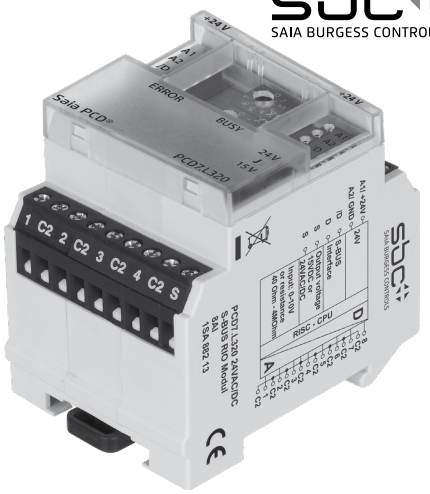
# Saia PCD7.L320

## 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 (×1 / ×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<br>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 MΩ |
| Fault | < 12 kΩ = 0,1 % / > 12 kΩ = 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<br>Device Connection<br>Plug-in terminal | <br>max. 2.5 mm² (terminals)<br>max. 1 mm² (screw-type) |
| Mounting position | any |
| Weight | 104 g |
| Housing dimensions | W × H × D, 50 × 70 × 65 mm |
| Mounting | Mounting standard rail TH35 per IEC 60715 |

### Mounting

Mounting and commissioning to be conform with current regulations:

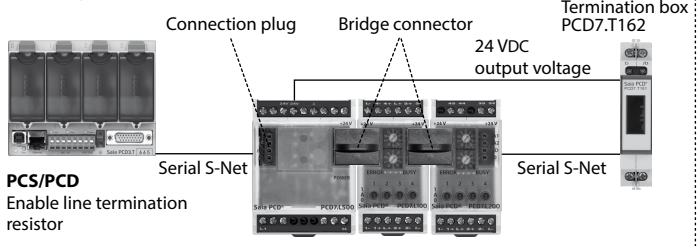
1. Power-off the installation
2. Place module onto 35 mm top hat rail and press down to engage.
3. Strip insulation from 7 mm of cable (max. single wire 4 mm², fine strand 2.5 mm², diameter 0.3 mm to 2.7 mm), insert into binding and tighten with a screwdriver.

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

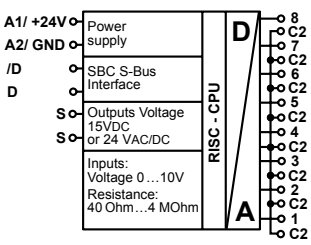
After 15 modules have been joined in sequence, the external supply voltage must be reapplied.

### Operational safety:

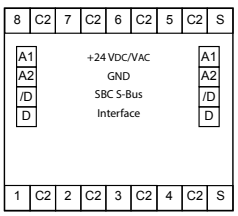
**Please take care to following points for a safety operation:**

– 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

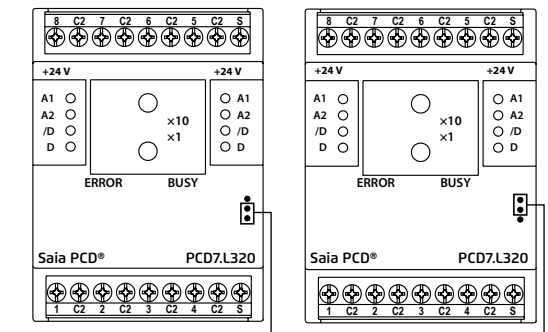
### Wiring Diagram



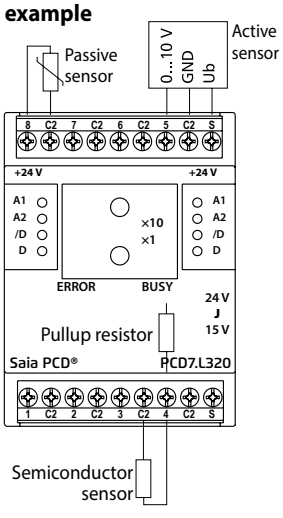

### Connection Diagram




### Jumper Positions for Voltage feeding of Active Sensors




### Connection example





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Technical reference website:
www.sbc-support.com


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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<br>(Display Register "x" to "y") 1 to 4 / 5 to 7 / 8 to 10 / 11 to 14<br>(Is is recommended to call them individually) | |

| **Status register:** | |
|---|---|
| Bit 0: | 1= Device recognized last transmission<br>0= Device did not recognize last transmission |
| Bit 1: | 1= Last transmission was a broadcast<br>0= Last transmission was not a broadcast |
| Bit 2: | 1= Last transmission came from master<br>0= Last transmission came from a slave |
| Bit 3: | 1= CRC of last message was correct<br>0= CRC of last message was incorrect |
| Bit 5: | 1= Device has executed an internal reset<br>0= Device function is OK |
| Bit 8: | 1= Internal bus to EEPROM is OK<br>0= Internal bus not working perfectly |
| Bit 9: | 1= EEPROM data memory is OK<br>0= EEPROM data memory is faulty |
| Bit 10: | 1= Baud rate uploaded from EEPROM<br>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,<br>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.