



PRM-X.2

Extension module

User guide

PRM-X.2_3-EN-127842-1.4

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Subject to technical changes and misprints

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1 Introduction

1.1 Terms and abbreviations

- **ALP** – programming software akYtec ALP for programming PR series relays, based on Function Block Diagram (FBD) programming language.
- **Application** – user program created using ALP software.
- **ADC** – analog-digital converter.
- **DAC** – digital-analog converter.

1.2 Symbols and key words

**WARNING**

WARNING indicates a potentially dangerous situation that could result in death or serious injuries.

**CAUTION**

CAUTION indicates a potentially dangerous situation that could result in minor injuries.

**NOTICE**

NOTICE indicates a potentially dangerous situation that could result in damage to property.

**NOTE**

NOTE indicates helpful tips and recommendations, as well as information for efficient and trouble-free operation.

2 Overview

PRM extension module provides additional inputs and outputs for the basic device PR200. The module inputs and outputs are controlled by a program running on PR200. To enable control, the module should be added to the PR200 configuration in ALP (sect. 4).

The module is a passive device and cannot be used without connection with the basic device over internal bus.

All modifications are designed in a plastic enclosure for DIN rail mounting.

Each PRM module is powered independently of the basic device. The basic device and the modules can be operated with different supply voltages.

2.1 Intended use

Extension modules of PRM series have been designed and built solely for the intended use described in this manual, and may only be used accordingly. The technical specifications contained in this manual must be observed.

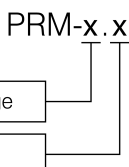
The module may be operated only in properly installed condition.

Improper use

Any other use is considered improper. Especially to note:

- This device should not be used for medical devices which receive, control or otherwise affect human life or physical health.
- The device should not be used in an explosive environment.
- The device should not be used in an atmosphere with chemically active substance.

2.2 Ordering code

PRM-x.x		Supply voltage	I/O
Supply voltage I/O		230 – 230 (94...264) V AC	1 – 8 DI, 8 DO
		24 – 24 (19...30) V DC	2 – 4 AI, 4 DO
			3 – 4 AI, 2 AO

2.3 Front indicators

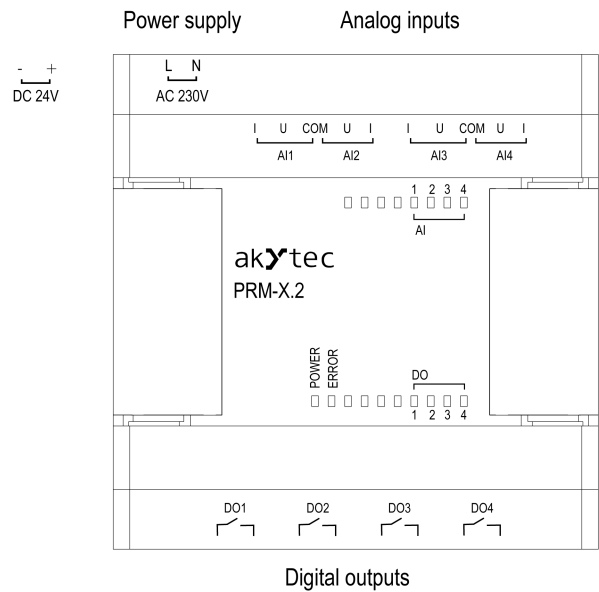


Fig. 2.1 Front view

Table 2.1 LED indicators

Indicator	Color	State	Value
POWER	Green	ON	Power on
ERROR	Red	Flashing	No communication with the basic device
			Device model does not match the model specified in the project
			The firmware version of the basic device and the module are incompatible
AI	Green	ON	Parameter Sensor type is set to Switch contact . HIGH level on corresponding input
DO	Green	ON	Parameter Output signal type selected

3 Specifications

3.1 Specifications

Table 3.1 General specification

Device	PRM-230.3	PRM-24.3
Power supply	230 (90...264) V AC; 50 (47...63) Hz	24 (19 ... 30) V DC
Power consumption, max.	8 VA	4 W
Galvanic isolation	2300 V	510 V
Inputs	Digital	—
	Analog	4
Out-puts	Digital	4
	Analog	—
Inter- nal bus	Frequency	2.25 MHz
	Packet rate (each 16 bit)	4000 packet/s
	Module number, max.	2
IP Code	IP20	
Dimensions	88 × 90 × 58 mm	
Mounting	DIN rail (35 mm)	
Weight	approx. 250 g	

