AMR-OP70/xx

Programable on-wall controller

Operation manual

Version 1.02

AMiT

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Contents

History of revisions

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Revision	Date	Changes
100	11. 04. 2012	New document
101	05. 11. 2013	Chapter 8.3 renaming, chapters 10.1 and 11.x revision.
102	02. 02. 2015	Chapters 2., 4., 5., 8.3., 9.1., 10, 11 revision. Changes in pictures.

Related documentation

1. **DetStudio** development environment help
    files: Esidet_cs.chm, Tridet_cs.chm

2. Data sheet **AMR-OP70/xx**
    file: amr-op70xx_d_cz_xxx.pdf

3. Application note AP0016 – Principles of using RS485 interface
    file: ap0016_cz_xx.pdf

1. Introduction

AMR-OP70/xx is a programmable on-wall controller. It is connected to control system via RS485 line. Along the whole area of the display is a touch panel which serves for servicing the on-wall controller.

Basic features
- Measuring of room temperature
- FSTN display with (64 × 132) resolution
- Controlled by touch panel
- RS485 line without galvanic separation
- Power supply 24 V DC
- User programming in DetStudio / EsiDet environment is possible
- MODBUS RTU or ARION communication protocol
- Programming option for control variants
  - Variant 1 – Room mode
  - Variant 2 – Room mode + fan mode
  - Variant 3 – Room mode + bi-stable switch

2. Technical parameters

Processor

Type	STM32F103RE
FLASH	512 kB
SRAM	64 kB
EEPROM	2 kB

Display

Type	FSTN / positive / BW
Resolution	(132 × 64) pixels
Visible area	(58 × 38) mm
Viewing angle	90 °
Backlight	LED
Backlight colour	White
Backlight lifetime	Min. 50 000 hours *)

Note *) Luminance drop to 50 %.

Touch panel

Type	Resistant
Number of contacts	10^6
Force of contact	10 g to 100 g
Hardness	≥ 3 H

Note The touch panel is designed to be controlled by the finger, tool without sharp edges or gloved finger.

Temperature sensor

Type	DS7505
Measuring range	-55 °C to +125 °C *)
Resolution	12 bit
Accuracy	±2 °C (-55 °C to 0 °C) ±0.5 °C (0 °C to 50 °C) ±2 °C (50 °C to 125 °C)
Device tempering	45 min **)

Note *) Thermal sensor parameters. Operating temperature range of on-wall controller is lower.

  **) Time from turning on. Measurement accuracy is reduced to ±2 °C, during this time.

RS485

Overvoltage protection	Transil 600 W
Galvanic separation	No
Terminating resistor *)	120 Ω on controller

Idle state definition *)
     up +5 V
     up 0 V
	
	 820 Ω on controller
	 820 Ω on controller

Maximum wire length	1200 m / 19200 bps
Max. number of stations on network	63 ARION / 247 MODBUS
Max. number of stations on segment	256
Connection point	CHF5/2 connector
Wire cross section	0.75 mm^2 to 2.5 mm^2

Note *) Terminating resistor and idle state definition are connected together.

Power supply	Nominal power supply voltage	24 V DC
	Power supply voltage range	10 V DC to 30 V DC
	Maximum power consumption	40 mA at 24 V DC
	Connection point	CHF5/2 connector
	Wire cross section	0.75 mm^2 to 2.5 mm^2

Mechanics	Mechanical design	Plastic cover, ABS
	Mounting	Vertical (on the wall)
	Ingress protection rate	IP20
	Dimensions (w × h × d)	(90 × 90 × 32) mm
	Weight – netto	100 g
	– brutto	112 g

Temperatures	Operating temperature range	-10 °C to 50 °C
	Storage temperature range	-20 °C to 70 °C

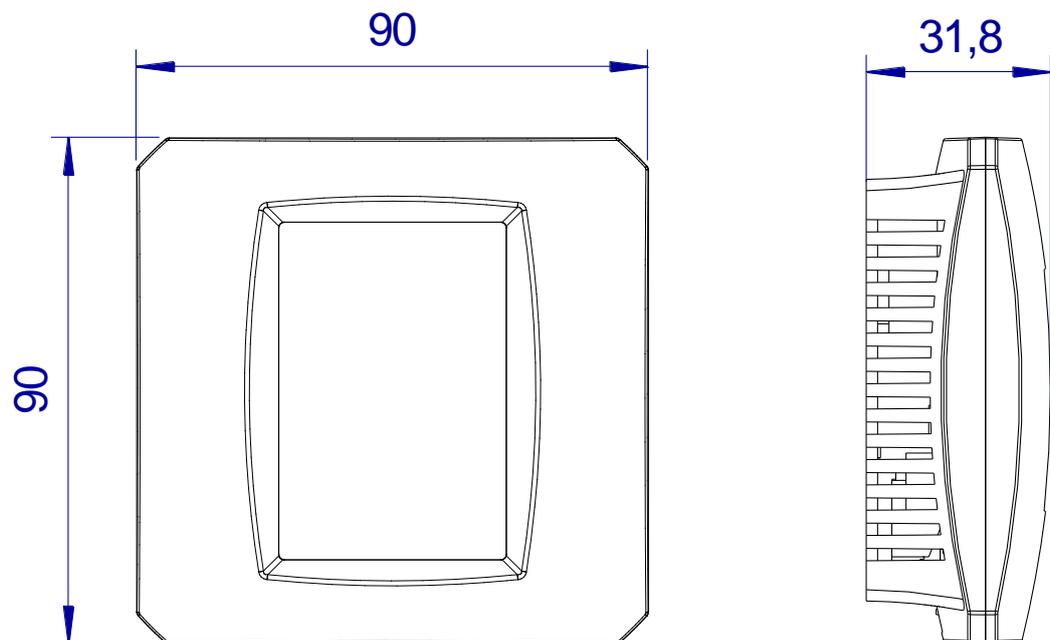| Others	Maximum ambient humidity	< 95 % non-condensing
	Programming	DetStudio / EsiDet
	Communication protocol	ARION / MODBUS

2.1. Dimensions

Fig. 1 - **AMR-OP70/xx** dimensions

2.2. Recommended drawing symbol

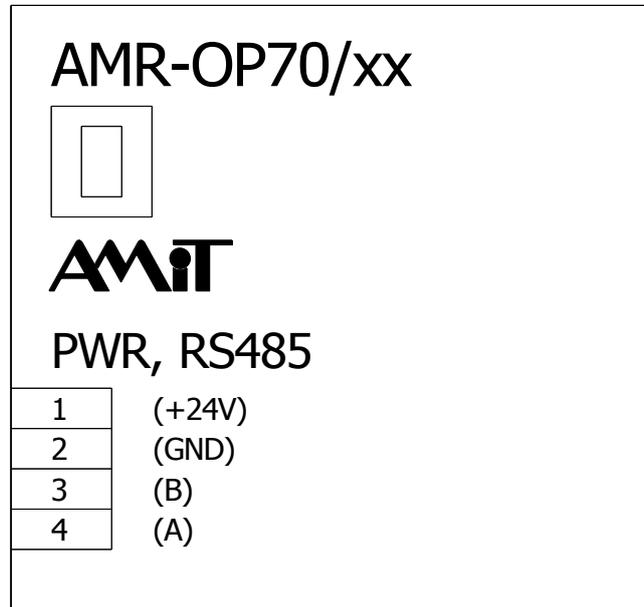Following drawing symbol is recommended for **AMR-OP70/xx** on-wall controller.

```
┌────────────────────────────────┐
│                                │
│   AMR-OP70/xx                  │
│                                │
│   ┌───┐                        │
│   │   │                        │
│   └───┘                        │
│                                │
│   AMiT                         │
│                                │
│   PWR, RS485                   │
│   ┌─────┐                      │
│   │  1  │  (+24V)              │
│   │  2  │  (GND)               │
│   │  3  │  (B)                 │
│   │  4  │  (A)                 │
│   └─────┘                      │
│                                │
└────────────────────────────────┘
```

Fig. 2 - Recommended drawing symbol for **AMR-OP70/xx**

3. Conformity assessment

The equipment meets the requirements of NV616/2006 Czech governmental decree. The compliance assessment with NV616/2006 has been performed in accordance with harmonized standard EN 61326-1.

