

# KJM MANDÍK Measurement & Control System Climatix DETAILED USER GUIDE



ATEX II 2G IIB T4

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This User Guide forms and integral part of the TPM 088/12 technical requirements for the MANDÍK air conditioning units. Amended version of documents can be found at [www.mandik.cz](http://www.mandik.cz)

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# TABLE OF CONTENTS

<b>1. GENERAL</b> . . . . .	5
<b>2. RELATED DOCUMENTS</b> . . . . .	6
<b>3. SAFETY</b> . . . . .	7
<b>4. INTRODUCTION</b> . . . . .	8
<b>5. CONTROL UNITS AND ROOM UNITS</b> . . . . .	9
5.1 Integrated HMI control unit . . . . .	9
5.2 HMI-DM control unit . . . . .	9
5.3 HMI-TM Control Unit . . . . .	10
5.4 POL822.60 Room Unit . . . . .	10
5.5 HMI@Web control . . . . .	11
5.6 HMI/ROx, HMI/SPx controls . . . . .	12
5.7 Touch panel . . . . .	13
<b>6. Control description</b> . . . . .	<b>15</b>
6.1 Buttons with functions . . . . .	15
6.2 Home screen . . . . .	15
6.3 Operational and auxiliary modes . . . . .	16
6.3.1 Selection of operating mode . . . . .	16
6.3.2 Turned Off mode . . . . .	16
6.3.3 Moderate heating mode. . . . .	16
6.3.4 Attenuation mode . . . . .	17
6.3.5 Comfort mode . . . . .	17
6.3.6 Auxiliary mode. . . . .	17
6.4 Selection of the KomponentyZařizení (ComponentsEquipment) . . . . .	18
6.4.1 Temperatures . . . . .	19
6.4.2 Fans . . . . .	21
6.4.3 Dampers . . . . .	23
6.4.4 Heat Recovery Unit . . . . .	25
6.4.5 Glycol . . . . .	26
6.4.6 Water Heating . . . . .	27
6.4.7 Electric Heating. . . . .	29
6.4.8 Gas Heating . . . . .	30
6.4.9 Water Cooling. . . . .	32
6.4.10 Condensing Unit. . . . .	33
6.4.11 Heat Pump . . . . .	34
6.4.12 Humidifier . . . . .	35
6.4.13 Control in Cascade. . . . .	35
6.4.14 Filters . . . . .	36
6.4.15 Air Quality . . . . .	37
6.4.16 Humidity . . . . .	38
6.4.17 Ventilation. . . . .	39
6.4.18 Fire/Smoke . . . . .	40

6.4.19 Fire Dampers . . . . .	40
6.4.20 Boiler Room . . . . .	41
6.4.21 Switchboard Air Condition . . . . .	42
6.5 TimingProgram Option. . . . .	42
6.6 InfoApplication Option. . . . .	43
6.7 Configuration Option . . . . .	43
6.8 Testing Option . . . . .	47
6.9 Inputs/Outputs Option. . . . .	47
6.10 Inputs/Outputs Assigned Option . . . . .	48
6.11 SystemParameters Option. . . . .	50
6.11.1 Time Settings . . . . .	50
6.11.2 LanguageOption . . . . .	50
6.11.3 Communication . . . . .	51
6.11.4 Password . . . . .	53
6.11.5 Summer/Winter Time . . . . .	53
6.11.6 Setting of SaveLoad . . . . .	53
6.12 PasswordEnter Option . . . . .	53
6.13 NextMaintenance Option . . . . .	53
<b>7 Alarm Messages . . . . .</b>	<b>.54</b>

# 1 | GENERAL

Following abbreviations are used in this User Guide:

- MaR – Measurement and Control System
- Control – Siemens Climatix control unit, placed in a measurement and control switchboard
- Components – air conditioning unit set consists of respective components, controlled by MaR.

There are graphic symbols used in this User Guide, warning about the following issues. These are:



Symbol warning about a potentially hazardous situation posing risk to life or with a potential to cause damage of the unit or of any part thereof.



Symbol warning about important issues related to the right installation, commissioning or maintenance of the unit or part thereof. Or they may indicate any suggestion or note for the installation, commissioning or maintenance.

This User Guide contains a manual for setting and control of the MaR MANDÍK air conditioning units of the M, P, S and T series.



**Before any initiation of works with the MaR, it's necessary to read this Guide and observe it. Observing this User Guide is a prerequisite for the right operation, function and meeting of warranty conditions. For any potential damage, caused by improper use, the manufacturer shall not be held responsible and all such risks shall be borne by the user.**

This Guide is designed for persons with valid authorisation for servicing activities for HVAC and air conditioning units.



**Any self-willed changes to the MaR switchboards, not approved by MANDÍK, a. s. in advance, cause to provided warranties and the warranty of safe use and operation null and void.**



**Turning the control board with regulator off is recommended only for a short time as even in case the air conditioning unit is turned off, the regulator performs certain control functions! In case of a long-term shutdown (for more than 3 days), the time calculation may be lost in regulator resulting in wrong operation of the air conditioning unit according to a time schedule.**



**This description shall be valid for the MaR with the Climatix regulator, equipped by the KJV-VS100023.10 software or any later model! The software version may be found in the InfoAplikace menu at the home section on screen.**

## 2 | RELATED DOCUMENTS

Each MaR, supplied with an air conditioning unit, has following documents attached, while they should be placed close to the air conditioning unit:

- Warranty note "Test certificate" for the switchboard according to the ČSN EN 61439-1-ED2
- MaR drawings documentation

Other documents can be found on the [www.mandik.cz](http://www.mandik.cz) website:

- KJM Mandík – TPM 088/12 technical conditions
- Manual for installation, commissioning, maintenance
- Manual for the KJ Mandík control from the SIEMENS – POL822 room unit
- KJM Climatix SD upload
- KJM Climatix ModBus
- KJM Climatix BACnet
- Manual for the DANFOSS frequency converters' control – FC 51 type
- Manual for the DANFOSS frequency converters' control – FC 101 type
- Manual for the DANFOSS frequency converters' control – FC 102 type

## 3 | SAFETY

In case of the MaR application, following instructions must be met according to this regulation.



**In case of assembly, power supply connection, commissioning, repairs and maintenance of units, it's necessary to observe valid standards, safety regulations and generally accepted technical regulations.**



**Assembly of units, including the power supply connection, commissioning of the unit, repairs, maintenance and operation may be performed only by natural person or legal entity with a valid authorisation. y to observe valid standards, safety regulations and generally accepted technical regulations.**

## 4| INTRODUCTION

For the control of Mandík air conditioning units, a freely programmable PLC Climatix regulator from Siemens is used, meeting the new requirements based on technical, technological, ecological and economical needs. This regulator belongs to the top ranked regulators, designed to control air conditioning units. It secures a comfortable regulation, safe and energy-saving operation of the HVAC equipment and full adaptation to the final solution, following the requirements of the customer. Another important aspect are the extensive communication possibilities, allowing easy control and cooperation with majority of superior systems and integration into the systems of buildings' equipment.

Measurement and control system with the Climatix regulator offers:

- Great ratio price/performance
- Easy installation
- Easy control in number of options
- Local and remote control
- Annual and weekly time schedule program
- Text display with transparent display of all data
- Display options on screen in any European language (Czech language preset)
- More options for operation modes
- Control of temperature and moisture in supply or premises
- Automatic recognition of the heating or cooling need
- Comprehensive accurate control of HVAC operation
- Transparent description of alarm messages, including history
- Changes in important parameters only after password is typed in (multiple levels)
- Connection of all HVAC components into one control system
- Controls all standard components of heating and cooling
- Unilateral designation of connecting terminals
- PC control by the use of an internet browser (standard supply) and subsequently from any place on internet
- Possibility of a visualisation upgrade and cooperation with superior systems



## 5| CONTROL UNITS AND ROOM UNITS

HMI control unit from the Climatix regulator control is designed to inform the user about an operational condition of the MANDÍK air conditioning unit, to enter or choose required values or conditions and for servicing purposes, in particular when commissioning the air conditioning unit. It consists of an LCD screen with backlight and functional keys. The HMI control panel has three design types.

For the control, it's possible to use also the POL822.60 room unit, designed only for user changes.

### 5.1 INTEGRATED HMI CONTROL UNIT

Integrated or fixed design of the control panel with display (Fig. 1) is connected to the regulator steadily. It has four buttons, one is for navigation, and a four-line display. It's designed for control and servicing purposes. Does not apply for all Climatix types of regulators.



Fig. 1

### 5.2 HMI-DM CONTROL UNIT

Transportable version (Fig. 2) has its type designation HMI-DM and may be used for the control of more air conditioning units or it may be installed on wall in air-conditioned premises. It contains four buttons, one is for navigation, and an eight-line display. Furthermore, it's equipped by a temperature sensor that may replace a heat sensor for the room if the control is placed within air-conditioned premises. Unit operation is signaled by a green diode in the info button. Fault is signaled by a red flashing LED diode in the alarm button. This control unit model may be placed only 700m from the MaR air condition regulator, connected by the use of a twisted pair cable. The control unit is designed for control and servicing purposes. Part of the HMI-DM control unit supply is the assembly note.



Fig. 2

## 5.3 HMI-TM CONTROL UNIT

This model is designed to be placed on the door of a metal switchboard (Fig. 3) within its type designation HMI-TM, having two options: model for a fixed installation on metal switchboard door or a free-hanging model with a magnetic base. It contains six buttons and a blue eight-line display with blue backlight. Unit operation is signaled by a green diode in the info button. Fault is signaled by a flashing red LED diode in the alarm button. Control unit is designed for control and servicing purposes. Assembly note forms part of the HMI-TM control unit supply.



Fig. 3

## 5.4 POL822.60 ROOM UNIT

And individual unit for the air conditioning control is the POL822.60 room unit (Fig. 4), designed only for user's operation and used in the combination with previous mentioned way of control or in combination with a PC control through a web interface. It has six buttons, while one is for navigation, and LCD display to show room temperature or selected one, operating modes, fan revolutions, actual time, signalisation of fault, etc. This room unit may be placed even 700m from the MaR regulator of the air conditioning unit and is connected by a twisted pair cable. Its description and the way of use is described in a separate manual. Assembly note forms part of the room unit supply.



Fig. 4

## 5.5 HMI@WEB CONTROL

HMI@Web (Fig. 5) control serves for the control of air conditioning unit by PC, equipped with web browser and ethernet network card.

Control is similar as the one from a regulator display or control units HMI-TM and HMI-DM. The possibility to change the displayed value is signaled by a red arrow at the end of the line. After clicking at this arrow by a pointer, a screen for typing in pops up and after changing the value from your keyboard, this change will be saved by clicking on the **Save** button. Green arrow at the end of line signalizes the possibility to enter lower levels, what will be done by clicking on this arrow again. Return from menu is done by clicking on the arrow in the first line with the heading menu or to the icon with an **ESC** inscription. Display of history or actual alarms will be done by clicking on an icon with bell. By clicking on the **Info** icon, home screen will occur. Icon with the OK inscription has no functionality standardly.

Access from the web browser is conditional upon typing of the right regulator address into the browser's command line and subsequently on typing of the right login data, name and password. If no screen occurred after entering the data, regulator's address was not entered properly.

Standard settings of regulator's address for the access by using HMI@Web from production is following:

- IP address: **192.168.1.42**
- Mask: **255.255.25.0**
- Gate: **192.168.1.254**
- DHCP **Passive**

Changes in these settings will be done after typing in the password in menu **SystémovéParemetry (System parameters) → Komunikace(Communication) → IP-Konfigurace(IP – Configuration) → ZměnaNastavení (Changes in settings)**. To initiate the executed change, it must be saved by the item **Reset Požadován (Reset required)!!!**

Here it's also possible to change the login data into HMI@Web from a web browser. Standard settings from factory are:

- Username: **KJWEB**
- Password: **SBT!Mandik**

The manufacturer recommends to perform changes to these HMI@Web parameters by the use of any from the control units!

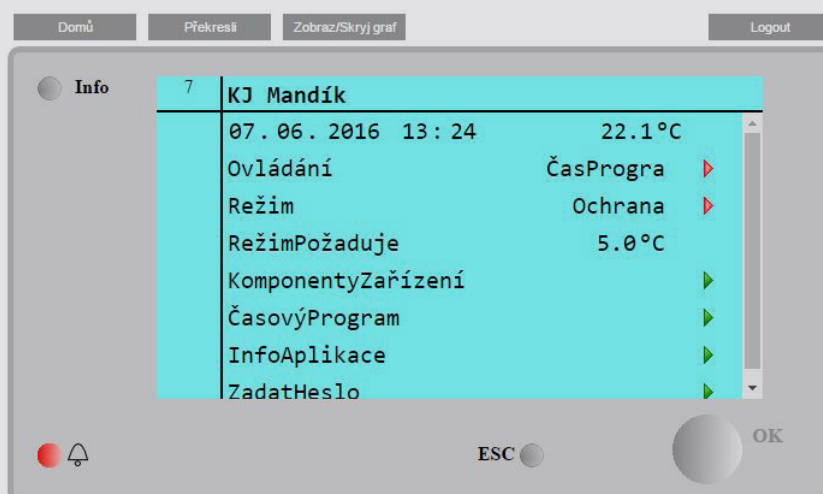


Fig. 5

Computer may be connected to the regulator directly by an ethernet cable, connected between a PC network card and a regulator connector, marked as **Ethernet**. Maximum length of cable may be even 100m, depending on the environment. If you're not a PC administrator, leave the necessary changes in settings of the regulator's IP address and PC setting to its administrator.

Computer may be connected to the regulator by LAN network. Here, the producer also recommends to assigned necessary changes in the IP address to regulator and PC settings to the administrator's network. Computer may be also connected to the regulator through internet from any PC, tablet or cell phone. HMI@Web regulator's integration into local network must be executed by an administrator of this network!

Recommended web browsers are Google Chrome and Firefox, and for a high-quality communication with the HMI@Web control, it's necessary to set the following parameters there:

- turn on a JavaScript support
- approve cookies
- find the existence of the latest versions in case of each page visit

Here, it's recommended to leave the necessary changes in settings of web browser to the PC or network administrator. In the HMI@Web control, it's possible, in real-time, to show even five analogical values (temperature, heating or cooling performance etc.) graphically by clicking on required value by mouse (Fig. 6). Chart may be set up/turned on by clicking on the Stop/StartTrending button. Chart may be displayed or hidden by clicking on the View/HiddenTrend button.

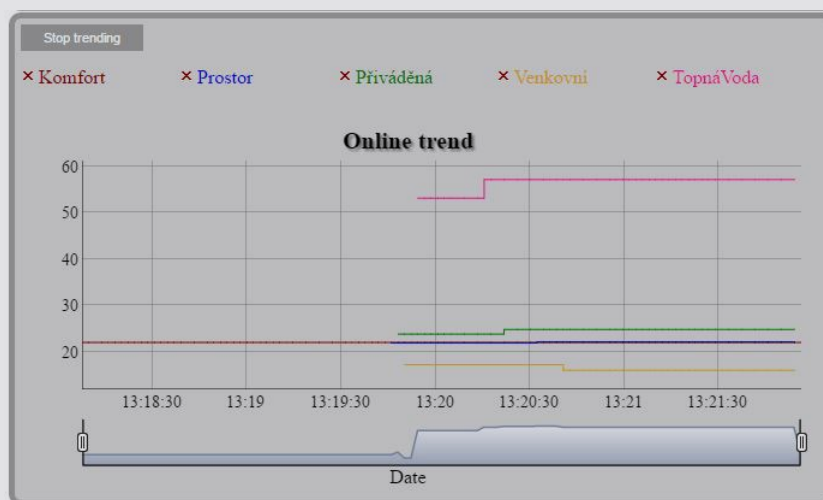


Fig. 6

## 5.6 HMI/ROx, HMI/SPx CONTROLS

HMI@Web (Fig. 5) control serves for the control of air conditioning unit by PC, equipped with web browser and ethernet network card.

HMI/ROx (Fig. 7) a HMI/SPx (Fig. 8) controls are designed for an external control of the air conditioning unit. These controls are appropriate for manufacturing, assembly or any other premises with high heat load or dust (kitchen etc.). The advantage is an easy manipulation of the air conditioning unit. HMI/ROx may contain maximum 3 rotary switches to select the mode or maximum 3 transmitters to enter the fans' revolutions and maximum 3 indication lights to signalize the condition or faults. HMI/SPx is a simple control unit in Tango version and is designed to turn air conditioning unit or mode on or off. It's supplied in a version with switch and selector. Indicator light may signalize the condition or fault. Specific design of control is optional and requirements for it are set during the order specification.



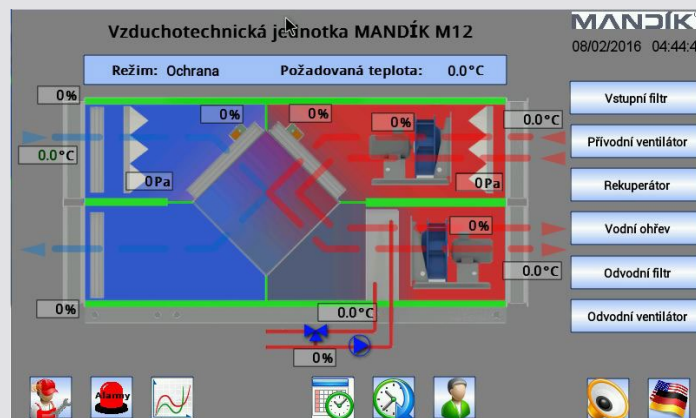
Fig. 7



Fig. 8

## 5.7 TOUCH PANEL

The Climatix touch panel of the POL8T1.XX/STD series serves for a local control and monitoring of air conditioning units. Control is set as intuitive, allowing all the functionalities to be easily and quickly accessible (Fig. 9). Touch panel is able to communicate with more Climatix regulators at the same time. For the communication with regulators, it uses ModBus or TCP/IP communication protocol. Touch panel is designed to be assembled to the switchboard door, control board or may be placed freely in the building premises. It's a colour LCD display with backlight and high resolution, 16.7 million colours. It's supplied in three sizes of 4.3", 7" and 12.1". Control of touch keyboard is the same as in case of any other similar devices, like smartphones, tablets, etc. More information about the touch panel can be found in a separate manual **Climatix touch panel**.



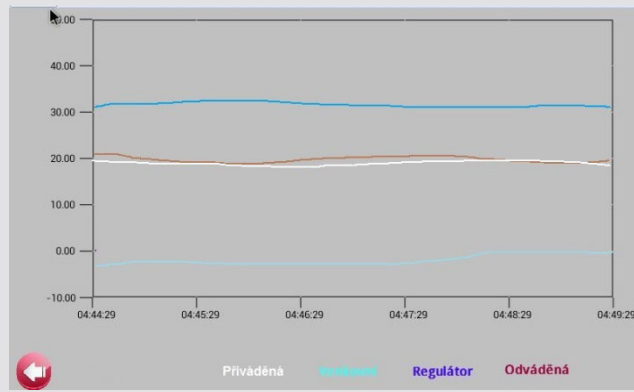


Fig. 9

# 6 | CONTROL DESCRIPTION


## 6.1 BUTTONS WITH FUNCTIONS

HMI control panel buttons are designed for control and configuration of parameters for the Climatix regulator at the MANDÍK air conditioning unit. Their description and functions are described in the following table.

Position of the pointer in menu is signalized inversely. The possibility to change the displayed value is signalized by an inverse display of the entire line. After clicking on the OK or Enter button, it's possible to change this value. Change in the value does not mean that it's saved in the regulator's memory. Value must be saved by the OK or Enter button. Arrow at the end of the line signalized the possibility to enter a lower level of menu, executed by the OK or Enter button.

If the HMI control panel is designed as transportable then, after inserting the control panel connector to the Climatix regulator in the switchboard, home screen will be open.

In certain applications, the control panel is embedded in th switchboard and it's not necessary to connected the pan and regulator. Home screen will appear then after turning on the power supply of regulator.

Button	Description
INFO	Return in menu by one level up to the initial screen. In case of alarms, return to the previous screen.
ESC	Return in menu by one level up to the initial screen. In case of alarms, return to the previous screen .
	Screen for alam administration will appear.
OK	Rotary switch combines the functionality of selection, confirmation and change in value. By turning the button, rolling in menu or change in the value is performed. By clicking the button, selected item in menu is entered or the change of requested value is confirmed. Not in HMI-TM version. In HMI@Web, this icon is non-functional.
Enter	This button is only in the HMI-TM version and serves only to confirm the selected menu or to confirm changes in value.
Up, Down	These two buttons are added only in the HMI-TM version, serving for moving in menu or value changes.

## 6.2 HOME SCREEN

Home screen, even without the password entered, is displayed at the figure below (Fig. 10). In the upper part of the display, there's an access level displayed (password level), air conditioning unit type and the number of selected line at the actual screen. In case of display integrated into regulator, at the end of the first line, bell will occur at the end of the first line. On the first line, below the line, there is the actual date, time and temperature according to the configuration (premises, air supplied and outlet). Date and time may be changed after the service password is added. On the following line, there are further options and information about the unit operation found, allowing the user to control and monitor the air conditioning unit.

**A very important aspect is the symbol of an auxiliary mode "PR", displayed before the actual operation mode at the fourth line of the screen!!!** If the symbol of auxiliary mode is displayed, settings do not have to be met for the actual operating mode. Respective auxiliary mode is then specified on the last line of the home screen.

On the other screens, in the left upper corner of the screen, there is the password level displayed, necessary for their display.

