Saia®S-Bus

S-Bus-SAFE and S-Bus-RAIL: remote input/output modules

Controls Division

saia-burgess

Control Systems and Components

Integrating input/output information within the Saia® S-Bus environment

Characteristics of remote input/output modules

- RAIL: switch box version to mount on top-hat rail according to DIN EN 60 715 TH35 (formerly DIN EN 50 022) (1 × 35 mm), with manual control level and feedback via bus. Data and parity modes are configurable
- SAFE: protected version for surface mounting, with IP 65 protection and manual control level
- Applications modules for light + shade, with direct actuation
- State indication by LED
- Triggered via Saia® S-Bus – the low cost master-slave network for commissioning, visualization and programming
- Automatic recognition of operating parameters in Saia® S-Bus network mode
- Simple connection with two-wire RS485 line

Saia® S-Bus – the master-slave network for operating data, visuals and programming

Advantages of Saia® S-Bus

Saia® S-Bus is the economic master-slave network that is built into every DDC substation as standard. It allows up to 254 slave stations to be connected via a simple, two-wire RS485 line. Locally, these networks can have further branches, either for additional Saia® PCDs, control terminals, remote input/output modules, or for non-Saia devices, such as electronic power meters.

Saia® S-Bus has the following outstanding features:

- Integral part of every PCD system
- Master-slave network with up to 254 slave systems in segments of 32 / 100 stations each
- Gateway function allowing connection of up to 4 masters on each Saia® S-Bus
- Network operation at level 1 for communicating operations data and level 2 for programming and debugging
- Easy manipulation during programming, installation, or commissioning
- High net data rates due to low protocol overheads, even at 38.4 kBit/s
- Good transmission safety, guaranteed by CRC-16 error recognition
- Remote data transfer and remote diagnosis via standard commercial modems for fixed or dialled connections, supported with data mode.
- Simple, efficient protocol that integrates well within foreign devices
- Saia® S-Bus is an open protocol. Further information can be obtained from local agents of Saia-Burgess Controls.

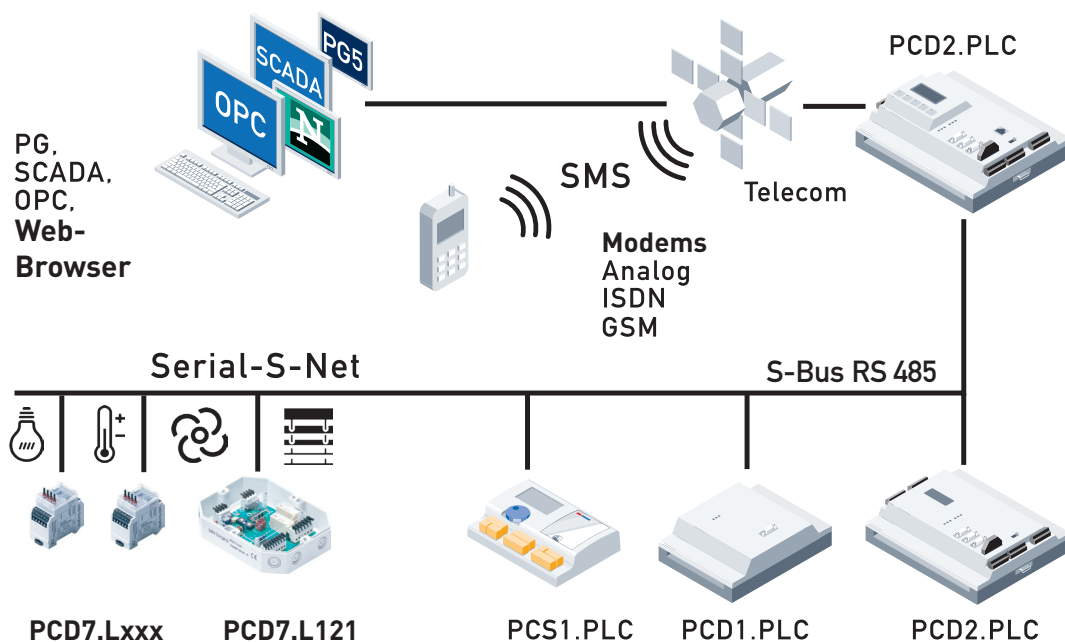## Use of slave devices in Saia® S-Bus

Slaves used may include remote input/output (RIO) modules, foreign devices (such as electronic power meters) or PCD stations. When using slaves, consider their electric load on the S-Bus. RAIL and SAFE remote input/output modules have high impedance and their load on the S-Bus is low. As a result, up to 100 such slaves can be used in any one segment (without repeaters).

Mixed mode PCD/RIO
PCDx/RAIL mode

In mixed mode (i.e. PCD systems with RIO modules) telegrams ≥ 26 Bytes are possible.
RAIL modules ignore bus telegrams ≥ 26 Bytes within an S-Bus branch. This means that automatic recognition of bit rate/operating mode is not forced for these modules.

PCDx/SAFE (and sometimes RAIL) mode

If SAFE modules are used with PCDx systems on a single S-Bus branch, keep telegram lengths ≤ 25 Bytes. Longer telegrams will be interpreted by SAFE modules as invalid and modules will switch to auto-baud mode. To avoid this, automatic bit rate recognition can be switched off via address 255.

PG, SCADA, OPC, **Web-Browser**

SMS

Modems Analog ISDN GSM

Telecom

PCD2.PLC

Serial-S-Net

S-Bus RS 485

PCD7.Lxxx   **PCD7.L121**   PCS1.PLC   PCD1.PLC   PCD2.PLC

Room Controlling

DDC.Plus RAIL/SAFE function description

Number of PCD systems (inc. master PCD) and RIOs on a single S-Bus branch

Total PCDs	Total RIOs	Total PCDs	Total RIOs	Total PCDs	Total RIOs	Total PCDs	Total RIOs
0…7	100	14	72	21	44	28	16
8	96	15	68	22	40	29	12
9	92	16	64	23	36	30	8
10	88	17	60	24	32	31	4
11	84	18	56	25	28	32	0
12	80	19	52	26	24		
13	76	20	48	27	20		

Data transfer

Remote input/output modules (RIOs) were developed as Saia®S-Bus data nodes for remote switching tasks. Via a PCDx/PCS1 type master station, RIO module inputs/outputs are read and manual/auto functions monitored.

Several PCDx/PCS1 systems and RIO modules can run simultaneously on one branch of the bus (see table above).

All Saia®S-Bus instructions (level 1) are recognized by these modules. Instructions that have no function in the device will receive a «NAK» (not acknowledged) response.

Operating mode recognition

RAIL modules

All RAIL modules for DIN rail mounting will automatically recognize operating modes. Whichever operating mode currently applies to the S-Bus branch (parity/data), it will be recognized and, if necessary, adjusted.

Standard mode: parity

Modules only recognize operating modes during bus communication.

Note:
If auto recognition is switched off via address 255 (bit = 0), the module will stay with its last valid operating mode.

SAFE modules

SAFE modules can only run in parity mode.
They do not have automatic recognition.

Exception:
PCD7.L121: Behaves as RAIL modules.
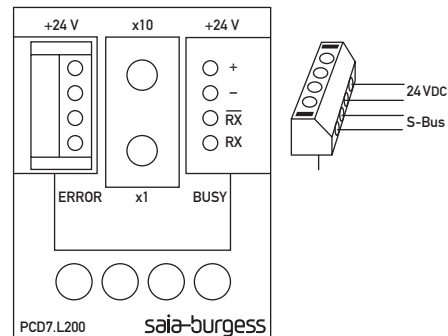
Bit rate recognition

All modules recognize the current bit rate automatically. Communications speeds are recognized and adjusted between 1200 and 38 400 kBit/s.

Standard value: 9600 kBit/s

Modules only recognize bit rates during bus communication.