Tested in accordance with standard	Type of test	Classification
EN 55011:2009	Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement	Complies
EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: EMC – Testing and measurement techniques – Electrostatic discharge immunity test, aerial discharge	±8 kV
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Radiated, radio-frequency, electromagnetic field immunity test, 800 MHz to 1000 MHz	20 V/m
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Radiated, radio-frequency, electromagnetic field immunity test, 1000 MHz to 2100 MHz	10 V/m
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Radiated, radio-frequency, electromagnetic field immunity test, 2100 MHz to 2500 MHz	5 V/m
EN 61000-4-4:2012	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test, power supply	±2 kV *)
EN 61000-4-4:2012	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test, RS485	±2 kV *)
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Electrostatic discharge immunity test, power supply.	±2 kV *)
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Electrostatic discharge immunity test, RS485.	±1 kV *)
EN 61000-4-6:2009	Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields	10 V

3.1. Other tests

Device was design according to:

Tested in accordance with standard	Type of test	Result
EN 60068-2-1:2007	Environmental testing – Part 2-1: Test A: Cold	Complies
EN 60068-2-2:2007	Environmental testing – Part 2-2: Test B: Dry heat	Complies
EN 61000-4-29:2000	Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests	Complies

4. Power supply

On-wall room controller **AMR-OP70/xx** can be powered only by DC power supply. Power source must meet the requirements stated in chapter 2. Technical parameters.
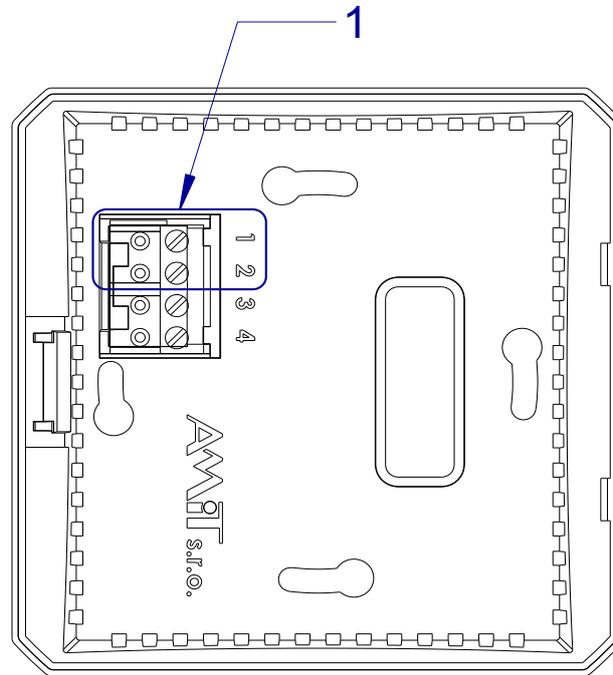
Fig. 3 -   Location of power supply connector

Legend

Number	Meaning
1	Power supply terminals

Connector wiring

Terminal	Label	Meaning
1	+24V	Power supply + 24 V DC
2	GND	Power supply GND

Wiring example

AMR-OP70/xx

PWR, RS485

+24V ss.	5	1 (+24V)
GND	6	2 (GND)
		3 (B)
		4 (A)

1
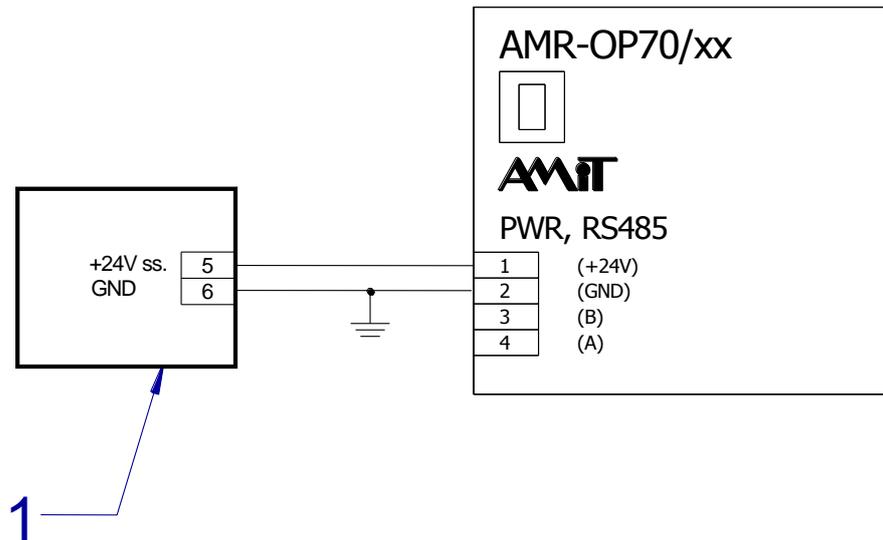
Fig. 4 - Power supply wiring example

Legend

Number	Meaning
1	External power supply

Note It is recommended to connect in one point the GND terminal with switchboard PE terminal when installation is made.

5. RS485 communication line
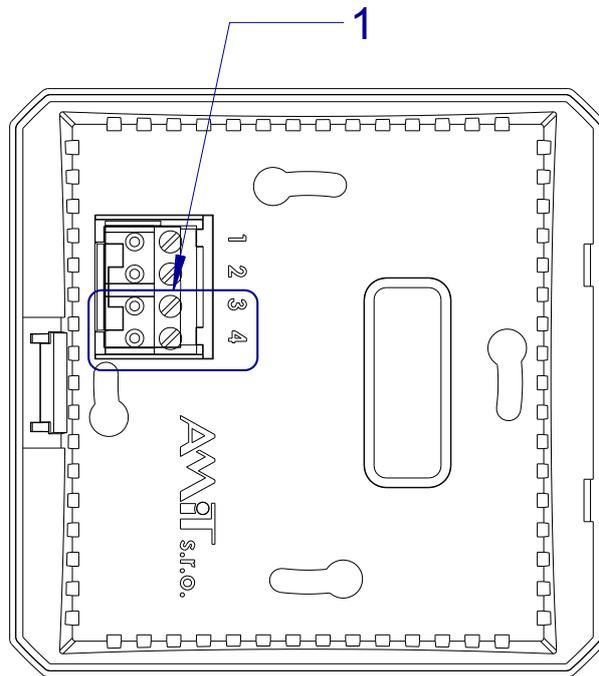
Fig. 5 - Location of RS485 connector

Legend

Number	Meaning
1	RS485 connector

Connector wiring

Terminal	Label	Meaning
3	B	RS485 line, signal B
4	A	RS485 line, signal A

On-wall controller is connected with control system via RS485 communication line. For proper working of RS485 is necessary to abide the rules presented in Application Note AP0016 – Principles of using RS485 interface.
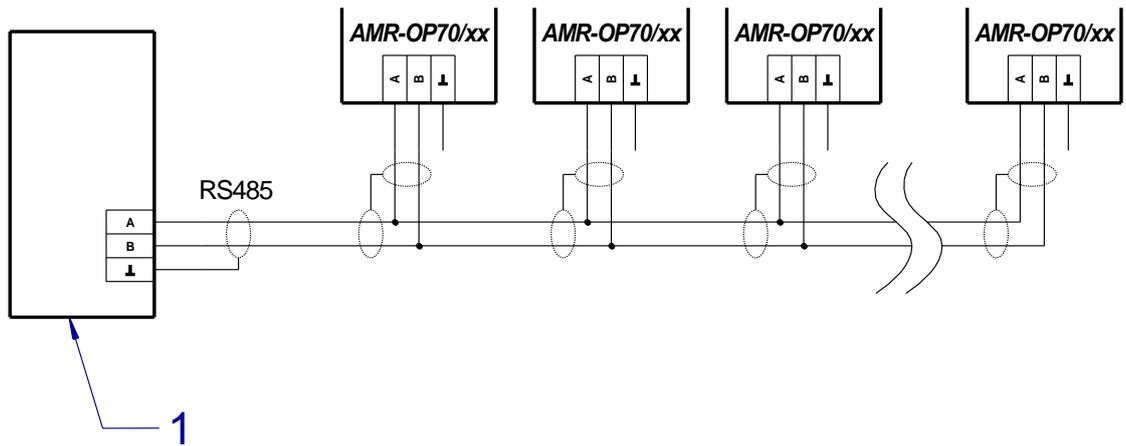
Fig. 6 - RS485 line wiring

