AMR-OP60/xx

Programmable on-wall controller

Operation manual

Version 1.00

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Contents

History of revisions

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Revision	Date	Changes
100	13. 5. 2014	New document

Related documentation

1. DetStudio Development Environment Help
2. Data sheet **AMR-OP60/xx**
   file: amr-op60xx_d_en_xxx.pdf
3. Application Note AP0016 – Principles of using RS485 interface
   file: ap0016_en_xx.pdf
4. Application Note AP0025 – ARION Network Communication – definition by table
   file: ap0025_en_xx.pdf

1. Introduction

AMR-OP60/xx is a freely programmable on-wall controller with graphic display and four buttons, which are used for operating. It is connected to superior control system via RS485 line.

Basic features

- Measuring of room temperature
- FSTN display with (256 × 128) resolution
- Controlled by four buttons
- ABB Elektro Praga (Time / Time Arbo / Element) design
- RS485 line without galvanic separation
- Power supply 24 V DC
- User programming in DetStudio / EsiDet environment is possible
- MODBUS RTU or ARION communication protocol
- Supplied with application program with a choice of control variant *)
  - Variant 1 – Room mode
  - Variant 2 – Room mode + fan mode
  - Variant 3 – Room mode + bi-stable switch

*Note: **) Application program is free to download on www.amit.cz. This is a standard application „TA_OP60FW01AM_xxx“.

2. Technical parameters

Processor

Type	STM32F207VET6
FLASH memory	512 KB
SRAM	132 KB
EEPROM	256 KB

Display

Type	FSTN / negative / white-blue
Resolution	(256 × 128) pixels
Visible area	(44 × 25) mm
Viewing angle	45 °
Backlight	LED
Backlight color	White
Backlight lifetime	Min. 50 000 hours *)

Note: *) Luminance drop to 50 %.

Temperature sensor

Type	DS18B20
Measuring range	-55 °C to +125 °C *)
Resolution	12 bit
Accuracy	±2 °C (-55 °C to -10 °C) ±0.5 °C (-10 °C to 85 °C) ±2 °C (85 °C to 125 °C)
Device tempering	45 min **)

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

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

RS485

Overvoltage protection	Transil 600 W
Galvanic separation	No
Terminating resistor	No *)
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	2 × WAGO 243-204
Wire cross section	0.6 mm2 to 0.8 mm2

Note: *) For termination you can use, for example **RR 120R** from AMiT company production.

Mechanics

Mechanical design	Plastic cover, ABS
Mounting	Into junction box KU68 with frame *)
Frame design	ABB Time / Time Arbo / Element *)
Ingress protection rate	IP20
Dimensions (w × h × d)	(71 × 71 × 28) mm **)
Weight	47 g

Note: *) Not included

**) Final dimensions depend on frame type

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	2 × WAGO 243-204
	Wire cross section	0.6 mm^2 to 0.8 mm^2

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

Others	Maximum ambient humidity	< 95 % non-condensing
	Application software	TA_OP60_FW01AM_xxx
	Programming	DetStudio / EsiDet
	Communication protocol	ARION / MODBUS

2.1. Dimensions

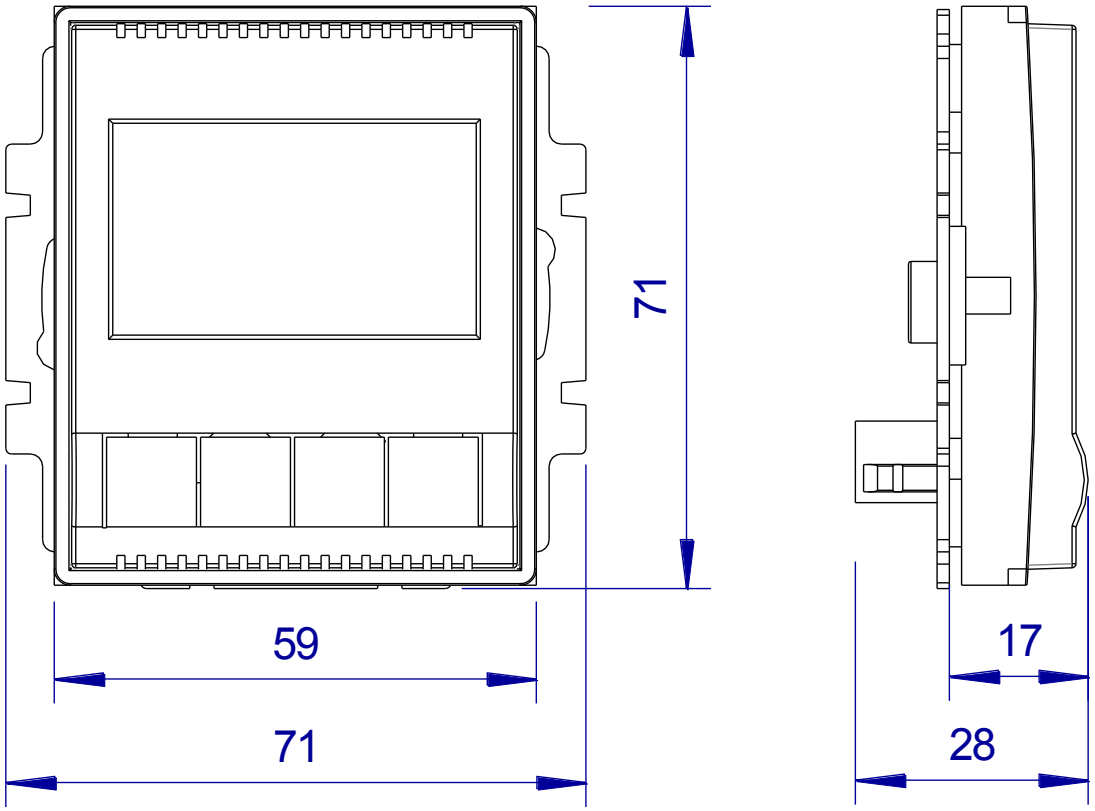


Fig. 1 - **AMR-OP60/xx** dimensions

2.2. Recommended drawing symbol

Following drawing symbol is recommended for **AMR-OP60/xx** on-wall controller.

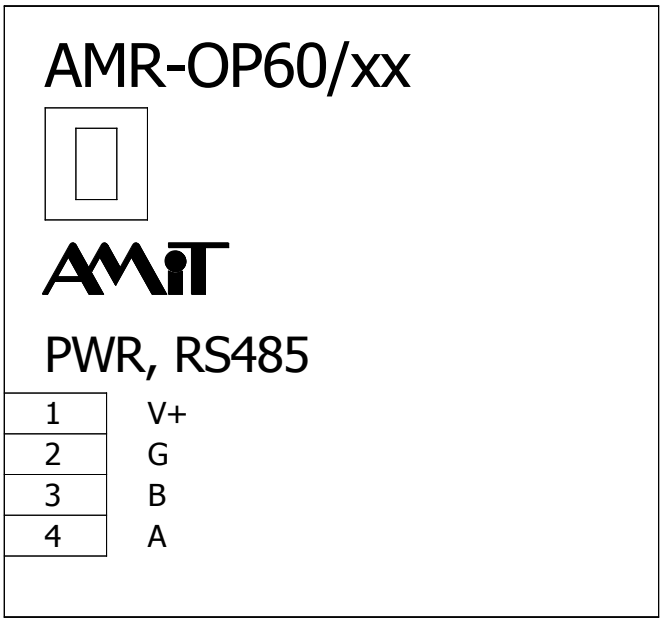


Fig. 2 - Recommended drawing symbol for **AMR-OP60/xx**

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	B
EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: EMC – Testing and measurement techniques – Electrostatic discharge immunity test, aerial discharge	±4 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

AMR-OP60/xx on-wall controller can be powered by DC power sources that meet the requirements, listed in chapter 2. Technical parameters.

