AMR-OP71C/xx

Programmable on-wall controller

Operation manual

Version 1.01

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Contents

History of revisions

Document name: amr-op71cxx_g_en_101.pdf

Revision	Date	Author of change	Changes
100	07. 07. 2016	Březina Jiří	New document.
101	30. 08. 2016	Březina Jiří	Size of EEPROM memory repaired.

Related documentation

1. Help file for EsiDet part of DetStudio development environment
   file: Esidet_en.chm
2. Application Note AP0005 – ARION Network Communication
   file: ap0005_en_xx.pdf
3. Application Note AP0008 – MODBUS Network Communication
   file: ap0008_en_xx.pdf
4. Application Note AP0016 – Principles of using RS485 interface
   file: ap0016_en_xx.pdf
5. Application Note AP0025 – ARION Network Communication – definition by table
   file: ap0025_en_xx.pdf
6. Application note AP0041 – Design of graphical elements for NOA7x series controllers
   file: ap0041_en_xx.pdf

1 Introduction

AMR-OP71C/xx is a programmable on-wall controller. It is connected to superior control system via RS485 line. The whole display area consists of touch panel, which serves for on-wall controller operation.

Basic features

- Measurement of room temperature
- Measurement of CO_2 concentration
- Acoustic signalization
- Periodical automatic CO_2 sensor re-calibration
- Manual CO_2 sensor calibration from configuration menu
- FSTN display with (64 × 132) resolution
- Touchscreen operated
- RS485 line without galvanic isolation
- Power supply 24 V DC
- Programming in DetStudio development environment / EsiDet
- MODBUS or ARION communication protocol
- Software selection of different control methods
  - 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	32 kB

Display

Type	FSTN / positive / BW
Resolution	(64 × 132) pixels
Visible area	(38 × 58) mm
Viewing angle	90 °
Backlight	LED
Backlight colour	White
Backlight lifetime	Min. 50 000 hours [1])

Note [1]) Luminance drop to 50 %.

Touch panel

Type	Resistive
Number of touches	10^6
Touching strength	10 g to 100 g
Hardness	≥ 3 H

Note Touch panel is intended to be operated by finger, tool without sharp edges or by finger-in-glove.

Temperature sensor

Type	Semiconductor sensor
Measuring range	-55 °C to +125 °C [2])
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 [3])

Note [2]) Thermal sensor parameters. Operating temperature range of on-wall controller is lower.

[3]) Starts when turning the device on. During this period, the accuracy of measurement is reduced to ±2 °C.

CO_2 sensor

Type	NDIR
Measuring range	400 ppm to 3000 ppm
Accuracy	±150 ppm [4])
Device temperating	15 s [5])

Note [4]) Accuracy is reached after finishing at least 3 automatic calibration cycles (hereinafter referred to as ACDL cycles). First calibration cycle after turning the device on takes 3 days, each following calibration cycle takes 7 days. During each ACDL cycle, area must be ventilated at least once, so the concentration of CO_2 in area reaches cca 400 ppm, which corresponds with concentration of CO_2 in open space.

[5]) Time since turning on. During this time, the unit displays value CO_2 = 0 ppm.

Acoustic signalization

Type	Piezo buzzer [6])

Note [6]) Can be set in user menu (volume, frequency).

RS485

Overvoltage protection		Transil 600 W
Galvanic isolation		No
Terminating resistor [7])		120 Ω on the unit
Idle state definition [7])	– to +5 V – to 0 V	820 Ω on the unit 820 Ω on the unit
Maximum wire length		1200 m / 19200 bps
Max. number of stations on segment		256
Connection point		CHF5/2 terminal
Wire cross section		0.75 mm^2 to 2.5 mm^2

Note [7]) Terminating resistor and idle state definition are connected concurrently.

Power supply

Nominal power supply voltage	24 V DC
Power supply voltage range	10 V DC to 30 V DC
Maximum power consumption	70 mA at 24 V DC
Power loss (typically)	0.8 W
Connection point	CHF5/2 terminal
Wire cross section	0.75 mm^2 to 2.5 mm^2
Power supply distribution	Device must not be supplied from DC power supply network of the building [8])

Note [8]) For more detailed information, see chapter “5.2 Installation rules” paragraph “Power supply”.

Mechanics

Mechanical design		Plastic cover, ABS
Mounting		Vertical (on the wall)
Ingress protection rate		IP20
Dimensions (w × h × d)		(90 × 110 × 29) mm
Weight	– netto – brutto	0.12 kg ±5 % 0.15 kg ±5 %

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
Max. number of stations on network	63 ARION / 247 MODBUS

2.1 Dimensions

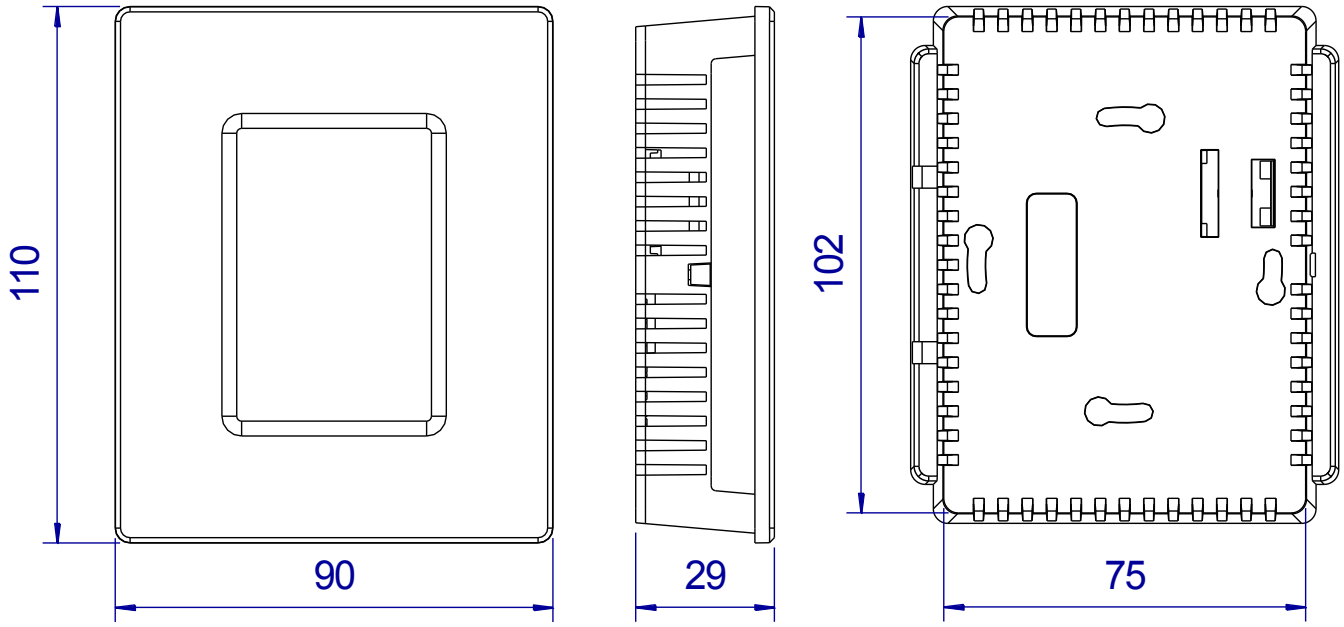

Fig. 1 – **AMR-OP71C/xx** dimensions

2.2 Recommended drawing symbol

Following drawing symbol is recommended for **AMR-OP71C/xx** on wall controller.

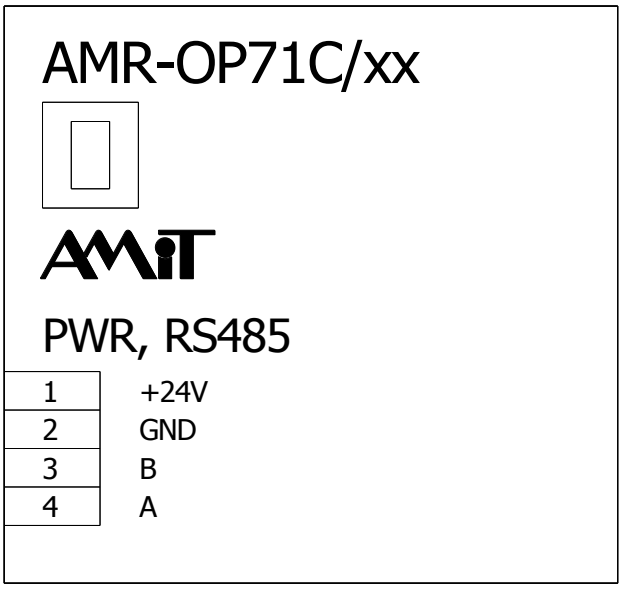

Fig. 2 – Recommended drawing symbol for **AMR-OP71C/xx**

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	Complies (±8 kV)
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test, 800 MHz to 1000 MHz	Complies (10 V/m)
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test, 1000 MHz to 2100 MHz	Complies (3 V/m)
EN 61000-4-3:2006	Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test, 2100 MHz to 2500 MHz	Complies (1 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	Complies (±2 kV)
EN 61000-4-4:2012	Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test, RS485	Complies (±2 kV)
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test, power supply	Complies (±2 kV)
EN 61000-4-5:2006	Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test, RS485	Complies (±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	Complies (3 V)

3.1 Other tests

Device was tested according to:

Tested in accordance with standard	Type of test	Result
EN 60068-2-1:2007	Environmental testing – Part 2-1: Tests – Test A: Cold	Complies
EN 60068-2-2:2007	Environmental testing – Part 2-2: Tests – 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 on DC input power port – Immunity test	Complies

4 Power supply and RS485 communication line

Power supply On wall controller **AMR-OP71C/xx** can be powered only by a DC power supply. Power source must meet requirements listed in chapter “2 Technical parameters”.