Legend	Number	Meaning
	1	Superior control system

In case of using structured cabling, it is recommended to connect one pair of wires to the positive terminal, one pair of wires to the negative terminal and one pair of wires to connect RS485 line.
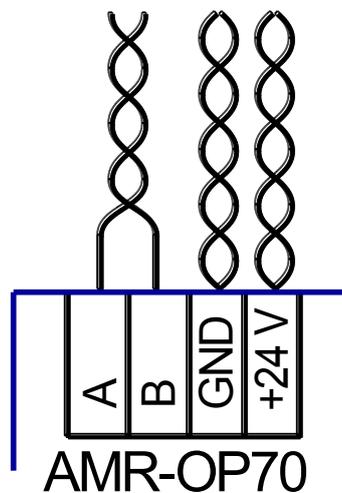
Fig. 7 - Connecting structured cabling to poles of controller

RS485 line termination Each controller on communication line RS485 must have correctly set termination resistor. To set the termination, the configuration jumpers located beside the RS485 connector are used. If the configuration jumpers are set, the termination is connected. The terminal stations on the line must always have connected the termination, continuously disconnected.
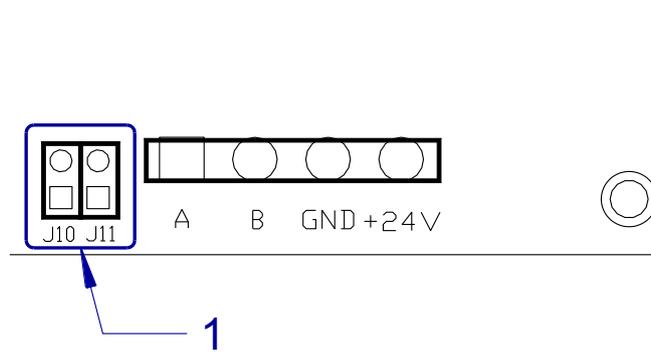
Fig. 8 - Location of configuration connections of RS485 line

Legend

Number	Meaning
1	RS485 line configuration jumpers

Meaning of jumpers

Jumpers	Meaning
Set	End-station – Idle state and line termination is active
Not set	Intermediate station – Idle state and line termination is inactive

Note By setting the jumpers the idle state on RS485 line is also defined.

Activity indication Activity on RS485 line is indicated on the LCD. If it is not specified other way in control system (via Guard Time), 30 s after communication interruption, an Error text is displayed in the status line on the controller (see Chapter 7.1).

6. Mounting

The on-wall controller is designated for assembly in an inside, dry environment. It is located 1.5 m above the floor in a place with good natural circulation of air. Do not mount the on-wall controller in a place where the temperature can be influenced by drafts, solar radiation, heat transmitted directly from the heater or another undesired influence. If supply conductors are installed in the plastic tube, it is necessary to seal the tube to prevent the flow of air.
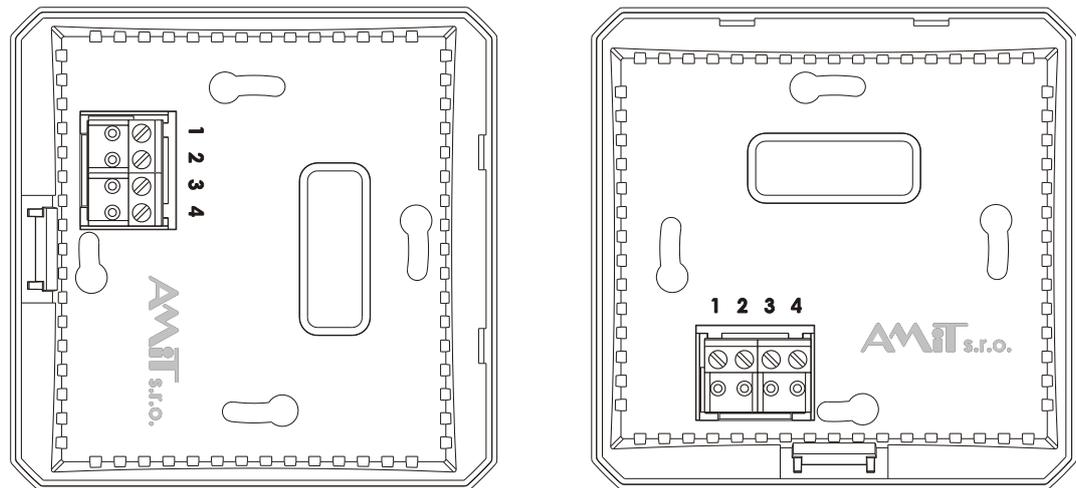
Fig. 9 - Mounting of on-wall controller for portrait (left)
and landscape (right) orientation

Portrait mounting Mounting of on-wall controller is done according to Fig. 9 left. The temperature sensor is located in the lower left corner.

Landscape mounting Mounting of on-wall controller is done according to Fig. 9 right. The temperature sensor is located in the lower right corner.

Note In another assembly method than recommended, the temperature sensor is heated by internal electronics and this leads to erroneous temperature readings.

6.1.   Dismantling of the cover

1. The cover is released by pressing the click on the left side of the controller (e.g. by the **MN1** dismantling tool or screwdriver). Then pull out the front side of the controller.
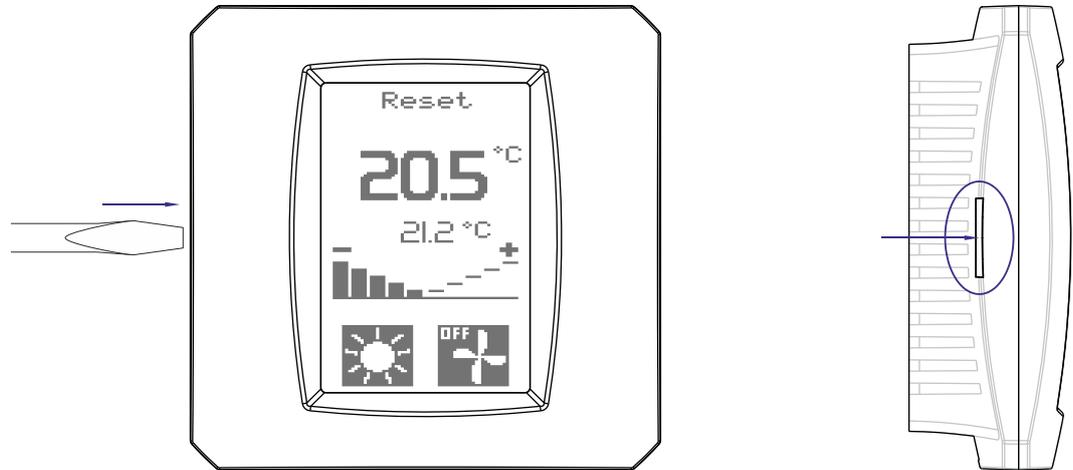
Fig. 10 - Place for pressing by the screwdriver

2. Mount the rear cover on the selected place. It is possible to select two pairs of assembly holes.
3. Connect the communication and supply conductors (see Chapter 4 and Chapter 5)
4. Set the configuration jumpers (see Chapter 5.)
5. Mount the upper part on the rear cover and click.

6.2.   Installation rules

EMC Filter It is required to use EMC filter on power input. Based on environment nature, power source properties and wiring layout this requirement can be revised.

Connecting to PE Connect the negative supplying terminal of controller (GND) to the switchboard PE terminal at the power source.