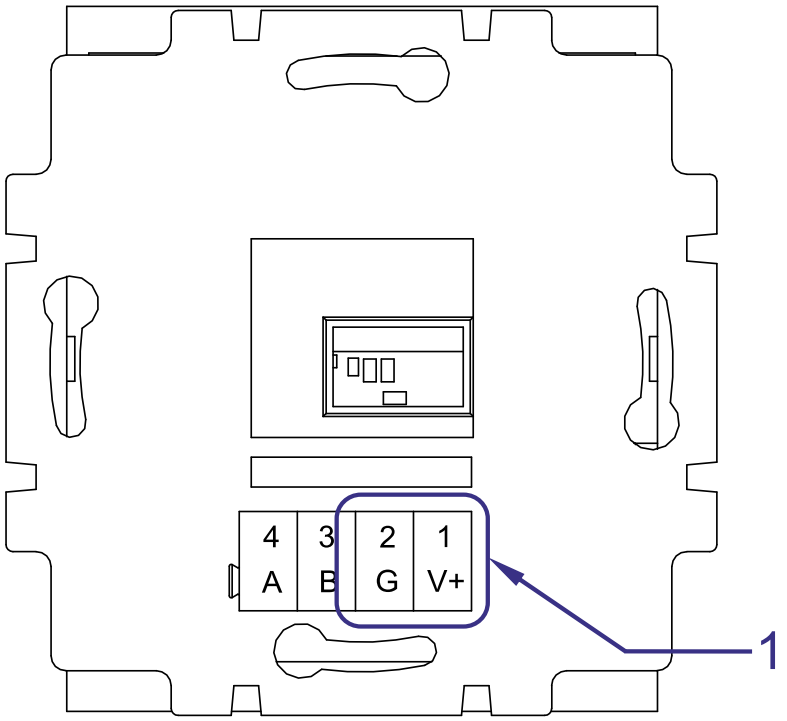


Fig. 3 - Location of power supply connector

Legend

Number	Meaning
1	Power supply pole

Each pole of the connector has 4 connection points. Power supply can be connected to any connection point (see Fig. 9 - Connecting to connection points).

Connector wiring

Pole	Label	Meaning
1	V+	Power supply + 24 V DC
2	G	Power supply GND

Wiring example

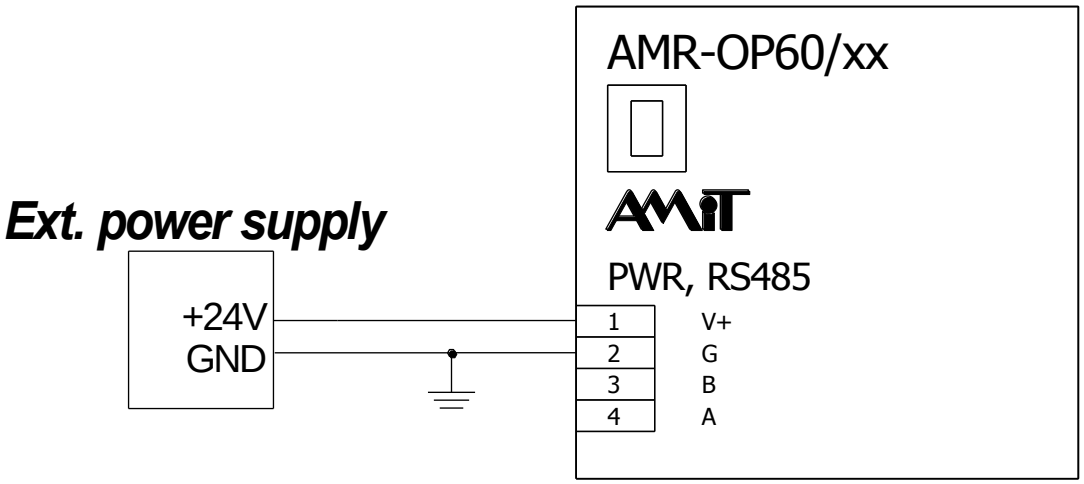


Fig. 4 - Power supply wiring example

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

5. RS485 communication line

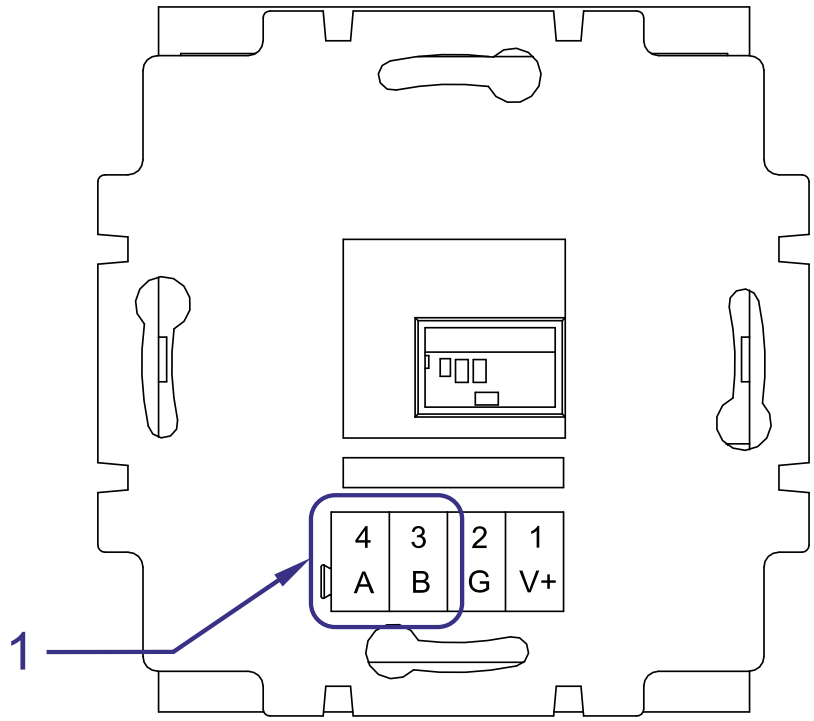


Fig. 5 - Location of RS485

Legend

Number	Meaning
1	Pole RS485

Each pole of the connector has 4 connection points. RS485 can be connected to any connection point (see Fig. 9 - Connecting to connection points).

Connector wiring

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

On-wall controller is connected with superior 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.*

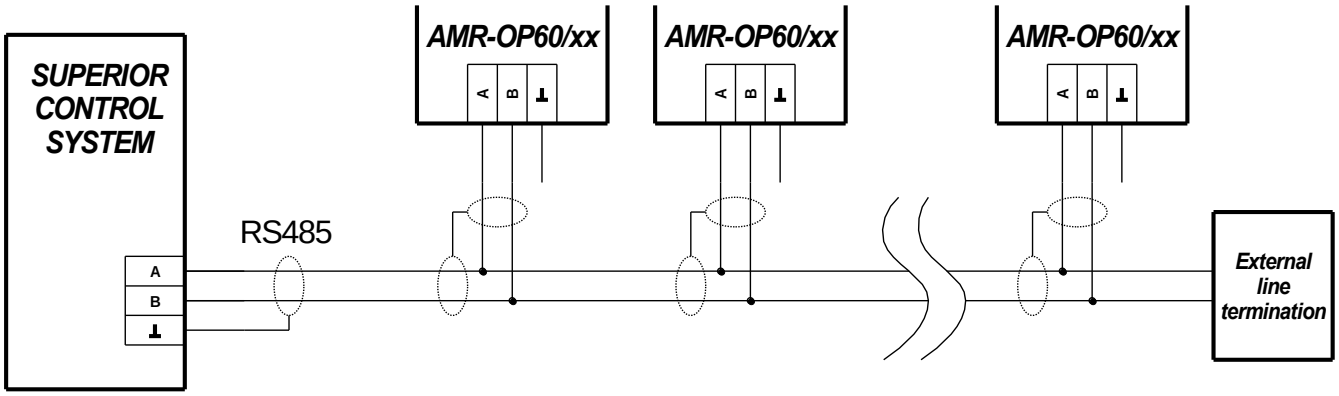


Fig. 6 - RS485 wiring

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.

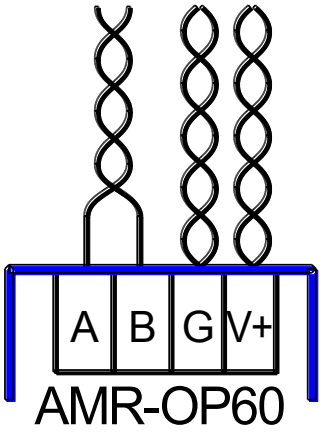


Fig. 7 - Connecting structured cabling to poles of controller

RS485 line termination

In case **AMR-OP60/xx** is an end-station on RS485 line, the line must be terminated with external terminating resistor 120 Ω, connected between poles A and B (for example **RR 120R** from AMiT company production.)