3.2 Analog inputs

Table 3.2 Analog inputs

ADC resolution	12 bit	
Sampling time, max.	1 ms	
Galvanic isolation	no	
Analog mode 1 (Linear input)		
Input signal	0-10 V, 4-20 mA	
Input resistance for 0-10 V input	10 kΩ	
Basic error	±0.5 %	
Temperature influence	±0.5 % / 10 °C	
Analog mode 2 (Temperature sensors)		
Input signal	see <i>Tab.</i>	
Measurement range	0...300 kΩ	
Least significant bit value, max.	1 °C	
Basic error	0...150 kΩ	±1.0 %
	151...300 kΩ	±2.0 %
	RTD, NTC and PTC	±1.5 %
Temperature influence	±0.5 % / 10 °C	
Digital mode		
Nominal input voltage	24 V DC	
HIGH/LOW threshold (adjustable in ALP)	1...8 V	
LOW/HIGH threshold (adjustable in ALP)	2...9 V	
Input current	1...15 mA	
Pulse length, min.	2 ms	
Signal frequency, max.	250 Hz	

Table 3.3 Sensors (analog mode 2)

Sensor	Measurement range
RTD	
Pt 500 ($\alpha = 0.00385 \text{ }^{\circ}\text{C}^{-1}$)	−200...+850 °C

Sensor	Measurement range
500P ($\alpha = 0.00391 \text{ }^{\circ}\text{C}^{-1}$)	-200...+850 $^{\circ}\text{C}$
Cu 500 ($\alpha = 0.00426 \text{ }^{\circ}\text{C}^{-1}$)	-50...+200 $^{\circ}\text{C}$
500M ($\alpha = 0.00428 \text{ }^{\circ}\text{C}^{-1}$)	-180...+200 $^{\circ}\text{C}$
Ni500 ($\alpha = 0.00617 \text{ }^{\circ}\text{C}^{-1}$)	-60...+180 $^{\circ}\text{C}$
Cu 1000 ($\alpha = 0.00426 \text{ }^{\circ}\text{C}^{-1}$)	-50...+200 $^{\circ}\text{C}$
1000M ($\alpha = 0.00428 \text{ }^{\circ}\text{C}^{-1}$)	-180...+200 $^{\circ}\text{C}$
Pt 1000 ($\alpha = 0.00385 \text{ }^{\circ}\text{C}^{-1}$)	-200...+850 $^{\circ}\text{C}$
1000P ($\alpha = 0.00391 \text{ }^{\circ}\text{C}^{-1}$)	-200...+850 $^{\circ}\text{C}$
Ni 1000 ($\alpha = 0.00617 \text{ }^{\circ}\text{C}^{-1}$)	-60...+180 $^{\circ}\text{C}$
Thermistors / NTC	
B57861S series, 2 k Ω , $B_{25/100} = 3560\text{K}$	-55...+100 $^{\circ}\text{C}$
B57861S series, 3 k Ω , $B_{25/100} = 3988\text{K}$	-55...+145 $^{\circ}\text{C}$
B57861S series, 5 k Ω , $B_{25/100} = 3988\text{K}$	-35...+145 $^{\circ}\text{C}$
B57861S series, 10 k Ω , $B_{25/100} = 3988\text{K}$	-35...+155 $^{\circ}\text{C}$
B57861S series, 30 k Ω , $B_{25/100} = 3964\text{K}$	-20...+155 $^{\circ}\text{C}$
B57861S series, 50 k Ω , $B_{25/100} = 3760\text{K}$	-10...+155 $^{\circ}\text{C}$
NTC 3435, 10 k Ω	-40...+105 $^{\circ}\text{C}$
NTC 3977, 10 k Ω	-40...+125 $^{\circ}\text{C}$
Thermistors / PTC	
KTY82-110	-55...+150 $^{\circ}\text{C}$
KTY82-120	
KTY82-121	
KTY82-122	
KTY82-150	
KTY82-151	

3.3 Digital outputs

Table 3.4 Digital outputs

Type	relay (NO)
Switching capacity	5 A, 250 V AC (resistive load)
	3 A, 30 V DC
Load current at 5 V DC, min.	10 mA
Service life, electrical	200,000 switching cycles
	100,000 switching cycles
Galvanic isolation	2830 V, individual