RS485 line The RS485 interface without galvanic isolation uses the common GND terminal together with power supply. For proper working of RS485, it is necessary to abide with the rules presented in *Application Note AP0016 – Principles of using RS485 interface.*

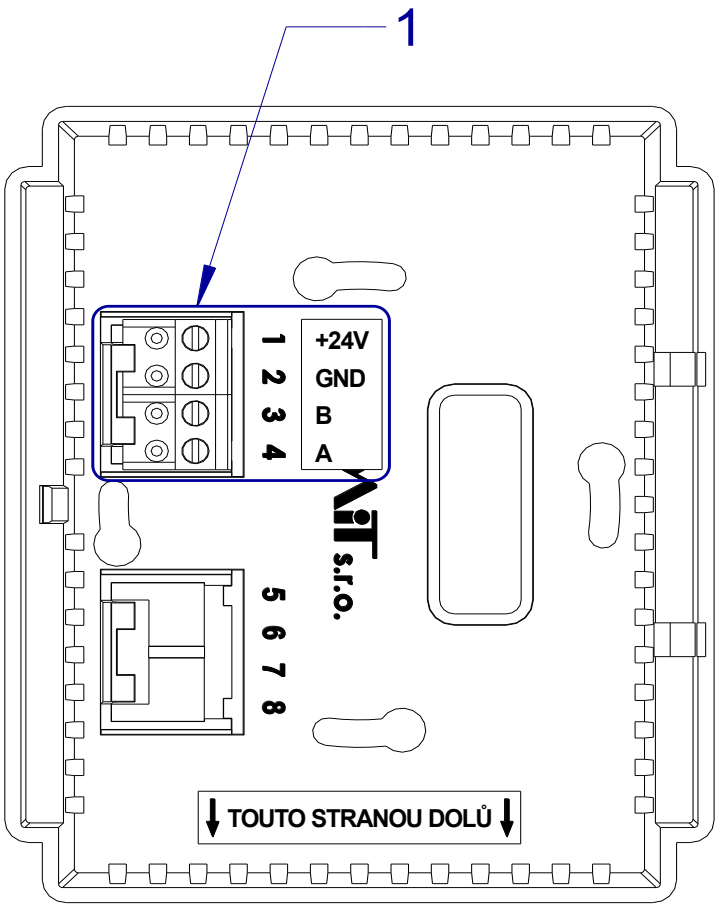

Fig. 3 – Power supply connector location

Legend

Number	Description
1	Power and RS485 line terminals

Terminal wiring

PIN	Signal	Description
1	+24V	Power supply +24 V DC
2	GND	Common ground
3	B	RS485 line, signal B
4	A	RS485 line, signal A

Wiring example

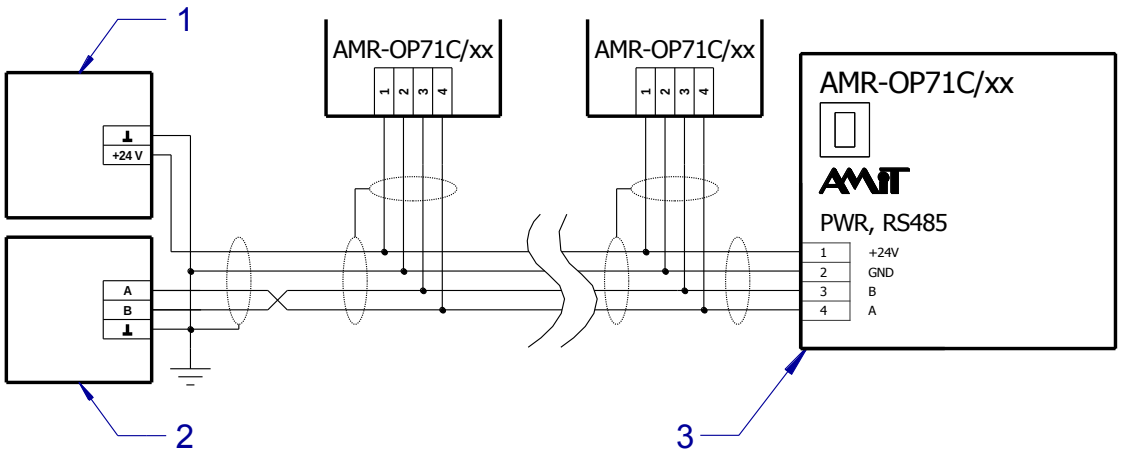

Fig. 4 – Power supply and RS485 wiring

Legend

Number	Description
1	Power supply 24 V DC
2	Superior control system
3	Programmable on-wall controller **AMR-OP71C/xx**

RS485 line termination

Each station on RS485 communication line must have properly set the line termination. Configuration jumpers located near the connector, are used for connection termination. When jumpers are fitted, line termination is connected. Line terminating stations must have the termination always connected and intermediate stations disconnected.

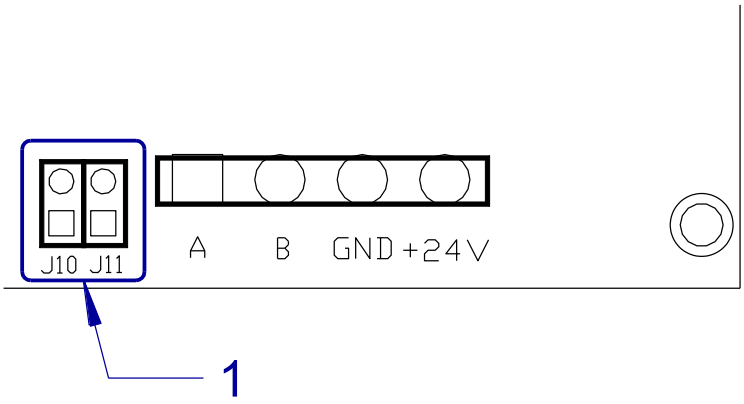

Fig. 5 – RS485 configuration jumpers location

Legend

Number	Description
1	RS485 configuration jumpers

Description of jumpers

Jumpers	Description
Are set	Terminal station – idle states and line termination are active.
Are not set	Intermediate station – idle states and line termination are inactive.

Note

We recommend to use structured cabling for power supply and RS485 wiring. For power connection, we recommend to use one pair of wires for positive

terminal, and second pair for negative terminal. Cable shielding must be connected in single point to PE terminal on the side of the power supply source.

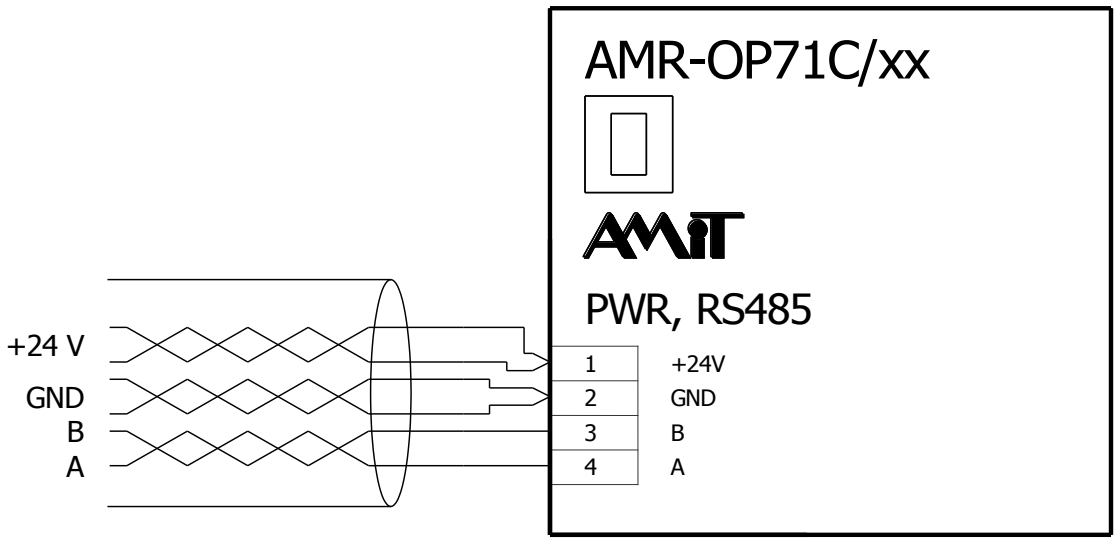

Fig. 6 – Example of structured cabling usage

5 Mounting

On-wall controller is intended to be mounted in internal, dry environment. Should be placed around 1.5 m above the floor, in an area with good and innate air circulation. Controller should not be placed in area where its temperature can be affected by the wind, sunshine, heat radiation from the heater, or other undesirable influences. If the inlet wires are led through the plastic pipe, it is necessary to seal the pipe to avoid air flow.

