

CPV Compact Air Handling Units

# INSTALLATION COMMISSIONING MAINTENANCE

**MANDÍK**<sup>®</sup>



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## 1 GENERAL

This manual uses graphics and symbols to highlight specific details. They include:



This symbol indicates a potentially hazardous situation and an imminent health or safety hazard to personnel, the unit, or its components.



This symbol indicates an electrocution hazard.



This symbol indicates an important detail related to proper installation, commissioning or maintenance of the unit or its components. It may also indicate a suggestion or a note concerning installation, commissioning, or maintenance.

This manual contains the procedures for proper installation, commissioning, and maintenance of the CPV line of compact air handling units from MANDÍK.



**Review these instructions prior to beginning any activity involving the unit and adhere to them. Adherence to these instructions is a prerequisite for the proper operation, and functionality, and to comply with warranty conditions. The manufacturer is not liable and the user bears all risks for any damage resulting from improper use.**

This manual is intended for personnel with valid authorisation and licenses to conduct service work on ventilation and air handling units.



**CPV air handling units are designed for central distribution and conditioning of air in ventilation and air-conditioning systems. Air conveyed by the unit must first be filtered to remove physical and gaseous impurities that could foul the installed components or corrode the materials used in the construction of the unit. Units are designed for normal environments without an explosion hazard with an ambient temperature of -30 °C to +40 °C, for circulating air within normal humidity levels (they are not designed for damp air service, such as in pool facilities, etc.). Any other use is prohibited.**



**Any arbitrary modifications to the unit, such as expansions, not previously approved by MANDÍK, a.s., shall render the provided warranty, along with the guarantee of safe use and operation, null and void.**

## 2 RELATED DOCUMENTS

The following documents are attached to every delivered unit:

- Warranty sheet
- Installation, operation and maintenance manual
- Technical specifications of the unit
- Declaration of conformity
- List of fasteners and other materials
- Drawing documentation for the control system
- Manual for installation and operation of the control system

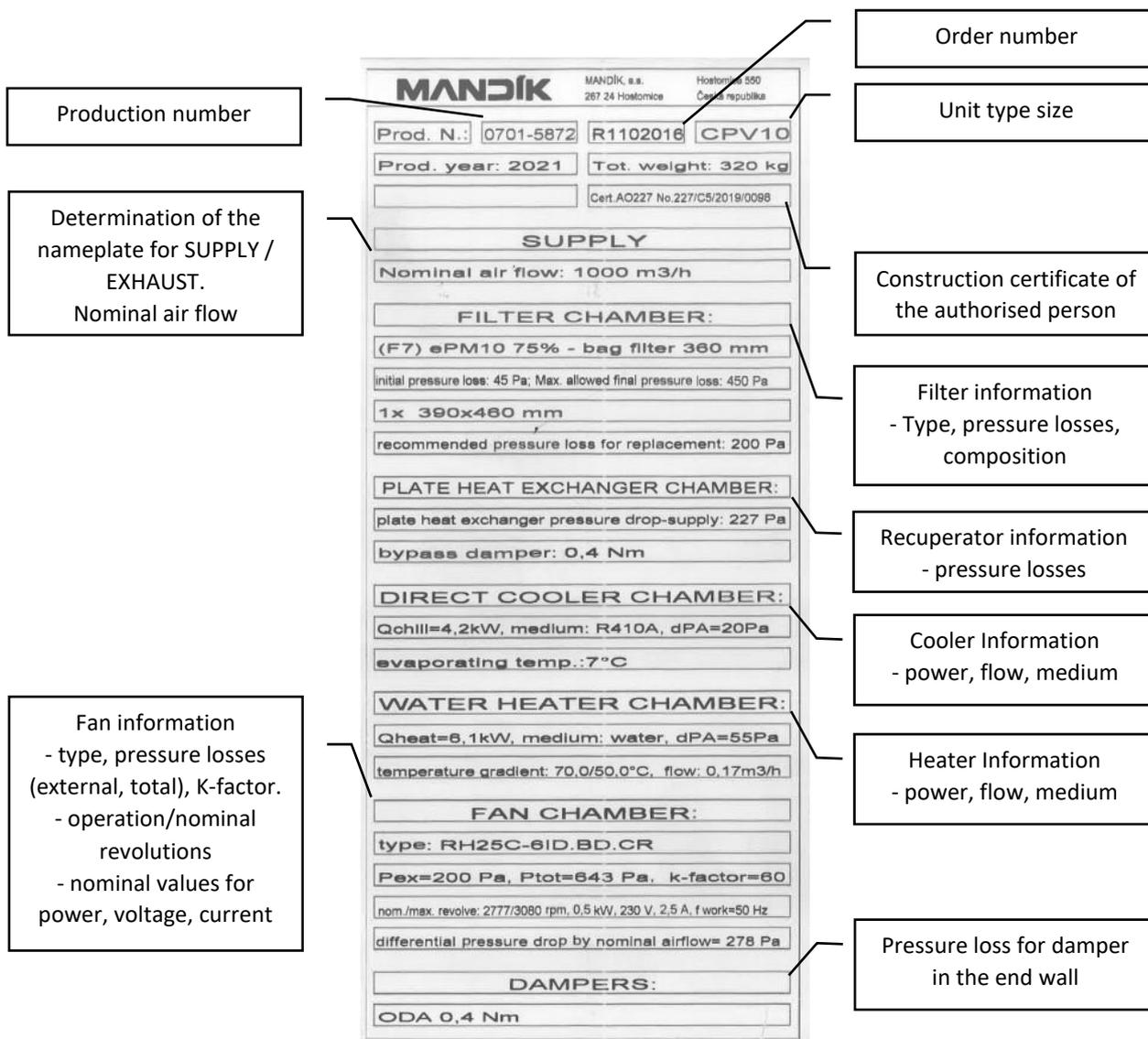
Other documents online at [www.mandik.cz](http://www.mandik.cz), in the Production Line / Air Handling units / Mandík Compact Air Handling Units:

- Instructions for control and configuration of the SIEMENS Climatix controller
- Instructions for control and configuration of the SIEMENS - POL822 room unit with controls

### 3 GENERAL INFORMATION

#### 3.1 UNIT IDENTIFICATION

Every unit is equipped with a nameplate that specifies it's basic technical parameters. Nameplates are a total of two, separately for the supply and exhaust part.



## 3.2 DIMENSIONS OF THE UNIT

The dimensions of the unit are calculated dynamically in the software per the specific order in steps of 1 mm. The specific dimensions of selected units are provided in the relevant technical specifications. The maximum production dimensions (specified for the external housing) are: length x width x height = 3880 x 2000 x 2200 mm.

## 3.3 CONNECTION DIMENSIONS

A unit may have round or square duct connections per specifications.

Air duct connection dimensions are calculated dynamically in the software per the specific order in steps of 10 mm. The specific connection dimensions of selected units are provided in the relevant technical specifications.

## 4 SAFETY

The safety instructions provided herein must be followed when using the unit.



- **All valid standards, safety regulations and generally accepted technical rules must be followed during assembly, wiring, commissioning, repairs and maintenance of the unit!**



- **Only natural persons or legal entities with valid authorisation are permitted to conduct assembly of the unit, including electrical wiring, commissioning, repairs, maintenance and operation.**

**The following general instructions are considered absolutely necessary. Additional recommended instructions are provided in detail in the section covering assembly, commissioning, and maintenance.**

The following points must be met before start-up of the unit:

- All service panels and doors on the unit must be secured and fastened.
- Ensure that no one is inside the unit or in any other hazardous area around the unit.
- Commissioning and maintenance instructions are provided in the corresponding sections of this manual.

The unit must not be operated under these conditions:

- The unit is installed in an environment where an explosive atmosphere may occur (does not apply to ATEX units)
- The unit is installed in close proximity to magnetic fields
- The air entering the unit contains aggressive gases or chemicals or the air temperature is below -30°C or higher than +50°C, or the return air humidity is excessively high (the unit is not designed for damp air service, such as in pool facilities, etc.)

Access inside the equipment and conducting any work on the equipment are prohibited until the following are met:

- The unit must be disconnected from power.
- All rotating parts (fans, etc.) must be stopped
- The unit must be locked out to prevent accidental start-up (e.g. at the service switch)
- Heat exchangers and hydraulic system components must be cooled down to the ambient temperature, i.e. a maximum surface temperature of +40°C
- Pressure in all pressurised systems must be equalised to the ambient pressure
- The operator must be equipped with suitable protective equipment

- No explosive atmosphere is present inside the equipment.

## 5 HANDLING, TRANSPORT AND STORAGE



- Units are delivered in compact assemblies.
- The units are wrapped in a plastic film, and are placed and packed on pallets. The specific type of packaging may be agreed upon individually
- **ATTENTION: the plastic film is protected by shipping packaging to protect the chamber during transport and must not be used for long-term storage of the chamber. Changes in temperature during transport may result in water vapour condensing inside the packaging and create suitable conditions to result in corrosion of the materials used in the chambers (e.g. white corrosion on galvanised components). The transport packaging must be removed immediately upon delivery to ensure air can enter the chambers and they can dry appropriately**
- During transport and relocation, the units may only be moved by forklift or using lifting straps and corresponding safety regulations must be followed (ČSN ISO 8792). Units may only be lifted from below. When lifting by crane, use straps under the unit; for larger units, these straps require a spacer from above, or additional reinforcement at points where the strap could deform the chamber. When transporting by forklift, support the chamber along the entire width of the chamber to prevent damage to the bottom of the unit.

Permitted handling activities are illustrated below.

- Upon receipt, the unit must be inspected to ensure it has been delivered in the agreed configuration and scope, and to ensure it was not damaged during transport. If damaged during transport, the receiving party shall record the scope of such damage on the carrier's delivery note. Failure to follow this procedure may result in denial of any claim involving damage during transport.
- Units must be stored in dry, and clean covered premises, protected from rain and snow, and in which the ambient temperature does not drop below +5 °C; they must also be protected from physical damage, contamination and corrosion caused by persistent exposure to condensed water vapour on the surface of the unit.
- **ATTENTION: If the equipment is suspended during transport, a safe distance must be maintained from the load and never enter the area under a load. Keep the acceleration and speed of lifting within safety limits. Never leave the equipment suspended for longer than necessary!**



Permitted handling:

- 1) Preparation and handling using a pallet truck



Openings are provided in the frame of the units for handling. During use, pallet truck forks must remain fully under the chamber.

## 2) Preparation and handling using a forklift

Openings are provided in the frame of the chamber for handling. During use, the forklift forks must remain fully under the chamber, see the illustration.



**ATTENTION: The chamber is not evenly balanced in terms of weight. Handling activities and lift heights must be adapted appropriately!**

## 3) Chambers are transported and handled on non-returnable pallets

During use, the forks on the forklift or pallet truck must remain fully under the pallet.