Module connection protection

RAIL modules

RAIL - with bus overload protection

In case of wiring errors or connectors that have been plugged in incorrectly, RAIL modules are protected against overloading.

SAFE - without bus overload protection

IP65 type devices are not protected against overloading.
If 24VDC is connected to the bus terminals, the module will be destroyed!

Electromagnetic compatibility (EMC)

The electromagnetic loading capacity of modules (their electromagnetic compatibility) has been tested to an amplitude of 2000 V. If an inductive load exceeds this amplitude, device function may be affected.

For devices with relay function and relatively large switching loads (motor contactors), we advise the series connection of an RC module.
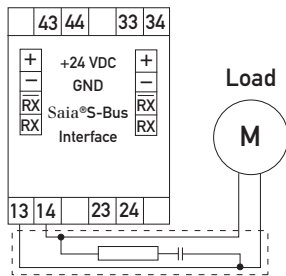
Example:

RC module	Resistor	100 Ω
	Capacitor	47 nF
	Input voltage	max. 250 VAC

Register description

The operational data of **RAIL/SAFE modules** is available in the form of registers and input/output information.

Depending on the input or output module, values may be read-only or read-write.

In modules that use registers as volatile memory, addresses 1…4 and 11…14 are reserved for the appropriate data.

Further information on applications data is available with the data for individual modules.

Configuration and operational data is stored in registers 5…10.

Configuration and operational data
Register:

5	Current bit rate
6	Module address
7	Status register
8	Bus timer
9	Operating mode
10	Error counter

Register 5 – current bit rate

The module›s current bit rate setting is shown by a decimal number, which stands for a particular bit rate.

Value (read and write)	Bit rate (kBit/s)
4	1200
5	2400
6	4800
7	9600 preset
8	19 200
9	38 400

We recommend that the value should by set by automatic recognition.

Note:

If bit rate is adjusted manually, the automatic function for bit rates and operating modes should be switched off.

In this state, the module will only be responsive to the set bit rate.

Register 6 – module address

Register 6 contains the setting for the **S-Bus s**lave address. This decimal number is read-only.

The **S-Bus ad**dress can only be set from the module›s front-panel address switch.

Register 7 – status register

The status register shows the current status of the device.

Bit	Status	Meaning
0	1	Device has recognized last transmission
	0	Device has not recognized last transmission
1	1	Last transmission was a broadcast message
	0	Last transmission was not a broadcast message
2	1	Last transmission came from master
	0	Last transmission did not come from master
3	1	CRC check of last message was correct
	0	CRC check of last message was not correct
4	–	Not used
5	1	Device has executed an internal reset
	0	Device working properly
6	–	Not used
7	–	Not used
8	1	Internal bus to EEPROM is OK
	0	Internal bus not working correctly
9	1	EEPROM data memory is OK
	0	EEPROM data memory is faulty
10	1	Bit rate has been loaded from EEPROM
	0	Bit rate = 9600 kBit/s (preset value)
11	–	Not used
12	1	Input/channel 1 overridden manually
	0	Input/channel 1 on automatic
13	1	Input/channel 2 overridden manually
	0	Input/channel 2 on automatic
14	1	Input/channel 3 overridden manually
	0	Input/channel 3 on automatic
15	1	Input/channel 4 overridden manually
	0	Input/channel 4 on automatic

Note:

Bits 12 to 15 are only for modules with manual switch

Register 8 – Bus-Timer

The bus timer is used to set a response time, during which the module waits for an answer from the master. The adjustable range is 20...200 milliseconds.

Registervalue	Meaning
2	20 ms (preset)
•	•
10	100 ms
•	•
20	200 ms

Reaction times are set in steps of 10 ms.
Times shorter than 20 ms are not possible.
The preset value for modules is 20 ms (value 2).

The shorter the bus timer setting, the faster modules will react to master telegrams. If too low a setting is chosen for the bus timer – up to 20 ms of the master station timeout – telegrams or connections may be lost.

Register 9 – operating mode

The module›s current setting for its operating mode is shown with a decimal number, which represents a particular operating mode.

Value (read and write)	Operating mode
1	Parity mode (preset)
2	Data mode

Register 10 – error counter (RAIL modules)

The error counter register increments as transmission or module errors are detected.

If the content of this register does not equal 0, an error has occurred (or several).

The counter can be reset by overwriting the register value with 0.

Note:
SAFE modules:
The IP 65 module version does not have an error counter. Register 10 shows status information (like register 7).

Automatic power recognition

Modules in their delivery state automatically recognize current bit rate in kBits/s and operating mode (data/parity).

Output 255	Automatic recognition
0	Switched off
1	Switched on (preset)

If **output 255** is set to « **0** », the module will only respond to the same transmission rate and mode that were set at the time of deactivation.

Note for **SAFE** modules:
SAFE modules can only be addressed in parity mode. Automatic changeover in **SAFE** modules only applies to the bit rate (except PCD7.L121).

Broadcast – messages

All writable registers can also be addressed by broadcast telegrams.

Housing data

Protection class	RAIL:	housing IP 50, terminals IP 20
	SAFE:	housing IP 65
		EN 60 529 (formerly DIN 40 050)
Ambient temperature		Operation: 0°C…+55°C
		Storage: -25°C…+70°C
Relative humidity		Ambient class 3k3 (EN 61 812-1)
Mounting position		any,
		RAIL: fits into subdistributor
		(45 mm cap size)
Side-by-side connection		RAIL: without spacing
		Up to 15 modules can be connected together via plug-in connection terminals. After 15 modules, a separate supply is necessary.
Dimensions (W x H x D)		RAIL: 35 x 70 x 65 mm
		(L120/L150 = 50 x 70 x 74 mm)
		SAFE: 159 x 41.5 x 120 mm

Applications / RIO modules
PCD7.L120 or PCD7.L121

Module functions

PCD7.L120 or PCD7.L121 modules can be used as independent, remote inputs/outputs (RIOs) or as autonomous function modules. As function modules, parameters can be set for «blind» and «light» applications.

Module function definition

Register:

12 Function mode
13 Application type
14 Blind running time
15 Louver adjustment time
16 Limiting value short/long key-pulse mode

Module function is defined via the following register address:

Register 12	0	RIO mode
	1	Application (preset)

Module behaviour in application mode

The module responds independently, without any delay, to the appropriate input information.
Module functions can be overridden or modified at any time via the **S-Bus** master.
In application mode, the specified inputs and outputs must be considered with the corresponding functions.

Application function blind/light

In the **PCD7.L120/L121** application module, all necessary linkages are programmed, including the electrical latching of input and output circuits. Signal inputs used may be simple keys or double keys.
Applications are defined via the following register address:

Register 13	0	Blind (preset)
	1	Light

Application description «Blind»

The module is **S-Bus** networkable and can be used for 1 blind («Louver adjustment», «Open» «Close»). Two additional digital inputs are available for wind and safety functions. In «Blind» application mode, relays are latched electrically against each other.

The following configurations are possible:
- Short key / long key operation
- Louver adjustment time
- Running time

Operating parameter definition

Blind running time «Open / Close» (register 14):
If input information remains within the defined short key time (register 16) the relay will be activated for the period defined in register 15 (louver adjustment). If input information remains active after overrunning the short key/long key limit, the relay will switch (without interruption) to «Open /

Close» mode and remain active for the maximum running time (register 14).

Register 14	0 ↔ 255	Max. blind run time in sec. (preset 30 = 30 seconds)

Louver adjustment time (Register 15):

Louver adjustment time defines the minimum relay operating time to adjust the angle of blind louvers.. If input information is short and in the appropriate direction, the relay will remain active at least for the defined time.
If input information is longer than the defined louver adjustment time, but still below the limit for «short key/long key mode» (register 16) the output relay will remain active as long as input information is present.