3   KJ Mandík		1
07.04.2017	14:05:24	21.3°C
ChoiceMode		Čas Prg ▶
PR Comfort		22.0°C
ComponentsEquipm		▶
Timing program		▶
InfoApplication		▶
EnterPassword	NextMaintenance	▶
NextMaintenance		▶
8.4.2018		

Fig. 10



## 6.3 BUTTONS WITH FUNCTIONS

The air conditioning unit may work in four basic operating modes: **Turned off**, **Moderate heating**, **Attenuation** and **Comfort**. Each of these modes may be set manually or automatically. In the manual mode, the selected operating mode is entered by personal and is kept by the next change in mode, again performed by personnel.

After the personnel switched the air conditioning unit to an automatic mode, following changes of operation modes are executed automatically, independently on personnel. There are two options of automatic switching of operating modes: **ČasProgram (Program with timing)** and **Přepínač (Selector)**. Configuration parameters of control will decide which of these options will be active. In case of the **ČasProgram** option, operation modes are changed automatically according to time schedule. In case of the **Přepínač** option, operating modes are changed automatically according to the values of digital and analogue inputs connected to an external equipment.

### 6.3.1 SELECTION OF OPERATING MODE

In the line **VolbaRežimu (mode selection)**, a request is entered for the type of operating mode, required from the unit. Actual operating mode will be displayed on the following line of the display, including the required temperature. The user may choose according to the configured type of automatic operation **Konfigurace(Configuration)** → **PřepínačRežimu (Mode selector)** from two of the following options:

- **ČasProgram (Program with timing), Turned off, Moderate heating, Attenuation, Comfort**
- **Selector, Turned off, Moderate heating, Attenuation, Comfort**

Economic operating mode **Attenuation** varies from the **Comfort** mode usually by lower required temperature and lower fans' speed. Revolutions for the **Comfort** a **Attenuation** operation are set in **KomponentyZařízení (Equipment components)** → **Ventilátory (Fans)**. Temperatures for operational modes are being set in **KomponentyZařízení** → **Teploty (Temperatures)**.

### 6.3.2 TURNED OFF MODE

In this operating mode, the air conditioning unit is turned off. Only safety functionalities may be working, protecting certain parts of the unit against their damage.

### 6.3.3 MODERATE HEATING MODE

In this operating mode, the air conditioning unit is turned off standardly if it does not activate any of the additional modes **Anti-freeze protection** of the premises or **Ventilation**. In the **Moderate heating** mode, the air conditioning unit may reach three conditions:

- **Prepared** – unit is turned off and only the safety functions are running, protecting certain parts of the unit against the damage.
- **Anti-freeze protection of space** – activates in case the temperature in space drops below the required temperature. Unit starts and turns on the heating components. If the unit contains a mixing damper, also the air circulation will be utilized by 100%. Unit will turn off after the required temperature in space is achieved. Usually, this additional mode is used in winter time when the building is not used for a longer time. Turning on the additional mode is signaled on the next line below the selected mode by the **MrázOchrana (anti freeze protection)** inscription and required temperature. Fan speed must correspond to the **Comfort** or **Attenuation** mode according to the last initiated operating mode. Required temperature is set in the **KomponentyZařízení** → **Teploty (Temperatures)** menu in the **MrázOchrana (5 °C)** variable.
- **Provětrání (Freecooling)** – usually, this mode is used in summer period for a night free cooling of the premises by using a cooler outside air if the temperature conditions are met. Initiation of the additional mode is signaled



on the next line below the selected mode by the **Provětrání** inscription and required temperature. Fan speed may correspond to the **Comfort** or **Attenuation** mode according to the last operating mode. Required temperature is set in the menu **KomponentyZařízení**→**Teploty** in the **Provětrání (18 °C)** variable. Freecooling must be allowed in the **Konfigurace** menu in the **Provětrání (Ano)** variable. Setting of further parameters is performed in the **KomponentyZařízení**→**Provětrání** menu and described in a separate chapter.

### 6.3.4 ATTENUATION MODE

In this operating mode, the air conditioning unit is turned on in an economic mode, where the required fan speed and required temperature is standardly lower. Required speed and temperature can be set by the user. Regulation controls respective components (heating, cooling, humidification) so required parameters are achieved. Usually, this operating mode is used outside of the accommodation or business hours.

Fan speed is set in the **KomponentyZařízení**→**Ventilátory** menu in the **Attenuation (80%)** variable for the inlet and outlet fan separately. Required temperature is set in the **KomponentyZařízení**→**Teploty** menu in the **Attenuation (18 °C)** variable.

### 6.3.5 COMFORT MODE

In this operating mode, the air conditioning unit is turned on in a mode, when the required fan speed is set for a comfort limit value and the required temperature for a comfort value. Regulator controls respective components (heating, cooling, humidification) so required parameters are achieved. Usually, this operating mode is used in accommodation or business time period.

Fan speed is set in the **KomponentyZařízení** → **Ventilátory** menu by the **Comfort (100%)** variable for the inlet and outlet fan separately. Required temperature is set in the **KomponentyZařízení** → **Teploty** menu by the **Comfort (22 °C)** variable.

### 6.3.6 AUXILIARY MODE

Information about the auxiliary mode activation is displayed by a **PR** symbol before the actual mode. The type of auxiliary mode will be displayed after the user password is entered at the end of the home screen or at the end of the **KomponentyZařízení** menu. Auxiliary mode will be activated in case a situation occurs, requiring temporary change of the air conditioning unit due to high-high or low-low temperature, fault of any component, non-standard operation of any component, unit protection etc. Following auxiliary modes may occur:

- **OdtáváníKondenzačníJednotky (AblationCondensingUnit)** – condensing unit is in the condition of ablation and the ambient temperature does not allow the operation of condensing unit in the heating mode. Fan speed is adjusted according to the settings in the **KomponentyZařízení** → **Ventilátor** → **OtáčkyOdtávání (SpeedAblation)** menu.
- **OdtáváníRekuperátoru (AblationHeatRecUnit)** – performance of the heat recoverz unit is reduced to 0% (damper of the board heat recovery unit closes). Speed of the inlet fan is adjusted according to the settings in the **KomponentyZařízení** → **Ventilátory** → **OtáčkyOdtávání** menu and the speed of outlet fan will remain at the value corresponding to the actual operating mode.
- **OdtáváníGlykolu (GlycolAblation)** – glycol performance is reduced to 0% and the pump stops. Inlet fan speed is adjusted according to the settings in the **KomponentyZařízení** → **Ventilátory**→ **OtáčkyOdtávání** menu and the speed of the outlet fan will remain at the value corresponding to the actual operating mode.
- **KompenzaceOtáček (SpeedCompensation)** – occurs is **KomponentyZařízení** → **Ventilátory** is allowed and the conditions in **KomponentyZařízení** → **Ventilátory**→ **KompenzaceTeploty** are met at the same time.
- **OdvětráníTopení (Ventilation/Heating)** – occurs if a ventilation of the gas or electric heating exchanger is performed or if the fans follow a pre-set ramp after the condensing unit mode is stopped. Time for exchangers' ventilation may be set individually for each of the mentioned heatings. Ventilation is performed only by an inlet fan.

- **OchranaVodníhoOhřevu (WaterHeatingProtection)** – in case of low heating water temperature **KomponentyZařízení→VodníOhřev→NízkáTeplotaVody**. Fan speed is adjusted according to settings in the **KomponentyZařízení→Ventilátory→OtáčkyHeatingPorucha** menu.
- **Předeřev (Preheating)** – preheating of water heating is signaled when the unit is started. Fan speed may be adjusted according to settings in the **KomponentyZařízení→VodníOhřev→KompenzaceOtáček** menu.
- **ČekáníNaKotelnu (Waiting for Boiler Room)** –
- **Start -**
- **BlokováníVentilátorů (FanTrip)** – air conditioning unit is tripped by the use of internal operating parameters for fans' start, e.g. in the **KomponentyZařízení→Ventilátory (PoruchaCooling, PoruchaHeating, Odtávání)** or **KomponentyZařízení→Kotelna→Zpoždění**.
- **NadřazenéBlokování (SuperiorTrip)** – operation of the air conditioning unit is tripped by a superior equipment, usually allowing to turn on the air conditioning unit on the basis of meeting technological and safety conditions, e.g. fire signalisation.
- **ČekáNaKotelnu** – fan start by a time parameter after the boiler room start is tripped.
- **BlokováníVentilátorů** – air conditioning unit operation is tripped by setting internal operating parameters for turning on the fans, eg. in **KomponentyZařízení→Ventilátory (PoruchaCooling, PoruchaHeating, Odtávání)** or **KomponentyZařízení→Kotelna→Zpoždění**.
- **NadřazenéBlokování (SuperiorTrip)** – operation of the air conditioning unit is tripped from the superior equipment, usually allowing to turn on the air conditioning unit on the basis of meeting technological or safety conditions, e.g. fire signalisation.
- **Test** – signaling testing equipment turned on. Testing is described in a separate chapter.

## 6.4 SELECTION OF THE KOMPONENTYZAŘÍZENÍ (COMPONENTSEQUIPMENT)

In the **KomponentyZařízení** item, after the maintenance password is typed in (Fig. 11), menu will be displayed with all components of the air conditioning unit, like **Teploty, Ventilátory, Hořák, ElektrickýOhřev, VodníOhřev, Chladič, Rekuperátor, Klapky, Filtry, KaskádníRegulace** and other, depending on the specific configuration of the unit. When the user password is typed in, some components will be displayed. At each component, there is the actual status displayed if practical. By its selection, more detailed information about the unit component condition may be displayed. Basic information for each component, accessible without the password, if practical, is the following:

- **Stav (Status) (% , Turned off/on)** – informing about the fact if the equipment is turned on and potentially any requirement for the performance in percentage required from the machine.
- **ProvozníHodiny (OperatingHours)** – may serve as information for the servicing workers with regard to the worn condition of fans or any other components.
- **PočetStartů (NumberStarts)** – described the operation of unit. Large number of starts may signalize wrong functionality of the entire air conditioning unit.

After typing the user password, following will be displayed:

- **PočetPoruch (NumberFaults)** – large number of faults is a signal for personnel to check the reason.

After the maintenance password is typed in, following will be displayed:

- **PID–Control** – showing values determining the quality and speed of control. Standardly, values are set in factory and their change should be done only by person aware of the control systems. Description and importance of respective variables can be found here:

1   ComponentsEquipment	1
Temperatures	▶
Fans	100% 100% ▶
Dampers	100% ▶
Heat recovery unit	0% ▶
Glycol	0% ▶
WaterHeating	0% ▶
ElectricalHeating	0% ▶
Burners	0% ▶
WaterCooling	0% ▶
CondensingUnit	0% ▶
Humidifier	0% ▶
CascadeControl	24.2°C ▶
Filters	Clean ▶
Air quality	Good ▶
Humidity	Good ▶
FireSmoke	▶
FireDampers	OK ▶
HeatPump	0% ▶
AuxiliaryMode:	SuperiorTrip

Fig. 11

■ **PID-Control (BLOK/MAX/MIN/REG/Y-NV/UDEF)** – control status of the PID controller. Respective statuses mean the following:

- **BLOK** – controller operation is not released,
- **MAX** – forced maximum output **O**,
- **MIN** – forced minimum output **O**,
- **REG** – controller is active,
- **Y-NV** – invalid required value **S**,
- **UDEF** – invalid output value **O**.

**S** (% or °C) – required value.

**P** (% or °C) – actual value.

**O** (% or °C) – output of the PID controller.

**TI** (s) – integrating element.

**KP** – proportional constant.

**TD** (s) – derivation element.

**PID-control** values are accessible only for certain components.

## 6.4.1 TEMPERATURES

In this menu, there can be information found about required and measured temperatures, including humidity according to configuration (Fig. 12). It's possible to perform correction of respective sensors and to determine which temperature value will be displayed on the home screen of the controller display.

- **Comfort (22 °C)** – required temperature for the **Comfort** mode.
- **Attenuation (18 °C)** – required temperature for the **Attenuation** mode.
- **MrázOchrana (AntiFreezeProtection) (5 °C)** – required temperature heating in the **Moderate heating** mode.
- **Provětrání (Freecooling) (18 °C)** – required temperature větrání in the **Moderate heating** mode.
- **Kompenzace (Compensation) (0 °K)** – difference between the ambient and required temperature when compensation of required temperature in the **Attenuation** or **Comfort** is activated. Compensation of required temperature is used under higher ambient temperatures and is based on the shifting of required temperature in dependence on the ambient temperature. In case of the 0°C value, compensation is tripped.

1   Temperatures	15
Comfort	22.0°C
Attenuation	18.0°C
AntiFreezeProtection	5.0°C
FreeCooling	18.0°C
Compensation	0.0°C
RoomTemperature	21.3°C
Correction 0s	0.0°C
TemperatureInlet	25.9°C
Correction 0s	0.0°C
TemperatureFlueGas	145.0°C
Correction 0s	0.0°C
AmbientTemperature	14.6°C
Correction 0s	0.0°C

Fig. 12

Example for **Kompenzace = 6 °C** in the **Comfort** mode:

- Ambient temperature  $\leq 28^\circ$  → required temperature = 22 °C.
- Ambient temperature = 32 ° → required temperature = 26 °C.

- **Prostorová (space)** – if the sensor is configured, it should be placed within a space, being objective of the air conditioning so the measured temperature is not affected by local effects like space heaters, sunlight through window etc. Standardly, the space equipment is supplied with an integrated heat sensor or QAA2030 sensor from Siemens can be supplied together with the NTC10k measurement device. If not configured, the heat sensor for inlet and outlet air may substitute it. There may be more space sensors installed and the resulting space temperature is determined by the **VíceČidelProstoru (MoreSpaceSensors)** parameter.
- **ProstorovýPřístroj (SpaceUnit)** – temperature at the sensor placed in a space unit. Unit must be configured for the display of this temperature.
- **Předeheř (Preheating)** – this sensor is used in case of preheating requirement for the inlet air and placed between the preheating and afterheating or cooling. Standardly, the QAM2130 sensor from Siemens is supplied with the NTC10k measurement device.

- **Přiváděná (Inlet)** – in most of cases, at least this sensor is configured to measure the temperature of the air inlet into space. Heat sensor is placed behind the last heating or cooling component before the air inlet into space. Maximum temperature in pipes is set for 50 °C on the basis of fire and hygiene standards. Standardly, the QAM2130 sensor from Siemens is supplied with with the NTC10k measurement device.
- **Spaliny (flue gas)** – this sensor must be configured in case the unit contains gas heater to secure the right functionality and protection of the gas exchanger, including emergency function. It's also used for the control of a bypass damper of gas exchanger to reduce condensing and fast heating of exchanger in case of gas heating start. The heat sensor is placed into the sump welded above the base of smoke pipes. Standardly, the QAZ21.5120 sensors from Siemens with the NI1000 measurement device is supplied.
- **Venkovní (outside)** – should be also configured for all air conditioning units to secure the right functionality of control system, in particular during the start of unit or its shutdown. Sensor should be placed in the outside environment so it's protected against the effects of weather that could affect the MaR incorrectly. For example, by a direct sunlight, rain, frost, wind etc. Standardly, the QAC2030 sensor from Siemens with the NTC10k measurement device is supplied. Also, the QAM2130 sensor may be used in case of mounting the sensor into or behind the louvres of the inlet damper. The outside sensor is also used for the control of air circulation by the mixing damper or by an efficient use of heat recovery unit. This sensor should be always configured as it's often connected to protective and start-up functionalities.
- **TopnáVodaOdváděná (HeatWaterOutlet)** – in case the unit is equipped by a water heater, the heat sensor must be configured for the temperature measurements of the heating water. Heat sensor of the heating water outlet secures the right functionality and protection of the water heat exchanger. It's placed on the outlet pipe of a water exchanger, so-called "return line," so it measures the real temperature of drained water. Standardly, the QAD36/101 sensor from Siemens is supplied with the NTC10k measurement device.
- **TopnáVodaPřiváděná (HeatWaterInlet)** – this sensor is placed on the inlet heating water pipeline so it measures the real temperature of water inlet into a water heat exchanger. It could be used to signal requirements for heating water preparation for the boiler room. Standardly, the QAD36/101 sensor from Siemens is supplied with the NTC10k measurement device.
- **ChladícíVodaOdváděná (CoolingWaterDrain)** – this sensor may be configured in case the unit contains water cooler. It's placed onto the drainage pipes of water exchanger, so-called "return line," so it measures the real temperature of drained cooling water. The sensor is only of an informative nature. Standardly, th QAD36/101 sensors from Siemens with the NTC10k measurement device is supplied.
- **ChladícíVodaPřiváděná (CoolingWaterInlet)** – this sensor is placed onto the inlet pipe for cooling water so it measures the real temperature of water inlet into the water heat exchanger. Sensor is only of an informative nature. Standardly, the QAD36/101 sensor from Siemens is supplied with the NTC10k measurement device.
- **ZaRekuperací (AfterHeatRecovery)** – this sensor may be configured only in case the unit contains heat recovery unit as it secures the right functionality and the heat recovery unit, including the emergency function. Temperature sensor is placed behind the heat recovery for air outlet. In certain configurations, it may replace the waste heat sensor. Standardly, the QAM2130 sensor from Siemens is supplied with the NTC10k measurement device.
- **Odváděná (outlet)** – in number of cases, heat sensor is configured as a replacement for the space heat sensor as it detects the temperature of air outlet from the space, not affected by local effects of the space. It's placed into the air extraction section. Standardly, the QAM2130 sensor from Siemens with the NTC10k measurement device is supplied.
- **Odpadní (Waste)** – it's used for the waste heat temperature measurement behind the ZZT components. It's placed into an extraction pipe behind the ZZT components. Standardly, the QAM2130 sensor from Siemens with the NTC10k measurement device is supplied.
- **Rozvaděč, 2Rozvaděč (Switchboard, 2switchboards)** – these sensors may be configured in case part of the MaR system is another power supply switchboard that must be ventilated or heated moderately. Part of such switchboard is also a ventilation fan and a heating unit. Heat sensors are placed in a way to achieve optimal operating heat conditions of performance and electronic elements placed in the switchboard. Standardly, Siemens sensors are supplied with the NTC10k measurement device or NI1000.

For each heat sensor, following values are displayed:

- **Teplota (Temperature) (°C)** – sets the temperature at the point of sensor placement. If the temperature value is lower than -100 °C, probably a short circuit occurred at the power supply cable or even the measurement cell. If the temperature exceeds 300 °C, then probably, the power supply cable was interrupted or the measurement cell. In the event of instable value, probably an external signal is induced into the power supply cable. Potential fault is signaled by a bell at the LCD display or flashing or lighted diode of alarm and message in the alarm list.

- **Korekce (Correction) (0s, 0°C)** – consists of two parameters. First serves for the purpose of clearing a disrupted signal from the sensor by entering filtration in seconds. Second may be used by the user to change the value set by sensor and to adjust the temperature deviation caused e.g. by the cable length. According to local conditions, it's possible to perform sensor correction only after the maintenance password is typed in. Settings related to the operation of air conditioning unit on the basis of temperatures follow and are accessible also after the access password is entered.
- **VíceČidelProstoru (MoreSpaceSensors)(Průměr/Max/Min/1/2/3/4/LétoMin/ZimaMin)** – in case of more space heat sensors, there's the way of calculation set or the final space temperature is added. In case 1, 2, 3, 4 is selected, the final space temperature is set by only a selected sensor and the other sensor are only informative. In case of any other options, the resulting value is calculated as a mathematical average, maximum or minimum. The **LétoMin (SummerMin)** will select the lowest measured space temperature during summer period and the highest one during winter time. The **ZimaMin (WinterMin)** will select the lowest measured space temperature during winter period and the highest one in summer.
- **VícePosunŽádané (MoreShiftSet) (Průměr/Max/Min/1/2/3/4/LétoMin/ZimaMin)** – important only for temperature measurement with space sensors with correction. If using more space heat sensors with correction of set temperature, the calculation method is set for the final correction of required temperature. In case 1, 2, 3, 4 is selected, the final correction is given only by correction from selected sensor while the other corrections are only informative. In case of other selections, the resulting correction is calculated as a mathematical average, maximum or minimum. The **LétoMin (SummerMin)** will select the lowest measured space temperature during summer period and the highest one during winter time. The **ZimaMin (WinterMin)** will select the lowest measured space temperature during winter period and the highest one in summer.
- **Displej (Display)(Prostor/Priváděná/Odváděná)** – it selects the temperature sensor whose value will be displayed in the second line of the home screen next to the actual time. Standardly, a reference heat sensor is selected, compared with the required temperature. It's possible to select a space heat sensor, sensor for air inlet and outlet.

## 6.4.2 FANS

The **Ventilátory (Fans)** (Fig. 13) item contains information about the fan operation manner. Standardly, the fans are driven by engines with frequency converters or the so-called EC engines. Protection of engines is secured by a thermal contact of frequency converter or EC motor in this case. Parameters of frequency convertes are set in the factory according to the technical specification for respective air conditioning unit. Fan speed with frequency converters is controlled by regulator within the range (0 Hz, 0 %) of even maximal (xHz, 100 %) set ones in the frequency converter. At EC engines, the revolutions are controlled from the regulator within the range (0 Hz, 0 %) of max (50 Hz, 100 %) revolutions. Minimum operating speed is limited to 18Hz. The reason is to protect the engine against any heat load under long-term operation at lower revolutions than 18 Hz. Basic information about fans, accessible after entering the user password can be found on the Fig. 13. In the **Stav (status)** line, information about the operation manner for fan is displayed:

- **Připraven (Prepared)** – fan prepared.
- **Moderate heating** – fan is started according to the **Moderate heating** mode requirement.
- **Attenuation** – fan is started according to the **Attenuation** mode requirement.
- **Comfort** – fan is started according to the **Comfort** mode requirement.
- **3xStupně (3xStages)** – fan is controlled by three-stage external contacts.
- **Tlak (Pressure)** – fan is controlled on the basis of request from the air volume or pressure sensor.
- **POL822** – fan is controlled by the user from a space device.
- **TDod** – fan revolutions compensated on the basis of temperature of supplied air.
- **Směšování (Mixing)** – fan speed is compensated on the basis of value in **KompenzaceSměšování (Mixing-Compensation)**.