**ATTENTION: The chamber is not evenly balanced in terms of weight. Handling activities and lift heights must be adapted appropriately!**

## 4) Handling with the unit using steel tubing and straps

The tubing must be passed through the round openings in the corner of the frame over the entire length, or width of the unit. The tubes must extend past the straps a minimum of 100 mm. It is best to equip the ends of the tubes with clips to prevent the straps from slipping. Use tubing 40 to 45 mm in diameter. Use tubing with a minimum wall thickness of 5 mm. The minimum clamping angle of the strap to the upper edge of the unit is 50°.

Only transport the unit in its horizontal working position.

To prevent deformation in the unit at the locations where pressure is applied by straps, ensure the straps are properly spaced above the unit or these points are protected with sufficiently rigid reinforcement.

**ATTENTION: Only suitable and permitted rigging equipment may be used for handling and transport of units!**

Comply with all valid technical regulations and legislation in the given country during handling. For example: ČSN EN 13 155+A2, ČSN ISO 12480-1.

## 6 ASSEMBLY AND INSTALLATION

### 6.1 GENERAL

- Only authorised personnel may assemble units. Personnel conducting assembly must comply with all valid technical regulations and legislation in the given country. For example: ČSN EN 45004, Act 174/68 Coll.
- Wiring and earthing of the electrical devices, electric motor and the entire electrical installation must comply in particular with ČSN 33 2190, ČSN 33 2000-4-41, ČSN 33 2000-5-51, ČSN 33 2000-5-54, and other valid regulations for the given environment to ensure safe operation.
- The unit and its accessories may only be placed into use by an authorised and trained specialised technician who is familiar with the equipment and the related hazards
- Before assembly of the unit, a check must be performed to ensure the site is prepared, along with the mains voltage, temperature and pressure of the heating medium, and the completeness and condition of all parts of the unit
- Any defects must be remedied prior to assembly of the unit
- The unit and its accessories may only be connected to 230 V / 400 V, 50 Hz mains.
- Access must be maintained to the wiring panel to which the systems are connected. Power components (circuit breakers, contactors, switches, etc.) must be clearly labelled in the wiring panel with the number of the equipment per the HVAC project!
- We recommend a representative of the assembling organisation and the user attend operator training.
- **The unit cannot perform any structural functions, such as supporting the static load of the building and related elements for the operation of the unit, or otherwise support footbridges and wiring, electrical switchboards, etc., except for any deviations permitted in consultation with Mandík, a. s. Failure to comply will void the warranty provided by Mandík, a. s.**
- Wearing protective gloves is recommended during assembly and handling of the unit.
- During handling and lifting, the units may only be moved by forklift or using lifting straps and corresponding safety regulations must be followed. The unit must not be raised and moved above personnel! See Subsection 5 HANDLING, TRANSPORT AND STORAGE
- All supports and braces delivered with the unit for transport must be removed prior to assembly
- **Total fan pressure is sized for the design external pressure losses upstream and downstream of the fan; see the technical specifications of the unit. The ductwork installation must be adapted accordingly, and without additional pressure losses that**



could result in a higher controlled working point for the fan and higher electric motor power usage.

## 6.2 GENERAL STIPULATIONS REGARDING UNIT PLACEMENT

- The minimum space for basic maintenance and service is dependent upon the width of the doors as specified in the technical specifications for the given unit, or a minimum of 600 mm
- The minimum space required for repairs and the replacement of devices is the width of the unit + 200 mm
- The minimum spacing between hot items and the unit is 200 mm.
- Units for outdoor installation must be sufficiently fastened to their base as required for the expected climactic conditions and exposure.

## 6.3 PLACING UNITS ON FLOORS

- Permitted handling of units for installation is specified in Subsection 4.
- The units must be installed on solid, level floors to which they can be rigidly fastened. It is advisable to install a dampening material (e.g. rubber, cork) under the frame of the unit at the place of installation
- The maximum permitted deviation from the horizontal is 0.5% (0.3°)
- The unit must be installed at a sufficient height above the floor / ground to provide sufficient trap height on chambers equipped with condensate drains, see the Subsection 6.6 TRAP ASSEMBLY.
- **Failure to ensure sufficient stability or levelness of the surface may degrade the functionality of the unit and even cause damage, including misalignment of the fan impeller relative to the inlet fairing, the inability to open the chamber doors, etc.!**



## 6.4 GENERAL INSTRUCTIONS FOR ASSEMBLING THE UNIT

Perform the following before installing the unit:

- Check the site of installation of the unit and the stability of all underlying surfaces: the unit is supported over its entire footprint, the unit is installed in a level position within the maximum allowed deviation, and the dampening material is installed between the unit and the underlying surface or steel structure.
- All packaging film is removed from the unit
- All additional items have been removed from the unit (cardboard boxes with accessories or control circuitry and other accessories) and placed in a secure and dry place

## 6.5 CONNECTING THE UNIT TO HVAC DUCTWORK



The unit may only be connected to square ducts using flexible elements installed on every supply / return on the unit (to prevent the transmission of vibration), or to round ducts using round ports with gaskets that are installed on every supply / return on the unit.

The HVAC ductwork must be connected without tension, i.e. so that the weight of the ductwork itself does not load the flexible element and the unit.

Flanged HVAC ductwork connections and flexible elements must be properly sealed.

