REMAK


# Control units

# VCS

INSTALLATION AND OPERATING INSTRUCTIONS

10/2019

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## Introduction

- The VCS control unit software is the intellectual property of REMAK a.s.
- VCS control units are manufactured in accordance with valid Czech and European regulations and technical standards.
- VCS control units must be installed and used only in accordance with this documentation.
- The manufacturer is not responsible for any damage resulting from use for purposes other than specified in this documentation, and the customer bears the risks of such use.
- The installation and operating documentation must be available for the operating and servicing staff. It is advisable to store this documentation close to the installed VCS control unit.
- When handling, installing, wiring, commissioning, repairing or servicing the air-handling units, it is necessary to observe valid safety rules, standards and generally recognized technical rules.
- All equipment connections must comply with the respective safety standards and regulations.
- Any changes or modifications to individual components of the VCS control unit which could affect its safe and proper functioning are forbidden.
- Before installing and using the air-handling units, it is necessary to familiarize yourself with and observe the directions and recommendations included in the following chapters.
- The VCS control units, including their individual parts, are not intended, due to their concept, for direct sale to end customers. Each installation must be performed in accordance with a professional project created by a qualified designer who is responsible for the proper selection and dimensioning of components concerning their suitability for a given application. Installation and commissioning may only be performed by an authorized company licensed in accordance with generally valid regulations.
- REMAK a.s. is not responsible for any damage, direct or indirect, caused by unauthorized or unqualified used of the software or hardware, or for any damage caused by ignoring the product's Operating Instructions.

*Up-to-date version of this document is available at website www.remak.eu*

# Equipment characteristics

## Application

VCS control units are compact control and power distributors used for the decentralized regulation and control of air-handling systems. They provide the equipment with high stability and safety while allowing easy control, including the viewing of operating states. (STOP - OPERATION - AUTO).

## Main Features

The VCS control unit is intended for the following:
- Complex autonomous control of air-handling systems
- Supply or room air temperature control (cascade control)
- Supply and power actuation of air-handling systems
- Protection and safeguarding of connected components

This control unit provides air-handling systems with control and safety functions. It can be equipped with the necessary number of proportional inputs and outputs depending on the required functions.
Sophisticated control algorithms ensure system stability, user-friendly control and energy savings. Another advantage is that the control unit's features also contribute to energy savings in air-handling system operation:

- Option to set the unit to 2 temperature modes
  - Comfort
  - Economy
- Time schedule setting options (daily or weekly time schedules)
- Additional operating mode setting options:
  - Optimized start
  - Temperature start-up
  - Night chilling
- Precise drive control using data communications (Modbus RTU protocol)
- Superior antifreeze protection with moderate heating of the heat exchanger during standby mode
- Precise analogue control of controlled peripheral units (according to the controlled component)

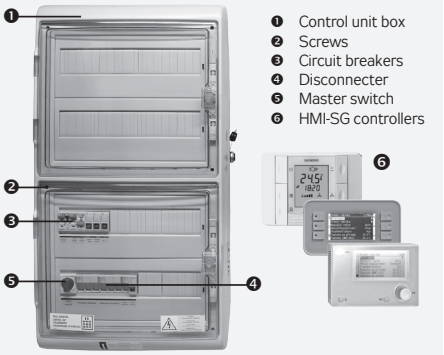
## Unit Design

These control units are designed in accordance with ČSN EN 60204-1. The unit's control and power parts are situated in a single box. The components, control and actuating elements, are fitted on the DIN bars inside the control unit. Depending on the version, the VCS control unit can be provided in plastic (plastic switchboard) or in sheet-steel (sheet-steel switchboard). Both designs are equipped with transparent doors. The controls are situated below these doors. Further, the VCS control unit can be produced as a built-in assembly and a part of an air-handling unit section, which must be designed for that purpose and meet specific requirements.

## Controller HW and SW Concept

The core of the VCS system is created by a powerful Siemens Climatix series PLC controller. The control unit can be equipped with one of two POL4xx and POL6xx controller versions depending on the components used in the air-handling unit. Simultaneously, additional external input/output or communication modules can be connected to the POL6xx controller.

**Figure 1** – VCS control unit design




For local control, the HMI-SG POL822/60 hand controller can be used. The control unit allows up to 8 basic control sequences to be used depending on the air-handling unit configuration. The order of some sequences can be changed (e.g. heating-mixing damper or cooling-fan cooling).
The heat pump or electric after-heater can be separated from basic sequences in the so-called extra sequences.
If this is the case, another sensor must be used in the air inlet, and a special set-point must be set for this type of control. This feature can only be used after prior consultation with the manufacturer. These units are delivered adapted to individual applications so they will provide exactly those features needed for the operation of a specific air-handling device.

## Control

**Local control**
The basic VCS controllers are devices (manual controllers with bus connection) for so-called local control of the control unit (see fig. 2):
**a) Room controller** - HMI-SG (POL822/60)
**b) Comfortable universal alphanumeric driver**
- HMI-DM nebo HMI-TM

*Note: For details, see controllers instructions part of the manual.*

**Distant control**
In addition to local VCS controllers, so-called remote control can be used. For this control, you need to connect VCS to LAN, WAN or Internet (For production, the control unit must be configured/ordered with the required functionality).
**a) HMI@WEB** - You can use the HMI @ WEB controller via the web interface. The controller fully complies with the local HMI-DM and TM controls.
**b) Mobile app** (see fig. 3) - You can use simple touch application for smartphones or tablets with Google Android (v. 4.1 and higher) or Apple iOS (v. 12.2 and higher).
**c) SCADA web interface**
Monitoring and operation using the device's technological scheme with operating parameters, respectively using the tabular interface of an internet browser on a PC. For details, refer to page 58.

## Control

**Other controls (technological)**

For basic control (triggering, mode switching) from a technology or a very simple manual button / switch control, you can use "Other Controls". External control via one or two non-voltage contacts.

**Control from parent system**

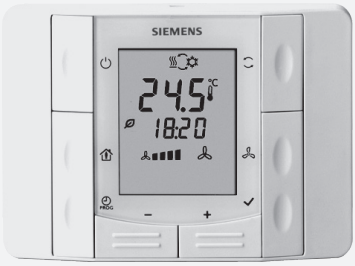
When integrating HVAC with the VCS control unit into complex building management systems (BMS), it is also possible to connect to these systems. Subsequently, it is possible to control and monitor the HVAC through them. The ModBus, LON, and BacNet standards can be used.

The different types of control must be designed when designing (configuring) VCS into the project and especially in production - the usability of remote control and connectivity to the BMS are dependent on the use of the corresponding controller.

*Detailed descriptions of all controller types, control and their use - see separate sections / chapters of this manual.*

**Figure 2** – HMI-SG (-DM, -TM) controllers

HMI-SG




HMI-TM


HMI-DM

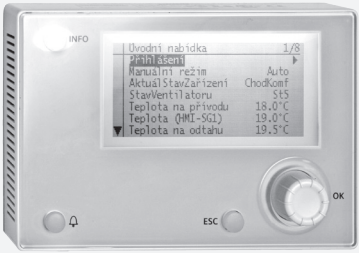
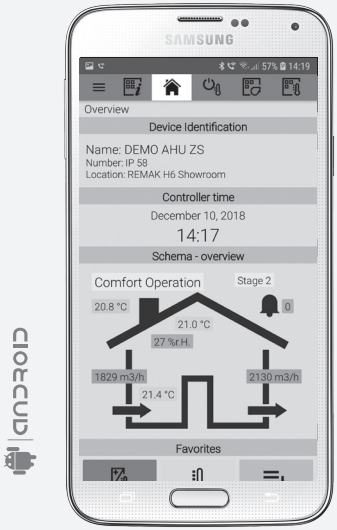


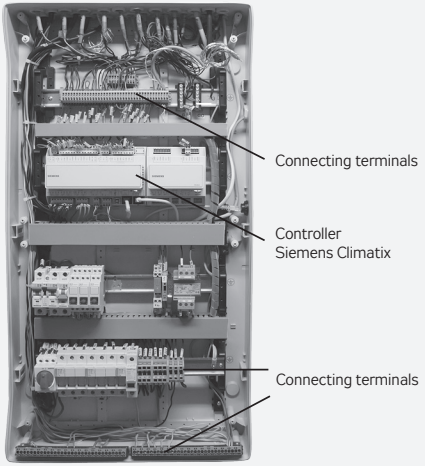

**Figure 3** – Mobile application




## Power Part

The power part, like the control part, is always "tailored" for a specific air-handling unit.

**Figure 4** – VCS control unit internal structure



## Design

### Boxes

Indoor VCS control units are built into plastic or sheet metal cabinets with front transparent doors under which controls are located. The permissible ambient temperature is 0 ° C to + 40 ° C.

VCS in exterior design are built into sheet metal cabinets with full front doors under which controls are located. In the configuration software we can design: range of average temperatures -40 ° C to 35 ° C, cabinet mounting (hanging / stand), door design (left / right), lighting, service drawer (select according to customer's destination).

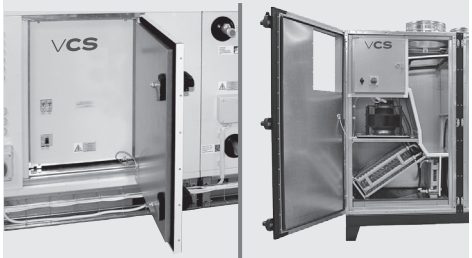
A space of minimum 15 cm must be left on each side of the box to allow access for cooling air and for changing the filter which is fitted in front of the fan.

As a standard, we provide a door lock and a box for storing unit documents. Depending on the particular configuration of the control unit, these enclosure dimensions are used (Table 1). The electrical enclosure of the plastic case corresponds to IP 65 with the door closed and IP 40 when the door is open. The electrical cabinet cover is IP 55 or IP 66 (depending on enclosure type) when the door is closed and IP 20 when the door is open. The metal enclosure with additional ventilation is IP54 with the door closed and IP 20 with the door open.

The VCS control units can be mounted directly on the Flammability Levels A and B according to EN 13501-1.

Additionally, the VCS control unit can be manufactured in an integrated design as part of the ventilation unit section. One of the options is a built-in section for assembled VZTs, which includes adjustments for the environment. This section is used when designing VZT with IP44 protection as well for outdoor units (with heating or cooling of the control unit).

**Figure 5 –** Installation in the XP unit section




**a)** AeroMaster XP **b)** CAKE

**Table 1 –** box dimensions in mm

| Version | Height | Width | Depth | Usual application |
|---|---|---|---|---|
| Plastic | 610 | 340 | 160 | Vento, FP, some XP (single-speed) |
| Plastic | 610 | 448 | 160 | Vento, FP, some XP (single-speed) |
| Plastic | 842 | 448 | 160 | Vento, FP, some XP (single-speed) |
| Sheet-steel | 800 | 550 | 250 | XP, sophisticated Vento assemblies |
| Sheet-steel | 1200 | 750 | 300 | XP |
| Sheet-steel | 1600 | 750 | 300 | XP |
| Sheet-steel | 2000 | 800 | 400 | XP |
| Sheet-steel | 2000 | 1000 | 400 | XP |

If needed, the boxes, sized 2000 × 800 × 400 mm and 2000 × 1000 × 400 mm, can be fitted with a ventilation set – a fan and a louver in opposite corners.

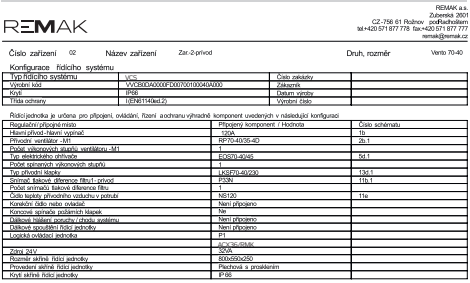
Another option is a built-in control unit within the compact CAKE unit. In this case, the VCS is a built-in component of the compact IP44 enclosure (when the door is closed). Figure 5.

## Design

The control system design is based on the selection of required features and on its internal configuration. The design is performed automatically using the algorithm integrated into the design software also used for the air-handling unit design. The design output provides an exact specification of the control unit, including the following individualised lists for a specific device:

- Summary of connected components
- Wiring diagrams of all components
- List of all recommended cables for the connection of all components (the cables must always be used in accordance with the el. equipment project documentation).

**Figure 6 –** Summary of connected components (example)



REMAK

REMAK a.s.
Zubereská 2601
CZ-756 61 Rožnov pod Radhoštem
tel:+420 571 877 778 fax:+420 571 877 777
remak@remak.cz

Číslo zařízení 02 Název zařízení Zař.2-přívod Druh, rozměr Vento 70-40

Konfigurace řídicího systému

| | | | |
|---|---|---|---|
| Typ řídicího systému | VCS | Číslo zakázky | |
| Výrobní kód | VVSBIDA0000FD0070010004A000 | Zákazník | |
| Kryt | IP66 | Datum výroby | |
| Třída ochrany | 1(EN61140ed.2) | Výrobní číslo | |

Řídicí jednotka je určena pro připojení, ovládání, řízení a ochranu výhradně komponent uvedených v následující konfiguraci

| | | |
|---|---|---|
| Regulační připojená místa | Připojený komponent / Hodnota | Číslo schématu |
| Hlavní přívod - hlavní vypínač | 125A | 1b |
| Přívodní ventilátor -M1 | RP70-40/36-4D | 2b.1 |
| Počet větracových stupňů ventilátoru -M1 | 1 | |
| Typ elektronického měřiče | EGS70-40/45 | 5d.1 |
| Počet spínaných větracových stupňů | 1 | |
| Typ přívodní klapky | LKSP70-40/230 | 13d.1 |
| Snímač. tlakové diference filtru1- přívod | FS3N | 11b.1 |
| Počet snímačů tlakové diference filtru | 1 | |
| Čidlo teploty přívodního vzduchu v potrubí | NS120 | 11e |
| Konekční čidlo nebo zvlášť | Není připojeno | |
| Koncové spínače požárních klapek | Ne | |
| Dálkové blokání poruchy / chodu systému | Není připojeno | |
| Dálkové spouštění řídicí jednotky | Není připojeno | |
| Logická ovládací jednotka | F1 | |
| Zdroj 24V | 5,0A | |
| Rozměr skříně řídicí jednotky | 800x550x250 | |
| Provedení skříně řídicí jednotky | Plechová s prosklením | |
| Kryt skříně řídicí jednotky | IP66 | |

**Figure 7 –** Component wiring (example)

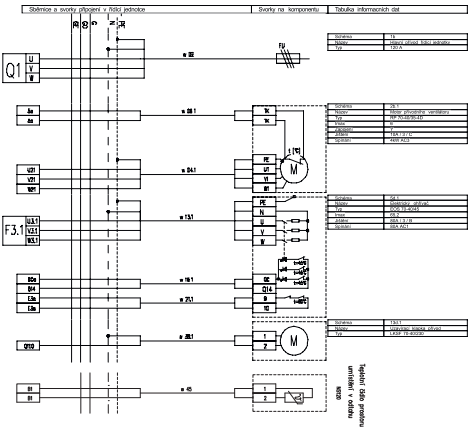
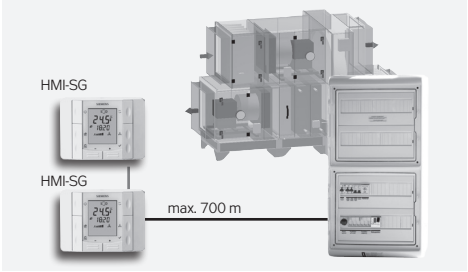



**Table 2 –** List of connecting cables (example)

| Cable No. | (Recommended) cable type | Power Supply | Cable length | Note |
|---|---|---|---|---|
| w 09.1 | CYKFY 4Bx… | 3x400V+PE | | |
| w 04.1 | CYKY 4Bx… | 3x400V+PE | | |
| w 45.1 | JQTQ 4Dx0,8 | 24V DC | | |
| w 06.1 | H05W-F 2Ax0,75 | 24V DC | | |
| w 12.1 | H05W-F 2Ax1 | 24V DC | | |
| w 09.1 | CYKFY 4Bx… | 3x400V+PE | | |

## Documentation

**Figure 8 –** Example of access to the unit




### Control Unit Designation

The control unit designation is always created by a unique code (generated by the AeroCAD design program for the control unit calculation and design), which is only included in the accompanying technical documentation (not on the control unit), and by the serial number (for communication with the manufacturer).

## Documentation

VCS control systems can be installed and used only in accordance with the delivered documentation.

### Documentation List

- Product Installation and Operating Instructions
- Control system configuration (summary of connected components), terminal diagram and list of recommended cables – device printout from the AeroCAD design program

#### Additional – General Documentation

The system or device documentation also includes the operating and inspection documentation kept during the device service life and the Service Regulations, for which the user is responsible.

### Service Regulations

Before putting the air-handling device into permanent operation, the device user in collaboration with the designer, or the supplier, must issue service regulations in accordance with local regulations.

We recommend including the following in these service regulations:

- Air-handling device assembly configuration, its intended use and a description of its operation in all operating modes
- Description of all safety and protective elements and their functions
- Summary of the health protection principles, safety and operating rules to be observed when operating the air-handling equipment
- List of requirements for operating staff qualifications and training, nomenclature list of personnel authorized to operate the air-handling device
- Detailed emergency and accident instructions to be followed by the operating staff
- Operating particularities in different climatic conditions (e. g. summer or winter operation)
- Inspection, checking and maintenance schedule, including a list of checking steps, and their recording

### Documentation Availability

The documentation delivered with the control system (original) and operating documentation must be permanently available for the operating and service staff and stored near the air-handling equipment. The Installation and Operating Instructions are also available at the website: **https://www.remak.eu**

#### Warning

The manufacturer reserves the right to make changes and amend the documentation due to technical innovations and changes to legislation without prior notice. **Information on changes and updates are always available at the website https://www.remak.eu**

## Safety Measures

- VCS control units are manufactured in accordance with valid regulations and technical standards.
- VCS control units must be installed and used only in accordance with this documentation.
- Any damage caused by improper use contrary to this documentation is the responsibility of the subject who failed to observe the instructions included in this documentation.
- When handling, installing, wiring, commissioning, repairing or servicing the air-handling units, it is necessary to observe valid safety rules, standards and generally recognized technical rules.
- In particular, it is necessary to use suitable tools and personal protective work aids (e. g. gloves) because of sharp edges and corners, respectively voltage, when performing any handling, installing, dismounting, repairing or checking.
- Any changes or modifications to individual components of the VCS control unit which could affect its safe and proper functioning are forbidden.
- The air-handling equipment configuration and documentation must not be changed without the prior consent of the manufacturer.
- **The VCS control units, including their individual parts, are not intended, due to their concept, for direct sale to end customers.** Each installation must be performed in accordance with a professional project created by a qualified designer who is responsible for the proper selection of equipment concerning its suitability for the given application.
- All connections of the equipment, including the VCS control unit, to the power mains must be performed in accordance with applicable local wiring standards and regulations.
- Wiring installation, commissioning, maintenance and repairs may only be performed by a specialized assembly company, respectively an authorized person duly qualified in accordance with generally valid regulations.
- Before installing and using the air-handling units, it is necessary to familiarize yourself with and observe the directions and recommendations included in the following chapters.

## Manipulation, transport, location

- The air-handling equipment can only be operated in accordance with the applicable Service Regulations. The operating staff must comply with the requirements included in the Service Regulations, respectively with the manufacturer's requirements (authorisation for some service activities).
- To avoid unintentional unit start-up, the master switch must be switched off and locked when repairing the VCS unit.

**Attention! in some cases, the main switch may not disconnect all circuits!**
These are control circuits from foreign devices such as - switching of demand for condensing units and heat pumps, signaling of operation and faults, switching of the boiler room request and others. See. the appropriate circuit diagram for specific VCS units.

## Conditions for Handling

The device can only be commissioned, operated and serviced by qualified personnel.

- The VCS control unit can only be operated by personnel provably trained and warned about possible dangers (by the manufacturer or authorized representative of the manufacturer) in accordance with the applicable Service Regulations for the air-handling unit.
- It is forbidden to remove, bypass or disconnect the safety equipment, safety functions and guards.
- Only air-handling components in perfect condition can be used. Failures affecting the equipment safety must be removed immediately.
- All safety measures against electrical accidents must be strictly observed. Any action resulting in restriction, even temporary, of the safety and protection functions must be avoided.
- It is strictly forbidden to remove safety guards, casings or other safeguards, operate the equipment or its components if the safeguards are disabled or restricted.
- Any action resulting in restriction of the prescribed insulation of the safety voltage must be avoided.
- When changing fuses, it is necessary to ensure the non-voltage state of the control unit and use only the specified fuses and protection elements.
- It is necessary to eliminate electromagnetic interference and the harmful effects of over-voltage on the signal, control and power cables, which could unintentionally initiate dangerous actions and functions or cause destruction of the electronic parts in individual components.
- Never work on the connected equipment under voltage! Before starting work on the air-handling unit, switch off and lock the master switch to disconnect the supply voltage. Use protective and work aids in accordance with the Service Regulations and standards applicable in the country where the unit is installed.
- If individual technical assemblies of the air-handling unit are equipped with service switches, and if allowed by the Service Regulations, installation conditions and characteristics, then such assembly (e.g. heater, fan, etc.) can be disconnected by switching off and locking the corresponding service switch.
- Never use abrasive cleaners, cleaners unsuitable for plastics or acid or alkaline solutions to clean to unit.
- Avoid splashing water, impacts and vibrations.
  Each air-handling equipment component must always be installed in accordance with the appropriate installation instructions.
  The manufacturer recommends fully ensuring the flawless condition and functioning of all protective elements and equipment. After failures, such as short circuits, have been removed, check the functionality of the automatic circuit breakers and protective elements, and verify the condition of the protective wiring interconnection and grounding.
  To ensure safe operation, it is necessary to verify the conditions of the water heating/cooling pumps – perform manual pump turning and set the output curve (over-design impairs the control quality).

**Warning:** If the remote control is used (including automatic schedule program), safety access must be ensured for each physical interference or entry into the air-handling unit (inspection, maintenance or repair) – i. e. disconnect the power supply by turning off the switch – avoid remote initiation of the unit by other users when work is being performed on the unit.

## Transport and Storage Before Installation

VCS control units are packed in cardboard boxes or installed in the corresponding air-handling unit section, if they are integrated into the air-handling unit. Measures for handling fragile goods must be taken when handling the unit.
The units must be stored in rooms complying with the following conditions:

- Maximum relative air humidity must not exceed 85 %, without water condensation
- Ambient temperature between –25 ºC and +60 ºC

Dust, water, caustics, corrosive agents or other materials negatively affecting the structure or the unit's components (causing degradation of plastic parts and insulation) must not enter the unit.

## Installation and Location

The VCS control unit location must provide good access for the operating personnel and easy connection of the cables. The installation site must be flat without rough spots.
When planning the air-handling unit location, it is necessary to keep sufficient space for maintenance, service and operating.
Check the completeness and intactness of the delivery in accordance with the bill of delivery before installation.
These control units are designed for normal (indoor, dustless, dry, non-explosive) environments. They can be mounted on A and B combustibility grade materials in accordance with EN 13501-1.
Permissible ambient temperature: +0 ºC to +40 ºC (24h average must not exceed +35 ºC)
The VCS control units in the switchboard boxes are mounted in the vertical position directly on the wall. The KAEDRA plastic switchboard box can also be partially embedded under plaster. The VCS unit installed in steel switchboard boxes can also be placed directly on the floor. The cables can be run along cable trenches, cable trays or under plaster.
The power cables are connected from below.
We recommend the wall-mounted units be fixed to the wall using dowels and screws suitable for the wall structure.

## Commissioning

*Note: As appropriate, the above-mentioned instructions apply also for control units integrated into the air-handling unit while observing the control unit installation and operating instructions delivered with the air-handling unit.*

Check the completeness and intactness of the delivery in accordance with the bill of delivery before installation.

# Commissioning

### Fitting and Wiring Check

A careful check and verification of the wiring of all control system components in accordance with the attached unit wiring diagram must be performed before the first start-up. The system cannot be connected to the power supply until these checks have been performed.
First of all, it is necessary to check the presence, locations and connections of the temperature sensors, fan thermo-contacts and heaters in accordance with the M&C project. Further, the connections of all error inputs must be checked.
It is also essential to check the fans, electric heaters, heat exchangers, filters and other parts of the connected air-handling unit for correct fitting in accordance with the air-handling accompanying documentation.
The above-mentioned checks must include a functionality check of each component.
Special attention must be paid to the check of the conductive interconnection of all parts of the air-handling unit and associated devices.

### Conditions for Connection

The connections must be performed in accordance with the applicable local wiring standards and regulations. Before putting the unit into operation, an initial wiring inspection must be performed in accordance with the national regulations.

### Settings

The VCS control unit has been manufactured according to the customer's requirements (the project), and the basic parameters have been pre-set so that the unit is ready for operation. With these settings, the control unit will start and begin the control for the pre-set parameters providing the connection of the unit has been performed correctly.
However, the professionals performing the unit commissioning must always check or adapt the air-handling unit's operating parameters to the specific design and behaviour of the control system and operating or local conditions.
**It is especially necessary to pay attention to the control constants and parameter, various correction values, temperature modes and time schedules, optional modes and functions.**
The data points are accessible through the HMI control panel. Setting the user **access levels i**s an important part of the settings procedure.
The default factory settings must be re-set according to the user and service company needs.
The Access passwords are the basic pre-set parameters which need to be reset when commissioning the unit, see the chapter *Control (HMI-SG)*.

### Additional Settings:

- To optimize the interaction between the control unit and peripheral devices, it is necessary to set, using the HMI-SG controller (see the List of Data Points in the section Settings – Control Signal Characteristic), corresponding values of the analogue signals for heating, cooling, heat recovery and gas heating, optional from 0–10 V and 2–10 V (pre-set).
  The values 2–10V are suitable for REMAK or Belimo actuators.

#### Room temperature Measuring Point Selection

- Up to two room temperature sensors can be installed in the air-conditioned room (HMI-SG controller with an integrated temperature sensor plus one additional temperature sensor, or two HMI-SG controllers with integrated temperature sensors). The final room temperature value for the control can be set as the minimum, maximum or average of both sensors (see the List of Data Points - Temperature Measuring Point Selection).

Selection of the specific point for adjusting or measuring the temperature value entering the control process results in more accurate setting of the room temperature.

#### Warning

The device parameters are structured and made available to users in accordance with their user roles (access levels). These roles must be assigned to the users according to their expertise and responsibility for device operation.

#### Basic Application Parameterization

- Default and common operation parameterization is described in the chapter *Control (see particular controller)*.

#### General Overview of Parameters

For a general overview of parameters available in the menu and access authorization of users, refer to the chapter VCS – Parameter Overview and Default Factory Settings. For the menu with HMI controller parameters and default values, refer to the chapter *Control (HMI-SG)*.

### Important Notes

Correct assembly, installation, commissioning and proper control are the essential conditions for flawless and safe operation of the control unit. The components connected to the control unit must correspond with the specification in the control unit documentation.
The procedures specified by the manufacturer in the unit documentation and the Service Regulations measures must be observed throughout the unit service life.

## Commissioning

### Location of Control System Sensors

**Inlet Air Temperature Sensor (NS 120)**

Control and anti–freeze sensors must always be situated behind the heater, respectively cooler – to measure the supply air temperature. They must not be situated in the room.

**VO antifreeze protection sensor (NS 130R)**

The return water temperature sensor must be situated in the return water line from the water heater so that it will be sufficiently bathed in water. The heating water circuit must ensure all the required functions for the water heater control and safety when the unit is shut down (filling the system with antifreeze mixture) as specified in the air-handling device project documentation. A capillary tube can be used as additional antifreeze protection. If it is not installed on the air-handling unit by the manufacturer, the capillary tube must be run (meandering way) through the entire cross-section of the water heater's rear side.

**Outdoor air temperature sensor (NS120)**

Ideally, it should be situated in the outside environment – only then are the control system's functions ensured even in the STOP mode or immediately after unit start-up (e.g. moderate pre-heating of the exchanger based on the actual outside temperature, etc.). If the sensor is situated in the fresh air inlet duct inside the building, the measured temperature is only correct when the fans are switched on (air flows) and the starting conditions are negatively affected – which can endanger the air-handling device's safety and even result in the water heat exchanger breaking down.

**Outdoor Temperature Sensor – installed outside (NS110A)**

The sensor (as with any thermometer) must be installed so that objective outdoor temperature measurement will be achieved. It must be protected against negative effects like sunshine, rainfall, frost deposits, e.g. situating it under a building's roof, using outdoor VZT roofs, situating it in the inlet louvers, inlet ducts or separate covering roof.

**Room Temperature Sensors**

Optionally, a room (NS100), duct (NS120) or HMI-SG controller integrated sensor can be used by the designer.

- **The room sensor** or HMI-SG controller with integrated room sensor must be situated in a spot "representing" the room temperature, and they must not be affected by local effects (heaters, windows, vertical temperature distribution in the room, etc.)
- **The duct sensor** must be situated in the room outlet duct – the advantage in this is that the average temperature of the air flowing from the room is measured without being affected by local effects (and it is hidden).

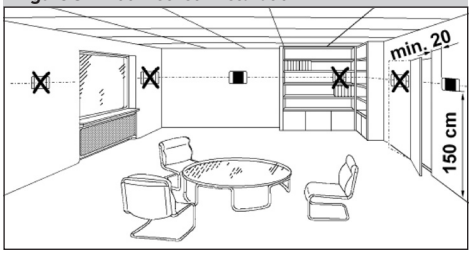
**Heat Exchanger's Antifreeze Protection Sensor (NS 130R)**

The sensor must be situated in the outlet air duct behind the heat exchanger.

**EO Pre-Heating Control Temperature Sensor (NS 120)**

To ensure correct control, the sensor must be situated behind the electric pre–heater (EO) – before other temperature adjusting components.

**Figure 9 –** Room sensor installation




**Flue Gas Temperature Sensor**

The Pt 100 sensor is used to measure the flue gas temperature. The sensor must be situated in a representative place within the flue gas installation.

**Inlet Air Humidity Sensor**

This is a duct sensor which must always be situated in an inlet branch after the air-handling unit. The selected position must be representative enough for the measured value. It must not be situated in the room.

**Room Humidity Sensor**

Optionally, a room or duct sensor can be used by the designer.

- The room sensor must be situated in the room in a "representative" place so that it will not be influenced by local effects (windows, doors, etc.)
- The duct sensor must be situated in the outlet duct from the room – the advantage here is that the mean humidity of the room outlet air is measured.

**TH 167 Gas Heating Safety Thermostat**

The sensor must be situated before the gas heater section behind the fan section. The thermostat must be situated so that it will start the fans to protect the air-handling components situated in front of the gas heater chamber if back air flow occurs.

**Air Quality Sensor – $CO_2$ (VOC, CO)**

The air quality sensors are placed in the outlet air duct or in the "representative" spots, thus ensuring objective air quality value measuring.

**VDK-10 Smoke sensor**

The smoke sensor is installed in the piping of the inlet or outlet branch, depending on the purpose of use. The VDK-10 sensor must be oriented correctly to the air flow, on the upper or side straight side of the duct, according to the manufacturer's installation diagram.

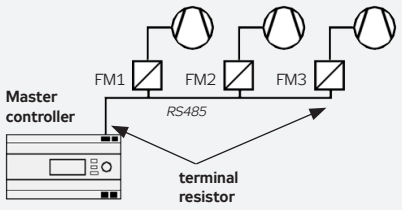
### Connection of the fan frequency inverters, heat exchanger to the Modbus bus

**Safety Conditions**

- Properly carried out transport, storage, installation, commissioning and careful handling is the main condition for correct and trouble-free operation.
- Protection, switching, wire routing and grounding must fully comply with the local regulations applicable for wiring.
- The 230/400 V AC power wiring must be strictly separated from the signal wiring (e.g. 24 V AC SELV)!

## Control and Protection Functions

**Figure 10 –** Inverter connection to the Modbus RTU




### Wiring

■ A shielded conductor must be used for the Modbus bus connection. The maximum conductor length depends on the communication speed. A maximum length of approx. 1000 m is recommended for the baud rate of 9600 Bd. The recommended conductors are included in the documentation created by the AeroCAD design program.

■ The controller is connected to two terminals marked A+ and B- and to the REF signal detection reference voltage terminal, which must always be interconnected with other participants on the bus.

■ To ensure correct functioning of the bus, the first and last device on the bus must be fitted with a terminal resistor. The first device, i.e. the master controller, terminal resistor setting is performed using the software (ensured by REMAK in the factory). The last device terminal resistor setting is performed on the last frequency inverter in the line connection. Refer to the Modbus bus wiring diagram. The setting procedure of the last terminal resistor is described in the documentation for a corresponding frequency inverter. A 120 Ohm resistor connected between the communication can also be used to terminate the wiring.

### Fan Failure Detection

■ To detect any fan failure, the motor thermo-contact and differential pressure sensor are connected to the frequency inverter inputs. The information provided by these elements is transmitted through the Modbus communication line to the control system, where it is processed.

### Modbus RTU Communication Settings

■ Each frequency inverter connected to the bus must be assigned a unique address as defined in the control system data points.

Pre-set Frequency Inverter Addresses – ModBus:

**Inlet Fan**

| | |
|---|---|
| Inlet fan | address =1 |
| Backup or twin fan | address =2 |
| Backup twin fan 1 | address =3 |
| Backup twin fan 2 | address =4 |

**Outlet fan**

| | |
|---|---|
| Outlet fan | address =5 |
| Backup or twin fan | address =6 |
| Backup twin fan 1 | address =7 |
| Backup twin fan 2 | address =8 |

**Auxiliary Fan**

| | |
|---|---|
| Auxiliary fan | address =9 |
| Twin fan | address =10 |

**Rotary Heat Regenerator**

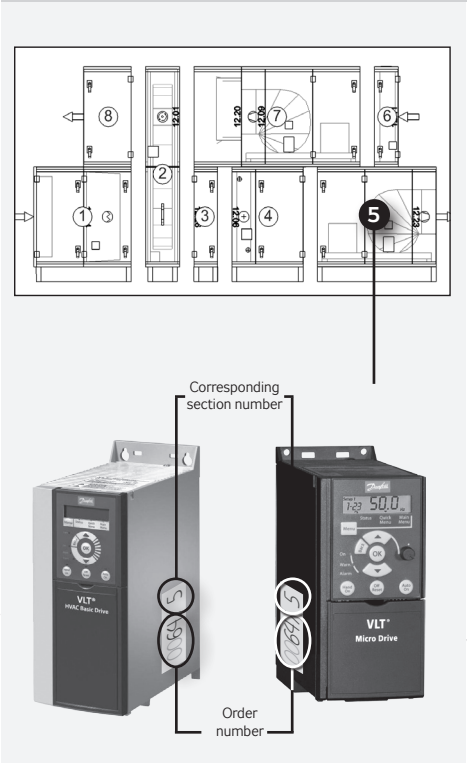
RHR motor address =11

■ The data points of all frequency inverters for communication with the Modbus bus must be set in accordance with the VCS control unit:

- Baud rate (9600 Bd – pre-set)
- Parity (none – pre-set)
- Number of stop bits (2 stop bits – pre-set)
- Response time limit
- Number of data bits (as standard, 8 bits – pre-set)

*All data points for the used frequency inverters are available on our website: www.remak.eu*

**Figure 11 –** Inverter association with a corresponding section




### Warning

Frequency inverters cannot be confused within different sections! Information on the assignment of a particular frequency inverter to the respective section is shown in the figure.

# Control and Protection Functions

*Note: This chapter describes only the basic control functions – the detailed design, respectively compatibility, of the entire device is ensured by the configuration performed using the AeroCAD design software. For more detailed information, contact the manufacture, REMAK a.s.*

## Main Control Features

The VCS control unit enables automatic control of the following basic functions for air temperature adjustment:

- Heating
- Cooling
- Mixing
- Recuperation (Heat Recovery)
- Dehumidification

PID controllers with pre-set control constants are assigned for all the above-mentioned functions. Basic settings of parameters are performed in the factory. The parameters can be changed using the HMI controller in the List of Data Points menu, item Control Constants.

A check, respectively optimization, of the unit settings must always be performed when commissioning the unit.

Control ensures energy-saving operation. Cascade temperature control – room temperature control or supply air temperature control.

The required temperature for the air-conditioned room can be set by selecting one of two temperature modes. Each mode has two pre-set temperature values to maintain the required temperature (an upper limit for heating and a lower limit for cooling). These values can be changed using the HMI controller in the List of Data Points, section Settings – Temperature Modes.

First, the control algorithm will start to control the functions which don't require energy, i.e. heat-recovery and mixing (depending on the user option). If this is not enough to maintain the required parameters or these features are not included in the air-handling unit, heating and cooling functions will be applied. If the heating or cooling control is not effective enough, an air output control will be added (heating/cooling-dependent fan speed compensation – user option). This control does not allow heating and cooling to be used at the same time, only one control sequence can be used at a time. This does not apply for special control application with controlled humidification where a cooler can be used for dehumidification and a heater for after-heating to the required temperature.

Heat pump, water and electric heater or gas heater functions can be connected to the heating control sequence. Heat pump, water cooler and condenser unit functions can be connected to the cooling control sequence.

## Temperature Correction and Limitation

The control unit enables adjustment and settings of the restricting limits for maximum and minimum supply air temperatures. In addition, it is possible to set the supply air and room temperature limits, respectively other correction or comfort options (e.g. set-point value compensation or heating/cooling-dependent fan speed compensation).

## Main Control Feature and Protection Description

Using the appropriate sensors, the VCS control unit can provide comprehensive protection of the air-handling unit, such as active antifreeze protection, fan state monitoring, filter fouling or over-temperature detection of the required temperature. Any deviations from the defined states or parameters are monitored and signalled and simultaneously, safety features are activated.

Depending on the failure consequence, the following happens:

The failure is only signalled and safety features are automatically activated. Once the failure has ceased, the unit will return to the standard mode without interference from the operator.

If a serious failure occurs, the unit will be switched to the STOP mode, and it can only be restarted after the failure has been removed and the operator's interference.

The VCS control unit system enables the air-handling unit behaviour (fan action) to be set when fire is detected (external failure, inlet or outlet air high temperature).

The settings can be as follows: the inlet or outlet fan is activated, both fans are activated or both fans are stopped (air-handling unit shutdown). The control unit is switched to the fire mode. The settings can be performed using the HMI controller in the List of Data Points, section Checks, System and Network Settings – Fire Alarm.

## Heating Control

Control is based on the required temperature, i.e. the selected temperature mode and data from the supply air temperature sensors, outdoor temperature and the water heat exchanger return water temperature. Control can be affected by correction values, maximum and minimum limits or antifreeze protection.

## Water heating

It is controlled by the SUMX mixing set actuator using a 0–10V continuous control signal (working range of 2–10V).

### Heating Mixing Set Pump Control

The mixing set pump is controlled depending on the outdoor temperature value and valve position (required heater output).

If the air-handling unit is in the STOP and Run mode, the pump is switched on when the outdoor temperature drops below 5ºC and switched off when the outdoor temperature rises above 6ºC. In this case, the pump is stopped without any run-down.

If the air-handling unit is in the Run mode, the pump is controlled by the valve actuator control algorithm. The pump is switched on when the request for the valve opening is higher than 5%.

If the pump has not been used for 168 hours, it will be switched on and turned for 60 seconds.

Failures (electrical) of the pump are sensed by the pump circuit breaker's auxiliary contact even in the STOP mode.

### Water Heater Antifreeze Protection Operation

The VCS control unit uses so-called active antifreeze protection. It uses a three-stage concept.

Antifreeze Protection Features:

## Control and Protection Functions

- Switching of the unit to the STOP mode
- Switching off of the fans
- Closing of the dampers
- Freezing danger signalling
- Mixing set control
- Pump starting

If the air-handling unit is in the Run mode, then antifreeze protection is activated when the outdoor temperature drops below 10 ºC (factory settings) and the water heat exchanger return water temperature drops below 15 ºC (factory settings). The extent of the mixing valve opening depends on the water heat exchanger's return water temperature value. Antifreeze protection will be deactivated when temperatures rise above the limit parameters.

If the air-handling unit is in the STOP - STAND-BY mode, then antifreeze protection is activated when the outdoor temperature drops below 10 ºC (factory settings) and the water heat exchanger's return water temperature drops below 30 ºC (factory settings). The extent of the mixing valve opening depends on the water heat exchanger's return water temperature value. Antifreeze protection will be deactivated when temperatures rise above the limit parameters.

The control unit continuously monitors the water heat exchanger's return water temperature. If the temperature is still falling and drops below 8ºC (factory settings), the following protection actions will be immediately taken regardless of the outdoor temperature:

The air-handling unit will be shut down, the dampers will be closed, the fans will be switched off and the failure alarm will be activated.

The mixing valve will be opened depending on the water temperature, and the circulation pump will be switched on.

The above-mentioned state will last until the operator checks the air-handling system or removes the failure cause and confirms the air-handling system is free of failure and resets the failure.

The control unit simultaneously monitors the supply air temperature in the Run mode. If the supply air temperature drops below 6 ºC (factory settings), the following protection actions will be immediately taken regardless of the outdoor temperature:

The air-handling unit will be shut down, the dampers will be closed, the fans will be switched off and the failure alarm will be activated.

The mixing valve will be opened depending on the water temperature, and the circulation pump will be switched on.

**Pre-Start Unit Pre-Heating Functions**

To avoid false freezing danger assessment in winter or during transition seasons, especially when the air-handling unit is being started, the control unit features a heating circuit pre-heating.

Pre-heating is dependent on the outdoor temperature value. If the outdoor temperature is higher than 10 ºC, the value of the valve opening will be 0 %, and pre-heating will not be activated.

Pre-heating will be activated when the outdoor temperature drops below 10 ºC. The mixing set valve will be forced to open to the value which is derived from the outdoor temperature (factory settings: +10 ºC = +10 %, -10 ºC = 100 %) for 120 seconds. Once this time has elapsed, the valve will be closed, "ramped down", until the mixing set control signal for heating is reached.

If the air-handling unit is restarted within 5 minutes of the moment the air-handling unit was shut down, pre-heating will not be activated.

Antifreeze protection setting parameters can be accessed through the HMI controller in the List of Data Points menu, sections *Parameters and Control Constants*.

### Electric Heating

Electric heating can be controlled using the following options:

- Switching of the full EO, EOS heater output
- Sequential switching of the EOSX electric heater's individual sections
- Sequential switching of the EO heaters
- Control of the EOS electric heaters using a PV valve (up to 45 kW)

**Electric heater protection**

If electric heater overheating (failure) is signalled (the temperature inside the heater exceeds +80 ºC) by opening the emergency thermostat contacts in the heater, this signal is interpreted by the control unit.

Electric heater control in the REMAK unit is doubled – the heater thermostat failure signal is simultaneously sent to the controller and auxiliary module.

The controller will interpret the failure signal and perform appropriate safety functions; first, the control signal for electric heating is blocked and then the heater contactor is disconnected.

The auxiliary safety module will mechanically disconnect the EO/S/X circuit breaker (i.e. it will trip the under-voltage trigger of the circuit breaker).

At the same time, control logic will ensure safe cooling of the heater when the air-handling unit is being shut down – transition to the STOP mode. The controller will ensure run-down of the fans (optional) so that the heating core is cooled.

### Gas heating

The gas heater is controlled using a burner output controller and a bypass damper (if the section is equipped with a BP damper). The required heating temperature is controlled depending on the required temperature (selected mode) and the readings from the inlet temperature, outdoor temperature and flue gas temperature sensors.

**Gas Burner Output Control**

- Single-stage ON/OFF control
- Two-stage control (two output stages)
- Modular (three-point), step-less control of the entire burner output range

Burner lighting is contingent on the fan operation.

At a 5 % request for heating, the 1st burner output stage is switched on. The minimum pre-set running time of this stage is 150 seconds. If the required temperature is not reached, the 2nd stage will be switched on at 70 % of the request for heating (two-stage output control). The second output stage is not restricted to the minimum running time, and will be switched off at 40 % of the request for heating.

## Control and Protection Functions

Further re-lighting of the burner is possible once the protection time of 150 seconds has elapsed. Modular control of the burner is step-less based on the actual requirement (set point) within the Min to Max output range of the gas burner.

**The bypass damper** (if included in the section) is controlled by a 0-10V signal (the operating range is 2–10 V depending on the required flue gas temperature (160 ºC pre-set). The regulating damper position controls the air flow coming through the gas section and bypass section so that a constant flue gas temperature is maintained. Accordingly:

- when $T_{flue\ gas} > T_{flue\ gas\ required}$ the bypass damper closes (closed = **0 V**)
- when $T_{flue\ gas} < T_{flue\ gas\ required}$ the bypass damper opens (open = **10 V**)

### Protection and Safety Functions:

The control unit ensures fan run-down to cool down the gas sections (the pre-set run-out time is 180 s). The gas section (chamber) temperature for protection and safety functions outside the VCS control system is picked up by the ESD3J triple electronic safety thermostat (located on the chamber) while the temperature before the heater chamber is picked up by the TH167 stem thermostat (it is necessary to install this thermostat when connecting the control system and set it to 50 ºC). The system of safety thermostats along with the control unit provides the following functions:

- If a temperature of 50 ºC (T3) is exceeded, even in the STOP mode, forced switching of fans (and opening of dampers) is activated in order to cool down the heater chamber.
- If a temperature of 80 ºC (T2) is exceeded in the Operating mode, the heater output control signal is switched off. When the temperature falls, this signal is switched on again. This is an operation safety function with no signalling of the failure.
- If a temperature of 110 ºC (T1) is exceeded, forced disconnection of the burner from the supply voltage is performed and this state is maintained until the thermostat is reset by the button located on its body. The reset cannot be performed until the chamber has cooled down to below the temperature evaluating threshold. Before the burner can be reset or restarted, it is necessary to evaluate and remove the reason for overheating (by-pass cannot be closed, insufficient air flow though the heat exchanger, exhaust gas temperature setting, etc.). The T1 stage of the triple thermostat is detected by the control unit (including/in series with the burner failure when it is not disconnected form the power supply) which initialises the Burner (heater) failure message and switching off of the unit (STOP) with run-out of fans to cool down the chamber.
- If the air back draught (chimney effect) occurs during the STOP mode and the air temperature in front of the gas section rises above 50ºC, the TH 167 thermostat will close and switch on the fans, open the inlet and outlet dampers, and thus the gas heater will be cooled down.
- Fan failure – the unit is immediately switched to the STOP mode without fan run-out (evaluated also during the STOP mode).
- The control unit monitors the states of the control sensors and evaluates exhaust gas overheating as well as failures of sensors.

### Heating and Cooling using Heat Pump

Two general control options are available for heat pumps. Control is not fixed to a specific heat pump type. The control option selection depends on the designer's consideration and heat pump type. Two control contacts and an analogue output are used for control.

#### Option A

The first digital contact is used to define the air temperature adjustment type – cooling/heating. The second digital contact is used to define the process activation – off/on. The analogue output 0..10 V represents the proportion of the request for heating or cooling.

#### Option B

The first digital contact is used to define the heating process – heating off/heating on. The second digital contact is used to define the cooling process – cooling off/cooling on.
Analogue output 0..10 V represents the proportion of the request for heating or cooling.
The heat pump control is equipped with an outdoor temperature-dependent blocking. The blocking alert is only informative and is not a failure state. The heat pump will be shut down if the outdoor temperature is equal to or lower than the reference temperature (see the Data Points). The heat pump will be started if the outdoor temperature is higher than the reference temperature (with hysteresis of 3 ºC). Frequent switching of the heat pump is eliminated by blocking of the cooling/heating restart for 120 seconds. The minimum operating time of the heat pump can also be set. When cooling/heating is required, the heat pump will be switched on at 20% of the control signal and switched off at 10% of the control signal (hysteresis of 10%). The low reference signal on the analogue output (0-10V) can be set in a range from 0% to 50 % of the control signal (pre-set 30 %, i.e. a 3-10 V control). The unit can be equipped with a function blocking the air-handling unit operation when defrosting the heat pump. The shut-off state of the air-handling unit is indicated on controllers. After the heat pump defrosting process has been completed, the air-handling unit operation will automatically be resumed.
Furthermore, it is possible changing behaviour of different control signals, e.g. AO signal inversion (see Data Points).

### Cooling Control

All cooling sources can be disabled depending on the outdoor temperature. Cooling is not disabled if the outdoor temperature is higher than the pre-set cooling enable temperature (pre-set 12 ºC).

#### Water Cooling

It is controlled the same way as water heating. The mixing set pump is switched depending on the control signal for the cooling valve. If the air-handling unit is in the Run mode, the pump will be switched on when the control signal for the cooling valve is higher than 5% and switched off when the control signal for the cooling valve is lower than 1%.

- Pump turning for 60 seconds is performed after every 168 hours of pump inactivity.

#### Direct Cooling

Direct cooling is controlled by switching the condensing unit output or by step-less control of the inverter condensing unit.

## Control and Protection Functions

If a single-circuit condensing unit is used, it will be switched on when 20 % of the control signal is required and switched off at 10 % (10 % hysteresis) of the control signal. If a double-circuit condensing unit, respectively two single-circuit condensing units are used, two stages will be switched. The first stage will be switched on when 20% of the control signal is required and switched off at 10% (10% hysteresis) of the control signal. The second stage will be switched on when 70 % of the control signal is required and switched off at 60 % (10 % hysteresis) of the control signal. Frequent switching of the single-stage condensing unit is eliminated by repeated cooling blocking for a certain time depending on the setting.
To eliminate the simultaneous switching of both stages at a sudden control signal increase, the timing (duration of the first stage) is set.

**Inverter Cooling Unit**

It is controlled using the start enable signal and step-less compressor output control signal. The minimum operating time can also be set. The condensing unit will be switched on when 20 % of the control signal is required and switched off at 10 % (10 % hysteresis) of the control signal. The unit compressor speed is controlled using a 0–10 V control signal.

**Inverter Unit and Single-Stage Condensing Unit Combination**

When cooling is required, the inverter will be switched on first and then the output will be raised to the maximum. Consequently, the single-stage condensing unit is switched on while the inverter output is lowered to 30 % of the control signal. If the request for cooling is still rising, the inverter output will be increased from 30 % up to the maximum level of the control signal.
If the request for cooling is decreasing, the inverter output will start to decrease and will be switched off at 0% of the control signal. The single-stage condensing unit is still in operation. In this phase of control, time blocking of the inverter is applied and simultaneously the single-stage condensing unit is prevented from being switched off. If the request for cooling is still decreasing once this time has elapsed, the inverter will be switched on with a maximum control signal and the single-stage condensing unit will be switched off. When the single-stage condensing unit is switched off, the inverter output will be at the maximum. Then the inverter output is reduced in accordance with the request. Thus step-less control is ensured in the entire cooling capacity range.

**Direct Evaporator Protection**

This protection is ensured using the CAP 2M capillary thermostat, which disconnects the control signal in the event of ice build-up on the evaporator. If two evaporators are used, each of them will have its own thermostat.

### Heat Recovery Control

Heat Recovery control of the rotary heat regenerator is ensured by step-less control using the heat exchanger frequency inverter through the Modbus communication bus. The plate heat exchanger, respectively plate heat exchanger bypass, is controlled using a 0–10 V (2–10 V) continuous signal. 100% of the step-less control signal equals 100 % heat recovery, i.e. maximum speed of the rotary heat regenerator or closed bypass of the plate heat exchanger. A digital output for two-point control (ON/OFF) is another option – thus, for example, the glycol circuit pump can be switched.

