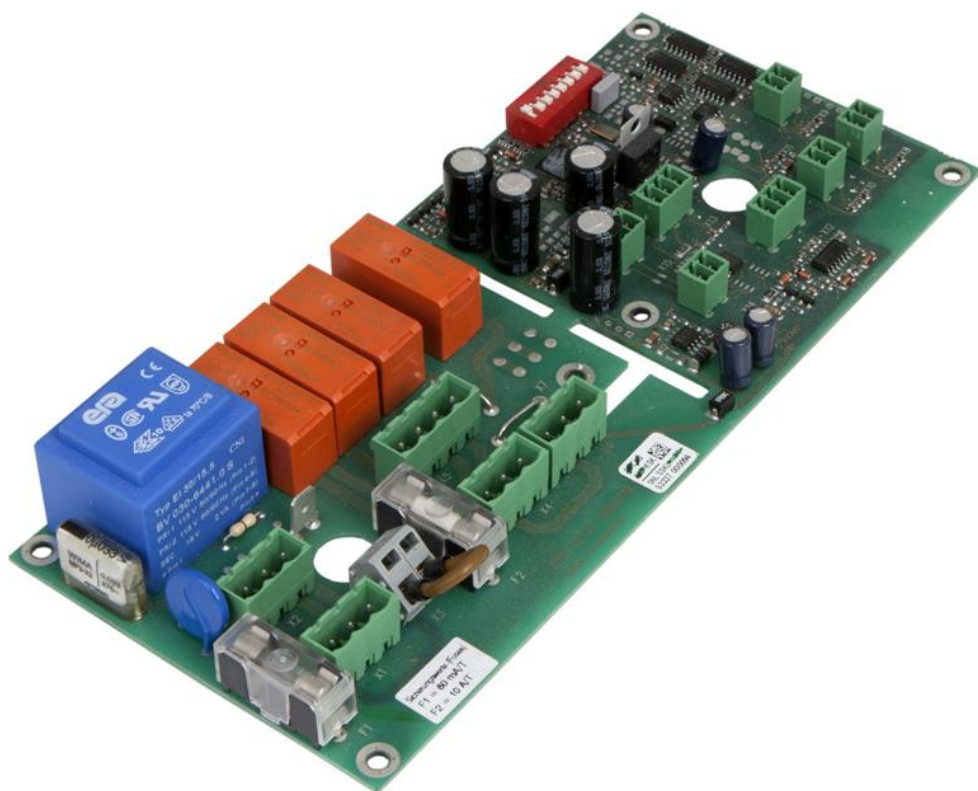


# Expansion Module

# HZS 541-1S



## System Description

The external HZS 541-1S expansion module provides users of biomass heating systems with additional 230 V AC relay outputs, analog inputs to connect PT1000/KTY81 sensors or room units and a digital input.

The electronics are built into an IP2x-sealed plastic housing and can be mounted on a wall or DIN rails. With installation into the IP2x-sealed plastic housing, the seal required for the heating rooms is achieved using PG screw fittings. Replacement fuses are also provided in the cover of the plastic housing. Communication with the other expansion modules or CPU is made over the CAN bus.

The CAN bus or 230 V AC supply is connected to the electronics and can be extended to other electronics. For this extension, terminals are provided so that redundant connections can be avoided. The supply for the internal electronics is generated through a transformer; no additional power supplies must therefore be connected.

The module also provides the option to monitor relay supply over an external temperature monitor. If no temperature monitor is connected, a bridge must be provided at X3. Otherwise, no voltage is applied to the relays!

Delivered with X3 bridged!