Specification of the supply / return connections on the unit:

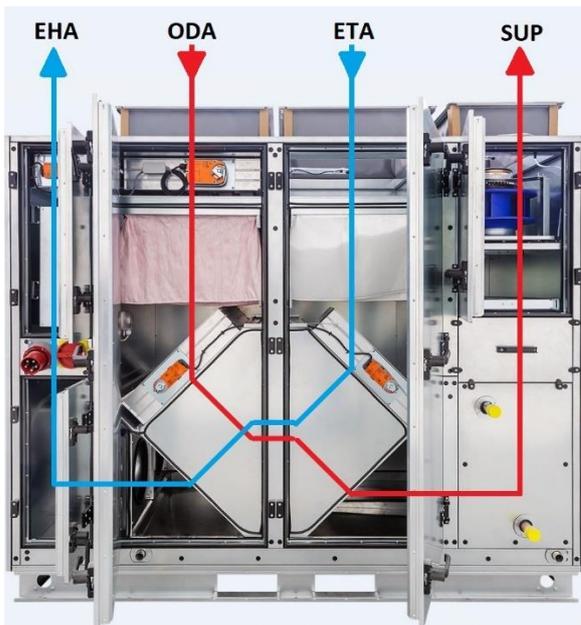


Fig. 1 outlets, right-hand design of CPV unit

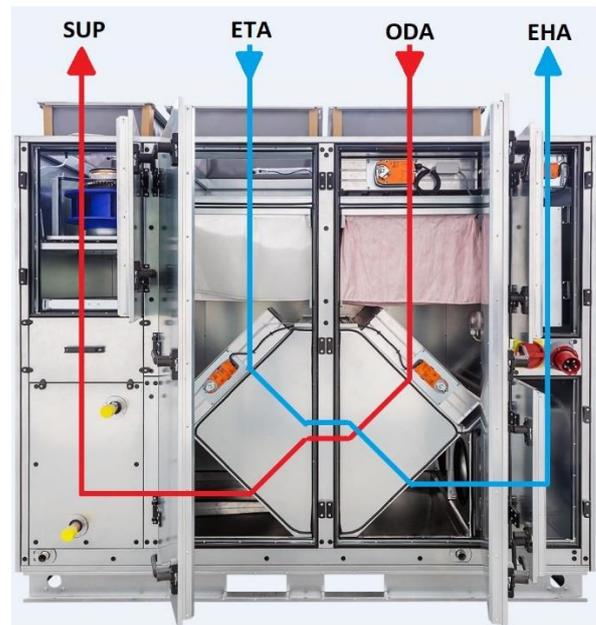


Fig 2 outlets, left-hand design of CPV unit

ODA – fresh outdoor air

SUP – supply to space

ETA – return (exhaust) from the space

EHA – exhaust air to atmosphere

## 6.6 CONDENSATE DRAIN TRAP CONNECTION



The condensate drain must be connected through a trap with a sufficient water column height to ensure flawless operation.

A trap connection under vacuum must always be filled with water prior to use and after extended shut-downs to ensure the condensate can drain freely.

Piping downstream of the trap must have an air gap and may not be directly connected to sewerage piping.

The height of the unit above the floor / ground must be adapted to the necessary height of the trap.

**When a trap is installed outdoors, the piping system must be tempered, i.e. using an electrical heating cable.**

Proper configuration of trap height per the pressure values is as follows:

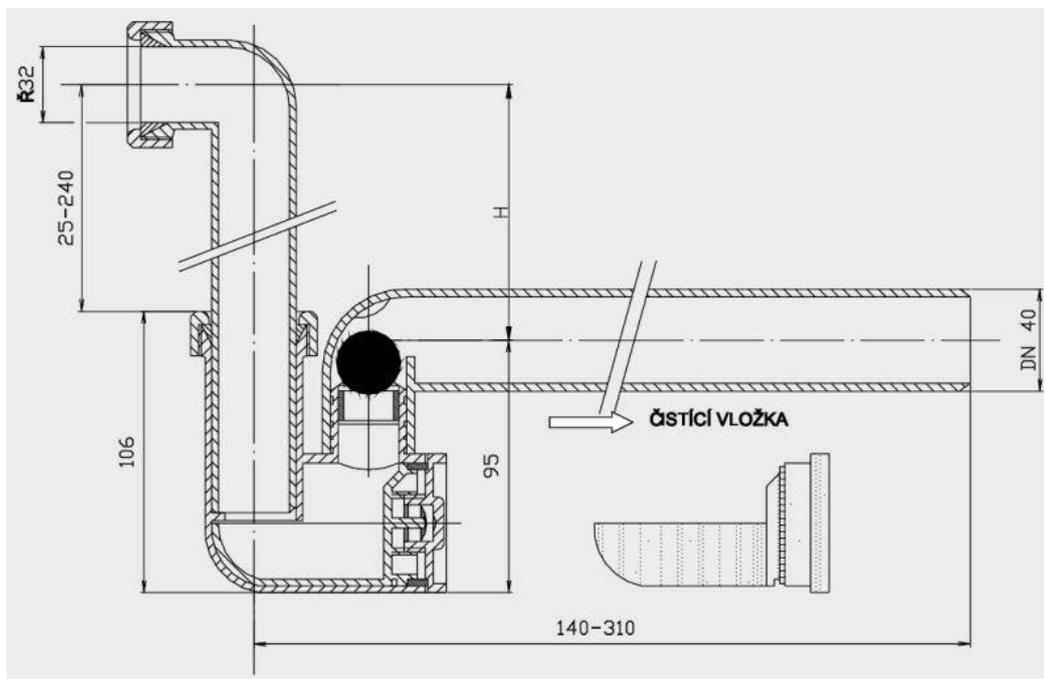


Fig. 3 Vacuum trap with ball HL136NGG

May be used at vacuum up to 2300 Pa.

