

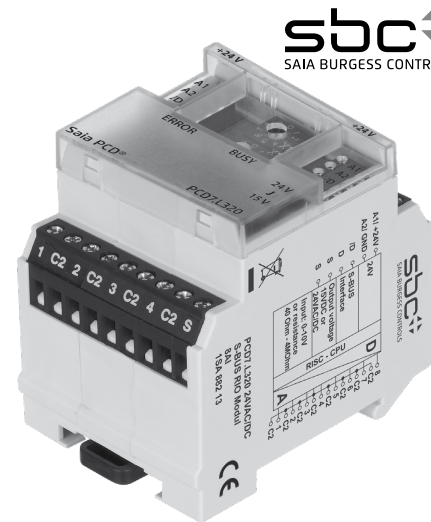
Saia PCD7.L320

Analog Input Module with 8 universally configurable inputs

The RIO module with 8 with 8 individually configurable resistance or voltage inputs was developed as a SBC S-Bus data node for peripheral measuring. Via a PLC of the type PCDx / PCS1 temperatures from different passive and active temperature sensors (e.g. PT100, PT1000, NI1000, NTC-10k, KTY81-110, LM235 etc.) and/or voltages of 0...10 VDC can be read.

Two address switches ($\times 1 / \times 10$) on the front panel allow module addressing and identification.

Addresses can be set between 00 and 99. Up to 100 RIO modules and a maximum of 3 PCD stations can be connected to one bus branch simultaneously. If the bus cycle time is critical, fewer than 30 slaves should be operated in one segment.



Technical data

Bus system	SBC S-Bus
Transmission rate	1200...38400
Transmission mode	Parity / Data
Bus length max.	1200 m (without repeater)
Nominal voltage UN	20 VDC...28 VDC / 20 VAC...28 VAC
Current consumption	<25 mADC / <65 mAAC
Power consumption	0.6 W / 16 VA
Relative duty cycle	100%
Reaction time	<20 ms (from receive data to send data reaction)
Recovery time	<3 s (after power failure)
Operating temperature range	-5 °C...+55 °C
Storage temperature range	-25 °C...+70 °C
Protective wiring	Reverse battery protection of service voltage Reverse battery protection of supply and bus
Status indicator	Green LED for operating and bus activity
Error indicator	Red LED for bus error message

Signal inputs

Resistance range	40 Ω to 4 M Ω
Fault	< 12 k Ω = 0,1% / > 12 k Ω = 1%
Voltage range	0...10 VDC (accuracy 10 mV)
Resistance range for deposit characteristic curve	-50 °C...+150 °C/according to HeaVAC (accuracy ± 0.1 °C)

Housing

Protection class to IEC 60529	Housing IP40 / Terminals IP20
Relative humidity	5...85% non-condensing
Connection cross-section Device Connection Plug-in terminal	max. 2.5 mm ² (terminals) max. 1 mm ² (screw-type)
Mounting position	any
Weight	104 g
Housing dimensions	W x H x D, 50 x 70 x 65 mm
Mounting	Mounting standard rail TH35 per IEC 60715

Mounting

Mounting and commissioning to be conform with current regulations:

1. Power-off the installation
2. Place module onto 35 mm tophat rail and press down to engage.
3. Strip insulation from 7 mm of cable (max. single wire 4 mm², fine strand 2.5 mm², diameter 0.3 mm to 2.7 mm), insert into binding and tighten with a screwdriver.

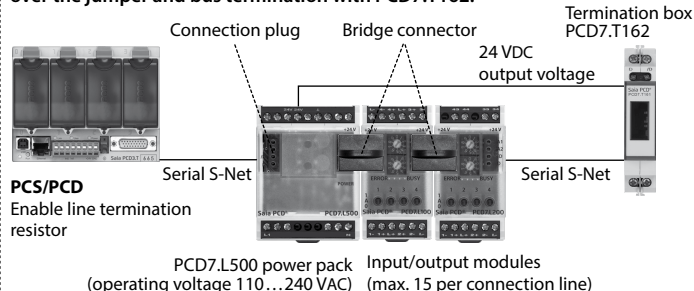
Connect supply voltage and field bus to plug-in screw terminal.



Caution!
Plug-in terminal has max. 1.5 mm² (single wire) connection cross-section.
Check correct connection of bus lines and supply.

Supply and Ground concept

Example with power supply PCD7.L500 with Serial S-Net connection over the terminal block and RAIL-modules with connecting of bus and supply voltage over the jumper and bus termination with PCD7.T162.