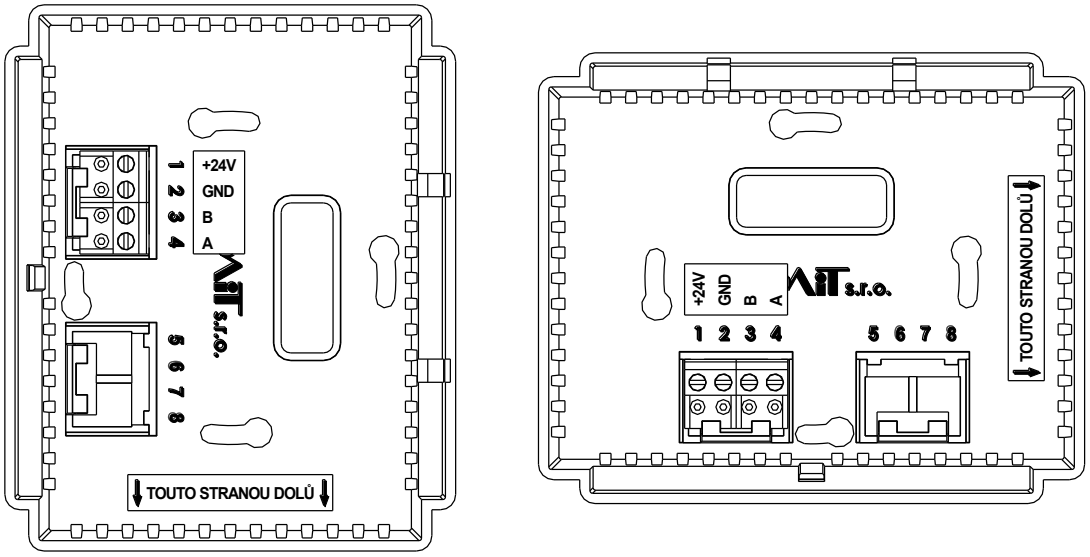

Fig. 7 – On-wall controller mounting in vertical position (left), in horizontal position (right)

Vertical mounting On-wall controller is mounted according to Fig. 7 left side. Temperature sensor is located in left lower corner.

Horizontal mounting On-wall controller is mounted according to Fig. 7 right side. Temperature sensor is located in right lower corner.

Note **Factory uploaded application requires vertical mounting.**
In case of incorrect mounting, temperature sensor is affected by the heat radiated by the electronics of the controller, which results in incorrect temperature readings.

5.1 Mounting procedure

1. Release the cover by pressing a latch on the on-wall controller's left side (for example, with a screwdriver or a blunt-tip). Then take off on-wall controller's front part.

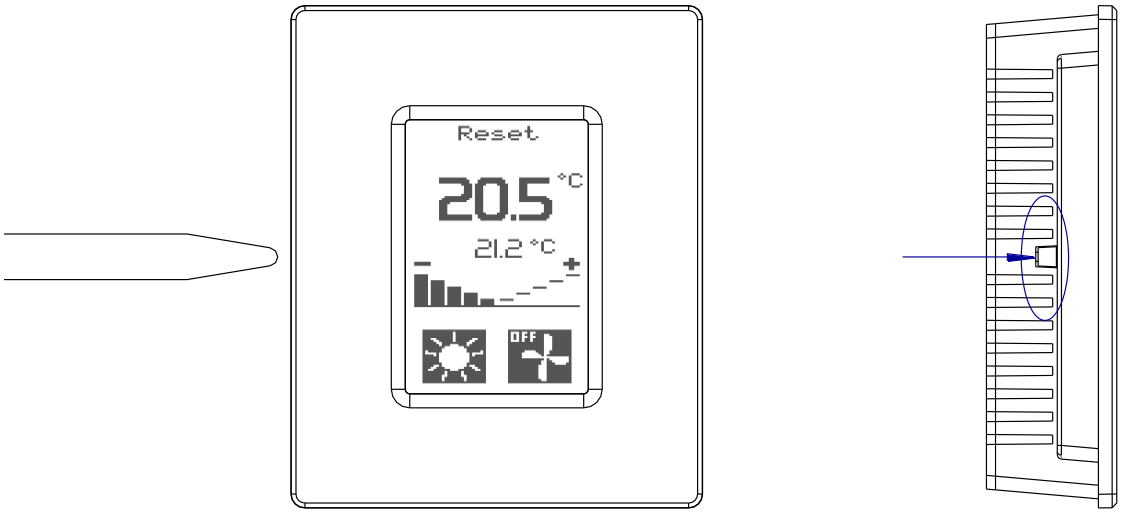

Fig. 8 – Place that must be pressed with blunt-tip

2. Mount rear cover on a selected location. There are two pairs of mounting holes available.
3. Connect the communication and power supply wiring according to chapter "4 Power supply and RS485 communication line").
4. Set the configuration jumpers (according to "4 Power supply and RS485 communication line").
5. Put the upper part on a rear cover and press gently until the latch clicks.

5.2 Installation rules

EMC filter EMC filter is used on power supply input. This requirement can be revised based on environment nature, power source properties and wiring layout.

Power supply Device cannot be supplied from DC power supply network of the building. Multiple devices can be powered from one power source only if the same device type located in the same building is powered from this power source.

Cabling design Cabling connected to terminals for RS485 line and power supply must be shielded.

Connecting to PE Connect module power supply terminal (GND) and cable shielding to PE terminal in one place, close to power supply source.

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

Note All PE connections must be realized with lowest impedance possible. Technical parameters of unit are guaranteed only when these wiring rules are applied.

6 Setup and operation of wall controller

On-wall controller has several working screens.

- Basic — displayed all time.
- User menu — is displayed by press on a particular area of a display.
- Configuration menu — is displayed by pressing continuously on a particular area of a display.
- Screen saver — if switched on, it will be displayed after pre-set time of controller inactivity.

6.1 Basic screen

The appearance of basic screen depends on application variant setting and on the way of displaying measured values. Variant is set by the service organization, during on-wall controller instalation. Mode of displaying of measured values can be set in configuration menu. Part of basic screen is common for all variants, part depends on selected variant.

Common icons

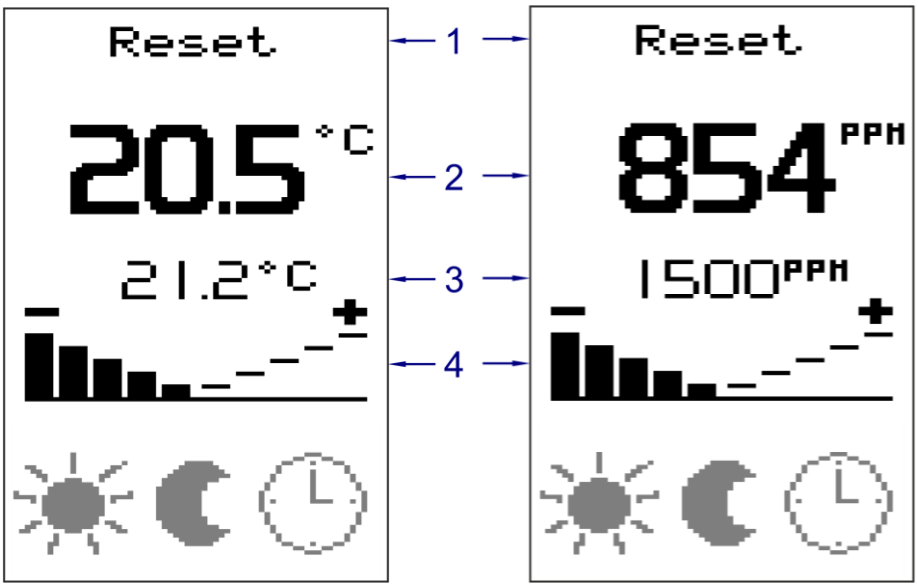

Fig. 9 – Common icons

Legend

Number	Description
1	Status bar
2	Measured temperature / CO_2 value
3	Desired temperature / CO_2 value for acoustic warning
4	Correction of required temperature

Status line

Fig. 10 – Status bar

Following data are displayed:

Status	Description
Reset	Controller restarted. No communication took place since the restart.
Error	Communication error. Time longer than Guard Time elapsed since last communication
Menu	Flawless operation of the unit.