Note:

For the finest possible louver adjustment, keep the minimum louver adjustment time low.

Register 15	0 ↔ 255	Min. louver adjustment time (1/10 sec.) preset 10 = 1.0 s

Short/long key mode (register 16)

Short/long key mode (register 16) defines the time limit for a key depression, after which the module switches from louver adjustment function (short key mode) to «open/close» function.
When input information is below the limiting value, the corresponding relay will remain active, at least for the defined louver adjustment time.
In long key mode, the relay becomes active for the blind running time defined in register 14.
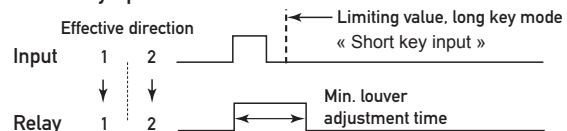
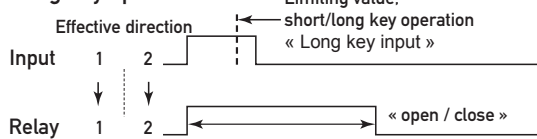| Register 16	0 ↔ 255	Limit value short/long key mode (1/10 sec.) preset 20 = 2.0 s

Run time interruption

To interrupt run time during the blind «Open / Close» sequence, press the button again (regardless of run direction).
Relay function cannot be interrupted during louver adjustment time.
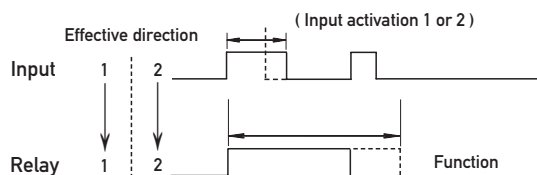
Short key operation

www.saia-pcd.com

S-Bus-SAFE and S-Bus-RAIL: Remote input/output modules for Saia® S-Bus

Long key operation

Limiting value, short/long key operation « Long key input »

Interruption of runtime   (« lift / lower »)

(Input activation 1 or 2)

Sensor control

Additional sensors for wind and window contact can be connected.

These sensors will respond by raising the blind for wind (relay 1 active) and, for window contact, by executing a safety stop.

A safety stop can be used to reduce the risk of injury in the immediate area of blind movement.

Instruction priorities

In application mode, relay states can be overriden via the master station.

However, the influence of the wind and window contact sensors (safety) has higher priority.

Within sensor-relay overriding, the following priorities apply:

1. **Wind sensor** (blind opening)
2. **Door contact sensor** (safety stop)

Manual / automatic switching

Relay functions can be overridden via the manual switch on modules PCD7.L120/L121. States: « 0 – Auto – On » may be selected. **Current switch** position can be read via the status register (**register 7 / bit 12/13**).

Suitable drives for blinds

These modules are suitable for controlling electro-motor drives with integral limit switches.

Application description « Light »

The module is networkable with **S-Bus** and can be used for 2 rows of windows (on/off). Two additional digital inputs are also available for uses that do not depend on the application.

On/off switching is via buttons.

Application « Light »   (Register 12 - « 1 » / Register 13 - « 1 »)

Light « on/off » key
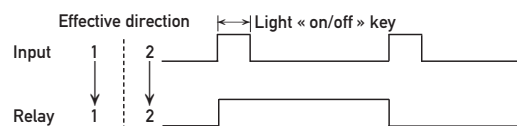
RIO function mode

In RIO function mode, inputs and outputs can be used independently of each other.

The combination module offers 4 digital inputs and 2 relay outputs in this function.

Module connections

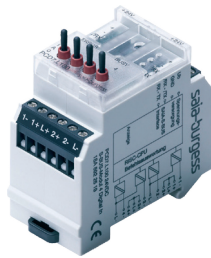|	Terminals	Function «Blind»	Function «Light»
Inputs	1	«Open»	Window row 1
	2	«Close»	Window row 2
	3	Door contact sensor	independent
	4	Wind sensor	independent
	5	Auxiliary contact	
Relay-outputs		Relay function	Relay
	11 / 12 / 14	«Open»	Window row 1
	21 / 22 / 24	«Close»	Window row 2

PCD7.L120
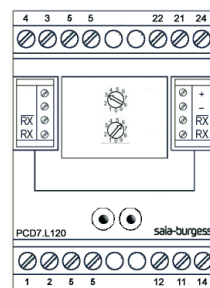
PCD7.L121
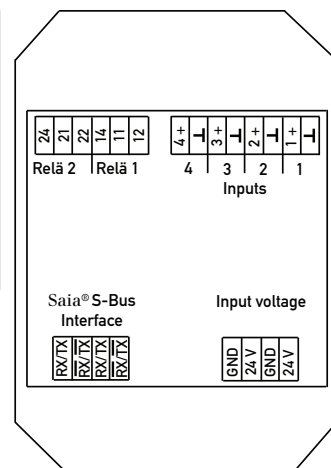
Input modules with 4 digital inputs, 24 V

PCD7.L100 RAIL

PCD7.L101 SAFE

Connection diagram

PCD7.L100 RAIL

Input 4			Input 3		
L–	4–	4+	L+	3+	3–

+	+24 VDC	+
	GND	
RX	Saia®S-Bus- Interface	RX
RX		RX

1–	1+	L+	2+	2–	L–
Input 1			Input 2		
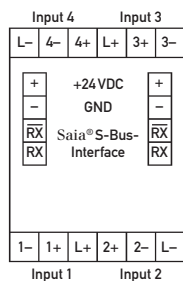
Screw terminals,
2.5 mm², 1.5 mm² for
supply voltage and bus

PCD7.L101 SAFE

RX/TX		L–
RX/TX	Saia®S-Bus	4–
RX/TX	Interface	4+
RX/TX		L+
		3+
		3–
GND		L–
24 V	Supply	2–
GND	voltage	2+
24 V		L+
		1+
		1–

Inputs 1…4

Spring terminals, 1.5 mm²,
single wire

Connection example 1

24 VDC/VAC
N

L–	4–	4+	L+	3+	3–

+24 V   10×   +24 V

Connection example 2

24 VDC/VAC
N

L–	4–	4+	L+	3+	3–

+24 V   10×   +24 V

For details about bus connection and adjusting the bus address,
see pages 17 and 18.

Technical data

Module characteristics

|	
Bus system	Saia®S-Bus
Transmission rate	1200…38 400 kBit/s
Transmission mode	Parity (RAIL and SAFE) / Data (RAIL)
Supply voltage	
■ RAIL and SAFE	24 VDC, −20 %/+10 %, reverse battery proof
■ RAIL	24 VAC ± 15 %
Current draw	max. 50 mA
Power draw	1.2 W
Duty cycle	100 %, relative
Response time	15 ms (data reception to reaction data transmission)
Return to standby	< 3 s, after voltage loss
Status/ function indicator	yellow LED for input state green LED for bus activity and supply voltage red LED for bus error message
Test voltage input/bus	2500 VAC, 50 Hz, 1 min
Special features	Manual control level with acknowledgement via bus, inputs electrically isolated

Digital signal inputs

Number of inputs	4, electrically isolated
Control input	24 VDC/AC max. 30 V, 6 mA at 24 VDC/AC

Input information

Input/ output	Status	Meaning
1	0	Channel 1 passive
	1	Channel 1 active (signal ≥ 7 VDC)
2	0	Channel 2 passive
	1	Channel 2 active (signal ≥ 7 VDC)
3	0	Channel 3 passive
	1	Channel 3 active (signal ≥ 7 VDC)
4	0	Channel 4 passive
	1	Channel 4 active (signal ≥ 7 VDC)
5	0	Channel 1 according to bus information
	1	Channel 1 according to manual switch
6	0	Channel 2 according to bus information
	1	Channel 2 according to manual switch
7	0	Channel 3 according to bus information
	1	Channel 3 according to manual switch
8	0	Channel 4 according to bus information
	1	Channel 4 according to manual switch

Input information is read as «Input» (input value) or «Output» (out-
put value).
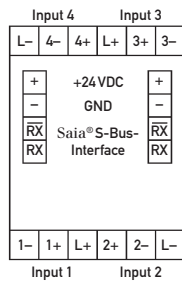Addresses 1…8 can be read together.

