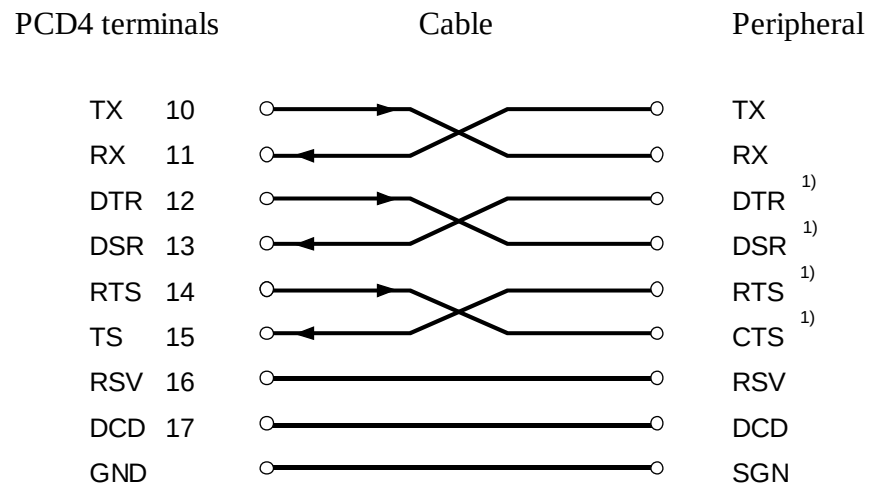
*) These terminals are wired only on serial interface no. 1.

<u>Signal type</u>	<u>Logical state</u>	<u>Required Value</u>	<u>Nominal Value</u>
Data signal	0 (space)	+3 V ... +15 V	+7 V
	1 (mark)	-15 V ... -3 V	-7 V
Control/ Message signal	0 (off)	-15 V ... -3 V	-7 V
	1 (on)	+3 V ... +15 V	+7 V

The idle state for data signals is "mark", the idle state for control/message signals is "off".

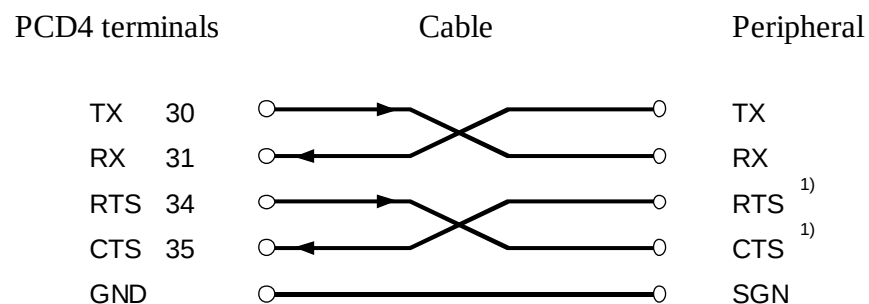
Connection examples for RS 232

- **For serial interface no. 1 :**



Adapt connector type and connections according to the peripheral.

- **For serial interface no. 3 :**



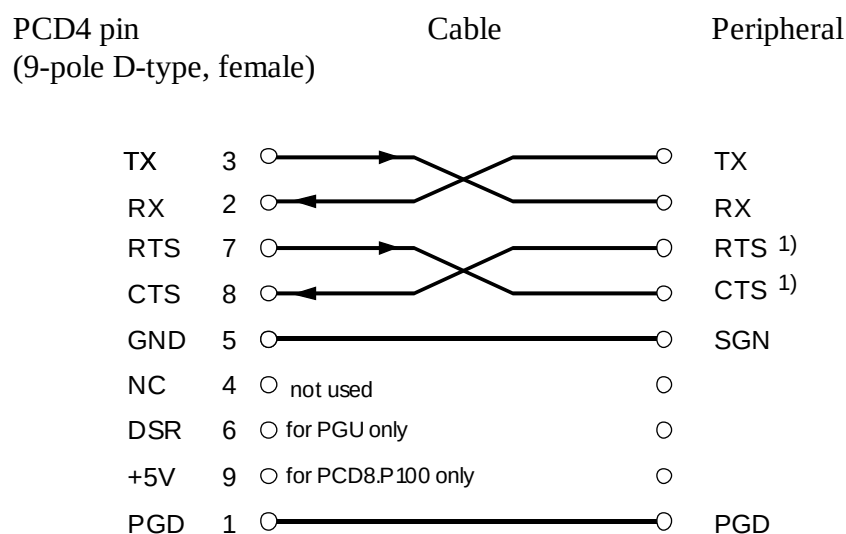
Adapt connector type and connections according to the peripheral.

- 1) For communication with serial terminals (VDUs), check which connections should be made. Set/clear the control signals using the SOCL instruction

- **For serial interface no. 0 :**

The PGU interface is located on the front panel of the processor module. This is primarily used for connection of the programming unit. However, the PGU interface can also be used as general purpose serial interface 0 for connection to another peripheral device, providing the following points are noted :

- During power-up, the firmware automatically configures the PGU interface to 9600 Baud for connection to the programming unit.
- If another peripheral device is to be connected, then serial interface 0 should be assigned accordingly using the SASI instruction.
- If the programming unit is subsequently connected in place of the peripheral during operation, the interface automatically switches back to PGU mode (connection pin 6 to pin 8).
- To use the interface once again for connection to the peripheral device, interface 0 must again be reassigned using the SASI instruction.
- See section 4.1.8 for PGU connection details.



Adapt connector type and connections according to the peripheral.

- 1) For communication with serial terminals (VDUs), check which connections should be made. Set/clear the control signals using the SOCL instruction.

3.3.2 Interface 20 mA current loop ^{*)}

Terminal	x0 :	TS	Transmitter Source	} Transmitter
Terminal	x2 :	TA	Transmitter Anode	
Terminal	x4 :	TC	Transmitter Cathode	
Terminal	x6 :	TG	Transmitter Ground	
Terminal	x1 :	RS	Receiver Source	} Receiver
Terminal	x3 :	RA	Receiver Anode	
Terminal	x5 :	RC	Receiver Cathode	
Terminal	x7 :	RG	Receiver Ground	

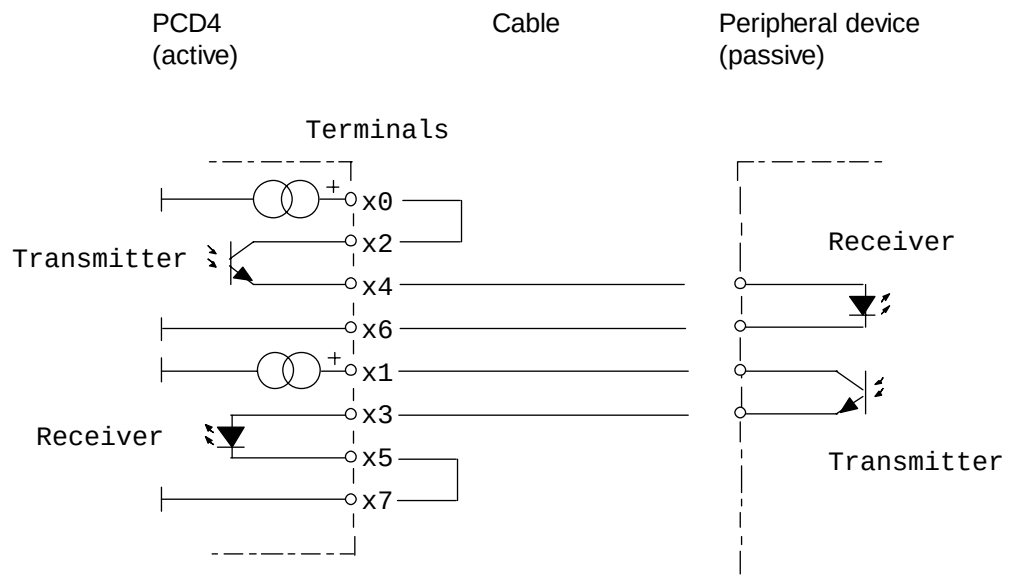
Signal type	Required value	Nominal value
Power for logic L (space)	-20 mA ... + 2 mA	0 mA
Power for logic H (mark)	+12 mA ... +24 mA	+20 mA
Neutral Voltage on TS, RS	+11.1 V ... +14.9 V	+13 V
Short circuit power on TS, RS	+18 mA ... +29.6 mA	+23.2 mA

The idle state for data signals is "mark".

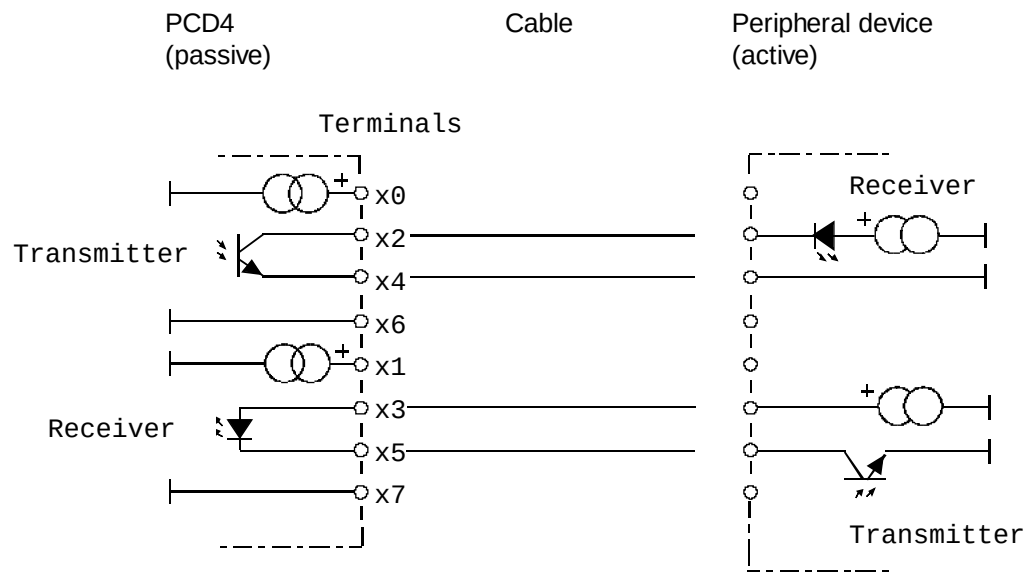
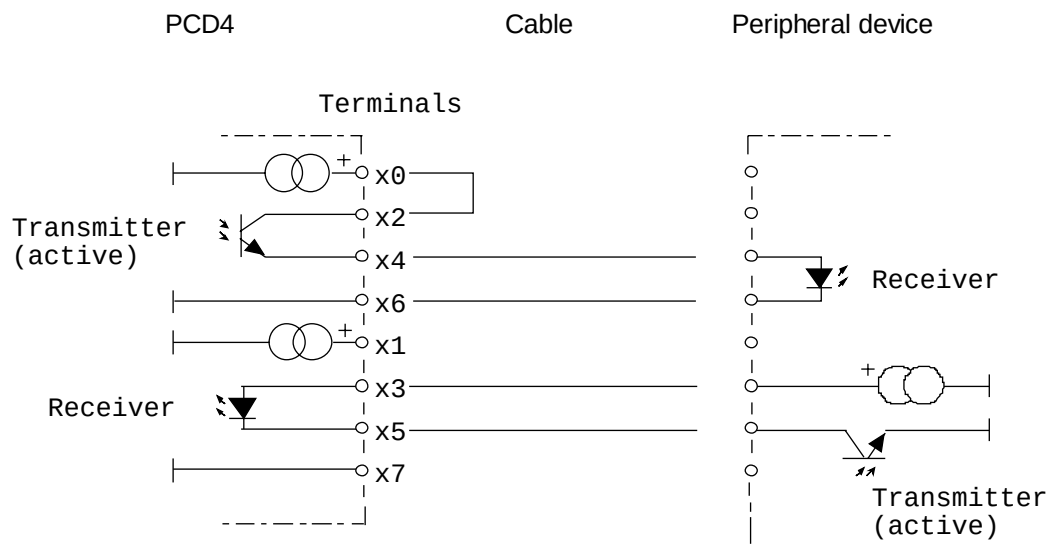
The user selects "active" or "passive" switching by means of wire jumpers on the screw terminals.

Connection examples for 20 mA current loop

a) PCD4 Active



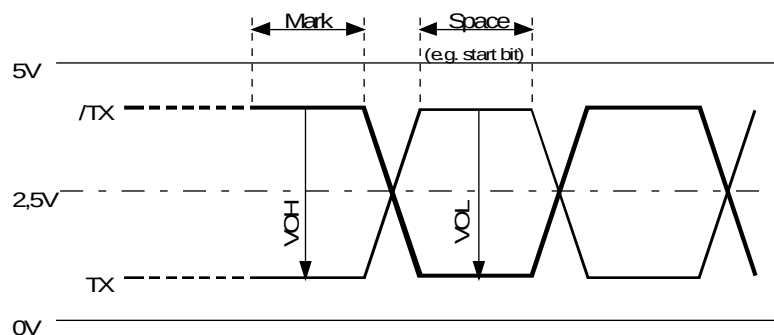
^{*)} max. baud rate for 20 mA current loop limited to 9600 Baud

b) PCD4 Passive**c) PCD4 transmitter and peripheral transmitter active**

3.3.3 Interface RS 422

Terminal	x0 :	TX	Transmit Data
Terminal	x2 :	/TX	Transmit Data
Terminal	x1 :	RX ¹⁾	Receive Data
Terminal	x3 :	/RX	Receive Data
Terminal	x4 :	RTS	Request To Send
Terminal	x6 :	/RTS	Request To Send
Terminal	x5 :	CTS ¹⁾	Clear To Send
Terminal	x7 :	/CTS	Clear To Send

Signal type	Logical state	Polarity
Data signal	0 (space)	TX positive to /TX
	1 (mark)	/TX positive to TX
Control/Message signal	0 (off)	/RTS positive to RTS
	1 (on)	RTS positive to /RTS

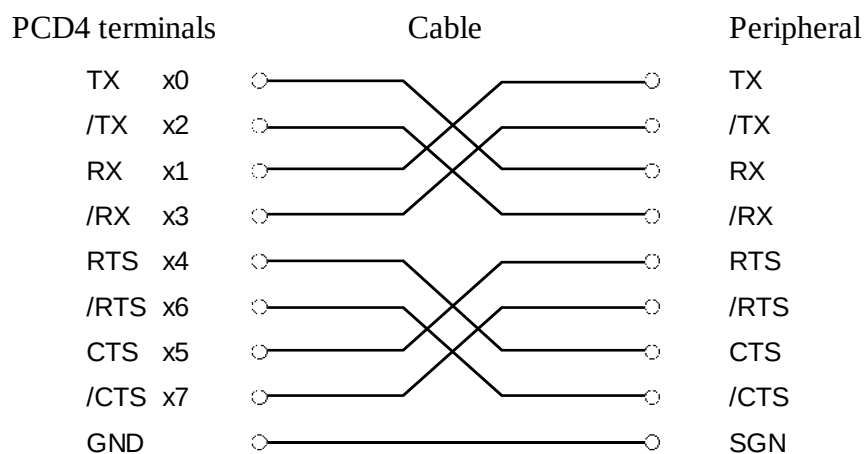


$V_{OH} = 2 \text{ V min (with load) to } 5 \text{ V max (without load)}$

$V_{OL} = -2 \text{ V ... } -5 \text{ V}$

- 1) Between RX - /RX and between CTS - /CTS there is in each case a termination resistance of 150 Ω .

Terminal example for RS 422



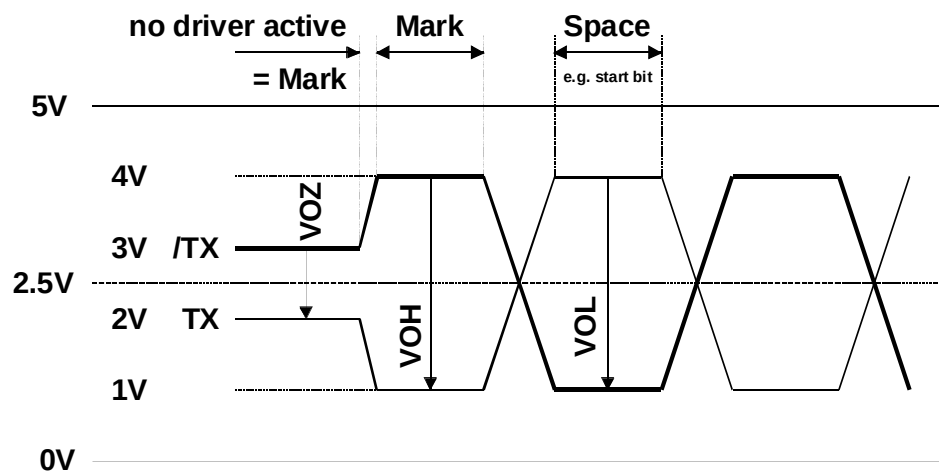
Adapt connector type and connections according to the peripheral.

3.3.4 Interface RS 485 ^{*)}

Interface no. 1 of bus module ..C130

Terminal 10 :	RX - TX	Data
Terminal 12 :	/RX - /TX	/Data
Terminal 11 :	} not used	
Terminal 13 :		
Terminal 14 :		
Terminal 16 :		
Terminal 15 :		
Terminal 17 :		
Terminal 32 :	} Terminals for termination and pull up and pull down resistors	
Terminal 33 :		
Terminal 36 :		
Terminal 37 :		

<u>Signal type</u>	<u>Logical state</u>	<u>Polarity</u>
Data signal	0 (space)	RX-TX positive to /RX-/TX
	1 (mark)	/RX-/TX positive to RX-TX



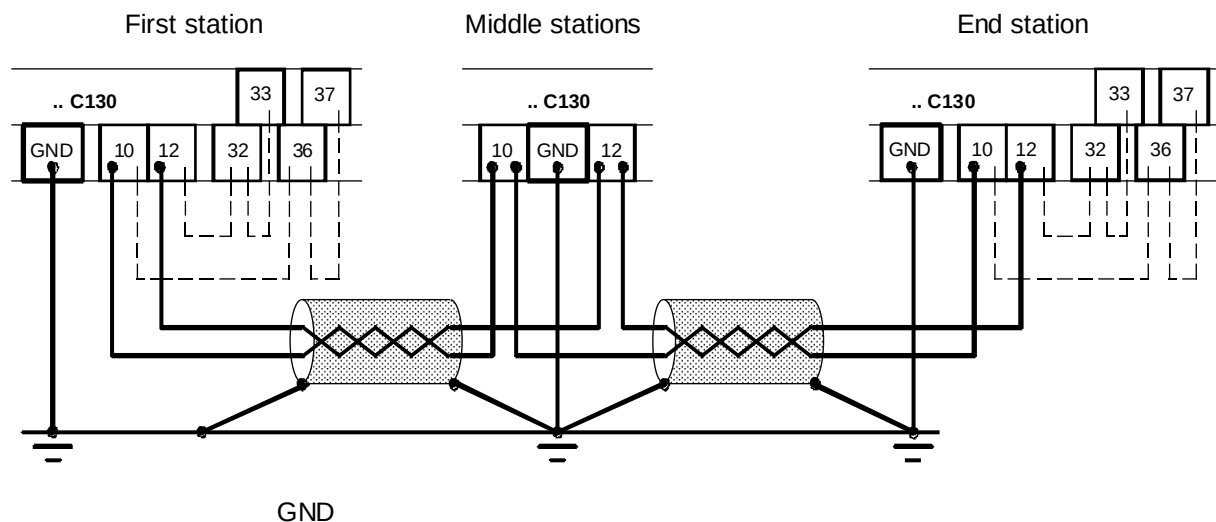
VOZ	=	0.9 V min ... 1.7 V max (no driver active)
VOH	=	2 V min (with load) to 5 V max (without load)
VOL	=	-2 V ... -5 V

^{*)} Serial interface no. 1 works as RS 422 by assignment in the SASI modes MC0 to MC3 or MD0/SD0. Using the assignment in the SASI modes MC4 or SM1/SS1 the interface no. 1 works as RS 485.

Connection example for RS 485 and S-Bus

RS 485 is a multi-point standard, which usually connects more than two stations. Screened twisted pair cable of at least $2 \times 0.5 \text{ mm}^2$ should be used, wired in accordance with the diagram below. Note that terminal 10 is always connected to terminal 10, and terminal 12 to 12.

The cable's screening must always be connected at both ends, to produce a continuous, solid earth line, and so reduces potential differences to a minimum.

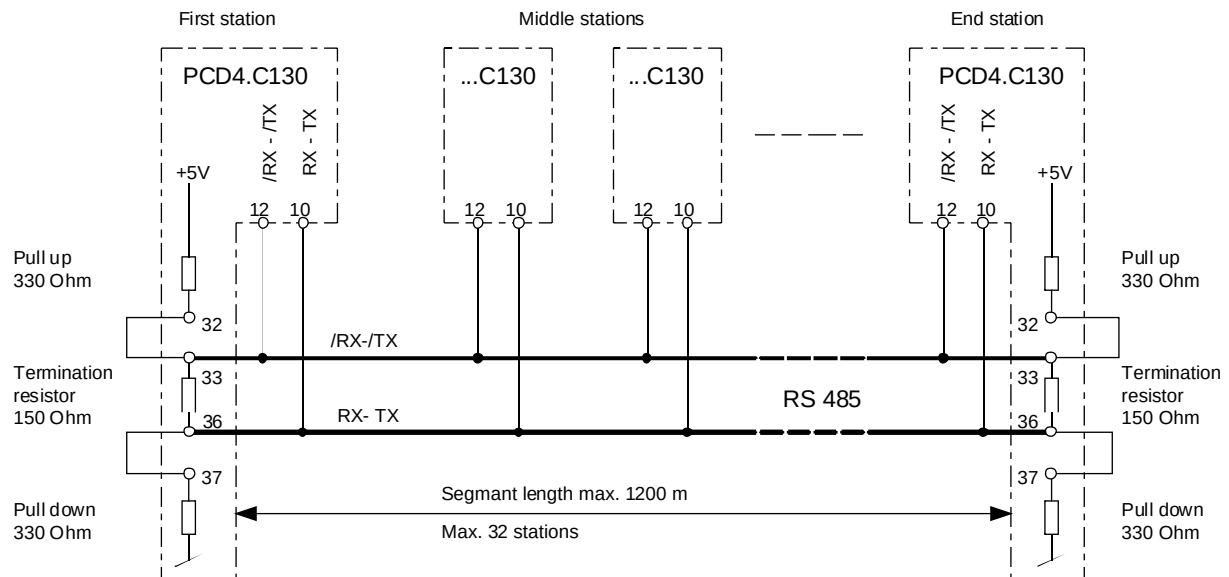


It is recommended that the RS 485 cable is not laid in direct proximity to motor cables which may produce interference, unless these cables are also well screened.

See also the manual "Installation components for RS 485 networks", order code 26/740 E.

Line termination resistors for RS 485 and S-Bus

To suppress noise and avoid reflections, every PCD4.C130 bus module incorporates damping resistors, which should be connected according to the following diagram. Spur cables must not exceed 0.5 m.



Important : If a network is expanded or an end station is replaced, care should always be taken to ensure that the ends correspond to the above diagram.

See also the manual "Installation components for RS 485 networks", order code 26/740 E.

3.4 Bus module PCD4.C340 for supply, processor, 4 I/O modules and 3 serial interfaces

The PCD4.C340 bus module has 6 sockets :



Socket no. 1

for power supply module PCD4.N2..

Socket no. 2

for processor module PCD4.M..

Socket no. 3 to 6

for I/O modules, ..W and ..H modules

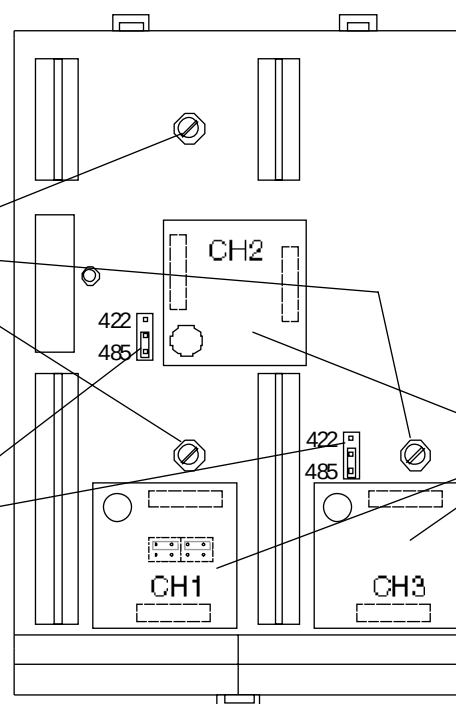
The 3 interfaces can be fitted with the required pluggable interface modules PCD7.F1x0

..F110 (RS 422 / RS 485)
 ..F120 (RS 232)
 ..F130 (20 mA current loop)
 ..F150 (RS 485 electrically isolated)

Arrangement of pluggable interface modules :

Fastening screws

Jumper for selecting RS 422 or RS 485 (CH2 and CH3)



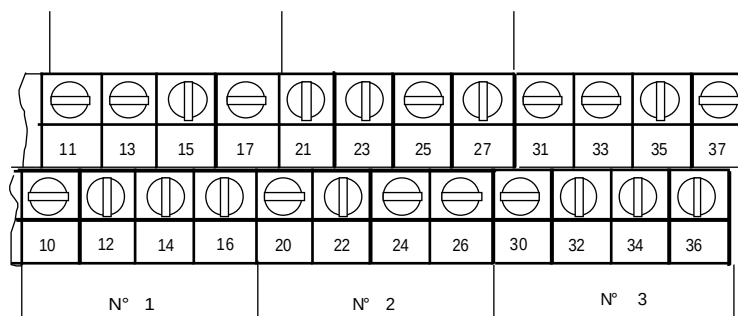
Factory setting of jumpers : RS 485

Pluggable interface modules PCD7.F110/F120 /F130/F150

The interface modules can be reached by removing the plastic cover of sockets 1 and 2 (far left cover), which is fastened with 3 screws. The interface modules are now accessible and can be manipulated. After completion of assembly, the cover should be screwed down again.

Connection of the supply, watch dog and reset ("External Reset") is the same as for the PCD4.C1x0 bus modules and can be referred to in section 3.2. Connection of the I/O modules is as described in section 3.5.

Connections for the serial interfaces, terminals 10 to 37 :



Each interface occupies 8 terminals :

Interface no. 1 : Terminals 10 ... 17 (x = 1)

Interface no. 2 : Terminals 20 ... 27 (x = 2)

Interface no. 3 : Terminals 30 ... 37 (x = 3)

Caution ! The pin configurations of the PCD4.C340 are not the same as the pin configurations of PCD4.C1x0 bus modules !

Ter- minal	Pluggable interface modules				
	PCD7.F110		PCD7.F120	PCD7.F130	PCD7.F150
	RS 422	RS 485	RS 232	20 mA CL	RS 485
x0	TX >	D	TX >	TS >	D
x1	/ TX >	/ D	RX <	RS >	/ D
x2	RX <		RTS >	TA <	
x3	/ RX <		CTS <	RA <	
x4	RTS >		DTR > *)	TC >	
x5	/ RTS >		DSR < *)	RC >	
x6	CTS <		RSV > *)	TG >	SGND
x7	/ CTS <		DCD < *)	RG >	
GND		GND			

*) These signals can only be used if the interface module PCD7.F120 is plugged onto communications interface no. 1 (CH1).

Important : The PCD7.F110 interface module can only be configured at interface no. 1 with application software as RS 422 or RS 485.



For interfaces no. 2 and 3 the function must be defined with the jumper "RS 422/RS 485" on the PCD4.C340 bus module when the interface module is installed.

Nameplate :

 MURTEN SWITZERLAND						
BUS MODULE						
Type	PCD4.C340					
Version	A					
Modif.	<table border="1" style="display: inline-table;"> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> </table>	1	2	3	4	5
1	2	3	4	5		
CH1:	_____					
CH2:	_____					
CH3:	_____					
						

The actual configuration should be entered on the nameplate of the module.

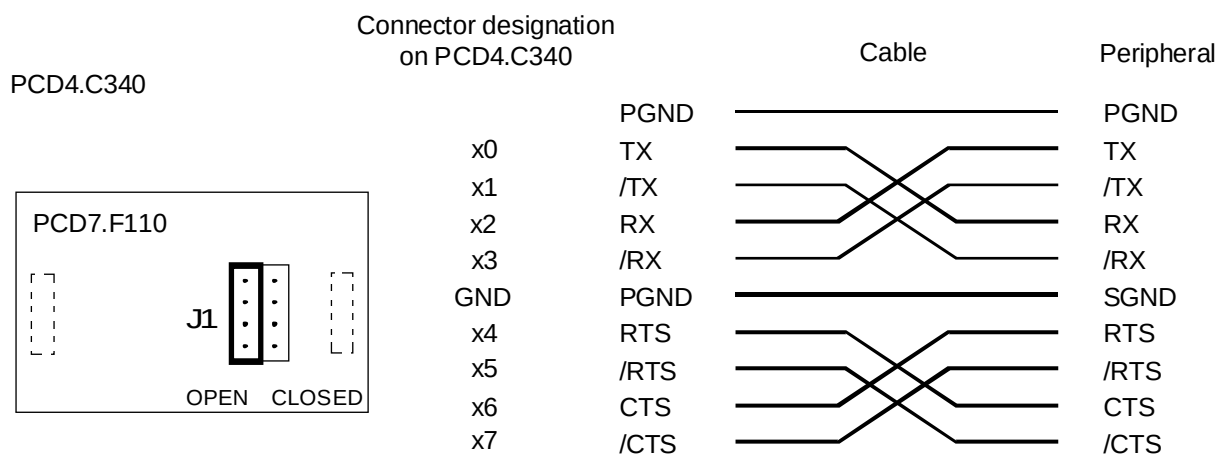
Connection examples :

As connection examples, refer to the specific serial interfaces in the following pages.

3.4.1 Interface RS 422 / RS 485 with module PCD7.F110

• Connection for RS 422

Point-to-point communications in all modes with the exception of MC4 and SS../SM.. (S-Bus) modes.



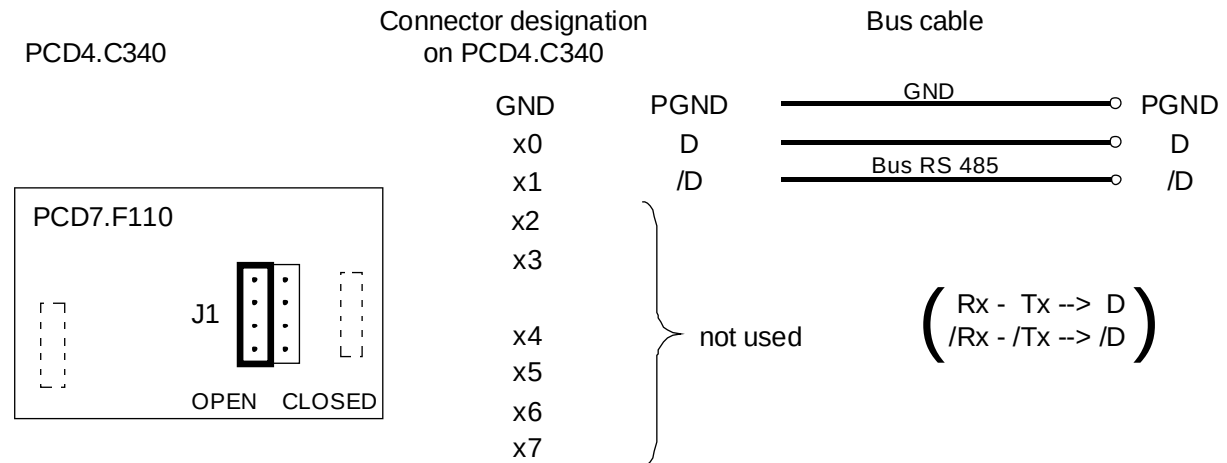
Note :

- For RS 422 each pair of receiver lines is terminated on the ..F110 module with a 150 Ω line termination resistor.
- For this, jumper J1 must be left in the "OPEN" position (factory setting). The jumper J1 is located on the rear side of the F1-board.

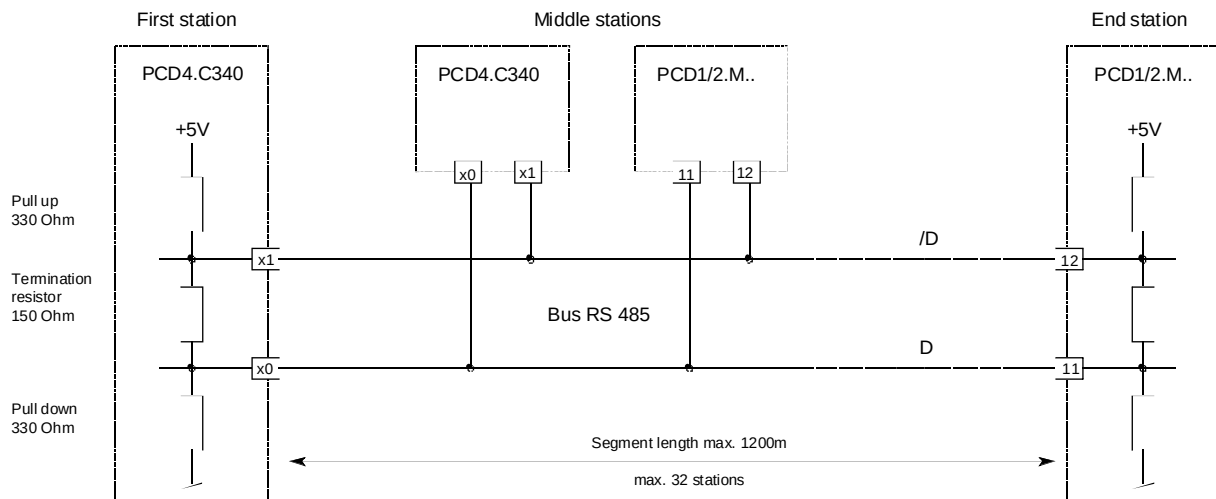
• Connection for RS 485 and S-Bus

In order to define the interface according to RS 485, the SASI instruction must be used to select one of the following modes :

- MC4 : RS 485 in C mode
- SS../SM.. : RS 485 in S-Bus mode



Selection of line termination resistors



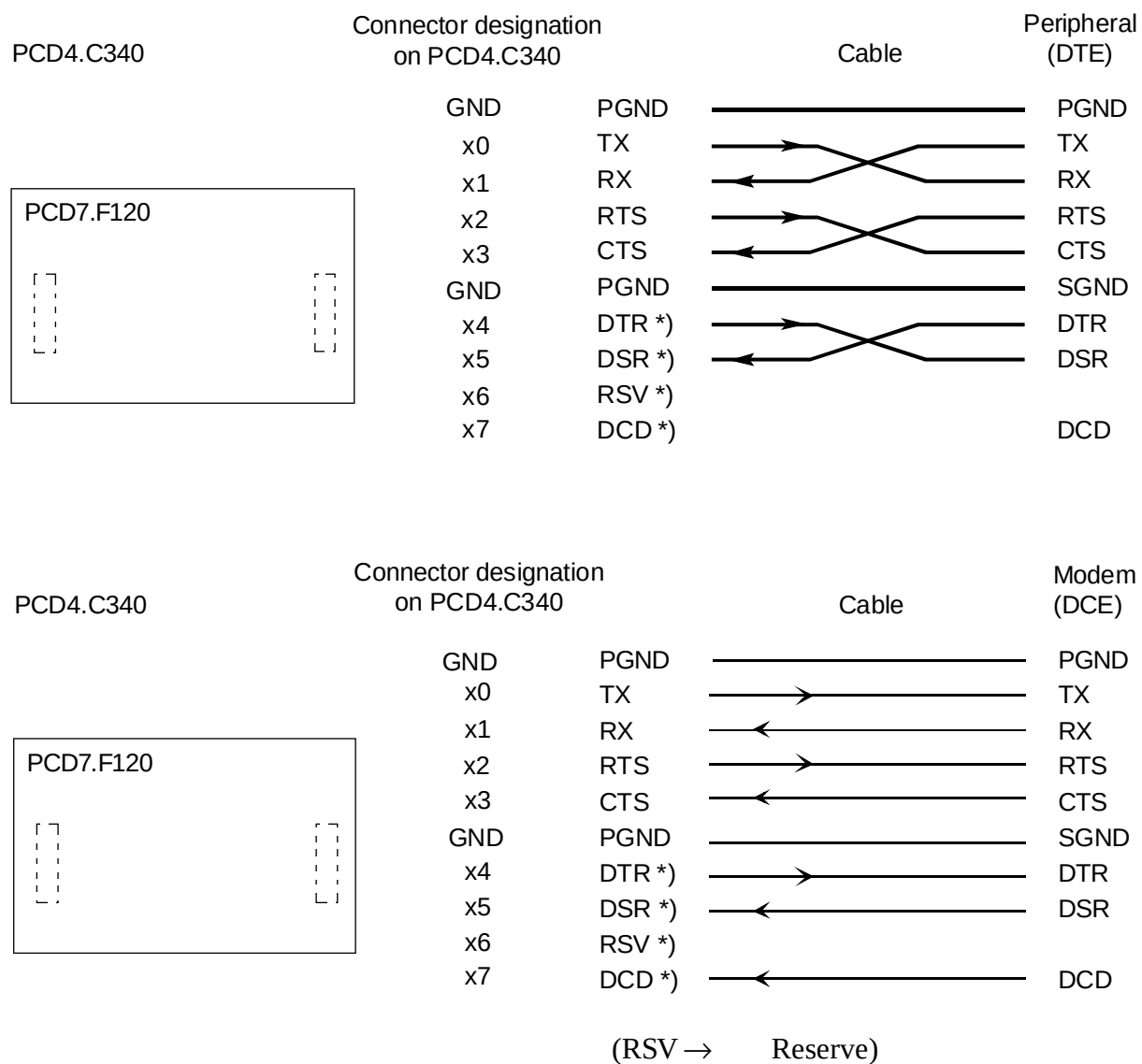
Note :

- At the first and last stations jumper J1 must be set to the "CLOSED" position.
  - For all other stations, jumper J1 must be left in the "OPEN" position (factory setting).
- The jumper J1 is located on the rear side of the F1-board.

See also manual "Installation Components for RS 485 Networks", order code 26/740 E.

3.4.2 Interface RS 232 with module PCD7.F120

This interface allows a connection to a modem



*) These signals can only be used, if the interface module PCD7.F120 is plugged in on place (CH1).

DTE : **Data Terminal Equipment**

DCE : **Data Communication Equipment**

3.4.3 Interface 20 mA current loop with module PCD7.F130 ^{*)}

Terminal	x0 :	TS	Transmitter Source	} Transmitter
Terminal	x2 :	TA	Transmitter Anode	
Terminal	x4 :	TC	Transmitter Cathode	
Terminal	x6 :	TG	Transmitter Ground	
Terminal	x1 :	RS	Receiver Source	} Receiver
Terminal	x3 :	RA	Receiver Anode	
Terminal	x5 :	RC	Receiver Cathode	
Terminal	x7 :	RG	Receiver Ground	

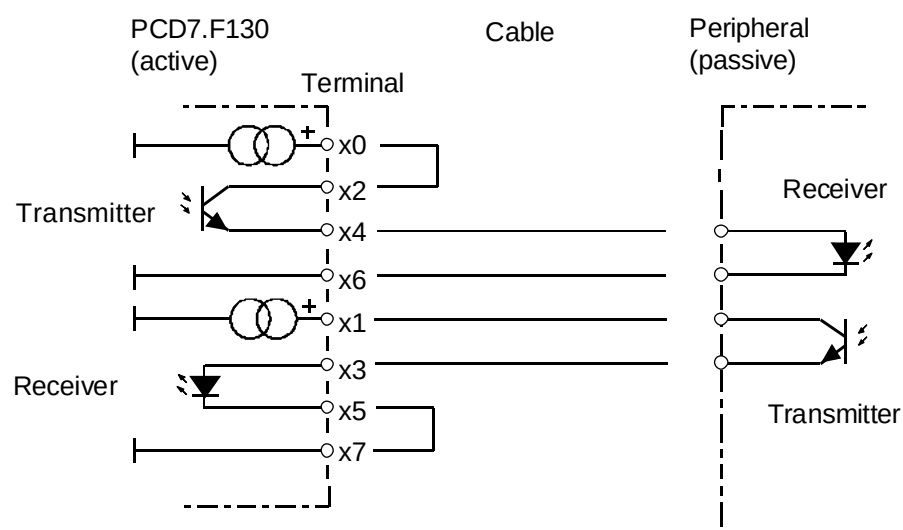
Signal type	Required value	Nominal value
Power for logic L (space)	-20 mA ... + 2 mA	0 mA
Power for logic H (mark)	+12 mA ... +24 mA	+20 mA
Neutral Voltage on TS, RS	+16.0 V ... +24.0 V	+24.0 V
Short circuit power on TS, RS	+18 mA ... +29.6 mA	+23.2 mA

The idle state for data signals is "mark".

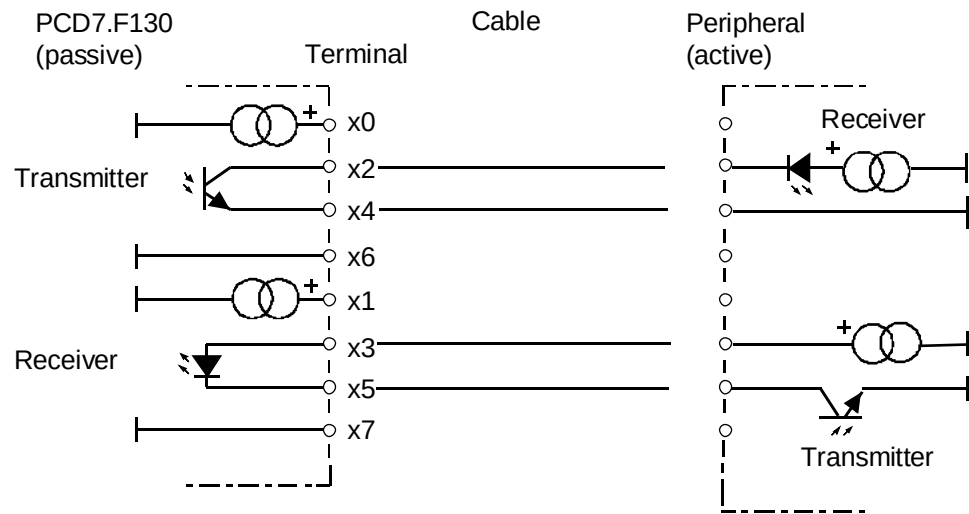
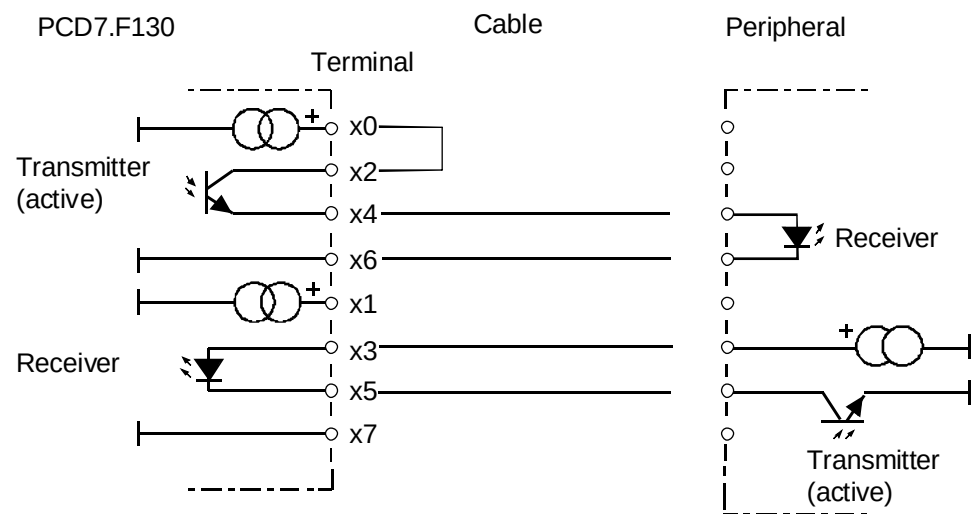
The user selects "active" or "passive" switching by means of wire jumpers on the screw terminals.

Connection examples for 20 mA current loop

a) PCD4 Active



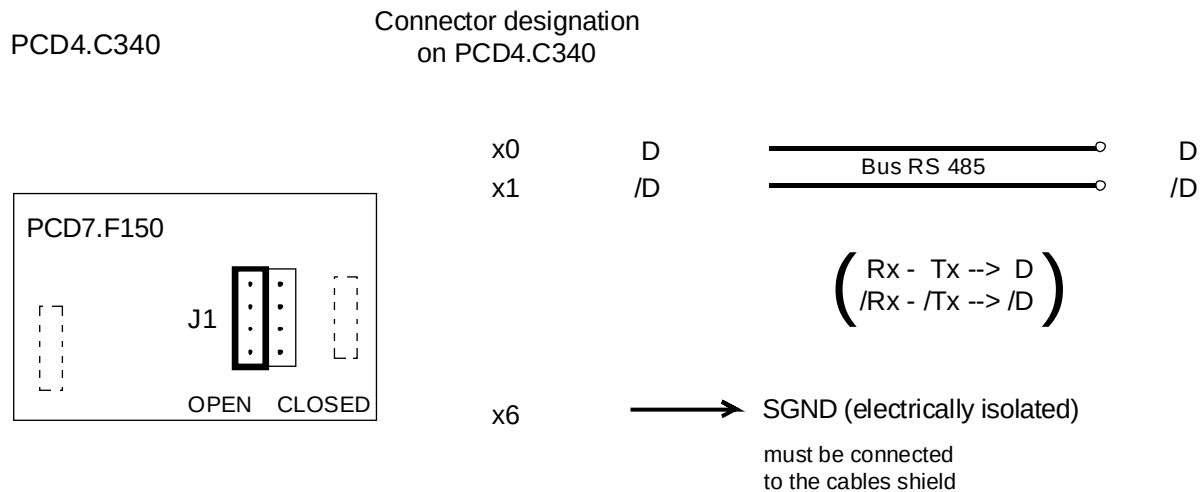
^{*)} max. baud rate for 20 mA current loop limited to 9600 Baud

b) PCD4 Passive**c) PCD4 transmitter and peripheral transmitter active**

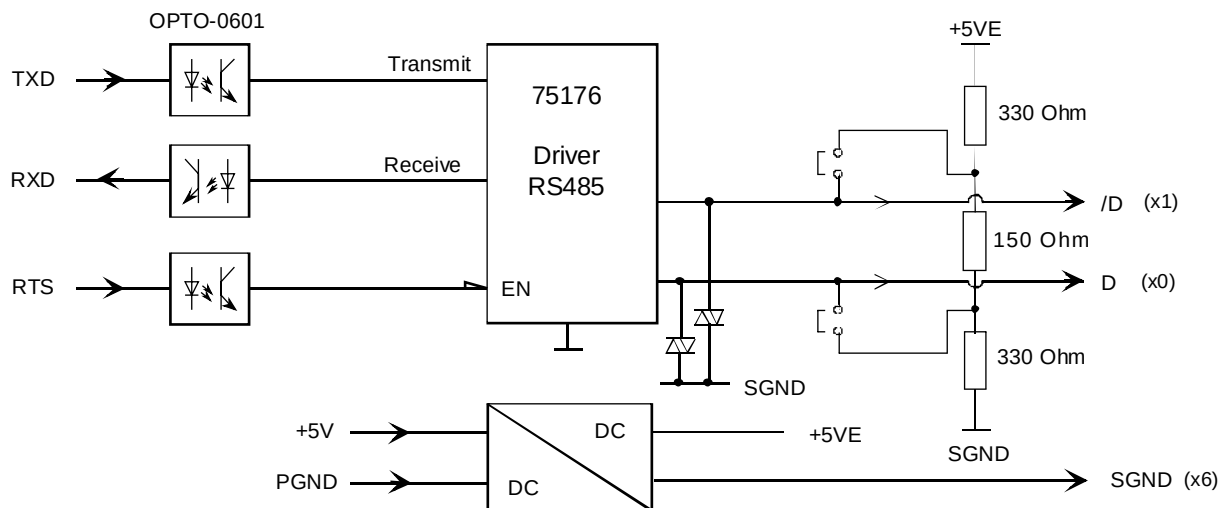
3.4.4 Interface RS 485, electrically isolated, with PCD7.F150

Electrical isolation is achieved with 3 optocouplers and a DC/DC converter. Data signals D and /D are each protected against overvoltages by a suppressor diode (10 V). The line termination resistors can be connected or disconnected with the jumper J1.

Connection



Block diagram



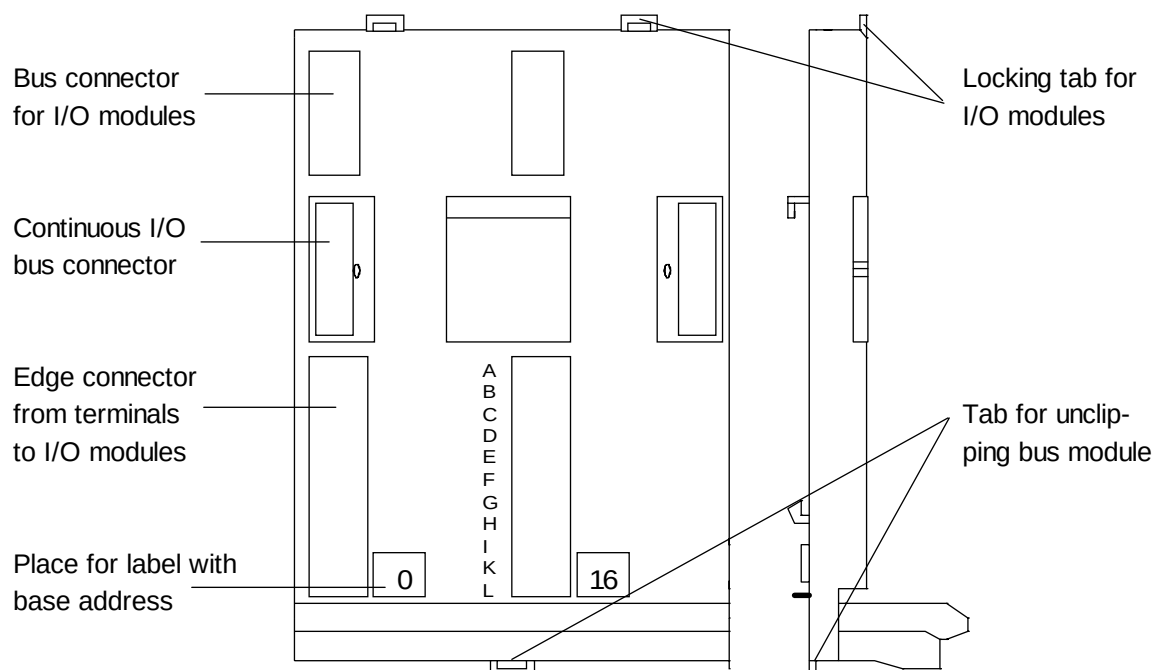
Note : Common mode voltage :
50 V, limited by capacitors between the data lines and SGND
(on the base module)

For the installation, see the manual "Installation components for RS 485 networks", order code 26/740 E.

3.5 Bus modules PCD4.C2x0 for input/output modules

There is a choice of three types :

- PCD4.C220 : for attaching 2 add-on I/O modules
- PCD4.C260 : for attaching 6 add-on I/O modules
- PCD4.C225 : for coupling the PCD4 I/O modules in expansion to a **PCD2.M...**
(see description in the chapter 3.6)



Screw terminal assignment of PCD4.C2x0 bus modules

1	3	5	7	9	11	13	15	+	a

0	2	4	6	8	10	12	14	-	b

The designations of screw terminals are the same for all PCD4.C2x0 bus modules.

The terminals for other I/O and special modules have different assignments. Consult the data sheets for the module.

See chapter 3.1 for the information regarding the wire sections and rated current of the terminals and PCB connectors.

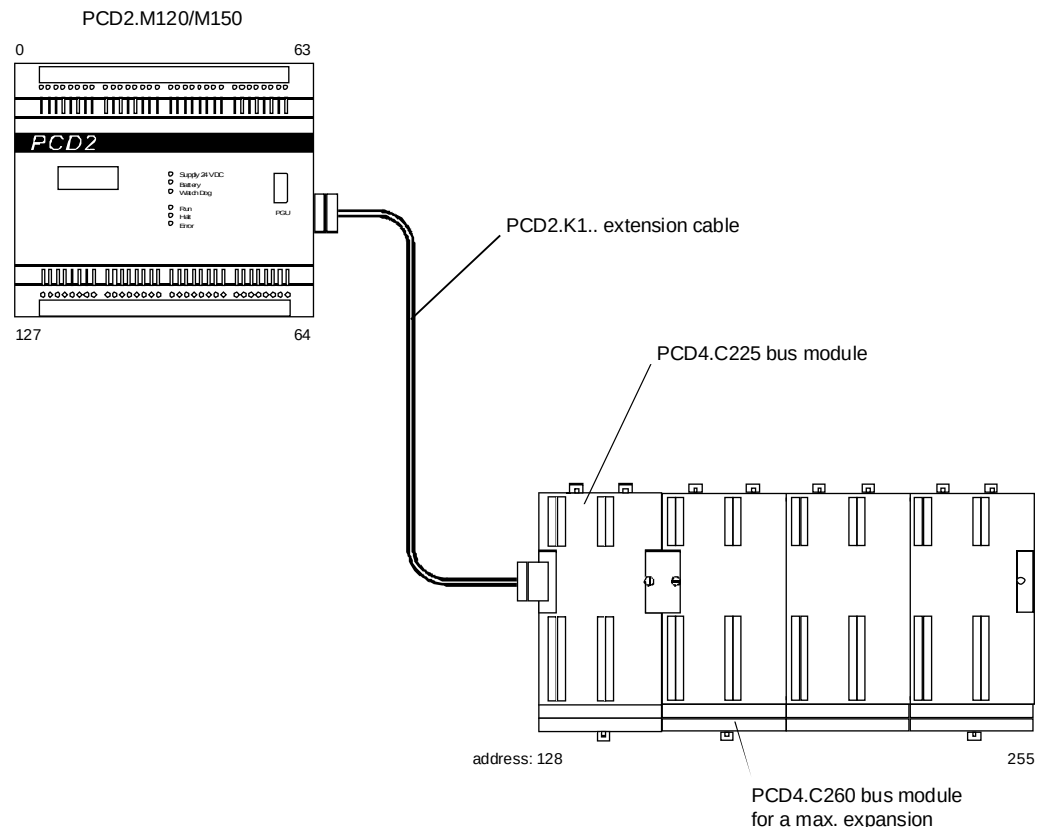
3.6 Bus module PCD4.C225 for coupling the PCD4 I/O modules in expansion to a PCD2.M...

The PCD4.C225 bus module version 'A', enables the manual control modules PCD4.A810, PCD4.A820 and PCD4.W800 (which are mainly used in building automation) to be coupled to the PCD2 series.

From version 'B' on, all PCD4 I/O modules with exception of ..H3/..H4 and ..W1/..W3/..W4 (± 15 V not wired) can be used (see table next page).

The PCD4.C225 has 2 module sockets. On the left of the module it is connected by the PCD2.K1x0 extension cable to the PCD2.M... . On the right of the module it is possible, as with every PCD4.C1x0 or ..C340 bus module, to connect an additional PCD4.C2x0 bus module via the PCD4 bus extension connector. Expansion can take place up to a maximum of 8 modules (3 x PCD4.C220 or 1 x PCD4.C260).

The PCD2 expansion cable PCD2.K1x0 is available in different lengths. The cable with the maximum length of 2 m, order reference PCD2.K120, is provided for local assembly of the PCD4.C225 with the PCD2.M... . It is, of course, also possible to use the shorter cable (..K100/..K110).



As with a PCD2.C100 expansion unit, addressing of the PCD4.C225 starts at 128 and extends, if fully equipped with a maximum of 8 modules, to 255. If an attempt is made to fit a 9th module, addressing starts at zero and then runs parallel to the address range of the PCD2.M... base module (addresses 0 - 15).

Caution :

It should be noted that, due to addressing conflicts with the watch dog, some restrictions for the 8th socket (addresses 240 - 255) or for address 255 only have to be respected (see table below).

Restrictions regarding the use of the PCD4 I/O modules :

Modules not allowed on the 8th socket	Modules not allowed to work address 255	Modules not possible to use on PCD4.C225
PCD4.A810	PCD4.A250	PCD4.H3xx
PCD4.H120	PCD4.A400	PCD4.H4x0
PCD4.H2x0	PCD4.A410	PCD4.W100
PCD4.W500	PCD4.B900/B901	PCD4.W300
PCD4.W600	PCD4.E110/E11x	PCD4.W400
	PCD4.E600/E601	

Current is supplied exclusively via the PCD2's +5 V supply.

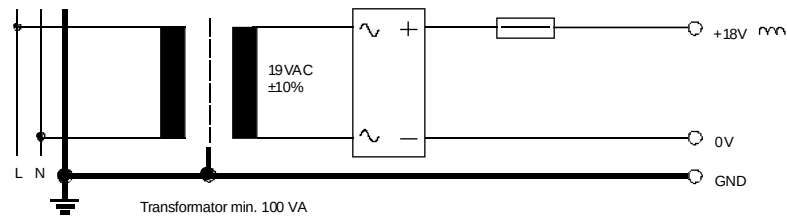
Nameplate :

 MURTEN SWITZERLAND						
BUS MODULE						
Type	PCD4.C225					
Version	B					
Modif.	<table border="1" style="display: inline-table;"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> </table>	1	2	3	4	5
1	2	3	4	5		
						

3.7 Power supply and connection plan

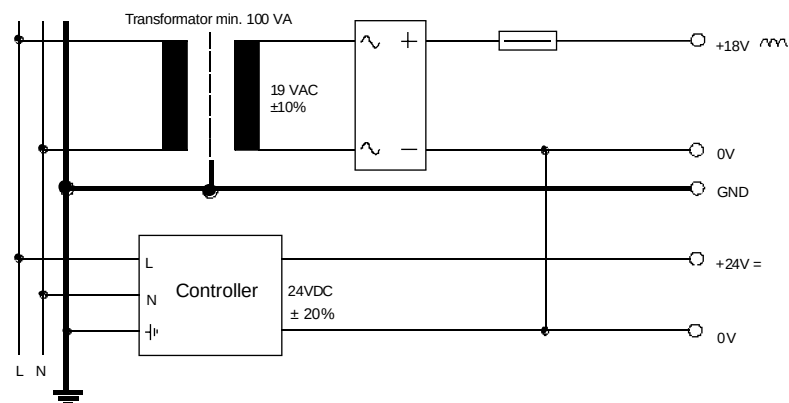
3.7.1 External power supply

- **Application :** simple and small installations



- Sensors Electromechanical switches
- Actuators Relays, lamps and small valves with < 0.5 A switching current
- For modules PCD4.N2.., PCD4.M1.., PCD4.M4..
PCD4.E1.., E6.., A2.., A4.., A8.., B9..
PCD4.W1.., W3.., W4.., W8..

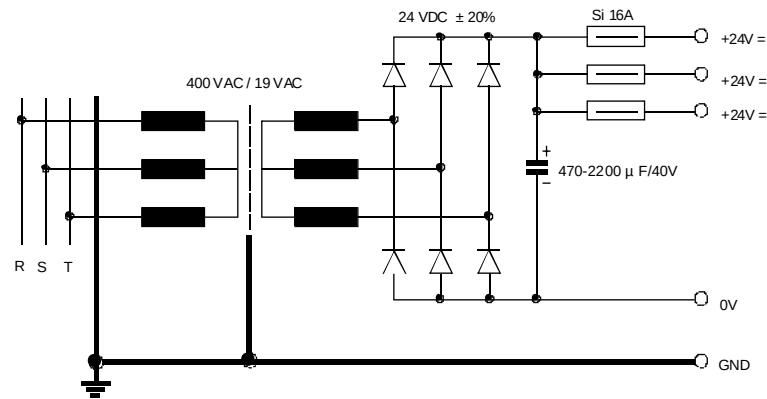
- **Application :** small to medium installations



- Sensors Electromechanical switches, proximity switches and photoelectric barriers
- Actuators Relays, lamps, displays and small valves with < 0.5 A switching current
- For modules PCD4.N2.., PCD4.M1.., PCD4.M4..
PCD4.E1.., E6.., A2.., A4.., A8.., B9..
PCD4.W1.., W3.., W4.., W5.., W6.., W8..
PCD4.H1..^{*)}, H2..^{*)}, H3..^{*)}, H4..^{*)}
PCD7.D1..^{*)}, D2..^{*)}, PCA2.D12^{*)}, D14^{*)}

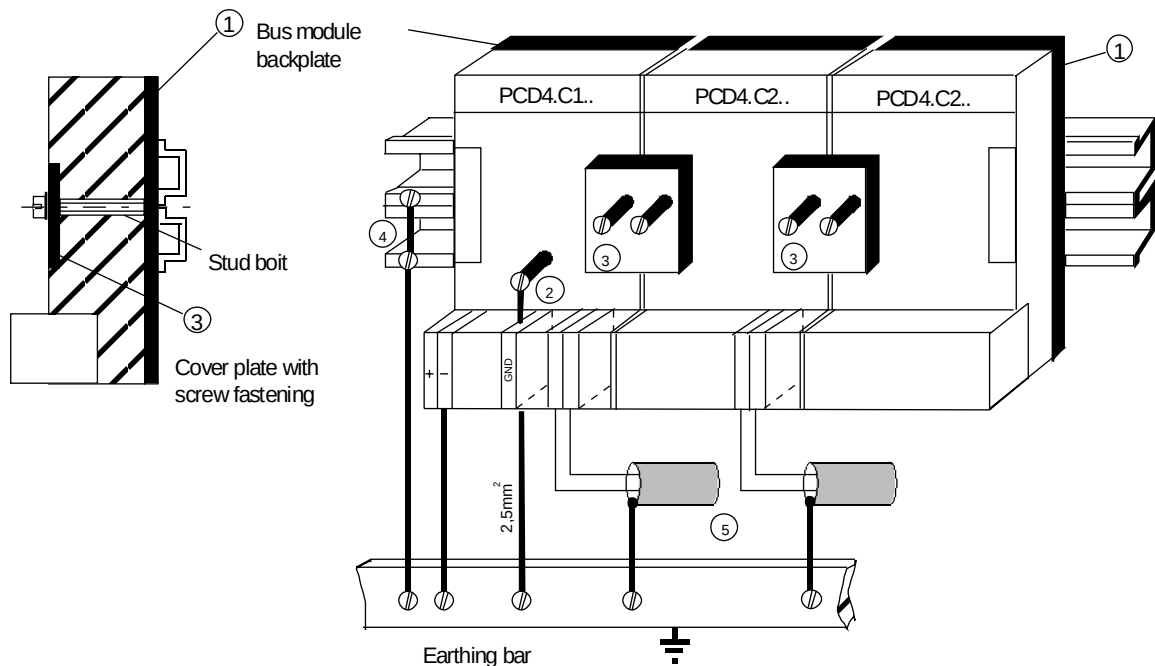
^{*)} These modules must be connected to 24 VDC smoothed.

- **Application : medium to large installations**



- Sensors Electromechanical switches, proximity switches and photoelectric barriers
- Actuators Relays, lamps, large valves and large contactors with consumption up to 2 A
- For modules PCD4.N2., PCD4.M1., PCD4.M4., PCD4.E1., E6., A2., A3., A4., A8., B9., PCD4.W1., W3., W4., W5., W6., W8., PCD4.H1., H2., H3., H4., PCD7.D1., D2..., PCA2.D12, D14

3.7.2 Grounding plan



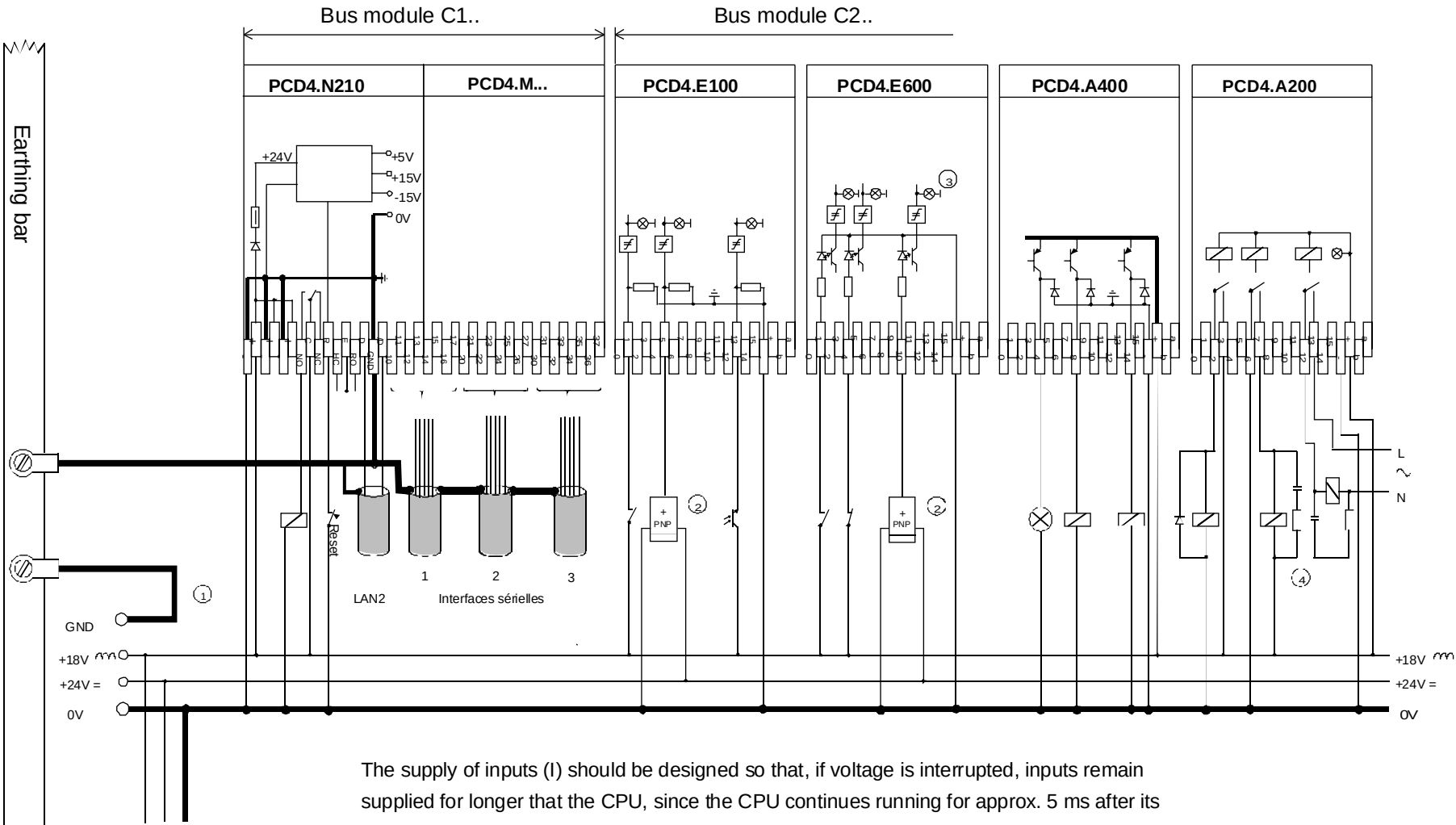
- 1) The bus module backplate forms the continuous protective ground (PGND) of the PCD4 system.
- 2) The stud bolt connects the protective ground to the bus module, which should be well connected to the earthing bar using the shortest possible length of 2.5 mm² wire.
- 3) The cover plates provide the earth connection between each bus module. It is important that the fastening screws are properly tightened: the lock washers ensure good contact.
- 4) It is also advisable to connect the mounting rails to the earthing bar. The negative terminal (–) should also be earthed.
- 5) Cable screening (RS 485 cables or those for ..H and ..W modules) should also be connected to the earthing bar.