Measured temperature

Fig. 11 – Measured temperature

Display of measured temperature depends on the way of displaying measured value set in menu (according to chapter “6.3.3 Sensors”).

Requested temperature

Fig. 12 Requested temperature.

The value of requested temperature is being sent by superior control system. Hyphens are displayed during correction, until new requested value is received from the superior control system. Value can be displayed with the delay of several seconds.

Correction bar graph

Fig. 13 – Correction of required temperature

Bar-graph is displayed only when Auto room mode is selected. It is not displayed in other modes (Energy saving and Comfort).

Desired temperature correction value is changed to plus or minus by pressing left or right side of the bar graph. After each correction change, instead of requested temperature, hyphens are displayed, until new requested temperature value is received from the superior control system.

Measured CO_2 concentration

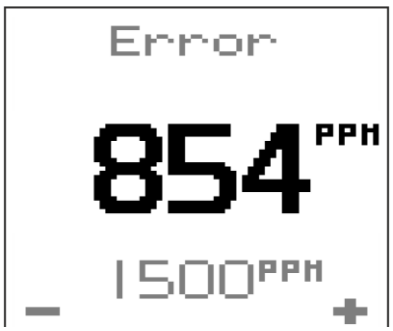

Fig. 14 – Measured CO_2 concentration

Displaying of measured temperature depends on way of displaying measured values, set in configuration menu (according to chapter “6.3.3 Sensors”).

CO_2 concentration for acoustic warning

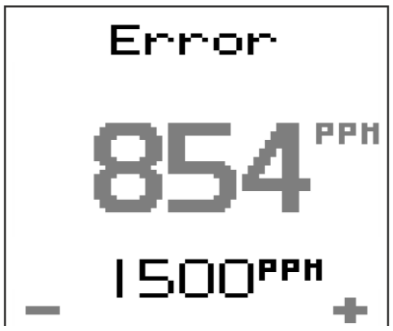

Fig. 15 – CO_2 concentration for acoustic warning

Value of CO_2 for the warning initiation can be set in configuration menu (according to chapter “6.3.3 Sensors”), or can be sent from superior system.

Mode icons Mode icons depend on set variant (see chapter “6.3.2 FW Setting”).

Variant 1

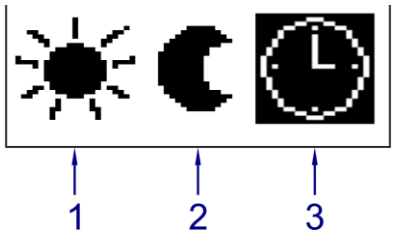

Fig. 16 – Icon for mode variant 1

Legend

Number	Description
1	Comfort mode
2	Energy saving mode
3	Mode Auto

Three icons are displayed for room mode. Highlighted Icon indicates selected room mode. Mode is activated by pressing on a particular icon:

Icon	Mode	Description
	Comfort	Is regulated to constant (comfort) temperature.
	Energy saving	Is regulated to constant (energy saving) temperature.
	Auto	Is regulated according to time plan, adjusted by correction value.

Variant 2

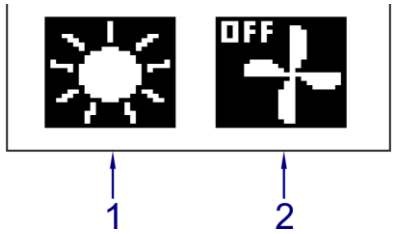

Fig. 17 – Icon for mode variant 2

Legend

Number	Description
1	Room mode
2	Fan mode

Icon for ventilation and room mode is displayed. You can switch between three states by pressing the room mode icon.

Icon	Mode	Description
	Comfort	Is regulated to constant (comfort) temperature.
	Energy saving	Is regulated to constant (energy saving) temperature.
	Auto	Is regulated according to time plan, adjusted by correction value.

By pressing the ventilation icon, you can switch between five states:

Icon	Mode	Description
	OFF	Fan is off.
	Auto	Fan is controlled automatically.
	Speed 1	Fan speed is set to level 1.
	Speed 2	Fan speed is set to level 2.
	Speed 3	Fan speed is set to level 3.

Variant 3

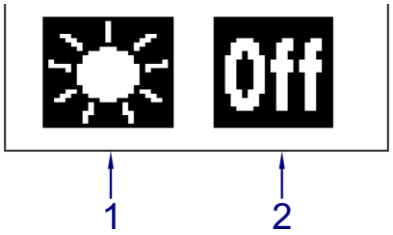

Fig. 18 – Icon for mode variant 3

Legend

Number	Description
1	Room mode
2	Switch

Room mode icon and power off icon are displayed. You can switch between three states by pressing the room mode icon.

Icon	Mode	Description
	Comfort	Is regulated to constant (comfort) temperature.
	Energy saving	Is regulated to constant (energy saving) temperature.
	Auto	Is regulated according to time plan, adjusted by correction value.

By pressing the power off icon you can switch between two states:

Icon	Mode	Description
Off	Off	Switch is off.
On	On	Switch is on.

6.2 User menu

User menu is called out by pressing the area shown below.

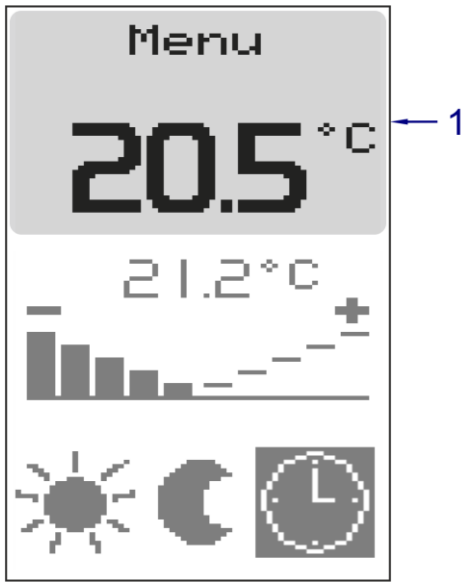

Fig. 19 – Calling user menu

Legend

Number	Description
1	Area for pressing

Menu items

Fig. 20 – User menu items

Legend

Number	Description
1	Brightness adjustment
2	Contrast adjustment
3	Language selection
4	Screen saver setting
5	Firmware version
6	Return back

Brightness Via the **Brightness** item can be set the brightness.

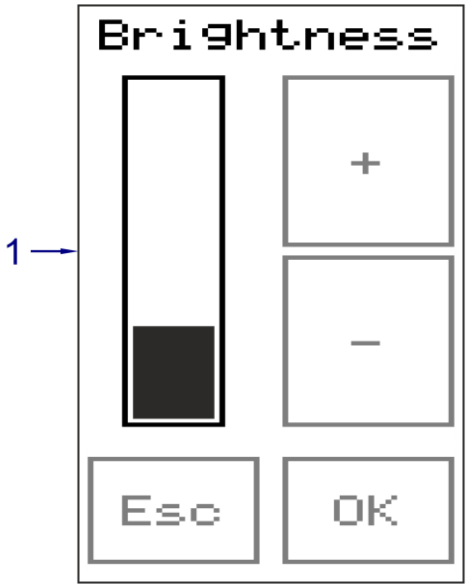

Fig. 21 – Brightness adjustment

Legend

Number	Description
1	Brightness level adjustment

Contrast Via the **Contrast** item can be set the contrast of the display.

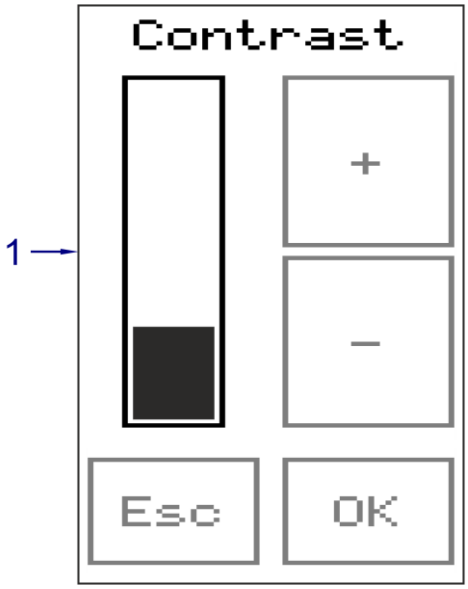

Fig. 22 – Contrast adjustment

Legend

Number	Description
1	Contrast level adjustment

Language Via the **Language** item can be switched texts between Czech and English on on-wall controller.

Fig. 23 – Language selection

Legend

Number	Description
1	Language selection

Display Via the **Display** item can be set screen saver time delay.