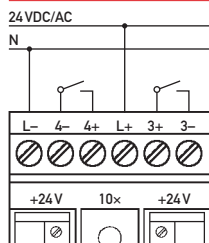# Input module with 4 digital inputs, 24 V without manual switch
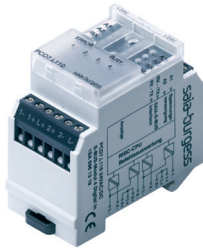
PCD7.L110 RAIL
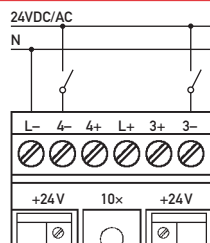
Connection diagram

PCD7.L110 RAIL

Screw terminals,
2.5 mm², 1.5 mm² for
supply voltage and bus

Technical data

Module characteristics

Bus system	Saia® S-Bus
Transmission rate	1200…38 400 kBit/s
Transmission mode	Parity / Data
Supply voltage	24 VDC/AC, −20 %/+10 %, reverse battery proof
Current draw	max. 50 mA
Power draw	1.2 W
Duty cycle	100 %, relative
Response timet	15 ms (data reception to reaction data transmission)
Return to standby	< 3 s, after voltage loss
Status/ function indicator	yellow LED for input state green LED for bus activity and supply voltage red LED for bus error message
Test voltage input/bus	2500 VAC, 50 Hz, 1 min
Special features	Input acknowledgement via bus and optical LED. Without manual switch

Digital signal inputs

Number of inputs	4, electrically isolated
Control input	24 VDC/AC max. 30 V, 6 mA at 24 VDC/AC

Connection example 1

Connection example 2

For details about bus connection and adjusting the bus address,
see pages 17 and 18..

Input information

Input/ output	Status	Meaning
1	0	Channel 1 passive
	1	Channel 1 active (signal ≥ 7 VDC)
2	0	Channel 2 passive
	1	Channel 2 active (signal ≥ 7 VDC)
3	0	Channel 3 passive
	1	Channel 3 active (signal ≥ 7 VDC)
4	0	Channel 4 passive
	1	Channel 4 active (signal ≥ 7 VDC)

Input information is read as «Input» (input value) or «Output» (output value).
Addresses 1…4 can be read together.

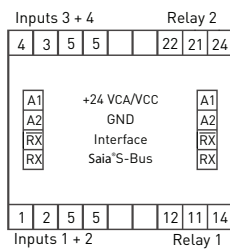# Output modules with 2 relays 250 VAC, 10 A / 4 digital inputs, 24 V
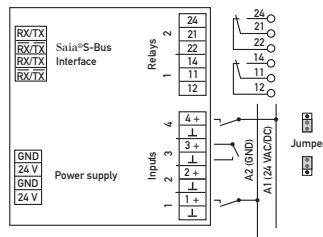
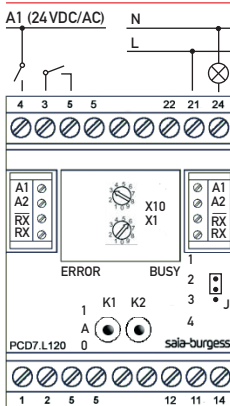**PCD7.L120 RAIL**

PCD7.L121 SAFE

Connection diagram

PCD7.L121 RAIL

Inputs 3 + 4					Relay 2		
4	3	5	5		22	21	24

A1	+24 VCA/VCC	A1
A2	GND	A2
RX	Interface	RX
RX	Saia®S-Bus	RX

1	2	5	5		12	11	14
Inputs 1 + 2					Relay 1		

PCD7.L121 SAFE

Connection examples 1 + 2

Connection example 3
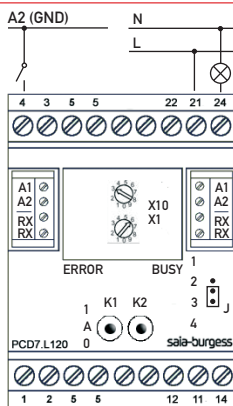
Notes on jumpers for PCD7.L120 and L130:

Depending on jumper position (J – under overlay) inputs can be operated as contact and voltage inputs, or with a trigger to GND:

Connection examples 1+2 (Preset)
Contact input
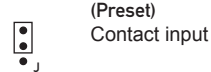
Connection example 3
Trigger to GND
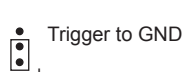
Function definition - Application mode

Address	Value	Function
12	0	Operating mode «RIO»
	1	Operating mode «Application» (Preset)
13	0	Application «Shade» (Preset)
	1	Application «Light»
14	0 ↔ 255	Max. blind run time «Open / Close» (preset value 30 = 30 seconds)
15	0 ↔ 255	Max. louver adjustment time «Angle» (preset value 10 = 1 second)
16	0 ↔ 255	Key time limit «Short/long key mode» (preset value 20 = 2 seconds)

Technical data

Module characteristics

Bus system	Saia® S-Bus
Transmission rate	1200…38 400 kBit/s
Transmission mode	Parity / Data
Supply voltage	
▪ RAIL and SAFE	24 VDC, −20 %/+10 %, reverse battery proof
▪ RAIL	24 VAC ± 10%
Current draw	max. 50 mA
Power draw	1.2 W
Duty cycle	100 %, relative
Response time	15 ms (data reception to reaction data transmission)
Return to standby	< 3 s, after voltage loss
Status/ function display	yellow LED for Inputs status green LED for bus activity and supply voltage red LED for bus error message
Special features	Manual control level with acknowledgement via bus, inputs electrically isolated

Digital signal inputs

Number of inputs	4, electrically isolated
Control input	24 VDC/AC max. 30 V, 6 mA at 24 VDC/AC

Output side

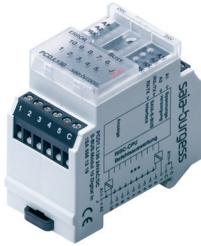|	
Number of outputs	2 electr. isolated changeover contacts
Switching voltage	max. 250 VAC
I/O switching current	max. 80 A, 20 ms
▪ Rated current RAIL	16 A (total current max. 25 A)
▪ Rated current SAFE	10 A
Contact fuse protection 16 A	
Lifetime mech.	RAIL: 1×10^7 switch cycles SAFE: 30×10^6 switch cycles
Lifetime electr.	RAIL: 1×10^5 switch cycles SAFE: 9×10^4 switch cycles
Switching frequency	max. 6/min at rated load
Test voltage	Coil/contact: 4000 VAC, 50 Hz, 1 min Contact/contact: 1000 VAC, 50 Hz, 1 min.

Note:
At high switching inductive loads additional RC elements are recommended.