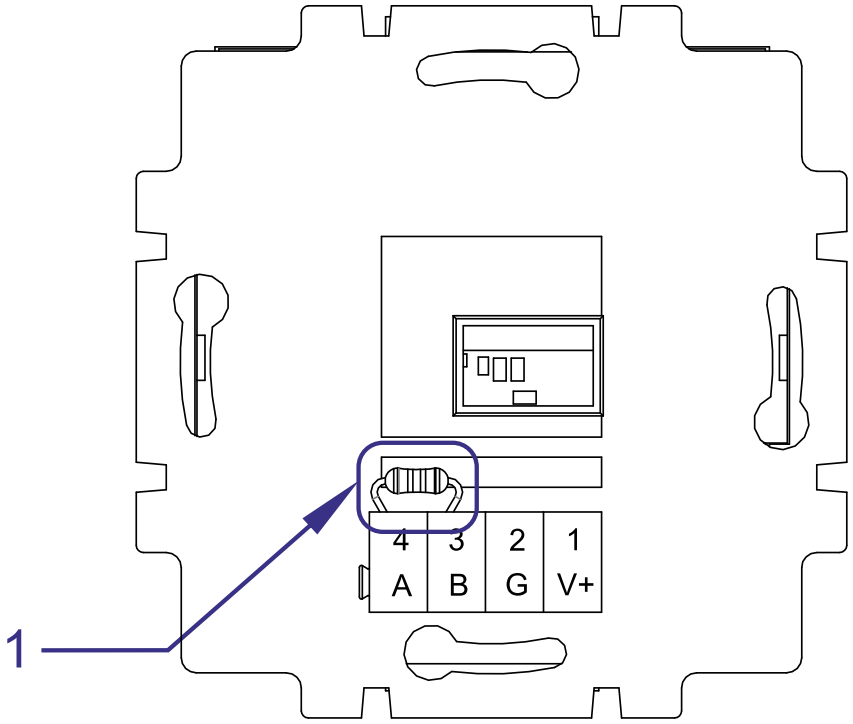


Fig. 8 - RS485 line termination

Legend

Number	Meaning
1	External terminating resistor

Any connection point of each pole of RS485 line can be used for connection of external resistor. (see following figure)

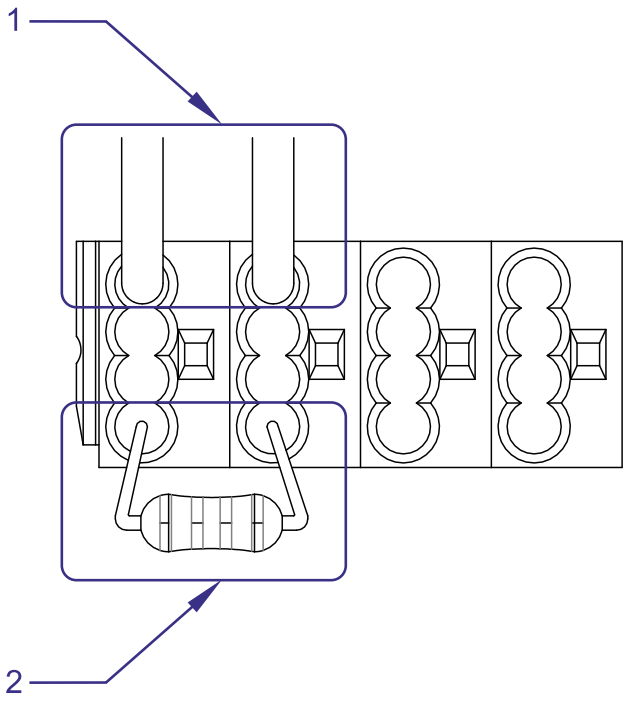


Fig. 9 - Connecting to connection points (poles detail in plan view)

Legend

Number	Meaning
1	RS485 connection
2	Connection of terminating resistor

Activity indication

Activity on RS485 line is indicated on LCD. If it is not specified other way in control system (via Guard Time), icon is displayed 30 s after communication interruption, indicating communication breakdown (See chapter 7.6. Communication interruption).

6. Mounting

Should be placed in the interior, in dry environment, about 1.5 m above the floor, in area with good 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 factors. If the inlet wires are led thru the plastic tube, it is necessary to seal the tube to avoid air flow.

For easier mounting, connection of power supply and RS485 is made with the connector that can be easily pulled out from the motherboard, after releasing latches.

On wall controller motherboard is connected to mounting box KU68. **Pay attention to the correct orientation according to the sign TOP 3271/3273 (terminal must be located at the bottom of the installation box)!** Put frame (ABB Time / Time Abro / Element) on the base, and with gentle pressure push electronics of on-wall controller.

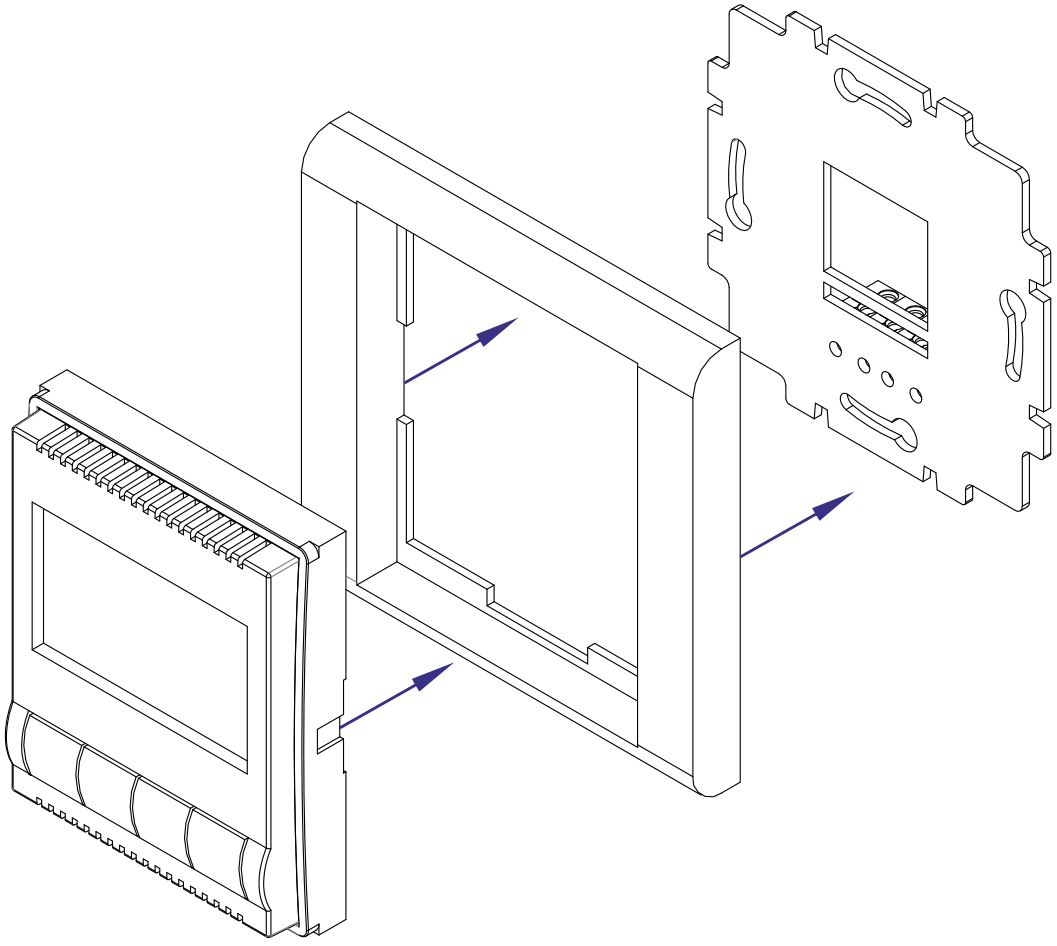


Fig. 10 - On-wall controller installation

Temperature sensor is located in left lower corner.

Note: In case of incorrect mounting, temperature sensor is affected by the heat radiated by the electronics of the controller that results in incorrect temperature readings.

6.1. Dismounting on-wall controller electronics

Electronics of on-wall controller can be released from the frame by gentle pressure on the latches located on both sides of electronics (for example with a screwdriver). After that it is possible to eject it from the frame.

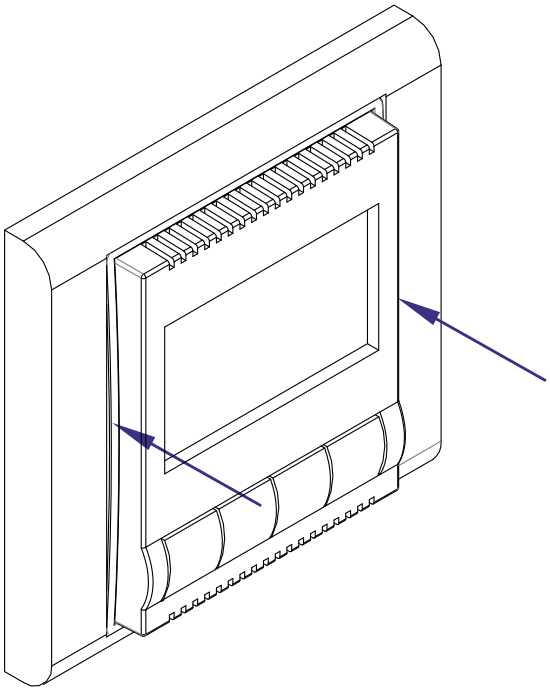


Fig. 11 - Location of latches

6.2. Installation rules

EMC filter It is recommended 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 (G) to the switchboard PE terminal (at the power source).