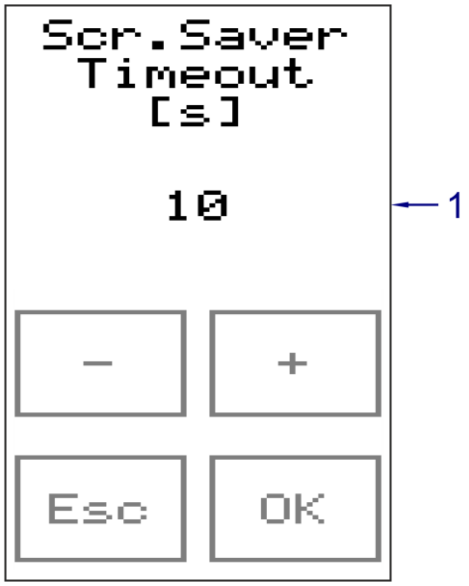

Fig. 24 – Setting time for screen saver activation

Legend

Number	Description
1	Time set for screen saver activation [s]

Following values can be set:

Value	Description
-1	Screensaver is off.
10 to 120	Screen saver time delay in seconds.

Help Via the **Help** item can be shown the actual version of application software loaded into the on-wall controller.

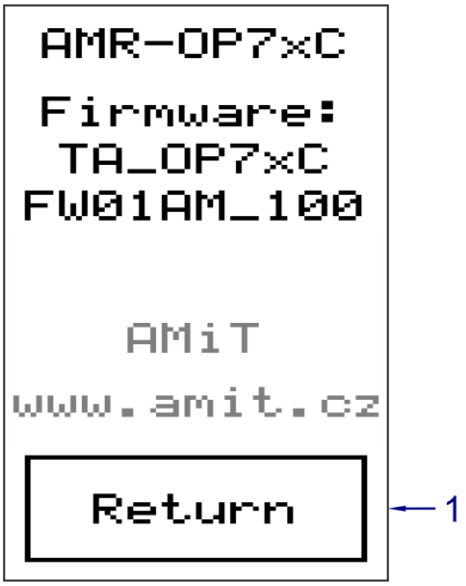

Fig. 25 – Firmware version

Legend

Number	Description
1	Return back to user menu

Return Via the **Return** item, you can return to the basic screen of on-wall controller.

6.3 Configuration menu

Configuration menu can be displayed by a long press for at least 10 seconds on the area shown below.

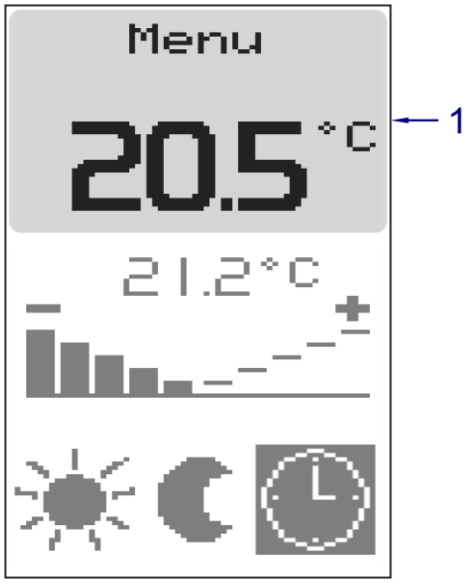

Fig. 26 – Calling configuration menu

Legend

Number	Description
1	Area for pressing

Caution Setting of on-wall controller (software and hardware) should be performed strictly by the service company. Wrong configuration settings could result in a controller malfunction.

Menu items

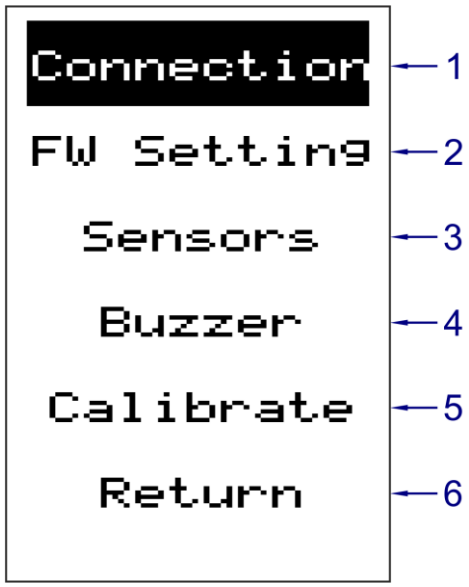

Fig. 27 – Configuration menu items

Legend

Number	Description
1	Communication settings
2	Variant selection
3	Settings of temperature and CO_2 sensors
4	Setting of acoustic signalization
5	Calibration
6	Return back

6.3.1 Connection

Via the Connection item can be set the communication parameters of the **AMR-OP71C/xx**.

Menu items

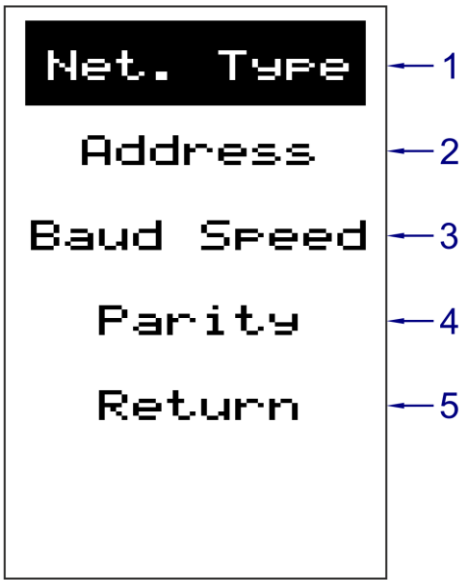

Fig. 28 – Menu with communication settings

Legend

Number	Description
1	Protocol selection
2	Address setting
3	Rate setting
4	Parity setting (only for MODBUS protocol)
5	Return back

Net. Type Via the **Net. Type** item can be selected one of the two communication protocols:

- ARION,
- MODBUS.

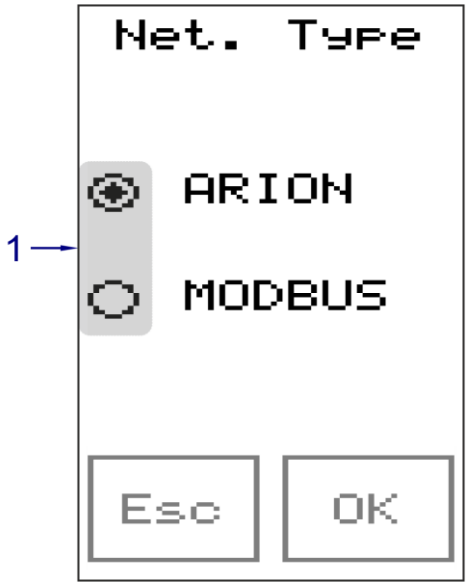

Fig. 29 – Communication protocol selection

Legend

Number	Description
1	Protocol selection

Address Via the **Address** item can be set the address within selected communication network. Each unit must have unique address. Allowed address range is:

- 1 to 63 (ARION),
- 1 to 247 (MODBUS).

Fig. 30 – Address setting

Legend

Number	Description
1	Address setting

Baud Speed Via the **Baud Speed** item can be set the communication rate within selected communication network. All devices connected to the network must have same communication rate (according to communication rate of the superior control system).

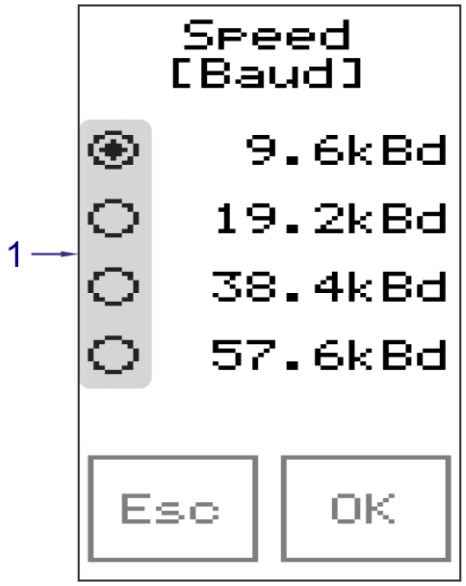

Fig. 31 – Setting communication rate

Legend

Number	Description
1	Rate selection

Parity This item can be used for parity settings – is relevant only when the MODBUS communication protocol is selected.

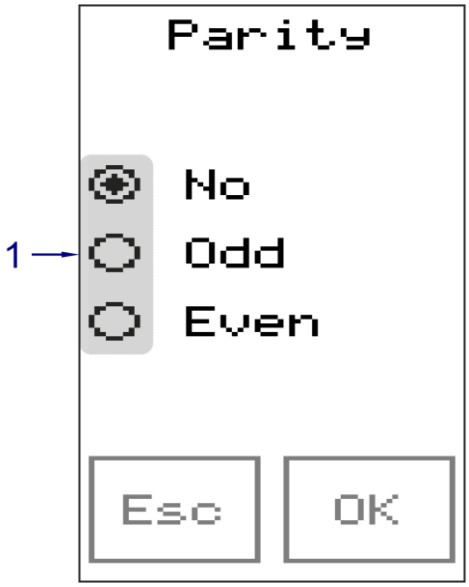

Fig. 32 – Setting parity for MODBUS protocol

Legend

Number	Description
1	Parity setting

Return Via the **Return** icon, you can return to the basic screen of on-wall controller.