3   Fans	1
Inlet	100% On
Status	Comfort
OperationHours	24
NumberStarts	6
Comfort	100%
Attenuation	80%
Outlet	90% On
Status	Comfort
OperationHours	24
NumberStarts	6
Comfort	90%
Attenuation	70%

Fig. 13



- **KvaVzduchu (AirQuality)** – fan speed compensated according to the air quality sensor.
- **Ventilace (Ventilation)** – fan ventilates the heating engines after the unit is turned off.
- **Filtr (Filter)** – fan speed compensated on the basis of a medium fouled filter and set value in the **Kompensace-Málo (LowCompensation)** in the **Filtry (Filters)** compensation.
- **Start** – starting sequence is running before the fans are started. E.g. opening of dampers for the air inlet and outlet, heat recovery unit start, preheating of water heating etc.
- **Uvolnění (Released)** – all conditions, necessary for the start of air conditioning unit fans on the basis of selected mode, described in the table No. 1, are not met. Specific value of **Uvolnění** is available in couple of menu lines below.

In the event of unit, equipped by inlet and outlet fan, information may be displayed for both fans or for each fan separately, according to the settings in configuration.

Following parameters are available only after the user or maintenance password is entered:

- **Comfort (100%)** – inlet and outlet fan speed, at the **Comfort** mode. Only in case the control of speed is selected from the room unit (configuration parameter **MnožstvíVzduchu = 'POL822'**), **Comfort** means the maximum value of speed that may be set from the room unit.
- **Attenuation (80%)** – inlet and outlet fan speed, at the **Attenuation** mode. Only in case the control of speed is selected from the room unit (configuration parameter **MnožstvíVzduchu = 'POL822'**), **Attenuation** means the minimum value of speed that may be set from the room unit.
- **MinOtáčky (minimum speed)(36%)** – serves for the protection of engine against heat overload under long-term operation at lower speed than 18Hz (36% for nominal speed 50Hz).
- **Otáčky (revs)(%,%,%)** – value of speed for three-stage control of fan speed by external contacts.
- **OchrannéOtáčky (ProtectiveSpeed)(%)** – speed value for the fault event of pressure gauge or air flow rate.
- **Ramp ▲ (60s)** – time (start-up ramp), during which the control signal of fan speed reaches the speed from 0 V (0 % speed) to 10 V (100 % speed). The value of start-up ramp is given by a fan type and by a technical specification of air conditioning unit. Fan start-up with the EC motor is controlled directly by the ramp value. Minimum speed of EC motor are set in the controller for 18 Hz. In case of fans with frequency converters, the ramp set in controller is of an informative nature as the fan start-up is given by a start-up ramp set in frequency converter parameters. As the actual fan revolutions are not monitored standardly, the ramp set in the controller serves mainly for the display of expected actual fan speed. Therefore, the values of start-up ramp should be set in the same way for frequency converter as for the controller. Also the minimum revolutions (speed) are set in the frequency converter parameters.
- **Ramp ▼ (30s)** – time (run-down ramp), per which the control signal of speed achieves inlet and outlet fan (each separately) from 10 V (100 % speed) to 0 V (0 % speed). Run-down ramp has a different value for each type of fan. Fans' run-down time with EC engines is determined by this value. In case of fans with frequency converters, the ramp is of an informative nature as the run-down time of fans is given by the run-down ramp set in frequency converter parameters. Therefore, the values of run-down ramp should be the same.
- **TlakQBM (QBMPressure)(Pa)** – displays the actual pressure in the pipe on the basis of analogue pressure gauge in case the configuration parameter is **MnožstvíVzduchu = 'QBM'**. Set point of pressure in the pipeline for respective modes is set in the parameters **Comfort** and **Attenuation (%)**. The set and real value of pressure (%) are sent to the **PID control**, governing fans so the set pressure in pipeline is achieved. Calculation of the **Comfort** and **Attenuation** value is following on the basis of required pressure (set point) in the pipeline:
  - **Comfort (%)** = Pressure set point for comfort (Pa) \* 100 / **RozsahQBM**
  - **Attenuation (%)** = Pressure set point for Attenuation (Pa) \* 100 / **RozsahQBM**
- **RozsahQBM (QBMRange)(Pa)** – here, the range value is typed in, set on respective used pressure gauge with an analogue output of 0–10V. Under this pressure value in pipeline, there will be a 10V voltage on the analogue output of pressure gauge. If this value is set incorrectly, speed control of the fans will not match the required values.
- **PID-Regulace (PID control)** – contains control parameters for fan operations, controlled at the set point for speed, given by the pressure gauge determining the quality and speed of control. Standardly, the values are set in factory and they should be changed only by person with the knowledge of control systems. Standard values from factory are: **TI = 120s, KP = 2, TD = 0**.
- **SpřaženáCirkulace (CoupledCirculation) (No/Inlet/Outlet/Both)** – serves for the fan speed control on the basis of mixing damper control within the range of speed set in Comfort and Attenuation in the same way as in case of speed control from the room unit. With a dropping volume of fresh air, speed of one or both fans is rising.

- **Uvolnění (Release)** – this is an information that the conditions for air conditioning unit fans' start-up is met on the basis of selected mode. If all conditions are met, the standard release value is 15. If the value is higher, requirement for the start-up has been formed on the basis of any superior function as a wrong air quality, high temperature difference between the set and inlet air temperature, etc. If the value is lower, fans do not start. Tables of conditions for fans' release and other equipment are specified in the Tab. 1 at the end of this paragraph.
- **OtáčkyChlazeníPorucha (SpeedCoolingFault)(Turn off/Mode/Compensation)** – fan speed under cooling failure is set here. Under a set point for **Turn off**, the fans will turn off, while in case of the value **Mode** they will stay on the same level given by mode or any other control and under the value **Compensation**, they will turn to revolutions compensated according to the temperature of air inlet.
- **OtáčkyOdtávání (SpeedAblation)(Turn off/mode/Compensation)** – fan speed in case of air conditioning unit, heat recovery unit or glycol loop exchanger ablation is determined. Under a pre-set value of **Turn off**, the fans will turn off, under the value of **Mode**, they will stay on the level given by mode or any other control and under the value of **Compensation**, they will turn to the speed compensated according to the air inlet temperature.
- **OtáčkyTopeníPorucha (SpeedHeatingFault)(Turn off/mode/Compensation)** – here, the fan speed under heating failure is determined. Under a set point for **Turn off**, the fans will turn off, while in case of the value **Mode** they will stay on the same level given by mode or any other control and under the value **Compensation**, they will turn to revolutions compensated according to the temperature of air inlet.
- **VypínačPřívodu (InletSwitch)(Disconnect/Connect)** – showing the condition of maintenance switch for the inlet fan, if configured.
- **VypínačOdvodu (OutletSwitch)(Disconnect/Connect)** – showing the condition of maintenance switch for the outlet fan, if configured.
- **KompensaceSměšování (CompensationMixing)(No/Inlet/Outlet/both)** – sets at which fan the speed will be compensated on the basis of mixing damper. Used in particular at compact units construed in a way that if the damper is open at 100%, the outlet fan pushed the air into a closed outlet damper.
- **KompensaceTeplota (TemperatureCompensation)** – fan speed compensation serving to reach the required temperature of air inlet by changing their level. Compensation may be allowed in case of low temperature of air inlet, ablation of certain heating component of the unit (condensing unit, heat recovery unit, heat pump, glycol), of cooling or heating failure. Following parameters after the compensation start-up:
  - **Zap (TurnOn)(1°C)** – shows by how many degrees the temperature of air inlet must be lower than the set point to activate compensation.
  - **Posunutí (Shift)(4°C)** – air inlet temperature shift for the PID speed governor.
  - **ZpožděníVyp (DelayTurnOff)(60s)** – time for which the speed must be calculated by a PID governor at least on the level of corresponding mode, to achieve compensation end.
  - **PID-Compensation** – contains control parameters for the operation of fans controlled at a required temperature of air inlet, setting the quality and speed of control. Standardly, the values are set in factory and their change must be performed only by person with knowledge of control systems. Standard values set in the factory are: **TI = 60s, KP = 8, TD = 0.**

Release	5	Conditions for fans' start-up
		<p>The "Release" value necessary to turn on the fans consists of the sum of values of following conditions and must be at least 15:</p> <ul style="list-style-type: none"> <li>1 – no failure occurred, causing trip of the fans</li> <li>2 – certain operating mode (Comfort, Attenuation, Moderate heating) selected</li> <li>4 – unit operation not tripped by any component (maintenance switch etc.)</li> <li>8 – standard operational requirements for fans' start-up (heating, cooling, ventilation)</li> <li>16 – forced start-up with higher priority as the standard operating requirement (ventilation of electric or gas heating, insufficient air quality etc.)</li> </ul>

Tab. 1 – Release of fans

## 6.4.3 DAMPERS

If the air conditioning unit is equipped by dampers, information about its condition is displayed. Damper control may be performed on the basis of unit operation, external contact or requirement for mixing. Mixing can be performed standardly on the basis of actual operating mode (**Comfort, Attenuation**), temperature (**Outside, Inlet, Premises, BehindRecUnit**), individual weekly time schedule, user requirements from the POL822 room

Dampers	1
FreshAir	0%
InletDamper	0%
OutletDamper	0%
MixingDamper	100%

Fig. 14

unit or it may be controlled according to the set point of temperature as a part of the heating or cooling sequence. Mixing may be affected by functionalities with high priority, e.g. sensors of air humidity and quality of protective functions under signaled fault. In case of fault related to the water heating (anti-freeze thermostat, low temperature of drained water at return pipeline, low temperature of air inlet), the mixing damper opens to 100% and the inlet and outlet dampers close. Inlet and outlet dampers are usually controlled by the same signal as the mixing damper only having an opposite rotating direction. For the right display of damper condition and quantity of fresh air, it's necessary to keep the right configuration of air conditioning damper according to the electrical connection. If the unit is in the **Turned off** condition, the inlet and outlet dampers must be completely closed and the mixing damper completely opened. Basic information about dampers (Fig. 14), available without typing the password, are:

- **Čerstvý vzduch (Fresh air) (%)** – fresh air volume inlet into premises.
- **Klapka (Damper) (%)** – requirement for damper position. The value will be displayed separately for each damper, allowed in configuration. Real position of damper should correspond with this value if its control outlet is configured in the right way according to electric diagram.

Following parameters are available only after the user password is typed in:

- **Směšování Comfort (Mixing Comfort) (Fixed/Temperature/TimeProg/POL822/Set/Preheating)** – under the assumption that the unit is equipped by a mixing damper, it's possible to set mixing for a fixed value in this parameter according to temperature, time program, POL822 room unit, to the required temperature of air inlet as a part of the heating or cooling sequence if the **Comfort** mode is active.
- **Směšování Attenuation (Mixing Attenuation) (Fixed/Temperature/TimeProg/POL822/Set/Preheating)** – under the assumption that the unit is equipped by a mixing damper, it's possible to set mixing for a fixed value in this parameter according to temperature, time program, POL822 room unit, to the required temperature of air inlet as a part of the heating or cooling sequence if the **Attenuation** mode is active.
- **Pevně Comfort (Fixed Comfort) (80%)** – fixed mixing position for the **Směšování Comfort='Pevně' (Mixing Comfort='Fixed')** option.
- **Pevně Attenuation (Fixed Attenuation) (50%)** – fixed mixing position for the **Směšování Attenuation='Pevně' (Mixing Attenuation='Fixed')** option.
- **Směšování Teplota (Mixing Temperature) (3°C, Outside/Space/Inlet/HeatRecUnit)** – displays the mixing temperature and sets the thermal sensors according to which the mixing will be governed for the **Směšování Comfort='Teplota' (Mixing Comfort='Temperature')** or for the **Směšování Attenuation='Teplota' (Mixing Attenuation='Temperature')** option.
- **MinTopit, MaxTopit (MinHeat, MaxHeat) (0°C)** – limit values of temperature for linear mixing in the heating mode for the **Směšování Comfort='Teplota'** or for the **Směšování Attenuation='Teplota'** option. **MinTopit** determines, under which temperature the fresh air volume is 0 %. **MaxTopit** determines, under which temperature the fresh air volume is 100 %. The volume of fresh air will change linearly between these limit temperatures.
- **MinChladit, MaxChladit (MinCooling, Max Cooling) (0°C)** – limit values of temperature for linear mixing in the cooling mode for the **Směšování Comfort='Teplota'** or for the **Směšování Attenuation='Teplota'** option. **MinChladit** determines, under which temperature the fresh air volume is 0 %. **MaxChladit** determines, under which temperature the fresh air volume is 100 %. The volume of fresh air will change linearly between these limit temperatures.
- **MinČerstvého Vzduchu (MinFreshAir) (15%)** – minimum hygiene value for air inlet damper. This parameter will not apply if the unit is in the **Turned off** condition. Inlet and outlet dampers are opened at least for this value during operation if the mixing mode is selected or if all dampers are controlled by one joint signal.
- **Časový Program (Time Program)** – setting of mixing timing program. Each day, it contains 6 timing points where the time and position of mixing damper is set. The timing program is functional only in case the **Směšování Comfort='ČasProg'** or the **Směšování Attenuation='ČasProg'** option is active.

Following parameters are available only after the maintenance password is put typed in:

- **Pořadí Chladit (Cooling Order) (No, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)** – this parameter determines the order of mixing damper in the cooling sequence. The No option means that the mixing damper will not contribute to cooling. The use of priorities depends on the number of cooling components in the cooling sequence. E.g. in case of two cooling components, the mixing order and condensing unit, mixing is set to the 1<sup>st</sup> position and condensing unit in the 2<sup>nd</sup>.
- **Pořadí Topit (Heating Order) (No, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)** – this parameter determines the order of mixing damper in the heating sequence. The No option means that the mixing damper will not contribute to heating.



The use of priorities depends on the number of heating components in the heating sequence. E.g. in case of three heating components in the order: heat recovery unit, water heating and mixing, the heat recovery will be set as the 1<sup>st</sup> one, water heat as the 2<sup>nd</sup> one and mixing as the 3<sup>rd</sup> one.

- **PID-Regulace (PID-control)** – contains control parameters for heating operation (Heating) and cooling operation (Cooling) of mixing damper, determining the quality and speed of position control for the mixing damper according to the set temperature under the **Mixing comfort** option set for the value **Set** or **2Set**. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: TI = 150s, KP = 8, TD = 0.
- **Řízení (Control) (0–10V/2–10V)** – this parameter may be set for each damper controlled from a separate controller outlet. Parameter determines the range of outlet control signal for the damper servodrive. This value is set according to the type of used servodrive.
- **Otevření(Opening) (90s)** – time of closing and opening of damper. When monitoring the return signal of damper position, a damper failure could be signaled on the basis of difference between the expected and real position of damper. If the return signal of damper position is not monitored, this value is only of an informative nature. During the start-up, turning on of the fans will be delayed by this time so the inlet and outlet dampers could be open before the fans' start-up.
- **Necitlivost(insensitivity) (20%)** – important only when monitoring the return signal of damper position. If the difference between the expected and real position of damper is higher than the insensitivity, then a damper failure may be signaled and fans will be turned on this basis.

## 6.4.4 HEAT RECOVERY UNIT

Except for the heat recovery, the heat recovery unit may serve also for cooling recovery. It may be designed as a board unit or rotary one. Its protection against freeze is secured by a sensor placed behind the unit, at the air outlet. As a sensor, the manostat or channel thermal sensor may be used or both of them together. If any of the sensors signaled heat recovery unit freezing, bypass dampers at the board recovery unit will be opened or the speed of rotary recovery unit will be decreased to minimum value. This condition is signaled as **PomocnýRežim – OdtáváníRekuperátoru (AuxiliaryMode – HeatRecUnitAblation)** at the controller's display in the main menu. At the same time, speed of inlet fan may be adjusted according to the settings of the **Komponenty→Ventilátory→OtáčkyOdtávání=Kompenzace** parameter. This condition is signaled as **PomocnýRežim – KompenzaceOtáček (AuxiliaryMode – SpeedCompensation)** at the controller's display in the main menu.

Engine protection of a rotary heat recovery unit is secured by a connection of thermal contact of the engine with frequency converter, if the engine is equipped thereby. If the motor is not equipped by a thermal contact, it's necessary to connect respective terminal at the frequency converter or to change the parameters of frequency converter so the converter does not monitor the condition of engine's thermal contact. Setting of the frequency converter parameters for respective order forms part of the documentation.

Basic information about the heat recovery unit, accessible without any password, can be seen at Fig. 15. On the line **Stav (Status)**, also the following information can be found besides the heat recovery performance in %:

- **Vypnut (Turn off)** – heat recovery unit is not used.
- **Chladí (Cooling)** – heat recovery unit is used for cooling.
- **Topí (Heating)** – heat recovery unit is used for heating.
- **Odtává (Ablation)** – heat recovery unit is in the ablation mode.
- **Porucha (Fault)** – heat recovery unit is not working properly. Specific fault is described in alarm messages.

If the user password is typed in, the number of faults of heat recovery from frequency converter, manostat or thermal sensor are displayed according to the type of used heat recovery and its protection.

Following parameters are accessible only after the maintenance password is typed in:

- **Zamrznutí (Freezing) (°C)** – temperature of anti-freeze protection, signaling heat recovery unit freezing.

Heat recovery unit	
Status 0%	Turned off
OperatingTime	0
StartsNumber	0

Fig. 15

This value is important only in case the channel thermal sensor is used for the anti-freeze protection, placed behind the heat recovery unit for the air outlet.

- **TeplotaZaRekuperátorem (TempBehindHeatRecUnit) (°C)** – actual temperature behind the heat recovery unit. This value will be displayed only in case a channel thermal sensor, placed behind the heat recovery unit at the air outlet, is used for the anti-freeze protection.
- **PořadíTopit (HeatOrder) (Ne,1,2,3,4,5,6,7,8,9,10)** – this parameter determines the order of a heat recovery unit in the heating sequence. The **No** option means that the heat recovery unit will not contribute to heating. The use of priorities depends on the number of heating components in the heating sequence. E.g. in case of three heating components in the order: mixing, heat recovery unit, water heating and mixing, the mixing will be set as the 1<sup>st</sup> one, heat recovery as the 2<sup>nd</sup> one and water heating as the 3<sup>rd</sup> one.
- **PořadíChladit (OrderCooling)(Ne,1,2,3,4,5,6,7,8,9,10)** – this parameter determines the order of a heat recovery unit in the cooling sequence. The **No** option means that the heat recovery unit will not contribute to cooling. The use of priorities depends on the number of heating components in the heating sequence. E.g. in case of two heating components in the order: heat recovery unit and condensing unit, the heat recovery unit will be set as the 1<sup>st</sup> one, while condensing unit as the 2<sup>nd</sup> one.
- **PID-Regulace** – contains control parameters for heating operation (Heating) and cooling operation (Cooling) of heat recovery unit, determining the quality and speed of heat recovery unit control on the basis of set and real temperature of air inlet. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: TI = 60s, KP = -5, TD = 0.
- **Rampa (ramp) ▲ ▼ (60s)** – time (start-up, run-down ramp), per which the control signal of heat recovery unit reaches from 0V (0% revs) to 10V (100% revs) and vice versa. The value is important only for the rotary heat recovery unit.
- **Řízení (Control) (0-10V/2-10V)** – this parameter is important only for the board heat recovery unit and determines the range of an outlet control signal for the bypass damper servodrive. This value is set according to the type of used servodrive.
- **Otevření (Opening)(90s)** – this parameter is important only for the board heat recovery unit and means the time of closing and opening of bypass damper. When monitoring the return signal of damper position, a damper failure could be signaled on the basis of difference between the expected and real position of damper. If the return signal of damper position is not monitored, this value is only of an informative nature.
- **Necitlivost (Insensitivity) (20%)** – this parameter is important only for the board heat recovery unit and only during the monitoring of the return signal of damper position of the heat recovery unit. If the different between the expected and real position of damper is higher than the insensitivity, then a damper failure may be signaled.

## 6.4.5 GLYCOL

Glycol loop may be used for the heat or cooling recovery as well as the heat recovery unit. Protection of the glycol exchanger against freezing may be secured by a manostat placed at the heat exchanger on the side of air outlet. In case of signalisation of exchanger's freezing, the glycol valve closed and pump turns off. This status is signaled as **PomocnýRežim – OdtáváníGlykolovéhoVýměníku (AuxiliaryMode – AblationGlycol-Exchange)** at the controller display in the main menu. At the same time, supply fan speed will be adjusted during the settings **Komponenty→Ventilátory→OtáčkyOdtávání=Kompenzace**. This status is signaled as **PomocnýRežim – KompenzaceOtáček (AuxiliaryMode – SpeedCompensation)** at a controller's display in the main menu.

Basic information about the glycol loop, available even without the password to be entered, can be found on the Fig. 16. On th line **Stav (Status)**, besides the performance of a glycol pump in %, there's also the information about the glycol loop operation:

- **Vypnut (Turn off)** – glycol loop not used.
- **Chladí (Cooling)** – glycol loop used for cooling.
- **Topí (Heating)** – glycol loop used for heating.
- **Odtává (Ablation)** – glycol loop exchanger is in the ablation mode.
- **Dopouští (Filling)** – glycol is filled into the loop.

Glycol	1
Status 0%	Turned off
OperatingTime	0
StartsNumber	0

Fig. 16

- **Porucha (Fault)** – glycol loop is not working correctly. Respective fault is specified in the alarm messages.

After the user password is typed in, also the number of glycol loop faults will be displayed.