$H=P/10$  (P = value of the pressure specified in the technical specifications of the unit [Pa])



Fig 4 Trap connection point

## 6.7 HOT / COLD WATER COIL CONNECTIONS



**All piping must be anchored separately from the heat exchangers. Piping systems conveying the working media may not exert pressure due to their weight of expansion forces on the**

blocks of the unit or the heat exchangers. Connections must be executed so that expansion of the piping as a result of temperature changes does not result in excessive loading of the ports.

Two wrenches must be used to tighten connections. Thread deformation is a significant risk otherwise!

A vent valve, if installed, must be located at the highest point on the hot / cold water supply line.

Always connect heat exchangers in a counter-flow configuration!

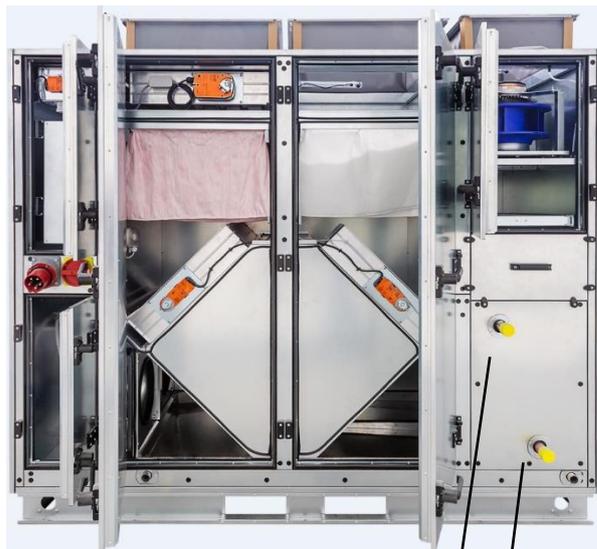


Fig 5 Right-hand unit configuration

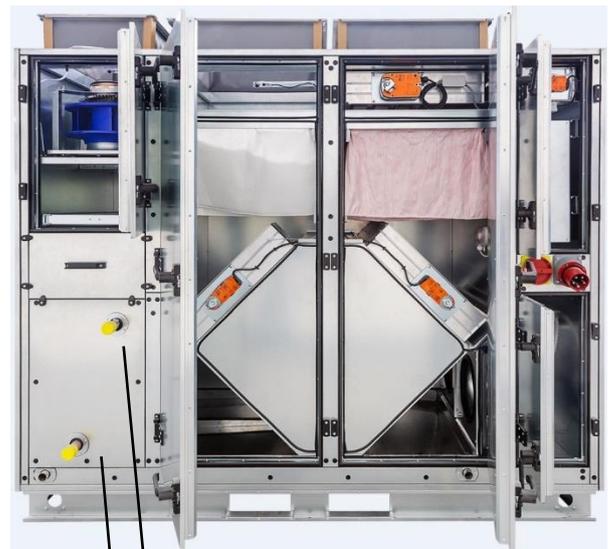


Fig 6 Left-hand unit configuration



A capillary freeze-protection thermostat is integrated into the unit, fully installed and connected to the control system from the factory.



The mixing loop for heat control, if part of delivery, is provided in a separate cardboard box.

The installation and service manual is attached to the mixing loop packaging. The manual provides detailed information on safe installation, commissioning, and maintenance.

Water supplying the heat exchangers must be treated to remove contaminants that cause fouling, especially those that corrode steel and cast iron components. The water must be chemically treated to the parameters specified in ČSN 07 7401 to prevent this contamination.

- Hydrogen exponent pH 7 - 9.
- Water hardness 1.0 mval.l<sup>-1</sup>.
- Chloride content, max. 30 mg.l<sup>-1</sup>.

Phosphate content converted to  $P_2O_5$ , min. 15 mg.l<sup>-1</sup>.

## 6.8 ELECTRICAL CONNECTIONS



**Any intervention into electrical panels or connection of the provided components may only be performed by personnel with professional qualifications under the valid legislation in the country of installation of the equipment!**



**Individual components of the unit are typically wired from the factory to the terminals of the controller and tests (fans, sensors, actuators, thermostats, manostats, electric heater, etc.).**

**It is only necessary to connect the provided peripheral devices (the POL822 room unit, Touch Panel, CO2 sensor, piping temperature sensor, control loop, etc.) All connection schematics are provided in the design documentation package for the unit, "MANDÍK Air Handler Controls".**

The mains connection for the unit is typically provided via a receptacle installed right next to the main switch. The type of receptacle is specified in the technical specifications of the unit, and the manner of installation is illustrated below.

If the unit is not equipped with a main power receptacle from the factory and a separate mains connection is required, the threaded cable gland next to the main switch is used for this purpose.