### Heat Exchanger Antifreeze Protection

■ Rotary heat regenerator protection is ensured using the NS 120 temperature sensor situated in the outlet air duct behind the heat exchanger. If the temperature drops below the pre-set ice build-up threshold, the speed of the rotary heat regenerator will be reduced. If the speed reduction is not enough to de-freeze the heat exchanger, the heat exchanger will be stopped. The heat exchanger speed reduction depends on the PID controller's constant setting.
■ Similarly as the rotary heat regenerator, control of the plate heat exchanger is ensured using the NS 120 temperature sensor and bypass actuator control. If the temperature behind the plate heat exchanger drops below the pre-set ice build-up threshold, the bypass damper actuator will be activated and the damper will stay open until the ice build-up melts from the heat exchanger. A pressure loss sensor or a CAP 3M capillary probe can also be used in some cases.
Protection of the plate heat exchangers without bypass can be ensured by a fan speed reduction.

### Plate heat exchanger – air-handling unit run-out

In some cases, the run-out will be performed when the air-handling unit is stopped. This will ensure drying of the heat-exchanger and prevent the creation of conditions for the growth of microorganism. Temperature and humidity sequences are active during this run-out. This feature is conditioned by previous operation of the heat recovery and the outside air temperature. As default, this feature is switched off. For the change in all values, refer to List of Data Points – Fans.

### Mixing Damper Control

It is ensured by step-less control of the mixing damper actuators using a 0–10V (2–10V) continuous signal. The signal is directly proportional to the air circulation, i.e. 100 % of the signal corresponds to 100 % of the required air circulation (0 % of fresh air).
The maximum level of air recirculation (when the fans are running) is limited by the minimum (hygienic) request for fresh air. If the device is in the STOP mode, the inlet and outlet duct dampers are closed and the circulation damper is open.

### Heat Recovery and Mixing Economy Control

If the temperature in the room (in the outlet duct) is lower than the outdoor temperature and a request for cooling simultaneously exists, the heat recovery and air recirculation functions will be automatically switched on at the maximum level to minimize the energy demand for cooling. This happens if the temperature difference reaches 3 ºC (the room temperature is lower than the outdoor temperature) while the temperature in the room (in the outlet duct) is higher than the required temperature and the difference between these two temperatures is at least 2 ºC.
Heat recovery and mixing functions will be switched off when the outdoor temperature is lower or equal to the room (outlet air) temperature, or the room (outlet air) temperature is higher

or equal to the required room temperature. Heat Exchanger control function activation settings are described in the chapter *Additional Operating Mode and Function Setting Options*.

**Heat Recovery and Mixing Control at Air-Handling Unit Start-Up**

The starting outdoor temperature and time are set for heat recovery and mixing (see Data Points). If the outdoor temperature is lower than the pre-set value at the air-handling unit start-up, the heat recovery and mixing functions will be switched on at the maximum level.

**Mixing Sequence Selection**

The mixing sequence for heating control is optional – the pre-set sequence for heating is as follows: first, the mixing function is applied and if the request for heating still increases, then the heating function will be applied (pre-set). This sequence can be changed according to user needs, see the chapter *Additional Operating Mode and Function Setting Options*.

## Humidity Control

The control unit evaluates the control signal for humidification or dehumidification depending on the room and inlet humidity sensors and the required humidity selected by the user.

**Humidification**

Humidification control can be ensured by two methods. Depending on the technology used, control for the required humidity can be performed by the VCS control unit or by an autonomous control (e.g., integrated into the humidifier).
In the first case, humidity control is ensured by the VCS control unit. Settings of humidity set-points and control parameters are included in the VCS control unit. The same applies for dehumidification. Thus, full accord of dehumidification and humidification control is ensured and unsuitable settings of set-points cannot be made. Furthermore, all the necessary parameters and information can be found in the control unit controllers. The control unit sends the start command, the request for humidification output to the humidifier, and monitors humidifier failures.
If autonomous control is used, the control unit sends information on the air-handling unit operation to the humidifier. In this case, control for the desired humidity is fully ensured autonomously by a specific humidifier. The control unit has no information about the state or output of the humidifier.

## Dehumidification

Air dehumidification is ensured by water or direct cooling. In case of dehumidification, after-heating is ensured by the heater, which is situated after the cooler. The control unit evaluates the control signal for the air cooler and heater depending on the room sensors and the required humidity selected by the user. The humidity in the room can be set from 20% to 95%. If the air-handling unit is equipped with a water cooler or a condensing unit with an inverter, the humidification process can be controlled using 0–10 V (2–10 V) step-less control. If the air-handling unit is equipped with a one-stage or a two-sage condensing unit, the humidification process is controlled using step control. When cooling is active due to a request for dehumidification, air after-heating is allowed (exceptionally) using the heater situated after the cooler.

If the request for heating is increased above 90 %, the request for dehumidification cooling is gradually reduced until the required inlet air temperature, respectively zero value of the request for cooling (at 100 % request for heating), is achieved – temperature control is prioritised to humidification.

# Auxiliary Control Functions

## Pre-heating function

Pre-heating is switched ON/OFF depending on the pre-set outdoor temperature value (pre-set 5 ºC).
The electric pre-heater (EO) is switched using a contactor. It is controlled according to the pre-set (required) temperature and compared with the temperature behind the preheater (measured by the NS 120 sensor). If the air-handling unit is switched off when the EO pre-heater is active, run-down of the fans will be performed. Failures are evaluated similarly as with EO heaters but the system is not shut down.
Water pre-heating is controlled by switching the pump (not included in the REMAK delivery) depending on the request for pre-heating. Antifreeze protection is ensured by a temperature sensor (NS130R) situated in the water heat exchanger return line. If the water temperature in the water heat exchanger's return line drops below the pre-set value, the freezing alarm will be activated, including safety functions, and the air-handling unit will be stopped.

## Auxiliary After-Heating Function with EOS

This function is applied when the main heater output is not sufficient (e.g. when water heating is shut down during transition seasons, etc.) It is possible to restrict the maximum electric after-heater output for each output stage. Thus correct cooling of the heating rods is ensured (see the Data Points). The electric after-heating function can also work as an independent sequence with its own settings of required temperatures. The electric after-heating function is disabled in the following cases:

- When night chilling is active
- During temperature start-up

## Heating Water Source Switching

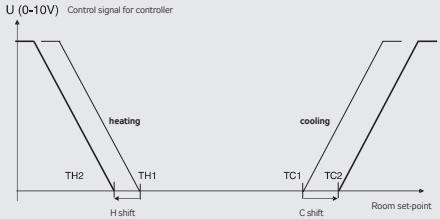
If this auxiliary function is active and the controller detects the need for heating water (request for air heating), the output for the heating water source (boiler) will be switched on – if the device is started in advance before the fans have been switched on. This function will only be applied if the outdoor temperature is higher than the pre-set value (factory settings: 15 ºC) otherwise the output is switched on permanently. Correct operation of the assembly must be ensured by suitable settings of the device start-up sequence parameters. To enable the heating water source switching function's correct operation, the outdoor temperature sensor must be installed so it will be able to read the actual outdoor temperature.

## Heating cable switching

In cases where a heating cable is used as a frost protection for condensate drain siphons, the control unit ensures its switching according to the outside temperature. The preset switching temperature is 2 º C (hysteresis 1 K), the power according to the cable used is self-regulated.

## Control and Protection Functions

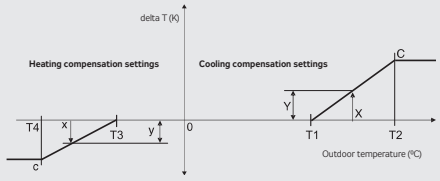
**Figure 12 –** Actual set-points with compensation (shift)




TH1.....Basic set-point of the required temperature for heating – upper heating limit
TH2.....Actual/current set-point of the required temperature for heating – upper heating limit = (TH1 - shift H)
TC1.....Basic set–point of the required temperature for heating – upper cooling limit
TC2.....Actual/current set-point of the required temperature for heating – upper cooling limit = (TH1 -shift C)

**H shift** for heating set-points
(A negative shift causes a reduction in the required temperature for heating.)
**C shift** for cooling set-points
(A negative shift causes a reduction in the required temperature for cooling.)

**Figure 13 –** Set-Point Compensation (Shift) Description and Settings




T3 .....Starting point for heating compensation
T4 .....End point for heating compensation
c .....Max. compensation value (delta T)
x.....Actual outdoor temperature
y.....Required heating set-point shift

T1 .....Starting point for cooling compensation
T2 .....End point for cooling compensation
C.....Max. compensation value (delta T)
X.....Actual outdoor temperature
Y.....Required cooling set-point shift

## Temperature Required Value Compensation

Temperature compensation is actually a correction (shift) of the required value (set point) of the controlled (room) temperature according to the outdoor temperature sensor reading, which adjusts (in addition to other correction values) the temperature specified in the temperature mode settings. It is mainly used to reduce differences between outdoor and indoor temperatures (to eliminate thermal shocks) and the energy demand of device operation. On the other hand, it can increase differences ("aggressiveness") in control, if adjusted reversely.

*Note: The data point values on the controller are described in full text (not using abbreviations like TH1, TC1, etc.). Generally, minus control is also possible.*

## Fan Speed Compensation

The VCS control unit system enables the pre-set fan speed to be adjusted depending on the air temperature, air quality or mixing damper position using fan speed compensations. The sum of individual compensations creates a so-called total compensation which affects the fan speed change.

### Outdoor Temperature-Dependent Fan Speed Compensation

The compensation adjusts the fan speed in regards to high or low outdoor temperatures. The fan speed is adjusted depending on the maximum heating or cooling compensation settings. A positive compensation value represents a fan speed increase. A negative compensation value represents a fan speed reduction.

*Note: To make the compensation effective, it is necessary to set a suitable maximum compensation value if only one compensation is used.*

### Room (Outlet) Temperature-Dependent Fan Speed Compensation

The fan output is adjusted depending on the required room temperature and the measured room (supply air) temperature. The compensation will be activated if the measured temperature is lower than the required temperature.
Using the compensation function, the fan speed can either be increased or reduced.

### Heating/Cooling-Dependent Fan Speed Compensation

The request for heating or cooling is evaluated by measuring the supply air temperature and comparing it with the required supply air temperature and then followed by fan output compensation. The compensation will be activated if the difference between the required supply air temperature and the actual supply air temperature is greater than the pre-set temperature hysteresis. The actual correction extent is related to the settings of the PID controller constants.

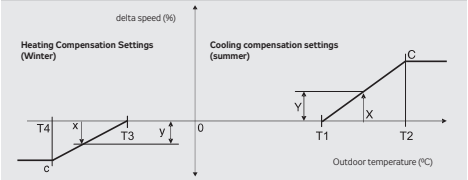
- **Heating Compensation:** It reduces the fan output and thus sufficient supply air heating is achieved based on the smaller air volume (used to eliminate insufficient output of the heat exchanger).
- **Cooling Compensation:** It increases the fan output (higher air-flow rate) and thus makes the room environment more comfortable, if cooling is insufficient.

This type of compensation also enables a change to the priority cooling – fan. So the change in the fan speed is applied first and then active cooling is applied as the request for cooling is rising. The settings can be performed using the HMI controller, refer to the chapter Additional Operating Mode and Function Setting Options.

### Air Quality-Dependent Fan Speed Compensation

The fan output can be adjusted depending on the measured $CO_2$ (VOC, CO) content and the pre-set required value. If the $CO_2$ (VOC, CO) content is higher than the pre-set (permissible) value, the fan speed will be increased. The compensation extent is affected by the settings of the PID controller constants. The measured value range must be set depending on the sensor used. Further, the sensor characteristic (Normal ascending for $CO_2$ and VOC or Inverse descending for CO) must be set. For the settings, refer to the Data Points.

**Figure 14 –** Fan Speed Compensation Description




T3 .....Starting point for heating compensation
T4 .....End point for heating compensation
c .....Max. compensation value (delta T)
x.....Actual outdoor temperature
y.....Actual fan speed shift for heating

T1 .....Starting point for cooling compensation
T2 .....End point for cooling compensation
C.....Compensation value (delta T)
X.....Actual outdoor temperature
Y.....Actual fan speed shift for cooling

## Control and Protection Functions

**Air Quality-Dependent Damper Position Compensation**

Functionality is similar and the settings are common with the air quality-dependent fan speed compensation. The fan output or mixing damper position can be affected by the difference between the measured and pre-set required $CO_2$ (VOC, CO) concentration in the room. The volume of fresh air will be increased if the measured value is higher than the required value. The volume of circulated air will be decreased. The compensation extent is affected by the settings of the PID controller constants.

**Humidity-dependent Damper Position Compensation**

If dehumidification using cooling is not sufficient (or not available), humidity-dependent mixing damper position compensation is the next step. This is adjusted depending on the required humidity and measured humidity in the room. If the measured humidity is higher than the required humidity in the room, the compensation will be activated.

**Humidity-dependent Fan Speed Compensation**

The fan output is controlled depending on the required humidity and measured humidity in the room. If the measured humidity is higher than the required humidity in the room, the compensation will be activated. The compensation function can either be set to increase or reduce the fan output.

The compensation functions can be enabled using the HMI controller, refer to the chapter *Additional Operating Mode and Function Setting Options*.

### Fan Speed Control

The VCS control unit enables either software or manual air output control, i.e. the speed of the following fans:

- Single-speed fans (ON/OFF control)
- Two-speed fans (two-stage control)
- Single-speed fans' backup (ON/OFF control)
- Five-stage TRN voltage controllers
- Fan frequency inverters using the Modbus bus – five-stage control

A standard control can be completed with a 3rd auxiliary fan which is controlled from the outlet or inlet fan depending on the control unit configuration.

**Two-Speed Fans**

The two-speed fans are always started using the first stage at the air-handling unit start-up. The transition time from the first to second stage can be adjusted. The transition time can also be adjusted for the reverse transition from the second to the first stage.

**TRN Voltage Controllers**

The control unit enables the voltage controllers to be connected and controlled in five output stages. Depending on the request, inlet and outlet control can be common or independent. The required output stage is always set in common. If the fans are controlled independently, it is possible to set the outlet controller correction against the inlet controller (see the Data Point Settings – TRN Correction). However, the control unit must be specially manufactured for this function (depending on the customer request). Either the same correction can be set for all the speed stages or for each speed stage independently. For the correction settings, refer to the chapter Optional Function and Mode Settings.

**Frequency Inverters**

For five-stage control devices, the request for the inlet and outlet fan speed is set in common. However, for frequency inverters, the request for the inlet and outlet fan output (0-100%) can be set separately for each stage (1 to 5) (see the Data Point Settings – Fans).

**Single-Speed Fan Backups (ON/OFF Control)**

The backup motor is started if the main motor fails. The backup is used either for the inlet or outlet fan, respectively for both. The motors are equipped with thermal protection (thermo-contact) and current protection. If the backup motor has been started, it is not possible to restart the main motor without resetting the failure. The main and backup motor current protection has a delay pre-set. Switching from the main to backup motor is immediate without delay if the main motor fails.

**Backup fan control via Modbus communication bus**

Using the Modbus communication bus, the five-stage fan control enables a backup fan or a pair of backup fans to start up if the main fan fails. If the backup fan or pair of backup fans fails, the air-handling unit will be shut down. Information about air-flow failures and motor overheating is sent via the Modbus communication bus and signalled accordingly.

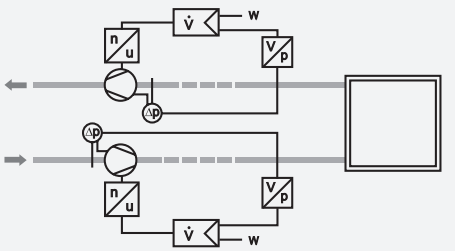
## Constant Air Flow/Pressure Control

When designing constant flow, pressure, overpressure and underpressure control, it is advisable to consider the overall design of the air-handling unit, respectively application of the mixing damper, and how the control behaviour can affect the measured pressure value.

### Constant Air Flow Control

Fan speed is controlled depending on the desired air flow rate ($m^3/h$). The air flow rate (air pressure in the diffuser recalculated to the air flow rate using the "k-factor") is measured by a sensor; the control system evaluates this value and compares it with the required value. The resulting fan speed is controlled so that the required air flow rate will be reached at the point of measurement (fan diffuser).

**Figure 15** – Constant Airflow Control



## Control and Protection Functions

**It is necessary to set the following pressure sensor parameters (see the Sensor Operating Manual):**

- Mode (for CPG = Mode 5.00)
- Measuring range: As needed

The correct range can be determined using a formula: $\Delta p_{max} = \frac{V^2_{max}}{k^2}$

(where k = "k-factor", Vmax = designed air flow rate of the device). The correct sensor range is then set according to the calculated pmax value.

- K-factor of the respective fan

**It is necessary to set the following parameters of the VCS control Unit (see List of HMI Data Points):**

- Air flow sensor measuring range – (maximum value from the CPG air flow sensor in $m^3/h$)
- This can be calculated using the formula or read from the CPG sensor menu (see the Sensor Operating Manual).
- The maximum measured air flow rate can be calculated according to the following formula:

$V_{max} = k \times \sqrt{\Delta P_{max}}$

Example: K-factor = 308, Maximum sensor range Pmax = 2000 Pa, Vmax = 13774 $m^3/h$. This value is then entered as the maximum range of the sensor in the VCS using HMI.

*Note: In AC, the "Max. Air Flow Rate" is stated for the fan assemblies. Attention! This is not the maximum range of the air flow sensor to be entered in the VCS control unit.*

- Number of fans (for twins = 2). The air flow rate of one fan is measured and is then multiplied by the number of fans.
- Required values (separately for the inlet and outlet fans) 5 required values are available for selection.

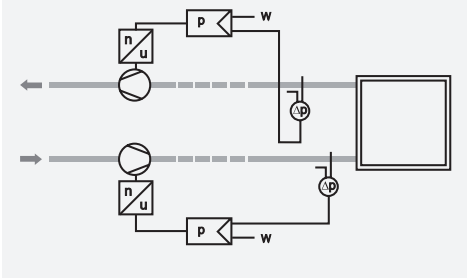
### Constant pressure control

Fan speed is controlled depending on the desired air pressure (Pa). The air pressure is measured by a sensor; the control system evaluates this value and compares it with the required value. The resulting fan speed is controlled so that the required air pressure will be reached at the point of measurement.

**It is necessary to set the following air flow sensor parameters (see the Sensor Operating Manual):**

- Mode (for CPG = Mode 4.00)
- Measuring range: As needed (200 Pa, resp. 1000 Pa)

**Figure 16** – Constant pressure control




**It is necessary to set the following parameters of the VCS control Unit (see List of HMI Data Points):**

- Air pressure sensor measuring range – (maximum value from the CPG air pressure sensor in Pa)
- Required values (separately for the inlet and outlet fans). 5 required values are available for selection.

**Constant Air Flow + Overpressure in the Room Control**

The inlet branch (fan) is adjusted to the constant air flow so that the required air volume is delivered to the room. The outlet branch is adjusted to the required difference in overpressure in the room. Thus, the outlet fan is adjusted to the required pressure (overpressure) depending on the pressure sensor location.

**Application:** Preventing dirt from entering the room.

**Constant Air Flow + Underpressure in the Room Control**

The outlet branch (fan) is adjusted to the constant air flow. The inlet branch (fan) is adjusted to the difference in underpressure in the room. Thus, the inlet fan is adjusted to the required pressure (underpressure) depending on the pressure sensor location.

**Application:** Preventing dirty air from entering the adjacent rooms

*Note: When commissioning the system, it is necessary to perform the settings and regulation of the device (PID constants, FI ramp, etc.)*

## Basic Information on VCS Operating Modes

### Operating states

There are three operating states defined for VCS control units (Stop, Run, Auto):

**Stop** – The device is in standstill mode (fans stopped). Important safety features like antifreeze protection and moderate pre-heating of the water heater are retained.

**Run** – The device is started in accordance with the pre–set temperature mode and fan speed.

**Auto** – Control is switched to the next operating mode with a lower priority. The Auto operating state cannot be set in the time schedule mode because it is a control type with the lowest priority.

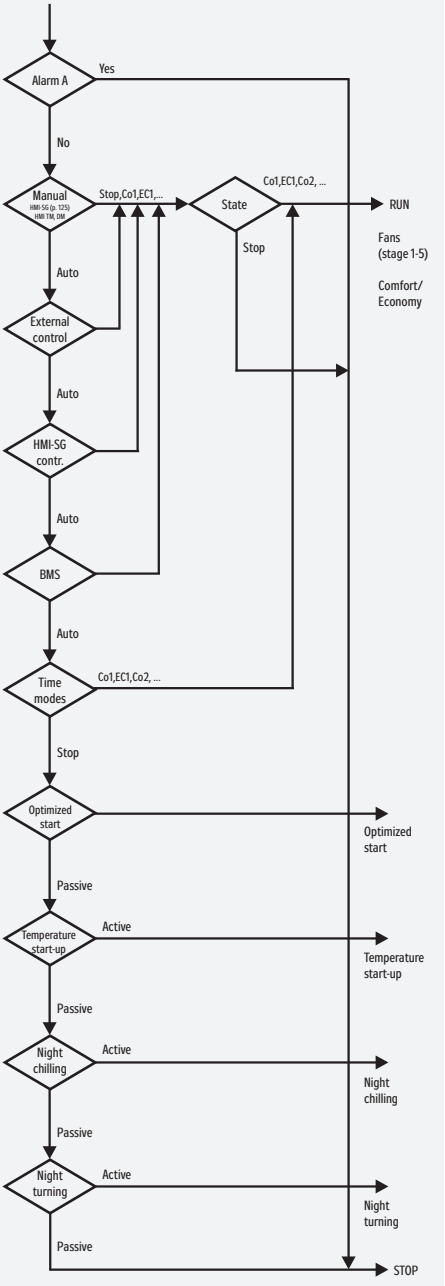
The operating mode determines which operating state will be active according to priorities (see Operating Modes).

### Operating Modes

The control unit's operating state (i.e. whether the air-handling unit is in the Stop or Run state) is determined by one of the operating modes (manual control, external control, HMI-SG controller, BMS or time schedule modes). HMI-DM or HMI-TM controllers affect control in the manual control mode. External control is performed by single- or two-contact control. BMS control enables control of the control unit by the higher level control device (e.g. smart building control systems; Note: pending). To control air handling systems, the HMI-SG controller is connected to the control unit.

## Additional Operating Modes

**Figure 17** – Operating modes




The operating mode which will determine the device's operating state (Run or Stop) is determined by the priority. Each operating mode is assigned a priority, i.e. the first option to control the control unit, to eliminate mutual interference. The operating modes are prioritized as follows, from the lowest to highest priority:

- Manual control
- External control
- Local HMI-SG controller
- BMS (pending)
- Time schedule
- Additional operating modes

The priorities and entire control system are shown in the diagram (Figure 17 ).

The fan speed control parameters are available through the HMI controller in the List of Data Points in the section Settings – Fans (inlet fan backup, outlet fan backup, TRN correction).

### Air-Handling Unit Additional Operating Modes

If no operating mode is applied and the time schedule mode is in the Stop state, the air-handling unit can be started from additional operating modes. The user can use the following additional operating modes to start the air-handling unit:

- Night chilling
- Temperature start-up
- Optimized start

Additional operating modes can be activated by the HMI-SG controller in the List of Data Points in the section Settings – Additional Operating Modes, Functions.

#### Control Application Starting Algorithm

Air-handling system operation safety is assessed first (fire detection and operational safety of the air-handling devices). Then the operating modes and their priorities are assessed (Manual, External, HMI-SG controller, BMS and time modes). If no control mode is currently used, the air-handling unit can, but may not, be put into one of the additional operating modes depending on the user's option. All the operating modes and their correlation are shown in the figure # 10 - "Operating modes". The current operating mode can be monitored through the HMI controller in the List of Data Points in the section Monitor – Current Modes.
When the fans run and the air-handling unit is in operation, two basic groups of parameters are used to control operation:

- Temperature mode
- Fan output (speed)

The fan output or speed can be set directly at levels corresponding to the air-handling system configuration:

- Single-speed motor fans:
  >> Stage 1
- Two-speed motor fans:
  >> Stage 1 / Stage 2
- All five-stage controlled fans:
  >> Stage 1 / Stage 2 /
  Stage 3 / Stage 4 / Stage 5

See the chapter Fan Speed Control.

## Additional Operating Modes

### Night Chilling

During night chilling, cold outdoor air is used to cool internal rooms of the buildings, thus excess heat accumulated in buildings during the day in summer months is removed. Night chilling minimizes the use of cooling devices and reduces the energy demand for temperature control day hours. During night chilling, the inlet and outlet dampers are fully open and fans run in the highest output stage. Night chilling start-up is enabled 12 hours before activation of the selected time schedule.

***Activation***

When the following conditions are fulfilled simultaneously:

- $T_{VEN} > T_{MIN}$
- $T_{VEN} < T_{PRO} - \Delta$
- $T_{PRO} > T_{ŽÁD} + T_{HYS}$

***Termination***

If one of the following conditions is fulfilled:

- Once minimum operating time has elapsed while no time mode is active (Stop mode)
- $T_{VEN} > T_{PRO} - 1$
- $T_{PRO} <= T_{ŽÁD}$

| | |
|---|---|
| $T_{MIN}$ | Minimum outdoor temperature; |
| $T_{VEN}$ | Outdoor air temperature; |
| $\Delta$ | Outdoor and indoor temperature difference |
| $T_{ŽÁD}$ | Required room temperature |
| $T_{HYS}$ | Temperature hysteresis |

### Temperature Start-Up

This feature prevents the building from overheating or overcooling. The energy used to maintain a constant temperature range and system temperature oscillations are lower than the energy consumption for overheated or overcooled room control. Air from the room is re-circulated through the air mixing section (mixing damper fully open). The fan speed is set to the highest output stage. During temperature start-up, it is possible to select whether the inlet and outlet dampers or dampers along with the outlet fan will be blocked. This can be performed using the HMI controller, refer to the chapter Additional Operating Mode and Function Setting Options.

**Cooling**

***Activation***

When the following conditions are fulfilled simultaneously:

- $T_{PRO} > T_{S,CH}$
- Once the $t_{BL}$ time interval has elapsed

***Termination***

If the following condition is fulfilled:

- $T_{PRO} < T_{S,CH} - T_{HYS}$

**Heating**

***Activation***

When the following conditions are fulfilled simultaneously:

- $T_{PRO} < T_{S,O}$
- Once the $t_{BL}$ time interval has elapsed

***Termination***

If the following condition is fulfilled:

- $T_{PRO} > T_{S,O} + T_{HYS}$

| | |
|---|---|
| $T_{PRO}$ | Required room temperature |
| $T_{S,CH}$ | Starting temperature for cooling |
| $T_{S,O}$ | Starting temperature for heating |
| $T_{HYS}$ | Temperature hysteresis at the stop |
| $t_{BL}$ | Heating blocking time |
| $t_{BEH}$ | Time remaining to start the time schedule |

### Optimized Start

This feature is used to ensure the comfortable temperature to be reached before the time schedule has been activated. Thus possible initial temperature non-conformities after the time schedule activation are removed. This feature includes the setting for the room ventilation to have the room temperature controlled as soon as possible. This is based on air recirculation within the room along with cooling or heating adjustment. The mixing damper is fully open.
It is possible to select whether the inlet and outlet dampers will only be blocked or whether the outlet fan will be blocked as well.

**Cooling**

***Activation***

When the following conditions are fulfilled simultaneously:

- $T_{PRO} > T_{S,CH} + T_{HYS}$
- $t_{\Delta TP} < t_{KOM}$

***Termination***

If the following condition is fulfilled:

- $T_{PRO} < T_{S,CH}$

**Heating**

***Activation***

When the following conditions are fulfilled simultaneously:

- $T_{PRO} < T_{S,O} - T_{HYS}$
- $t_{\Delta TP} < t_{KOM}$

***Termination***

If the following condition is fulfilled:

- $T_{PRO} > T_{S,O}$

| | |
|---|---|
| $T_{PRO}$ | Required room temperature |
| $T_{S,CH}$ | Required temperature set-point for cooling |
| $T_{S,O}$ | Required temperature set-point for heating |
| $T_{HYS}$ | Temperature hysteresis |
| $t_{KOM}$ | Pre-set interval before time program start-up |
| $t_{\Delta TP}$ | Time remaining to the time program start-up |

### Night Turning Feature

When the supply air temperature sensor is not present, the outlet air temperature is evaluated. As the temperature is measured in the outlet, the fans are started at specified time intervals and air from the room is drawn into the outlet duct. The night turning feature is used along with the night chilling or temperature start-up modes. Night turning can be specified by the turning start time, time remaining to next turning and turning duration time.

# Temperature modes, Time modes

## Temperature modes

The VCS control unit system offers the possibility to maintain the controlled room or supply air temperature using two user adjustable temperature modes:

- Comfortable (normal mode usually used for temperature control)
- Economy (e.g. night moderate heating)

Temperature modes are defined by the levels and staging of the required temperature set-points, respectively the temperature difference (systems with heating and cooling) – i.e. according to the environment comfort. They also affect the operating energy demand. Each temperature mode is defined by the temperature settings for heating (lower environment temperature limit – minimum temperature) and the temperature settings for cooling (upper limit – maximum temperature). The area of maintained controlled temperature ("dead zone") lies between these temperature set-points. Of course, maintaining the pre-set temperatures is dependent on the correct dimensioning of heating or cooling systems. Temperature modes are correlated so that the less comfortable mode has the required temperature:

- For heating, the required temperature (lower limit) is always lower than (or the same as) the more comfortable mode.
- For cooling, the required temperature (upper limit) is always greater than (or the same as) the more comfortable mode

For more comfortable modes in systems with both heating and cooling, the environment temperature "dead zone" is always narrower (or the same). Temperature modes are pre-set, see Data Points, Setting – Temperature Modes.

*Note: The system automatically monitors the above-mentioned temperature correlation and immediately adjusts the information about the possible maximum and minimum of each value depending on the user settings.*

**Warning**

Settings, respectively the control process, also affect the correction values.

## Time modes

The VCS control unit system provides the possibility to control operation depending on pre-set time schedules (modes).

- Daily schedule – allows max. 6 changes per day (mode with the lowest priority)
- Weekly schedule – allows max. 7 changes per week
- Exception schedule – allows max. 10 changes per week

Switch-off schedule – allows max. 10 changes (mode with the highest priority)

These modes interact, applying the system priorities. At any time, the air-handling operation is always controlled by the time schedule with the highest priority provided that it has an active time interval for that moment. The weekly and daily schedules can be overridden by the exception schedule or switch-off schedule at any time. The daily schedule is arranged for each day of the week.

The weekly schedule is the same for each week of the year. Requirements for specific days (e.g. holidays) must be scheduled within the exception time schedule.

The following parameters are set for the weekly and daily schedules:

- Start time (= end of previous interval)
- Fan output (speed) stages
- Temperature mode

The exception and switch-off schedules can be set for:

- Date – day of the week
- Range of days – a period (e.g. holiday)
- Week – days of the week (Monday, Tuesday,...)

**Warning!**

A time interval of 00:00 must be set for the start of each day. The default interval for that day.

The default setting is weekly and daily time schedule.

Temperature modes in weekly and daily time schedules can be set using the HMI-SG controller in List of Data Points in the Settings section – Temperature modes, the chapter Control (HMI-SG controller). The exception and switch-off schedules can be set using HMI-DM, HMI-TM or HMI@Web controllers.

**Time Schedule Operating Settings**

| **Date** | |
|---|---|
| Starting day: *,**01.01.12** | 1st January 2012 is the specific day of operation. |
| Starting day: **Mo,*.*.**** | Every Monday is the specific day of operation. |
| Starting day: ***,*.Even.**** | Every even month (February, April, June,...) is the specific month of operation in each year. |
| **Range of Days** | |
| Starting day: ***,23.06.12**<br>End: ***,12.07.12** | Days from 23rd June 2012 to 12th July 2012 are the specific days of operation in the year. |
| Starting day: ***,23.12.****<br>End: ***,31.12.**** | Days from 23rd to 31st December are the specific days of operation in each year. |
| Starting day: ***,23.12.11**<br>End: ***,01.01.12** | Days from 23rd December 2011 to 1st January 2012 are the specific days of operation. |
| Starting day: ***,*.*.****<br>End: ***,*.*.**** | An exception time schedule or a switching off schedule is permanently active and the weekly program will not be applied! |
| **Week** | |
| Day of the week: ***,fri,*** | Every Friday is the specific day of operation |
| Day of the week: ***,Fri,Even** | Every Friday in an even month (February, April, June,...) is the specific day of operation |
| Day of the week: ***,*,*** | When the starting day is entered in this way, an exception time schedule or a switching off schedule is permanently active and the weekly program will not be applied! |
| Day of the week: **2.,*,*** | The second week of every month is the specific day of operation. |

## Control (HMI-SG)

### Local HMI-SG controller

The HMI-SG (Human Machine Interface) enables full control and monitoring of the equipment's operating parameters. The air-handling unit parameters can be accessed through the List of Data Points, which is protected by the password applicable for the corresponding access level.

**HMI-SG controller enables the following items to be reviewed:**

- Room (outlet) temperature
- Current air-conditioning process (cooling, heat recovery, mixing or heating)
- Temperature mode (Economy, Comfort)
- Current system time and day of the week
- Fan output stage

Other information is available via the List of Data Points, see the chapter Data Point List Access and Editing. The HMI-SG POL822.60/STD hand controller is used to control air-handling devices. This controller can be connected to the POL 4xx or POL 6xx master controller (respective to the terminals ready in the control unit).

**Operating conditions**

Degree of protection: IP 30 Permissible ambient temperature: 5 ºC to 40 ºC Relative humidity < 85 %

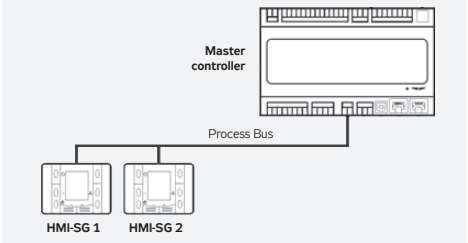
**Warning:**

To avoid unintentional unit start-up, the master switch must be switched off and locked when repairing the VCS unit.

### Wiring and Installation

The HMI-SG controller is connected to the Process Bus (KNX). A twin cable or a twisted pair of leads can be used to perform the connection to the KNX bus.

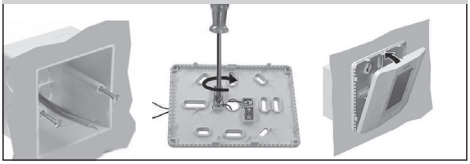
**Figure 14** – Connection to the control unit




The controller can be installed using a wall wiring box or embedded in plaster. The maximum distance between the control unit and room controller is up to 700 m.
HMI-SG controllers are connected to the master controller in series and wiring is always performed to one point.

*Note: The Installation Instructions are part of the HMI-SG controller delivery.*

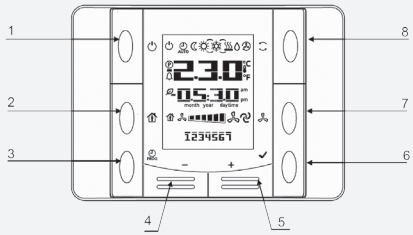
**Figure 18 –** Wiring box installation



**Function Buttons**

The room unit consists of the face plate and back cover, which can be separated. There are 8 function buttons on the controller's face plate.

**Figure 19 –** HMI-SG controller



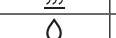
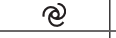
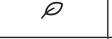
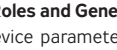
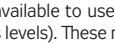
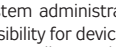

### Controller Description

**Table 3** – Function Buttons description

| Button number | Icon | Name | Function description |
|---|---|---|---|
| T1 | ⏻ | Power | Air-handling unit start or stop |
| T2 | | Presence | not used |
| T3 | PROG | Program | The time schedule button: by holding this button, you can set the date; by pressing this button, you can set the desired temperature mode timing and required fan output stage |
| T4 | − | Minus | Temperature correction – pre-set depending on the selected temperature mode |
| T5 | + | Plus | Temperature correction – pre-set depending on the selected temperature mode |
| T6 | ✓ | OK | Confirmation of the date or time schedule settings |
| T7 | | Fan | Fan output (speed) stage setting; each button cyclically increases the setting by one stage. The current output stage is displayed on the display |
| T8 | | Mode | Temperature mode selection (Auto, Comfort and Economy). By pressing the button, the modes can be cycled. The currently selected temperature mode is indicated by an icon on the display |

## Control (HMI-SG)

**Table 4** – Display description

| Icon | Display | Description |
|---|---|---|
| I1 |  | Indication of room temperature or correction of the required temperature in ºC or ºF |
| |  | Room temperature in ºC (increment 0.1 ºC) |
| |  | Room temperature in ºF (increment 0.5 ºF) |
| |  | Required temperature correction in ºC or ºF |
| I2 |  | Time |
| I3 |  | Fan output (speed) stage |
| I4 |  | Days of the week |
| I5 |  | On/Off |
| I6 |  | Mode Auto |
| I7 |  | Temperature mode *Economy* |
| I8 |  | Temperature mode *Comfort* |
| I9 |  | Cooling sequence |
| I10 |  | Heating sequence |
| I11 |  | Humidification |
| I12 |  | Fan Speed Compensation |
| I13 |  | Mode *Presence* (this mode is not used as standard) |
| I14 |  | Recovery and mixing sequences – energy savings |
| I15 |  | Alarm |
| I16 |  | Data point editing |

**User Roles and General Specification**

The device parameters (data points) are structured and made available to users in accordance with their user roles (access levels). These roles must be assigned to the users by the system administrator according to their expertise and responsibility for device operation.

- **Guest** – allows only common parameters to be viewed.
- **User** – allows common parameters to be viewed and controlled, as well as start and stop of the device.
- **Administrator** – allows the system administrator to view and control common and some special parameters, pre-set operating parameters and modes for the user.
- **Service** – an access level recommended only for the supplier or authorized service provider. In addition to the administrator's level, it allows the user to adjust highly specialised configuration parameters related to the air-handling system and its instrumentation, control constants, water heater protection parameters, etc.

**HMI to VCS System Access Default (factory) Settings**

A control using the HMI controller uses an access right structure in accordance with the concept of structured access of the air-handling device, refer to the chapter *Overview and List of Date Points, Factory Settings*.

The HMI controller allows only four passwords (always four-digit and numerical) to be set, each for a different access level. Factory set default rights to access the VCS control unit using the HMI controller:

**Table 5** – access levels

| Designation | Level | Password (factory setting) |
|---|---|---|
| S | SERVICE | 4444 |
| A | ADMINISTRATOR | 3333 |
| U | USER | 2222 |
| G | HOST | 0000 |

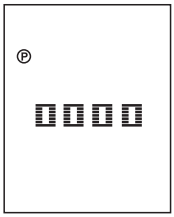
**Warning:**

- When commissioning the device, we strongly recommend changing the factory settings according to user needs to maintain the safety of the device itself as well as the controlled process.
- It is advisable to note and store the Service and Administrator passwords in a suitable (confidential) place (or update them upon each change to settings) to have easy access to them and thus maintain access to the system at the Service and Administrator levels.
- If the Service password changed from the factory setting is lost (forgotten), it is necessary to contact the manufacturer's representative. The lost Administrator level password can be retrieved by the user of the Service level (usually the supplier, installer or M&C service company).
- The changed password settings cannot be automatically restored (reset, etc.) to the factory settings.
- The user of the SERVICE level can change the passwords of all other user levels, the user of the ADMINISTRATOR level can change the passwords of the GUEST and USER levels while users of the USER or GUEST levels are not allowed to change any passwords.

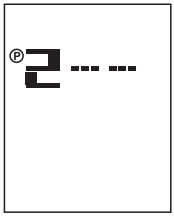
## Control (HMI-SG)

**Data Point List Access and Editing**

An overview of the structure of parameters accessible via the HMI-SG controller is available in the List of Data Points upon logging in using the appropriate access right level. The data points for writing and reading are assigned different access right levels. The procedure for access for editing and reading of data points is as follows:

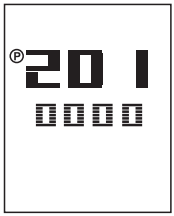



**1) The edit mode** is signalled by an icon (I16). This mode can be accessed by pressing the Plus (T5), Minus (T4) and Mode (T8) buttons simultaneously. The cursor flashes in the first position from the left, ready for the 1st password digit to be entered. Change the value of the digit by pressing the Plus (T5) or Minus (T4) button and confirm by pressing the **Mode** (T8) button and the cursor will move to the next position. The password is activated after entering and confirming the last digit of the password by pressing the T8 button.




**2)** Upon entering the correct password, the **data points** for the respective access level (password) are displayed.

*Note: If the entered password is wrong, "---" will be displayed.*




**3)** Using the Plus (T5) or Minus (T4) buttons, select the first number of the data point group and confirm the selection by pressing the mode (T8) button. Then select a desired data point within the group in the same way as the first number of the data point group. The number on the first line represents a data point code while the number on the second line represents its value.

**4)** If the parameter value is highlighted, the data point is only for reading. If the parameter value flashes, the data point can be edited in accordance with the access level you logged in at.

**5)** The value can be edited by the Plus (T5) or Minus (T4) buttons. To confirm changes to the value, press the Mode (T8) button. Upon confirming the changes, the data point cursor will start to flash, and you can move to the next parameter in the group. Another group of parameters, i.e. return to a higher level, can be made by pressing the **Power** (T1) button.

*Note: If no change is made within 1 minute, the data point editing mode will be exited.*

### Communication Settings

Once the HMI-SG controller has been connected to the control unit, the communication between both devices will be set automatically. If two HMI-SG controllers have been connected to the control unit, it is necessary to set a new address for one of the controllers. An interface for the communication settings will be displayed on the controller, and then parameter #7 must be changed.

**1)** The interface for the communication settings is displayed by pressing and holding the **Power** (T1), **Mode** (T8), **Minus** (T4) and **Plus** (T5) buttons simultaneously. The cursor flashes in the first position from the left, ready for the 1st password digit to be entered. Change the value of the digit by pressing the Plus or Minus (T4) button and confirm by pressing the Mode (T8) button and the cursor will move to the next position. Changes to the parameter settings can only be made by the ADMINISTRATOR, SERVICE or USER role users.

**2)** After a correct password has been entered, press the **Mode** (T8) button to enter the interface for changes to parameter settings.

**3)** Use the Plus (T5) or Minus (T4) buttons to browse the communication parameters. Press the Mode (T8) button to confirm selection of the desired parameter (parameters for communication settings are listed in the following table).

**Table 6** – Communication settings

| Parameter number/Description | |
|---|---|
| 001 | **KNX connection state**<br>• **OK** – bus communication is OK<br>• **NF** – no bus communication |
| 002 | **Physical address (X.1.1)**<br>X...value range 0 to 15; generated automatically |
| 003 | **Physical address (1.X.1)**<br>X...value range 0 to 15; generated automatically |
| 004 | **Physical address (1.1.X)**<br>X...value range 0 to 252; generated automatically |
| 005 | **Byte (program) address (X.1.1)**<br>X...value range 0–126 (pre-set value is 5)<br>This value needs to be changed if several master controllers are connected to the KNX bus by several controllers |
| 006 | **Room (program) address (1.X.1)**<br>X...value range 1 to 14 (pre-set value is 1) |
| 007 | **Zone (program) address (1.1.X)**<br>X...value range 1 to 15 (pre-set value is 1)<br>This value must be changed from 1 to 2 if 2 controllers are connected to the same master controller. |
| 008 | **Network failure detection enabled**<br>Network failure detection enabled or disabled; network failure is indicated by the word "NET". |
| 009 | **Physical address automatic assignment (pre-set value is 1)**<br>0...Room unit uses firmly defined physical address<br>1...automatic generation of the controller's address |

**4)** The cursor with the communication parameter value will start to flash. The parameter value can be changed by pressing the Plus or Minus (T4) buttons. Press the **Power** (T1) button to confirm the change to the communication parameter value.
**5)** To return to a higher level, press the **Power** (T1) button. If no change is made within 1 minute, the interface will be exited.
*Note: If the air-handling unit is controlled by two HMI-SG controllers, the last change made from one of the controllers will be valid.*

## System Date and Time Settings

Here, the actual VCS system date and time can be set – these setting are required for correct functioning of the time schedule programs. The procedure for system date and time setting is as follows:
After long hold the **Program** (T3) button to set the date and time. Press the Plus (T5) and Minus (T4) buttons to change the date and time values. Press the **OK** (T6) button to confirm the changes and the cursor will move to the next item. The cursor cycles through the following items:

**Hour → Minute → Month → Day → Year**

### Default Application Parameterization

To ensure comfortable and economy operation requiring minimum attendance, it is necessary to perform the main settings defining the parameters and air output, respectively the temperature control, and stability in the ventilated/air-conditioned room. Data points must be set for all the relevant parameters:

- Temperature modes
- Time schedules
- Control parameters
- Correction values
- Antifreeze Protection
- Control constants
- Optional modes and functions

The parameters are described in the chapter *List of Data Points, Factory Settings*.

## Operating the HMI-SG controller

If only one HMI-SG controller is connected to the control unit, it then serves as an operating controller for full setting and control of the control unit. During the first start-up of the air-handling unit, the manual operating mode (the highest priority) is set to the Stop state, and the HMI-SG controller does not interfere with control of the control unit. In the Manual operating mode, it is necessary to change the state from Stop to Auto using data point #125 and thus move the priority from the control unit to the HMI-SG controller's operating mode.

### First Control Unit Start-Up Using HMI-SG Controller

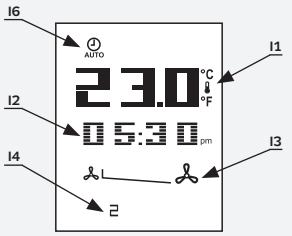
**1)** Press the Plus (T5), Minus (T4) and Mode (T8) buttons simultaneously to display the log-in screen for the 4-digit password. Change the value of the digit by pressing the Plus (T5) or Minus (T4) button. Press the Mode (T8) button to confirm the entered digit and the cursor will move to the next position. Once the correct password has been entered, the data point screen will be displayed. Press the Power (T1) button to leave the log-in interface.

**2)** The first digit "0–" will be displayed. To change the first digit value, press the Plus (T5) or Minus (T4) button. To confirm the entered value, press the Mode (T8) button.

Use the Plus (T5) and Minus (T4) buttons to set the last two digits to get the string "125". To confirm the entered value, press the Mode (T8) button. To return to the previous step, press the Power (T1) button.

**3)** The flashing number on the second line represents a data point value. Use the Minus (T4) buttons to change the data point value from "1" to "0" and confirm by pressing the Mode (T8) button. To return to the previous step, press the Power (T1) button.

**Figure 20 –** HMI-SG controller LCD display




The situation before initiating the control unit from the HMI-SG controller is illustrated in figure 16. The Stop operating mode is indicated by the Auto icon (I6). Current temperature (I1) and system time (I2) are displayed. The fans are not running (I3). The day of the week is indicated by digits (1–7) in the lower part of the display.

*Note: 12h/24h system time format cam be changed using data point **898**. The source of the displayed temperature can be selected using data point **887**.*

## Control (HMI-SG)

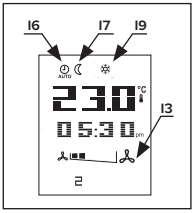
### Operating Screen (Examples)

After making the HMI-SG controller a service controller, it is possible to change the control unit settings. Use the Mode (T8) button to manually switch between the Run state with temperature modes (Comfort or Economy) and the Auto state. Use the Power (T1) button to put the air-handling unit into the Stop operating state, the display in the HMI-SG operating mode will only display the **ON/OFF** icon (I5).

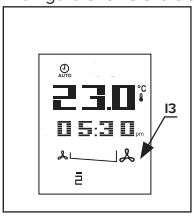
#### Operating State Auto

The fan speed and temperature mode are set depending on the time schedule compilation. It is possible to set a correction to the required temperature, see the chapter Required Temperature Correction. It is also possible to adjust the time schedule, see the chapter Daily (Weekly) Time Schedule.

The figure shows the Auto operating state display. The state is signalled by an icon (I6). The air-handling unit is controlled in accordance with the time schedule. The moderate heating temperature mode (I7) with a cooling sequence (I9) is active. The fans are set to the second speed stage (I3). Apart from the cooling sequence, the heating (I10), heat recovery and mixing (I14) icons can be displayed.




The figure shows the situation where a time schedule controlled air-handling unit is in the Stop operating state. The fans are not running (I3). No temperature modes or heating or cooling sequences are active.

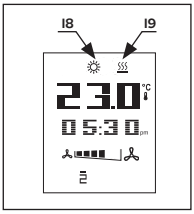



**Warning:** Current additional operating mode stats are not displayed but can be monitored in the List of Data Points in the section Monitor – Current Modes – Current Modes – Current operating Mode.

#### Manual Operating Mode (Run)

In Manual operating mode, it is possible to select the required temperature mode, set any fan speed output stage and the required temperature correction.

This display shows the manually selected Comfort temperature mode (I8) with a heating sequence (I10) and the fourth fan speed stage. In Manual mode, the fan speed can be set using the Fan button (T7). To manually switch between the temperature modes, use the Mode (T8) button.

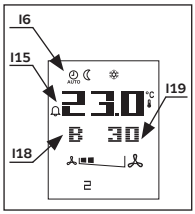



### Failure Detection

If a failure of external components connected to the device failure detection inputs (incorrect state of the contact) occurs, the VCS control unit will automatically put out an alarm in accordance with an internal algorithm – indicating the faulty object and in case of severe failures stopping the air-handling unit. Each failure is more closely specified by a failure class. The failure class determines the severity of the failure. A class failures will shut down the air-handling unit. B class failures will deactivate some system functions (e.g. compensation if the temperature sensor fails) but they will not shut down the air-handling unit. Numerical failure codes specifying the failure events are listed in the chapter Failures. If more failure events occur, the number of the failure with the highest priority (the most serious failure) will be displayed.

### Failure Screen (example)

If a failure occurs, the air-handling unit is put in the STOP state (respectively the Run mode is retained, B class failure). This is indicated by flashing Auto (I6) and Alarm (I15) icons on the display. The failure class (I18) and number (I19) are displayed below the temperature indication. Indication of the alarm will cease shortly after all failure events have been removed. The number shown on the display can also be accessed via data point **824**.




#### Failure Reset

Failure reset can only be performed once the cause of the failure has been identified and removed. The failures are reset using data point **825**.

#### Required Temperature Settings in Temperature Modes

Required temperature settings for the Comfort and Economy temperature modes are performed in the List of Data Points –Temperature Modes:

- 101 – Comfort cooling
- 103 – Comfort heating
- 105 – Economy cooling
- 107 – Economy heating

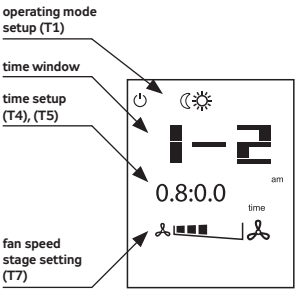
#### Required Temperature Correction

The pre-set required temperatures in each temperature mode can be changed within ±3 ºC directly from the HMI-SG controller. Use the Plus (T5) button to increase the required temperature or use the Minus (T4) button to decrease the required temperature. The one button pressing increment or decrement value can be set in data point 897. This temperature adjustment is only valid for a current mode. Upon transition between modes, this correction will be reset.