Following parameters are available only after the maintenance password is typed in:

- **VykonZapnutí (PerformanceTurnOn) (6%)** – necessary minimum performance calculated for the pump start.
- **Řízení (Control) (0–10V/2–10V)** – parameter defining the range of an output control signal for a valve servodrive. It must match with the range of a control signal, specified in technical parameters of servodrive.
- **DopustitGlykol (FillGlycol) (80%)** – this value determines the pressure limit in a glycol loop, and if the bottom limit is exceeded, glycol pump for filling should start. Pressure in the glycol loop is measured by a pressure gauge with the output of 0–10V. Required value is calculated in the following manner: **DopustitGlykol(%)** = minimum pressure (Pa) \* 100 / sensor range.
- **PořadíTopit (OrderHeating) (Ne, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)** – this parameter determines the order of a glycol loop in the heating sequence. Its use is described in detail for the components of **Rekuperátor (Heat recovery unit)** or **Klapky (Dampers)**.
- **PořadíChladit (OrderCooling) (Ne, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)** – this parameter determines the order of a glycol loop in the cooling sequence. Its use is described in detail for the components of **Rekuperátor (Heat recovery unit)** or **Klapky (Dampers)**.
- **PID-Regulace (PID-control)** – contains regulation parameters for heating operation (heating) and cooling operation (Cooling) of the glycol unit: regulation parameters for heating operation (heating) and cooling operation (Cooling) of a glycol loop, determining the quality and speed of performance regulation in the glycol loop on the basis of set and real temperature of supplied air. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 60s, KP = 2, TD = 0.**

## 6.4.6 WATER HEATING

Water heating (Fig. 17) is controlled on the basis of selected mode and required temperature in combination with thermal sensors. Standardly, qualitative control by a three-way valve and electric water pump is used. On the line **Stav (Status)**, information about operation is displayed along with the water heating in %:

- **Vypnut (Turn off)** – Water heating not used.
- **Zapnut (Turn on)** – Water heating in the heating mode.
- **Předehřev (Preheat)** – preheat running.
- **MinTDod** – low temperature of supplied air, heating is turned on.
- **MinTVod** – low temperature of heating water, heating is turned on.
- **MinTVen** – low temperature of heating water, pump is on.
- **Thermostat** – anti-freeze protection of water exchanger, thermostat is active, heating is turned on.
- **Porucha (Fault)** – certain fault is written in alarm notifications, heating is turned on.

WaterHeating	1
Stav 0%	Turned Off
HeatWaterDrained	21.6°C
OperationTime	0
StartNumber	0

Fig. 17

Antifreeze protection is secured by an anti-freeze thermostat, heat sensor of drained or supplied water and heat sensor or supplied or ambient air.

- **Havarijní protimrazová ochrana (Emergency anti-freeze protection)** is performed by an anti-freeze thermostat on the basis of supplied air temperature by an anti-freeze thermostat. The anti-freeze thermostat signalizes temperature drop of supplied air below the value set on thermostat, ideally by a disconnection contact. In case the emergency anti-freeze protection is activated, fans will turn off, mixing damper will open for 100%, pump will turn on, three-way valve will open fully and a fault is signalized.
- **Provozní protimrazová ochrana (Operating anti-freeze protection)** is performed on the basis of water temperature at the return, ambient temperature and the temperature of supplied air in the following cases:
  - In case the unit is turned on, temperature of heating water drops below 6 °C (**MinTVod**). Pump will turn on and the three-way valve will open in full. The anti-freeze protection is stopped if the temperature rises above 7 °C.
  - In case the unit is turned on, temperature of supplied air drops below 6 °C (**MinTDod**). Pump will turn on and the three-way valve will open in full. The anti-freeze protection is stopped if the temperature rises above 7 °C.

- Protection when unit is stopped (**MinTVod**) – if the temperature of heating water drops below 10 °C, pump will switch and a three-way valve will start to open. It will be fully open at 4 °C. Between 4 °C and 10 °C, the valve position is linearly dependent on the temperature of drained water.
- On the basis of **ČerpadloZap (PumpOn)** option, it's possible, under low temperature of the ambient air, to turn on the pump if the unit is turned off or on.

The anti-freeze protection is signaled as **PomocnýRežim – OchranaVodníhoOhřevu (AuxiliaryMode – Water-HeatingProtection)** at controller's display in the main menu.

In case of any fault of water heating, a three-way valve will open in full and the pump will turn on. If the unit is running during the fault, fan speed may decrease during the setting of **Komponenty→Ventilátory→OtáčkyHeating-Porucha=Kompenzace**. This condition is signaled as **PomocnýRežim – KompenzaceOtáček** at the controller's display in the main menu.

When the user password is typed in, the number of water heating faults will be displayed.

Following parameters are available only after the maintenance password is typed in:

- **VykonZapnutí (PerformanceOn) (1%)** – necessary minimum performance for turning on the water heating pump.
- **Řízení (Control) (0–10V/2–10V)** – parameter determines the range of an output control signal for the servodrive of a three-way valve. It must correspond to the range of a control signal specified in technical parameters of a servodrive.
- **Otevření (Opening) (90s)** – time per which the valve of a control joint opens or closes. When monitoring a feedback signal of valve position, valve fault could be signaled on the basis of difference between an expected and real position of the valve. If no feedback signal is monitored, this value of expected valve position is only of an informative nature.
- **PořadíTopit (HeatOrder) (Ne, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)** – this parameter determines the order of water heating in the heating sequence. The use is described in detail in the **Heat Recovery Unit** or **Dampers** sections.
- **PID–Regulace** – contains control parameters determining the quality and speed of performance control for water heating on the basis of set and real temperature of supplied air. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 120s, KP = 6, TD = 0**.
- **NížkáTeplotaVody (LowTemp)(12°C)** – limit temperature value for the drained water, serving as a water heating protection when unit is operating (pump turned on). If the temperature of heating water is lower, valve opens and fan speed compensation activates by the time the temperature rises above the value **PotřebnáTeplotaVody (NecessaryWaterTemperature)**.
- **PotřebnáTeplotaVody (20°C)** – limit temperature value for the drained water so the function of water heating corresponded to the designed parameters of an air conditioning unit. However, sometimes it's necessary to change this value with regard to the boiler room performance, supplying heating water.
- **Předehřev (Preheat)** – secures temperature-friendly start of the unit in cold seasons without any speed compensation of fans. Consisting of two sequences with following parameters:
  - **Zap (On) (180s)** – period of the first sequence when fans will start, pump will turn on and a fixed value for fan opening will be set on the basis of ambient temperature and the **Min** and **Max** parameters. Fixed opening of valve will be set linearly between these limit temperatures.
  - **Vyp (Off)(20%/min)** – second sequence when the valve opening, calculated by a preheat starts to decrease the speed set by the **Vyp** parameter and at the same time, the **PID regulace** control of valve opening will be allowed on the basis of required temperature. Actual opening of valve reflects the higher one.
  - **Min (–10°C, 100%)** – minimum ambient temperature, by which the valve opens fully after the preheat start.
  - **Max (5°C, 50%)** – maximum ambient temperature, by which the valve opens for 50% after the preheat start.
  - **KompenzaceOtáček (Speed compensation) (No/Yes/Only)** – option of a combination of preheat and compensation of fans' speed on the basis of supplied air temperature. Respective items have the following meaning:
    - **No** – during the preheat, speed compensation will not apply.
    - **Yes** – speed compensation is active at the same time as the preheat.
    - **Only** – instead of preheat, only the speed compensation is active.
- **ČerpadloZapnutí (PumpTurnOn) (Normal/LowTemp/Heating/OffLowTemp)** – maximum ambient temperature, by which the valve opens for 40 % after the preheat is started. Respective items shall mean the following:

- **Normálně (Normal)** – in the heating mode, the pump will turn on only in case the requirement for valve opening is higher than **VykonZapnutí**.
- **NizkáTeplota (LowTemperature)** – pump will be turned on even in case the ambient temperature is lower than the value set in **Předeřev–Max. (Preheat – Max.)** The condition is that the unit may not be in the turned off mode.
- **Topit (Heating)** – pump will turn on even in case of lower requirement for valve opening as **VykonZapnutí (PerformanceTurnOn)**, if the condition is met, that in the heating sequence, water heating come to the order.
- **VypNizkáTeplota (TurnOffLowTemp)** – pump will turn on even in case the ambient temperature is lower than the value set in the **Předeřev–Max** minus **4°C**. The requirement is that the unit is in the mode turned off.

## 6.4.7 ELECTRIC HEATING

Electric heating (Fig. 18) is controlled on the basis of selected mode and required temperature in combination with thermal sensors. Single-stage, multi-stage, modulation or combined electric heaters are used. Requirement for turning on the electric heater are the fans turned on. Control of electric heating is prepared for the control of even 4 sections of modulated and non-modulated ones, including their combination.

On the line **Stav (Status)**, information about operation is displayed along with the electric heating in:

- **Vypnut (Turn off)** – Electric heating not used.
- **Zapnut (Turn on)** – Electric heating in the heating mode.
- **Porucha (Fault)** – electric heating contactor is disconnected in case of heating requirement, heating is turned off.

ElectricHeating		1
Status 0%		Turned off
OperatingTime		0
StartNumber		0
2Section		0
Status 0%		Turned off
OperatingTime		0
StartNumber		0

Fig. 18

When the user password is typed in, the number of electric heating faults will be displayed.

Protective functions are secured by an emergency thermostat, disconnecting the electric heating in case of overheat while this status is signalized in a controller, performing the entire cooling of electric exchanger. Do not turn off the air conditioning unit power supply (supply fan) if the electric heating is running! It will be overheated!

In case of electric heating fault, fan speed reduction may occur after the cooling of exchanger under the setting of **Komponenty→Ventilátory→OtáčkyHeatingPorucha=Kompenzace** parameter. This status is signalized as **PomocnýRežim – KompenzaceOtáček** at controller's display in the main menu.

Following parameters are available only after the maintenance password is typed in:

- **StykačZapnut (ContactorOn) (No/Yes)** – important only in case of modulated electric heaters and allows turning on the contactor for the entire heating period even if the modulation signal is zero. The aim is to reduce the wear of contactors.
- **SekceZap/Vyp (SectionOn/Off) (120s)** – important only in case of multi-stage electric heaters and setting the time after which the next stage switches on or off.
- **Vyvětrat (Ventilate) (180s)** – used only after when the unit mode is turned off under operating electric heating. Fans run for a pre-set period of time, cooling down the electric exchanger by air flow.
- **MaxVýkon (MaxPerformance) (100%)** – here, it's possible to set the limitation of maximum performance of electric heater. Most of the time, this function will apply under a reduced performance of fans when the electric exchanger becomes overheated.
- **ZapnoutPři (TurnOnIf) (3%)** – necessary minimum performance for the contactor to be turned on, if not turned on by the **StykačZapnut (ContactorTurnOn)** item.
- **PořadíTopit (HeatingOrder) (No, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)** – this parameter determines to order of electric heating in the heating sequence. Its utilization is described in detail in the **Heat Recovery Unit** or **Damper** sections.
- **PID–Regulace** – contains values, determining the quality and speed of performance control for electric heating on the basis of set and real temperature of supplied air. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 120s, KP = 6, TD = 0**.
- **SekcíRozvaděče (SwitchboardSections) (°C, 1/2/3/4)** – temperature in the switchboard and the number of sections of electric heating in the switchboard.



- **kW/Sekce (kW/Section) (kW)** – value of performance per one section according to the real distribution of electrical heating in sections. This value may be different for respective sections.
- **Maximální Teplota (MaxTemperature) (60°C)** – maximum temperature in switchboard. If exceeded, electric heating is turned off. This function is used mainly for multistage electric heaters where operating thermostats, placed directly in the switchboard, are not used.

## 6.4.8 GAS HEATING

Burner for gas heating is controlled on the basis of selected mode and required temperature in combination with thermal sensors and bypass damper of burner, if installed. Also, the burner in-built units Monzun from Mandík a.s. or units with burners from other manufacturers may be installed. Burners may be single-stage, double-stage or modulation ones. Maximum value of 100 % for a modulation burner corresponds to the maximum performance of exchange in kW according to documentation. Minimum value of real performance is set during the commissioning of burner, corresponding to the minimum performance of 0%. Under an ordinary operation, the burner turns on only in case fans are started. Burner operation is signalized by a control light on the control board. During the seasons (spring and autumn), number of starts may be higher as in case of winter season. Too frequent burner starts may signalize an incorrect functionality of the entire air conditioning unit.

Bypass damper of gas exchanger is controlled on the basis of temperature in flue gases so required temperature of flue gases is achieved under ordinary operation when optimal incineration is achieved as well. Another function of a bypass damper is to secure a minimum condensation of water vapors in the exchanger under a cold start. Protective functions are secured by an emergency thermostat and thermal sensor in flue gases. Thermal sensor in flue gases has the function of an operational thermostat set for 200 °C. In case such temperature is achieved in flue gases, burner is turned off while fans are running. After cooling down below 80°C, the burner starts again, if no other fault occurred. It monitors the temperature in flue gases also in case the unit is turned off and if it exceeds 80 °C, so it turns on the fans to achieve cooling. Emergency thermostat is placed behind the gas exchanger and is set for 90 °C as a fixed value. If such temperature is exceeded, emergency thermostat turns off the burner power supply and an intervention of personnel, that should take care of the cause of such condition, is expected (thermostat reset). In case of power supply disconnection for control under the operation of gas heating, overheating occurs! In case of fault of gas heating, fan speed may decrease after cooling down during the setting of **Komponenty → Ventilátory → Otáčky Heating Porucha = Kompenzace** parameter. This condition is signalized as a **Pomocný Režim – Kompenzace Otáček** at the controller's display in the main menu.

Convector is a function securing appropriate thermal conditions for the burner ignition, protecting it against freezing. If no external thermal sensor is installed, the thermal sensor of flue gas is used for the protection, placed into the base of stack in the outside environment. Practical execution is the 230 V socket, controlled from a controller, placed in a chamber with burner electronics. Electric space heater or heating cable can be connected to the socket. In case the power supply of control board or controller is disconnected, this protection won't work! It's used in particular at external configurations of air conditioning units.

Basic information about the gas heating is available without the need to type in password at Fig. 19. On the **Stav (Status)** line, besides the gas heating performance in %, also the information about its operation is displayed:

- **Vypnut (Turn off)** – Gas heating not used.
- **Zapnut (Turn on)** – Gas heating in the heating mode.
- **PorHořáku (BurnerFault)** – gas burner signalized fault or that it's not ignited.
- **MaxTSpal** – flue gas temperature higher as the maximum allowed, heating turned off.
- **PorTSpal** – porucha čidla teploty spalín, ohřev je vypnut.

If the user password is typed in, the number of gas heating faults will be displayed.

Following parameters are available only after the maintenance password is typed in:

- **Povolit Zapnout (Allow On) (0,4°C)** – if the difference of set and actual temperature exceeded pre-set value, burner ignition is allowed.

Burner	1
Status 0%	Turned off
OperatingTime	0
StartNumber	0

Fig. 19

- **PovolitVypnout (AllowOff) (0,4°C)** – if the difference of set and actual temperature exceeded pre-set value, burner turning off is allowed.
- **Hystereze (Hysteresis) (1°C)** – hysteresis of necessary inlet temperature calculated within a cascade regulation, necessary for turning the burner on and off. The aim is to decrease the number of burner's turning on and off.
- **IntegralZapnutí (IntegralOn) (0,4°C)** – integration value, calculated from the difference of necessary temperature calculated in a cascade control, shifted by **Hysteresis/2** and inlet temperature. If the integration value is met as well as the **PovolitZapnout** condition, burner is turned on. The aim of integration is to reduce the number of burner's ignitions.
- **IntegralVypnutí (IntegralOff) (0,4°C)** – integration value, calculated from the difference of the inlet and necessary temperature calculated in a cascade control, shifted by **Hysteresis/2**. If the integration value is met as well as the **PovolitVypnout** condition, burner is turned off. The aim of integration is to reduce the number of turning off of burners.
- **SpalinyMax (MaxFlueGas) (200°C)** – emergency limit of flue gas temperature. If achieved, burner is turned off and fault is signalized.
- **SpalinyMin (MinFlueGas) (80°C)** – in case of flue gas temperature drop below this value, fan may be turned off.
- **ČasVentilu (ValveTime) (40s)** – time for which the servodrive of burner valve can reset the valve from 0 % to 100 %. This value is necessary for the correct three-point control of servodrive.
- **Vyvětrat (Ventilate) (180s)** – minimum delay time for the fan turn off after the gas heating is turned off.
- **ZpožděníPoruchy (FaultDelay) (60s)** – delay in fault signalisation after meeting of requirement for the fan start. This value must be higher than the time between start and real ignition of burner with subsequent signalisation of burning.
- **MaxVýkon (MaxPerformance) (100%)** – here, it's possible to set the limits of maximum performance of gas heater. Most of the time, this function will apply under a reduced fans' performance when the gas exchanger may become overheated.
- **PořadíTopit (HeatingOrder) (Ne, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)** – this parameter determines the order of gas heating in the heating sequence. The use is described in detail in the **Heat Recovery Unit** or **Damper** sections.
- **PID-Regulace (PID-control)** – contains values, determining the quality and speed of performance control for gas heating on the basis of set and real temperature of supplied air. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 60s, KP = 5, TD = 0.**
- **ZpožděníOchrana (DelayProtection) (60s)** – determines the delay for burner turning off when maximum temperature of supplied air is achieved **MaxPřiváděná (MaxSupplied)** in **KaskádníRegulace (Cascade/Control).**
- **PID-Spaliny (PID-FlueGases)** – contains values, determining the quality and speed of performance limitation control for gas heating on the basis of real and maximum temperature of flue gases. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 60s, KP = 5, TD = 0.**

Following basic information about a bypass damper of gas exchange is available if the maintenance password is entered:

- **Řízení (Control) (Normal/Invert, 0-10/2-10)** – polarity and the type of control signal must correspond to the range of a control signal, mentioned in the technical parameters of servodrive. In case the burner is turned off, the damper must be open.
- **SpalinyŽádaná (SetPointFlueGas) (140°C)** – required temperature of flue gas at which the damper position control is active. Control at this value starts to apply only after the temperature of flue gases is lower by 40 °C than the set temperature so the exchanger could heat up as fast as possible. If the flue gas temperature is higher than **SpalinyMax (MaxFlueGas)**, then the bypass damper of exchanger is closed, so the exchanger may cool down.
- **PID-Regulace** – contains values determining the quality and speed of position control for bypass damper for gas heating on the basis of flue gas temperature. PID control does not apply in case of flue gas temperature lower than 80°C (damper open at 100%). Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 60s, KP = 2, TD = 0.**
- **Otevření (Opening) (90s)** – time per which the bypass damper of gas heating opens or closes. When mklapka plynového ohřevu otevře nebo zavře. When monitoring a feedback signal of valve position, valve fault could be signalized on the basis of difference between an expected and real position of the valve. If no feedback signal for damper is monitored, this value of expected valve position is only of an informative nature.

- **Necitlivost (Insensitivity) (20%)** – important only when monitoring the feedback signal of damper position. If the difference between the expected and real damper position is higher than insensitivity, damper fault could be signaled while the fans will turn off on this basis.

After the maintenance password is typed in, basic information about a gas exchanger convector can be found:

- **Zapnout (TurnOn) (4°C, BurnerOff/Always)** – determines if moderate heating of burner box should be performed only if the burner is turned off or always when a drop of ambient temperature or flue gas temperature occurs below the limit value of temperature for turning on. If a heating equipment is used with a built-in thermostat, it's recommended to set the limit temperature to a value higher than 10°C and to set the required temperature in the burner box at the thermostat.
- **Zpoždění (Delay) (10min)** – delay parameter for turning on and off the convector if the temperature of external or flue gas sensor exceeded the limit value.

## 6.4.9 WATER COOLING

Water cooling is controlled on the basis of selected mode and required temperature in cooperation with thermal sensors. Standardly, a high-quality three-way valve and an electric water pump are used.

Basic information about cooling, available without the password, can be found at the Fig. 20. Before the actual performance of water cooling, there are the **T** or **H** letters signalized by physical units, according to which the water cooling is controlled. **T** means the control on the basis of required temperature and **H** means control on the basis of required humidity.

On the **Stav (Status)** line, besides the water cooling performance in %, also the information about its operation is displayed:

WaterCooling		1
Status T 80%		Turned off
OperationTime		0
StartNumber		0

Fig. 20

- **Vypnut (Turn off)** – Water cooling not used.
- **Zapnut (Turn on)** – Water cooling is active.
- **Porucha (Fault)** – vodního cooling pump shows fault, valve will be closed.

If the user password is typed in, the number of water cooling faults will be displayed.

In case of water cooling fault, fan speed may be reduced according to the settings of the **Komponenty** → **Ventilátory** → **OtáčkyCoolingPorucha=Kompenzace** parameter. This status is signalized as **PomocnýRežim – Kompenzace-Otáček** at the controller's screen in the main menu.

Following parameters are available only after the maintenance password is typed:

- **VykonZapnutí (PerformanceTurnOn) (6%)** – necessary minimum performance to turn on the water cooling pump.
- **Výstup (Output)(0–10V/2–10V)** – This parameter determines the range of an output control signal for the servodrive of a three-way valve. It has to correspond to the range of control signal, specified in the technical parameters of servodrive.
- **Otevření (Opening)(90s)** – time per which the valve of a control joint opens or closes. When monitoring the back signal of valve position, a valve fault may be signalized on the basis of difference between the expected and real position of valve. If the back signal is not monitored, this value of estimate valve position is only of informative nature.
- **PořadíChladit (OrderCool) (No, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)** – this parameter determines the order of water cooling in the cooling sequenc. The use is described in detail in the **Heat Recovery Unit** or **Dampers** sections.
- **PID-Regulace (PID-Control)** – contains the value determining the quality and speed of water cooling control on the basis of set and actual temperature of air supply. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 150s, KP = -8, TD = 0.**



## 6.4.10 CONDENSING UNIT

There's a large number of manufacturers of external cooling equipment that may be used with air conditioning units. Almost each manufacturer of cooling or condensing unit has his own control system. That causes large fractionalism in the way of control of cooling or condensing units and sometimes it's very hard to align the control of an air conditions and condensing unit. Therefore, it's possible to choose the control type of condensing unit (cooler) according to respective ways of control from certain manufacturers, continuously extended. A separate PID controller is designed for each mode of condensing unit (cooling, heating). Condensing units' control is prepared for the control of 2 individual units, modulated or non-modulated, including their combinations. Basic information about condensing units are available without the need of typing the password in at the Fig. 21.