Input/ output information

Input	Status	Meaning
1	0	Channel 1 passive
	1	Channel 1 active (signal ≥ 7 VDC)
2	0	Channel 2 passive
	1	Channel 2 active (signal ≥ 7 VDC)
3	0	Channel 3 passive
	1	Channel 3 active (signal ≥ 7 VDC)
4	0	Channel 4 passive
	1	Channel 4 active (signal ≥ 7 VDC)

Output	Status	Meaning
5	0	relay 1 passive
	1	relay 1 active
6	0	relay 2 passive
	1	relay 2 active

PCD7.L130 –
Input modules with 10 digital inputs 24 V


PCD7.L130

Connection diagram

PCD7.L130

```
        inputs 6 - 10
   ┌──────────────────────┐
   │ 10 │ 9 │ 8 │ 7 │ 6 │ C │
   ├──────────────────────┤
   │ 11 │  +24 VDC/VAC  │ 11 │
   │ 12 │     GND       │ 12 │
   │ Rx │  Saia S-Bus   │ Rx │
   │ Rx │  Interface    │ Rx │
   │                        │
   │ 1 │ 2 │ 3 │ 4 │ 5 │ C │
   └──────────────────────┘
        inputs 1 - 5
```
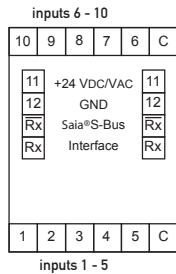
Screw terminals,
2.5 mm², 1.5 mm² for
supply voltage and Bus

Connection examples 1 + 2
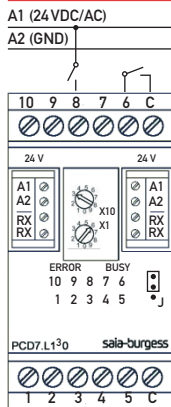
Connection example 3
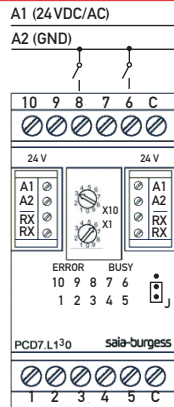
Notes on jumpers for PCD7.L120 / L121 and L130:

Depending on jumper position (J – under overlay) inputs can be operated as contact and voltage inputs, or with a trigger to GND:

Connection examples 1+2 (Preset)
Contact input
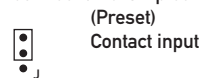
Connection example 3
Trigger to GND

Technical data

Module characteristics

Bus system	Saia S-Bus
Maximal bus length	1200 m (without Repeater)
Transmission rate	1200…38 400 kBit/s
Transmission mode	Parity / Data
Supply voltage U_N	24 VDC/AC, −20 %/+10 %, reverse battery proof
Current draw	< 75 mADC / < 80 mAAC
Power draw	1.8 W / 1.9 VA
Duty cycle	100 %, relative
Response time	15 ms (data reception to reaction data transmission)
Return to standby	< 3 s, after voltage loss
Operating temperature	0 °C…+55 °C
Storage temperature	−25 °C…+70 °C
Protective wiring	Reverse battery protection of operating voltage Reverse battery protection of supply and bus EMC according to DIN EN61000-6-2
Status/ function display	yellow LED for input status green LED for bus activity red LED for bus error message
Test voltage Input/Bus	2500 VAC, 50 Hz, 1 min

Digital signal inputs

Number of Signal inputs	10, electrically connected 24 VDC/AC max. 30 V, 6 mA at 24 VDC/AC

Input information

| Input	Status	Meaning
1	0	Channel 1 passive
	1	Channel 1 active (signal ≥7 VDC)
2	0	Channel 2 passive
	1	Channel 2 active (signal ≥7 VDC)
3	0	Channel 3 passive
	1	Channel 3 active (signal ≥7 VDC)
4	0	Channel 4 passive
	1	Channel 4 active (signal ≥7 VDC)
5	0	Channel 5 passive
	1	Channel 5 active (signal ≥7 VDC)
6	0	Channel 6 passive
	1	Channel 6 active (signal ≥7 VDC)
7	0	Channel 7 passive
	1	Channel 7 active (signal ≥7 VDC)
8	0	Channel 8 passive
	1	Channel 8 active (signal ≥7 VDC)
9	0	Channel 9 passive
	1	Channel 9 active (signal ≥7 VDC)
10	0	Channel 10 passive
	1	Channel 10 active (signal ≥7 VDC)

Input information is read as «Input» (input value) or «Output» (output value).

Addresses 1…10 can be read together.

Output modules with 4 relays 250 VAC/6 A (RAIL) or 4 relays 250 VAC/10 A (SAFE)
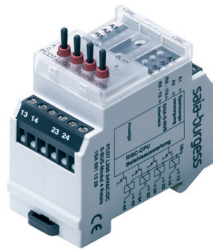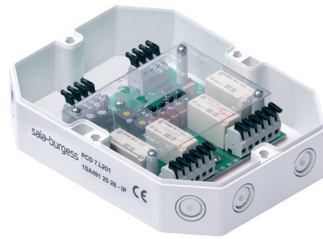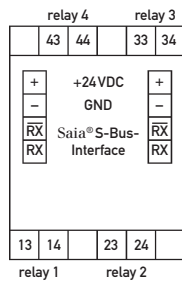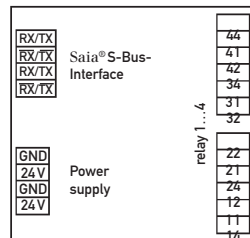

PCD7.L200 RAIL   PCD7.L201 SAFE
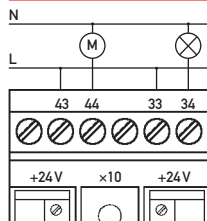
Connection diagram

PCD7.L200 RAIL

Screw terminals,
2.5 mm², 1.5 mm² for
supply voltage and bus

PCD7.L201 SAFE

Spring terminals, 1.5 mm²,
single wire

Connection example

For details about bus connection and setting the bus address, see pages 17 and 18.

Technical data

Module characteristics

Bus system	Saia® S-Bus
Transmission rate	1200…38 400 kBit/s
Transmission mode	Parity (RAIL and SAFE) / Data (RAIL)
Supply voltage	24 VDC, −20 %/+10 %, reverse battery proof
Current draw	RAIL: 100 mA, SAFE 150 mA
Power draw	RAIL: 2.4 W, SAFE 3.6 W
Duty cycle	100 %, relative
Control input	24 VDC/AC max. 30 V, 6 mA at 24 VDC/AC
Response time	15 ms (data reception to reaction data transmission)
Return to standby	200 ms, after voltage loss
Status/ function display	yellow LED for relay status green LED for bus activity and supply voltage red LED for bus error message
Special features	Manual control level with acknowledgement via bus, inputs electrically isolated

Output side

|	
Number of outputs	RAIL: 4 electr. isolated make contacts SAFE: 4 electr. isolated changeover contacts
Contact material	RAIL: AgNi, SAFE: AgSnO$_2$
Switching voltage	max. 250 VAC
I/O switching current	RAIL: max. 12 A, 4 s at 100% ED SAFE: max. 80 A, 20 ms
Rated current	RAIL: 6 A per relay (max. 12 A) SAFE: 10 A per relay (max. 30 A)
Contact fuse protection	RAIL: 6 A, SAFE: 16 A
Lifetime mech.	RAIL: 1x10^7 switch cycles SAFE: 30 x 10^6 switch cycles
Lifetime electr.	RAIL: 1x10^5 switch cycles SAFE: 9 x 10^4 switch cycles
Switching frequency	max. 6/min at rated load
Test voltage	Coil/contact: 4000 VAC, 50HZ, 1 min Contact/contact: 1000 VAC, 50HZ, 1 min.