If inlet wires are led outside of the building, surge protection must be used.

RS485 line It is necessary to perform connecting of RS485 line according to recommendations presented in Application Note AP0016 – Principles of using RS485 interface.

Note All PE connections must be realized with as low as possible impedance. Technical parameters of on-wall controller are guaranteed only when these wiring rules are applied.

7. Setup and operation of on-wall controller

On-wall controller has several working screens:
- Basic   is always displayed.
- User menu   is displayed by touching the selected area of the screen.
- Configuration menu is displayed by holding the selected area of the screen.
- Screen saver   if it is enabled, it is displayed after a certain time of controller inactivity.

7.1. Basic screen

The design of the screen depends on selected application variant. Variant is set by the service organization, during on-wall controller installation. Part of basic screen is common for all variants, part depends on selected variant.

Common items
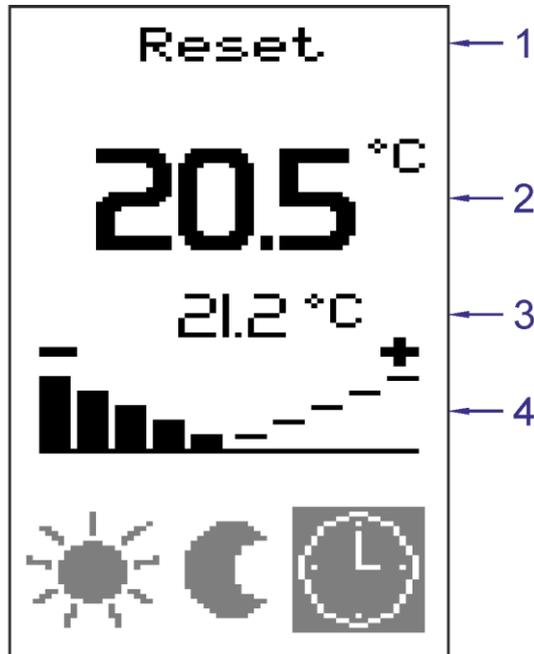
Fig. 11 - Common items

Legend

Number	Meaning
1	Status line
2	Measured temperature
3	Requested temperature
4	Correction

Status line

Fig. 12 - Status line

The following data are displayed:

Status	Meaning
Reset	The controller was restarted; no communication took place from restart.
Error	Error in communication. Longer time than Guard Time expired from the last communication.
Menu	Error-free running of the controller.

Measured temperature

Fig. 13 - Measured temperature

Display of measured temperature in the area does not depend on the communication; it is always displayed.

Requested temperature

Fig. 14 - Requested temperature

The requested temperature is sent by the superior control system. During correction change dashes are displayed until new requested value is received from the superior control system. Value could be shown with several second delays.

Correction bar graph

Fig. 15 - Correction of requested temperature

The correction bar graph displays only in the Auto mode for the room. In other modes (Decreased and Comfort) it is not displayed.

Press the right or the left part of the bar-graph to change the value of the correction to plus or minus. After each change of the correction dashes are displayed instead of the requested temperature up to the time of receipt of a new requested temperature from the superior control system.

Icons of modes These depend on the variant of the application.

Variant 1
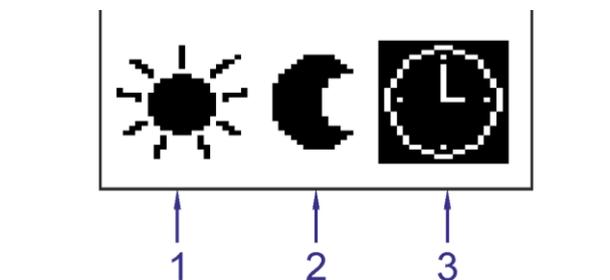
Fig. 16 - Modes icons for variant 1

Legend

Number	Meaning
1	Mode Comfort
2	Mode Decrease
3	Mode Auto

Three icons for the mode of the room are displayed. The highlighted icon displays the selected mode. Press the individual icons to activate the respective mode.

Icon	Meaning	Description
☀	Comfort	Regulation is on constant (comfort) temperature.
☾	Decrease	Regulation is on constant (decreased) temperature.
🕐	Auto	Regulation is according to the adjusted time plan modified by the correction.

Variant 2
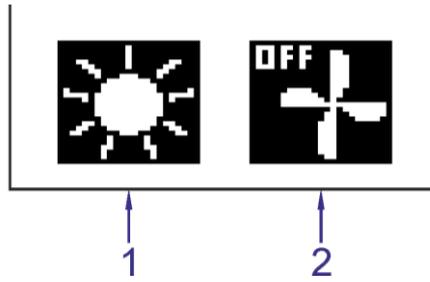
Fig. 17 - Modes icons for variant 2

Legend

Number	Meaning
1	Room mode
2	Fan mode

Room mode icon and Fan mode icon is displayed. Press the icon with the room mode to switch between three statuses.

Icon	Meaning	Description
☀	Comfort	Regulation is on constant (comfort) temperature.
☾	Decrease	Regulation is on constant (decreased) temperature.
🕐	Auto	Regulation is according to the adjusted time plan modified by the correction.

Press the icon with fan mode to switch between five statuses.

Icon	Meaning	Description
	OFF	The ventilator is switched off.
	Auto	The ventilator is regulated automatically.
	Speed 1	The ventilator has speed 1.
	Speed 2	The ventilator has speed 2.
	Speed 3	The ventilator has speed 3.

Variant 3
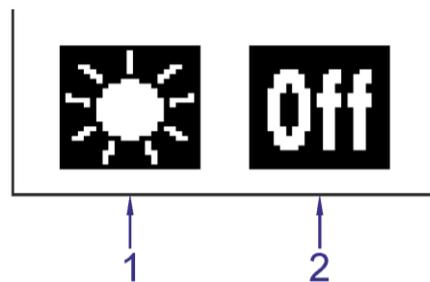
Fig. 18 - Modes icons for variant 3

Legend

Number	Meaning
1	Room mode
2	Switch

Room mode and switch status icon is displayed. Press the icon with the room mode to switch between three statuses.

Icon	Meaning	Description
☀	Comfort	Regulation is on constant (comfort) temperature.
☾	Decrease	Regulation is on constant (decreased) temperature.
🕐	Auto	Regulation is according to the adjusted time plan modified by the correction.

Press the icon with switch status to switch between two statuses.

Icon	Meaning	Description
Off	Off	OFF switch.
On	On	ON switch.

7.2.   User menu

User menu is showed up by pressing the display in the under mentioned area.
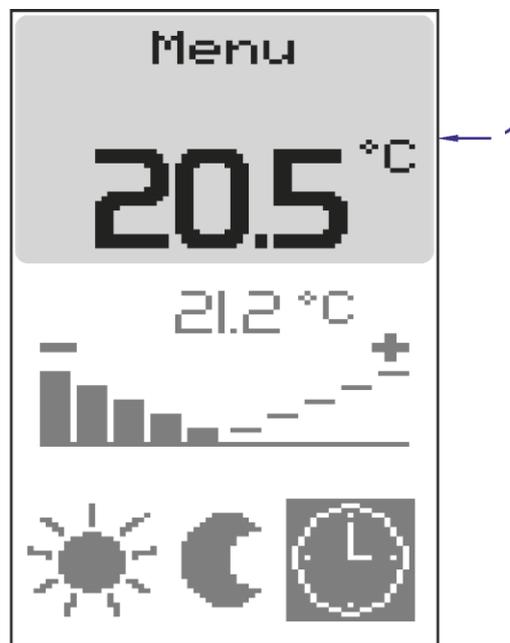
Fig. 19 - Calling up user menu