On the **Stav (Status)** line, besides the condensing unit performance in %, also the information about its operation is displayed:

- **Vypnuta (TurnedOff)** – condensing unit not used.
- **Chladí (Cooling)** – condensing unit works in the cooling mode.
- **Topí (Melting)** – condensing unit works in the heating mode.
- **Odtává (Ablation)** – condensing unit works in the ablation mode.
- **Porucha (Fault)** – condensing unit signaled fault.

If the condensing unit signalizes internal mode of ablation, then **interní režim odtávání**, then **PomocnýRežim – OdtáváníKondenzačníJednotky** is displayed on the main menu screen. At the same time, in **Komponenty→Ventilátory→OtáčkyOdtávání=Kompence** fan speed may be reduced. This status is signalized as **PomocnýRežim – KompenceOtáček** at controller's main menu screen.

In case of fault of condensing unit, fan speed may be reduced according to the settings of the **Komponenty→Ventilátory→OtáčkyCoolingPorucha=Kompence** parameter. This status is signalized as **PomocnýRežim – KompenceOtáček** at controller's main menu screen.

If the user password is typed in, the number of water cooling faults will be displayed.

Following parameters are available only after the maintenance password is typed in:

- **TrvaleZapnout (PermTurnOn) (Unit/CH)** – specifies turning on of an external condensing unit. When choosing **Unit**, external unit is turned on along with an air conditioning unit. When choosing **C/H**, turning on will be activated only after the cooling or heating request.
- **ZpožděníZapnutí (DelayTurnOn) (2min)** – delay in turning the condensing unit on works as a time filter in transitory periods.
- **VýkonZapnutí (PerfTurnOn) (3%)** – required minimum performance for turning on the condensing unit.
- **MaxVýkon (MaxPerf) (100%)** – here, the maximum performance limitation of condensing unit may be set. Most of the time, this function is used under a decreased performance of fans.
- **MinVenkovníChladit (MinExtCool) (10°C)** – minimum temperature of ambient air under which the condensing unit may be cooling effectively. Usually, this parameter is set by a manufacturer in the documentation fro a condensing unit.
- **MinVenkovníTopit (MinAmbHeat) (2°C)** – minimum temperature of ambient air under which the condensing unit may be heating effectively. Usually, this parameter is set by a manufacturer in the documentation fro a condensing unit.
- **BlokovatLéto/Zima (TripSummer/Winter) (No/Yes)** – this parameter trips heating by condensing unit during the summer period and cooling of the same unit during winter period. Actual period is specified in the **KaskádníRegulaci (CascadeControl)**.
- **PořadíChladit (OrderCool)(No, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)** – this parameter determines the order of condensing unit in the cooling sequence. Its use is described in detail in the **Heat Recovery Unit** or **Damper** section.
- **PořadíTopit (OrderHeat)(No, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)** – this parameter determines the order of condensing unit in the cooling sequence. Its use is described in detail in the **Heat Recovery Unit** or **Damper** section.
- **ChladitZapnout (CoolingTurnOn)(6.25V)** – important for condensing units whose conditions are controlled by constant voltage level of the direct signal 0–10V (**TypŘízení=FDP3**). Voltage is typed in according to the technical specification when the condensing unit cooling mode is turned on.

CondensingUnit		1
Unit		0% Off
OperationTime		0
StartNumber		0
NumberAblation		0
2Uni		0% Off
OperationTime		0
StartNumber		0
NumberAblation		0

Fig. 21

- **VětratZapnout (VentilationTurnOn) (4.75V)** – important for condensing units whose conditions are controlled by constant voltage level of the direct signal 0–10 V (**TypŘízení=FDP3**). Voltage is typed in according to the technical specification when the condensing unit ventilation mode is turned on.
- **TopitZapnout (HeatingTurnOn)(3.25V)** – important for condensing units whose conditions are controlled by constant voltage level of the direct signal 0–10 V (**TypŘízení=FDP3**). Voltage is typed in according to the technical specification when the condensing unit heating mode is turned on.
- **PID regulace (PID-Control) – Topit, Chladit (Heating,Cooling)** – contains the value determining the quality and speed of performance control of condensing unit on the basis of set and actual temperature of air supply. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 300s, KP = 5, TD = 0**.

## 6.4.11 HEAT PUMP

Heat pump represents a compact component of the Mandík air conditioning unit, if installed. In principle, this is an integrated single- or double-circuit inverter. It consists of exchangers, compressors, electronic expansion valves, pressure gauges, thermal sensors and autonomous controller for the EVD expansion valves from Carel. Detailed description of EVD controller settings, including commissioning, is specified in a separate manual, supplied by Carel manufacturer. Usually, setting and commissioning of the heat pump forms part of the air conditioning unit supply.

Basic information about the heat pump, available without the need to type in the password, can be found at Fig. 22. The number before the item name determines the first or second circuit. In the **Stav (Status)** line, information about its operation is displayed:

HeatPump		1
Status		Off
1Circuit		0% Off
2Circuit		0% Off
1OperationHours		0
1NumberStart		0
2OperationHours		0
2NumberStart		0

Fig. 22

- **Vypnut (Turn off)** – heat pump not used.
- **Zapnut (Turn on)** – heat pump is active.
- **Porucha (Fault)** – heat pump is faulty.

Following parameters are available only after the maintenance password is typed in:

- **ZbýváDoVypnutí (RemainingOff) (s)** – displays the time by turning off the circuit.
- **PořadíTopit (OrderHeating) (No, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)** – this parameter determines the order of condensing unit in the heating sequence. Its use is described in detail in the **Heat Recovery Unit** or **Damper** section.
- **PořadíChladit (OrderCooling) (No, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10)** – this parameter determines the order of condensing unit in the cooling sequence. Its use is described in detail in the **Heat Recovery Unit** or **Damper** section.
- **PID-regulace (PID-Control)** – contains the value determining the quality and speed of heat pump performance control on the basis of set and actual temperature of air supply. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 60s, KP = 2, TD = 0**.
- **PříštíStart (NextStart) (600s)** – time between turning off the unit and next start of each circuit or of the heat pump compressor. It secures the avoidance of frequent turning on and off of compressors. Recommended maximum number of compressors' starts is approximately 6x per hour.
- **VýkonZapnutí (PerformanceOn) (10%)** – necessary minimum performance to turn on the circuit or compressor.
- **ZpožděníVyp (DelayOff)(10s)** – delay in turning off the compressor if zero performance is achieved.
- **MaxVýkon (MaxPerformance) (100%)** – here, it's possible to set the limitation of maximum performance of both circuits of thermal pump.

## 6.4.12 HUMIDIFIER

Humidifier serves for the purpose of achieving the required air humidity by steam generators. These generators may be controlled continuously or in alternating way, according to the typ used. Basic information about air humidification, available even without the password, can be found at Fig. 23. In the **Stav (Status)** line, besides the humidifier's performance in %, also the information about its operation is displayed:

Humidifier	1
Status	0% Off
Humidity	67%
OperationHours	0
NumberStart	0

Fig. 23

- **Vypnut (Turn off)** – Humidifier not used.
- **Zapnut (Turn on)** – Humidifier is active.
- **Porucha (Fault)** – Humidifier is faulty.

After the user password is typed in, following will be displayed besides the number of faults:

- **Žádáno (Set)(%)** – required humidity, on the basis of which the humidifier's performance is going to be controlled.

Following parameters are available only after the maintenance password is typed in:

- **PID-Regulace (PID-Control)** – contains the value determining the quality and speed of humidifier's performance control on the basis of set and actual value of air humidity. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 180s, KP = -2, TD = 0.**
- **VykonZapnutí (PerformanceOn)(10%)** – necessary minimum performance to turn on humidifier.
- **ZpožděníVyp (DelayOff) (10s)** – time for which the required performance of humidifier must be equal to 0%, so it could be turned off.
- **MaxVýkon (MaxPerformance) (100%)** – allows the limitation of maximum performance of humidifier.

## 6.4.13 CONTROL IN CASCADE

The cascade control item (Fig. 24) allows much better control of required temperature in case the required temperature is related to the temperature of premises or outlet temperature. Part of cascade control are other parameters, affecting the air conditioning unit operation. Cascade control is available only after the maintenance password is typed in.

CascadeControl	1
Status	0.0°C Off
Temperature	Room
PID-Control	GESP
S22.0°C	P15.0°C 0.8.0°C

Fig. 24

- **Stav (Status) (°C, TurnOff/Heat/Cool/Ventilate)** – required temperature of supplied air and actual condition of cascade control, calculated on the basis of required temperature, **KlimaNecitlivost (InsensitivityAirCond)**, **KlimaTeplota (TempAirCond)** values, inlet temperature, **MaxVypočtená (MaxCalculated)** value, **MinVypočtená (MinCalculated)** and **MezNecitlivost (LimitInsensitivity)** values.
- **Teplota (Temperature) (Inlet/Room/Outlet)** – selects the temperature, compared with the required temperature for selected mode. On the basis of difference of these temperatures, the cascade control calculates the necessary temperature of air supply to achieve the required temperature in an optimal way. Cascade control will apply only if the selected room temperature or air outlet temperature is selected. If the inlet temperature is selected, then there's a direct control and the cascade control won't apply.
- **PID-Regulace (PID-Control)** – contains value determining the quality and speed of cascade control on the basis of set and actual temperature. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 900s, KP = 10, TD = 0.**
- **MaxVypočtená (°C)** – actual maximum limit of required air supply temperature the cascade controller may calculate.
- **MinVypočtená (°C)** – actual minimum limit of required air supply temperature the cascade controller may calculate.
- **HorníMez (UpperLimit) (30°C)** – maximum static potential required temperature of air supply the cascade controller may calculate. This value shall be valid only in case of **HorníHystereze (UpperHysteresis)=0°C.**

- **DolníMez (BottomLimit)(16°C)** – minimum static potential required temperature of air supply the cascade controller may calculate. This value shall be valid only in case of **DolníHysteréze (BottomHysteresis)=0°C**.
- **HorníHysteréze (0°C)** – value that will determine the maximum possible required temperature of air supply as a sum of the **RežimPožaduje (ModeRequires)(Comfort, Attenuation, Moderate heating)** temperature and **HorníHysteréze**, so the maximum possible required temperature will be changing dynamically according to the required temperature.
- **DolníHysteréze (0°C)** – value that will determine the minimum possible required temperature of air supply as the temperature difference of the **RežimPožaduje (Comfort, Attenuation, Moderate heating)** and **DolníHysteréze**, so the minimum possible required temperature will be changing dynamically according to the required temperature.
- **MezNecitlivost (LimitInsensitivity)(2°C)** – if the air supply temperature exceeds the value of **MaxVypočtená+MezNecitlivost**, all heating unit components will be turned off immediately or cooling components turned on. If the temperature of air supply drops below the value **MaxVypočtená–MezNecitlivost**, all cooling components of unit will be turned off or heating components of the unit turned on.
- **MaxPřiváděná (MaxSupply) (50°C)** – limit value of air supply temperature. In case of its excess, heating aggregates will be turned off.
- **KlimaTopitChladit (AirCondCool)(Both/Heat/Cool)** – determines if the air conditioning unit will be allowed to perform heating and cooling at the same time or cooling or heating only.
- **KlimaTeplota (TempAirCond) (Ambient/Room/Inlet/Outlet)** – selects the thermal sensor, the so-called reference temperatures, according to which the controller must decide if the unit should be heating or cooling. It's possible to choose the thermal sensor outside, in the room or for the inlet or outlet air.
- **KlimaNecitlivost (InsensitivityAirCond)(2°C)** – serves for the determination of temperature limit under which the unit must be heating and under which it should be cooling. It's a band of insensitivity around required temperature, in which no change occurs from the **Heating** status into the **Cooling** status and vice versa.
  - Unit is heating if: **KlimaTeplota** (ref. temperature) < **ŽádanáTeplota – KlimaNecitlivost/2**.
  - Unit is cooling if: **KlimaTeplota** (ref. temperature) > **ŽádanáTeplota + KlimaNecitlivost /2**.

Switching from cooling to heating under the temperature of supplied air, staying within the limits of cascade control, will occur only in case all cooling components are turned off. Switching from heating to cooling under the temperature of supplied air, staying within the limits of cascade control, will occur only in case all heating components are turned off. These conditions do not have to apply in case of humidification.

- **ZpožděníT/Ch (Delay)(60s)** – time interval between the switching from heating to cooling or vice versa.
- **Období (Season) (Summer/Winter, 18°C, 60min)** – shows the condition controller has diagnosed on the basis of comparison of ambient temperature with a decisive temperature for pre-set period of time. Values of decisive temperature and time are specified on the next line. If the ambient temperature is lower for the specified period of time, the **Winter** season occurs and if it's higher for the specified period of time, then the **Summer** season occurs. For example the function of the condensing unit or water heating in case of air conditioning unit start is governed according to the seasons. If there is no sensor of ambient temperature configured, the **Winter** season is pre-set.
- **EnergetickýÚsporný (EnergySaving) (No/Heat/Cool)** – informing about the fact if heat recovery unit is used for the actual heating or cooling or the mixing damper, if installed.

## 6.4.14 FILTERS

This item contains information about the condition of all monitored filters. Filter's monitoring is performed by one or two manostats or one or two pressure gauges with an analog outlet of 0–10 V. In case the unit is equipped by few filters, each filter should be monitored separately. At each filter, there's the actual condition described, informing about the level of filter fouling (**OK/MinŠpina(MinDirt)/Špinavý(Dirty)/MaxŠpina(-MaxDirt)/Čidlo(Sensor)**) according to the settings or pressure (**Pa**). Pressure gauge settings on filters is prescribed in the technical note to each air conditioning unit. Signalisation of filters' settings is divided into three optional grades. In the event of first **Light**, filter fouling is only signalised, while in case of the second **Low**, the speed is reduced according to the

Filters	1
FilterofSupply	OK
Pressure	183Pa
FaultyClock	0% Off
–Light	0
–Low	0
–Much	0

Fig. 25

compensation coefficient and in case of third **Much**, the unit turns off. In case of bad condition of filter, it's recommended to replace the filter, otherwise the filter may be torn or pressure ratios may be changed.

Basic information about filters, available without typing password, can be found at Fig. 25.

If the user password is typed in, also the clock operated with faulty filters will be displayed as well as the number of unit starts with faulty filters.

Following parameters are available only after the maintenance password is typed in and related only to pressure sensors with analog outlet of 0–10 V, so-called manostat, and are identical for all filters:

■ **Nastavení Poruch (Fault Settings):**

These settings will apply only in case the fouled filters are monitored by a pressure sensor with an outlet contact, so-called manostat, signaling only two filter conditions (**OK/Fouled**).

- **Filtr Přívodu (Inlet Filter) (Light/Low/Much)** – determines the behaviour of unit under the condition of inlet filter **Špinavý (Fouled)**. It will add this condition to one of three limits corresponding to filter monitoring by manometer.
- **Filtr Odvodu (Outlet Filter) (Light/Low/Much)** – determines the behaviour of unit under the condition of outlet filter **Špinavý (Fouled)**. It will add this condition to one of three limits corresponding to filter monitoring by manometer.
- **Tukový Filtr (Grease Filter) (Light/Low/Much)** – determines the behaviour of unit under the condition of grease filter **Špinavý (Fouled)**. It will add this condition to one of three limits corresponding to filter monitoring by manometer.

This settings shall apply only to the pressure sensor with an analog outlet of 0–10V, the so-called manometer and corresponding to all filters.

- **Lehce (Light)(200Pa)** – setting the pressure limit under which alarm message on fouling is displayed.
  - **Málo (Low)(250Pa)** – setting the pressure limit under which alarm message on fouling is displayed and the fan speed reduced according to the coefficient of speed compensation **Kompensace Málo (Compensation Low)**.
  - **Hodně (Much)(300Pa)** – setting the pressure limit under which alarm message on fouling is displayed and the air conditioning unit is turned off.
  - **Rozsah (Range)(500Pa)** – determines the pre-set range on the manometer. If the range on manometer is not the same as this value, the filter protection won't work properly.
- **Kompensace Málo (Compensation Low)(1.00)** – determines the coefficient for fan speed compensation if a medium pressure limit Low is achieved on filter. For example, in case of the coefficient value of 0.85, the speed will be decreased to 85% from the value of speed for selected Comfort or Attenuation mode.

## 6.4.15 AIR QUALITY

Air quality is a parameter that may affect the fan performance and the position of a mixing (circulation) damper. Air quality may be monitored by sensors with digital outlet or sensors with analog outlets of 0–10 V. This section is related to the air quality control by changing the quantity of fresh air supply.

Basic information, available without the password, are displayed at the Fig. 26.

- **Stav (Status) (Good/Bad, ppm)** – actual air quality condition with regard to the required value and the actual measured value if measured by sensor or sensors with an analog outlet.
- **Stav (Dobrá/Špatná)** – actual air quality condition with regard to the required value set directly at the air quality sensor if measured by sensor or sensors with an analog outlet

Following parameters are accessible only after the user password is typed in:

- **Špatné hodiny (Faulty clock)** – informing about the operation time per which the air quality was assessed as a bad one.
- **Počet aktivací (Number of activations)** – serving as an information value about the number of assessments, not complying with the air quality.
- **2Čidlo, 3Čidlo, 4Čidlo (2/3/4Sensor) (ppm)** – Air quality, measured by other sensors according to the number of configured sensors.

AirQuality	1
Status	Good Oppm

Fig. 26



Following parameters are available only after the maintenance password is typed in:

- **Korekce (Correction) (0s, 0°C)** – consisting of two parameters. First one serves for the clearing of interfered signal from the sensor by putting down the filtration in seconds. Second may be used by the user for changing the value specified by sensor and perform modification of deviation formed e.g. by cable length.
- **Zapnout (TurnOn)(1000ppm)** – limit value of air quality if measures by sensor or sensors with analog outlet. If exceeded, wrong condition is signalized and fan speed along with mixing dampers will be reset to a required value for a wrong condition of air quality according to the **Control** Control manner option. Standard values of fan speed (**Comfort, Attenuation**) and the opening of dampers should be lower than this value.
- **Žádáno (Required) (800ppm)** – limit value of air quality, if measured by sensor or sensors with analog outlet. Under this value, signalisation of bad air quality is stopped. Fan speed and mixing returns to the original values.
- **VentilátorPřívodu (Inlet fan)(No/Yes, 100%)** – selection of permission for inlet fan speed control according to the air quality and fan speed in case the air quality condition is bad. Standard value of fan speed for respective modes (**Comfort, Attenuation**) should be lower than these values.
- **VentilátorOdvodu (OutletFan)(100%)** – selection of permission for outlet fan speed control according to the air quality and fan speed in case the air quality condition is bad. Standard value of fan speed for respective modes (**Comfort, Attenuation**) should be lower than these values.
- **ČerstvýVzduch (FreshAir)(No/Yes, 100%)** – selection of permission of mixing according to the air quality and the level of mixing in case of bad air quality condition. Standard values of mixing for respective modes (**Comfort, Attenuation**) should be lower than this value.
- **Řízení (Control)(Fixed/Sensor)** – in case of **Fixed** selection, fixed fan speed is set under bad air quality for respective fans and mixing is set to the value specified at the mixing damper. In case of **Sensor** selection, fans and dampers will be governed directly by a signal supplied from an air quality sensor under bad air quality.
- **Platnost (Validity)(Mode/Always/Moderate heating)** – the **Mode** option will secure that the system will react on bad air quality only in case the unit is in the **Comfort** or **Attenuation** mode. The **Always** option will secure that the system will react on bad air quality even in case the unit is in the **Moderate heating** mode. In case of the **Moderate heating** option, the system will react to the wrong air quality only in the **Moderate heating** mode.
- **PID-Regulace (PID-Control)** – contains the value determining the quality and speed of control on the basis of set and actual air quality in case of air quality measurement by a sensor or sensors with an analog outlet. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 240s, KP = -2, TD = 0**.
- **Rozsah (Range)(2000ppm)** – here, the range value is entered, set on a respective used air quality sensor. Standardly, it's 2000ppm. Under this air quality, there will be a 10V voltage on the analog outlet. If this value is entered incorrectly, the air quality control will be incorrect.
- **VíceČidel (MoreSensors) (Average/Max/Min/1/2/3/4)** – in case of more sensors, it's determined in which way the end value of air quality is added. In case of 1, 2, 3, 4 option, the value is given only by a selected sensor while the other sensors are only informative. In case of other options, the final value is calculated as a mathematical average, maximum or minimum.

## 6.4.16 HUMIDITY

Passive dehumidification of ventilated premises is performed by an increase in the quantity of supplied ambient air thanks to the fan performance change, position change of the mixing damper or by both methods at the same time. Air humidity can be monitored by sensors with a digital output or sensors with analog outputs of 0–10 V. Basic information in case of passive dehumidification, without the need to enter password, can be seen at Fig. 27.

Humidity	
Humidity	Good 67%

Fig. 27

- **Vlhkost (Humidity) (Good/High, %)** – actual condition of humidity with regard to the required value and the actual measured value if measured by sensor or sensors with an analog output.
- **Vlhkost (Good/High)** – actual condition of humidity with regard to the required value, set directly at the humidity sensor if measures by sensor or sensors with a digital output.