Surge Protection 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 — displayed all time.
- User menu — displayed after a short press on the button under the menu icon.
- Configuration menu — displayed after a long press on the button under the menu icon.
- Screen saver — if screen saver is allowed, it will be displayed after pre-set 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 icons

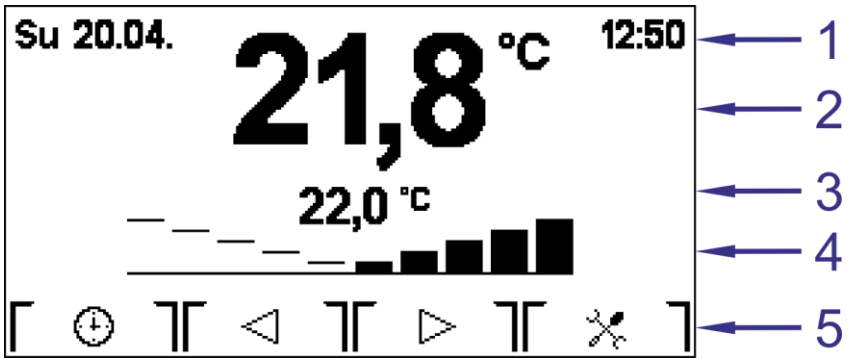


Fig. 12 - Common icons

Legend

Number	Meaning
1	Date and Time
2	Measured temperature
3	Requested temperature.
4	Correction of requested room temperature
5	Line with icons above buttons

Date and Time

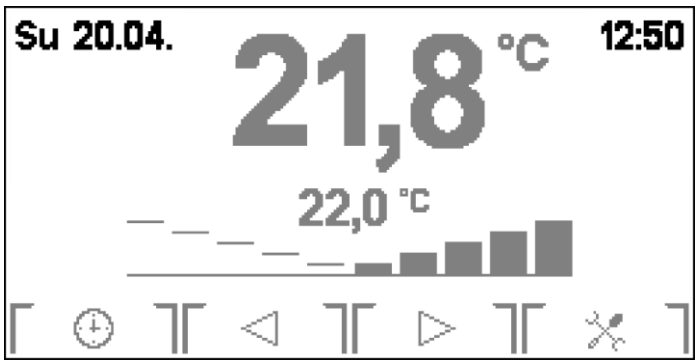


Fig. 13 - Date and Time

Date and time is received from superior control system. The time will not be displayed if the time information is not sent by the superior control system after power supply connection or restart.

Measured temperature

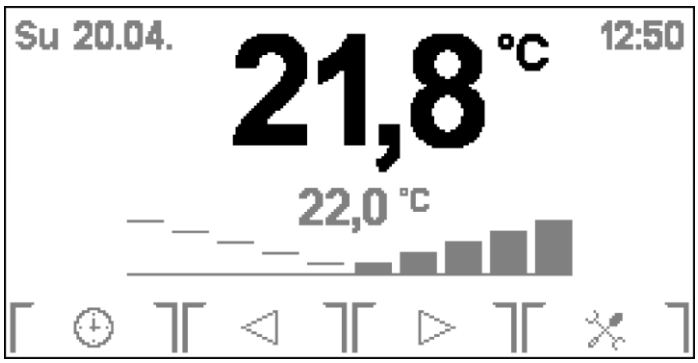


Fig. 14 - Measured temperature

Room temperature is displayed on LCD independently of communication.

Requested temperature

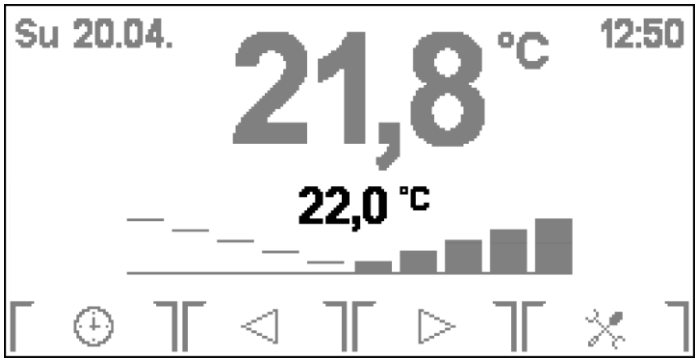


Fig. 15 - Requested temperature.

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

Correction bar graph

Correction bar graph (for Variant 2 and Variant 3 also ⌈ ⌉ symbol, which activates on particular button possibility to call screen for setting correction) is displayed only in **Auto** mode for room. It is not displayed in other modes (Mild and Comfort).

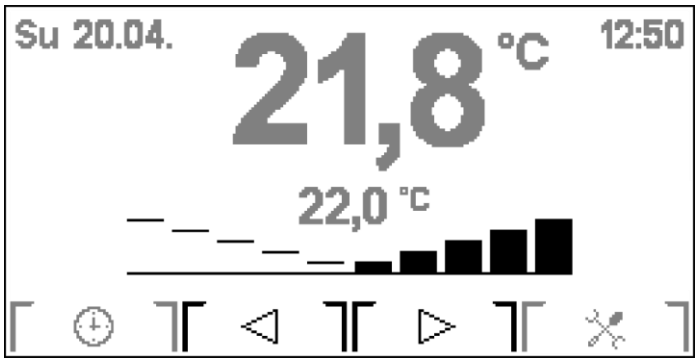


Fig. 16 - Correction of required temperature

Correction value is changed to plus or minus by pressing buttons ⌈ ◁ ⌉ or ⌈ ▷ ⌉ under icons. After each correction change, instead of requested temperature, hyphens are displayed, until new requested temperature value is received from the superior control system.

Line with icons

In the icons line there is an icon, displayed all the time that informs about possibility to call user menu or configuration menu. (see chapter 7.3. User's menu, and chapter 7.4. Configuration menu). Other icons are given by selected variant (see chapter 7.2. Mode icons).

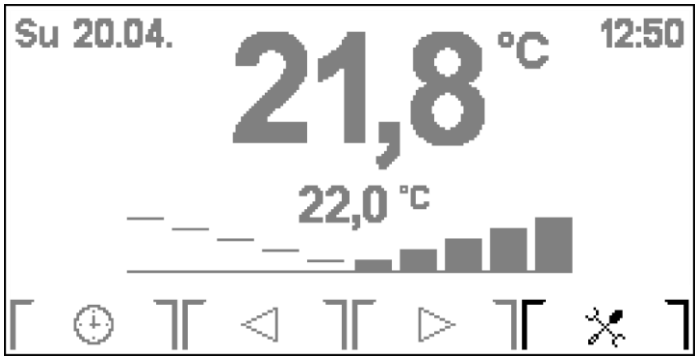


Fig. 17 - Icon above the button, for calling menu

7.2. Mode icons

Mode icons depend on application.

7.2.1 Variant 1

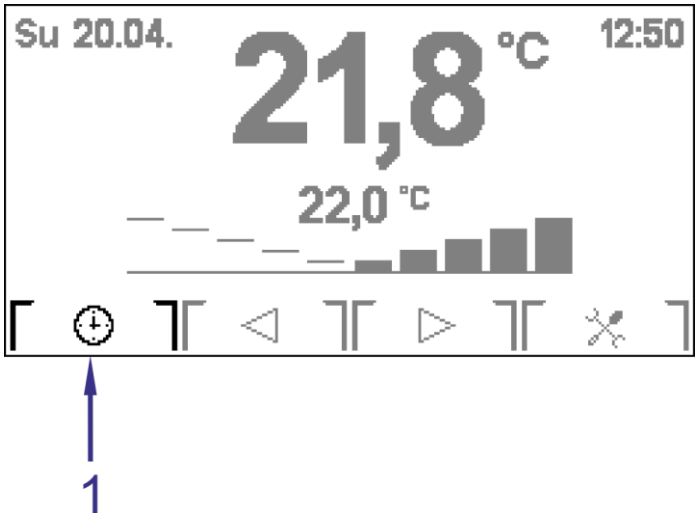
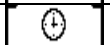


Fig. 18 - Icon for mode variant 1

Legend

Number	Meaning
1	Icon showing what room mode is set

By pressing button under icon you can switch between three room modes.