Joined without spacing

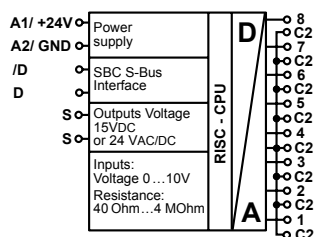
After 15 modules have been joined in sequence, the external supply voltage must be reapplied.

Operational safety:

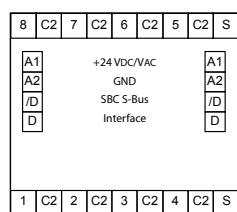
Please take care to following points for a safety operation:

- Maximal cable length
- S-Bus member and segment division
- Potential compensation by one single grounding of power supply
- Termination of both network sides
- Cable shield

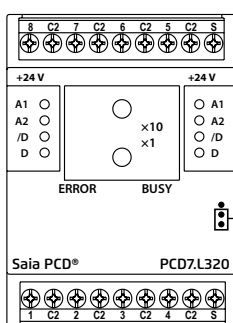
Wiring Diagram



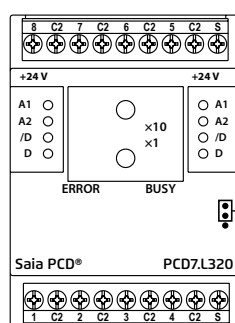
Connection Diagram



Jumper Positions for Voltage feeding of Active Sensors

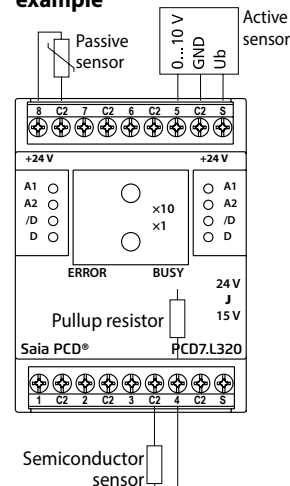


Jumper below the faceplate
Jumper in bottom position:
Contacts S = 15 VDC
(Factory setting)



Jumper below the faceplate:
Jumper in top position:
Contacts S = 24 VAC/DC

Connection example



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Technical details subject to change.

Product Support,
Technical reference website:
www.sbc-support.ch

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Software Description

Data transmission

All SBC S-Bus instructions (level 1) are recognized. Instructions that have no function in the device are answered with <NAK>. The module has integral, automatic baud rate and transmission mode recognition.

Access via S-Bus: Read Register	
Address	Information
5	Baud rate (plain text → kBit/s)
6	Module address
7	Status register
8	Bus timer
9	Current transmission mode (data / parity)
10	Bus error counter (divided into 4 bytes)
11	Bus-Timeout
The following registers can be called together (Display Register "x" to "y") 1 to 4 / 5 to 7 / 8 to 10 / 11 to 14	

Status register:	
Bit 0:	1= Device recognized last transmission 0= Device did not recognize last transmission
Bit 1:	1= Last transmission was a broadcast 0= Last transmission was not a broadcast
Bit 2:	1= Last transmission came from master 0= Last transmission came from a slave
Bit 3:	1= CRC of last message was correct 0= CRC of last message was incorrect
Bit 5:	1= Device has executed an internal reset 0= Device function is OK
Bit 8:	1= Internal bus to EEPROM is OK 0= Internal bus not working perfectly
Bit 9:	1= EEPROM data memory is OK 0= EEPROM data memory is faulty
Bit 10:	1= Baud rate uploaded from EEPROM 0= Baud rate is at default value (9600 Bd.)
All other bits are reserved for factory tests.	

Access via S-Bus: Read Register, Write Register		
Address	Value	Baud rate setting (Baud kbit/s)
5	4	1 200
	5	2 400
	6	4 800
	7	9 600
	8	19 200
	9	38 400
Address	Value range/Value	Meaning
8	2 ↔ 20	20 ↔ 200 ms
9	1	Parity Mode
	2	Data Mode (factory setting)
10	0	Reset of error
11	0	Bus timeout switched off
	1–255	Time in 1 second steps → on no bus activity the outputs will be switched off

Bus timer (register 8)

The value displayed indicates how long the module waits until a telegram is complete. The time is shown in 10 ms steps (e.g.: value 20 → a time of 200 ms). The recommended time is 100 ms, i.e. a register value of 10. If the time is reduced, modules will react faster to telegrams from the master. If there is a heavy load on the master station, a bus timer setting that is too low may lead to lost telegrams. Times of less than 20 ms (value 2) are not permitted. Times that reach the master station within 20 ms of the timeout will lead to lost connections. The value is stored in EEPROM and protected against voltage loss. (Factory setting : 2)

«Write Output»

The write output instruction at address 255 is recognized as broadcast message. Automatic baud function:
“Write or Display output 255” (1 = autobaud active / 0 = autobaud inactive)
N.B: After a power failure, the last baud rate set will be reinstalled.
For further information on the use of modules linked to S-Bus, including all restrictions, count register see documentation 26/339 EN.