Following parameters are available only after the user password is entered.

- **ŠpatnéHodiny (FaultyClock)** – informing about the operation time during which the air humidity was evaluated as high.

- **PočetAktivací (NumberActivations)** – serves as an information value about the number of evaluations of a high air humidity.
- **2Čidlo, 3Čidlo, 4Čidlo (%)** – humidity measures by other sensors according to the number of configured sensors.

Following parameters are available only after the maintenance password is typed in:

- **Korekce (Correction) (0s, 0°C)** – consisting of two parameters. First one serves for the clearing of interfered signal from the sensor by entering the filtration in seconds. The second one may be used by the user for the change of value set by the sensor and to perform deviation modification, caused e.g. by cable length.
- **Zapnout (TurnOn) (55%)** – in case of passive dehumidification, this is a limit value of high humidity if measured by sensor or sensors with an analog output. In case it's exceeded, high humidity is signalled and fan speed along with mixing dampers is set to a required value for high air humidity according to the option of **Control** control method. Standard values of fan speed (**Comfort, Attenuation**) and for the opening of dampers should be lower than these values.
- **Žádáno (Set) (50%)** – limit value of air humidity if measured by sensor or sensors with an analog output. Under this value, signalisation of high air humidity is ended. Fan speed and mixing returns to the original values.
- **VentilátorPřívodu (InletFan) (No/Yes, %)** – option for fan speed control permission according to the air humidity and supply fan speed in case of high air humidity. Standard value of fan speed for respective modes (**Comfort, Attenuation**) should be lower than these values.
- **VentilátorOdvodu (OutletFan) (%)** – option for fan speed control permission according to the air humidity and supply fan speed in case of high air humidity. Standard value of fan speed for respective modes (**Comfort, Attenuation**) should be lower than these values.
- **ČerstvýVzduch (FreshAir) (No/Yes, %)** – selection of control permission for mixing control according to the air humidity and the level of mixing in case of high air humidity. Standard humidity values for respective modes (**Comfort, Attenuation**) should be lower than this value.
- **Řízení (Control)(Fixed/Sensor)** – if **Fixed** is selected under high air humidity, fan speed will be set for fixed speed specified for respective fans and mixing is set for the value specified for mixing dampers. If **Sensor** is selected under high air humidity, fans and dampers are controlled on the basis of signal transmitted from the humidity sensors so the required humidity is achieved if possible.
- **Platnost (Valid)(Mode/Always)** – the **Mode** option will secure that the system will react on a high air humidity only in case the unit is in operation. The **Always** option will secure that the system will react on a high air humidity also in case the unit is not operating.
- **PID-Regulace (PID-Control)** – contains the value determining the quality and speed of control on the basis of set and actual air humidity in case of humidity measurement by sensor or sensors with analog output. Standardly, the values are set in the factory and their change may be performed only by person with the knowledge of control systems. Standard values, set in the factory, are: **TI = 240s, KP = -2, TD = 0**.
- **VíceČidel (MoreSensors) (Average/Max/Min/1/2/3/4)** – in case of more sensors, it's determined how the end value of air humidity is calculated or added. In case of 1, 2, 3, 4 option, the value is given by a selected sensor while the other sensors are only informative. In case of other options, value is calculated as a mathematical mean, maximum or minimum.

## 6.4.17 VENTILATION

Ventilation serves for a free ventilation of premises and temperature decrease therein with the use of ambient air cold. Used mainly during the night hours. It may be started only in case a **Moderate heating** mode is selected. The necessary condition is a sufficiently low temperature of ambient air and an active time program for ventilation. Basic information without the need to enter password can be found at Fig. 29.

If the user password is entered, following items are available thereafter:

**Ručně (Manual) (Off/On)** – allows to turn on manual ventilation under necessary conditons.

**Žádáno (Set)(18°C)** – required temperature within premises. If the temperature in premises is higher, ventilation is needed.

■ **Posunutí (Shift)(5°C)** – ambient temperature must be lower than the room temperature at least by this value so ventilation is permitted.

Ventilation		1
Status		Turned on
OperationTime		11
NumberStart		28

Fig. 29

- **MinVenkovní (MinAmbient)(10°C)** – minimum ambient temperature, under which ventilation is not allowed as overcooling could occur. Under this temperature, immediate turning off of ventilation could be executed, independently on **MinZap**.
- **MinZapnuto (MinTurnOn)(30min)** – minimum period for which ventilation is turned on.
- **Ovládáno (Controlled)(No/Manual/Contact/TimePr)** – informing about the way of starting the actual ventilation.
- **TypPřepínače (SwitchType) (Normal/Direct)** – **Normal** option allows only to turn on ventilation under the meeting of necessary conditions, while the **Direct** option turns on ventilation without meeting of necessary conditions.
- **Blokováno (Trip)(Mode/TVenkMin/TVenkMax/TPřivMin/Fault/No)** – informing about the reason, halting the start of ventilation.
  - **Režim (Mode)** – means that the unit is not in the **Moderate heating** mode.
  - **TVenkMin** – means that the ambient temperature is lower than MinAmbient.
  - **TVenkMax** – means that the ambient temperature is higher than the room temperature, minus **Hystereze (Hysteresis)**.
  - **TPřivMin** – means that the inlet temperature is lower than 7 °C.
  - **Porucha (Fault)** – means that a fault of some of the thermal sensors occurred.
  - **No** – means that the ventilation is not tripped.
- **ČasovýProgram (TimeProgram)** – time program for a free ventilation for respective days of the entire week. Each days contains six daily time points for the ventilation condition option. Entering the daily time point consists of the starting time in **hh:mm:ss** and the mode (**TurnOff/TurnOn**).

## 6.4.18 FIRE/SMOKE

The Fire/Smoke item (Fig. 30) allows to deactivate the air conditioning unit in case of fire signalisation from the fire control room or signalisation from a smoke or fire sensor. An engaged contact is expected at the inlet of controller from a fire control room or from smoke or fire sensors. A disengaged contact is signalized as **Fire** or **Smoke**. This item is not available for users, only after the maintenance password is entered.

- **PožárníSignalizace (FireSignalisation) (OK/Fire)** – information about the condition of a fire control room or fire alarm placed in the pipeline or within premises.
- **Kouř, 2Kouř (Smoke, 2smoke)(OK/Smoke)** – information about the condition of even two smoke sensors placed in the pipeline or within premises.
- **PočetAktivací (Number of activations)** – serves as an information value about the number of evaluations of fire or smoke.

1   Fire/Smoke	1
FireSignalisation	OK
NumberActivations	0
Smoke	OK
NumberActivations	0
2Smoke	OK
NumberActivations	0

Fig. 30

## 6.4.19 FIRE DAMPERS

Fire dampers are equipped by two end switches, signaling end positions of dampers in engaged position and may be controlled by servodrives or manually. On the basis of the condition of these control contacts, it monitors the condition of fire dampers and decides on the air conditioning unit operation. Monitoring of dampers may be performed by the use of an electronic relay THC24-B. In a standard configuration, even 8 fire dampers could be monitored. Basic information, available after the maintenance password is entered, is displayed at Fig. 31:

The way of monitoring and the fire damper type are set in the configuration (**Motor/1 contact/THC 1/2contacts**). If the contact at any fire damper disengages, signaling open damper under the operation of unit, then the unit turns off and signalizes a fire damper fault.

1   Fire/Smoke	1
1Damper	Closed
2Damper	Closed
3Damper	Closed
4Damper	Closed

Fig. 31



- **n-Klapka (n-Damper)(InterPosition/Closed/Open/Fault)** – information about the fire damper position. Each end position is displayed separately. Works for all fire dampers.

## 6.4.20 BOILER ROOM

The **Boiler Room** item contributes to a higher quality function of the water heating and may eliminate boiler room system insufficiencies. Allows to heat the heating water from boiler room in advance to the required value before the air conditioning unit fans are started. There are number of options to turn of the boiler room and may be combined mutually for the specific conditions of each installation. Here, there are only the basic options mentioned and the other ones may be added to the software on the basis of requirements for the installation of an air conditioning. Basic information without the need to enter password can be found at Fig. 32:

BoilerRoom	1
Status	Off
OperationTime	0
NumberStart	0

Fig. 32

- **Stav (Status)(Off/On)** – actual status of request to start the boiler room.

Following parameters are available only after the password is typed in:

- **Vodní Ohřev (WaterHeat)(No/Winter/Always)** – boiler room turned on by turning on the water heating:
  - **Ne (No)** – request to turn on the boiler room does not activate.
  - **Zima (Winter)** – request for boiler room start during winter season is activated (**Kaskádní Regulace → Období**) in case of request for water heating start.
  - **Vždy (Always)** – activates the request for boiler room under the occurrence of request to start water heating.
- **Nízká Teplota Vody (LowWaterTemp) (No/Yes)** – in case of **Yes** option, request for boiler room start during low temperature of drained heating water is activated. Value of signalisation of low temperature of drained water is set in the **Water heating** Item.
- **Nízká Venkovní (LowAmbient)(5°C, No/Winter/Heating/Always)** – turning on the boiler room on the basis of ambient air temperature:
  - **Ne (No)** – request to turn on the boiler room is not activated.
  - **Zima (Winter)** – request to the boiler room for winter season is activated (**Kaskádní Regulace → Období**) if the ambient temperature drops below 5 °C.
  - **Topit (Heat)** – request to the boiler room is activated if the request for water heating start is present and the ambient temperature is lower than 5 °C at the same time.
  - **Vždy (Always)** – activates the boiler room request if the ambient temperature is lower than 5 °C.
- **Rozdíl (Difference) (50°C, No/Winter/Heating/Always)** – turning on the boiler room on the basis of difference between the set and ambient temperature:
  - **Ne** – request to turn on the boiler room is not activated.
  - **Zima** – request to the boiler room for winter season is activated (**Kaskádní Regulace → Období**) if the difference between an ambient and set temperature is higher than 50 °C.
  - **Topit** – request to the boiler room is activated if the request for water heating start is present and the difference between the ambient and set temperature is higher than 50 °C.
  - **Vždy** – activates the boiler room request if the difference between ambient and set temperature is higher than 50°C.
- **Kondenzační jednotka (Condensing unit) (70%, No/Winter/Always)** – Important inf cases if under maximum performance of the condensing unit, the water heating start follows. The possibilities to turn on boiler room on the basis of condensing unit performance are the following:
  - **Ne** – request to turn on the boiler room is not activated.
  - **Zima** – request to the boiler room for winter season is activated (**Kaskádní Regulace → Období**) and the performance of condensing unit exceeded 70 %.
  - **Vždy** – activates the boiler room request if the condensing unit performance exceeded 70 %.

- **Zpoždění (Delay) (3min, No/Winter/Always)** – delay of the request to turn on the fan (unit start) after the request to turn on the boiler room was activated, having three options:
  - **Ne** – delay of the request to turn on the fans in case of unit start won't occur.
  - **Zima** – delay of the request to turn on the fans in case of unit start is activated in winter season (**KaskádníRegulace** → **Období**) along with the request to turn on the water heating.
  - **Vždy** – delay of the request to turn on the fans in case of unit start is activated in case of request to turn on water heating.

## 6.4.21 SWITCHBOARD AIR CONDITION

The item Switchboard Air Condition (Fig. 33) allows moderate heating and ventilate the switchboard with controller on the basis of ambient or internal temperature of controller, thus eliminating the effects of surrounding environment on the components placed in the switchboard. This item is available only after the maintenance password is entered.

- **Topit, Větrat (Heat, Ventilate) (TurnOn/Off)** – actual condition of the request to turn on moderate heating or switchboard's ventilation.

1   SwitchboardAirCond		1
Temp	External 35°C	
Heating Off	Closed	
OperationTime 0	Closed	
NumberStart 0	Closed	

Fig. 33

Following parameters are available only after the password is entered:

- **NízkáTeplota (LowTemp)(4°C)** – temperature when the moderate heating of switchboard turns on. Moderate heating turns of 5 minut after the end of request.
- **VysokáTeplota (HighTemp)(40°C)** – temperature, if exceeded, ventilation of switchboard turns on. Ventilation turns off 5 minutes after the end of request.
- **Teplota (Temperature)(Climatix/Ambient/External)** – determines the temperature according to which the selection will be done for moderate heating or ventilation of switchboard:
  - **Climatix** – moderate heating of switchboard on the basis of internal temperature of controller.
  - **Venkovní** – moderate heating of switchboard on the basis of external temperature.
  - **Externí** – moderate heating of switchboard on the basis of a separate thermal sensor or sensors placed in the switchboard.
- **Zpoždění (Delay) (1min)** – delay of the end of request to turn on moderate heating or switchboard ventilation.

## 6.5 TIMINGPROGRAM OPTION

In this item, a menu with timing programs is displayed for respective days for the entire week (Fig. 34). Each day contains six daily time points to select the air conditioning unit status. Setting of the daily time point consists of the starting time setting in **hh:mm:ss** and of the mode (**TurnOff/Moderate heating/Attenuation/Comfort**).

If the air conditioning unit is going to be governed by a timing program will be decided on the home screen, in the **VolbaRežimu (ModeSelection)** item.

3   TimingProgram		1
Monday	Pas	
06:00:00	Comfort ▶	
08:00:00	Attenuation ▶	
14:00:00	Comfort ▶	
16:00:00	Attenuation ▶	
22:00:00	Moderate heating ▶	
24:60:60	▶	
Tuesday	Comfort Act	
06:00:00	Comfort ▶	
08:00:00	Attenuation ▶	
14:00:0	Comfort ▶	

Fig. 34

## 6.6 INFOAPPLICATION OPTION

In the **InfoApplication** menu, there is the basic contact information displayed in the first four lines (equipment type, company website, maintenance email, phone number to maintenance). At the fifth line, software version is displayed in the controller.

InfoApplication	1
KJVS103623.10	Pas
7.1.2018 15:30	
KJ Mandík	
www.mandik.cz	
+420311706877	

Fig. 35

## 6.7 CONFIGURATION OPTION

The configuration item (Fig. 36) defines components of the air conditioning unit that should control the regulation. Basic configuration is performed in factory or in case of additional changes to components and should be performed by an authorized employee. Thus, the functionality of machine is set with its control method subsequently. In case of unprofessional setting, danger of damage to the machine or breach of occupational health regulations are present. Configuration is available after the maintenance password is entered. The **No** option sets if certain item is not already installed in the unit or if its function should not be monitored. The **Yes** option determines that respective item is installed in the unit only once. The number instead of **Yes** provides you with the number of components that may be installed. Non-standard options of items are described separately.

- **ProstorováTeplota (RoomTemp) (No/1/2/3/4/1K/2K/3K/4K)** – for the room temperature measurement, even 4 space thermal sensors or 4 such sensors with correction of set temperature may be used (1K/2K/3K/4K).
- **PřiváděnáTeplota (InletTemp)(No/Inlet/Preheat/Both)** – for the inlet air temperature measurement, it's possible to select a thermal sensor according to the measurement purpose:
  - **Přívod (Supply)** – sensor is designed for supply air temperature measurement into the room.
  - **Předehřev (Preheat)** – sensor is designed for temperature measurement after potential preheating.
  - **Obě (Both)** – both thermal sensors for air supply.
- **TopnáVodaTeplota (HeatWaterTemp)(No/Drained/Inlet/Both)** – for water heating temperature measurement, it's possible to select a thermal sensor according to the measurement purpose:
  - **Odváděná (Drained)** – sensor is designed to measure the water temperature on the outlet pipe, so-called return pipe.
  - **Přiváděná (Supplied)** – sensor is designed to measure the water temperature on the inlet pipe.
  - **Obě (Both)** – both water heating temperature sensors are used.
- **ChladicíVodaTeplota (CoolingWaterTemperature) (No/Drained/Inlet/Both)** – for the water cooling temperature measurement, it's possible to select a thermal sensor according to the purpose of measurement:
  - **Odváděná** – sensor is designed to measure the water temperature at the outlet pipe, so-called return pipe.
  - **Přiváděná** – sensor is designed to measure the water temperature at the inlet pipe.
  - **Obě** – both water heating temperature sensors are used.
- **OdváděnáTeplota (No/ Drained/Waste/Both)** – for the temperature measurement of extracted air, it's necessary to select thermal sensors according to the measurement purpose:
  - **Odváděná** – sensor is designed to measure the air temperature, carried out of the premises.
  - **Odpadní** – sensor is designed to measure the air temperature, carried out to the ambient environment.
  - **Obě** – both temperature sensors for air extraction are used.

1   Konfigurace	1
GasHeating	Mod
WaterHeat	Yes
Cooler	1xC/H
MixingDamper	Yes
TemperaturePremises	1
InletTemperature	1
TempFlueGas	1
AmbientTemp	Yes
InletFan	FM
InletFilter	D
OutletFa	FM
OutletFilter	D

Fig. 36

- **Vlhkost (Humidity) (No/Dehumidification/Humidification/Both),(/D/1xA/2xA/3xA/4xA)** – first parameter defines the use of humidity sensors:
  - **Ne** – no humidity sensors are used, setting of the second parameter is unimportant.
  - **Odvlhčení (Dehumidification)** – humidity sensors are used to control dehumidification by the use of any from the cooling components or by the use of fans and mixing dampers.
  - **Vlhčení (Humidification)** – humidity sensors are used to control humidification by the use of humidifier.
  - **Obě** – both options of use of humidity sensors are possible.

As a second parameter, the type and quantity of humidity sensors is selected. 1 sensor may be selected with a digital output contact (**DI**) or even 4 sensors with an analog output of 0–10V (**AI/2xAI/3xAI/4xAI**).
- **Kvalita vzduchu (AirQuality) (No/DI/AI/2xAI/3xAI/4xAI)** – for the air quality measurement, 1 sensor may be selected with a digital output contact (**DI**) or even 4 sensors with an analog output of 0–10V (**AI/2xAI/3xAI/4xAI**).
- **KlapkaPřívodu, KlapkaOdvodu (InletDamper, OutletDamper) (No/Unit/Mixing/Contact)** – damper control options:
  - **Jednotka (Unit)** – damper opens on the basis of signal to start the unit.
  - **Směšovat (Mixing)** – damper will be controlled inversely to the mixing damper.
  - **Kontakt (Contact)** – damper will be controlled by external contact.
- **Zpětná poloha klapky (BackPositionDamper)(No/AI/2AI/DI/2DI)** – selecting the monitoring manner of actual position of dampers:
  - **AI** – analog signal on actual damper position. In case of divided damper, the analog signal of first damper connects as a control signal for the second damper and as a signal on the damper position, the analog signal from the second damper is used.
  - **DI** – contact identifying actual damper position. In case of divided damper, the digital contacts of damper position are interconnected in series and connect to a digital input.
- **Filtry (Filters) (Ne/DI/2xDI/AI/2F–DI/2xAI)** – to monitor filters' fouling, it's possible to use the manostat with a digital output through contact or pressure sensor with an analog output of 0–10V in a following way:
  - **DI** – pressure sensors with an output contact, so-called manostat, is used for the monitoring of condition of one filter while the signalized level of fouling is set in **KomponentyZařízení → Filtry (ComponentsEquipment - Filters)**.
  - **2xDI** – two manostats are used for the monitoring of two levels of fouling of one filter, while the signalized fouling level of each of them is set in **KomponentyZařízení → Filtry**.
  - **AI** – for the monitoring of condition of one filter, the pressure sensor with an analog output is used, the so-called. manometer, the signalized fouling level is set in **KomponentyZařízení → Filtry**.
  - **2F–DI** – two manostats for condition monitoring of two filters are used, while the signalized fouling level of each of them is set in **KomponentyZařízení → Filtry**.
  - **2xAI** – for the condition monitoring of two filters, pressure sensors with an analog output are used, so-called manometers, while the signalized levels of fouling are set in **KomponentyZařízení → Filtry**.
- **VentilátorPřívodu (InletFan) (No/Yes/FM–MB/EC–MB)** – inlet fan motor may be controlled by a frequency converter (**FM**) or the EC motor (**EC**) may be used with following possibilities:
  - **Ano (Yes)** – to control the inlet fan, digital and analog inputs and outputs are used.
  - **FM–MB** – frequency converter of an inlet fan is controlled by a ModBus communication.
  - **EC–MB** – EC motor of inlet fan is controlled by a ModBus communication.
- **MnožstvíVzduchu (AirVolume) (Controller/QBM/CPG/POL822/%POL822)** – source of a control signal for fans may be:
  - **Regulátor (Controller)** – to control the fan speed, fixed value of revolutions in % is used for the actual mode, set at the controller's display.
  - **QBM** – to control the air pressure, supplied by fan, the output signal of the QBM pressure gauge from Siemens is used.