## **Configuration**

**1x Digital input**

**4x relay outputs 3 A**

**3x PT1000 inputs (-50 ... +200 °C) or**

**3x KTY81-110 (-25 ... +100 °C) or**

**3x KTY81-122 (-25 ... +100 °C)**

**1x analog input for room unit RTV**

## Technical Data

### Controller performance data

|                                                          |                                              |
|----------------------------------------------------------|----------------------------------------------|
| Processor                                                | AT90CAN32                                    |
| Internal program memory (Flash-PROM)                     | 32 kbytes (Flash)                            |
| Internal data and/or program buffering (internal EEPROM) | 1-kbyte (Flash), no buffer battery required! |
| Interfaces                                               | 1x CAN-Bus                                   |

### Electrical requirements

|                                                        |                                                                    |
|--------------------------------------------------------|--------------------------------------------------------------------|
| Supply voltage for the relays and internal electronics | 230 V AC $\pm 10\%$                                                |
| Power supply frequency                                 | 50-60 Hz                                                           |
| Current consumption electronics                        | 15 mA                                                              |
| Current consumption of electronics and connected loads | maximum 10 A                                                       |
| Fuses                                                  | 10 A (F2) for the relay outputs<br>250 mA (F1) for the transformer |

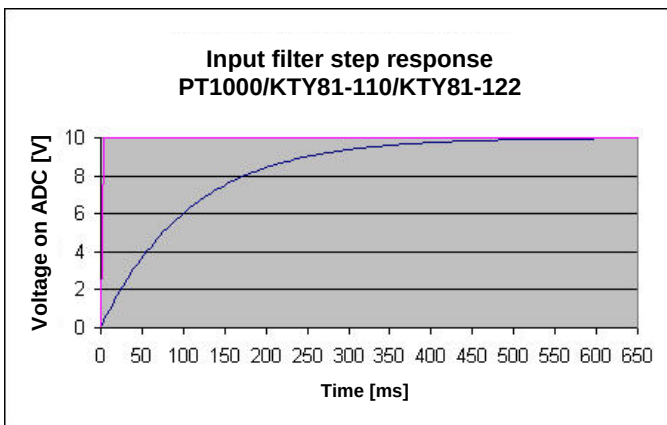
### Relay specifications

|                     |               |
|---------------------|---------------|
| Output voltage      | 230 V         |
| Max. Output current | 3 A           |
| Number of relays    | 4             |
| Relay types         | normally open |
| Switching time      | <10 ms        |

The relay outputs can only be switched individually and a maximum of only 3 relay outputs can be on at the same time! Switching several relays simultaneously causes the supply voltage for the electronics to fail.

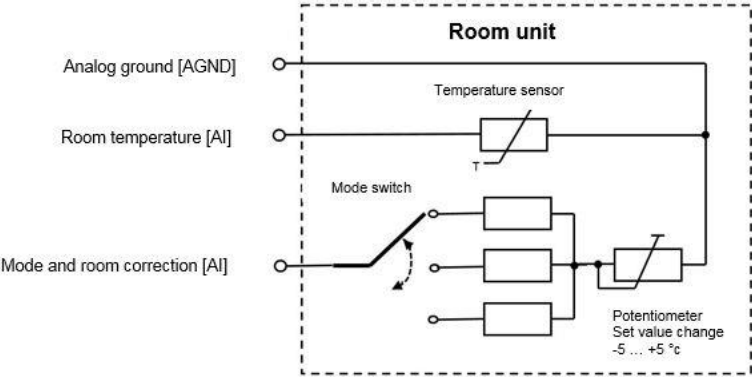
## Temperature input specifications for KTY81-110 / KTY81-122 or (PT1000)

|                             |                 |                 |                 |
|-----------------------------|-----------------|-----------------|-----------------|
| Number of inputs            | 3               |                 |                 |
| Applicable sensor Type      | KTY81-110       | KTY81-122       | PT1000          |
| Measurement range           | -30 ... +145 °C | -30 ... +145 °C | -50 ... +170 °C |
| Sensor range                | 623.6-2170 Ω    | 629.9-2191.9 Ω  | 803.1-1647.7 Ω  |
| Resolution                  | 0.2 °C          | 0.2 °C          | 0.2 °C          |
| Typical current measurement | 1.1 mA          |                 |                 |
| Input resistance            | 8.2 KΩ          |                 |                 |
| Input filter                | 100 ms          |                 |                 |
| Measurement precision       | ±0.5 °C         | ±0.5 °C         | ±0.5 °C         |