## Control (HMI-SG)

### Time Schedule Compilation Procedure

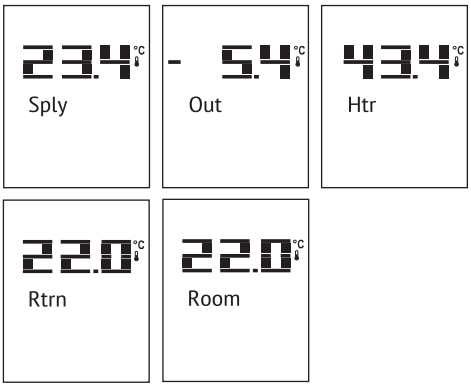
**1)** Press the Program **(T3)** button to enter the time schedule configuration menu for each day of the week.
B HMI SG displays the first day of the week, i.e. Monday. Up to 6 time windows ((1-1 to 1-6) can be set for each day.
**3)** The Mode **(T8)** button enables you to select a day by cycling through the week days (1-2-3-4-5-6-7-A). The "A" option is used to set the time schedule for business days (1 – 5) simultaneously. If you make any change to the "A" time schedule, the settings of the "A" day will be copied to all business days.
**4)** The Power **(T1)** button is used to assign the selected time window with an operating mode (Stop-Economy-Comfort).
**5)** The Fan **(T7)** button is used to set the fan operation speed stage (st. 1 – st. 5).
**6)** The Minus **(T4)** and Plus **(T5)** buttons are used to set the beginning of the time window; to confirm the time setting, press the OK **(T6)** button.
**7)** Once the beginning of the time window has been set, move to the next settings in the time window.
**8)** If you set the beginning of the time window to "--:--", the window will be disabled.
**9)** Press and hold the OK **(T6)** button to go back one step in the time schedule settings within the set time.
**10)** Press and hold the Fan **(T7)** button to go back one step in the time schedule settings within the fan speed stage settings.
**11)** Press and hold the Mode **(T8)** button to move one step back (a weekday selection).
**12)** Press the Program **(T3)** or Presence **(T2)** button to exit the Time Schedule Settings menu.
**13)** If no settings are performed in the time schedule within 1 minute, the menu will be automatically left..




**Quick Menu:**

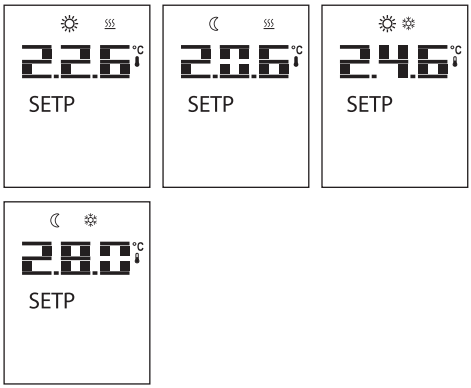
This enables quick access to the temperature and selected value monitoring without editing.
Use the Minus (T4) and Plus (T5) to switch between the temperature values.
Use the Program (T3) or Presence (T2) buttons to exit the Quick Menu. Only those values which are included within the given version of the VCS unit are displayed.
Briefly press the **OK (T6)** button to display the values listed below:

- Inlet temperature (Sply)
- Outdoor temperature (Out)
- Return water temperature (Htr)
- Outlet temperature (Rtrn)
- Room temperature (Room)



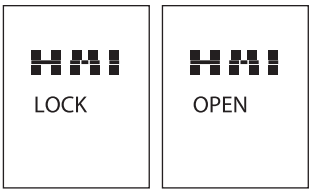

Press and hold the **OK (T6)** button to display the values listed below:

- Comfort temperature mode (heating)
- Economy temperature mode (heating)
- Comfort temperature mode (cooling)
- Economy temperature mode (cooling)




**Lock/Unlock the SG II buttons**

Press and hold the Presence **(T2)** button to lock/unlock the SG II controller in order to prevent unauthorised access to the device control.



## Control (HMI-SG)

### Additional Operating Modes and Function Settings

Additional operating modes and functions can be activated in the List of Data Points in the section Settings – Additional Operating Modes, Functions. Once the respective mode or function has been set, it is necessary to perform SW reset using a specific data point **211** (Reset after the configuration of additional modes/functions).

**Optional Additional Operating Modes**

- Night Chilling
- Temperature start-Up
- Time mode start optimization

**Optional additional functions**

- Outdoor Temperature-Dependent Fan Speed Compensation
- Heating/cooling dependent fan speed compensation
- Room (Outlet) Temperature-Dependent Fan Speed Compensation
- Humidity-dependent Fan Speed Compensation
- Air Quality-Dependent Damper Position Compensation
- Heating/cooling–dependent fan speed compensation – cooling sequence
- Cooling using heat recovery with rotary regenerator option or using mixing damper
- Heating and mixing sequence order
- Outlet fan correction – using five-stage control (TRN controllers)
- Difference between required and actual temperature monitoring
- Damper and outlet fan blocking
- Room temperature measuring point selection

### User Settings Backup and Recovery

It is advisable to perform backups especially before significant changes in control parameter settings (PID controller factors, temperature setting for compensations or starting of the optional additional modes), or always when the control works optimally. Data backup or recovery can be performed using the HMI controller in the List of Data Points, section Checks – User Settings.

### List of Data Points, Factory Settings

**Warning:**

The device parameters are structured and made available to users in accordance with their user roles (access levels). These roles must be assigned to users by the system administrator according to their expertise and responsibility for device operation. Access to the data points is also limited by the user role level – for levels lower than Service, not all parameters (data points) are displayed, respectively, they can be read without being able to change (save) them. The Parameter List with a combination of all possible air-handling unit applications is included in the List of data points under the highest access right.

REMAK

# List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| | | | | **Monitor** | | | | | | |
| | | | | **Temperature** | | | | | | °C |
| | | 001 | G | Temperature in the inlet | | | | | | °C |
| | | 002 | G | Temperature in the room 1 | | | | | | °C |
| | | 003 | G | Temperature in the room 2 | | | | | | °C |
| | | 004 | G | Room unit 1 | | | | | | °C |
| | | 005 | G | Room unit 2 | | | | | | °C |
| | | 006 | G | Temperature in the outlet | | | | | | °C |
| | | 007 | G | Outdoor temperature | | | | | | °C |
| | | 008 | G | Return water temperature | | | | | | °C |
| | | 009 | G | Heat exchanger freezing temperature | | | | | | °C |
| | | 010 | G | Electric preheater temperature | | | | | | °C |
| | | 011 | G | Water preheater temperature | | | | | | °C |
| | | 012 | G | Electric reheater temperature | | | | | | °C |
| | | 013 | G | Flue gas temperature | | | | | | °C |
| | | 014 | G | Final room temperature (controlled) | | | | | | °C |
| | | | | **Humidity** | | | | | | |
| | | 015 | G | Inlet air relative humidity | | | | | | %r.H. |
| | | 016 | G | Room air relative humidity | | | | | | %r.H. |
| | | 017 | G | Outdoor air relative humidity | | | | | | %r.H. |
| | | | | Pressure | | | | | | |
| | | 018 | G | Pressure in the inlet | | | | | | Pa |
| | | 019 | G | Pressure in the outlet | | | | | | Pa |
| | | 020 | G | Air flow rate in the inlet | | | | | | m3/h |
| | | 021 | G | Air flow rate in the outlet | | | | | | m3/h |
| | | | | **$CO_2$ (VOC, CO)** | | | | | | |
| | | 022 | G | $CO_2$ (VOC, CO) concentration | | | | | | ppm |
| | | | | Performances | | | | | | |
| | | 023 | G | Inlet fan output | | | | | | % ($m^3$/h, Pa) |
| | | 024 | G | Outlet fan output | | | | | | % ($m^3$/h, Pa) |
| | | 025 | G | 3rd fan output | | | | | | % |
| | | 026 | G | Outlet level for the electric reheater | | | | | | % |
| | | 027 | G | Heating mixing set valve position | | | | | | % |
| | | 028 | G | Outlet level for cooling | | | | | | % |
| | | 029 | G | Cooling output (stage) | | | | | | |
| | | 030 | G | Electric preheater position | | | | | | % |
| | | 031 | G | Outlet level for the electric heater | | | | | | % |
| | | 032 | G | Heat pump output | | | | | | % |
| | | 033 | G | Outlet position to the mixing damper | | | | | | % |
| | | 034 | G | Heat exchanger control outlet position | | | | | | % |
| | | 035 | G | Modulation burner outlet position | | | | | | % |
| | | 036 | G | By-pass damper outlet position | | | | | | % |
| | | | | **Operating states** | | | | | | |
| | | 037 | G | Fan state | 0 | - | | | | |
| | | | | | 1 | Stage 1 | | | | |
| | | | | | 2 | Stage 2 | | | | |
| | | | | | 3 | Stage 3 | | | | |
| | | | | | 4 | Stage 4 | | | | |
| | | | | | 5 | Stage 5 | | | | |
| | | 038 | G | Electric pre-heater state | 1 | off | | | | |
| | | | | | 2 | on | | | | |
| | | 039 | G | Water pre-heater state | 0 | off | | | | |
| | | | | | 1 | on | | | | |
| | | 040 | G | Electric re-heater state | 1 | off | | | | |
| | | | | | 2 | on | | | | |
| | | 041 | G | Water heater pump state | 0 | off | | | | |
| | | | | | 1 | on | | | | |
| | | 042 | G | Pre-heating function of water heating | 0 | off | | | | |

## List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| | | | | | 1 | on | | | | |
| | | 043 | G | Water cooler pump state | 0 | off | | | | |
| | | | | | 1 | on | | | | |
| | | 044 | G | Evaporator cooling stage | 1 | off | | | | |
| | | | | | 2 | Stage 1 | | | | |
| | | | | | 3 | Stage 2 | | | | |
| | | 045 | G | Inverter cooling stage (inverter) | 0 | off | | | | |
| | | | | | 1 | on | | | | |
| | | 046 | G | Inverter cooling stage (step1+inverter) | 0 | off | | | | |
| | | | | | 1 | on | | | | |
| | | 047 | G | Heat pump operating state | 0 | out of operation | | | | |
| | | | | | 1 | cooling | | | | |
| | | | | | 2 | heating | | | | |
| | | 048 | G | Electric heater operating state | 1 | off | | | | |
| | | | | | 2 | on | | | | |
| | | 049 | G | Gas Burner operating states (stages) | 1 | off | | | | |
| | | | | | 2 | Stage 1 | | | | |
| | | | | | 3 | Stage 2 | | | | |
| | | | | **Current modes** | | | | | | |
| | | 050 | G | Fan output stages (external equipment) | 0 | Auto | | | | |
| | | | | | 1 | off | | | | |
| | | | | | 2 | Stage 1 | | | | |
| | | | | | 3 | Stage 2 | | | | |
| | | | | | 4 | Stage 3 | | | | |
| | | | | | 5 | Stage 4 | | | | |
| | | | | | 6 | Stage 5 | | | | |
| | | 051 | G | AHU current operating mode | 0 | Stop | | | | |
| | | | | | 1 | Comfort | | | | |
| | | | | | 2 | Economy | | | | |
| | | | | | 3 | - | | | | |
| | | | | | 4 | Optimized start | | | | |
| | | | | | 5 | Night chilling | | | | |
| | | | | | 6 | Temperature start-up | | | | |
| | | | | | 7 | Night turning | | | | |
| | | | | | 8 | | | | | |
| | | | | | 9 | Fire mode | | | | |
| | | | | | 10 | Safety stop | | | | |
| | | | | | 11 | Fan run-out | | | | |
| | | | | | 12 | Start | | | | |
| | | | | **Current temperature control values** | | | | | | |
| | | 052 | G | Calculated required temperature for heating with cascade control | | | | | | °C |
| | | 053 | G | Calculated required temperature for cooling with cascade control | | | | | | °C |
| | | 054 | G | Calculated required temperature for heating | | | | | | °C |
| | | 055 | G | Calculated required temperature for cooling | | | | | | °C |
| | | 056 | G | Current temperature-dependent control (inlet, room, outlet) | 0 | room | | | | |
| | | | | | 1 | outlet | | | | |
| | | | | | 2 | inlet | | | | |
| | | | | Current humidity values | | | | | | |
| | | 058 | G | Calculated absolute inlet air humidity | | | | | | g/kg |
| | | 059 | G | Calculated inlet air humidity enthalpy | | | | | | kJ/kg |
| | | 060 | G | Calculated absolute room air humidity | | | | | | g/kg |
| | | 061 | G | Calculated room air humidity enthalpy | | | | | | kJ/kg |
| | | 062 | G | Calculated absolute outdoor air humidity | | | | | | g/kg |
| | | 063 | G | Calculated outdoor air humidity enthalpy | | | | | | kJ/kg |
| | | 064 | G | Request for dehumidification | | | | | | % |
| | | 065 | G | Request for humidification | | | | | | % |

# List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| | | 066 | G | Humidifier state | *0* | *off* | | | | |
| | | | | | *1* | *on* | | | | |
| | | | | **Settings** | | | | | | |
| | | | | **Temperature modes** | | | | | | |
| 101 | A | 102 | G | Comfort - cooling | | | 24.6 | 0 | 99 | °C |
| 103 | A | 104 | G | Comfort - heating | | | 22.6 | 0 | 99 | °C |
| 105 | A | 106 | G | Economy - cooling | | | 28 | 0 | 99 | °C |
| 107 | A | 108 | G | Economy - heating | | | 20.6 | 0 | 99 | °C |
| 109 | A | 110 | G | Required temperature for cooling, Temperature start-up | | | 15 | -64 | 64 | °C |
| 111 | A | 112 | G | Required temperature for heating, Temperature start-up | | | 25 | -64 | 64 | °C |
| 113 | A | 114 | G | Required room temperature , Night chilling (control for inlet) | | | 22 | -64 | 64 | °C |
| 115 | A | 116 | G | Required room temperature , Boost (control for inlet) | | | 20 | -64 | 64 | °C |
| 117 | A | 118 | G | Required temperature for cooling, Boost | | | 15 | -64 | 64 | °C |
| 119 | A | 120 | G | Required temperature for heating, Boost | | | 25 | -64 | 64 | °C |
| | | | | Cascade control limitation - limiter | | | | | | |
| 121 | S | 122 | A | Max. difference between room temperature and inlet temperature | | | 10 | 0 | 64 | °C |
| 123 | S | 124 | A | Min. difference between room temperature and inlet temperature | | | 10 | 0 | 64 | °C |
| | | | | **Operation mode** | | | | | | |
| 125 | A | 126 | G | AHU manual control (Temperature mode, fan output stage) | 0 | Auto | Stop | | | |
| | | | | | 1 | Stop | | | | |
| | | | | | 2 | Economy; St1 | | | | |
| | | | | | 3 | Comfort; St1 | | | | |
| | | | | | 4 | Economy; St2 | | | | |
| | | | | | 5 | Comfort; St2 | | | | |
| | | | | | 6 | Economy; St3 | | | | |
| | | | | | 7 | Comfort; St3 | | | | |
| | | | | | 8 | Economy; St4 | | | | |
| | | | | | 9 | Comfort; St4 | | | | |
| | | | | | 10 | Economy; St5 | | | | |
| | | | | | 11 | Comfort; St5 | | | | |
| 127 | A | 128 | G | AHU start-up time-out after power supply failure | | | 10 | 0 | 9999 | s |
| | | | | **External control** | | | | | | |
| 129 | U | 130 | G | External contact function definition (Ext. control 1 contact) | 0 | Start function | 0 | | | |
| | | | | | 1 | Start and Stop function | | | | |
| 131 | U | 132 | G | Transition time from ext. control mode to AUTO mode (Ext. control 1 contact) | | | 0 | 0 | 23 | h |
| 133 | U | 134 | G | Fan output stage setting (Ext. control 1 contact or 2 contacts) | 0 | Auto | 2 | | | |
| | | | | | 1 | off | | | | |
| | | | | | 2 | Stage 1 | | | | |
| | | | | | 3 | Stage 2 | | | | |
| | | | | | 4 | Stage 3 | | | | |
| | | | | | 5 | Stage 4 | | | | |
| | | | | | 6 | Stage 5 | | | | |
| 135 | U | 136 | G | Temperature mode setting (Ext. control 1 contact or 2 contacts) | 0 | Comfort | 0 | | | |
| | | | | | 1 | Economy | | | | |
| 137 | U | 138 | G | Fan output stage setting "Higher" (Ext. control 2 contacts) | 0 | Auto | 5 | | | |
| | | | | | 1 | off | | | | |
| | | | | | 2 | Stage 1 | | | | |
| | | | | | 3 | Stage 2 | | | | |
| | | | | | 4 | Stage 3 | | | | |
| | | | | | 5 | Stage 4 | | | | |
| | | | | | 6 | Stage 5 | | | | |
| 139 | U | 140 | G | Temperature mode setting "Higher" (Ext. control 2 contacts) | 0 | Comfort | 0 | | | |
| | | | | | 1 | Economy | | | | |
| | | | | **Fans - Modbus** | | | Control limits | | | |
| 141 | A | | | Inlet fan output St1 setting | | | 0.1 | | | % ($m^3$/h, Pa) |

## List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| 142 | A | | | Inlet fan output St1 setting (a factor of 10) | | | | | | % (m³/h, Pa) |
| 143 | A | | | Inlet fan output St2 setting | | | 25 | | | % (m³/h, Pa) |
| 144 | A | | | Inlet fan output St2 setting (a factor of 10) | | | | | | % (m³/h, Pa) |
| 145 | A | | | Inlet fan output St3 setting | | | 50 | | | % (m³/h, Pa) |
| 146 | A | | | Inlet fan output St3 setting (a factor of 10) | | | | | | % (m³/h, Pa) |
| 147 | A | | | Inlet fan output St4 setting | | | 75 | | | % (m³/h, Pa) |
| 148 | A | | | Inlet fan output St4 setting (a factor of 10) | | | | | | % (m³/h, Pa) |
| 149 | A | | | Inlet fan output St5 setting | | | 100 | | | % (m³/h, Pa) |
| 150 | A | | | Inlet fan output St5 setting (a factor of 10) | | | | | | % (m³/h, Pa) |
| 151 | A | | | Outlet fan output St1 setting | | | 0.1 | | | % (m³/h, Pa) |
| 152 | A | | | Outlet fan output St1 setting (a factor of 10) | | | | | | % (m³/h, Pa) |
| 153 | A | | | Outlet fan output St2 setting | | | 25 | | | % (m³/h, Pa) |
| 154 | A | | | Outlet fan output St2 setting (a factor of 10) | | | | | | % (m³/h, Pa) |
| 155 | A | | | Outlet fan output St3 setting | | | 50 | | | % (m³/h, Pa) |
| 156 | A | | | Outlet fan output St3 setting (a factor of 10) | | | | | | % (m³/h, Pa) |
| 157 | A | | | Outlet fan output St4 setting | | | 75 | | | % (m³/h, Pa) |
| 158 | A | | | Outlet fan output St4 setting (a factor of 10) | | | | | | % (m³/h, Pa) |
| 159 | A | | | Outlet fan output St5 setting | | | 100 | | | % (m³/h, Pa) |
| 160 | A | | | Outlet fan output St5 setting (a factor of 10) | | | | | | % (m³/h, Pa) |
| 161 | A | 162 | U | 3rd fan output St1 setting | | | 0.1 | 0.1 | 100 | % |
| 163 | A | 164 | U | 3rd fan output St2 setting | | | 25 | 0.1 | 100 | % |
| 165 | A | 166 | U | 3rd fan output St3 setting | | | 50 | 0.1 | 100 | % |
| 167 | A | 168 | U | 3rd fan output St4 setting | | | 75 | 0.1 | 100 | % |
| 169 | A | 170 | U | 3rd fan output St5 setting | | | 100 | 0.1 | 100 | % |
| 171 | A | 172 | U | Fan run-out after unit stop shut-down | | | 180 | 0 | 9999 | s |
| 570 | A | | | Enabling the fan run-out according to DEV | *0* | *No* | 1 | | | |
| | | | | | *1* | *Yes* | | | | |
| 571 | A | | | Unit run-out – blocking by the minimum outside temperature | | | -15 | -64 | 64 | °C |
| 572 | A | | | Unit run-out – blocking by the maximum outside temperature | | | 5 | -64 | 64 | °C |
| 573 | A | | | Unit run-out – time | | | 5 | 1 | 60 | Min |
| | | | | **Inlet backup – single-speed motors** | | | | | | |
| 173 | A | 174 | U | Failure flow evaluation time-out after main fan start-up | | | 180 | 0 | 9999 | s |
| 175 | A | 176 | U | Failure flow evaluation time-out after backup fan start-up | | | 180 | 0 | 9999 | s |
| | | 181 | U | Information – backup activation | 0 | non-activated | | | | |
| | | | | | 1 | activated | | | | |
| | | | | Outlet backup - single-speed motors | | | | | | |
| 177 | A | 178 | U | Failure flow evaluation time-out after main fan start-up | | | 180 | 0 | 9999 | s |
| 179 | A | 180 | U | Failure flow evaluation time-out after backup fan start-up | | | 180 | 0 | 9999 | s |
| | | 182 | U | Information - backup activation | 0 | non-activated | | | | |
| | | | | | 1 | activated | | | | |
| | | | | **TRN correction** | | | | | | |
| 183 | A | 183 | A | Common for all operating stages St | 0 | - 4 stages | 0 | | | |
| | | | | | 1 | - 3 stages | | | | |
| | | | | | 2 | - 2 stages | | | | |
| | | | | | 3 | - 1 stage | | | | |
| | | | | | 4 | 0 | | | | |
| | | | | | 5 | + 1 stage | | | | |
| | | | | | 6 | + 2 stages | | | | |
| | | | | | 7 | + 3 stages | | | | |
| | | | | | 8 | + 4 stages | | | | |
| 184 | A | 184 | A | For operating stage St1 | 0 | - 4 stage | 0 | | | |
| | | | | | 1 | - 3 stage | | | | |
| | | | | | 2 | - 2 stage | | | | |
| | | | | | 3 | - 1 stage | | | | |
| | | | | | 4 | 0 | | | | |

# List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| | | | | | 5 | + 1 stage | | | | |
| | | | | | 6 | + 2 stages | | | | |
| | | | | | 7 | + 3 stages | | | | |
| | | | | | 8 | + 4 stages | | | | |
| 185 | A | 185 | A | For operating stage St2 | 0 | - 4 stage | 0 | | | |
| | | | | | 1 | - 3 stage | | | | |
| | | | | | 2 | - 2 stage | | | | |
| | | | | | 3 | - 1 stage | | | | |
| | | | | | 4 | 0 | | | | |
| | | | | | 5 | + 1 stage | | | | |
| | | | | | 6 | + 2 stages | | | | |
| | | | | | 7 | + 3 stages | | | | |
| | | | | | 8 | + 4 stages | | | | |
| 186 | A | 186 | A | For operating stage St3 | 0 | - 4 stage | 0 | | | |
| | | | | | 1 | - 3 stage | | | | |
| | | | | | 2 | - 2 stage | | | | |
| | | | | | 3 | - 1 stage | | | | |
| | | | | | 4 | 0 | | | | |
| | | | | | 5 | + 1 stage | | | | |
| | | | | | 6 | + 2 stages | | | | |
| | | | | | 7 | + 3 stages | | | | |
| | | | | | 8 | + 4 stages | | | | |
| 187 | A | 187 | A | For operating stage St4 | 0 | - 4 stage | 0 | | | |
| | | | | | 1 | - 3 stage | | | | |
| | | | | | 2 | - 2 stage | | | | |
| | | | | | 3 | - 1 stage | | | | |
| | | | | | 4 | 0 | | | | |
| | | | | | 5 | + 1 stage | | | | |
| | | | | | 6 | + 2 stages | | | | |
| | | | | | 7 | + 3 stages | | | | |
| | | | | | 8 | + 4 stages | | | | |
| 188 | A | 188 | A | For operating stage St5 | 0 | - 4 stage | 0 | | | |
| | | | | | 1 | - 3 stage | | | | |
| | | | | | 2 | - 2 stage | | | | |
| | | | | | 3 | - 1 stage | | | | |
| | | | | | 4 | 0 | | | | |
| | | | | | 5 | + 1 stage | | | | |
| | | | | | 6 | + 2 stages | | | | |
| | | | | | 7 | + 3 stages | | | | |
| | | | | | 8 | + 4 stages | | | | |
| | | | | **TRN – fan start-up (without outlet for dampers)** | | | | | | |
| 189 | S | 189 | S | Forced fan start-up time setting to Stage 1 | | | 20 | 0 | 99 | s |
| | | | | Two-speed motors | | | | | | |
| 190 | A | 191 | U | Transition time interval from speed 1 to speed 2 | | | 15 | 0 | 999 | s |
| 192 | A | 193 | U | Transition time-out from speed 2 to speed 1 | | | 12 | 0 | 99 | s |
| | | | | Inlet temperature limitation | | | | | | |
| 194 | S | 194 | S | Minimum inlet air temperature | | | 15 | 0 | 64 | °C |
| 195 | S | 195 | S | Maximum inlet air temperature | | | 35 | 0 | 64 | °C |
| | | | | Additional operating modes, functions | | | | | | |
| 196 | S | 196 | S | Outdoor temperature dependent fan speed compensation | 0 | No | 0 | | | |
| | | | | | 1 | Yes | | | | |
| 197 | S | 197 | S | Heating/cooling dependent fan speed compensation | 0 | No | 0 | | | |
| | | | | | 1 | Heating | | | | |
| | | | | | 2 | Cooling | | | | |

## List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| | | | | | 3 | Heating + Cooling | | | | |
| 198 | S | 198 | S | Air quality dependent fan speed compensation | 0 | No | 1 | | | |
| | | | | | 1 | Yes | | | | |
| 199 | S | 199 | S | Room (outlet) temperature dependent fan speed compensation | 0 | No | 0 | | | |
| | | | | | 1 | Yes | | | | |
| 230 | S | 230 | S | Humidity-dependent fan speed compensation | 0 | No | 0 | | | |
| | | | | | 1 | Yes | | | | |
| 231 | S | 231 | S | Limitation of dehumidification during heating | 0 | No | 0 | | | |
| | | | | | 1 | Yes | | | | |
| 201 | S | 201 | S | Difference between required and actual temperature monitoring | 0 | No | 0 | | | |
| | | | | | 1 | inlet | | | | |
| | | | | | 2 | room | | | | |
| | | | | | 3 | Inlet+room | | | | |
| 202 | S | 202 | S | Air quality dependent damper position compensation | 0 | No | 0 | | | |
| | | | | | 1 | Yes | | | | |
| 246 | S | 246 | S | Humidity-dependent mixing damper position compensation | 0 | No | 0 | | | |
| | | | | | 1 | Yes | | | | |
| 247 | S | 247 | S | Max. limit of fresh air according to T outdoor (ventilation unit) | 0 | No | 0 | | | |
| | | | | | 1 | Yes | | | | |
| 203 | S | 203 | S | Cooling using HR (RHE, BP PE, mixing damper) | 0 | without HR cooling | 3 | | | |
| | | | | | 1 | RHE, BP PE | | | | |
| | | | | | 2 | mixing damper | | | | |
| | | | | | 3 | RHE+ damper | | | | |
| 204 | S | 204 | S | Heating/cooling dependent fan speed compensation-cooling sequence (fan, cooler) | 0 | fan+cooler | 1 | | | |
| | | | | | 1 | cooler+fan | | | | |
| 205 | S | 205 | S | Mixing heating sequence (damper, heater) | 0 | damper+heater | 0 | | | |
| | | | | | 1 | heater+damper | | | | |
| 206 | S | 206 | S | Night cooling | 0 | without chilling | | | | |
| | | | | | 1 | with chilling | | | | |
| 207 | S | 207 | S | Temperature start-up | 0 | N/A | 0 | | | |
| | | | | | 1 | heating | | | | |
| | | | | | 2 | cooling | | | | |
| | | | | | 3 | heating + cooling | | | | |
| 208 | S | 208 | S | Time mode start optimization | 0 | N/A | 0 | | | |
| | | | | | 1 | heating | | | | |
| | | | | | 2 | cooling | | | | |
| | | | | | 3 | heating + cooling | | | | |
| 209 | S | 209 | S | Damper and outlet fan blocking | 0 | N/A | 0 | | | |
| | | | | | 1 | dampers | | | | |
| | | | | | 2 | dampers+fan | | | | |
| 210 | S | 210 | S | Outlet fan correction type (TRN controllers) | 0 | separate stages | 0 | | | |
| | | | | | 1 | shared stages | | | | |
| 211 | S | 211 | S | Reset after configuration of additional modes/functions | 0 | without reset | | | | |
| | | | | | 1 | reset | | | | |
| 212 | S | 212 | S | Room temperature measuring point selection | 0 | average | 3 | | | |
| | | | | | 1 | minimum | | | | |
| | | | | | 2 | maximum | | | | |
| | | | | | 3 | room temp. sensor 1 | | | | |
| | | | | | 4 | room temp. sensor 2 | | | | |
| | | | | | 5 | HMI-SG 1 controller | | | | |
| | | | | | 6 | HMI-SG 2 controller | | | | |
| | | | | **Control signal characteristic** | | | | | | |
| 213 | A | 213 | A | Control signal 0-10 V or 2-10 V, heating | 0 | 0-10V | | | | |
| | | | | | 1 | 2-10V | 1 | | | |
| 214 | A | 214 | A | Control signal 0-10 V or 2-10 V, cooling | 0 | 0-10V | | | | |
| | | | | | 1 | 2-10V | 1 | | | |
| 215 | A | 215 | A | Control signal 0-10 V or 2-10 V, mixing damper | 0 | 0-10V | | | | |
| | | | | | 1 | 2-10V | 1 | | | |

# List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| 216 | A | 216 | A | Control signal 0-10 V or 2-10 V, heat exchanger by-pass damper | 0 | 0-10V | | | | |
| | | | | | 1 | 2-10V | 1 | | | |
| 217 | A | 217 | A | Control signal 0-10 V or 2-10 V, chamber by-pass damper | 0 | 0-10V | | | | |
| | | | | | 1 | 2-10V | 1 | | | |
| | | | | Required inlet temperature extra set-point | | | | | | |
| 218 | A | 219 | G | Required inlet temperature extra set-point (applied when el. re-heating or heat pump is removed from the main sequence) | | | 20 | 0 | 99 | °C |
| 220 | S | 220 | S | Fan start-up delay (after damper) | | | 20 | 0 | 9999 | s |
| 221 | S | 221 | S | **Outdoor-dependent fan speed interlocking** | | | -60 | -64 | 64 | °C |
| | | | | **Control – Flow (Pressure)** | | | | | | |
| 222 | A | 223 | U | Setting range of flow sensor - inlet (a factor of 100) | | | 8000 | 0 | 2*105 | m3/h |
| 224 | A | 225 | U | Setting range of flow sensor - outlet (a factor of 100) | | | 8000 | 0 | 2*105 | m3/h |
| 226 | A | 227 | U | Setting range of pressure sensor - inlet (a factor of 100) | | | 6000 | 0 | 7000 | Pa |
| 228 | A | 229 | U | Setting range of pressure sensor - outlet (a factor of 100) | | | 6000 | 0 | 7000 | Pa |
| 232 | A | 233 | U | K factor – inlet | | | 95 | 0 | 9999 | |
| 234 | A | 235 | U | K factor – outlet | | | 95 | 0 | 9999 | |
| 236 | A | 237 | U | NunberInletFan | | | 1 | 1 | 100 | |
| 238 | A | 239 | U | NunberOutletFan | | | 1 | 1 | 100 | |
| | | 240 | S | K Factor - Enabled | 0 | No | | | | |
| | | | | | 1 | Yes | 1 | | | |
| | | | | **Inputs configuration** | | | | | | |
| | | 241 | S | Reverse function of fault input for Cooling or Heat Pump | 0 | Normal | 0 | | | |
| | | | | | 1 | Reversed | | | | |
| | | | | Device configuration | | | | | | |
| | | 270 | U | Regulation supply fan | 0 | none | | | | |
| | | | | | 1 | 1 stage | | | | |
| | | | | | 2 | 5 stage (TRN) | | | | |
| | | | | | 3 | V10 | | | | |
| | | | | | 4 | V100 | | | | |
| | | | | | 5 | V10 + back-up | | | | |
| | | | | | 6 | V100 + back-up | | | | |
| | | | | | 7 | 2xV10 | | | | |
| | | | | | 8 | 2xV100 | | | | |
| | | | | | 9 | 2xV10 + back-up | | | | |
| | | | | | 10 | 2xV100 + back-up | | | | |
| | | 271 | U | Regulation exhaust fan | 0 | none | | | | |
| | | | | | 1 | 1 stage | | | | |
| | | | | | 2 | 5 stage (TRN) | | | | |
| | | | | | 3 | V10 | | | | |
| | | | | | 4 | V100 | | | | |
| | | | | | 5 | V10 + back-up | | | | |
| | | | | | 6 | V100 + back-up | | | | |
| | | | | | 7 | 2xV10 | | | | |
| | | | | | 8 | 2xV100 | | | | |
| | | | | | 9 | 2xV10 + back-up | | | | |
| | | | | | 10 | 2xV100 + back-up | | | | |
| | | 272 | U | Regulation additional fan | 0 | none | | | | |
| | | | | | 1 | 1 stage | | | | |
| | | | | | 2 | 5 stage (TRN) | | | | |
| | | | | | 3 | V10 | | | | |
| | | | | | 4 | V100 | | | | |
| | | | | | 7 | 2xV10 | | | | |
| | | | | | 8 | 2xV100 | | | | |
| | | 273 | U | Heating | 0 | no | | | | |
| | | | | | 1 | water | | | | |
| | | | | | 2 | electric | | | | |
| | | | | | 3 | gas | | | | |

## List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| | | 274 | U | Heat pump | 0 | no | | | | |
| | | | | | 1 | variation A | | | | |
| | | | | | 2 | variation B | | | | |
| | | 275 | U | Type of gas heating | 0 | 1 stage | | | | |
| | | | | | 1 | 2 stage | | | | |
| | | | | | 2 | modulation | | | | |
| | | 276 | U | Byppas damper gas heater | 0 | no | | | | |
| | | | | | 1 | yes | | | | |
| | | 277 | U | Cooling | 0 | no | | | | |
| | | | | | 1 | water | | | | |
| | | | | | 2 | 1 step | | | | |
| | | | | | 3 | 2 step | | | | |
| | | | | | 4 | inverter | | | | |
| | | | | | 5 | inverter + 1 step | | | | |
| | | 278 | U | Heat recovery | 0 | no | | | | |
| | | | | | 1 | plate | | | | |
| | | | | | 2 | wheel | | | | |
| | | | | | 3 | glycol | | | | |
| | | 279 | U | Mixing | 0 | no | | | | |
| | | | | | 1 | yes | | | | |
| | | 280 | U | Preheating | 0 | no | | | | |
| | | | | | 1 | water | | | | |
| | | | | | 2 | electric | | | | |
| | | 281 | U | Extra heating | 0 | no | | | | |
| | | | | | 1 | electric | | | | |
| | | 282 | U | Temperature control mode | 0 | supply | | | | |
| | | | | | 1 | cascade - room | | | | |
| | | | | | 2 | cascade - return | | | | |
| | | 283 | U | Humidity control mode | 0 | no | | | | |
| | | | | | 1 | room | | | | |
| | | | | | 2 | supply | | | | |
| | | | | | 3 | cascade - room | | | | |
| | | | | **Control parameters** | | | | | | |
| | | | | Temperature start-up | | | | | | |
| 301 | A | 302 | U | Cooling trigger temperature | | | 30 | -64 | 64 | °C |
| 303 | A | 304 | U | Heating trigger temperature | | | 25 | -64 | 64 | °C |
| 305 | A | 306 | U | Hysteresis | | | 1 | 0.1 | 64 | °C |
| 307 | A | 308 | U | Heating and cooling blocking time | | | 30 | 0 | 999 | min |
| 309 | A | 310 | U | Operating time | | | 0 | 0 | 999 | min |
| | | | | **Night colling** | | | | | | |
| 311 | A | 312 | U | Temperature hysteresis | | | 3 | 0 | 64 | °C |
| 313 | A | 314 | U | Minimum outdoor temperature setting | | | 12 | -64 | 64 | °C |
| 315 | A | 316 | U | Outdoor temperature and room temperature difference | | | 5 | 1 | 64 | °C |
| 317 | A | 318 | U | Minimum night chilling operating time | | | 30 | 0 | 999 | min |
| | | | | **Boost function** | | | | | | |
| 319 | A | 320 | U | Pre-set interval before time program start-up | | | 60 | 0 | 999 | min |
| 321 | A | 322 | U | Temperature hysteresis | | | 0.5 | -64 | 64 | °C |
| | | | | Required temperature compensation | | | | | | |
| 323 | A | 324 | U | Cooling initial point (outdoor temperature) | | | 25 | -64 | 64 | °C |
| 325 | A | 326 | U | Cooling end point (outdoor temperature) | | | 30 | -64 | 64 | °C |
| 327 | A | 328 | U | Maximum cooling compensation (required value) | | | 2 | -64 | 64 | dK |
| 329 | A | 330 | U | Heating initial point (outdoor temperature) | | | 5 | -64 | 64 | °C |
| 331 | A | 332 | U | Heating end point (outdoor temperature) | | | -20 | -64 | 64 | °C |
| 333 | A | 334 | U | Maximum heating compensation (required value) | | | -1 | -64 | 64 | dK |
| | | 335 | U | Required cooling value current shift | | | | -64 | 64 | °C |
| | | 336 | U | Required heating value current shift | | | | -64 | 64 | °C |
| | | | | **Outdoor temperature dependent fan speed compensation** | | | | | | |
| 337 | A | 338 | U | Cooling initial point (outdoor temperature) | | | 25 | -64 | 64 | °C |

REMAK

# List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| 339 | A | 340 | U | Cooling end point (outdoor temperature) | | | 30 | -64 | 64 | ºC |
| 341 | A | 342 | U | Maximum cooling compensation (speed) | | | 0 | -100 | 100 | % |
| 343 | A | 344 | U | Heating initial point (outdoor temperature) | | | 5 | -64 | 64 | ºC |
| 345 | A | 346 | U | Heating end point (outdoor temperature) | | | -20 | -64 | 64 | ºC |
| 347 | A | 348 | U | Maximum heating compensation (speed) | | | 0 | -100 | 100 | % |
| | | 349 | U | Current cooling speed compensation | | | | -100 | 100 | % |
| | | 350 | U | Current heating speed compensation | | | | -100 | 100 | % |
| | | | | Room (outlet) temperature dependent fan speed compensation | | | | | | |
| 351 | A | 351 | A | Compensation function setting | | | | | | |
| | | | | | 0 | increase | 0 | | | |
| | | | | | 1 | decrease | | | | |
| | | 352 | U | **Actual compensation** | | | | 0 | 100 | % |
| 353 | A | 353 | A | Required room temperature | | | 20 | 0 | 99 | ºC |
| | | | | Heating/cooling dependent fan speed compensation | | | | | | |
| 354 | A | 354 | A | Heating temperature hysteresis | | | 1 | 0 | 20 | ºC |
| 355 | A | 355 | A | Cooling temperature hysteresis | | | 1 | 0 | 20 | ºC |
| | | 356 | U | Heating compensation display | | | | 0 | 100 | % |
| | | 357 | U | Cooling compensation display | | | | 0 | 100 | % |
| | | | | Air quality dependent compensation (damper position/fan speed) | | | | | | |
| 358 | A | 359 | U | Compensation function setting (according to the sensor characteristics) | 0 | Normal | 0 | | | |
| | | | | | 1 | Inverted | | | | |
| 360 | A | 361 | U | Required (allowable) value of the CO2, VOC, (CO) concentration | | | 800(50) | 0 | 3000 | ppm |
| 362 | A | 363 | U | CO2, VOC, (CO) sensor range setting | | | 2000(300) | 0 | 3000 | ppm |
| | | 364 | U | CO2, VOC (CO) compensation rate display | | | | 0 | 100 | % |
| | | | | **Sequence** | | | | | | |
| | | | | **Heat pump - heating** | | | | | | |
| 365 | A | 366 | U | Outdoor temperature dependent heat pump blocking | | | -8 | -45 | 35 | ºC |
| 367 | A | 368 | U | Temp. hysteresis applied for outdoor temperature dependent heat pump unblocking | | | 3 | 1 | 10 | ºC |
| 369 | A | 370 | U | Minimum operating time for heat pump heating | | | 60 | 0 | 9999 | s |
| 371 | A | 372 | U | Re-heating blocking | | | 120 | 5 | 600 | s |
| 373 | A | 374 | U | Heat pump switching on | | | 20 | 0 | 100 | % |
| 375 | A | 376 | U | Digital output opening hysteresis | | | 10 | 1 | 100 | % |
| | | 377 | U | Information - outdoor temperature dependent heat pump heating blocking | 0 | inactive | | | | |
| | | | | | 1 | active | | | | |
| | | | | **Heat pump - cooling** | | | | | | |
| 378 | A | 379 | U | Outdoor temperature dependent heat pump blocking | | | 14 | -45 | 35 | ºC |
| 380 | A | 381 | U | Tep. hysteresis applied for outdoor temperature dependent heat pump unblocking | | | 3 | 1 | 10 | ºC |
| 382 | A | 383 | U | Minimum operating time for heat pump cooling | | | 60 | 0 | 9999 | s |
| 384 | A | 385 | U | Re-cooling blocking | | | 120 | 5 | 600 | s |
| 386 | A | 387 | U | Heat pump switching on | | | 20 | 0 | 100 | % |
| 388 | A | 389 | U | Digital output opening hysteresis | | | 10 | 1 | 100 | % |
| 390 | A | 391 | U | Heat pump low reference signal setting for A output | | | 30 | 0 | 50 | % |
| | | 392 | U | Information - outdoor temperature dependent heat pump cooling blocking | 0 | inactive | | | | |
| | | | | | 1 | active | | | | |
| | | | | **Heat Pump - Special** | | | | | | |
| | | 260 | S | Inversion signal for Heat Pump – heating | 0 | Off | | | | |
| | | | | | 1 | On | | | | |
| | | 261 | S | Inversion signal for Heat Pump – cooling | 0 | Off | | | | |
| | | | | | 1 | On | | | | |
| | | 262 | S | Special signal 0-10V (Daikin) switchover | 0 | Off | | | | |
| | | | | | 1 | On | | | | |
| | | 263 | S | The difference between the demand and the real signal to determine St2 | | | 40 | 0 | 100 | % |
| | | 264 | S | Time needed to pass from 0 to 100% | | | 120 | 0 | 500 | s |
| | | 265 | S | The signal voltage request of heating (Toshiba) | | | 3.25 | 0 | 10 | V |
| | | 266 | S | The signal voltage request of cooling (Toshiba) | | | 6.25 | 0 | 10 | V |
| | | 267 | S | The signal voltage request of STOP (Toshiba) | | | 0 | 0 | 10 | V |

## List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| | | 268 | S | The signal voltage request of START (Toshiba) | | | 8 | 0 | 10 | V |
| | | | | **Cooling** | | | | | | |
| 393 | A | 394 | U | Outdoor temperature to enable cooling – all versions | | | 12 | -64 | 64 | ºC |
| 395 | A | 396 | U | Minimum pump operating time – water version | | | 180 | 0 | 9999 | s |
| 397 | A | 398 | U | Pump downtime to the pump turning activation – water version | | | 168 | 0 | 9999 | h |
| 399 | A | 401 | U | Active pump turning time – water version | | | 60 | 0 | 9999 | s |
| 397 | A | 398 | U | Minimum operating time, single-stage condensing unit – version with single-stage condensing unit | | | 60 | 0 | 9999 | s |
| 399 | A | 401 | U | Re-cooling blocking time – versions with single-, two-stage condensing units | | | 120 | 5 | 600 | s |
| 402 | A | 403 | U | Retention time during transition from Stage 1 to Stage 2 – version with two-stage condensing unit | | | 360 | 5 | 600 | s |
| 404 | A | 405 | U | Cooling request dependent evaporator Stage 1 switch-on – version with two-stage condensing unit | | | 20 | 0 | 100 | % |
| 406 | A | 407 | U | Cooling request dependent evaporator Stage 2º switch-on – version with two-stage condensing unit | | | 70 | 0 | 100 | % |
| 408 | A | 409 | U | Hysteresis for transition from Stage 1 to Stage 2, two-stage condensing unit | | | 10 | 0 | 20 | % |
| 410 | A | 411 | U | Minimum inverter operating time – version with inverter | | | 10 | 0 | 9999 | s |
| 412 | A | 413 | U | Inverter re-start blocking time – version with single-stage condensing unit + inverter | | | 60 | 0 | 300 | s |
| 413 | A | | | AO cooling signal inversion | 0 | Switched OFF | | | | |
| | | | | | 1 | Switched ON | | | | |
| | | | | **Water heating with pre-heating function** | | | | | | |
| 414 | A | 415 | U | Outdoor temperature-dependent pump start-up in the AHU Stop and Run mode | | | 5 | -64 | 64 | ºC |
| 416 | A | 417 | U | Minimum pump run time | | | 180 | 0 | 9999 | s |
| 418 | A | 419 | U | Pump downtime to the pump turning activation | | | 168 | 0 | 9999 | h |
| 420 | A | 421 | U | Active pump turning time | | | 60 | 0 | 9999 | s |
| 422 | A | 423 | U | Active function preheating of water operation time | | | 120 | 0 | 600 | s |
| 424 | A | 425 | U | Pre-heating function blocking time between AHU unit shut-down and restart | | | 5 | 0 | 30 | min |
| 426 | A | 427 | U | Water heater circuit heating curve setting at the AHU start-up X1 | | | -10 | -30 | 5 | ºC |
| 428 | A | 429 | U | Water heater circuit heating curve setting at the AHU start-up Y1 | | | 100 | 0 | 100 | % |
| 430 | A | 431 | U | Water heater circuit heating curve setting at the AHU start-up X2 | | | 10 | 0 | 50 | ºC |
| 432 | A | 433 | U | Water heater circuit heating curve setting at the AHU start-up Y2 | | | 10 | 0 | 100 | % |
| 434 | A | 435 | U | Stop to Run mode switching delay AP trigger value | | | 60 | 0 | 600 | s |
| 436 | A | 437 | U | Water heat exchanger dependent AP trigger value – AHU in Run mode | | | 15 | 0 | 50 | ºC |
| 438 | A | 439 | U | Water heat exchanger dependent AP trigger value - AHU in Stop mode | | | 30 | 0 | 50 | ºC |
| 440 | A | 441 | U | Inlet air dependent AP evaluation enabling delay after the unit start-up | | | 60 | 0 | 600 | s |
| 442 | A | 443 | U | Inlet air temperature dependent AP start-up – failure alarm A | | | 6 | -64 | 64 | ºC |
| 444 | A | 445 | U | Inlet air temperature dependent AP start-up | | | 8 | -64 | 64 | ºC |
| 446 | A | 447 | U | Maximum return water temperature | | | 70 | 20 | 140 | ºC |
| | | | | **Water pre-heating** | | | | | | |
| 448 | A | 449 | U | Outdoor dependent pre-heating (pump) start-up | | | 5 | -50 | 15 | ºC |
| 450 | A | 451 | U | Pump downtime to the pump turning activation | | | 168 | 0 | 9999 | h |
| 452 | A | 453 | U | Active pump turning time | | | 30 | 0 | 9999 | s |
| 454 | A | 455 | U | Minimum pump run time | | | 30 | 0 | 9999 | s |
| | | | | Heating water source switching | | | | | | |
| 456 | A | 457 | U | Limit value for heating | | | 15 | 5 | 25 | ºC |
| 458 | A | 459 | U | Start-up sequence delay | | | 120 | 10 | 600 | s |
| | | | | **Gas heating** | | | | | | |
| 460 | A | 461 | U | Cooling sequence enabling | 0 | without cooling | | | | |
| | | | | | 1 | with cooling | | | | |
| 462 | A | 463 | U | Minimum burner run time | | | 150 | 0 | 600 | s |
| 464 | A | 465 | U | Minimum burner downtime | | | 150 | 0 | 600 | s |
| 466 | A | 467 | U | Burner restart protection time (burner Stage 1) | | | 150 | 0 | 600 | s |
| 468 | A | 469 | U | Modulation burner opening/closing speed (burner Stage 1) | | | 5 | 0 | 20 | %/s |
| 470 | A | 471 | U | Heating request value for the burner Stage 2 switch-off | | | 40 | 10 | 100 | % |
| 472 | A | 473 | U | Maximum flue-gas temperature setting for alarm | | | 230 | 210 | 400 | ºC |
| 474 | A | 475 | U | Maximum flue-gas temperature | | | 210 | 160 | p.472 | ºC |
| 476 | A | 477 | U | Requested flue-gas temperature | | | 160 | 150 | 210 | ºC |
| 478 | A | 479 | U | Minimum flue-gas temperature | | | 150 | 100 | 160 | ºC |
| | | | | Electric heating | | | | | | |
| 480 | A | 481 | U | Electric heating switching on – request for heating | | | 20 | 0 | 100 | % |
| 482 | A | 483 | U | Electric heating hysteresis | | | 10 | 1 | 100 | % |

# List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| | | | | **Mixing** | | | | | | |
| 484 | A | 484 | U | Minimum fresh air value setting | | | 20 | 0 | 100 | % |
| 484 | A | 484 | U | Minimum fresh air value setting – Comfort mode (pool unit) | | | 20 | 0 | 100 | % |
| 485 | A | 485 | A | Minimum fresh air value setting – Economy mode (pool unit) | | | 20 | 0 | 100 | % |
| 484 | A | 485 | U | Minimum fresh air flow rate setting | | | 20 | 0 | 100 | % |
| 486 | A | 487 | U | Starting temperature for mixing damper wide-open position | | | 15 | -64 | 64 | °C |
| 488 | A | 489 | U | Starting time for mixing damper wide-open position | | | 60 | 0 | 600 | s |
| | | 490 | U | Mixing damper control signal recurrence vale (normal/inverse) | | | 100 | 0 | 100 | % |
| | | | | **Max. limit of fresh air function (ventilation unit)** | | | | | | |
| 563 | A | 564 | U | Max. limit of fresh air according to T outdoor | | | 40 | 0 | 100 | % |
| 565 | A | 566 | U | T outdoor from which the Max. limit of fresh air is activated | | | -10 | -100 | 100 | °C |
| | | 567 | U | Information about the Max. limit of fresh air activation | 0 | Inactive | | | | |
| | | | | | 1 | Active | | | | |
| 491 | A | 492 | U | Required temperature for pre-heating | | | -20 | -50 | 10 | °C |
| 493 | A | 494 | U | Outdoor dependent electric pre-heating blocking | | | -30 | -50 | 10 | °C |
| 495 | A | 496 | U | Heating request dependent el. –pre-heating switch-on | | | 20 | 0 | 100 | % |
| 497 | A | 498 | U | Hysteresis for electric pre-heater switch-off | | | 10 | 0 | 100 | % |
| | | | | Electric reheating | | | | | | |
| 502 | A | 503 | U | Heating request dependent electric re-heating start-up for Stage 1 | | | 20 | 0 | 100 | % |
| 504 | A | 505 | U | Hysteresis for electric re-heating switch-off | | | 10 | 1 | 100 | % |
| 506 | A | 507 | U | Fan stage dependent outlet limitation ST1 | | | 100 | 0 | 100 | % |
| 508 | A | 509 | U | Fan stage dependent outlet limitation ST2 | | | 100 | 0 | 100 | % |
| 510 | A | 511 | U | Fan stage dependent outlet limitation ST3 | | | 100 | 0 | 100 | % |
| 512 | A | 513 | U | Fan stage dependent outlet limitation ST4 | | | 100 | 0 | 100 | % |
| 514 | A | 515 | U | Fan stage dependent outlet limitation ST5 | | | 100 | 0 | 100 | % |
| | | | | **Heat recovery** | | | | | | |
| 516 | A | 517 | U | Freezing determination temperature exchanger | | | 1 | -64 | 64 | °C |
| 518 | A | 519 | U | Start temperature for maximum - HRE speed/volume open BP PE | | | 15 | -64 | 64 | °C |
| 520 | A | 521 | U | Start time for maximum - HRE speed/volume open BP PE | | | 60 | 0 | 600 | s |
| 522 | A | 523 | U | Heat recovery request dependent HRE run enabling | | | 38 | 0 | 100 | % |
| 524 | A | 525 | U | Hysteresis for HRE run stop | | | 5 | 0 | 100 | % |
| | | 526 | U | Information - antifreeze protection start-up | 0 | inactive | | | | |
| | | | | | 1 | active | | | | |
| | | | | **Night turning** | | | | | | |
| 527 | A | 528 | U | Time to next turning | | | 3 | 0 | 9999 | h |
| 529 | A | 530 | U | Active turning time | | | 300 | 0 | 9999 | s |
| | | | | **Humidification** | | | | | | |
| 531 | A | 532 | U | Relative set-point of relative humidity - Comfort | | | 40 | 0 | 100 | %r.H. |
| 535 | A | 536 | U | Relative set-point of humidity - Economy | | | 30 | 0 | 100 | %r.H. |
| 541 | A | 542 | U | Humidification blocking in summer | 0 | Ne | 0 | | | |
| | | | | | 1 | Ano | | | | |
| | | 545 | U | Humidification output | | | | | | % |
| | | 550 | G | Calculated current humidification set-point in the cascade | | | | | | |
| | | | | **Dehumidification** | | | | | | |
| 533 | A | 534 | U | Dehumidification relative set-point - Comfort | | | 60 | 0 | 100 | %r.H. |
| 537 | A | 538 | U | Dehumidification relative set-point - Economy | | | 70 | 0 | 100 | %r.H. |
| 533 | A | 534 | U | Dehumidification required relative value | | | 60 | 0 | 100 | %r.H. |
| 537 | A | 538 | U | Dehumidification required absolute value | | | 12 | 0 | 100 | g/kg |
| 539 | A | 540 | U | Maximum humidity required value | | | 80 | 0 | 100 | %r.H. |
| | | 543 | U | Current humidity value | | | | | | |
| | | 544 | U | Maximum humidity | | | | | | % |
| | | 546 | U | Dehumidification output | | | | | | % |
| | | 547 | U | Dew point | | | | | | °C |
| 548 | A | 549 | U | Dew point deviation | | | 1 | -64 | 64 | °C |
| | | 551 | G | Calculated current dehumidification required value for cascade control | | | | | | %r.H. |
| | | | | Humidity-dependent fan speed compensation | | | | | | |
| 552 | A | 553 | U | Humidity required value for compensation | | | 50 | 0 | 100 | %r.H. |
| 554 | A | 555 | U | Fan speed compensation function | 0 | increase | 0 | | | |