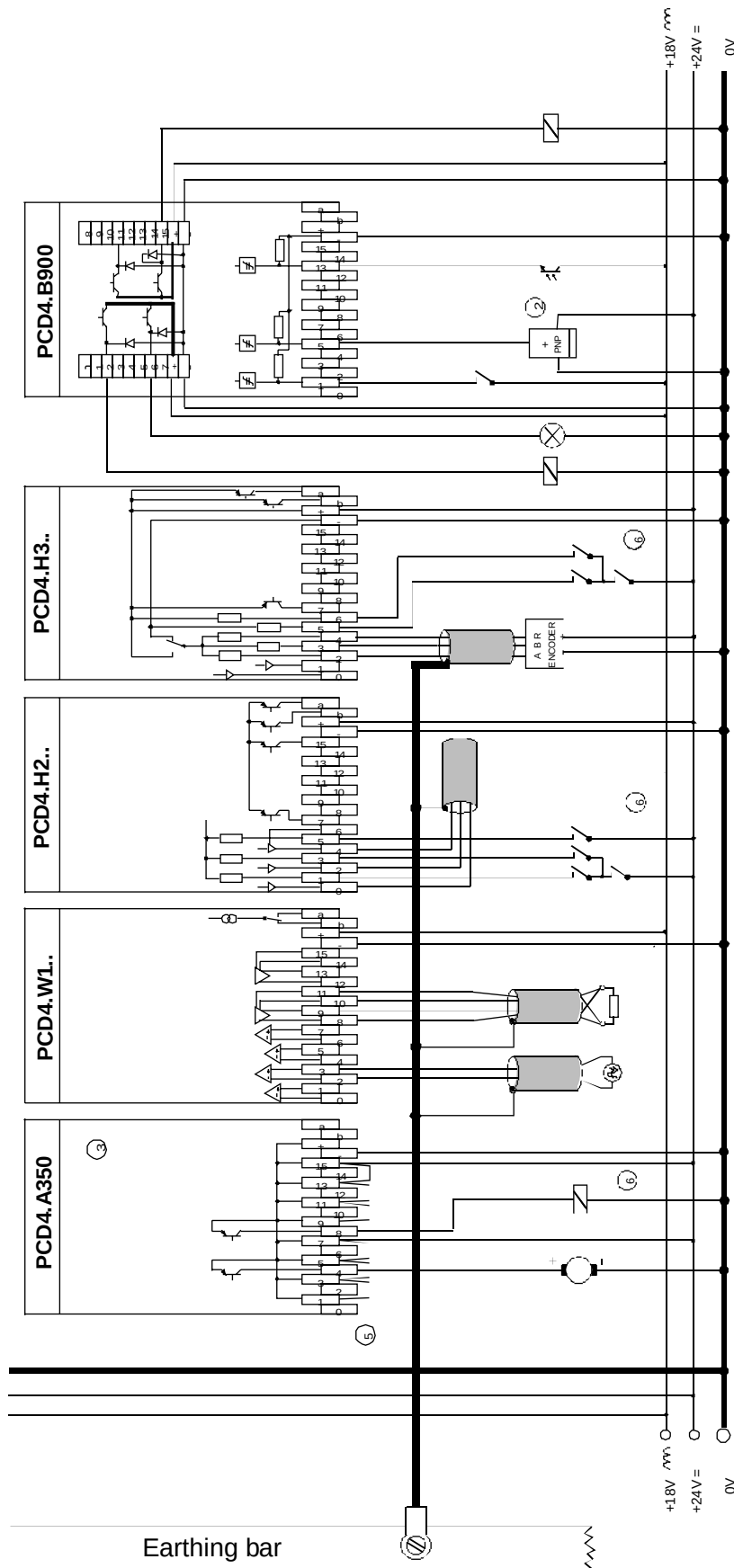


Importante note :

To function perfectly, every PCD4 system must absolutely be connected in accordance with the above grounding plan.

3.7.3 Connection plan





1) Use a power supply with 3-phase transformer and bridge rectifier allows all inputs and outputs to be supplied from the same source. In this case, the two lines "+18V rectified" and "+24V smoothed" can be viewed as a single shared line.

2) Regulated voltage is only necessary if required by the transmitting device. For example proximity switches demand narrower voltage tolerances and cannot generally cope with more than 10% ripple.

3) The galvanically isolated modules A350 and E600 can be supplied by separate circuits, as long as the potential difference to system ground does not exceed 50V.

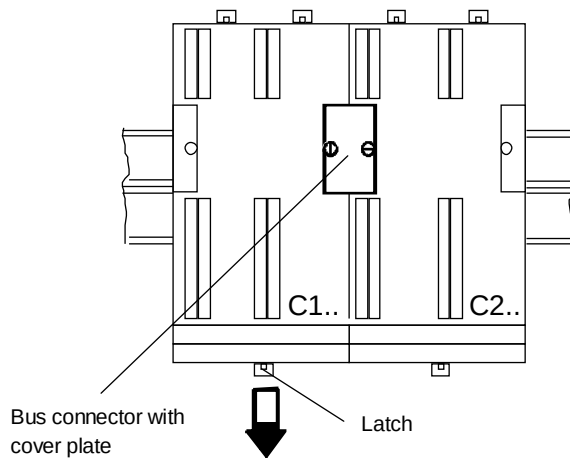
4) If relay modules are used, an external RC spark protection is recommended, particularly when switching inductive loads. Apart from avoiding undesired noise, this has the advantage of increasing the lifespan of the contacts. It is only permissible to connect either extralow voltages or low voltages to the same relay module (see instructions for installation in the detailed description of the A200 module).

5) The positive terminals on the A350 module should be connected together (despite the internal connection). This prevents the current on an individual PCB contact from exceeding 2A.

6) The entire 24 VDC supply can (especially for small systems) be provided by rectified direct current. However, smoothed direct current is required for electronically protected outputs (A350) as well as for input modules with a typical input delay of less than 6 ms (e.g., E101, B901, H120, H2..., H3..., PCA2.D12 and D14).

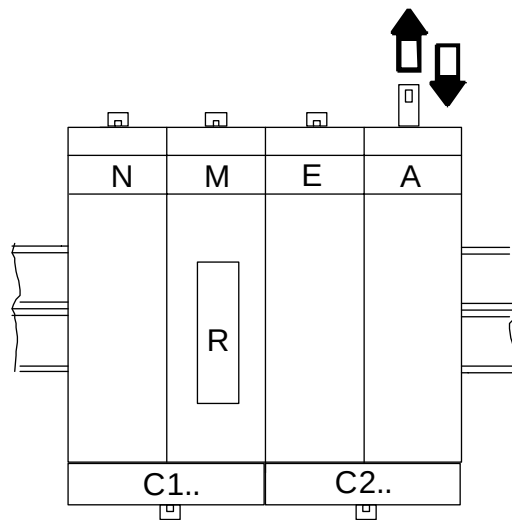
3.8 Quick guide to handling the PCD4

3.8.1 Bus module assembly



- 1) Snap the bus module PCD4.C1x0 or ..C340 onto the DIN double mounting rail (by pulling the lower latch down).
- 2) Then snap a PCD4.C220 or ..C260 bus module to the right of it.
- 3) Supplied with the ..C2x0 you will find :
  - the bus connector
  - the bus connector cover plate
 Insert the bus connector and push home at each end, and firmly tighten both screws on the cover plate (ground connection)

• Inserting plug-in modules



- 4) To plug in the modules :
  - pull the top latch upwards as far as it will go
  - push then module in all the way
  - push the latch down again

The following modules can be used :

- position N : PCD4. N200
(supply) PCD4. N210
- position M : PCD4. M110
(processor) PCD4. M125/M145
PCD4. M445

with on

- position R : PCD7. R210/R220
(memory) PCD7. R310

(Caution : take care that the jumper is **not** in position WR)

or

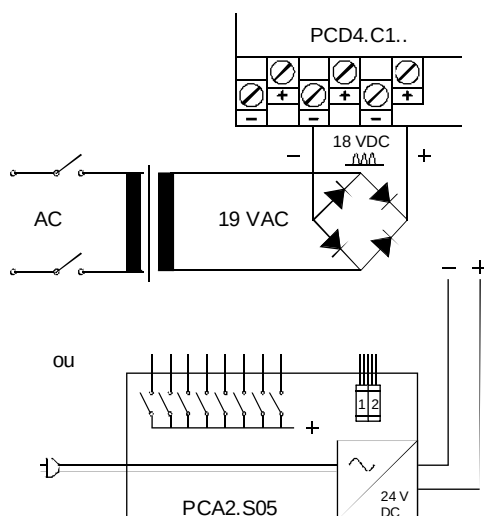
- position M : PCD4.Mx70

with on

- position R : PCD7.R400
- position E : PCD4. E110/E11x
(inputs) PCD4. E600/E601
PCD4. B900/B901

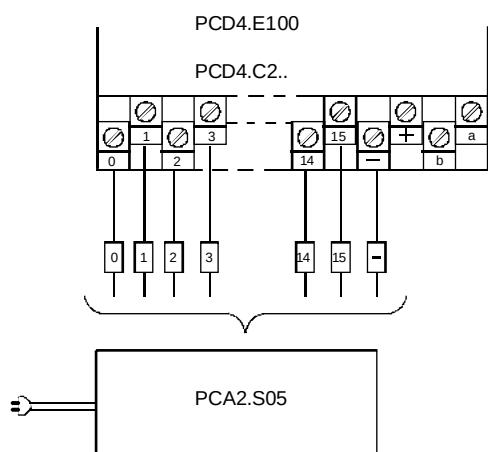
- position A : PCD4. A200/A250
(outputs) PCD4. A350
PCD4. A400

- **Connection of power supply**



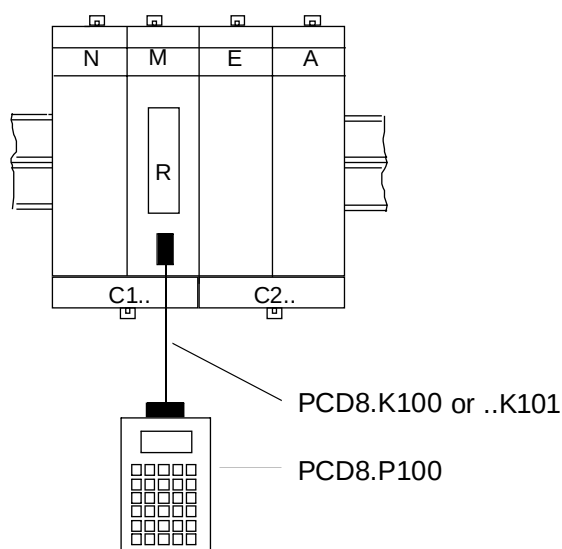
- 5) Connect 24 VDC smoothed or 18 VDC full wave rectified to terminals + and -. For small-scale requirements, 24 VDC at 0.5 A is adequate. An easy way to do this is to use the PCA2.S05 input simulator (no longer available), which not only provides 16 input switches but also offers 24 VDC.

- **Connection of inputs**



- 6) The PCA2.S05 applies +24 VDC to inputs 0 to 15 via the switches. This can also be obtained from an external power source.

- **Connection of PCD8.P100 programming unit**



- 7) Use cable PCD8.K101 to connect the PCD8.P100 programming unit to the PGU interface.
(or the former ..K100 cable).

3.8.2 Entering a lamp flasher program

• C P ENTER ALT
Y

• W P 0 ENTER

(0) COB		SP	0	ENTER
		SP	0	ENTER
STH	SP SP	I	SP 3	ENTER
ANL	SP SP	T	SP 9	ENTER
LD	SP SP	T	SP 9	ENTER
			SP 5	ENTER
COM	SP SP	O	SP 16	ENTER
ECOB				ENTER

• Cold start and RUN

HOME ALT
E C ENTER Y
R ENTER

• Program

```
COB 0 ; Start of Cyclic
      0 ; Organization Block 0
-----
STH I 3 ; If input 3 high
ANL T 9 ; and timer 9 timed out
LD T 9 ; then timer 9 starts
      5 ; again with 0.5 sec
COM 0 16 ; and toggles output 16
-----
ECOB ; End of Cyclic
      ; Organization Block
```

8) Switch on 24 VDC. After completion of the power up tests, the P100 indicates status "STOP". All processor LEDs are off.

9) As a precaution, user memory should be cleared before entering the program. This is done with the "Clear Program and texts" command, by pressing the keys shown.

10) Type : "Write", "Programm",
<address> 0, "ENTER".

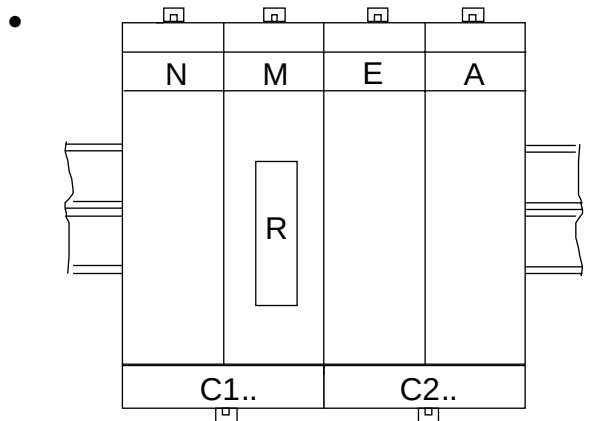
11) The program can now be entered starting from address 0.
Incorrect entries can be deleted by pressing "ALT" and "DEL" simultaneously ("ALT+DEL").

Note : The P100 always indicates both Timers "T" and Counters "C" with a "C"..

12) Next, a cold start must be done, then the PLC can be put into "RUN".

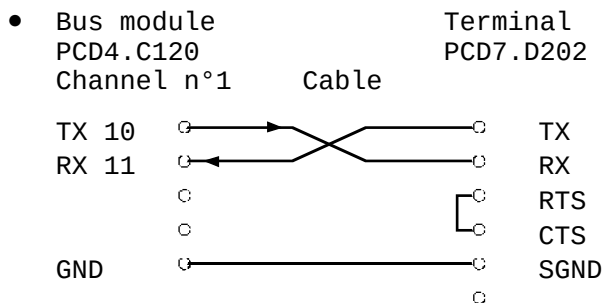
13) The "RUN" LED on the processor module goes on : the program is now running. If input 3 is switched on, output 16 will flash at the rate 0.5 sec on and 0.5 sec off.

3.8.3 Outputting texts to the PCD7.202 terminal via the RS 232 serial interface



- 14) The following modules must be present for channel 1 to be used as an RS 232 interface :

- bus module PCD4.C120 or ..C340 with interface PCD7.F120
- processor module PCD4.M125/ M145/M445 or PCD4.Mx70 series
- output module PCD4.A400



- 15) Make up the cable for connecting the PCD4 and the terminal in MC0 mode (no control lines needed).

Do not forget the RTS-CTS jumper on the PCD7.D202

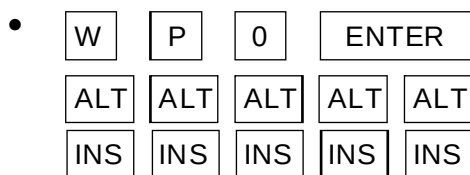
or use the cable PCD7.K422

-

- 16) Provide a 24 VDC supply to the terminal.



- 17) To enter the additional program, put the CPU into "STOP". The "RUN" LED on the processor module should go out.



- 18) Entering the text output program on the P100.

By simultaneously depressing the "ALT" and "INS" keys ("ALT+INS") we first insert five blank lines before the COB, in which we enter the code shown to initialize the interface (channel 1 is initialized from the definition in TEXT 100).

```
X0B 16
SASI 1 ; assign channel 1
      100 ; from text 100
EX0B
```

-  , , , 14 ECOB

```

STH 0 16 ; if 0 16 High
DYN F 0
ANK 0 30 ; and XBSY Low
CFB H 2 ; output text
ECOB ; from PB 2

```

```

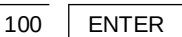
PB      2 ; Program Block 2
STXT    1 ; output to channel 1
        1 ; the text number 1
EPB

```

- 19) Use the down arrow key to step down to line 14, and overwrite line 14 and subsequent lines with the program shown.

Note : After instructions such as STH or ANL, the P100 always shows "I" (Input), even if an Output "O" is being referenced.

Text number 1, containing the date and time, should be output to the D100's display every second (synchronized with the flashing lamp).

-  24 ●
  100  ○
○
○
○
○
30 ● XBSY
31 ○

UART:9600,8,E,1;MODE
:MC0;DIAG:Q24.R100

- 20) Now enter the serial interface definition text using : "Write" "teXt" "100"

U → To enter the underlined characters (red alphabetic keys) the "ALT" key must be pressed simultaneously.

Note : If O24 is entered after "DIAG:", 8 diagnostic flags (in this case, outputs) are actually used. In our example, only O30 is referenced as the "text bus flag" XBSY.



Save TEXT 100 by pressing "ALT+ENTER" simultaneously.

-  

- 21) The original "Write teXt 100" command is re-displayed.

Now write TEXT 1 by pressing "1" then "ENTER".

- ```

<12>   HAVE A NICE DAY
<13><10> WITH YOUR
PCD4<13><19> $D<10>
$H<26>

```

22) Enter TEXT 1 to produce this display :

|                 |          |
|-----------------|----------|
| HAVE A NICE DAY |          |
| WITH YOUR PCD4  |          |
| 91-07-26        | (TIME)   |
| (Date)          | 17:30:42 |

- ALT

ENTER

23) Save TEXT 1 with "ALT+ENTER".

- HOME

E

C

ENTER

ALT

Y

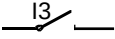
24) After entering program and text, another cold start must be done to reset the PLC.

- HOME

R

ENTER

25) Select "RUN" from main menu.

- 

O 16 blinks  
and text is  
output

26) Closing switch I3 not only makes output LED O16 flash, but also outputs the text every second (it may be necessary to correct the time with the "Write clock" command).  
Output O30 is turned on briefly every second, while the text is output (this is the "text busy flag" XBSY).

**Notes :**

## 4. The earlier processor modules of the PCD4 series

---

A range of different processor modules are available for the PCD4, so that the optimal solution for performance and price can be offered for every application.

The processors can be divided into 4 groups which are briefly described below :

**The M110 series** has 1 processor (10 MHz) and, apart from serial interface 0 for the programming unit (always present) has no other serial interface.

**The M1x5 series** has 1 processor (16 MHz) and, apart from serial interface 0 for the programming unit (always present) has 1 or 3 additional serial interfaces.

**The M445 series** has 2 independent processors (multi-processor system, 16 MHz) and an additional PROFIBUS-FMS coprocessor. This series has, apart from the serial programming interface always provided, 3 additional independent serial interfaces. The PROFIBUS-FMS connection takes place via an additional connector on the front panel of the module.

**A new Mx70 series** based on the technology of the PCD2.M170 (25 MHz) is treated in the chapter 5 of this manual.

Remarks about CPU's from the preceding generation (10 MHz) :

The M1.. series including the processor modules PCD4.M120 and M140 has been replaced by the M1x5 series.

The M2.. series including the processor module PCD4.M240 has been replaced by the M445 series.

The M3.. series including the processor module PCD4.M340 (coprocessor for SAIA<sup>®</sup> LAN2) has not been replaced (phased out module).

The M4.. series including the processor module PCD4.M440 has been replaced by the M445 series.

## 4.1 Points common to all processor modules

---

### 4.1.1 General

**The entire instruction set** of the PCD range is available to all processor types. Therefore, every processor allows bit and word processing, integer and floating point calculation and PID control in BLOC TEC, GRAF TEC or as a flow chart. If serial interfaces are present, all communications possibilities can also be used.

All PROFIBUS-FMS functions can be handled with the M445 processor.

Other features are the programmable diagnostics using up to 32 system interrupts (XOBs), and test instructions which can be incorporated into all user programs.

A summary of the combinations of bus and processor modules is found in section 4.4 at the end of this chapter.

### 4.1.2 Shared characteristics

|                                                                                                                                                                   |                                     |                                                                                                          |                                                     |       |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------|-------|------------------|
|                                                                                                                                                                   | Microprocessor                      | M110/M1x5                                                                                                | 32-bit $\mu$ P                                      | 68000 | 10, resp. 16 MHz |
|                                                                                                                                                                   |                                     | M445                                                                                                     | 32-bit $\mu$ P                                      | 68340 | 16 MHz           |
|                                                                                                                                                                   | Number of instructions              | More than 100, with four different addressing modes.                                                     |                                                     |       |                  |
|                                                                                                                                                                   | Processing time                     | Bit processing :                                                                                         |                                                     |       |                  |
|                                                                                                                                                                   | PCD4.M110                           | e. g. : ANH F 0 = 6...10 $\mu$ s <sup>*)</sup>                                                           |                                                     |       |                  |
|                                                                                                                                                                   |                                     | Word processing :                                                                                        |                                                     |       |                  |
|                                                                                                                                                                   |                                     | e. g. : ADD R 0 } = 35...60 $\mu$ s <sup>*)</sup>                                                        |                                                     |       |                  |
|                                                                                                                                                                   |                                     | R 1                                                                                                      |                                                     |       |                  |
|                                                                                                                                                                   |                                     | R 2                                                                                                      |                                                     |       |                  |
|                                                                                                                                                                   | Processing time                     | Bit processing :                                                                                         |                                                     |       |                  |
|                                                                                                                                                                   | PCD4.M1x5/M445                      | e. g. : ANH F 0 = 3.6...6 $\mu$ s <sup>*)</sup>                                                          |                                                     |       |                  |
|                                                                                                                                                                   |                                     | Word processing :                                                                                        |                                                     |       |                  |
|                                                                                                                                                                   |                                     | e. g. : ADD R 0 } = 20...40 $\mu$ s <sup>*)</sup>                                                        |                                                     |       |                  |
|                                                                                                                                                                   |                                     | R 1                                                                                                      |                                                     |       |                  |
|                                                                                                                                                                   |                                     | R 2                                                                                                      |                                                     |       |                  |
|                                                                                                                                                                   |                                     | *) Processing time is affected by the number of active serial interfaces and the speed of data exchange. |                                                     |       |                  |
| per system                                                                                                                                                        | {                                   | Number of I/Os                                                                                           | 512                                                 |       |                  |
| {                                                                                                                                                                 |                                     | Cyclic Organization Blocks (COB)                                                                         | 16                                                  |       |                  |
|                                                                                                                                                                   |                                     | Index registers                                                                                          | 17 x 13 bit<br>(1 for each COB and 1 for all XOB's) |       |                  |
|                                                                                                                                                                   | Exception Organization Blocks (XOB) | Up to 32                                                                                                 |                                                     |       |                  |
|                                                                                                                                                                   | Program Blocks (PB) <sup>1)</sup>   | 300                                                                                                      |                                                     |       |                  |
|                                                                                                                                                                   | Function Blocks (FB) <sup>1)</sup>  | 1000, with run-time parameters                                                                           |                                                     |       |                  |
|                                                                                                                                                                   | Sequential Blocks (SB)              | 32, for GRAFTEC programming with 2000 Steps and 2000 Transitions with up to 32 active parallel branches  |                                                     |       |                  |
| per CPU                                                                                                                                                           | {                                   | Texts (TX) and Data Blocks (DB)                                                                          | 8000; with up to 3 levels of sub-texts              |       |                  |
| All user memory (programs, texts, data blocks, flags, registers, counters, timers, etc...) and the hardware clock are located in the memory module PCD7.R1../R3.. |                                     |                                                                                                          |                                                     |       |                  |

1) PB and FB calls can be nested up to 7 levels, in any combination.

### 4.1.3 Operating states of the processor module

Every processor module can have the following operating states :

START, RUN, CONDITIONAL RUN, STOP, HALT and RESET.

Every processor has three LEDs on the front panel :

- RUN                      Yellow LED
- HALT                     Red LED
- ERROR                  Yellow LED

| <u>State</u>                         | <u>LED</u>                                    | <u>Meaning</u>                                                                                                                                                            |
|--------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| START                                | RUN on<br>HALT on<br>ERROR on                 | Self-check for approx. 1 sec when switched on, or after a "Restart". (Lamp check)                                                                                         |
| RUN                                  | RUN on<br>HALT off<br>ERROR off               | Normal processing of the user program after START, if no PG connected.                                                                                                    |
| COND. RUN                            | RUN flashing<br>HALT off<br>ERROR off         | Conditional RUN. A breakpoint has been set by the debugger (Run Until..) which is not yet satisfied.                                                                      |
| STOP                                 | RUN off<br>HALT off<br>ERROR off              | If the PCD is on and the PG connected and running the debugger, then the CPU has not yet been put into RUN, or was stopped by the PG. Or a breakpoint has been satisfied. |
| HALT                                 | RUN off<br>HALT on<br>ERROR off               | Serious error in user program, hardware error or HALT instruction processed, or no program loaded.                                                                        |
| RESET                                | RUN on<br>HALT on<br>ERROR on                 | The supply voltage is too low or there is an EXTERNAL RESET.                                                                                                              |
| RUN or<br>COND. RUN<br>despite ERROR | RUN on<br>or flashing<br>HALT off<br>ERROR on | A self-check interrupted during the processing of a program and the corresponding XOB is not programmed.                                                                  |



The jumpers "Enable", "Reset Output" and "Halt/Clear" on the PCD4.C1x0 or PCD4.C340 bus module, together with the two switches "Halt, Clear" on the front panel of the supply module PCD4.N2.., can influence the operating state of the processor, or else react to these operating states (e.g. in case of power loss all outputs are set low). The following chapters contain further information on this.

#### 4.1.4 "RESET OUTPUT" - "ENABLE" jumper

If a wire jumper joins the screw terminals RESET OUTPUT (RO) and ENABLE (E) on the supply bus module and the processors (PCD4.C1x0 or PCD4.C340), all outputs of the whole system are set low in case of a HALT or STOP of CPU 0.

This HALT or STOP can be triggered off by the RUN/HALT switch on the supply module PCD4.N210, by the debugger, by the HALT instruction, or as a result of a serious error in a user program.

Note : If this jumper is fitted and the processor is being run in "Trace" or "Run Until" mode at start-up, all outputs are set low after every program stop, which can be very misleading.

Important : If analogue modules of the PCD4.W3.. and W4.. series are being used, **operation in "Trace" mode with this jumper fitted is NOT allowed**, this can lead to incorrect output !

If no jumper is fitted between these terminals, the outputs retain their present state after a HALT or a STOP.

If a processor module with 2 CPUs is being used and CPU 0 goes into HALT, then CPU 1 also goes into HALT. However, if CPU 1 goes into HALT, CPU 0 is not affected and the outputs are not set low, even if the jumper is fitted.

#### 4.1.5 "HALT/CLEAR" - "ENABLE" jumper

If a supply module of the type PCD4.N210 is fitted (this one has one RUN/HALT switch and a CLEAR button on the front panel), both these switches can be made active by inserting a wire jumper between the HALT/CLEAR (HC) and ENABLE (E) screw terminals of the supply and processor bus module (PCD4.C1x0 or PCD4.C340).

If **the RUN/HALT switch** is in the HALT position, both processor modules immediately go into the **HALT state**. This switch has higher priority than the PG commands Run, Trace and Restart. The red "HALT" LED on the processor module is illuminated in the HALT state.

If **the RUN/HALT switch** is switched from HALT to RUN, both processors execute a **cold start**, i.e. the self-check is executed, all volatile elements are set low and the cold start user routine (XOB 16) is executed.

If **the CLEAR button** is pressed while the switch is being switched from the HALT to the RUN position, **all elements, with the exception of the registers, are set low or to zero** (also all non-volatile flags and counters). At all other times the CLEAR button has no effect.

#### 4.1.6 The "EXTERNAL RESET" function

If an 0 volt signal (Ground) is connected to screw terminal "R" (External Reset) of the supply and processor bus module, the processor immediately goes into RESET and all outputs are set low within a maximum of 2 ms, independently of the "Reset Output - Enable" jumper. Removal of the 0 volt signal gives a cold start.

To prevent the processor starting itself up again, this should be done in user software. (e.g. wait at the beginning of XOB 16 until an input is switched on).

This "Hardware Reset" has effects on the voltage monitoring of the power supply module, and works in the same way as the "Reset", if the supply voltage is too low.

#### 4.1.7 The firmware

The firmware (system program) is located on 2 EPROMs numbered "1" and "2" and carry indications of the firmware version number V... .

|                     | Processor module | EPROM   |             | Firmware version |           |
|---------------------|------------------|---------|-------------|------------------|-----------|
|                     |                  | type    | access time | EPROM "1"        | EPROM "2" |
|                     | PCD4.M110        | 27C512  | ≤ 120 ns    | V005/1           | V005/2    |
| CPU 0               | PCD4.M1x5        | 27C1001 | ≤ 100 ns    | V0E0/1           | V0E0/2    |
| CPU 1 <sup>*)</sup> | PCD4.M445        | 27C1001 | ≤ 100 ns    | V0E0/1           | V0E0/2    |

**\*) Caution !** Do not mixed the firmware CPU 0 and CPU 1, it is not the same.

Firmware is subject to upward compatible firmware changes.

#### 4.1.8 The PGU serial interface

This interface is a 9-pole D-type connector (female). The connector is located on the front panel of every processor module. During commissioning the PGU connector is used with the programming unit. Upon completion of the commissioning phase then the PGU connector can also be used for a general purpose interface as channel 0. (See chapter 3.3.1)

This interface is of the type RS 232.

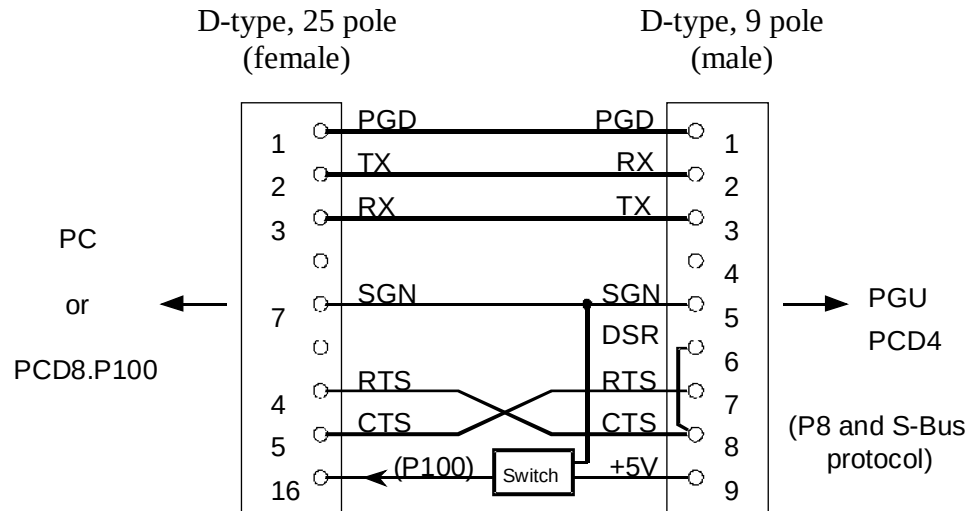
Pin assignment and data are as follows :

| Pin no. | Signal | Meaning           |
|---------|--------|-------------------|
| 3       | TX     | Transmit Data     |
| 2       | RX     | Receive Data      |
| 7       | RTS    | Request To Send   |
| 8       | CTS    | Clear To Send     |
| 5       | SGN    | Signal Ground     |
| 4       | NC     | Not Connected     |
| 6       | DSR    | PGU Connected     |
| 9       | +5V    | Supply P100       |
| 1       | PGD    | Protective Ground |

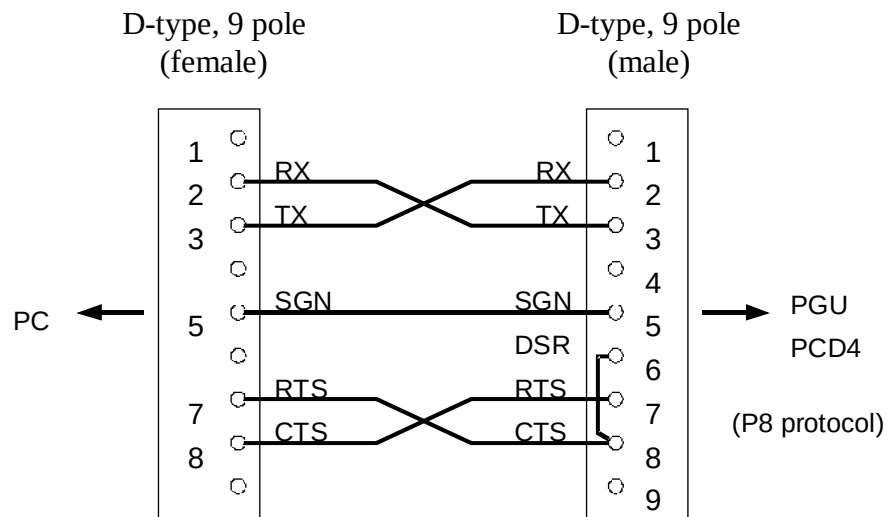
| <u>Signal type</u>         | <u>Logical state</u> | <u>Required Value</u> | <u>Nominal Value</u> |
|----------------------------|----------------------|-----------------------|----------------------|
| Data signal                | 0 (space)            | +3 V ... +15 V        | +7 V                 |
|                            | 1 (mark)             | -15 V ... -3 V        | -7 V                 |
| Control/<br>Message signal | 0 (off)              | -15 V ... -3 V        | -7 V                 |
|                            | 1 (on)               | +3 V ... +15 V        | +7 V                 |

The idle state for data signals is "mark", the idle state for control/message signals is "off".

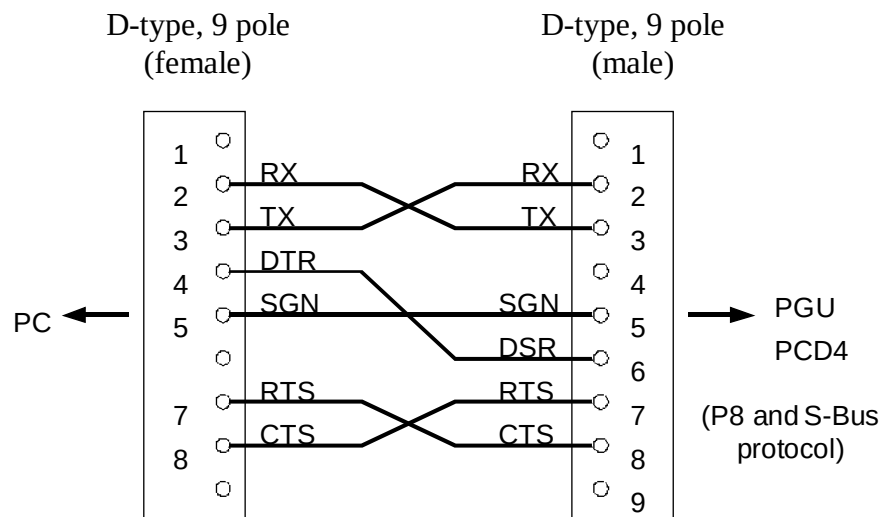
**PCD8.K101 connecting cable** (for P8 and S-Bus protocol)  
(as replacement for ..K100 which cannot be used for PCD1)



**PCD8.K110 connecting cable** (for P8 protocol)



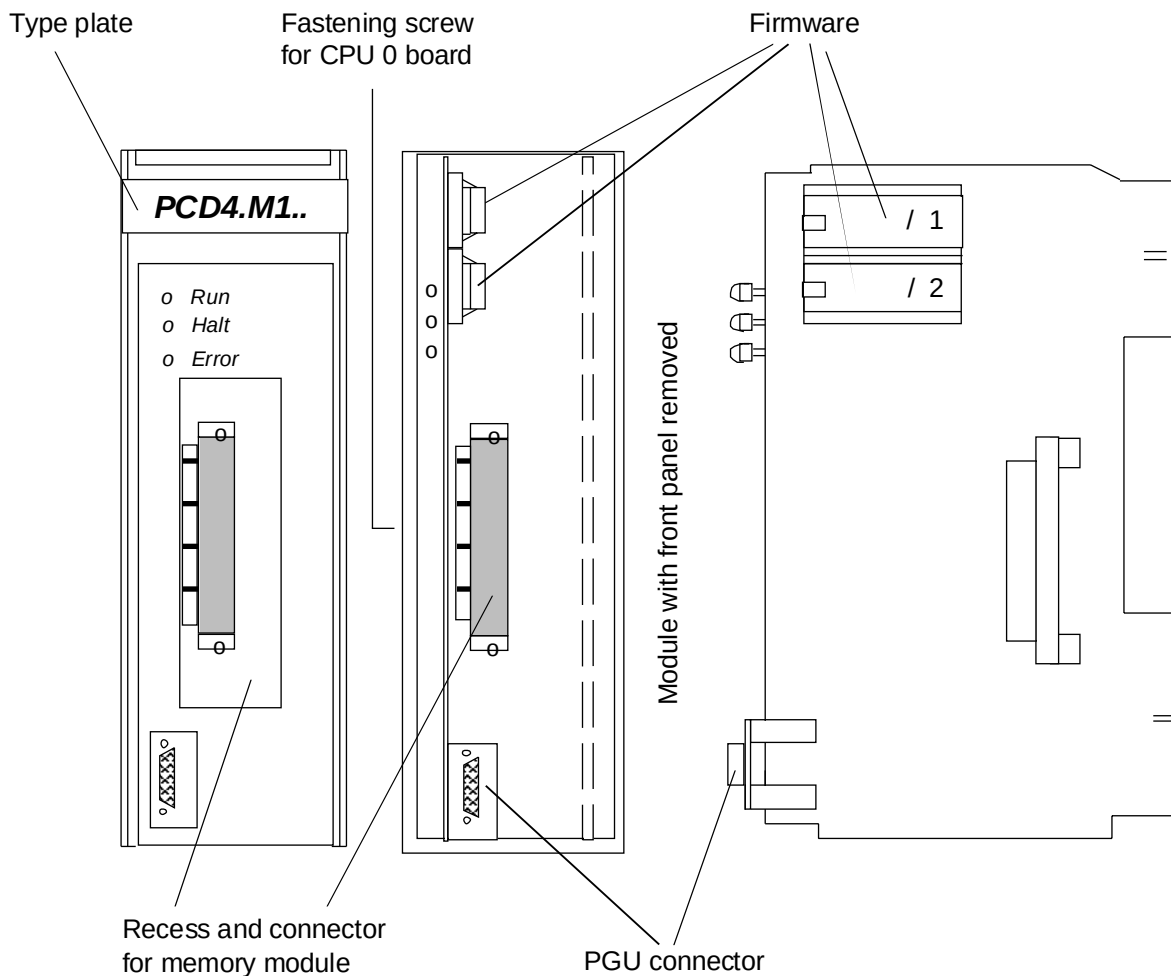
**PCD8.K111 connecting cable** (for P8 and S-Bus protocol)



## 4.2 The processor modules PCD4.M110 and PCD4.M1x5 with 1 processor

The M1.. series (PCD4.M110 and PCD4.M1x5) has 1 processor and, apart from the serial programming interface (always present), has either no additional serial interfaces, or 1 or 3 serial interfaces.

### 4.2.1 Front panel and board layout



To update the firmware, remove the processor module (cartridge) from the bus module, then remove the front panel from the processor module and unscrew and take out the board. Now both EPROMs can be easily changed. Re-assembly is done in the reverse order.

#### 4.2.2 Processor module PCD4.M110

This is the simplest processor module. Apart from the PGU interface, it has no other serial interfaces.

Recommended bus module : PCD4.C100

Internal power consumption (5 V bus) 600 mA

#### 4.2.3 Interfaces of processor module PCD4.M125

Apart from PGU interface no. 0, this processor module has one other interface (no. 1).

Recommended bus module :

- PCD4.C110 With this combination, interface no. 1 is of type 20 mA current loop (CL).  
For other protocols, bus module PCD4.C120 can be used for RS 232, or PCD4.C130 for RS 422/RS 425. It should be noted that in both these combinations two interfaces of each bus module remain unused.
- PCD4.C340 The interface no. 1 can be fitted with the required pluggable interfaces modules :
  - PCD7.F110 → RS 422 / RS 485
  - PCD7.F120 → RS 232 (modem possible)
  - PCD7.F130 → 20 mA current loop
  - PCD7.F150 → RS 485 electrically isolated

Internal power consumption (5 V bus) 740 mA

#### 4.2.4 Interfaces of processor module PCD4.M145

Apart from PGU interface no. 0, this processor module has three other interfaces, nos. 1, 2 and 3.

Recommended bus module : The types of serial interface are dependent on the bus module chosen.

- PCD4.C120 Bus module with 3 interfaces :
  - no. 1 → RS 232 (modem possible)
  - no. 2 → 20 mA current loop <sup>\*)</sup>
  - no. 3 → 20 mA current loop <sup>\*)</sup>
- PCD4.C130 Bus module with 3 interfaces :
  - no. 1 → RS 422 / RS 485 <sup>\*\*)</sup>
  - no. 2 → RS 422
  - no. 3 → RS 232
- PCD4.C340 The interfaces nos. 1, 2 and 3 can be fitted with the required pluggable interface modules :
  - PCD7.F110 → RS 422 / RS 485
  - PCD7.F120 → RS 232 (modem possible)
  - PCD7.F130 → 20 mA current loop
  - PCD7.F150 → RS 485 electrically isolated

Bus module PCD4.C120 or PCD4.C340 (equipped with the communication module PCD7.F120 plugged in on place CH1 only) should be chosen **for connecting the PCD4 to a modem**, as only interface no. 1 of type RS 232 has all the control lines necessary for the control of a modem.

Bus modules PCD4.C100 and PCD4.C110 can also be used with a PCD4.M145, but the processor module interfaces cannot be employed, or else only partially.

Internal power consumption (5 V bus) 740 mA

<sup>\*)</sup> max. baud rate limited to 9600 bps

<sup>\*\*)</sup>  in SASI modes MC4, and SM1, SS1 or SM0, SS0

**Notes :**



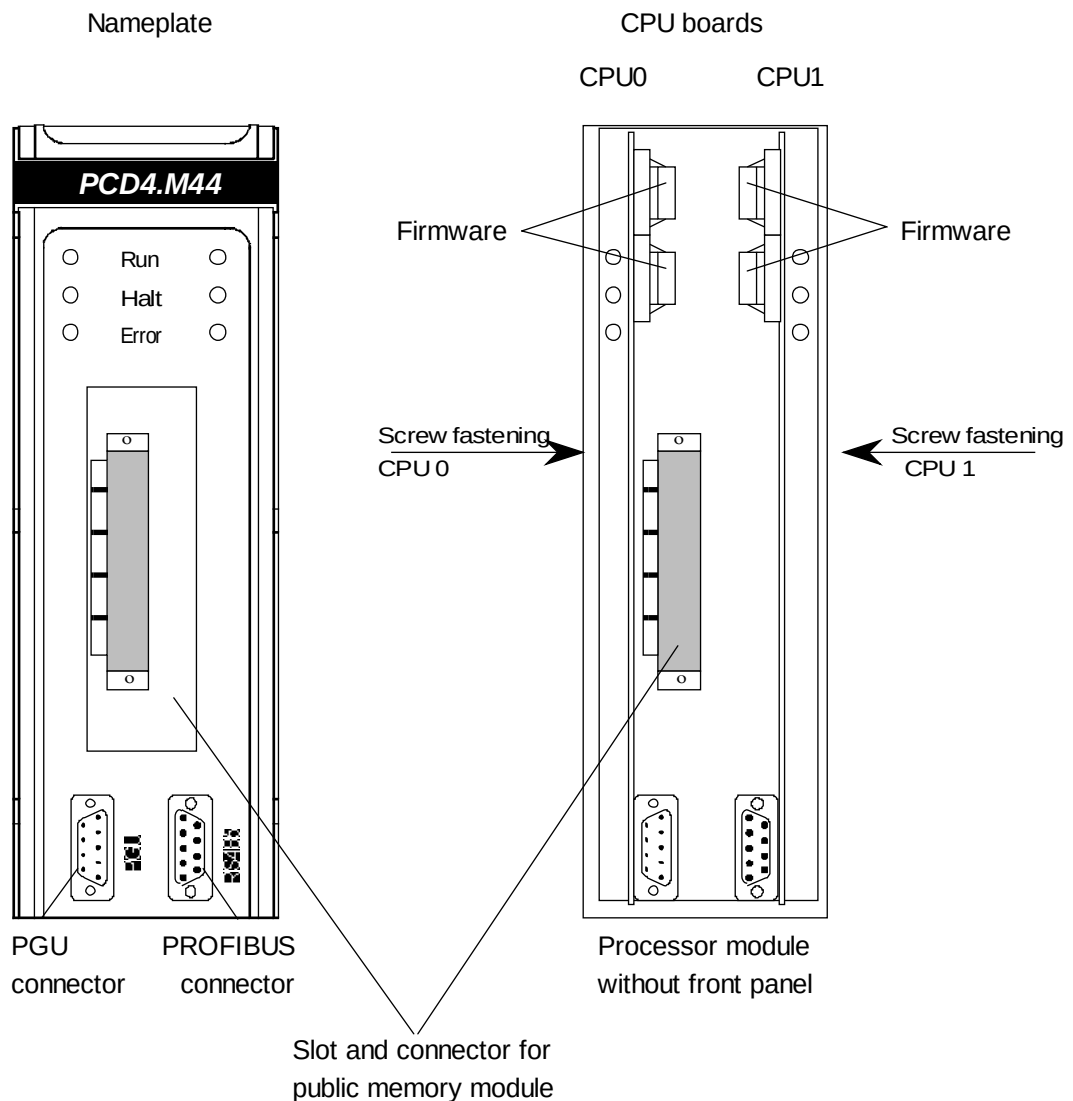
## 4.3 The processor module PCD4.M445 with 2 processors and an additional PROFIBUS-FMS co-processor

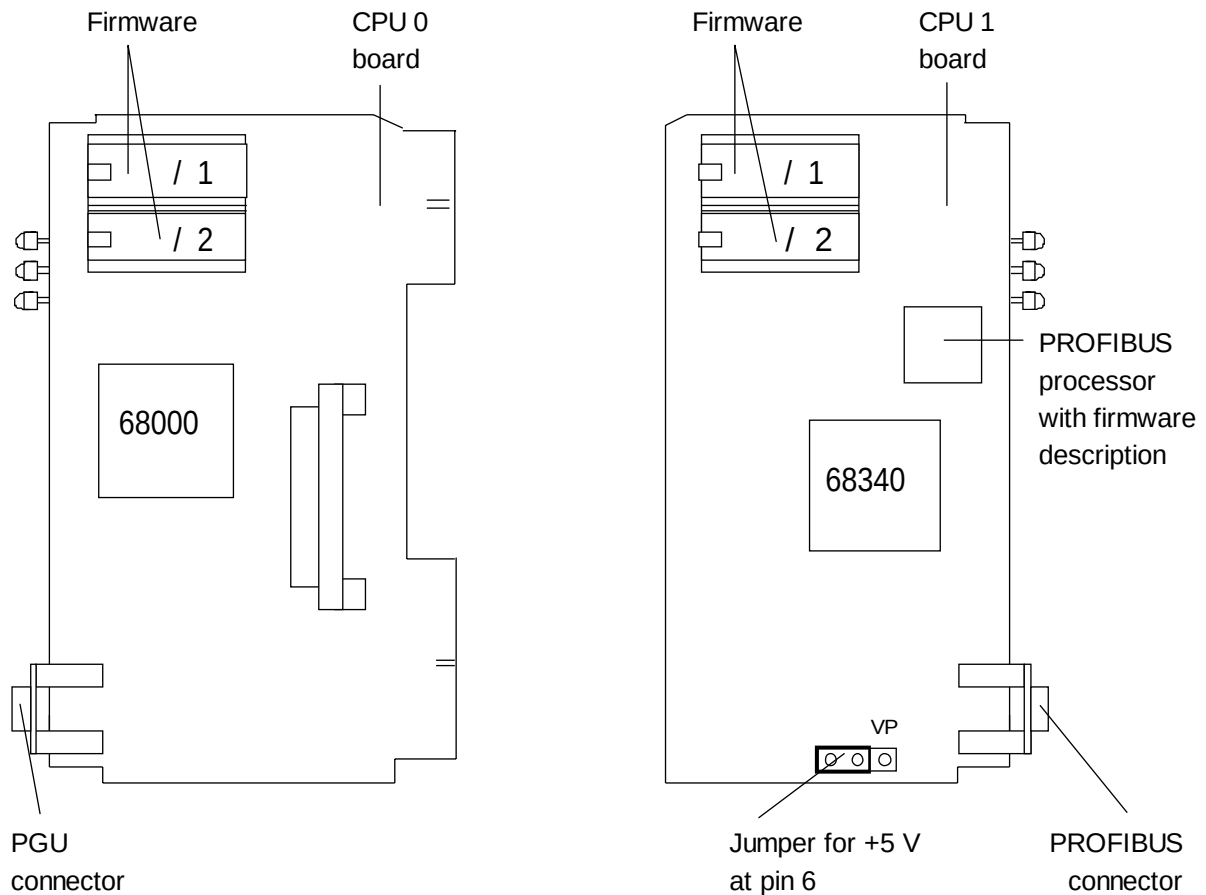
This processor module has 2 independent processors (genuine multiprocessor system).

In addition to the programming interface which is always there, it also has 3 additional serial interfaces which are also independent of each other.

The module has a further PROFIBUS-FMS co-processor, connected via a 9-pole D-type connector on the front panel.

### 4.3.1 Front panel and board layout

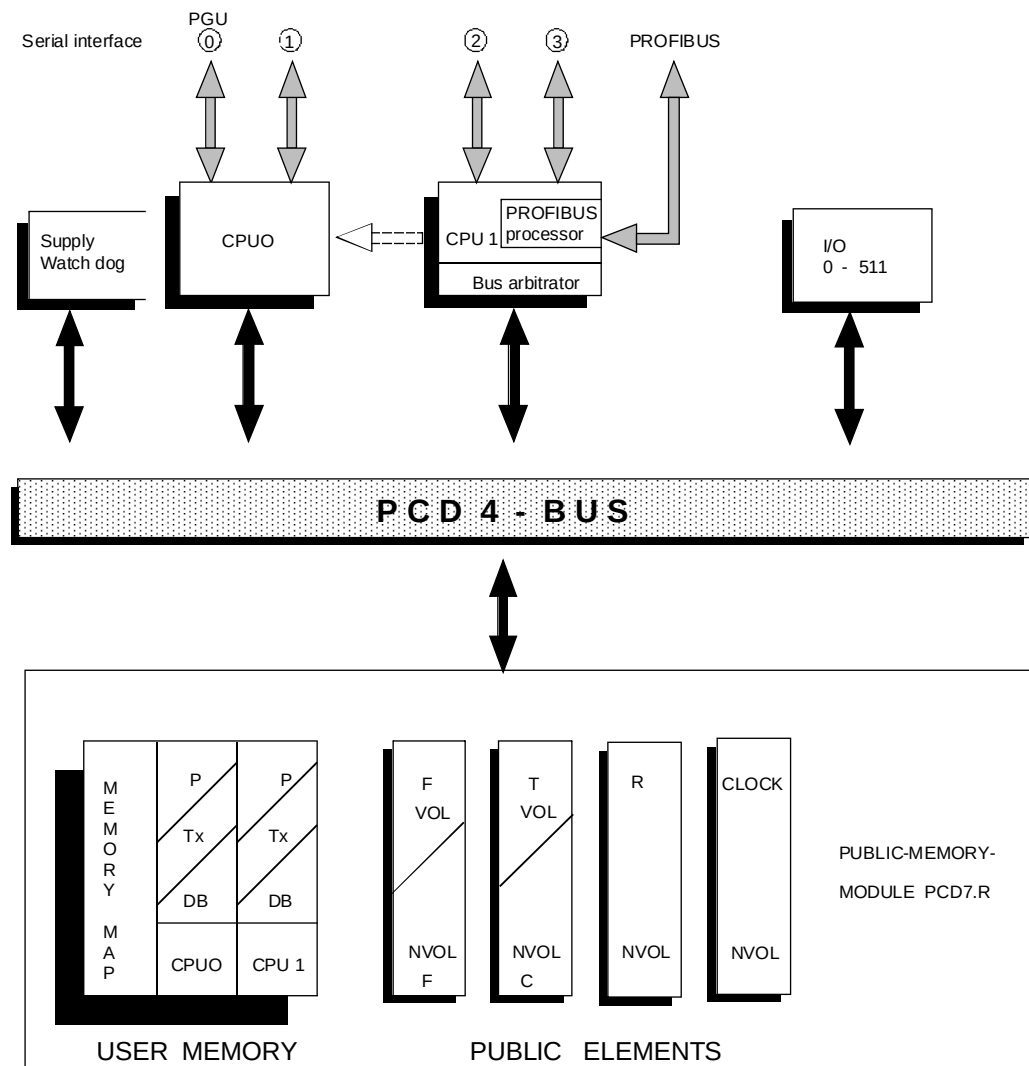




The three types of firmware for the CPU 0, CPU 1 and for the PROFIBUS-FMS co-processor must co-ordinate with each other. Therefore any firmware updates should only be carried out in the factory.

Internal power consumption (5 V bus)      1440 mA

### 4.3.2 Block diagram



Access to the serial interfaces :

- CPU 0 : no. 0 PGU and no. 1
- CPU 1 : no. 0 PGU and nos. 1, 2, 3



**Important :** The above-mentioned limitation regarding the access to the serial communication interfaces should be taken into account. In certain cases, user programs must be adapted.

The PROFIBUS-FMS co-processor is situated on the printed circuit board of CPU 1. Its interface is accessible at an additional 9-pole, D-type connector (female) on the front panel (like the PGU connector).

### 4.3.3 Serial interfaces of the PCD4.M445 processor module

This processor module has, apart from the PGU interface no. 0, three more interfaces numbered 1, 2 and 3. (The PROFIBUS-FMS interface is dealt with separately in the following section).

Recommended bus module : The types of serial interface are dependent on the bus module chosen.

- PCD4.C120 Bus module with 3 interfaces :
  - no. 1 → RS 232 (modem possible)
  - no. 2 → 20 mA current loop <sup>\*)</sup>
  - no. 3 → 20 mA current loop <sup>\*)</sup>
- PCD4.C130 Bus module with 3 interfaces :
  - no. 1 → RS 422 / RS 485 <sup>\*\*)</sup>
  - no. 2 → RS 422
  - no. 3 → RS 232
- PCD4.C340 The interfaces nos. 1, 2 and 3 can be fitted with the required pluggable interface modules :
  - PCD7.F110 → RS 422 / RS 485
  - PCD7.F120 → RS 232 (modem possible)
  - PCD7.F130 → 20 mA current loop
  - PCD7.F150 → RS 485 electrically isolated

Bus module PCD4.C120 or PCD4.C340 (equipped with the communication module PCD7.F120 plugged in on place CH1 only) should be chosen **for connecting the PCD4 to a modem**, as only interface no. 1 of type RS 232 has all the control lines necessary for the control of a modem.

Bus modules PCD4.C100 and PCD4.C110 can also be used with a PCD4.M445, but the processor module interfaces cannot be employed, or else only partially.

Internal power consumption (5 V bus) 1440 mA

<sup>\*)</sup> max. baud rate limited to 9600 bps

<sup>\*\*)</sup>  in SASI modes MC4, and SM1, SS1 or SM0, SS0

#### 4.3.4 The PROFIBUS-FMS interface



Technical data in brief :

- FMS protocol according to DIN 19245 parts 1 and 2
- Status : PROFIBUS-FMS master or slave
- Controller class 2 (extended)
- Transmission speeds : 9.6, 19.2, 38.4, 93.75, 187.5 or 500 kBit/sec
- Up to 127 addressable stations (divided by PCD7.T100 repeater into segments of 32 stations each)
- Up to 90 connections established simultaneously (channels 10 to 99) for synchronous or asynchronous communications

#### 4.3.5 PROFIBUS-FMS utilities and data types

- |                           |                                                                              |
|---------------------------|------------------------------------------------------------------------------|
| • Initiate                | Establish a connection                                                       |
| • Abort                   | Terminate a connection                                                       |
| • Reject                  | Rejection of a telegram                                                      |
| • Identify<br>(as server) | Identification of "Virtual Field Device"<br>(manufacturer, type and version) |
| • Status                  | Advise functional status of station                                          |
| • GET-OV<br>(as server)   | Advise object directory                                                      |
| • Read                    | Read/write contents of an object                                             |
| • Write                   | with the following data types :                                              |
|                           | - Boolean                                                                    |
|                           | - Integer 8 / 16 / 32 Bit                                                    |
|                           | - Unsigned 8 / 16 / 32 Bit                                                   |
|                           | - Octet string                                                               |
|                           | - Bit string                                                                 |
|                           | - Floating point                                                             |

#### 4.3.6 SAIA® PCD PROFIBUS configurator

The creation of a user program, i.e. the configuration of PROFIBUS in the PCD (SASI text), takes place with the SAIA® PCD PROFIBUS configurator (PCD8.C20E). This configuration tool runs under MSWINDOWS (see PROFIBUS-FMS manual order code 26/742 E).

The SAIA® PCD PROFIBUS configurator provides user-prompting for entry of all parameters required by PROFIBUS, also enabling them to be loaded into the processor and documented.

#### 4.3.7 PROFIBUS-FMS connection

The PROFIBUS-FMS is connected to the 9-pole, D-type connector (female), located on the front panel of the PCD4.M445 module.

The pin assignment is as follows :

| Pin number | PROFIBUS standard | SAIA | Signification                                     |
|------------|-------------------|------|---------------------------------------------------|
| 3          | RxD/TxD-P         | /D   | Receive/Transmit-Data-Positive                    |
| 8          | RxD/TxD-N         | D    | Receive/Transmit-Data-Negative                    |
| 5          | DGND              | SGND | Data reference potential<br>(Signal Ground)       |
| 1          | SHIELD            | PGND | Shield, Protective Ground                         |
| 6 *)       | VP                | +5 V | Supply voltage +5 V<br>(+5 V output, max. 100 mA) |

The other pins are not connected.

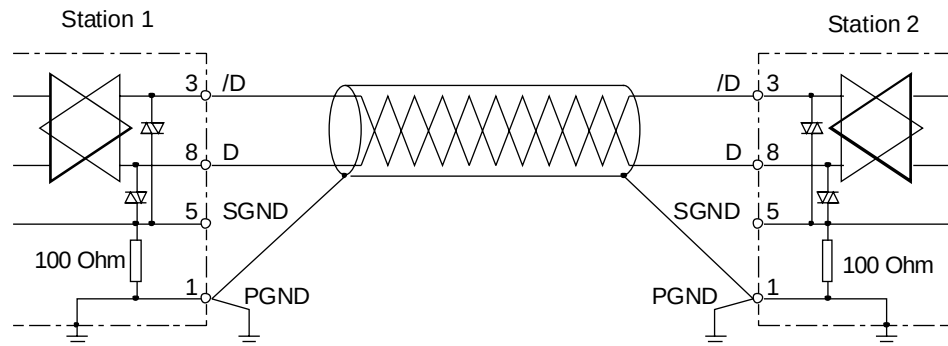
\*) Connectable with jumper. Factory setting : disconnected

The shielding must be connected to the metal case of the plug. The sleeve must be secured with an electrically conductive screw connection.

All connections of the PROFIBUS-FMS interface, with the exception of pin 1 (PGND), are electrically isolated from the rest of the module, whereby a 100  $\Omega$  resistor between SGND and PGND draws the electrically isolated circuit towards PGND (frame ground).

D and /D are protected against overvoltage peaks by built-in 10 V transient suppressor diodes.

### Connection, bus line routing and earthing plan



**Important :** The two signal lines "D" and "/D" must not be confused !

For the wiring diagram shown above, the potential difference between the data reference potentials SGND of all stations should not exceed  $\pm 7$  V.

#### Bus cable

For the bus cable, screened, twisted, 2-core cable should be used. The wave resistance should be in the range 100 to 130  $\Omega$  at  $f > 100$  kHz, the cable capacity should be  $< 100$  pF/m and the core section should be at least  $0.22 \text{ mm}^2$  (AWG 24). Maximum signal loss allowed is 6 dB.

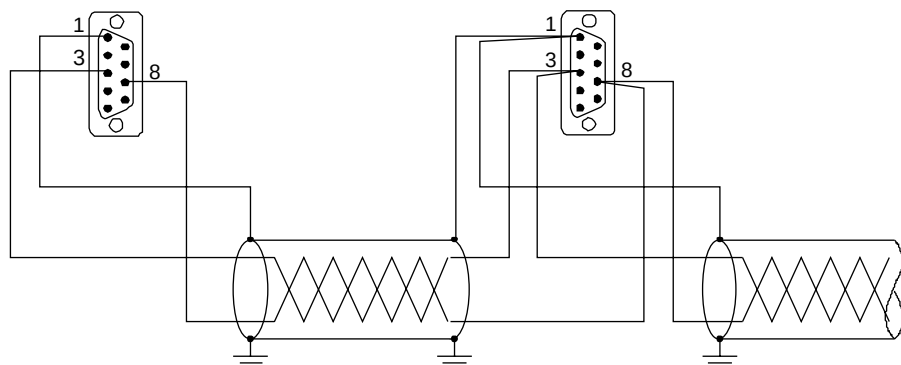
Recommended, proven types of bus cable :

#### Manufacturer :

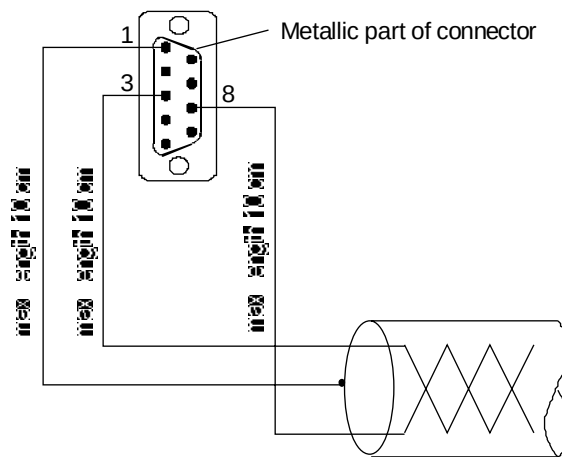
- Volland AG
- CABLOSWISS
- Kromberg & Schubert

#### Cable type :

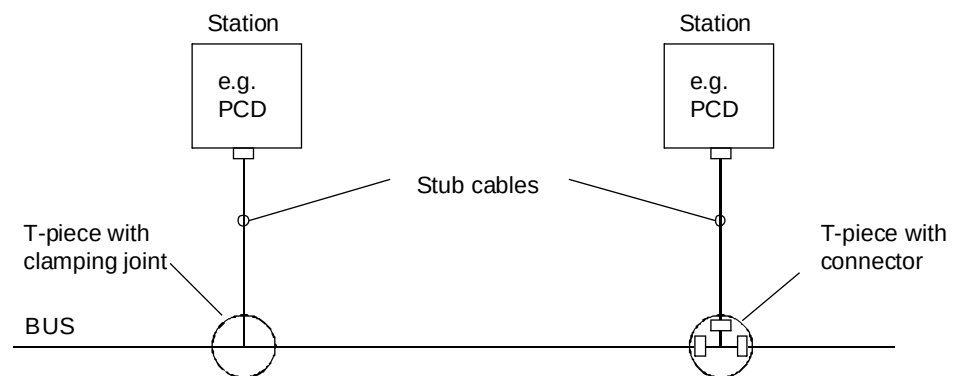
UNITRONIC-BUS  
1 x 2 x AWG24  
371'502



Care should be taken to ensure that the bus line still remains continuously connected when one or more plugs are removed.



The unshielded part of the cable at any connector, and from the shield alone to pin 1, should not exceed 10 cm.



In the case of a wiring plan using stub cables, care should be taken to ensure that the shielded stub cables are no longer than 100 cm for a transmission speed up to 19.2 kBit/s, and no longer than 30 cm for 500 kBit/s.



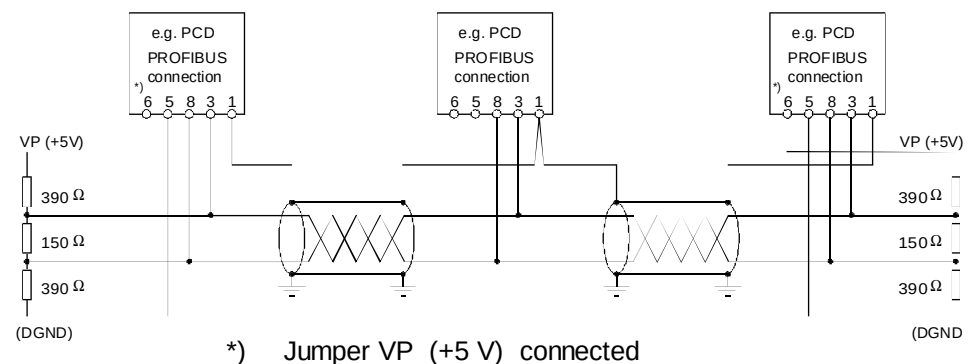
### Line termination

To suppress interference and avoid reflections, the bus must be correctly terminated at both ends.

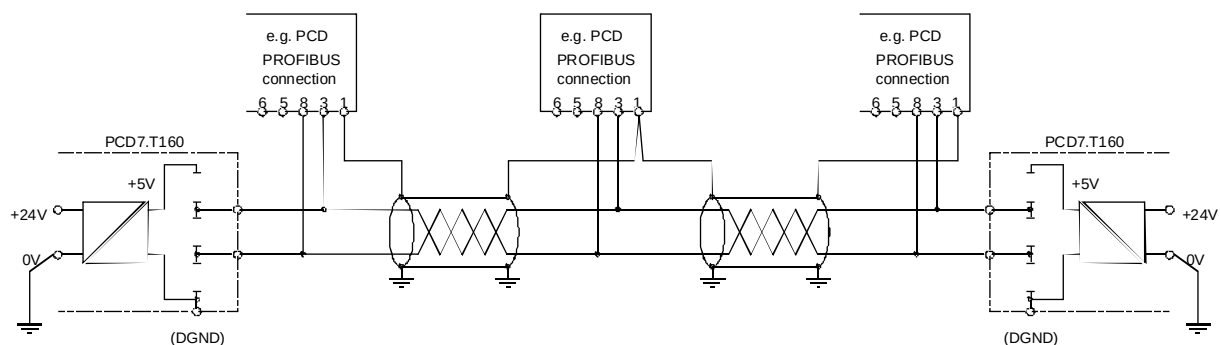
**Important :** The termination networks must be applied to each bus, even if initial trials show that they would also work without them.



### General solution with external resistors :



The PCD7.T160 termination boxes should be used to terminate the bus cleanly :



Further information on the correct installation of PROFIBUS can be obtained from the manual "Installation components for RS-485 networks", order number 26/740 E.

For more detailed information, please consult the manual :

**"PROFIBUS-FMS with SAIA® PCD"**

Order reference : PUBLI-26/742 E.

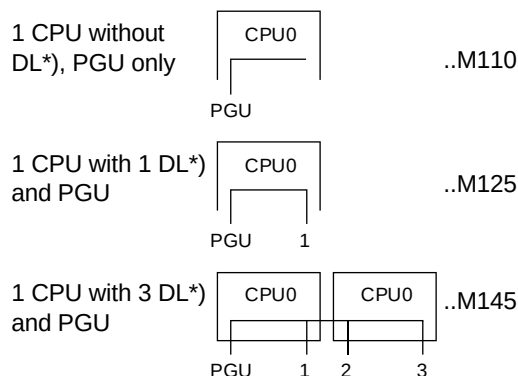
#### 4.4 Summary of bus and processor module combinations

The following table shows diagrams of the various processor modules and their valid combinations with bus modules.

**PCD4.M.. processor modules.**

Each has one RS232 connector for the programming unit (PGU) or for another peripheral

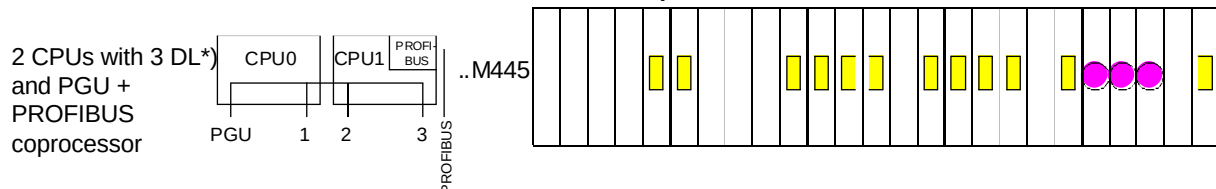
### Processor modules with 1 CPU



### Bus modules PCD4.C1.. with their serial interfaces

[illegible]

### Processor module with 2 CPUs and 1 PROFIBUS-FMS coprocessor



Notes on the serial interfaces:

-  = serial interfaces (data lines) which can be used.
-  = Each space can be filled with a plug-in interface module PCD7.F110, F120, F130 or F150 in any required combination.
- The PGU connector is located on the front of each processing module as a 9-pin D-type connector (female).
- The PROFIBUS-FMS connection is also on the front of the module.
- The remaining serial interfaces connections are via the bus module screw terminals.
- All serial interfaces can be individually assigned as desired by the user program.