3.4 Galvanic isolation

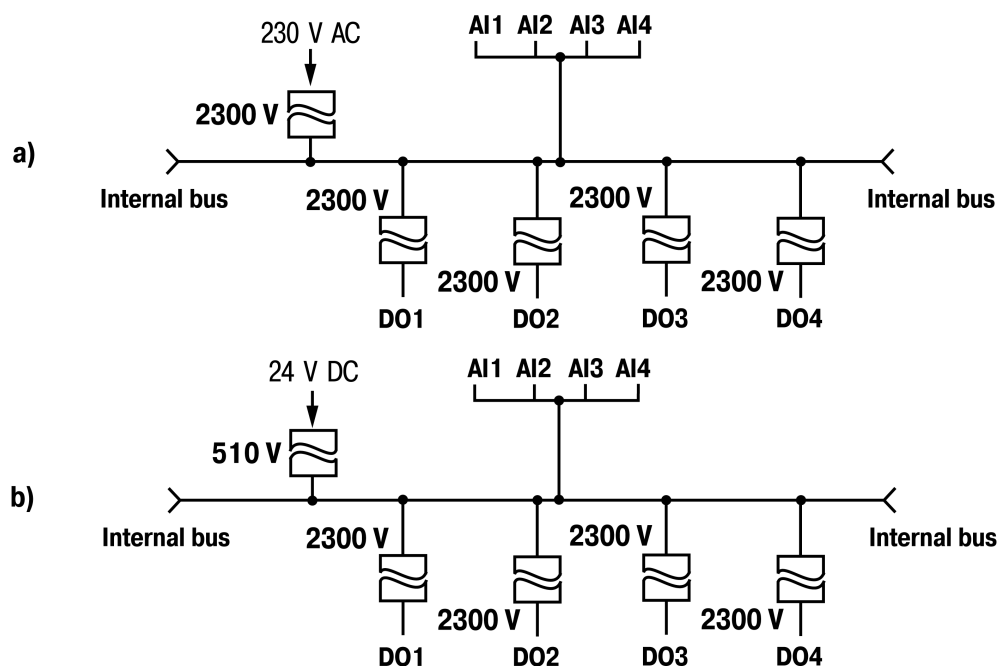


Fig. 3.1 Galvanic isolation PRM-2.230 (a) and PRM-2.24 (b)

3.5 Environmental conditions

The device is designed for natural convection cooling. It should be taken into account when choosing the installation site.

The following environment conditions must be observed:

- clean, dry and controlled environment, low dust level
- closed non-hazardous areas, free of corrosive or flammable gases

Conditions	Permissible range
Ambient operating temperature	-20...+55°C
Storage temperature	-25...+55°C
Relative humidity	up to 80% (at +25°C, non-condensing)
Altitude	up to 2000 m above sea level
EMC immunity	conforms to IEC 61000-6-2
EMC emission	conforms to IEC 61000-6-4

4 Installation



WARNING

Electric shock could kill or seriously injure.
All electrical connections must be performed by a fully qualified electrician.
Ensure that the mains voltage matches the voltage marked on the nameplate.
Ensure that the device is provided with its own power supply line and electric fuse.



CAUTION

The device must be powered off before connecting to internal bus or peripheral devices. Switch on the power supply only after the wiring of the device has been completed.
Remove the terminal blocks only after powering off the device and all connected equipment.
Do not feed any external devices from the power contacts of the device.



NOTICE

Supply voltage for 24 VDC models may not exceed 30 V. Higher voltage can damage the device.
If the supply voltage is lower than 19 VDC, the device cannot operate properly but will not be damaged.



NOTICE

Signal cables should be routed separately or screened from the supply cables.
Shielded cable should be used for the signal lines to ensure the EMC precautions.



NOTE

Before switching on, make sure that the device was stored at the specified ambient temperature (-20 ... +55 °C) for at least 30 minutes.

The extension module of PRM series are mounted on DIN rail to the right of the PR200 basic device.