## List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| | | | | | 1 | decrease | | | | |
| | | 556 | U | Compensation display | | | | | | % |
| | | | | **Humidity-dependent mixing damper position compensation** | | | | | | |
| 560 | A | 561 | U | Fan speed compensation function | 0 | Increase | 0 | | | |
| | | | | | 1 | Decrease | | | | |
| | | 562 | U | Compensation display | | | | | | % |
| | | | | Control constants | | | | | | |
| | | | | Cooling factors (all versions) | | | | | | |
| 601 | S | 602 | A | Proportional factor | | | -5 | | | |
| 603 | S | 604 | A | Integrating factor | | | 60 | | | s |
| 605 | S | 606 | A | Derivative factor | | | 0 | | | s |
| | | | | Heat pump factors - heating | | | | | | |
| 607 | S | 608 | A | Proportional factor | | | 5 | | | |
| 609 | S | 610 | A | Integrating factor | | | 300 | | | s |
| 611 | S | 612 | A | Derivative factor | | | 0 | | | s |
| | | | | Heat pump factors - cooling | | | | | | |
| 613 | S | 614 | A | Proportional factor | | | -5 | | | |
| 615 | S | 616 | A | Integrating factor | | | 300 | | | s |
| 617 | S | 618 | A | Derivative factor | | | 0 | | | s |
| | | | | Room (outlet) temperature dependent fan speed compensation | | | | | | |
| 619 | S | 620 | A | Proportional factor | | | 20 | | | |
| 621 | S | 622 | A | Integrating factor | | | 0 | | | s |
| 623 | S | 624 | A | Derivative factor | | | 0 | | | s |
| | | | | Heating dependent fan speed compensation | | | | | | |
| 625 | S | 626 | A | Proportional factor | | | 5 | | | |
| 627 | S | 628 | A | Integrating factor | | | 120 | | | s |
| 629 | S | 630 | A | Derivative factor | | | 0 | | | s |
| | | | | Cooling dependent fan speed compensation | | | | | | |
| 631 | S | 632 | A | Proportional factor | | | -10 | | | |
| 633 | S | 634 | A | Integrating factor | | | 120 | | | s |
| 635 | S | 636 | A | Derivative factor | | | 0 | | | s |
| | | | | Air quality CO2 (VOC,CO) dependent compensation (damper position/ fan speed) | | | | | | |
| 637 | S | 638 | A | Proportional factor | | | -0.3 | | | |
| 639 | S | 640 | A | Integrating factor | | | 300 | | | s |
| 641 | S | 642 | A | Derivative factor | | | 0 | | | s |
| | | | | **Mixing** | | | | | | |
| 643 | S | 644 | A | Proportional factor | | | 7 | | | |
| 645 | S | 646 | A | Integrating factor | | | 45 | | | s |
| 647 | S | 648 | A | Derivative factor | | | 15 | | | s |
| | | | | Heat recovery RHE/BP PE | | | | | | |
| 649 | S | 650 | A | Proportional factor | | | 3 | | | |
| 651 | S | 652 | A | Integrating factor | | | 60 | | | s |
| 653 | S | 654 | A | Derivative factor | | | 1 | | | s |
| | | | | Heat recovery – antifreeze protection | | | | | | |
| 655 | S | 656 | A | Proportional factor | | | 20 | | | |
| 657 | S | 658 | A | Integrating factor | | | 150 | | | s |
| 659 | S | 660 | A | Derivative factor | | | 0 | | | s |
| | | | | Electric reheating | | | | | | |
| 661 | S | 662 | A | Proportional factor | | | 1 | | | |
| 663 | S | 664 | A | Integrating factor | | | 60 | | | s |
| 665 | S | 666 | A | Derivative factor | | | 0 | | | s |
| | | | | Electric pre-heating | | | | | | |
| 667 | S | 668 | A | Proportional factor | | | 5 | | | |
| 669 | S | 670 | A | Integrating factor | | | 120 | | | s |
| 671 | S | 672 | A | Derivative factor | | | 0 | | | s |
| | | | | Water heating with pre-heating function | | | | | | |
| 673 | S | 674 | A | Proportional factor – AP from return water | | | 20 | | | |
| 675 | S | 676 | A | Integrating factor - AP from return water | | | 90 | | | s |

# List of Data Points (HMI-SG controller)

| Menu HMI-SG | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | Factory Settings | | | |
| Notation | | Reading | | | Value | Min | Max | |
| code | level | code | level | | | | | |
| 677 | S | 678 | A | Derivative factor - AP from return water | 0 | | | s |
| 679 | S | 680 | A | Proportional factor - AP from inlet air | 50 | | | |
| 681 | S | 682 | A | Integrating factor - AP from inlet air | 0 | | | s |
| 683 | S | 684 | A | Derivative factor - AP from inlet air | 0 | | | s |
| 685 | S | 686 | A | Proportional factor - AP from max. return water temperature | -3 | | | |
| 687 | S | 688 | A | Integrating factor - AP from max. return water temperature | 300 | | | s |
| 689 | S | 690 | A | Derivative factor - AP from max. return water temperature | 0 | | | s |
| 691 | S | 692 | A | Proportional factor - from temperature request | 5 | | | |
| 693 | S | 694 | A | Integrating factor - from temperature request | 150 | | | s |
| 695 | S | 696 | A | Derivative factor - from temperature request | 0 | | | s |
| | | | | Electric heating | | | | |
| 697 | S | 698 | A | Proportional factor | 2 | | | |
| 699 | S | 701 | A | Integrating factor | 60 | | | s |
| 702 | S | 703 | A | Derivative factor | 0 | | | s |
| | | | | **Gas heating** | | | | |
| 704 | S | 705 | A | Proportional factor - burner | 5 | | | |
| 706 | S | 707 | A | Integrating factor - burner | 60 | | | s |
| 708 | S | 709 | A | Derivative factor - burner | 0 | | | s |
| 710 | S | 711 | A | Proportional factor - bypass damper | -5 | | | |
| 712 | S | 713 | A | Integrating factor - bypass damper | 120 | | | s |
| 714 | S | 715 | A | Derivative factor - bypass damper | 0 | | | s |
| 716 | S | 717 | A | Proportional factor - maximum temperature of flue gas | 10 | | | |
| 718 | S | 719 | A | Integrating factor - maximum temperature of flue gas | 120 | | | s |
| 720 | S | 721 | A | Derivative factor - maximum temperature of flue gas | 0 | | | s |
| 722 | S | 723 | A | Proportional factor - minimum temperature of flue gas | -10 | | | |
| 724 | S | 725 | A | Integrating factor - minimum temperature of flue gas | 120 | | | s |
| 726 | S | 727 | A | Derivative factor - minimum temperature of flue gas | 0 | | | s |
| | | | | Cascade temperature control | | | | |
| 728 | S | 729 | A | Proportional factor | 10 | | | |
| 730 | S | 731 | A | Integrating factor | 1200 | | | s |
| | | | | **Cascade humidity control** | | | | |
| 732 | S | 733 | A | Proportional factor | 4 | | | |
| 734 | S | 735 | A | Integrating factor | 0 | | | s |
| | | | | Humidification | | | | |
| 736 | S | 737 | A | Proportional factor | 5 | | | |
| 738 | S | 739 | A | Integrating factor | 120 | | | s |
| 740 | S | 741 | A | Derivative factor | 0 | | | s |
| 732 | S | 733 | A | Proportional factor | 4 | | | |
| 734 | S | 735 | A | Integrating factor | 0 | | | s |
| | | | | Dehumidification | | | | |
| 742 | S | 743 | A | Proportional factor | -2 | | | |
| 744 | S | 745 | A | Integrating factor | 240 | | | s |
| 746 | S | 747 | A | Derivative factor | 0 | | | s |
| | | | | Humidity-dependent fan speed compensation | | | | |
| 748 | S | 749 | A | Proportional factor | -5 | | | |
| 750 | S | 751 | A | Integrating factor | 0 | | | s |
| 752 | S | 753 | A | Derivative factor | 0 | | | s |
| | | | | Constant Air Flow/Pressure Control - inlet | | | | |
| 754 | S | 755 | A | Proportional factor | 0.3 | | | |
| 756 | S | 757 | A | Integration factor | 30 | | | s |
| 758 | S | 759 | A | Differentiation factor | 0 | | | s |
| | | | | Constant Air Flow/Pressure Control - outlet | | | | |
| 760 | S | 761 | A | Proportional factor | 0.3 | | | |
| 762 | S | 763 | A | Integration factor | 30 | | | s |
| 764 | S | 765 | A | Differentiation factor | 0 | | | s |
| | | | | Checks, system and network settings | | | | |
| | | | | **Humidity-dependent mixing damper position compensation** | | | | |
| 766 | S | 767 | A | Proportional factor | -2 | | | |
| 768 | S | 769 | A | Integrating factor | 45 | | | s |

| Menu HMI-SG | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| 770 | S | 771 | A | Derivative factor | | | 0 | | | s |
| | | | | Difference between required and inlet temperature monitoring | | | | | | |
| 801 | A | 802 | G | Maximum difference (±ºC) | | | 10 | 0 | 99 | ºC |
| 803 | A | 804 | G | Minimum limit (ºC) | | | 10 | 0 | 99 | ºC |
| 805 | A | 806 | G | Time delay after AHU start-up (s) | | | 60 | 0 | 9999 | s |
| | | | | Difference between required and room (outlet) temperature monitoring | | | | | | |
| 807 | A | 808 | G | Maximum difference (±ºC) | | | 10 | 0 | 99 | ºC |
| 809 | A | 810 | G | Minimum limit (ºC) | | | 10 | 0 | 99 | ºC |
| 811 | A | 812 | G | Time delay after AHU start-up (s) | | | 600 | 0 | 9999 | s |
| | | | | **Remote fault** | | | | | | |
| 813 | A | 814 | G | Failure class selection to digital output | 0 | Failure A | 1 | | | |
| | | | | | 1 | Failure A+B | | | | |
| | | 815 | G | Alarm message (generated depending on priorities) | 0 | Normal | | | | |
| | | | | | 1 | Alarm | | | | |
| | | | | **Fire mode** | | | | | | |
| 816 | A | 817 | G | Fan behaviour during fire selection | 0 | Stop | 0 | | | |
| | | | | | 1 | Inlet fan | | | | |
| | | | | | 2 | Outlet fan | | | | |
| | | | | | 3 | Both fans | | | | |
| 818 | A | 819 | G | Fan output during fire selection | | | 80 | 0 | 100 | % |
| 820 | A | 821 | G | Fire alarm activation inlet temperature | | | 70 | 0 | 99 | ºC |
| 822 | A | 823 | G | Fire alarm activation outlet temperature | | | 50 | 0 | 99 | ºC |
| | | | | Alarm number for HMI | | | | | | |
| | | 824 | U | Alarm number | | | | | | |
| | | | | System settings - control unit | | | | | | |
| 825 | A | 825 | A | Failure acknowledgement (reset of all failures after they have been removed) | 0 | No | | | | |
| | | | | | 1 | Yes | | | | |
| 826 | S | 826 | S | Software reset of the controller | 0 | without reset | | | | |
| | | | | | 1 | reset | | | | |
| 827 | S | 827 | S | Control unit location building physical address | | | 0 | 0 | 15 | |
| 828 | S | 828 | S | Control unit location floor physical address | | | 0 | 0 | 15 | |
| 829 | S | 829 | S | Control unit device address | | | 0 | 0 | 250 | |
| | | | | **SD card** | | | | | | |
| 830 | S | | | Application load from SD card | 0 | No change | | | | |
| | | | | | 1 | Loading | | | | |
| 834 | S | | | Parameter save to SD card | 0 | Passive | | | | |
| | | | | | 1 | Active | | | | |
| | | 835 | S | Parameter save to SD card - successful | 0 | No | | | | |
| | | | | | 1 | Yes | | | | |
| 836 | S | | | Parameter load from SD card | 0 | Passive | | | | |
| | | | | | 1 | Pasrtial | | | | |
| | | | | | 2 | Full | | | | |
| | | 837 | S | Parameter load SD card - successful | 0 | No | | | | |
| | | | | | 1 | Yes | | | | |
| 831 | S | 831 | S | Data point recovery (factory settings) | 0 | No | | | | |
| | | | | | 1 | Yes | | | | |
| | | | | User settings | | | | | | |
| 832 | A | 832 | A | Data point saving (user settings) | 0 | without saving | | | | |
| | | | | | 1 | with saving | | | | |
| 833 | A | 833 | A | Data point recovery (user settings) | 0 | No | | | | |
| | | | | | 1 | Yes | | | | |
| | | | | ModBus | | | | | | |
| | | 838 | S | Alarm | 0 | OK | | | | |
| | | | | | 1 | Error | | | | |
| 839 | S | 839 | S | Failure flow activation delay (at fan start-up) | | | 45 | 0 | 600 | s |
| 840 | S | 840 | S | Failure flow activation delay (during fan run) | | | 5 | 0 | 600 | s |
| 841 | S | 841 | S | Thermo-contact (TK) failure activation delay (fans) | | | 2 | 0 | 600 | s |
| 842 | S | 842 | S | Frequency inverter failure activation delay | | | 2 | 0 | 600 | s |

| Menu HMI-SG | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| 843 | S | 843 | S | Number of message repeating during error transfers | | | 2 | | | |
| 844 | S | 844 | S | Number of error transfers for communication failure evaluation | | | 6 | | | |
| 845 | S | 845 | S | Frequency inverter 1 address, inlet fan | | | 1 | | | |
| 846 | S | 846 | S | Frequency inverter 2 address, inlet fan backup or second inlet fan | | | 2 | | | |
| 847 | S | 847 | S | Frequency inverter 3 address, inlet fan twin backup | | | 3 | | | |
| 848 | S | 848 | S | Frequency inverter 4 address, inlet fan twin backup | | | 4 | | | |
| 849 | S | 849 | S | Frequency inverter 5 address, outlet fan | | | 5 | | | |
| 850 | S | 850 | S | Frequency inverter 6 address, outlet fan backup or second outlet fan | | | 6 | | | |
| 851 | S | 851 | S | Frequency inverter 7 address, outlet fan twin backup | | | 7 | | | |
| 852 | S | 852 | S | Frequency inverter 8 address, outlet fan twin backup | | | 8 | | | |
| 853 | S | 853 | S | Frequency inverter 9 address, 3rd auxiliary fan | | | 9 | | | |
| 854 | S | 854 | S | Frequency inverter 10 address, second 3rd auxiliary fan | | | 10 | | | |
| 857 | S | 857 | S | Frequency inverter 11 address, rotary heat exchanger | | | 11 | | | |
| 858 | S | 858 | S | Control unit Modbus resistance terminal | 0 | inactive | | | | |
| | | | | | 1 | active | | | | |
| | | | | **Network connection configuration (After setting – the reset is required !!)** | | | | | | |
| 859 | A | | | DHCP | 0 | passive | | | | |
| | | | | | 1 | active | | | | |
| 860 | A | | | Settings IP[w] | | | 192 | 0 | 255 | |
| 861 | A | | | Settings IP[x] | | | 168 | 0 | 255 | |
| 862 | A | | | Settings IP[y] | | | 1 | 0 | 255 | |
| 862 | A | | | Settings IP[z] | | | 199 | 0 | 255 | |
| | | 864 | U | Actual IP[w] | | | | | | |
| | | 865 | U | Actual IP[x] | | | | | | |
| | | 866 | U | Actual IP[y] | | | | | | |
| | | 867 | U | Actual IP[z] | | | | | | |
| 868 | A | | | Settings mask [w] | | | 255 | 0 | 255 | |
| 869 | A | | | Settings mask [x] | | | 255 | 0 | 255 | |
| 870 | A | | | Settings mask [y] | | | 255 | 0 | 255 | |
| 871 | A | | | Settings mask [z] | | | 0 | 0 | 255 | |
| | | 872 | U | Actual mask [w] | | | | | | |
| | | 873 | U | Actual mask [x] | | | | | | |
| | | 874 | U | Actual mask [y] | | | | | | |
| | | 875 | U | Actual mask [z] | | | | | | |
| 876 | A | | | Settings gateway [w] | | | 0 | 0 | 255 | |
| 877 | A | | | Settings gateway[x] | | | 0 | 0 | 255 | |
| 878 | A | | | Settings gateway [y] | | | 0 | 0 | 255 | |
| 879 | A | | | Settings gateway [z] | | | 0 | 0 | 255 | |
| | | 880 | U | Actual gateway [w] | | | | | | |
| | | 881 | U | Actual gateway [x] | | | | | | |
| | | 882 | U | Actual gateway [y] | | | | | | |
| | | 883 | U | Actual gateway [z] | | | | | | |
| | | | | **System settings - room unit** | | | | | | |
| 884 | S | 884 | S | Transition to time program delay | | | 1 | 0 | 23 | h |
| 885 | A | 885 | A | Byte address, Diagnostic mode – byte address | | | 5 | | | |
| 886 | A | 886 | A | Alarm mode | 0 | N/A | 2 | | | |
| | | | | | 1 | only after alarm | | | | |
| | | | | | 2 | constantly | | | | |
| 887 | S | 887 | S | Room temperature display, combined or inlet temperature | 0 | Temp. from HMI-SG | 0 | | | |
| | | | | | 1 | Temperature average | | | | |
| | | | | | 2 | Outlet Temperature | | | | |
| | | | | | 3 | Temperature in the inlet | | | | |
| 895 | U | 895 | U | Temperature unit display settings ºC/ºF | 0 | ºC | 0 | | | |
| | | | | | 1 | ºF | | | | |
| 896 | A | 896 | A | Required value compensation setting +/- | | | 3 | 0 | 12 | ºC |
| 897 | A | 897 | A | Required value increment | 0 | Increment per 0.1 | 0 | | | ºC |
| | | | | | 1 | Increment per 0.5 | | | | ºC |

| Menu HMI-SG | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | | | | Meaning | | | Factory Settings | | | |
| Notation | | Reading | | | | | Value | Min | Max | |
| code | level | code | level | | | | | | | |
| 898 | A | 898 | A | Displayed time format - 12h/24h | 0 | 24 h | | | | |
| | | | | | 1 | 12 h | | | | |
| | | | | **Passwords** | | | | | | |
| 899 | S | 899 | S | Password for Service level access | | | | 0 | 9999 | |
| 901 | A | 901 | A | Password for Admin level access | | | | 0 | 9999 | |
| 902 | U | 902 | U | Password for User level access | | | | 0 | 9999 | |
| 903 | G | 903 | G | Password for Guest level access | | | | 0 | 9999 | |
| | | | | **Comunication with Building management system (BMS) - (After settings - reset required !!)** | | | | | | |
| | | | | **LON** | | | | | | |
| 921 | S | 921 | S | Send heart beat (s) | | | 2700 | 0 | 9999 | s |
| 922 | S | 922 | S | Receive heart beat (s) | | | 3600 | 0 | 9999 | s |
| 923 | S | 923 | S | Min send intervall (s) | | | 5 | 0 | 9999 | s |
| 924 | S | 924 | S | Service pin | 0 | inactive | | | | |
| | | | | | 1 | active | | | | |
| 925 | S | 925 | S | Out temperature value | 0 | of application | 0 | | | |
| | | | | | 1 | of communication | | | | |
| 926 | S | 926 | S | Fire alarm (external) | 0 | of application | 0 | | | |
| | | | | | 1 | of communication | | | | |
| | | | | Modbus RTU - Slave (BMS) | | | | | | |
| 925 | S | 925 | S | Out temperature value | 0 | of application | | | | |
| | | | | | 1 | of communication | | | | |
| 926 | S | 926 | S | Fire alarm (external) | 0 | of application | | | | |
| | | | | | 1 | of communication | | | | |
| 931 | S | 931 | S | Modbud Slave1 | 0 | inactive | | | | |
| | | | | | 1 | active | | | | |
| 932 | S | 932 | S | Address Slave1 | | | 1 | | | |
| 933 | S | 933 | S | Baud rate Slave1 | | default | 9600 | | | b/s |
| | | | | 2400 (factor 10) | | | | | | |
| | | | | 4800 (factor 10) | | | | | | |
| | | | | 9600 (factor 10) | | | | | | |
| | | | | 19200 (factor 10) | | | | | | |
| | | | | 38400 (factor 10) | | | | | | |
| 934 | S | 934 | S | Stop bits Slave1 | 0 | One stop bit | 1 | | | |
| | | | | | 1 | Two stop bits | | | | |
| 935 | S | 935 | S | Parity Slave1 | 0 | Even | 2 | | | |
| | | | | | 1 | Odd | | | | |
| | | | | | 2 | None | | | | |
| 936 | S | 936 | S | Termination (resistor) Slave1 | 0 | inactive | 0 | | | |
| | | | | | 1 | active | | | | |
| 937 | S | 937 | S | Response timeout Slave1 | | | 5 | 0 | 3600 | s |

## List of Failures (HMI-SG controller)

| Failure Description | Class | Failure Number | Failure Causes |
|---|---|---|---|
| | | | |
| Reduced humidification output | B | 10 | Reduced humidification output due to the temperature priority (swimming-pool unit) – an information message. |
| Auxiliary Fan | B | 15 | 1.) Communication error between control unit and the auxiliary fan frequency inverter (Modbus data bus) – inverter internal error; wrong settings of the frequency inverter data points – bus communication protocol, data transfer rate, parity, number of stop-bits, communication timeout; poor connection of the bus cable to the frequency inverter terminals; bus terminal resistance settings on the last frequency inverter has not been performed. |
| | | | 2.) Auxiliary fan failure (Modbus data bus) - thermo-contact, flow sensor |
| Auxiliary Fan - twin | B | 16 | 1.) Communication error between control unit and the auxiliary fan twin frequency inverter (Modbus data bus) – inverter internal error; wrong settings of the frequency inverter data points - bus communication protocol, data transfer rate, parity, number of stop-bits, communication timeout; poor connection of the bus cable to the frequency inverter terminals; bus terminal resistance settings on the last frequency inverter has not been performed. |
| | | | 2.) Auxiliary fan twin failure (Modbus data bus) - thermo-contact, flow sensor |
| Backup fans in the inlet | B | 18 | Main inlet fan failure (backup fan activated) - thermo-contact, flow sensor |
| | | | A Class failure – inlet backup fan shutdown |
| Backup fans in the outlet | B | 19 | Main outlet fan failure (backup fan activated) - thermo-contact, flow sensor |
| | | | A Class failure - outlet backup fan shutdown |
| Communication, Modbus | B | 23 | Communication error between control unit and the fan or ROV frequency inverter (Modbus data bus) - inverter internal error; wrong settings of the frequency inverter data points – bus communication protocol, data transfer rate, parity, number of stop-bits, communication timeout; poor connection of the bus cable to the frequency inverter terminals; bus terminal resistance settings on the last frequency inverter has not been performed. |
| Process communication KNX | B | 23 | Communication error between control unit and HMI-SG controller (KNX bus) |
| Room unit 1 - Temperature | B | 24 | Disconnected or damaged HMI-SG1 controller |
| Room unit 2 - Temperature | B | 24 | 1) Disconnected or damaged HMI-SG2 controller |
| | | | 2) Wrong HMI-SG2 controller communication address setting (the same address with the HMI-SG1 controller) |
| Outdoor temperature | B | 25 | Disconnected or damaged outdoor temperature sensor |
| Room temperature | B | 26 | Disconnected or damaged room temperature sensor |
| Outlet temperature | B | 28 | Disconnected or damaged outlet temperature sensor |
| Inlet temperature difference | B | 32 | Information message on the difference between inlet and required temperatures, providing the Inlet and Required Temperature Difference Monitoring has been activated (in the data point 201). If the temperature difference is higher than pre-set Maximum Difference (data point 801) or if the inlet temperature drops below the pre-set minimum threshold (data point 803), an information message is displayed. |
| Room temperature difference | B | 33 | Information message on the difference between room/outlet and required temperatures, providing the Inlet and Required Temperature Difference Monitoring has been activated (in the data point 201). If the temperature difference is higher than pre-set Maximum Difference (data point 807) or if the room/outlet temperature drops below the pre-set minimum threshold (data point 809), an information message is displayed. |

## List of Failures (HMI-SG controller) *(continuation)*

| Failure Description | Failure Class | Failure Number | Failure Causes |
|---|---|---|---|
| Outdoor temperature dependent heat pump blocking | B | 35 | Information message – The heat pump blocked due to outdoor temperature |
| Heat pump | B | 36 | Heat pump failure – contact |
| Humidification | B | 37 | Humidifier failure - contact |
| Filters | B | 39 | Filter failure - contact |
| Fan operating hours | B | 40 | The pre-set fan operating hours have been exceeded; operating hours are set using the HMI-DM, TM or HMI@Web controllers. |
| Cooling | B | 41 | Cooling failure (direct expansion evaporation, inverter condensing unit) -contact |
| ZZT (antifreeze protection) | B | 42 | 1.) Lost communication between control unit and ROV frequency inverter - inverter internal error; wrong settings of the frequency inverter data points (bus communication protocol, data transfer rate, parity, number of stop-bits, communication timeout; poor connection of the bus cable to the frequency inverter terminals; bus terminal resistance on the last frequency inverter has not been performed) |
| | | | 2.) Antifreeze protection ROV/DEV has been activated due to drop in temperature below the pre-set value (data point 516). |
| ZZT (ROV) | B | 43 | Belt - rotary heat exchanger |
| Inlet air relative humidity | B | 46 | 1.) Inlet air humidity sensor disconnected or damaged |
| | | | 2.) Humidity > 100% |
| Outdoor air relative humidity | B | 47 | 1.) Outdoor air humidity sensor disconnected or damaged |
| | | | 2.) Humidity > 100% |
| Room air relative humidity | B | 48 | 1.) Room air humidity sensor disconnected or damaged |
| | | | 2.) Humidity > 100% |
| Air quality ($CO$, $CO_2$) | B | 49 | 1.) Air quality sensor disconnected or damaged |
| | | | 2.) Air quality > 3000 ppm |
| Back draught protection (TH) | B | 55 | Back draught protection for the chamber after cooling – thermostat TH 167 or ES3M-T3. |
| Flue-gas high temperature, heater shut down | B | 56 | Flue-gas temperature sensor disconnected or damaged |
| Flue-gas high temperature, VZT shut down | A | 57 | 1.) Flue-gas temperature sensor disconnected or damaged |
| | | | 2.) Flue-gas temperature is higher than the pre-set temperature (data point 472). |
| Burner failure | A | 58 | Burner internal failure - contact |
| Electric preheater | A | 59 | Temperature behind the electric pre-heater < -50ºC |
| | B | 59 | 1.) Temperature sensor behind the electric heater disconnected or damaged |
| | | | 2.) Electric pre-heater failure - thermostat |
| Temperature in the inlet | A | 60 | 1.) Inlet air sensor disconnected or damaged |
| | | | 2.) Inlet air temperature is higher than the pre-set temperature (data point 442) – water heating antifreeze protection (PMO) is active. |
| Heat exchanger freezing | B | 61 | Temperature sensor behind ROV disconnected or damaged |
| Electric heating | A | 62 | Electric heater failure - thermostat |

## List of Failures (HMI-SG controller) *(continuation)*

| Failure Description | Class | Failure Number | Failure Causes |
|---|---|---|---|
| Electric reheating | A | 63 | Electric after-heater failure - thermostat |
| Water heater pump | A | 65 | Water heater pump failure - contact |
| Water heating additional antifreeze protection (PMO) | A | 65 | Electric heating additional PMO - thermostat |
| Inlet fan | A | 66 | Backup inlet fan error - thermo-contact |
| Inlet fan (airflow failure) | A | 66 | 1.) Backup inlet fan error - flow sensor |
| | | | 2.) Single-speed fan error - flow sensor |
| Outlet fan | A | 67 | Backup outlet fan error - thermo-contact |
| Outlet fan (airflow failure) | A | 67 | Backup outlet fan error - flow sensor |
| Air flow sensor (pressure) - inlet fan | A | 69 | Unconnected or damaged air flow sensor (pressure) - inlet fan |
| Air flow sensor (pressure) - outlet fan | A | 70 | Unconnected or damaged air flow sensor (pressure) - outlet fan |
| Fan (inlet, outlet) | A | 71 | 1.) Communication error between control unit and the inlet/outlet fan frequency inverter (Modbus data bus) - inverter internal error; wrong settings of the frequency inverter data points – bus communication protocol, data transfer rate, parity, number of stop-bits, communication timeout; poor connection of the bus cable to the frequency inverter terminals; bus terminal resistance settings on the last frequency inverter has not been performed. |
| | | | 2.) Inlet/outlet fan error - thermo-contact |
| Fan (inlet, outlet) – flow failure | A | 72 | 1.) Lost communication between control unit and fan frequency inverter - inverter internal error; wrong settings of the frequency inverter data points - bus communication protocol, data transfer rate, parity, number of stop-bits, communication timeout; poor connection of the bus cable to the frequency inverter terminals; bus resistance terminal settings on the last frequency inverter has not been performed. |
| | | | 2.) Inlet/outlet fan error - flow sensor |
| Water pre-heating | A | 74 | 1.) Temperature sensor disconnected or damaged |
| | | | 2.) Water temperature in the water heat exchanger return pipe > 140 ºC, or water temperature in the water heat exchanger return pipe < 5 ºC |
| Outlet temperature-dependent fire alarm activation | A | 81 | Fire alarm triggered due to exceeded pre-set outlet air temperature (data point 820) |
| Inlet temperature-dependent fire alarm activation | A | 81 | Fire alarm triggered due to exceeded pre-set inlet air temperature is (data point 821) |
| Fire alarm (external failure) | A | 81 | 1.) Fire alarm triggered by the fire dampers - contact |
| | | | 2.) External failure - contact |
| Water heater return water | A | 82 | 1.) Temperature sensor disconnected or damaged |
| | | | 2.) Water temperature in the water heat exchanger return pipe > 140 ºC, or water temperature in the water heat exchanger return pipe < 8 ºC |

## Remak Mobile App

### Introduction

REMAK Application is a touchscreen application for mobile phones (smartphones) and tablets running Google Android (v. 4.1 and higher) or Apple iOS (v. 12.2 and higher). in installations / applications where you can use Wi-Fi LAN and / GSM mobile data to connect to the Internet.
Mobile applications such as HMI to VCS serve as a user-friendly driver for basic HVAC control - triggering desired mode (+ switching off), setting (user-friendly parameters only) and simple operation overview (feedback).

### Function

Mobile application brings control/monitoring capabilities easily and from anywhere- where a mobile device can be connected via wifi or GSM mobile data to a computer network, of the Internet (ie provided the network's functionality (availability) is no longer necessary, and no other operating mode is required). It does not include full service setup/commissioning, but with the mobile application, the standard HMI @ WEB interface is also available - including via the mobile application menu (but standard sign-in required) - which must be used for commissioning of the whole device and basic network communication and password settings for the safe operation of the mobile application to control the HVAC.
An example of a mobile application for setting the setpoints is shown in Figure 22.
*Note: The VCS control unit must be equipped (factory-configured) with a LAN connection, incl. License (or Configuration ID) to use Remak - Inthouse.*
*If the application licence is ordered = configured in the project, configuration IDs (two "codes") for the mobile application and the licence for the respective VCS, or controller, are included in the accompanying VCS documentation and printed on the stickers attached directly to the controller.*

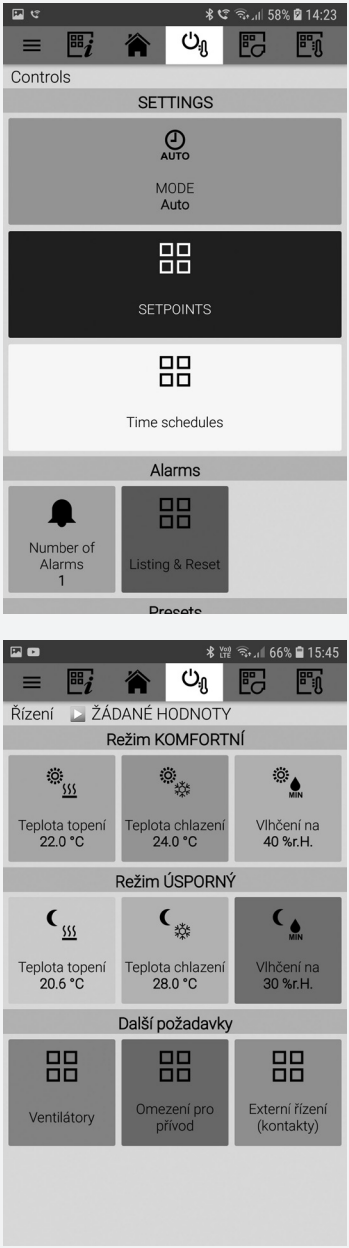
### Security

Use of the application is security with an adjustable password in the controller. Security against unauthorized access to the LAN must be provided with standard IT resources (see also on page 54 of this manual).
**Note: Setting your own PLC password for Remak (as well as JSON communication) as well as for HMI@ EB is one of the necessary safeguards against unauthorized operation!**
Further, the application (in the Settings menu) provides an extended log-in option for the "Advanced" user role using a "special" constant password (this is not a security password) allowing some specific elements for experts, i.e., more detailed information about automatic operation or the control mode (otherwise accessible on the HMI@WEB interface) to be displayed. This information can be rather confusing for ordinary users. Note: The RMKDEV user role is not intended for standard use, it is used only for development/test purposes of the manufacturer.

### Additional information

Additional user information (basic features, questions and answers, application installation information) can be found on the product web page: https://www.remak.eu"

**Figure 21** – mobile app GUI



## Control (HMI-DM,HMI-TM controllers)

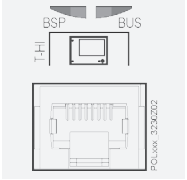
HMI-DM (HMI-TM) control devices ensure communication between the VCS control unit and the user. They are intended for air-handling device control, handling and service. The HMI control device can be connected to the POL4xx or POL6xx controllers. During controller operation, a single HMI control device can be connected or disconnected and alternatively (in sequence) used to control multiple control units (controllers).

### Connection

The HMI-DM controller can be connected using a serial interface (4-wire, twisted pair) with two RJ45 connectors. The cable length is 1.5 m (the cable is included in the delivery). When installed on a wall, the HMI-DM controller can be connected using a shielded 8-wire UTP cable with two RJ45 connectors. The maximum distance is up to 50 m.
The HMI-TM controller can be connected to the control unit using a 4-wire cable (twisted pair) with one RJ45 connector and one slim connector. The cable length is 2.5 m (the cable is included in the delivery).

**Warning**
After connecting the controller to the control unit, it is necessary to route the cable through the PG16 grommet. Thus degree of protection IP20 is ensured. If a higher level of protection of the distribution board casing is required, the grommet will have to be resealed. An optional grommet with an RJ 45 connector can be used to make it easy to connect (disconnect) the HMI controller (an extra order is required, not included in the standard delivery). Then the RJ45 connector must be connected to the RJ45 socket on the controller. For the socket marking, see the figure.

**Figure 22**




### HMI-DM controller

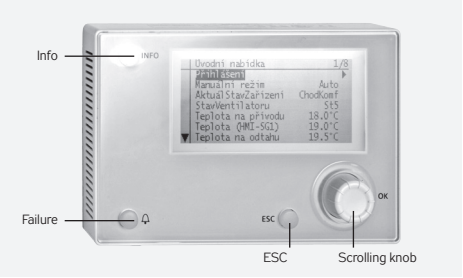
#### Operating conditions

Degree of protection: IP 31. Permissible ambient temperature: -40 ºC to 70 ºC. Relative humidity <95 %.

#### Device Description

The controller consists of two separate parts – the face plate with a display and the rear plate. Dimensions of the HMI-DM controller are 144x96x26 mm and the integrated LCD display resolution is 208x96 pixels. The display can show 8 lines. The HMI-DM controller is equipped with three function buttons, **INFO, FAILURE** and **ESC**, and one **scrolling knob**. The scrolling knob and buttons are used to navigate within the menu and to change the parameters and control values. The **INFO, FAILURE** and **ESC** buttons are equipped with LEDs to indicate operating states.
The controller can also be delivered in a version for free location. The magnets on the rear side of the HMI enable the controller to be attached to metal parts (e.g. the air-handling unit).

**Figure 23 –** HMI-DM cotroller



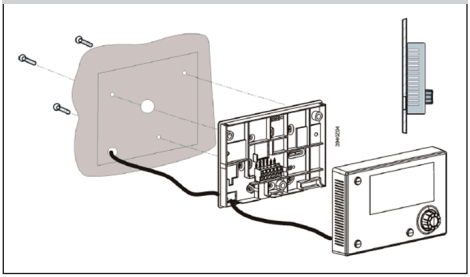

For fixed mounting, the controller is equipped with threaded holes on its rear side to screw it to the mounting plate.

**Table 1** – Function Buttons

| Button (Name) | Activity | Description |
|---|---|---|
| **Scrolling knob** | Turning | - Selection from the menu<br>- Selection from the parameters or change to a value |
| | Press | - Selection/confirmation |
| | Hold | - When logged in, press and hold for at least 3 s to go to the log-in/log-out page.<br>- When not logged in at any access level, the log-in page is displayed. |
| **Esc** | Press | - Cancels the change to the parameter value<br>-Returns to the upper level of the menu/previous page<br>- Returns to the last active page before accessing the Password Administration page<br>- Returns to the last active page before accessing the Home page using the Info button. |
| | Hold | - Goes to the Start Menu |
| **Info** | Press | - Goes to the Main Menu from the current menu page<br>- Goes to the Start Menu page from the Main Menu |
| | Flashing green | - Air-handling unit start-up sequence |
| | Green light | - Air-handling unit operation |
| **Failures** | Press | - Every time you press this button, you will cycle through the following pages → List of Failures → History of Failures → Alarm Settings (failure confirmation and reset) |
| | Flashing red | - Active unconfirmed failures |
| | Red light | - Active confirmed failures |

## Control (HMI-DM,HMI-TM controllers)

**Figure 24 – Installation on a Wall**



## HMI-TM controller

### Operating conditions

Degree of protection: IP 65 (version with magnetic fixation). Permissible ambient temperature: -20 ºC to 60 ºC. Relative humidity: 5 % to 95 %.

### Device Description

Dimensions of the HMI-TM controller are 173x95.5x21.6 mm. The LCD display resolution is 128x96 pixels. The HMI-TM controller is equipped with 6 function buttons, **INFO, FAILURE, ESC, UP, DOWN** and **ENTER**. The **INFO, FAILURE** and **ESC** buttons simultaneously indicate operating states (Stop – failure, operation). The **UP, DOWN** and **ENTER** buttons are used to navigate through the menu. The magnetic plate on the rear side of the HMI enables free attachment to metal objects.

**Figure 25 –** HMI-TM controller

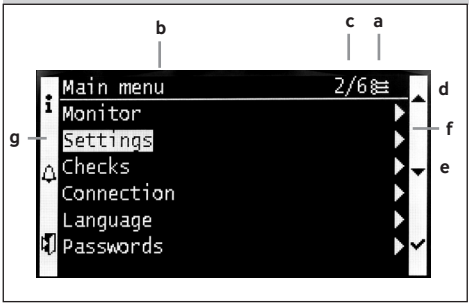

**Table 2** – Function Buttons

| Button (Name) | Activity | Description |
|---|---|---|
| **Up** | Press | - Scrolling the list upwards<br>- Increases the parameter value |
| | Hold | - Hold this button longer than 1.5 s to speed up the list scrolling upwards<br>- Increases the parameter values in higher grades |
| **Down** | Press | - Scrolling the list downwards<br>- Decreases the parameter values |
| | Hold | - Hold this button longer than 1.5 s to speed up the list scrolling downwards<br>- Decreases the parameter values in higher grades |
| **Enter** | Press | Selection/confirmation |
| | Hold | - When logged in, press and hold for at least 3 s to go to the log-in/log-out page.<br>- When not logged in at any access level, the log-in page is displayed. |
| **Info** | Press | - Goes to the Main Menu from the current menu page<br>- Goes to the Start Menu page from the Main Menu |
| | Flashing green | - Air-handling unit start-up sequence |
| | Green light | - Air-handling unit operation |
| **Failures** | Press | - Every time you press this button, you will cycle through the following pages → List of Failures → History of Failures → Alarm Settings (failure confirmation and reset) |
| | Flashing red | - Active unconfirmed failures |
| | Red light | - Active confirmed failures |
| **Esc** | Press | - Cancels the change to the parameter value<br>- Returns to the upper level of the menu/previous page<br>- Returns to the last active page before accessing the Password Administration page<br>- Returns to the last active page before accessing the Home page using the Info button. |
| | Hold | - Moves to the HMI Settings page |

## Control (HMI-DM,HMI-TM controllers)

### Display Layout

**Figure 26 –** LCD isplay




**a** The user log-in is graphically indicated by the key symbol in the page heading. The access levels are distinguished by the following symbols.

**Table 3** – access levels

| User | Icon |
|---|---|
| GUEST | |
| USER | |
| ADMINISTRATOR | |
| SERVICE | |

**b** Page Heading
**c** Current line from the total number of lines on the page
**d** The page also includes the line above the current display
**e** The page also includes the line below the current display
**f** Access to the Main Menu from the current menu page
**g** Current line of the selection

**Access to the Submenu**

The cursor marks the selection of parameters on a corresponding line. The arrow indicator in the right part of the display indicates the option to access a submenu.

- Turn the knob (or use the Up and Down buttons) to select the required line.
- Press the knob (Enter) to access the submenu.


If only the value description is highlighted on the line, the value on the line is intended only to be displayed, refer to Temperatures.

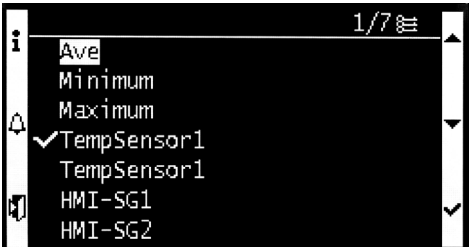

**Value Settings**

If the description and value of the parameter is highlighted on the line, the highlighted value can be changed.

- Turn the knob (or use the Up and Down buttons) to select the line.
- Press the knob (Enter) to confirm the page selection.
- Turn the knob (or use the Up and Down buttons) to change the parameter values.
- Press the knob (Enter) to confirm the value change.
- Press the Esc button to exit the page.


**Setting the Selection from Multiple Parameters**

- The current parameter selection is marked.
- Turn the knob (or use the Up and Down buttons) to select a new parameter.
- Press the knob (Enter) to confirm the selection or press the Esc button to retain the original value as valid.




**Setting the Continuous Value using the Knob**

The scale displays minimum and maximum values.

- Set the arrow on the respective number
- By turning the wheel, the number can be changed from 0 to 9.
- The cursor is moved to the following item automatically
- Press the knob to confirm the selection or press the Esc button to retain the original value as valid

**Setting the Continuous Value using the Up and Down Buttons**

- Press (hold) the Up or Down button to set the required value.
- Press Enter to confirm the selection or press the Esc button to retain the original value as valid.

## Control (HMI@Web – Connection to PC and LAN/WAN)

# Installation and Connection to PC and LAN/WAN

## Basic Requirements

The HMI@Web controller is intended to operate the VCS control unit using an internet browser. This controller is a more convenient variant of HMI DM, TM controllers featuring remote control and PC control. However, it is not equipped with comfort features like data collection and filing, e-mail messages on system failure events. User access is the same as with HMI DM, TM controllers. No administration of users or their roles is created.

The PC must be equipped with an Ethernet network card with the RJ-45 connector, or connected to the LAN network - the HMI@Web system can be connected directly to (one) PC or integrated into the LAN, resp. WAN network, and is accessible from any computer (access authorization is needed) in the network. The TCP/IP protocol must be installed on your PC (to install the TCP/IP protocol, refer to your operating system manual).

**Figure 27 –** Network connection settings


**Notice – Proxy server settings**

o ensure proper interoperation of the internet browser on your PC directly connected to the HMI@Web unit, it is necessary to disable proxy server!

In Internet Explorer 8: Go to "Tools" / "Internet Options" >> "Connections" >> button / "Local network options" / "Specify" ... lower half of the window = "Proxy server" box – must not be checked (see figure).

**Warning**

Before putting the HMI@Web controller operated by PC, respectively via LAN network, into operation, the installation of the controlled air-handling unit must be checked to see whether it has been performed in accordance with its Installation and Operating Instructions (installation, inspections, safety precautions, heating media, etc.)! Refer to *"Location and Installation"*.

## Default HMI@Web IP Address Setting

During production, the HMI@Web unit was assigned the fixed IP address: **192.168.1.199,** mask 255.255.255.0, and the default port 0.0.0.0.

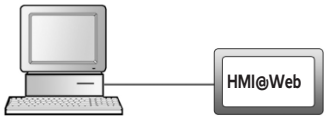
**Notice**

If this address cannot be used in LAN, it is necessary to change the setting from the computer (directly connected PC as described below) before connecting it to the network.

## HMI@Web controller Start-up Procedure

**1. Step: HMI@Web controller connection:**

**Figure 28** – HMI@Web unit connected directly to PC




**HMI@Web + stand-alone PC = HMI@Web controller connected directly to PC**

Using the Ethernet crossed cable* (UTP cable, RJ-45 connectors) connect the HMI@Web unit ("LAN" socket on the upper side of the controller) to the network card of your computer.

**Figure 29**

*Attention: Connector RJ-45 marked BSP, BUS cannot be used! It is intended for HMI controller – refer to "HMI Controller Operating Instructions".*

Max. length of the cable between the HMI@Web and computer can be 100 m; however, we recommend 80 m. Switch the HMI@Web main switch on. If a greater distance between the PC and the VCS control unit controlled by the HMI@Web controller is desired, it will be necessary to use a structured network (Ethernet) including active network elements – see below, or contact a specialized PC and IT supplier.

** This cable is not part of delivery.*

## Control (HMI@Web – Connection to PC and LAN/WAN)

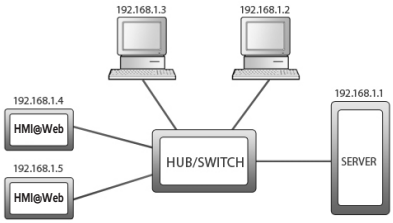
**Connection of the VCS control unit with the HMI@Web controller to the LAN**

**Warning**

If the default IP address of the HMI@Web unit cannot be used in the LAN network – i.e. a different address range is used in the LAN network (e.g. 10.0.0..., 192.168.10.....), or the existing PC within the LAN network has already been assigned the IP address ...199 (can be verified by the "ping + IP address" command) which must be retained - it is necessary to change the HMI@Web IP address setting from the computer (as described above) before connecting it to the network.
If you are not an administrator of the LAN network, you will have to contact your LAN administrator. The same applies if you are not an administrator of your computer.
Using the Ethernet cable (not included in the HMI@Web delivery) connect the HMI@Web unit to the LAN network connecting point in the same way as any other LAN device. The same conditions as in step 1 (connecting points, cable lengths) apply for connection to LAN.
To set the addresses, it is possible to use other controllers like HMI SG, TM and DM. Maximum HMI@Web unit distance from an active network element must comply with the Ethernet network conditions.

*Notice: The HMI@Web unit can also be connected to the LAN network via the wi-fi access point in the client mode, etc. – consult your network administrator.*

**Figure 30** – HMI@Web connected to local network




To be able to operate the HMI@Web unit, a unique IP address within the network range (see fig. # 8) must be assigned to the HMI@Web unit. Go to "Connection" >> "LAN connection" (refer to Step 4: Activation).
Always restart the HMI@Web unit after assigning a new IP address – the new setting is applied after restart.
Attention! Always consult your network administrator if connecting the HMI@Web to LAN.

**2. Step: Computer Configuration - TCP/IP Settings**

**Warning**

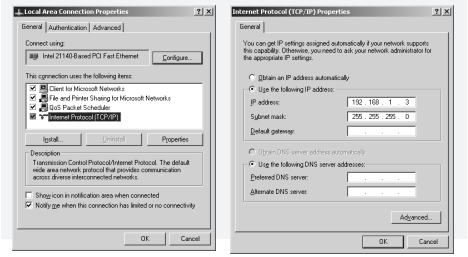
In this step, settings of the PC using Microsoft Windows® 7 are described; if you use other operating systems you will have to perform corresponding settings of your computer in accordance with your operating system user manual, or ask an expert for help. This setting procedure is needed only for a permanent direct connection to PC, or to change the HMI@Web settings before its integration into the LAN network.

After setting the HMI@Web unit (following the below described procedure), and when the HMI@Web default address complies with network addressing, it is only necessary to enable new hardware in the infrastructure administration – there is no need to make any other adjustments to individual PCs.

**Adjust PC network card settings in Windows:**

Go to "Start" >> "Settings" >> "Control Panel" >> "Network connection"). Click (right mouse button) on "Local network connection", then on "Properties", and display "Internet protocol (TCP/IP)" properties".