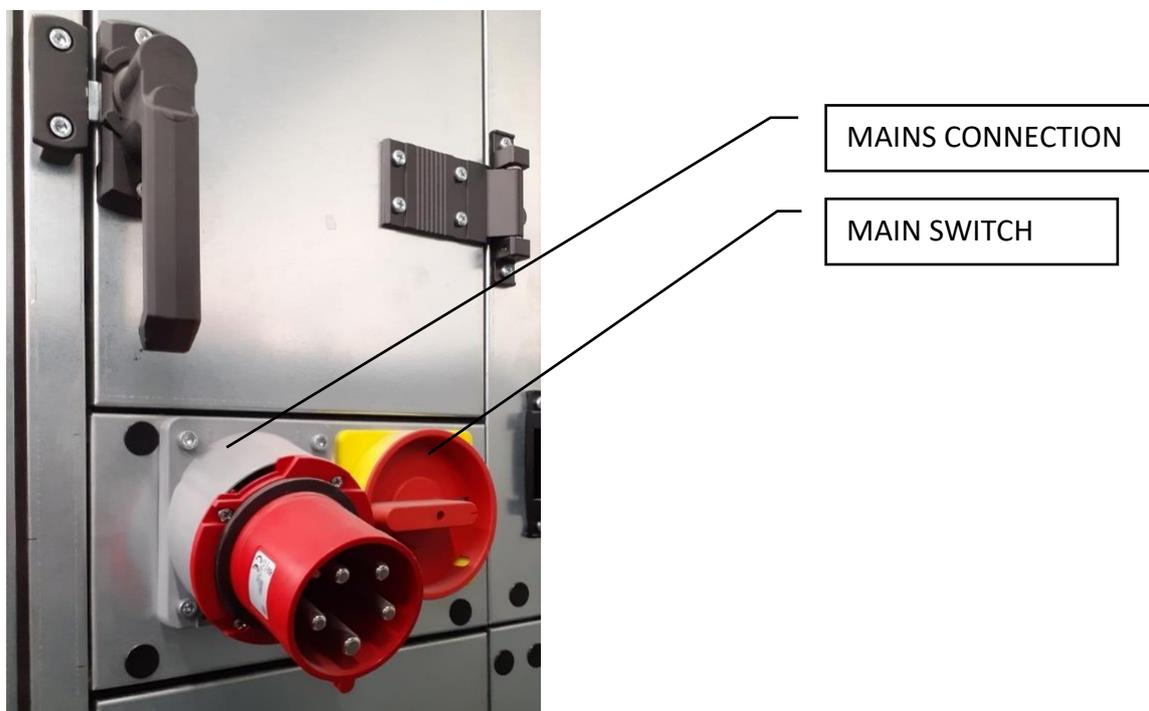


Fig 7 Main connection for the unit and main switch

The provided threaded glands located right next to the main switch are used to connect the provided peripherals to the terminal block.



**The mains connection schematic for models with a hot water coil is provided in Annex D.**

**The mains connection schematic for models with an electric heater is provided in Annex E.**

**The connection schematic for peripherals: the CO2 sensor, POL822 room unit, and exterior outdoor air temperature sensor, is provided in Annex F.**

## 7 ACTIVITIES PRIOR TO COMMISSIONING

### 7.1 GENERAL



- The unit may only be commissioned by instructed and trained personnel and with full adherence to applicable safety regulations and standards.
- Prior to commissioning, it is necessary to complete all the previous steps in the installation instructions.
- Prior to commissioning, the individual steps below must be completed and recorded in a suitable protocol that is then attached to the operating documentation and a copy of which must be sent by post to MANDÍK, a.s. or via email to our service centre at [service@mandik.cz](mailto:service@mandik.cz).
- The following paragraph with instructions may be followed step-by-step when inspecting the individual parts of the unit and which is created as a protocol and may be used as a suitable guide for the commissioning process.

## 7.2 INSPECTING THE UNIT PRIOR TO INITIAL START-UP

### LIST OF SERVICING OPERATIONS PRIOR COMMISSIONING AIR-CONDITIONING UNIT MANDÍK

Order number:	User:
Date:	Commissioning party:
Project name:	Serial number:
Address:	Position:
Date of first start-up:	

OPERATIONS FOR THE UNIT IN GENERAL					
Opera tion	Description of servicing operation	Completion of operation		Measured or set value *	Comment
		YES	NO		
1.01.	Check the seating order of the chambers within the unit acc. to the documentation.				
1.02.	Check each chamber for external or internal damage.				
1.03.	Check the seating of the unit – on the floor/ceiling acc. to installation instructions.				
1.04.	Check connecting eccentric pieces between the chambers – in the “tightened” position.				
1.05.	Check the tightness of chamber connections – visually, acc. to installation instructions.				
1.06.	Check the total tightness of the unit – visually (the door, service panels, fixed panels, etc.).				
1.07.	Check the mounting of the roof on outdoor units acc. to installation instructions.				
1.08.	Check the cleanness of the chamber interior – without foreign bodies and construction				
1.09.	Check closing of the unit – the door, service panels.				
1.10.	Check the connection of HVAC piping to the damping inserts acc. to installation				
1.11.	Check the legibility and cleanness of manufacturing and safety plates. Clean if				
1.12.					
1.13.					
1.14.					
1.15.					
1.16.					
1.17.					
1.18.					
1.19.					

OPERATIONS FOR THE UNIT IN GENERAL – ELECTRICAL AND MEASURING AND CONTROL					
Operation number	Description of servicing operation	Completion of operation		Measured or set value *	Comment
		YES	NO		
1.20.	Check the connection and condition of the main power				
1.21.	Check the connection and condition of the peripherals - external sensors, remote control				
1.22.					
1.23.					
1.24.					
1.25.					
1.26.					
1.27.					
1.28.					
1.29.					
1.30.					

SPECIAL OPERATIONS:					
Operation number	Description of servicing operation	Completion of operation		Measured or set value *	Comment
		YES	NO		
1.31.					
1.32.					
1.33.					
1.34.					

In ..... date .....

Stamp and signature of service technician

Stamp and signature of authorised representative of the facility operator

Surname and number of service technician in capital letters

Surname of the operator's authorised representative in capital letters

\* Record the value only when a value needs to be measured.