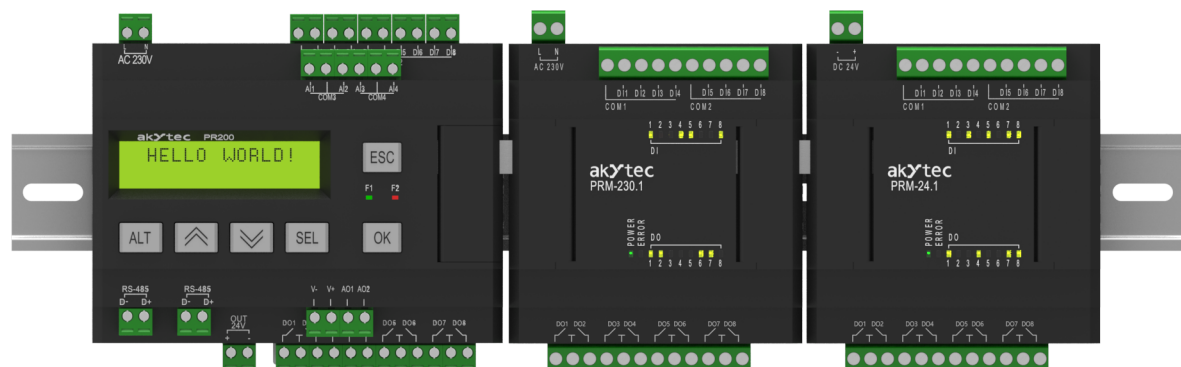


Fig. 4.1

After mounting on DIN-rail, an internal bus connection between PR200 and the module should be implemented ([Sect. 4.1](#)). Then the power supply and the peripheral devices should be connected to the module terminal blocks ([Sect. 4.2](#)).

For dimension drawing see [Appendix A.](#)

4.1 Internal bus

An internal high-speed bus provides the same high-speed performance of the module that of the basic device. It allows reading of the input values and writing of the output values of the module within one program cycle.

The PRM modules are connected to PR200 in series. Maximum two modules can be connected. To implement the internal bus, connect PRM to PR200, using the supplied 4.5 cm flat cable.

PRM has two **EXT** connectors located under the right and left covers on the device front. The connector under the left cover is used to connect the 1st PRM to PR200 or the 2nd PRM to the 1st one. The connector under the right cover is used to connect PR200 to the 1st PRM or the 1st PRM to the 2nd one.

When connected, the flat cable should be placed in a special recess under the cover to enable PRM to be pushed close to PR200 (*Fig. 4.2*).

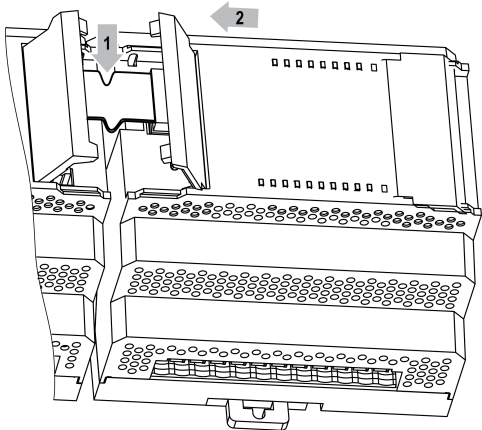


Fig. 4.2

4.2 Terminal block layout

For terminal block layout see *Fig. 4.3 and 4.4*.

For terminal assignment see *Tab. 4.1*

1	2	35	36	37	38	39	40	41	42	43	44
											
24 V DC		AI1		COM		AI2		AI3		COM AI4	
PRM-24.2											
DO1				DO2		DO3		DO4			
23 24		25 26		27 28		29 30					

Fig. 4.3 PRM-24.2 terminal block layout

1	2	35	36	37	38	39	40	41	42	43	44				
230 V AC		I	U	U	I	I	U	U	I	I	U				
		AI1	COM	AI2	AI3	COM	AI4								
PRM-230.2															
DO1				DO2	DO3	DO4									
23	24	25	26	27	28	29	30								

Fig. 4.4 PRM-230.2 terminal block layout

Table 4.1 Terminal assignment

No.	Marking	Description	No.	Marking	Description
1	DC 24 V / - or AC 230 V	Power supply	23	DO1	Digital output DO1
2	DC 24 V / + or AC 230 V	Power supply	24		
35	AI1 / I	AI1 terminal 1	25	DO2	Digital output DO4
36	AI1 / U	AI1 terminal 2	26		
37	COM	AI1 / AI2 common terminal	27	DO3	Digital output DO3
38	AI2 / U	AI2 terminal 1	28		
39	AI2 / I	AI2 terminal 2	29	DO4	Digital output DO4
40	AI3 / I	AI3 terminal 1	30		
41	AI3 / U	AI3 terminal 2	—	—	—
42	COM	AI3 / AI4 common terminal	—	—	—
43	AI4 / U	AI4 terminal 1	—	—	—
44	AI4 / I	AI4 terminal 2	—	—	—

4.2.1 Analog inputs wiring

**NOTICE**

Before connecting analog sensors, ensure the input signal selected in configuration corresponds to the connected one. Wrong signal can cause the device damage. The COM terminals are internally connected.