**Figure 31** – TCP/IP settings

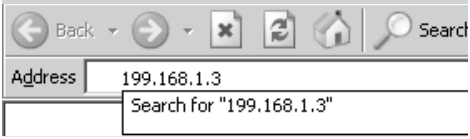



If the protocol is not found in the list of items (it is not installed), add the item to the system. Click the "Install" button, select the "Internet protocol (TCP/IP)", and follow the instructions on the screen.
Select item "Use the following IP address". Type "192.168.1.3"** into the "IP address" box and "255.255.255.0" into the "Network mask" box.
Do not type anything into the item boxes of the second part of the window (leave them blank).
If you are prompted by the system to restart, confirm the restart immediately.

**Connection, resp. TCP/IP Protocol Verification**

To verify the settings and connection, type the HMI@Web address into the URL box of the internet browser (the HMI@Web system must be switched on); it should start functioning in 0.5 – 3 minutes - the time needed to initialize the webserver.

**Figure 32** – IP address entry




After sending the request, and if the settings and connecting are correct, the HMI@Web unit is ready to be configured, and the login window is displayed on the screen requesting the user name and password.

*** Any number from 1 to 254 except 199 (which is assigned to the HMI@Web controller) can be used in the first place of the IP address.*

## Control (HMI@Web – Connection to PC and LAN/WAN)

**3rd Step Setting the Web@HMI for Connection**
The Web@HMI controller can be configured from the web interface (the same one which serves for normal operation of the system). Enter the following IP address http://192.168.1.199 in the address field in the web browser and confirm with the "Enter" button. Note: The Web@HMI configuration for the connection itself is not dependent on the browser used. Enter log-in data in the fields of the Web Server dialog box – see the figure:

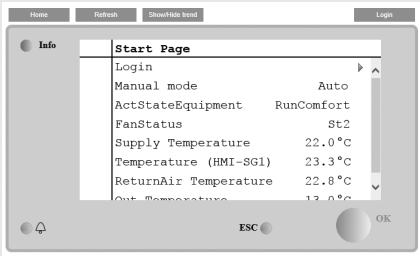
**User name:** **WEB (or ADMIN)***
**Password:** **SBTAdmin!**

** ADMIN only if the WEB log-in is non-functional (for older systems)*

**Figure 33 –** Web Server dialog box


There is an account for one user on the HMI@Web Web Server. The Web Server user log-in name and password can be changed in the menu: Connection >> LAN Connection. Upon successful log-in to the HMI@Web Web Server, the Start screen is displayed.

**Figure 34 –** Start screen




To access the Main Menu, it is necessary to log in at the corresponding access level. Upon selecting the link on the first line the log-▶ dialog box to enter the password is displayed.
The input field for entering the password is at the bottom of the browser. Enter log–in data to the fields of the dialog box – see the figure above; enter password – 4444.
(factory pre-set access password to the HMI@Web – for the first start-up.

**Figure 35 –** Log-in screen

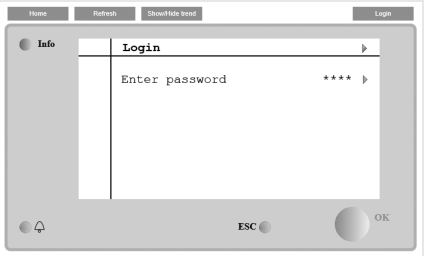
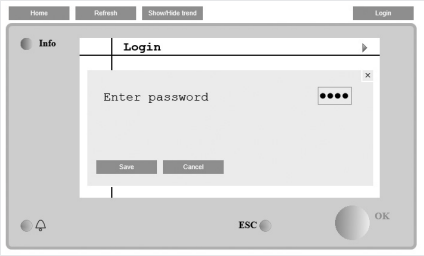



**Figure 36 –** Password dialog box




**Attention** – it is only valid until changed.
These log-in data correspond to the highest level user authorisation (role: service) – they should only be reserved for the supplier performing the installation or the service provider.
It is advisable to change the log-in data as soon as upon first log-in (Passwords >> Password change – actual or lower access level password change is offered). The dialog box to enter a new password is displayed at the bottom of the browser. Press the Save button to confirm and save the changes to the settings.

**Warning**
Once the changes have been made, it will no longer be possible to use the original data to log in. Keep your log-in data safely stored (keep them confidential). If you lose them, contact the manufacturer or authorized service representative.
Apart from the service log-in data, it is also necessary to modify other user pre-set log-in data to enable access to the HMI@Web for the operating staff – rename them according to the actual authorised users and change the corresponding passwords:

| Role | Pwd | Level number |
|---|---|---|
| SERVICE | 4444 | 2 |
| ADMINISTRATOR | 3333 | 4 |
| USER | 2222 | 6 |
| GUEST | 0000 | 8 |

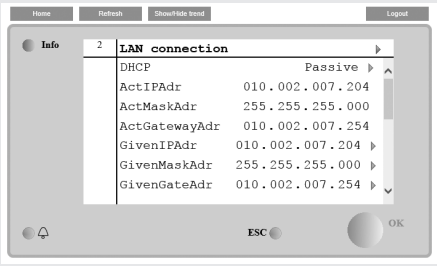
*Note: If the user settings are not performed within this phase of commissioning, it is necessary to perform them at the latest during training of the operating staff or device handover to the end user.*

## Control (HMI@Web – Connection to PC and LAN/WAN)

**4th Step: How to Change the HMI@Web Controller IP Address**

The HMI@Web controller IP address for operation in your network can be changed from the following page:
Connection >> LAN connection

**Figure 37 –** LAN connection settings

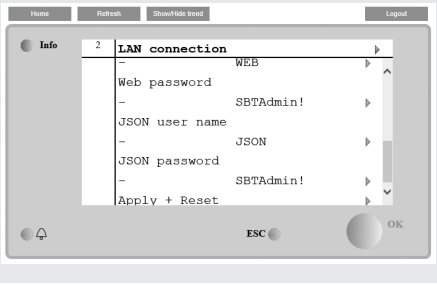



The lines allowing entries of values are marked with a red button.
Once the button of the respective line has been activated, enter the new value in the dialog box at the bottom of the browser. Press the Save button to confirm and save the changes.
Progressively enter and save all the items "Enter ..." (Address, Mask or Gate).
Finally, restart the HMI@Web controller using the option "Apply + Reset". After the restart, the device starts reporting on the new address (once the initiation has been completed – it takes about 3 minutes).** To resume communication (if the network segment has been changed), it may be necessary to readjust the network connection settings on your PC so that they are compatible with the HMI@Web controller (respectively LAN); the HMI@Web controller with the modified setting can be alternatively connected to the LAN. It is necessary to enter the correct network address in the browser to enable log-in.

**5th step: LAN Connection Setting Warning**

Any changes to the settings must be performed cautiously and carefully at each step. Each modifiable parameter (Address, Mask or Gate) must be carefully checked and saved separately.

**Obrázek 38 –** password setup for LAN connection




Then it is necessary to send (plan) the change entry – after that, the settings must be finished using the option "Apply + +Reset". (Warning: Do not perform the restart by switching off or disconnecting the device – when saving the changes using the "Apply + Reset" option, the settings are simultaneously stored in an archive which is needed for restart of the device after a power supply failure - otherwise, there is a risk of uncontrolled changes to the settings.)

*Note: Control start-up after device restart takes several seconds – it does not to do anything with the Web Server initiation. That is because of the standard start-up sequences that are being performed during the connected air-handling system start-up, i.e. opening of dampers, pre-heating and fan start. We strongly recommend not using the configuration with the address assigned by the DHCP server; instead, use the fixed IP address.*

**Warning**

If the IP address of the given device happens to get lost (e.g. once the LAN setting have been changed) and it is not possible to establish the connection (no response to the "ping" command, etc.), it is possible to use the HMI-DM or HMI-TM controllers to set the required parameters and restart the device directly.

*Note: In extreme cases, the device can be looked up within the network using the MAC address (indicated on the name plate) – contact the network administrator.*

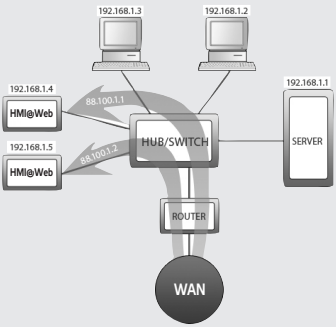
### Internet Integration

By connecting the WebClima system to the local network via the above-mentioned setting of the IP address and authorization of users, the basic (direct-interactive) monitoring and operating possibilities within the local network or by PC are enabled.
To enable access to the WebClima system via internet, it is necessary to ensure direct access to the device from internet.

*Notice: This is necessary especially if supervision (operation, service) outside the company is required.*

**To connect your HMI@Web unit to the internet, contact your network administrator.**

**Figure 39 –** connection to the WAN network



## Control (HMI@Web – Connection to PC and LAN/WAN)

In doing so, we recommend the following:
- Implement the HMI@Web unit into the secured inner network after the router / network firewall. The direct access to the unit must be ensured by further directing.
- To increase security, we recommend locating the device in the reserved network (DMZ) which is not a part of the company's LAN network, or accessing the device via the company's VPN.

**Setting the Network Elements to enable HMI@Web Access via Internet**

Ask your local network administrator to perform these activities!

The network administrator in this case has at their disposal 2 public static IP addresses for the HMI@Web control unit: 88.100.1.1 and 88.100.1.2
The administrator can set the IP address translation at the router, for example, as follows:

| Public IP address | Inner IP address |
|---|---|
| 88.100.1.1 | 192.168.1.4 |
| 88.100.1.2 | 192.168.1.5 |

or (to minimize the need for public addresses) leading through only one public IP address and communication port.

**Warning to the network administrator**

To enable access via internet it is necessary to enable access to the inner IP address via port 80 (http).
Other communication ports must be DISABLED to keep the operation secure!

**REMAK does not bear any responsibility for any misuse of the HMI@Web software (Windows CE) or unauthorized penetration of the inner LAN network due to insufficient inner network security.**

### Internet Browser Settings to operate the HMI@Web controller

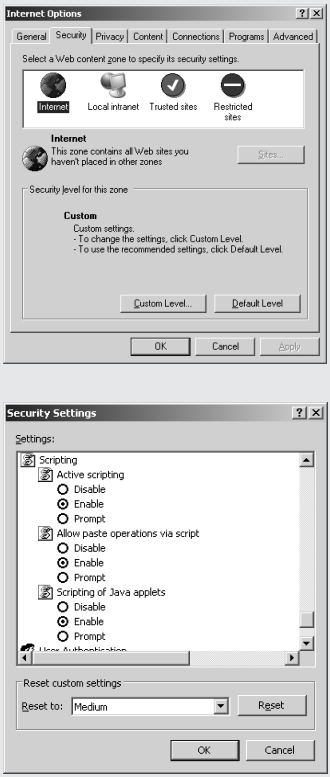
Support of JavaScript and cookies must be enabled to ensure correct functioning of the browser interface on each PC connected to the HMI@Web controller. JavaScript is used to update values in the right (information) panel and for programming time schedules, and cookies are used for login. Further, file opening in new windows must also be enabled.
As the parameters are measured on-line, we also recommend adjusting the temporary files retention (cache settings) in the internet browser (this is essential especially for MS Internet Explorer). The browser must verify the actual page version in every access to the page. Otherwise, saved not current values of parameters can be presented. If you have any doubts whether the read data are correct, refresh the page by clicking on the refresh icon on the browser menu bar, or use shortcut keys CTRL+F5 – forced page loading outside cache.
The HMI@Web graphic user interface is optimized for Microsoft Internet Explorer 6.0/7.0 and FireFox 2.0.
Other web browsers' settings must be checked in accordance with the following instructions.

### Internet Explorer browser

**Internet Explorer JavaScript Support:**

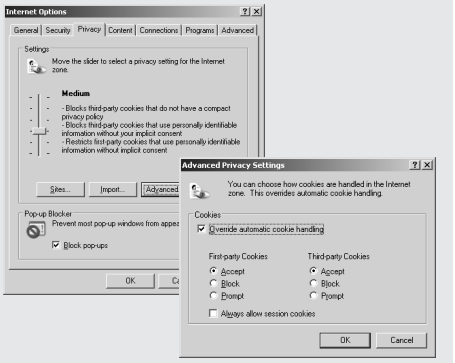
Go to the Internet Explorer menu "Tools" / "Internet Options" >> "Security" >> "Custom Level" >> "Scripting" – must be enabled.

**Figure 40** – JavaScript support settings



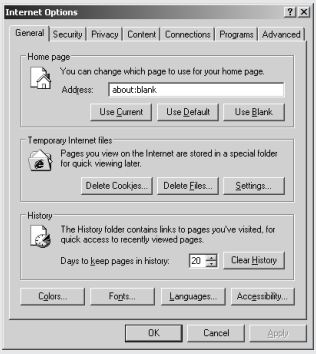
**Internet Settings (Explorer Cookies):**
Go to the Internet Explorer menu "Tools" / "Internet Options" >> "Privacy" >> "Advanced" >> "Accept Cookies"
(see fig. # 16)

**Figure 41** – Cookies settings (IE)



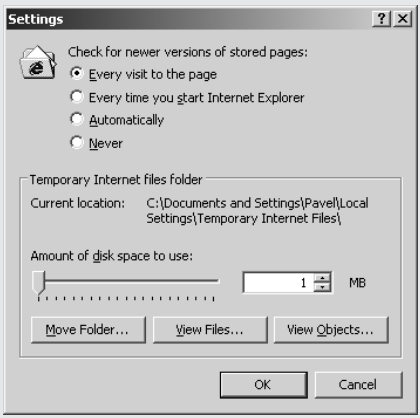

**Temporary Files' Settings**
Go to the Internet Explorer menu "Tools" / "Internet Options" >>, "General >> "Temporary Internet files" >> "Settings...".

**Figure 42** – Temporary Files' Settings (IE)




In the following window "Setting" >> "Check fro newer versions of stored files >> select "Every visit to the page" >> set "Amount of disk space to use:" to the minimum (8 MB). Then save the settings clicking the "OK" button.

**Figure 43** – Temporary Files' Settings (IE)




## Mozilla Firefox

**Mozilla Firefox JavaScript support**
By default, Javascript in Firefox is enabled and no additional installation is required for it.

**Cookies settings check in Mozilla Firefox**
Cookies are enabled by default.

**Other browsers can be set similarly (however, the HMI@Web manufacturer does not guarantee their proper functionality).**

## Proxy servers

The proxy severs must be disabled if direct connection PC <-> HMI@Web is used.

**Disabling proxy servers - Internet Explorer:** Go to "Tools" / "Internet Options" >> "Connections" >> "Local network options" >> uncheck the box "Proxy server"

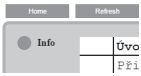
**Disabling proxy servers - Firefox:** Go to menu "Tools" / "Options" >> ... >>"Expanded>> bookmark "Network" >> Settings >> check the "Direct network connection".

**If access is made within LAN, contact your LAN/PC administrator to perform the settings**.

## Control (HMI@Web – Connection to PC and LAN/WAN)

### HMI@Web Environment Description

The Web controller HMI@Web is controlled using the following buttons:

| Button/Icon | Description |
|---|---|
|  | Press:<br>- Go to Main menu from the current page in the menu<br>- Go to the Home Menu page from the Start menu<br>Flashes green - Startup sequence for HVAC<br>Glows green - HVAC Run |
|  | The Info icon icon indicates the access level to which the user is logged in after the correct password; the icon is a link to opt-out from the HMI @ Web menu |
|  | Trouble-free status; the icon is the link to go to the malfunctions page |
|  <br>*Note: glows red* | Signaling one or more alarms after a fault has been acknowledged (the bell does not move); the icon is the link to go to the malfunctions page |
|  <br>*Note: flashesred* | Signaling a new fault before confirming it (the bell moves); the icon is the link to go to the malfunctions page |
| Home | Link to main menu page from anywhere in the menu |
| ESC | Go back one step, return to the previous page in the menu |
| Refresh | Reload the current page in the menu |
| *Note: Icon with green tinting* | Go to the next page in the menu |
| *Note: Icon with red tinting* | Set value or selection from the menu |
| Cancel | Cancel the newly entered value or parameter selections before her confirmation - remains original value or selection |
| Save | Confirm new value or selection from the menu |

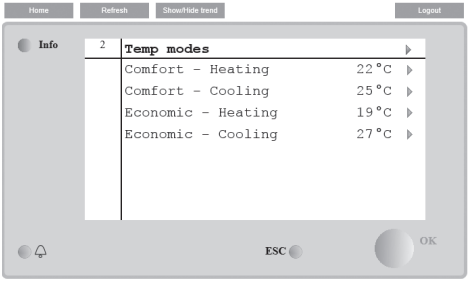
### Basic HMI@Web Operation Settings – Recapitulation

The basic HMI@Web system commissioning settings to prepare it for operating staff:

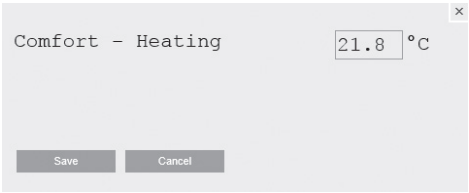
- Assigning authorization groups to users and their setting before putting the unit into operation (to ensure unit security against unauthorized access).
- System time setting*

**Required Settings in Temperature Modes:**

Required temperature settings are performed from the page Settings >> Temperature Modes.



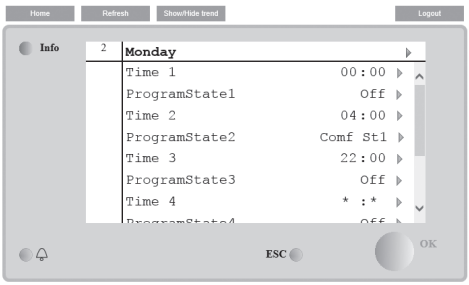

Clicking the red ▶ button at the respective temperature you will display a dialog box for a new temperature entering.




Save the new temperature using the **SAVE** button.
To return to the previous page in the menu, click the **CANCEL** button. To go to the Main Menu, click the **HOME** button.

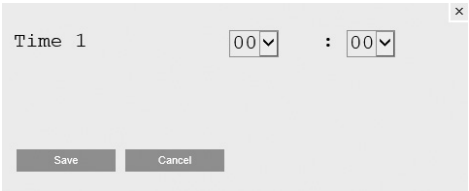
**Weekly (Daily) Time Schedule Settings**

Weekly time schedule can be set from the page Settings >> Time Modes >> Time Schedule.
An exception time schedule can also be set in the weekly time schedule.



## Control (HMI@Web – Connection to PC and LAN/WAN)

An exception time schedule can also be set in the weekly time schedule. It is possible to set maximum 6 time changes and program states for each day of the week.
Clicking the red ▶ button you will display a dialog box at the bottom of the browser window:




Save the new time value using the **SAVE** button. Each time is assigned with a desired program state (fan speed stages and temperature mode). The program state can be entered using the dialog box displayed after clicking the red ▶ button on the row of the respective program state:

Confirm the new program state using the **SAVE** button.


The time assigned with *:* characters and Stop program state will not be applied. For the detailed description of the time schedule settings, refer to the chapter "Temperature and Time Modes".

### SCADA VCS – control (visualization and data collection)

it is a tool that extends the user's ability to control HMI @ Web. SCADA (Supervisory Control and Data Acquisition) "Dispatch Control and Data Collection". SCADA VCS enables above all the comfort and control of the HVAC equipment.

- clear list of failures / history
- visualization of HVAC devices
- Clear schedules and calendar settings
- Tracking HVAC behavior using trends (current / archive)
- includes the HMI @ WEB driver

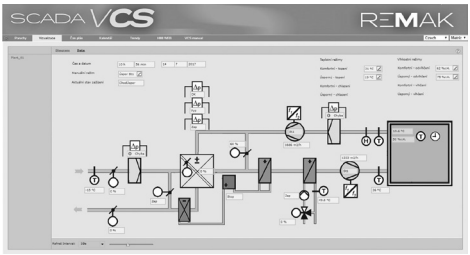
(access to all data points)

The VCS is equipped with a web server running SCADA VCS. Just connect the VCS to the LAN / WAN and then use the Internet browser to connect to the VCS control unit with the SCADA.
The connection is done in the same way as for HMI @ WEB control, part of the manual - Controls (HMI @ Web - connection and installation to PC and LAN / WAN).

**Login credentials for access verification to the SCADA server:**

user name: WEB
password: SBTAdmin!

This tool will be appreciated by service and assembly companies to regulate the operation of HVAC equipment. Users will quickly orient themselves in the HVAC device assembly and appreciate the ease of setting user parameters.




* HMI@Web controller automatically switches between summer and winter time according to European customs.

## List of Data Points (HMI-DM, HMI-TM and HMI@WEB controllers)

| Menu HMI-DM,HMI-TM a HMI@WEB | | | | | | |
|---|---|---|---|---|---|---|
| Menu | | Meaning | Factory settings | | | |
| | | | Value | Min | Max | Units |
| **Monitor** | | Monitor | | | | |
| **Current modes** | | Current modes | | | | |
| ActStateEquipment | | Current device state | | | | |
| FanStageExtCnt | | Fan output stage (external control) | | | | |
| FanStatus | | Fan state | | | | |
| Actual time schedule | | Current time schedule | | | | |
| | CalendarWeek | Weekly time schedule | | | | |
| | CalendarExcept | Exception time schedule | | | | |
| | CalendarOff | Switch-off time schedule | | | | |
| NumbOfFailures | | Current number of failures | | | | |
| **Temperatures** | | Temperatures | | | | |
| Supply | | Inlet air temperature | | | | ºC |
| Room | | Room temperature | | | | ºC |
| Room unit 1 | | Temperature (HMI-SG1) | | | | ºC |
| Room unit 2 | | Temperature (HMI-SG2) | | | | ºC |
| Return air | | Outlet air temperature | | | | ºC |
| Outdoor | | Outdoor air temperature | | | | ºC |
| Return water heat | | Return water temperature from the water heater | | | | ºC |
| Air heat exchanger | | Outlet air temperature behind the heat exchanger | | | | ºC |
| Air electric preheat | | Temperature behind the electric pre-heater | | | | ºC |
| ReturnWaterPreheating | | Return water temperature from the water pre-heater | | | | ºC |
| ExtraElectricHeating | | Temperature behind the electric after-heater | | | | ºC |
| Flue gas | | Flue gas temperature | | | | ºC |
| ValidRegulationRoom | | Room temperature (for control) | | | | ºC |
| **Humidity** | | Humidity | | | | |
| Supply air relative | | Inlet - relative | | | | %r.H. |
| Supply air absolut | | Outlet - absolute | | | | g/kg |
| Supply air enthalpy | | Inlet - enthalpy | | | | kJ/kg |
| Room relative | | Room - relative | | | | %r.H. |
| Room absolut | | Room - absolute | | | | g/kg |
| Room enthalpy | | Room - enthalpy | | | | kJ/kg |
| Outs air relative | | Outdoor - relative | | | | %r.H. |
| Outs air absolut | | Outdoor - absolute | | | | g/kg |
| Outs air enthalpy | | Outdoor - enthalpy | | | | kJ/kg |
| **Flow (Pressures)** | | Flow (Pressures) | | | | |
| SupplyPress | | SupplyPress | | | | Pa |
| ReturnPress | | ReturnPress | | | | Pa |
| SupplyFlow | | SupplyFlow | | | | m3/h |
| ReturnFlow | | ReturnFlow | | | | m3/h |
| **Air quality** | | Air quality | | | | |
| | | | CO2 (VOC, | | | |
| | CO2 (VOC,CO) | | CO) | | | ppm |
| **Outputs** | | Performances | | | | |
| Fan supply output | | Inlet fan output | | | | % |
| Fan exhaust output | | Outlet fan output | | | | % |
| Fan additional output | | Auxiliary fan output | | | | % |
| ExtraElectricalHtgPos | | Outlet level for the electric reheater | | | | % |
| Heating valve | | Heating mixing set valve position | | | | % |
| Cooling valve | | Cooling valve position | | | | % |
| Cooling 2 | | Cooling valve position 2 | | | | % |
| Cooling 3 | | Cooling valve position 3 | | | | % |
| Electrical preheating | | Electric pre-heater outlet position | | | | % |
| ElectricalHeatingValve | | Electric reheater outlet position | | | | % |
| Heat pump output | | Heat pump outlet position | | | | % |
| Heat Pump 2 | | Heat pump outlet position 2 | | | | % |
| Heat Pump 3 | | Heat pump outlet position 3 | | | | % |
| Mixing section position | | Outlet position to the mixing damper | | | | % |
| Heat exchanger position | | Heat exchanger control outlet position | | | | % |
| Gas heating out level | | Outlet level for the gas heater | | | | % |
| BypassDamperPosition | | Outlet position for gas heater's BP damper | | | | % |
| Request humidity | | Request for humification | | | | % |
| Request dehumidity | | Request for dehumidification | | | | % |
| **Working states** | | Operating states | | | | |
| FanSupplyStatus | | Inlet fan state | | | | |
| FanExhaustStatus | | Outlet fan state | | | | |
| FanAdditionalStatus | | Auxiliary fan state | | | | |
| ElectPreheat | | Electric pre-heater state | | | | |
| WaterPreheat | | Water pre-heater pump state | | | | |
| ElectReheating | | Electric re-heater state | | | | |
| PumpOfWaterHeating | | Pump of water heating | | | | |
| StateHeatExchanger | | Rotary exchanger State | | | | |
| PrehtgFunctionsWaterHtg | | Pre-heating functions (water heating) | | | | |
| WaterCoolPump | | Water cooler pump state | | | | |
| CoolingStDXCool | | Cooling stage (2St) | | | | |
| CoolInverter | | Cooling stage (inverter) | | | | |
| ChlazInverter 2 | | Cooling stage (inverter) 2 | | | | |
| ChlazInverter 3 | | Cooling stage (inverter) 3 | | | | |
| Cool1Step | | Cooling state (1 St + inverter) | | | | |
| HeatPump | | Heat pump state | | | | |
| ElectricHeater | | Electric heater state | | | | |
| GasHeater | | Gas heater state | | | | |

# List of Data Points (HMI-DM, HMI-TM and HMI@WEB controllers)

## Menu HMI-DM,HMI-TM a HMI@WEB

| Menu | | | Meaning | Factory settings | | | |
|---|---|---|---|---|---|---|---|
| | | | | Value | Min | Max | Units |
| | StateHumidifier | | Humidifier state | | | | % |
| **Settings** | | | Settings | | | | |
| | | | | Date and time | | | |
| | Date and Time | | | | | | |
| | TimeValidity | | System time validity | | | | |
| **Temp modes** | | | Temperature modes | | | | |
| | Comfort - Heating | | Comfortable heating | 22.6 | 0 | 99 | °C |
| | Comfort - Cooling | | Comfortable cooling | 24.6 | 0 | 99 | °C |
| | Economic - Heating | | Economy heating | 20.6 | 0 | 99 | °C |
| | Economic - Cooling | | Economy cooling | 28 | 0 | 99 | °C |
| | ExSpvSupplyTmp | | Extra required inlet air temperature | 20 | 0 | 99 | °C |
| **Manual mode** | | | Manual mode | | | | |
| **Time schedules** | | | Time modes | | | | |
| | CalendarWeek | | Weekly time schedule | | | | |
| | CalendarExcept | | Exception time schedule | | | | |
| | CalendarOff | | Switch-off time schedule | | | | |
| **Control humidity** | | | Humidity control | | | | |
| | DehumSpvRel | | Dehumidification required relative value | 60 | 0 | 100 | %r.H. |
| | DehumSpvAbs | | Dehumidification required absolute value | 12 | 0 | 100 | g/kg |
| | HumMaxSpv | | Maximum humidity required value | 80 | 0 | 100 | %r.H. |
| | ActualValueHum | | Current humidity value | | | | |
| | ActCascSpvDeh | | Calculated current dehumidification required value in cascade control | | | | |
| | HumMaxCtlr | | Maximum humidity | | | | % |
| | HumidityCtrl | | Humidification output | | | | |
| | DeHumidityCtrl | | Dehumidification output | | | | % |
| | Dewpoint | | Dew point current value | | | | °C |
| | DewpointDedZone | | Dew point deviation | 1 | -64 | 64 | °C |
| **Fans** | | | Fans | | | | |
| | RegulFans-Flow(Press) | | RegulFans-Flow(Press) | | | | |
| | | SupplyPrsRangeSnsr | SupplyPrsRangeSnsr | | | | |
| | | ReturnPrsRangeSnsr | ReturnPrsRangeSnsr | | | | |
| | | SupplyFlowRangeSnsr | SupplyFlowRangeSnsr | | | | |
| | | ReturnFlowRangeSnsr | ReturnFlowRangeSnsr | | | | |
| | | SupplyKFactor | SupplyKFactor | | | | |
| | | ReturnKFactor | ReturnKFactor | | | | |
| | | NmbrOfSplyFans | NmbrOfSplyFans | | | | |
| | | NmbrOfRtrnFans | NmbrOfRtrnFans | | | | |
| | | Enable - K Factor | Enable - K Factor | | | | |
| | FanSupplyOutputSetpointVal | | Inlet fan output | | | | |
| | | Fan output 1. stage % | Output settings St1 | | | | |
| | | Fan output 2. stage % | Output settings St2 | | | | |
| | | Fan output 3. stage % | Output settings St3 | | | | |
| | | Fan output 4. stage % | Output settings St4 | | | | |
| | | Fan output 5. stage % | Output settings St5 | | | | |
| | FanExhaustOutputSetpointVal | | Outlet fan output | | | | |
| | | Fan output 1. stage % | Output settings St1 | | | | |
| | | Fan output 2. stage % | Output settings St2 | | | | |
| | | Fan output 3. stage % | Output settings St3 | | | | |
| | | Fan output 4. stage % | Output settings St4 | | | | |
| | | Fan output 5. stage % | Output settings St5 | | | | |
| | FanAddOutputSetpointVal | | Additional fan output | | | | |
| | | Fan output 1. stage % | Output settings St1 | | | | |
| | | Fan output 2. stage % | Output settings St2 | | | | |
| | | Fan output 3. stage % | Output settings St3 | | | | |
| | | Fan output 4. stage % | Output settings St4 | | | | |
| | | Fan output 5. stage % | Output settings St5 | | | | |
| | TRN Correct | | Outlet fan speed TRN correction | | | | |
| | | ValueOfCorrection | For all stages | | | | |
| | | FanOutputSt1 | TRN correction for stage 1 | | | | |
| | | FanOutpuSt2 | TRN correction for stage 2 | | | | |
| | | FanOutputSt3 | TRN correction for stage 3 | | | | |
| | | FanOutputSt4 | TRN correction for stage 4 | | | | |
| | | FanOutputSt5 | TRN correction for stage 5 | | | | |
| | Back-up supply fan | | Single-speed inlet fan backup | | | | |
| | | StrtUpDlyFlowMain | Failure flow evaluation time-out after main fan start-up | 180 | 0 | 9999 | s |
| | | StrtUpDlyFlowBackUp | Failure flow evaluation time-out after backup fan start-up | 180 | 0 | 9999 | s |
| | | SupplyFanBackUp | Active main fan backup | | | | |
| | Back-up exhaust fan | | Single-speed outlet fan backup | | | | |
| | | StrtUpDlyFlowMain | Failure flow evaluation time-out after main fan start-up | 180 | 0 | 9999 | s |
| | | StrtUpDlyFlowBackUp | Failure flow evaluation time-out after backup fan start-up | 180 | 0 | 9999 | s |
| | | ExhaustFanBackUp | Active main fan backup | | | | |
| | Fan run-out to DEVV | | Fan run-out according to DEV | | | | |
| | | Enable | Enable run-out | | | | |
| | | TeplotaVenkovniMin | Blocking by the MIN outdoor temperature | -15 | -64 | 64 | °C |
| | | TeplotaVenkovniMax | Blocking by the MAX outdoor temperature | 5 | -64 | 64 | °C |
| | | Fan run-out | Fan run-out | 5 | 1 | 60 | min |
| | Fan run-out | | Fan run-out | 180 | 0 | 9999 | s |
| | MinStOnTimeTrans | | Time transition to 2St speed - two-speed fans | 15 | 0 | 999 | s |

## List of Data Points (HMI-DM, HMI-TM and HMI@WEB controllers)

### Menu HMI-DM,HMI-TM a HMI@WEB

| Menu | | | Meaning | Factory settings Value | Min | Max | Units |
|---|---|---|---|---|---|---|---|
| RundownTmTrans | | | Time transition to 1St speed - two-speed fans | 12 | 0 | 99 | s |
| BlckHighSpeedFan | | | Outdoor temperature-dependent fan speed interlocking | -60 | -64 | 64 | ºC |
| ForceStrtTimOn1St | | | Forced fan start-up to 1St speed (TRN - damper output absent) | 20 | 0 | 99 | ºC |
| DelayStartFan | | | Fan start-up delay (after damper) | 20 | 0 | 9999 | s |
| FanRunDwn | | | Fan run-out | 180 | 0 | 9999 | s |
| FlowActDelayStrtErr | | | Failure flow activation delay (at fan start-up) | 45 | 0 | 600 | s |
| FlowActDelayRunErr | | | Failure flow activation delay (during fan run) | 5 | 0 | 600 | s |
| TherContActDelayTmErr | | | Thermo-contact (TK) failure activation delay (fans) | 2 | 0 | 600 | s |
| FreqInvActSetDelayTmErr | | | Frequency inverter failure activation delay | 2 | 0 | 600 | s |
| **Control Parameters** | | | Control parameters | | | | |
| ValueOfTemperatureRegulation | | | Temperature control values | | | | |
| | MaxDevRmSplyTemp | | Maximum difference between room and inlet temperatures | 5 | 0 | 64 | ºC |
| | MinDevRmSplyTemp | | Min. difference between room and inlet temperatures | 5 | 0 | 64 | ºC |
| | ActCascSpvHeating | | Calculated required temperature for heating with cascade control | | | | ºC |
| | ActCascSpvCooling | | Calculated required temperature for cooling with cascade control | | | | ºC |
| | ActMainSpvHeating | | Calculated required temperature for heating | | | | ºC |
| | ActMainSpvCooling | | Calculated required temperature for cooling | | | | ºC |
| | ActualTempControlMode | | Current temperature-dependent control (inlet, room, outlet) | | | | |
| SplyTempLimitation | | | Inlet temperature limitation | | | | |
| | SplyMinLimit | | Minimum inlet air temperature | 15 | 0 | 64 | ºC |
| | SplyMaxLimit | | Maximum inlet air temperature | 35 | 0 | 64 | ºC |
| Sequences | | | Sequence | | | | |
| | WaterHtgWithFunctionPreHtg | | Water heating with pre-heating function | | | | |
| | | PmpStrtOutTmp | Outdoor temperature-dependent pump start-up in the AHU Stop and Run mode | 5 | -64 | 64 | ºC |
| | | PmpMinRunTime | Minimum pump run time | 180 | 0 | 9999 | s |
| | | PmpKickTm | Pump downtime to the pump turning activation | 168 | 0 | 9999 | h |
| | | PmpKickTmOn | Active pump turning time | 60 | 0 | 9999 | s |
| | | PreHtgTm | Active water pre-heating operation time | 120 | 0 | 600 | s |
| | | PreHtgTmOff | Function blocking time between AHU unit shut-down and restart | 5 | 0 | 30 | min |
| | | PreHtgEquCurX1 | Water heater circuit heating curve setting at the AHU start-up X1 | -10 | -30 | 5 | ºC |
| | | PreHtgEquCurY1 | Water heater circuit heating curve setting at the AHU start-up Y1 (%) | 100 | 0 | 100 | % |
| | | PreHtgEquCurX2 | Water heater circuit heating curve setting at the AHU start-up X2 | 10 | 0 | 50 | ºC |
| | | PreHtgEquCurY2 | Water heater circuit heating curve setting at the AHU start-up Y2 (%) | 10 | 0 | 100 | % |
| | StrtDelaySwtchAntiFreeze | | Stop to Run mode switching delay AP trigger value | 60 | 0 | 600 | s |
| | StrtAntiFreezeInRun | | Water heat exchanger dependent AP trigger value - AHU in Run mode | 15 | 0 | 50 | ºC |
| | StrtAntiFreezeInStop | | Water heat exchanger dependent AP trigger value - AHU in Stop mode | 30 | 0 | 50 | ºC |
| | DlyEvalSplyAntiFreeze | | Inlet air dependent AP evaluation enabling delay after the unit start-up | 60 | 0 | 600 | s |
| | StrtSplyAntiFreezAlmA | | Inlet air temperature dependent AP start-up - failure alarm A | 6 | -64 | 64 | ºC |
| | StrtSplyAntiFreez | | Inlet air temperature dependent AP start-up | 8 | -64 | 64 | ºC |
| | MaxTempReturnWater | | Maximum return water temperature | 70 | 20 | 120 | ºC |
| **Electric heating** | | | Electric Heating | | | | |
| | ActiveElectricalHtg | | Electric heating switching on - request for heating | 20 | 0 | 100 | % |
| | HystOffElectricalHtg | | Electric heating hysteresis | 10 | 1 | 100 | % |
| **Gas heating** | | | Gas heating | | | | |
| | EnableSequenceCool | | Cooling sequence enabling | | | | |
| | MinOnTime | | Minimum burner run time | 150 | 0 | 600 | s |
| | MinOffTime | | Minimum burner downtime | 150 | 0 | 600 | s |
| | BlckTmAgainStrt1StBurner | | Burner restart protection time (burner Stage 1) | 150 | 0 | 600 | s |
| | RampModulationBurner | | Modulation burner opening/closing speed (%/s) (burner Stage 1) | 5 | 0 | 20 | %/s |
| | MinLoadOff2StBurner | | Heating request value for the burner Stage 2 switch-off (%) | 40 | 10 | 100 | % |
| | SetPointAlarmTmpFlueGas | | Maximum flue-gas alarm temperature | 230 | 210 | 400 | ºC |
| | MaxTempFlueGas | | Maximum flue-gas temperature | 210 | 160 | 230 | ºC |
| | SetPointTempFlueGas | | Requested flue-gas temperature | 160 | 150 | 210 | ºC |
| | MinTmpFlueGas | | Minimum flue-gas temperature | 150 | 150 | 160 | ºC |
| **Electrical preheating** | | | Electric pre-heating | | | | |
| | SetPointPreHtgTmp | | Required temperature for pre-heating | -20 | -50 | 10 | ºC |
| | BlckElPreHtgOutTmp | | Outdoor dependent electric pre-heating blocking | -30 | -50 | 10 | ºC |
| | ActiveElPreHtg | | Heating request-dependent electric pre-heating switch-on | 20 | 0 | 100 | % |
| | HystOffPreHtg | | Hysteresis for electric pre-heater switch-off | 10 | 0 | 100 | % |
| **Water preheating** | | | Water pre-heating | | | | |
| | PreheatPumpStpt | | Outdoor dependent pre-heating (pump) start-up | 5 | -50 | 15 | ºC |
| | PmpKickTm | | Pump downtime to the pump turning activation | 168 | 0 | 9999 | h |
| | PmpKickTmOn | | Active pump turning time | 30 | 0 | 9999 | s |
| | PmpMinRunTime | | Minimum pump run time | 30 | 0 | 9999 | s |
| **Extra electrical heating** | | | Electric reheating | | | | |
| | ActiveExtraElHeating | | St1 heating request dependent electric re-heating start-up | 20 | 0 | 100 | % |
| | HystOffExtraElHeating | | Hysteresis for electric re-heating switch-off | 10 | 1 | 100 | % |
| | MaxPowExtraHtgForFanSt1 | | Fan St1 dependent outlet limitation | 100 | 0 | 100 | % |
| | MaxPowExtraHtgForFanSt2 | | Fan St2 dependent outlet limitation | 100 | 0 | 100 | % |
| | MaxPowExtraHtgForFanSt3 | | Fan St3 dependent outlet limitation | 100 | 0 | 100 | % |
| | MaxPowExtraHtgForFanSt4 | | Fan St4 dependent outlet limitation | 100 | 0 | 100 | % |
| | MaxPowExtraHtgForFanSt5 | | Fan St5 dependent outlet limitation | 100 | 0 | 100 | % |
| | Heat Pump, H, Heat Pump 2, Heat Pump 3 | | | | | | |
| **HeatPump - heating** | | | Heat pump - heating | | | | |
| | StptBlckOutTmp | | Outdoor temperature dependent heat pump blocking | 5 | -45 | 35 | ºC |
| | StptHysOutTmp | | Temp. hysteresis for outdoor temperature dependent heat pump unblocking | 3 | 1 | 10 | ºC |

REMAK

# List of Data Points (HMI-DM, HMI-TM and HMI@WEB controllers)

## Menu HMI-DM,HMI-TM a HMI@WEB

| Menu | | Meaning | Factory settings | | | |
|---|---|---|---|---|---|---|
| | | | Value | Min | Max | Units |
| | MinRunTm | Minimum operating time for heat pump heating | 60 | 0 | 9999 | s |
| | BlckTmAgainStrt | Re-heating blocking | 120 | 5 | 600 | s |
| | ActiveHeatPump | Heat pump switching on | 20 | 0 | 100 | % |
| | HysOffHeatPump | Digital output opening hysteresis | 10 | 1 | 100 | % |
| | AlarmFromOutTmp | Information - outdoor temperature dependent heat pump heating blocking | | | | |
| | StartAnalogVal | Heat pump analogue signal lower level | 30 | 0 | 50 | % |
| **HeatPump - cooling** | | Heat pump - cooling | | | | |
| | StptBlckOutTmp | Outdoor temperature dependent heat pump blocking | 14 | -45 | 35 | °C |
| | StptHysOutTmp | Temp. hysteresis for outdoor temperature dependent heat pump unblocking | 3 | 1 | 10 | °C |
| | MinRunTm | Minimum operating time for heat pump cooling | 60 | 0 | 9999 | s |
| | BlckTmAgainStrt | Re-cooling blocking | 120 | 5 | 600 | s |
| | ActiveHeatPump | Heat pump switching on | 20 | 0 | 100 | % |
| | HysOffHeatPump | Digital output opening hysteresis | 10 | 1 | 100 | % |
| | AlarmFromOutTmp | Information - outdoor temperature dependent heat pump cooling blocking | | | | |
| | StartAnalogVal | Heat pump analogue signal lower level | 30 | 0 | 50 | % |
| **HeatPump - special** | | HeatPump - special | | | | |
| | Invert signal heating | Signal inversion - HeatPump heating mode | | | | |
| | Invert signal cooling | Signal inversion - HeatPump cooling mode | | | | |
| | DaikinSpec0-10V | 0-10V special signal switching (Daikin) | | | | |
| | DifferSt1-St2SigDaikin | % difference between request and St2 real signal | 40 | 0 | 100 | % |
| | ChangeTimeToMaxSigDaikin | Time needed for signal bypass 0-100% | 120 | 0 | 500 | s |
| | StartAnalogVal | Heat pump analogue signal lower level | 30 | 0 | 50 | % |
| **Heat recovery** | | Heat recovery | | | | |
| | HeatExFreezAlarm | Freezing determination heat exchanger | 1 | -64 | 64 | °C |
| | HeatExTmpMaxSpeed | Start temperature for maximum - HRE speed/volume open BP PE | 15 | -64 | 64 | °C |
| | HeatExTmMaxSpeed | Start time for maximum - HRE speed/volume open BP PE | 60 | 0 | 600 | s |
| | SetStartRequestHeatEx | Heat recovery request dependent HRE run enabling | 38 | 0 | 100 | % |
| | SetHysHeatEx | Hysteresis for HRE run stop | 5 | 0 | 100 | % |
| | InfoStrtAntiFreez | Information - antifreeze protection start-up | | | | |
| **Mixing** | | Mixing | | | | |
| | MinFreshAir | Minimum fresh air flow rate | 20 | 0 | 100 | % |
| | MinFreshAir - Comfort | Minimum fresh air flow rate - Comfort (pool unit) | 20 | 0 | 100 | % |
| | MinFreshAir - Econom | Minimum fresh air flow rate - Economy (pool unit) | 20 | 0 | 100 | % |
| | MixDampTempFullOp | Starting temperature for mixing damper wide-open position | 15 | -64 | 64 | °C |
| | MixDampTmFullOp | Starting time for mixing damper wide-open position | 60 | 0 | 600 | s |
| | ValueOfMixing | Mixing damper control signal recurrence vale (normal/inverse) (%) | 100 | 0 | 100 | % |
| | ActMaxFrshAirLim | Information about the Max. limit of fresh air activation (vent. unit) | | | | |
| | MaxFrshAir | Max. limit of fresh air according to T outdoor (vent. unit) | | | | |
| | ToutActMaxFrshAir | T outdoor from which the Max. limit of fresh air is activated (vent. unit) | | | | |
| **Cooling** | | Cooling | | | | |
| | ClgBlckOutTmp | Outdoor temperature-dependent blocking | 12 | -64 | 64 | °C |
| | MinRumTmPump | Minimum pump operating time | 180 | 0 | 9999 | s |
| | PmpKickTm | Pump downtime to the pump turning activation | 168 | 0 | 9999 | h |
| | PmpKickTmOn | Active pump turning time | 60 | 0 | 9999 | s |
| | MinRunTm1StDXClg | Minimum operating time; 1St condensing unit | 60 | 0 | 9999 | s |
| | BlckTmAgainStrtDXCool | Re-cooling blocking; 1St (2St) condensing unit | 120 | 5 | 600 | s |
| | TmRemainIn1StDXCool | Minimum dwell time in condensing unit's 1St; 2St condensing unit | 360 | 5 | 600 | s |
| | DXCoolStage1On | Condensing unit's 1St switch-on | 20 | 0 | 100 | % |
| | DXCoolStage2On | Condensing unit's 2St switch-on | 70 | 0 | 100 | % |
| | DXCoolHysOff1St | Hysteresis for 1St - 2St transition, 2St condensing unit | 10 | 0 | 20 | % |
| | MinRunTmInverter | Minimum operating time; inverter | 10 | 0 | 9999 | s |
| | BlckTmAgainDXCool+Inv | Re-cooling blocking, 1St + condensing unit | 60 | 0 | 300 | s |
| | Cooling signal inversion | Signal Inversion for Heat Cooling Pump | | | | |
| | OmezDleVlhkProst | Cooling limited by room air humidity | 65 | 0 | 100 | % |
| Cooling 2 | | | | | | |
| | NastBlokOdVenkTep | Outdoor temperature-dependent blocking of cooling | 12 | -64 | 64 | °C |
| | MinDobaProvČerpadla | Minimum pump operating time | 180 | 0 | 9999 | s |
| | Inverze signal chlazení | Signal Inversion for Heat Cooling Pump | | | | |
| Cooling 3 | | | | | | |
| | NastBlokOdVenkTep | Outdoor temperature-dependent blocking of cooling | 12 | -64 | 64 | °C |
| | MinDobaProvČerpadla | Minimum pump operating time | 180 | 0 | 9999 | s |
| | Cooling signal inversion | Signal Inversion for Heat Pump Cooling | | | | |
| | DemandHtg | Heating Water Source Switching | | | | |
| | StptTmpDemandHtg | Heating-water heating start-up | 15 | 5 | 25 | °C |
| | StptDlyStrtSeq | Start-up sequence delay | 120 | 10 | 600 | s |
| CompensationRequestTemperatur | | Required temperature compensation | | | | |
| | ClgCompStart | Cooling initial point (outdoor temperature) | 25 | -64 | 64 | °C |
| | ClgCompEnd | Cooling end point (outdoor temperature) | 35 | -64 | 64 | °C |
| | MaxValCompClg | Maximum cooling compensation (required value) | 2 | -64 | 64 | dK |
| | ActShiftReqTempClg | Required cooling value current shift | | -64 | 64 | °C |
| | CompHStart | Heating initial point (outdoor temperature) | 0 | -64 | 64 | °C |
| | CompHEnd | Heating end point (outdoor temperature) | -20 | -64 | 64 | °C |
| | MaxCompHtg | Maximum heating compensation (required value) | -1 | -64 | 64 | dK |
| | ActShiftReqTempHtg | Required heating value current shift | | -64 | 64 | °C |
| FanCompensationOutTemperature | | Outdoor temperature-dependent fan speed compensation | | | | |
| | ClgCompStart | Cooling initial point (outdoor temperature) | 25 | -64 | 64 | % |
| | ClgCompEnd | Cooling end point (outdoor temperature) | 30 | -64 | 64 | °C |
| | MaxValCompStgClg | Maximum cooling compensation (speed) | 0 | -100 | 100 | % |
| | ActValComStgFanClg | Current cooling speed compensation | | -100 | 100 | % |
| | CompHStart | Heating initial point (outdoor temperature) | 5 | -64 | 64 | °C |

## List of Data Points (HMI-DM, HMI-TM and HMI@WEB controllers)

**Menu HMI-DM,HMI-TM a HMI@WEB**

| Menu | | Meaning | Factory settings Value | Min | Max | Units |
|---|---|---|---|---|---|---|
| | CompHEnd | Heating end point (outdoor temperature) | -20 | -64 | 64 | ºC |
| | MaxValCompStgHtg | Maximum heating compensation (speed) | 0 | -100 | 100 | % |
| | ActValComStgFanHtg | Current heating speed compensation | | -100 | 100 | % |
| FanCompensationRoomExhaustTmp | | Room (Outlet) Temperature-Dependent Fan Speed Compensation | | | | |
| | FunctionComp | Compensation function setting | | | | |
| | SpvTempInRoom | Required room temperature | 20 | 0 | 99 | ºC |
| | ActValCom | Actual compensation | | 0 | 100 | % |
| FanCompensationSequenceHtg | | Heating dependent fan speed compensation | | | | |
| | HysTempHeating | Heating temperature hysteresis (ºC) | 1 | 0 | 20 | ºC |
| | ActValCom | Heating compensation display (%) | | 0 | 100 | % |
| FanCompensationSequenceClg | | Cooling dependent fan speed compensation | | | | |
| | HysTempCooling | Cooling temperature hysteresis (ºC) | 1 | 0 | 20 | ºC |
| | ActValCom | Cooling compensation display (%) | | 0 | 100 | % |
| Compensation air quality | | Air quality dependent compensation (damper position/fan speed) | | | | |
| | SetFuncAirQuality | Compensation function setting (according to the sensor characteristics) | | | | |
| | SpvValueConcentration | Required (allowable) value of the CO2, VOC, (CO) concentration | 800(50) | 0 | 3000 | ppm |
| | SettingRangeSensor | CO2, VOC, (CO) sensor range setting | 2000(300) | 0 | 3000 | ppm |
| | ActValComp | CO2, VOC (CO) compensation rate display, % | | 0 | 100 | % |
| Humidity fan compensation | | Humidity-dependent fan speed compensation | | | | |
| | FanCmpHumSpv | Humidity required value for compensation | 50 | 0 | 100 | %r.H. |
| | Func compensation | Fan speed compensation function | | | | |
| | ActValComp | Compensation display | | | | % |
| Humidity Hrec Damp compensat | | Humidity-dependent mixing damper compensation | | | | |
| | Func compensation | Fan speed compensation function | | | | |
| | ActValComp | Compensation display | | | | % |
| TemperatureStart | | Temperature start-up | | | | |
| | StrtTmpHeating | Heating trigger temperature | 25 | -64 | 64 | ºC |
| | SpvTmpHeating | Required temperature for heating | 25 | -64 | 64 | ºC |
| | StrtTmpCooling | Cooling trigger temperature | 30 | -64 | 64 | ºC |
| | SpvTmpCooling | Required temperature for cooling | 15 | -64 | 64 | ºC |
| | Temperature hysterese | Hysteresis | 1 | 0.1 | 64 | ºC |
| | BlckTmAgainStart | Heating and cooling blocking time | 30 | 0 | 999 | min |
| | MinRunTm | Minimum operating time | 0 | 0 | 999 | min |
| Night Cooling | | Night chilling | | | | |
| | SpvTmpRoom | Required room temperature, inlet-dependent control | 22 | -64 | 64 | ºC |
| | HysTmpRoom | Temperature hysteresis | 3 | 0 | 64 | ºC |
| | MinOutTmp | Minimum outdoor temperature setting | 12 | -64 | 64 | ºC |
| | OutRoomOnDiffTmp | Outdoor temperature and room temperature difference | 5 | 1 | 64 | ºC |
| | MinRunTm | Minimum operating time | 30 | 0 | 999 | min |
| Boost | | Optimized start | | | | |
| | PreStrtTmTimeSchedul | Pre-set interval before time program start-up | 60 | 0 | 999 | min |
| | SpvTmpRoom | Required room temperature - inlet-dependent control | 20 | -64 | 64 | ºC |
| | HysTmp | Temperature hysteresis | 0.5 | -64 | 64 | ºC |
| | SpvTmpHeating | Required temperature for heating | 25 | -64 | 64 | ºC |
| | SpvTmpCooling | Required cooling temperature | 15 | -64 | 64 | ºC |
| Night kick | | Night turning | | | | |
| | DateTime | Turning time | | | | |
| | TmToNextKick | Time to next turning (h) | 3 | 0 | 9999 | h |
| | TmOn | Active turning time (s) | 300 | 0 | 9999 | s |
| **Control factors** | | Control constants | | | | |
| TempCascade | | Cascade control factors | | | | |
| | PropFactor | Proportional factor | 10 | | | |
| | IntegFactor | Integrating factor | 1200 | | | s |
| AntiFreezeRetWatHeat | | Return water AP factors | | | | |
| | PropFactor | Proportional factor | 20 | | | |
| | IntegFactor | Integrating factor | 90 | | | s |
| | DifferFactor | Derivative factor | 0 | | | s |
| AntiFreezeSplyTemp | | Inlet air AP factors | | | | |
| | PropFactor | Proportional factor | 50 | | | |
| | IntegFactor | Integrating factor | 0 | | | s |
| | DifferFactor | Derivative factor | 0 | | | s |
| MaxRetWatHeat | | Maximum return water temperature factors | | | | |
| | PropFactor | Proportional factor | -3 | | | |
| | IntegFactor | Integrating factor | 300 | | | s |
| | DifferFactor | Derivative factor | 0 | | | s |
| SetpointTempWaterHeating | | Water heating required temperature factors | | | | |
| | PropFactor | Proportional factor | 5 | | | |
| | IntegFactor | Integrating factor | 150 | | | s |
| | DifferFactor | Derivative factor | 0 | | | s |
| Electrical heating | | Electric heating factors | | | | |
| | PropFactor | Proportional factor | 5 | | | |
| | IntegFactor | Integrating factor | 120 | | | s |
| | DifferFactor | Derivative factor | 0 | | | s |
| BurnerFactors | | Gas burner factors | | | | |
| | PropFactor | Proportional factor | 5 | | | |
| | IntegFactor | Integrating factor | 60 | | | s |
| | DifferFactor | Derivative factor | 0 | | | s |
| Bypass damper | | Gas heater bypass damper factors | | | | |
| | PropFactor | Proportional factor | -5 | | | |
| | IntegFactor | Integrating factor | 120 | | | s |
| | DifferFactor | Derivative factor | 0 | | | s |