### 7.3 CONFIGURATION OF THE CONTROL SYSTEM FOR UNIT START-UP

The control system is completely installed from the factory and is pre-configured and tested for the specific configuration of the unit.



**During commissioning, it is critical to only control air output by changing the EC fan output percentage and adjusting the schedule for the "Economy" / "Comfort" modes.**

**Fan output is set by default from the factory at the rated air output of the unit.**

Make any changes to controller parameters as follows:

- 1) using the controller's web interface and a laptop computer

to simplify the process of connecting the laptop to the controller, use the Ethernet port located right next to the main switch

The IP address of the controller is 192.168.1.42

- 2) using the integrated POL871 controller, if provided.



To change parameters and as a reference for the menu in the Siemens Climatix controller, use the

“Detailed instructions for Climatix operation and commissioning”, available at:

<https://mandik.cz/product-line/air-handling-units/control-system> in the Manuals and miscellaneous section, and the Climatix operating instructions controls document.

## 8 COMMISSIONING

### 8.1 ACTIVITIES PRIOR TO INITIAL START-UP

The following must be performed prior to initial start-up:

- activities prior to commissioning per the previous paragraph 6.
- final technical audit of the electrical installation
- adjustment of the fan speed per the values in the technical specifications of the unit

The following must be checked prior to initial start-up of the unit:

### 8.2 ACTIVITIES DURING INITIAL START-UP



**The fans must not be started with the shut-off dampers in the unit or the control dampers in the ductwork closed. Avoid a pressure surge caused by testing the functions of fire and other quick-closing dampers.**

**The initial test operation of the unit should be less than 30 minutes. The unit and all its sections must then be subjected to a thorough inspection.**

**After initial start-up, clean all the inlet filters or replace with new filters.**

The following are checked during initial start-up:

The unit in general:

- Listen for any unusual mechanical sounds
- Check for excessive vibration from the unit
- Seals for the unit's chambers and the seals on all additional penetrations through the housing of the unit
- The fresh air (ODA) and exhaust (EHA) dampers are open

Hot water coil:

- Leaks in the water system connections to the heat exchanger

Electric heater:

- The airflow velocity must not drop below 1 m/s.

Cold water coil

- Leaks in the water system connections to the heat exchanger

Direct cooler

- Leaks in the water system connections to the heat exchanger

Plate-type recovery heat exchanger:

- Proper operation (opening) of the by-pass damper per the recuperator output set point
- Proper operation of the condensate drain trap (height, filling with water)

### 8.3 INITIAL PLACEMENT OF THE UNIT INTO SERVICE



**Once all the previous points are complete (assembly and installation, activities prior to initial start-up, etc.), the unit may be placed into test operation:**

- 1) Connect power - connect the power cord to the receptacle
- 2) Activate the unit at the service switch by rotating to the “1” position
- 3) Starting the unit:
  - see Annex B. QUICK STARTING THE UNIT - WEB / POL871 HMI CONTROLLER
  - see Annex C. QUICK STARTING THE UNIT - POL822 ROOM UNIT
- 4) Controlling air output – see paragraph 8.4
- 5) Schedule settings – see the instructions:  
“Detailed instructions for Climatix operation and commissioning”, available at:  
<https://mandik.cz/product-line/air-handling-units/control-system> in the Manuals and miscellaneous section, and the Climatix operating instructions controls document.

### 8.4 CONTROLLING AIR OUTPUT FROM THE UNIT

During initial start-up and after completing the activities in the previous paragraph 8.3, the air output of the unit must be checked per requirements or the speed must be adjusted using the EC fan controller.



**Quick supply / return fan output settings are provided in Annex A. QUICK FAN ADJUSTMENT - WEB / POL871 HMI CONTROLLER**

**Placing the unit into service (operating mode) is specified in Annex B. QUICK STARTING THE UNIT - POL871 HMI CONTROLLER**

or

**Placing the unit into service (operating mode) is specified in Annex C. QUICK STARTING THE UNIT - POL822 ROOM UNIT**

The unit is equipped with test ports, as illustrated below, for measuring fan air output or differential pressure.