Icon	Meaning	Description
	Comfort	Is regulated to constant (comfort) temperature
	Attenuation	Is regulated to constant (power saving) temperature
	Auto	Is regulated according to time plan, adjusted by correction value

7.2.2 Variant 2

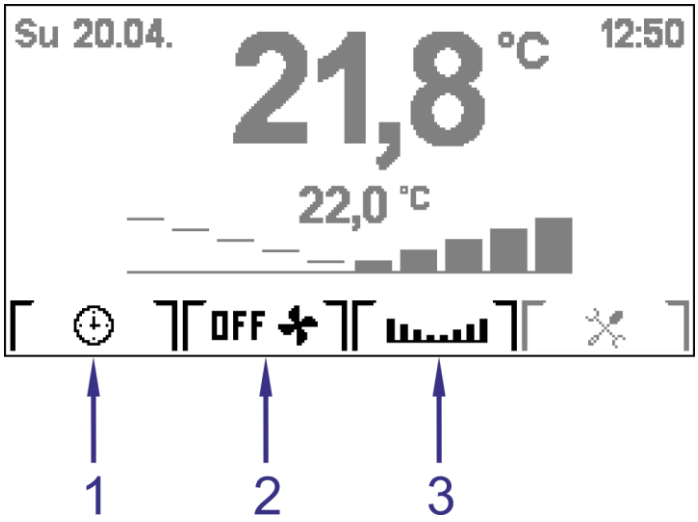


Fig. 19 - Icon for mode variant 2

Legend

Number	Meaning
1	Icon showing what room mode is set
2	Icon showing what fan mode is set
3	Icon, showing function for calling screen for setting correction

By pressing button under icon 1 you can switch between three room modes.

Icon	Meaning	Description
	Comfort	Is regulated to constant (comfort) temperature
	Attenuation	Is regulated to constant (power saving) temperature
	Auto	Is regulated according to time plan, adjusted by correction value

By pressing button under icon 2 you can switch between five fan modes.

Icon	Meaning	Description
OFF	OFF	Fan is off
AUT	Auto	Fan is controlled automatically
I	Speed 1	Fan speed is set to level 1
II	Speed 2	Fan speed is set to level 2
III	Speed 3	Fan speed is set to level 3

The screen for setting correction of requested room temperature can be displayed by pressing button under icon 3.

7.2.3 Variant 3

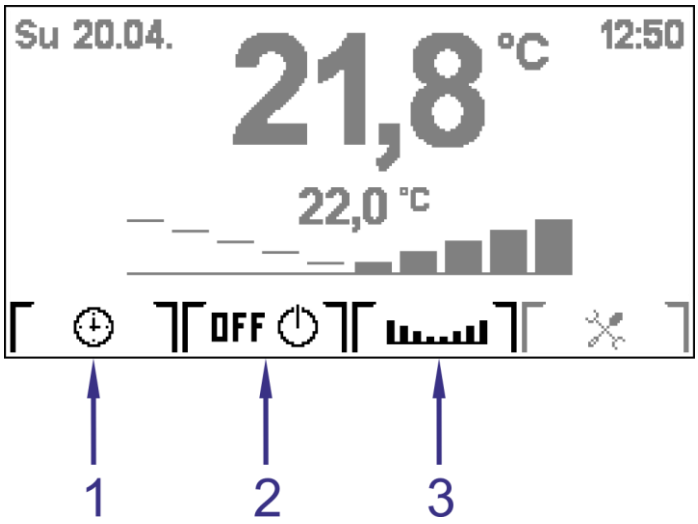


Fig. 20 - Icon for mode variant 3

Legend

Number	Meaning
1	Icon showing what room mode is set
2	Icon showing switch status
3	Icon, showing function for calling screen for setting correction

By pressing button under icon 1 you can switch between three room modes.

Icon	Meaning	Description
	Comfort	Is regulated to constant (comfort) temperature
	Attenuation	Is regulated to constant (power saving) temperature
	Auto	Is regulated according to time plan, adjusted by correction value

By pressing button under icon 2 you can toggle between two switch modes.

Icon	Meaning	Description
OFF	Off	Switch is off
ON	On	Switch is off

7.3. User's menu

User menu can be called by pressing button under icon [ ].

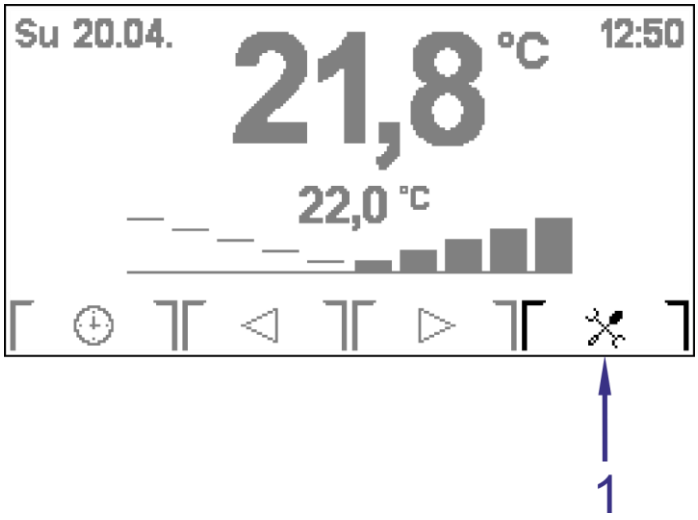


Fig. 21 - Calling user menu

Legend

Number	Meaning
1	Icon above the button for calling user menu

Menu items.

Fig. 22 - User's menu

Legend

Number	Meaning
1	Menu items.
2	Icons above buttons for working with menu

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
Esc	Leaving the screen
▽	Go to next item
△	Go to previous item
Enter	Confirmation of selected menu item

Next items can be selected from the menu:
- Brightness
- Contrast
- Language
- Display
- Info

Brightness The display brightness can be set, by item Brightness.

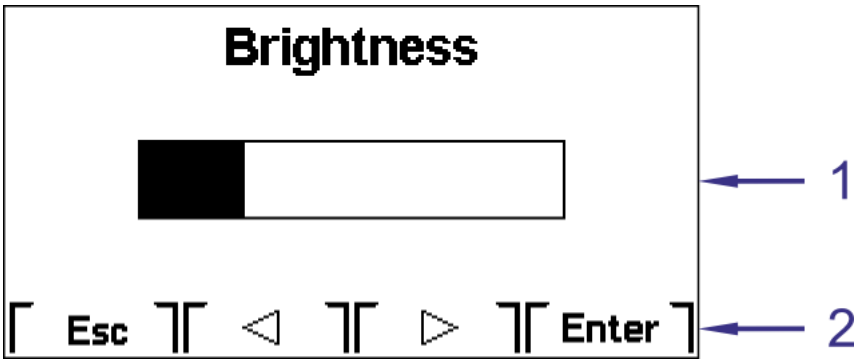


Fig. 23 - Brightness adjustment

Legend

Number	Meaning
1	Set brightness level
2	Icons signalizing about possibility to raise / lower brightness level

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
◁	Lower brightness level
▷	Higher brightness level

Contrast The display contrast can be set, by item Contrast.

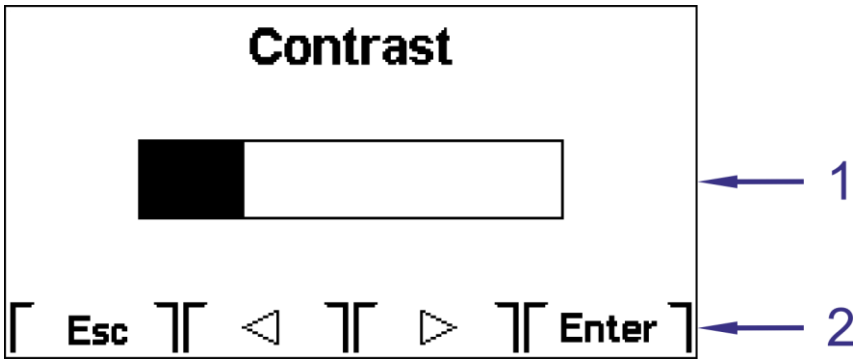


Fig. 24 - Contrast setting

Legend

Number	Meaning
1	Set contrast level
2	Icons signalizing about possibility to raise / lower contrast level

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
◁	Lower contrast level
▷	Higher contrast level

Language Item Language allows switching between Czech and English texts on on-wall controller.