6.3.2 FW Setting

Via the **FW Setting** item can be selected one of three variants (see chapter “6.1 Basic screen”).

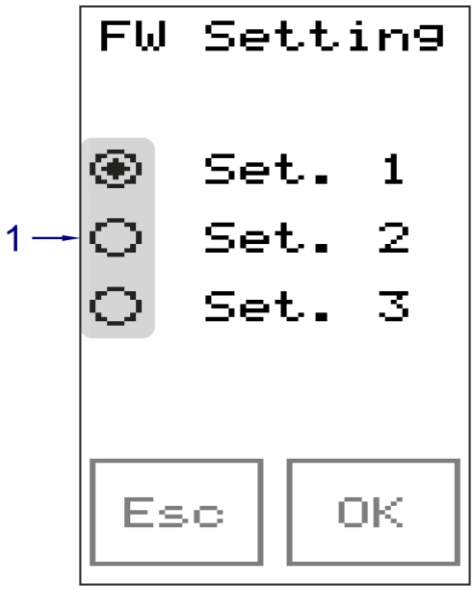

Fig. 33 – Variant selection

Legend

Number	Description
1	Variant selection

6.3.3 Sensors

Via the **Sensors** item can be set sensors for temperature and CO_2, which are located in on-wall controller.

Menu items

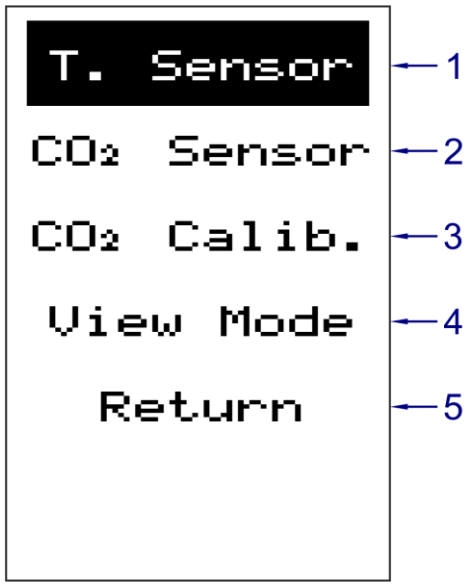

Fig. 34 – Sensors menu items

Legend

Number	Description
1	Setting of measured temperature correction
2	Setting of value of CO_2 for acoustic warning
3	CO_2 sensor calibration
4	Display of measured values
5	Return

T. Sensor Via the **T. Sensor** item can be set the correction of measured value.

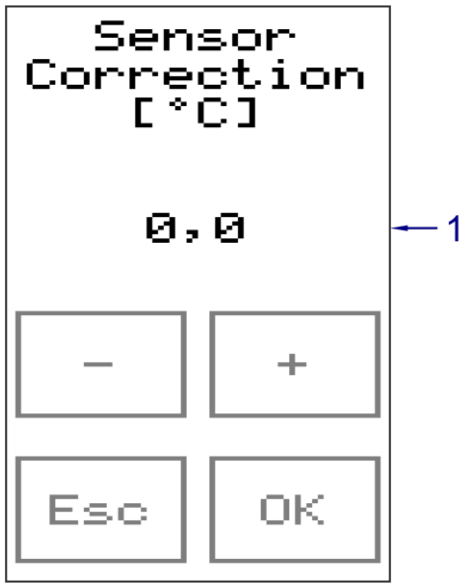

Fig. 35 – Correction of temperature sensor

Legend

Number	Description
1	Measured temperature correction [°C]

Following values can be set:

Value	Description
-10.0 to 10.0	Measured temperature correction [°C]

CO_2 Sensor Via the **CO_2 Sensor** can be set concentration value for acoustic warning. For concrete buzzer settings, see chapter “6.3.4 Buzzer”.

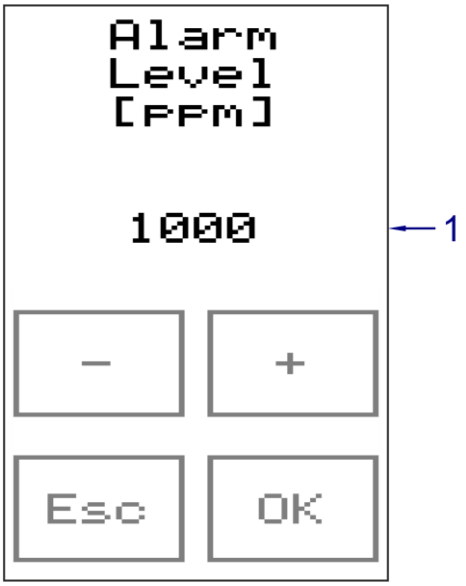

Fig. 36 – CO_2 concentration for acoustic warning

Legend

Number	Description
1	CO_2 value for acoustic warning [ppm]

Following concentration values can be set:

Value	Description
400 to 3000	CO_2 concentration for acoustic warning [ppm]

CO_2 Calib. Via the **CO_2 Calib.** can be done manual calibration of the CO_2 sensor.

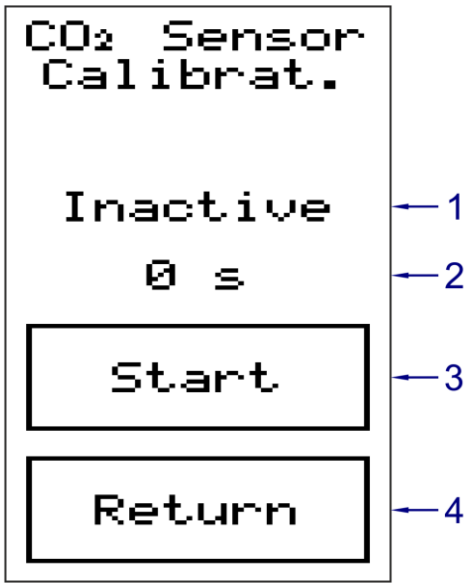

Fig. 37 – Manual CO_2 sensor calibration

Legend

Number	Description
1	Information about calibration progress
2	Duration until the end of calibration
3	Manual calibration start
4	Return

Note Before manual calibration, area must be ventilated, so the concentration of CO_2 in area reaches cca 400 ppm, which corresponds with concentration of CO_2 in open space. The duration of calibration is approximately 15 minutes.

The controller also has an ability of automatic CO_2 sensor calibration, that cannot be deactivated. Automatic calibration process is described in section CO_2 sensor, in chapter “2 Technical parameters”.

View Mode Via the **View Mode** item can be set one of three variants of displaying the measured value. Temperature and CO_2 value will alternate periodically every 5 s by choosing the **Switch** option.

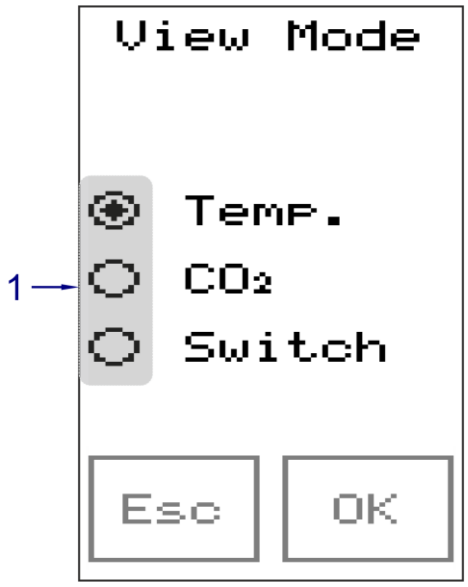

Fig. 38 – Method of displaying measured value

Legend

Number	Description
1	Variant selection

Return Via the **Return** icon, you can return to the basic screen of on-wall controller.

6.3.4 Buzzer

Via the **Buzzer** item can be set the acoustic warning.

Menu items

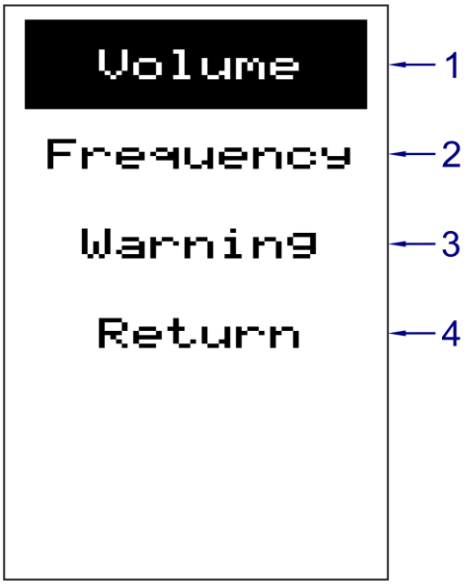

Fig. 39 – Buzzer menu items

Legend

Number	Description
1	Setting the volume level of acoustic warning
2	Setting the frequency of acoustic warning
3	Setting the interval of acoustic warning
4	Return

Volume Via the **Volume** item can be set the volume level of acoustic warning in four steps.