\*) DL = Data Line

## 5 CPU options

### Differentiation of base units

|                                                                      |  |  |  |  |  |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                                                      | PCD4.M110                                                                         | PCD4.M125                                                                         | PCD4.M145                                                                         | PCD4.M445                                                                           | PCD4.M170                                                                           |
| Number of inputs/outputs or I/O module sockets                       | 510 <sup>1)</sup><br>32                                                           | 510 <sup>1)</sup><br>32                                                           | 510 <sup>1)</sup><br>32                                                           | 510 <sup>1)</sup><br>32                                                             | 510 <sup>1)</sup><br>32                                                             |
| Number of CPUs                                                       | 1                                                                                 | 1                                                                                 | 1                                                                                 | 2                                                                                   | 1                                                                                   |
| Processing time                                                      | 6 µs<br>35 µs                                                                     | 4 µs<br>20 µs                                                                     | 4 µs<br>20 µs                                                                     | 4 µs<br>20 µs                                                                       | 2 µs<br>10 µs                                                                       |
| Serial data ports<br>PGU, sockets on bus or processor modules        | 1 (PGU)<br>RS 232                                                                 | 1 + 1<br>RS 232, RS 422,<br>RS 485, TTY/<br>current loop 20 mA                    | 1 + 3<br>RS 232, RS 422,<br>RS 485, TTY/<br>current loop 20 mA                    | 1 + 3<br>RS 232, RS 422,<br>RS 485, TTY/<br>current loop 20 mA                      | 1 + 3 + 2<br>RS 232, RS 422,<br>RS 485, TTY/<br>current loop 20 mA                  |
| Field bus connections                                                | SAIA®S-Bus                                                                        | SAIA®S-Bus                                                                        | SAIA®S-Bus                                                                        | SAIA®S-Bus<br>PROFIBUS FMS                                                          | SAIA®S-Bus<br>PROFIBUS FMS<br>PROFIBUS DP                                           |
| Network connections                                                  | no                                                                                | no                                                                                | no                                                                                | no                                                                                  | Ethernet-TCP/IP                                                                     |
| User memory<br>RAM standard equipment<br>Expansion with RAM or EPROM | 0...172 KBytes <sup>2)</sup><br>up to 428 KBytes <sup>2)</sup>                    | 0...172 KBytes <sup>2)</sup><br>up to 428 KBytes <sup>2)</sup>                    | 0...172 KBytes <sup>2)</sup><br>up to 428 KBytes <sup>2)</sup>                    | 0...172 KBytes <sup>2)</sup><br>up to 428 KBytes <sup>2)</sup>                      | 1024 KBytes<br>1024 KBytes [..R400]                                                 |
| Date-time                                                            | yes                                                                               | yes                                                                               | yes                                                                               | yes                                                                                 | yes                                                                                 |
| Data protection and power reserve for real-time clock                | >2 month<br>(battery)                                                             | >2 month<br>(battery)                                                             | >2 month<br>(battery)                                                             | >2 month<br>(battery)                                                               | 1–3 years with<br>lithium battery                                                   |
| Interrupt inputs or fast counter inputs                              | no<br>–                                                                           | no<br>–                                                                           | no<br>–                                                                           | no<br>–                                                                             | 2<br>1 kHz                                                                          |

<sup>1)</sup> With 32 x PCD4.B900 modules an I/O capacity of 512 I plus 512 O is achieved.

<sup>2)</sup> Via central memory module with memory modules plugged on.

1) With 32xPCD4.B900 modules an I/O capacity of 512 inputs plus 512 outputs is achieved.

2) Via central memory module with memory modules plugged on..



## Contents

---

|        |                                                             |        |
|--------|-------------------------------------------------------------|--------|
| 5.1    | PCD4.M170 controller                                        | 5.1-3  |
| 5.1.1  | Performance characteristics                                 | 5.1-3  |
| 5.1.2  | PCD4.M170 block diagram                                     | 5.1-5  |
| 5.1.3  | Pin configuration                                           | 5.1-6  |
| 5.1.4  | Stromversorgung, Watch Dog, Reset....                       | 5.1-8  |
| 5.1.5  | Battery                                                     | 5.1-9  |
| 5.1.6  | Processor module operating states                           | 5.1-11 |
| 5.1.7  | User memory for program, text and data blocks               | 5.1-14 |
| 5.1.8  | PCD7.R400 flash card, 1 MByte                               | 5.1-15 |
| 5.1.9  | EEPROM configuration memory                                 | 5.1-20 |
| 5.1.10 | PGU connector for attaching programming units               | 5.1-21 |
| 5.1.11 | PGU connector as RS232 communications port                  | 5.1-22 |
| 5.1.12 | Interrupt inputs                                            | 5.1-23 |
| 5.1.13 | Firmware update                                             | 5.1-25 |
| 5.2    | Communications possibilities with PCD4.M170                 | 5.1-27 |
| 5.2.1  | General                                                     | 5.1-27 |
| 5.2.2  | Sockets for communications cassette modules                 | 5.1-27 |
| 5.2.3  | Serial interfaces RS 232, RS 422 und RS 485                 | 5.1-29 |
| 5.2.4  | Field bus connections                                       | 5.1-30 |
| 5.2.5  | Network connections                                         | 5.1-31 |
| 5.2.6  | Connection diagrams for RS 232-, RS 422- and RS 485-modules | 5.1-33 |
| 5.2.7  | Connection diagrams for field bus modules                   | 5.1-39 |



5.1 PCD4.M170 controller

5.1.1 Performance characteristics



|                     |                                      |                                                                                                                                                                                                                                                      |
|---------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power supply module | CPU-module                           | Bus modules with terminals                                                                                                                                                                                                                           |
| <b>PCD4.N210</b>    | <b>PCD4.M170</b>                     | The PCD4 bus, formed by the bus modules, extends through the whole system. This bus provides the data path between all system components and is used by the processors and all add-on I/O modules. The internal power is also supplied via this bus. |
|                     | with PCD7.R400 1024 KByte flash card |                                                                                                                                                                                                                                                      |

The PCD4 series is an extremely flexible system. From the minimum system with the simplest processor, one serial interface, a power supply module and 2 I/O modules, through to the fully equipped system with up to 32 I/O and function modules, processor module ..M170, up to 6 independent serial interfaces or SAIA®S-Bus, PROFIBUS FMS/DP or Ethernet-TCP/IP network connections. The system can be assembled in one go, or expanded in stages.

All modules are in the form of equal sized cassettes. Cassette modules are plugged into the appropriate bus modules. The bus modules are in turn snapped onto 35mm mounting rails according to DIN/EN 50022 and connected together to form the system bus. Connections to the external process are wired to the bus modules, which means that cassette modules can be inserted or removed without affecting the wiring.

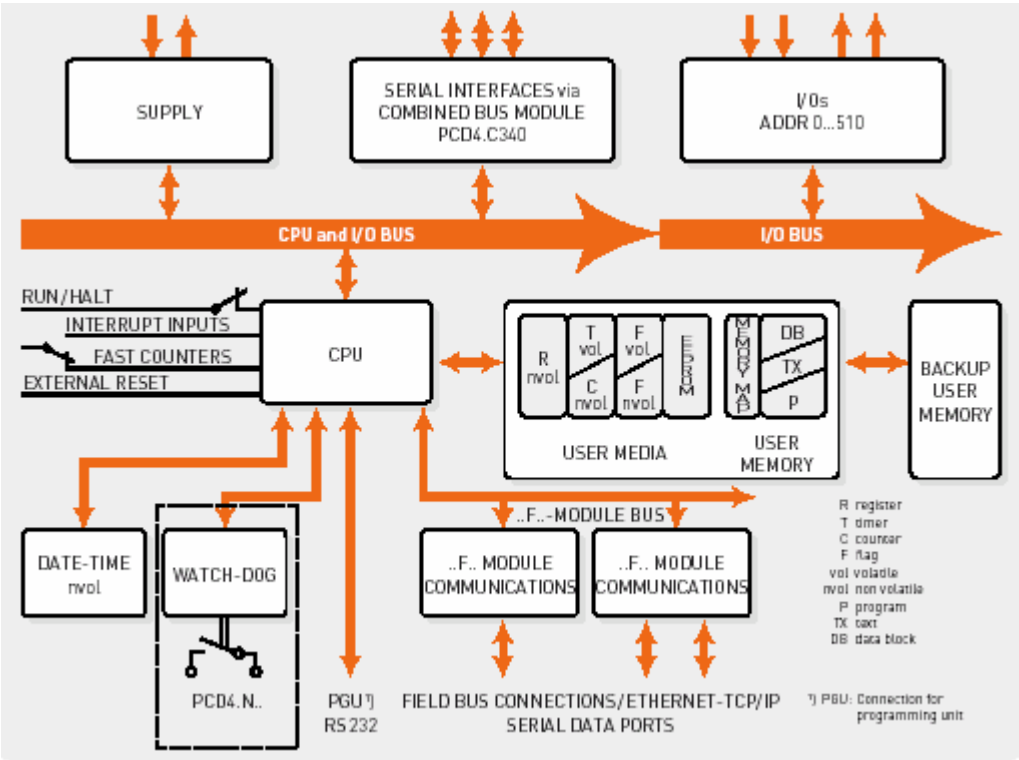
## Functions

| Function                         | PCD4.M170                                |
|----------------------------------|------------------------------------------|
| Firmware                         | on SMD - flash                           |
| I/O modules                      | All PCD4 I/O modules can be used         |
| Bus modules                      | All PCD4.C... can be used                |
| PGU / serial port # 0            | RS232c                                   |
| Serial Port # 1, 2, 3            | Can be configured for bus module         |
| Serial Port # 4 & 5              | Socket B2                                |
| Network modules                  | Sockets B1 / B2                          |
| Processor                        | 68340 @ 25 MHz                           |
| Processing times <sup>1)</sup> : | Performance:                             |
| - Bit processing                 |                                          |
| STH F 0                          | 1.87 µs                                  |
| SET O 0                          | 3.00 µs                                  |
| NOP                              | 4.70 µs (artificially lengthened)        |
| - Word processing                |                                          |
| CMP R 0, R 1                     | 7.62 µs                                  |
| MUL R 0, R 1, R 2                | 11.58 µs                                 |
| FMUL R 0, R 1, R 2               | 14.71 µs                                 |
| User memory:                     |                                          |
| - RAM standard equipment         | 1024 KByte user memory                   |
| - Extended memory                | PCD7.R400 (1024 KByte flash card memory) |
| Programming tools:               | P100 from version \$3.01                 |
|                                  | PG5 from version 1.0                     |
| FB and Fbox compatibility        | yes                                      |

1) From internal RAM, without S-Bus

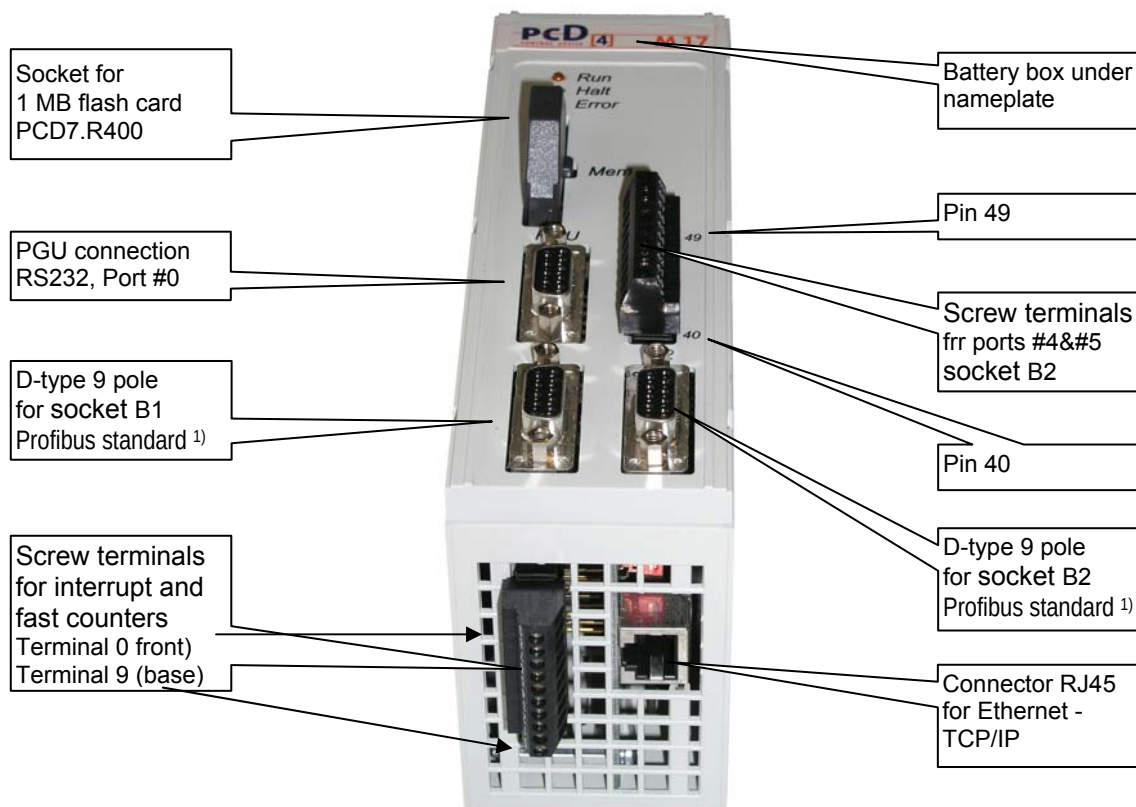


5.1.2 PCD4.M170 block diagram



|      |             |     |           |                     |
|------|-------------|-----|-----------|---------------------|
| P =  | program     | R = | registers | date-time (clock)   |
| TX = | text        | T = | timers    |                     |
| DB = | data blocks | C = | counters  | vol = volatile      |
|      |             | F = | flags     | nvol = non volatile |

### 5.1.3 Pin configuration



1) The pin configuration of these two D-Sub connectors (9 pole female) complies with the PROFIBUS standard. The two D-type connectors should preferably be used for PROFIBUS networks. Further serial ports should, if possible, be connected to the 10-pole plug in screw terminals.



**Caution:** Removal of the cover exposes components to contact that are sensitive to electrostatic discharges.

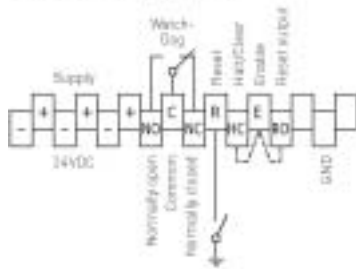
When the supply is connected, no manipulations should be carried out (such as changing jumper positions or inserting/removing I/O modules, etc.).



Batteries can be changed while the supply is connected, without loss of data and in all operating modes. The battery box is located beneath the nameplate (see also PCD4.M170, Changing batteries).

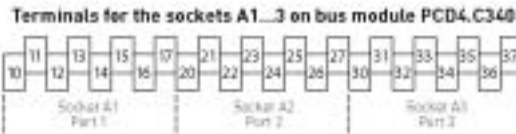
## Pin configuration ports #0 to Port #5

**Supply and watch-dog**  
Terminals on bus module  
PCD4.C100 and PCD4.C340



| Serial data ports via sockets A1...3 on bus module PCD4.C340 |                     |                     |                     |                        |                            |
|--------------------------------------------------------------|---------------------|---------------------|---------------------|------------------------|----------------------------|
| Port #1...3                                                  |                     |                     |                     |                        |                            |
| Terminal                                                     | RS 422<br>PCD7.F110 | RS 485<br>PCD7.F110 | RS 232<br>PCD7.F120 | TTY/20 mA<br>PCD7.F130 | RS 485 [galv]<br>PCD7.F150 |
| x0                                                           | Tx                  | D                   | Tx                  | TS                     | D                          |
| x1                                                           | /Tx                 | /D                  | Rx                  | RS                     | /D                         |
| x2                                                           | Rx                  |                     | RTS                 | TA                     |                            |
| x3                                                           | /Rx                 |                     | CTS                 | RA                     |                            |
| x4                                                           | RTS                 |                     | DTR <sup>1)</sup>   | TC                     |                            |
| x5                                                           | /RTS                |                     | DSR <sup>1)</sup>   | RC                     |                            |
| x6                                                           | CTS                 |                     | RSV <sup>1)</sup>   | TG                     | SGND                       |
| x7                                                           | /CTS                |                     | DCD <sup>1)</sup>   | RG                     |                            |
| GND                                                          |                     | GND                 |                     |                        |                            |

<sup>1)</sup> These signals can only be used if the interface module PCD7.F120 is plugged into socket no. 1



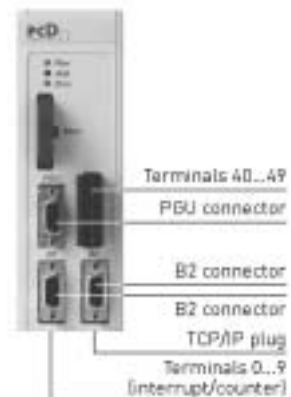
| PGU/RS 232<br>Port #0 |      |
|-----------------------|------|
| PGU<br>RS 232         |      |
| 1                     | PGND |
| 2                     | RXD  |
| 3                     | TXD  |
| 4                     | -    |
| 5                     | GND  |
| 6                     | DSR  |
| 7                     | RTS  |
| 8                     | CTS  |
| 9                     | +5V  |

| Serial data ports, socket B2: screw terminal blocks on PCD4.M170 |                     |                            |                     |                                |                        |                          |
|------------------------------------------------------------------|---------------------|----------------------------|---------------------|--------------------------------|------------------------|--------------------------|
| Port #4 and Port #5                                              |                     |                            |                     |                                |                        |                          |
| Port #                                                           | Terminal<br>40...49 | RS 485/RS 232<br>PCD2.F520 | RS 485<br>PCD7.F772 | RS 422 and RS 232<br>PCD2.F520 | 2x RS 232<br>PCD2.F522 | RS 232 full<br>PCD2.F522 |
| 4                                                                | 40                  | PGND                       | PGND                | PGND                           | PGND                   | PGND                     |
|                                                                  | 41                  | TXD                        | RX - TX             | TXD                            | TXD                    | TXD                      |
|                                                                  | 42                  | RXD                        | /RX - /TX           | RXD                            | RXD                    | RXD                      |
|                                                                  | 43                  | RTS                        | -                   | RTS                            | RTS                    | RTS                      |
| 5                                                                | 44                  | CTS                        | -                   | CTS                            | CTS                    | CTS                      |
|                                                                  | 45                  | PGND                       | -                   | PGND                           | PGND                   | PGND                     |
|                                                                  | 46                  | RX - TX                    | -                   | TX                             | TXD                    | DTR                      |
|                                                                  | 47                  | /RX - /TX                  | -                   | /TX                            | RXD                    | DSR                      |
|                                                                  | 48                  | -                          | -                   | RX                             | RTS                    | -                        |
|                                                                  | 49                  | -                          | -                   | /RX                            | CTS                    | DCD                      |

| Serial data ports, sockets B1 and B2:<br>9-pole, D-type connector, on PCD4.M170, Port #4 and Port #5 |                                   |                                   |                                   |                        |
|------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|------------------------|
| D-Sub<br>B1 and B2                                                                                   | RS 422<br>PCD2.F520 <sup>1)</sup> | RS 485<br>PCD2.F520 <sup>1)</sup> | RS 232<br>PCD2.F522 <sup>1)</sup> | PROFIBUS<br>Port #8/#9 |
| 1                                                                                                    | PGND                              | PGND                              | PGND                              | PGND                   |
| 2                                                                                                    | -                                 | -                                 | -                                 | -                      |
| 3                                                                                                    | /TX                               | /RX - /TX                         | RxD                               | RxD/TxD-P              |
| 4                                                                                                    | -                                 | -                                 | -                                 | CNTR-P/RTS             |
| 5                                                                                                    | RX                                | -                                 | RTS                               | GND                    |
| 6                                                                                                    | /RX                               | -                                 | CTS                               | +5V                    |
| 7                                                                                                    | -                                 | -                                 | -                                 | -                      |
| 8                                                                                                    | TX                                | RX - TX                           | TxD                               | RxD/TxD-N              |
| 9                                                                                                    | -                                 | -                                 | -                                 | -                      |

<sup>1)</sup> Only in socket B2 and Port #5

| Interrupt<br>and/or counter |       |
|-----------------------------|-------|
| Terminal<br>0...9           |       |
| 0                           | IN A1 |
| 1                           | IN B1 |
| 2                           | IN A2 |
| 3                           | IN B2 |
| 4                           | OUT 1 |
| 5                           | OUT 2 |
| 6                           | +     |
| 7                           | -     |
| 8                           | PGND  |
| 9                           | PGND  |



### PROFIBUS DP/FMS on PCD4.M170

Connection of socket B2 can be achieved either via screw terminal block or via the 9-pole, D-type connector. Details see relevant documentation.

### Ethernet-TCP/IP on PCD4.M170

Connection via RJ45 plug, category 5

#### **5.1.4 Power supply, Watch Dog, Reset....**

**Power supply and plan connection**, see chapter 3.7

**Power supply modules**, see chapter 7

**Watch Dog**, see chapter 7.2

**Reset....**, see chapter 4.1.n

### 5.1.5 Battery

The PCD is equipped with a standard, non-rechargeable 3.0 V lithium battery

- Type: CR 2032 (IEC)

A battery is enclosed with each new PCD and must be inserted before commissioning. SAIA only recommends the use of types with a capacity of min. 200 mAh, e.g.:

- RENATA order reference 4'507'4817'0

The battery supports the following functions during a power failure:

- RAM memory for F / C / R / history data
- RAM memory for P / TX / DB
- Real-time clock

How long the battery can safeguard stored data depends largely on the power needs of RAM memory. If the calculation is based on extreme values, total buffer duration (when the PCD is isolated from the supply) is 1 to 3 years. The batteries spontaneously discharge at an annual rate of approx. 5%. These values relate to an ambient temperature of 25°C.

The above figures are reduced at ambient temperatures higher than 25°C.

The Battery LED comes on and XOB 2 is called whenever battery power is lower than 2.3V or higher than 3.5 V

- the battery is flat
- the battery has an interruption
- the battery is missing

### Battery replacement

In any operating mode the battery can be changed without difficulty and without loss of data, as long as power remains connected to the PCD.

## Battery replacement

In any operating mode the battery can be changed without difficulty and without loss of data, as long as power remains connected to the PCD.

Since the CPU is additionally equipped with a SuperCAP, the PCD4.M170 can also be briefly disconnected from the supply (for up to 1 h) while the battery is changed.



Lithium battery, positive pole (+) downward.

1. Remove cover.
2. Take out the old battery with the help of an isolated tool (pair of tweezers).
3. Push the new lithium battery with its positive pole (+) downward into the battery box
4. Mount the cover

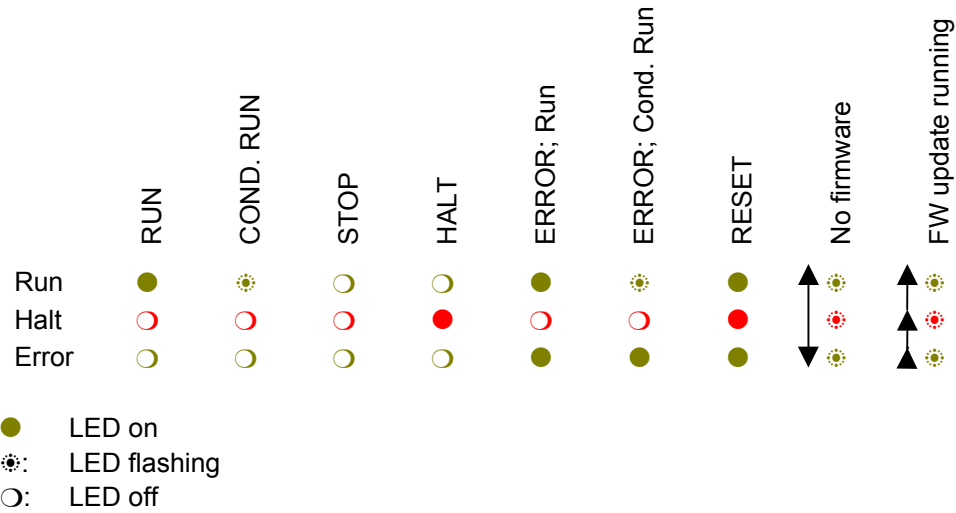
5.1.6 Processor module operating states

Possible operating states

The processor can have the following operating states:

RUN, COND. RUN, STOP, HALT, RESET and ERROR.

3 LEDs indicate these states:    RUN            yellow LED  
                                         HALT            red LED  
                                         ERROR        yellow LED

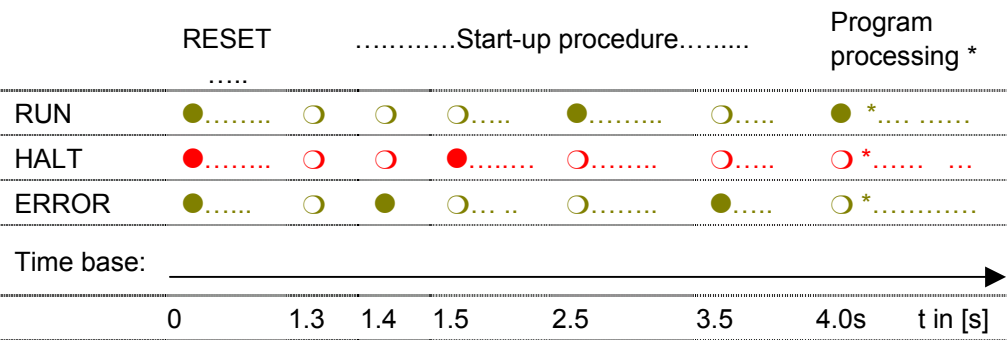


|                           |                                                                                                                                                                                                                                                                                             |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RUN</b>                | Normal processing of the user program.                                                                                                                                                                                                                                                      |
| <b>COND. RUN</b>          | Conditional RUN mode. The condition of a breakpoint set with the PG has not yet been satisfied.                                                                                                                                                                                             |
| <b>STOP</b>               | <p>The following circumstances will set the operating state to STOP:</p> <ul style="list-style-type: none"> <li>▪ PG connected and in debug mode when CPU is switched on</li> <li>▪ PCD stopped by the PG</li> <li>▪ a COND. RUN breakpoint has been satisfied</li> </ul>                   |
| <b>HALT</b>               | <p>The following circumstances will set the operating state to HALT:</p> <ul style="list-style-type: none"> <li>▪ RUN/HALT switch active and in HALT position</li> <li>▪ HALT instruction processed</li> <li>▪ Unrecoverable error in the user program</li> <li>▪ Hardware error</li> </ul> |
| <b>ERROR</b>              | Internal diagnostics have detected an error during processing of the program (RUN or COND. RUN). However, the corresponding error handling XOB has not been programmed.                                                                                                                     |
| <b>RESET</b>              | <p>The following are causes of a RESET state:</p> <ul style="list-style-type: none"> <li>▪ Self-diagnosis during power-up (for approx. 1s)</li> <li>▪ Supply voltage is too low.</li> </ul>                                                                                                 |
| <b>No firmware</b>        | <p>↑ The system has no runnable firmware available. New firmware must be loaded with the PG5 tool: FW Update (LEDs flash in up/down sequence)</p> <p>↓</p>                                                                                                                                  |
| <b>FW update running:</b> | <p>↑ Firmware is being loaded. The controller must not be switched off while new firmware is being loaded. (LEDs flash from bottom to top)</p> <p>↑</p>                                                                                                                                     |



PCDn.M170 start-up procedure

When the CPU powers up, the M170 self-starts. During this process, operating state LEDs will show the following sequence:



- : LED on
- : LED off

\*) In RUN the user program is being processed correctly.  
Other possible operating states after start-up are:

|       |       |                                                |
|-------|-------|------------------------------------------------|
| RUN   | ●     |                                                |
| HALT  | ○     | The user program is being correctly processed. |
| ERROR | ○ / ● |                                                |

|       |       |                                                                                                                                                                                                                       |
|-------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RUN   | ○     | 1. The CPU has stopped (while PG connected).<br>2. The CPLD is being reprogrammed (after a firmware update). <b>Caution:</b> During this procedure, the controller must not be switched off (duration: approx. 30s ). |
| HALT  | ○     |                                                                                                                                                                                                                       |
| ERROR | ○ / ● |                                                                                                                                                                                                                       |

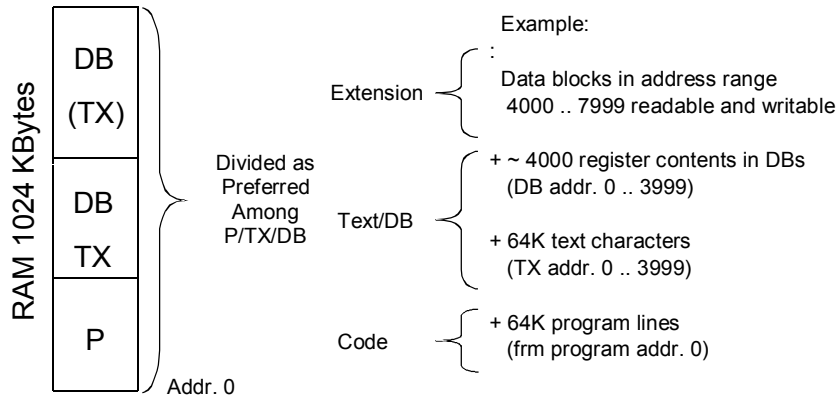
  

|       |       |                                         |
|-------|-------|-----------------------------------------|
| RUN   | ○     | The M170 is in the HALT operating state |
| HALT  | ●     |                                         |
| ERROR | ○ / ● |                                         |

**Note:**  
The ERROR LED is switched on if an error is detected and the corresponding error handling XOB has not been programmed.

### 5.1.7 User memory for program, text and data blocks

The PCD2.M170 base unit contains 1024 kBytes of RAM.



All 3 resources can exist together in the same memory, as long as they do not exceed 1024 KBytes in total. Please note, therefore:

- 1 program line takes up 4 Bytes (max. 256K program lines)
- 1 text character takes up 1 Byte (max. 1024K text characters)
- 1 register content in DB form takes up 8 Bytes plus 3 Bytes per DB.

#### Useful information about DBs:

- In the address range 4000.. 7999 one register (32 Bit) needs 4 Bytes of space in memory. For its part, every DB needs 8 bytes (for address and length).
- Data blocks can also be accommodated in the address range 0 .. 3999. They then have the same address range as text. However, a register content requires 8 Bytes, plus 3 Bytes per DB. In addition, the time to access these data blocks is longer than in address range 4000.. 7999.

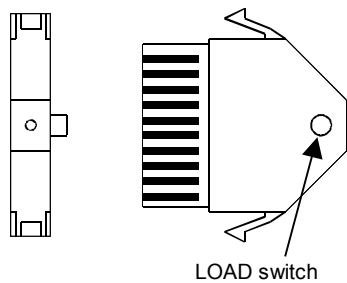
### 5.1.8 PCD7.R400 flash card, 1 MByte

#### Validity

This description is valid for the following CPUs:

- PCD2.M170
- PCD4.M170

#### User program transfer



With the PCD7.R400 flash memory card it is easy to copy any program that is stored on the card to the user memory of the relevant PCD.

#### Procedure:

1. Plug in PCD7.R400 flash memory card
2. Switch on supply
3. Hold LOAD switch down for 3 s with the tip of a ballpoint pen
4. The program is copied to the PCD's user memory

In addition, a number of special instructions and functions are available with the PG5:

- User program backup (copy, RAM → flash card)
- User program update (copy, flash card → RAM)
- Saving text / DBs to the flash card
- Restoring text / DBs to RAM (source: PCD7.R400)

RAM memory is transferred to the flash card by a function of the PG5 programming tool.



#### Caution:

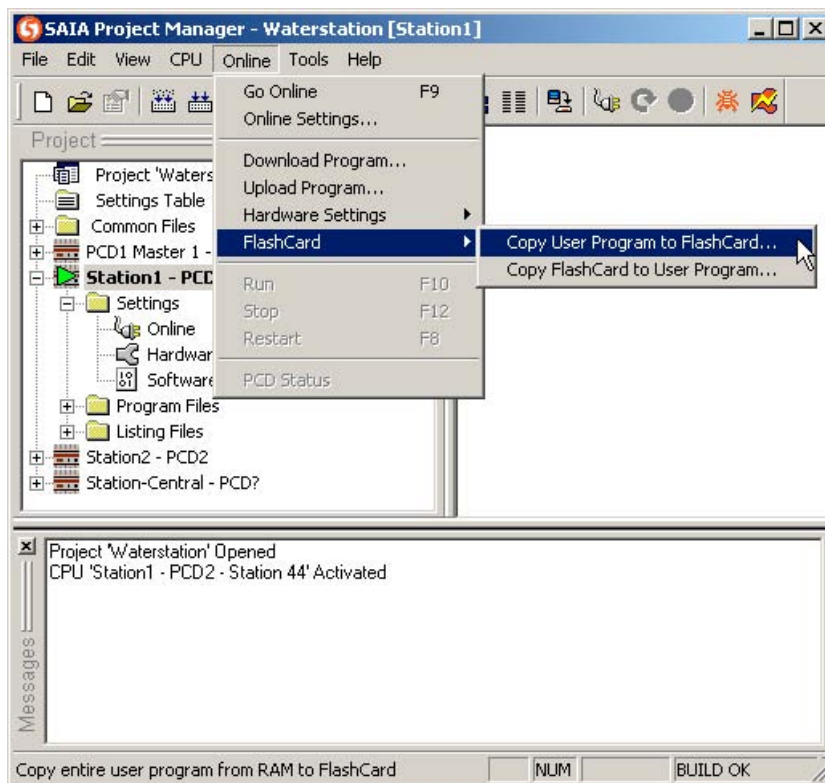
The flash card should not be inserted or removed while the power is connected. The PCD's supply must be switched off before the card is plugged in or withdrawn.

## Copy user program ↔ flash card

The user program is always copied in full (code, text and extensions). The range for backing up DBs/text is deleted from the flash card when the user program is transferred. With SYSWR, DBs/text stored on the flash card will therefore be lost.

### Methods of copying:

- a) with PG5 SPM:
  - copy from PCD to flash card
  - copy from flash card to PCD
- b) LOAD switch:
  - copy from flash card to PCD
  - (hold switch down for 3 seconds at least)
- c) If there is no user program in the PCD on start-up, or if no correct header can be identified, copying from the flash card to the PCD takes place automatically.



### N.B.:

While copying is underway, the PCD is always in stop. A subsequent manual start is required.

**SYSWR/SYSRD for save/restore text/DBs**

This function is used to save/restore DBs and text to the flash card.

Features:

- 64 KByte memory for backup
- DBs/text from extension memory (4000..7999)

SYSWR function:

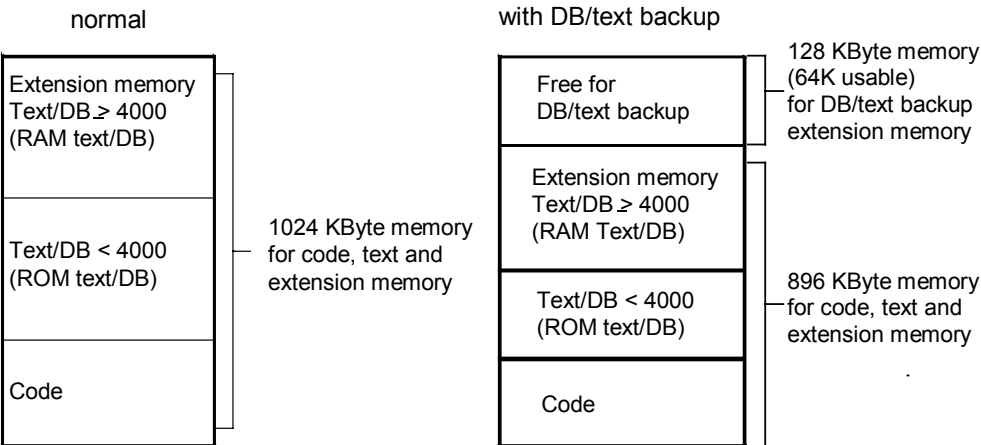
- SYSWR 9000 backup DBs/text to flash card
- SYSWR 9001 restore DBs/text from flash card
- SYSWR 9002 delete memory

The save/restore function must be enabled during memory configuration. It is then possible to allocate memory in 2 flash sectors (128 KByte) to DBs/text. Half of this memory (64 KByte) can now be used for saving DBs/text >4000 (RAM DB/text). The firmware automatically deletes a previous version of DBs/text if the same sequence is saved again. In some cases, the firmware will create free space in memory, since certain DBs/text have been saved several times. A sector of flash memory is deleted for that purpose. ACCU = H indicates via SYSWR that the memory mechanism is busy. Before any save/restore of the DBs/text can take place, a SYSRD 9000 instruction must be executed to ensure that background functions have finished.

If there is no free space in memory for storing DBs/text, this is indicated by diagnostics.

**Memory configuration for saving DBs/text**

During memory configuration, the option "Reserve 128KByte for Text/DB backup" must be activated.



## Flash card SYSWR

|              |                                    |
|--------------|------------------------------------|
| <b>SYSWR</b> | <b>Kx or Rx</b><br><b>Ky or Ry</b> |
|--------------|------------------------------------|

Where: **Kx or Rx** is the constant or register with the function code.  
**Ky or Ry** is the or register with the text/DBs.

There are two SYSWR commands for copying text/DBs:

|                |      |                                                                         |
|----------------|------|-------------------------------------------------------------------------|
| Function code: | 9000 | for copying text/DBs from RAM to flash card                             |
|                | 9001 | for copying text/DBs from flash card to RAM                             |
|                | 9002 | for deleting memory (all DBs/text stored on the flash card are deleted) |

Allowed values for:

**Ry or Ky:** 4000..7999

|        |           |                                     |
|--------|-----------|-------------------------------------|
| Flags: | Accu = L: | Flash card ready → SYSWR executable |
|        | Accu = H: | Flash card not ready → wait         |

The error flag is set if an error is detected. → Read diagnostic register with  
 SYSRD 9000

### Please note:



The flash card can be overwritten a maximum of 1 million times. Therefore, the SYSWR 900x command must never be included in program loops.

When writing, please note that, due to the lengthy processing times of these instructions, they should not be used in XOB 0.

## Flash card SYSRD

|              |                              |
|--------------|------------------------------|
| <b>SYSRD</b> | <b>Kx or Rx</b><br><b>Ry</b> |
|--------------|------------------------------|

Where: **Kx** or **Rx** is the constant or register with the function code.  
**Ry** is the diagnostic register

Function code: 9000 Flash card test

Allowed values for **Ry**: 0 .. 4095 Diagnostic register

Flags: ACCU = L: flash card ready → SYSWR executable  
 ACCU = H: flash card not ready → wait

The error flag is set if an error is detected → Read diagnostic register

## Description of the diagnostic register

| Bit    | Description            | Cause                                                                                               |
|--------|------------------------|-----------------------------------------------------------------------------------------------------|
| 0      | No flash card          | No flash card in PCD                                                                                |
| 1      | Header not configured  | No header/user program on the flash card                                                            |
| 2      | SYSWR not enabled      | DB/text memory mode not active (memory configuration)                                               |
| 3      | DB/Text not present    | Incorrect DB/text numbers (addresses)                                                               |
| 4      | DB/Text format invalid | DB/text format has been changed (length)                                                            |
| 5      | Restored               | DB/text on flash card has been restored because an error occurred.                                  |
| 6      | Memory full            | Too many DBs/text. No more space free in memory                                                     |
| 7      | Already processing     | The previous SYSWR 900x instruction had not been processed in full before the next one was started. |
| 8 ..31 | Reserve                |                                                                                                     |

### 5.1.9 EEPROM configuration memory

The PCD has a small memory for permanent storage of settings for the S-Bus, the modem connection (max. 250 characters or. 232 with S-Bus gateway) and some production data. To a limited extent, the user also has the possibility of using this memory for writing to registers (K2000... K2049) and for writing the S-Bus station number (K6000).

The contents of 50 registers (50x32 bits) can be read with the SYSRD command, or written with SYSWR.

**SYSRD**                      **Kx or Rx** (source)  
                                     **Ry** (destination)

**Kx** = constant 2000... 2049, i.e. EEPROM register 0... 49.

**Rx** = address of register containing the above constant.

**Ry** = address of register in which the value read will be stored.

**SYSWR**                      **Kx or Rx** (destination)  
                                     **Ry** (source)

**Kx** = constant 2000... 2049, i.e. EEPROM register 0... 49.

**Rx** = address of register containing the above constant.

**Ry** = address of register from which the value written will be taken.



**Caution:**

The EEPROM register can be overwritten a maximum of 100 000 times.

Therefore, instructions SYSWR K 20xx and K 6000 should never be included in program loops. Several EEPROM registers can be read consecutively within a short time.

When writing, it should be noted that the instructions SYSWR K 20xx and K 6000 last approx. **20 ms**, during which time no other user instructions will be processed. These instructions should not, therefore, be used in XOB 0 either.



5.1.10 PGU connector for attaching programming units

The PGU interface (no. 0) runs to a 9-pole D-type connector (female). During commissioning, the programming unit will be connected via this interface. The interface type is RS 232c. Its pin configuration is as follows (with relevant signals):

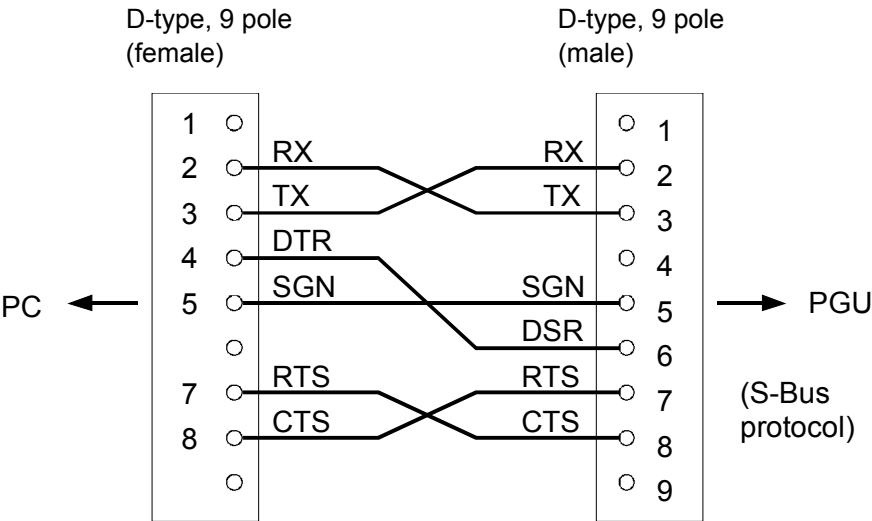
| Pin no. |      | Signal            |
|---------|------|-------------------|
| 3       | TXD  | Transmit Data     |
| 2       | RXD  | Receive Data      |
| 7       | RTS  | Request To Send   |
| 8       | CTS  | Clear To Send     |
| 5       | SGN  | Signal Ground     |
| 4       | -    | Not Connected     |
| 6       | DSR  | PGU Connected     |
| 9       | +5 V | Supply P100       |
| 1       | PGND | Protective Ground |

| Signal type    | Logical state | Rated value  | Nominal value |
|----------------|---------------|--------------|---------------|
| Data signal    | 0 (space)     | +3V to +15V  | +7V           |
|                | 1 (mark)      | -15V to - 3V | -7V           |
| Control /      | 0 (off)       | -15V to - 3V | -7V           |
| Message signal | 1 (on)        | +3V to +15V  | +7V           |

The neutral position for data signals is "mark" and for control and message signals "off".

For operation with a programming unit, the S-Bus protocol has been provided. Use of the PCD8.P800 service unit is possible from firmware version \$301.

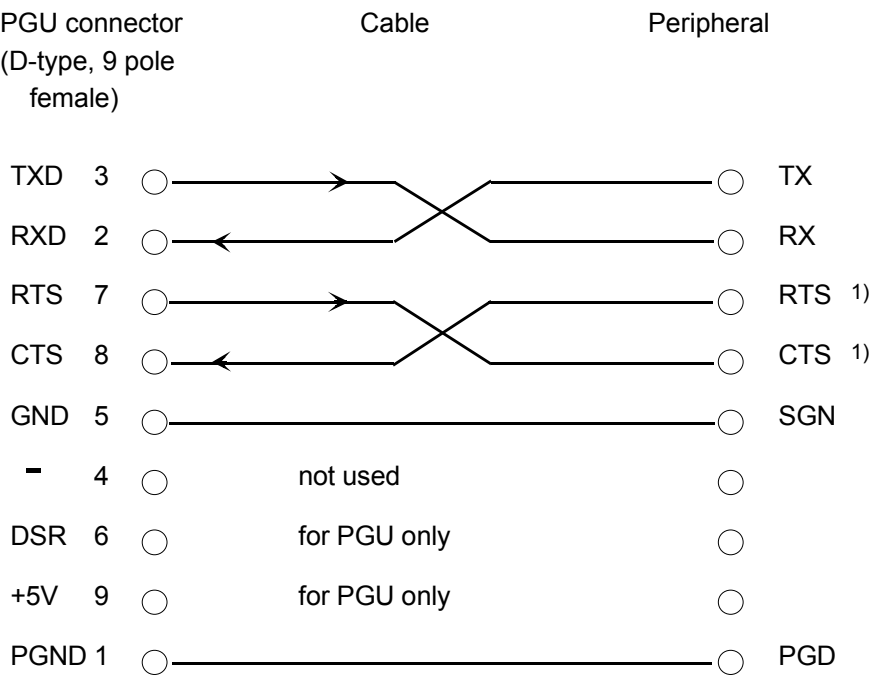
PCD8.K111 connecting cable (for S-Bus protocol)



5.1.11 PGU connector as RS232 communications port

When commissioning/programming is complete, this interface can be used as a data line.

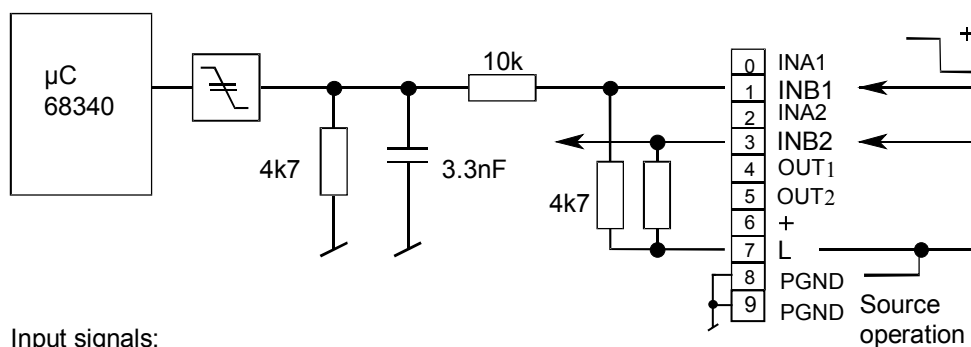
- When the PCD is powered up, firmware automatically sets the PGU interface to 9600 Baud, ready to work with the programming unit.
- If any other peripheral device is to be connected, a SASI instruction must be used to configure interface 0 accordingly.
- If during operation a programming unit is again connected in place of the peripheral device, the switch back to PGU mode takes place automatically (bridge pin 6 to pin 8).
- Before the port can be used again as a data line for the peripheral device, a SASI instruction is once more needed to configure interface 0 accordingly



1) When communicating with terminals it is necessary to check whether certain pins should be provided with bridges, or whether they should be set H or L with the SOCL instruction.

### 5.1.12 Interrupt inputs

Both interrupt inputs are located on the main board and can be connected via the 10-pole (0 – 9) plug-in terminal block.



Input signals:

$$H = 15..30V$$

L = -30.. +5V

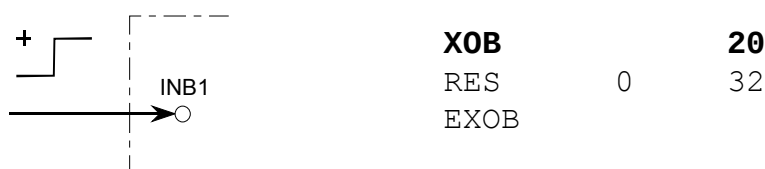
(for sink operation L at +24V)

## Functional method

Immediately after the last user instruction has been processed, a positive edge at INB1 calls **XOB 20**. A positive edge at INB2 calls **XOB 25**. The reaction time before XOB 20 or XOB 25 will be called is **max. 1 ms**. The user is free to choose which alarm or counting functions should be executed within the interrupt XOB.

## Alarm function

When a positive edge is received at INB1, output 32 must be reset within max. 1 ms, independently of the user program..



### Counting function up to 1kHz

The interrupt inputs can also be used for counting functions up to approx 1 kHz.

Example:

```

COB   0
          0
:
:
STH I   5   ;   If signal at I5 is H,
DYN F   5
LD   C   10   ;   counter 10 will be loaded
          200   ;   with value 200 and
SET O   33   ;   output 33 will be set.
:
:
ECOB

XOB   20   ;   If pos. Edge is at INB1,
DEC C   10   ;   the counter will decrement
STL C   10   ;   and, when it reaches zero,
RES O   33   ;   output 33 will be reset.
EXOB

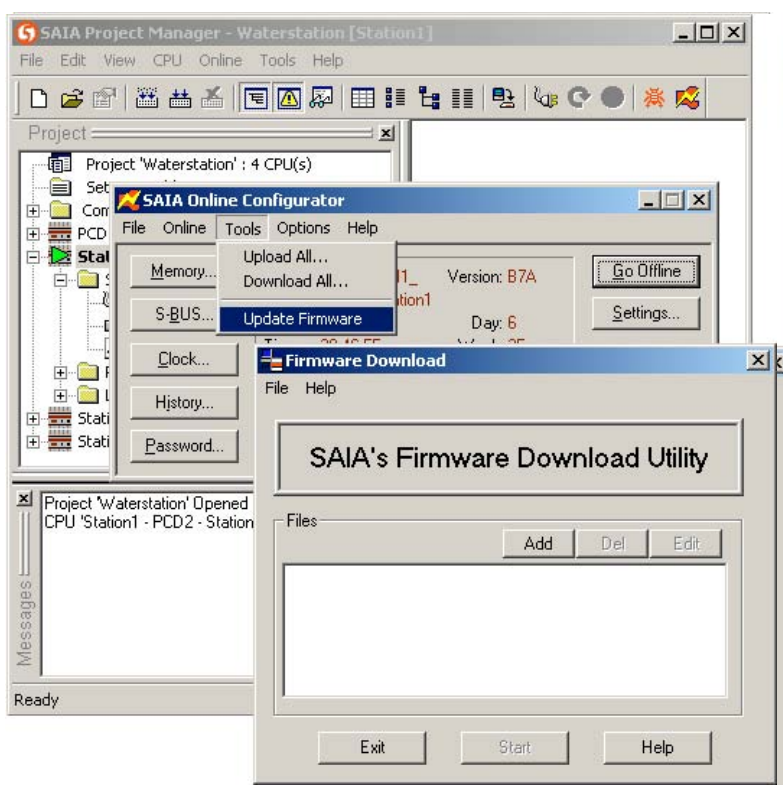
```

### 5.1.13 Firmware update

#### Firmware Download

A firmware update can be executed with the PG5's 'FWDnld.exe' function (FWDnld.exe). The following steps should be executed:

1. Start online configurator
2. Select serial connection under Settings:
  - PGU or
  - S-Bus (Modem, Ethernet TCP/IP)
3. Click "Go Online"
4. Select menu: "Tools" => "Update Firmware".
5. Select firmware files (\*.blk) with "ADD"  
The FW file contains a binary Motorola format (.blk).
6. Start download. (with "START")
7. Wait until the controller restarts.





When this message is displayed, the new firmware has been stored in the controller's RAM. The firmware will subsequently be programmed into flash memory (see LED states).

Depending on the new firmware, the "CPLD" may also then be programmed (all LEDs off). The PCD should not under any circumstances be switched off during this time (about 10 to 30 seconds).

**LED states during FW update**

|                          |               |   |                                                                                                                     |
|--------------------------|---------------|---|---------------------------------------------------------------------------------------------------------------------|
| <b>FW update running</b> | RUN           | ▲ | FW is being loaded. While the new FW is being loaded, the controller must not be switched off.                      |
|                          | HALT<br>ERROR | ▲ |                                                                                                                     |
|                          |               |   | LEDs flash from bottom to top                                                                                       |
| <b>No FW</b>             | RUN           | ▲ | No runnable firmware is available on the system. New FW must be loaded with the additional PG5 program "FW Update". |
|                          | HALT<br>ERROR | ▼ |                                                                                                                     |
|                          |               |   | LEDs flash in sequence up and down                                                                                  |



**Please note:**  
The user program in PCD RAM will be lost when the new firmware is loaded. It can be loaded again from the flash card (if present) next time the PCD restarts.

5.2 Communications possibilities with PCD4.M170

5.2.1 General

SAIA®S-Bus (PGU), Port #0

SAIA®S-Bus with its safe and easy protocol, is already available in the base equipment (without additional modules) of all PCDs as master or slave.

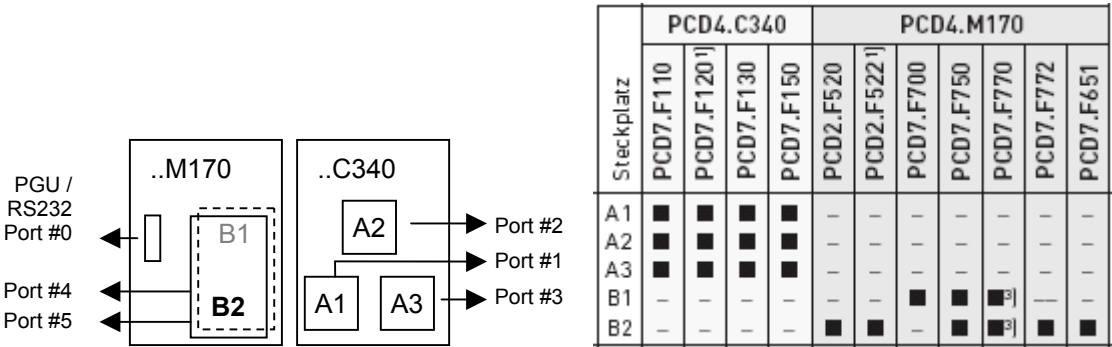


| Technical data    |                                                                                                         |
|-------------------|---------------------------------------------------------------------------------------------------------|
| Master connection | 38.4 kBit/s<br>(high net data rates due to low protocol overhead), up to 4 masters via gateway function |
| Slave connection  | Up to 254 slaves in segments of 32 stations each                                                        |



Manuals:  
Saia S-Bus → 26/739, RS485 → 26/740  
Technical information → 26/370 and 26/339

5.2.2 Sockets for communications cassette modules



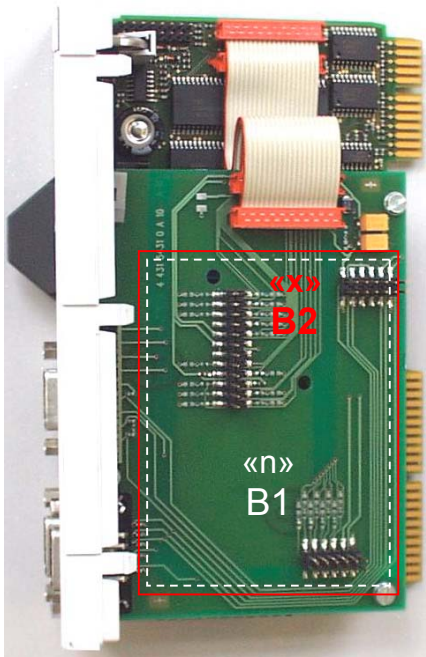
- 1) Suitable for modem connection due to provision of 6 control lines.  
(PCD7.F120 always on socket1).
- 3) 2 × PROFIBUS DP Slave are not possible

Serial data ports #1 to #3

The serial interface modules PCD7.F1nn for ports #1 to #3 (sockets A1 to A3) are described in chapter 3.4.n.

**Sockets B1 and B2 for PCD2.F5\_\_ or PCD7.F\_\_, ports #4 and #5**

The PCD4.M170 has two module sockets - one on the rear side (white) and one on the front side (red) for communication modules PCD2.F5\_\_ or PCD7.F\_\_.



**Order numbers for configured processor modules**

The processor modules PCD4.M170 Fnx are delivered pre-configured:

- «n» defines the ..Fnnn-module on socket B1 (rear side)
- «x» defines the ..Fnnn-module on socket B2 (front side)

| n (socket B1, rear side)           | x (socket B2, front side)                |
|------------------------------------|------------------------------------------|
| 0 = empty                          | 0 = empty                                |
| 1= PCD7.F700 (PROFIBUS FMS)        | ---                                      |
| 2 = PCD7.F750 (PROFIBUS DP Master) | 2 = PCD7.F750 (PROFIBUS DP Master)       |
| 3 = PCD7.F770 (PROFIBUS DP Slave)  | 3 = PCD7.F770 (PROFIBUS DP Slave)        |
| ---                                | 4 = PCD7.F772 (PROFIBUS DP Slave, RS485) |
| ---                                | 7 = PCD2.F520 (RS 232/422, RS 485)       |
| ---                                | 8 = PCD2.F522 (RS 232)                   |
| ---                                | 9 = PCD7.F65x (Ethernet-TCP/IP)          |



### 5.2.3 Serial interfaces RS 232, RS 422 und RS 485

#### Modules for serial data ports on socket B2, ports #4 and #5



#### **PCD2.F520**

RS 232 with RTS/CTS and  
RS 422 without RTS/CTS or  
RS 485 electrically connected with line  
termination resistors capable of activation,  
suitable for S-Bus or other communications  
modes.



#### **PCD2.F522**

Choice possible between  
2× RS232 with RTS/CTS or  
1× RS232 full with RTS/CTS, DTR/DSR, DCD,

suitable for modem connection

Jumper for selection of  
2 x RS232 (default)  
or  
1 x RS232 full  
(The module PCD4.M170 must be opened to  
change the jumper position.)

## 5.2.4 Field bus connections

### PROFIBUS FMS and PROFIBUS DP

For the field level in industrial automation, PROFIBUS DP and FMS are provided as standardized, open network protocols for data transfer.

#### Technical data PROFIBUS FMS

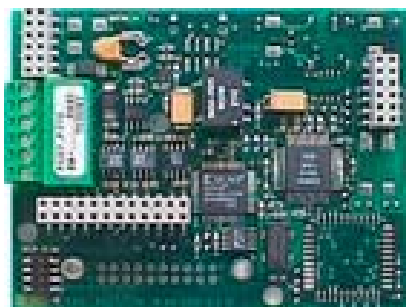
|                   |                                                                        |
|-------------------|------------------------------------------------------------------------|
| <b>Connection</b> | Up to 500 kBit/s,<br>Up to 126 parties in segments of 32 stations each |
|-------------------|------------------------------------------------------------------------|

#### Technical data PROFIBUS DP

|                          |                                                  |
|--------------------------|--------------------------------------------------|
| <b>Master connection</b> | 12 MBit/s,                                       |
| <b>Slave connection</b>  | Up to 124 slaves in segments of 32 stations each |

### PROFIBUS connection modules at socket B1 or B2

PCD7.F770



**PCD7.F700**

For connection of PROFIBUS FMS

**PCD7.F750**

For connection of PROFIBUS DP  
as Master

**PCD7.F770**

For connection of PROFIBUS DP  
as Slave

**PCD7.F772**

For connection of PROFIBUS DP  
as Slave and with electrically isolated  
RS 485 port

**Note:** It is recommended that the line termination resistors should be included in the cable connector. There are no termination resistors on the module itself. With PCD7.F700 (PROFIBUS FMS) the termination box PCD7.T160 should be used.



#### Manuals:

Installation components → 26/740, Profibus FMS → 26/742, Profibus DP → 26/765, PCD RIO for Profibus DP → 26/766, RIO Fieldbus modules 26/764

5.2.5 Network connections

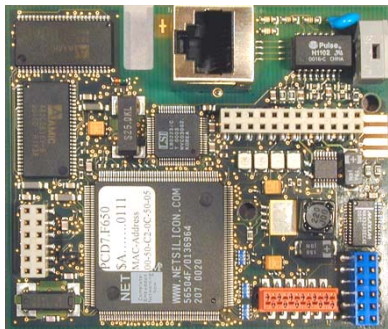
Ethernet-TCP/IP

The intelligent co-processor module provides the PCD with access to the Ethernet

| Technical data         |                                                                                                                                |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Connection             | 10 Base-T/100 Base TX (RJ 45)                                                                                                  |
| Speed                  | 10/100 MBit/s (autosensing)                                                                                                    |
| Protocols and services | SAIA@S-Bus with UDP/IP for<br>PG5 ⇔ PCD communication,<br>PCD ⇔ PCD multimaster communication and<br>SCADA ⇔ PCD communication |

Ethernet-TCP/IP connection module at socket B2

PCD7.F65x

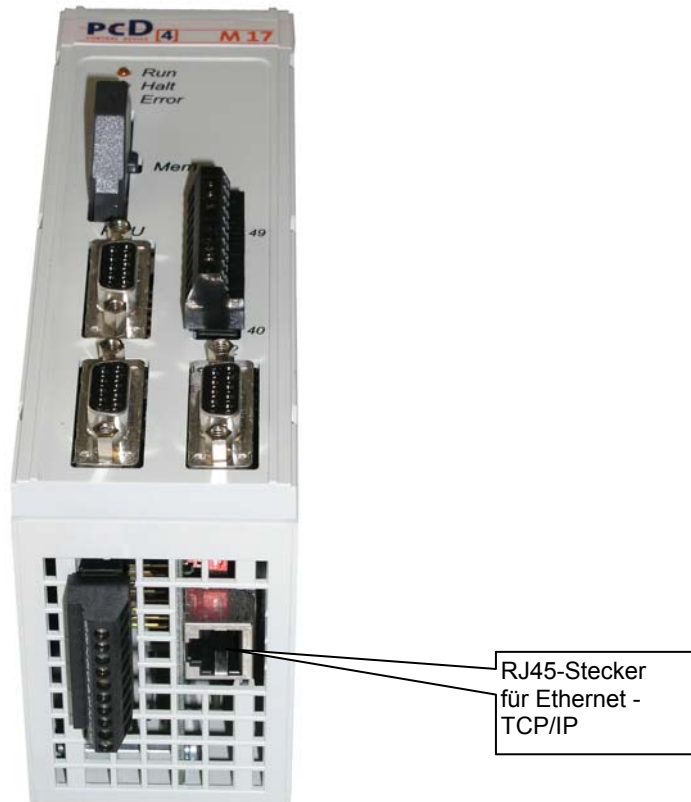


**PCD7.F65x**  
Intelligent interface module for connection to Ethernet-TCP/IP



**Manual:**  
TCP/IP → 26/776  
Technical information → 26/356

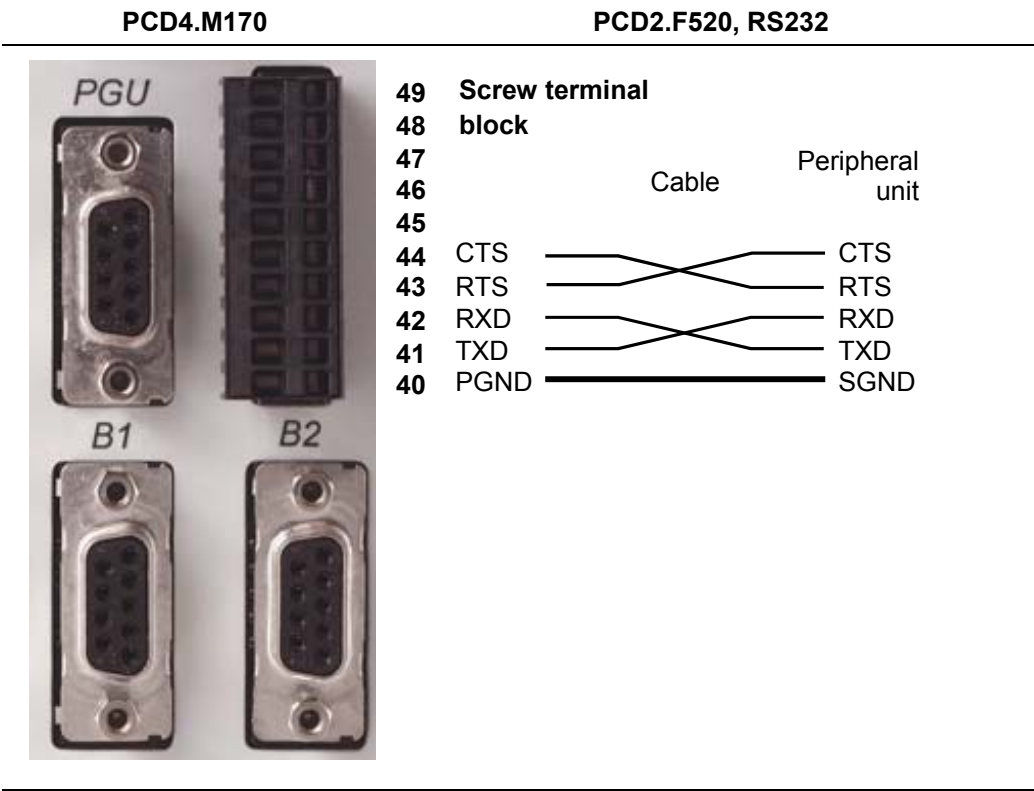
## Ethernet-TCP/IP connector



5.2.6 Connection diagrams for RS 232-, RS 422- and RS 485-modules

RS 232/422/485 serial interface with module PCD2.F520,  
ports #4 and #5, socket B2

RS 232 interface, connection for peripheral unit,  
port #4, socket B2



**Note:**  
These ports do not have any control lines. If control lines are required, insert a PCD7.F110 module at socket A, or a PCD2.F522 module at socket B2.

RS 422 interface, connection of peripheral unit, port #5, socket B2

As assigned in the user program the modules with two serial interfaces RS422 and RS485 will work with the assigned protocol, i.e. RS422 or RS485

| Communications mode | Type  | With SOCL instruction (immediatly after SASI instruction) the protocol used may be changed. |
|---------------------|-------|---------------------------------------------------------------------------------------------|
| MC0...MC3, MD0/S0   | RS422 |                                                                                             |
| MC4, S-Bus          | RS485 |                                                                                             |

**PCD4.M170**



**PCD2.F520, RS422**

49 /RX  
48 RX  
47 /TX  
46 TX  
45 PGND  
44  
43  
42  
41  
40

**Screw terminal block B2**

Cable

Peripheral unit

| D-type female B2 | Pin | PCD2.F520, RS422 |
|------------------|-----|------------------|
| Port #5          | 1   | PGND             |
|                  | 2   | -                |
|                  | 3   | /TX              |
|                  | 4   | -                |
| RS422            | 5   | /RX              |
|                  | 6   | RX               |
|                  | 7   | -                |
|                  | 8   | TX               |
|                  | 9   | -                |

**Notes:**  
For RS 422 each pair of receiver lines is terminated with a 150Ω line termination resistor. For this, jumper J1 must be left in the "OPEN" position (factory setting).  
These ports do not have any control lines. If control lines are required, insert a PCD7.F110 module at socket A1 (port #1) of ..C340 or PCD2.F522 module at socket B2.

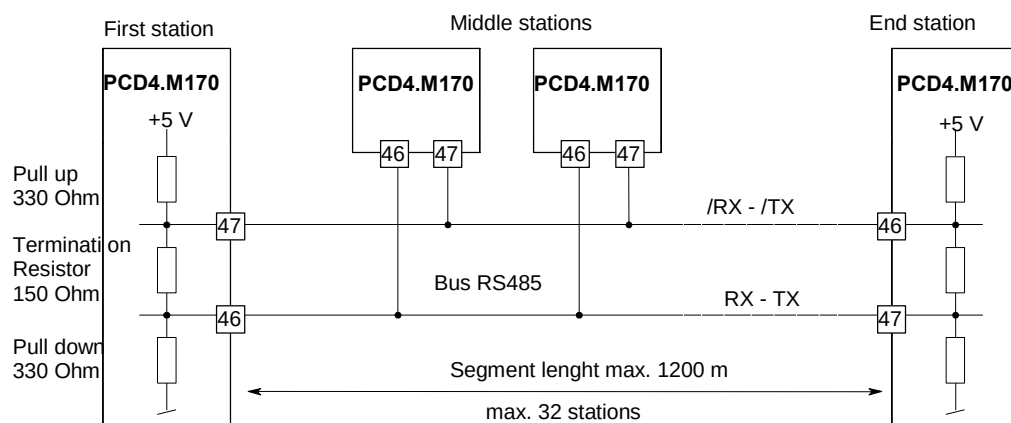
RS 485 interface, port #5, socket B2

As assigned in the user program the modules with two serial interfaces RS422 and RS485 will work with the assigned protocol, i.e. RS422 or RS485

| Communications mode | Type  | With SOCL instruction (immediatly after SASI instruction) the protocol used may be changed. |
|---------------------|-------|---------------------------------------------------------------------------------------------|
| MC0...MC3, MD0/S0   | RS422 |                                                                                             |
| MC4, S-Bus          | RS485 |                                                                                             |

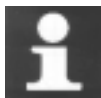
| PCD4.M170                                                                          |                         | PCD2.F520, RS485      |                 |
|------------------------------------------------------------------------------------|-------------------------|-----------------------|-----------------|
|  |                         | Cable                 | Peripheral unit |
| 49                                                                                 |                         |                       |                 |
| 48                                                                                 |                         |                       |                 |
| 47                                                                                 | /RX-/TX                 | _____                 | /RX-/TX         |
| 46                                                                                 | RX-TX                   | _____ Bus RS485 _____ | RX-TX           |
| 45                                                                                 | PGND                    | _____                 | SGND            |
| 44                                                                                 |                         |                       |                 |
| 43                                                                                 |                         |                       |                 |
| 42                                                                                 | Screw terminal block B2 |                       |                 |
| 41                                                                                 |                         |                       |                 |
| 40                                                                                 |                         |                       |                 |
| D-type female B2                                                                   | Pin                     | PCD2.F520, RS485      |                 |
| Port #5                                                                            | 1                       | PGND                  |                 |
|                                                                                    | 2                       | -                     |                 |
|                                                                                    | 3                       | /RX - /TX             |                 |
|                                                                                    | 4                       | -                     |                 |
|                                                                                    | 5                       | -                     |                 |
| RS485                                                                              | 6                       | -                     |                 |
|                                                                                    | 7                       | -                     |                 |
|                                                                                    | 8                       | RX – TX               |                 |
|                                                                                    | 9                       | -                     |                 |

## Selection and connection of line termination resistors



### Note:

At the first and last stations, jumper J1 must be set to the "CLOSED" position.  
For all other stations, jumper J1 must be left in the "OPEN" position (factory setting).