# List of Data Points (HMI-DM, HMI-TM and HMI@WEB controllers)

## Menu HMI-DM,HMI-TM a HMI@WEB

| Menu | Meaning | Factory settings | | | |
|---|---|---|---|---|---|
| | | Value | Min | Max | Units |
| GasHeatingMaximalTempFlueGas | Maximum temperature of flue gas | | | | |
| PropFactor | Proportional factor | 10 | | | |
| IntegFactor | Integrating factor | 120 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| GasHeatingMinimumTempFlueGas | Minium temperature of flue gas | | | | |
| PropFactor | Proportional factor | -10 | | | |
| IntegFactor | Integrating factor | 120 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Electrical preheting | Electric pre-heating factors | | | | |
| PropFactor | Proportional factor | 5 | | | |
| IntegFactor | Integrating factor | 120 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Extra electrical heating | Electric after-heating factors | | | | |
| PropFactor | Proportional factor | 1 | | | |
| IntegFactor | Integrating factor | 60 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Heat pump - heating | Heat pump factors - heating | | | | |
| PropFactor | Proportional factor | 5 | | | |
| IntegFactor | Integrating factor | 300 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Heat pump - cooling | Heat pump factors - cooling | | | | |
| PropFactor | Proportional factor | -5 | | | |
| IntegFactor | Integrating factor | 300 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Heat pump 2 - heating | Heat pump factors 2 - heating | | | | |
| PropFactor | Proportional factor | 5 | | | |
| IntegFactor | Integrating factor | 300 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Heat pump 2 - cooling | Heat pump factors 2 - cooling | | | | |
| PropFactor | Proportional factor | -5 | | | |
| IntegFactor | Integrating factor | 300 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Heat pump 3 - heating | Heat pump factors 3 - heating | | | | |
| PropFactor | Proportional factor | 5 | | | |
| IntegFactor | Integrating factor | 300 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Heat pump 3 - cooling | Heat pump factors 3 - cooling | | | | |
| PropFactor | Proportional factor | -5 | | | |
| IntegFactor | Integrating factor | 300 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Heat recovery | Heat recovery RHE/BP PE | | | | |
| PropFactor | Proportional factor | 3 | | | |
| IntegFactor | Integrating factor | 60 | | | s |
| DifferFactor | Derivative factor | 1 | | | s |
| Heat exchanger freeze | Heat recovery AP factors | | | | |
| PropFactor | Proportional factor | 20 | | | |
| IntegFactor | Integrating factor | 150 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Mixing | Mixing factors | | | | |
| PropFactor | Proportional factor | 7 | | | |
| IntegFactor | Integrating factor | 45 | | | s |
| DifferFactor | Derivative factor | 15 | | | s |
| Cooling | Cooling factors | | | | |
| PropFactor | Proportional factor | -5 | | | |
| IntegFactor | Integrating factor | 60 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Humidification | Humidification factors | | | | |
| PropFactor | Proportional factor | 5 | | | |
| IntegFactor | Integrating factor | 120 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Dehumidity | Dehumidification factors | | | | |
| PropFactor | Proportional factor | -2 | | | |
| IntegFactor | Integrating factor | 240 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| Humidity cascade | Humidity cascade control factors | | | | |
| PropFactor | Proportional factor | 4 | | | |
| IntegFactor | Integrating factor | 0 | | | s |
| FanCompensationSequenceHtg | Heating-dependent fan speed compensation factors | | | | |
| PropFactor | Proportional factor | 5 | | | |
| IntegFactor | Integrating factor | 120 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| FanCompensationSequenceClg | Cooling-dependent fan speed compensation factors | | | | |
| PropFactor | Proportional factor | -10 | | | |
| IntegFactor | Integrating factor | 120 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| FanCompensationRoomExhaustTmp | Room (outlet) temperature-dependent fan speed compensation factors | | | | |
| PropFactor | Proportional factor | 20 | | | |
| IntegFactor | Integrating factor | 0 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| FanCompensationHumidity | Humidity-dependent fan speed compensation factors | | | | |

## List of Data Points (HMI-DM, HMI-TM and HMI@WEB controllers)

**Menu HMI-DM,HMI-TM a HMI@WEB**

| Menu | Meaning | Factory settings | | | |
|---|---|---|---|---|---|
| | | Value | Min | Max | Units |
| PropFactor | Proportional factor | -5 | | | |
| IntegFactor | Integrating factor | 0 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| HrecDampCompHumidity | Humidity-dependent mixing damper position compensation factors | | | | |
| PropFactor | Proportional factor | -2 | | | |
| IntegFactor | Integrating factor | 45 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| CompensationAirQuality | Air quality CO2(VOC,CO)-dependent compensation (damper position/fan speed) factors | | | | |
| PropFactor | Proportional factor | -0.3 | | | |
| IntegFactor | Integrating factor | 300 | | | s |
| DifferFactor | Derivative factor | 0 | | | s |
| SplyFanVarCtlr | SplyFanVarCtlr | | | | |
| PropFactor | PropFactor | -0.3 | | | |
| IntegFactor | IntegFactor | 30 | | | s |
| DifferFactor | DifferFactor | 0 | | | s |
| ExhFanVarCtlr | ExhFanVarCtlr | | | | |
| PropFactor | PropFactor | -0.3 | | | |
| IntegFactor | IntegFactor | 30 | | | s |
| DifferFactor | DifferFactor | 0 | | | s |
| **Device configuration** | Device configuration | | | | |
| Aplication info | Application information | | | | |
| Device Info | Device information | | | | |
| Unit ºC → ºF | Change units from Metric to imperial | | | | |
| Version OS | OS version | | | | |
| InternTempRegulator | Controller internal temperature | | | | |
| Operating Hours | Operating hours | | | | |
| Type of device | Device type | | | | |
| Inputs configuration | Inputs configuration | | | | |
| HeatPumpAlm | Heat Pump Fault | | | | |
| Cooling alarm | Cooling Fault | | | | |
| Output configuration | Output configuration | | | | |
| Signal type heating | Control signal 0-10 V or 2-10 V, heating | | | | |
| Signal type cooling | Control signal 0-10 V or 2-10 V, cooling | | | | |
| Signal type mix damper | Control signal 0-10 V or 2-10 V, mixing damper | | | | |
| SignalTypByPassHeatRec | Control signal 0-10 V or 2-10 V, heat exchanger by-pass damper | | | | |
| SignalTypeByPassBurn | Control signal 0-10 V or 2-10 V, chamber by-pass damper | | | | |
| RegulationSupplyFan | Type of regulation supply fan | | | | |
| RegulationExhaustFan | Type of regulation exhaust fan | | | | |
| RegulationAddtionalFan | Type of regulation additional fan | | | | |
| Heating | Heating | | | | |
| Heat pump | Heat pump | | | | |
| Gas heat type | Type of gas heating | | | | |
| GasHeaterBypassDamp | Byppas damper gas heater | | | | |
| Cooling | Cooling | | | | |
| Heat recovery | Heat recovery | | | | |
| Mixing | Mixing | | | | |
| Preheating | Preheating | | | | |
| Extra heating | Extra heating | | | | |
| TemperatControlMode | Temperature control mode | | | | |
| HumidityControlMode | Humidity control mode | | | | |
| RemoteFault-ClassFault | Remote fault - choice class fault | | | | |
| Version SW-HMI | SW-HMI version | | | | |
| **AditionalOperModeAndFunction** | Additional operating modes, functions | | | | |
| TemperatureMeasurePointSelect | Room temperature measuring point selection | | | | |
| FanCompensationOutTemperature | Outdoor Temperature-Dependent Fan Speed Compensation | | | | |
| Fan compensation sequence | Heating/cooling dependent fan speed compensation | | | | |
| Fan compensation air quality | Air quality-dependent fan speed compensation | | | | |
| FanCompensationRoomExhaustTmp | Room (outlet) temperature-dependent fan speed compensation | | | | |
| Temperature deviation alarm | Difference between required and actual temperature monitoring | | | | |
| AntiFreezeDEV | DEV Water Heater Antifreeze Protection Variant | | | | |
| HeatRecoveryCompensationAirQ | Air quality-dependent damper position compensation | | | | |
| Heat recovery cooling | Cooling using ZZT (ROV, BP, DEV, mixing damper) | | | | |
| Fan cooling sequence | Heating/cooling dependent fan speed compensation-cooling sequence (fan, cooler) | | | | |
| HeatRecovery-DamperSequence | Mixing heating sequence (damper, heater) | | | | |
| Night coolling | Night chilling | | | | |
| Temperature start-up | Temperature start-up | | | | |
| Boost | Time mode start optimization | | | | |
| BlockedDamper-AndExhaustFan | Damper and outlet fan blocking | | | | |
| Type corrrect TRN exhaust fan | Outlet fan correction type (TRN controllers) | | | | |
| LimitationDeHumidiForHeating | Limitation of dehumidification during heating | | | | |
| Humidity fan compensation | Humidity-dependent fan speed compensation | | | | |
| Humidity HrecDampCompensation | Humidity-dependent mixing damper position compensation | | | | |

# List of Data Points (HMI-DM, HMI-TM and HMI@WEB controllers)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | ActiveMaxFrshAirDHrec | | Function activation - Max. limit of fresh air according to T outdoor (vent. unit) | | | | |
| | | Apply + Reset | | Reset after configuration of additional modes/functions | | | | |
| | HMI-SG | | | HMI-SG | | | | |
| | | DisplayedRoomTemp | | Room temperature display, combined or inlet temperature | | | | |
| | | SetpoitRangeCorr | | Required value compensation setting +/- | 3 | 0 | 12 | °C |
| | | SetpointIncrement | | Required temperature increment setting (0.5/0.1) (°C) | 0.1 | 0.1 | 0.5 | °C |
| | | TimeFormat | | Displayed time format (12h/24h) | 24 | 12 | 24 | h |
| | External Control | | | External control | | | | |
| | | ToggFuncInp1 | | External contact function definition (Ext. control 1 contact) | | | | |
| | | DelayOfTmToAUTO | | Transition time from ext. control mode to AUTO mode (Ext. control 1 contact) | 0 | 0 | 23 | h |
| | | FanOutputStg1 | | Fan output stage setting (Ext. control 1 contact or 2 contacts) | | | | |
| | | FanOutputStg2 | | Fan output stage setting "Higher" (Ext. control 2 contacts) | | | | |
| | | TmpMod1 | | Temperature mode setting (Ext. control 1 contact or 2 contacts) | | | | |
| | | TmpMod2 | | Temperature mode setting "Higher" (Ext. control 2 contacts) | | | | |
| | | FanStageExtCnt | | Fan output stages (external control) | | | | |
| | Identification device | | | Device identification | | | | |
| | | Name of device | | Equipment name | | | | |
| | | Number of devices | | Device number | | | | |
| | | Location of the installation | | Device location | | | | |
| **Checks** | | | | Checks | | | | |
| | Save / Restore | | | Saving and recovery | | | | |
| | | UpgradeStart | | Application loading from SD card | | | | |
| | | SaveDataOnSDCard | | Data saving to SD card | | | | |
| | | SaveDataFromSDCard | | Data loading from SD card | | | | |
| | | RestoreFactorySetting | | Factory settings recovery | | | | |
| | | Restore settings | | Settings recovery | | | | |
| | | Save settings | | Save settings | | | | |
| | Operating hours | | | Operating hours | | | | |
| | | Supply fan | | Operating hour counter - inlet fan | | | | |
| | | Exhaust fan | | Operating hour counter - outlet fan | | | | |
| | | Additional fan | | Operating hour counter – 3rd auxiliary fan | | | | |
| | | Operating hours settings fans | | Fan operating hours settings | | | | |
| | | | OperationHoursAlm | Fan operating hour alarm state | | | | |
| | | | EnblOperHoursAlm | Alarm enable fan operating hour | | | | |
| | | | OperHoursLimit | Operating hours for alarm activation | 17520 | 0 | 999999 | h |
| | | Water preheating | | Operating hour counter – water pre-heating | | | | |
| | | ElectricPreheating | | Operating hour counter - electric pre-heating | | | | |
| | | Heating water | | Operating hour counter - water heating | | | | |
| | | Electrical heating | | Operating hour counter - electric heating | | | | |
| | | Cooling water | | Operating hour counter - water cooling | | | | |
| | | CoolingCondenUnit | | Operating hour counter – condensing unit | | | | |
| | | ChlazKondJednotka 2 | | Operating hour counter – condensing unit 2 | | | | |
| | | ChlazKondJednotka 3 | | Operating hour counter – condensing unit 3 | | | | |
| | | ExtraElectricalHtg | | Operating hour counter - electric after-heating | | | | |
| | | TepČerpadlo-ohřev | | Operating hour counter – Heating Pump - heating | | | | |
| | | TepČerpadlo-chlaz | | Operating hour counter – Heating Pump - cooling | | | | |
| | | TepČerpadlo2-ohřev | | Operating hour counter – Heating Pump 2 - heating | | | | |
| | | TepČerpadlo2-chlaz | | Operating hour counter – Heating Pump 2 - cooling | | | | |
| | | TepČerpadlo3-ohřev | | Operating hour counter – Heating Pump 3 - heating | | | | |
| | | TepČerpadlo3-chlaz | | Operating hour counter – Heating Pump 3 - cooling | | | | |
| | SetpointAndSupplyTmpDeviation | | | Difference between required and inlet air temperature monitoring. | | | | |
| | | MaxDeviation | | Maximum difference (±°C) | 10 | 0 | 99 | °C |
| | | MinLimit | | Minimum limit (°C) | 10 | 0 | 99 | °C |
| | | DlyOnTmEvalAfterStart | | Time delay evaluation after AHU start-up (s) | 60 | 0 | 9999 | s |
| | SetpointAndRoomTmpDeviation | | | Difference between required and room (outlet) air temperature monitoring. | | | | |
| | | MaxDeviation | | Maximum difference (±°C) | 10 | 0 | 99 | °C |
| | | MinLimit | | Minimum limit (°C) | 10 | 0 | 99 | °C |
| | | DlyOnTmEvalAfterStart | | Time delay evaluation after AHU start-up (s) | 600 | 0 | 9999 | s |
| | FireAlarmActivityFans | | | Fan behaviour during fire alarm | | | | |
| | FireAlarmFansOutSpv | | | Fan output during fire alarm | 80 | 0 | 100 | % |
| | SplyTmpFireLmt | | | Fire alarm activation inlet temperature | 70 | 0 | 99 | °C |
| | ExhstTmpFireLmt | | | Fire alarm activation outlet temperature | 50 | 0 | 99 | °C |
| **Connection** | | | | Connection | | | | |
| | Modbus Master | | | ModbusMaster | | | | |
| | | AdrFreqInv1SplyFan | | Frequency inverter 1 address, inlet fan | 1 | | | |
| | | AdrFreqInv2SplyFan | | Frequency inverter 2 address, inlet fan backup or second inlet fan | 2 | | | |
| | | AdrFreqInv3SplyFan | | Frequency inverter 3 address, inlet fan twin backup | 3 | | | |
| | | AdrFreqInv4SplyFan | | Frequency inverter 4 address, inlet fan twin backup | 4 | | | |
| | | AdrFreqInv5ExhFan | | Frequency inverter 5 address, outlet fan | 5 | | | |
| | | AdrFreqinv6ExhFan | | Frequency inverter 6 address, outlet fan backup or second outlet fan | 6 | | | |
| | | AdrFreqInv7ExhFan | | Frequency inverter 7 address, outlet fan twin backup | 7 | | | |
| | | AdrFreqInv8ExhFan | | Frequency inverter 8 address, outlet fan twin backup | 8 | | | |
| | | AdrFreqInv9AddFirst | | Frequency inverter 9 address, 3rd auxiliary fan | 9 | | | |
| | | AdrFreqInv10AddSec | | Frequency inverter 10 address, second 3rd auxiliary fan | 10 | | | |
| | | AdrFreqInv11RotHeatExch | | Frequency inverter 11 address, rotary heat exchanger | 11 | | | |
| | | ResistiveTerminatBus | | Control unit Modbus resistance terminal | | | | |
| | | NumberRepeatErrMess | | Number of message repeating during error transfers | 2 | | | |
| | | NumberOfErrMess | | Number of error transfers for communication failure evaluation | 6 | | | |
| | LAN Connection | | | LAN connection | | | | |
| | | DHCP | | DHCP | | | | |
| | | ActIPAdr | | Current IP address | | | | |
| | | ActMaskAdr | | Current mask address | | | | |

## List of Data Points (HMI-DM, HMI-TM and HMI@WEB controllers)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | ActGatewayAdr | | Current gate address | | | | |
| | GivenIPAdr | | IP address input | | | | |
| | GivenMaskAdr | | Mask address input | | | | |
| | GivenGateAdr | | Gate address input | | | | |
| | HostName | | Host name | | | | |
| | MACAdrress | | MAC address | | | | |
| | Web user name | | HMI@WEB user name: | | | | |
| | Web user name | | HMI@WEB password | | | | |
| | Apply+Reset | | Apply+Reset | | | | |
| LON | | | LON | | | | |
| | OutTmpCommunicat | | Outdoor temperature from the bus | | | | |
| | ExtAlarmCommunicat | | External failure form the bus | | | | |
| Modbus - CommModul | | | Modbus communication module | | | | |
| LON - CommModul | | | LON communication module | | | | |
| | OutTmpCommunicat | | Outdoor temperature from the bus | | | | |
| | ExtAlarmCommunicat | | External failure form the bus | | | | |
| BACnet/IP | | | BACnet/IP communication module | | | | |
| Language | | | Language | | | | |
| | Current Language | | Current language | | | | |
| Passwords | | | Passwords | | | | |
| | Login | | Log-in | | | | |
| | Log Out | | Log-out | | | | |
| | Change password | | Password change | | | | |
| | | Password:SERVICE | Password: SERVICE | | | | |
| | | Level:SERVICE | Level: SERVICE | | | | |
| | | Password:ADMIN | Password: ADMINISTRATOR | | | | |
| | | Level:ADMIN | Level: ADMINISTRATOR | | | | |
| | | Password:USER | Password: USER | | | | |
| | | Level:USER | Level: USER | | | | |
| | | Password:GUEST | Password: GUEST | | | | |
| | | Level:GUEST | Level: GUEST | | | | |
| **Function button** | | | | | | | |
| **– Fault** | | | | | | | |
| 1x | Alarm list detail | | Last failure digital description | | | | |
| 2x | Alarm list: | | List of failures | | | | |
| | Acknowledge | | Failure reset | | | | |
| 3x | Alarm history: | | Error history | | | | |
| | Acknowledge | | Failure reset | | | | |
| 4x | Alarms | | Failures | | | | |
| | Alarm list: | | List of failures | | | | |
| | Reset | | Reset | | | | |
| | Alarm history: | | Error history | | | | |
| | Reset | | Reset | | | | |

## List of failures (HMI-DM, HMI-TM and HMI@WEB controllers)

| Failure name | Failure Description |
|---|---|
| SupplyTmpSnsr | Inlet air temperature sensor |
| RoomTmpSnsr | Room air temperature sensor |
| HMI-SG1 | Local HMI-SG1 controller |
| HMI-SG2 | Local HMI-SG2 controller |
| ReturnAirTmpSnsr | Outlet air temperature sensor |
| OutTmpSnsr | Outdoor temperature sensor |
| HtgFrstTmpSnsr | Return water temperature sensor |
| FrostTmpSnsrHeatEx | Antifreeze protection temperature sensor |
| PreElHtgTmpSnsr | Temperature sensor after the el. pre-heater |
| PreWtrHtgTmpSnsr | Pre-heating antifreeze protection temperature sensor |
| ExtraSupplyTmp | Temperature sensor after the el. after-heater |
| BrnrFlueTmpSnsr | Flue gas temperature sensor |
| AirQualitySnsr | Air quality sensor |
| SupplyHumSnsr | Inlet air humidity sensor |
| RoomHumSnsr | Room air humidity sensor |
| OutHumSnsr | Outdoor air humidity sensor |
| Supply fan | Inlet – 1st fan |
| SplyFanInfBckUp | Inlet fan backup information |
| SplyFanBckUpOrTwn | Backup or twin – 2nd inlet fan |
| TwnSplyFanActBckUp | Twin inlet fan backup information |
| SplyFanBckUpFrsTwn | 1st inlet fan twin backup |
| SplyFanBckUpSecTwn | 2nd inlet fan twin backup |
| Exhaust fan | Outlet fan – 1st fan |
| ExhFanActBckUp | Outlet fan backup information |
| ExhFanBckUpOrTwn | Backup or twin - 2nd outlet fan |
| ExhFanBckUpFrsTwn | Twin backup – 1st outlet fan |
| TwnExhFanActBckUp | Twin outlet fan backup information |
| ExhFanBckUpSecTwn | Twin backup – 2nd outlet fan |
| Fan additional | Auxiliary 3rd fan |
| FanTwinAdditional | Auxiliary 3rd twin fan |
| Supply fan - flow | Supply fan air-flow fault |
| Exhaust fan - flow | Exhaust fan air-flow fault |
| AdditionalFan-Flow | Additional fan air-flow fault |
| WaterHeatingPump | Water heat pump fault |
| Heat pump | Heat pump fault |
| BlockHeatPumpFromOutTmpHeating | Blocking the heat pump from outer temperature - heating |
| BlockHeatPumpFromOutTmpCooling | Blocking the heat pump from outer temperature - cooling |
| Fan | Fan |
| Filter | Filter fouling |
| Electric heating | Electric heater |
| Fire | Fire |
| OverHeatFlueGas | Flue gas temperature exceeded |
| HighFlueGasTemp | High flue gas temperature |

## List of failures (HMI-DM...)

| Failure name | Failure Description |
|---|---|
| BackdraftProtec | Gas heater thermostat switching ON |
| Burner | Gas heater |
| ElectricPreheating | Electric pre-heating |
| ExtraElectricalHtg | Electric after-heating |
| CondensingUnit | Condensing unit |
| FreqInvRotHeatEx | ROV failure |
| AntiFreezeHeatEx | Heat exchanger antifreeze protection |
| SplyFanMainTK | Main inlet fan - Thermocontact |
| SplyFanBckUpTK | Backup inlet fan - Thermocontact |
| SplyFanMainDifPr | Main inlet fan - pressure deference sensor |
| SplyFanBckUpDifPr | Backup inlet fan - pressure deference sensor |
| SupplyFanBack-up | Active inlet fan twin backup |
| ExhFanMainTK | Main outlet fan - Thermocontact |
| ExhFanBckUpTK | Backup outlet fan - Thermocontact |
| ExhFanMainDifPr | Main outlet fan - pressure deference sensor |
| ExhFanBckUpDifPr | Backup outlet fan - pressure deference sensor |
| ExhaustFanBack-up | Active outlet fan twin backup |
| CommunicatioModbus | Modbus communication |
| FanOperHours | Fan operating hours |
| StptSplyTmpDev | Difference between required and inlet air temperature monitoring. |
| StptRoomTmpDev | Difference between required and room (outlet) air temperature monitoring. |
| HeatPumpDefrost | Heat pump defrosting function |
| Inlet Pressure | Unconnected or damaged pressure sensor - inlet fan |
| Outlet Pressure | Unconnected or damaged pressure sensor - outlet fan |
| Inlet Air Flow | Unconnected or damaged flow sensor - inlet fan |
| Outlet Air Flow | Unconnected or damaged flow sensor - outlet fan |
| Humidifier | Humidifier fault |
| Reduced humidification output | Reduced humidification output due to the temperature priority (swimming-pool unit) – an information message |

## Other Ways of Control

### External control

This enables the control unit to be connected to other technology using **single-** or **two-contact** control. The Auto operating state of the air-handling unit is always the default state for external control.

#### Single-Contact Control

This type of control can be performed in two ways (Start (default) or Start and Stop functions) depending on the data point setting.
**Start function:** By activating the switch (switching 1/0), the air-handling unit is put into the Run operating state (fan output stage and temperature mode). The control unit time in the Run state is always given by the timer settings. Another activation of the switch will prolong the control unit time in the Run state for a pre-set time in the timer. Once the pre-set time has elapsed, the unit will go into the Auto operating state. If the timer is set to zero, the contact input is ready for the switch action (on-off, switching 1) – if the switch is in the "On" position, the air-handling unit is in the Run operating state; after switching to the "Off" position, the air-handling unit will go into the Auto state.
**Start and Stop function:** By activating the switch "Start function" (switching 1/0), the air-handling unit is put into the Run operating state (fan output stage and temperature mode) for the timing period. Upon activation of the switch "Stop function" in the active timing interval, the pre-set operating mode will be stopped and the unit will go into the Auto state. The air-handling unit will also go into the Auto state once the timing interval has elapsed. If the timer is set to zero, the contact input is ready for the switch action (on-off, switching 1) – if the switch is in the "On" position, the air-handling unit is in the Run operating state; after switching to the "Off" position, the air-handling unit will go into the Auto state.

#### Two-Contact Control

This enables the selection of two Run mode operating states (Higher and Lower). Each Run operating state is set in a different temperature mode and fan speed stage. By combining the Stop or Auto operating modes, it is possible to set the required state of the Run mode. The contact states can be combined as follows:

| Operating mode | 1st contact | 2nd contact |
|---|---|---|
| Auto | Off | Off |
| Lower stage | On | Off |
| Higher stage | Off | On |
| Stop | On | On |

Setting of the Run operating state (temperature mode and fan output stage) and timer (only for one specific device) is performed using the HMI-SG controller in the List of Data Points in the section Settings – External Devices.

The two-contact control is also used (factory setting) for the use of REMAK ORe2 series wall-mounted controllers and ORe1 (this controller series does not use one of the manual stages).

# Connection to the Master System (LonWorks Standard)

## Remote Signalling

The VCS Control unit can optionally be equipped with one or two outputs for remote signalling.
Depending on the configuration, the following:

- Only failure (non-potential contact, max. load 230 V/1 A)
- Failure and operation (2 non-potential contacts, max. load 230 V/1 A).

## LonWorks Network

The VCS control unit enables integration of the centralized BMS (Building Management System) using the LonWorks communication bus. Using the suitably integrated system, it is possible to control the air-handling device operating state. For a specific description of the variables to be used for the integration, refer to the section "Description of Pre-defined Variables in the LONWorks Network". The final functionality, monitoring and control options will be dependant on the integrator used to ensure connection to the master BMS system.

## Network Interface

Connection to the network is ensured by a galvanically separated FTT-10A transceiver. This Free Topology Transceiver has been designed for the LonWorks network with a TP/FT-10 type transmission channel. This transmission channel uses a free topology network, a twisted pair and baud rate of 78 kbps.
Applicable network topologies to be used along with the FTT-10A transceiver:

- Free topology
  (including the star and circular topology)
  – Free topology
- Bus topology
  – Line (Bus) topology

Each device in the LonWorks network is identified by a unique neuron ID identifier. The unique neuron ID identifier assigned by the manufacturer can always be found on the Climatix controller which is a part of the VCS control unit.

For more information on the LonWorks Standard refer to:
www.echelon.com
www.lonmark.org

## Data Point Settings for Application of Some Network Input Variables

Using the controllers along with the VCS control system, it is possible to make changes in the assignment of the functions to some network input variables (SNVT). For some input variables like outdoor temperature and fire alarm (external failure), it is necessary to select if the value is to be used from the communication or from the application in the Controller Menu. Thus it can be determined if the outdoor temperature sensor is connected directly to the VCS control unit or its temperature reading is sent through the communication (LonWorks).

## Description of Pre-defined Variables in the LonWorks Network

This section includes description of SNVT variables (Standard Network Variable Types) according to assigned REMAK data points. The list below includes specifications of variables for all the VCS control system variants. For example, if the VCS control system (air-handling device) was not equipped with gas heating it is not possible to use these variables.

### Input Variables

| Network Variable: | nviTemps |
|---|---|
| Description: | Req. heating temperature (Comfort)<br>Req. cooling temperature (Comfort)<br>Req. heating temperature (Economy)<br>Req. cooling temperature (Economy)<br>Minimum supply air temperature<br>Maximum supply air temperature |
| Object: | SNVT_temp_Setpt |
| Remark: | Structured Variable |

| Network Variable: | nviTemp01 |
|---|---|
| Description: | Not used |
| Object: | SNVT_temp_p |

| Network Variable: | nviTemp02 |
|---|---|
| Description: | Outdoor temperature |
| Object: | SNVT_temp_p |

| Network Variable: | nviAHum00 |
|---|---|
| Description: | Humidification Reference Value |
| Object: | SNVT_abs_humid |
| Remark: | For absolute and relative |

| Network Variable: | nviAHum01 |
|---|---|
| Description: | Dehumidification Reference Value |
| Object: | SNVT_abs_humid |
| Remark: | For absolute and relative |

| Network Variable: | nviPpm00 |
|---|---|
| Description: | Air quality Reference Value |
| Object: | SNVT_count |

| Network Variable: | nviPress_Flow00 |
|---|---|
| Description: | Not used |
| Object: | SNVT_count |

| Network Variable: | nviPress_Flow01 |
|---|---|
| Description: | Not used |
| Object: | SNVT_count |
| Network Variable: | nviPress_Flow02 |
| Description: | Not used |
| Object: | SNVT_count |

| Network Variable: | nviPress_Flow03 |
|---|---|
| Description: | Not used |
| Object: | SNVT_count |
| Network Variable: | nviPress_Flow04 |
| Description: | Not used |
| Object: | SNVT_count |

## Connection to the Master System (LonWorks Standard)

| Network Variable: | nviPress_Flow05 |
|---|---|
| Description: | Not used |
| Object: | SNVT_count |

| Network Variable: | nviResetAlarm | |
|---|---|---|
| Description: | Failure reset | |
| Object: | SNVT_switch | |
| Values: | | |
| | 0 | Normal |
| | 1 | Reset |
| | >1 | Not defined |
| State: | 0: | Inactive |
| | 1: | Active |
| Default: | Value: | 0 |
| | State: | 0 |
| Remark: | The State must be set to "1" to be used for the Value | |

| Network Variable: | nviOpMode | |
|---|---|---|
| Description: | Stav zařízení požadovaný z BMS | |
| Object: | SNVT_switch | |
| Values: | | |
| 0 | Auto (interní časový program) | |
| 1 | Stop | |
| 2 | Economy, 1St | |
| 3 | Comfort, 1St | |
| 4 | Economy, 2St | |
| 5 | Comfort, 2St | |
| 6 | Economy, 3St | |
| 7 | Comfort, 3St | |
| 8 | Economy, 4St | |
| 9 | Comfort, 4St | |
| 10 | Economy, 5St | |
| 11 | Comfort, 5St | |
| >11 | Not defined | |
| State: 0: | Inactive | |
| 1: | Active | |
| Remark: | The State must be set to "1" to be used for the Value | |

| Network Variable: | nviControl | | |
|---|---|---|---|
| Description: | External control | | |
| Object: | SNVT_state (16 bit) | | |
| Bits: | | | |
| Bit [0 ...15] | Binary: | *Reverse: | |
| | 0 | 15 | |
| External control 1 | 1 | 14 | |
| External control 2 | 2 | 13 | |
| | 3 | 12 | |
| | 4 | 11 | |
| | 5 | 10 | |
| | 6 | 9 | |
| Fire alarm | 7 | 8 | "0"=Fault, "1" No fault |
| | 8 | 7 | |
| | 9 | 6 | |
| Bit [0 ...15] | Binary: | *Reverse: | |
| | 10 | 5 | |
| | 11 | 4 | |
| | 12 | 3 | |
| | 13 | 2 | |
| | 14 | 1 | |
| | 15 | 0 | |

Remark: *The bit name order can be reversed in some LON software tools.

### Output Variables

| Network Variable: | nvoTemps |
|---|---|
| Description: | Req. heating temperature (Comfort)<br>Req. cooling temperature (Comfort)<br>Not used<br>Req. heating temperature (cascade, inlet)<br>Req. cooling temperature (cascade, inlet)<br>Not used |
| Object: | SNVT_temp_Setpt |
| Remark: | Structured Variable |

| Network Variable: | nvoTemp01 |
|---|---|
| Description: | Inlet temperature |
| Object: | SNVT_temp_p |

| Network Variable: | nvoTemp02 |
|---|---|
| Description: | Return water temperature |
| Object: | SNVT_temp_p |

| Network Variable: | nvoTemp03 |
|---|---|
| Description: | Outdoor temperature |
| Object: | SNVT_temp_p |

| Network Variable: | nvoTemp04 |
|---|---|
| Description: | Room temperature (for control) |
| Object: | SNVT_temp_p |

| Network Variable: | nvoTemp05 |
|---|---|
| Description: | Outlet temperature |
| Object: | SNVT_temp_p |

| Network Variable: | nvoTemp06 |
|---|---|
| Description: | Temperature behind the heat exchanger |
| Object: | SNVT_temp_p |

| Network Variable: | nvoTemp07 |
|---|---|
| Description: | Flue gas temperature |
| Object: | SNVT_temp_p |

| Network Variable: | nvoTemp08 |
|---|---|
| Description: | Temperature behind electric pre-heating or Return water temperature form the water heater |
| Object: | SNVT_temp_p |

| Network Variable: | nvoPpm00 |
|---|---|
| Description: | Air quality |
| Object: | SNVT_count |

## Connection to the Master System (LonWorks Standard)

| Network Variable: | nvoPress00 |
|---|---|
| Description: | Inlet pressure |
| Object: | SNVT_press_p |

| Network Variable: | nvoPress01 |
|---|---|
| Description: | Outlet pressure |
| Object: | SNVT_press_p |

| Network Variable: | nvoPress02 |
|---|---|
| Description: | Not used |
| Object: | SNVT_press_p |

| Network Variable: | nvoPress_Flow00 |
|---|---|
| Description: | Current request for the inlet fan |
| Object: | SNVT_flow |
| Remark: | %, Pa or l/s |

| Network Variable: | nvoPress_Flow01 |
|---|---|
| Description: | Current request for the outlet fan |
| Object: | SNVT_flow |
| Remark: | %, Pa or l/s |

| Network Variable: | nvo_Flow00 |
|---|---|
| Description: | Inlet air-flow |
| Object: | SNVT_flow |

| Network Variable: | nvo_Flow01 |
|---|---|
| Description: | Outlet air-flow |
| Object: | SNVT_flow |

| Network Variable: | nvoPerc00 |
|---|---|
| Description: | Heater output |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc01 |
|---|---|
| Description: | Cooling output |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc02 |
|---|---|
| Description: | Heat exchanger output |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc03 |
|---|---|
| Description: | Mixing output |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc04 |
|---|---|
| Description: | Not used |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc05 |
|---|---|
| Description: | Electric heater output |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc06 |
|---|---|
| Description: | Inlet fan output |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc07 |
|---|---|
| Description: | Outlet fan output |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc08 |
|---|---|
| Description: | Not used |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc09 |
|---|---|
| Description: | Air humidity in the inlet |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc10 |
|---|---|
| Description: | Air humidity in the room |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc11 |
|---|---|
| Description: | Outdoor air humidity |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc12 |
|---|---|
| Description: | Humidification output |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc13 |
|---|---|
| Description: | Dehumidification output |
| Object: | SNVT_lev_count |

| Network Variable: | nvoPerc14 |
|---|---|
| Description: | Electric after-heater output |
| Object: | SNVT_lev_count |

| Network Variable: | nvoAHum00 |
|---|---|
| Description: | Absolute humidity in the inlet |
| Object: | SNVT_abs_humid |

| Network Variable: | nvoAHum01 |
|---|---|
| Description: | Absolute humidity in the outlet |
| Object: | SNVT_abs_humid |

| Network Variable: | nvoOpMode | | |
|---|---|---|---|
| Description: | Current device state | | |
| Object: | SNVT_switch | | |
| Values: | 0 | Stop | |
| | 1 | Operation (Comfort) | |
| | 2 | Operation (Economy) | |
| | 3 | Not used | |
| | 4 | Optimized start | |
| | 5 | Night chilling | |
| | 6 | Temperature start-up | |
| | 7 | Night turn-over | |
| | 8 | Not used | |
| | 9 | Fire | |
| | 10 | Safety stop | |
| | 11 | Fan run-down | |
| | 12 | Start | |
| | >12 | Not defined | |
| State: | 0: | Inactive | :Mode Auto |
| | 1: | Active | :Mode OS |
| Default: | Value: | 0 | |

## Connection to the Master System (LonWorks Standard)

| | | |
|---|---|---|
| | State: | 0 |
| Network Variable: | nvoSwitch00 | |
| Description: | Current fan state | |
| Object: | SNVT_switch | |
| Values: | 0 | Stop |
| | 1 | 1St |
| | 2 | 2St |
| | 3 | 3St |
| | 4 | 4St |
| | 5 | 5St |
| | >5 | Not defined |
| State: | 0: | Inactive |
| | 1: | Active |

| Network Variable: | nvoState | | |
|---|---|---|---|
| Description: | Alarm classes, Control mode | | |
| Object: | SNVT_state_64 (64 bit) | | |
| Bits: | | | |
| Bit [0 ...63] | | Binary: | *Reverse: |
| Alarm class - danger (A) | | 0 | 63 |
| Alarm class - critical (A) | | 1 | 62 |
| Alarm class - low (B) | | 2 | 61 |
| Alarm class - warning (B) | | 3 | 60 |
| | | 4 | 59 |
| | | 5 | 58 |
| | | 6 | 57 |
| | | 7 | 56 |
| | | 8 | 55 |
| | | 9 | 54 |
| | | 10 | 53 |
| Current control temperature - room | | 11 | 52 |
| Current control temperature - outlet | | 12 | 51 |
| Current control temperature - inlet | | 13 | 50 |
| Current control humidity - room | | 14 | 49 |
| Current control humidity - inlet | | 15 | 48 |
| | | . | . |
| | | . | . |
| | | . | . |
| | | 63 | 0 |

Remark: *The bit name order can be reversed in some LON software tools

| Network Variable: | nvoDO | | |
|---|---|---|---|
| Description: | Digital outputs | | |
| Object: | SNVT_state_64 (64 bit) | | |
| Bits: | | | |
| Bit [0 ...63] | | Binary: | *Reverse: |
| Inlet damper | | 0 | 63 |
| Outlet damper | | 1 | 62 |
| Fire damper | | 2 | 61 |
| | | 3 | 60 |
| Inlet Fan - Run | 4 | 59 | |
| Inlet Fan - Stop | | 5 | 58 |
| | | 6 | 57 |
| | | 7 | 56 |
| | | 8 | 55 |
| Outlet Fan - Run | | 9 | 54 |
| Outlet Fan - Stop | | 10 | 53 |
| | | 11 | 52 |
| | | 12 | 51 |
| | | 13 | 50 |
| | | 14 | 49 |
| | | 15 | 48 |
| Cooling - pump | | 16 | 47 |
| Cooling DX, Stop | | 17 | 46 |
| Cooling DX, 1st | | 18 | 45 |
| Cooling DX, 2st | | 19 | 44 |
| | | 20 | 43 |
| | | 21 | 42 |
| Heat recovery | | 22 | 41 |
| | | 23 | 40 |
| Water heating - pump | | 24 | 39 |
| | | 25 | 38 |
| Electric heating, Stop | | 26 | 37 |
| Electric heating, 1st | | 27 | 36 |
| | | 28 | 35 |
| | | 29 | 34 |
| | | 30 | 33 |
| | | 31 | 32 |
| Heat pump DO 2 | | 32 | 31 |
| | | 33 | 30 |
| | | 34 | 29 |
| | | 35 | 28 |
| | | 36 | 27 |
| | | 37 | 26 |
| Heat pump DO 1 | | 38 | 25 |
| | | 39 | 24 |
| Electric after-heating, Stop | | 40 | 23 |
| Electric after-heating, 1st | | 41 | 22 |
| | | 42 | 21 |
| | | 43 | 20 |
| | | 44 | 19 |
| Request for humidification | | 45 | 18 |
| Humidifier pump | | 46 | 17 |
| | | 47 | 16 |
| | | 48 | 15 |
| | | 49 | 14 |
| Gas heating, st1 | | 50 | 13 |
| Gas heating, st2 | | 51 | 12 |
| Gas heating, Mod+ | | 52 | 11 |
| Gas heating, Mod- | | 53 | 10 |
| | | 54 | 9 |
| | | 55 | 8 |
| Alarm output (A failures) | | 56 | 7 |
| Alarm output (B failures) | | 57 | 6 |
| | | 58 | 5 |
| | | 59 | 4 |
| | | 60 | 3 |
| Request for boiler room | | 61 | 2 |
| Water pre-heating | | 62 | 1 |
| Electric pre-heating | | 63 | 0 |

Remark: *The bit name order can be reversed in some LON software tools.

## Connection to the Master System (LonWorks Standard)

| Network Variable: | nvoDI | |
|---|---|---|
| Description: | Digital Inputs | |
| Object: | SNVT_state_64 (64 bit) | |
| Bits: | | |
| Bit [0 ...63] | Binary: | *Reverse: |
| | 0 | 63 |
| External input 1 | 1 | 62 |
| External input 2 | 2 | 61 |
| | . | . |
| | . | . |
| | . | . |
| | . | . |
| | 63 | 0 |

Remark: *The bit name order can be reversed in some LON software tools

| Network Variable: | **nvoAlarm** | |
|---|---|---|
| Description: | Alarms | |
| Object: | SNVT_state_64 (64 bit) | |
| Bits: | | |
| Bit [0 ...63] | Binary: | *Reverse: |
| Dampers | 0 | 63 |
| Fire dampers | 1 | 62 |
| Burner failure | 2 | 61 |
| Inlet fan | 3 | 60 |
| Outlet fan | 4 | 59 |
| Fans - operating hours | 5 | 58 |
| Back-up inlet fan | 6 | 57 |
| Back-up outlet fan | 7 | 56 |
| Cooling | 8 | 55 |
| Flue-gas high temperature | | |
| - AHU shut down | 9 | 54 |
| Heat recovery | 10 | 53 |
| | 11 | 52 |
| Heat recovery (antifreeze protection) | 12 | 51 |
| | 13 | 50 |
| Mixing | 14 | 49 |
| Flue-gas high temperature | | |
| - heater shut down | 15 | 48 |
| Heating, pump | 16 | 47 |
| Water heating | 17 | 46 |
| Electric heating | 18 | 45 |
| Back draught protection (TH) | 19 | 44 |
| Heat pump Cooling | 20 | 43 |
| | 21 | 42 |
| Heat pump, heating | 22 | 41 |
| | 23 | 40 |
| Electric after-heating | 24 | 39 |
| | 25 | 38 |
| Humidifier, pump | 26 | 37 |
| Humidification | 27 | 36 |
| | 28 | 35 |
| Fire | 29 | 34 |
| Electric pre-heating | 30 | 33 |
| Filters | 31 | 32 |
| Outdoor temeprature | 32 | 31 |
| Inlet temperature | 33 | 30 |
| Return water temperature | 34 | 29 |
| Room temperature 1 | 35 | 28 |
| Room temperature 2 | 36 | 27 |
| Outlet temperature | 37 | 26 |
| | 38 | 25 |
| | 39 | 24 |
| | 40 | 23 |
| | 41 | 22 |
| | 42 | 21 |
| | 43 | 20 |
| | 44 | 19 |
| Temperature, HMI SG 1,2 | 45 | 18 |
| Inlet temperature difference | 46 | 17 |
| Room temperature difference | 47 | 16 |
| Pressure differences (air-flow), inlet | 48 | 15 |
| Pressure differences (air-flow), outlet | 49 | 14 |
| | 50 | 13 |
| Outdoor air humidity | 51 | 12 |
| Air humidity difference, inlet | 52 | 11 |
| Air humidity difference, room53 | 10 | |
| Dew point | 54 | 9 |
| | 55 | 8 |
| Air quality | 56 | 7 |
| | 57 | 6 |
| | 58 | 5 |
| | 59 | 4 |
| | 60 | 3 |
| | 61 | 2 |
| | 62 | 1 |
| | 63 | 0 |

Remark: *The bit name order can be reversed in some LON software tools

## Connection to the Master System (ModBus Standard)

### Modbus (BMS)

The VCS control unit enables integration of the centralized BMS (Building Management System) using the Modbus communication bus ((Modbus RTU and/or ModbusTCP). Using a suitably integrated system, it is possible to control the air-handling device operating state. Specifications of the variables (data points) used for integration are described in the section Description of Pre-defined Variables in the Modbus Network. The final functionality, monitoring and control options will be dependent on the integrator used to ensure connection to the master BMS system.

### Generally

Modbus is a worldwide recognized standard defined by Modbus Organization, Inc.
The Modbus Organization is a group of independent suppliers of automation devices. The Modbus Organization administers and develops communication systems for distributed automation systems. It also provides information to obtain and share information about the protocols, their application and certification to simplify implementation by users with the aim to reduce expenses for communication. For detailed information on the Modbus protocol, refer to www.modbus.org.

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### Modbus RTU

The Modbus communication protocol works using the Master/Slave principle. The Slave function is used for the VCS control unit communication with the master system. Thus, the VCS control unit behaves like a Slave during communication and expects requests from the Master (master system).
There are two variants of the Modbus protocol serial transfer mode. The VCS control unit uses the RTU (Remote Terminal Unit) mode. Therefore, a unique Modbus RTU identification is very important.
The RS 485 standard is used to transfer the data through a half-duplex twin-lead.
The transfer lead (cable) must be selected depending on this standard and other conditions. For more information, refer to www.modbus.org
Correct wiring must be carried out to ensure proper operation – 115/230 V AC must be strictly isolated from 24 V SELV AC. There are three terminals, "+", "-" and reference voltage terminal "REF", available in the control unit to connect the VCS control unit to the bus.
To ensure correct functioning of the bus, the first and last device on the bus must be fitted with a terminal resistor. Therefore, it is possible to perform software settings of the terminal resistor in the VCS control unit for the Modbus Slave (see the Data Points in the VCS Installation and Operating Instructions).
It is also necessary to set other communication parameters in the VCS control unit data points (section – Communication with Modbus RTU Master System).
Default values of the data points for the Slave Modbus RTU:

- Slave address – 1
- Baud rate – 9600 Bd
- Parity - None
- Number of stop bits – 2
- Response time limit – 5 s

For more information, refer to the List of Data Points Note: Once these data points have been set, the device must be restarted. After the restart, the device is ready to communicate in accordance with the set parameters.

### Modbus TCP

This is the second Modbus communication option available with the VCS control system. In this case, Ethernet (TCP/IP) is used for data transfer and works on Client/Server principle. For communication with the parent system, VCS is a Server function.

**VCS default settings:**
Fixed IP (DHCP is possible), adress: 192.168.1.199, mask 255.255.255.0, gateway 0.0.0.0, Modbus TCP – port 502 (fixed).

The settings can be made by see. appropriate paragraph according to the used driver (eg HMI TM, DM, Web - Connection - LAN connection menu).
*Note: you must restart the device after setting these data points. After this restart, VCS is ready to communicate according to the set value.*

### Modbus Registers

The Modbus registers are divided according to their properties. For a general description and explanation of the registers, refer to the table below:

**Table 8** – Modbus registers

| ModbusType | Reference | Description |
|---|---|---|
| Coil Status | 0xxxx | Read/Write Discrete Outputs or Coils. |
| Input Status | 1xxxx | Read Discrete Inputs. |
| Input Register | 3xxxx | Read Input Registers. |
| Holding Register | 4xxxx | Read/Write Output or Holding Registers. |

**Data types used to transfer the values:**
16-bit for real values (Unsigned Word)
16-bit for status values (Signed Word)
1-bit for status values like 0=Off (switched off) and 1=On (switched on)
1-bit for alarm values like 0=Alarm and 1=Normal (OK)

**Divisor (Multiplier):**
The so-called Divisor (Multiplier) is used for values which need the decimal numbers to be transferred. For example, for temperatures the value Divisor (Multiplier) of 10 is used to enable a one decimal place value to be transferred.
For example, a temperature of 23.2ºC is transferred by the Modbus as 232. The number must be divided by 10 to get the correct value. For information indicating this fact, refer to the note for a particular data point.

## Connection to the Master System (ModBus Standard)

### Description of Pre-defined Variables in the Modbus Network

This section includes a description of variables (registers) according to the assigned REMAK data points. The list below includes specifications of variables for different VCS control system variants at the discretion of REMAK a.s.
For example, if the VCS control system (air-handling device) has not been equipped with gas heating, it will not be possible to use these variables.