Output information

Output	Status	Meaning
1	0	relay 1 passive
	1	relay 1 active
2	0	relay 2 passive
	1	relay 2 active
3	0	relay 3 passive
	1	relay 3 active
4	0	relay 4 passive
	1	relay 4 active
5	0	relay 1 according to bus information
	1	relay 1 according to manual switch
6	0	relay 2 according to bus information
	1	relay 2 according to manual switch
7	0	relay 3 according to bus information
	1	relay 3 according to manual switch
8	0	relay 4 according to bus information
	1	relay 4 according to manual switch

Relay status information is supplied as «Output».
    Addresses 1…8 can be read or written together.
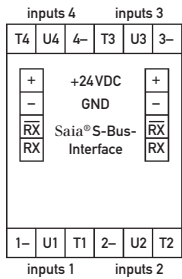
Analogue modules with 4 inputs Pt 1000 and 0…10 VDC

PCD7.L300 RAIL
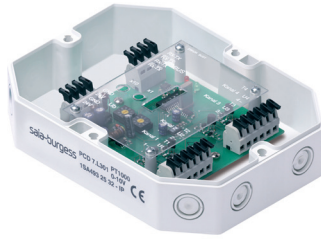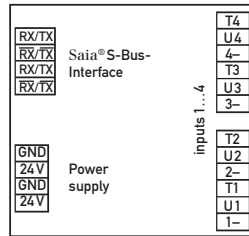
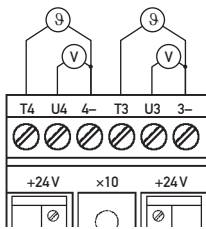**PCD7.L301 SAFE**

Connection diagram

PCD7.L300 RAIL

Screw terminals,
2.5 mm², 1.5 mm² for
supply voltage and bus

PCD7.L301 SAFE

Spring terminals, 1.5 mm²,
single wire

Connection example

Technical data

Module characteristics

Bus system	Saia® S-Bus
Transmission rate	1200…38 400 kBit/s
Transmission mode	Parity (RAIL and SAFE) / Data (RAIL)
Supply voltage	24 VDC, −20 %/+10 %, reverse battery proof
Current draw	max. 30 mA
Power draw	1 W
Duty cycle	100 %, relative
Response time	max 20 ms (data reception to reaction data transmission)
Return to standby	< 3 s, after voltage loss
Status/ function display	green LED for bus activity and supply voltage red LED for bus error message
Test voltage Input/Bus	2500 VAC, 50 Hz, 1 min
Special features	Passive and active sensors can be used simultaneously.

Input side Pt 1000

Number of channels	4 × Pt 1000, 2-wire measurement
Temperature range	−50…+150 °C
Resolution	0.1 °C
Data range	−50.0…+150 °C, HeaVAC library format
Accuracy	± 0.1 °C (+sensor tolerance) over measurement range

Input side 0…10 VDC

Number of channels	4 × 0…10 VDC
Resolution	10 mV
Error	max. ± 100 mV
Data range	0…1000 = 0.0…100.0 HeaVAC library format
Input impedance	10 kΩ

Register information

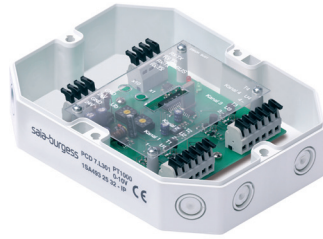| Register	Meaning
1	Pt 1000 temperature 1 (1/10 of value = temperature)
2	Pt 1000 temperature 2 (1/10 of value = temperature)
3	Pt 1000 temperature 3 (1/10 of value = temperature)
4	Pt 1000 temperature 4 (1/10 of value = temperature)
11	Voltage input 1 (1/100 of value = voltage)
12	Voltage input 2 (1/100 of value = voltage)
13	Voltage input 3 (1/100 of value = voltage)
14	Voltage input 4 (1/100 of value = voltage)

Temperature values are supplied as «Register».
Register addresses 1…4 and 11…14 can be read together.
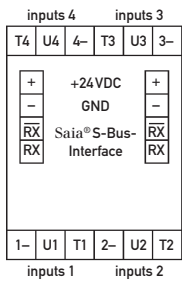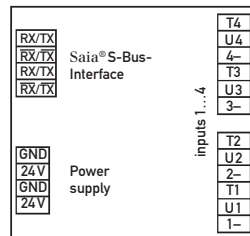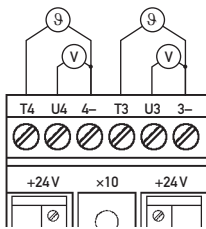
Analogue modules with 4 inputs Ni 1000 and 0…10 VDC

PCD7.L310 RAIL

PCD7.L311 SAFE

Connection diagram

PCD7.L310 RAIL

```
    inputs 4         inputs 3
  T4 U4  4–    T3  U3  3–

  +    +24VDC    +
  –     GND
  RX   Saia®S-Bus-  RX
  RX   Interface    RX

  1–  U1  T1    2–  U2  T2
    inputs 1         inputs 2
```

Screw terminals,
2.5 mm², 1.5 mm² for
supply voltage and bus

PCD7.L311 SAFE

```
  RX/TX
  RX/TX   Saia®S-Bus-
  RX/TX   Interface
  RX/TX

  GND
  24V    Power
  GND    supply
  24V
```

```
          T4
          U4
          4–
          T3
          U3
          3–
  inputs 1…4
          T2
          U2
          2–
          T1
          U1
          1–
```

Spring terminals, 1.5 mm²,
single wire

Connection example

```
  T4  U4  4–    T3  U3  3–

  +24V    ×10    +24V
```

For details about bus connection and setting the bus address, see pages 17 and 18.

Technical data

Module characteristics

Bus system	Saia®S-Bus
Transmission rate	1200…38 400 kBit/s
Transmission mode	Parity (RAIL and SAFE) / Data (RAIL)
Supply voltage	24 VDC, −20 %/+10 %, reverse battery proof
Current draw	max. 30 mA
Power draw	1 W
Duty cycle	100 %, relative
Response time	max 20 ms (data reception to reaction data transmission)
Return to standby	< 3 s, after voltage loss
Status/ function display	green LED for bus activity and supply voltage red LED for bus error message
Test voltage Input/Bus	2500 VAC, 50 Hz, 1 min
Special features	Passive and active sensors can be used simultaneously

Input side Ni 1000

Number of channels	4 × Ni 1000, 2-wire measurement
Temperature range	−50…+150 °C
Resolution	0.1 °C
Data range	−50.0…+150 °C, HeaVAC library format
Accuracy	± 0.1 °C (+sensor tolerance) over measurement range

Input side 0…10 VDC

Number of channels	4 × 0…10 VDC
Resolution	10 mV
Error	max. ± 100 mV
Data range	0…1000 = 0.0…100.0 HeaVAC library format
Input impedance	10 kΩ

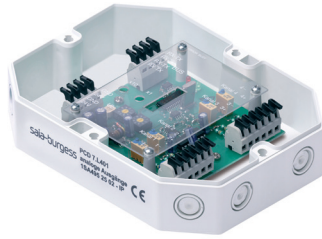## Register information

Register	Meaning
1	Ni 1000 temperature 1 (1/10 of value = temperature)
2	Ni 1000 temperature 2 (1/10 of value = temperature)
3	Ni 1000 temperature 3 (1/10 of value = temperature)
4	Ni 1000 temperature 4 (1/10 of value = temperature)
11	Voltage input 1 (1/100 of value = voltage)
12	Voltage input 2 (1/100 of value = voltage)
13	Voltage input 3 (1/100 of value = voltage)
14	Voltage input 4 (1/100 of value = voltage)

Temperature values are supplied as «Register».
Register addressen 1…4 and 11…14 can be read together.

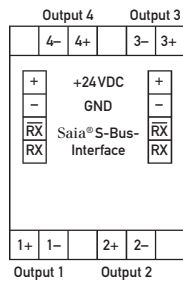# Analogue modules with 4 outputs 0…10 VDC

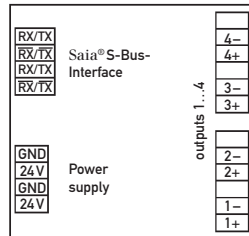PCD7.L400 RAIL

PCD7.L401 SAFE

Connection diagram

PCD7.L400 RAIL

Screw terminals,
2.5 mm², 1.5 mm² for
supply voltage and bus

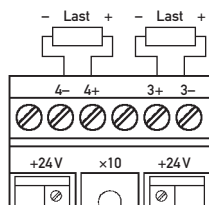### PCD7.L401 SAFE

Spring terminals, 1.5 mm²,
single wire

Connection example

For details about bus connection and setting the bus address, see pages 17 and 18.