Table 4.2 Sensor cable requirements

Signal	Cable length, max. (m)	Total resistance, max. (Ω)
4-20 mA	100	5
0-10 V	100	100
2-wire RTD, thermistors, other resistive signals	100	—

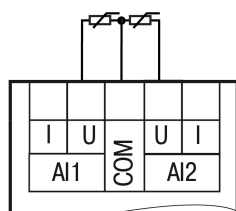


Fig. 4.5 RTD wiring

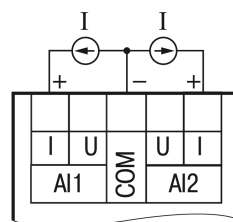


Fig. 4.6 I sensor wiring

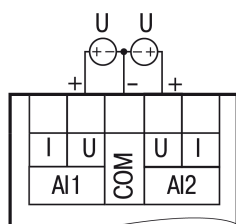


Fig. 4.7 U sensor wiring

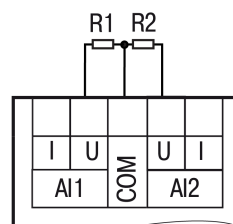


Fig. 4.8 Resistance sensor wiring

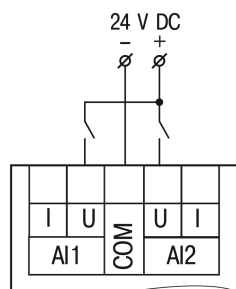


Fig. 4.9 Switch contact wiring

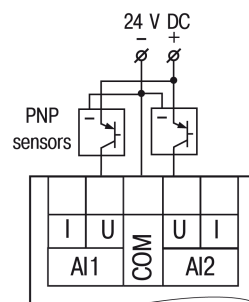
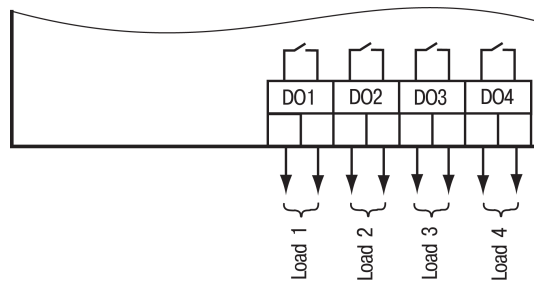


Fig. 4.10 3-wire sensor with PNP output

4.2.2 Digital output wiring

*Fig. 4.11 Relay output wiring*

4.3 Quick replacement

PRM is equipped with plug-in terminal blocks which enable quick replacement of the device without disconnecting the existing wiring.

To replace the device:

1. Power off all connected lines including power supply.
2. Remove all detachable parts of the terminal blocks
3. Replace PRM
4. Connect detachable parts with existing wiring to the device

5 Configuration

To add a module to the basic device configuration:

1. Open a PR200 project in ALP.
2. Open **Device configuration**.
3. Select the item '**Extension modules**' in the structure tree.
4. Add PRM module using the context menu (*Fig. 5.1*)

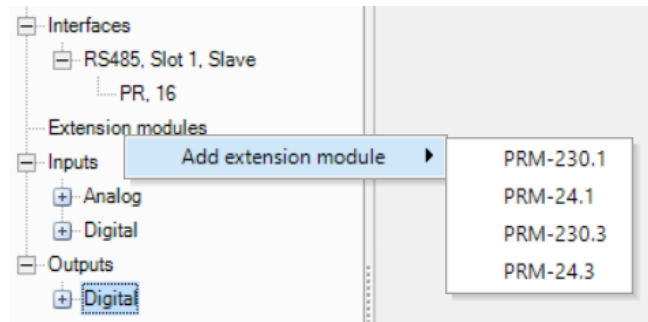


Fig. 5.1

The parameter **Extension number** (*Fig. 5.2*) is the position of PRM, when counting from left to right from PR200. The next module to the left of PR200 should be added to the configuration first to be assigned as No.1. The next added module is always assigned as No.2. If there is no module assigned as No.1, a new module cannot be assigned as No.2.