#### Coil status (Read/Write)

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 0x0001 | Alarm acknowledge | 0-1 | Off*On |
| 0x0002 | | | |
| 0x0003 | | | |
| 0x0004 | | | |
| 0x0007 | | | |
| | | | |
| 0x0011 | | | |
| 0x0012 | Ext control input 1 | 0-1 | Off*On |
| 0x0013 | Ext control input 2 | 0-1 | Off*On |
| 0x0014 | | | |
| 0x0015 | Fire alarm | 0-1 | OK*Alarm |

#### Input states (Read)

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 1x0001 | Alarm class danger (A) | 0-1 | Off*On |
| 1x0002 | Alarm class critical (A) | 0-1 | Normal*Alarm |
| 1x0003 | Alarm class low (B) | 0-1 | Normal*Alarm |
| 1x0004 | Alarm class warning (B) | 0-1 | Normal*Alarm |
| 1x0005 | | | |
| | | | |
| 1x0011 | | | |
| 1x0012 | Ext control input 1 | 0-1 | Off*On |
| 1x0013 | Ext control input 2 | 0-1 | Off*On |
| 1x0014 | | | |
| 1x0015 | | | |
| | | | |
| 1x0020 | | | |
| 1x0021 | | | |
| 1x0022 | | | |
| 1x0023 | | | |
| 1x0024 | | | |
| | | | |
| 1x0026 | Fan alarm | 0-1 | OK*Alarm |

## Connection to the Master System (ModBus Standard)

**Input states (Read)** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 1x0027 | Supply fan alarm | 0-1 | OK*Alarm |
| 1x0028 | Supply fan fdbk | 0-1 | OK*Alarm |
| 1x0029 | Sply fan deviation | 0-1 | Passive*Active |
| 1x0030 | Exhaust fan alarm | 0-1 | OK*Alarm |
| 1x0031 | Exhaust fan fdbk | 0-1 | OK*Alarm |
| 1x0032 | Exhaust fan deviation | 0-1 | Passive*Active |
| 1x0033 | Fan op hours alarm | 0-1 | Passive*Active |
| | | | |
| | | | |
| 1x0036 | Cooling DX alarm | 0-1 | OK*Alarm |
| 1x0037 | | | |
| 1x0038 | Cooling pump alarm | 0-1 | OK*Alarm |
| 1x0039 | Ice build-up on the heat pump evaporator | 0-1 | OK*Alarm |
| 1x0040 | Heat recovery alarm | 0-1 | OK*Alarm |
| 1x0041 | | | |
| 1x0042 | | | |
| 1x0043 | Hrec frost monitor | 0-1 | OK*Alarm |
| 1x0044 | | | |
| 1x0045 | Water heat pump alarm + auxiliary PMO CAP | 0-1 | OK*Alarm |
| 1x0046 | | | |
| 1x0047 | Htg frost monitor | 0-1 | OK*Frost |
| 1x0048 | El htg alarm | 0-1 | OK*Alarm |
| 1x0049 | Heat pump blocking by outdoor temperature | 0-1 | Passive*Active |
| 1x0050 | Heat pump blocking by pressure in the plate heat-exchanger | 0-1 | Passive*Active |
| 1x0051 | Heat pump operation blocking | 0-1 | OK*Alarm |
| 1x0052 | | | |
| 1x0053 | | | |
| 1x0054 | | | |
| 1x0055 | | | |
| 1x0056 | El heating 2 alarm | 0-1 | OK*Alarm |
| 1x0057 | Sply tmp deviation | 0-1 | Passive*Active |
| 1x0058 | Room tmp deviation | 0-1 | Passive*Active |
| 1x0059 | | | |
| | | | |
| 1x0062 | | | |
| 1x0063 | | | |

**Input states (Read)** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 1x0064 | | | |
| 1x0065 | | | |
| 1x0066 | | | |
| 1x0067 | | | |
| | | | |
| | | | |
| 1x0070 | Filter alarm | 0-1 | OK*Alarm |
| 1x0071 | Supply filter alarm | 0-1 | OK*Alarm |
| 1x0072 | Exh filter alarm | 0-1 | OK*Alarm |
| 1x0073 | Fire alarm | 0-1 | OK*Alarm |
| 1x0074 | Supply tmp fire alm | 0-1 | OK*Alarm |
| 1x0075 | Exh tmp fire alarm | 0-1 | OK*Alarm |
| 1x0076 | Inlet temperature (antifreeze protection) | 0-1 | OK*Alarm |
| 1x0077 | | | |
| 1x0078 | Modbus comm alarm | 0-1 | OK*Alarm |
| | | | |
| 1x0080 | Outside air temp | ºC | OK*Alarm |
| 1x0081 | Supply air temp | ºC | OK*Alarm |
| 1x0082 | Heating frost tmp | ºC | OK*Alarm |
| 1x0083 | Room temperature | ºC | OK*Alarm |
| 1x0084 | Room temperature 2 | ºC | OK*Alarm |
| 1x0085 | Return air temp | ºC | OK*Alarm |
| 1x0086 | Exhaust air temp | ºC | OK*Alarm |
| 1x0087 | | | |
| 1x0088 | | | |
| 1x0089 | | | |
| 1x0090 | | | |
| 1x0091 | | | |
| 1x0092 | Outdoor air humidity relative) | %r.H. | OK*Alarm |
| 1x0093 | Inlet air humidity (relative) | %r.H. | OK*Alarm |
| 1x0094 | Room air humidity (relative) | %r.H. | OK*Alarm |
| 1x0095 | Inlet air flow rate | m3/h | OK*Alarm |
| 1x0096 | Outlet air flow rate | m3/h | OK*Alarm |
| 1x0097 | Inlet air pressure | Pa | OK*Alarm |
| 1x0098 | Outlet air pressure | Pa | OK*Alarm |
| 1x0099 | | | |
| 1x0100 | Air quality | ppm | OK*Alarm |

## Connection to the Master System (ModBus Standard)

**Input states (Read)** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 1x0101 | | | |
| 1x0102 | RmUTmp1 | °C | OK*Alarm |
| 1x0103 | RmUTmp2 | °C | OK*Alarm |
| 1x0104 | BrnrFlueTmp | °C | OK*Alarm |
| 1x0105 | PreElHtgTmp | °C | OK*Alarm |

**Input register (Read)**

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 1x0106 | PreEtrHtgTmp | °C | OK*Alarm |
| | | | Unsigned Word |
| 3x0001 | **General status (Word 1)** | 0-65535 | 0-1 for each bit or counted binary to a decimal number |
| | | | |
| Bit0 | Alarm class danger (A) | | |
| Bit1 | Alarm class critical (A) | | |
| Bit2 | Alarm class low (B) | | |
| Bit3 | Alarm class warning (B) | | |
| Bit4 | | | |
| Bit5 | | | |
| Bit6 | | | |
| Bit7 | | | |
| Bit8 | | | |
| Bit9 | | | |
| Bit10 | | | |
| Bit11 | Actual control temp, room | | |
| Bit12 | Actual control temp, exh | | |
| Bit13 | Actual control temp, sply | | |
| Bit14 | | | |
| Bit15 | | | |
| | | | Unsigned Word |
| 3x0005 | **Digital inputs (Word 1)** | 0-65535 | 0-1 for each bit or counted binary to a decimal number |
| Bit0 | | | |
| Bit1 | External control 1 | | |
| Bit2 | External control 2 | | |
| Bit3 | | | |
| Bit4 | | | |
| Bit5 | | | |

## Connection to the Master System (ModBus Standard)

**Input register (Read)** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| Bit6 | | | |
| Bit7 | | | |
| Bit8 | | | |
| Bit9 | | | |
| Bit10 | | | |
| Bit11 | | | |
| Bit12 | | | |
| Bit13 | | | |
| Bit14 | | | |
| Bit15 | | | |
| | | | |
| 3x0006 | **Digital inputs (Word 2)** | 0-65535 | 0-1 for each bit or counted binary to a decimal number |
| Bit0 | | | |
| Bit1 | | | |
| Bit2 | | | |
| Bit3 | | | |
| Bit4 | | | |
| Bit5 | | | |
| Bit6 | | | |
| Bit7 | | | |
| Bit8 | | | |
| Bit9 | | | |
| Bit10 | | | |
| Bit11 | | | |
| Bit12 | | | |
| Bit13 | | | |
| Bit14 | | | |
| Bit15 | | | |
| | | | |
| | | | Unsigned Word |
| 3x0009 | **Digital outputs (Word 1)** | 0-65535 | |
| Bit0 | Supply (Exhaust) dampers | | |
| Bit1 | | | |
| Bit2 | | | |
| Bit3 | | | |
| Bit4 | Supply fan, running | | |
| Bit5 | Supply fan, off | | |

## Connection to the Master System (ModBus Standard)

**Input register (Read)** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| Bit6 | | | |
| Bit7 | | | |
| Bit8 | | | |
| Bit9 | Exhaust fan, running | | |
| Bit10 | Exhaust fan, off | | |
| Bit11 | | | |
| Bit12 | | | |
| Bit13 | | | |
| Bit14 | | | |
| Bit15 | | | |
| | | | |
| 3x0010 | **Digital outputs (Word 2)** | 0-65535 | 0-1 for each bit or counted binary to a decimal number |
| Bit0 | Cooling pump | | |
| Bit1 | Cooling DX, off | | |
| Bit2 | Cooling DX, stage 1 | | |
| Bit3 | Cooling DX, stage 2 | | |
| Bit4 | | | |
| Bit5 | | | |
| Bit6 | | | |
| Bit7 | | | |
| Bit8 | Heating pump | | |
| Bit9 | | | |
| Bit10 | Electrical heating, off | | |
| Bit11 | Electrical heating, st1 | | |
| Bit12 | | | |
| Bit13 | | | |
| Bit14 | | | |
| Bit15 | | | |
| | | | |
| 3x0011 | **Digital outputs (Word 3)** | 0-65535 | 0-1 for each bit or counted binary to a decimal number |
| Bit0 | Heat pump DO 2 | | |
| Bit1 | | | |
| Bit2 | | | |
| Bit3 | | | |
| Bit4 | | | |
| Bit5 | | | |

## Connection to the Master System (ModBus Standard)

**Input register (Read)** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| Bit6 | Heat pump DO 1 | | |
| Bit7 | | | |
| Bit8 | Extra el heating, off | | |
| Bit9 | Extra el heating, stage 1 | | |
| Bit10 | | | |
| Bit11 | | | |
| Bit12 | | | |
| Bit13 | Request for humidification | | |
| Bit14 | | | |
| Bit15 | | | |
| | | | |
| 3x0012 | **Digital outputs (Word 4)** | 0-65535 | 0-1 for each bit or counted binary to a decimal number |
| Bit0 | | | |
| Bit1 | | | |
| Bit2 | Burner heating, st1 | | |
| Bit3 | Burner heating, st2 | | |
| Bit4 | Burner heating, Mod+ | | |
| Bit5 | Burner heating, Mod- | | |
| Bit6 | | | |
| Bit7 | | | |
| Bit8 | Alarm output, high | | |
| Bit9 | Alarm output, low | | |
| Bit10 | | | |
| Bit11 | | | |
| Bit12 | | | |
| Bit13 | Heating demand | | |
| Bit14 | PreWtrHeating | | |
| Bit15 | PreEl.Heating | | |
| | | | Unsigned Word |
| 3x0013 | **Alarms (Word 1)** | 0-65535 | |
| Bit0 | | | |
| Bit1 | | | |
| Bit2 | Burner failure | | |
| Bit3 | Supply fan | | |
| Bit4 | Exhaust fan | | |
| Bit5 | Fan operating hours | | |
| Bit6 | Supply back up | | |

## Connection to the Master System (ModBus Standard)

**Input register (Read)** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| Bit7 | Exhaust back up | | |
| Bit8 | Cooling | | |
| Bit9 | OverHeat Burner heating | | |
| Bit10 | Heating recovery | | |
| Bit11 | | | |
| Bit12 | Heating recovery frost | | |
| Bit13 | | | |
| Bit14 | Heating recovery damper | | |
| Bit15 | Flue-gas high temperature, heater shut down | | |
| | | | |
| 3x0014 | **Alarms (Word 2)** | 0-65535 | 0-1 for each bit or counted binary to a decimal number |
| Bit0 | Heating pump | | |
| Bit1 | | | |
| Bit2 | Electrical Heating | | |
| Bit3 | Burner fan overrun TH | | |
| Bit4 | Heat pump cooling | | |
| Bit5 | | | |
| Bit6 | Heat pump heating | | |
| Bit7 | | | |
| Bit8 | Extra Electrical Heating | | |
| Bit9 | | | |
| Bit10 | | | |
| Bit11 | Humidification | | |
| Bit12 | PreWtrHeating | | |
| Bit13 | Fire Alarm (external alarm) | | |
| Bit14 | Electric pre-heating | | |
| Bit15 | Filter Alarm | | |
| | | | |
| 3x0015 | **Alarms (Word 3)** | 0-65535 | 0-1 for each bit or counted binary to a decimal number |
| Bit0 | Out temperature | | |
| Bit1 | Supply temperature | | |
| Bit2 | Heating frost temperature | | |
| Bit3 | Room1 temperature | | |
| Bit4 | Room2 temperature | | |
| Bit5 | Exhaust temperature | | |
| Bit6 | Extract temperature | | |
| Bit7 | | | |

## Connection to the Master System (ModBus Standard)

**Input register (Read)** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| Bit8 | | | |
| Bit9 | | | |
| Bit10 | | | |
| Bit11 | | | |
| Bit12 | | | |
| Bit13 | Room unit 1,2 - temperature | | |
| Bit14 | Supply temperature deviation | | |
| Bit15 | Room/Exh temp deviation | | |
| | | | |
| 3x0016 | **Alarms (Word 4)** | 0-65535 | 0-1 for each bit or counted binary to a decimal number |
| Bit0 | Supply press/flow deviation | | |
| Bit1 | Exhaust press/flow deviation | | |
| Bit2 | | | |
| Bit3 | Outdoor air humidity | | |
| Bit4 | Inlet air humidity | | |
| Bit5 | Room air humidity | | |
| Bit6 | Dew point | | |
| Bit7 | | | |
| Bit8 | Air quality | | |
| Bit9 | | | |
| Bit10 | | | |
| Bit11 | | | |
| Bit12 | | | |
| Bit13 | | | |
| Bit14 | | | |
| Bit15 | | | |
| | | | Unsigned Word |
| 3x0017 | Act operating mode | 0-12 | Present value |
| | 0=Off | | |
| | 1=On/Comfort | | |
| | 2=Economy | | |
| | 3=Na | | |
| | 4=Osstp | | |
| | 5=NightClg | | |
| | 6=UnOcc | | |
| | 7=NightKick | | |
| | 9=Fire | | |

## Connection to the Master System (ModBus Standard)

**Input register (Read)** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| | 10=Stop | | |
| | 11=OverRun | | |
| | 12=StartUp | | |
| | 12=Start | | |
| | | | |
| 3x0018 | Act fan step | 0-5 | Off*Stage1*Stage2*St age3*Stage4*Stage5 |
| 3x0019 | | | |
| 3x0020 | Op mode man st/tmp | 0-11 | Auto*Off*Eco St1*Comf St1*Eco St2*Comf St2*Eco St3*Comf St3*Eco St4*Comf St4*Eco St5*Comf St5 |
| 3x0021 | | | |
| 3x0022 | TSP steps/tmp | 0-10 | Off*Eco St1*Comf St1*Eco St2*Comf St2*Eco St3*Comf St3*Eco St4*Comf St4*Eco St5*Comf St5 |
| 3x0023 | Act Opmode ext ctrl | 0-6 | Auto*Off*Stage 1*Stage 2*Stage 3*Stage 4*Stage 5 |
| 3x0024 | | | |
| 3x0025 | Supply (Exhaust) air damper cmd | 0-1 | Off*On |
| 3x0026 | | | |
| 3x0027 | | | |
| 3x0028 | Supply fan cmd | 0-6 | Off*Stage 1*Stage 2*Stage 3*Stage 4*Stage 5 |
| 3x0029 | Sply fan outp sign | 0-100% | |
| 3x0030 | Exhaust fan cmd | 0-6 | Off*Stage 1*Stage 2*Stage 3*Stage 4*Stage 5 |
| 3x0031 | Exh fan outp signal | 0-100% | |
| 3x0032 | | | |
| 3x0033 | Cooling outp signal | 0 - 100% | |
| 3x0034 | Cooling pump cmd | 0-1 | Off*On |
| 3x0035 | Cooling DX cmd | 0-2 | Off*Stage 1*Stage 2 |
| 3x0036 | Hrec outp signal | 0 - 100% | |
| 3x0037 | | | |
| 3x0038 | Hrec dmpr outp sign | 0 - 100% | |
| 3x0039 | Inlet/outlet damper swimming pool unit | 0 - 100% | |
| 3x0040 | Heating outp signal | 0 - 100% | |

## Connection to the Master System (ModBus Standard)

**Input register (Read)** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 3x0041 | Htg pump cmd | 0-1 | Off*On |
| 3x0042 | El htg outp signal | 0 - 100% | |
| 3x0043 | El heating cmd | 0-1 | Off*On |
| 3x0044 | Heat pump Cooling | 0 - 100% | |
| 3x0045 | Heat pump | 0 - 100% | |
| 3x0046 | Heat pump state | 0-2 | None*Cooling*Heating |
| 3x0047 | Heat pump Heating | 0 - 100% | |
| 3x0048 | Heat pump (heating) | 0-1 | None*Heating |
| 3x0049 | El htg 2 outp sign | 0 - 100% | |
| 3x0050 | El heating 2 cmd | 0-1 | Off*On |
| 3x0051 | | | |
| 3x0052 | Humidification | 0 - 100% | |
| 3x0053 | Humidification (state) | 0-1 | Off* On |
| 3x0054 | | | |
| 3x0055 | Dehumidification | 0 - 100% | |
| | | | |
| 3x0057 | | | |
| 3x0058 | | | |
| 3x0059 | | | |
| 3x0060 | Alarm output | 0-1 | Normal*Alarm |
| 3x0061 | | | |
| 3x0062 | | | |
| | | | |
| 3x0064 | Act airquality comp | 0 - 100% | |
| 3x0065 | Act fan clg value | 0 - 100% | |
| 3x0066 | Act fan htg value | 0 - 100% | |
| 3x0067 | Act fan comp tmp | 0 - 100% | |
| 3x0068 | Current fan speed compensation (humidity) | 0 - 100% | |
| 3x0069 | | | |
| 3x0070 | | | |
| 3x0071 | Current mixing compensation (humidity) | 0 - 100% | |
| 3x0072 | Outside air temp | `-x.y - +x.y ºC | (factor 10) |
| 3x0073 | Supply air temp | `-x.y - +x.y ºC | (factor 10) |
| 3x0074 | Heating frost tmp | ºC | (factor 10) |
| 3x0075 | Valid room tmp | ºC | (factor 10) |
| 3x0076 | Return air temp | ºC | (factor 10) |
| 3x0077 | Exhaust air temp | ºC | (factor 10) |

## Connection to the Master System (ModBus Standard)

**Input register (Read)** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 3x0078 | | | |
| 3x0079 | | | |
| 3x0080 | | | |
| 3x0081 | | | |
| 3x0082 | | | |
| 3x0083 | | | |
| 3x0084 | Outdoor air humidity - relative | %r.H. | |
| 3x0085 | Outdoor air humidity - absolute | `-x.y - +x.y g/kg | (divider 10) |
| 3x0086 | Outdoor air humidity - enthalpy | `-x.y - +x.y kJ/kg | (divider 10) |
| 3x0087 | Inlet air humidity - relative | %r.H. | |
| 3x0088 | Inlet air humidity - absolute | `-x.y - +x.y g/kg | (divider 10) |
| 3x0089 | Inlet air humidity - enthalpy | `-x.y - +x.y kJ/kg | (divider 10) |
| 3x0090 | Room air humidity - relative | %r.H. | |
| 3x0091 | Room air humidity – absolute | `-x.y - +x.y g/kg | (divider 10) |
| 3x0092 | Room air humidity - enthalpy | `-x.y - +x.y kJ/kg | (divider 10) |
| 3x0093 | Dew point | `-x.y - +x.y g/kg | (divider 10) |
| | | | |
| 3x0095 | Inlet air flow rate | 0 - x m3/h | |
| 3x0096 | Outlet air flow rate | 0 - x m3/h | |
| 3x0097 | Inlet air flow rate | 0 - x Pa | |
| 3x0098 | Outlet air pressure | 0 - x Pa | |
| 3x0099 | | | |
| | | | |
| 3x0101 | Air quality | 0 – x ppm | |
| 3x0102 | | | |
| | | | |
| 3x0104 | Act heating stpt | `-x.y - +x.y ºC | |
| 3x0105 | Act cooling stpt | ºC | |
| 3x0106 | Act sply htg stpt | ºC | |
| 3x0107 | Act sply clg stpt | ºC | |
| 3x0108 | Current required value of humidity - humidification | 0 - x.y %r.H. | (divider 10) |
| 3x0109 | Current required value of humidity - dehumidification | %r.H. | (divider 10) |
| 3x0110 | Current humidification required value for cascade control | %r.H. | (divider 10) |
| 3x0111 | Current dehumidification required value in cascade control | %r.H. | (divider 10) |
| 3x0112 | Act sply fan stpt | 0-100% (0 - x l/s) | |

## Connection to the Master System (ModBus Standard)

**Input register (Read)** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 3x0113 | Act exh fan stpt | 0-100% (0 - x l/s) | |
| 3x0114 | | | |
| 3x0115 | | | |
| 3x0116 | | | |
| 3x0117 | | | |
| 3x0120 | Hour | | |
| 3x0121 | Minute | | |
| 3x0122 | Second | | |
| 3x0123 | Year | | |
| 3x0124 | Month | | |
| 3x0125 | Day | | |
| 3x0130 | Burner flue temp | ºC | (factor 10) |
| 3x0131 | PreEl. heating temp | ºC | (factor 10) |

**Holding register (Read/Write) [03:H]**

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 3x0132 | PreWater heating temp | ºC | (factor 10) |
| 3x0133 | Burner damper | 0-100% | |
| | | | |
| 3x0200 | RoomUnitsActRmUMode | 0-3 | Auto*Comf*StBy*Eco |
| 3x0210 | RoomUnitsActSpvShift | ºC | |
| 3x0211 | RmUTmp1 | ºC | |
| 3x0212 | RmUTmp2 | ºC | |
| | | | Unsigned Word |
| 4x0001 | Control bits | 0-65535 | |
| Bit0 | | | |
| Bit1 | External control 1 | | |
| Bit2 | External control 2 | | |
| Bit3 | | | |
| Bit4 | | | |
| Bit5 | | | |
| Bit6 | | | |
| Bit7 | Fire alarm (external alarm) | | |
| Bit8 | | | |
| Bit9 | | | |
| Bit10 | | | |
| Bit11 | | | |
| Bit12 | | | |

## Connection to the Master System (ModBus Standard)

**Holding register (Read/Write) [03:H]** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| Bit13 | | | |
| Bit14 | | | |
| Bit15 | | | |
| | | | Unsigned Word |
| | | | Present value |
| 4x0005 | Control state required by BMS (variant without air temperature conditioning) | 0-6 | Auto*Off*St1*St2*St3* St4*St5 |
| 4x0006 | Device state – BMS request | 0-11 | Auto*Off*Eco St1*Comf St1*Eco St2*Comf St2*Eco St3*Comf St3*Eco St4*Comf St4*Eco St5*Comf St5 |
| 4x0007 | | | |
| 4x0008 | Control state required by Manual control (variant without air temperature conditioning) | 0-6 | Auto*Off* St1* St2* St3* St4* St5 |
| 4x0009 | Op mode man st/tmp | 0-11 | Auto*Off*Eco St1*Comf St1*Eco St2*Comf St2*Eco St3*Comf St3*Eco St4*Comf St4*Eco St5*Comf St5 |
| 4x0010 | | | |
| 4x0011 | | | |
| 4x0012 | | | |
| | | | Signed Word |
| | | | PresentValue |
| 4x0020 | | | (factor 10) |
| 4x0021 | | | |
| 4x0022 | Comfort htg stpt | °C | |
| 4x0023 | Comfort clg stpt | °C | |
| 4x0024 | | | |
| 4x0025 | | | |
| 4x0026 | Economy htg stpt | °C | |
| 4x0027 | Economy clg stpt | °C | (factor 10) |
| 4x0028 | | | |
| 4x0029 | | | |
| 4x0030 | | | |
| 4x0031 | | | |
| 4x0032 | | | |

## Connection to the Master System (ModBus Standard)

**Holding register (Read/Write) [03:H]** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 4x0033 | | | |
| 4x0034 | | | |
| 4x0035 | | | |
| 4x0036 | Sply max limit | `-x.y - +x.y ºC | (factor 10) Higt limit |
| 4x0037 | Sply min limit | `-x.y - +x.y ºC | (factor 10) Low limit |
| | | | |
| 4x0039 | Set-point of relative humidity - Comfort | 0 - x %r.H. | |
| 4x0040 | Dehumidification relative set-point - Comfort | 0 - x %r.H. | |
| 4x0041 | Set-point of relative humidity - Economy | 0 - x %r.H. | |
| 4x0042 | Dehumidification relative set-point – Economy | 0 - x %r.H. | |
| 4x0043 | | | |
| 4x0044 | | | |
| 4x0045 | | | |
| 4x0046 | | | |
| 4x0047 | | | |
| 4x0048 | | | |
| 4x0049 | | | |
| 4x0050 | Sply fan st1 stpt | 0 - x l/s | %, Pa or l/s |
| 4x0051 | Sply fan st2 stpt | | |
| 4x0052 | Sply fan st3 stpt | | |
| 4x0053 | Sply fan st4 stpt | | |
| 4x0054 | Sply fan st5 stpt | | |
| 4x0055 | | | |
| 4x0056 | Exh fan st1 stpt | 0 - x l/s | %, Pa or l/s |
| 4x0057 | Exh fan st2 stpt | | |
| 4x0058 | Exh fan st3 stpt | | |
| 4x0059 | Exh fan st4 stpt | | |
| 4x0060 | Exh fan st5 stpt | | |
| 4x0061 | | | |
| 4x0062 | Air quality stpt CO | 0 - x ppm | |
| 4x0063 | Air quality stpt CO2, VOC | 0 - x ppm | |
| | | | TrackingValueCOM |
| 4x0064 | Outside air temp | `-x.y - +x.y ºC | (factor 10) |
| 4x0065 | Air relative humidity - room | %r.H. | (divider 10) |
| 4x0066 | Room temperature | ºC | |
| 4x0067 | | | |
| | | | |

## Connection to the Master System (ModBus Standard)

**Holding register (Read/Write) [03:H]** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| Advanced mode | | | |
| | | | Signed Word |
| | | | PresentValue |
| 4x0070 | | | |
| 4x0071 | | | |
| 4x0072 | | | |
| 4x0073 | | | |
| 4x0074 | | | |
| 4x0075 | | | |
| 4x0076 | | | |
| 4x0077 | | | |
| 4x0078 | | | |
| 4x0079 | | | |
| 4x0080 | | | |
| 4x0081 | | | |
| 4x0082 | CaseFlowLimtMinDev | °C | (factor 10) |
| 4x0083 | CaseFlowLimtMaxDev | °C | (factor 10) |
| 4x0084 | | | |
| 4x0085 | | | |
| 4x0086 | | | |
| 4x0087 | | | |
| 4x0088 | | | |
| 4x0089 | | | |
| 4x0090 | Minimum fresh air flow rate (%) - Economy | 0 - 100% | |
| 4x0091 | Minimum fresh air flow rate (%) – Comfort | 0 - 100% | |
| 4x0092 | | | |
| 4x0093 | | | |
| 4x0094 | | | |
| 4x0095 | | | |
| 4x0096 | | | |
| 4x0097 | | | |
| 4x0098 | | | |
| 4x0099 | | | |
| 4x0100 | | | |
| 4x0101 | | | |
| 4x0102 | | | |
| 4x0103 | | | |

## Connection to the Master System (ModBus Standard)

**Holding register (Read/Write) [03:H]** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 4x0104 | | | |
| 4x0105 | | | |
| 4x0106 | | | |
| 4x0107 | | | |
| 4x0108 | | | |
| 4x0109 | | | |
| 4x0110 | | | |
| 4x0111 | | | |
| 4x0112 | | | |
| 4x0113 | | | |
| 4x0114 | | | |
| 4x0115 | | | |
| 4x0116 | | | |
| | | | |
| | **Control constants** | | |
| 4x0201 | Cooling | (factor 100) | Gain - Signed Word |
| 4x0202 | Cooling | 0 - x sec | Integral - Unsigned Word |
| 4x0203 | Cooling | 0 - x sec | Differential - Unsigned Word |
| 4x0204 | Heat recovery | (factor 100) | Gain - Signed Word |
| 4x0205 | Heat recovery | 0 - x sec | Integral - Unsigned Word |
| 4x0206 | Heat recovery | 0 - x sec | Differential - Unsigned Word |
| 4x0207 | Hrec frost protect | (factor 100) | Gain - Signed Word |
| 4x0208 | Hrec frost protect | 0 - x sec | Integral - Unsigned Word |
| 4x0209 | Hrec frost protect | 0 - x sec | Differential - Unsigned Word |
| 4x0210 | | | |
| 4x0211 | | | |
| 4x0212 | | | |
| 4x0213 | Hrec damper | (factor 100) | Gain - Signed Word |
| 4x0214 | Hrec damper | 0 - x sec | Integral - Unsigned Word |
| 4x0215 | Hrec damper | 0 - x sec | Differential - Unsigned Word |
| 4x0216 | Water heating | (factor 100) | Gain - Signed Word |
| 4x0217 | Water heating | 0 - x sec | Integral - Unsigned Word |
| 4x0218 | Water heating | 0 - x sec | Differential - Unsigned Word |
| 4x0219 | Htg frost protect | (factor 100) | Gain - Signed Word |
| 4x0220 | Htg frost protect | 0 - x sec | Integral - Unsigned Word |
| 4x0221 | Htg frost protect | 0 - x sec | Differential - Unsigned Word |
| 4x0222 | Electrical heating | (factor 100) | Gain - Signed Word |

## Connection to the Master System (ModBus Standard)

**Holding register (Read/Write) [03:H]** *(continuation)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 4x0223 | Electrical heating | 0 - x sec | Integral - Unsigned Word |
| 4x0224 | Electrical heating | 0 - x sec | Differential - Unsigned Word |
| 4x0225 | Burner | (factor 100) | Gain - Signed Word |
| 4x0226 | Burner | 0 - x sec | Integral - Unsigned Word |
| 4x0227 | Burner | 0 - x sec | Differential - Unsigned Word |
| 4x0228 | Burner Damper | (factor 100) | Gain - Signed Word |
| 4x0229 | Burner Damper | 0 - x sec | Integral - Unsigned Word |
| 4x0230 | Burner Damper | 0 - x sec | Differential - Unsigned Word |
| 4x0231 | | | |
| 4x0232 | | | |
| 4x0233 | | | |
| 4x0234 | El. reheating (El. heating 2) | (factor 100) | Gain - Signed Word |
| 4x0235 | El. reheating (El. heating 2) | 0 - x sec | Integral - Unsigned Word |
| 4x0236 | El. reheating (El. heating 2) | 0 - x sec | Differential - Unsigned Word |
| 4x0237 | | | |
| 4x0238 | | | |
| 4x0239 | | | |
| 4x0240 | | | |
| 4x0241 | | | |
| 4x0242 | | | |
| 4x0243 | | | |
| 4x0244 | | | |
| 4x0245 | | | |
| 4x0246 | | | |
| 4x0247 | | | |
| 4x0248 | | | |
| 4x0249 | | | |
| 4x0250 | | | |
| 4x0251 | | | |
| 4x0252 | | | |
| 4x0253 | | | |
| 4x0254 | | | |
| 4x0255 | Supply fan | (factor 100) | Gain - Signed Word |
| 4x0256 | Supply fan | 0 - x sec | Integral - Unsigned Word |
| 4x0257 | Supply fan | 0 - x sec | Differential - Unsigned Word |
| 4x0258 | Exhaust fan | (factor 100) | Gain - Signed Word |
| 4x0259 | Exhaust fan | 0 - x sec | Integral - Unsigned Word |

## Connection to the Master System (ModBus Standard)

**Holding register (Read/Write) [03:H]** *(pokračování)*

| Adress | Description | Values/Units | Remarks |
|---|---|---|---|
| 4x0260 | Exhaust fan | 0 - x sec | Differential - Unsigned Word |
| 4x0261 | Humidification | (divider 100) | Gain - Signed Word |
| 4x0262 | Humidification | 0 - x sec | Integral - Unsigned Word |
| 4x0263 | Humidification | 0 - x sec | Differential - Unsigned Word |
| 4x0264 | | | |
| 4x0265 | | | |
| 4x0266 | | | |
| 4x0267 | Dehumidification | (divider 100) | Gain - Signed Word |
| 4x0268 | Dehumidification | 0 - x sec | Integral - Unsigned Word |
| 4x0269 | Dehumidification | 0 - x sec | Differential - Unsigned Word |
| 4x0270 | Air quality | (factor 100) | Gain - Signed Word |
| 4x0271 | Air quality | 0 - x sec | Integral - Unsigned Word |
| 4x0272 | Air quality | 0 - x sec | Differential - Unsigned Word |
| 4x0273 | Casc controller tmp | (factor 10) | Gain - Signed Word |
| 4x0274 | Casc controller tmp | 0 - x sec | Integral - Unsigned Word |
| 4x0275 | Humidity cascade control | (Factor 10) | Gain - Signed Word |
| 4x0276 | Humidity cascade control | 0 - x sec | Integral - Unsigned Word |
| 4x0277 | HeatPumpHtg | (factor 100) | Gain - Signed Word |
| 4x0278 | HeatPumpHtg | 0 - x sec | Integral - Unsigned Word |
| 4x0279 | HeatPumpHtg | 0 - x sec | Differential - Unsigned Word |
| 4x0280 | HeatPumpClg | (factor 100) | Gain - Signed Word |
| 4x0281 | HeatPumpClg | 0 - x sec | Integral - Unsigned Word |
| 4x0282 | HeatPumpClg | 0 - x sec | Differential - Unsigned Word |
| 4x0283 | ElPreHtg | (factor 100) | Gain - Signed Word |
| 4x0284 | ElPreHtg | 0 - x sec | Integral - Unsigned Word |
| 4x0285 | ElPreHtg | 0 - x sec | Differential - Unsigned Word |
| 4x0283 | WtrPreHtg | (factor 100) | Gain - Signed Word |
| 4x0284 | WtrPreHtg | 0 - x sec | Integral - Unsigned Word |
| 4x0285 | WtrPreHtg | 0 - x sec | Differential - Unsigned Word |

## Connection to the Master System (BacNet Standard)

### BACnet/IP (BMS)

The VCS control unit enables integration of the centralized BMS (Building Management System) using the BACnet/IP communication standard. Using a suitably integrated master system, it is possible to control the air-handling device's operating state.

### Generally

BACnet is a standard communication protocol for Building Automation and Control Networks developed by ASHRAE (American Society of Heating, Refrigerating and Air-conditioning Engineers). The main goal was to create a protocol which enables the integration of systems from different manufacturers intended for building automation. For detailed information on the BACnet protocol, refer to the following websites:

www.bacnet.org
www.bacnetinternational.net

### BACnet/IP Protocol

There are several variants of the BACnet protocol. The VCS control system uses BACnet/IP for the Ethernet network. The BACnet communication protocol works using the Master/Slave principle. The Server function is used for VCS unit system communication with the master system. This means that the VCS control unit behaves like a Server in the communication.
Protocol settings can be performed using one of the following controllers: HMI, DM, TM or Web. Switching on and off, restart and other settings of the BACnet server can be carried out through the web page (calling the address set in the VCS control unit). For detailed information on the BACnet/IP Standard (EDE file and others) settings and application, refer to the Siemens BACnet/IP Communication Module documentation available on the REMAK website.

The following table includes a list of basic data points which can be used for this communication and their description. The list includes specifications of variables for different VCS control system variants.

For example, if the VCS control system (air-handling device) has not been equipped with gas heating, it will not be possible to use these variables. The final functionality, monitoring and control options will be dependent on the integrator used to ensure connection to the master BMS system.

### List and Description of Basic Data Points

| Data point name | Meaning |
|---|---|
| Device | Device |
| Diagnostic | Diagnostics |
| SystemClock | System time |
| AirQuality | Air quality |
| RoomTmp | Room temperature |
| RmUTmp1 | HMI-SG1 |
| RmUTmp2 | HMI-SG2 |
| ValidRoomTmp | Temperature in the room after control |
| ReturnAirTmp | Outlet air temperature |
| SupplyTmp | Inlet air temperature |
| OutTmp | Outdoor temperature |
| HtgFrstTmp | Return water temperature (water heater) |
| ExhaustTmp | Outlet air temperature after the heat exchanger |
| PreElHtgTmp | Temperature, electric pre-heating |
| PreWtrHtgTmp | Return water temperature (water pre-heating) |
| BrnrFlueTmp | Flue gas temperature |
| RoomHum | Air humidity in the room - relative |
| SupplyHum | Inlet air humidity - relative |
| OutHum | Outdoor air humidity - relative |
| RmHumAbs | Absolute air humidity in the room |
| SplyHumAbs | Absolute inlet air humidity |
| OutHumAbs | Absolute outdoor air humidity |
| RmEnth | The room - enthalpy |
| OutEnth | Outdoor enthalpy |
| ActOpMode | Current state of the device |
| ActFanStep | Current state of the fans |
| OpModeAutoManSt.Swtch | Manual mode (control) |
| OpModeAutoManStTmp.Swtch | Manual mode (control) |

## Connection to the Master System (BacNet Standard)

### List and Description of Basic Data Points *((continuation))*

| | |
|---|---|
| OpModeBmsTimeSt.Swtch | BMS control mode (control, master system) |
| OpModeBmsTimeStTmp.Swtch | BMS control mode (control, master system) |
| TmpSpv.CoSpvHtg | Required value for heating - Comfort |
| TmpSpv.CoSpvClg | Required value for cooling - Comfort |
| TmpSpv.EcSpvHtg | Required value for heating - Economy |
| TmpSpv.EcSpvClg | Required value for cooling - Economy |
| HumSpvRel.SpvHum | Required value for humidification (relative) |
| HumSpvRelSpvDehum | Required value for dehumidification (relative) |
| AirQSpv | Required value for air quality |
| ScheduleSt | Weekly time schedule |
| ScheduleStTmp | Weekly time schedule |
| CalendarEx | Exception time schedule |
| CalendarOff | Switch-off schedule |
| ActCascSpvHtg | Current required heating temperature (cascade) |
| ActCascSpvClg | Current required cooling temperature (cascade) |
| ActCascSpvDeh | Current required value for dehumidification (cascade) |
| ActCascSpvHum | Current required value for humidification (cascade) |
| Heating.Pos | Heating node valve outlet position |
| ElectricalHtg.Pos | Electric heating outlet position |
| Cooling.Pos | Cooling valve outlet position |
| ExtraElHtg.Pos | Electric after-heating outlet position |
| Hrec.Pos | Heat exchanger control outlet position |
| HrecDamp.Pos | Mixing damper outlet position |
| aoHeatPumpHtg.Pos | Heat pump outlet position - heating |
| aoHeatPumpClg.Pos | Heat pump outlet position - cooling |
| HumidityCtrl.Pos | Humidification current value |
| DeHumidity.PrVal | Dehumidification current value |
| AirQCmp.PrVal | Air quality compensation current value |
| SplyFan.Cmd.St | Current stage, inlet fan |
| ExhFan.Cmd.St | Current stage, outlet fan |
| Heating.Pmp.Cmd.OnOff | Heating pump state |
| ElectricalHtg.CmdSt.St | Electric heater state |
| ExtraElHtg.CmdSt.St | Electric after-heater state |
| Cooling.Pmp.Cmd.OnOff | Water cooler pump state |
| Cooling.CmdDx.St | Cooling state, inverter cooling unit |
| Damper.Exh.OnOff | Damper, outlet |
| Damper.Sply.OnOff | Damper inlet |
| AlmOutHigh | Alarm, output A |
| AlmOutLow | Alarm, output B |
| AlmCl0 | Alarm, class A |
| AlmCl1 | Alarm, class A |
| AlmCl2 | Alarm, class B |
| AlmCl3 | Alarm, class B |
| FireAlm | External alarm |
| AckAlmPls | Failure release |

## POOL UNITS – description of control

The VCS also allows the control of air-conditioning units designed to ventilate swimming pools (swimming pools, water parks, rehabilitation complexes with water procedures, etc.). As the ventilation needs of these spaces are different from the needs of ventilation of common areas (offices, restaurants, etc.), the control system needs to be optimized according to these requirements. Therefore, the behavior of the control system has been modified to create a unique control and control system for pool units.
This section of the manual supplements the VCS control system information from the perspective of HVAC pool control. Regarding regulation, pool units are divided into two basic variants. S and without integrated heat pump. The unit without a "ventilating" heat pump only uses outside air to achieve the desired humidity. The integrated heat pump unit uses both the outdoor air and the circulation mode and the integrated heat pump to achieve the desired humidity.
Other modifications only complement these two basic variants. For example, additional cooling, reheater, etc.).

### Unit operation modes

- **Comfort** (used for normal operation of air conditioning systems to provide a comfortable environment for people in the wind). In this mode, the minimum amount of fresh air is preset to 30%..
- **Economical** (used for HVAC mode to ensure economical operation when there is no need to provide comfortable conditions - there are no persons in the ventilated area).

In this mode, the minimum amount of fresh air is preset to 0%.
For each mode, the set room temperature, the maximum humidity in the room and the minimum amount of fresh air are set separately.
The behavior of the control system is also different in these modes and is optimized for maximum energy-efficient operation of the unit. In Comfortable mode, emphasis is placed on reaching the desired values with respect to the need to supply fresh air for people in the ventilated area. In Economical mode, people are not expected to be in the windspace. That is why other management procedures can be used in this mode to achieve the desired values for economical operation and energy savings.

**Temperature control**

For pool units, room temperature control with limitation of supply air temperature is used. The set room temperature is set to Comfort and Economy. The supply air temperature is not directly regulated but its intervention in the regulation is in case of deviation from the set limits. The minimum and maximum supply air temperature values are set in the control. See Settings. list of data points.
Temperature control is superior to humidity control. In some situations, the dehumidification performance may exceptionally be reduced due to the higher priority of temperature control. This state is signaled on the controllers.

**Humidity control (Dehumidification)**

For pool units, room moisture control is used. Desired humidity is achieved in various ways according to the type of HVAC pool units.

Pro-Vapor Pool Unit (Units without Integrated Heat Pump) - The required humidity is achieved by mixing. By supplying a sufficient amount of outdoor dry air. In addition, fan speed control is used to increase the required power.

Pool unit with integrated heat pump and circulation flap - the method of achieving the desired humidity varies according to the selected unity mode:

**Comfort Mode**

1st stage of dehumidification - mixing + 2nd stage of fan speed
2nd degree of dehumidification - 100% mixing + 3rd stage of fan speed

**Economy Mode**

1st dehumidification stage - circulation mode + running of the heat pump + raising the speed to 2 degrees.
2nd stage dehumidification - mixing + 2nd stage of fan speed

**Fan speed control:**

for pool units, a constant flow rate control is usually used in three preset steps. The transition between stages is fully automated and is controlled according to temperature and humidity requirements. The user has the option to switch the unit on any power level. However, if it switches the unit to maximum speed, it automatically blocks the possibility of increasing the speed and optimizing the operation of the HVACfrom an energy point of view. The ability to switch on unity to the maximum speed is primarily possible for service purposes and exceptional operational requirements.
The unit increases fan speed when dehumidifying. It can also increase fan speeds in case of sufficient power of heating components. This increases the heating power.

**HVAC components control**

regulation of individual components (mixing, water heating, etc.) is based on the standard HVAC control. However, for a pool unit there are some differences that are described below:

- **Mixing damper and inlet/outlet damper**

The dampers are continuously controlled according to the temperature requirement. Furthermore, the position is affected by the requirement for humidity. The mixing valve may no longer be coupled with the inlet / outlet dampers. Their mutual functions may be different in some situations for pool units. For example, when the plate heat recovery is active (pool units with integrated cooling).
Extreme temperature protection - at an outside temperature of T <-10 ° C, the maximum amount of fresh air is limited to 40%. This ensures greater control stability. Settings and signaling see data. mixing points.

## POOL UNITS – description of control

■ **Circulating damper**
Enabled in economy mode heating or dehumidification stage 1. If the circulation damper is open, the inlet and outlet valves are closed. The outdoor unit is not circulating and 100% circulates it. The mixing valve is further regulated according to temperature and humidity.

■ **Heat Pump**
Activated and continuously controlled on request from temperature control. However, during circulation, it is not controlled by temperature but is activated based on the requirement of humidity control.
Restriction of operation: Heat pump operation is blocked if one of these situations occurs:

1. outdoor temperature is out of set limits
2. the pressure differential on the heat exchanger is out of range $\Delta P_{min} - \Delta P_{mid}$

To set all parameters, see list of data points.

■ **Plate Heat Exchanger**
Power regulation is ensured by continuous bypass control.
Pro-Vapor Pool Unit (Units without Integrated Heat Pump).

**Anti-freeze protection – standard (for the plate heat exchanger without integrated mixing):**

Intervention and bypass control according to the standard regulation of the standard HVAC based on the measured exhaust air temperature after the recuperator - part of the manual for frost protection of the heat exchange.

**Anti-freeze protection – option (for a plate heat exchanger with integrated mixing)**
Additionally, over the standard, following is supplemented:
■ when activating this bypass, the inlet/outlet dampers are preferably fully opened + the mixing valve is closed
■ Reduced speed of the intake fan to stage 1

**Pool unit with integrated heat pump and circulation damper:**

**Anti-freeze protection – standard**
is ensured by monitoring the state of the differential pressure transmitter ΔPmax (min. state 60s), while monitoring the outdoor temperature below -5 ° C and the state when the unit is supplying fresh air. If these conditions occur, the unit will activate the antifreeze protection:
The unit switches to the preset time (default 15 minutes, if ΔPmax lasts longer) to the antifreeze mode (Economy mode, dehumidification of 1st stage - circulation, bypass closed). When the antifreeze mode is complete, re-activation is blocked.

**Anti-freeze protection – option**
It is used in exceptional cases where the standard is very active and reduces dehumidifying power and fresh air frequently. Switching between variants is possible with HMI. The activation is the same as the standard option. The intervention is the same, except for the inlet and outlet dampers, which are controlled according to the humidity requirement (Economy mode, dehumidification of the 1st stage - circulation, bypass closed, mixing valve is closed, supply / exhaust flaps regulated).

■ **Pump for pool water heating**
The pump discharges excess heat that is generated during the dehumidification and operation of the HVAC unit. It is triggered under the condition of dehumidification requirement and sufficient supply air temperature. Furthermore, there is a requirement for dehumidification and the required room air temperatures and active heat pump operation.

**Additional control functions**
Further, all other features based on the standard HVAC application are fully available. These are described in the relevant paragraphs for a standard application. Like:
■ Recovery and mixing at the start of the HVAC
■ Start optimization
■ Night cooling

## Integrated cooling – Controller for Compressor Output Control


**Safety Measures**

Check the correct supply voltage (see Technical Data) before connecting the device. Do not expose the device to moisture or water. Use the devise so that the operating conditions will not be exceeded and the device will not be exposed to abrupt changes in temperatures at high humidity causing air humidity condensation.
Warning: Disconnect all power supply connections before you start any maintenance work on the device.
The sensors must be located out of reach of the end user. Do not disassemble the device. If the device fails or malfunctions, send it back, including a detailed description of the failure.

## General Description

The PLC controller controls cooling in the air-conditioned room depending on the signals received from the parent system and pre-set parameters. It measures temperature in the compressor discharge and pressure in the heat exchangers. If the device is fitted with a 4-way valve (Premium" version), it is possible to switch the unit between cooling (in summer) and heating (in winter) modes of the ventilated room, including heat recovery. For a more detailed description of this technology, refer to the User Manual. The device is equipped with preparations for a differential pressostat in the air-handling unit channel, serving as antifreeze protection of the evaporator. The signal received from this switch will start defrosting by directing inlet air to the evaporator's fins. Defrosting starts automatically if the limit evaporation temperature is set below 4ºC, when ice build-up is created on the evaporator's surfaces which need to be defrosted. If the differential pressostat is not present, defrosting can also be set for time cycles using the parameters. Evaporation pressure is used to monitor the device and the unit's output is reduced to protect the evaporator against freezing at low evaporation temperatures. Condensation pressure monitoring is another way of providing device protection. When this value is increased, the unit's output is reduced to prevent a failure. The output reduction is signalled by the relay contact – KA7. The output reduction level can also be signalled by 0-10V analogue outputs. One signal's reduction is based on the evaporation temperature and the other one is based on the condensation temperature. The device is able to control condensation pressure using an analogue output. This feature is only available for the "Premium" version.

## Process Control

Control is started as soon as the contacts for the unit start are closed. Relay – KA9. If the unit is equipped with reversation, the cooling or heating mode is selected.

The selection is made by the relay – KA11 (closed = heating). Then the unit output is controlled by the 0-10V analogue signal. Operation of the unit is indicated by a dry contact, the same way as an error. The unit is equipped with several protections, protecting the cooling device against damage (pressure switches, outlet temperature monitoring, etc.).

## Controller Operation

**SET(F4)** Shows the user parameters.
In the programming mode, it is used to select the parameter or confirm the operation.

**ESC(F2)** In the programming mode, it is used to cancel the operation. Cancels the action.
Long hold = Failure reset

**(F1)** No Function

**(F3)** No Function

**Key combination:**

**SET(F2) + Esc (F4)** Enters the programming mode.

| LED | Mode | Function |
|---|---|---|
| | On | Unit start is requested |
| | On | Cooling in operation |
| | On | Heating in operation |
| | On | Defrosting in progress |
| | On | Power valve switched on |
| | On | Alarm |
| | On | No function |
| °C | On | Measured units |
| ABC | On | Programming Menu |
| ABC | Flashes | Remembers the Prog. Menu password for 60 s |
| | 1 | FA1 circuit breaker open |
| | 2 | FA2 circuit breaker open |
| | 3 | Low-pressure pressostat open |
| | 4 | High-pressure pressostat open or incorrect phase sequence |
| | 5 | Electronic injection valve failure |
| | 6 | Output limiting relay closed |

## Viewing Temperatures and Alarms

**Viewing Temperatures**

1. Briefly press the SET button to display "Pen".
2. Using the arrows, scroll to "Prb" and press the SET button to confirm.
3. Scroll to the temperature analogue input (Anxx) and press the SET button to confirm.
4. The display shows the temperature of the corresponding sensor.

**Viewing Analogue Output Values**

1. Briefly press the SET button to display "Pen".
2. Using the arrows, scroll to "AO" and press the SET button to confirm.
3. Scroll to the analogue output (AOnxx) and press the SET button to confirm.
4. The display shows the value of the corresponding analogue output.

**Viewing Alarms**

1. Briefly press the SET button to display "Pen".
2. Using the arrows, scroll to "AL" and press the SET button to confirm.
3. A corresponding alarm is displayed. If more than one alarm is displayed, use the arrows to scroll between them.

## Main Functions

**Viewing and Changing Basic Parameters**

1. Briefly press the SET button to display "USr".
2. Press the SET button to confirm.
3. Using the arrows, scroll to the desired parameter and press the SET button to confirm.
4. Using the arrows, change the value and press the SET button to confirm.
5. To return to the menu, press the ESC button.

**Changing Values of any Parameter**

Simultaneously press the SET + ESC buttons to switch the device to the programming mode (the indicator comes ON). At the same time, the "Par" is displayed. Press the SET button to confirm.
*Using the ⩓ or ⩔ buttons, select the parameter group and press the SET button to confirm.*
*Using the ⩓ or ⩔ buttons, select the parameter.*
*Press the SET button to display its current value.*
*Using the ⩓ or ⩔ buttons, set the new value of the parameter.*
*Press the SET button to save the value.*
*Exit: To return to the main screen, press the ESC button or wait 60 seconds.*
*Note: Some parameters require a code to be displayed.*

**Hidden Parameters**

To display hidden parameters, enter a code when opening the programming menu.