Technical data

Module characteristics

Bus system	Saia® S-Bus
Transmission rate	1200…38 400 kBit/s
Transmission mode	Parity (RAIL and SAFE) / Data (RAIL)
Supply voltage	24 VDC, −20 %/+10 %, reverse battery proof
Current draw	max. 50 mA
Power draw	1.2 W
Duty cycle	100 %, relative
Response time	10 ms (data reception to reaction data transmission)
Return to standby	550 ms, after voltage loss
Status/ function display	green LED for bus activity and supply voltage red LED for bus error message
Test voltage Input/Bus	2500 VAC, 50 Hz, 1 min

Output side

Number of outputs	4 × 0…10 VDC
Output current	5 mA at 10 VDC, ≥ 2 kΩ
Resolution	10 mV / Digit
Error	max. ± 100 mV
Data range	0…1000 = 0.0…100.0 HeaVAC library format

Register information

Register	Meaning
1	Analogue value Output 1
2	Analogue value Output 2
3	Analogue value Output 3
4	Analogue value Output 4

Input information is supplied as register values.
Registers 1…4 can be read or written together.

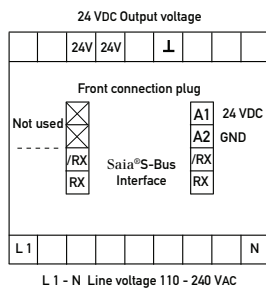# Power pack 230 VAC/24 VDC for supply of all RAIL and SAFE modules

PCD7.L500

Connection diagram PCD7.L500

24 VDC Output voltage

| 24V | 24V | ⊥ |

Front connection plug

Not used

A1	24 VDC
A2	GND
/RX	/RX
RX	RX

Saia®S-Bus Interface

L 1   N

L 1 - N Line voltage 110 - 240 VAC

Connection example PCD7.L500

24VDC Output voltage

24V 24V   ⊥

S-Bus Network →   Front bridge plugs   → 24VDC
                                            S-Bus Network

PCD7.L500

L1   N

L1 / N Line voltage110 - 240VAC
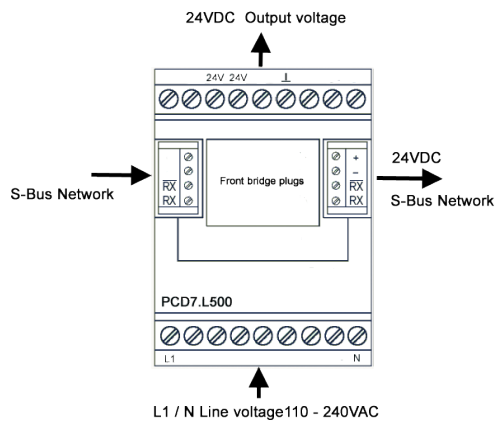
Technical data

Input side

Primary voltage	110…240 VAC, 50/60 Hz
Fuse, internal	T 1A, 250 V (Solder fuse)

Output side

Secondary voltage	24 VDC
Power	12 W (for 3… max. 15 modules)
Output current	max. 500 mA
Accuracy	± 5 % (on delivery)

Device safety

Standard	EN60950
Output	Safety extra low voltage (SELV) according to EN60950
Protection class	Class 2
Leakage current	< 0.25 mA (at 50/60 Hz and maximalum input voltage)

EMC

Noise emission	CE mark according to EN61000-6-3:2001 EN61000-6-4:2001 EN 55011:1998 + A1:1999 class B
Noise immunity	CE mark according to EN61000-6-2:2001

Ambient temperature

Operation	0… +45°C
Storage	-20… +70°C

Connections

Primary voltage	Screw terminals 2.5 mm² (below)
Secondary voltage	Screw terminals 2.5 mm² (above) Plug-in terminals 1.5 mm² (right)
S-Bus network	Plug-in terminals 1.5 mm² (right and left)

Housing

|	
Protection type	Houting IP 50 Terminals IP 20 acc. to EN 60529 (formerly DIN 40050)
Humidity class	F according to DIN 40040
Mounting position	any
Weight	approx. 100 g
Dimensions W×H×D	50 × 70 × 74 mm
Mountable side-by-side	Without spacing

Note:
Only the right-hand plug-in connection can be used to transfer the 24VDC secondary voltage via plug-in bridge connectors. The secondary voltage cannot be measured off on the left side of the module.
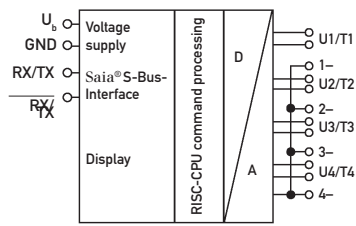The network connection can be used on both sides of the module.

Pictorial schematics

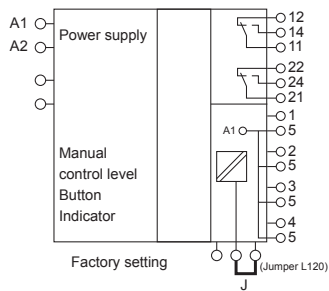## Pictorial schematic PCD7.L100/L101/L110
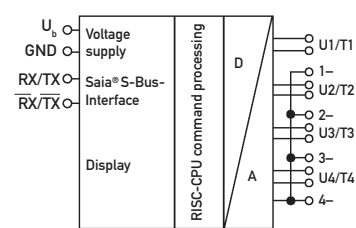

Pictorial schematic PCD7.L120/L121

Pictorial schematic PCD7.L130

Pictorial schematic PCD7.L200/L201
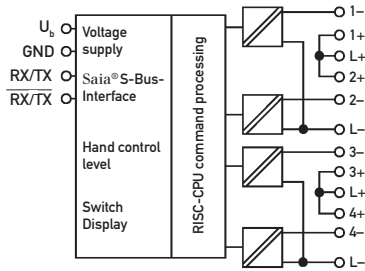
Pictorial schematic PCD7.L300/L301