See manual RS485 → 26/740



2 x RS 232 - module PCD2.F522, serial data ports #4 and #5,  
Socket B2

2 x RS 232, connection of 2 peripheral units

| PCD4.M170                                                                          | 2 x RS 232 |                            |                    |
|------------------------------------------------------------------------------------|------------|----------------------------|--------------------|
|  |            | Screw terminal<br>block B2 | Peripheral<br>unit |
|                                                                                    |            | Cable                      |                    |
|                                                                                    | 49         | CTS                        | CTS                |
|                                                                                    | 48         | RTS                        | RTS                |
|                                                                                    | 47         | RXD                        | RXD                |
|                                                                                    | 46         | TXD                        | TXD                |
|                                                                                    | 45         | PGND                       | SGND               |
|                                                                                    | 44         | CTS                        | CTS                |
|                                                                                    | 43         | RTS                        | RTS                |
|                                                                                    | 42         | RXD                        | RXD                |
|                                                                                    | 41         | TXD                        | TXD                |
|                                                                                    | 40         | PGND                       | SGND               |

1 x RS 232, port #3, socket B2

| PCD4.M170                                                                           | D-type<br>female B2 | Pin | RS232 |
|-------------------------------------------------------------------------------------|---------------------|-----|-------|
|  | Port #5             | 1   | PGND  |
|                                                                                     |                     | 2   | -     |
|                                                                                     |                     | 3   | RXD   |
|                                                                                     | RS232               | 4   | -     |
|                                                                                     |                     | 5   | RTS   |
|                                                                                     |                     | 6   | CTS   |
|                                                                                     |                     | 7   | -     |
|                                                                                     |                     | 8   | TXD   |
|                                                                                     |                     | 9   | -     |

1 x RS 232 full, connection of peripheral unit (DTE),  
port #4, socket B2

# PCD4.M170

# 1 x RS 232 full

**Screw terminal  
block B2**

|    |         |   |       |        |      |
|----|---------|---|-------|--------|------|
| 49 | DCD     | 1 |       | 1 / 8  | DCD  |
| 48 | Reserve |   |       |        |      |
| 47 | DSR     | 6 | ↔     | 6 / 6  | DSR  |
| 46 | DTR     | 4 | ↔     | 4 / 20 | DTR  |
| 45 | PGND    | 5 | ===== | 5 / 7  | SGND |
| 44 | CTS     | 8 | ↔     | 8 / 5  | CTS  |
| 43 | RTS     | 7 | ↔     | 7 / 4  | RTS  |
| 42 | RXD     | 2 | ↔     | 2 / 3  | RXD  |
| 41 | TXD     | 3 | ↔     | 3 / 2  | TXD  |
| 40 | PGND    |   | ===== |        | SGND |

D-type 25 / 9pol.  
Peripheral unit DTE  
z.B. PC COM Port

1 x RS 232 full, connection of external modem (DCE),  
port #4, Socket B2

| PCD4.M170                                                                           |  | 1 x RS 232 full |              |   |      |                               |
|-------------------------------------------------------------------------------------|--|-----------------|--------------|---|------|-------------------------------|
| Screw terminal block B2                                                             |  | Cable           | Modem (ETCD) |   |      |                               |
|  |  | 49              | DCD          | ← | DCD  | D-type m 25poles (z.B. Zyxel) |
|                                                                                     |  | 48              | Reserve      |   |      | 8                             |
|                                                                                     |  | 47              | DSR          | ← | DSR  | 6                             |
|                                                                                     |  | 46              | DTR          | → | DTR  | 20                            |
|                                                                                     |  | 45              | PGND         | → | SGND | 7                             |
|                                                                                     |  | 44              | CTS          | ← | CTS  | 5                             |
|                                                                                     |  | 43              | RTS          | → | RTS  | 4                             |
|                                                                                     |  | 42              | RXD          | ← | RX   | 3                             |
|                                                                                     |  | 41              | TXD          | → | TX   | 2                             |
|                                                                                     |  | 40              | PGND         | → | SGND |                               |

5.2.7 Connection diagrams for field bus modules

PROFIBUS FMS, module PCD7.F700, socket B1, (ports #9 / #8)

| D-type female, 9 poles B1 |              | PCD4.M170                                                                            |
|---------------------------|--------------|--------------------------------------------------------------------------------------|
| Pin                       | PROFIBUS-FMS |  |
| 1                         | PGND         |                                                                                      |
| 2                         | -            |                                                                                      |
| 3                         | RxD/TxD-P    |                                                                                      |
| 4                         | CNTR-P/RTS   |                                                                                      |
| 5                         | GND          |                                                                                      |
| 6                         | +5V-         |                                                                                      |
| 7                         | -            |                                                                                      |
| 8                         | RxD/TxD-N    |                                                                                      |
| 9                         | -            |                                                                                      |

**Note:** There are no termination resistors on th module itself. The necessary 5V-power supply is also missing. Correct termination can be achieved only with the termination box PCD7.T160.

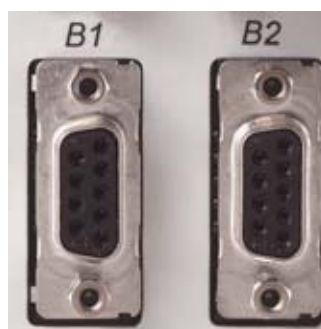
See manuals: Installation Components → 26/740 and/or Profibus FMS → 26/742).

**PROFIBUS DP Master, module PCD7.F750, socket B1 and/or B2  
ports #9/ #8**

**D-type female, 9 poles**

**B1 and / or B2**

| Pin | PROFIBUS DP Master |
|-----|--------------------|
| 1   | PGND               |
| 2   | —                  |
| 3   | RxD/TxD-P          |
| 4   | CNTR-P/RTS         |
| 5   | GND                |
| 6   | +5V-               |
| 7   | —                  |
| 8   | RxD/TxD-N          |
| 9   | —                  |



**Note:** It is recommended that the line termination resistors should be included in the cable connector. There are no termination resistors on the module itself.

**PROFIBUS DP Slave, module PCD7.F770, Socket B1 or B2,  
ports #9 / #8**

**D-type female, 9 poles**  
**B1 or B2**

| Pin | PROFIBUS DP Slave |
|-----|-------------------|
| 1   | PGND              |
| 2   | -                 |
| 3   | RxD/TxD-P         |
| 4   | CNTR-P/RTS        |
| 5   | GND               |
| 6   | +5V-              |
| 7   | -                 |
| 8   | RxD/TxD-N         |
| 9   | -                 |



**Note:**  
Possible is only 1 module PCD7.F770 on socket B1 or B2.  
It is recommended that the line termination resistors should be included in the cable connector. There are no termination resistors on the module itself.

**PROFIBUS DP Slave, module PCD7.F772, Socket B2,  
ports #9 / #8**

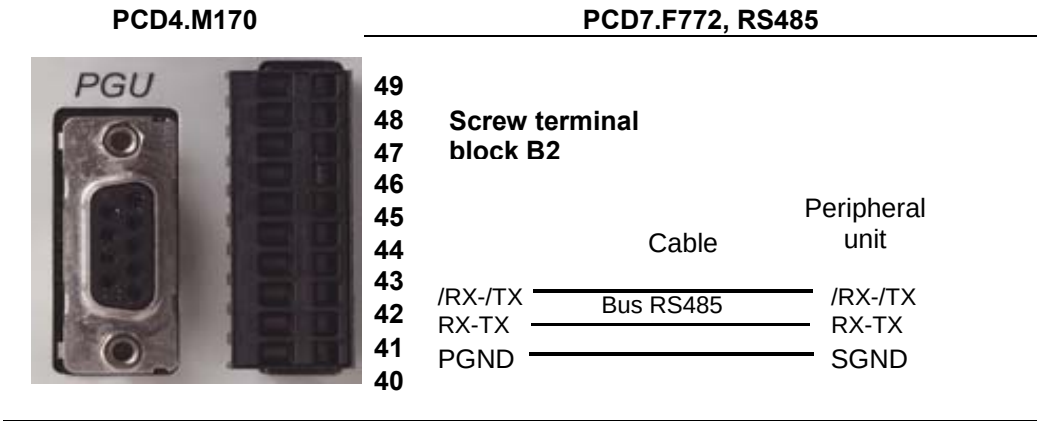


| D-type female, 9 poles<br>B2 |                   |
|------------------------------|-------------------|
| Pin                          | PROFIBUS DP Slave |
| 1                            | PGND              |
| 2                            | –                 |
| 3                            | RxD/TxD-P         |
| 4                            | CNTR-P/RTS        |
| 5                            | GND               |
| 6                            | +5V-              |
| 7                            | –                 |
| 8                            | RxD/TxD-N         |
| 9                            | –                 |

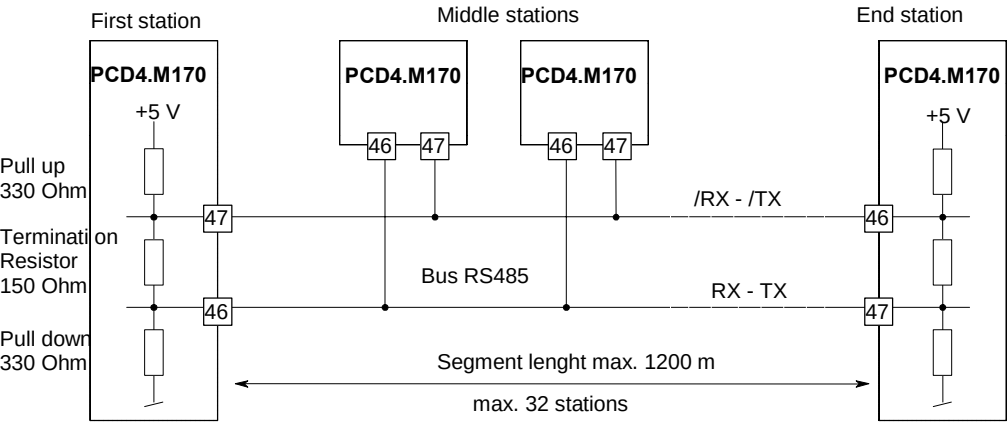
**Note:** It is recommended that the line termination resistors should be included in the cable connector. There are no termination resistors on the module itself.

The bus can also be connected directly at the 6 pole terminal of the PCD7.F7nn module. In this case the cassette PCD4.M170 must be opened.

RS485 electrically isolated, module PCD7.F772, socket B2, port #4



Selection and connection of line termination resistors



**Note:** It is recommended that the line termination resistors should be included in the cable connector. There are no termination resistors on the module itself.

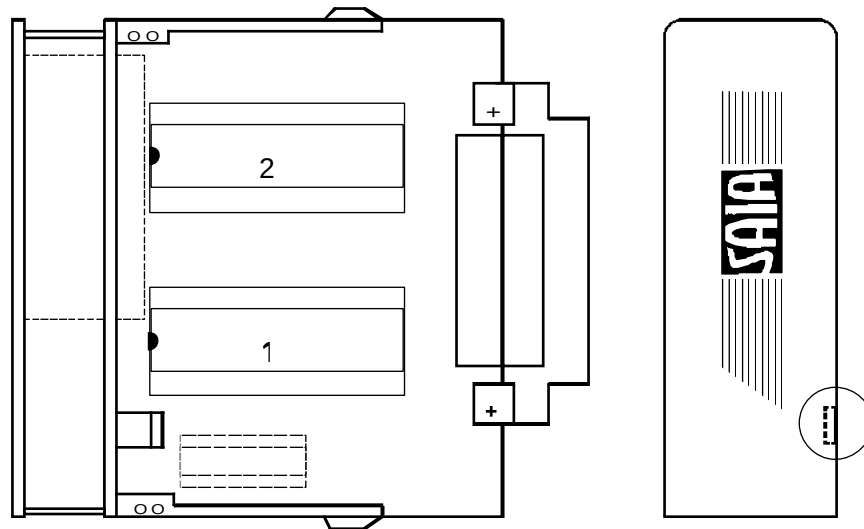




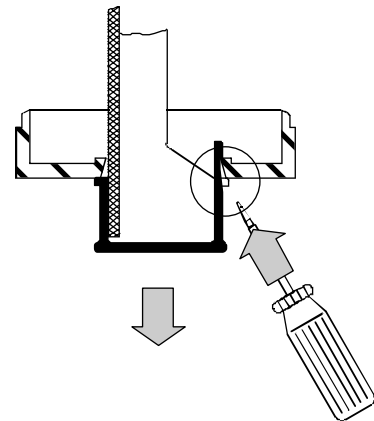
## 6. The public memory modules PCD7.R...

The public memory module (PCD7.R1.. or PCD7.R3..) has a central function within the system. It contains the user programs and texts of both processors, with their memory map, all flags, registers, timers, counters and the hardware clock (when present). The memory module is inserted in the recess provided in the front panel processor module.

It should be repeated here that, when power is connected, the removal or insertion of modules is not permitted. In particular, this applies to the public memory modules described in this section.



The memory module is provided with a security clip to prevent it from falling out during transportation and heavy vibrations. To remove the module screwdriver no. 1 or 2 is needed. The screwdriver must be inserted and the memory module simultaneously removed.



Remarks : The PCD7.R... modules differ from the superseded PCD4.R... models in their increased memory capacity for program, texts and data blocks.

Important : The processor modules of the **PCD4.Mx70 series** are equipped with a new public memory module **PCD7.R400** (see details in chapter 5).

## 6.1 Common specifications

---

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>User memory</b>                    | <p>for program, texts and data blocks</p> <p>PCD7.R1../R2.. : max. 256 KBytes</p> <p>PCD7.R310 : max. 428 KBytes</p> <p>(PCD4.R1../R2.. ) : max. 64 KBytes</p>                                                                                                                                                                                                                                                                                                                                      |
| <b>Flags</b>                          | <p>8192 x 1 bit flags</p> <p>The division of non-volatile and volatile flags is done by the DEFVM instruction.</p>                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Registers</b>                      | <p>4096 x 32 bit registers</p> <p>All registers are always non-volatile</p>                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Data formats</b>                   | <p>The standard format is decimal.</p> <p>Range : <math>-2\,147\,483\,648 \dots +2\,147\,483\,647</math><br/> <math>-2^{31} \dots +2^{31}-1</math></p> <p>These alternative formats are supported :</p> <p>Binary : 31 bits with +/- sign</p> <p>Hexadecimal : 0 ... FFFFFFFF</p> <p>BCD : 0 ... 1999999999</p> <p>Floating Point :</p> <p><math>+9.223\,37 \times 10^{18} \dots +5.42\,101 \times 10^{-20}</math><br/> <math>-9.223\,37 \times 10^{18} \dots -5.42\,101 \times 10^{-20}</math></p> |
| <b>Timers/Counters</b>                | <p>1600 x 31 bits</p> <p>The division between timers and counters is done by the DEFTC instruction.</p> <p>All counters are non-volatile.</p> <p>All timers are volatile.</p>                                                                                                                                                                                                                                                                                                                       |
| <b>Data formats</b>                   | As for registers, but positive values only and without floating point                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Timebase for timers</b>            | 10 ms ... 10 s (the same for both processor modules). The timebase is defined with the DEFTB instruction.                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Hardware clock</b>                 | Week, day of week, year, month, date, hour, minute, second                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Precision</b>                      | Better than 15 s/month at $T_a = 15 \dots 30^\circ\text{C}$                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Battery power reserve</b>          | 2 months (see section 6.2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Power consumption</b><br>(5 V bus) | all memory modules 140 mA each                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## 6.2 The battery

---

The rechargeable NiCd battery prevents loss of data when the controller is switched off (user program and text on RAM, registers, counters and non-volatile flags, history log) and also powers the hardware clock.

The "Batt" LED on the front panel of the supply module PCD4.N2.. shows the battery state (PCD4 powered on) :

|          |   |          |   |                                 |
|----------|---|----------|---|---------------------------------|
| LED Batt | = | off      | : | Battery ok.                     |
| LED Batt | = | on (red) | : | Battery low<br>(XOB2 is called) |

The battery is located on the memory module. The battery change due date is written on a label on the memory module's handle.

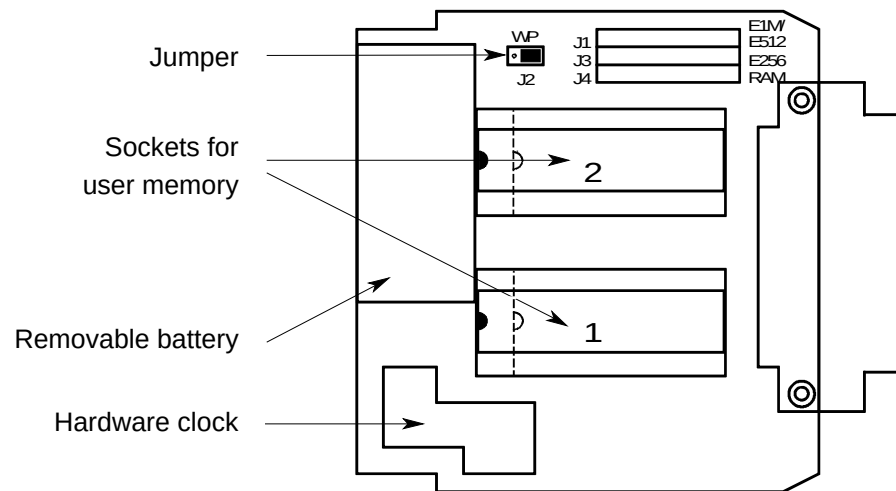
In the case of the older PCD7.R1../R2.. (and PCD4.R1../R2..) modules, the battery is changed by removing the module from the PCD, removing the two screws and lifting off the handle. Before replacing the battery, the data in memory (registers, counters, flags etc.) can be saved using the programming tools, then restored after the new battery has been inserted and has been in use for a short time.

With the PCD7.R310, it is possible to change the battery while the PCD is running (live) (see section 6.4).

|                                |                                                                     |              |
|--------------------------------|---------------------------------------------------------------------|--------------|
| Data :                         | - Fully charged battery power reserve in<br>unpowered memory module | 2 months     |
|                                | - Battery charge-up time                                            | 15 hours     |
|                                | - Life expectancy                                                   | 5 years      |
|                                | - Nominal voltage                                                   | 2.4 V        |
| Order number (for replacement) |                                                                     | 4 507 1360 0 |

## 6.3 PCD7.R110 with user memory up to 256 KBytes

### Presentation



### Type summary

Three different modules are available :

- PCD7.R110 for EPROM with hardware clock
- PCD7.R210 <sup>3)</sup> fitted with 64 KBytes RAM <sup>2)</sup> with hardware clock
- PCD7.R220 <sup>3)</sup> fitted with 256 KBytes <sup>1)</sup> RAM <sup>2)</sup> with hardware clock

The following can be used as EPROM :

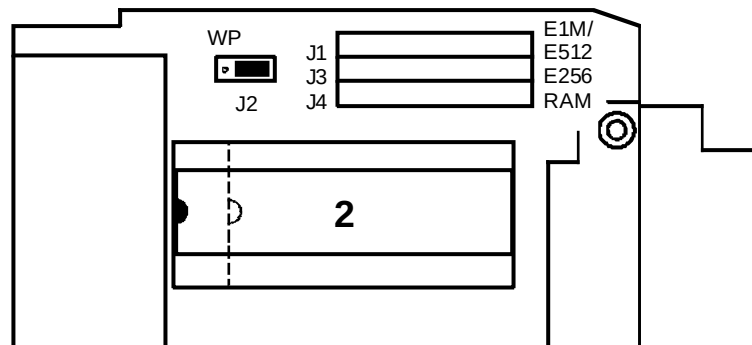
- Type 27C256-10 , Item number 1 chip piece 4'502'5327'0  
fitted with 2 EPROMs resulting in 64 KBytes user memory  
(insert EPROMs aligned to the right)
- Type 27C512-10 , Item number 1 chip piece 4'502'3958'0  
fitted with 2 EPROMs resulting in 128 KBytes user memory  
(insert EPROMs aligned to the right)
- Type 27C1001-10 , Item number 1 chip piece 4'502'7126'0  
fitted with 2 EPROMs resulting in 256 KBytes <sup>1)</sup> user memory

- Note :
- 1 text character requires memory capacity of 1 byte
  - 1 program line requires memory capacity of 4 bytes
  - 1 register in DB requires memory capacity of 8 bytes

Any combination in the same RAM or EPROM user memory is possible.

- 1) From version "E" upwards of processor modules PCD4.Mxx0
- 2) Using non original RAM components (equipped by SAIA) there is a danger of loss of data
- 3) Phased out modules

## Setting the jumpers



Insertion of jumpers allows the following memory chips to be fitted :

| Memory                  | Jumpers position<br>(large jumper block) | Results in PCD4<br>memory |
|-------------------------|------------------------------------------|---------------------------|
| EPROM                   | J3 : 2 x 27C256-10 EPROM's               | 64 KBytes <sup>2)</sup>   |
|                         | J1 : 2 x 27C512-10 EPROM's               | 128 KBytes                |
|                         | J1 : 2 x 27C1001-10 EPROM's              | 256 KBytes <sup>1)</sup>  |
| RAM<br>(factory fitted) | J4 : 2 x 256 KBit RAM                    | 64 KBytes                 |
|                         | J4 : 2 x 1 MBit RAM                      | 256 KBytes <sup>1)</sup>  |

1) From version "E" upwards of processor modules PCD4.Mxx0

2) In the models for EPROM (type ..R110) the factory setting for the jumper is position J3.

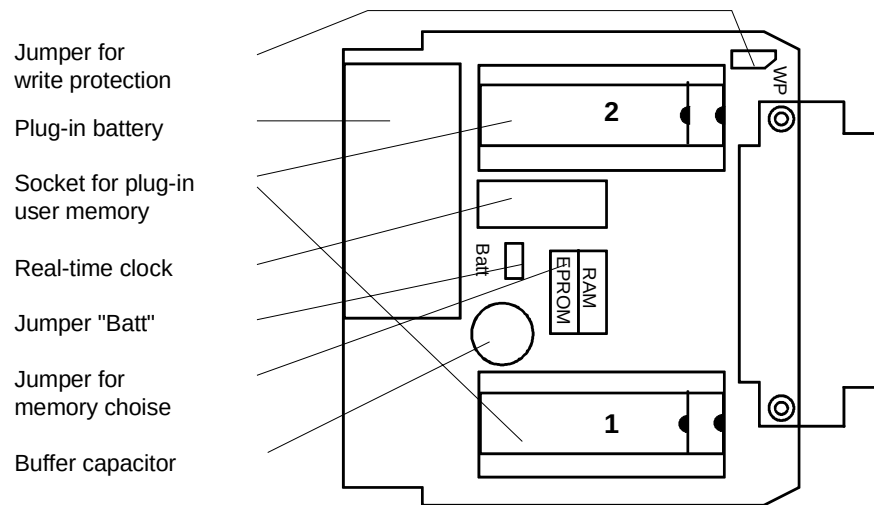
The **single jumper J2** is for write protection when RAM memory is used.

Position WP : Write Protected

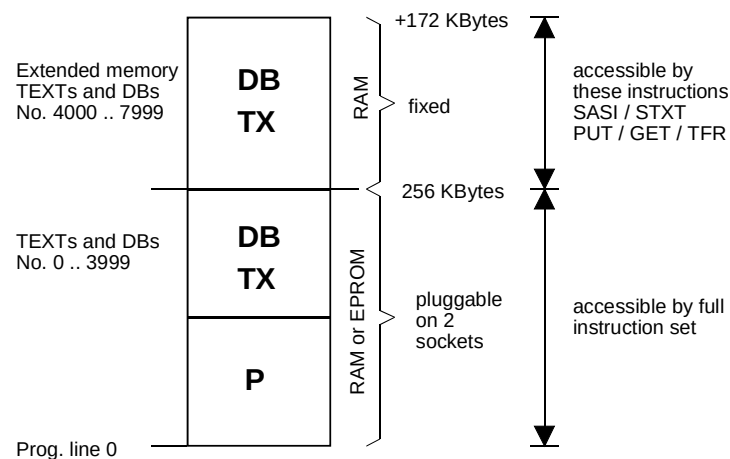
The factory setting is "not write protected".

## 6.4 PCD7.R310 with user memory up to 428 KBytes

### Presentation



### Division of memory



### Equipment and jumper positions :

| Memory | Type                       | Order number for 1 piece | Jumpers                            | Results in PCD4 memory <sup>*)</sup> |
|--------|----------------------------|--------------------------|------------------------------------|--------------------------------------|
| EPROM  | 27C512-10                  | 4'502'3958'0             | EPROM : 2 x 512 KBit<br>2 x 1 MBit | 128 KBytes                           |
|        | 27C1001-10 <sup>**) </sup> | 4'502'7126'0             |                                    | 256 KBytes                           |
| RAM    | 62'256ALP-70               | 4'502'5414'0             | RAM : 2 x 256 KBit<br>2 x 1 MBit   | 64 KBytes                            |
|        | TC55'1001BPL-70L           | 4'502'7013'0             |                                    | 256 KBytes                           |

<sup>\*)</sup> additional 172 KBytes RAM for TX and DB

<sup>\*\*)</sup>  AMD                    AM27C010-90DC  
 Fairchild                NM27C010Q-90  
 SGS-Thomson          M27C1001-10F1

By the enlargement of fixed RAM memory, the capacity of the ..R310 module can be increased to 428 KBytes. For example, it is possible to insert 2 EPROMs in the 2 sockets producing a total of 256 KBytes for fixed programs, texts and data blocks.

Read/write data blocks and texts are stored in the additional 172 KBytes of RAM. In this way, the 172 KBytes can be used to store approx. 40 K of 32-bit registers, transferable as required to CPU registers R0 ... 4095 with the PUT, GET and TFR instructions.

Note :

1 element of 1 data block in address range 0 ... 3999 uses 8 bytes

1 element of 1 data block in address range 4000 ... 7999 uses 4 bytes

The **small jumper "+5V/BATT"** can be used to disconnect the real-time clock from the battery. This results in longer data protection. However, in this operating mode the clock will only run when the PCD is powered up.

Jumper at "BATT" setting :      clock runs from battery  
(running always) \*)

Jumper at "+5V" setting :      clock disconnected from battery

\*) Factory setting of jumper

With RAM, the **small "WP" jumper** can be used to protect memory from being overwritten :

Jumper "WP" in position "WP" : write protected

Standard factory setting: not write protected. If the memory is fitted with EPROMs, the "WP" jumper is not significant.

### Changing the battery

There are 2 different ways of replacing the battery without loss of data, depending on circumstances :

a) Changing the battery while the PCD4 is running (live) :

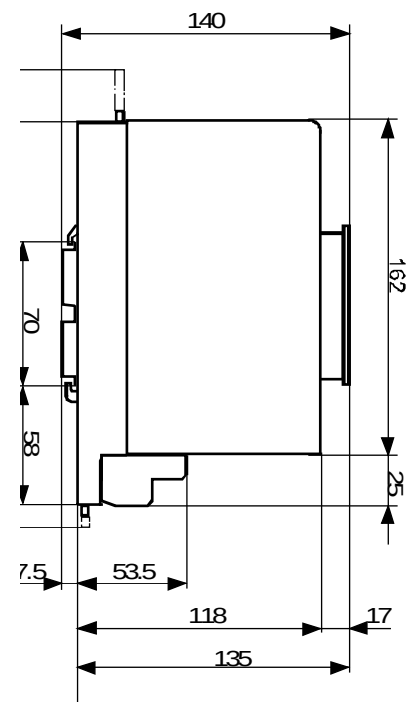
To lift off the plastic handle only (not the board), a screw is removed from the side. Lift off the handle and take out battery from the side of the socket. Insert new battery and screw down handle.

b) Changing the battery when memory module has been taken out :

Remove plastic handle in the same way and change the battery. A buffer capacitor protects data for at least 30 sec. when the battery is exchanged.

## Mechanics

The PCD7.R310 memory module is 3 mm longer than the previous models, which may have to be taken into account for installation in an enclosure.



## Compatibility

The PCD7.R310 modules' expanded memory capacity can be utilized by all firmware and Programming Utilities versions starting from the following :

|                               |             |                 |
|-------------------------------|-------------|-----------------|
| - PCD4.M110 *)                | Version "G" | (firmware V003) |
| - PCD4.M125                   | Version "A" | (firmware V00B) |
| - PCD4.M145                   |             |                 |
| - PCD4.M445 (CPU 0)           |             |                 |
| - PCD4.M445 (CPU 1)           | Version "A" | (firmware V00B) |
| - PCD6.M540                   | Version "C" | (firmware V002) |
| - PCD Programming Utilities : | PG3         | V1.7            |
|                               | PG4         | V1.21           |

The new PCD7.R310 memory modules can also be used with older CPUs. However, memory expansion above 256 KBytes cannot be utilized in this case.

Almost all older user programs will run with the PCD7.R310.

\*) also for the old CPUs ..M120, ..M140, ..M240 and ..M340



## 7. The power supply modules PCD4.N2..

---

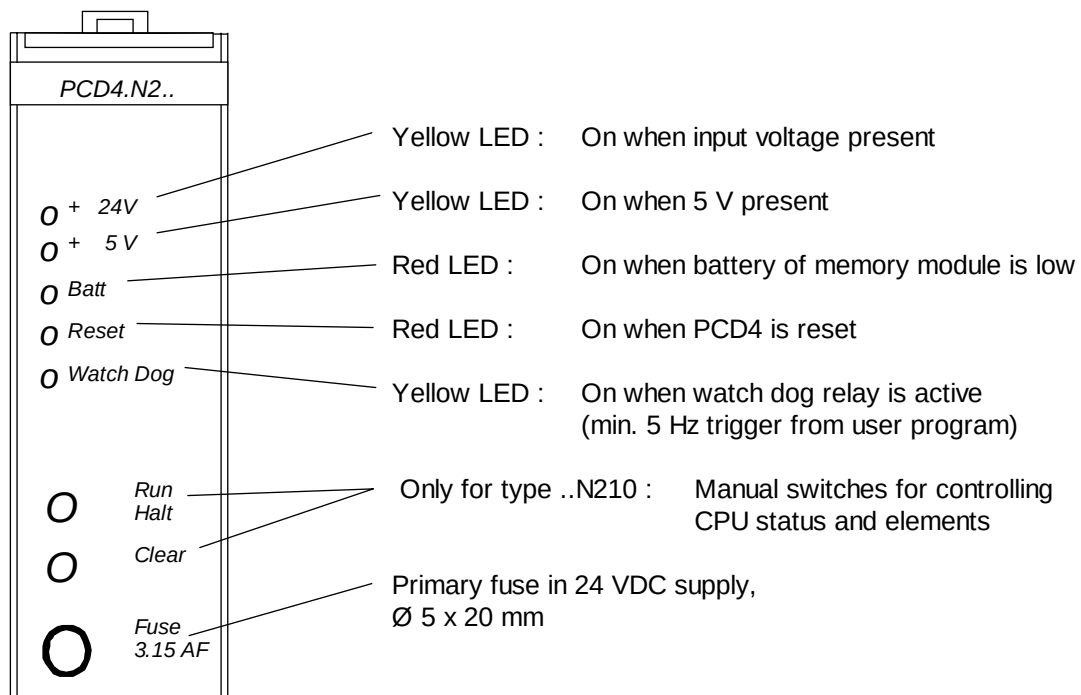
### 7.1 General

---

|                                         |                                                                                                         |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------|
| Type PCD4.N200<br>( $\geq$ version "B") | Basic type for digital I/O modules only<br>(E.. and A.. types),<br>without "Halt" and "Clear" switches. |
| Type PCD4.N210<br>( $\geq$ version "B") | For all I/O modules (E.., A.., W.., and H..<br>types), with "Halt" and "Clear" switches.                |

#### Technical Information

|                                          |                                                                                                                                                                                                                                                                                                                                                   |             |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------|-------------|--|------|-----|-----|--|-------|-------|-------|-------------------|-------|--------|--------|-------------------|
| Supply voltage                           | 24 VDC    ±20 % smoothed<br>19 VAC    ±15 % from transformer of<br>min. 100 VA full-wave rectified<br>results in pulsating 18 VDC<br>(see section 3.7)                                                                                                                                                                                            |             |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| Galvanically isolated                    | No, negative connected to chassis                                                                                                                                                                                                                                                                                                                 |             |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| Current                                  | Max. 2.5 A at 24 VDC                      (version A : 2 A)                                                                                                                                                                                                                                                                                       |             |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| Input fuse                               | 3.15 AF fast                                      (version A : 4 AT)                                                                                                                                                                                                                                                                              |             |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| Reverse voltage protection               | Yes                                                                                                                                                                                                                                                                                                                                               |             |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| Output voltages and currents to PCD4 bus | <table><tr><td></td><td><u>N200</u></td><td><u>N210</u></td><td></td></tr><tr><td>+5 V</td><td>4 A</td><td>4 A</td><td></td></tr><tr><td>+15 V</td><td>0.1 A</td><td>0.5 A</td><td>(vers. A : 0.3 A)</td></tr><tr><td>-15 V</td><td>0.05 A</td><td>0.45 A</td><td>(vers. A : 0.2 A)</td></tr></table><br>Short circuit protection on all outputs. |             | <u>N200</u>       | <u>N210</u> |  | +5 V | 4 A | 4 A |  | +15 V | 0.1 A | 0.5 A | (vers. A : 0.3 A) | -15 V | 0.05 A | 0.45 A | (vers. A : 0.2 A) |
|                                          | <u>N200</u>                                                                                                                                                                                                                                                                                                                                       | <u>N210</u> |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| +5 V                                     | 4 A                                                                                                                                                                                                                                                                                                                                               | 4 A         |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| +15 V                                    | 0.1 A                                                                                                                                                                                                                                                                                                                                             | 0.5 A       | (vers. A : 0.3 A) |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| -15 V                                    | 0.05 A                                                                                                                                                                                                                                                                                                                                            | 0.45 A      | (vers. A : 0.2 A) |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| Voltage monitoring                       | 24 VDC input voltage and<br>+5 V, +15 V, -15 V output                                                                                                                                                                                                                                                                                             |             |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| Watch dog frequency                      | ≥ 5 Hz on addresses 255 or 511                                                                                                                                                                                                                                                                                                                    |             |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| Watch dog contact                        | 48 VAC or VDC, max. 0.5 A                                                                                                                                                                                                                                                                                                                         |             |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| External reset                           | Fast reset input of 2 ms (R to chassis = Reset)<br>for Instruction Pointer, Outputs, Timers and<br>volatile Flags. (Details see section 4.1.6)                                                                                                                                                                                                    |             |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |
| Output power held after power failure    | min. 10 ms (at max. load, i.e. 4 A at 5 V)<br>(without calling XOB 0)<br>(version A : min. 5 ms)                                                                                                                                                                                                                                                  |             |                   |             |  |      |     |     |  |       |       |       |                   |       |        |        |                   |

**Front panel****Description**

The PCD4.N2.. power supply module provides the internal power for the entire PCD4 system via the PCD4 bus. The modules are plugged into the left-hand connector of the PCD4.C1x0 or ..C340 bus module (next to the processor module).

If PCD4.W.. or H.. type I/O modules are present, the PCD4.N210 power supply module should be used, which provides them with a stabilized voltage of –15 VDC.

The PCD4.N2.. power supply modules are adequate to provide power for up to 16 digital I/O modules (up to 256 I/Os) in any desired combination. For more than 16 modules or use of W... and H... types see section 7.3.

As the diagram shows, every N2.. module has :

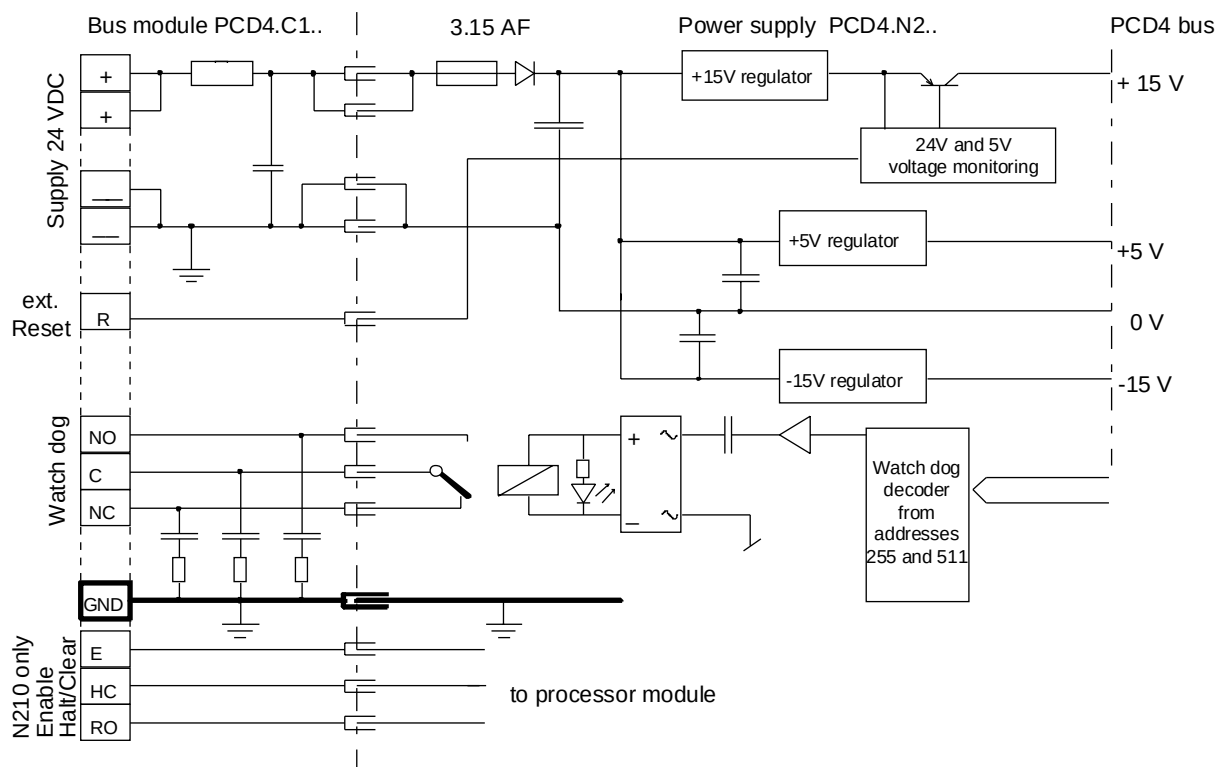
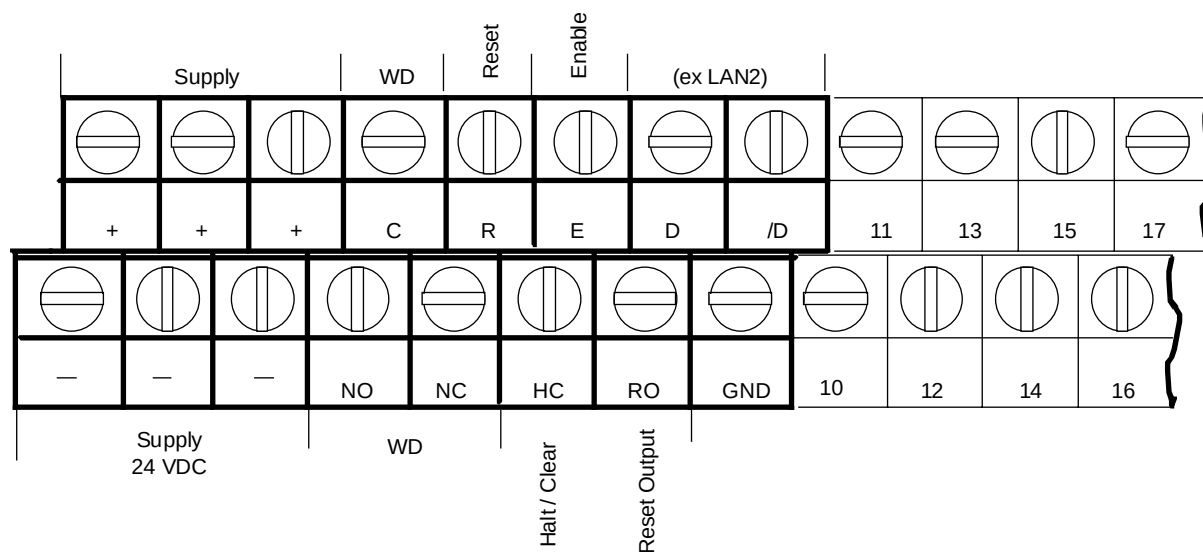
- LEDs showing operating states
- Voltage monitoring
- Watch dog circuit
- ..N210 : Manual switches for controlling CPU status and elements

- **Voltage monitoring** provides control when the PCD4 is powered off and on, and ensures it is "Reset" if the voltage is low. This prevents the PCD4 from continuing to run if errors may occur.
- **The "Halt/Clear"** switches on the front are only present on the ..N210 model. "Halt" allows the controller to be set into the "Halt" state manually (without using the programming unit). "Clear" allows all the elements to be cleared (excluding the Registers and the real-time clock). For details, see the chapter describing processor modules.

To avoid unintentional use of these switches, both switches are only active if the following jumpers on the ..C1x0 or ..C340 module are present :

- Jumper E-HC : Activates the "Halt" and "Clear" switches
  - Jumper E-RO : Forces all outputs low in the "Halt" and "Stop" states (see bus module ..C1x0 or ..C340)
- **External reset.** In any operating state, the PCD4 can be reset within 2 ms, if the "R" connector on the bus module is grounded (GND). On reset, the following elements are affected :
    - All digital Outputs are reset (independent of jumper E-RO)
    - All Timers and volatile Flags are reset
    - Instruction Pointer is set at zero (coldstart)

The Reset state is indicated by the corresponding LED on the front panel.

**Block diagram****Screw terminal connections of PCD4.C1x0 or ..C340 bus module**

## 7.2 Use of the "Watch Dog"

The watch dog circuit enables the correct processing of the user program to be monitored reliably. In case of error, effective safety measures can be taken.

The WD relay remains active (contact C-NO closed) as long as I/O addresses 255 or 511 receive an alternating signal  $\geq 5$  Hz.

This signal is easily produced by inserting the instruction "COM O 255" or "COM O 511" in any COB which is being cyclically executed.

```

COB   0   ; or COB 1 ... 15
          0

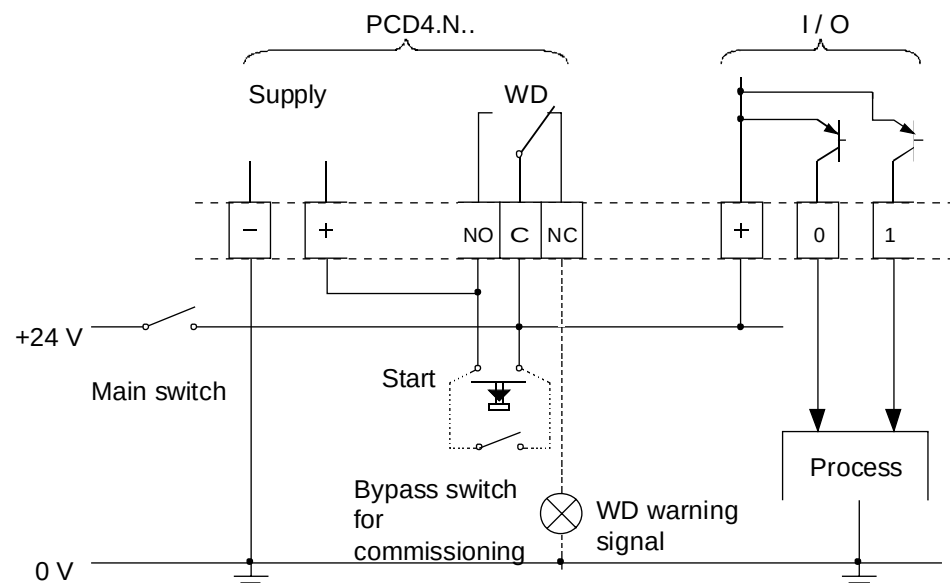
(ACC   H   )
  COM   0 255   ; or 0 511
  ⋮   ⋮
  ⋮   ⋮
ECOB

```

If a fault should arise in the user program or the CPU, or if any other operating mode than "RUN" is chosen, the watch dog will time-out, the C-NO relay contact opens and the yellow watch dog LED is extinguished. Necessary safety measures can now be carried out using this watch dog relay contact.

**Note :** Watch dog addresses 255 and 511 should NOT be used as element addresses for digital inputs and outputs. In general, special modules such as analogue, motion control or fast counting modules, must not be used at addresses 240 ... 255 and 496 ... 511.

### Connection diagram



## 7.3 Power requirements of the PCD4 modules

The PCD4 power supply modules provide the **internal** power for all PCD4 modules at +5 V, +15 V and –15 V.

If the system is extended to contain up to 32 I/O modules (512 I/O addresses), it is necessary to check internal power requirements when there are a large number of modules.

### Capacity of the PCD4.N2.. power supply module

| Type<br>PCD4       | I at +5 V<br>( mA ) | I at +15 V<br>( mA ) | I at –15 V<br>( mA ) |
|--------------------|---------------------|----------------------|----------------------|
| ..N200             | 4000                | 100 <sup>2)</sup>    | 50 <sup>2)</sup>     |
| ..N210 (≥ vers. B) | 4000                | 500                  | 450                  |
| ..N210 (vers. A)   | 4000                | 300                  | 200                  |

### Power requirements of PCD4 modules

| Type<br>PCD4 | I at +5 V<br>( mA ) |                    | I at +15 V<br>( mA ) |                    | I at –15 V<br>( mA ) |                    |
|--------------|---------------------|--------------------|----------------------|--------------------|----------------------|--------------------|
|              | max.                | mean <sup>1)</sup> | max.                 | mean <sup>1)</sup> | max.                 | mean <sup>1)</sup> |
| ..C100       | 25                  | 18                 | --                   | --                 | --                   | --                 |
| ..C110       | 60                  | 50                 | 40                   | 20                 | --                   | --                 |
| ..C120       | 85                  | 50                 | 80                   | 40                 | 20                   | 10                 |
| ..C130       | 320                 | 220                | --                   | --                 | --                   | --                 |
| ..C220       | 5                   | 5                  | --                   | --                 | --                   | --                 |
| ..C225       | 5                   | 5                  | --                   | --                 | --                   | --                 |
| ..C260       | 5                   | 5                  | --                   | --                 | --                   | --                 |
| ..C340       | 5                   | 5                  | --                   | --                 | --                   | --                 |
| ..M110       | 600                 | 600                | 5                    | 3                  | 16                   | 8                  |
| ..M125       | 740                 | 740                | 5                    | 3                  | 16                   | 8                  |
| ..M145       | 740                 | 740                | 5                    | 3                  | 16                   | 8                  |
| ..M445       | 1440                | 1440               | 5                    | 3                  | 16                   | 8                  |
| PCD7.R110    | 140                 | 140                | --                   | --                 | --                   | --                 |
| .R310        | 140                 | 140                | --                   | --                 | --                   | --                 |
| PCD7.F110    | 50                  | 50                 | --                   | --                 | --                   | --                 |
| .F120        | 10                  | 10                 | --                   | --                 | --                   | --                 |
| .F130        | 10                  | 10                 | 40                   | 40                 | --                   | --                 |
| .F150        | 130                 | 130                | --                   | --                 | --                   | --                 |
| PCD8.P100    | 120                 | 120                | --                   | --                 | --                   | --                 |

1) 2) See next page

| Type<br>PCD4 | I at +5 V<br>( mA )      |                          | I at +15 V<br>( mA ) |                    | I at -15 V<br>( mA ) |                    |
|--------------|--------------------------|--------------------------|----------------------|--------------------|----------------------|--------------------|
|              | max.                     | mean <sup>1)</sup>       | max.                 | mean <sup>1)</sup> | max.                 | mean <sup>1)</sup> |
| ..E100       | (5) 45                   | (5) 25                   | --                   | --                 | --                   | --                 |
| ..E11x       | 45                       | 25                       | --                   | --                 | --                   | --                 |
| ..E60x       | 45                       | 25                       | --                   | --                 | --                   | --                 |
| ..A200       | (65) 25                  | (35) 15                  | 3                    | 3                  | --                   | --                 |
| ..A250       | 45                       | 25                       | 3                    | 3                  | --                   | --                 |
| ..A350       | (50) 25                  | (30) 15                  | 3                    | 3                  | --                   | --                 |
| ..A400       | (125) 45                 | (65) 25                  | 6                    | 6                  | --                   | --                 |
| ..A410       | 45                       | 25                       | 3                    | 3                  | --                   | --                 |
| ..A810       | 45                       | 45                       | 3                    | 3                  | --                   | --                 |
| ..A820       | 45                       | 45                       | 3                    | 3                  | --                   | --                 |
| ..B90x       | (130) 95                 | (70) 50                  | 7                    | 7                  | --                   | --                 |
| ..W100       | 50                       | 50                       | 35                   | 35                 | 35                   | 35                 |
| ..W300       | 30                       | 30                       | 16                   | 16                 | 9                    | 9                  |
| ..W400       | 10                       | 10                       | 50                   | 30                 | 25                   | 15                 |
| ..W500       | 150                      | 150                      | 3                    | 3                  | --                   | --                 |
| ..W600       | 200                      | 200                      | 3                    | 3                  | --                   | --                 |
| ..W800       | 30                       | 30                       | 10                   | 10                 | --                   | --                 |
| ..H120       | 120                      | 65                       | 9                    | 9                  | --                   | --                 |
| ..H210       | 85                       | 65                       | 3                    | 3                  | --                   | --                 |
| ..H215       | 85                       | 70                       | 3                    | 3                  | --                   | --                 |
| ..H220       | 150                      | 100                      | 3                    | 3                  | --                   | --                 |
| ..H225       | 95                       | 95                       | 3                    | 3                  | --                   | --                 |
| ..H31x       | 150                      | 100                      | 9                    | 9                  | 3                    | 3                  |
| ..H32x       | 220                      | 180                      | 11                   | 11                 | 6                    | 6                  |
| ..H4x0       | 650<br>+ 100<br>per axis | 550<br>+ 100<br>per axis | 8                    | 6                  | 25                   | 20                 |

- 1) 50 % of all I/Os active and remaining modules at statistical mean load.
- 2) This voltage is not regulated. Therefore modules of the types W... and H... require the ..N210 power supply (power supply for RS 232).

These modules require the ..N210 power supply.

( ) superseded versions

|              |        |    |                |
|--------------|--------|----|----------------|
| new versions | E100 : | B  | from 1993      |
|              | A200 : | A1 | from 1993      |
|              | A350 : | C  | from Q4 / 1994 |
|              | A400 : | B  | from Q4 / 1994 |
|              | B900 : | B  | from 1991      |

**Example 1 :** 16 I/O modules (address range 0 ... 255)

| Type<br>PCD4 | I at +5 V<br>( mA ) |                 | I at +15 V<br>( mA ) |       | I at -15 V<br>( mA ) |       |
|--------------|---------------------|-----------------|----------------------|-------|----------------------|-------|
|              | max.                | mean            | max.                 | mean  | max.                 | mean  |
| 1 x C120     | 85                  | 50              | 80                   | 40    | 20                   | 10    |
| 1 x M125     | 740                 | 740             | 5                    | 3     | 16                   | 8     |
| 1 x R110     | 140                 | 140             | --                   | --    | --                   | --    |
| 6 x E110     | 270                 | 150             | --                   | --    | --                   | --    |
| 2 x A350     | 50                  | 30              | 6                    | 6     | --                   | --    |
| 4 x A400     | 180                 | 100             | 24                   | 24    | --                   | --    |
| 3 x W100     | 150                 | 150             | 105                  | 105   | 105                  | 105   |
| 1 x H320     | 220                 | 180             | 11                   | 11    | 6                    | 6     |
| 2 x C220     | 10                  | 10              | --                   | --    | --                   | --    |
| 2 x C260     | 10                  | 10              | --                   | --    | --                   | --    |
| (1 x P100)   | (120)               | (120)           | --                   | --    | --                   | --    |
| Total        | 1855<br>(+ 120)     | 1560<br>(+ 120) | 231                  | 189   | 147                  | 129   |
| Test         | < 4000              | < 4000          | < 500                | < 500 | < 450                | < 450 |

This PCD4 system with digital and analogue modules and a controller for 2 axes can easily be supplied by the PCD4.N210 module (version "A" or  $\geq$  "B").

The occasional use of the PCD8.P100 hand-held programming unit will not cause any power supply problems.



**Example 2 :** 24 I/O modules (address range 0 ... 383)

| Type<br>PCD4 | I at +5 V<br>( mA ) |                 | I at +15 V<br>( mA ) |       | I at -15 V<br>( mA ) |       |
|--------------|---------------------|-----------------|----------------------|-------|----------------------|-------|
|              | max.                | mean            | max.                 | mean  | max.                 | mean  |
| 1 x C340     | 5                   | 5               | --                   | --    | --                   | --    |
| 2 x F110     | 100                 | 100             | --                   | --    | --                   | --    |
| 1 x F120     | 10                  | 10              | --                   | --    | --                   | --    |
| 1 x M445     | 1440                | 1440            | 5                    | 3     | 16                   | 8     |
| 1 x R310     | 140                 | 140             | --                   | --    | --                   | --    |
| 4 x E110     | 180                 | 100             | --                   | --    | --                   | --    |
| 4 x A200     | 100                 | 60              | 12                   | 12    | --                   | --    |
| 10 x B900    | 950                 | 500             | 70                   | 70    | --                   | --    |
| 1 x W300     | 30                  | 30              | 16                   | 16    | 9                    | 9     |
| 1 x W400     | 10                  | 10              | 50                   | 30    | 25                   | 15    |
| 1 x W500     | 150                 | 150             | 3                    | 3     | --                   | --    |
| 1 x W600     | 200                 | 200             | 3                    | 3     | --                   | --    |
| 2 x H225     | 190                 | 190             | 6                    | 6     | --                   | --    |
| 1 x C220     | 5                   | 5               | --                   | --    | --                   | --    |
| 3 x C260     | 15                  | 15              | --                   | --    | --                   | --    |
| (1 x P100)   | (120)               | (120)           | --                   | --    | --                   | --    |
| Total        | 3525<br>(+ 120)     | 2955<br>(+ 120) | 165                  | 143   | 50                   | 32    |
| Test         | < 4000              | < 4000          | < 500                | < 500 | < 450                | < 450 |

This complex PCD4 system with two CPUs is easily supplied by the PCD4.N210 module (version "A" or  $\geq$  "B"); it consists of 416 digital I/O, 32 analogue I/O and 4 controlled stepper motor axes).

In the above example, if the maximum address range of 511 (32 modules) were fully utilized, e.g. with a further 8 x ..B900 modules and 2 bus modules, this maximum system would require :

at 5 V :      max. 4295 mA    (+ 120 mA for P100)  
                 mean 3365 mA    (+ 120 mA for P100)

at +15 V :    max. 221 mA  
                 mean 199 mA

Result :      The above configuration (672 digital I/O, 32 analogue I/O, 4 controlled stepper motor axes) **CANNOT** be extended to 32 modules.

**Example 3 :** 32 digital I/O modules (address range 0 ... 511)

| Type<br>PCD4 | I at +5 V<br>( mA ) |                 | I at +15 V<br>( mA ) |       | I at -15 V<br>( mA ) |       |
|--------------|---------------------|-----------------|----------------------|-------|----------------------|-------|
|              | max.                | mean            | max.                 | mean  | max.                 | mean  |
| 1 x C340     | 5                   | 5               | --                   | --    | --                   | --    |
| 1 x F120     | 10                  | 10              | --                   | --    | --                   | --    |
| 2 x F130     | 20                  | 20              | 80                   | 80    | --                   | --    |
| 1 x M145     | 740                 | 740             | 5                    | 3     | 16                   | 8     |
| 1 x R310     | 140                 | 140             | --                   | --    | --                   | --    |
| 10 x E110    | 450                 | 250             | --                   | --    | --                   | --    |
| 6 x A350     | 150                 | 90              | 18                   | 18    | --                   | --    |
| 16 x B900    | 1520                | 800             | 112                  | 112   | --                   | --    |
| 6 x C260     | 30                  | 30              | --                   | --    | --                   | --    |
| (1 x P100)   | (120)               | (120)           | --                   | --    | --                   | --    |
| Total        | 3065<br>(+ 120)     | 2085<br>(+ 120) | 215                  | 213   | 16                   | 8     |
| Test         | < 4000              | < 4000          | < 500                | < 500 | < 450                | < 450 |

This purely digital configuration of 32 I/O modules with a total of 720 digital I/Os is permitted for the PCD4.N210 (version "A" or  $\geq$  "B").

## 8. Digital input/output modules

---

To guarantee maximum protection against interference, all digital I/O modules pass a stringent 4 kV interference test, in accordance with IEC 801-4. The modules can be plugged anywhere on the PCD4 bus, providing the I/O bus module's edge connector has not been keyed to prevent insertion of that module type.

The module type number is marked on the front panel of each module. The addresses and names of each signal can be written on the label.



**Caution :** Digital I/O modules should only be changed when the PCD4 is disconnected from the power source.

### Digital input modules PCD4.E...

| Types /<br>/ Characteristics | ..E110            | ..E111            |  | ..E600         | ..E601         |
|------------------------------|-------------------|-------------------|--|----------------|----------------|
| Number of inputs             | 16                | 16                |  | 16             | 16             |
| Nominal input voltage        | 24 VDC            | 24 VDC            |  | 24 VDC         | 24 VDC         |
| Electrically isolated        | No                | No                |  | Yes            | Yes            |
| Operating mode               | Source<br>or sink | Source<br>or sink |  | Source<br>only | Source<br>only |
| Input current                | 8 mA              | 8 mA              |  | 7 mA           | 7 mA           |
| Input delay (ms.)            | 8.0               | 0.1               |  | 8.0 / 8.0      | 0.1 / 0.3      |
| See chapter                  | 8.1               | 8.1               |  | 8.2            | 8.2            |

**Digital output modules PCD4.A...**

| Types /<br>/ Characteristics | ..A200                  | ..A250                  | ..A350                | ..A400                | ..A410                |
|------------------------------|-------------------------|-------------------------|-----------------------|-----------------------|-----------------------|
| Number of outputs            | 8                       | 16                      | 8                     | 16                    | 16                    |
| Control element              | Relay <sup>1)</sup>     | Relay <sup>2)</sup>     | MOSFET                | MOSFET                | MOSFET                |
| Electrically isolated        | Yes                     | Yes                     | Yes                   | No                    | Yes                   |
| Operating mode               | ("Make"<br>contact)     | ("Make"<br>contact)     | Positive<br>switching | Positive<br>switching | Positive<br>switching |
| Breaking capacity            | 2A, 250VAC<br>2A, 50VDC | 2A, 250VAC<br>2A, 50VDC | 2A,<br>24VDC          | 0.5A,<br>24VDC        | 0.5A,<br>24VDC        |
| Short-circuit<br>protection  | No                      | No                      | Yes                   | No                    | No                    |
| See chapter                  | 8.3                     | 8.4                     | 8.5                   | 8.6                   | 8.7                   |

1) Relay with integrated contact protection

2) Relay without contact protection

The combined input/output modules PCD4.B90x are intended to double the input/output capacity of the PCD4 in the same space.

Their functions and technical specifications are based on the existing PCD2 digital I/O modules (for details, see section 8.8).

## 8.1 PCD4.E110/E111 Module with 16 digital inputs

---

### Application

Low price input module for source or sink operation with 16 non-isolated inputs. Suitable for most electronic and electro-mechanical switching elements at 24 VDC, special voltages are possible.

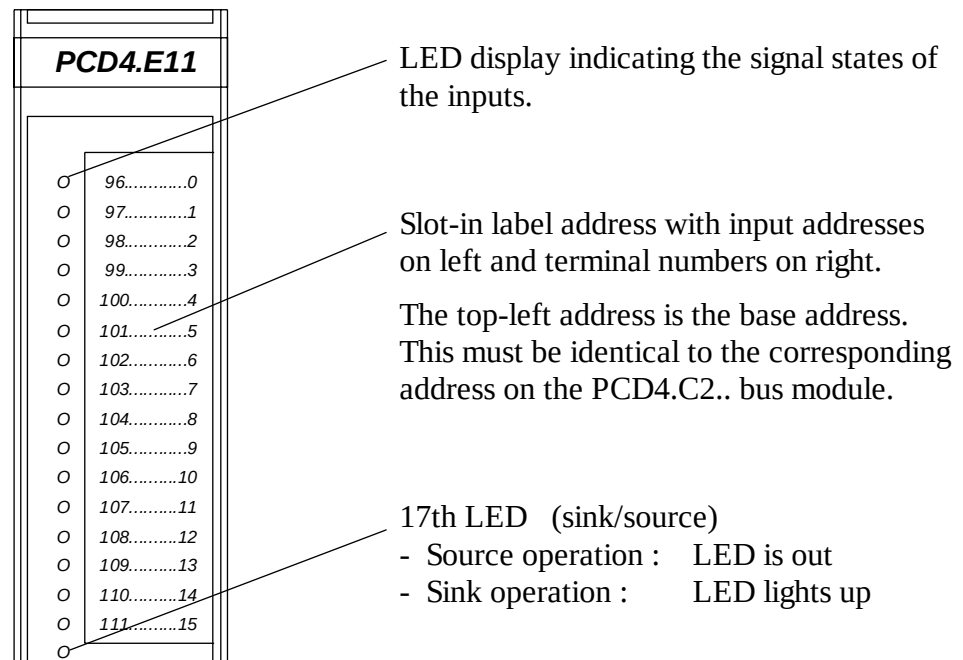
### Technical data

|                                                      |                                                                                                                                 |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Number of inputs per module                          | 16, electrically connected                                                                                                      |
| Operating mode                                       | Source or sink operation                                                                                                        |
| Input voltage $U_e$ (nominal)                        | E110 : 24 VDC, smoothed or pulsed<br>E111 : 24 VDC, smoothed with<br>ripple of max. 10 %<br>Special: 5, 12 or 48 VDC on request |
| Input current                                        | 8 mA at 24 VDC (12 or 48 VDC)<br>4 mA at 5 VDC                                                                                  |
| Typical input delay                                  | E110 : 8 ms, smoothed or<br>pulsed voltage<br>E111 : 0.1 ms, smoothed voltage<br>(ripple of max. 10 %)                          |
| Ambient temperature                                  | Operating : -20 ... +55°C<br>Storage : -20 ... +85°C                                                                            |
| Conforms to standards                                | IEC 1131-2<br>VDI 2880<br>NF C63-850                                                                                            |
| Resistance to interference<br>according to IEC 801-4 | 4 kV under direct coupling<br>2 kV under capacitance coupling<br>(3 kV impulse 1.2 / 50 $\mu$ s IEC 255-4)                      |
| Internal current consumption<br>(from 5 V bus)       | 5 ... 45 mA                                                                                                                     |

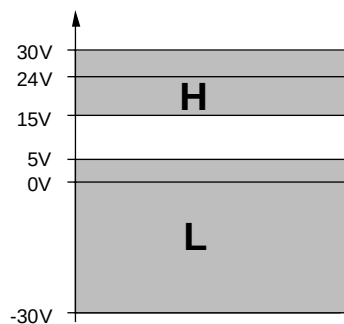


**Important :** If an universal PCD4.E110/E111 input module replaces a former PCD4.E100/E101 input module, the negative terminal ("–") must always be wired.

## Presentation



## Input signal definition for standard version 24 VDC

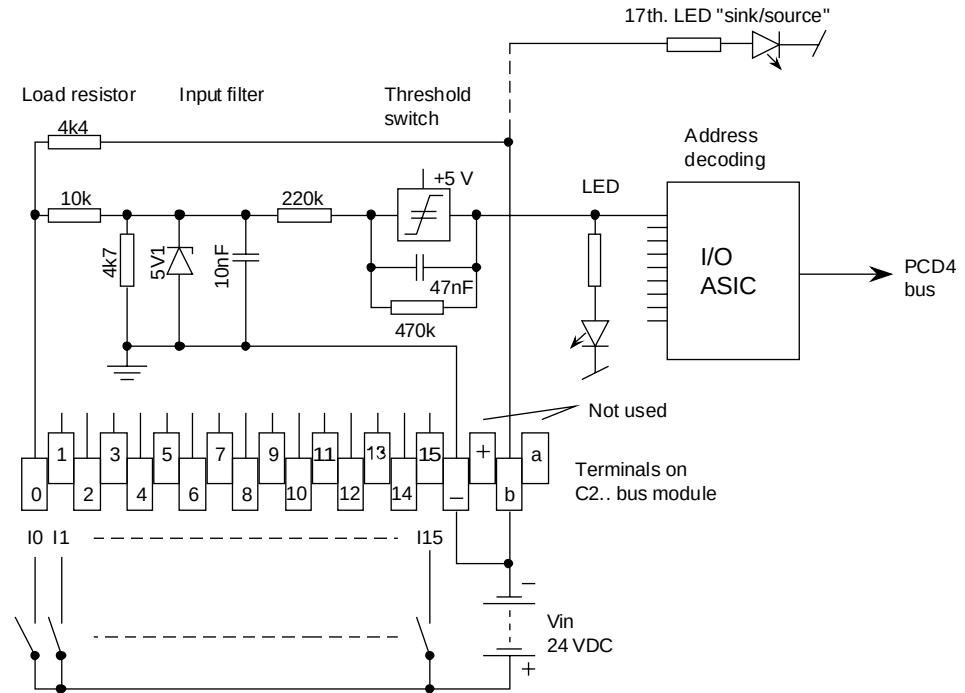


Due to the input delay of typically 8 ms in the standard version (..E110), full-wave rectified DC voltage is adequate for the external supply.

For the ..E111 model, smoothed DC voltage is required.

## Input circuits and terminal assignments

- **Source operation or positive logic :** (for standard version 24 VDC)

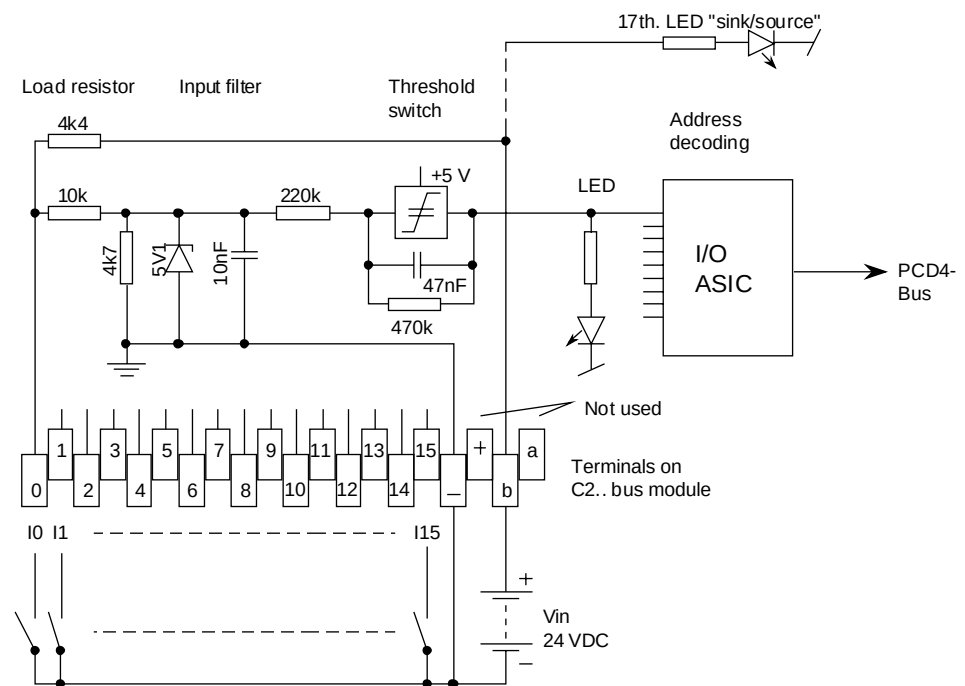


Switch closed

(Positive at input) : Signal status "H" = LED lights up

Switch open : Signal status "L" = LED is out

- **Sink operation or negative logic :** (for standard version 24 VDC)



Switch closed

(negative at input) : Signal status "L" = LED is out

Switch open : Signal status "H" = LED lights up

**Notes :**



## 8.2 PCD4.E600/E601 Module with 16 digital inputs, with electrical isolation

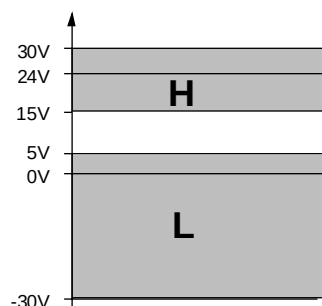
### Application

Input module with electrical isolation for source operation only with 16 inputs. Suitable for most electronic and electro-mechanical switching elements at 24 VDC

The model type PCD4.E601 differs from type PCD4.E600 because of its shorter input rise-time. The ..E601 model needs a smoothed DC voltage.