- **CPG** – to control the air volume supplied by fan, the output signal of the CPG air flow meter from Ziehl-Abbeg is used.
  - **POL822** – to control the fan speed, fixed value of revolutions is set from the space device within the revolutions range for **Attenuation** and **Comfort**.
  - **%POL822** – to control the fan speed, fixed value of revolutions, set from the space device within the minimum and maximum revolutions, is set in %.
- **VentilátorOdvodu (OutletFan)(No/Yes/Spol)** – outlet fan motor may be controlled in two ways:
    - **Ano (Yes)** – separately in the same way as the inlet fan.
    - **Spol (Together)** – together with inlet fan by corresponding control signals.
- **ServisníVypínač (MaintSwitch) (No/All/Inlet/Outlet)** – installation of maintenance switch may be:
    - **Vše(All)** – maintenance switches are installed at the inlet and outlet fan.
    - **Přívod (Inlet)** – maintenance switch is installed only at the inlet fan.
    - **Odvod (Outlet)** – maintenance switch is installed only at the outlet fan.
- **PovoleníChodu (PermissionOperation) (Both/Heat/Cool)** – permission for the fans to operate according to the modes is an option for specific configurations of air conditioning units:
    - **Obojí (Both)** – fans are always turned on if the Heating or Cooling mode is active.
    - **Topit (Heat)** – fans are always turned on if the Heating mode is active.
    - **Chladit (Cool)** – fans are always turned on if the Cooling mode is active.
- **Rekuperátor (HeatRecUnit) (No/Board/Rotary/BoardZV/RotaryZV/RotaryMB)** – specifies the type of applied heat recovery unit and its properties:
    - **Deskový** – board heat recovery unit with a bypass damper, not monitoring its position.
    - **Rotační** – rotary heat recovery unit with a frequency converter, controlled by digital and analog outputs of controller.
    - **DeskovýZV** – board heat recovery unit with one bypass damper, monitoring its position.
    - **RotačníZV** – rotary heat recovery unit with a frequency converter, controlled by digital and analog outputs of controller with a sensor for heat recovery unit speed control.
    - **RotačníMB** – rotary heat recovery unit with a frequency converter controlled at bus bar (ModBus).
- **ElektrickýOhřev (ElectricHeating) (No/1S/2S–1M/2S–2M/3S–1M/3S–3M/4S–1M/4S–4M)** – it's possible to choose even 4 sections with the following control:
    - **1S** – electric heating contains only one section and the control may be modulated or On/Off.
    - **2S–1M** – electric heating contains two sections. One is controlled in a modulated way and the second one by On/Off.
    - **2S–2M** – electric heating consists of two sections. Both are controlled in modulated way.
    - **4S–1M** – electric heating consists of four sections. This one is controlled in a modulated way while the residual three are controlled by On/Off.
    - **4S–4M** – electric heating consists of four sections. All of them are controlled in modulated way.
- **PlynovýOhřev (GasHeat) (Mod/1st/2st)** – sets the control method for gas heating:
    - **Mod** – gas burner installed is modulating.
    - **1st** – instalovaný plynový hořák je jednostupňový.
    - **2st** – instalovaný plynový hořák je dvoustupňový.
- **KlapkaVýměníku (DamperExchanger) (No/Yes/ZV)** – configuration of gas exchanger damper:
    - **Ano** – gas exchanger contains a damper without reverse monitoring of position.
    - **ZV** – gas exchanger contains exchanger damper with reverse monitoring of position.

- **KondenzačníJednotka (CondensingUnit) (Modulant/FDP3/...), (Ne/1xC–H/2xC–H/1xC/2xC)** – first configuration option is the control type, where control types of respective condensing units' manufacturers are offered directly. Furthermore, it's possible to select 2 condensing units with the cooling or heating functions (**1xC–H/2xC–H**) or 2 condensing units with only the cooling function (**1xC/2xC**).
- **TeplnéČerpadlo (HeatPump) (No/1/2/1–MB/2–MB)** – specifies the type of used heat pump and its control method:
  - **1** – heat pump with one circuit.
  - **2** – heat pump with two circuits.
  - **1–MB** – heat pump with one circuit, equipped by a compressor frequency converter and a module of hydraulic valve, controlled via bus bar (ModBus).
  - **2–MB** – heat pump with two circuits, equipped by a compressor frequency converters and modules of hydraulic valve, controlled via bus bar (ModBus).
- **PožárníSignalizace (FireAlarm) (No/EPS/Smoke/EPS+Smoke) – je možné konfigurovat:**
  - **EPS** – only fire sensor or fire alarm.
  - **Kouř (Smoke)** – two smoke sensors.
  - **EPS+Kouř** – two smoke sensors and a fire sensor or fire alarm are installed.
- **PožárníKlapky (FireDamper) (Motor/Man2C/THC/Man1C), (Ne/1/2/3/4/5/6/7/8)** – according to the control method of even eight fire dampers following is selected:
  - **Motor** – fire damper with a drive and an end switch for end open position.
  - **Man2C** – fire damper without drive with two end switches for end positions.
  - **THC** – fire damper connected through a control relay THC24–B.
  - **Man1C** – fire damper without drive with an end switch for end open position.
- **PřepínačeRežimů (ModeSwitches)(No/Modes/2xMísto/3xOtáčky/Pobyť/BMS\_KvitPor)** – selection of automatic operation type. Options for external switches are following:
  - **Ne (No)** – unit control not selected by external switches. In case of operating mode at the home screen, the **ČasovýProgram** is offered.
  - **Režimy (Modes)** – in **PřiřazeníVst/Výst→PřepínačeRežimů (AssignedIn/Out – ModeSwitches)**, there are two digital inputs for mode control displayed. First has a function of **Off/On** for the air conditioning unit, while the second one serves for switching of **Attenuation/Comfort** modes in case of first closed contact. The **Switch** operating mode at the home screen may not be changed to any other if the first switch is closed. Other inputs **BMS** and **KvitPor** have their function described in the **BMS\_KvitPor** option.
  - **2xMísto (2xPlace)** – in **PřiřazeníVst/Výst→PřepínačeRežimů**, there are two digital inputs for the unit start from two different places. The **Switch** operating mode at the home screen may not be changed to any other one if any of the switches is closed. Other inputs **BMS** and **KvitPor** have their function described in the **BMS\_KvitPor** option.
  - **3xOtáčky (3xRevs)** – in **PřiřazeníVst/Výst→PřepínačeRežimů** there are three digital inputs displayed for switching the fan speed whose respective values may be set in the **KomponentyZařízení→Ventilátor→Otáčky**. The unit turns on by switching any of them. The **Switch** operating mode at the home screen can't be changed to any other if any sensor is closed. Other **BMS** and **KvitPor** inputs have their function described in the **BMS\_KvitPor** option.
  - **Pobyť** – in **PřiřazeníVst/Výst→PřepínačeRežimů** there is a digital input for unit start displayed from the position mode button. Other **BMS** and **KvitPor** inputs have their function described in the **BMS\_KvitPor** option.
  - **BMS\_KvitPor** – v **PřiřazeníVst/Výst→PřepínačeRežimů** there is a digital input for unit operation permission from the superior **BMS** system and for the input for a distant fault receipt **KvitPor**.
- **ModBusPort (Ne/Local/Service/IP/Loc+Serv/Loc+IP/Serv+IP/Vše)** – specified the applied ports for communication by using the ModBus protocol, while it's possible to choose their combination as well:
  - **Local** – local port selected at controller, marked as **RS485**.
  - **Service** – service port selected at controller, marked as **T–HI**.
  - **IP** – ethernet port selected at controller, marked as **Ethernet**. This option may not be selected at the Climatix controllers of the POL4xx series.



- **PožadovánRestart (RestartRequired)(Select/Execute)** – **Select** is a navigating text for the **Execute** option, saving parameters into the user storage of controller. At the same time, it performs controller's restart, thus initializing performed changes.
- **ParametryNahrát (LoadParam) (Select/Load)** – **Select** is a navigating text for the **Load** option, loading parameters from a back-up user memory of controller. **At the same time, it performs controller's restart, thus initializing performed changes.**
- **TovárníNastavení (FactorySettings) (Select/Load)** – **Select** is a navigating text for the **Load** option, loading the original configuration, set in factory. **At the same time, it performs controller's restart, thus initializing performed changes.**

## 6.8 TESTING OPTION

Equipment testing item (Fig. 37) is accessible only if the maintenance password is entered. This function is designed for the maintenance technicians when commissioning the air conditioning unit or during maintenance checks. Testing function allows a separate control of any air conditioning unit component. Permission for testing is performed by setting the **PovolitTestování=Ano** and it is signaled as an auxiliary mode **Test** at the controller's display. It allows to turn the fan on and off, to set opening angle for dampers in percentage, to turn the burner on and off and control its performance in % etc. When testing the equipment, no protective functions must be operating and therefore, in case of unprofessional manipulation equipment could be damaged or the occupational health regulations breached. If the testing is ended, set **PovolitTestování=Ne!** Otherwise, standard control won't work!

1   TestingEquipment	1
AllowTesting	Yes
Dampers	65%
ExchangerDamper	100%
InletFan	54%

Fig. 37

## 6.9 INPUTS/OUTPUTS OPTION

Here, the actual values are displayed at real inputs and outputs of controller, including the status of their functional condition. In case of suspicion for non-functionality or fault, it's possible to check, if connected sensors work correctly and expected values are displayed. At the figure 38, there are all inputs and outputs displayed as information. Each line contains an input type with a sequence number, corresponding to a description of controller's connectors. Then, a value follows, information about the status and universal inputs of function or sensor type, forming part of company settings. Designation system for inputs and outputs is **xVy** and the meaning is following:

1   Inputs/Outputs	1
X1 109154 OK	I-NTC10k
X2 32767 noSensor	I-NTC10k
X3 8000 OK	0-V
X4 0 OK	I-DI
D1 Turned Off OK	
Y1 10000 OK	
Q1 Turned On OK	

Fig. 38

- **x** – sequence number of inputs and outputs of controller and may reach the following values:
  - Missing number – inputs and outputs of the POL638 controller.
  - 1 – inputs and outputs of the first extension of POL945.
  - 2 – inputs and outputs of the first extension of POL955
  - 3 – inputs and outputs of the first extension of POL985
  - 4 – inputs and outputs of the second extension of POL945
  - 5 – inputs and outputs of the second extension of POL955
  - 6 – inputs and outputs of the second extension of POL985.

Single extensions must be permitted in the configuration.

- **V** – determines the type of outputs according to the following syntax:
  - **X** – universal input with potentially assigned input function. It's possible to connect certain types of resistance,

voltage, amperage and digital sensors to this input. If necessary, the input may be configured as a voltage, amperage or digital output.

- **B** – NTC10K thermal input.
- **D** – isolated digital input.
- **Y** – analog output with the 0–10 V range.
- **Q** – really output of 230VAC, max. 3 A / 2 A (cos 0.6).

- **y** – is a sequence number for input or output at the controller or at the extension of controller.

## 6.10 INPUTS/OUTPUTS ASSIGNED OPTION

The item “Inputs/Outputs Assigned Option” (Fig. 39) is available only after the maintenance password is entered. Here, inputs and outputs of controllers are assigned to the sensors of temperature, fans, filters, electric heating etc., according to electrical drawings for real connections. Settings is performed in the factory and changes may be done only by person aware of the issue as in case of incorrect settings, damage of equipment may occur as well as any harm to the personnel.

Assignment of digital and analog inputs is performed for each component separately (Fig. 27) after the component is taken out, according to the following examples:

1   Inp/OutpAssign	1
Temperature	▶
Fan	▶
Filters	▶
ElectricHeating	▶
WaterHeating	▶
AssginDigitalOutputs	▶
AssginAnalogOutputs	▶

Fig. 39

- **Přiřazení vstupu teplotnímu čidlu (Assignment of input to thermal sensor)** – in the **Temperature** menu, one input is selected under the **AssignInputs** at pre-set temperature marked according to the syntax, described in the previous chapter **Inputs/Outputs** (e.g. for the first space thermal sensor **Prostorová (Space) = X1**). Except for these inputs, assignment to a space device is offered, having unique designation U1 and U2. Further possibility is the assignment of constant temperature by setting the input to **Set**. Required value for required temperature is set under the inscription **NastaveníHodnoty (ValueSetting) – Set**. Example of setting the space temperature to a fixed value of 25 °C is done in two steps:

1. **InputsAssignment: Prostorová (Space) = Set.**
2. **NastaveníHodnoty – Set: Prostorová = 25 °C.**

- **Přiřazení vstupu komponentě (Assignment of component input)** – after the selection of required components under the **PřiřazeníVstupů** for selected component komponenty one of the digital inputs, marked according to the syntax in the **Inputs/Outputs** (e.g. for the inlet fan **PřívodStav (SupplyCondition = D1)** chapter is selected. Another possibility is the assignment of constant value (**TurnedOff/On**) by the **Set** option. Required value at the inlet for required function is then set under the **NastaveníHodnoty (ValueSetting) – Set**. Example of setting the condition of supply fan to a fixed value **TurnedOn** is done in two steps:

1. **PřiřazeníVstupů (InputAssignment): PřívodStav (ConditionInlet)= Set.**
2. **NastaveníHodnoty–Set: PřívodStav = Zapnuto.**

- **Přiřazení digitálních výstupů (assignment of digital outputs)** – performed in the menu **PřiřazeníDigitVýstupů (AssignmentDigitOutputs)**, where in the line of required digital output, under the inscription **PřiřazeníVýstupů**, the required component is assigned that should be controlled by this output (e.g. **DO.Q1 = FanS** will be set for the inlet fan, started from the Q1 output). List of abbreviations of respective components, used at the assignment of outputs is specified in the table 2. Part of the assignment is the possibility of inversion for the output condition (**Normal/Invert**). Another possibility is the assignment of constant value (**TurnedOff/On**) by using the output setting to **Set**. Required value at this output is then set under the **NastaveníHodnoty – Set** inscription. Example of setting the permanent start of Q1 output is performed in two steps:

1. **Přiřazení Výstupů: DO.Q1 = Set.**
2. **Nastavení Hodnoty-Set: DO.Q1 = Zapnuto.**

- **Přiřazení analogových výstupů (Assignment of analog outputs)** – performed in the menu **Přiřazení Analog-Výstupů (Assign Analog Output)**, where in the line of required analog outputs, under the inscription **Přiřazení Výstupů** required component is assigned that should be controlled by this output (e.g. for the damper of board heat recovery unit from the Y1, **AO.Y1 = Recup** is set). List of abbreviations of respective components, used at the assignment of outputs is specified in the table 2. Another possibility is the assignment of constant analog value (0–10V) in % by using the **Set (1% = 0.1V)** option. Required value at this output is then set under the **Nastavení Hodnoty – Set** inscription. Example of setting the 8.5V at an analog output Y1 is performed in two steps:

1. **Přiřazení Výstupů: AO.Y1 = Set.**
2. **Nastavení Hodnoty-Set: AO.Y1 = 85%.**

Composition of the filters	
Inlet fan	FanS
Outlet fan	FanE
Mixing damper	DmpM
Inlet damper	DmpS
Outlet damper	DmpE
Heat Recovery Unit	Recup
Glycol loop	Glyc
Pump for glycol adding	AddGl
Water heating	WtrH
Preheat – water heating	PreH
Electric heating, 1. section	EIH
Electric heating 2. section	EIH2
Electric heating 3. section	EIH3
Electric heating 4. section	EIH4
Gas heating	Gas
Gas heating – add performance	GasM
Gas heating – reduce performance	GasL
Bypass damper of gas heating exchanger	DmpG
Convactor of gas heating	CnvG
Condensing unit – turn on	Cond
Condensing unit 1 – cooling	CondC
Condensing unit 1 – heating	CondH
Condensing unit 1 – performance	Cond1
Condensing unit 1 control type FDP3 – heating/cooling	Cond1CH
Condensing unit 2 – cooling	Cond2C
Condensing unit 2 – heating	Cond2H
Condensing unit 2 – performance	Cond2
Condensing unit 2 control type FDP3 – heating/cooling	Cond2CH
Condensing unit 3 – cooling	Cond3C
Condensing unit 3 – heating	Cond3H
Condensing unit 3 – performance	Cond3
Condensing unit 3 control type FDP3 – heating/cooling	Cond3CH
Condensing unit 4 – cooling	Cond4C
Condensing unit 4 – heating	Cond4H
Condensing unit 4 – performance	Cond4

Condensing unit 4 control type FDP3 – heating/cooling	Cond4CH
Condensing unit 5 – cooling	Cond5C
Condensing unit 5 – heating	Cond5H
Condensing unit 5 – performance	Cond5
Condensing unit 5 control type FDP3 – heating/cooling	Cond5CH
Condensing unit 6 – cooling	Cond6C
Condensing unit 6 – heating	Cond6H
Condensing unit 6 – performance	Cond6
Condensing unit 6 control type FDP3 – heating/cooling	Cond6CH
Thermal pump 1.loop – performance	HP1
Thermal pump 2.loop – performance	HP2
Thermal pump 1.loop – kompresor	HPC1
Thermal pump 2.loop – kompresor	HPC2
Thermal pump 1.loop – expansion valve	HPE1
Thermal pump 2.loop – expansion valve	HPE2
Thermal pump 1.loop – 4-way valve - cooling/heating	HPV1
Thermal pump 2.loop – 4-way valve - cooling/heating	HPV2
Humidifier	Hum
Fire damper	DmpF
Fire signalisation	Fire
Filter fouling signalisation	Filtr
Fault signalisation	Err
Signalisation of fans' operation	Fans
Boiler room	Boil
Comfort mode	Kom
Attenuation mode	Red
Distributor – heating	RackH
Distributor – cooling	RackC
Flow rate controller 1	AFL1
Flow rate controller 2	AFL2
External input 1	Ext1
External input 2	Ext2
Prepared for customer modification	xx1
Prepared for customer modification	xx2
Prepared for customer modification	xx3
Prepared for customer modification	xx4
Prepared for customer modification	xx5
Prepared for customer modification	xx6

Tab. 2 – List of abbreviations for outputs' assignment

## 6.11 SYSTEMPARAMETERS OPTION

The System Parameters item (Fig. 40) is available only after the maintenance password is entered. It's possible to set the time and date, change the HMI language, set the communication parameters, change the pre-set passwords etc. Furthermore, only such parameters will be described that may be useful for the user.

1   SystemParameters	1
7.06.2016	14:05:24
LanguageOption	▶
Communication	▶
Password	▶
Summer/winterTime	▶
SettingsSaveLoad	▶

Fig. 40

## 6.11.1 TIME SETTINGS

Actual date and time is displayed at the first line, under the home page line and on the screen **SystémovéParametry (SystemParameters)**. Change may be performed in any of these places only after the maintenance password is entered. If the line with time information is selected, that by pushing the OK button the data and time settings is entered. Entering is ended automatically after the seconds are typed in or it can be exited at any time by clicking on the ESC key. Right entering of date and time is important for the right function of air conditioning unit according to a time program.

## 6.11.2 LANGUAGEOPTION

In principle, language option is executed when commissioning the unit, serving for switching of displayed texts at HMI to the language required by the user. Standardly, English, German, Czech, Russian and French languages are supported, but it's possible to extend it also by another languages.

## 6.11.3 COMMUNICATION

In general, the controller may communicate with other superior or inferior devices by using the communication protocols. To connect them to superior BMS systems (Building Management System), the BACnet, LonWorks, ModBus and TCP/IP protocols may be used. For the purpose of integration of inferior components, the Process bus (KNX) and ModBus protocols may be used:

- **Process bus (KNX)** – this protocol allows flexible interconnection of control elements of the building with a controller. In case of the Climatix controller, these are in particular POL822 space devices or HMI-DM POL895 control units. Space device forms part of the **SystémovéParametry (SystemParameters)** → **Komunikace (Communication)** → **ProstorovýPřístroj (SpaceDevice)** menu. One air conditioning unit may be controlled from two space devices at the same time. Settings and control of a space device is described in a separate manual **Návod k ovládání KJ Mandík z prostorového přístroje POL822 (Control manual for KJ Mandík from the POL822 space device)**. Each space device has this communication settings:
  - **Komunikace (Communication)(OK/Fault)** – informing about the communication fault between the controller and space device.
  - **Adresa (Address)** – here, the communication parameters are entered, corresponding to the 005, 006 and 007 parameters in the space device for each space device separately.
  - **TlačítkoPobytu (StayButton) (60min)** – sets the time per which the **Comfort** operating mode is active after entering the **Stay** button at the **POL822** space device. After the expiration of this time or after repeated pushing of the **Stay** button, the unit returns to the previous operating mode.
  - **ResetPožadován (ResetRequired)** – change of the address is stored by the selection of **Perform** option in this item.
- **TCP/IP** – this way of communication uses internet and in this case, it could be used for the connection of controller into the computer network to a superior system or PC. Change to the standard setting of IP address and other properties is performed after entering the user password in the **SystémovéParametry** → **Komunikace** → **IP-Konfigurace** → **ZměnaNastavení** menu. To initiate this change, it must be saved by selecting the **Perform** option in the **ResetPožadován** item!! Connection of the controller to PC with the possibility of controller's control by using any internet browser is described in detail in the chapter **5.5 Ovládání HMI@Web (HMI@Web Control)**.
- **ModBus** – it's an open protocol for mutual communication of different devices allowing the data transfer through different networks and bus bars. It works on the **Master/Slave** principle, so on the principle of messages transfer between a server and client. For the communication with a superior control system, the **Slave** mode is used while for the communication with an inferior device, the **Master** mode is used. The Climatix controller offers the possibility of ModBus RTU and ModBus IP protocols that could be used at the same time. Permission for the protocols and the selection of ports is performed in the **Configuration** menu by the selection in the **ModBus** item:

- **Ne** – no ModBus protocol permitted.
- **Local** – ModBus RTU protocol is allowed at the RS485 port and the physical connection of serial transfer by using the RS485 is secured by a double-conductor line, connected to the controller's connection with the designation **RS485**. Standard communication parameters are set in the **SystémovéParemetry→Komunikace→ModBus** mode (Fig. 41). Performed changes must be saved by the selection of **Perform** option in the **ResetRequired** item!!

1   ModBus	1
ModBusRTU_Local	
Master/Slave	Slave
Speed	19200
2StopBits	No
Parity	None
Address	1
Finish	Active

Fig. 41

- **Service** – ModBus RTU protocol is allowed at the service port and the physical connection of serial transfer by using the RS485 is secured by a double-conductor line ended by the RJ45 terminal, connected to a service connector by a controller with the **T-HI** designation. Standard parameters are set in the menu **SystémovéParemetry→Komunikace→ModBus** (Fig. 42). The only specific parameter is the setting of service port function from the ModBus communication **ModBusRTU\_Serv=Aktiv**. Under these settings, it's not possible to connect any external control unit to the service port. Performed changes must be saved by selecting the **Perform** option in the **ResetRequired** item!!