Legend	Number	Meaning
	1	Touch area

Menu items
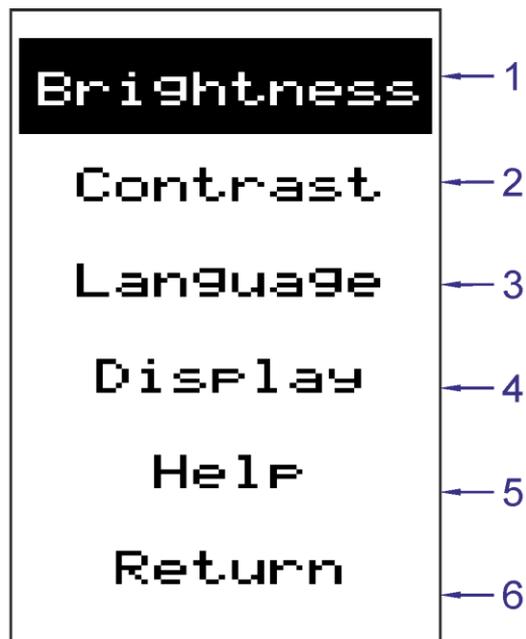
Fig. 20 - User menu items

<table>
<tr><td>*Legend*</td><td colspan="2">

Number	**Meaning**
1	Brightness setting
2	Contrast setting
3	Language selection
4	Screensaver setting
5	Firmware version
6	Return to the basic screen

</td></tr>
</table>

Brightness   By using the **Brightness** item it is possible to set the brightness on the display.
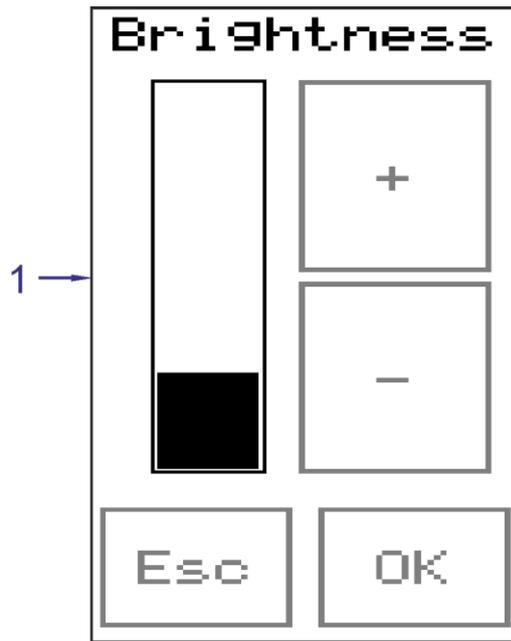
Fig. 21 - Brightness setting

Legend

Number	Meaning
1	Brightness set level

Contrast   By using the **Contrast** item it is possible to set the contrast on the display.
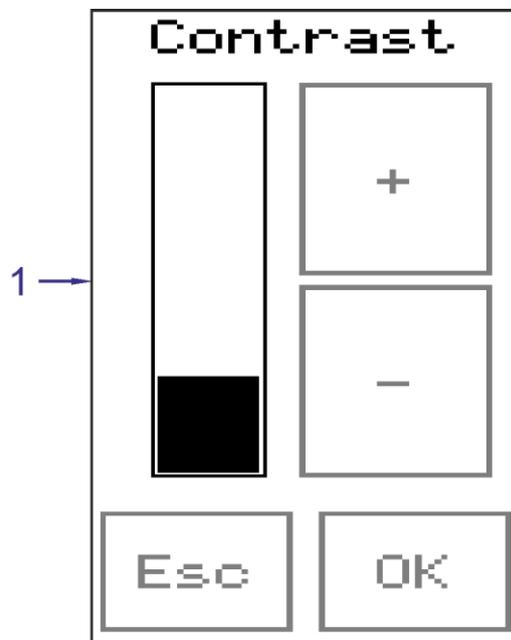
Fig. 22 - Contrast setting

Legend

Number	Meaning
1	Contrast set level

Language By using the **Language** item it is possible to select between Czech and English texts on the on-wall controller.

Fig. 23 - Language selection

Legend	**Number**	**Meaning**
	1	Language selection

Display Setting the time during which the screensaver is activated.

Fig. 24 - Setting the time for activation of the screensaver

Legend	**Number**	**Meaning**
	1	Adjusted dimming time

It is possible to set the following values:

Value	Meaning
-1	The screensaver is disabled.
10 to 120	Time in seconds until the screensaver is activated.

Help By selecting **Help** to display the firmware version used in the wall controller.

Fig. 25 - Firmware version

Legend

Number	Meaning
1	Return back

Return Select **Return** to return to the basic screen for the on-wall controller.

7.3. Configuration menu

The configuration menu is called up by pressing and holding in the under mentioned area for a minimum of 10 s.
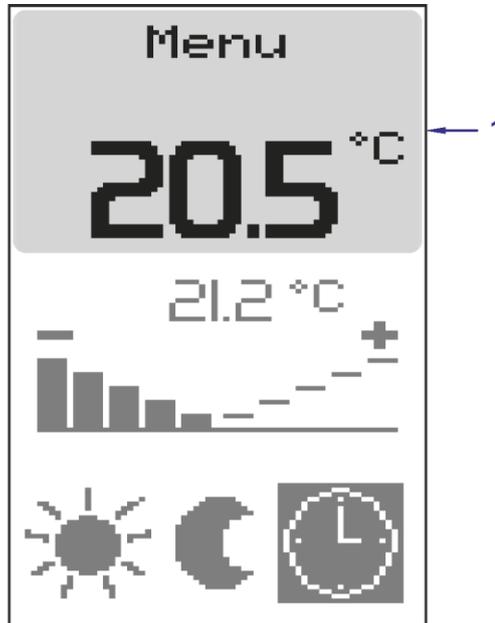
Fig. 26 - Calling configuration menu

Legend	**Number**	**Meaning**
	1	Touch area

Caution The setting of the controller (in terms of both software and hardware) should be exclusively performed by the service organization. Incorrect setting of service parameters will result in the non-functionality of the whole controller.

Menu items
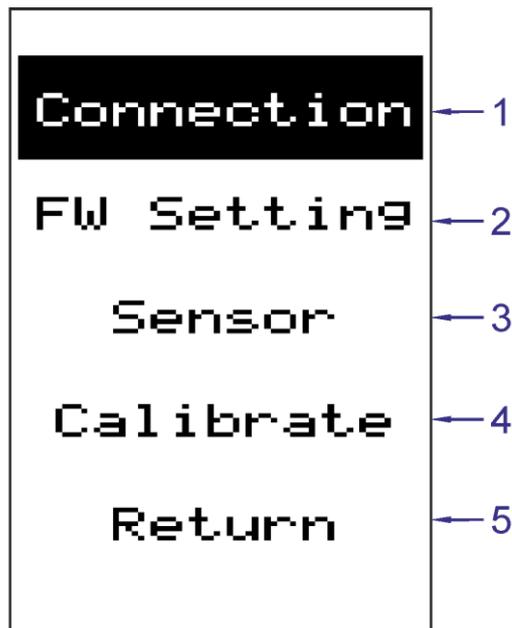
Fig. 27 - Service menu items

	Number	Meaning
Legend	1	Communication settings
	2	Variant selection
	3	Sensor correction
	4	Calibration
	5	Return Back

Connection By using the **Connection** item it is possible to set communication parameters of **AMR-OP70/xx**. Detailed information can be found in Chapter 7.3.1.