No potential separation

Pictorial schematic PCD7.L310/L311

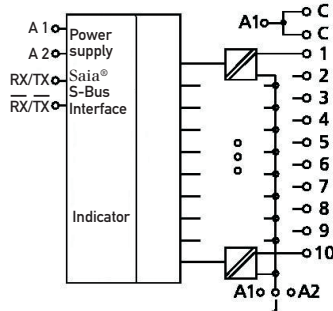No potential separation

Pictorial schematic PCD7.L400/L401

No potential separation
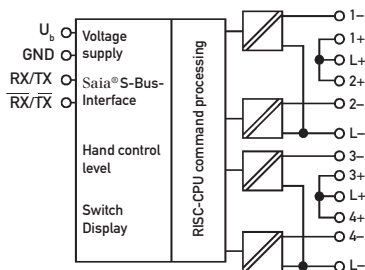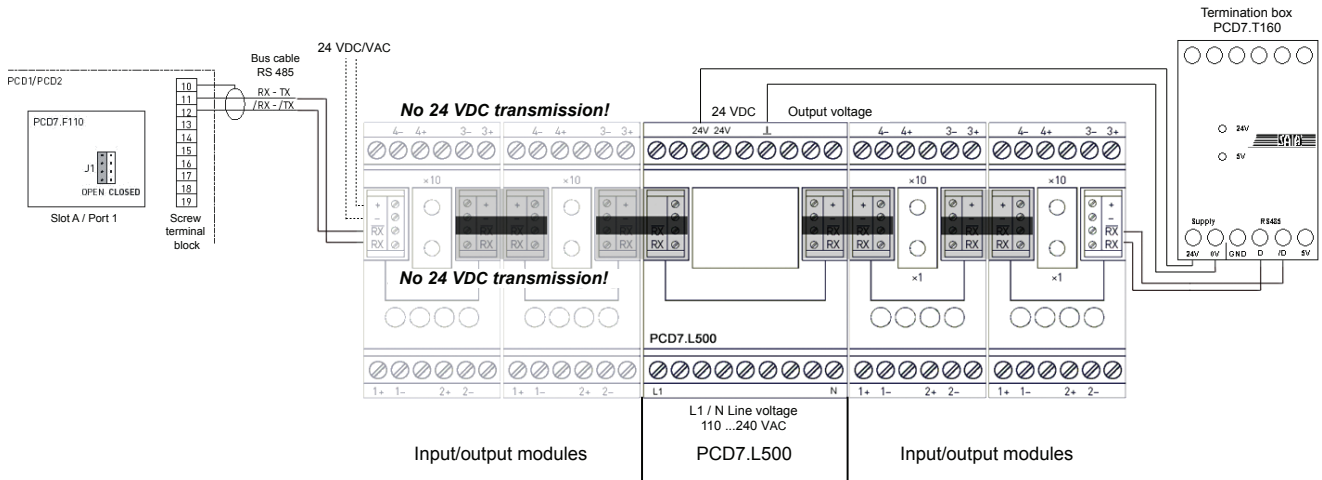
Pictorial schematic PCD7.L500
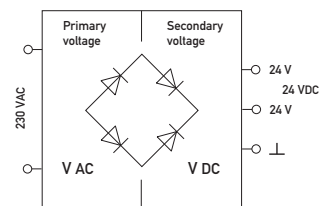
Bus connection possibilities

S-Bus connection with connection plug on the PCD7.L500 power pack
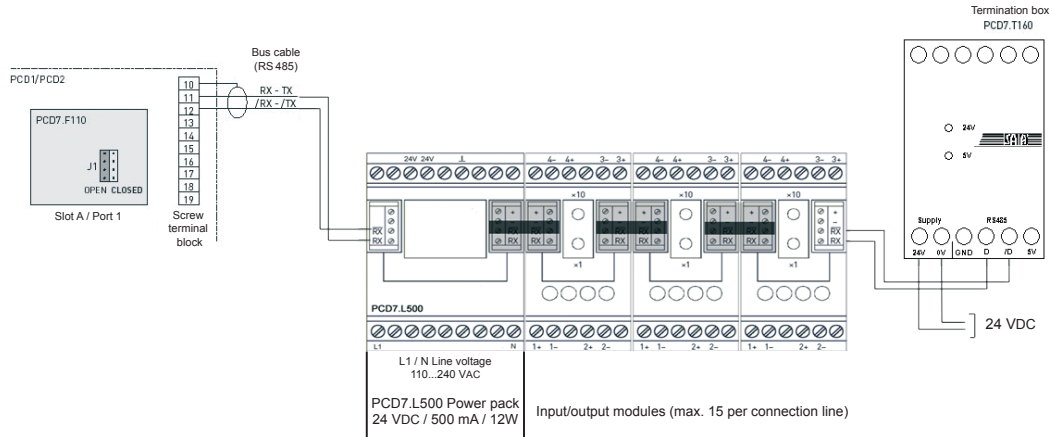
S-Bus connection with connection plug on input/output modules, linked by bridge connector to PCD7.L500 power pack
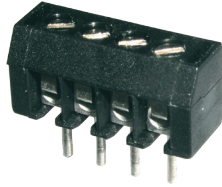

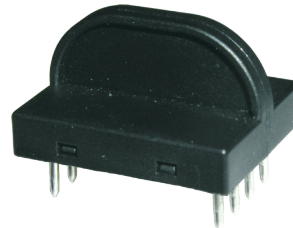## S-Bus connection with connection plug on input/output modules and separate module supply

S-Bus-SAFE and S-Bus-RAIL: Remote input/output modules for Saia® S-Bus
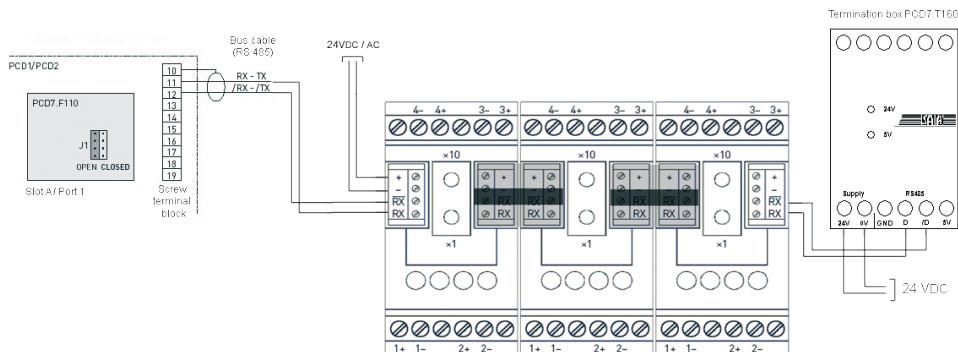
RAIL modules
Terminals / connectionS

Connection plug

The connection plug is used to connect the 24 VDC/VAC supply voltage and/or for connection of the Saia® **S-Bus** (RS485 network).
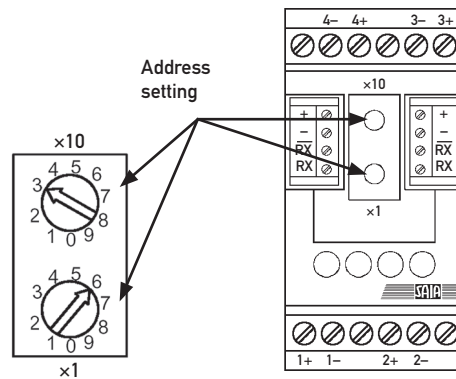

Bridge connector

The bridge connector is used for simple transfer of the 24 VDC/VAC supply voltage to the Saia® **S-Bus** (RS485 vetwork) between RAIL modules mounted side-by-side.

Bus addressing

Module address is set by applying an ordinary screwdriver to the address switches.
Example for address setting (address 36):

Ordering information

S-Bus-RAIL (DIN rail mounting)

Type	Description	Weight
PCD7.L100	Input module with 4 digital inputs 24 VDC, with manual switch	80 g
PCD7.L110	Input module with 4 digital inputs 24 VDC, without manual switch	95 g
PCD7.L120	Input/Output module with 2 relays 250 VAC and 4 digital inputs 24 VDC	125 g
PCD7.L130	Input module with 10 digital inputs 24 VDC	80 g
PCD7.L200	Output module with 4 relays, 250 VAC, 6 A	110 g
PCD7.L300	Analogue module with 4 inputs each of Pt1000 and 0…10 VDC	95 g
PCD7.L310	Analogue module with 4 inputs each of Ni1000 and 0…10 VDC	95 g
PCD7.L400	Analogue module with 4 outputs 0…10 VDC	95 g

S-Bus SAFE (surface mounted)

Type	Description	Weight
PCD7.L101	Input module with 4 digital inputs 24 VDC, with manual switch	305 g
PCD7.L121	Input/Output module with 2 relays 250 VAC and 4 digital inputs 24 VDC	340 g
PCD7.L201	Output module with 4 relays, 250 VAC, 10 A	350 g
PCD7.L301	Analogue module with 4 inputs each of Pt1000 and 0…10 VDC	305 g
PCD7.L311	Analogue module with 4 inputs each of Ni1000 and 0…10 VDC	305 g
PCD7.L401	Analogue module with 4 outputs 0…10 VDC	305 g

Power pack 230 VAC / 24 VDC

Type	Description	Weight
PCD7.L500	For supply of all RAIL and SAFE modules	115 g

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Control Systems and Components

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