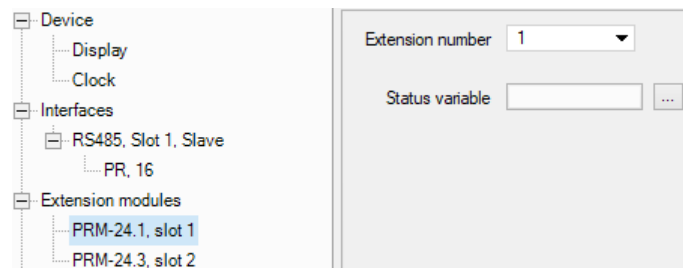


Fig. 5.2

Data exchange between PR200 and PRM No.2 is carried out through PRM No. 1. If PRM No.1 is powered off, the data exchange between PR200 and PRM No.2 is interrupted. PRM can be removed from the project only after disconnecting all the variables assigned to its inputs and outputs. The position of PRM in the configuration can be changed using the context menu.

The project can be transferred to PR200 irrespective of whether the modules are connected or not.

When a module is added to configuration, additional inputs AI1... AI4 and outputs Q1...Q4 with the module number in brackets appear in the workspace (*Fig. 5.3*).

When a module is added to the project, its inputs and outputs become available for polling.

To read the inputs or change the status of the outputs, create variables of the appropriate type and associate them with module I/Os. If it is necessary to sample the module I/Os over the network, they have to be associated with network variables.

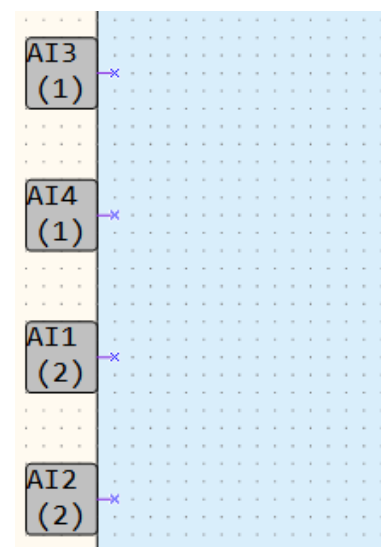


Fig. 5.3

Table 5.1 Module parameters

Parameter	Description
Common	
Status	Select a BOOL variable to read the status: – TRUE, if the communication with PRM is established and the PRM model is the same as the specified in the configuration – FALSE, if the communication with PRM is lost or the PRM model differs from that specified in the configuration
Inputs	
Sensor type	The type of sensor connected to the inputs. The input value will be converted into the unit corresponding to the sensor type (for example, with RTD or thermocouple, the input values will be converted into degrees Celsius). The default setting OFF means that the input is disabled and will not be sampled. The setting OFF for unused channels increases the sampling rate.
Filter time constant	0...65 seconds, 0 – filter disabled
Decimal point position	Position of decimal point
Lower measuring limit	Minimum level of sensor output signal
Upper measuring limit	Maximum level of sensor output signal
Outputs	
Safe state	Output signal in case of loss of communication with the basic device

6 Firmware update

If a new project is loaded into the device and the firmware of the device and extension module are incompatible, the connection between them will be interrupted and the red **ERROR** indicator on the module will flash.

To update firmware:

1. Connect the module to the basic device over internal bus.
2. Connect the basic device to the PC.
3. Switch on the power supplies of the basic device and the module.
4. Start ALP and select the menu item **Device > Firmware updater**.
5. Click **No** in the opened dialog to select the module manually.
6. Open the tab **Extension modules**, select the extension number and the device model and confirm with **Select**



NOTICE

Ensure reliable power supply of the basic device and modules during the update. If it failed, the update should be probably repeated.

7 Calibration

If the accuracy of the input or output of the device is no longer in accordance with the specification, it can be calibrated. The module must be connected to the basic device to be calibrated. The calibration is carried out the same way as of the basic device.



CAUTION

Ensure reliable power supply of the basic device and modules during the calibration. If it fails, the calibration should be repeated.

Each analog input and output has its own calibration coefficients for each sensor type.

The calibration coefficients are calculated based on the ratio between the current input signal and the reference signal and stored in the non-volatile device memory.

If the calculated coefficients go beyond the permissible limits, a message about the error cause will be displayed.

7.1 Input calibration

Input signals: 4-20 mA, 0-10 V, 0-300 kΩ.