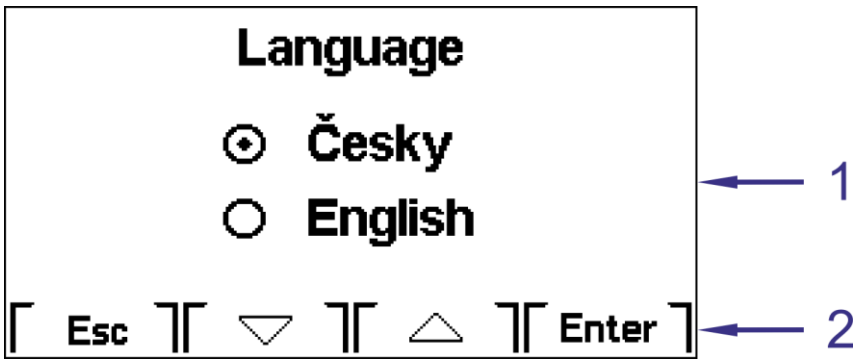


Fig. 25 - Language selection

Legend

Number	Meaning
1	Selected language
2	Icon signalizing about possibility to change language

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
▽	Go to next item
△	Go to previous item

Display Item Display allows setting screen saver time delay.

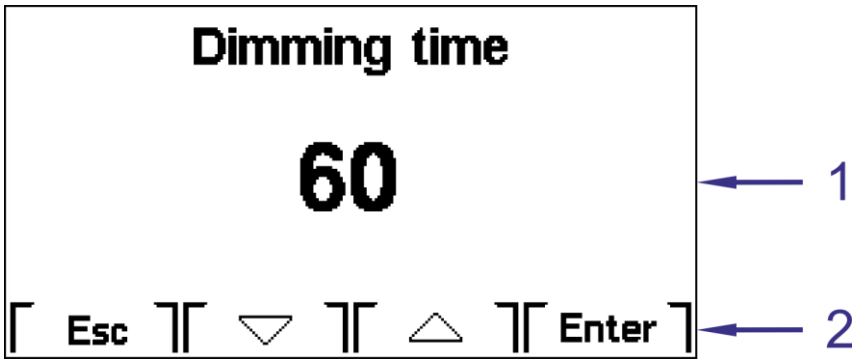


Fig. 26 - Setting time for screen saver activation

Legend

Number	Meaning
1	Time after which screen saver is activated
2	Icons signalizing about possibility to change time.

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
▽	Lower time value
△	Higher time value

Following values can be set:

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

Info By selecting item **Info,** the actual version of application software, loaded in to the controller, is displayed.

Fig. 27 - Firmware version

Legend

Number	Meaning
1	Icon above button for leaving the screen

Return By pressing button under icon [Esc] you can return to the basic screen of on-wall controller.

7.4. Configuration menu

Configuration menu can be called-out by a long press on button under icon [✕] for at least 10 s.

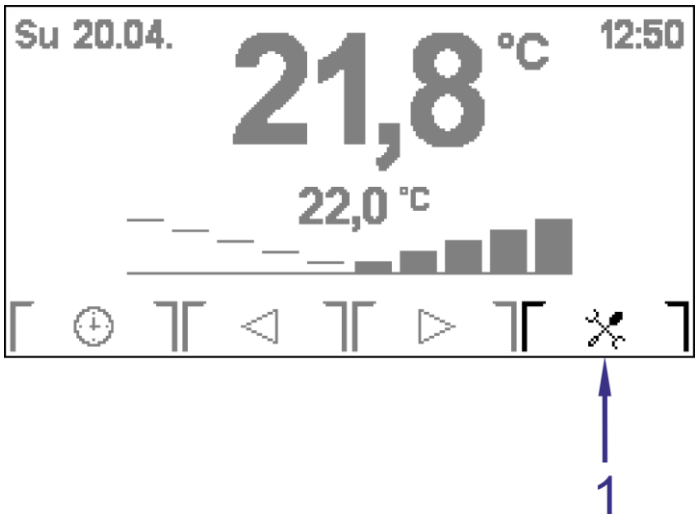


Fig. 28 - Calling configuration menu

Legend

Number	Meaning
1	Icon above the button for calling configuration menu

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

Menu items.

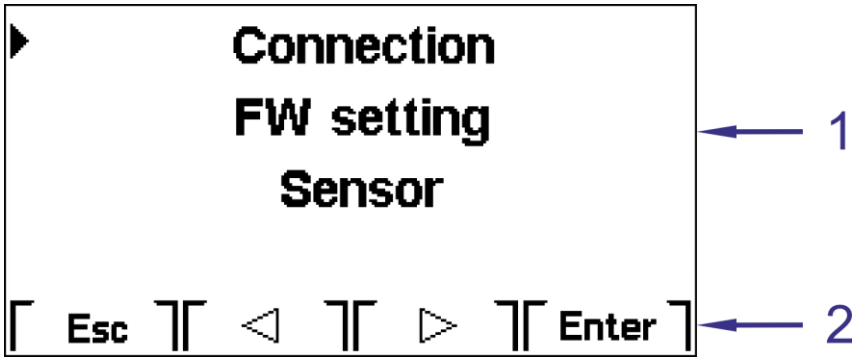


Fig. 29 - Configuration menu

Legend

Number	Meaning
1	Menu items.
2	Icons above buttons for working with menu

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
Esc	Leaving the screen
▽	Go to next item
△	Go to previous item
Enter	Confirmation of selected menu item

Next items can be selected from the menu:
- Connection
- FW setting
- Sensor

Connection **AMR-OP60/xx** communication parameters can be set via **Connection** item. Closer information can be found in chapter 7.4.1. Communication settings.

FW setting Via item **FW setting**, the one of three variants of **AMR-OP60/xx** can be selected (see chapter 7.2. Mode icons).

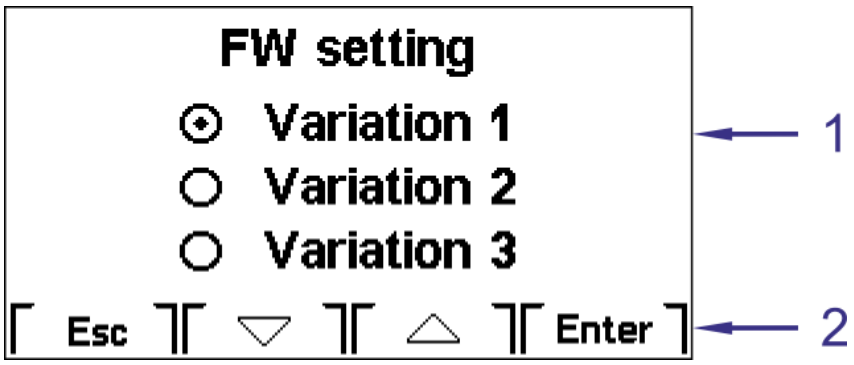


Fig. 30 - Variant selection

Legend

Number	Meaning
1	Selected variant
2	Icons above the buttons for working with screen

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
Esc	Leaving the screen
▽	Go to next variant
△	Go to previous variant
Enter	Confirmation of selected variant

Sensor Correction of the sensor, located in inside the controller, can be performed via item **Sensor**.

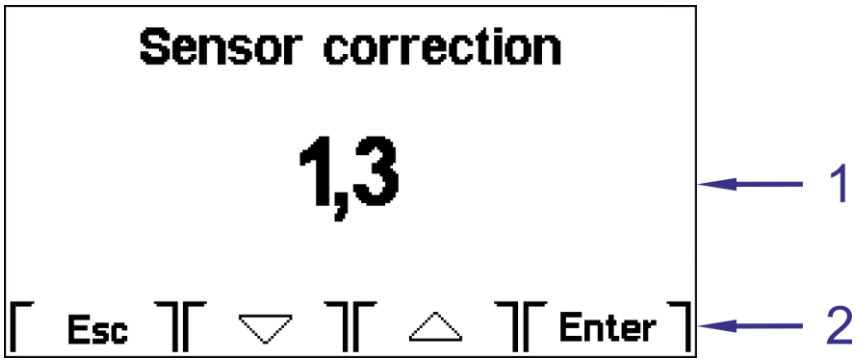


Fig. 31 - Correction of temperature sensor

Legend

Number	Meaning
1	Set correction value
2	Icons above the buttons for working with screen

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
Esc	Leaving the screen
▽	Reduce correction value
△	Increase correction value
Enter	Confirmation of correction value

Sensor correction value can be set within the range -1.5 °C to 1.5 °C

7.4.1 Communication settings

Communication type and parameters can be set in configuration menu via item **Connection**