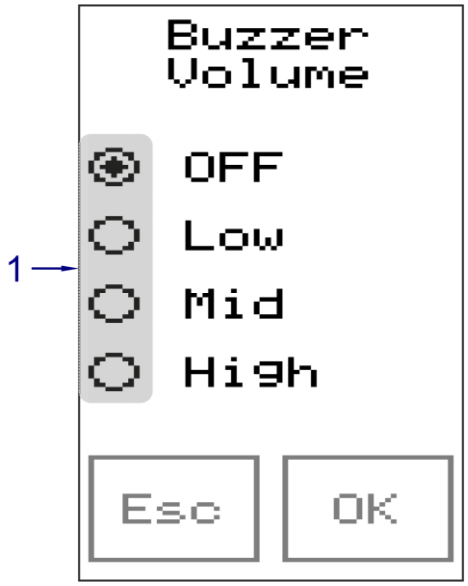

Fig. 40 – Buzzer volume

Legend

Number	Description
1	Volume settings

Note By selecting the option “OFF”, the user will not be informed about exceeding the CO_2 value set for warning.

Frequency Via the **Frequency** item can be set tone pitch of acoustic warning.

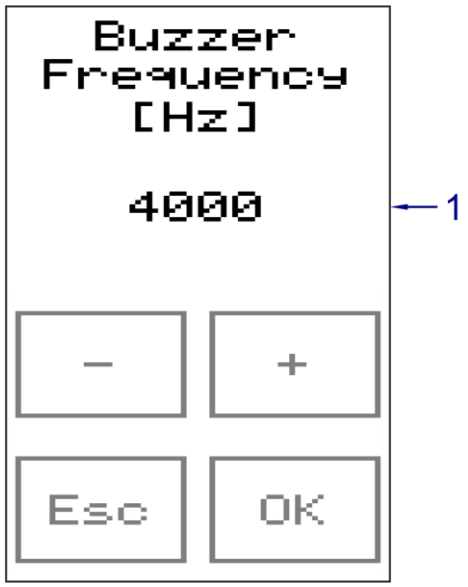

Fig. 41 – Frequency of acoustic warning

Legend

Number	Description
1	Setting the frequency of acoustic warning [Hz]

Following values can be set:

Value	Description
20 to 20000	Frequency of acoustic warning [Hz]

Warning Via the **Warning** item can be set interval between each acoustic warning.

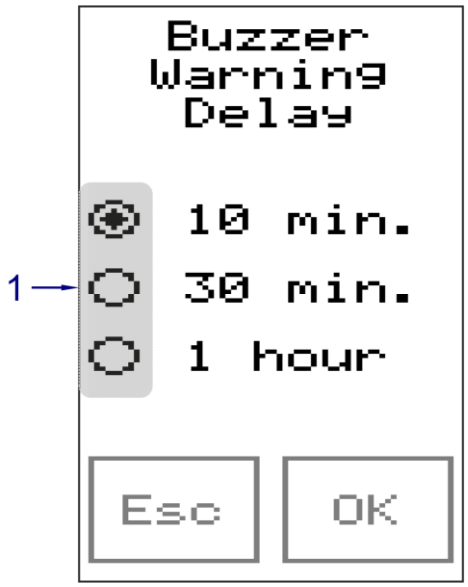

Fig. 42 – Interval of warning

Legend

Number	Description
1	Setting the interval

Return Via the **Return** icon, you can return to the basic screen of on-wall controller.

6.3.5 Calibrate

Via the **Calibrate** item, the touch screen can be calibrated.

6.3.6 Return

Pressing the **Return** item will restart on-wall controller (this will confirm the settings) and will return the controller to its default screen.

6.4 Screen saver

If turned on in menu, screen saver is displayed after pre-set time (screen saver is displayed, backlight is off). After the first touch of the screen – backlight is turned on, after the second touch- basic screen is displayed.

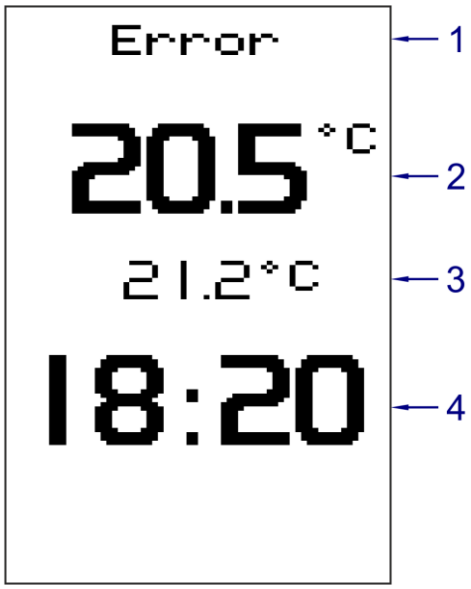

Fig. 43 – Screen for screen saver

Legend

Number	Description
1	Status bar
2	Measured temperature / measured CO_2 value
3	Desired temperature / CO_2 value for acoustic warning
4	Time of superior system

When screen saver is active, status bar displays only Reset and Error statuses (see chapter “6.1 Basic screen”). Values of temperature and CO_2 are displayed according to set method of displaying measured values in configuration menu (see chapter “6.3.3 Sensors”).

Note If time is not transmitted over the network, **--** is displayed instead of numerical value.

7 ARION protocol program operation

In ARION network **AMR-OP71C/xx** can acquire following states:

Reset Bits 0 to 7 of the **Status** registry are set to value True after the restart of on-wall controller. On-wall controller does not have a valid value:

- room and fan mode settings,
- switch state,
- correction values (it has a zero value),
- required temperature.

The correct value can be written only by a superior control system. Values that have been written by the user will be ignored, until the valid value from the superior control system is received.

Error On-wall controller supports communication interruption control (parameter **Guard Time** in ARION network). If the communication fails, the **Error** text will be displayed in a status bar and the controller will behave the same as in **Reset** state (with the exception of correction value, which remains at initial value).

7.1 Digital inputs

On-wall controller status information is transmitted on digital inputs.

Description of the function module

Function module	Number of signals	Note
ARI_DigIn	3	Multiple signals can be read simultaneously via this module. Single signals correspond with single bits of database variables.

Description of single signals

Module signal	Description
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 registry from the side of on-wall controller has occurred, bit n.1 of this channel (DI.1) is set to value True. Once the superior control system reads-out the value from the registry, it sets bit n.1 of digital output channel (DO.1) to value True by writing value False to bit n.1 of digital input channel (DI.1).

7.2 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	Multiple signals simultaneously can be written by the module. Single signals correspond with single bits of the database variable.

Description of single signals

Module signal	Description
0	Zeroing bit DI.0
1	Zeroing bit DI.1
2	Zeroing bit DI.2

7.3 Register layout

Register with n. 0

Name	Number	Type	Description
Status reset	0 (bit 0 to 15)	R/W	Zeroing corresponding bits of Status registry. The bit is set in case of simultaneous writing of value True to the setting and zeroing register (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 both setting and zeroing registers (prevailing “set”). While reading this registry, the last recorded value is returned.

Registers with numbers 1 to 6

Name	Number	Type	Description
Status	1	R	Description of single bits

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

Bit 2	Bit 1	Description
0	0	Automat
0	1	Energy saving
1	0	Comfort
1	1	Not used

Bit	Description
3	Switch. Applies only for the Variant 3. In other variants this bit is not used.
4 5 6	Fan mode.

Bit 6	Bit 5	Bit 4	Description
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. These bits are not used by controller in other variants.

Bit	Description
7 *)	Status of DI input Ni1000 / contact.

Name	Number	Type	Description
Correction (Float)	2	R/W	Correction of required temperature [%]. 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 [9]) (Float)	5	R	Measured temperature Ni1000 [°C] with floating point.
Brightness LED [9]) (Float)	6	R/W	LED brightness [%]. Range: 0 to 100. Value 0 corresponds with minimal brightness, but not LED power off.
Measured CO_2 value	7 (bit 0 to 15)	R	Measured concentration of CO_2 [ppm].
CO_2 limit	7 (bit 16 to 32)	R/W	Limit value of CO_2 concentration for acoustic warning.

Note [9]) Is not active in **AMR-OP71C/xx**. Possible writing value to the registry is ignored and does not affect the function of the on-wall controller.

7.4 Operating time setting

On-wall controller allows to display time while screen saver is active (see chapter “6.4 Screen saver”). This is a superior control system time, which is displayed only if the parameter **TimeBroadcast** is set to value True in superior control system during ARION network parameterization.