Room unit specifications

|                                            |                                                                                         |                                                                                             |             |                                                                                        |
|--------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------|
| Number of room unit connections            | 1                                                                                       |                                                                                             |             |                                                                                        |
| Temperature sensor type                    | PT1000/KTY81-110/KTY81-122/NI1000                                                       |                                                                                             |             |                                                                                        |
| Temperature sensor range                   | -25° ... +100°C                                                                         |                                                                                             |             |                                                                                        |
|                                            | PT1000                                                                                  | KTY81-110                                                                                   | KTY81-122   | NI1000                                                                                 |
| Sensor temperature -25 °C                  | typ. 902 Ω                                                                              | typ. 654 Ω                                                                                  | typ. 660 Ω  | typ. 867 Ω                                                                             |
| Sensor temperature 100 °C                  | typ. 1385 Ω                                                                             | typ. 1696 Ω                                                                                 | typ. 1713 Ω | typ. 1618 Ω                                                                            |
| Mode selector switch (MSS)                 | night  | automatic  |             | day  |
| Set value change +5 °C                     | typ. 1335 Ω                                                                             | typ. 1665 Ω                                                                                 |             | typ. 1004 Ω                                                                            |
| Set value change 0 °C                      | typ. 1380 Ω                                                                             | typ. 1710 Ω                                                                                 |             | typ. 1050 Ω                                                                            |
| Set value change -5 °C                     | typ. 1423 Ω                                                                             | typ. 1753 Ω                                                                                 |             | typ. 1092 Ω                                                                            |
| Resolution temperature sensor              | 0,6 Ω                                                                                   |                                                                                             |             |                                                                                        |
| Resolution MSS set value change            | 0,6 Ω                                                                                   |                                                                                             |             |                                                                                        |
| Measure management temperature sensor      | ±2 Ω                                                                                    |                                                                                             |             |                                                                                        |
| Measurement precision MSS set value change | ±2 Ω                                                                                    |                                                                                             |             |                                                                                        |
| Input resistance                           | 4.7 K                                                                                   |                                                                                             |             |                                                                                        |
| Input filter                               | 100 ms                                                                                  |                                                                                             |             |                                                                                        |



The room unit RTV (05-895-541-Z10) with the KTY81-122 sensor can be ordered from SIGMATEK.  
Room units with PT1000, KTY81-110 or NI1000 can be directly ordered from Co. EAP.

## Digital input specifications

|                     |                 |               |
|---------------------|-----------------|---------------|
| Input voltage       | typically +24 V | maximum +30 V |
| Signal level        | low: <+8 V      | high: >+14 V  |
| Switching threshold | typically +11 V |               |
| Input current       | 5 mA at +24 V   |               |
| Input delay         | typically 5 ms  |               |
| Number              | 1               |               |

## Terminal requirements

|                              |                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Connection technology</b> | <b>Connector terminals are not included in delivery!</b><br><br>The following sprint terminals are required:<br>5x FK-MCP1.5/2-ST-3,5 Phoenix Contact spring terminal connector<br>2x FK-MCP1.5/3-ST-3.5 Phoenix Contact spring terminal connector<br>4x FKC2.5/3-ST-5.08 Phoenix Contact spring terminal connector<br>1x FKC2.5/4-ST-5.08 Phoenix Contact spring terminal connector |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Miscellaneous**