1   ModBus	1
ModBusRTU_Serv	Aktiv
Master/Slave	Slave
Speed	19200
2StopBits	No
Parity	None
Address	1
Finish	Active

Fig. 42

- **LocalIP** – ModBus IP protocol is permitted at the ethernet port and the mechanical connection for transfer through TCP/IP by using the RS485 is performed by the UTP cable, ended by the RJ45 terminal, connected to the ethernet connector of controller with the designation **Ethernet**. In the menu **SystémovéParemetry→Komunikace→ModBus** (Fig. 43), only the role of controller at the bus bar and potential address are set. For the initialisation, it's necessary to save the changes by selecting the **Perform** option in the **ResetRequired** item!!
- **Vše (All)** – this option allows all integrated ModBus communication possibilities so the controller may be controlled from the connected touch screen (slave mode) and it may control frequency converters of fan motors at the same time (master mode).

1   ModBus	1
ModBus IP	
Master/Slave	Slave
Address	1
ResetRequired!!!	Option

Fig. 43

In the Climatix controller, the ModBus may be also executed by the additional communication POL902 module. Further information about the ModBus communication are placed in a separate manual **KJM Climatix ModBus** and in the system documentation to the Climatix controller from Siemens.

- **LonWorks** – this protocol is an industrial communication bus bar, reminding of internet from certain point of view. For the Climatix controller, this communication is executed by the use of an additional communication module POL906. Further information about the communication is found in a separate **KJM Climatix LonWorks** manual and in a system documentation for the Climatix controller from Siemens.
- **BACnet** – this protocol is a standard communication protocol for buildings' control. In the Climatix controller, it's executed by the use of additional communication modules POL908 (BACnetIP) or POL904 (BACnetMSTP). Other information about communication are found in a separate **KJM Climatix BACnet** manual and in a system documentation for the Climatix controller from Siemens.
- **GSM modem** – communication by the use of GSM modem allows the control and monitoring of air conditioning unit with the use of SMS messages from a mobile phone. Connection between the modem and controller is executed by the use of RS232 and the modem is connected to the controller through the service connector with the T-HI designation. Standard communication parameters are set in the **SystémovéParemetry → Komunikace → Modem** menu. Further information about communication are found in a separate **KJM Climatix GSM modem** manual and in a system documentation for the Climatix controller from Siemens.



## 6.11.4 PASSWORD

In this item, it's possible to log in and log out with password. Further possibility is to change the pre-set user or maintenance password if the existing passwords are known (Fig. 44).

1   Password	1
InterPassword	▶
LogOut	▶
ChangePassword	▶

Fig. 44

## 6.11.5 SUMMER/WINTER TIME

Requirement for the right switching between the summer and winter time is the right setting of actual time. Standardly, switching is allowed. Summer time initiation is set in the controller for the last Sunday in March when the time is shifted by 1 hour in advance, so from two to three hours. The end of summer time is set in the controller to the last Sunday in October when the time is shifted by 1 hour backwards, so from three to two hours.

## 6.11.6 SETTING OF SAVELOAD

This function serves for the storage of actual parameters of the controller to the SD card or their loading from the SD card to the controller. Loading and saving is confirmed by an inscription at the display. Closer information can be found in a separate KJM Climatix SD upload manual.

1   SettingsSaveLoad	1
ConfigSaveSD	▶
ConfigSavedSD	No
ConfigLoadSD	▶
ConfigLoadingSD	No
Reset required!!	▶

Fig. 45

## 6.12 PASSWORDENTER OPTION

Only the basic data are displayed at the controller's screen if the password is entered when it's allowed to change only the mode (**TurnOff/Moderate heating/Attenuation/Comfort**). All the other changes may be performed only if entering the user or maintenance password. At each menu item, in the description, there's the necessary password specified. Standardly, from the factory, following passwords are set:

- **user** = "0000" – in the left upper corner of the display, an access level No. 3 is displayed.
- **maintenance** = "2222" – in the left upper corner of the display, an access level No. 1 is displayed.
- **factory** = "xxxx" – in the left upper corner of the display, an access level No. 0 is displayed.

## 6.13 NEXTMAINTENANCE OPTION

The **NextMaintenance** item serves for the purpose of data entering for the next required maintenance with optional intervals **Annually, 6Months, 3Months, 1Month**, whose expiration activates the alarm message **Maintenance**, informing the personnel about the need to perform maintenance checks. This function is reasonable in particular at the units with gas heating when annual maintenance checks of gas equipment are required. This function may be prohibited in the **Configuration** menu in the **Maintenance=No** item. The date of the next required maintenance is specified on the next line.

# 7 | ALARM MESSAGES

Screen of alarm messages (Fig. 41) is available through the Alarm key, marked by bell or red diode. Newly formed alarm is signaled by moving bell at the screen or by a flashing diode in the button. Acknowledgment is performed in the menu **ActualAlarms** by setting the **Acknowledge** item to the **Perform**. After the acknowledgment that may be performed only after the password of any level is entered, the diode stops flashing. The number of active alarms is on the same line.

After the alarm ends, it shifts from the actual alarms to the history of alarms, where after the alarm's name, there is "OK" added. In certain applications, alarm occurrence may be signaled by the mark "+" and the alarm's end by the mark "-" before the alarm's name. The "-" mark before the alarm's name is an equivalent of "OK" after the name of the alarm. The list of actual alarms and of the history of alarms may contain max. 50 items and work in cycle. That means that the latest alarm is rewritten into the oldest one.

By the acknowledgment of a selected alarm, the alarm detail is displayed (Fig. 42). In the first line, there's the name of alarm with "OK" added if the alarm has ended already. On the second line, there's a value and description of class. On the third line, there's the date and time of alarm's occurrence or end.

List of all alarm messages is described in the following table (Tab. 3). For all components, where monitoring is secured by a contact, there's contact closed expected under right functionality. Usually, a faulty or a non-standard component status is also signaled by a closed contact.

If the air conditioning unit contains more components, their potential alarm is designated in the name by a sequence number (e.g.: **SpaceTemperature, 2SpaceTemperature or CondensingUnit, 2CondensingUnit**). Each alarm has its own class set from the factory, on which the air conditioning unit operation depends in case this alarm occurs. In certain specific cases, also the alarm class may be changed in the menu of respective components after the factory password is entered. The meaning of alarm **Class** is the following:

- **A+ Class** – the highest alarm class with turn off the air conditioning unit, turning on again if the alarm cause and alarm acknowledgment is removed.
- **A class** – high alarm class that will turn off the air conditioning unit, starting against after the cause of alarm is removed without any alarm acknowledgment.
- **B class** – low alarm class will not turn off the air conditioning unit, but the unit may switch to an auxiliary mode. The unit will return to the original mode after the alarm cause expires without the need to acknowledge alarm.
- **C class** – the lowest alarm class serves only for notifications, air conditioning unit remains in operation.

Alarms	1
ActualAlarms	0
HistoryAlarms	5

Fig. 41

AlarmDetail	1
ThermostatWaterHeating	OK
1	Class(A)
2.11.2017	13:56:16

Fig. 42

Name of the alarm	Class	Description
ČerpadloVodOhřevu (WaterHeatingPump)	B	Pump fault of water heating from the pump thermal contact or pump circuit breaker contact.
ČerpadloVodOhřevu (WaterHeatingPump)	B	Pump fault of water heating from the pump thermal contact or pump circuit breaker contact.
ČerpadloGlykol (GlycolPump)	B	Glycol pump fault from the pump thermal contact or pump circuit breaker contact.
ČidloKouře (SmokeSensor)	A	Smoke signalisation in pipes or space (fire risk) by a smoke sensor contact.
ČidloKvalityVzduchu xxxxxxx (AirQualitySensor)	B	Damaged, disconnected or incorrectly configured air quality sensor. Text „xxxxxx“ specifies the sensor fault.
ČidloVlhkosti xxxxxxx (HumiditySensor)	B	Damaged, disconnected or incorrectly configured humidity sensor. Text „xxxxxx“ specifies the sensor fault.
ElektrickýOhřev (ElectricalHeating)	B	Information about electrical heating fault on the basis of thermostat contact monitoring.
ElektrickýOhřev2S (ElectricalHeating2S)	B	Information about electrical heating fault in the second section on the basis of thermostat contact monitoring.
FiltrOdvodu xxxxxxx (OutletFilter)	A	Damaged, disconnected or incorrectly configured sensor for the pressure at the air outlet filter. Text „xxxxxx“ specifies the sensor fault.
FiltrOdvoduDI (OutletFilterDI)	B	Signalisation of fouled filter of air outlet from the manostat contact.

FiltrOdvodu MaxŠpinavý (OutletFilter MaxFouled)	A+	Signalisation of the 3.grade of fouled filter for air outlet by the pressure sensors.
FiltrOdvodu MinŠpinavý (OutletFilter MinFouled)	C	Signalisation of the 1.grade of fouled filter for air outlet by the pressure sensors.
FiltrOdvodu Špinavý (OutletFilter Fouled)	B	Signalisation of the 2.grade of fouled filter for air outlet by the pressure sensors.
FiltrPřívodu xxxxxxx (InletFilter)	A	Damaged, disconnected or incorrectly configured sensor for the pressure at the air inlet filter. Text „xxxxxx“ specifies the sensor fault.
FiltrPřívoduDI (InletFilterDI)	B	Signalisation of fouled filter of air inlet from the manostat contact.
FiltrPřívodu MaxŠpinavý (InletFilter MaxFouled)	A+	Signalisation of the 3.grade of fouled filter for air inlet by the pressure sensors.
FiltrPřívodu MinŠpinavý (InletFilter MinFouled)	C	Signalisation of the 1.grade of fouled filter for air inlet by the pressure sensors.
FiltrPřívodu Špinavý (InletFilter Fouled)	B	Signalisation of the 2.grade of fouled filter for air inlet by the pressure sensors.
FiltrTukový xxxxxxx (GreaseFilter)	A	Damaged, disconnected or incorrectly configured sensor for the pressure at the air inlet grease filter. Text „xxxxxx“ specifies the sensor fault.
FiltrTukovýDI (GreaseFilterDI)	B	Signalisation of fouled grease filter of air inlet from the manostat contact.
FiltrTukový MaxŠpinavý (GreaseFilter MaxFouled)	A+	Signalisation of the 3.grade of fouled grease filter for air inlet by the pressure sensors.
FiltrTukový MinŠpinavý (GreaseFilter MinFouled)	C	Signalisation of the 1.grade of fouled grease filter for air inlet by the pressure sensors.
FiltrTukový Špinavý (GreaseFilter Fouled)	B	Signalisation of the 2.grade of fouled grease filter for air inlet by the pressure sensors.
GlykolManostat (GlycolManostat)	B	Freezing of a glycol exchanger on the side of air outlet, signaled by a manostat contact.
KlapkaOdvodu (OutletDamper)	A	Outlet damper position does not correspond to the value corresponding to the preset parameters <b>Insensitivity</b> and <b>Opening</b> .
KlapkaOdvodu xxxxxxx (OutletDamper)	B	Damaged, disconnected or incorrectly configured position monitoring of an outlet damper. Text „xxxxxx“ specifies the sensor fault.
KlapkaPřívodu (InletDamper)	A	Inlet damper position does not correspond to the value corresponding to the preset parameters <b>Insensitivity</b> and <b>Opening</b> .
KlapkaPřívodu xxxxxxx (InletDamper)	B	Damaged, disconnected or incorrectly configured position monitoring of an inlet damper. Text „xxxxxx“ specifies the sensor fault.
KlapkaRekuper (DamperHeatRecUnit)	B	Position of the bypass damper of the heat recovery unit does not correspond to the value corresponding to the preset parameters <b>Insensitivity</b> and <b>Opening</b> .
KlapkaRekuper xxxxxxx (DamperHeatRecUnit)	B	Damaged, disconnected or incorrectly configured position monitoring of a bypass damper of the heat recovery unit. Text „xxxxxx“ specifies the sensor fault.
KlapkaSměšování (DamperMixing)	B	Position of the mixing damper does not correspond to the value corresponding to the preset parameters <b>Insensitivity</b> and <b>Opening</b> .
KlapkaSměšování xxxxxxx (DamperMixing)	A	Damaged, disconnected or incorrectly configured position monitoring of a mixing damper. Text „xxxxxx“ specifies the sensor fault.
KlapkaVýměníku (DamperExchanger)	B	Position of the bypass damper of gas exchanger does not correspond to the value corresponding to the preset parameters <b>Insensitivity</b> and <b>Opening</b> .
KlapkaVýměníku xxxxxxx (DamperExchanger)	B	Damaged, disconnected or incorrectly configured position monitoring of a bypass damper at the gas exchanger. Text „xxxxxx“ specifies the sensor fault.
KondenzačníJednotka (CondensingUnit)	B	Information about the condensing unit fault on the basis of outlet monitoring from condensing unit, informing about its operation or fault.
KvalitaVzduchu Špatná (AirQualityBad)	B	Bad air quality signaled by a contact o analog sensor according to limit values <b>TurnOn</b> and <b>TurnOff</b> in the component <b>AirQuality</b> .
MB–Rekuperátor (MB-HeatRecUnit)	B	Fault of the ModBus communication with a frequency converter of a rotary heat recovery unit.
MB–TepelnéČerpadlo (MB-HeatPump)	A	Fault of the ModBus communication with a frequency converter of a heat pump.
MB–VentilátorOdvodu (MB-OutletFan)	A+	Fault of the ModBus communication with a frequency converter of an outlet fan.
MB–VentilátorPřívodu (MB-InletFan)	A+	Fault of the ModBus communication with a frequency converter of an inlet fan.
PlynovýOhřev (GasHeating)	B	Gas burner fault on the basis of unavailable information about the operation signaled directly at the burner or burner chamber.
PlynovýOhřev Porucha (GasHeating Fault)	B	Information about the fault of gas burner on the basis of relay contact, informing about its fault, signaled also directly at the burner or burner chamber.
Požár–EPS (Fire-EPS)	A	Signalizace nebezpečí požáru kontaktem z požárního čidla nebo požární ústředny (EPS).
PožárníKlapka (FireDamper)	A	Signalisation of fire hazard from the fire damper. Damper is in unexpected position.
PožárníKlapka Otevřena (FireDamper Open)	A	Signalisation of fire hazard from the fire damper. Damper is in unexpected position – open.
PožárníKlapka Zavřena (FireDamper Closed)	A	Signalisation of fire hazard from the fire damper. Damper is in unexpected position – closed.

ProstorovýPřístroj (SpaceDevice)	B	Damaged, disconnected or incorrectly configured space device.
PrůtokVzduchu (AirFlowRate)	B	Signalisation of insufficient air flow rate.
PřiváděnáTeplota Nízká (InletTemperature Low)	B	Low temperature of inlet air, coming through the water heat exchanger, is lower than 6°C. Water heat pump is turned on and the valve is open for 100%.
Rekuperátor (HeatRecoveryUnit)	B	Fault of motor frequency converter of a rotary heat recovery unit from the frequency converter contact or the rotary heat recovery unit is not rotating, probably on the basis of cracked or loose belt.
RekuperátorMan Námraza (ManHeatRecUnit Freezing)	C	Heat recovery unit freezing, signaled by a manostat contact.
RekuperátorTepl Námraza (TempHeatRecUnit Freezing)	C	Heat recovery unit freezing, signaled by a thermal sensor downstream the heat recovery unit, according to the <b>Freezing</b> value in the <b>HeatRecUnit</b> component.
RozvaděčTeplota Vysoká (DistributorTemp High)	B	Safe temperature in the distributor with electric heating exceeded. Electric heating turned off.
SpalinyTeplota Vysoká (FlueGasTemp High)	B	High temperature of flue gas from gas heating according to the value <b>FlueGasMax</b> in the component <b>GasHeating</b> , under which the gas burner turns off.
TeplnéČerpadlo EEV (HeatPump EEV)	A	Signalisation of fault from the EVD controller, controlling the expansion valve in the heat pump loop.
TeplnéČerpadlo Fáze (HeatPump Phase)	A+	Signalisation of incorrect phase sequence for heat pump compressors from phase tracker.
TeplnéČerpadlo Kompresor (HeatPump Compressor)	A	Signalisation of compressor overheating by thermal protection.
TeplnéČerpadlo Měnič (HeatPump Converter)	A	Signalisation of fault from the frequency converter, controlling heat pump compressor.
TeplnéČerpadlo Námraza (HeatPump Freezing)	C	Signalisation of heat pump exchanger freezing from manostat.
TeplnéČerpadlo NízkýTlak (HeatPump LowPressure)	A+	Signalisation of low pressure in the heat pump loop from the pressure sensor.
TeplnéČerpadlo VysokýTlak (HeatPump HighPressure)	A+	Signalisation of high pressure in the heat pump loop from the pressure sensor.
TeplotaOdpadní xxxxxxx (WasteAirTemperature)	B	Damaged, disconnected or incorrectly configured thermal sensor for waste air. Text „xxxxxx“ specifies the sensor fault.
TeplotaOdváděná xxxxxxx (OutletTemperature)	B	Damaged, disconnected or incorrectly configured thermal sensor for air outlet from space. Text „xxxxxx“ specifies the sensor fault.
TeplotaOdváděnáVodChl xxxxxxx(OutletTemperature-WaterCool)	B	Damaged, disconnected or incorrectly configured thermal sensor for water cooling water outlet. Text „xxxxxx“ specifies the sensor fault.
TeplotaOdváděnáVodOhř xxxxxxx	A	Damaged, disconnected or incorrectly configured thermal sensor for water heating water outlet. Text „xxxxxx“ specifies the sensor fault.
TeplotaProstor xxxxxxx (SpaceTemperature)	B	Damaged, disconnected or incorrectly configured thermal sensor for space. Text „xxxxxx“ specifies the sensor fault.
TeplotaProstorKor xxxxxxx (SpaceTempCorrection)	B	Damaged, disconnected or incorrectly configured thermal sensor with correction for set temperature. Text „xxxxxx“ specifies the sensor fault.
TeplotaPředehřev xxxxxxx (PreHeatTemperature)	B	Damaged, disconnected or incorrectly configured thermal sensor for air supply downstream preheat. Text „xxxxxx“ specifies the sensor fault.
TeplotaPřiváděná xxxxxxx (SuppliedTemperature)	A	Damaged, disconnected or incorrectly configured thermal sensor for air supply into the space. Text „xxxxxx“ specifies the sensor fault.
TeplotaPřiváděnáVodChl xxxxxxx (WaterCoolTemp-Supply)	B	Damaged, disconnected or incorrectly configured thermal sensor for water cooling water supply. Text „xxxxxx“ specifies the sensor fault.
TeplotaPřiváděnáVodOhř xxxxxxx (WaterHeatTemp-Supply)	A	Damaged, disconnected or incorrectly configured thermal sensor for water heating water supply. Text „xxxxxx“ specifies the sensor fault.
TeplotaRozvaděč xxxxxxx (TempDistributor)	A	Damaged, disconnected or incorrectly configured thermal sensor in distributor. Text „xxxxxx“ specifies the sensor fault.
TeplotaSpalin xxxxxxx (FlueGasTemperature)	A	Damaged, disconnected or incorrectly configured thermal sensor for flue gas temperature. Text „xxxxxx“ specifies the sensor fault.
TeplotaVenkovní xxxxxxx (AmbientTemperature)	A	Damaged, disconnected or incorrectly configured thermal sensor. Text „xxxxxx“ specifies the sensor fault.
TeplotaZaRekuper xxxxxxx (TempDownsHeatRecUnit)	A	Damaged, disconnected or incorrectly configured thermal sensor. Text „xxxxxx“ specifies the sensor fault.
TermostatVodOhřevu (WaterHeatThermostat)	A	Freezing danger at the water heating exchanger. Water heat pump turned on, valve open in full and the air conditioning unit turned off.
TlakGlykolu xxxxxxx (GlycolPressure)	B	Damaged, disconnected or incorrectly configured pressure sensor in a glycol loop. Text „xxxxxx“ specifies the sensor fault.
TlakVentOvodu xxxxxxx (PressureOutletFanAir)	B	Damaged, disconnected or incorrectly configured pressure sensor of the outlet fan air. Text „xxxxxx“ specifies the sensor fault.
TlakVentPřívodu xxxxxxx (PressureInletFanAir)	B	Damaged, disconnected or incorrectly configured pressure sensor of the inlet fan air. Text „xxxxxx“ specifies the sensor fault.

TopnáVoda Studená (HeatingWaterCold)	A	Low temperature of heating water for water heating. Water heating pump turned on and valve open for 100%.
VentilátorOdvodu (Outlet Fan)	A+	Outlet fan fault caused by a frequency converter contact in the fan engine.
VentOdvoduVypínač (OutletFanSwitch)	A	Maintenance switch of outlet fan not turned on.
VentilátorPřívodu (InletFan)	A+	Inlet fan fault caused by a frequency converter contact in the fan engine.
VentPřívoduVypínač (SwitchInletFan)	A	Maintenance switch of inlet fan not turned on.
Vlhkost Vysoká (Humidity High)	B	Bad air humidity signalized by contact or analog sensor according to limit values <b>TurnOn</b> and <b>TurnOff</b> in the <b>Humidity</b> component.
Zpráva Servis (MaintenanceMessage)	C	Information about the need of a planned maintenance check according to the value in the <b>NextMaintenance</b> component.
Zvlhčovač (Humidifier)	B	Humidifier fault on the basis of insufficient information about its operation signalized directly from humidifier.
Zvlhčovač Porucha (Fault Humidifier)	B	Information about the fault of humidifier on the basis of information about its fault signalized directly from the humidifier.

Tab. 3 – List of fault alarms







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This User Guide forms and integral part of the TPM 088/12 technical requirements for the MANDÍK air conditioning units. Amended version of documents can be found at [www.mandik.cz](http://www.mandik.cz)

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