8 MODBUS protocol program operation

In MODBUS network **AMR-OP71C/xx** can acquire following states:

Reset Bits 0 to 7 of the **Status** registry are set to value True after the restart of on-wall controller. On-wall controller does not have a valid value:

- room and fan mode setting
- button status,
- correction values (it has a zero value),
- required temperature.

The correct value can be written only by a superior control system. Values that have been written by the user will be ignored, until valid value from the superior control system is written to register 101.

Error On-wall controller supports communication interruption control (**Guard Time** register). If the superior control system does not use **Guard Time** parameter, and on-wall controller is not receiving valid frame within 30 s, it automatically switches to **Error** status. In the **Error** state – the **Error** text will be displayed in a status bar and the controller will behave the same as in **Reset** state (with the exception of correction value, which remains at initial value).

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.

8.1 Register layout

Supported functions:

- 03 Read Holding Registers – reading registers,
- 16 Write Multiple Registers – writing registers.

All values are saved in BigEndian format.

System registers with addresses 0 to 8

Name	Address	Type	Description
Module ID	0	R	Module identification Unit type is given by number. 35 = AMR-OP7x, is given by HW type.
FW	1	R	Firmware version, 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	Communication rate.
Parity	6	R/W EEPROM	Parity.

Name	Address	Type	Description
Address	7	R/W EEPROM	Address.
System Status	8	R/W	System status register. System uses it, it can not be accessed by the application.

Application registers with addresses 100 to 115

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

Name	Address	Type	Description
Status Set	100	R/W	Setting corresponding bits of Status registry. In case of simultaneous writing of True value into both setting and zeroing bit (prevailing “set”). While reading this registry, the last recorded value is returned.
Status Reset	101	R/W	Zeroing corresponding bits of Status registry. The bit is set in case of simultaneous writing of the value True to the both setting and zeroing register (prevailing “set”). While reading this registry, the last recorded value is returned.
Status	102 103	R	Description of single bits

Bit	Description
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 affect on the controller function.
1 2	Room mode

Bit 2	Bit 1	Description
0	0	Automat
0	1	Energy saving
1	0	Comfort
1	1	Not used

Bit	Description
3	Switch. Applies only for the Variant 3. In other variants this bit is not used.
4 5 6	Fan mode.

Bit 6	Bit 5	Bit 4	Description
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. These bits are not used by controller in other variants.
7 *)	Status of DI input Ni1000 / contact.

Name	Address	Type	Description
Correction (Float)	104 105	R/W	Correction of required temperature [%]. 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.
Measured Ni1000 [10]) (Float)	110 111	R	Measured temperature Ni1000 [°C] with floating point.
LED brightness [10]) (Float)	112 113	R/W	LED brightness [%]. Range: 0 to 100. Value 0 corresponds with minimal brightness, but not LED power off.
CO_2 limit	114	R/W	Limit value of CO_2 concentration for acoustic warning.
Measured CO_2 value	115	R	Measured concentration of CO_2 [ppm].

Note [10]) Is not active in **AMR-OP71C/xx**. Possible writing value to the registry is ignored and does not affect the function of the on-wall controller.

8.2 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.

9 Programming

The on-wall controller **AMR-OP71C/xx** is delivered from the manufacturer with loaded application program, which can be freely downloaded from www.amitomation.com. On-wall controller can be also reprogrammed with another, own 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 development environment
- AMRconfig service and programming utility
- AMRmultidownload multiprogramming utility

SW Download Development environment can be freely downloaded on www.amitomation.com.

9.1 Setting of communication parameters

Change of communication parameter can be performed:

- from PC via DetStudio / AMRconfig,
- from application program via configuration menu, see chapter “6.3 Configuration menu”,
- from service application via service menu, see chapter “9.2 Service mode”.

Connection to the PC On-wall controller **AMR-OP71C/xx** must be connected to the PC via RS485 converter (for example type **SB485s** produced by the AMiT company) using point-to-point connection.

Note Communication with on-wall controller from DetStudio can be set only via MODBUS RTU communication protocol. If the application has set different type of network (ie. ARION communication protocol), it is needed to activate the loader, see chapter “9.3 Loader”.

9.2 Service mode

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

Service application in **AMR-OP71C/xx** is always available, user can always switch to it, and it can not be deleted. After switching to service application, the service menu is displayed.

Service mode is activated by this procedure:

- disconnect the **AMR-OP71C/xx** from power supply,
- touch the touchscreen anywhere and keep pressing,
- connect the **AMR-OP71C/xx** to power supply,
- release the pressure on the touchscreen.

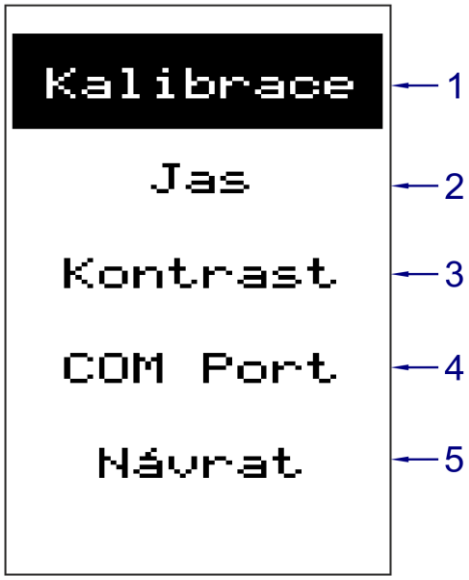

Fig. 44 – Items of service menu

Legend

Number	Description
1	Calibration
2	Brightness adjustment
3	Contrast adjustment
4	Serial Line Setting
5	Return back

Following items can be set via service menu:
- Calibration – calibration of the touchscreen sensitive layer,
- Brightness – brightness intensity change,
- Contrast – change of display contrast,
- Serial interface communication parameters [11]).

[11]) Possibility to change parameters can be affected by user application.

To quit from service menu press button *"**Return**"*. The on-wall controller will restart.

9.3 Loader

The state, when the Loader is running can be used in cases when the user application is causing any troubles, for example repetitive restarting, inability to connect to the unit, etc.

Loader activation

Loader can be activated by interconnecting service jumper. Particular action is called-out according to moment and length of jumper installation.

Interconnection duration	**Action**
> 1 s – after turning on	Loader with original communication parameters is launched.
> 3 s and < 10 s – while the application is running	Loader with original communication parameters is launched.
> 10 s	Loader with factory pre-set communication parameters is launched. The original application is launched after each further start.

Jumper location

The service jumper, located on PCB, is accessible after the cover is taken off, see Fig. 45.

Note

Unwanted interconnection of pins, located close to each other, when the controller is on has no effect on its functionality.

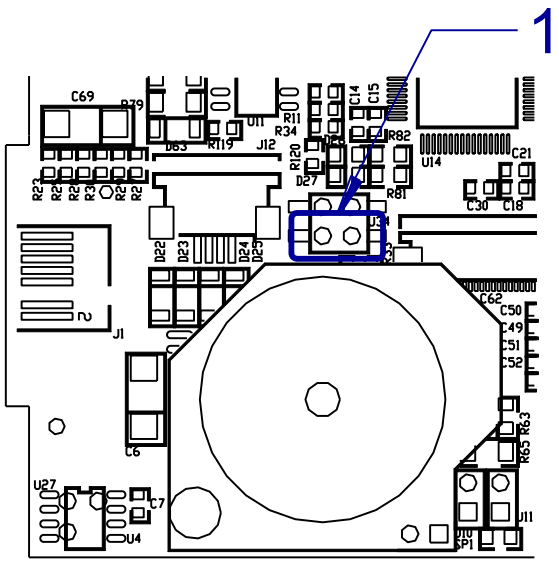

Fig. 45 – Interconnection of service jumper on **AMR-OP71C/xx** PCB

Legend

Number	**Description**
1	Service jumper

10 Factory settings

RS485 configuration Jumpers, which activate the line termination and idle state definition are fitted.

Program settings

Item	Set value
Network type	ARION
Address	1
Speed	38400 bps
Viewing variant	Var. 1
Display of measured values	Switch
Correction	0.0 °C
Buzzer volume	Off
Buzzer frequency	4000 Hz
Warning by a buzzer	10 min.
CO_2 concentration for acoustic warning	1000 ppm

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

11 Ordering information and completion

On-wall controller	**AMR-OP71C/xx [12])**	Unit complete – see chapter 11.1 Completion

Note [12]) **xx** indicates colour design of the product. Available versions are listed in following table.

Colour variants

	Backframe colour	**Cover colour**
AMR-OP71C/01	black	platinum
AMR-OP71C/02	black	metallic gray

11.1 Completion

AMR-OP71C/xx

Part	**Quantity**
On-wall controller	1

12 Maintenance

With exception of cleaning, the device requires no periodic control nor maintenance.

Cleaning Depending on equipment usage, the dust is to be removed occasionally from equipment. 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!**

13 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.