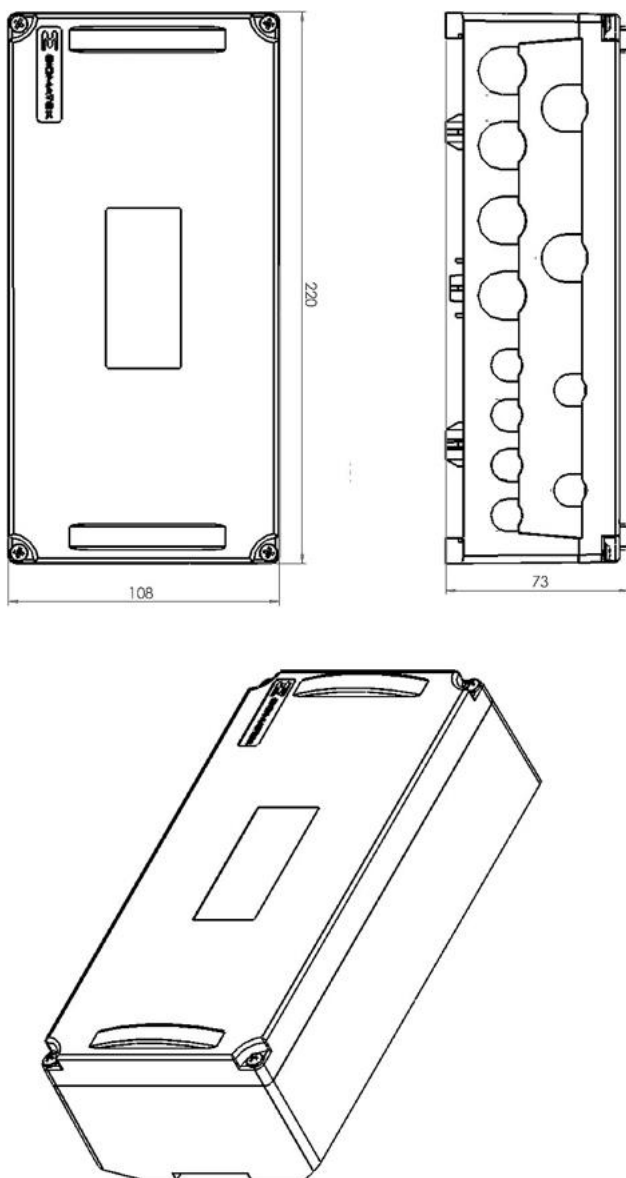
|                  |                                                           |
|------------------|-----------------------------------------------------------|
| Article Number   | 05-895-541-1S                                             |
| Hardware version | 2.x                                                       |
| Station number   | set over DIP-switch, maximum of 255 participants possible |
| HW classes       | HZS54x                                                    |

**Environmental conditions**

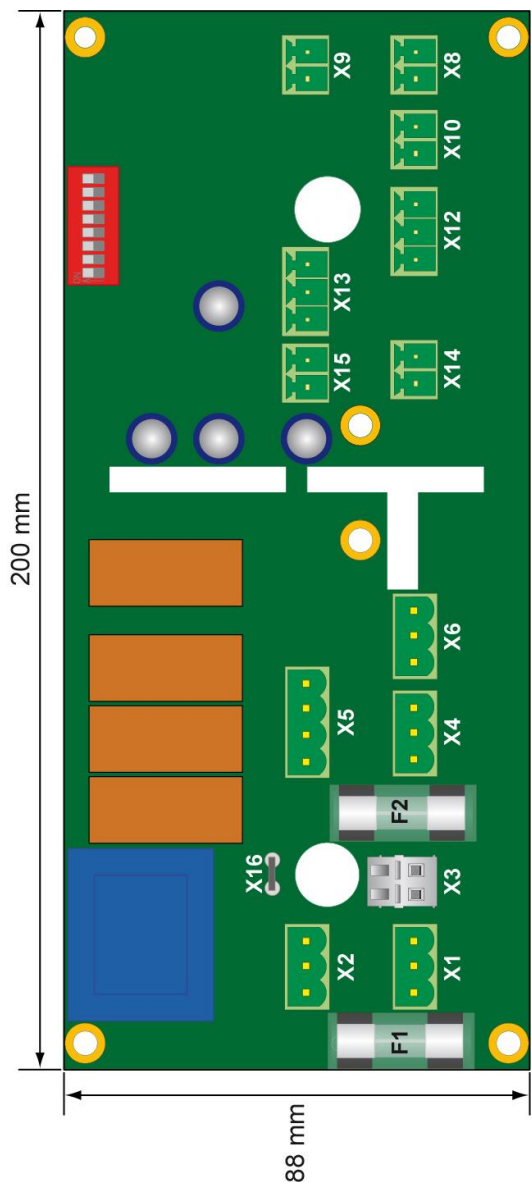
|                         |                                |                      |
|-------------------------|--------------------------------|----------------------|
| Storage temperature     | -20 ... +70 °C                 |                      |
| Operating temperature   | 0-60 °C                        |                      |
| Humidity                | 0-95 %, non-condensing         |                      |
| EMC stability           | according to EN 61000-6-2:2001 |                      |
| Shock resistance        | EN 60068-2-27                  | 150 m/s <sup>2</sup> |
| Housing protection type | IP2x                           |                      |