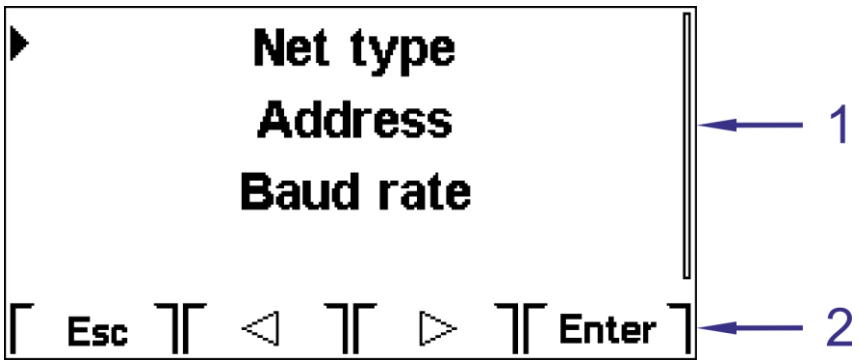


Fig. 32 - Menu with communication settings

Legend

Number	Meaning
1	Menu items.
2	Icons above buttons for working with menu

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
Esc	Leaving the screen
▽	Go to next item
△	Go to previous item
Enter	Confirmation of selected menu item

Next items can be selected from the menu:
- Net type
- Address
- Baud rate
- Parity

Net type Via item **Net type,** one of two communication protocols can be selected:
- ARION
- MODBUS

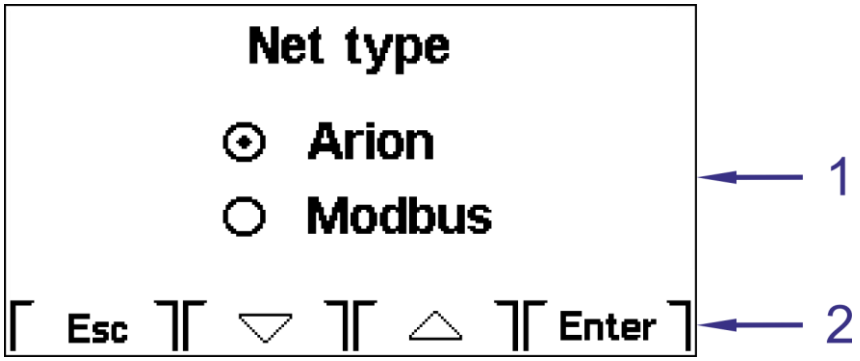


Fig. 33 - Communication protocol selection

Legend

Number	Meaning
1	Selected communication protocol
2	Icons above the buttons for working with screen

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
Esc	Leaving the screen
▽	Go to next item
△	Go to previous item
Enter	Confirmation of selected variant

Address Via item **Address**, the address within selected communication network can be set. Each device connected to the network must have unique address. Allowed address range is:
- 1 to 63 (ARION)
- 1 to 247 (MODBUS)

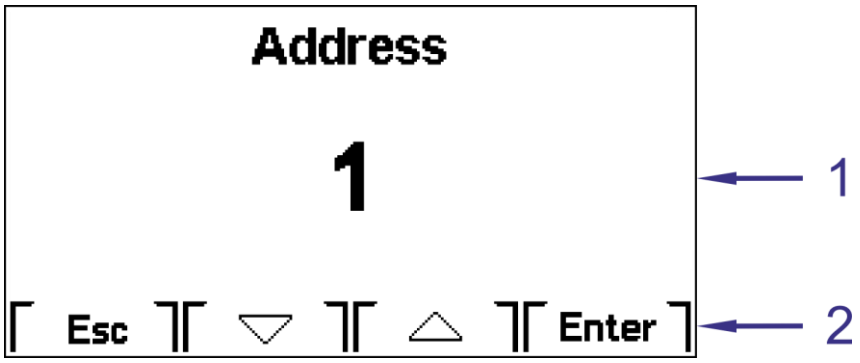


Fig. 34 - Setting address

Legend

Number	Meaning
1	Address
2	Icons above the buttons for working with screen

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
Esc	Leaving the screen
▽	Reduce address value
△	Increase address value
Enter	Confirmation of selected variant

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

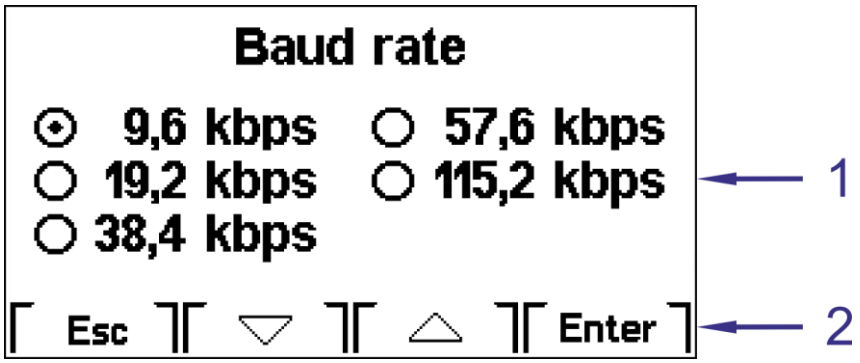


Fig. 35 - Setting communication speed

Legend

Number	Meaning
1	Selected communication speed
2	Icons above the buttons for working with screen

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
Esc	Leaving the screen
▽	Go to next value
△	Go to previous value
Enter	Confirmation of selected speed

Parity There is a point to set this item only if the MODBUS protocol was selected. Parity can be set by this item.

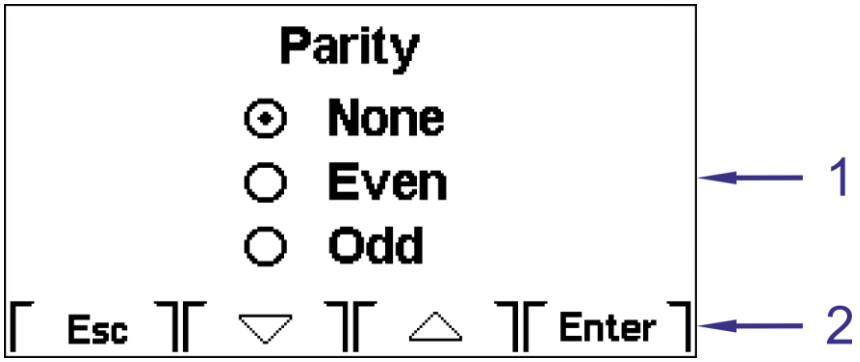


Fig. 36 - Setting parity for MODBUS protocol

Legend

Number	Meaning
1	Selected parity
2	Icons above the buttons for working with screen

Meaning of buttons under icons (2) is as follows:

Icon	Meaning
Esc	Leaving the screen
▽	Go to next item
△	Go to previous item
Enter	Confirmation of selected parity

If ARION protocol was selected, the following screen will be displayed.

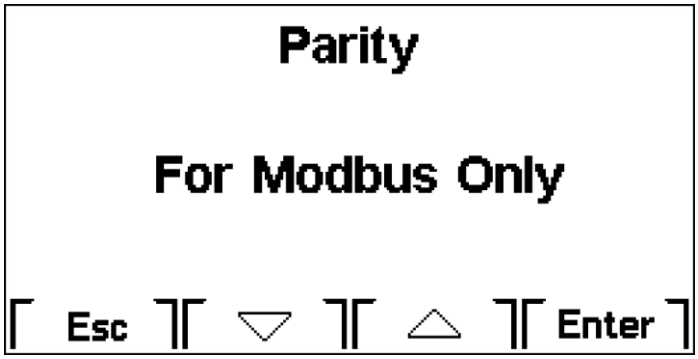


Fig. 37 - Setting parity for ARION

7.5. Screen saver

If allowed in menu, screen saver is displayed after pre-set time (screen saver is displayed, backlight is off) After first press of any key- backlight is turned on, after second press- basic screen is displayed.

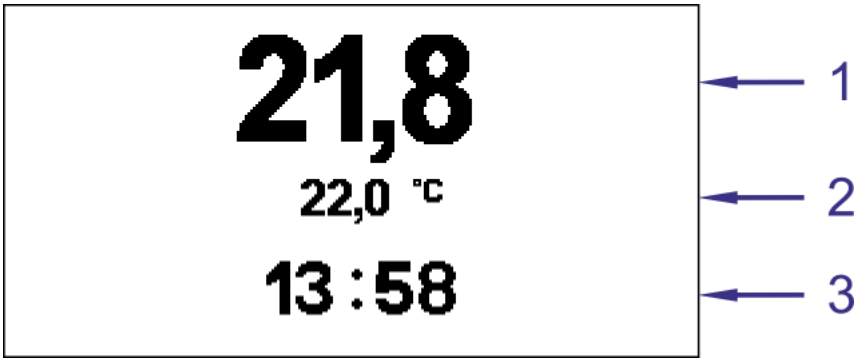


Fig. 38 - Screen for screen saver

Legend

Number	Meaning
1	Measured temperature
2	Requested temperature.
3	Time of superior system

Note: If after power supply connection, or controller restart, the time setting is not received from superior control system- the time will not be displayed.