### Technical data

|                                        |                                                                                                                          |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Number of inputs per module            | 16, electrically isolated by opto-couplers, source operation only                                                        |
| Input voltage U <sub>e</sub> (nominal) | E600 : 24 VDC, smoothed or pulsed<br>E601 : 24 VDC, smoothed with ripple of max. 10 %<br>Special: 5 or 48 VDC on request |



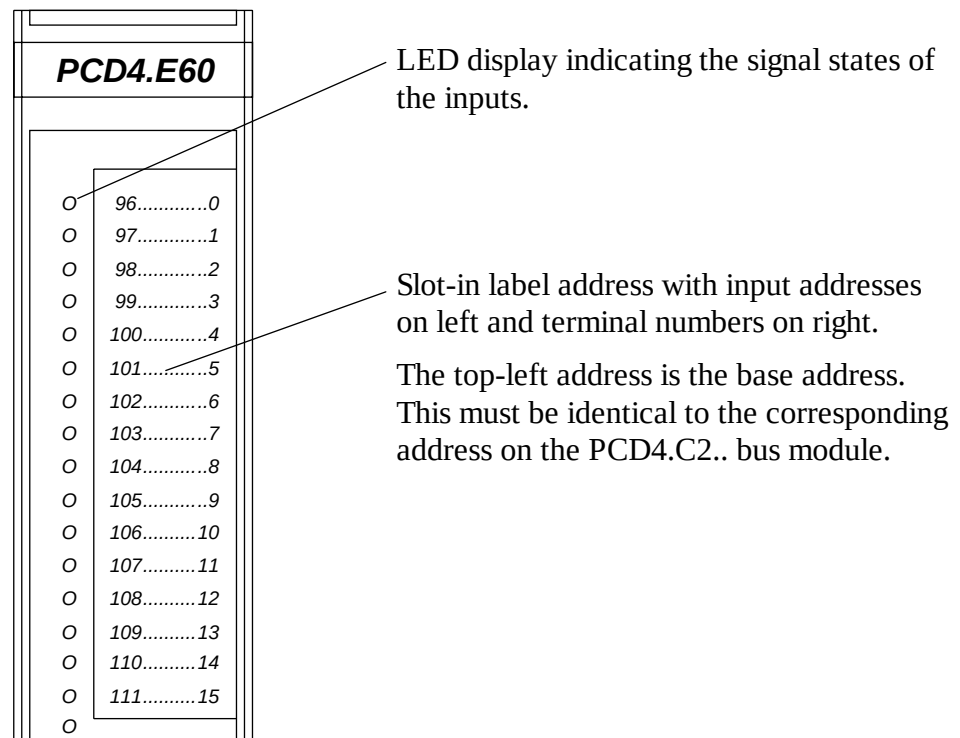
Due to the input delay of typically 8 ms in the standard version (..E600), full-wave rectified DC voltage is adequate for the external supply.

For the ..E601 model, smoothed DC voltage is required.

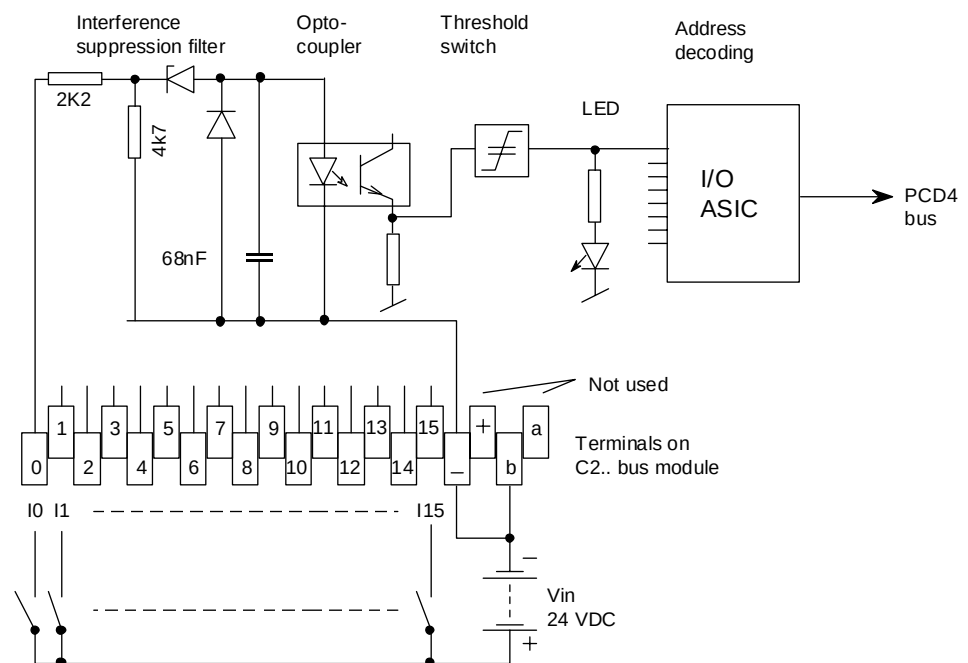
|                                                   |                                                                                       |
|---------------------------------------------------|---------------------------------------------------------------------------------------|
| Input current                                     | 7 mA at 24 VDC                                                                        |
| Typical input delay (low-high / high-low)         | E600 : 8 ms / 8 ms<br>E601 : 0.1 ms / 0.3 ms                                          |
| Resistance to interference according to IEC 801-4 | 4 kV under direct coupling<br>2 kV under capacitance coupling (whole brunch of pairs) |
| Electrical isolation voltage                      | 1000 VAC, 1 min. <sup>1)</sup>                                                        |
| Optocoupler isolation voltage                     | 2.5 kV                                                                                |
| Internal current consumption (from 5 V bus)       | 1 ... 45 mA                                                                           |

- 1) **Caution !** This information only applies for the module itself, i.e. without bus module. On each bus module there is an anti-interference capacitor of 47 nF / 250 V between the negative (–) terminal and PGND, and between the positive (+) terminal and PGND.

## Presentation



## Input circuit (source operation) and terminal assignments



Switch closed

(Positive at input) : Signal status "H" = LED lights up

Switch open : Signal status "L" = LED is out

## 8.3 PCD4.A200 Digital output module with 8 relay contacts, type "normally open" (with contact protection)

---

### Application

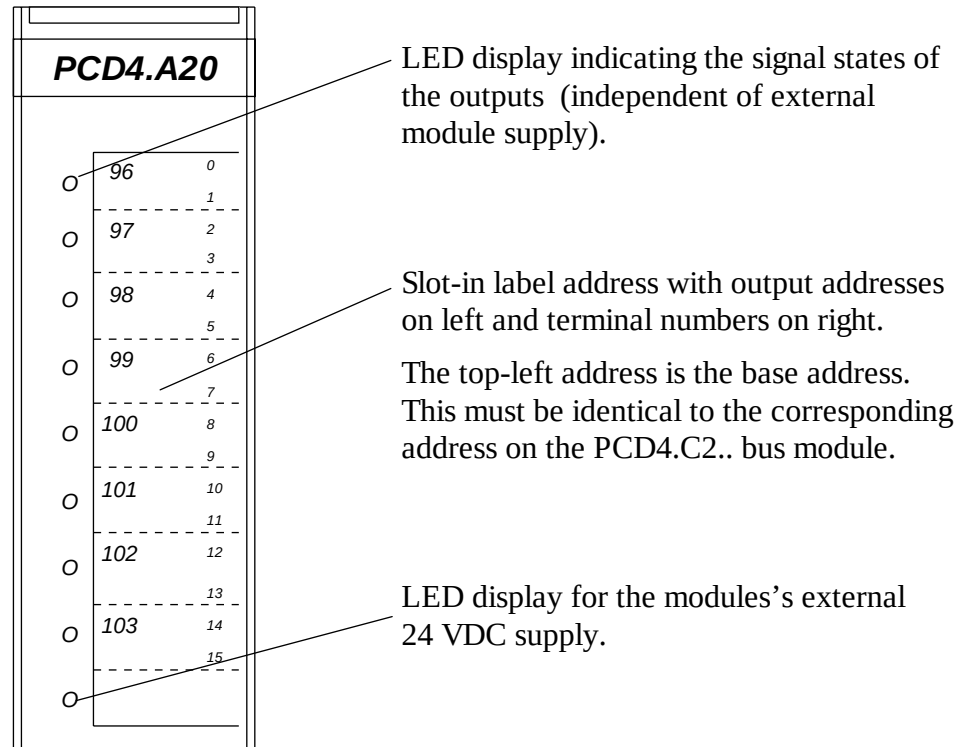
The module contains 8 relays with normally-open contacts for direct or alternating current up to 2 A, 250 VAC. It is especially suited wherever perfectly isolated AC switching circuits must be controlled with infrequent switching (see "installation notes").

### Technical data

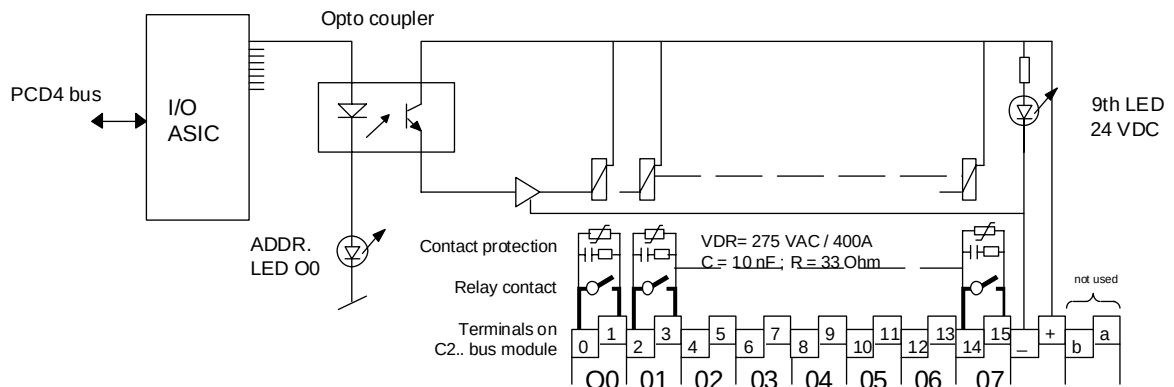
|                                                    |                                                                                                                                                                                                                                                                     |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of outputs per module                       | 8, isolated normally, open contacts (NO)                                                                                                                                                                                                                            |
| Type of relay (typical)                            | REO 30024, SCHRACK <sup>1)</sup>                                                                                                                                                                                                                                    |
| Switch rating<br>(Contact lifetime)                | 2 A, 250 VAC AC1<br>(0.7 x 10 <sup>6</sup> operations)<br>1 A, 250 VAC AC11<br>(1.0 x 10 <sup>6</sup> operations)<br>2 A, 50 VDC DC1<br>(0.3 x 10 <sup>6</sup> operations) <sup>4)</sup><br>1 A, 24 VDC DC11<br>(0.1 x 10 <sup>6</sup> operations) <sup>2) 4)</sup> |
| Relay coil supply <sup>3)</sup>                    | Nominal 24 VDC, smoothed or pulsed, 8 mA per relay                                                                                                                                                                                                                  |
| Voltage tolerance dependent on ambient temperature | 20°C : 17.0 ... 35 VDC<br>30°C : 19.5 ... 35 VDC<br>40°C : 20.5 ... 32 VDC<br>50°C : 21.5 ... 30 VDC                                                                                                                                                                |
| Typical output delay                               | 5 ms at 24 VDC                                                                                                                                                                                                                                                      |
| Resistance to interference according to IEC 801-4  | 4 kV under direct coupling<br>2 kV under capacitance coupling (whole branch of pairs)                                                                                                                                                                               |
| Internal current consumption (from the bus)        | +5 V : 5 ... 25 mA<br>+15 V : 3 mA                                                                                                                                                                                                                                  |

- 1) from version B (Q4 / 1994)
- 2) only with external recovery diode
- 3) this terminal is reverse voltage protected
- 4) these ratings are not UL-listed !

## Presentation



## Output circuit and terminal assignments



Outputs usable as desired

Relay energized (contact closed): LED lights up  
 Relay reset (contact open) : LED is out  
 24 VDC must be connected to terminals +/- and 9. LED must lights up

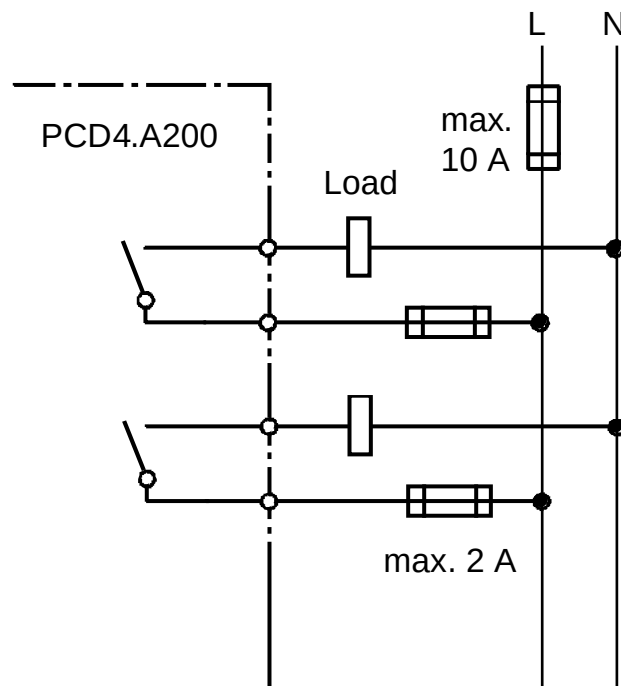
If the relay contact is open, the current leakage through the contact protector is **0.7 mA** (at 230 V / 50 Hz). This should be taken into account for the smaller AC loads.

### Installation notes

For reasons of safety it is **not allowed** that low voltages (up to 50 V) and higher voltages (50 ... 250 V) are connected to the same module.

If a PCD4 system module is connected to a higher voltage (50 ... 250V), higher voltage approved components have to be used for all elements which are galvanically connected to the system.

Using higher voltage (50 ... 250V), all connections to the relay contacts are to be connected on the same circuit. That means at one point in such a way that they are all protected against one AC-phase by only one fuse. Each load circuit may be protected individually by a fuse of max. 2 A.



### Switching inductive loads

Because of the physical properties of inductivity, it is not possible to disconnect inductance without interference. This interference must be minimized as far as possible. Although the PCD is immune to this interference, there are other devices which may be susceptible.

It should be noted here that, as part of the harmonization of standards throughout the EU, the EMC standards are valid from 1996 (EMC Directive 89/336/EG). Two principles should therefore be emphasized :

- 1) THE PROTECTION AGAINST INTERFERENCES FROM INDUCTIVE LOADS IS IMPERATIVE.
- 2) INTERFERENCE SHOULD BE ELIMINATED AS CLOSE AS POSSIBLE TO ITS SOURCE.

It is therefore recommended that a protection circuit should be fitted at the load (often available as normal components on standardized contactors and valves).

When switching direct voltage it is urgently recommended that a recovery diode is fitted above the load. This should even take place when, theoretically, an Ohmic load is switched.

In practice, there will always be a proportion which is inductive (connection cable, resistance coil, etc.). In this case it should be noted that the switch-off time will be longer :

$$T_a \text{ approx. } L/RL * \sqrt{(RL * IL/0.7)}$$

For direct voltage the transistor output modules are recommended.

## Relay manufacturer's information on RC unit dimensioning.

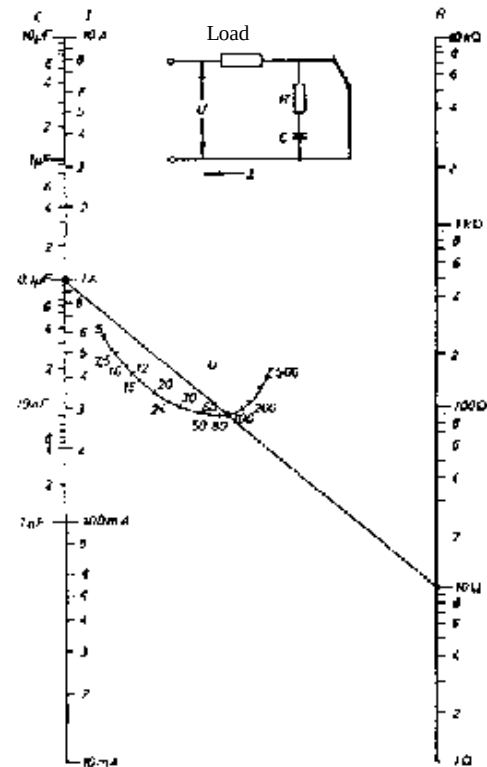
### Wiring contact protection :

The purpose of contact protection wiring is to suppress switch arcing ("sparks") and thereby prolong the lifetime of the contacts. All protection wiring has disadvantages as well as advantages. The diagram opposite should simplify the search for a favourable solution in each case. For the cancellation of arcing by means of an RC unit, see example.

The value for C is the direct result of the switching current. The resistance value R can be established by drawing a straight line through the corresponding points on the I and U curves and reading off the resistance at the intersection with the R curve.

When switching off load circuits with inductive components (e.g. relay coils and magnet coils) the interruption of current results in overvoltage (standard inductance) at the switching contacts. This may amount to many times the operating voltage and so threatens the insulation of the load circuit. The resultant breaking spark leads to rapid wear of the relay contacts. For this reason contact protection wiring is particularly important with inductive load circuits.

### Dimensioning guide for RC combinations



### Example :

$$U = 100V; \quad I = 1A$$

C is found directly as  $0.1 \mu F$

R =  $10 \Omega$  (from line through R scale)

**Notes :**



## 8.4 PCD4.A250 Digital output module with 16 relay contacts, type "normally open" (without contact protection)

---

### Application

The module contains 16 relays with normally-open contacts for direct and alternating current up to 2 A, 250 VAC. The module is particularly suited to situations where AC switching circuits with infrequent switch actuation are controlled (see "installation notes"). The relay contacts have no integral contact protection. For each group of 4 relay contacts there is a common connection to a separate 4-pole terminal.

### Technical data

|                                                    |                                                                                                                                                                                                                                                                     |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of outputs per module                       | 4 x 4, common terminal for each group of 4, open contacts (NO)                                                                                                                                                                                                      |
| Type of relay (typical)                            | REO 30024, SCHRACK <sup>1)</sup>                                                                                                                                                                                                                                    |
| Application range                                  | >12 V, >100 mA                                                                                                                                                                                                                                                      |
| Switch rating<br>(Contact lifetime)                | 2 A, 250 VAC AC1<br>(0.7 x 10 <sup>6</sup> operations)<br>1 A, 250 VAC AC11<br>(1.0 x 10 <sup>6</sup> operations)<br>2 A, 50 VDC DC1<br>(0.3 x 10 <sup>6</sup> operations) <sup>4)</sup><br>1 A, 24 VDC DC11<br>(0.1 x 10 <sup>6</sup> operations) <sup>2) 4)</sup> |
| Relay coil supply <sup>3)</sup>                    | Nominal 24 VDC, smoothed or pulsed, 8 mA per relay                                                                                                                                                                                                                  |
| Voltage tolerance dependent on ambient temperature | 20°C : 17.0 ... 35 VDC<br>30°C : 19.5 ... 35 VDC<br>40°C : 20.5 ... 32 VDC<br>50°C : 21.5 ... 30 VDC                                                                                                                                                                |
| Typical output delay                               | 5 ms at 24 VDC                                                                                                                                                                                                                                                      |
| Resistance to interference according to IEC 801-4  | 4 kV under direct coupling<br>2 kV under capacitance coupling (whole brunch of pairs)                                                                                                                                                                               |
| Internal current consumption (from the bus)        | +5 V : 5 ... 45 mA<br>+15 V : 3 mA                                                                                                                                                                                                                                  |

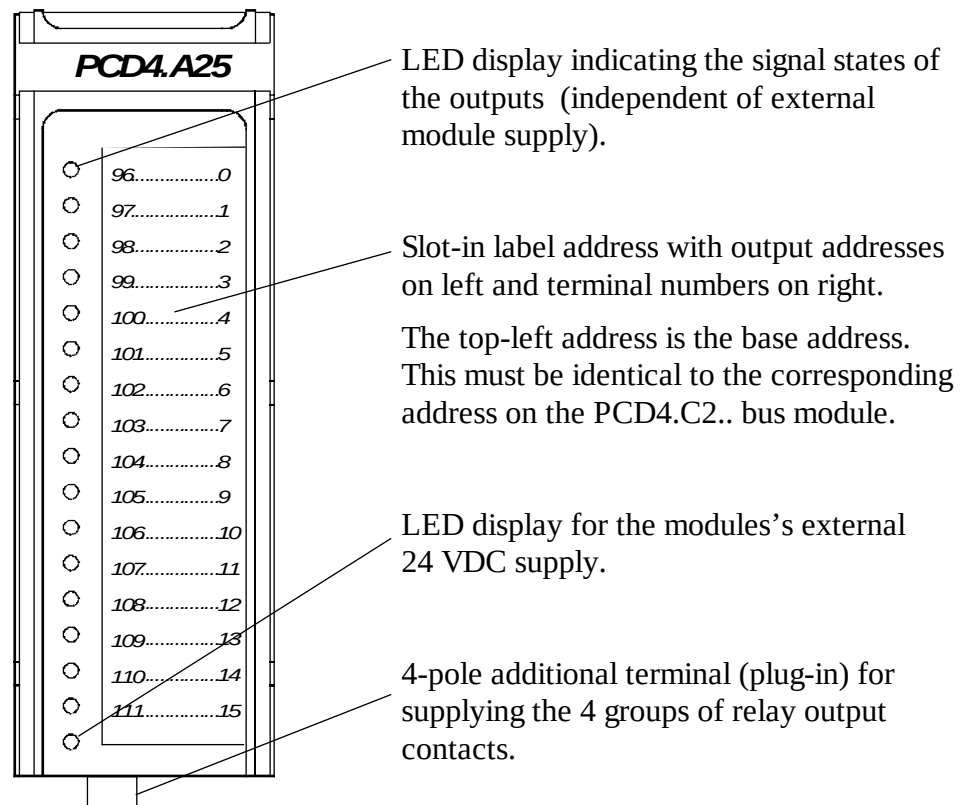
1) from version B (Q4 / 1994)

2) only with external recovery diode

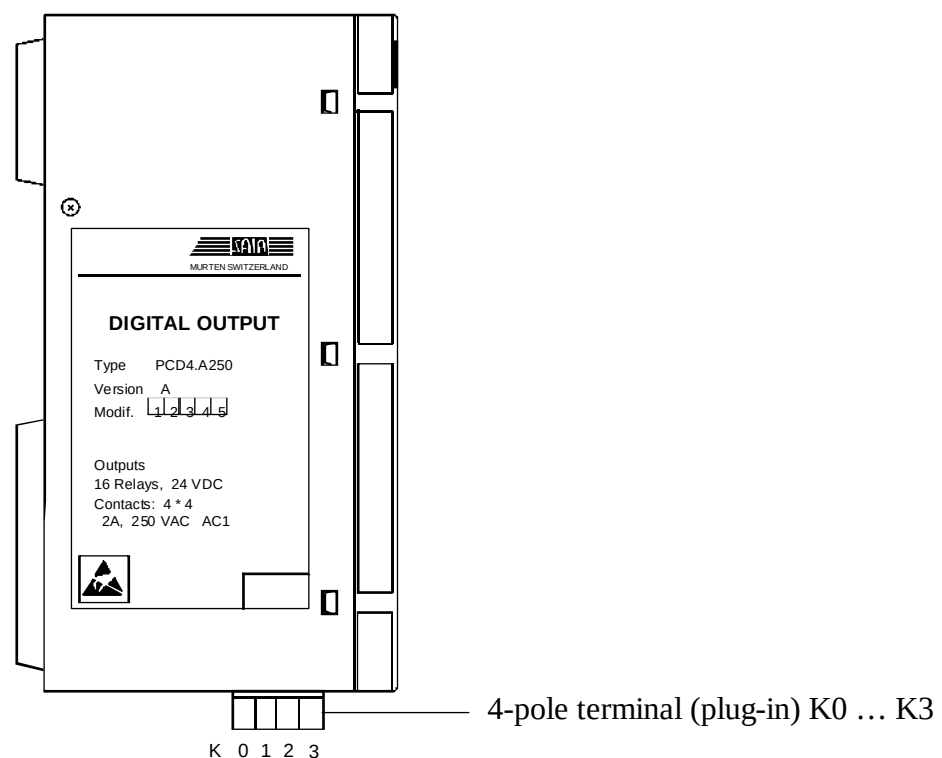
3) this terminal is reverse voltage protected

4) these ratings are not UL-listed !

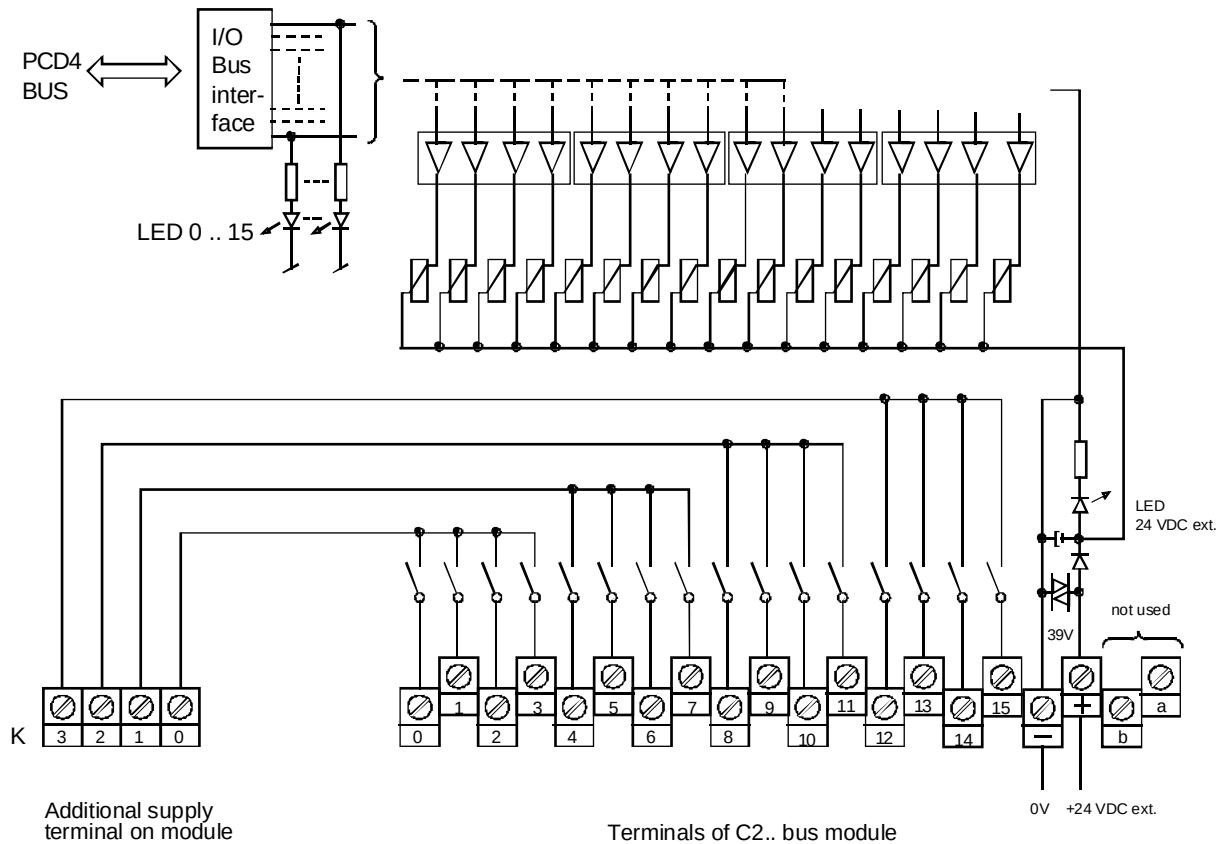
## Presentation



## Additional supply terminals and name plate



## Output circuit and terminal assignments



|             |                                                                                        |
|-------------|----------------------------------------------------------------------------------------|
| K0 ... K3 : | Terminal plug                                                                          |
| 0 ... 15 :  | Relay contact, corresponds to output address                                           |
| +, - :      | External supply of relay coils,<br>the " - " is connected with internal Ground of PCD4 |

|                                                  |               |
|--------------------------------------------------|---------------|
| Relay energized (contact closed) <sup>1)</sup> : | LED lights up |
| Relay reset (contact open) :                     | LED is out    |

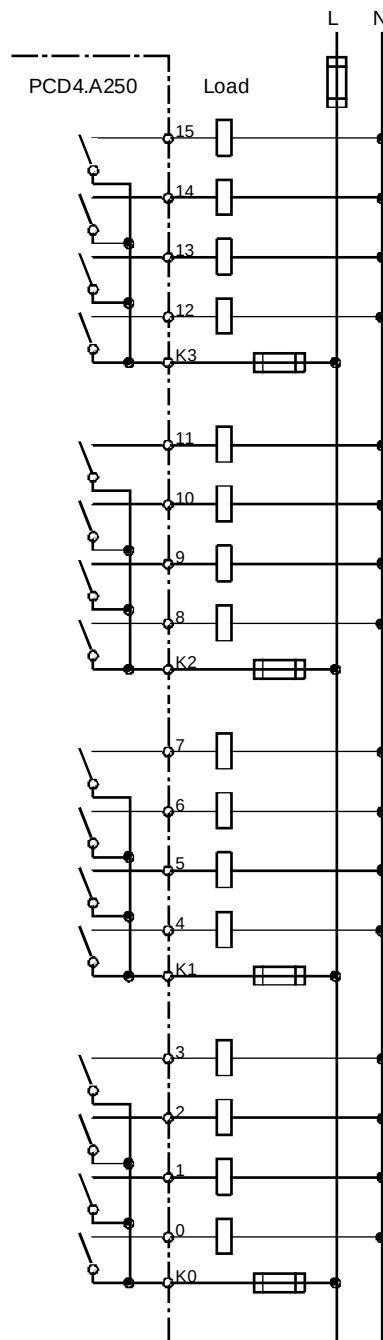
- 1) When the PCD4 supply and the module's +24 Vext. are switched on.

### Installation notes

For reasons of safety it is **not allowed** that low voltage (up to 50 V) and higher voltage (50 ... 250 V) are connected to the same module

If a PCD4 system module is connected to a higher voltage (50 ... 250 V), higher voltage approved components have to be used for all elements which are galvanically connected to the system.

Using higher voltage (50 ... 250 V), all connections to the relay contacts are to be connected on the same circuit. That means at one point in such a way that they are all protected against one AC phase by only one fuse. The individual load circuits, however, can again be individually fuse protected.



### Switching inductive loads

Because of the physical properties of inductivity, it is not possible to disconnect inductance without interference. This interference must be minimized as far as possible. Although the PCD is immune to this interference, there are other devices which may be susceptible.

It should be noted here that, as part of the harmonization of standards throughout the EU, the EMC standards are valid from 1996 (EMC Directive 89/336/EG). Two principles should therefore be emphasized :

- 1) THE PROTECTION AGAINST INTERFERENCES FROM INDUCTIVE LOADS IS IMPERATIVE.
- 2) INTERFERENCE SHOULD BE ELIMINATED AS CLOSE AS POSSIBLE TO ITS SOURCE.

It is therefore recommended that a protection circuit should be fitted at the load (often available as normal components on standardized contactors and valves).

When switching direct voltage it is urgently recommended that a recovery diode is fitted above the load. This should even take place when, theoretically, an Ohmic load is switched.

In practice, there will always be a proportion which is inductive (connection cable, resistance coil, etc.). In this case it should be noted that the switch-off time will be longer :

$$T_a \text{ approx. } L/RL * \sqrt{(RL * IL/0.7)}$$

For direct voltage the transistor output modules are recommended.

## Relay manufacturer's information on RC unit dimensioning.

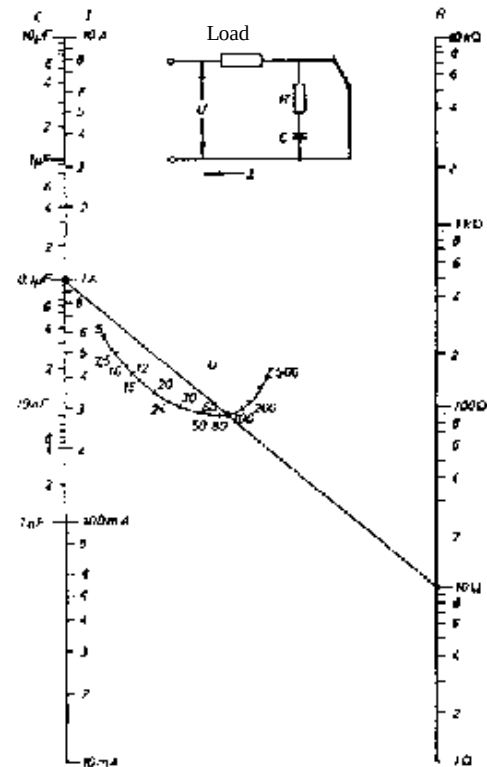
### Wiring contact protection :

The purpose of contact protection wiring is to suppress switch arcing ("sparks") and thereby prolong the lifetime of the contacts. All protection wiring has disadvantages as well as advantages. The diagram opposite should simplify the search for a favourable solution in each case. For the cancellation of arcing by means of an RC unit, see example.

The value for C is the direct result of the switching current. The resistance value R can be established by drawing a straight line through the corresponding points on the I and U curves and reading off the resistance at the intersection with the R curve.

When switching off load circuits with inductive components (e.g. relay coils and magnet coils) the interruption of current results in overvoltage (standard inductance) at the switching contacts. This may amount to many times the operating voltage and so threatens the insulation of the load circuit. The resultant breaking spark leads to rapid wear of the relay contacts. For this reason contact protection wiring is particularly important with inductive load circuits.

### Dimensioning guide for RC combinations



### Example :

$$U = 100V; \quad I = 1A$$

C is found directly as  $0.1 \mu F$

$R = 10 \Omega$  (from line through R scale)

## 8.5 PCD4.A350 Module with 8 digital outputs, 24 VDC / 2 A, with electrical isolation

---

### Application

Efficient output module with 8 transistor outputs of 5 mA up to 2 A, isolated, short-circuit protected, voltage range 8 ... 32 VDC.

### Technical data

|                                   |                                                                                                                                                                                                                                                                                        |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of outputs per module      | 8, electrically isolated by optocouplers                                                                                                                                                                                                                                               |
| Output current (I <sub>a</sub> )  | 5 mA ... 2 A<br>(leakage current max. : 1 mA)<br>within the voltage range 8 ... 24 VDC, the load resistance should be at least 12 Ω.<br>max. inductivity : - 150 mH at 1.5 A<br>- 80 mH at 2 A                                                                                         |
| Behaviour under short-circuit     | If the load circuit shorts out, the output current is limited to 3.5 A. Sustained over-load causes the output to switch off after a few seconds. From this time, attempts are periodically made to switch on. If the over-load has ceased, the output switches on again automatically. |
| Operating mode                    | Source operation<br>(positive switching)                                                                                                                                                                                                                                               |
| Total current per module          | See diagram (next page)                                                                                                                                                                                                                                                                |
| Voltage range (U <sub>a</sub> )   | 8 ... 32 VDC, smoothed                                                                                                                                                                                                                                                                 |
| Residual ripple of U <sub>a</sub> | max. 10 %                                                                                                                                                                                                                                                                              |
| Voltage drop                      | max. 2 V at I = 2 A                                                                                                                                                                                                                                                                    |
| Typical output delay              | 10 µs - switch on delay<br>100 µs - switch off delay<br>(resistive load 5 mA ... 2 A)                                                                                                                                                                                                  |
| Ambient temperature               | Operating : -20 ... +55°C<br>Storage : -20 ... +85°C                                                                                                                                                                                                                                   |

Conforms to standards

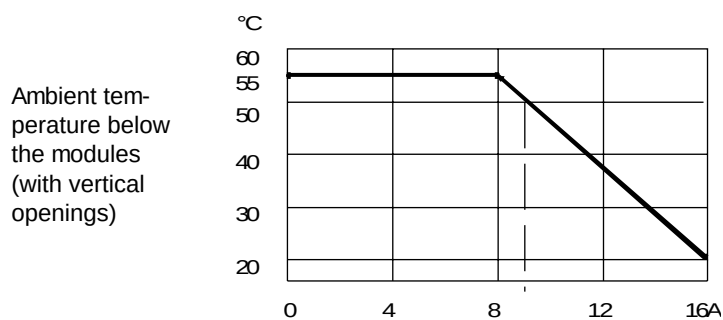
IEC 1131-2  
DIN 19230 and 19232  
VDI 2880  
NF C63-850

Resistance to interference  
according to IEC 801-4

4 kV under direct coupling  
2 kV under capacitance coupling  
(whole bunch of pairs)

Internal current consumption  
(from 5 V bus)

max. 25 mA

**Current load/ambient temperature diagram**

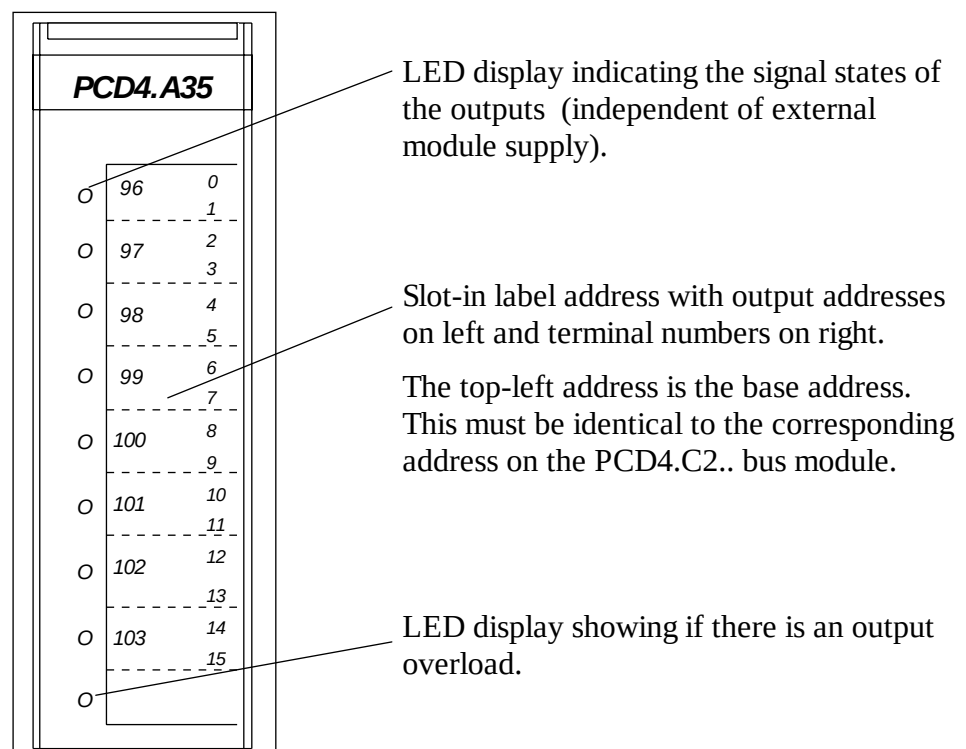
Example :  
(Ua = 24 VDC)

4 x 48 W valves (50% duty cycle <sup>\*)</sup> 4A  
2 x 48 W valves (75% duty cycle <sup>\*)</sup> 3A  
2 x 24 W contactors (95% duty cycle <sup>\*)</sup> 2A

Mean overall current 9A  
Permissible ambient temperature 50°C

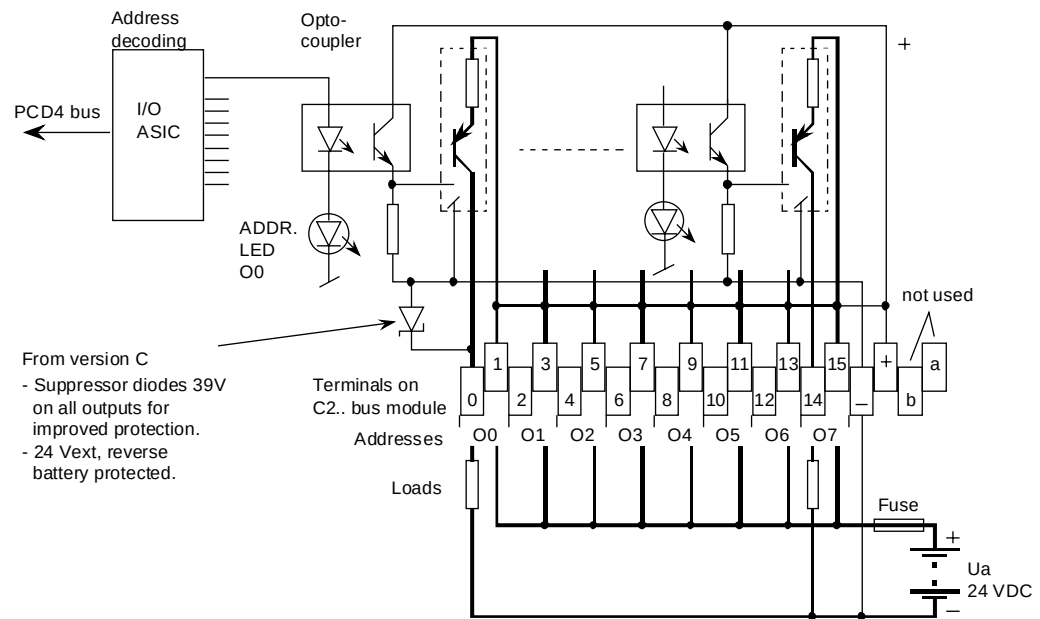
Mean sustained overall current for all outputs in the same module (module in vertical position)

<sup>\*)</sup> thermal time constant of the module : 5 min.

**Presentation**



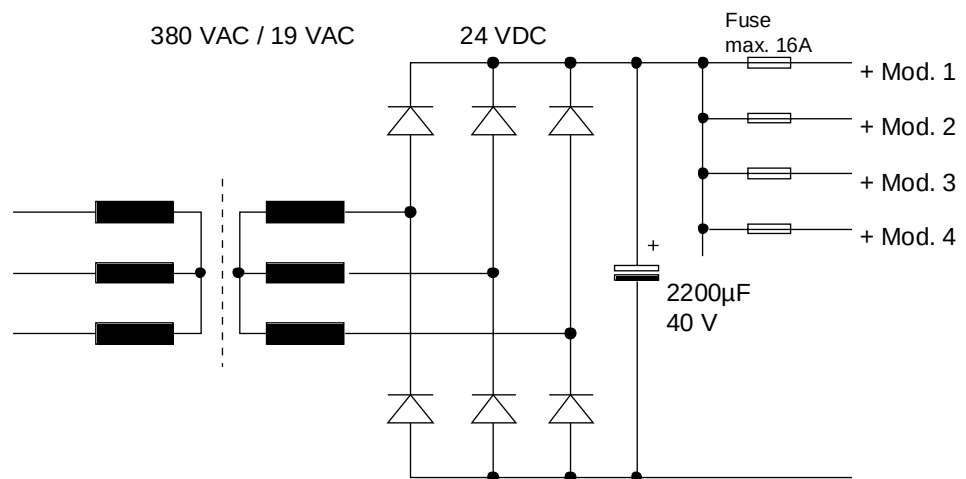
## Output circuit and terminal assignments



Output conducting (set) : LED lights up  
 Output disconnected (reset) : LED is out

## User external supply

The following user supply is recommended for minimal ripple. To bypass turn-on peaks (e.g. caused by a lamp load), a capacitor on the DC voltage side is imperative.



Capacity of three-phase transformer

$$P(\text{VA}) = I_{\text{max } 24 \text{ VDC}} (\text{A}) * 27 \text{ V}$$

Note : All information refers to version "B" (or "C").  
 The earlier version "A" has the outputs in 2 groups :  
 Group 1 = outputs 0 - 3 ; Group 2 = outputs 4 - 7

**Notes :**

## 8.6 PCD4.A400 Module with 16 digital outputs, 0.5 A, electrically connected

---

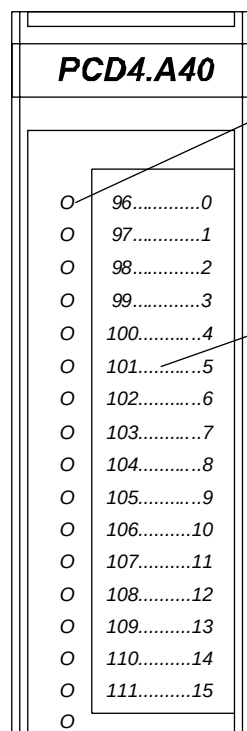
### Application

Low cost output module with 16 transistor outputs 5 ... 500 mA, without short-circuit protection. Non-isolated current circuits in the voltage range 5 ... 32 VDC.

### Technical data

|                                                   |                                                                                                                                                                                         |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of outputs per module                      | 16, electrically connected                                                                                                                                                              |
| Output current (Ia)                               | 5 ... 500 mA<br>(leakage current max. : 0.1 mA)                                                                                                                                         |
| Operating mode                                    | Source operation<br>(positive switching)                                                                                                                                                |
| Total current per module                          | 16 x 0.5 A = 8 A<br>(on 100% duty cycle)<br>(from version "B")                                                                                                                          |
| Voltage range (Ua)                                | 5 ... 32 VDC, smoothed<br>10 ... 27 VDC, pulsed                                                                                                                                         |
| Voltage drop                                      | max. 0.3 V at 0.5 A<br>(version "A" : 1.0 V)                                                                                                                                            |
| Typical output delay                              | 10 µs - switch on delay<br>50 µs - switch off delay<br>(version "A" : 10 µs)<br>(resistive load 5 ... 500 mA)<br>with inductive loads, the delay is longer due to the protective diode. |
| Ambient temperature                               | Operating : -20 ... +55°C<br>Storage : -20 ... +85°C                                                                                                                                    |
| Conforms to standards                             | IEC 1131-2<br>VDI 2880<br>NF C63-850                                                                                                                                                    |
| Resistance to interference according to IEC 801-4 | 4 kV under direct coupling<br>2 kV under capacitance coupling<br>(whole brunch of pairs)                                                                                                |
| Internal current consumption (from 5 V bus)       | 5 ... 45 mA<br>(version "A" : 5 ... 125 mA)                                                                                                                                             |

## Presentation

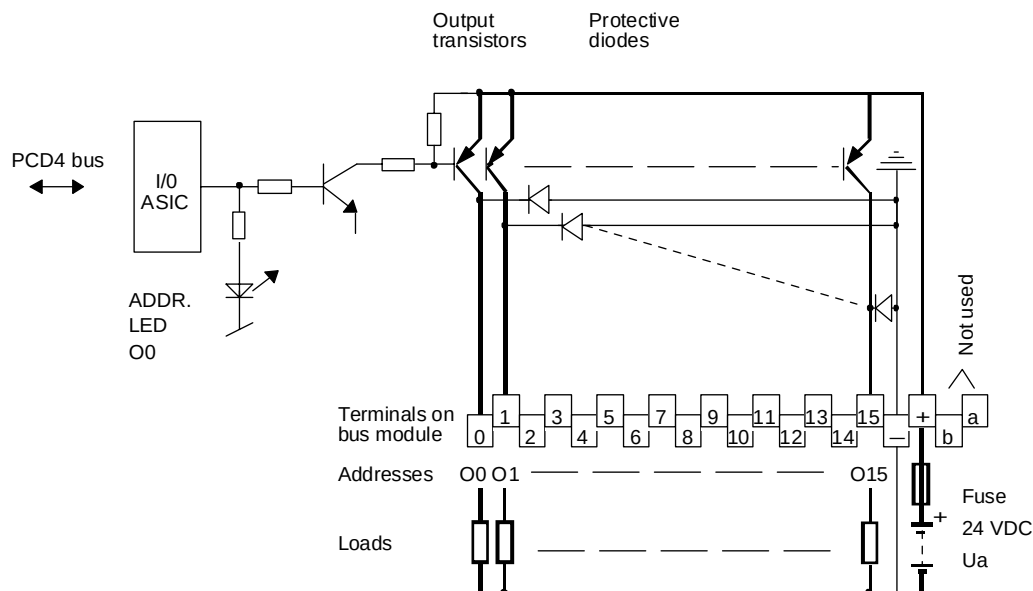


LED display indicating the signal states of the outputs (independent of  $U_a$ ).

Slot-in label address with output addresses on left and terminal numbers on right.

The top-left address is the base address. This must be identical to the corresponding address on the PCD4.C2.. bus module.

## Output circuit and terminal assignments



Output conducting (set) : LED lights up  
Output disconnected (reset) : LED is out

Fuse : It is recommended that each PCD4.A400 module is protected against short-circuit with a quick-break fuse of max. 10 A.

Terminal current : The terminals 0 ... 15 can carry the nominal output current (500 mA), the "+" terminal can carry a total current of 8 A.

## 8.7 PCD4.A410 Module with 16 digital outputs, 0.5 A, with electrical isolation

---

### Application

Output module, electrically isolated from the CPU, with 16 MOSFET transistor outputs 1 ... 500 mA, without short-circuit protection. Electrically isolated current circuits in the voltage range 5 ... 32 VDC.

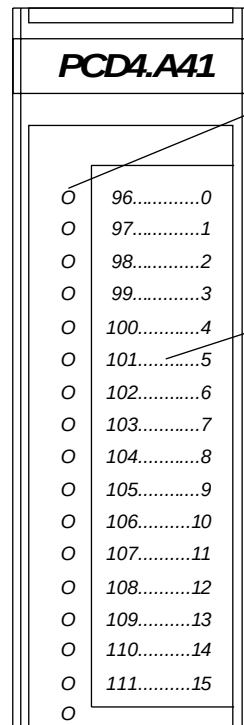


**Caution :** This module **is not** suitable for driving the PCA2.D12/D14 display modules !

### Technical data

|                                                                              |                                                                                                                                                                |
|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of outputs per module                                                 | 16, electrically isolated                                                                                                                                      |
| Output current (Ia)                                                          | 1 ... 500 mA<br>(leakage current max. : 0.1 mA)                                                                                                                |
| Operating mode                                                               | Source operation<br>(positive switching)                                                                                                                       |
| Total current per module                                                     | 8 A (on 100% duty cycle)                                                                                                                                       |
| Voltage range (Ua)                                                           | 5 ... 32 VDC, smoothed<br>10 ... 27 VDC, pulsed                                                                                                                |
| Voltage drop                                                                 | max. 0.3 V at 0.5 A                                                                                                                                            |
| Typical output delay                                                         | 5 µs - switch on delay<br>500 µs - switch off delay<br>(resistive load 5 ... 500 mA)<br>with inductive loads, the delay is longer due to the protective diode. |
| Electrical isolation voltage<br>All terminal connections<br>against CPU part | 1500 VAC, 1 minute                                                                                                                                             |
| Common voltage mode                                                          | 200 V                                                                                                                                                          |
| Resistance to interference<br>according to IEC 801-4                         | 4 kV under direct coupling<br>2 kV under capacitance coupling<br>(whole branch of pairs)                                                                       |
| Internal current consumption<br>(from the bus)                               | +5 V : 5 ... 45 mA<br>+15 V : 3 mA (for reset)                                                                                                                 |

## Presentation

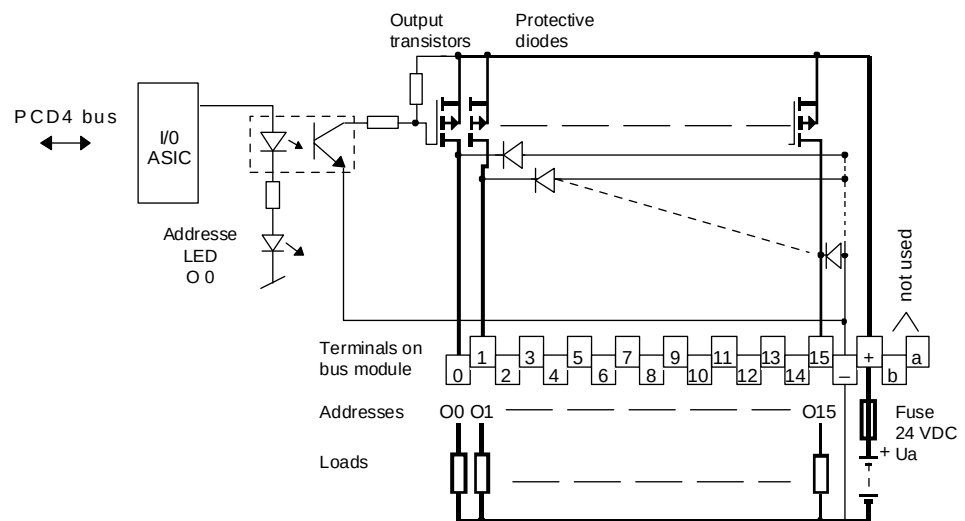


LED display indicating the signal states of the outputs (independent of  $U_a$ ).

Slot-in label address with output addresses on left and terminal numbers on right.

The top-left address is the base address. This must be identical to the corresponding address on the PCD4.C2.. bus module.

## Output circuit and terminal assignments



Output conducting (set) : LED lights up  
Output disconnected (reset) : LED is out

The minus terminal (–) is NOT connected to the internal ground. Due to interference decoupling capacitors on the bus module from – and + terminal to PGND, the common mode voltage is limited to 200 V AC or DC.

Fuse : It is recommended that each PCD4.A410 module is protected against short-circuit with a quick-break fuse of max. 10 A.

Terminal current : The terminals 0 ... 15 can carry the nominal output current (500 mA), the "+" terminal can carry a total current of 8 A.

## 8.8 PCD4.B900/B901 Digital input/output module, with 16 inputs and 16 outputs

---

### Application

The ..B900 module doubles the I/O capacity in the same space in an inexpensive way. Inputs and outputs are electrically connected and function in accordance with the source operation principle.

Inputs and outputs use the same addresses. For this reason, the setting commands such as OUT, SET, RES or even BITO(R) and DIGO(R) are the only ones that may be used for outputs. All interrogation commands refer to the corresponding inputs.

Type ..B901 has a short input delay of typically 0.4 ms

### Technical data on inputs

|                               |                                                                                          |
|-------------------------------|------------------------------------------------------------------------------------------|
| Number of inputs per module   | 16, electrically connected,<br>source operation only                                     |
| Connections                   | Screw connections on bus module                                                          |
| Input voltage $U_e$ (nominal) | B900 : 24 VDC, smoothed or pulsed<br>B901 : 24 VDC, smoothed with<br>ripple of max. 10 % |
| Input current                 | 8 mA at 24 VDC                                                                           |
| Typical input delay           | B900 : 9 ms<br>B901 : 0.4 ms                                                             |

### Technical data on outputs

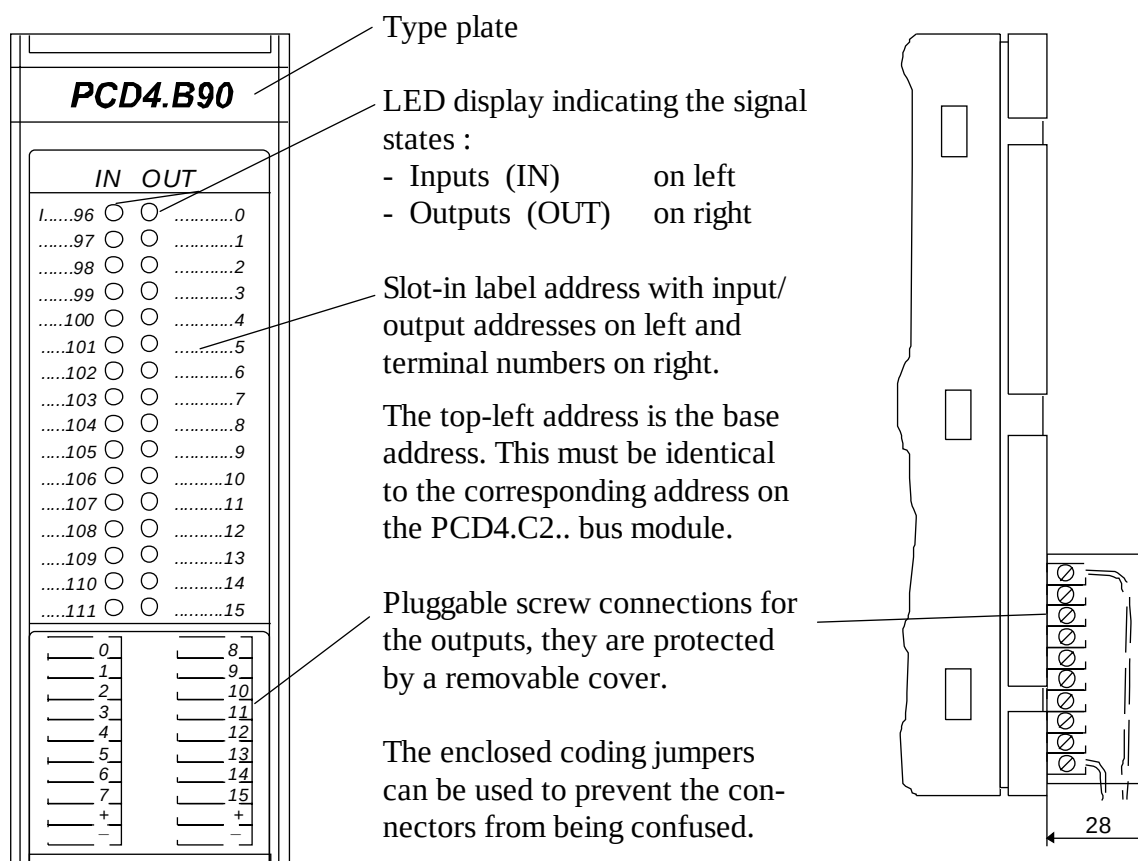
|                              |                                                                                                                                                      |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of outputs per module | 16, electrically connected                                                                                                                           |
| Connections                  | Pluggable screw connectors at<br>module front                                                                                                        |
| Output current ( $I_a$ )     | 5 ... 500 mA<br>(leakage current max. : 0.1 mA)<br>within the voltage range 5 ... 24 VDC,<br>the load resistance should be at<br>least 48 $\Omega$ . |
| Operating mode               | Source operation<br>(positive switching)                                                                                                             |
| Total current per module     | 6 A (UL rating max. 4.5 A)                                                                                                                           |

|                      |                                                                               |
|----------------------|-------------------------------------------------------------------------------|
| Voltage range (Ua)   | 5 ... 32 VDC, smoothed<br>10 ... 27 VDC, pulsed                               |
| Voltage drop         | 1 V at 0.5 A                                                                  |
| Typical output delay | 10 µs, with inductive loads, the delay is longer due to the protective diode. |

### Common technical data on inputs/outputs

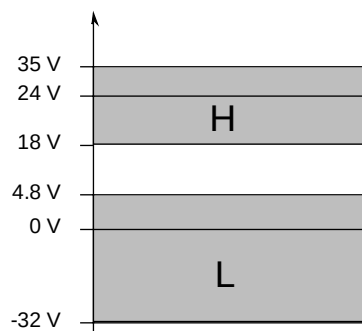
|                                                   |                                                                                          |
|---------------------------------------------------|------------------------------------------------------------------------------------------|
| Ambient temperature                               | Operating : -20 ... +55°C<br>Storage : -20 ... +85°C                                     |
| Conforms to standards                             | IEC 1131-2<br>VDI 2880<br>NF C63-850                                                     |
| Resistance to interference according to IEC 801-4 | 4 kV under direct coupling<br>2 kV under capacitance coupling<br>(whole branch of pairs) |
| Internal current consumption (from the bus)       | +5 V : 5 ... 95 mA<br>+15 V : 7 mA                                                       |

### Presentation





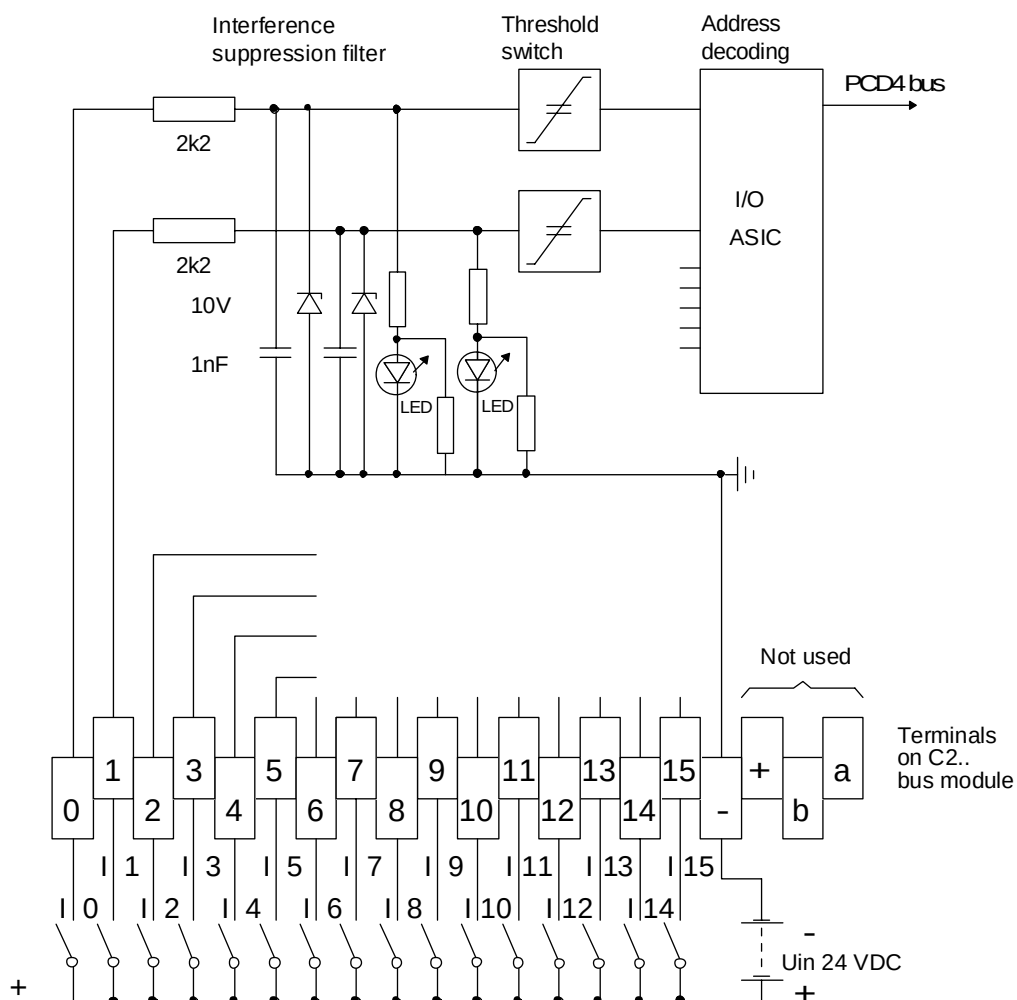
### Input signal definition



Due to the input delay of typically 9 ms in the standard version (..B900), full-way rectified DC voltage is adequate for the external supply.

For the ..B901 model, smoothed DC voltage is required

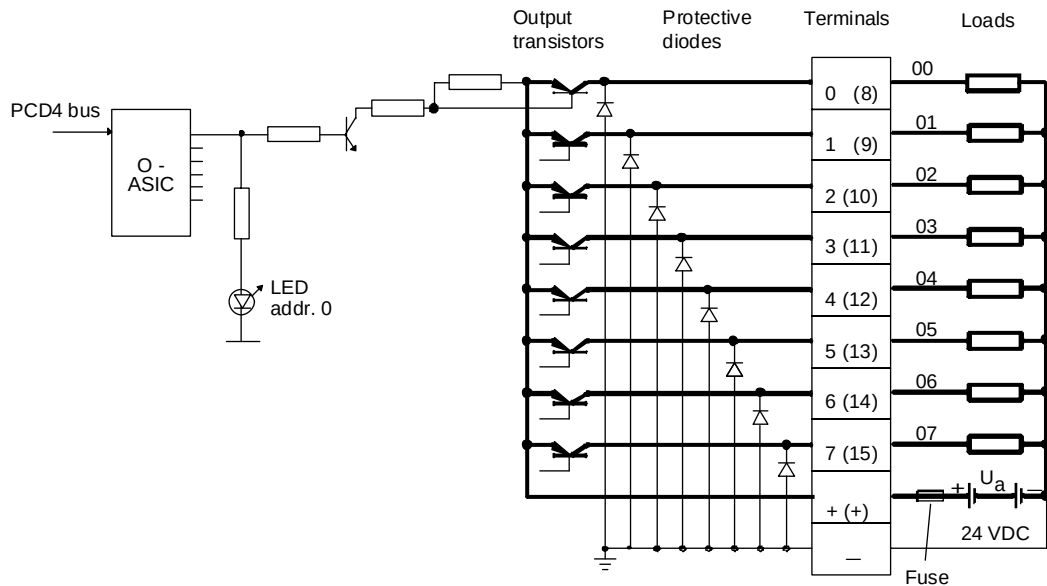
### Input circuit (source operation) and terminal assignments



Switch closed

(Positive at input) : Signal status "H" = LED lights up } left row  
 Switch open : Signal status "L" = LED is out } ( IN )

## Output circuit

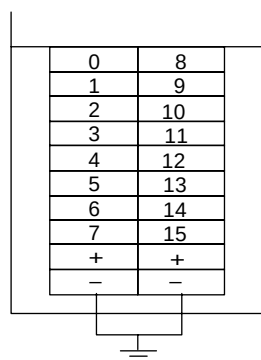


|                               |               |                        |
|-------------------------------|---------------|------------------------|
| Output conducting (set) :     | LED lights up | } right row<br>( OUT ) |
| Output disconnected (reset) : | LED is out    |                        |

**Fuse :** It is recommended that each PCD4.B90x module is protected against short-circuit with a quick-break fuse of max. 10 A.

**Terminal current :** The terminals 0 ... 15 may be loaded with the nominal output current (500 mA), the "+" terminals with the total current of 4 A each.

## Output terminal assignments



The terminals are always numbered from 0 ... 15. The absolute output address is determined by adding the basic address of the module to the terminal number.

The screw terminals are pluggable, which allows separating 8 output circuits from the control at all times.

Cabling guide's, see "Presentation".

## Note concerning the voltage source for inputs and outputs

The input and output circuits may be operated with different voltages within the specified range. The two voltage sources share the negative pole and they are connected to ground. This also holds true for the two output groups 0 ... 7 and 8 ... 15 (different positive pole, common negative pole).

## 9. Analogue input/output modules

Analogue modules have a flexible design. A choice of "Range Modules", which govern the I/O voltage range, are available for each base module. There are up to 8 analogue channels available per module.