To calibrate input:

1. Connect the reference signal source to the input ([Fig. 7.1](#)).

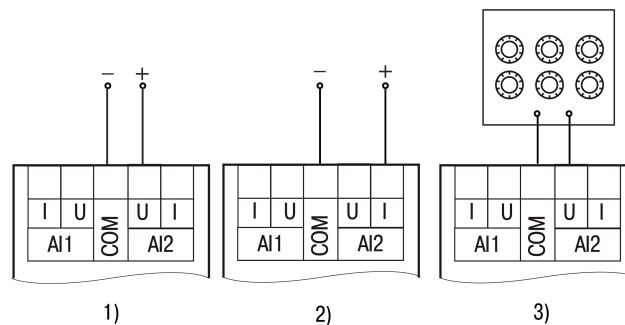


Fig. 7.1 Connection of the reference signal source to an input

2. Connect the module to the basic device over internal bus.
3. Connect the basic device to the PC.
4. Switch on the power supplies of the basic device and the module.
5. Start ALP and select the menu item **Device > Calibration** to start the calibration tool.
6. Select the appropriate PRM model in the dialog window.
7. Select **Analog inputs** as calibration target.
8. Select the type of input signal and other calibration parameters ([Fig. 7.2](#)).

Calibration settings

Input parameters

Sensor type: 4-20 mA

Lower measuring limit, mA: 5

Midpoint, mA: 12

Upper limit, mA: 19

Analog filter (0 - 60 s): 1

External resistor (45-50 ohm): not used

[Reset settings](#)

Calibrate: All

Back Next Cancel

Fig. 7.2 Parameter configuration

Set the three points for calibration curve and the filter time constant. The greater the filter time constant, the longer the calibration process will take, but the more accurate calculation of the coefficients will be achieved.

Select the input to calibrate. If you select **All**, all inputs will be calibrated sequentially, therefore the appropriate reference signal has to be applied to all inputs.

9. Click **Next** and follow the instructions.

8 Maintenance



WARNING
Cut off all power before maintenance.

The maintenance includes:

- cleaning of the housing and terminal blocks from dust, dirt and debris
- checking the device fastening
- checking the wiring (connecting leads, fastenings, mechanical damage)



NOTICE
The device should be cleaned with a damp cloth only. No abrasives or solvent-containing cleaners may be used.

9 Transportation and storage

Pack the device in such a way as to protect it reliably against impact for storage and transportation. The original packaging provides optimum protection.

If the device is not taken immediately after delivery into operation, it must be carefully stored at a protected location. The device should not be stored in an atmosphere with chemically active substances.

Permitted storage temperature: -25...+55 °C



NOTE

***The device may have been damaged during transportation.
Check the device for transport damage and completeness!
Report the transport damage immediately to the shipper and akYtec GmbH!***

10 Scope of delivery

PRM	1
Short guide	1
Connection cable	1
Terminal blocks (set)	1



NOTE

The manufacturer reserves the right to introduce amendments to the device's scope of delivery.

Appendix A. Dimensions

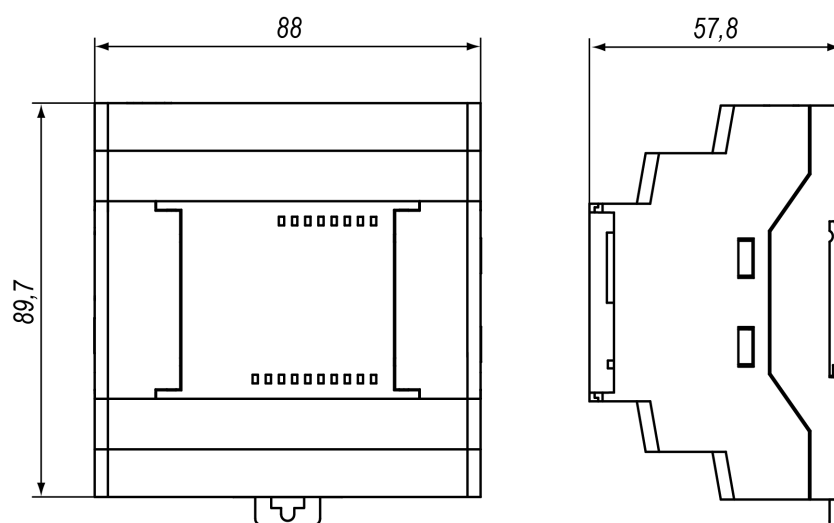


Fig. A.1