7.6. Communication interruption

Interruption of communication with superior control system / controller restart is indicated by icon, displayed under measured temperature, instead of requested temperature.

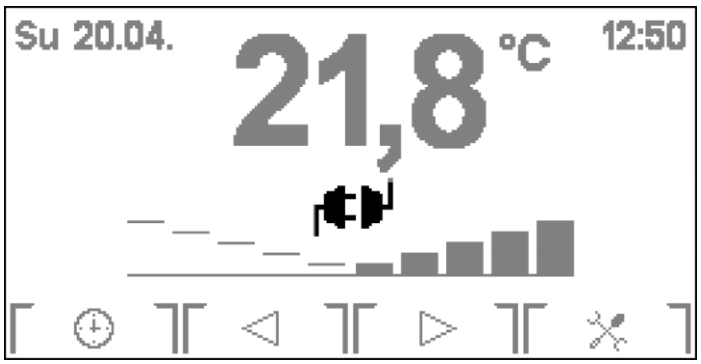


Fig. 39 - Communication interruption on basic screen

Fig. 40 - Communication interruption during active screen saver

Icon is displayed until controller receives valid data from the superior control system.

8. ARION protocol program operation

In ARION network, the **AMR-OP60/xx** controller provides data via registers in combination with digital input/output channels.

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 n. 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	Zeroing bit DI.0
1	Zeroing bit DI.1
2	Zeroing bit DI.2

8.3. 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 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.

Registers with n. 1 to 6

<table>
<tr><th>Name</th><th>Number</th><th>Type</th><th>Description</th></tr>
<tr><td>Status</td><td>1</td><td>R</td><td>Meaning of single bits
<table>
<tr><th>Bit</th><th>Meaning</th></tr>
<tr><td>0</td><td>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 controller function.</td></tr>
<tr><td>1
2</td><td>Room mode
<table>
<tr><th>Bit 2</th><th>Bit 1</th><th>Meaning</th></tr>
<tr><td>0</td><td>0</td><td>Automat</td></tr>
<tr><td>0</td><td>1</td><td>Attenuation</td></tr>
<tr><td>1</td><td>0</td><td>Comfort</td></tr>
<tr><td>1</td><td>1</td><td>Not used</td></tr>
</table></td></tr>
<tr><td>3</td><td>Switch.
Applies only for the Variant 3. In other variants this bit is not used.</td></tr>
<tr><td>4
5
6</td><td>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.</td></tr>
<tr><td>7 *)</td><td>Status of DI input Ni1000 / contact</td></tr>
</table></td></tr>
<tr><td>Correction (Float)</td><td>2</td><td>R/W</td><td>Correction [%]. Range: -100 to 100 with floating point.</td></tr>
<tr><td>Requested temperature (Float)</td><td>3</td><td>R/W</td><td>Requested temperature [°C] with floating point.</td></tr>
<tr><td>Measured temperature (Float)</td><td>4</td><td>R</td><td>Measured temperature [°C] with floating point.</td></tr>
<tr><td>Measured Ni1000 (Float)</td><td>5</td><td>R</td><td>Measured temperature Ni1000 [°C] with floating point.</td></tr>
</table>

8.4. Operating time setting

On-wall controller supports displaying of time. 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.

8.5. Communication interruption

On-wall controller supports communication interruption control (parameter **Guard Time** in ARION network) In case the communication interruption has occurred, the icon is displayed on the on-wall controller (see chapter 7.6. Communication interruption). Bits 0 to 7 of the **Status** registry are set to value True. During the communication interruption, on-wall controller does not have a valid value of:

- room and fan mode setting
- button status,
- required temperature.

In case of on-wall controller restart, the correction value will be zeroed as well.

Then, 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.

Note: 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 “Communication interruption” status.

9. MODBUS protocol program operation

AMR-OP60/xx provides data via holding registers in MODBUS network.

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 register
- 16 Write Multiple Registers – writing registers

All values are saved in BigEndian 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. 50 = AMR-OP60, 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. System uses it, it 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 and system-supported by special object, or it can be programmed by standard objects.

Name	Address	Type	Description
Status Reset	100	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 bit (prevailing "set"). While reading this registry, the last recorded value is returned.
Status Set	101	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.

<table>
<tr><th>Name</th><th>Address</th><th>Type</th><th>Description</th></tr>
<tr><td>Status</td><td>102
103</td><td>R</td><td>Meaning of single bits
<table>
<tr><th>Bit</th><th>Meaning</th></tr>
<tr><td>0</td><td>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.</td></tr>
<tr><td>1
2</td><td>Room mode
<table>
<tr><th>Bit 2</th><th>Bit 1</th><th>Meaning</th></tr>
<tr><td>0</td><td>0</td><td>Automat</td></tr>
<tr><td>0</td><td>1</td><td>Attenuation</td></tr>
<tr><td>1</td><td>0</td><td>Comfort</td></tr>
<tr><td>1</td><td>1</td><td>Not used</td></tr>
</table></td></tr>
<tr><td>3</td><td>Switch.
Applies only for the Variant 3. In other variants this bit is not used.</td></tr>
<tr><td>4
5
6</td><td>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.</td></tr>
<tr><td>7 *)</td><td>Status of DI input Ni1000 / contact</td></tr>
</table></td></tr>
<tr><td>Correction (Float)</td><td>104
105</td><td>R/W</td><td>Correction [%]. Range: -100 to 100 with floating point.</td></tr>
<tr><td>Requested temperature (Float)</td><td>106
107</td><td>R/W</td><td>Requested temperature [°C] with floating point.</td></tr>
<tr><td>Measured temperature (Float)</td><td>108
109</td><td>R</td><td>Measured temperature [°C] with floating point.</td></tr>
</table>

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: *) Is not active in **AMR-OP60/xx**. Possible writing value to the registry is ignored and does not affect 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.

9.3. Communication interruption

On-wall controller supports communication interruption control. If the on-wall controller is not receiving valid frame within 30 s, the icon is displayed automatically (see chapter 7.6. Communication interruption). Bits 0 to 7 of the **Status** registry are set to value True During the communication interruption, on-wall controller does not have a valid value of:

- room and fan mode setting
- button status,
- required temperature.

In case of on-wall controller restart, the correction value will be zeroed as well.

Then, 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.

10. Programming

The on-wall controller **AMR-OP60/xx** is delivered from the manufacturer with loaded application program, which can be freely downloaded from www.amit.cz. 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:
- AMRconfig service and programming utility
- AMRmultidownload multiprogramming utility

SW download Development environment is free to download on www.amit.cz.

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 7.4.1.
- from service application, via service menu, see chapter 10.3.

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

Note: Communication with station can be established from DetStudio only via MODBUS communication protocol (for example every time after service application activation, see chapter 10.2. Service application)

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.

Service application can be accessed by holding all four **AMR-OP60/xx** buttons pressed for at least 3 seconds.

10.3. Service menu

After switching to service application, the service menu is displayed.

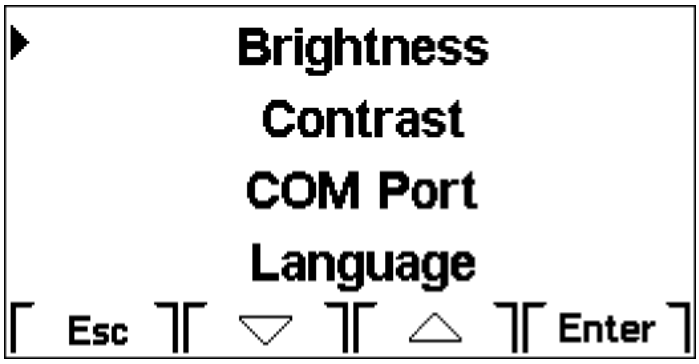


Fig. 41 - Items of service menu

Following items can be set via service menu:

- Brightness- brightness intensity change
- Contrast – change of display contrast
- Serial interface communication parameters *)
- Language

Note: *) Can be set only in case they are not given by user application.

To quit from service menu press button under the icon "Esc". The on-wall controller will restart.

11. Factory settings

RS 485 configuration Without external terminating resistor.

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-OP60/xx *)**	Complete, see chapter 12.1. Completion

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

Others	**RR 120R**	External termination resistor for RS485

12.1. Completion

AMR-OP60/xx

Part	Quantity
On-wall controller	1
Motherboard	1
WAGO 243-204	4
Operation manual	1

13. Maintenance

Device requires no periodic control.

Covers should be cleaned with soft cloth. Dirty covers should be washed with gently wet cloth with mild soap solution, and then wiped with dry cloth.

Never use tough cleaning cloth, or preparations containing sharp parts to clean covers of the controller.

Do not use aggressive chemical solutions (gasoline, acetone etc.)

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.