FW setting Select the **FW setting** item to select one of three **AMR-OP70/xx** variants (see Chapter 7.1).
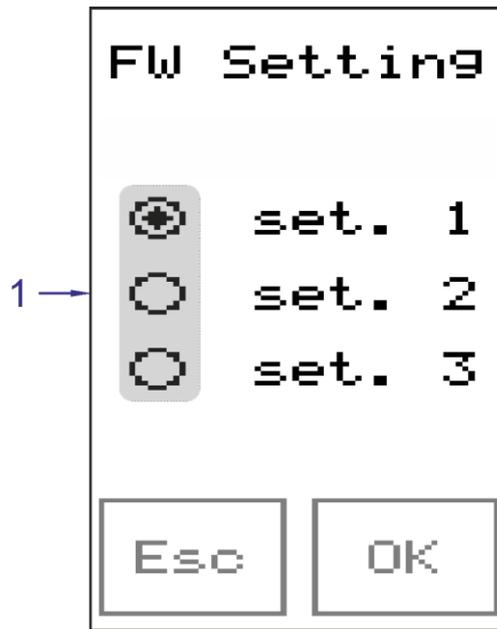
Fig. 28 - Variant selection

	Number	Meaning
Legend	1	Variant selection

Sensor By using the **Sensor** item it is possible to set correction of the sensor located in the on-wall controller.
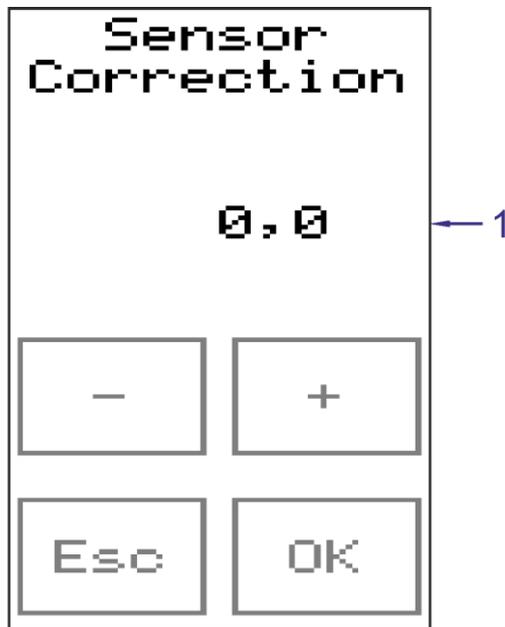
Fig. 29 - Temperature sensor correction

	Number	Meaning
Legend	1	Adjusted correction

Calibration By using the **Calibration** item it is possible to calibrate the touch display.

Back Use the **Back** item to restart the on-wall controller (which confirms the setting) and to return to the basic screen.

7.3.1   Communication setting

The type and communication parameters can be set in the service menu by the **Connection** item.
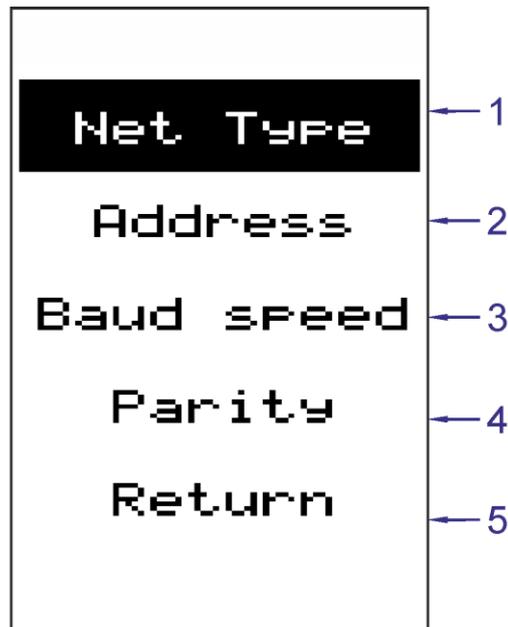
Fig. 30 - Menu for communication setting

Legend

Number	Meaning
1	Protocol selection
2	Address setting
3	Speed setting
4	Parity setting (for MODBUS only)
5	Return back

Net type By using the **Net type** item it is possible to select between two communication protocols.
- ARION
- MODBUS.
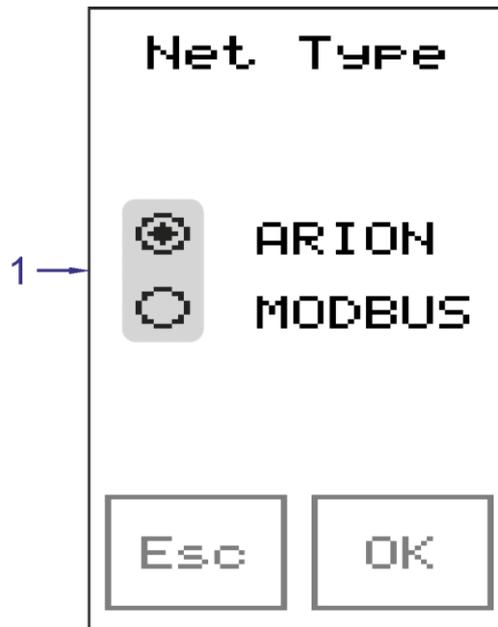
Fig. 31 - Selection of communication protocol

Legend

Number	Meaning
1	Protocol selection

Address Use the **Address** item to set the address within the selected communication net-
work. The address must be unique for each controller. The permitted scope is:
- 1 to 63 (ARION)
- 1 to 247 (MODBUS)

Fig. 32 - Address setting

Legend

Number	Meaning
1	Adjusted address

Speed Use the **Speed** item to set the communication speed within the selected communication network. The communication network must have all units connected into the same network with the same speed (according to the stated communication speed in the control system).
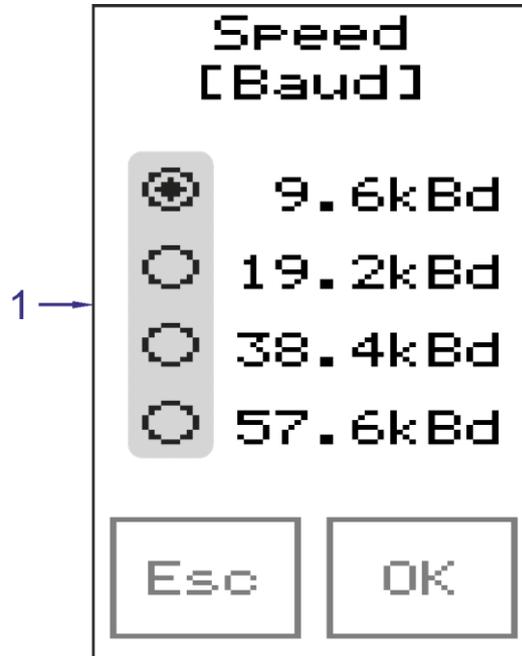
Fig. 33 - Communication speed setting

Legend

Number	Meaning
1	Speed selection

Parity It makes sense to only set this item where communication protocol MODBUS was selected. Parity can be set by it.
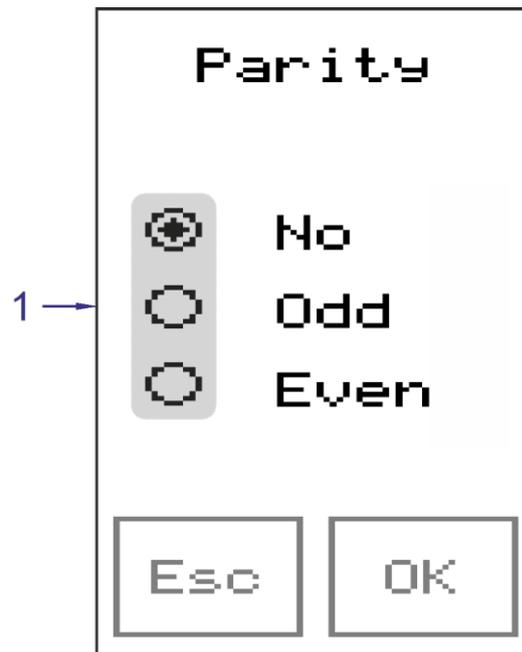
Fig. 34 - MODBUS protocol parity setting

Legend

Number	Meaning
1	Parity selection

Return Use the **Return** item to return to the configuration menu.