## Mechanical Dimensions



# Terminal Overview



## Terminal Layout

### X1: 230 V AC power line

3-pin Phoenix RM5.08 connector



| Pin | Function   |
|-----|------------|
| 1   | Phase      |
| 2   | Neutral    |
| 3   | Earth wire |

### X2: 230 V AC power dissipation

3-pin Phoenix RM5.08 connector



| Pin | Function   |
|-----|------------|
| 1   | Phase      |
| 2   | Neutral    |
| 3   | Earth wire |

### X3: Temperature monitor (Standard: clip)



| Pin | Function           |
|-----|--------------------|
| 1   | Phase              |
| 2   | Relay supply phase |

1

**If no external temperature monitor is connected, pins 1 and 2 must be connected to one another with a bridge.**

### X4: 230 V AC relay output 3 A

3-pin Phoenix RM5.08 connector

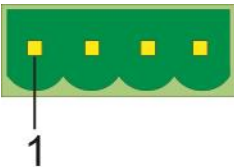


| Pin | Function |
|-----|----------|
| 1   | LR1      |
| 2   | N        |
| 3   | PE       |

1

### X5: 230 V AC relay output 3 A

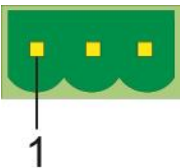
4-pin Phoenix RM5.08 connector



| Pin | Function |
|-----|----------|
| 1   | LR2      |
| 2   | LR3      |
| 3   | N        |
| 4   | PE       |

### X6: 230 V AC relay output 3 A

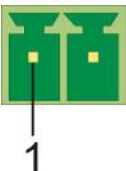
3-pin Phoenix RM5.08 connector



| Pin | Function |
|-----|----------|
| 1   | LR4      |
| 2   | N        |
| 3   | PE       |

### X8 Temperature input (AI1)

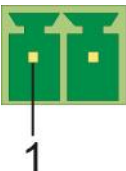
2-pin Phoenix connector RM 3.5



| Pin | Function |
|-----|----------|
| 1   | AI1      |
| 2   | AGND     |

### X9 Temperature input (AI2)

2-pin Phoenix connector RM 3.5



| Pin | Function |
|-----|----------|
| 1   | AI2      |
| 2   | AGND     |

### X10 Temperature input (AI3)

2-pin Phoenix connector RM 3.5



| Pin | Function |
|-----|----------|
| 1   | AI3      |
| 2   | AGND     |

### X12: Room unit analog inputs (AI4 and AI5)

3-pin Phoenix RM3.5 connector



| Pin | Function                 |
|-----|--------------------------|
| 1   | room temperature         |
| 2   | mode and room correction |
| 3   | AGND                     |

### X13: digital input (DI1)

3-pin Phoenix RM3.5 connector



| Pin | Function |
|-----|----------|
| 1   | +24 V    |
| 2   | DI1      |
| 3   | GND      |

**The internal +24 V for the electronics cannot draw more than 10 mA!  
Thereby, a maximum of only 3 relays can be on at the same time!**

**X14: CAN-Bus IN – CAN-Bus connection**

2-pin Phoenix connector RM 3.5



| Pin | Function        |
|-----|-----------------|
| 1   | CAN A (CAN LOW) |
| 2   | CAN B (High)    |

**X15 CAN-Bus OUT – CAN-Bus connection**

2-pin Phoenix connector RM 3.5



| Pin | Function        |
|-----|-----------------|
| 1   | CAN A (CAN LOW) |
| 2   | CAN B (High)    |

**X16: Ground connection**

Included with delivery are dummy covers on the cable inlets, which can be replaced with PG7 (low voltage lines) or PG11 (230 V lines) screw fittings as required. The fittings are not included with delivery!