### Analogue input modules PCD4.W...

| Types                                      | Range module<br>PCD7.W.. | Number of<br>channels | Measuring range                                                    | Resolu-<br>tion       | Accuracy                                  | See<br>chap. |
|--------------------------------------------|--------------------------|-----------------------|--------------------------------------------------------------------|-----------------------|-------------------------------------------|--------------|
| <b>..W100</b><br><b>4 I</b><br><br>(+ 2 O) | ..W101                   | 4                     | 0 ... +10 V<br>-10 ... +10 V<br>-5 ... +5 V                        | 12 bits               | unip. : $\pm 0.5\%$<br>bip. : $\pm 0.6\%$ | 9.1          |
|                                            |                          | 2                     | Pt/Ni 1000                                                         |                       |                                           |              |
|                                            | ..W105                   | 4                     | *) 0 ... +20 mA<br>-20 ... +20 mA<br>-10 ... +10 mA                |                       |                                           |              |
| <b>..W300</b><br><b>8 I</b>                | ..W100                   | 4                     | -10 ... +10 V                                                      | 12 bits<br>+ sign bit | $\pm 0.35\%$                              | 9.2          |
|                                            | ..W101                   | 4                     | -1 ... +1 V                                                        |                       |                                           |              |
|                                            | ..W102                   | 4                     | -100 ... +100 mV                                                   |                       |                                           |              |
|                                            | ..W103                   | 4                     | *) -20 ... +20 mA                                                  |                       |                                           |              |
|                                            | ..W104                   | 4                     | +4 ... +20 mA<br>two-wire current converter                        |                       |                                           |              |
|                                            | ..W110                   | 4                     | Pt 1000 : -50 ... +150°C                                           |                       |                                           |              |
|                                            | ..W111                   | 4                     | Ni 1000 : -50 ... +150°C                                           |                       |                                           |              |
|                                            | ..W120                   | 4                     | Constant current 2 mA<br>..W100 : Pt/Ni 1000<br>..W101 : Pt/Ni 100 | ---                   |                                           |              |
| <b>..W500</b><br><b>8 I</b>                | ..W100                   | 4                     | 0 ... +10 V<br>-10 ... +10 V                                       | 12/15<br>bits         | $\pm 0.3\%$                               | 9.4          |
|                                            | ..W101                   | 4                     | 0 ... +1 V<br>-1 ... +1 V                                          |                       |                                           |              |
|                                            | ..W103                   | 4                     | *) 0 ... +20 mA                                                    |                       |                                           |              |
|                                            | ..W104                   | 4                     | +4 ... +20 mA<br>two-wire current converter                        |                       |                                           |              |
|                                            | ..W110                   | 4                     | Pt 1000 : -50 ... +150°C                                           |                       |                                           |              |
|                                            | ..W111                   | 4                     | Ni 1000 : -50 ... +150°C                                           |                       |                                           |              |
|                                            | ..W120                   | 4                     | Constant current 0 ... 10 mA<br>..W101 : Pt/Ni 100/1000            | ---                   |                                           |              |

\*) +4 ... +20 mA by user program

**Analogue output modules PCD4.W...**

| Types                                  | Range module<br>PCD7.W.. | Number of<br>channels | Output range                                 | Resolu-<br>tion | Accuracy                               | See<br>chap. |
|----------------------------------------|--------------------------|-----------------------|----------------------------------------------|-----------------|----------------------------------------|--------------|
| <b>..W100</b><br><b>2 O</b><br>(+ 4 I) | ..W200                   | 1                     | 0 ... +10 V                                  | 12 bits         | ± 1.0 %                                | 9.1          |
|                                        | ..W201                   | 1                     | 0 ... +1 V                                   |                 | ± 1.5 %                                |              |
|                                        | ..W202                   | 1                     | -10 ... +10 V                                |                 | ± 1.0 %                                |              |
|                                        | ..W203                   | 1                     | -1 ... +1 V                                  |                 | ± 1.5 %                                |              |
|                                        | ..W204                   | 1                     | 0 ... +20 mA                                 |                 | ± 1.65 %                               |              |
|                                        | ..W205                   | 1                     | +4 ... +20 mA                                |                 | ± 1.65 %                               |              |
|                                        | ..W206                   | 1                     | -10 ... 0 V                                  |                 | ± 1.0 %                                |              |
| <b>..W400</b><br><b>8 O</b>            | none                     | 8                     | 0 ... +10 V<br>0 ... +20 mA<br>+4 ... +20 mA | 8 bits          | voltage : ± 1.5 %<br>current : ± 2.0 % | 9.3          |
| <b>..W600</b><br><b>8 O</b>            | ..W300                   | 2                     | 0 ... +10 V                                  | 12 bits         | voltage : ± 0.3 %                      | 9.5          |
|                                        | ..W302                   | 2                     | -10 ... +10 V                                |                 |                                        |              |
|                                        | ..W304                   | 2                     | 0 ... +20 mA                                 |                 | current : ± 0.3 %                      |              |
|                                        | ..W305                   | 2                     | +4 ... +20 mA                                |                 |                                        |              |



**Caution :** Analogue I/O modules should only be changed when the PCD4 is disconnected from power source.

## 9.1 PCD4.W100 Analogue input/output module, 6 channels (4I + 2O), 12 bit resolution

---

### Application

The ..W100 analogue module for fast processes consists of a base module and up to three add-on range modules which select the input and output voltage or current ranges.

This enables the 4 input channels and 2 output channels to be configured independently; it is also possible to directly connect two resistive temperature sensors.

### Module overview

#### Base module :

PCD4.W100 : Contains the input multiplexer with the A/D converter for 4 input channels via the range module, and connections for 2 output channels.

#### Range modules :

##### • Inputs

PCD7.W101 : 4 channels, measurement range 0 ... 10 V,  $\pm 10$  V or  $\pm 5$  V, input resistance 10 M $\Omega$

PCD7.W105 : 4 channels, measurement area 0 ... 20 mA,  $\pm 20$  mA or  $\pm 10$  mA, input resistance 499  $\Omega$  / 0.1 %

Time constant on input filter : 1 ms

##### • Outputs

PCD7.W200 : 1 channel, range 0 ... 10 V, min. load resist.  $\geq 3$  k $\Omega$

PCD7.W201 : 1 channel, range 0 ... 1 V, min. load resist.  $\geq 300$   $\Omega$

PCD7.W202 : 1 channel, range  $\pm 10$  V, min. load resist.  $\geq 3$  k $\Omega$

PCD7.W203 : 1 channel, range  $\pm 1$  V, min. load resist.  $\geq 300$   $\Omega$

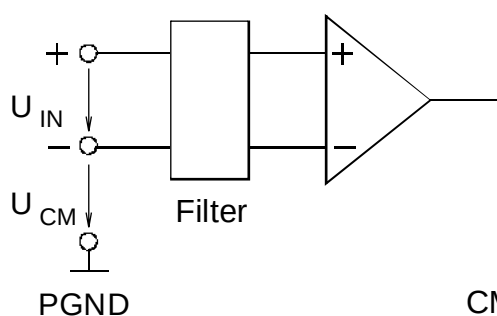
PCD7.W204 : 1 channel, range 0 ... 20 mA, max. circuit resist. 500  $\Omega$

PCD7.W205 : 1 channel, range 4 ... 20 mA, max. circuit resist. 500  $\Omega$

PCD7.W206 : 1 channel, range  $-10$  ... 0 V, min. load resist.  $\geq 3$  k $\Omega$

**Technical data of the base module****• Inputs**

|                                                      |                                                                                                                            |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Number of input channels                             | 4 voltage or current inputs, or<br>2 inputs for resistive temperature<br>sensors (Pt/Ni 1000)                              |
| Potential separation                                 | No                                                                                                                         |
| Measuring principle                                  | Differential                                                                                                               |
| Input ranges                                         | See section "range modules"                                                                                                |
| Resolution<br>(digital representation)               | 12 bits (0 ... 4095)<br>Unipolar or bipolar, selectable by<br>jumper on the base module.                                   |
| A/D conversion time                                  | $\leq 30 \mu\text{s}$                                                                                                      |
| Accuracy<br>(referred to measured value)             | 0.45 % $\pm$ 2 LSB unipolar<br>0.45 % $\pm$ 6 LSB bipolar                                                                  |
| Repeating accuracy                                   | Within 3 LSB                                                                                                               |
| Temperature error (typical)                          | 0.2 % across temp. range 0 ... 50°C                                                                                        |
| Max. overvoltage at<br>analogue inputs               | 60 VDC                                                                                                                     |
| Resistance to interference<br>according to IEC 801-4 | 1 kV under capacitance coupling,<br>with cables not shielded<br>2 kV under capacitance coupling,<br>with cables shielded   |
| Common-mode behaviour                                | $U_{\text{IN}} + U_{\text{CM}} \leq \pm 12 \text{ V}$<br>$\text{CMR} = 74 \text{ dB}$<br>$\text{CMMR} = 200 \mu\text{V/V}$ |

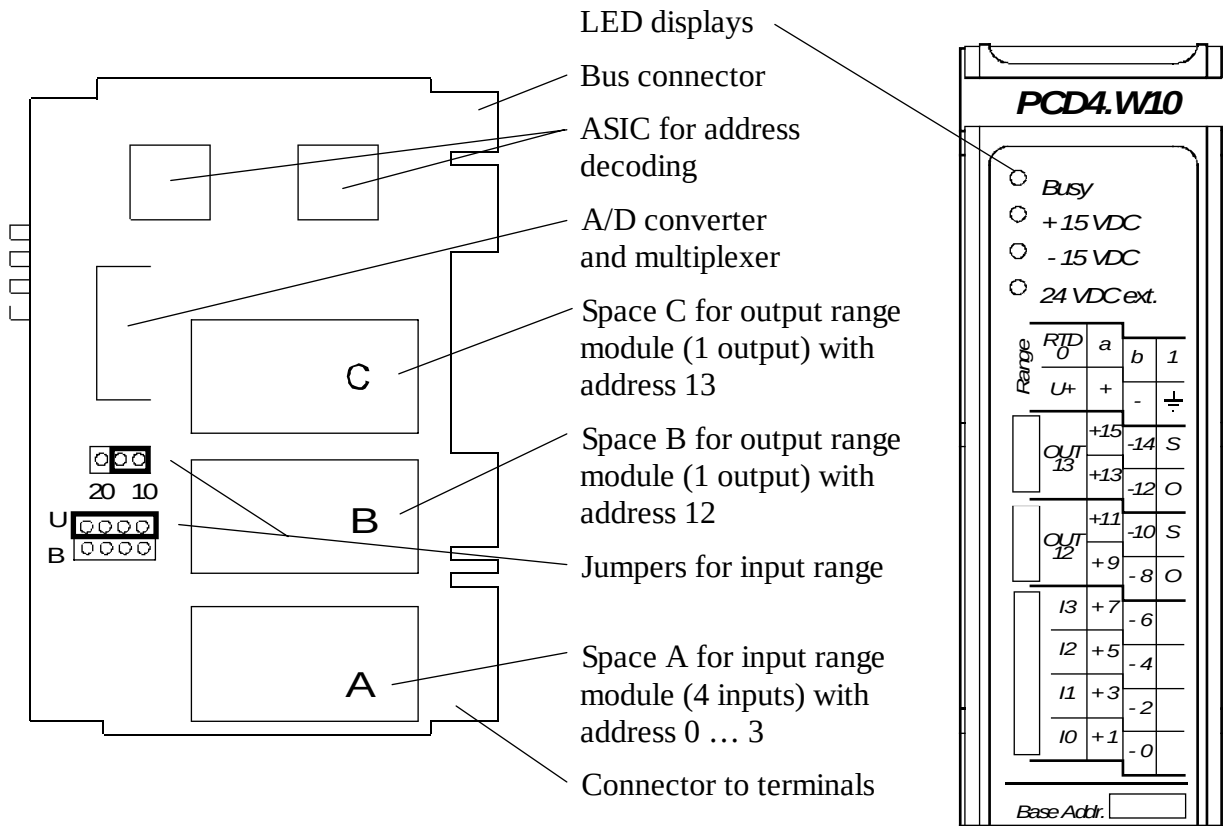


CM : Common mode

- **Outputs**

|                                                |                                                                                                         |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| Number of output channels                      | Max. 2, voltage or current,<br>short-circuit protected                                                  |
| Potential separation                           | No                                                                                                      |
| Output ranges                                  | See section "range modules"                                                                             |
| Resolution<br>(digital representation)         | 12 bits (0 ... 4095)<br>Unipolar or bipolar, depending on<br>choice of the range module.                |
| D/A conversion time                            | $\leq 20 \mu\text{s}$                                                                                   |
| SENSE inputs                                   | 2 each per output : for precise volt-<br>age control                                                    |
| Resistance of OUT<br>signal cables             | Max. 200 $\Omega$<br>(total for both cables)                                                            |
| Accuracy<br>(referred to output value)         | Voltage : 1 % $\pm$ 5 mV<br>Current : 1.4 % $\pm$ 50 $\mu\text{A}$<br>Constant current : 2 mA $\pm$ 1 % |
| Temperature error (typical)                    | 0.2 % across temp. range 0 ... 50°C                                                                     |
| External supply 24VDC                          | Only required for current outputs,<br>same quality as for supply module<br>N2.. (max. 50 mA)            |
| Internal current consumption<br>(from the bus) | +5 V : 50 mA<br>+15 V : 35 mA<br>-15 V : 35 mA                                                          |

### Presentation



The following functional blocks can be seen :

- The base printed circuit board (PCB) with bus interface, address decoding, A/D converter with multiplexer (MUX) and three spaces for insertion of range modules.
- Spaces A, B and C for I/O range modules :
  - A : 4 inputs with the same signal ranges
  - B + C : Each output with an individual signal range
- Factory setting of jumpers : 10 / U



### Insertion of the range modules

The base printed circuit board must first be removed from the module housing in order to install a range module. This is done by pressing in the snap fastenings on either side of the front panel. Then the PCB fastening screw on the upper left hand side of the module is unscrewed, so that the PCB can be removed from the casing.

At the lowest space A, one range module for 4 input channels with addresses 0 ... 3 (+ base address) can be fitted. The upper spaces B and C are each reserved for 1 output channel with addresses 12 and 13 (+ base address).

After installing the range modules, close the housing and tighten up the PCB fastening screw again.



**Caution :** The base PCB and the range modules incorporate components which are sensitive to electrostatic discharges.

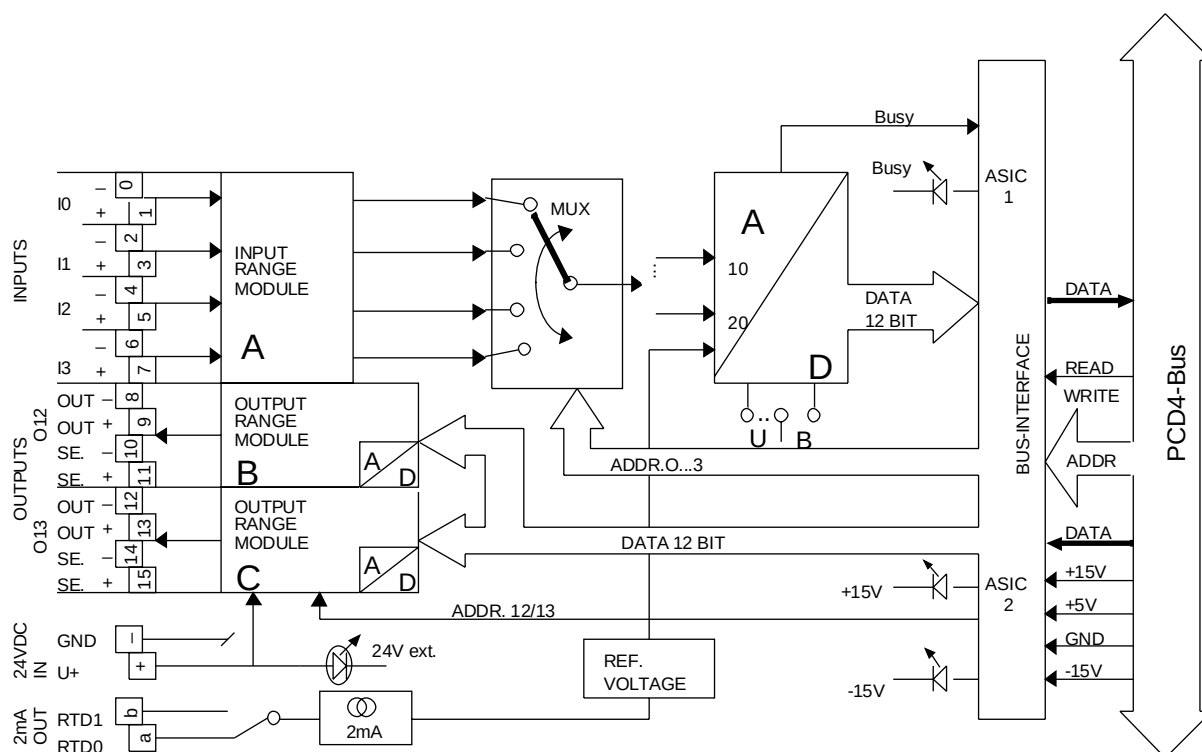
Various types of range modules can be attached to the output spaces B and C. In order to keep the internal equipment obvious to outside inspection, remember to write the I/O type on the labels provided on the front and side panel (see example below).

|                                   |
|-----------------------------------|
| <input type="radio"/> Busy        |
| <input type="radio"/> + 15 VDC    |
| <input type="radio"/> - 15 VDC    |
| <input type="radio"/> 24 VDC ext. |

| Range    | RTD    | a     | b   | 1 |
|----------|--------|-------|-----|---|
|          | 0      | +     | -   | ÷ |
| 4...20mA | OUT 13 | +15   | -14 | S |
|          |        | +13   | -12 | O |
|          |        |       |     |   |
| 0...10V  | OUT 12 | +11   | -10 | S |
|          |        | +9    | -8  | O |
|          |        |       |     |   |
| 0...20mA |        | I3 +7 | -6  |   |
|          |        | I2 +5 | -4  |   |
|          |        | I1 +3 | -2  |   |
|          |        | I0 +1 | -0  |   |
|          |        |       |     |   |

Base Addr. 128

|                                                                                                             |             |
|-------------------------------------------------------------------------------------------------------------|-------------|
| <br>MURTEN SWITZERLAND |             |
| <b>ANALOG IN/OUT</b>                                                                                        |             |
| Type                                                                                                        | PCD4.W100   |
| Version                                                                                                     | B           |
| Modif.                                                                                                      | 1 2 3 4 5   |
| Inputs                                                                                                      |             |
| 0 ... 3                                                                                                     | 0 ... 20 mA |
| Outputs                                                                                                     |             |
| 12                                                                                                          | 0 ... 10 V  |
| 13                                                                                                          | 4 ... 20 mA |
|                          |             |

**Block diagram****Meaning of the 16 addresses**

Input/Output for channel selection and A/D conversion (1 = selected)

Input channels

|    |    |    |    |
|----|----|----|----|
| I0 | I1 | I2 | I3 |
|----|----|----|----|

A/D convert

|   |
|---|
| 8 |
|---|

Output channels

|     |     |
|-----|-----|
| O12 | O13 |
|-----|-----|

Bit address for data read/write

|    |    |    |    |    |    |    |    |    |    |     |     |
|----|----|----|----|----|----|----|----|----|----|-----|-----|
| 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  | 11  |
| D0 | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 |

|              |              |            |         |
|--------------|--------------|------------|---------|
| 12           | 13           | 14         | 15      |
| DA12 bipolar | DA13 bipolar | AD bipolar | AD-Busy |

LSB MSB

Digital value,  
12 bit read/write

Read only

If bit 12 "DA 12 bipolar" = 1 : then a bipolar output range module is fitted at space B (address 12)

If bit 13 "DA 13 bipolar" = 1 : then a bipolar output range module is fitted at space C (address 13)

If bit 14 "AD bipolar" = 1 : then jumper U/B is in the bipolar position for input range module at space A

If bit 15 "AD Busy" = 1 : then A/D conversion is in progress

### User program for reading an analogue value

To read an analogue value from channel I2 into Register R102.

```

(ACC H)   (accu must be 1)
SET   0 2 *)   ; select input channel I2
RES **) 0 8 *)   ;
SET   0 8 *)   ; } start A/D conversion
RES   0 8 *)   ; }
STH   I 15 *)   ; high = conversion in progress 30 µs
JR   H -1   ; (wait or branch until is complete)

BITI   12   ; read A/D value, 12 bits
      I 0 *)   ; from address 0 (LSB)
      R 102   ; into Register R102

```

\*) The base address of the module must be added to these operands.

\*\*) If Pt/Ni 1000 are used wait 10 ms (before instruction RES) due to conversion RTD0 to RTD1 (2 mA).

### User program to output an analogue value

Outputs an analogue value from Register R113 to output channel O13.

```

BITO   12   ; output 12 bits
      R 113   ; from Register R113
      0 0 *)   ; to address 0 (LSB)

(ACC H)   (accu must be 1)
SET   0 13 *)   ; select output channel 013
RES   0 13 *)   ; and start D/A conversion

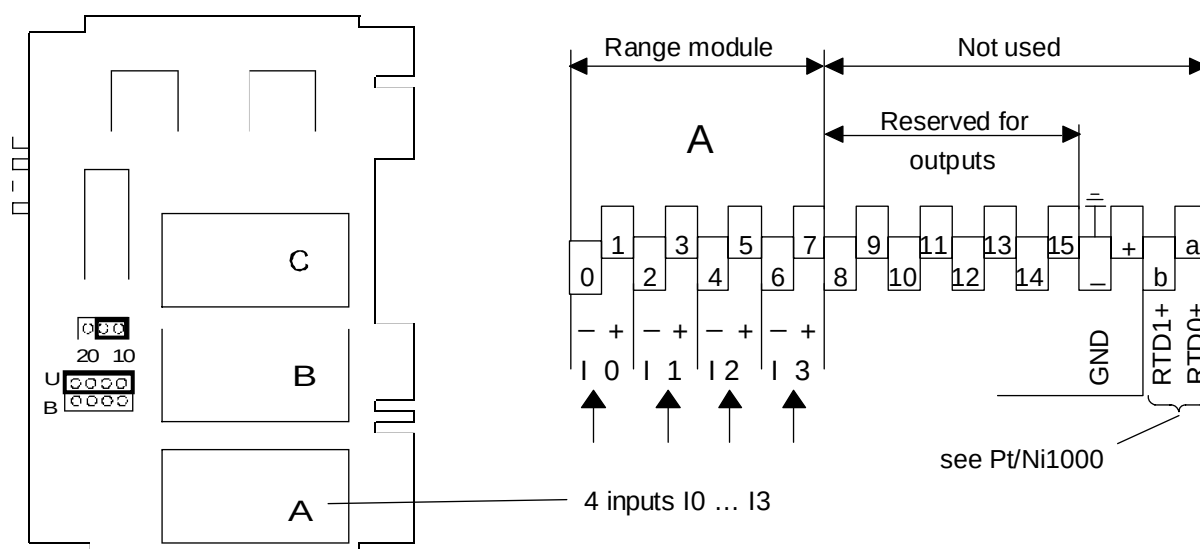
```

\*) The base address of the module must be added to these operands.

### Module connection of analogue inputs

Practically any combination of I/O channel range modules is possible. The 4 inputs have the same range of measurement, while the outputs can be individually configured.

- **Voltage inputs for ranges : 0 ... 10 V,  $\pm 10$  V or  $\pm 5$  V**



Installing at space A

#### Range module

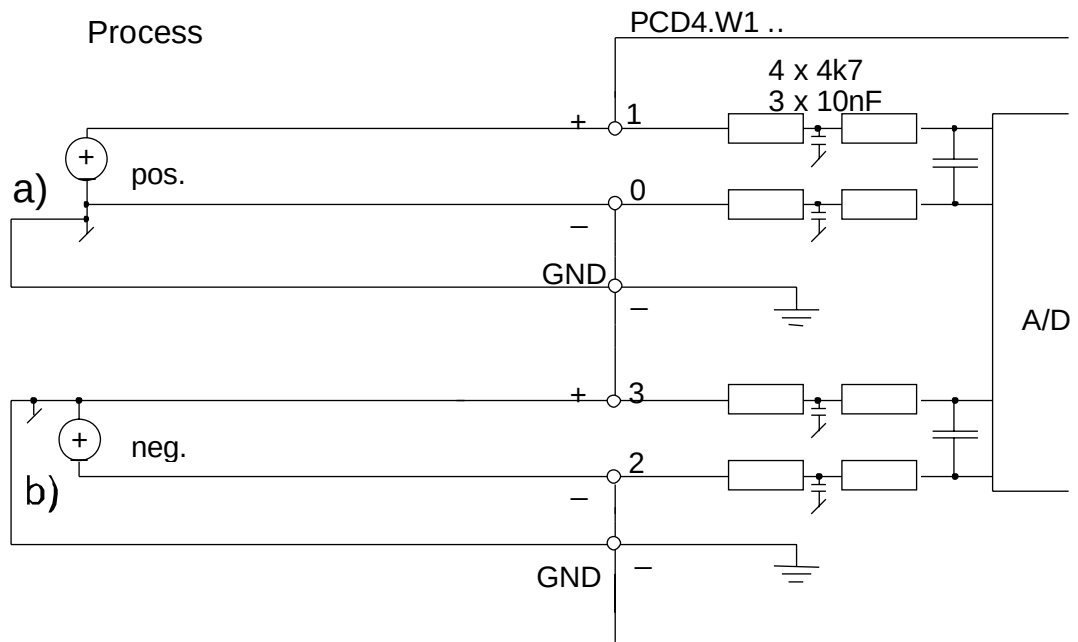
PCD7.W101 : measuring range 0 ... 10 V,  $\pm 10$  V or  $\pm 5$  V

There are two jumpers on the base module for voltage range selection :

|    |   |                                                |
|----|---|------------------------------------------------|
| U  | = | unipolar voltage                               |
| B  | = | bipolar voltage                                |
| 10 | = | entire voltage range of 10 V                   |
| 20 | = | entire voltage range of 20 V (e.g. $\pm 10$ V) |

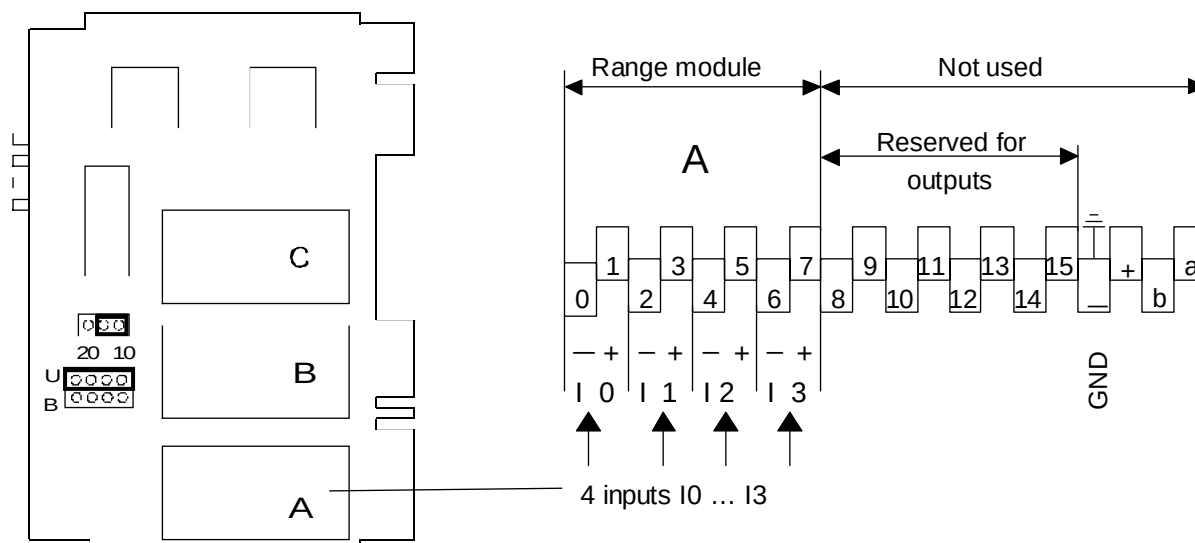
Digital input values are as follows :

|                |         | Range module PCD7.W101 |                    |                   |
|----------------|---------|------------------------|--------------------|-------------------|
| Jumper         | U / B   | U                      | B                  | B                 |
| Jumper         | 10 / 20 | 10                     | 20                 | 10                |
| Signal         |         | 0 ... 10 V             | $\pm 10$ V         | $\pm 5$ V         |
| Digital values |         |                        |                    |                   |
|                | 4095    | +10 V $\uparrow$       | +10 V $\uparrow$   | +5 V $\uparrow$   |
|                | 2048    | +5 V $\uparrow$        | 0 V $\uparrow$     | 0 V $\uparrow$    |
|                | 0       | 0 V $\uparrow$         | -10 V $\downarrow$ | -5 V $\downarrow$ |



**Note :** The process ground, or that of an input amplifier, must be connected to the ground of the analogue module (at terminal " - "). In unipolar operation, the more positive potential is connected to the " + " terminal. In this way, negative voltages (b) can also be measured.

- **Current inputs for ranges : 0 ... 20 mA, 4 ... 20 mA,  $\pm 20$  mA or  $\pm 10$  mA**



Installing at space A

#### Range module

PCD7.W105 : measuring range 0 ... 20 mA, 4 ... 20 mA,  $\pm 20$  mA or  $\pm 10$  mA

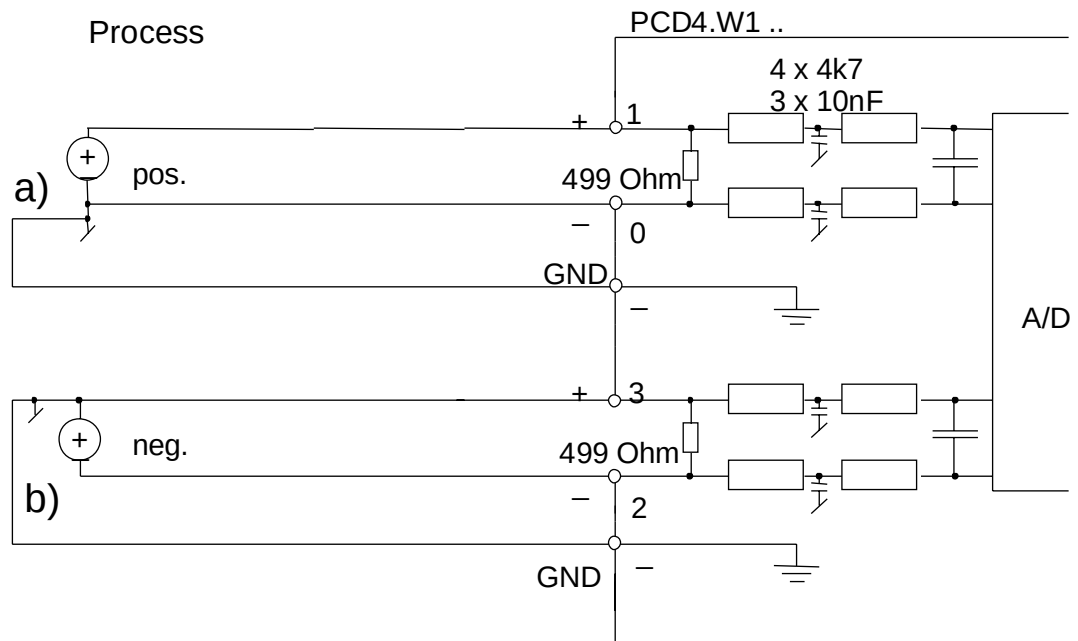
There are two jumpers on the base module for current range selection :

|    |   |                                                  |
|----|---|--------------------------------------------------|
| U  | = | unipolar input                                   |
| B  | = | bipolar input                                    |
| 10 | = | entire current range of 20 mA                    |
| 20 | = | entire current range of 40 mA (e.g. $\pm 20$ mA) |

Digital input values are as follows :

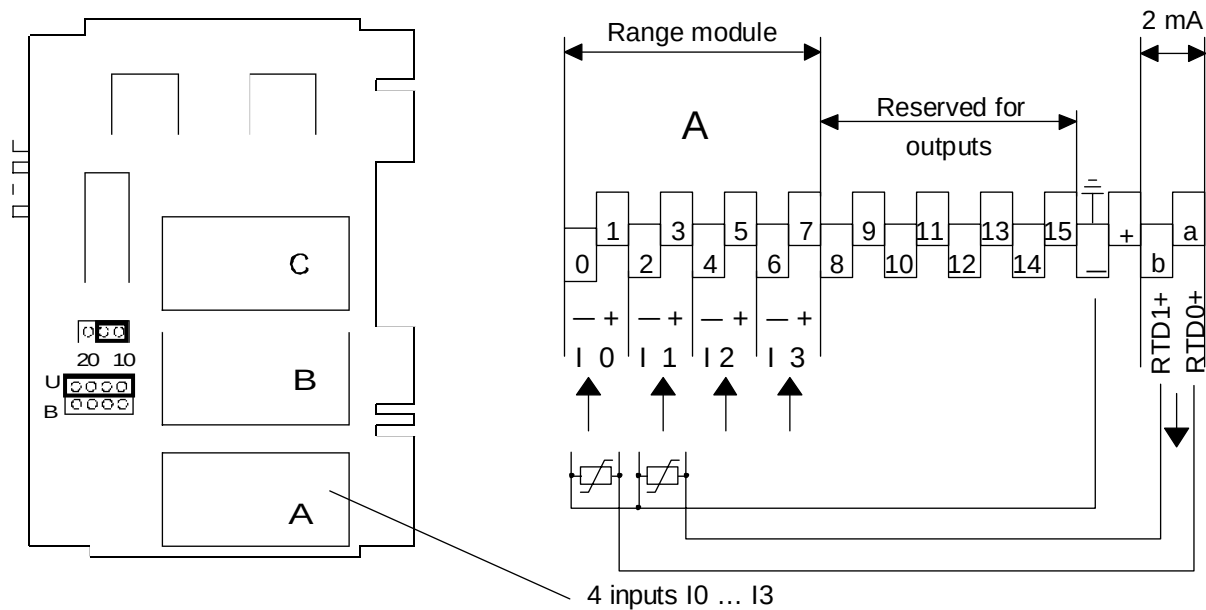
|                |         | Range module PCD7.W105 |             |             |
|----------------|---------|------------------------|-------------|-------------|
| Jumper         | U / B   | U                      | B           | B           |
| Jumper         | 10 / 20 | 10                     | 20          | 10          |
| Signal         |         | 0 ... 20 mA            | $\pm 20$ mA | $\pm 10$ mA |
| Digital values |         |                        |             |             |
| 4095           |         | +20 mA                 | +20 mA      | +10 mA      |
| 2048           |         | +10 mA                 | 0 mA        | 0 mA        |
| 819 *)         |         | +4 mA *)               |             |             |
| 0              |         | 0 mA                   | -20 mA      | -10 mA      |

\*) The same range module is fitted for current range 4 ... 20 mA.  
The 4 mA current limit is controlled with the user program.



**Note :** The process ground, or that of an input amplifier, must be connected to the ground of the analogue module (at terminal " - "). In unipolar operation, the more positive potential is connected to the " + " terminal. In this way, negative voltages (b) can also be measured.

- **Connection of 2 resistive temperature sensors Pt/Ni 1000**



Installing at space A

Range module

PCD7.W101 : (0 ... 10 V) for Pt 1000 or Ni 1000

The 2 mA constant current is supplied from the base module to the terminals " a " (RTD0) and " b " (RTD1).

RTD0 must connect to input channel I0 and RTD1 to I1.

RTD0 can be read by reading channel I0, RTD1 is read by reading channel I1.

Inputs I2 and I3 are available for other inputs 0 ... 10 V.

Recommended jumper positions on the base module are : U and 10.

For calculation of temperature and digital value, see description of analogue module PCD4.W300.

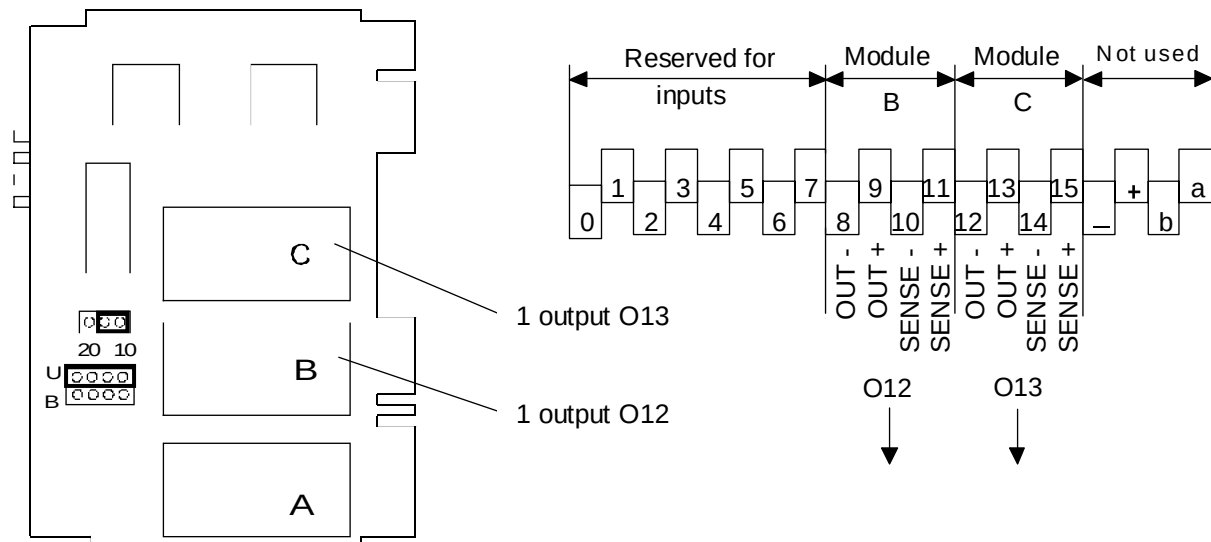
**Note :** Due to conversion RTD0 to RTD1 (2 mA) the wait time must be increased to 10 ms (see "Programming and I/O addressing"). When only one terminal is used (RTD0 or RTD1), the unused terminal must be connected to the negative terminal " - ".



### Module connection of analogue outputs

On the PCD4.W100 base module, the 2 output channels can be individually configured from a selection of output range modules. The spaces B and C are provided for this. The following description shows both outputs with the same range module.

- **Voltage outputs**



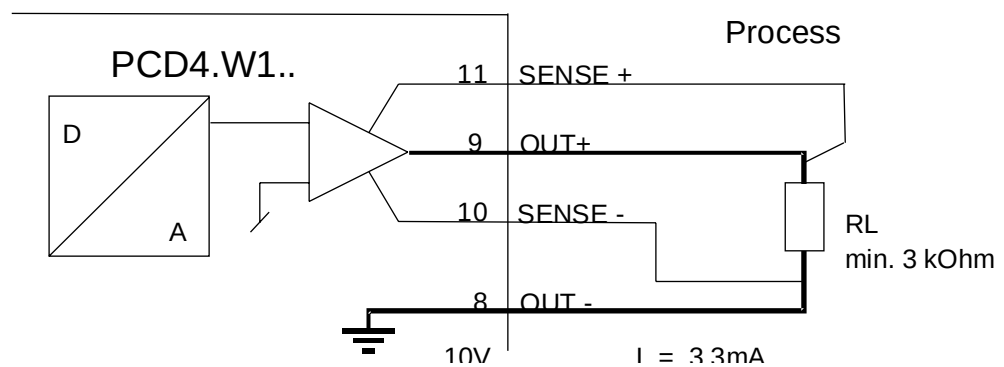
Installing at space B and/or C

#### Range module

|             |                            |             |
|-------------|----------------------------|-------------|
| PCD7.W200 : | 1 output channel for range | 0 ... 10 V  |
| PCD7.W201 : | 1 output channel for range | 0 ... 1 V   |
| PCD7.W202 : | 1 output channel for range | $\pm 10$ V  |
| PCD7.W203 : | 1 output channel for range | $\pm 1$ V   |
| PCD7.W206 : | 1 output channel for range | -10 ... 0 V |

Digital output values are as follows :

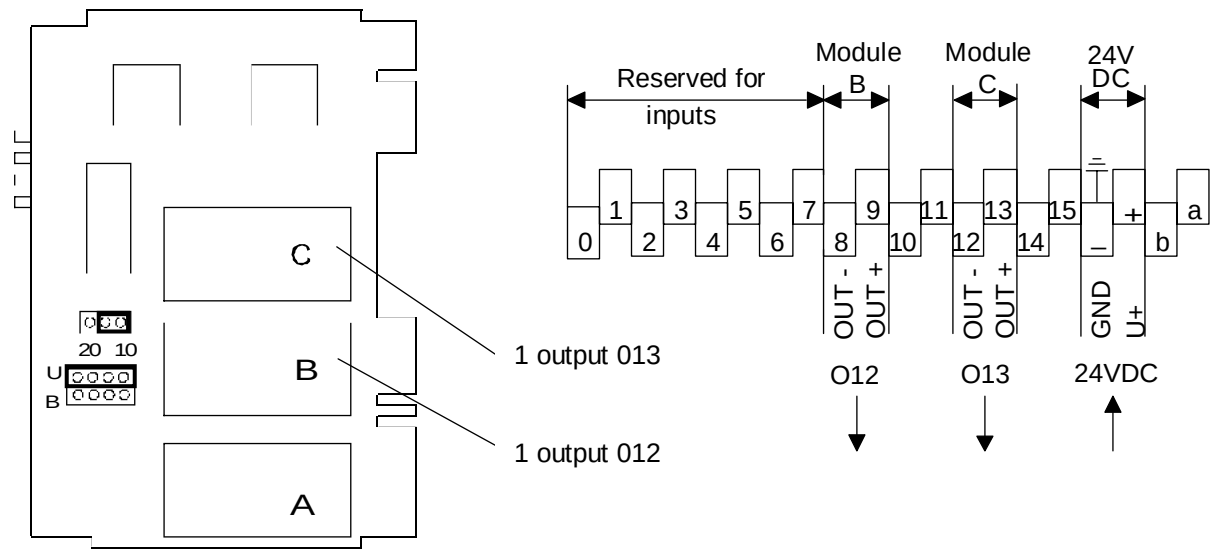
| Digital values | Range module PCD7.W2.. |                       |                         |                        |                         |
|----------------|------------------------|-----------------------|-------------------------|------------------------|-------------------------|
|                | ..W200<br>(0 ... 10 V) | ..W201<br>(0 ... 1 V) | ..W202<br>( $\pm 10$ V) | ..W203<br>( $\pm 1$ V) | ..W206<br>(-10 ... 0 V) |
| 4095           | +10 V $\uparrow$       | +1 V $\uparrow$       | +10 V $\uparrow$        | +1 V $\uparrow$        | 0 V $\downarrow$        |
| 2048           | +5 V $\uparrow$        | +0.5 V $\uparrow$     | 0 V $\downarrow$        | 0 V $\downarrow$       | -5 V $\downarrow$       |
| 0              | 0 V $\uparrow$         | 0 V $\uparrow$        | -10 V $\downarrow$      | -1 V $\downarrow$      | -10 V $\downarrow$      |



**Note :** Two "SENSE" measurement cables are provided to increase voltage precision at the load resistance  $R_L$ .

These must be high impedance cables ( $I \leq 0.2 \text{ mA}$ ), by which the effective voltage  $R_L$  is measured, and if necessary corrected. If the SENSE detectors are not required, then terminals 8-10 and 9-11 must be connected together.

• Current outputs



Installing at space B and/or C

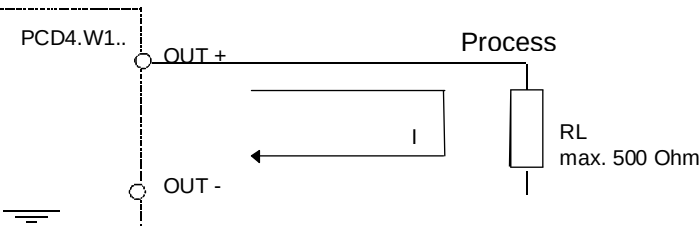
Range module

PCD7.W204 : 1 output channel for range 0 ... 20 mA

PCD7.W205 : 1 output channel for range 4 ... 20 mA

Digital outputs values are as follows:

| Digital values | Range module PCD7.W2..  |                         |
|----------------|-------------------------|-------------------------|
|                | ..W204<br>(0 ... 20 mA) | ..W205<br>(4 ... 20 mA) |
| 4095           | +20 mA                  | +20 mA                  |
| 2048           | +10 mA                  | +12 mA                  |
| 0              | 0 mA                    | +4 mA                   |



For supplying current outputs, the " + " terminal must be connected to +24 VDC. This supply can be that same as that of the power supply module PCD4.N2.. with a maximum current requirement of 60 mA.

The spaces B and C can be independently fitted with different output modules (e.g.: B = current output and C = voltage output.)

**Notes :**

## 9.2 PCD4.W300 Analogue input module, 8 channels, 12 bit resolution and sign bit

---

### Application

The ..W300 analogue module for slow processes consists of a base module with 1 or 2 add-on input range modules.

Voltage ranges of  $\pm 100$  mV to 10 V, or current ranges 0 ... 20 mA and 4 ... 20 mA can be measured, and stored in digital form in a Register. Resistive temperature sensors or thermocouples can also be connected.

Various input range modules can be used to configure the module for specific requirements.

### Module overview

#### Base module :

PCD4.W300 : For use in a 50 Hz environment with anti-phase noise suppression. Input multiplexer for up to 8 input channels. Special 2 mA constant current output.

#### Range modules :

PCD7.W100 : 4 channels, voltage range  $\pm 10$  V,  
input resistance 200 k $\Omega$  / 0.2 %

PCD7.W101 : 4 channels, voltage range  $\pm 1$  V,  
input resistance  $\geq 10$  M $\Omega$

PCD7.W102 : 4 channels, voltage range  $\pm 100$  mV,  
input resistance  $\geq 10$  M $\Omega$

PCD7.W103 : 4 channels, current range  $\pm 20$  mA (4 ... 20 mA),  
input resistance 49.9  $\Omega$  / 0.1 %

PCD7.W104 : 4 channels, current range 4 ... 20 mA for two-wire converter, resistance 49.9  $\Omega$  / 0.1 %,

PCD7.W110 : 4 channels, for Pt 1000, temperature range  
-50 ... +150°C, resolution approx. 1/10°C

PCD7.W111 : 4 channels, for Ni 1000, temperature range  
-50 ... +150°C, resolution  $\leq 1/10$ °C

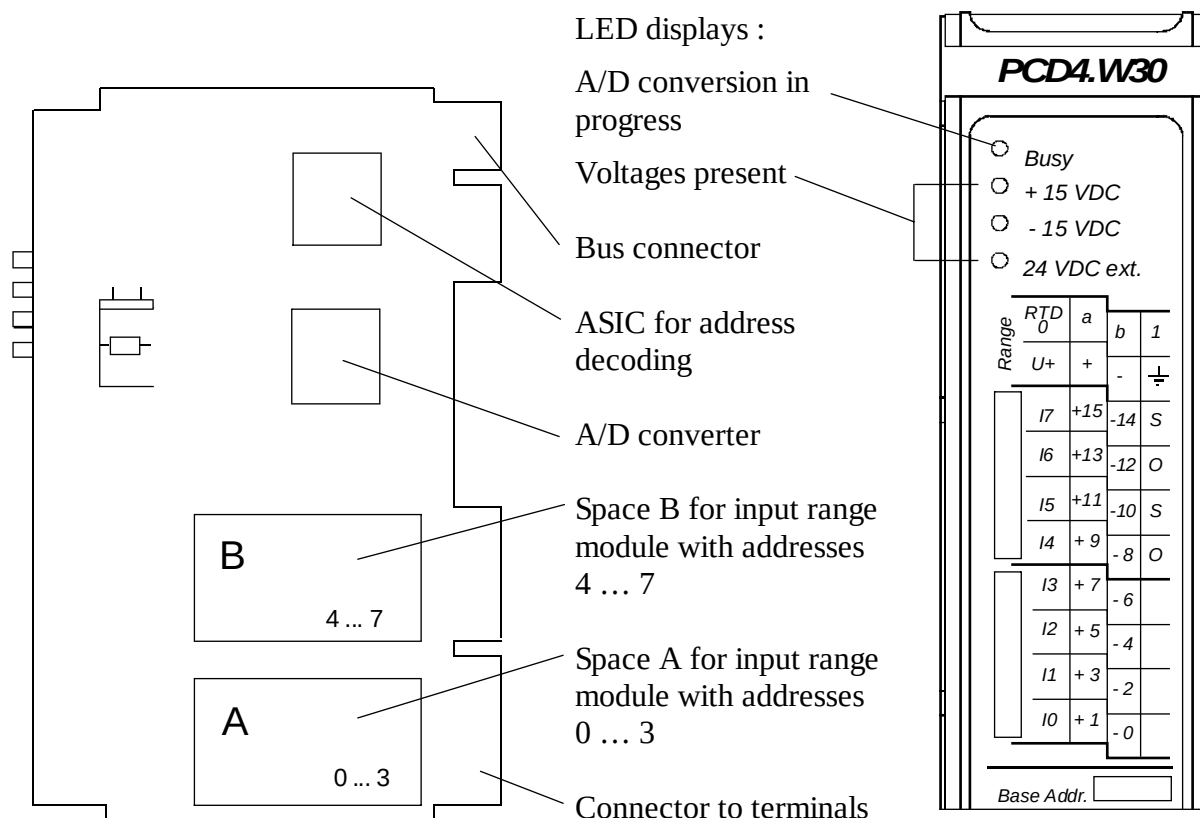
PCD7.W120 : 4 x 2mA constant current outputs, for 4 x Pt/Ni 100 or  
Pt/Ni 1000 resistive temperature sensors

Time constant on input filter : 1 ms

**Technical data of the base module**

|                                                      |                                                                                                                                                                                                       |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of input channels                             | 8 voltage or current inputs, or<br>4 inputs for resistive temperature sensors with four-wires (Pt/Ni 100 or Pt/Ni 1000), or<br>8 inputs for resistive temperature sensors with two-wires (Pt/Ni 1000) |
| Potential separation                                 | No (differences of the minus potential max. 1.5 V)                                                                                                                                                    |
| Measuring principle                                  | Differential                                                                                                                                                                                          |
| Input ranges                                         | See section "range modules"                                                                                                                                                                           |
| Resolution<br>(digital representation)               | 12 bits + sign bit ( $\pm 4095$ )                                                                                                                                                                     |
| Conversion principle                                 | Integration                                                                                                                                                                                           |
| Integration time                                     | 20 ms (at 60 Hz : $16\frac{2}{3}$ ms)                                                                                                                                                                 |
| A/D conversion time                                  | $\leq 120$ ms (at 60 Hz : $\leq 100$ ms)                                                                                                                                                              |
| Error message                                        | When range exceeded by $> \pm 4095$                                                                                                                                                                   |
| Accuracy<br>(referred to measured value)             | 0.3 % $\pm 2$ LSB                                                                                                                                                                                     |
| Repeating accuracy                                   | Within 3 LSB                                                                                                                                                                                          |
| Temperature error (typical)                          | 0.8 % across temp. range 0 ... 50°C                                                                                                                                                                   |
| Max. overvoltage at<br>analogue inputs               | 60 VDC                                                                                                                                                                                                |
| Resistance to interference<br>according to IEC 801-4 | 1 kV under capacitance coupling,<br>with cables not shielded<br>2 kV under capacitance coupling,<br>with cables shielded                                                                              |
| Output                                               | 1 x 2 mA $\pm 1$ % constant current output for temperature compensation of the sensors (Pt/Ni 100) when thermocouples are connected                                                                   |
| External supply 24 VDC                               | Only required for current inputs from two-wire current converters, supply of same quality as for supply module N2..                                                                                   |
| Internal current consumption<br>(from the bus)       | +5 V : 30 mA<br>+15 V : 16 mA<br>-15 V : 9 mA                                                                                                                                                         |

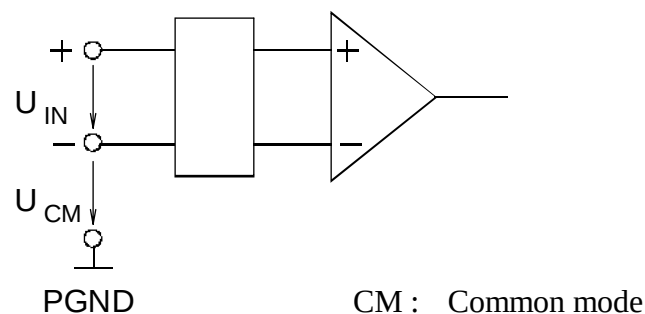
## Presentation



The following functional blocks can be seen :

- The base printed circuit board (PCB) with bus interface, address decoding, A/D converter with multiplexer (MUX) and two spaces for insertion of range modules.
- Spaces A and B to receive the range modules

Common-mode behaviour



$$U_{IN} + U_{CM} \leq 2.5 \text{ V}$$

$$\text{CMR} = 86 \text{ dB}$$

$$\text{CMMR} = 50 \text{ } \mu\text{V/V} @ U_{CM} \pm 1.5 \text{ V}$$

### Insertion of the range modules

The base printed circuit board must first be removed from the module housing in order to install a range module. This is done by pressing in the snap fastenings on either side of the front panel. Then the PCB fastening screw on the upper left hand side of the module is unscrewed, so that the PCB can be removed from the casing.

At the lowest space A, one range module for 4 input channels with addresses 0 ... 3 (+ base address) can be fitted. The upper space B is either for the 4 channels with addresses 4 ... 7 (+ base address) or for the special PCD7.W120 module for the resistive temperature sensors.

After installing the range modules, close the housing and tighten up the PCB fastening screw again.



**Caution :** The base PCB and the range modules incorporate components which are sensitive to electrostatic discharges.

Various types of range modules can be attached to the output spaces A and B. In order to keep the internal equipment obvious to outside inspection, remember to write the I/O type on the labels provided on the front and side panel (see example below).

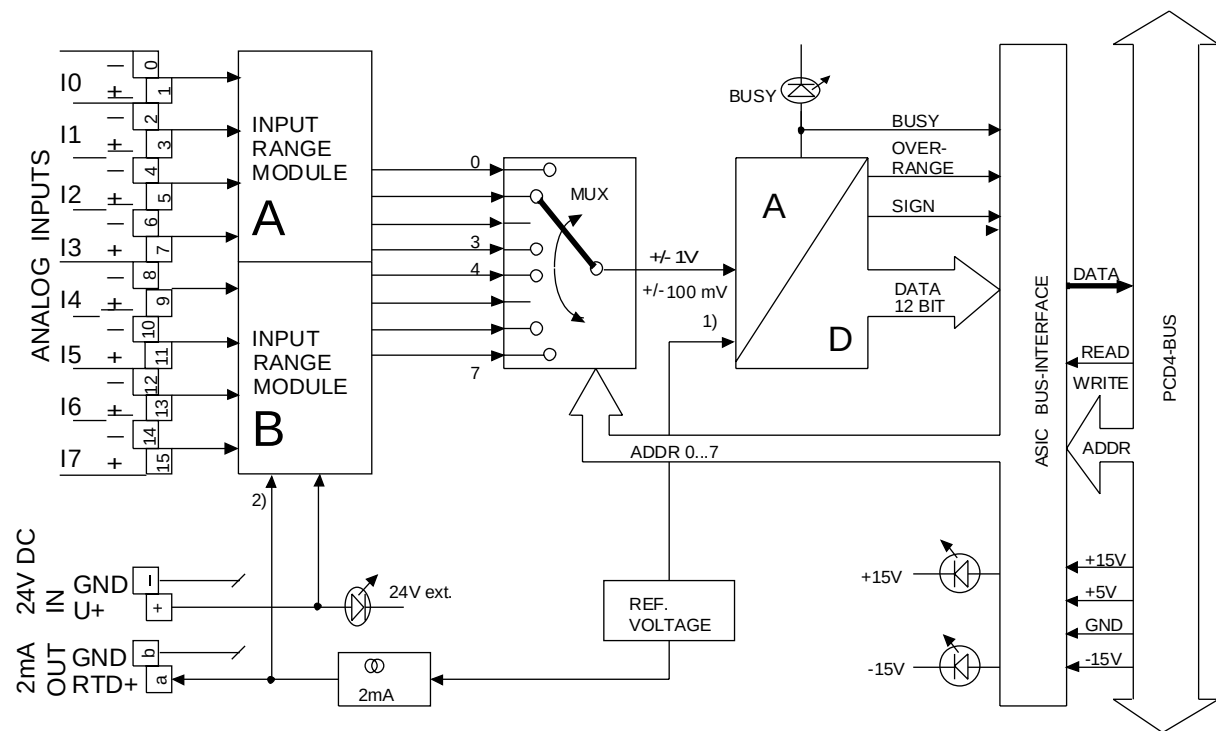
|                                   |
|-----------------------------------|
| <input type="radio"/> Busy        |
| <input type="radio"/> + 15 VDC    |
| <input type="radio"/> - 15 VDC    |
| <input type="radio"/> 24 VDC ext. |

| Range       | RTD<br>0 | a   | b   | 1                |
|-------------|----------|-----|-----|------------------|
|             | U+       | +   | -   | $\frac{1}{\div}$ |
| 4 ... 20 mA | 17       | +15 | -14 | S                |
|             | 16       | +13 | -12 | O                |
|             | 15       | +11 | -10 | S                |
|             | 14       | +9  | -8  | O                |
| ±1 V        | 13       | +7  | -6  |                  |
|             | 12       | +5  | -4  |                  |
|             | 11       | +3  | -2  |                  |
|             | 10       | +1  | -0  |                  |

Base Addr.

|                                                                                                                     |                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>SAIA<br>MURTEN SWITZERLAND |                                                                                                                                                            |
| <b>ANALOG INPUT</b>                                                                                                 |                                                                                                                                                            |
| Type                                                                                                                | PCD4.W300                                                                                                                                                  |
| Version                                                                                                             | A                                                                                                                                                          |
| Modif.                                                                                                              | <input type="text" value="1"/> <input type="text" value="2"/> <input type="text" value="3"/> <input type="text" value="4"/> <input type="text" value="5"/> |
| Inputs                                                                                                              |                                                                                                                                                            |
| 0 ... 3                                                                                                             | ± 1 V (W101)                                                                                                                                               |
| 4 ... 7                                                                                                             | 4 ... 20 mA (W104)                                                                                                                                         |
|                                 |                                                                                                                                                            |



**Block diagram**

- 1) By installing range module ..W102 ( $\pm 100$  mV) the A/D converter for the corresponding addresses is set for  $\pm 100$  mV.
- 2) By installing range module ..W120 in space B, the 2 mA source is connected to output terminals 8 ... 15.

**Meaning of the 16 addresses**

Input channel selected  
(1 = selected)

|    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|
| I0 | I1 | I2 | I3 | I4 | I5 | I6 | I7 |
|----|----|----|----|----|----|----|----|

Bit address for data read

|                      |    |    |    |    |    |    |    |    |    |     |     |          |         |    |         |
|----------------------|----|----|----|----|----|----|----|----|----|-----|-----|----------|---------|----|---------|
| 0                    | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10  | 11  | 12       | 13      | 14 | 15      |
| D0                   | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 | D10 | D11 | Sign bit | Overrun |    | AD busy |
| 12 bit digital value |    |    |    |    |    |    |    |    |    |     |     |          |         |    |         |

- Bit 12 "sign bit" = 1 : Negative value
- Bit 13 "overrun" = 1 : Absolute value > 4095
- Bit 15 "AD busy" = 1 : A/D conversion in progress.

**User program**

To read an analogue value from channel I 3 into Register R103.

```

(ACC H)   (accu must be 1)
SET   0 3 *) ; select input channel I3 and
               ; start A/D conversion
STH   I 15 *) ; high=conversion in progress ≤120 ms
JR   H -1   ; (wait or branch until is complete)

BITI   12   ; read A/D value, 12 bits
       I 0 *) ; from address 0 (LSB)
       R 103   ; into Register R103

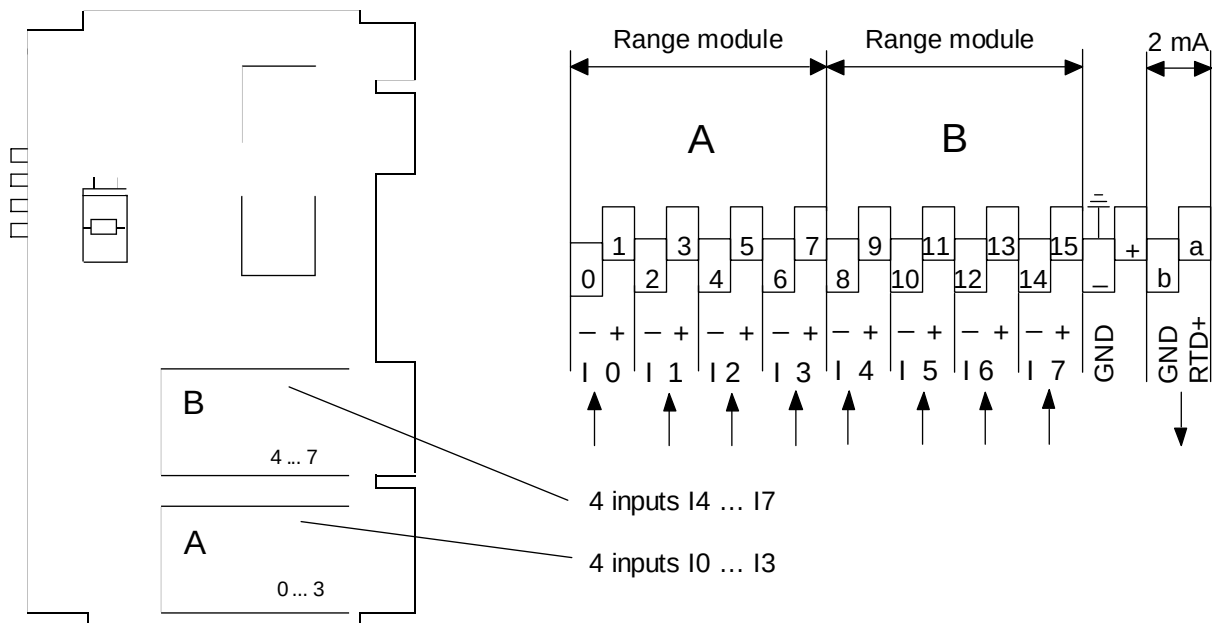
STH   I 12 *) ; check sign bit
CFB   H
STH   I 13 *) ; check overrun (amount > 4095)
CFB   H   ; value out of range

```

\*) The base address of the module must be added to these operands.

### Module connection of analogue inputs

- Voltage inputs for ranges :  $\pm 100$  mV,  $\pm 1$  V or  $\pm 10$  V



Installing at space A and/or B

#### Range module

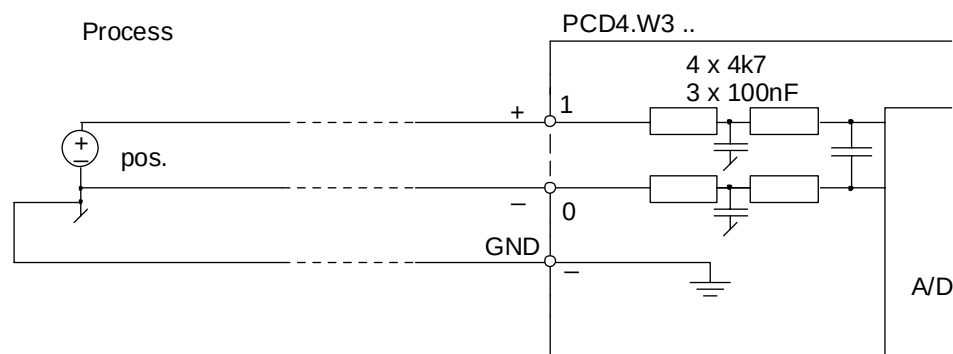
PCD7.W100 : measuring range  $\pm 10$  V =  $\pm 4095$

PCD7.W101 : measuring range  $\pm 1$  V =  $\pm 4095$

PCD7.W102 : measuring range  $\pm 100$  mV =  $\pm 4095$

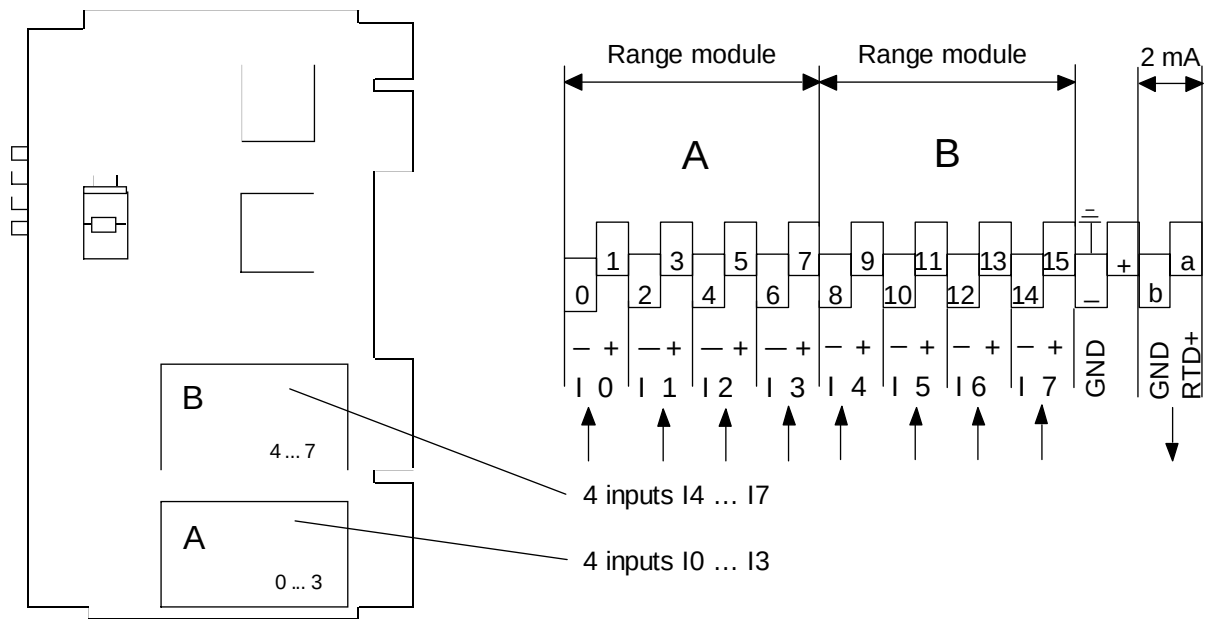
The spaces A and B can be fitted with different range modules.

The 2 mA constant current output RTD+ is always available, independent of the range modules fitted.



**Note :** The process ground, or that of an input amplifier, must be connected to the ground of the analogue module (at terminal " - "). Instead of a separate ground line the shield of the cable can be used.

- **Current inputs for ranges :  $\pm 20$  mA or 4 ... 20 mA**



Installing at space A and/or B

#### Range module

PCD7.W103 : measuring range  $\pm 20$  mA =  $\pm 4095$

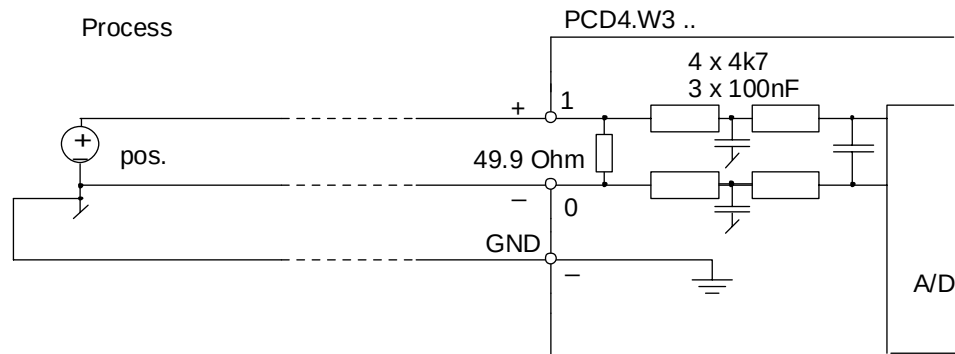
The same range module is fitted for the range 4 ... 20 mA.

The current limits are controlled by the user program :

|       |   |        |               |
|-------|---|--------|---------------|
| 4 mA  | = | + 819  | digital value |
| 20 mA | = | + 4095 | digital value |

The spaces A and B can be fitted with different range modules (eg. A =  $\pm 20$  mA and B =  $\pm 10$  V).

The 2 mA constant current output RTD+ is always available, independent of the range modules fitted.



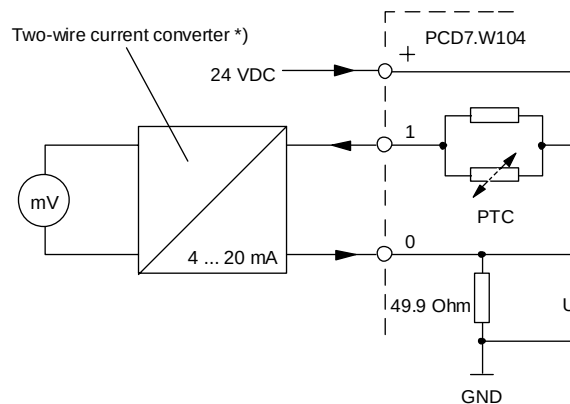
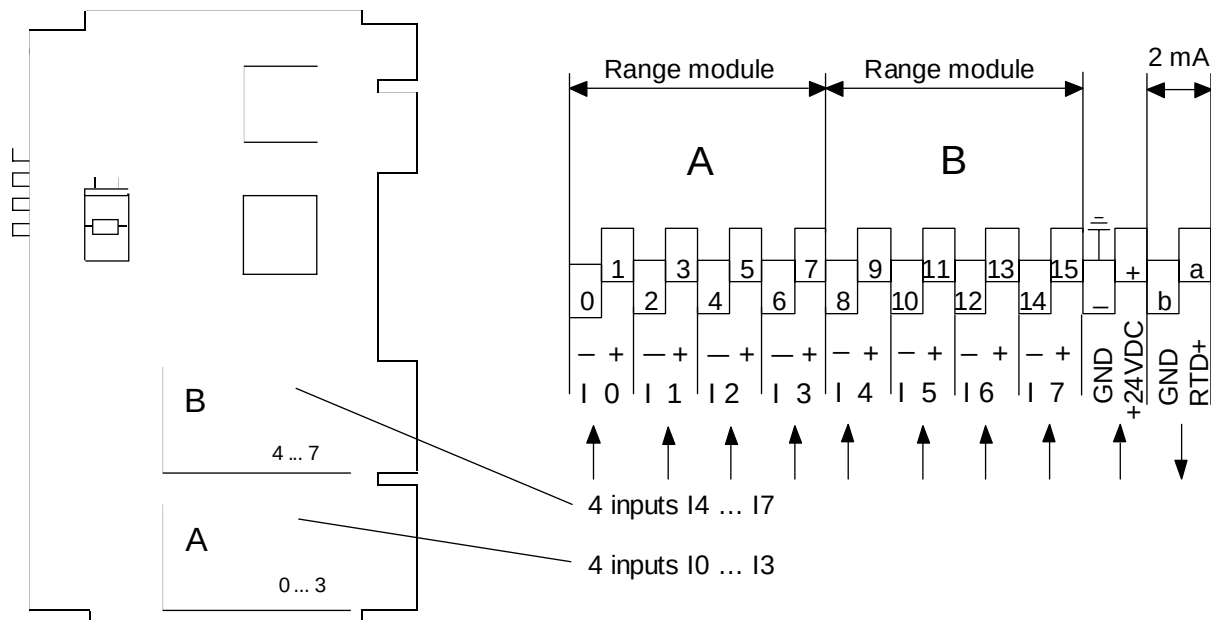
**Note :** The process ground, or that of an input amplifier, must be connected to the ground of the analogue module (at terminal " - "). Instead of a separate ground line the shield of the cable can be used.