Individually configurable Inputs

Register 12 – 19: Configuration of inputs

Access via S-Bus: Read register Write Register. All registers can have shared access. Register content is stored in EEPROM, default 1 (voltage).

For each input, there is a configuration register:

Input	1	2	3	4	5	6	7	8
Register	12	13	14	15	16	17	18	19

The configuration register can assume the following values for the measurement range:

Value	Description
1	Voltage 0 ... 10 V
2	Voltage 0 ... 10 V, with Pullup-resistor 2 kΩ on 5 V, for sensors for example LM235
3	Resistor 40 Ω ... 4 MΩ
4	Conversion with an individual interpolation table, additional configuration is adjusted in register 20
5	Temperature with sensor PT100
6	Temperature with sensor PT500
7	Temperature with sensor PT1000
8	Temperature with sensor NI1000, Temperature-coefficient TK5000
9	Temperature with sensor NI1000, Temperatur-coefficient TK6180
10	Temperature with sensor BALCO 500
11	Temperature with sensor KTY81-110
12	Temperature with sensor KTY81-210
13	Temperature with sensor NTC-1k8 (Thermokon)
14	Temperature with sensor NTC-5k (Thermokon)
15	Temperature with sensor NTC-10k (Thermokon)
16	Temperature with sensor NTC-20k (Thermokon)
17	Temperature with sensor LM235

Register 21–28: measured value

Access via S-Bus: Read Register
Register 21 to 28 can have shared access.

Adresse	Information
21	measured value 1
22	measured value 2
23	measured value 3
24	measured value 4
25	measured value 5
26	measured value 6
27	measured value 7
28	measured value 8

Depending on the measurement range, the following units apply (measured value at numerical value 1).

Spannung	Resistance	Temperature
0.01 V	0.01 Ω	0.1 °C

Register 20: Configuration for an individual interpolation table

Access via S-Bus: Read register Write Register.
Register content is stored in EEPROM, default 1 (voltage).
If a separate interpolation table is to be used, this register serves to set the range of measurement for the sensor, and define whether the interpolation required is linear (e.g. PT1000) or exponential (e.g. NTC, resistance is logarithmic).

Value	Description	Unit	Interpolation
1	Voltage 0 ... 10 V	0.01 V	linear
2	Voltage 0 ... 10 V, with Pullup-resistor 2 kΩ an 5 V	0.01 V	
3	Resistance 40 Ω ... 4 MΩ	0.01 Ω	
4	Voltage 0 ... 10 V	0.01 V	exponential
5	Voltage 0 ... 10 V, with Pullup-resistor 2 kΩ an 5 V	0.01 V	
6	Resistance 40 Ω ... 4 MΩ	0.01 Ω	

Register 30 – 49: Interpolation table

Access via S-Bus: Read register Write Register. All registers can have shared access. Register content is stored in EEPROM, default 0.
If a sensor type is used for which no characteristic curve is stored in the device, it is possible to define an individual interpolation table for conversion.

The table contains up to 10 sample points from the sensor's characteristic curve and interpolates between them. For each sample point there are 2 registers: first the measurement value, then the voltage or resistance value. Below is an example for the PT1000 sensor.

Sample points are added from the top of the table, maximum 10
The table ends when both values are 0, if there are fewer sample points.
Temperature and resistance values must be sorted in ascending or descending order.

Example using a PT1000 temperature sensor with 5 interpolation points:

Sample points	Register Temp.	Register value Unit 0,1 °C	Temp. °C	Register Resistance	Register value Unit 0,01 Ω	Resistance Ω
1	30	–100	–10	31	96086	960.86
2	32	100	10	33	103903	1039.03
3	34	300	30	35	111673	1116.73
4	36	500	50	37	119397	1193.97
5	38	700	70	39	127075	1270.75
6	40	0		41	0	
7	42	0		43	0	
8	44	0		45	0	
9	46	0		47	0	
10	48	0		49	0	

In the PT1000, value 3 must be in configuration register 20
The device uses this to measure resistance values.
For conversion to temperature, linear interpolation is applied.