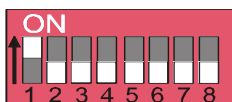
Opening the cover and connecting the cable can only be done by trained personnel and with the 230 V AC power supply disconnected!  
Current safety regulations and rules must be observed!

Do not connect wiring while voltage is applied!  
X1 (current supply IN 230 V AC) can only be supplied with power after the wiring has been completed and the housing closed.  
**CAUTION: On the circuit board, it is possible to come into contact with 230 V voltages!**

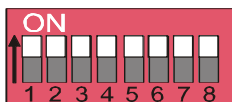
**Do not insert connectors while voltage is applied!**

## DIP-Switch Station Numbers (binary)

E.g.:



= 1



= 255



= 81

## CAN BUS Setup

This section explains how to configure a CAN bus correctly. The following parameters must first be set: Station number

### CAN bus station number

Each CAN bus station is assigned its own station number (can be set from 0 to 255) With this station number, data can be exchanged with other stations connected to the bus. Up to 255 stations can be installed in a CAN bus system. In a CAN bus system however, each station number can only be assigned once.

| SW 1 | SW 2 | SW 3 | SW 4 | SW5 | SW6 | SW7 | SW8 | Station |
|------|------|------|------|-----|-----|-----|-----|---------|
| 0    | 0    | 0    | 0    | 0   | 0   | 0   | 0   | 0       |
| 1    | 0    | 0    | 0    | 0   | 0   | 0   | 0   | 1       |
| 0    | 1    | 0    | 0    | 0   | 0   | 0   | 0   | 2       |
| 1    | 1    | 0    | 0    | 0   | 0   | 0   | 0   | 3       |
| 0    | 0    | 1    | 0    | 0   | 0   | 0   | 0   | 4       |
| 1    | 0    | 1    | 0    | 0   | 0   | 0   | 0   | 5       |
| 0    | 1    | 1    | 0    | 0   | 0   | 0   | 0   | 6       |
| 1    | 1    | 1    | 0    | 0   | 0   | 0   | 0   | 7       |
| 0    | 0    | 0    | 1    | 0   | 0   | 0   | 0   | 8       |
| 1    | 0    | 0    | 1    | 0   | 0   | 0   | 0   | 9       |
| 0    | 1    | 0    | 1    | 0   | 0   | 0   | 0   | 10      |
| 1    | 1    | 0    | 1    | 0   | 0   | 0   | 0   | 11      |
| 0    | 0    | 1    | 1    | 0   | 0   | 0   | 0   | 12      |
| 1    | 0    | 1    | 1    | 0   | 0   | 0   | 0   | 13      |
| 0    | 1    | 1    | 1    | 0   | 0   | 0   | 0   | 14      |
| 1    | 1    | 1    | 1    | 0   | 0   | 0   | 0   | 15      |
| 0    | 0    | 0    | 0    | 1   | 0   | 0   | 0   | 16      |
| ...  |      |      |      |     |     |     |     |         |
| 1    | 1    | 0    | 1    | 1   | 1   | 1   | 1   | 251     |
| 0    | 0    | 1    | 1    | 1   | 1   | 1   | 1   | 252     |
| 1    | 0    | 1    | 1    | 1   | 1   | 1   | 1   | 253     |
| 0    | 1    | 1    | 1    | 1   | 1   | 1   | 1   | 254     |
| 1    | 1    | 1    | 1    | 1   | 1   | 1   | 1   | 255     |

A terminating resistor (150 R) must be inserted at the end of the CAN bus.