- **Current inputs for 4 ... 20mA from two-wire current converter**

Two-wire current converters require a 24 VDC supply, as shown in the diagram below :

\*) The range module ..W104 can also be used without the two-wire current converters for normal 20 mA inputs.

To implement this, the inputs must be connected to the even terminals (0, 2, 4 etc.) and the common ground terminal " - ".



Installing at space A and/or B

#### Range module

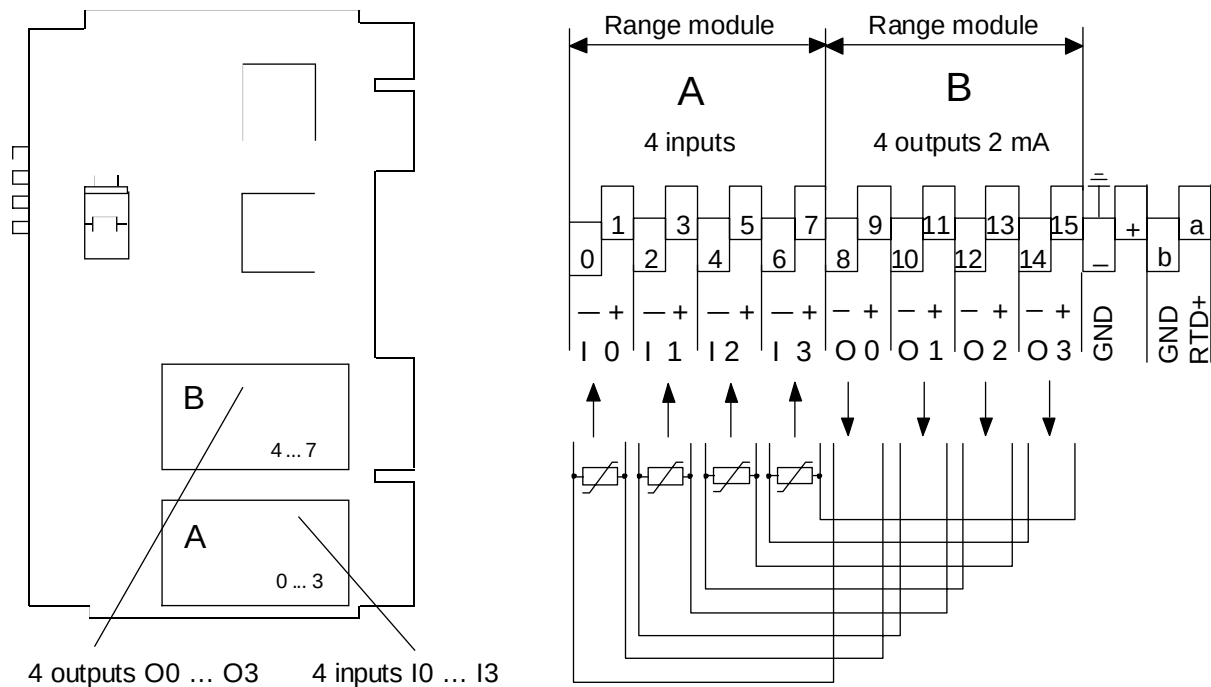
|            |                 |             |       |   |        |
|------------|-----------------|-------------|-------|---|--------|
| PCD7.W104: | measuring range | 4 ... 20 mA | 4 mA  | = | + 819  |
|            | (digital value) |             | 20 mA | = | + 4095 |

The " + " terminal must be connected to +24 VDC to supply the current converter. This supply can be the same as that of the power supply module PCD4.N2.. . Maximum current required is 0.2 A with 8 converters connected.

The spaces A and B can be fitted with different range modules (eg. A = 4 ... 20 mA and B =  $\pm 10$  V).

The 2mA constant current output RDT+ is always available, independent of the range modules fitted.

- **Connection of 4 resistive temperature sensors Pt/Ni 100 or Pt/Ni 1000**



Installing at space A

#### Range module

PCD7.W101 : ( $\pm 1$  V) for 4 sensors Pt100 or Ni100

PCD7.W100 : ( $\pm 10$  V) for 4 sensors Pt1000 or Ni1000

Installing at space B

#### Special range module

PCD7.W120 : for 4 constant current outputs at 2 mA

The module in space B provides a constant current of 2 mA up to a circuit resistance of 2000  $\Omega$ . The voltage drop across the resistive temperature sensor is connected to the range module in space A.

**Note :** Not used 2mA outputs must be short-circuited

#### **Software**

If the range modules are correctly installed on the base module (voltage inputs in space A, constant current outputs in space B), this is recognized as an arrangement for resistive temperature devices. The user therefore needs only to be concerned with the treatment of voltage inputs on the software side, as described in the chapters entitled "User program".

### Temperature measurement with Pt 100 and range module for $\pm 1$ V

At 0°C, the temperature dependent Pt 100 resistance shows a resistance of **R0 = 100  $\Omega$** . Within the temperature range of -20°C to +200°C, the change in resistance can be described with an accuracy of  $\pm 1$  % using the following formula :

$$R_T = R_0 (1 + 3.83 * 10^{-3} * T) \quad T \text{ in } ^\circ\text{C}$$

At the range module, sensitivity S amounts to " $\pm 1$  V" under 2 mA :

$$S = 3.83 * 10^{-3}/^\circ\text{C} * 4096 \text{ LSB}/1\text{V} * 0.002\text{A} * 100\Omega = 3.14 \text{ LSB}/^\circ\text{C}$$

The 2 mA constant current gives a voltage of 0.2 V at 100  $\Omega$ .

On the " $\pm 1$  V" range modules, this corresponds to a digital value of :

$$4096 * 0.2 = 819 ; \quad \text{i.e. } 100 \Omega = 0^\circ\text{C} = 819 \text{ LSB} = \text{Offset}$$

These two values allow the temperature in  $^\circ\text{C}$  to be determined at any time from the digital measurement.

|                                                                      |
|----------------------------------------------------------------------|
| $T (^\circ\text{C}) = \frac{\text{digital measurement} - 819}{3.14}$ |
|----------------------------------------------------------------------|

or

|                                               |                                |
|-----------------------------------------------|--------------------------------|
| $\text{digital measurement} = 3.14 * T + 819$ | $T \text{ en } ^\circ\text{C}$ |
|-----------------------------------------------|--------------------------------|

Example 1 :

|                                                       |          |
|-------------------------------------------------------|----------|
| digital measurement                                   | 1300 LSB |
| $T = \frac{1300 - 819}{3.14} = + 153.2^\circ\text{C}$ |          |

Example 2 :

|                                                     |         |
|-----------------------------------------------------|---------|
| digital measurement                                 | 770 LSB |
| $T = \frac{770 - 819}{3.14} = - 15.6^\circ\text{C}$ |         |

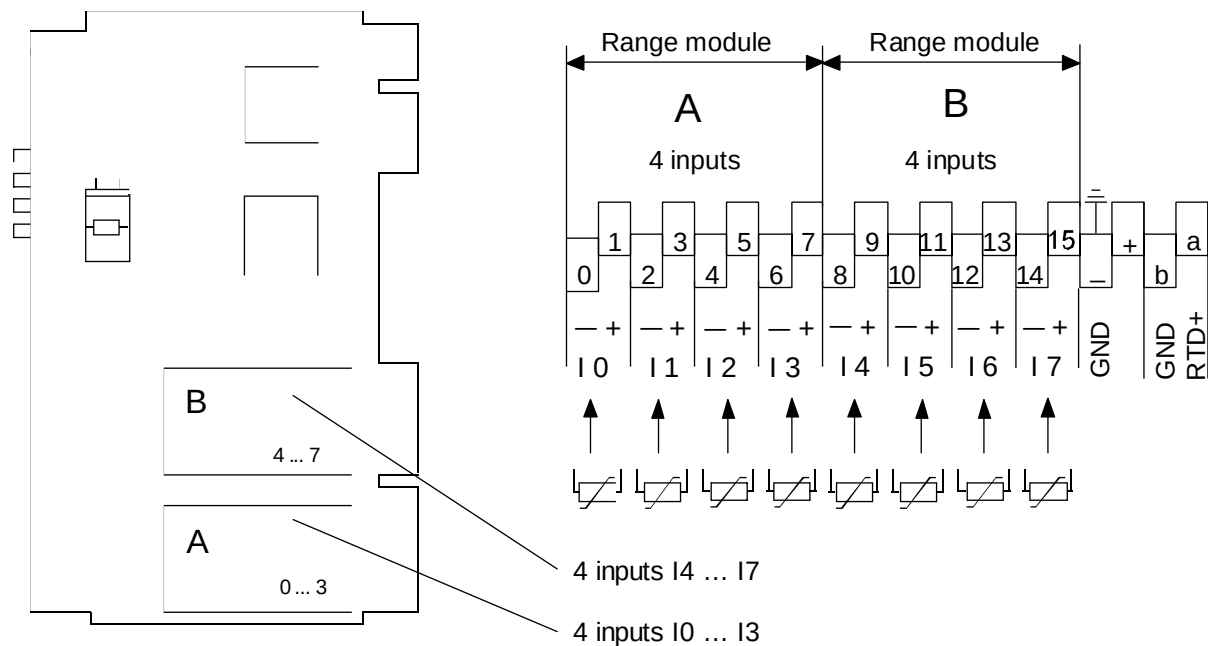
Example 3 :

|                                                  |
|--------------------------------------------------|
| 100°C corresponds to which digital measurement ? |
| Digital measurement = $3.14 * 100 + 819 = 1133$  |

### Temperature measurement with Pt 1000 and range module $\pm 10$ V

The same formula apply as for Pt100.

- **Connection of 8 resistive temperature sensors Pt 1000 or Ni 1000**



Installing at space A

Range module

PCD7.W110 for 4 sensors Pt 1000

PCD7.W111 for 4 sensors Ni 1000

Installing at space B

Range module

PCD7.W110 for 4 sensors Pt 1000

PCD7.W111 for 4 sensors Ni 1000

Each of these modules will accept connection of 4 x Pt/Ni 1000 resistive temperature sensors. An internal stabilized power supply provides the voltage for the resistive temperature sensors. The modules are adjusted in the factory and are independent of the PCD4.W300 base module; i.e. the modules are interchangeable.

Adjustment to compensate for cable length is possible using each channel's potentiometer on the module itself. However, to guarantee interchangeability, it is preferable for this compensation to take place in the user program.



The " Rt " temperature sensor resistance values and the corresponding " Dv " digital value, which after conversion is located in a PCD register, can be taken from the following tables in steps of 10°C for Pt1000 or Ni1000. The interpolation factor is also given in Digit/°C or °C/Digit for each 10° range.

For these modules, the conversion formulae from " Rt " to " Dv " and vice versa are as follows :

| Pt 1000                              | Ni 1000                              |
|--------------------------------------|--------------------------------------|
| $Dv = \frac{40950 * Rt}{Rt + 14165}$ | $Dv = \frac{40950 * Rt}{Rt + 17900}$ |
| $Rt = \frac{14165 * Dv}{40950 - Dv}$ | $Rt = \frac{17900 * Dv}{40950 - Dv}$ |

Current load of the  
resistive temperature sensor

< 1 mA

Drift in measured value

≤ 0.05°C/°C (3 Bit/10 °C)

| Temp.<br>°C | Rt<br>Ω | Dv<br>Digits | dDv<br>Digits/°C |
|-------------|---------|--------------|------------------|
| -50         | 803.15  | 2197         |                  |
| -40         | 842.75  | 2300         | 10.2             |
| -30         | 882.24  | 2401         | 10.1             |
| -20         | 921.61  | 2502         | 10.1             |
| -10         | 960.86  | 2601         | 10.0             |
| 0           | 1000.00 | 2700         | 9.9              |
| 10          | 1039.02 | 2798         | 9.8              |
| 20          | 1077.93 | 2896         | 9.7              |
| 30          | 1116.72 | 2992         | 9.7              |
| 40          | 1155.39 | 3088         | 9.6              |
| 50          | 1193.95 | 3183         | 9.5              |
| 60          | 1232.39 | 3278         | 9.4              |
| 70          | 1270.72 | 3371         | 9.4              |
| 80          | 1308.93 | 3464         | 9.3              |
| 90          | 1347.02 | 3556         | 9.2              |
| 100         | 1385.00 | 3647         | 9.1              |
| 110         | 1422.86 | 3738         | 9.1              |
| 120         | 1460.61 | 3828         | 9.0              |
| 130         | 1498.24 | 3917         | 8.9              |
| 140         | 1535.75 | 4005         | 8.8              |
| 150         | 1573.15 | 4093         | 8.8              |

### Examples for fine adjustment by interpolation.

#### • PT 1000

Example 1 (Pt 1000) :

To find : Temperature for digital value of 2930

2896 → 20°C

2930 - 2896 = 34

$$\frac{34}{\text{Dv (20°C)}} = \frac{34}{9.7} = 3.5^{\circ}\text{C}$$

2930 → 20°C + 3.5°C = 23.5°C  
=====

| Temp.<br>°C | Rt<br>Ω | Dv<br>Digits | dDv<br>Digits/°C |
|-------------|---------|--------------|------------------|
| -50         | 742.55  | 1631         |                  |
| -40         | 791.31  | 1734         | 10.3             |
| -30         | 841.46  | 1839         | 10.5             |
| -20         | 892.96  | 1946         | 10.7             |
| -10         | 945.82  | 2055         | 10.9             |
| 0           | 1000.00 | 2167         | 11.2             |
| 10          | 1055.52 | 2280         | 11.4             |
| 20          | 1112.36 | 2396         | 11.6             |
| 30          | 1170.56 | 2514         | 11.8             |
| 40          | 1230.11 | 2633         | 12.0             |
| 50          | 1291.05 | 2755         | 12.2             |
| 60          | 1353.40 | 2879         | 12.4             |
| 70          | 1417.21 | 3004         | 12.6             |
| 80          | 1482.50 | 3132         | 12.8             |
| 90          | 1549.34 | 3262         | 13.0             |
| 100         | 1617.79 | 3394         | 13.2             |
| 110         | 1687.89 | 3529         | 13.4             |
| 120         | 1759.72 | 3665         | 13.7             |
| 130         | 1833.35 | 3805         | 13.9             |
| 140         | 1908.87 | 3946         | 14.2             |
| 150         | 1986.35 | 4090         | 14.4             |

#### • Ni 1000

Example 2 (Ni 1000) :

To find : Digital value for temperature of 48°C

50°C → 2755 Digits

48°C - 50°C = - 2°C

2°C → 2 \* 12.2 = 24.4 Digits

48°C → 2755 - 24.4 = 2730.6  
=====

- **Connection of thermocouples**

When thermocouples are used, particular attention must be paid to two points :

- Thermocouples produce only very small voltages. Therefore the  $\pm 100$  mV range modules must be used.
- The voltage of thermocouples is a function of the difference in temperature between the measuring point and the thermocouple connector.

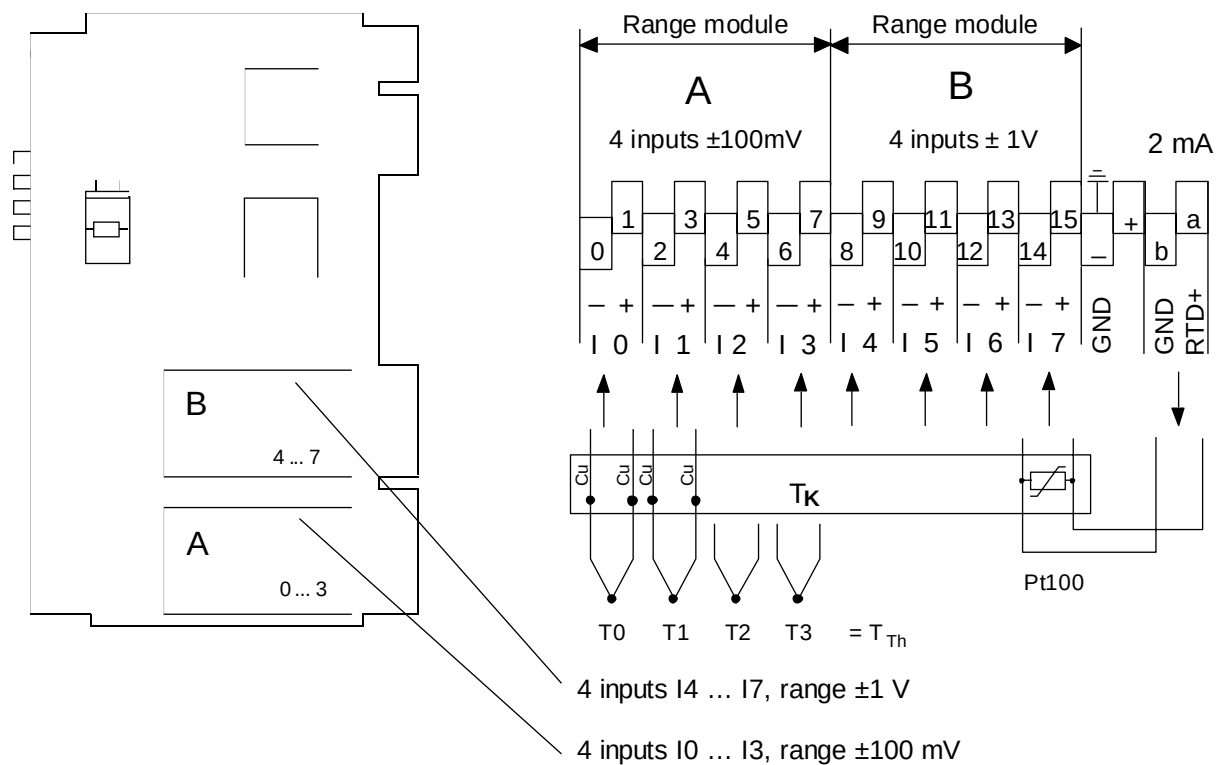
In order to obtain the real temperature, the temperature of the connector must be recorded, which can be done using an additional Pt 100 thermocouple.

The real temperature  $T_W$  therefore :

$$T_W = T_{TH} + T_K$$

$T_{TH}$  = Temperature difference

$T_K$  = Temperature of the thermocouple connectors



### Installing at space A

### Range module

PCD7.W102 ( $\pm 100$  mV) for 4 thermocouples

### Installing at space B

## Range module

PCD7.W101    ( $\pm 1$  V)    for 1 x Pt 100 input  
(3 inputs of  $\pm 1$  V are free for other uses)

The 2 mA constant current for the resistive temperature sensor Pt 100 is supplied by the RTD+ terminal.

## 9.3 PCD4.W400 Analogue output module, 8 channels, 8 bit resolution

---

### Application

Rapid output module with 8 output channels of 8 bits respectively. Different output signals can be reversed with the aid of insertable jumpers. Suited for processes in which a large numbers of actuators must be controlled such as in the chemical industry and building automation.

### Base module

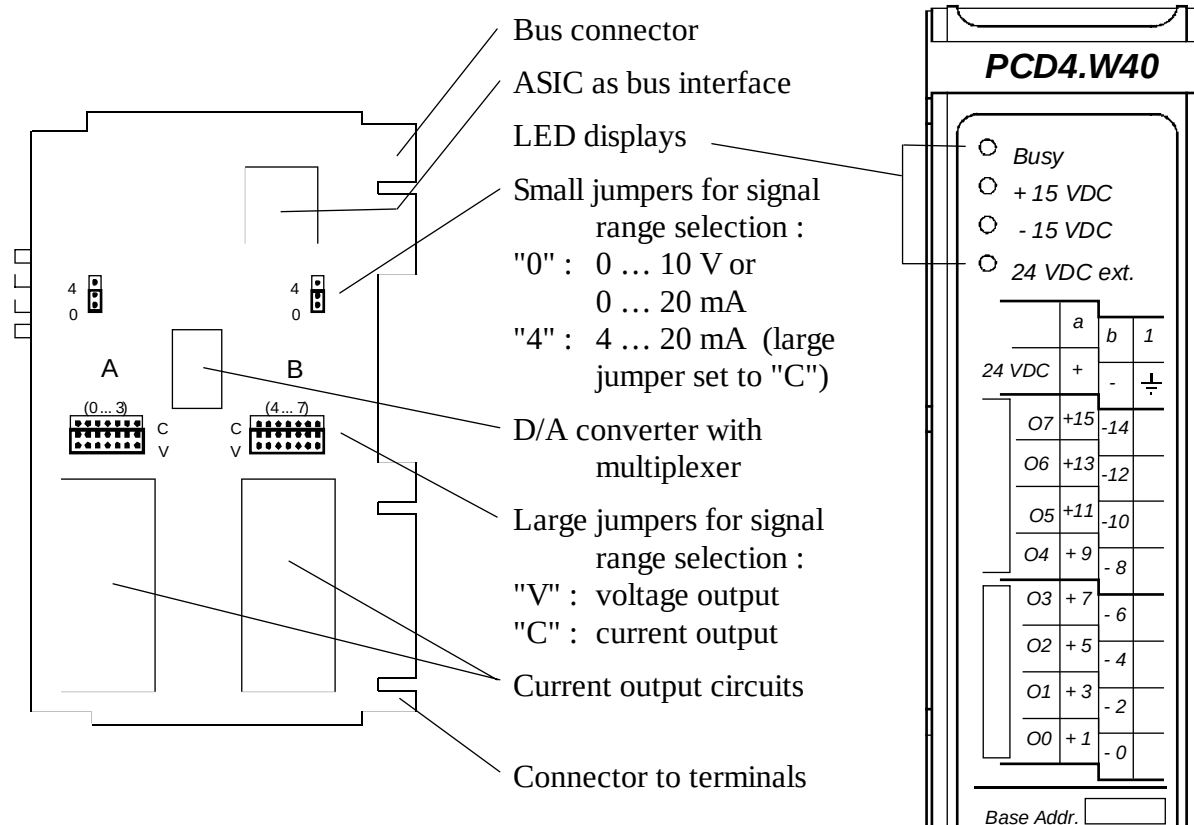
PCD4.W400 : Universal module with 8 output channels of 8 bits respectively, signals can be selected (4 outputs respectively) for 0 ... 10 V, 0 ... 20 mA or 4 ... 20 mA.

### Technical data of the base module

|                                        |                                                                                                                                                                               |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of output channels              | 8 (in 2 groups),<br>short-circuit protected                                                                                                                                   |
| Potential separation                   | No                                                                                                                                                                            |
| Output ranges                          | <div> <div> 0 ... 10 V <sup>*)</sup><br/> 0 ... 20 mA<br/> 4 ... 20 mA </div> <div> }</div> <div> selectable with<br/> jumpers in groups<br/> of 4 outputs each </div> </div> |
|                                        | <sup>*)</sup> Factory setting                                                                                                                                                 |
| Resolution<br>(digital representation) | 8 bits (0 ... 255)                                                                                                                                                            |
| D/A conversion time                    | < 5 µs                                                                                                                                                                        |
| Load impedance                         | 0 ... 10 V : ≥ 3 kΩ<br>0 ... 20 mA : 0 ... 500 Ω<br>4 ... 20 mA : 0 ... 500 Ω                                                                                                 |
| Accuracy<br>(referred to output value) | 0 ... 10 V : 1 % ± 50 mV<br>0 ... 20 mA : 1 % ± 0.2 mA<br>4 ... 20 mA : 1 % ± 0.2 mA                                                                                          |
| Residual ripple                        | 0 ... 10 V : < 15 mV pp<br>0 ... 20 mA : < 50 µA pp<br>4 ... 20 mA : < 50 µA pp                                                                                               |
| Temperature error (typical)            | 0.2 % across temp. range 0 ... 50°C                                                                                                                                           |

|                                                      |                                                                                                                          |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| External supply 24 VDC                               | max. 0.2 A<br>(required for current outputs only)<br>Tolerance : as power supply<br>for PCD4.N2..                        |
| Ambient temperature                                  | Operating : 0 ... +50°C<br>Storage : -20 ... +85°C                                                                       |
| Resistance to interference<br>according to IEC 801-4 | 1 kV under capacitance coupling,<br>with cables not shielded<br>2 kV under capacitance coupling,<br>with cables shielded |
| Internal current consumption<br>(from the bus)       | +5 V : 10 mA<br>+15 V : 20 mA + 3.5 mA/channel<br>-15 V : 25 mA                                                          |

### Presentation



Factory setting of jumpers :  
 " V " : voltage output  
 " 0 " : range 0 ... 10 V

### Reinsertion of jumpers

The base printed circuit board must first be removed from the module housing in order to reinsert the jumpers. This is done by pressing in the snap fastenings on either side of the front panel. Then the PCB fastening screw on the upper left hand side of the module is unscrewed, so that the PCB can be removed from the casing.

After reinserting the jumpers, close the housing and tighten up the PCB fastening screw again.



**Caution :** The entire base PCB incorporates components which are sensitive to electrostatic discharges.

In order to keep the internal equipment obvious to outside inspection, remember to write the I/O type on the labels provided on the front and side panel (see example below).

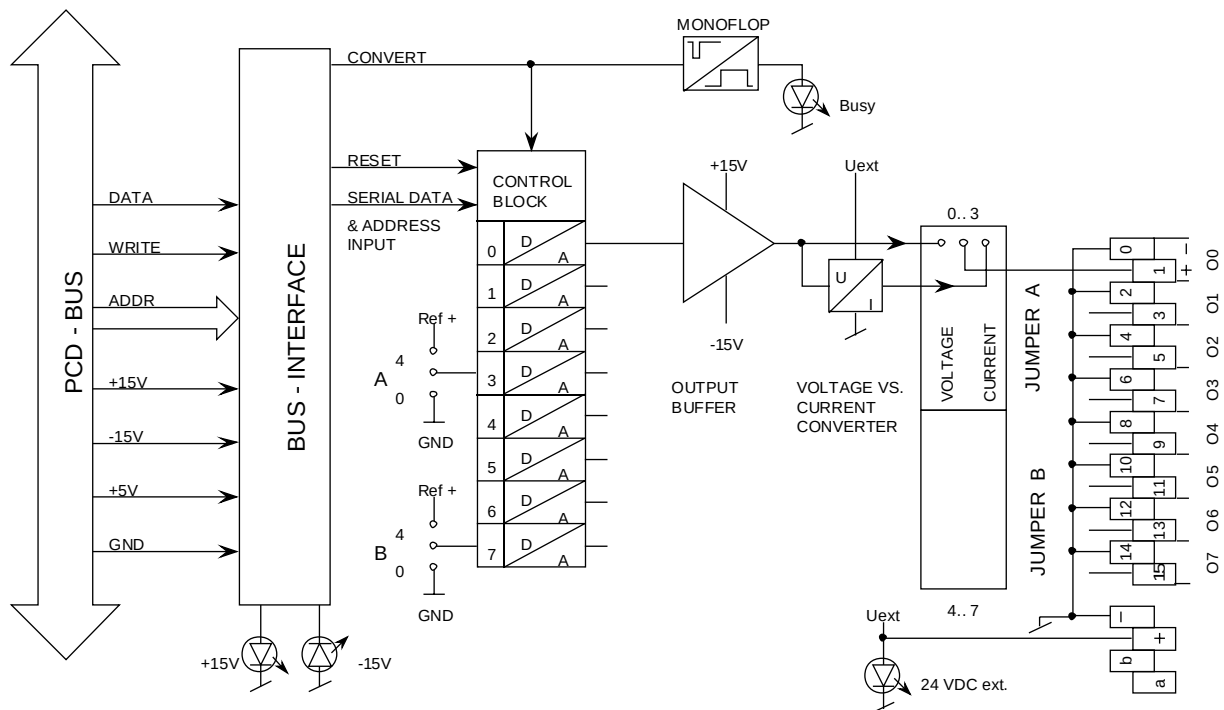
|                                   |
|-----------------------------------|
| <input type="radio"/> <i>Busy</i> |
| <input type="radio"/> + 15 VDC    |
| <input type="radio"/> - 15 VDC    |
| <input type="radio"/> 24 VDC ext. |

|             | a  | b   | 1             |
|-------------|----|-----|---------------|
| 24 VDC      | +  | -   | $\frac{1}{2}$ |
| 4 ... 20 mA | O7 | +15 | -14           |
|             | O6 | +13 | -12           |
|             | O5 | +11 | -10           |
|             | O4 | +9  | -8            |
| 0 ... 10 V  | O3 | +7  | -6            |
|             | O2 | +5  | -4            |
|             | O1 | +3  | -2            |
|             | O0 | +1  | -0            |

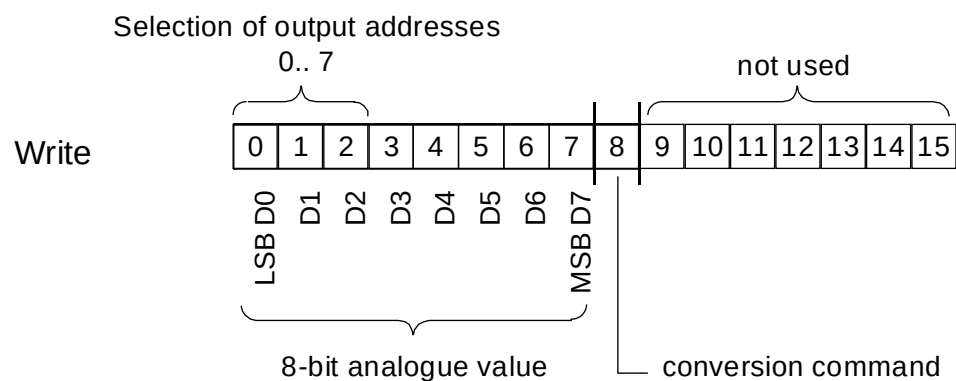
Base Addr.

|                                                                                                             |                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <br>MURTEN SWITZERLAND |                                                                                                                                                            |
| <b>ANALOG OUTPUT</b>                                                                                        |                                                                                                                                                            |
| Type                                                                                                        | PCD4.W400                                                                                                                                                  |
| Version                                                                                                     | A                                                                                                                                                          |
| Modif.                                                                                                      | <input type="text" value="1"/> <input type="text" value="2"/> <input type="text" value="3"/> <input type="text" value="4"/> <input type="text" value="5"/> |
| Outputs                                                                                                     |                                                                                                                                                            |
| 0 ... 3                                                                                                     | 0 ... 10 V                                                                                                                                                 |
| 4 ... 7                                                                                                     | 4 ... 20 mA                                                                                                                                                |
|                         |                                                                                                                                                            |

### Block diagram



### Meaning of the 16 addresses



Analogue value output procedure :

The address of the desired output channel (0 ... 7 binary) is written to bits 0 ... 2. The 8 bits for the analogue value to be output are subsequently set. Finally, bit 8 is set to 1 to trigger D/A conversion. The output address and data is entered serially. There is no need to wait for a "Busy" because of the short D/A conversion time.



### User program

The value of register R150 must be output via output O50. Therefore, only the lower 8 bits of R150 are important.

Output O50 can be found on the W400 module with basic address 48. The relative output address is  $50 - 48 = 2$ .

```
(ACC H)   (ACCU must be 1)
LD   R 151   ; The relative address of the output
          2   *) ; channel is loaded into R151

BITOR   3   ; Relative output address 2
          R 151 ; (from R151) is loaded into
          0 48 **) ; the D/A converter of module 48

BITOR   8   ; The value to be output (8 bits)
          R 150 ; is loaded from register 150 into
          0 48 **) ; the D/A converter of module 48

SET   0 56   **) ; D/A conversion is triggered by
                   ; activation of bit 8
                   ; (48 **) + 8 = 56)
```

\*) The **relative output address** (without basic address) is stated.

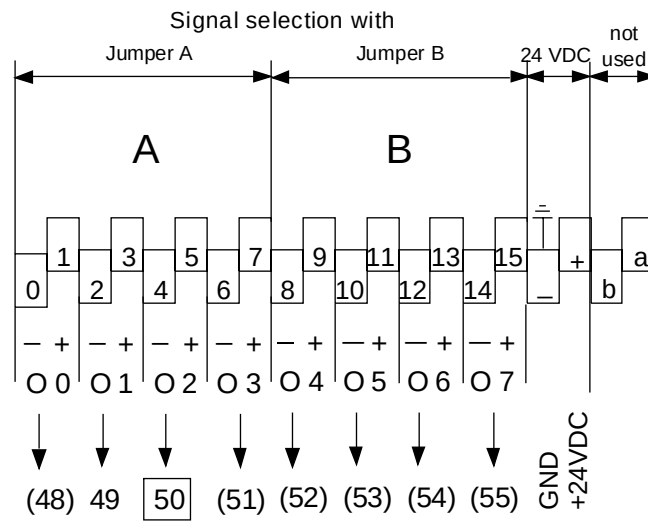
\*\*) The **basic address** of the module must be stated here.

### Digital/analogue values and jumper positions

|                |       |            |             |             |
|----------------|-------|------------|-------------|-------------|
| Large jumper   | V / C | V          | C           | C           |
| Small jumper   | 0 / 4 | 0          | 0           | 4           |
| Signal range   |       | 0 ... 10 V | 0 ... 20 mA | 4 ... 20 mA |
| Digital values | 255   | 10.0 V     | 20 mA       | 20 mA       |
|                | 128   | 5.0 V *)   | 10 mA *)    | 12 mA *)    |
|                | 0     | 0 V        | 0 mA        | 4 mA        |

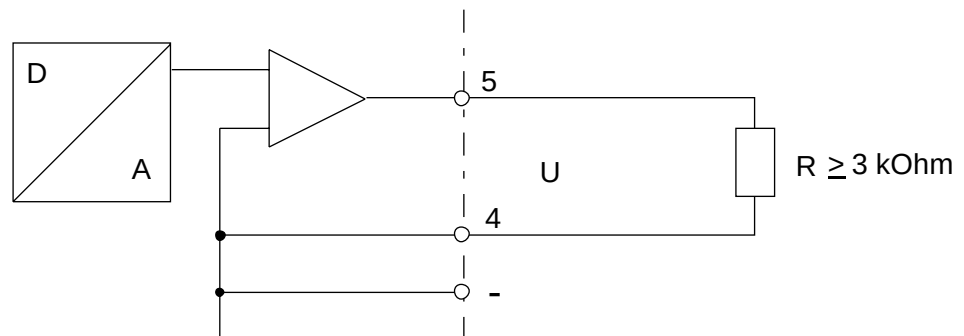
\*) The exact values are 1/255 higher

### Module connection of analogue outputs

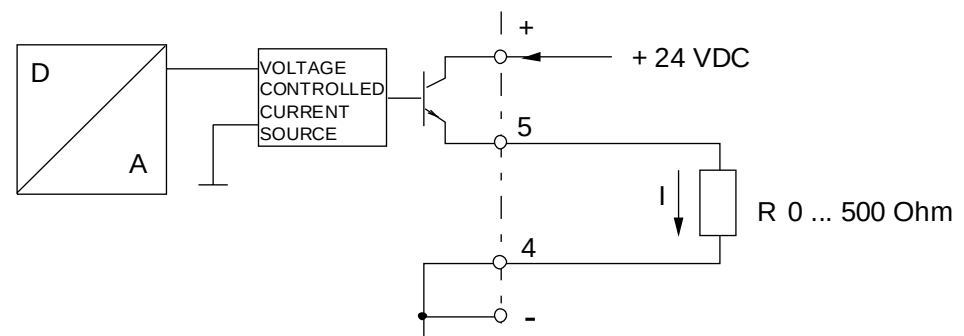


(User program example)

- **Voltage outputs for range : 0 ... 10 V :**



- **Current outputs for range : 0 ... 20 mA or 4 ... 20 mA (selectable with jumpers)**



An external 24 VDC supply voltage is required for current outputs.

## 9.4 PCD4.W500 Analogue input module, 8 channels, 12/15 bit resolution, with galvanic isolation

---

### Application

Intelligent analogue input module with galvanic isolation, 12/15-bit resolution and A/D conversion time of 100  $\mu$ s (single shot). As a range module it is used with PCD7.W1x0 modules. The following connections are therefore possible :

- 8 inputs for voltage range 0 ... +10 V
- 8 inputs for current range 0 ... 20 mA
- 8 inputs for Pt/Ni 1000 resistive temperature sensors, 2 wires
- 4 inputs for Pt 100/1000 or Ni 100/1000 resistive temperature sensors, 4 wires

A microcontroller enables intelligent functions to be executed locally without burdening the central processor module :

- single-shot - continuous measurement
- formats :
  - 12 bit (single shot) or 12/15 bit (continuous),
  - proportional to input size,
  - user definable scaling
- comparator function with two limiting values per input and adjustable hysteresis
- linearization and conversion to °C when standard temperature sensors are used
- connection of resistive temperature sensors (Pt 100/1000, Ni 100/100)
- status information, such as wire break, short-circuit or error

**Module overview****Base module :**

PCD4.W500 : containing the galvanically isolated DC/DC converter to supply the plug-in range modules, the input multiplexer, A/D converter, programmable current source, optocoupler for galvanic isolation from the PCD processor, microcontroller with its peripheral components, such as the I/O bus interface.

**Range modules :**

PCD7.W100 : 4 channels, ranges 0 ... 10 V or  $\pm 10$  V

PCD7.W101 : 4 channels, ranges 0 ... 1 V or  $\pm 1$  V  
(4 wires Pt/Ni 100/1000)

PCD7.W103 : 4 channels, range 0 ... 20 mA (or 4 ... 20 mA)

PCD7.W104 : 4 channels, range 4 ... 20 mA for 2 wire measuring transducer

PCD7.W110 : 4 channels for Pt 1000, temperature range  $-50 \dots +150^{\circ}\text{C}$ ,  
2-wire measurement

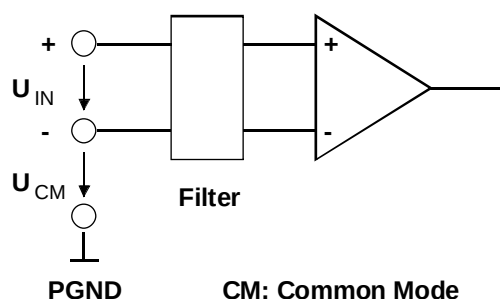
PCD7.W111 : 4 channels for Ni 1000, temperature range  $-50 \dots +150^{\circ}\text{C}$ ,  
2-wire measurement

PCD7.W120 : 4 channels for Pt/Ni 100/1000, constant current outputs

The input filter time constant is 1 ms

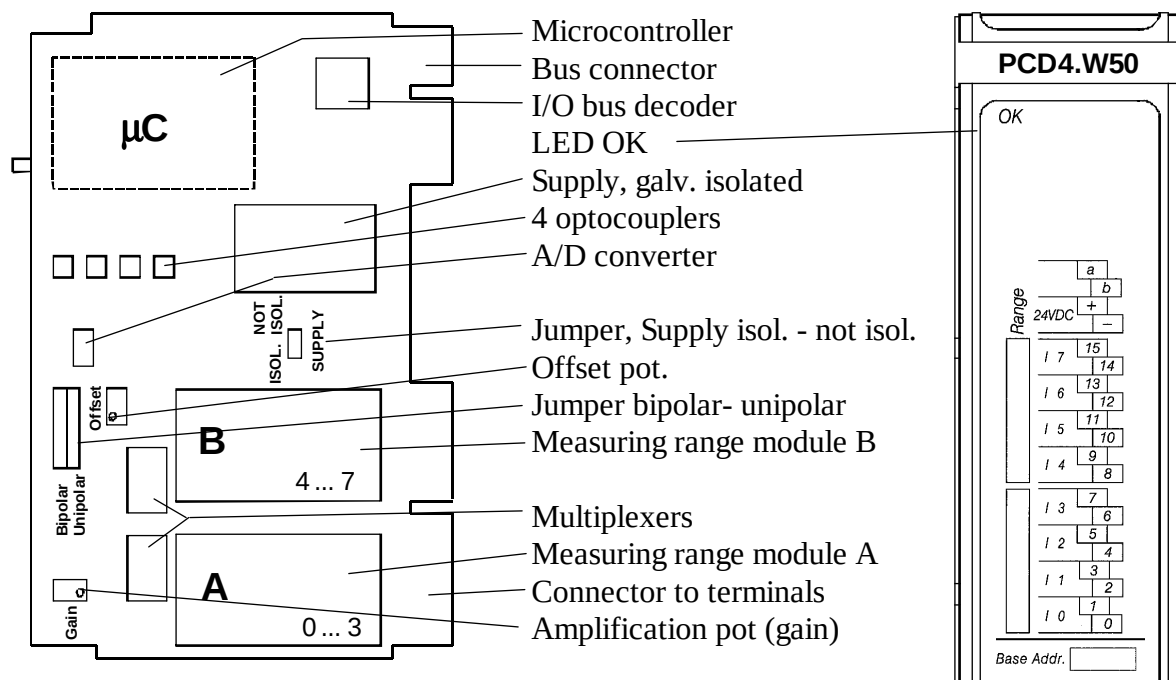
**Technical data of the base module**

|                                               |                                                                                                                                                                   |             |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Number of input channels                      | 8 voltage or current inputs, or<br>8 or 4 inputs for resistive temperature<br>sensors (Pt 100/1000 or Ni 100/1000)                                                |             |
| Potential separation                          | Yes, between PCD-GND and module<br>GND 500 VDC, 1 min                                                                                                             |             |
| Measuring principle                           | Differential                                                                                                                                                      |             |
| Input ranges                                  | See section "range modules"                                                                                                                                       |             |
| Resolution<br>(digital representation)        | 12 bit (0 ... 4095), single-shot mode                                                                                                                             |             |
| A/D conversion time                           | max. 100 $\mu$ s                                                                                                                                                  | single shot |
|                                               | max. 65 $\mu$ s                                                                                                                                                   | continuous  |
| Admissible over-voltage at<br>analogue inputs | 60 VDC                                                                                                                                                            |             |
| Accuracy<br>(referred to range end value)     | $\pm 0.25\%$ $\pm 2$ LSB                                                                                                                                          |             |
| Repeating accuracy                            | $\pm 2$ LSB                                                                                                                                                       |             |
| Temperature error                             | $\pm 0.02\%$ / $^{\circ}$ C                                                                                                                                       |             |
| Current outputs                               | 0 ... 10 mA constant current for resis-<br>tive temperature sensors (for use with<br>PCD7.W120 range module only).<br>Standard value : 2 mA<br>Resolution : 8 bit |             |
| Resistance to interference<br>(burst)         | 2 kV under capacitive coupling<br>with screening                                                                                                                  |             |
| Common-mode behaviour                         | $U_{IN} + U_{CM} \leq \pm 10$ V CMR > 75 dB                                                                                                                       |             |



External supply 24 VDC as PCD4.N210 (transformer 19 V,  
bridge rectifier)

Current consumption internal from PCD4 bus +5 V : 150 mA  
external for current output +24 V: 100 mA

**Presentation**

The following functional blocks can be seen :

- Basic card with bus interface, address decoding, microcontroller system, optocouplers, multiplexers and two spaces for insertion of range modules.
- Space A for insertion of range module with addresses 0 ... 3 and space B for insertion of range module with addresses 4 ... 7.

The "Offset" and "Gain" potentiometers are pre-set in the factory and should not be adjusted.

For more detailed information, please consult the manual :

**"Intelligent analogue input/output modules"**

Order reference : PUBLI-26/747 E.

## 9.5 PCD4.W600 Analogue output module, 8 channels, 12 bit resolution, with galvanic isolation

---

### Application

Intelligent analogue output module with galvanic isolation, 12-bit resolution and 8 outputs for voltage range 0 ...10 V and  $\pm 10$  V or current range 0 ... 20 mA and 4 ... 20 mA.

A microcontroller enables intelligent functions to be executed locally without burdening the PCD's CPU :

- single output or synchronous updating
- conversion of digital value to a range-proportional format
- user definable scaling for range and offset
- identification of the module in user program and identification of range modules

**Module overview****Base module :**

PCD4.W600 : containing the galvanically isolated DC/DC converter to supply the plug-in range modules, the microcontroller with its peripheral components, and the I/O bus interface.

**Range modules :**

These contain the optocoupler for galvanic isolation from the PCD processor, the D/A converter and the output stages.

PCD7.W300 : 2 channels, range 0 ... 10 V

PCD7.W302 : 2 channels, range  $\pm 10$  V

PCD7.W304 : 2 channels, range 0 ... 20 mA

PCD7.W305 : 2 channels, range 4 ... 20 mA

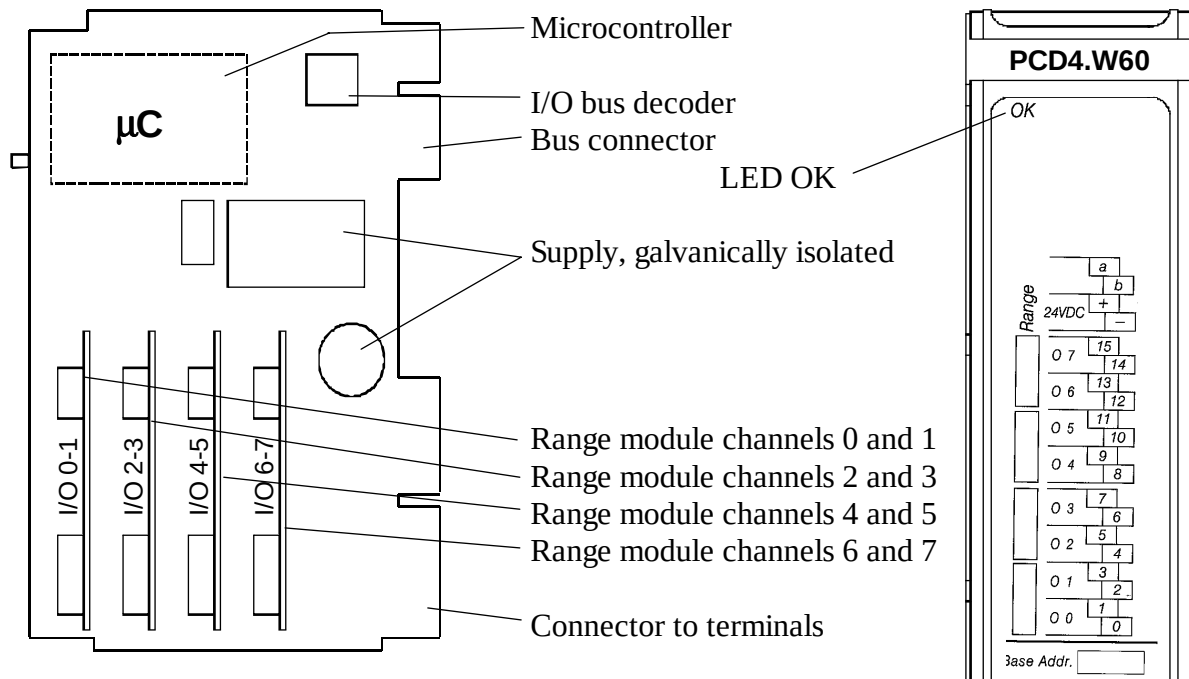
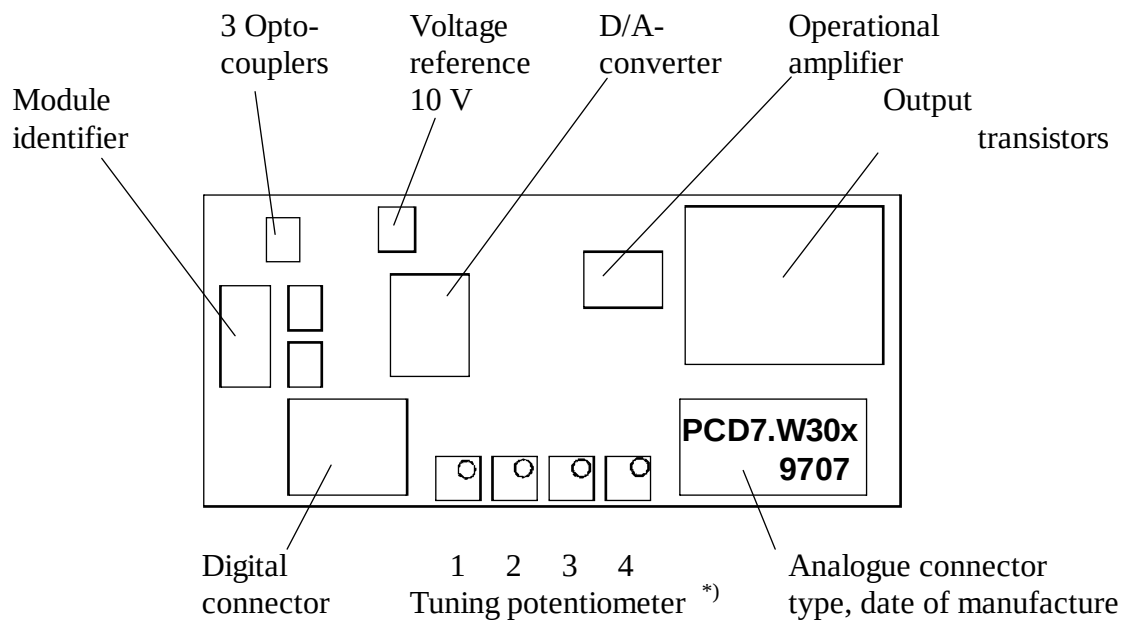


**Technical data of the base module**

|                                           |                                                                                                                                  |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Number of output channels                 | 8 voltage or current outputs<br>(in 4 groups), short-circuit proof                                                               |
| Potential separation                      | Yes, between PCD-GND and module<br>GND 500 VDC, 1 min                                                                            |
| Output ranges                             | See section "range modules"                                                                                                      |
| Resolution<br>(digital representation)    | 12 bit ( 0 ... 4095)                                                                                                             |
| D/A conversion time                       | 0.1 ms for voltage (resistive load)<br>0.8 ms for voltage (capacitive load)<br>0.3 ms for current                                |
| Load impedance                            | Voltage : $\geq 3 \text{ k}\Omega$<br>Current : 0 ... 500 $\Omega$<br>capacitive load < 1 $\mu\text{F}$<br>inductive load < 1 mH |
| Accuracy<br>(referred to range end value) | Voltage : $\pm 0.15 \%$ $\pm 5 \text{ mV}$<br>Current : $\pm 0.2 \%$ $\pm 20 \mu\text{A}$<br>4 mA : $\pm 20 \mu\text{A}$         |
| Temperature error                         | $\pm 0.02 \text{ }^\circ\text{C}$                                                                                                |
| Linearity error                           | Voltage : $\pm 0.05 \%$<br>Current : $\pm 0.1 \%$                                                                                |
| Repeating accuracy                        | $\pm 0.05 \%$                                                                                                                    |
| Residual ripple                           | Voltage : $\pm 0.05 \%$<br>Current : $\pm 0.1 \%$                                                                                |
| Current consumption                       | internal from PCD4 bus +5 V : 200 mA<br>external +24 V <sup>*)</sup> : 100 mA + 20 mA<br>per current output                      |

\*) Requirement as PCD4.N210

### Presentation of the main module and a range module



\*) These potentiometers are factory set and **should not be** adjusted by the user.

For more detailed information, please consult the manual :

**"Intelligent analogue input/output modules"**

Order reference : PUBLI-26/747 E.

## 10. Manual operation modules

---

The SAIA<sup>®</sup> PCD is increasingly used in building automation. In order to guarantee the necessary manual overrides for this area of application, specific manual operation modules have been developed for the PCD4 series.

These manual operation modules are based on digital and analogue output modules and are activated either via the user program or via manual switches. Like all I/O modules, the manual operation modules are plugged onto the PCD4.C2x0 I/O bus modules.

**PCD4.A810 :** Digital manual operation module, single-stage,  
8 channels

8 relays, each with 1 'make' contact with switching  
"Automatic" - "Manual 1-0"

**PCD4.A820 :** Digital manual operation module, dual-stage,  
4 channels

4 x 2 relays, each with 1 'make' contact with switching  
"Automatic" - "Manual 1-0-2"

**PCD4.W800 :** Analogue manual operation module, 8 bits,  
4 channels

with switching "Automatic" - "Manual"

Signal ranges : 0 ... 10 V, 0 ... 20 mA or 4 ... 20 mA

Display : 10 LED array for each channel

Potentiometer : 0 ... 100 % for each channel

**PCD4.C225 :** Bus module for operating the above-mentioned manual control modules with a PCD2.M..., with the exception of the PCD2.M110 (see detailed information in part 3.6)

**Notes :**

## 10.1 PCD4.A810 Digital output module with manual overrides, 1 level

---

PCD4.A810 : 8 relay contacts (make contacts) with switching between automatic and manual

### Functional description

The module has eight relay outputs (channels). Each channel has a switch with the positions AUTO, MAN 0, MAN 1.

- On AUTO the relay can be switched on or off normally by the user program.
- On MAN 0 the relay is switched off.
- On MAN 1 it is switched on.

A red LED shows the state of the relay. When the switch is not on AUTO, a yellow LED is illuminated and a reply signal can be read in the user program.

As long as it is connected externally to 24 V, manual operation and the alarm function work, even when the CPU or internal +5 V is switched off.

In automatic operation the outputs are handled in the same way as a normal PCD4 output module, i.e. the outputs are reset for a CPU restart cold, for an external reset and for a power down.

This module can also be coupled to a PCD2.M... (except PCD2.M110) by means of the PCD4.C225 bus module and the cables PCD2.K2x0.

### Programming model

|       | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8     | 9     | 10    | 11  | 12  | 13  | 14  | 15  |
|-------|----|----|----|----|----|----|----|----|-------|-------|-------|-----|-----|-----|-----|-----|
| Write | A0 | A1 | A2 | A3 | A4 | A5 | A6 | A7 | ----- | empty | ----- |     |     |     |     |     |
| Read  | A0 | A1 | A2 | A3 | A4 | A5 | A6 | A7 | /M0   | /M1   | /M2   | /M3 | /M4 | /M5 | /M6 | /M7 |

A0 ... 7 : Relay output 0 ... 7 Automatic  
 /M0 ... 7 : Reply "Man" - "Auto" (Man = L)

It is not the purpose of this document to give further detailed information on programming (e.g. HLK-FB handling, technical considerations of security for programming, etc.). The intention here is only to provide information on the functions made available by the hardware.

## Alarm function

A special input signal influences each individual CHANNEL, depending on jumper setting.

The following jumper settings are possible :

- DISABLE,
- ACTIVE OFF,
- ACTIVE ON.

**Important :** The alarm signal is active = Low !

a) **DISABLE**

The channel preserves the momentary state.

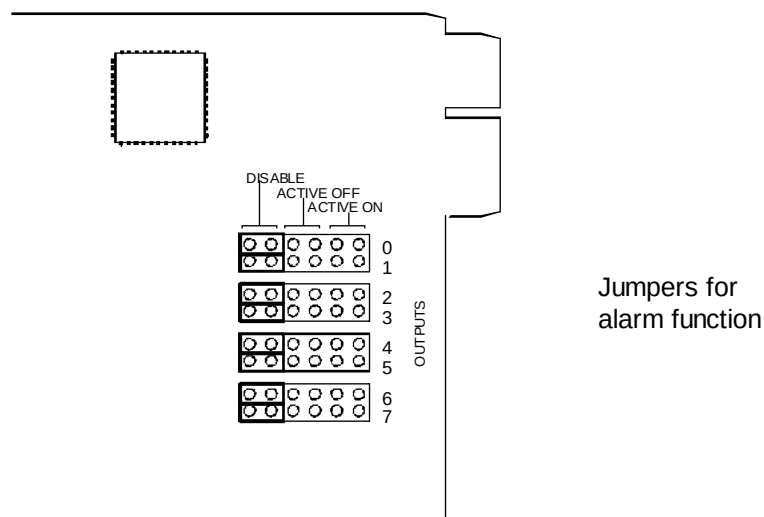
b) **ACTIVE OFF**

Regardless of any switch position, the relay is released, the corresponding red LED is not illuminated, the /Mx signal is zeroed and the yellow LED is on.

c) **ACTIVE ON**

Regardless of any switch position, the relay is active, the corresponding red LED lights up, the /Mx signal is zeroed and the yellow LED is on.

The jumper settings can only be changed if the printed circuit board is removed from the module cassette.



**Function table**

Example : channel 0 as an example)

a : Alarm input (H = 24 V, L = 0 V)  
 A0 : Relay output 0 automatic  
 /M0 : Reply "Man" - "Auto" (Man = L)

**a) Jumper on alarm "DISABLE"**

| a | Switch         | A0     | Relay + Red LED | /M0    | Yellow LED |
|---|----------------|--------|-----------------|--------|------------|
| X | AUTO           | 0<br>1 | OFF<br>ON       | H<br>H | OFF<br>OFF |
|   | MAN 0<br>MAN 1 | X<br>X | OFF<br>ON       | L<br>L | ON<br>ON   |

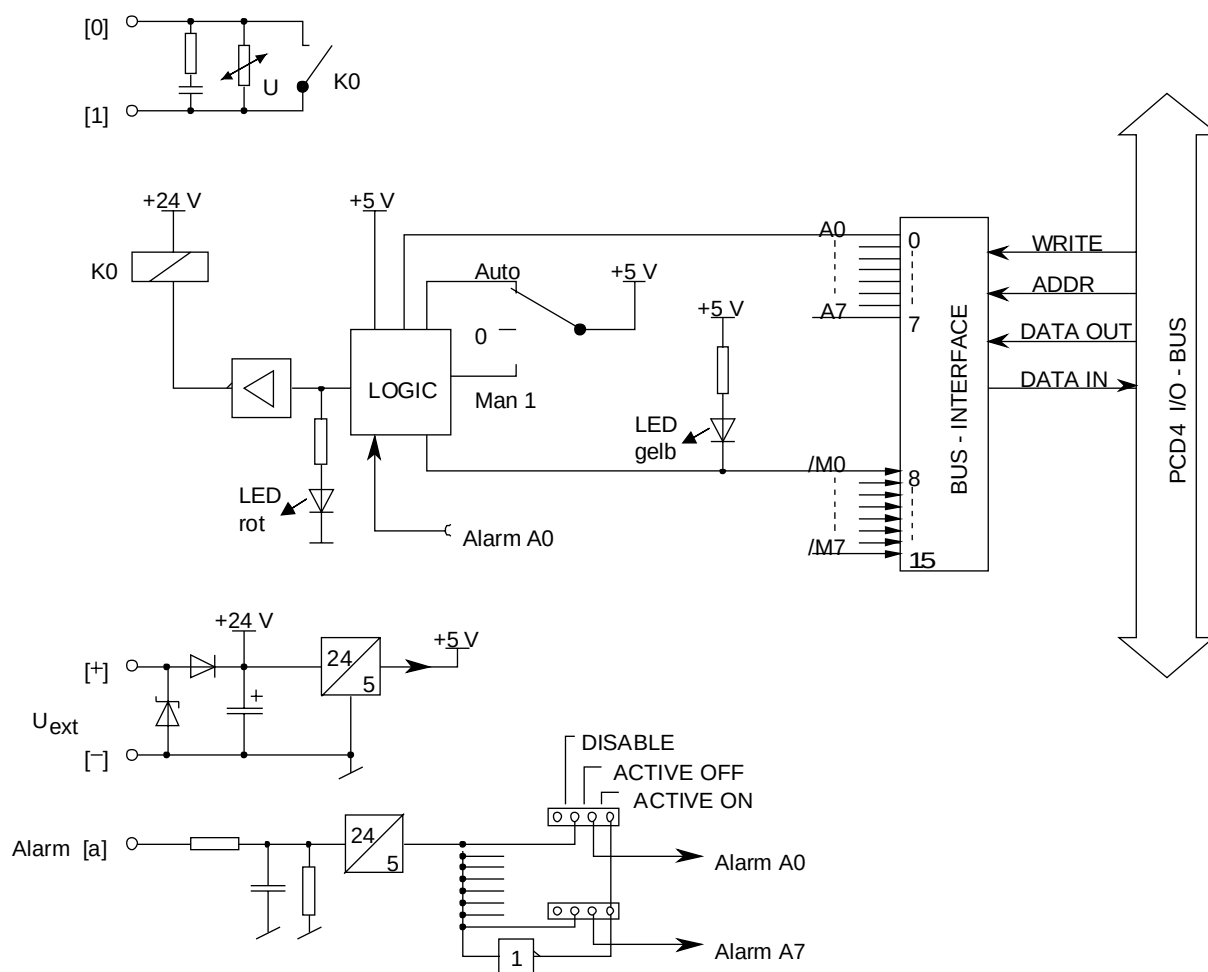
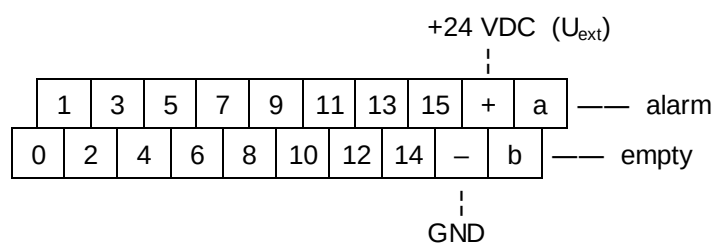
**b) Jumper on alarm "ACTIVE OFF"**

| a      | Switch         | A0     | Relay + Red LED | /M0    | Yellow LED |
|--------|----------------|--------|-----------------|--------|------------|
| H<br>H | AUTO           | 0<br>1 | OFF<br>ON       | H<br>H | OFF<br>OFF |
| H<br>H | MAN 0<br>MAN 1 | X<br>X | OFF<br>ON       | L<br>L | ON<br>ON   |
| L<br>L | AUTO           | 0<br>1 | OFF<br>OFF      | L<br>L | ON<br>ON   |
| L<br>L | MAN 0<br>MAN 1 | X<br>X | OFF<br>OFF      | L<br>L | ON<br>ON   |

**c) Jumper on alarm "ACTIVE ON" \*)**

| a      | Switch         | A0     | Relay + Red LED | /M0    | Yellow LED |
|--------|----------------|--------|-----------------|--------|------------|
| H<br>H | AUTO           | 0<br>1 | OFF<br>ON       | H<br>H | OFF<br>OFF |
| H<br>H | MAN 0<br>MAN 1 | X<br>X | OFF<br>ON       | L<br>L | ON<br>ON   |
| L<br>L | AUTO           | 0<br>1 | ON<br>ON        | L<br>L | ON<br>ON   |
| L<br>L | MAN 0<br>MAN 1 | X<br>X | ON<br>ON        | L<br>L | ON<br>ON   |

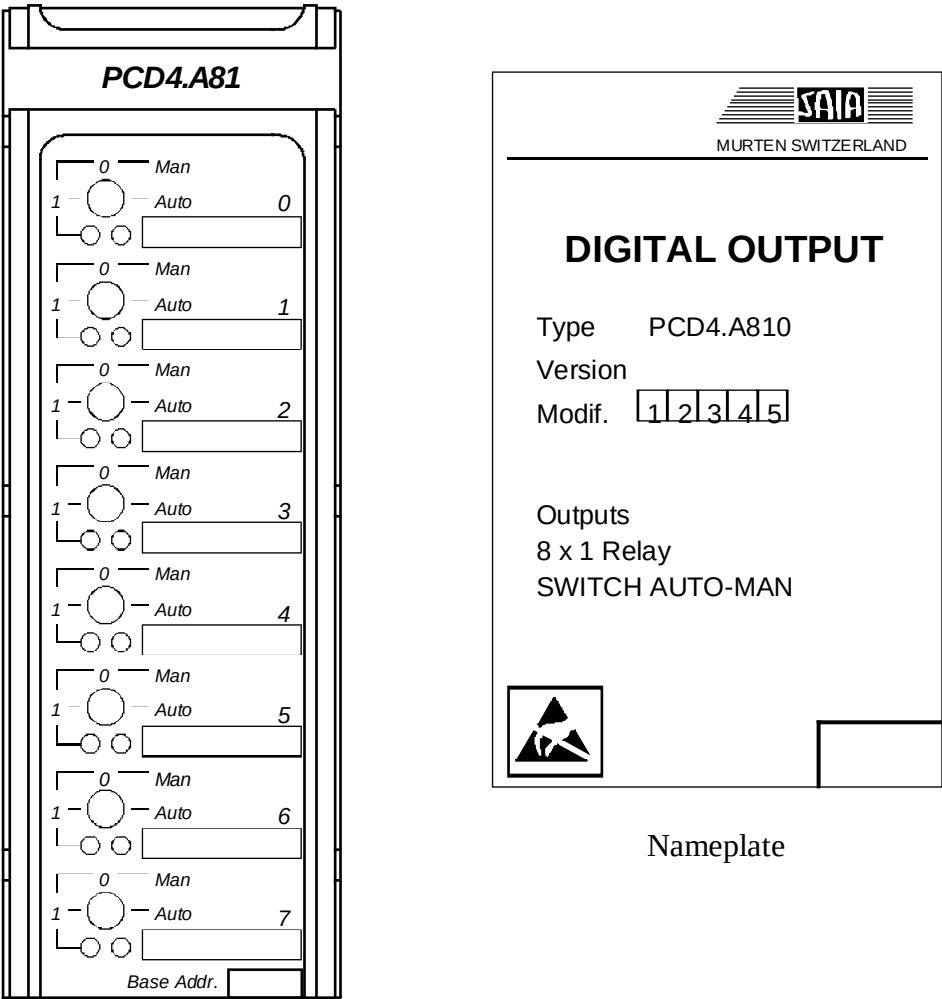
\*) With the jumper in the "ACTIVE ON" position, the relays can be enabled momentarily when the supply is either switched on or off.

**Block diagram****Connection diagram for the user**

|           |        |        |        |        |        |          |          |          |
|-----------|--------|--------|--------|--------|--------|----------|----------|----------|
| Address A | 0      | 1      | 2      | 3      | 4      | 5        | 6        | 7        |
| Terminal  | 0<br>1 | 2<br>3 | 4<br>5 | 6<br>7 | 8<br>9 | 10<br>11 | 12<br>13 | 14<br>15 |
| Channel   | 0      | 1      | 2      | 3      | 4      | 5        | 6        | 7        |



Front panel and nameplate



Front panel

Coding port

Inputs/outputs connector



**Electrical data**

- Internal power supply

+5 V : 5 ... 45 mA

+15 V : 3 mA

- External power supply

For the operation of this module the user must provide a supply for the relays.

Voltage tolerance dependent on ambient temperature :

| Temperature | Smoothed DC   | Pulsating DC |
|-------------|---------------|--------------|
| 20°C        | 18.5 ... 30 V | 14 ... 21 V  |
| 30°C        | 19.5 ... 30 V | 15 ... 21 V  |
| 40°C        | 20.5 ... 30 V | 16 ... 21 V  |
| 50°C        | 21.5 ... 30 V | 17 ... 21 V  |

Current consumption at 24 V : 10 ... 150 mA

The connection has reverse bias protection, and protection against transitory overvoltages ensured by a suppressor diode of 39 V  $\pm$ 10 %.

- Connection value of contacts

Breaking capacity :

|      |         |                                 |
|------|---------|---------------------------------|
| 2 A, | 250 VAC | AC1                             |
| 1 A, | 250 VAC | AC11                            |
| 2 A, | 50 VDC  | DC1                             |
| 1 A, | 50VDC   | DC11 (only with recovery diode) |

Contact lifetime :

|        |         |                                  |
|--------|---------|----------------------------------|
| 2 A,   | 220 VAC | 0.2 x 10 <sup>6</sup> operations |
| 1 A,   | 220 VAC | 0.8 x 10 <sup>6</sup> operations |
| 0.4 A, | 220 VAC | 5.0 x 10 <sup>6</sup> operations |

(AC1)

- Insulation resistance

All contacts against +, –, PGND, GND, +5 V and ±15 V :

500 VDC      10 MOhm      (Ref. GL B.2)

- Insulation voltage

All contacts against +, –, PGND, GND, +5 V and ±15 V :

2000 VAC      1 min      (Ref. GL B.14)

- Insulating distance

All contacts against +, –, PGND, GND, +5 V and ±15 V :      3.2 mm

Contact to contact :      1.6 mm

- Characteristics of the alarm input

The input is designed for source operation. The signal voltage used can be smoothed DC or pulsating DC.

Input voltage level

- Alarm active :      –30 ... +5 V (or contact open)

- Alarm disable :      +15 ... +30 V

Input current :      5 mA at 24 V

Switch on/off delay time :      4 ... 12 ms

## Commissioning

The user must set the available jumpers according to his application.

- The jumpers for the alarm functions are on DISABLE.

### Switching inductive loads

Because of the physical properties of inductivity, it is not possible to disconnect inductance without interference. This interference must be minimized as far as possible. Although the PCD is immune to this interference, there are other devices which may be susceptible.

It should be noted here that, as part of the harmonization of standards throughout the EU, the EMC standards are valid from 1996 (EMC Directive 89/336/EG). Two principles should therefore be emphasized :

- 1) THE PROTECTION AGAINST INTERFERENCES FROM INDUCTIVE LOADS IS IMPERATIVE.
- 2) INTERFERENCE SHOULD BE ELIMINATED AS CLOSE AS POSSIBLE TO ITS SOURCE.