7.4. Screensaver

If enabled in the menu, after a set time the screensaver is activated (the screensaver screen is displayed and the screen backlight is deactivated). After first pressing of the screen, the backlight is activated and after second pressing the basic screen is displayed.
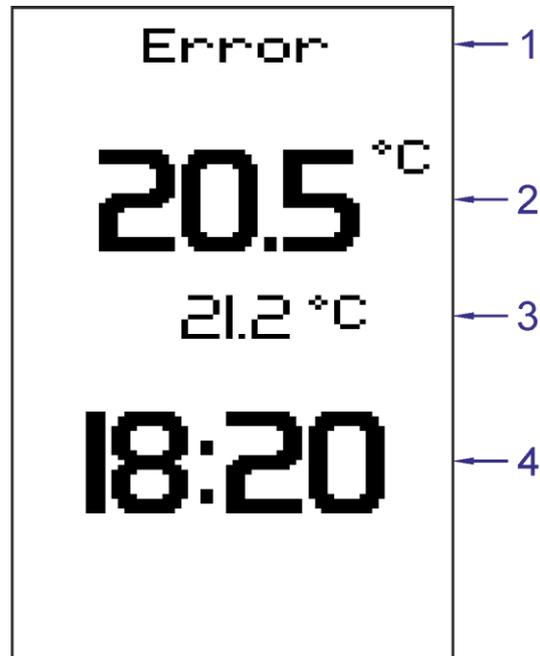
Fig. 35 - Screensaver screen

Legend

Number	Meaning
1	Status line
2	Measured temperature
3	Requested temperature
4	Supervisory control system time

When the screensaver is active, the status line only displays the Reset and Error status (see Chapter Status line).

Note If the time is not sent through the network, then characters **--** are displayed instead of numeric values.

8. Program service protocol ARION

In ARION network **AMR-OP70/xx** can be in one of following statuses:

Reset After restarting the on-wall controller bits 0 to 7 of the **Status** register are set into value True. The on-wall controller does not have a valid value of the:
- adjusted room mode and fan mode,
- status of the button,
- value of the correction (has zero value),
- requested temperature.

Writing of the valid value is possible only by the superior control system. The values defined by the user will be ignored until then.

Error On-wall controller supports checking the breakdown of the communication (**Guard Time** parameter in ARION network). In the case that there is a breakdown in communication, the text **Error** is displayed in the status line and the on-wall controller will have the same behaviour as in the case of the **Reset** status except for the correction value that stay the same. In the case that the superior control system does not use the **Guard Time** parameter and the on-wall controller does not receive within the valid framework within 30 s, it will pass into the **Error** status.

8.1. Digital inputs

On-wall controller status information is transferred via digital inputs.

Description of the function module

Function module	Number of signals	Note
ARI_DigIn	3	Via module, more signals can be read simultaneously. Single signals correspond with single bits of database variables.

Meaning of single signals

Module signal	Meaning
0	Restart
1	Writing to arbitrary register from the side of the controller has occurred.
2	Communication interruption.

Note We recommend periodic reading of digital input channel. If writing to the registry from the side of the controller has occurred, than the bit no. 1 of this channel (DI.1) is set to True. Once the superior control system reads-out registry values, by writing value True to bit n. 1 of digital output channel (DO.1), it sets bit n. 1 of the digital input channel to value False.

8.2. Digital outputs

Single bits of digital input channels are set to value False by corresponding digital outputs.

Description of the function module	Function module	Number of signals	Note
	ARI_DigOut	3	More signals simultaneously can be written by the module. Single signals correspond with single bits of the database variable.

Meaning of single signals	Module signal	Meaning
	0	Resetting bit DI.0
	1	Resetting bit DI.1
	2	Resetting bit DI.2

8.3. Register layout

	Name	Number	Type	Description
Register with n. 0	Status reset	0 (Bit 0 to 15)	R/W	Resetting corresponding bits of Status registry. The bit is set in case of simultaneous writing of value True to the setting and zeroing bit (prevailing "set"). While reading this registry, the last recorded value is returned.
	Status set	0 (Bit 16 to 32)	R/W	Setting corresponding bits of Status registry. The bit is set in case of simultaneous writing of value True to the setting and zeroing registers (prevailing "set"). While reading this registry, the last recorded value is returned.

	Name	Number	Type	Description
Registers with n. 1 to 6	Status	1	R	Meaning of single bits:

Bit	Meaning
0	Change of value from the controller. This bit is set when the value of Status registry is changed by the controller. Value of this bit has no effect on the control controller function.
1 2	Room mode

Bit 2	Bit 1	Meaning
0	0	Automat
0	1	Decrease
1	0	Comfort
1	1	Not used

Bit	Meaning
3	Switch. Applies only for the Variant 3. In other variants this bit is not used.

	4 5 6		Fan mode.<table><tr><th>Bit 6</th><th>Bit 5</th><th>Bit 4</th><th>Meaning</th></tr><tr><td>0</td><td>0</td><td>0</td><td>Device is OFF</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Level 1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Level 2</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Level 3</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Automat</td></tr></table>Applies only for the Variant 2. In other variants this bits are not used.
	7 *)		Status of DI input Ni1000 / contact
Correction (Float)	2	R/W	Correction [%]. Range: -100 to 100 with floating point.
Requested temperature (Float)	3	R/W	Requested temperature [°C] with floating point.
Measured temperature (Float)	4	R	Measured temperature [°C] with floating point.
Measured *) Ni1000 (Float)	5	R	Measured temperature Ni1000 [°C] with floating point.
LED brightness *) (Float)	6	R/W	LED brightness [%]. Range: 0 to 100. Value 0 corresponds with minimal brightness, but not LED power off.

Note *) Not active in **AMR-OP70/xx**. Possible entry into the registry value is ignored and has no effect on the function of the on-wall controller.

8.4. Operating time setting

On-wall controller supports displaying of time in screensaver (see Chapter 7.4). This is a superior control system time, which is displayed only if during ARION network parameterization in superior system, the parameter TimeBroadcast is set to value True.

9.   MODBUS protocol program operation

In MODBUS network **AMR-OP70/xx** can be in one of following statuses:

Reset After restarting the on-wall controller bits 0 to 7 of the **Status** register are set into value True The on-wall controller does not have a valid value of the:
- adjusted room mode and fan mode,
- status of the button,
- value of the correction (has zero value),
- requested temperature.

Writing of the valid value is possible only by the superior control system. The values defined by the user will be ignored until then.

Error On-wall controller supports checking the breakdown of the communication (**Guard Time** register). In the case that there is a breakdown in communication, the text **Error** is displayed in the status line and the on-wall controller will have the same behaviour as in the case of the **Reset** status except for the correction value that stay the same. In the case that the superior control system does not use the **Guard Time** parameter and the on-wall controller does not receive within the valid framework within 30 s, it will pass into the **Error** status.

Note Communication with **one stop bit** takes place if there is an **odd or even parity** set. Communication with **two stop bits** takes place, when **no parity** is set.

9.1.   Register layout

Supported functions:
- 03 Read Holding Registers – reading registers
- 16 Write Multiple Registers – writing registers

All values are saved in Big-endian format.

System registers with addresses 0 to 8 This part is system-managed, and cannot be affected by user.

Name	Address	Type	Description
Module ID	0	R	Module identification. Controller type is given by number. 35 = AMR-OP7x, is given by HW type
FW	1	R	Firmware version, is taken from the project
Time	2 3	R/W	System time. Number of seconds since 1.1.1980, 0:00:00.
Guard Time	4	R/W EEPROM	Number of [ms] for evaluation of MODBUS communication interruption. Zero value will result in permanent disconnection and Error state.
Baud Rate	5	R/W EEPROM	EEPROM, baud rate
Parity	6	R/W EEPROM	EEPROM, parity
Address	7	R/W EEPROM	EEPROM, address
System Status	8	R/W	System status register. Used by system, this cannot be accessed by the application.

Application registers with addresses 100 to 109

These parameters are given by the application program. They can be either pre-defined as system-supported special object, or it can be programmed by standard objects.

Name	Address	Type	Description
Status Set	100	R/W	Setting corresponding bits of Status registry. The bit is set in case of simultaneous writing of value True to the setting and zeroing bit (prevailing "set"). While reading this registry, the last recorded value is returned.
Status Reset	101	R/W	Resetting corresponding bits of Status registry. The bit is set in case of simultaneous writing of value True to the setting and zeroing registers (prevailing "set"). While reading this registry, the last recorded value is returned.
Status	102 103	R	Meaning of single bits
Correction (Float)	104 105	R/W	Correction [%]. Range: -100 to 100 with floating point.
Requested temperature (Float)	106 107	R/W	Requested temperature [°C] with floating point.
Measured temperature (Float)	108 109	R	Measured temperature [°C] with floating point.