1. Simultaneously press the SET + ESC buttons to switch the device to the programming mode (the indicator comes ON). At the same time, "Par" is displayed.
2. Using the ⩓ ⩔ buttons, select "PASS" and press the SET button to confirm.
3. Using the ⩓ ⩔ buttons, enter the numerical code required for the parameter group in question (Level 1 or 2) and press the SET button to confirm.
4. Then proceed in the same way as in point 6.2. Now the parameters are visible.

Exit: To return to the main screen, press the ESC button or wait 60 seconds.

## Parameters

**User Parameters (S---)**

- **S-00 Pre-set evaporation temperature (-10.0 to 10.0ºC):** A value limiting the unit's output depending on the evaporation temperature.
- **S-01 Pre-set condensation temperature (30.0 to 90.0ºC):** A value limiting the unit's output depending on the condensation temperature.
- **S-02 Condenser settings (20.0 to S-01ºC):** A pre-set value of the condensation pressure to control the condenser fans. If used.
- **S-04 Start (Yes/No):** If "Yes" is set, the unit is started at 100 % output regardless of the input signal control value. Level 1 (PASS = 1) – only for service (P---)
- **P-16 Maximum compressor discharge temperature (90.0 to 140.0 ºC):** When this temperature is exceeded, the compressor is switched off.
- **P-20 Minimum compressor runtime (5 to 120 sec):** If the compressor is switched on, it can only be switched off once this time has elapsed. This is a safety value.
- **P-21 Minimum compressor off time (30 to 300 sec):** If the compressor is switched off, it can only be switched on once this time has elapsed. This is a safety value.
- **P-22 PWM valve switching period (10 to 20 sec):** Switching period of the digital compressor power valve
- **P-23 Pen HP (3 to 10 sec):** Allowed number of high-pressure pressostat failures per P-24 time.
- **P-24 Pei HP (15 to 60 sec):** Time interval for counting high-pressure pressostat failures.
- **P-25 Pen LP (3 to 10 sec):** Allowed number of low-pressure pressostat failures per P-24 time.
- **P-26 Pei LP (15 to 60 sec):** Time interval for counting low-pressure pressostat failures. Level 2 (PASS = 2) – only for service (P---)
- **P-01 PID LP Udz:** PID control upper insensitive zone.
- **P-02 PID LP Ldz:** PID control lower insensitive zone.
- **P-03 PID LP Bp:** PID control proportionality zone.
- **P-04 PID LP Ti:** PID control integration constant.
- **P-05 PID LP Td:** PID control derivative constant.
- **P-06 PID LP Arw:** PID control anti-reset lift.
- **P-07 PID LP Speed:** Maximum number of PID output changes per 1 sec.
- **P-10 Hyst UP Ext:** Upper hysteresis for the cooling unit start. When this limit is exceeded, the input analogue signal is accepted.

## Integrated cooling – Controller for Compressor Output Control

- **P-17 Coolant:** Used coolant type. (0= R404A, 1=R22,2=R744, 3 = R290, 4 = R134A, 5 = R407C, 6 = R410A, 7 = R427A, 8 = R507A).
- **P-32 PID HP Udz:** PID control upper insensitive zone.
- **P-33 PID HP Ldz:** Control lower insensitive zone
- **P-34 PID HP Bp:** Control proportionality zone
- **P-35 PID HP Ti:** Control integration constant
- **P-36 PID HP Td:** Control derivative constant
- **P-37 PID HP Arw:** Control anti-reset lift
- **P-38 PID HP Speed:** Maximum number of PID output changes per 1 sec.
- **P-40 Bypass time LP:** Low-pressure pressostat bypass time upon compressor start.
- **P-41 Filter time LP:** Low-pressure pressostat bypass time when the compressor is running.
- **P-42 Bypass time LPA:** Low-pressure sensor failure bypass time upon compressor start.
- **P-43 Filter time LPA:** Low-pressure sensor bypass time when the compressor is running.
- **P-45 Curb Enable:** Output limitation enable from the PID high-pressure controller.
- **P-47 Warning time (0 to 600 sec):** Time for which the output limitation is signalled.
- **P-50 PID Cond Bp:** PID control proportionality zone.
- **P-51 PID Cond Ti:** Control integration constant
- **P-52 PID Cond Td:** Control derivative constant
- **P-53 PID Cond Udz:** PID control upper insensitive zone.
- **P-54 PID Cond Ldz:** PID control lower insensitive zone
- **P-55 PID Cond Speed:** Maximum number of PID output changes per 1 sec.
- **P-56 PID Cond Arw:** Control anti-reset lift.
- **P-48 Warning value (0 to 100%):** PID controller limiting value – when exceeded, the output limitation is signalled.
- **P-60 Increment time (10 to 600 sec):** Additional compressor connection time.
- **P-61 Decrement time (0 to 120 sec):** Additional compressor switch-off delay time.
- **P-66 Dif. through En.:** Enables use of the differential pressostat information for the cooling heat exchanger. Anti-freeze protection. It starts defrosting.
- **P-67 Swap time:** Cooling/heating mode switching time.
- **P-68 Det time:** Maximum defrosting time.
- **P-69 Dit time:** Defrosting interval.
- **P-70 Switch OFF:** The compressor is switched off when switching cooling/heating modes.
- **P-71 Switch Cap.:** (0 to 100%) Compressor output between cooling/heating mode switching.
- **P-74 Defrost LP:** (-10.0 to 2.5ºC) Evaporation pressure limit compared with S-00 below when defrosting is enabled.
- **P-77 Maf:** Number of cycles for the pressure oscillation mathematical filter.
- **P-79 App:** Application selection.

| Application Version | Settings |
|---|---|
| One compressor with output control, BASIC version | -1 |
| Two compressors, BASIC version | - 2 |
| One compressor without output control, PREMIUM version | 1 |
| Two compressors, PREMIUM version | 2 |

**Viewing Alarms**

If a failure occurs during operation, this state is signalled by a flashing symbol ⚠. Furthermore, the corresponding alarm can be displayed. For a description, refer to point 5.2.

**Alarm Types**

| Code | Cause | Description |
|---|---|---|
| A-01 | LP sensor failure | Check 4-20mA current loop. |
| A-02 | Td sensor failure | Check the temperature sensor. |
| A-03 | HP sensor failure | Check 4-20mA current loop. |
| A-04 | Compressor 1 failure 1 | Check the compressor protections. |
| A-05 | Compressor 2 failure | Check the compressor protections. |
| A-06 | HP failure | Number of HP pressostat failures exceeded. |
| A-07 | LP failure | Number of LP pressostat failures exceeded. |
| A-08 | Control sig. failure | Check 0-10V signal. |
| A-09 | Expanding module failure | Expanding module does not respond. |
| A-10 | EEV failure | Expansion valve failure. |
| A-11 | Condenser failure | Check the condenser circuit breaker. |

**Additional Display Views (P-79 parameter)**

| Code | Description |
|---|---|
| Outr | The sensor is out of the measuring range. |
| An06 | Digital compressor discharge temperature. |
| An10 | Evaporation temperature |
| An11 | Condensation temperature |
| An12 | Evaporation pressure |
| An13 | Condensation pressure |
| An14 | Inlet temperature 1 |
| An15 | Inlet temperature 2 |
| AIL3 | Input signal value (0 = 0V, 100 = 10V) |
| AIL4 | LP sensor value (bar) |
| AIE4 | HP sensor value (bar) |
| AOL3 | Limiting value according to Te |
| AOE3 | Limiting value according to Tc |
| AOE4 | Condenser control analogue signal value |
| FrEE | Electronics Menu active, only for service purposes. |

## Technical Data

| | |
|---|---|
| **Packaging** | **Self-extinguishing ABS plastic** |
| **Box** | Front panel, 32 × 74 mm, depth 80 mm |
| **Panel degree of protection** | IP65 |
| **Connection** | Screw terminal box for wires up to 2.5 mm2 cross-section |
| **Supply voltage** | 12, 24 V AC |
| **Input power** | Max. 6 VA |
| **Display** | Four-digit, red LEDs, digit height 14.2 mm |
| **Inlets** | Up to 5 sensors NTC (-40 to 110ºC) |
| **Additional inputs** | 6x digital tension-free contact |
| **Relay outputs** | 4x switching relay, 2A, 250 V AC |
| **Triac outputs** | 1x triac relay, 2A, 250 V AC |
| **Analogue outputs** | 1× conf., 2× 0–10V |
| **Data memory** | EEPROM |
| **Operating temperature range** | -10ºC to 55ºC |
| **Storing temperature range** | -20ºC to 85ºC |
| **Relative humidity** | 10 to 90 % (non-condensing) |
| **Measuring and control range** | Depending on the sensor used |
| **Accuracy (at ambient temperature 25 ºC)** | ± 0,7 ºC ±1 digit |

## Integrated cooling – Controller for Compressor Output Control

### Standard Setting Values

| Code | Description | Range: | Def. |
|---|---|---|---|
| S-00 | Set Te | -10.0...10.0ºC | 4.1 |
| S-01 | Set Tc | 30.0...90.0ºC | 63.0 |
| S-02 | Set Cond | 20.0...S-01ºC | 17.0 |
| S-04 | Full output | Yes...No | 15.0 |
| P-01 | PID LP_Udz | --- | 0 |
| P-02 | PID LP Ldz | --- | 0 |
| P-03 | PID LP BP | --- | 40.0 |
| P-04 | PID LP Ti | --- | 120.0 |
| P-05 | PID LP Td | --- | 0 |
| P-06 | PID LP Arw | --- | 1 |
| P-07 | PID LP Speed | --- | 0 |
| P-10 | Hyst UP | 5...20 % | 10 |
| P-16 | Set Td | 90.0...140.0ºC | 120.0 |
| P-17 | Coolant type | 0 – 9 | 5 |
| P-20 | Min T on | 5...120 sec | 30 |
| P-21 | Min T off | 30...300 sec | 60 |
| P-22 | PWM period | 10...20 sec | 10 |
| P-23 | Pen HP | 3...10 | 3 |
| P-24 | Pei HP | 15...60 min | 15 |
| P-25 | Pen LP | 3...10 | 3 |
| P-26 | Pei LP | 15...60 min | 15 |
| P-32 | PID HP_Udz | --- | 0 |
| P-33 | PID HP Ldz | --- | 0 |
| P-34 | PID HP BP | --- | 20.0 |
| P-35 | PID HP Ti | --- | 100.0 |
| P-36 | PID HP Td | --- | 0 |
| P-37 | PID HP Arw | --- | 1 |
| P-38 | PID HP Speed | --- | 0 |
| P-40 | BLP Bypass | --- sec | 30 |
| P-41 | BLP Filter | --- sec | 4 |
| P-42 | BLPA Bypass | --- sec | 60 |
| P-43 | BLPA Filter | --- sec | 120 |
| P-45 | Curb En | --- | Yes |
| P-47 | Warning time | 0...600 sec | 60 |
| P-48 | Warning value | 0...100 % | 10 |
| P-50 | PID Cond BP | --- | 15.0 |
| P-51 | PID Cond Ti | --- | 100.0 |
| P-52 | PID Cond Td | --- | 0 |
| P-53 | PID Cond _Utz | --- | 0 |
| P-54 | PID Cond Ldz | --- | 0 |
| P-55 | PID Cond Speed | --- | 0 |
| P-56 | PID Cond Arw | --- | 1 |
| P-60 | T inc | 10...600 sec | 60 |
| P-61 | T dec | 0...120 sec | 10 |
| P-66 | DP En | --- | No |
| P-67 | Swap time | --- sec | 30 |
| P-68 | Def time | --- sec | 30 |
| P-69 | Def interval | --- hod | 6 |
| P-70 | Switch off | --- | Yes |
| P-71 | Switch Cap | 0...100 % | 30 |
| P-74 | Defrost LP | -10,0...2,5 ºC | 4,0 |
| P-77 | Maf | --- | 100 |
| P-79 | App | --- | -1 |

## Integrated cooling – Electronic Expansion Valve Overheating Controller


**Safety Instructions**

Read these Operating Instructions carefully. Incorrect use can result in serious damage to the device and personal injury.
Installation can only be performed by a suitably qualified and experienced person.
Before starting the installation, all power supply sources must be disconnected.
Temperatures must be within the specified ranges.
All connections must comply with the applicable electrical regulations in force.
The device must not be connected to voltage until all electrical connections have been connected.

Warning: The EC3-X33 controller is equipped with a renewable backup source containing lead and acids. Therefore, it cannot be disposed along with normal waste – the battery is subject to waste recycling regulations. In any case, it must be recycled in accordance with the applicable regulations in force (98/101/EEC).

⚠ **If the output relay is not used, the user must ensure proper safety regarding power supply breakdown-related failures.**

| | |
|---|---|
| Output for EX4 to 8 valves | at 24 V DC, max. 0.8 A |
| Teplota okolí | 0...60 ºC |
| | 1...25 ºC (the longest battery service life) |
| | > 35 ºC (battery service life < 2 years) |

⚠ **To keep the system reliable, it is advisable to change the battery every year.**

**Location**

The EC3-X33 controller can be installed on the DIN bar. The EC3-331 controller is designed to be installed on the DIN bar. Position: On a vertical plate with the output for the step motor situated only on the upper side.

**Electrical Connection**

**Zapojení podle schématu**

The device may only be connected to the power supply once all conductors have been connected in accordance with the wiring diagram.
The device cover is grounded to the 6.3 mm terminal.

**Warning:** To comply with the applicable regulations (especially CEI 107-70), it is necessary to ensure the following: T transformer 24 V AC must be double insulated in Class II. Power supply 24 V AC is not grounded. To eliminate mutual influence and grounding problems, it is recommended to use separate condensers for the EC3 and other devices. **If connected to the mains, the EC3 will be destroyed.**

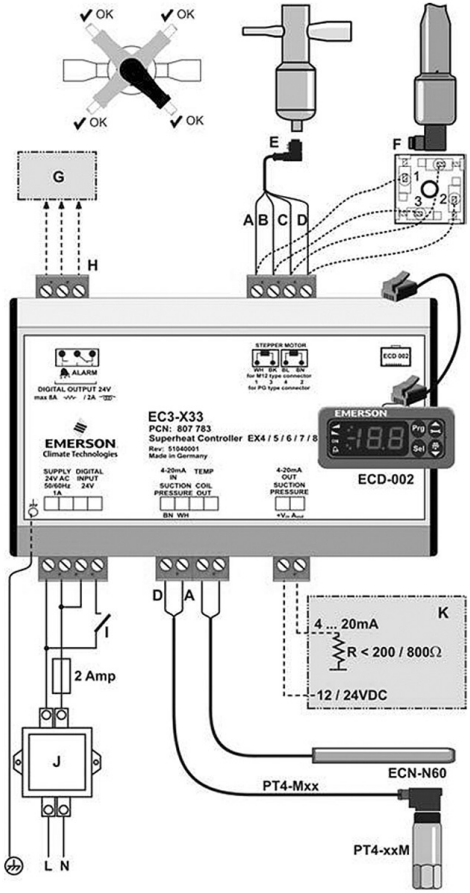
## Technical Data

| | |
|---|---|
| Power supply | 24 VAC ±10%, 50/60 Hz Class II |
| Energy consumption | 25 VA max. EC3-X32, incl. EX 4-8 |
| Terminal box | Push-in type for 0.14 ... 1.5 mm2 conductors |
| Grounding | 6.3 mm grounding connector |
| Degree of protection | IP20 |
| Connection to ECD-002 | ECC-N** or category 5 conductor with RJ45 |
| Digital Input I | 0 / 24V DC/AC for ON/OFF control |
| NTC input | ECN-N60, output temperatures from the evaporator |
| Inlet pressure input, 4-20mA | PT5/07M;PT5/18M;PT5/30M Alco Controls |
| Output 4-20mA | for other controller K 12/24V |
| Deviation from the input signal | Max. ± 8% |
| Failure relay H | SPDT 24 V DC/AC 2 A ind |
| ON | Failure-free operation |
| OFF | Failure or disconnected power supply |

## Integrated cooling – Electronic Expansion Valve Overheating Controller

| Digital input I operation according to commands for the compressor/thermostat | | |
|---|---|---|
| **It controls:** | Operating conditions | digital input |
| Compressor | Compressor start | closed/24V (start) |
| | Compressor stop | opened/0V (stop) |
| Thermostat | Command (compressor is running) | closed/24V (start) |
| | No command | opened/0V (stop) |

## Wiring Diagram




**Conductor Marking and Purpose**

- E EX valve connection using terminated cable (A white, B black, C brown, D blue)
- F EX8 (respectively EX7) valve connection – only terminal
- G Auxiliary control device
- H Failure relay – no voltage when the power supply is switched off or failure signal received
- I Digital input: 0V = open (stop); 24V = closed (start)
- J Class II transformer – power supply 24V AC/25 VA
- K External controller – usually not ALCO (output from EC3 can be used)

⚠ **The basic purpose of this relay is to protect the system when the power supply fails, if the communication interface or ECD-002 is not used.**

**Commissioning Preparations**

Exhaust coolant from the corresponding part of the cooling circuit.

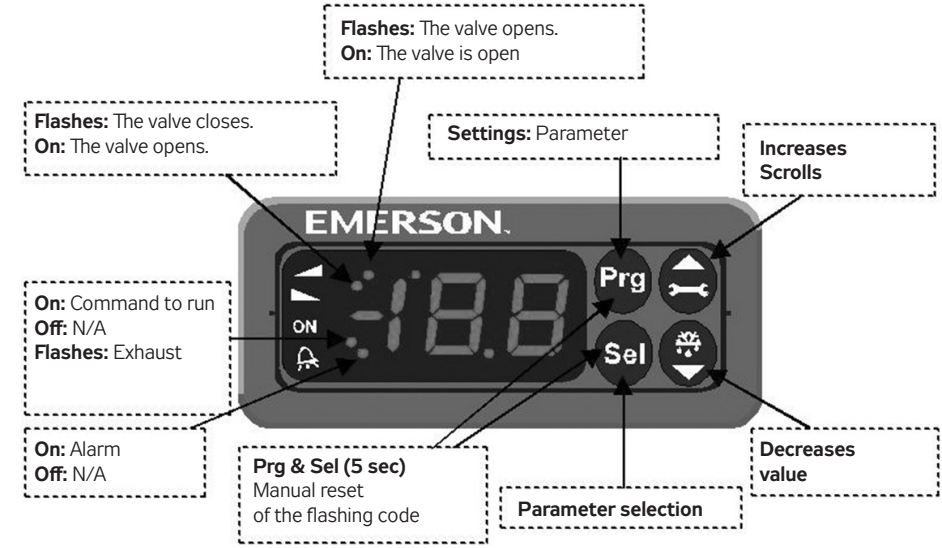
**Warning:**

The EX valve is delivered in the open position – it must be closed before it is filled with coolant.
Connect the EC3 to 24V while the digital input I is open (0V) – the valve will be closed.
Once the valve has been closed, the circuit can be filled with coolant.

**Warning:**

Settings of the EC3 must be performed before the valve is connected to voltage. Digital input I must not be connected to 24V before all the parameters are set.
ECD-002 can be connected to EC3 in the G socket using an ECC-Nxx conductor or another common Class 5 cable equipped with RJ 45 connectors.

## **ECD-002 Display with Buttons** (LED Indicators and Settings)




**Settings of Main Parameters on ECD-002 (before start)**

Make sure the digital input I is without voltage, then it is possible to connect the terminal to 24V.

**Important:** When the digital input is switched off (0V), the main parameters will be set as follows: Coolant Type (u0), Pressure Sensor Type (uP) and Valve Type (ut).

These parameters must be set at voltage of 0V to prevent damage to the valve or compressor due to the transfer of the setting changes to the controlled element.

To make it easy, the setting procedure is described at the end of this manual. Once these parameters have been set and saved, the other functions can be set during operation.

**Start-up**

Start the system and verify it for proper overheating settings. The EC3-X33/53 controller can work even without the connected ECD-002 display. The ECD is mainly used to set the desired actions.

**Setting Procedure using ECD-002**

The device settings are protected by a digital code. The default factory setting is "12". To enter the program, proceed as follows:

- Press and hold the PRG button for more than 5 seconds, 0 will start flashing.
- Using the ▲ or ▼ buttons, set 12 as the password and press the SEL button to confirm.
- Then the first parameter (/1) to be set is displayed. Change the settings using the procedure below:
- Using the ▲ or ▼ buttons, select the parameter code to be changed.
- Press the ▲ or ▼ button to increase or decrease the value.
- Press the SEL button to confirm the new value and continue to the next parameter.

The process still repeats: "press the ▲ or ▼ to set on the display..."

**To exit the parameter change mode**

Press the **PRG** button to confirm the new values and close the setting process of the newly changed parameters.

**To exit without changing any parameter:**

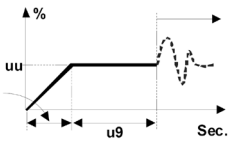
Do not touch any button for the next 60 seconds (time for setting will elapse).

**Reset – Recovery of Default Factory Settings**

- Make sure the digital input is without voltage (0V).
- Simultaneously press the ▲ and ▼ buttons for more than 5 seconds, "0" will display.
- Using the ▲ or ▼ button, set the password "12" and press the SEL button to confirm.
- If a different password is used, this new password is set and A0 will appear.
- Press the SEL button to reset the device – the default factory settings will be restored.
- Press the PRG button to exit and save the default factory settings

**Valve Build-Up Time at Start (parameters uu and u9)**

EX4/5/6 ≤ 1,5 sec
EX7 ≤ 3,2 sec
EX8 ≤ 5,2 sec



## Integrated cooling – Electronic Expansion Valve Overheating Controller

**Main Parameters – change if other settings are desired**

| Code | Parameter description and options | Min. | Max. | Factory settings | Actual settings |
|---|---|---|---|---|---|
| H5 | Password | 1 | 199 | 12 | |
| u0 | Coolant: | 0 | 7 | 1 | |
| | 0 = R22 1 = R134a 2 = R507 3 = R404A 4 = R407C 5 = R410A 6 = R124<br>7 = R744 (subcritical conditions) | | | | |
| uP | The used sensor type: | 0 | 1 | 0 | |
| | 0 = PT4-07M (for R22/R134a/R507/R404A/R407C/R124) 1 = PT4-18M (for R410A)<br>2 = PT4-30M (for R744, subcritical) | | | | |
| ut | The used valve type: | 1 | 5 | 5 | |
| | 1 = EX4 2 = EX5 3 = EX6 4 = EX7 5 = EX8 | | | | |

**Additional properties (set if necessary)**

| | | | | |
|---|---|---|---|---|
| uu | Initial opening of the valve (%) | 10 | 100 | 50 |
| u9 | Valve opening time (seconds) | 1 | 30 | 5 |
| uL | Low overheating reporting | 0 | 2 | 1 |
| | 0 = N/A (for flooded evaporator) 1 = Yes with auto-reset 2 = No with manual reset<br>switches at 0.5K (if it lasts 1 min); switches immediately at 3K | | | |
| u5 | Rated overheating (K)<br>If uL used (auto run) | 3 | 30 | 6 |
| | If uL not used | 0.5 | 30 | 6 |
| u2 | MOP function | 0 | 1 | 1 |
| | 0 = Yes 1 = No | | | |
| u3 | MOP settings (ºC), saturated temperature | * | * | X |
| | Set by the manufacturer according to the used coolant.<br>+13ºC for R22 +15ºC for R134a +7ºC for R507 +7ºC for R404A +15ºC for R407C+15ºC for R410A<br>+50ºC for R124 | | | |
| ⌐¬5 | Used units (only for u3, u5, ⌐¬1 | 0 | 1 | 0 |
| | 0 = ºC, K, bar 1 = ºF, R, psig | | | |
| | (Psig is divided by 10 - example: displayed 12.5 equals 125 psig) | | | |
| ⌐¬1 | Displayed value | 0 | 4 | 0 |
| | 0 = measured overheating 1 = measured evaporating pressure, (bar); 2 = valve opening (%),<br>3 = measured water output temperature 4 = calculated evaporation temperature (ºC) from measured pressure | | | |
| u4 | Overheating control method | 0 | 1 | 0 |
| | 0 = normal, 1 = slow | | | |
| b1 | Action of the battery if it fails. | 0 | | |
| | **(only for EC3-X33), according to the table:** | | | |

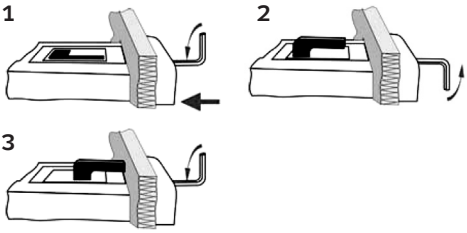
| Number | Display | Failure relay | Valve | Reset option after replacement |
|---|---|---|---|---|
| 0 | – | – | controls | – |
| 1 | Ab | – | controls | – |
| 2 | Ab | switches | fully closed | automatically |
| 3 | Ab (flashes) | switches | fully closed | manually |

⚠ **If b1 is set to 0 or 1, the user must ensure suitable protection to protect the system against failures caused by power supply breakdowns.**

*) Maximum and minimum values are dependent on the coolant type

## ECD-002 Display Installation

The ECD-002 display can be connected at any time during operation. The EC2-371 is integrated into a 71 x 29mm panel – see dimensional drawing.
Insert the device into the panel **(1)**.
The swivel lugs must be inserted into the device edges. Use the provided Allen wrench and turn the openings in the front face to move the lugs along the guides until they contact the panel wall **(2)**.
Using the wrench, tighten both lags to the back panel wall so that the device cannot move – see figure **(3)**.




⚠ **Attention! DO NOT tighten too much to prevent the lugs to be broken.**

## Troubleshooting

| Code | Cause | Function | Relay H | Valve | Remedy | Reset |
|---|---|---|---|---|---|---|
| **E0** | Pressure sensor failure | | closes | closes | Check PT4 sensor and its connection. | Auto |
| **E1** | Temperature sensor failure | | closes | closes | Check NTC sensor and its connection. | Auto |
| **A** | EX valve not connected | | closes | | Check the valve wiring and power supply. | Auto |
| **Ab** | Defective battery | b1=1 | | working | Low capacity, charge or replace the battery. If the signal is weak once the battery has been charged, replace the battery. This can happen if the battery has not been used for a long time. | |
| **Ab** | | b1=2 | closes | closes | | |
| **Ab flashes** | | b1=3 | closes | closes | | Manual |
| **Er** | Display error | | | | Data for the display are out of its range. Check the sensors. | Auto |

**Message "---" (no data displayed):** Display shows only dashes "---" during start and if no data for display are available.

*Note: If more failures occur at the same time, the most serious failure is valuated and displayed first before the other less serious failures. Operating data will be displayed once all failures have been resolved.*

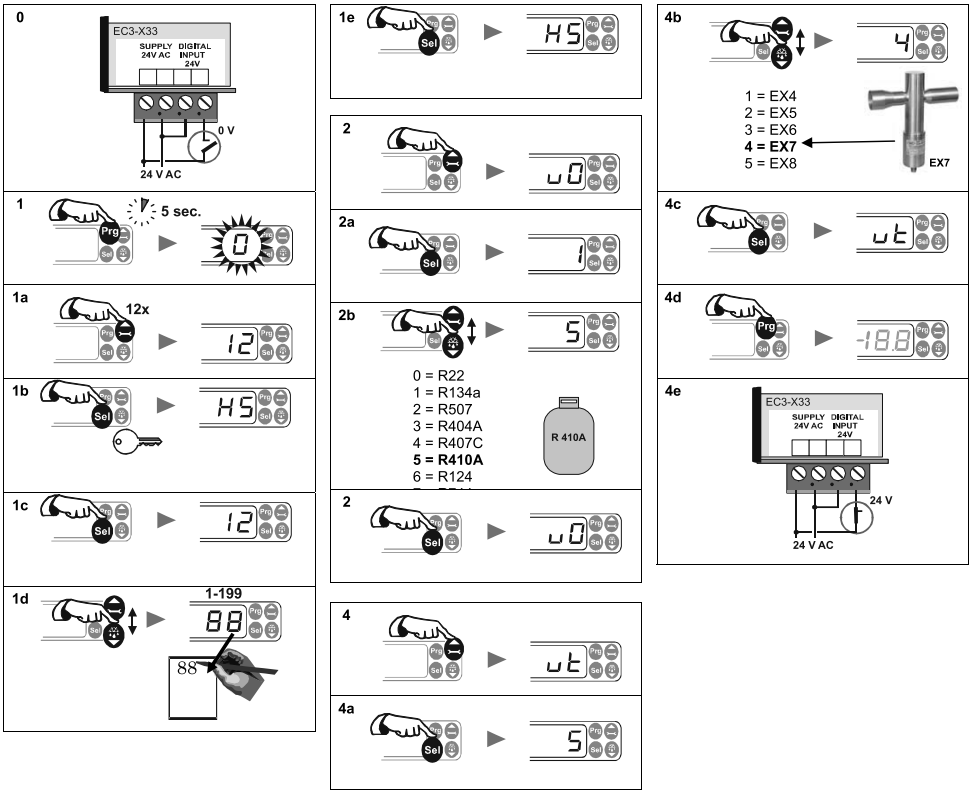
## Check of System Operating Conditions

Data to be permanently displayed on the display can be selected (parameter ⌐1). Temporarily, other data can also be displayed. This function cannot be set during a failure. The display shows numerical values for 1 second (see parameter ⌐1) and then the selected parameter. After 5 minutes, it returns to the selected parameter ⌐1.

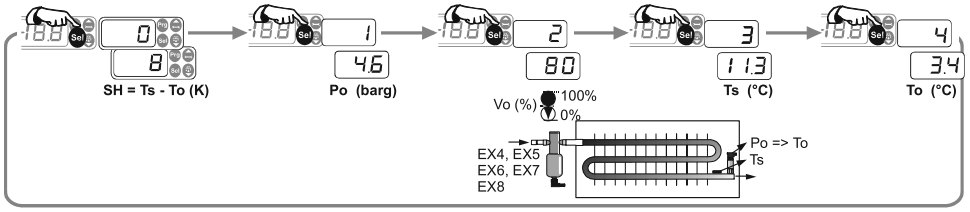
| Failure | Possible reason | Remedy |
|---|---|---|
| Operational overheating differs from pre-set overheating | Defective sensors | - Check the connection.<br>ECN-N60 temperature sensor must be used.<br>- PT4 pressure sensor must be used according to the manual for the given coolant.<br>- The sensor conductors must be routed apart from the power conductors. |
| Low overheating – wet operation | - Defective sensors<br>- Incorrect el. connection of the EX valve | Check the sensors and connections of the valve - EC3, el. conductor. |
| The valve does not close | - The digital input I is energized.<br>- Wrong parameters | The valve will close if the input is energized, I = 0V. Check the settings |
| Unstable overheating – cycling | Unsuitable evaporator | Select higher overheating – find stable settings |
| The valve performs contrary in relation to the EX3 command | Incorrect el. connection | Connect the conductor colours correctly according to the wiring diagram. |
| The valve will not open at high pressure difference | Incorrect settings of the "**u**" parameter | Check and adjust the settings |
| Overheating change after some time | The motor needs to be synchronized | The digital input must not be permanently energized with 24V, it is necessary to switch off the power 1x per week for 5 seconds if the compressor does not stop. |

## Integrated cooling – Electronic Expansion Valve Overheating Controller

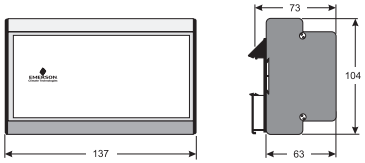
### Illustrative Procedure of EC3-X33 and ECD-002 Settings



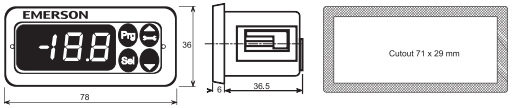

**Data display**




## Dimensions

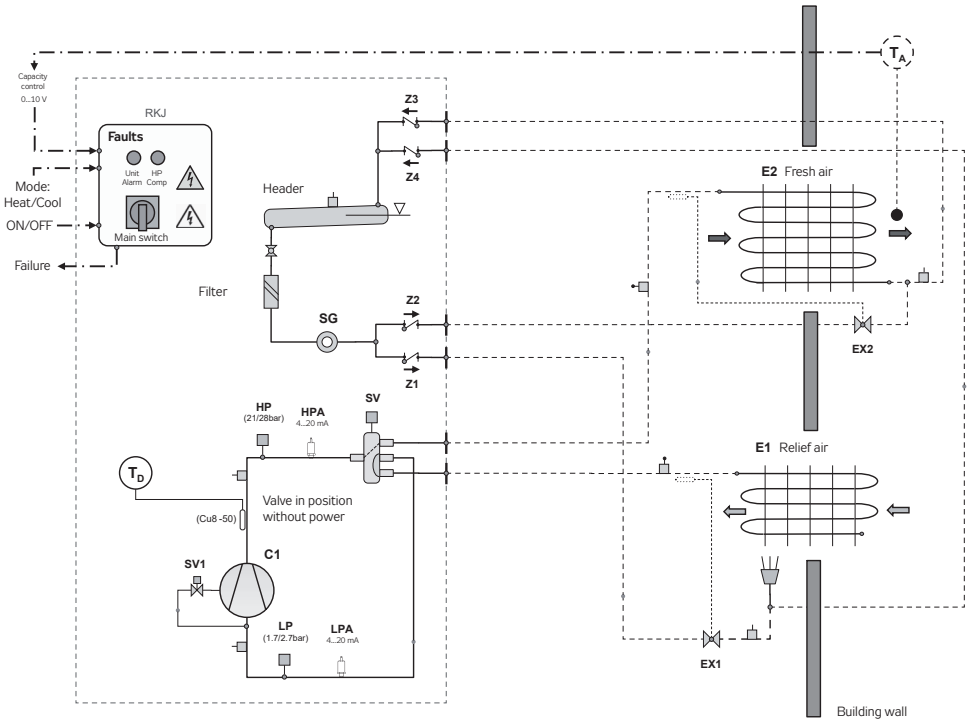



EX3-X33




ECD-002

## Integrated cooling – KHD-S1_ _.R Backup System Wiring Diagram




*Note: The 4-way valve is displayed in the "cooling" position (SV without power); the E1 heat-exchanger is in evaporator mode.*

**Legend:**

| | |
|---|---|
| C1 | Cooling compressor |
| SV1 | Power valve |
| SV | 4-way valve |
| SG | Sight glass |
| EX | Expansion valves |
| E1, 2 | Evaporator/condenser |
| Td, Ts | Temperature sensors |
| Z1-4 | Back valves |
| LP | Low-pressure pressostat |
| HP | High-pressure safety pressostat |
| RKJ | Unit power and control distribution board |
| TA | Room temperature |

## Function description

Unit start and operating mode (heating/cooling) can be selected by an external signal. The E2 heat exchanger is alternatively used for heating or cooling of fresh air supplied to the air-conditioned object. The heat potential of the outlet air is always used. In winter, the outlet air transfers the heat to the E1 heat exchanger. Thus, heat recovery is achieved. The unit works in heat pump mode. The valve is without power. Cold inlet air is heated in the E2 heat exchanger (condenser).

In summer, fresh air is cooled as needed in the E2 heat exchanger. The SV valve is energized and the 4-way valve is moved to the opposite position. The E2 heat exchanger now works as an evaporator. Relatively cold outlet air exhausted from the building effectively cools the E1 heat exchanger (condenser). Surplus heat is transferred out of the building.

Proper functionality of the system is ensured by the control switchboard (RKJ) with the integrated PLC control system. The application software optimises the unit's operation and protects it against overloading. The heat recovery level can be steplessly controlled (0...10V signal) depending on the inlet air temperature TA (behind the E2 heat exchanger). If the maximum permissible condensation temperature is reached, the output is automatically reduced. The system is also protected against freezing of the evaporator by an automatically limited lowest evaporation temperature.

## Unit Activation

Check the correct interconnection of the control unit and air-handling unit. Check the motors (frequency inverters) - power part, controls, dampers, filter pressure sensors, motors, sensors... - in accordance with the air-handling unit.
Check the locations of the sensors, check the mechanical parts (dampers, motors) for free rotation and sticking.
Fan pressure and differential pressure sensing hoses must be situated so that they will sense static pressure (the end of the hose must not be oriented against the air flow. It must be oriented perpendicularly or in the direction of the air flow).
Depending on the operating mode, a large quantity of condensate can be created inside the unit. Before starting the unit, it is advisable to check the condensate drainage circuit, especially the correct height of the siphons (according to the fan pressure), correct interconnection of the siphons – individual siphons must not be hermetically connected, filling of siphons with water and free passage through the piping.

**Differential Pressure Sensor Setting Inspection**

On the filters: Set the value of the final pressure loss in accordance with the rating plate data.
On the heat exchanger: The values are also indicated on the rating plate. They are derived from the operating pressure loss of the heat exchanger.
If the results of the inspection are OK, connect the distribution board to the power supply but still maintain the STOP mode.
Enter the "Inputs" item in the service menu of the controller and check the state and functionality of the digital inputs (by short circuiting the cable ends or disconnecting the cable).
Stay in the "Inputs" item in the service menu of the controller and using the documentation check that the displayed values for the sensors correspond to reality (compare with a calibrated thermometer). If in doubt about the correct sensor, disconnect the sensor and check the displayed value.
Check the position of the dampers (inlet and outlet dampers closed, short-circuit damper open), failure-free operating state.
If the system indicates a failure, trace the failure, check the component indicating the failure and remove the failure.
If no failures are indicated, test/simulate possible failures. Attention! Some failures can only be recalled when the device is running, e.g. air flow failure. Reset the failures.
Go to the service menu of the controller and test in sequence individual elements of the unit (dampers, heat exchanger, heater, heat pump, circulation pumps and fans). Switch to manual mode and test functionality (positions of damper, opening of valves, direction of turning of fans). Once the testing is finished, return all items to the AUTO mode.

*Note: This way of testing ensures switching off in case of a failure. When testing by direct switching of the outputs, no protection is functional.*

**Unicon Air Flow Sensor Settings**

Sensor operation (Mode) – set to 5.00
Adjust measuring range in Pa (in accordance with max. pressure of the fan).
Set the k-factor in accordance with the fan impeller type, see Table.

| Impeller | k-factor |
|---|---|
| RH 22 C | 47 |
| RH 25 C | 60 |
| RH 28 C | 75 |
| RH 31 C | 95 |
| RH 35 C | 121 |
| RH 40 C | 154 |
| RH 45 C | 197 |
| RH 50 C | 262 |
| RH 56 C | 308 |
| RH 63 C | 381 |
| RH 71 C | 490 |
| RH 80 C | 620 |
| RH 90 C | 789 |
| RH 10 C | 999 |
| RH 11 C | 1233 |

## Unit Activation

To ensure stepless air-flow control using the Unicon sensor and to prevent the fan output cycling, we recommend setting the frequency inverter start-up and run-down ramps to 180 s (Danfoss frequency inverter –parameters 3-41 and 3-42).
If the system is equipped with a PLC controller for compressor output control, it is necessary to follow the provided Operating Instructions, especially to check and remove possible failure messages. The controller has already been set and the parameters need not be adjusted, with only some exceptions.
Now it is possible to switch the unit to RUN mode (see chapter 4.1 Main Switch).
Check the fan current consumption in each operating mode. If higher than Imax (see motor rating plate), it must be decreased (e.g. by decreasing the max. frequency of the frequency inverter).

**Current Date and Time Settings**

According to the customer's requirements, set the desired temperature and humidity at full operating mode (e.g. 31ºC, 50%) and at reduced operating mode (e.g. 28ºC, 70%). It is also necessary to set the time schedule for full operating mode (time of swimming pool use, e.g. 9.00-20.00 h).
Outside this time, the unit is operated in reduced operating mode.
If the air-handling unit is equipped with the Unicon constant air flow sensor, set this required air flow in the Carel controller menu.
The swimming-pool unit should be constantly in operation, except for service and maintenance periods.
The system is filled with a calculated quantity of coolant in the factory.

## Coolant Handling

The used HFC type coolants (e.g. R404A, R407C, R410A,...) fall into the category of monitored greenhouse substances in accordance with European Parliament and Council Directive EC 842/2006 on F-gases (Art. 3, par. 6) and CZ Act no. 483/2008 Sb on air conservation. The user of a cooling device containing ≥3kg of coolant is obliged to keep records on results of periodic leak tests, the so-called Cooling Device Service Book, which must include the following data:

- Volume and type of coolant used during unit installation
- Results of performed preventive checks, especially the results of leakage tests
- Volume of added or drained coolant when performing maintenance or during unit operation or liquidation.

The records must include identification of the personnel or company who performed the maintenance or servicing. Any checks or intervention into the cooling circuit may only be performed by personnel certified by the Ministry of Health of the Czech Republic. On request, the user must submit the logs to the appropriate control authority.
The frequency of checks is determined by the volume of coolant:

up to 30 kg ..... once a year
up to 300 kg ... twice a year

If a leak is found, it must be removed immediately. Repeat leakage tests of the circuit must be performed one month after the repair to verify the repair's efficiency.

## Other Ways of Control, Checks, Failures

### Checks

**Temperature Difference Monitoring**

This enables the difference between the required and actual supply air or room temperature to be monitored. The monitored temperature is compared with the pre-set tolerance ±ºC while simultaneously monitoring the temperature drop below the minimum limit. If the monitored temperature is below the minimum limit or outside the permissible tolerance for more than 1 hour, an informative error will be activated. The optional temperature difference monitoring can be enabled using the HMI controller, refer to the chapter Additional Operating Modes and Function Setting Options. Temperature minimum limit or tolerance can be set using the HMI controller in the List of Data Points in the section Monitored temperature Check Settings, System and Network Setting – Difference Monitoring.

### Failures

The VCS unit monitors, evaluates and informs about various types of system failures. Possible failures are indicated, see the chapter of appropriate HMI controller (SG, TM, DM or Web) or Remote Indication. Failure messages identify failed objects/components which need to be inspected, respectively to find and remove the cause of the failure (or confirm absence of any problem) before acknowledging the failure. For failure reset, refer to the chapters of HMI controllers.

**Failure Inputs (digital)**

All important air-handling unit components (fan motors, electric heaters, etc.) are equipped with failure inputs (contacts) which after being connected to the devoted inputs (terminals) are evaluated by the VCS unit, respectively by the controller. If a failure (incorrect state of the contact) occurs, the VCS control unit will automatically put out an alarm in accordance with an internal algorithm – indicating the faulty object and in case of severe failures stopping the air-handling unit.

*Note: In the Stop mode (at the beginning of start-up) the state of the air-flow sensors is indicated as correct. However, it is actually a failure state (contacts open) which, in these situations, is not evaluated by the system as a failure (this evaluation is performed once a pre-set time has elapsed). Similarly, the filter fouling sensor in the Stop mode – without air flow rate – is put into standby mode (contacts closed) which does not correspond with a failure state even though a failure occurred and was indicated during the previous operation (this state will change once the devise has been started up – if the filter has not been changed).*

**Temperature Sensor Failures**

Information about temperature sensors are specific failure messages evaluating their state outside the standard working range of measured temperatures. The controller will automatically report a disconnected, open or short-circuited temperature sensor, respectively abnormal value. If the main control sensors (e.g. supply air temperature sensor) or protection sensors (antifreeze protection) fail, the controller will shut down the system.

Outdoor and indoor temperature sensor failures will not shut down the entire system, only the functions related to the required input variable from the sensor. To operate properly, the VCS system requires all sensors according the specification to be operative.

**Water Heater Antifreeze Protection Failures**

The water heater protection system to prevent a breakdown caused by water freezing during a heating water delivery failure will report a failure if the heating water or air temperatures drop below the pre-set limits. For details about water heater antifreeze protection, refer to the chapter Description of Control and Protection Features.

### Possible Causes of Indicated Failures

#### Antifreeze Protection Alarm

- Low water temperature in the water heat exchanger
- Check water temperature in the water heat exchanger
- Check the heating water source.
- Inspect or clean the SUMX mixing set filter.
- Inspect the heat exchanger's fins for fouling.
- Verify the circulation pump activation and operation.
- Verify functionality of the three-way valve
- Check the NS 130 temperature sensor in the duct.

#### Electric Heater Failure

- Inspect the electric heater thermo-contacts.
- Check the electric heater switching.
- Check the circuit breaker and EOS(X) electric heater condition.
- Inspect or clean the filter insert.
- Inspect the dampers for opening.
- Verify smooth air flow

#### Electric Heater Specialities

The EOS series electric heater design provides safe, reliable and long service life. As semiconductor relays (SSR) are used to switch the electric heaters, it is necessary to pay close attention to operating conditions, especially to over-voltage in the wiring and permissible increases in the temperature of the SSR relays.

SSR relays are advanced semiconductor components ensuring electric heater output switching with minimum noise. Due to the SSR relay design technology, the voltage at its poles must not exceed 1200V. As standard, SSR relays are equipped with over-voltage protection. If over-voltage exceeds the values specified by ČSN 330420 for wiring category III, there is a risk of service life shortening or even SSR relay destruction. In these cases, it is necessary to provide the control unit supply line with multistage over-voltage protection. An increased risk of over-voltage exists in the vicinity of 22kV/400V distribution transformers, highly loaded power lines routed in parallel, frequency inverters, etc.

Another danger comes from unacceptable overheating of the SSR relay internal structure above the permissible limit, leading to its destruction. Sufficient cooling of the SSR relay is ensured by placing the SSR cooler in the air duct, where it is cooled by the air flow.

## Troubleshooting

Overheating of the SSR relay internal structure can also be caused by increased transition resistance at the poles (terminals), i.e. between the feed conductor and terminal. Therefore, it is necessary to ensure proper tightening of the SSR terminal bolts.

### Fan Failures

- Check connections of the thermo-contacts.
- Check the condition of the motor circuit breaker .
- Inspect the V-belt.
- Check the fan for free rotation.
- Check connections of the P33N differential pressure sensor.
- Check the motor current.
- Inspect the frequency inverter

### Air-Flow Failure

- Check the condition of the V-belt .
- Check the fan for free rotation.
- Check performance of the differential pressure sensor.
- Check the fan for proper operation and correct direction of rotation.
- Inspect the frequency inverter.

### Failure Signalling – Fire, Smoke

- Check the condition of the fire dampers.
- Check the condition of the connected external device.

### Fouled Filters

- Check the filter for fouling. Replace if necessary.
- Check the P33N pressure sensor settings.

### Cooling Failure

- Check the condition of the connected cooling unit.
- Inoperative cooling – without failure indication
- Verify the water cooler circulation pump activation and operation (at active cooling signal above 20% = 2V)

### Antifreeze Protection Sensor Failure

- Check the heating water temperature.
- Check the connections of the NS 130R sensor.
- Replace the sensor

### Power indicator does not illuminate

- Inspect the supply voltage.
- Inspect the auxiliary circuit breaker.
- Inspect the power supply source fuses

## Troubleshooting

When performing any handling or troubleshooting of the air-handling device, the power supply of the entire distribution board must be disconnected using the main switch. When performing inspections, pay increased attention to the correct functioning of the protection devices (SUMX mixing set, motor thermo-contacts and electric heater thermo-contacts). Verify the correct functioning of evaluating, protection and switching devices. Check the control signal. Check the terminals for proper tightening, both on the peripheral device side and control unit side.

## Regular Inspections

Service inspections of the entire air-handling system must be performed at least twice a year (unit transition from winter to summer operating mode).
In addition to these, extra inspections must also be performed after a unit failure, natural disaster or emergencies.
Maintenance of the control unit includes just regular cleaning and inspection of the screw connections – wires, grounding, component fixing, etc. Internal parts of the unit must be cleaned of dust and any other dirt at the specified maintenance intervals.
If the control unit is equipped with a fan fitted with a filter (outdoor version), change the filter once a year.
If necessary, clean the face panel of the unit's box using a wet cloth. Use common cleaners.
If the control unit is equipped with a filter fan (external version), replace the filter once a year.
When changing over to the summer operating mode, drain the heating water circuit; the mixing set pump must be disconnected. To do so, turn the disconnector to the "Off" position. (Otherwise, ensure regular turning of the pump to prevent the pump seizing; operating the pump without water can damage it). In the winter operating mode, the pump must be activated using the reverse order of steps, i.e. turned "On" and checked for proper operation.
The same procedure must be performed when the water cooler is being shut down for a season or reactivated. (Note that the water cooler pump does not turn the system).

## Spare Parts and Service

Spare parts are not included in the VCS unit delivery.
If any spare parts are needed, they can be ordered from the manufacturer or regional distributor.
Warrantee and regular servicing can be ordered from the manufacturer or the authorized service provider (see the list on www.remak.eu).

## Spare Parts and Service

### Disposal and Recycling

**Information for disposal in other countries outside EU**

Observe the applicable local environmental protection and waste disposal regulations.

**For users from EU countries**

When disposing of components and materials, observe the 2012/19/EU Directive, applicable national and local environmental protection and waste disposal regulations.

**For users from the Czech Republic**

Observe the applicable local environmental protection and waste disposal regulations. Active carbon which contains toxic substances, radioactive impurities or PCB must be disposed of in accordance with applicable legal regulations. When disposing of the air-handling unit once its service life has expired, follow Waste Act No. 185/2001 Sb. as amended by Directive No. 352/2005 Sb. (electric waste).

### Waste Classification

(in accordance with Directive No. 93/2016 Sb.)

**Packaging used:**

- 15 01 01 cardboard box *(paper and cardboard packaging)*
- 15 01 02 polyester packaging pads *(plastic packaging)*
- 15 01 03 pallet *(wooden packaging)*

**Disabled device and its parts:**

- 13 02 06 Waste engine, transmission and lubricating oils (synthetic engine, transmission and lubricating oils)
- 16 01 17 Iron metals
- 16 01 18 Non-iron metals
- 15 02 03 Filter material
- 16 02 14 Disposed parts not included under numbers 16 02 09 – 16 02 13
- 16 02 15 Electric parts *(dangerous compounds removed from disposed devices)*

### Abbreviations

**BPDEV**.....Plate Heat Exchanger Bypass
**TČ**.....Heat Pump
**TK**.....Thermocontact
**PMO**.....Antifreeze Protection
**ROV**.....Rotary Heat Exchanger
**VZT**.....Air-handling Device
**ZZT**.....Heat Recovery
**FTT-10A**.....Free Topology Transceiver for channel type TP/FT-10 (LON)
**TP/FT-10**.....Physical channel to transmit data over Twisted Pair to Free Topology networks
**SNVT**.....Standard Network Variable Type (LON)
**LON**.....Local Operating Network
**SCADA**.....Supervisory control and data acquisition
**BMS**.....Building Management System
**ModBus RTU**.....Communication protocol (Remote Terminal Unit)
**Climatix**.....A series of controllers providing the same features
**AHU**.....Air Handling Unit
**SELV**.....Safety Extra-Low Voltage
**HMI**.....HumanMachineInterface – remote controller
**BACnet**.....Building Automation and Control Network
**TCP/IP**.....Transmission Control Protocol, např.. Ethernet/Internet

It is alway necessary observe local laws!



***Warning***

*The manufacturer reserves the right to make changes and amend the documentation due to technical innovations and changes to legislation without prior notice.*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REMAK

REMAK a.s.
Zuberská 2601, 756 61 Rožnov pod Radhoštěm,
tel.: +420 571 877 778, fax: +420 571 877 777,
email: remak@remak.eu, internet: www.remak.eu