It is therefore recommended that a protection circuit should be fitted at the load (often available as normal components on standardized contactors and valves).

When switching direct voltage it is urgently recommended that a recovery diode is fitted above the load. This should even take place when, theoretically, an Ohmic load is switched.

In practice, there will always be a proportion which is inductive (connection cable, resistance coil, etc.). In this case it should be noted that the switch-off time will be longer :

$$T_a \text{ approx. } L/RL * \sqrt{(RL * IL/0.7)}$$

### Safety regulations

For reasons of safety it is **not allowed** that low voltages (up to 50 V) and higher voltages (50 ... 250 V) are connected to the same module.

In the case of low voltage, only one phase per module via a common fuse is permissible. However, the individual load circuits can then be fused individually.

**General technical data**

## Surrounding atmospheric conditions

- Temperature (Fresh air temperature measured at the base of PCD4)

|                     |               |                    |
|---------------------|---------------|--------------------|
| Operation :         | −20 ... +55°C | IEC1131-2, 2.1.1.1 |
| Storage/Transport : | −25 ... +70°C | IEC1131-2, 2.1.1.2 |

- Relative humidity

|                                                                    |                    |
|--------------------------------------------------------------------|--------------------|
| 5 ... 95 % (indoor) without condensation<br>(as DIN 40040 class F) | IEC1131-2, 2.1.1.3 |
|--------------------------------------------------------------------|--------------------|

## Surrounding mechanical conditions

- Vibrations

IEC1131-2, 2.1.3.1 (as IEC68-2-6)

|               |          |
|---------------|----------|
| 10 ... 57 Hz  | 0.075 mm |
| 57 ... 150 Hz | 1.0 g    |

- Shock

IEC1131-2, 2.1.3.2 (as IEC68-2-27)

Half sine 15 g / 11 ms in 3 axes (12 times)

- Toppling and rolling

IEC1131-2, 2.1.3.3 (as IEC68-2-31)

Drop height : 100 mm

## Electromagnetic compatibility (EMC)

## IEC1131-2, Annex C

- ESD IEC 801-2 Draft 4
  - 4 kV HVR 4 kV Air Discharge
  - (Divergence from IEC1131-2 : 8kV min)
- Burst IEC 801-4
  - + / – connections, all contacts : 4 kV direct
  - all contacts : 2 kV capacitive bunched cables
- 1.2 / 50  $\mu$ s Impulse IEC 255-4 and IEC 805-5
  - + / – connections, all contacts : 3 kV disconnected from power source

**Standards complied with**

|                                      |               |
|--------------------------------------|---------------|
| IEC 1131-2                           | 1992          |
| (previously IEC 65A (Central Office) | 22 Nov. 1988) |
| VDE110 Part 1                        | 1989          |
| Germanischer Lloyd GL                | Sept. 1990    |
| Svensk Standard SEN SS 4361503       | 1986          |

## 10.2 PCD4.A820 Digital output module with manual overrides, 2 levels

---

PCD4.A820 : 8 relay contacts (make contacts) with switching between automatic and manual (1 - 0 - 2 positions)

### Functional description

The module has eight relay outputs (2 per channel). Each channel has two switches : switch 1 with the AUTO and MAN positions and switch 2 with the 1-0-2 positions.

- On AUTO both relays can be switched on or off normally via the user program.
- On MAN activation via the user program is interrupted and the relays are enabled using switch 2 (see function table).

A red LED shows the state of the relay (only when 24 V connected externally). When switch 1 is on MAN, a yellow LED is illuminated and a reply signal can be read in the user program.

As long as it is connected externally to 24 V, manual operation and the alarm function work, even when the CPU or internal +5 V is switched off.

In automatic operation the outputs are handled in the same way as a normal PCD4 output module, i.e. the outputs are reset for a CPU restart cold, for an external reset and for a power down.

This module can also be coupled to a PCD2.M... (except PCD2.M110) by means of the PCD4.C225 bus module and the cables PCD2.K2x0.

### Programming model

|       | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8     | 9     | 10    | 11  | 12 | 13 | 14 | 15 |
|-------|----|----|----|----|----|----|----|----|-------|-------|-------|-----|----|----|----|----|
| Write | A0 | A1 | A2 | A3 | A4 | A5 | A6 | A7 | ----- | empty | ----- |     |    |    |    |    |
| Read  | A0 | A1 | A2 | A3 | A4 | A5 | A6 | A7 | /M0   | /M1   | /M2   | /M3 |    |    |    |    |

A0 ... 7 : Relay output 0 ... 7 Automatic  
 /M0 ... 7 : Reply "Man" - "Auto" (Man = L)

It is not the purpose of this document to give further detailed information on programming (e.g. HLK-FB handling, technical considerations of security for programming, etc.). The intention here is only to provide information on the functions made available by the hardware.

## Alarm function

A special input signal influences each individual RELAY, depending on jumper setting.

The following jumper settings are possible :

- DISABLE,
- ACTIVE OFF,
- ACTIVE ON.

**Important :** The alarm signal is active = Low!

a) **DISABLE**

The relay preserves the momentary state.

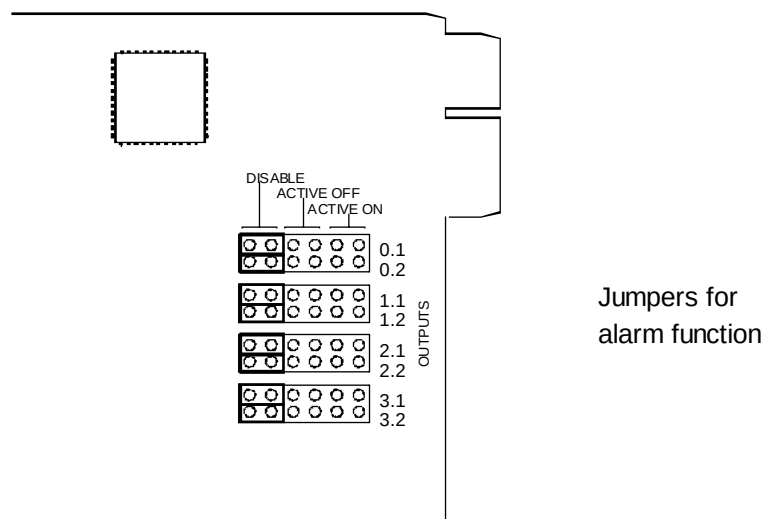
b) **ACTIVE OFF**

Regardless of any switch position, the relay is released, the corresponding red LED is not illuminated, the /Mx signal is zeroed and the yellow LED is on.

c) **ACTIVE ON**

Regardless of any switch position, the relay is active, the corresponding red LED lights up, the /Mx signal is zeroed and the yellow LED is on.

The jumper settings can only be changed if the printed circuit board is removed from the module cassette.





**Function table**

Example : channel 0 as an example

a : Alarm input (H = 24 V, L = 0 V)  
 A0 : Relay output 0 automatic  
 /M0 : Reply "Man" - "Auto" (Man = L)

**a) Jumper on alarm "DISABLE"**

| a | Switch 1 | Switch 2 | A0 | A1 | Relay 1 +<br>Red LED 1 | Relay 2 +<br>Red LED 2 | /M0 | Yellow LED |
|---|----------|----------|----|----|------------------------|------------------------|-----|------------|
| X | AUTO     | X        | 0  | 0  | OFF                    | OFF                    | H   | OFF        |
|   |          | X        | 1  | 0  | ON                     | OFF                    | H   | OFF        |
|   |          | X        | 0  | 1  | OFF                    | ON                     | H   | OFF        |
|   | ! )      | X        | 1  | 1  | ON                     | ON                     | H   | OFF        |
|   | MAN      | 0        | X  | X  | OFF                    | OFF                    | L   | ON         |
|   |          | 1        | X  | X  | ON                     | OFF                    | L   | ON         |
|   |          | 2        | X  | X  | OFF                    | ON                     | L   | ON         |

**b) Jumper on alarm "ACTIVE OFF"**

(Only on relay 1 as an example. Relay 2 operates identically.)

| a | Switch 1 | Switch 2 | A0 | A1 | Relay 1 +<br>Red LED 1 | Relay 2 +<br>Red LED 2 | /M0 | Yellow LED |
|---|----------|----------|----|----|------------------------|------------------------|-----|------------|
| H | AUTO     | X        | 0  | 0  | OFF                    | OFF                    | H   | OFF        |
|   |          | X        | 1  | 0  | ON                     | OFF                    | H   | OFF        |
|   |          | X        | 0  | 1  | OFF                    | ON                     | H   | OFF        |
|   | ! )      | X        | 1  | 1  | ON                     | ON                     | H   | OFF        |
|   | MAN      | 0        | X  | X  | OFF                    | OFF                    | L   | ON         |
|   |          | 1        | X  | X  | ON                     | OFF                    | L   | ON         |
|   |          | 2        | X  | X  | OFF                    | ON                     | L   | ON         |
| L | AUTO     | X        | 0  | 0  | OFF                    | OFF                    | L   | ON         |
|   |          | X        | 1  | 0  | OFF                    | OFF                    | L   | ON         |
|   |          | X        | 0  | 1  | OFF                    | ON                     | L   | ON         |
|   | ! )      | X        | 1  | 1  | OFF                    | ON                     | L   | ON         |
|   | MAN      | 0        | X  | X  | OFF                    | OFF                    | L   | ON         |
|   |          | 1        | X  | X  | OFF                    | OFF                    | L   | ON         |
|   |          | 2        | X  | X  | OFF                    | ON                     | L   | ON         |

!) Caution : In automatic operation this possibility is not latched.  
 The user must take measures using appropriate programming.  
 Normally latching is also implemented at the level of the  
 power contactor.

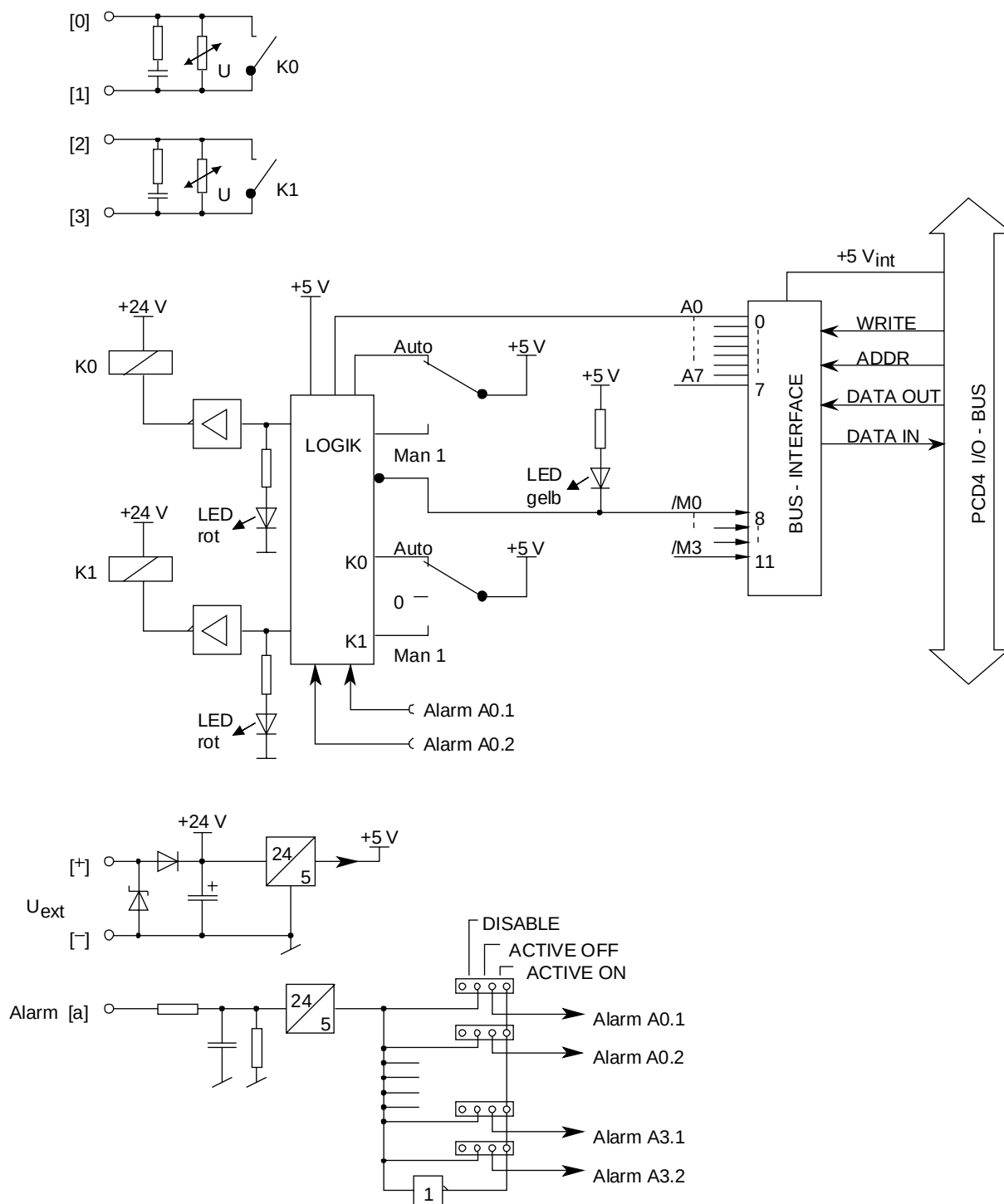
**c) Jumper on alarm "ACTIVE ON" \*)**

(Only on relay 1 as an example. Relay 2 operates identically.)

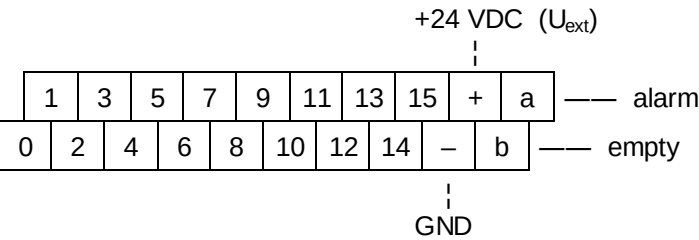
| a | Switch 1 | Switch 2 | A0 | A1 | Relay 1 +<br>Red LED 1 | Relay 2 +<br>Red LED 2 | /M0 | Yellow LED |
|---|----------|----------|----|----|------------------------|------------------------|-----|------------|
| H | AUTO     | X        | 0  | 0  | OFF                    | OFF                    | H   | OFF        |
|   |          | X        | 1  | 0  | ON                     | OFF                    | H   | OFF        |
|   |          | X        | 0  | 1  | OFF                    | ON                     | H   | OFF        |
|   | ! )      | X        | 1  | 1  | ON                     | ON                     | H   | OFF        |
|   | MAN      | 0        | X  | X  | OFF                    | OFF                    | L   | ON         |
|   |          | 1        | X  | X  | ON                     | OFF                    | L   | ON         |
|   |          | 2        | X  | X  | OFF                    | ON                     | L   | ON         |
| L | AUTO     | X        | 0  | 0  | ON                     | OFF                    | L   | ON         |
|   |          | X        | 1  | 0  | ON                     | OFF                    | L   | ON         |
|   |          | X        | 0  | 1  | ON                     | ON                     | L   | ON         |
|   | ! )      | X        | 1  | 1  | ON                     | ON                     | L   | ON         |
|   | MAN      | 0        | X  | X  | ON                     | OFF                    | L   | ON         |
|   |          | 1        | X  | X  | ON                     | OFF                    | L   | ON         |
|   |          | 2        | X  | X  | ON                     | ON                     | L   | ON         |

! ) and !! )    Caution :    These output states, which arise in case of an alarm, are not allowed under certain circumstances. When "programming" the alarm functions, extreme caution should therefore be exercised. Normally latching should also be implemented at the level of the power contactor.

\*)    With the jumper in the "ACTIVE ON" position, the relays can briefly be excited when the supply is either switched on or off.

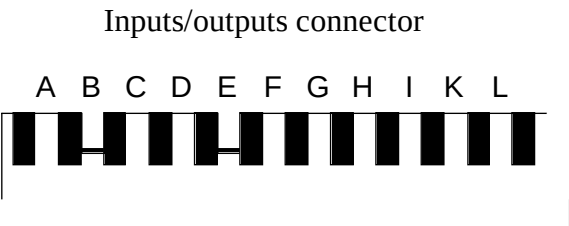
**Block diagram**

Connection diagram for the user

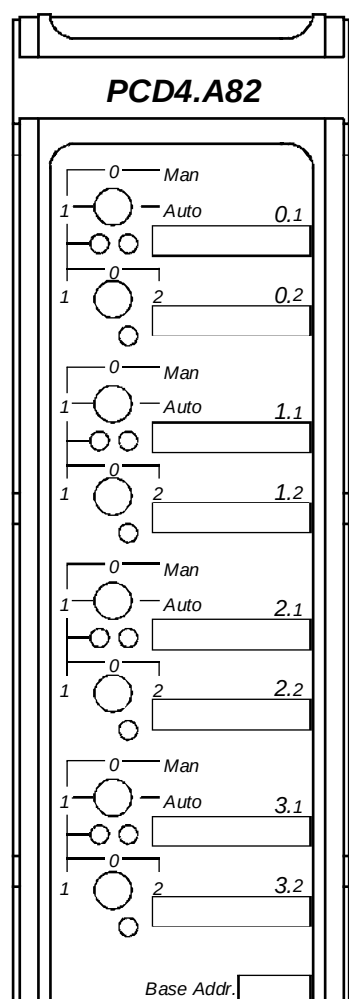


|           |     |     |     |     |     |     |     |     |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|
| Address A | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   |
| Terminal  | 0   | 2   | 4   | 6   | 8   | 10  | 12  | 14  |
|           | 1   | 3   | 5   | 7   | 9   | 11  | 13  | 15  |
| Channel   | 0.1 | 0.2 | 1.1 | 1.2 | 2.1 | 2.2 | 3.1 | 3.2 |

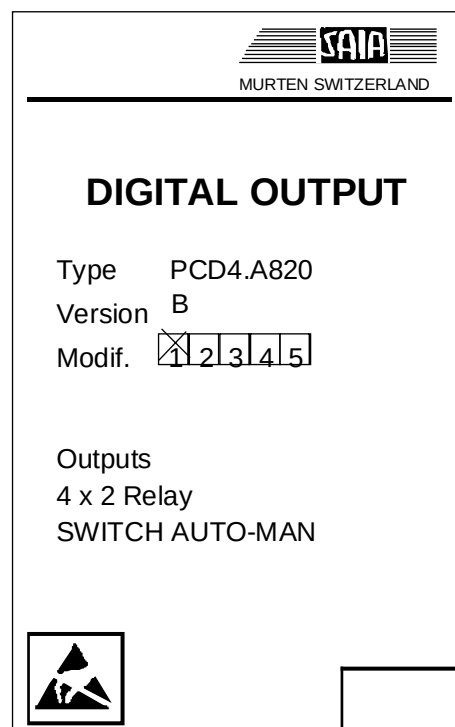
Coding port



## Front panel and nameplate

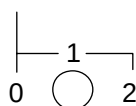


Front panel



Nameplate

**Caution !** On the modules with hardware version " A " the 3-positions switch has a different reaction ( 0 - 1 - 2 positions instead of 1 - 0 - 2 ).



**Electrical data**

- Internal power supply

+5 V : 5 ... 45 mA

+15 V : 3 mA

- External power supply

For the operation of this module the user must provide a supply for the relays.

Voltage tolerance dependent on ambient temperature :

| Temperature | Smoothed DC   | Pulsating DC |
|-------------|---------------|--------------|
| 20°C        | 18.5 ... 30 V | 14 ... 21 V  |
| 30°C        | 19.5 ... 30 V | 15 ... 21 V  |
| 40°C        | 20.5 ... 30 V | 16 ... 21 V  |
| 50°C        | 21.5 ... 30 V | 17 ... 21 V  |

Current consumption at 24 V : 10 ... 150 mA

The connection has reverse bias protection, and protection against transitory overvoltages ensured by a suppressor diode of 39 V  $\pm$  10 %.

- Connection value of contacts

Breaking capacity :

|      |         |                                 |
|------|---------|---------------------------------|
| 2 A, | 250 VAC | AC1                             |
| 1 A, | 250 VAC | AC11                            |
| 2 A, | 50 VDC  | DC1                             |
| 1 A, | 50VDC   | DC11 (only with recovery diode) |

Contact lifetime :

|        |         |                                  |
|--------|---------|----------------------------------|
| 2 A,   | 220 VAC | 0.2 x 10 <sup>6</sup> operations |
| 1 A,   | 220 VAC | 0.8 x 10 <sup>6</sup> operations |
| 0.4 A, | 220 VAC | 5.0 x 10 <sup>6</sup> operations |

(AC1)

- Insulation resistance

All contacts against +, –, PGND, GND, +5 V and ±15 V :

500 VDC      10 MOhm      (Ref. GL B.2)

- Insulation voltage

All contacts against +, –, PGND, GND, +5 V and ±15 V :

2000 VAC      1 min      (Ref. GL B.14)

- Insulating distance

All contacts against +, –, PGND, GND, +5 V and ±15 V :      3.2 mm

Contact to contact :      1.6 mm

- Characteristics of the alarm input

The input is designed for source operation. The signal voltage used can be smoothed DC or pulsating DC.

Input voltage level

- Alarm active :      –30 ... +5 V (or contact open)

- Alarm disable :      +15 ... +30 V

Input current :      5 mA at 24 V

Switch on/off delay time :      4 ... 12 ms

## Commissioning

The user must set the available jumpers according to his application.

- The jumpers for the alarm functions are on DISABLE.

### Switching inductive loads

Because of the physical properties of inductivity, it is not possible to disconnect inductance without interference. This interference must be minimized as far as possible. Although the PCD is immune to this interference, there are other devices which may be susceptible.

It should be noted here that, as part of the harmonization of standards throughout the EU, the EMC standards are valid from 1996 (EMC Directive 89/336/EG). Two principles should therefore be emphasized :

- 1) THE PROTECTION AGAINST INTERFERENCES FROM INDUCTIVE LOADS IS IMPERATIVE.
- 2) INTERFERENCE SHOULD BE ELIMINATED AS CLOSE AS POSSIBLE TO ITS SOURCE.

It is therefore recommended that a protection circuit should be fitted at the load (often available as normal components on standardized contactors and valves).

When switching direct voltage it is urgently recommended that a recovery diode is fitted above the load. This should even take place when, theoretically, an Ohmic load is switched.

In practice, there will always be a proportion which is inductive (connection cable, resistance coil, etc.). In this case it should be noted that the switch-off time will be longer :

$$T_a \text{ approx. } L/RL * \sqrt{(RL * IL/0.7)}$$

### Safety regulations

For reasons of safety it is **not allowed** that low voltages (up to 50 V) and higher voltages (50 ... 250 V) are connected to the same module.

In the case of low voltage, only one phase per module via a common fuse is permissible. However, the individual load circuits can then be fused individually.



**General technical data**

## Surrounding atmospheric conditions

- Temperature (Fresh air temperature measured at the base of PCD4)

|                     |               |                    |
|---------------------|---------------|--------------------|
| Operation :         | −20 ... +55°C | IEC1131-2, 2.1.1.1 |
| Storage/Transport : | −25 ... +70°C | IEC1131-2, 2.1.1.2 |

- Relative humidity

|                                                                    |                    |
|--------------------------------------------------------------------|--------------------|
| 5 ... 95 % (indoor) without condensation<br>(as DIN 40040 class F) | IEC1131-2, 2.1.1.3 |
|--------------------------------------------------------------------|--------------------|

## Surrounding mechanical conditions

- Vibrations

IEC1131-2, 2.1.3.1 (as IEC68-2-6)

|               |          |
|---------------|----------|
| 10 ... 57 Hz  | 0.075 mm |
| 57 ... 150 Hz | 1.0 g    |

- Shock

IEC1131-2, 2.1.3.2 (as IEC68-2-27)

Half sine 15 g / 11 ms in 3 axes (12 times)

- Toppling and rolling

IEC1131-2, 2.1.3.3 (as IEC68-2-31)

Drop height : 100 mm

## Electromagnetic compatibility (EMC)

## IEC1131-2, Annex C

- ESD IEC 801-2 Draft 4
  - 4 kV HVR 4 kV Air Discharge
  - (Divergence from IEC1131-2 : 8kV min)
- Burst IEC 801-4
  - + / – connections, all contacts : 4 kV direct
  - all contacts : 2 kV capacitive bunched cables
- 1.2 / 50  $\mu$ s Impulse IEC 255-4 and IEC 805-5
  - + / – connections, all contacts : 3 kV disconnected from power source

**Standards complied with**

|                                      |               |
|--------------------------------------|---------------|
| IEC 1131-2                           | 1992          |
| (previously IEC 65A (Central Office) | 22 Nov. 1988) |
| VDE110 Part 1                        | 1989          |
| Germanischer Lloyd GL                | Sept. 1990    |
| Svensk Standard SEN SS 4361503       | 1986          |

## 10.3 PCD4.W800 Analogue output module with manual overrides

---

PCD4.W800 : 4 x 8 bit analogue outputs with switching between automatic and manual 0 ... 100 %

### Functional description

The module has four analogue outputs with 8-bit resolution. A two-way switch on each output enables switching between automatic and manual operation.

- In the AUTO position this module works as a standard PCD4.W400, so this function is not explained in detail in this document. (for details, see chapter 9.3).
- In the MAN position, automatic operation is interrupted and the output voltage or current can be adjusted via a potentiometer. In this case a yellow LED is illuminated and a reply signal can be read in the user program.

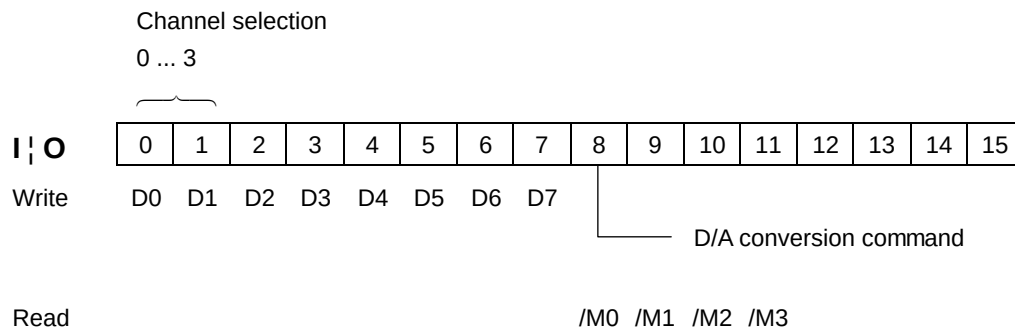
A ten-level LED bar scale indicates the output value from 0 ... 100 % in both AUTO and MAN operation. The LED bar scale is powered by the external power supply.

As long as it is connected externally to 24 V, manual operation and the alarm function work, even when the CPU or internal +5 V is switched off.

In automatic operation the outputs are handled in the same way as a normal PCD4.W400 analogue module, i.e. the outputs are reset to 0 V or 0/4 mA for a CPU restart cold, for an external reset and for a power down.

This module can also be coupled to a PCD2.M... (except PCD2.M110) by means of the PCD4.C225 bus module and the cables PCD2.K2x0.

## Programming model



/M0 ... /M3 :     Reply "Man" - "Auto" (Man = L)

### Procedure to output analogue value

The address of the desired output channel is written to bits D0 and D1 :

Value 0 = channel 0    →    I<sub>I</sub>O 0 = L, I<sub>I</sub>O 1 = L  
 Value 1 = channel 1    →    I<sub>I</sub>O 0 = L, I<sub>I</sub>O 1 = H  
 Value 2 = channel 2    →    I<sub>I</sub>O 0 = H, I<sub>I</sub>O 1 = L  
 Value 3 = channel 3    →    I<sub>I</sub>O 0 = H, I<sub>I</sub>O 1 = H

The 8 bits are then set for the analogue output value. Finally, D/A conversion is activated by setting bit 8 high.

Example :    A value (0 ... 255) from register R 1000 is to be output on output channel 1.

```

BA   EQU IIO

(ACC H)   (ACCU must be 1)
LD   R 151   ; The relative address of the output
              1   ; channel is loaded into R151

BITOR   3   ; Channel selection as
          R 151   ; above table)
          BA+0

BITOR   8   ; The output value (8 bits) is
          R 1000   ; loaded from register R 1000
          BA+0   ; to the D/A converter

SET   BA+8   ; D/A conversion is triggered by
              ; activation of bit 8

```

Programming with channel selection from a register, as described for the PCD4.W400 module, can also be used here.

## Alarm function

A special input signal influences each individual OUTPUT, depending on jumper setting.

The following jumper settings are possible :

- DISABLE,
- ACTIVE OFF,
- ACTIVE ON.

**Important :** The alarm signal is active = Low !

a) **DISABLE**

The channel preserves the momentary state.

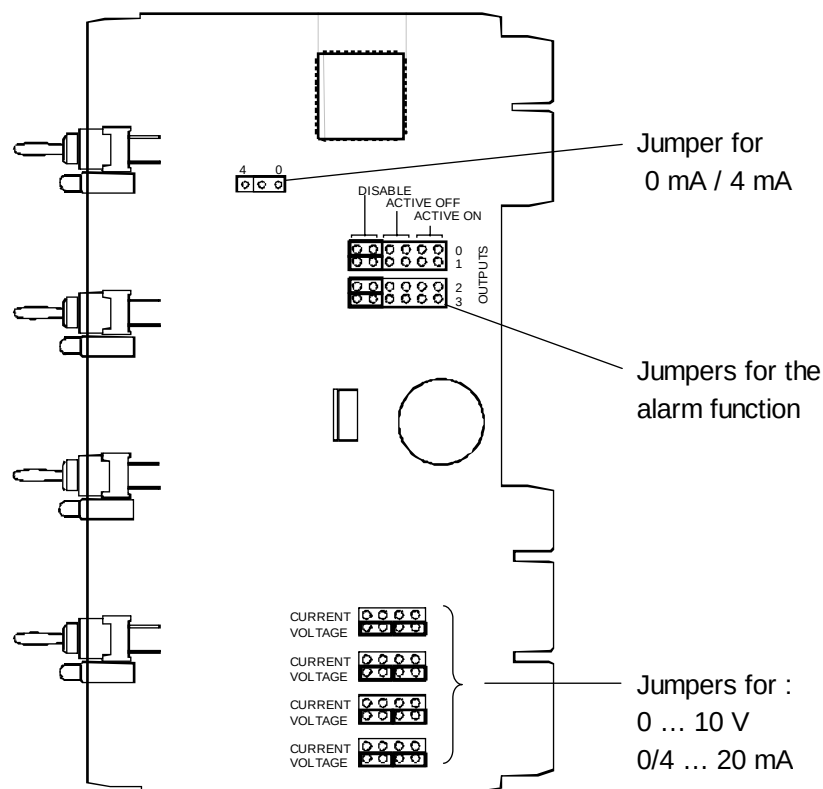
b) **ACTIVE OFF**

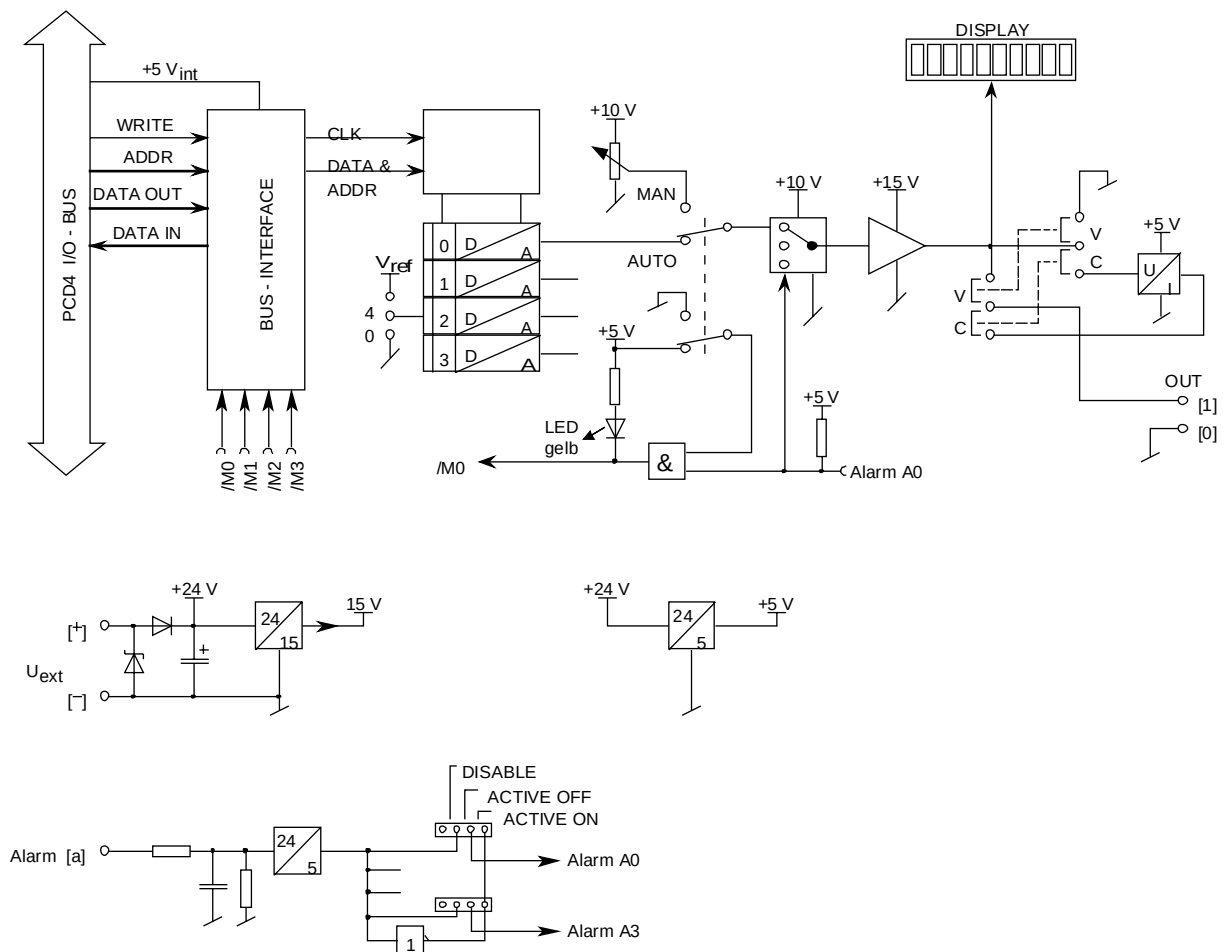
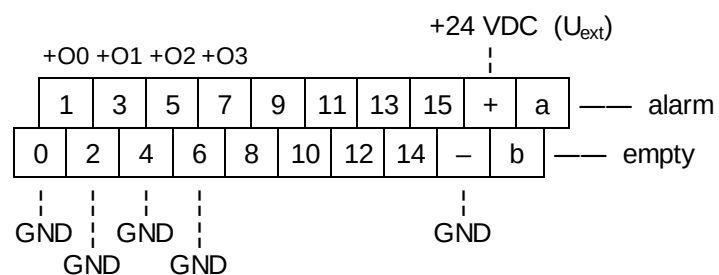
Regardless of the current output value, the output is switched to 0 %. The /Mx signal is zeroed and the yellow LED is on.

c) **ACTIVE ON**

Regardless of the current output value, the output is switched to 100 %. The /Mx signal is zeroed and the yellow LED is on.

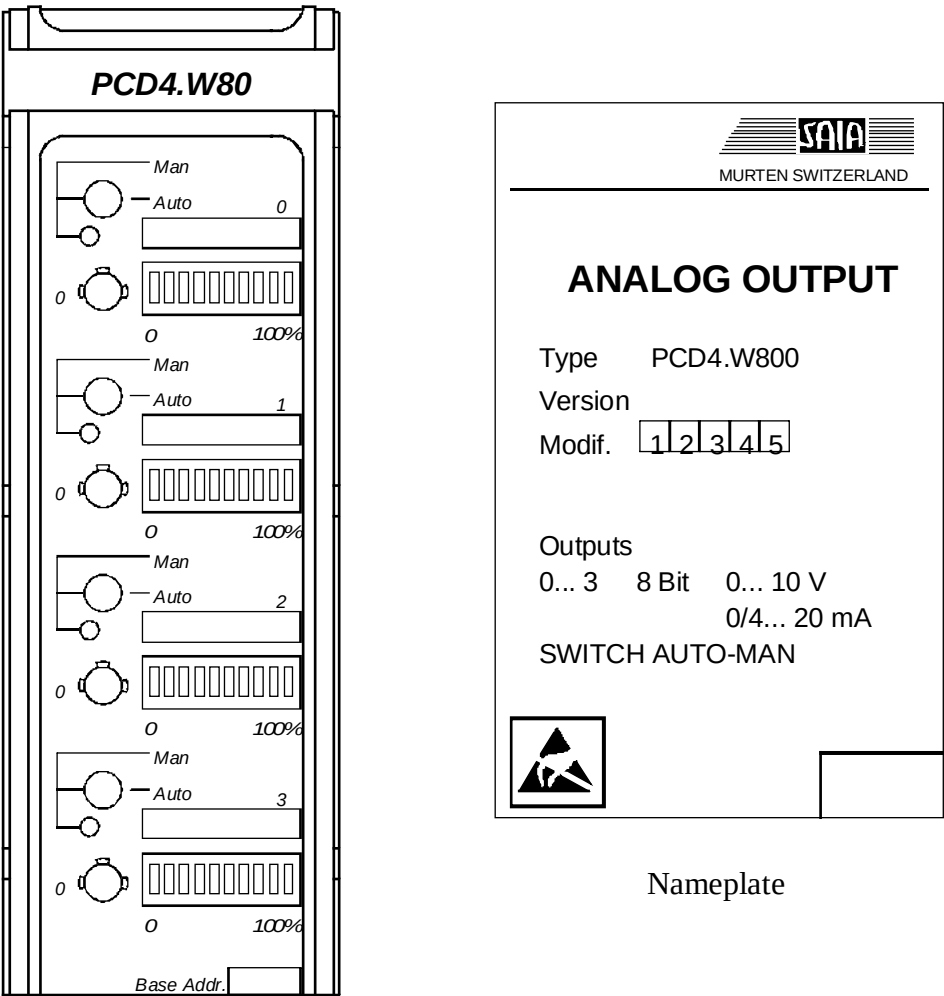
The jumper settings can only be changed if the printed circuit board is removed from the module cassette.



**Block diagram****Connection diagram for the user**

Pins 8 ... 15 are not connected.

Front panel and nameplate



Front panel

Coding port

Inputs/outputs connector



**Electrical data**

- Internal power supply

+5 V : 30 mA

+15 V : 10 mA

- External power supply

For operation of the module, the user must supply 24 VDC  $\pm 20\%$  or 18 VDC from a full-wave rectifier  $\pm 15\%$ , without filter capacitor.

The connection has reverse bias protection, and protection against transitory overvoltages ensured by a suppressor diode of 39 V  $\pm 10\%$ .

- Output characteristics

Signal range :                      0 ... 10 V  
                                             0 ... 20 mA  
                                             4 ... 20 mA

Current/voltage is jumper selectable for each channel. Offset 0/4 can only be selected module by module.

The jumper settings can only be changed if the printed circuit board is removed from the module cassette.

For signal range 4 ... 20 mA, the LED bar scale does not return to 0 %.

|                  |         |                           |
|------------------|---------|---------------------------|
| Load impedance : | voltage | $\geq 3 \text{ k}\Omega$  |
|                  | current | $\leq 500 \text{ }\Omega$ |

|            |         |                          |
|------------|---------|--------------------------|
| Accuracy : | voltage | 1 % $\pm 50 \text{ mV}$  |
|            | current | 1 % $\pm 0.2 \text{ mA}$ |

|                   |         |                               |
|-------------------|---------|-------------------------------|
| Residual ripple : | voltage | $< 15 \text{ mV pp}$          |
|                   | current | $< 50 \text{ }\mu\text{A pp}$ |

|                              |               |
|------------------------------|---------------|
| Current consumption at 24 V: | 10 ... 150 mA |
|------------------------------|---------------|



- Characteristics of the alarm input

The input is designed for source operation. The signal voltage used can be smoothed DC or pulsating DC.

Input voltage level

- Alarm active (L) :            −30 ... +5 V (or contact open)
- Alarm disable (H) :        +15 ... +30 V

Input current :                5 mA at 24 V

Switch on/off delay time :   4 ... 12 ms

### Commissioning

The user must set the available jumpers according to his application.

- For all outputs the factory setting of jumpers is 0 ... 10 V.
- The jumpers for the alarm functions are on DISABLE.

### General technical data

Surrounding atmospheric conditions

- Temperature (Fresh air temperature measured at the base of PCD4)

|                     |               |                    |
|---------------------|---------------|--------------------|
| Operation :         | −20 ... +55°C | IEC1131-2, 2.1.1.1 |
| Storage/Transport : | −25 ... +70°C | IEC1131-2, 2.1.1.2 |

- Relative humidity

|                                                                    |                    |
|--------------------------------------------------------------------|--------------------|
| 5 ... 95 % (indoor) without condensation<br>(as DIN 40040 class F) | IEC1131-2, 2.1.1.3 |
|--------------------------------------------------------------------|--------------------|

Surrounding mechanical conditions

- Vibrations

IEC1131-2, 2.1.3.1 (as IEC68-2-6)

10 ... 57 Hz        0.075 mm

57 ... 150 Hz     1.0 g

- Shock

IEC1131-2, 2.1.3.2 (as IEC68-2-27)

Half sine 15 g / 11 ms in 3 axes (12 times)

- Toppling and rolling

IEC1131-2, 2.1.3.3 (as IEC68-2-31)

Drop height : 100 mm

### Electromagnetic compatibility (EMC)

IEC1131-2, Annex C

- ESD IEC 801-2 Draft 4

4 kV HVR 4 kV Air Discharge

(Divergence from IEC1131-2 : 8kV min)

- Burst IEC 801-4

+ / – connections, all contacts : 4 kV direct

Alarm input : 2 kV capacitive bunched cables

Analogue outputs : 2 kV capacitive bunched cables

- 1.2 / 50  $\mu$ s Impulse IEC 255-4 and IEC 805-5

|                                   |      |                                     |
|-----------------------------------|------|-------------------------------------|
| + / – connections, all contacts : | 3 kV | } disconnected from<br>power source |
| Analogue outputs :                | 1 kV |                                     |

### Standards complied with

|                                      |               |
|--------------------------------------|---------------|
| IEC 1131-2                           | 1992          |
| (previously IEC 65A (Central Office) | 22 Nov. 1988) |
| Germanischer Lloyd GL                | Sept. 1990    |
| Svensk Standard SEN SS 4361503       | 1986          |

## 11. Fast counter and positioning modules

---

**PCD4.H120** **'Fast counting and measuring module'** for the acquisition of counting pulses up to 166 kHz at a counting capacity of 999 999. It is also possible to output pulse strings with a programmable frequency. The module can also be used to measure pulse lengths, period lengths and frequencies.

Every module contains 2 separate systems.

**PCD4.H2x0** **'Motion control modules for stepper motors'** for controlling 1 or 2 stepper motor driven axes with a step frequency of 33 Hz to 20 k Hz. Programmable acceleration and deceleration ramp. Maximum positioning distance 16 777 216 steps, maximum number of ramp steps 65 535 steps. Inputs for reference and limit switches 24 VDC. Outputs for controlling motor power amplifiers and for connection to display module PCA2.D14.

Phased out  
modules,  
no longer available

Various versions for controlling one or two axes.

**PCD4.H225** **New motion control module for stepper motors**, always with two axes, equipped with the new HSMC20-98-P processor.

This module is extensively compatible with the older module PCD4.H220. The differences are described in a supplement manual.

**PCD4.H3xx** **'Motion control modules for servo drives'** for controlling 1 or 2 servomotor driven axes with shaft encoder. PID-controlled position and speed. Phase encoder signals up to 100 kHz. Digital inputs for reference and limit switches 24 VDC. Analogue output  $\pm 10$  V or pulse width modulated output (PWM) for controlling the motor power amplifier. Digital output or connection to display module PCA2.D14.

Various versions for controlling one or two axes.

**PCD4.H4x0** **'Motion control modules for servo drives with linear and circular interpolation'** using the latest DSP (digital signal processor) technology, the PCD4.H4x0 module is able to control 2 or 4 servo motor axes either independently or with linear or circular interpolation. The resultant S-shaped velocity profile produces motion which is both rapid and smooth.

With its own memory and a high level of integrated intelligence, the PCD4.H4x0 module takes almost all the load from the PCD4's CPU, leaving it completely free for actual process control. Useful function boxes and a powerful software package make programming and commissioning extremely simple. The novice programmer is supported by readily comprehensible test and diagnostic information with appropriate help functions, all of which make the processes transparent.

More information in the following manuals :

PCD4.H120 : Manual 26/731 E

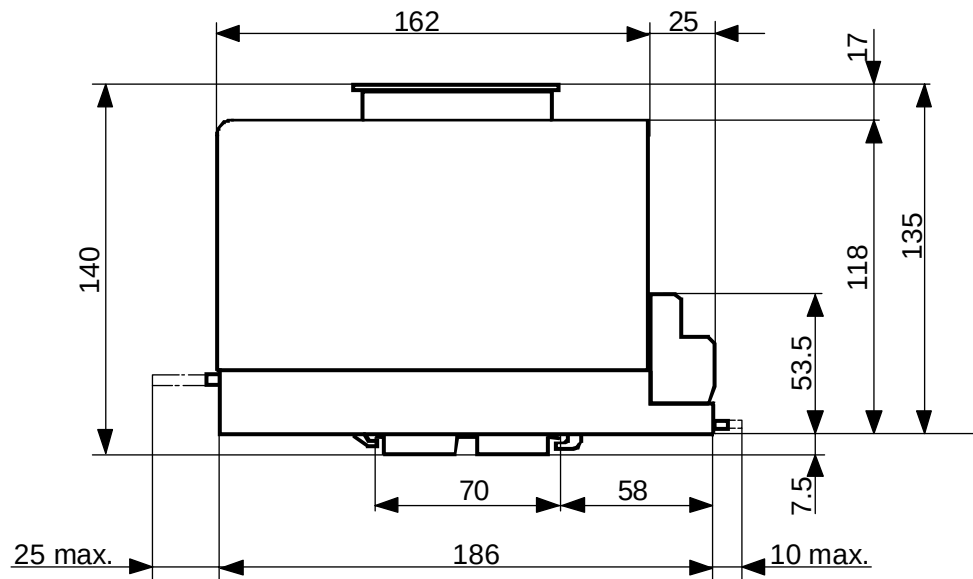
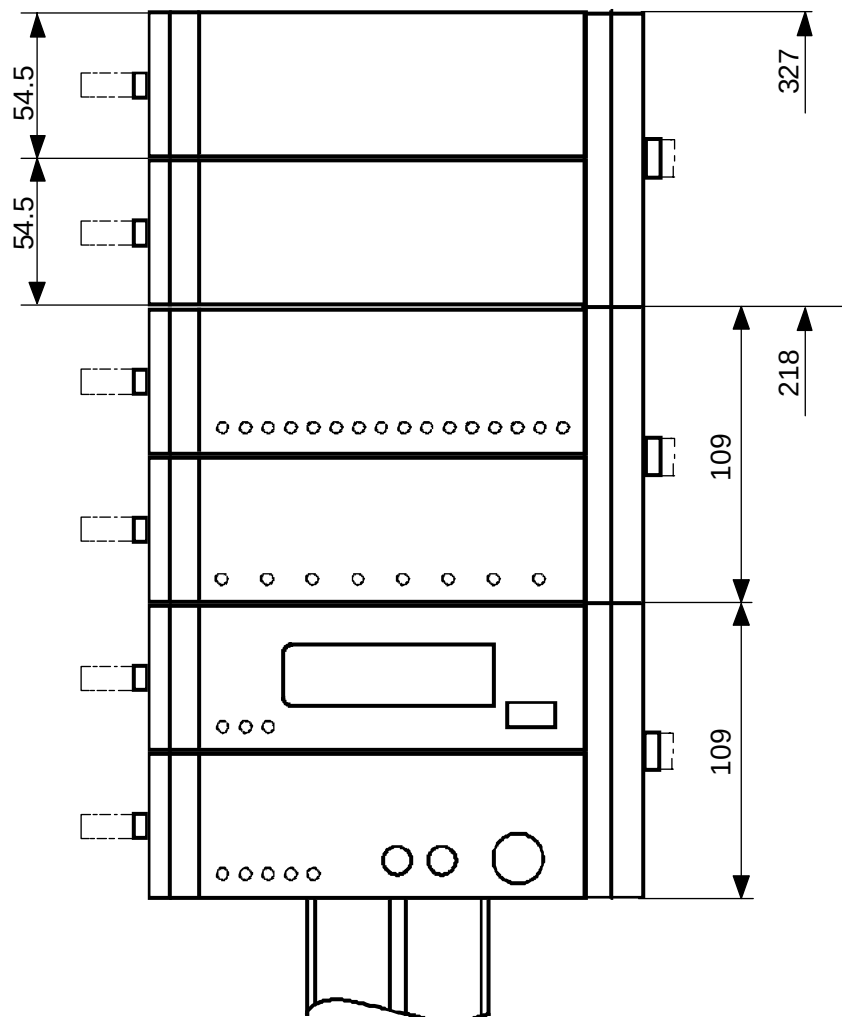
PCD4.H2x0 : Manual 26/730 E

PCD4.H225 : Supplement to existing manual 26/730 E

PCD4.H3xx : Manual 26/729 E

PCD4.H4x0 : Manual 26/752 E

## 12. Dimensions of the PCD4



# Ordering information

| Type                               | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Weight        |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|------------------|------------------|------------------------------|------------------------------------|------------------------------------|-----------------------------------|-----------------------------------|------------------------------------------|--|----------------------------------|--|-----------------------|--|---------------------------------|--|
| PCD4.M170 F..                      | <b>The PCD4.M170 Fnx processor module is supplied ready configured:</b><br>“n” defines the ..F.. module at socket B1 and “x” defines the ..F.. module at socket B2                                                                                                                                                                                                                                                                                                                                                                                                                              | 380 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
|                                    | <table><tr><th>n (socket B1)</th><th>x (socket B2)</th></tr><tr><td>0 = not equipped</td><td>0 = not equipped</td></tr><tr><td>1 = PCD7.F700 (PROFIBUS FMS)</td><td>2 = PCD7.F750 (PROFIBUS DP master)</td></tr><tr><td>2 = PCD7.F750 (PROFIBUS DP master)</td><td>3 = PCD7.F770 (PROFIBUS DP slave)</td></tr><tr><td>3 = PCD7.F770 (PROFIBUS DP slave)</td><td>4 = PCD7.F772 (PROFIBUS DP slave, RS485)</td></tr><tr><td></td><td>7 = PCD2.F520 (RS232/422, RS485)</td></tr><tr><td></td><td>8 = PCD2.F522 (RS232)</td></tr><tr><td></td><td>9 = PCD7.F65x (Ethernet-TCP/IP)</td></tr></table> | n (socket B1) | x (socket B2) | 0 = not equipped | 0 = not equipped | 1 = PCD7.F700 (PROFIBUS FMS) | 2 = PCD7.F750 (PROFIBUS DP master) | 2 = PCD7.F750 (PROFIBUS DP master) | 3 = PCD7.F770 (PROFIBUS DP slave) | 3 = PCD7.F770 (PROFIBUS DP slave) | 4 = PCD7.F772 (PROFIBUS DP slave, RS485) |  | 7 = PCD2.F520 (RS232/422, RS485) |  | 8 = PCD2.F522 (RS232) |  | 9 = PCD7.F65x (Ethernet-TCP/IP) |  |
| n (socket B1)                      | x (socket B2)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 0 = not equipped                   | 0 = not equipped                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 1 = PCD7.F700 (PROFIBUS FMS)       | 2 = PCD7.F750 (PROFIBUS DP master)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 2 = PCD7.F750 (PROFIBUS DP master) | 3 = PCD7.F770 (PROFIBUS DP slave)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 3 = PCD7.F770 (PROFIBUS DP slave)  | 4 = PCD7.F772 (PROFIBUS DP slave, RS485)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
|                                    | 7 = PCD2.F520 (RS232/422, RS485)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
|                                    | 8 = PCD2.F522 (RS232)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
|                                    | 9 = PCD7.F65x (Ethernet-TCP/IP)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD7.R400                          | Flash card with 1 MByte for backup of the user program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 g           |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 4'507'4817'0                       | Lithium battery (replacement)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 10 g          |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
|                                    | <b>Processor modules</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.M110                          | with PGU/RS232 interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 250 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.M125                          | supports 1 additional serial data port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 250 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.M145                          | supports 3 additional serial data ports                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 310 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.M445                          | with dual processor, co-processor PROFIBUS FMS, 3 additional serial data ports                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 390 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 4'507'1360'0                       | NiCd battery (replacement)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 10 g          |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
|                                    | <b>Public memory modules</b> (for preceding processor modules)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD7.R110                          | with 2 sockets for EPROM or RAM memory components up to 256 KBytes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 70 g          |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD7.R310                          | for up to 428 KBytes, equipped with 172 KBytes RAM (for DB/TX) and 2 sockets for additional EPROM or RAM memory components up to 256 KByte                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 80 g          |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
|                                    | <b>Memory components</b> (2 chips required for each module)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 4'502'5414'0 <sup>1)</sup>         | 2×RAM chip, 64 KBytes user memory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 8 g           |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 4'502'7013'0 <sup>1)</sup>         | 2×RAM chip, 256 KBytes user memory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 8 g           |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 4'502'5327'0                       | 2×EPROM chip, 64 KBytes user memory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12 g          |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 4'502'3958'0                       | 2×EPROM chip, 128 KBytes user memory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 12 g          |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 4'502'7126'0                       | 2×EPROM chip, 256 KBytes user memory                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 12 g          |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 26/734 E                           | <b>PCD4 series hardware manual</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.C100                          | <b>CPU bus module</b> with 2 sockets for the power supply and the processor module, without additional serial data port                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 380 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.C340                          | <b>Combined bus module</b> with sockets for processor module, power supply module, 4 I/O modules and 3 sockets for communications modules PCD7.F1..                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1100 g        |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
|                                    | <b>Communications modules</b> for plugging onto PCD4.C340                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD7.F110                          | RS422/RS485 interface, electrically connected                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 8 g           |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD7.F120                          | RS232 interface (suitable for modem connection)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 8 g           |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD7.F130                          | 20 mA current loop interface                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 8 g           |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD7.F150                          | RS485 interface, electrically isolated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 8 g           |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
|                                    | <b>I/O bus modules</b> , connector to the preceding bus module is supplied with each I/O module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.C220                          | with 2 I/O module sockets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 375 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.C260                          | with 6 I/O module sockets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1100 g        |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
|                                    | <b>Bus extension cables</b> , shielded, with screw-mounted connectors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.K200                          | for 2-row mounting, up to max. 256 I/Os, length 100 cm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 160 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.K210                          | for 2-row mounting, up to max. 256 I/Os, length 80 cm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 140 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.K250                          | for 2-row mounting, more than 256 I/Os, length 36 cm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 105 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.K260                          | for 3 and 4-row mounting, more than 256 I/Os, length 72 cm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 140 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 4'421'8698'0                       | Bus connector set (supplementary)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 20 g          |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
|                                    | <b>Power supply modules</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.N200                          | for digital I/O modules only                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 340 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| PCD4.N210                          | for all digital and analogue I/O modules and the ..H.. function modules                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 380 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |
| 4'104'5195'0                       | <b>Empty module housing</b> to cover an unused socket on the bus module                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 110 g         |               |                  |                  |                              |                                    |                                    |                                   |                                   |                                          |  |                                  |  |                       |  |                                 |  |

<sup>1)</sup> Risk of data loss if non-SAIA RAM components are used.

| Type                                                         | Description                                                                                                                                                                                                                                                         | Weight |
|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <b>Digital input modules</b>                                 |                                                                                                                                                                                                                                                                     |        |
| PCD4.E110                                                    | 16 inputs 24 VDC, input delay typ. 8ms                                                                                                                                                                                                                              | 160 g  |
| PCD4.E111                                                    | 16 inputs 24 VDC, input delay typ. 0.1 ms                                                                                                                                                                                                                           | 160 g  |
| PCD4.E600                                                    | 16 inputs 24 VDC, input delay typ. 8ms, electrically isolated                                                                                                                                                                                                       | 160 g  |
| PCD4.E601                                                    | 16 inputs 24 VDC, input delay typ. 0.3 ms, electrically isolated                                                                                                                                                                                                    | 160 g  |
| <b>Relay output modules</b>                                  |                                                                                                                                                                                                                                                                     |        |
| PCD4.A200                                                    | 8 “make” contacts 2 A/250 VAC or 2 A/50 VDC                                                                                                                                                                                                                         | 270 g  |
| PCD4.A250                                                    | 16 “make” contacts 2 A/250 VAC or 2 A/50 VDC                                                                                                                                                                                                                        | 250 g  |
| <b>Transistor output modules</b>                             |                                                                                                                                                                                                                                                                     |        |
| PCD4.A350                                                    | 8 outputs 24 VDC/2 A                                                                                                                                                                                                                                                | 330 g  |
| PCD4.A400                                                    | 16 outputs 24 VDC/0.5 A                                                                                                                                                                                                                                             | 170 g  |
| PCD4.A410                                                    | 16 outputs 24 VDC/0.5 A, electrically isolated                                                                                                                                                                                                                      | 170 g  |
| <b>Combined input/output module</b>                          |                                                                                                                                                                                                                                                                     |        |
| PCD4.B900                                                    | with 16 inputs 24 VDC/9 ms and 16 transistor outputs 0.5 A/5...32 VDC                                                                                                                                                                                               | 250 g  |
| <b>Additional set of front tags for digital I/O modules</b>  |                                                                                                                                                                                                                                                                     |        |
| 4'310'8567'0                                                 | for address range 0...127                                                                                                                                                                                                                                           |        |
| 4'310'8568'0                                                 | for address range 128...254                                                                                                                                                                                                                                         |        |
| 4'310'8569'0                                                 | for address range 255...510                                                                                                                                                                                                                                         |        |
| 4'310'8570'0                                                 | for ..W.. and ..H.. modules                                                                                                                                                                                                                                         |        |
| <b>Analogue input/output modules, electrically connected</b> |                                                                                                                                                                                                                                                                     |        |
| PCD4.W100                                                    | <b>Basic module</b> for 4 input channels and up to 2 output channels, resolution 12 bit<br><b>Plug-in range modules</b> , signal ranges (load impedance):                                                                                                           | 190 g  |
| PCD7.W101 <sup>1)</sup>                                      | 4 input channels for 0...10 V, $\pm 10$ V, $\pm 5$ V or 2 Pt/Ni 1000 (four wires) plus 2 $\times$ 0...10 V                                                                                                                                                          | 15 g   |
| PCD7.W105                                                    | 4 input channels for 0...20 mA, $\pm 20$ mA, $\pm 10$ mA (4...20 mA via user program)                                                                                                                                                                               | 15 g   |
| PCD7.W200                                                    | 1 output channel 0...10 V ( $\geq 5$ k $\Omega$ )                                                                                                                                                                                                                   | 15 g   |
| PCD7.W201                                                    | 1 output channel 0...1 V ( $\geq 500$ $\Omega$ )                                                                                                                                                                                                                    | 15 g   |
| PCD7.W202                                                    | 1 output channel $\pm 10$ V ( $\geq 5$ k $\Omega$ )                                                                                                                                                                                                                 | 15 g   |
| PCD7.W203                                                    | 1 output channel $\pm 1$ V ( $\geq 500$ $\Omega$ )                                                                                                                                                                                                                  | 15 g   |
| PCD7.W204                                                    | 1 output channel 0...20 mA ( $\leq 500$ $\Omega$ )                                                                                                                                                                                                                  | 15 g   |
| PCD7.W205                                                    | 1 output channel 4...20 mA ( $\leq 500$ $\Omega$ )                                                                                                                                                                                                                  | 15 g   |
| PCD7.W206                                                    | 1 output channel -10...0 V ( $\geq 5$ k $\Omega$ )                                                                                                                                                                                                                  | 15 g   |
| <b>Analogue input module, electrically connected</b>         |                                                                                                                                                                                                                                                                     |        |
| PCD4.W300                                                    | <b>Basic module</b> for 8 input channels, resolution 12 bit + sign bit<br><b>1 or 2 plug-in range modules</b> , signal ranges (load impedance):                                                                                                                     | 190 g  |
| PCD7.W100 <sup>1)</sup>                                      | Range module for 4 channels $\pm 10$ V or 4 Pt/Ni 1000 (four wires)                                                                                                                                                                                                 | 15 g   |
| PCD7.W101 <sup>1)</sup>                                      | Range module for 4 channels $\pm 1$ V or 4 Pt/Ni 100 (four wires)                                                                                                                                                                                                   | 15 g   |
| PCD7.W102                                                    | Range module for 4 channels $\pm 100$ mV                                                                                                                                                                                                                            | 15 g   |
| PCD7.W103                                                    | Range module for 4 channels $\pm 20$ mA or 4...20 mA                                                                                                                                                                                                                | 15 g   |
| PCD7.W104                                                    | Range module for 4 channels 4...20 mA for two-wire transducers                                                                                                                                                                                                      | 15 g   |
| PCD7.W110                                                    | Range module for 4 channels Pt 1000 with a temperature range of -50...+150 °C and a resolution of 0.1 °C (two-wire connection)                                                                                                                                      | 15 g   |
| PCD7.W111                                                    | Range module for 4 channels Ni 1000 with a temperature range of -50...+150 °C and a resolution of 0.1 °C (two-wire connection)                                                                                                                                      | 15 g   |
| PCD7.W120                                                    | 4 stabilized current outputs of 2 mA for 4 Pt/Ni 100 and Pt/Ni 1000 resistance thermometer (four-wire connection)                                                                                                                                                   | 15 g   |
| <b>Analogue output module, electrically connected</b>        |                                                                                                                                                                                                                                                                     |        |
| PCD4.W400                                                    | <b>Analogue module with 8 output channels</b> (2 $\times$ 4), resolution 8 bit, can be allocated by jumper to different output signals in groups of 4: 0...10 V ( $\geq 5$ k $\Omega$ ), 0...20 mA ( $\leq 500$ $\Omega$ ) and/or 4...20 mA ( $\leq 500$ $\Omega$ ) | 170 g  |
| <b>Analogue input module, electrically isolated</b>          |                                                                                                                                                                                                                                                                     |        |
| PCD4.W500                                                    | <b>Basic module</b> for up to 8 input channels, resolution 12 up to 15 bit<br><b>1 or 2 plug-in range modules</b> , signal ranges (load impedance):                                                                                                                 | 190 g  |
| PCD7.W100                                                    | Range module for 4 channels $\pm 10$ V or 4 Pt/Ni 1000 (four wires)                                                                                                                                                                                                 | 15 g   |
| PCD7.W101                                                    | Range module for 4 channels $\pm 1$ V or 4 Pt/Ni 100 (four wires)                                                                                                                                                                                                   | 15 g   |
| PCD7.W103                                                    | Range module for 4 channels $\pm 20$ mA or 4...20 mA                                                                                                                                                                                                                | 15 g   |
| PCD7.W104                                                    | Range module for 4 channels 4...20 mA for two-wire transducers                                                                                                                                                                                                      | 15 g   |
| PCD7.W110                                                    | Range module for 4 channels Pt 1000 with a temperature range of -50...+150 °C and a resolution of 0.1 °C (two-wire connection)                                                                                                                                      | 15 g   |
| PCD7.W111                                                    | Range module for 4 channels Ni 1000 with a temperature range of -50...+150 °C and a resolution of 0.1 °C (two-wire connection)                                                                                                                                      | 15 g   |
| PCD7.W120                                                    | 4 stabilized current outputs of 2 mA for 4 Pt/Ni 100 and Pt/Ni 1000 resistance thermometer (four-wire connection)                                                                                                                                                   | 15 g   |

<sup>1)</sup> Other signal ranges on request

# Ordering information

| Type                                                           | Description                                                                                                                                                                                        | Weight |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <b>PCD4.W600</b>                                               | <b>Analogue output module, electrically isolated</b><br><b>Basic module</b> for up to 8 output channels, resolution 12 bit<br><b>1...4 plug-in range modules</b> , signal ranges (load impedance): | 190 g  |
| <b>PCD7.W300</b>                                               | 2 output channels 0...10 V ( $\geq 5\text{ k}\Omega$ )                                                                                                                                             | 15 g   |
| <b>PCD7.W302</b>                                               | 2 output channels $\pm 10\text{ V}$ ( $\geq 5\text{ k}\Omega$ )                                                                                                                                    | 15 g   |
| <b>PCD7.W304</b>                                               | 2 output channels 0...20 mA ( $\leq 500\Omega$ )                                                                                                                                                   | 15 g   |
| <b>PCD7.W305</b>                                               | 2 output channels 4...20 mA ( $\leq 500\Omega$ )                                                                                                                                                   | 15 g   |
| <b>Manual operation modules</b>                                |                                                                                                                                                                                                    |        |
| <b>PCD4.A810</b>                                               | Digital, single-stage manual operation module with<br>8 "make" contacts 2 A/250 VAC or 2 A/50 VDC                                                                                                  | 240 g  |
| <b>PCD4.A820</b>                                               | Digital, dual-stage manual operation module with<br>2 x 4 "make" contacts 2 A/250 VAC or 2 A/50 VDC                                                                                                | 240 g  |
| <b>PCD4.W800</b>                                               | Analogue manual operation module with 8 output channels,<br>resolution 8 bit                                                                                                                       | 225 g  |
| <b>PCD4.H120</b>                                               | <b>Counting and measuring module</b> , up to 166 kHz, with 2 independent<br>systems                                                                                                                | 180 g  |
| <b>26/731 E</b>                                                | PCD4.H120 manual                                                                                                                                                                                   |        |
| <b>PCD4.H225</b>                                               | <b>Motion control module for stepper motors</b> , up to 20 kHz, for 2 axes                                                                                                                         | 200 g  |
| <b>26/730 E</b>                                                | PCD4.H2.. manual supplement                                                                                                                                                                        |        |
| <b>Motion control modules for servo drives</b> , up to 100 kHz |                                                                                                                                                                                                    |        |
| <b>PCD4.H310</b>                                               | for 1 axis, encoder signals 24 VDC                                                                                                                                                                 | 195 g  |
| <b>PCD4.H320</b>                                               | for 2 axes, encoder signals 24 VDC                                                                                                                                                                 | 225 g  |
| <b>PCD4.H311</b>                                               | for 1 axis, encoder signals 5 V/RS 422                                                                                                                                                             | 300 g  |
| <b>PCD4.H321</b>                                               | for 2 axes, encoder signals 5 V/RS 422                                                                                                                                                             | 350 g  |
| <b>PCD8.H340 30E</b>                                           | Commissioning software to the modules ..H3..                                                                                                                                                       |        |
| <b>26/729 D</b>                                                | PCD4.H3.. manual                                                                                                                                                                                   |        |
| <b>Motion control modules for servo drives</b> , up to 150 kHz |                                                                                                                                                                                                    |        |
| <b>PCD4.H420</b>                                               | for 2 axes, encoder signals 24 VDC or 5 V/RS 422                                                                                                                                                   | 380 g  |
| <b>PCD4.H440</b>                                               | for 4 axes, encoder signals 24 VDC or 5 V/RS 422                                                                                                                                                   | 700 g  |
| <b>PCD8.H340 40E</b>                                           | Programming and commissioning tool                                                                                                                                                                 |        |
| <b>26/752 E</b>                                                | PCD4.H4.. manual                                                                                                                                                                                   |        |
| <b>PCD7.D120</b>                                               | <b>Display module</b> for control panel installation with 6-digit display<br>(7-segment LED)                                                                                                       | 175 g  |

saia-burgess  
Smart solutions for comfort and safety

## Saia-Burgess Controls Ltd.

Bahnhofstrasse 18  
CH-3280 Murten/Switzerland

Telephone ++41 26 672 71 11  
Telefax ++41 26 670 44 43

E-mail: [pcd@saia-burgess.com](mailto:pcd@saia-burgess.com)  
Homepage: [www.saia-burgess.com](http://www.saia-burgess.com)  
Support: [www.sbc-support.ch](http://www.sbc-support.ch)

## Saia-Burgess Controls Kft.

Liget utca 1  
H-2040 Budaörs

Telephone 023/501 170  
Telefax 023/501 180

E-mail: [office@saia-burgess.hu](mailto:office@saia-burgess.hu)  
Homepage: [www.saia-burgess.hu](http://www.saia-burgess.hu)  
Support: [www.sbc-support.ch](http://www.sbc-support.ch)

## Your local contact:

## Australasian Agents:



**TRIARM** Pty. Ltd.  
Innovative Automation Solutions

Online: [www.triarm.com.au](http://www.triarm.com.au)  
Email: [sales@triarm.com.au](mailto:sales@triarm.com.au)  
Phone: +61 (0)3 8768 7260  
Fax: +61 (0)3 9005 2852