Within the Status row, description:

Bit	Meaning
0	Change of value from the controller. When the Status register is changed by the on-wall controller, this bit is set. Value of this bit has no effect on the controller function.
1 2	Room mode
3	Switch. Applies only for the Variant 3. In other variants this bit is not used.
4 5 6	Fan mode.
7 *)	Status of DI input Ni1000 / contact

Room mode table:

Bit 2	Bit 1	Meaning
0	0	Automat
0	1	Decrease
1	0	Comfort
1	1	Not used

Fan mode table:

Bit 6	Bit 5	Bit 4	Meaning
0	0	0	Device is OFF
0	0	1	Level 1
0	1	0	Level 2
0	1	1	Level 3
1	0	0	Automat

Applies only for the Variant 2. In other variants this bits are not used.

Application registers with addresses 110 to 113

Name	Address	Type	Description
Measured Ni1000 *) (Float)	110 111	R	Measured temperature Ni1000 [°C] with floating point.
LED brightness *) (Float)	112 113	R/W	LED brightness [%]. Range: 0 to 100. Value 0 corresponds with minimal brightness, but not LED power off.

Note *) Not active in **AMR-OP70/xx**. Possible entry into the registry value is ignored and has no effect on the function of the on-wall controller.

9.2. Operating time setting

Writing time to the single on-wall controller, connected to the MODBUS network is performed by writing to the registers 2 and 3 of the particular on-wall controller.

10. Programming

The on-wall controller **AMR-OP70/xx** is delivered from the manufacturer with loaded application program which is prepared for universal control of other AMREG controllers. On-wall controller can be also reprogrammed with another user program.

Another program creation is possible by using:
- DetStudio / EsiDet   development environment

Loading of the program from the DetStudio to the on-wall controller can be performed via:
- DetStudio / EsiDet   development environment
- AMRconfig   service and programming utility
- AMRmultidownload   multiprogramming utility

SW download   Development environment is free to download from www.amit.cz, Download section.

10.1. Setting of communication parameters

Change of communication parameter can be performed:
- from PC via DetStudio / AMRconfig
- from application program, via configuration menu, see Chapter 7.3.
- from service application, via service menu, see Chapter 10.3.

Connection to the PC   On-wall controller **AMR-OP70/xx** must be connected to the PC via RS485 converter (for example type **SB485s** from AMiT company production) using point-to-point connection.

Note   Communication with station can be established from DetStudio only via MODBUS communication protocol or when Loader is activated, see Chapter 10.4.

10.2. Service application

Service application supports setting of basic parameters of the on-wall controller via "Service menu".

Service application in **AMR-OP60/xx** is always available, user can always switch to it, and it cannot be deleted. After switching to the service application, service menu always shows. The way of switching is described in the following chapters.

10.3. Service menu

Service menu can be accessed by switching to the „Service application" as follows:
- Turn off the power supply.
- Touch the touch screen anywhere.

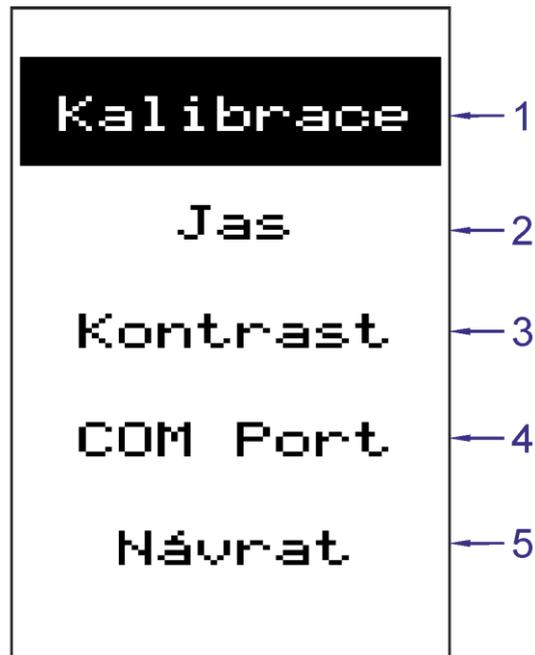- Turn on the power supply while still touching the touch screen.

Fig. 36 - Service menu items

Legend

Number	Meaning
1	Calibration
2	Brightness setting
3	Contrast setting
4	Serial interface setting
5	Return back

Following items can be set via service menu:
- Kalibrace – calibration of touch screen
- Jas – brightness intensity change
- Kontrast – change of display contrast
- COM Port – serial interface communication parameters *)

*)   Can be set only in case they are not forced by user application.

To quit from service menu press "Návrat" item. The on-wall controller will restart.

10.4. Loader

State when Loader is running can be used in cases where the user application is causing any problems, such as repeated restarts, the inability to connect witch controller, etc.

Loader
Activation
The Loader can be activated by connecting service jumper. Depending on the time and length of the connecting, controller takes the appropriate action, see table.

Length of the con-necting	Action
> 1 s – after turning on	Loader starts
> 3 s and < 10 s – during application run	Application restarts and Loader starts
> 10 s	Application restarts and Loader starts with factory setting, see Chapter 11. Factory settings.

Service jumper location After removing the cover, the service connection is accessible on the PCB, see Fig. 37.

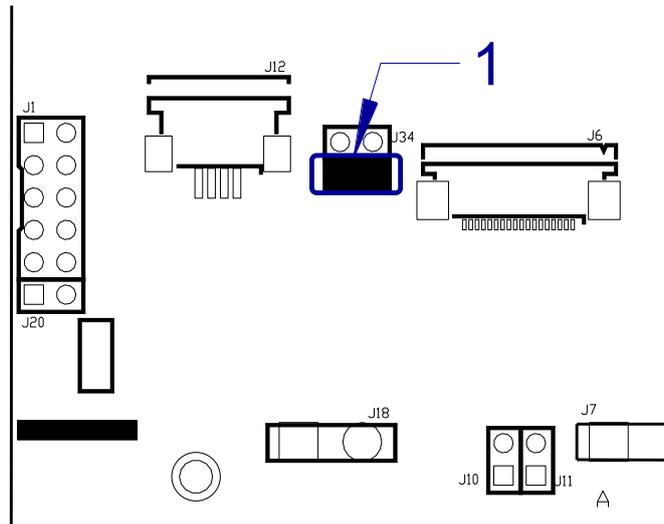*Note* Unwanted coupling of adjacent jumpers while controller is turned on does not affect its function.

Fig. 37 - Service jumper position on PCB of **AMR-OP70/xx**

Legend

Number	Meaning
1	Service jumper

11. Factory settings

RS485 configuration Configuration jumpers defining idle state and line termination are set.

Program settings

Item	Set value
Network type	ARION
Address	1
Baud rate	38400 bps
Viewing variant	Variant 1
Correction	0.0 °C

Display	Set value
Brightness	100 %
Contrast	50 %
Language	Czech
Display – dimming time	60 s

12. Ordering information and completion

On-wall controller	**AMR-OP70/xx *)**	Complete, see chapter 12.1. Completion

Note   *)   **xx** indicates colour design of the product. Available versions are listed in datasheet.

Others	**MN1**	Cover dismantling tool for **AMR-OP70/xx**

12.1. Completion

AMR-OP70/xx	Part	Quantity
	Programmable on-wall controller	1

13. Maintenance

Device requires no periodic control or maintenance except for cleaning.

Cleaning Time after time with regard to way of device usage, it is necessary to remove dust from inside electronics. The equipment can be cleaned by dry soft brush or vacuum cleaner, only when turned-off and disassembled.

Note **The maintenance mentioned above can be performed by manufacturer or authorized service only!**

14. Waste disposal

Electronics disposal The disposal of electronic equipment is subject to the regulations on handling electrical waste. The equipment must not be disposed of in common public waste. It must be delivered to places specified for that purpose and recycled.