## Status LED

| LED Status         | Definition                                                     |
|--------------------|----------------------------------------------------------------|
| LED blinks (20 Hz) | general error                                                  |
| LED blinks (4 Hz)  | controller is running, CAN bus communication with CPU active   |
| LED blinks (1 Hz)  | controller is running, CAN bus communication with CPU inactive |
| LED off            | controller not active, no supply                               |

## Wiring Guidelines

The signals recorded by the analog inputs are very small in comparison to the digital signals. To ensure error-free operation, a careful wiring method must be followed:

- The lines connected to the source of the analog signals must be as short as possible and parallel wiring to digital signal lines must be avoided.
- The signal lines must be shielded.
- 230 V AC lines (power circuit and relay outputs etc.) must not be wired parallel to analog and digital input lines.

### Wiring guidelines for digital inputs

The input filters used, which suppress noise signals, allow operation in harsh environmental conditions. In addition, a careful wiring method is recommended to ensure error-free function.

The following guidelines should be observed:

- Avoid parallel connections between input lines and load bearing or AC circuits.
- Correct wiring to mass

### General information on the relay outputs

All relay coils are powered by the internal +24 V DC supply. The cross sectional area of the relay outputs must be large enough for the maximum continuous current at 230 V AC for each connected load as used in the specifications for the relay outputs. It is important to note that at high currents, thermal loads affect the wiring and with continuous over loading can lead to a break down! Hi voltages can current leakage or arcing between different potentials!

To ensure error-free operation, a careful wiring method must be followed.

- Avoid parallel wiring between input lines and load-bearing circuits.

## Wiring guidelines for analog inputs

The analog signals are very small in comparison to the digital signals. To ensure error-free operation, a careful wiring method must be followed.

- The connection lines to the source of the analog signals must be as short as possible and parallel wiring to digital signal lines or AC circuits must be avoided.
- The signal lines should be 2-pin shielded or twisted pair wires.

## CAN bus wiring guidelines

For the CAN bus wiring, twisted-pair shielded wires must be used. The cable shielding must be connected to earth either directly before the terminal over a large surface and with low Ohms (grounding clamps) or with a blade terminal.

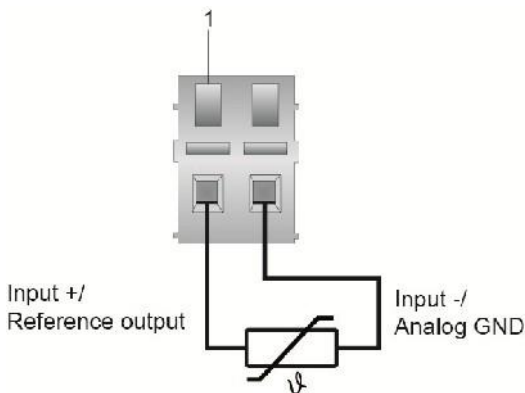
Noise signals can therefore be prohibited from reaching the electronics and affecting the function.

## Temperature Measurement with Thermo Resistors

### 2-wire measurement

The 2-wire measurement is only recommended for short sensor wires, as the resistance of the wire affects the measurement.

The positive input must be connected with the reference output and the negative input with analog GND.



# Analog Input Specifications

## Temperature resistors

|                                |                                                                |
|--------------------------------|----------------------------------------------------------------|
| Measurement range              | 640-1780 $\Omega$                                              |
| Measurement range 1: KTY81-110 | 653-1696 $\Omega$ (-25 ... +100 °C)<br>resolution: 0.15 °C/d   |
| Measurement range 2: KTY81-122 | 660-1717 $\Omega$ (-25 ... +100 °C)<br>resolution: 0.15 °C/d   |
| Measurement range 3: PT1000    | 803-1758,6 $\Omega$ (-50 ... +200 °C)<br>resolution: 0.35 °C/d |
| Input filter                   | 100 ms                                                         |

## Room temperature setting (X12)

If a **room temperature switch** is used to regulate floor heating, it must be connected with the module according to the following connector layout at **X12**.



To connect the **room unit**, use a 3-wire cable with a minimum cross section of **0.25 mm<sup>2</sup>** (maximum **1.5 mm<sup>2</sup>**) (e.g. LiYY 3x0.25 or LiYY 3x1.5)!