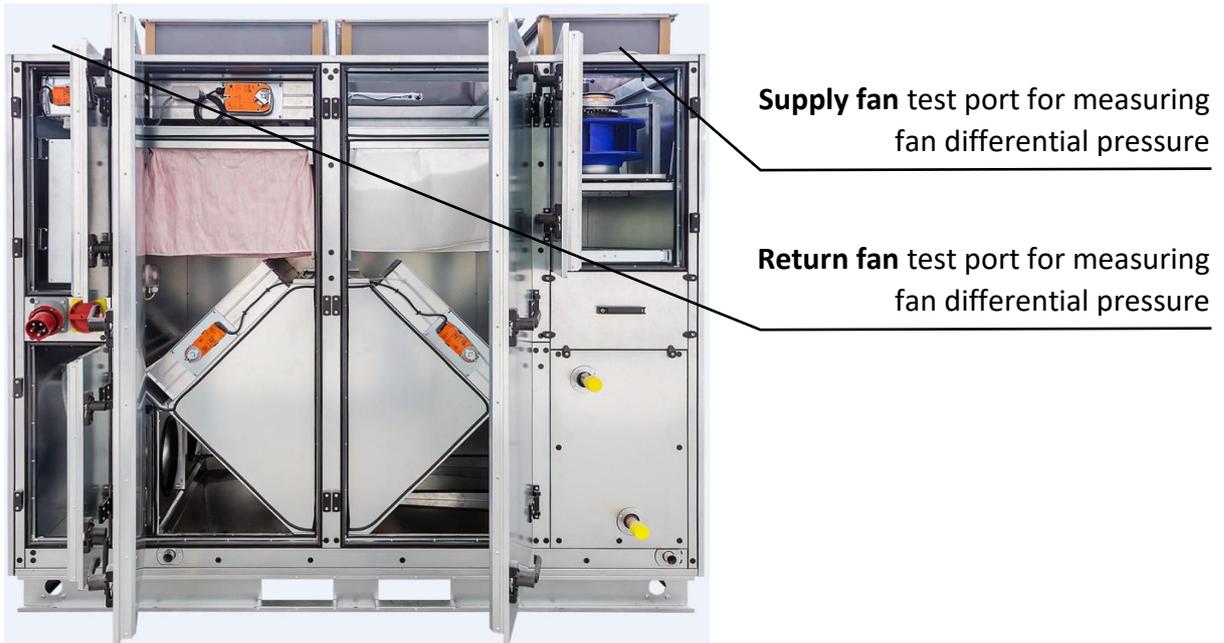


Fig 8 Right-hand unit configuration (the fan test ports are opposite for left-hand unit configuration)

Once differential pressure is measured [Pa], air output  $[m^3/h]$  is calculated using the k-factor for the given fan and the equations specified in the fan sticker.

Air output may also be calculated as follows:

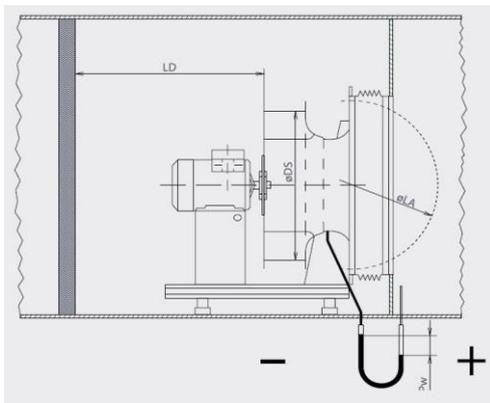


Fig 10 Measurement instrument connection.

Fan type:	Dsa:	K faktor:
[-]	[mm]	[-]
25	257	60
28	286	75
31	320	95
35	360	121
40	406	154
45	457	197
50	514	252

Fig 9 K-factors for open fan impellers Applies for an air density of 1.2 kg/m3

$$\dot{V} = k \cdot \sqrt{\Delta p_w} \quad \text{Equation for calculating air output } [m^3/h].$$

$k$  = k-factor (table above),  $\Delta p_w$  = measured pressure differential [Pa]

Fan speed is adjusted by changing fan output [%] to correct for any deviations between the measured air output and the air output set point specified by the project (technical specifications). Increased output = increased air output and vice versa.

All dampers must be in the maximum open position when changing settings.



**If the required air output cannot be achieved, this indicates an inspection of the unit (internal clogging, foreign local pressure resistances) or ductwork (foreign local pressure resistances, design external pressure loss does not match the actually installed ductwork), etc. is required.**

**An entry on the changes to unit settings must be recorded in the corresponding protocol.**

**The measured values are considered suitable if the deviation between the measured values and the values in the technical specifications of the unit do not exceed +-10%.**

**Changes to air output must be conducted per the pressure conditions specified in the project or by the type of operation inside the conditioned space: equalized pressure, positive-pressure or negative-pressure ventilation.**

The control protocol must specify the following information:

- Identification of the equipment (order number, serial number, position in the project)
- Details as to the person making control changes, including their signature and stamp
- Nominal parameters of the equipment (air output, fan motor current ratings – nameplate values)
- Measuring instruments in use
- Functional schematic of the equipment, including a schematic of the ductwork with dimensions and specification of components (inserted elements – attenuators, filters, etc., control dampers, tees, elbows, etc.)
- A list and the values of measurement points
- Schedule of the control process (start-up of the unit and shut-down of the unit)
- Climactic conditions during operation of the unit (initial and final temperatures and humidity of the supply and return air)
- A record of operation and the status of individual parts of the unit specified in subsection 7.1
- A record of any identified defects
- A record from evaluation testing (results, date, etc.)
- A table of measured and set values for the individual fans (air output, currents, etc.)

## 8.5 OPERATOR TRAINING AND HANDOVER OF THE UNIT

The following steps must be performed during training:

- User training for operation and maintenance of the unit

- Completion of a training record. A copy shall be sent by post to MANDÍK, a.s. or via email to the service department at [service@mandik.cz](mailto:service@mandik.cz)
- Training for operating and configuration of user parameters of the Climatix control system controller
- Completion of a control system training record. A copy shall be sent by post to MANDÍK, a.s. or via email to the service department at [service@mandik.cz](mailto:service@mandik.cz)
- Completion of a record of unit configuration. A copy shall be sent by post to MANDÍK, a.s. or via email to the service department at [service@mandik.cz](mailto:service@mandik.cz)
- Handover of the unit to the user
- Completion of a record of handover of the unit to the user. A copy shall be sent by post to MANDÍK, a.s. or via email to the service department at [service@mandik.cz](mailto:service@mandik.cz)
- Establishment of an operating log book for the equipment
- Handover of documentation to the user (instructions from the manufacturer, technical audit of the electrical installation, training protocol for operation and maintenance, training protocol for the control system, handover protocol for the unit, and unit control protocol).

## 9 OPEATION AND MAINTENANCE

### 9.1 DESCRIPTION OF THE UNIT – COMPONENTS

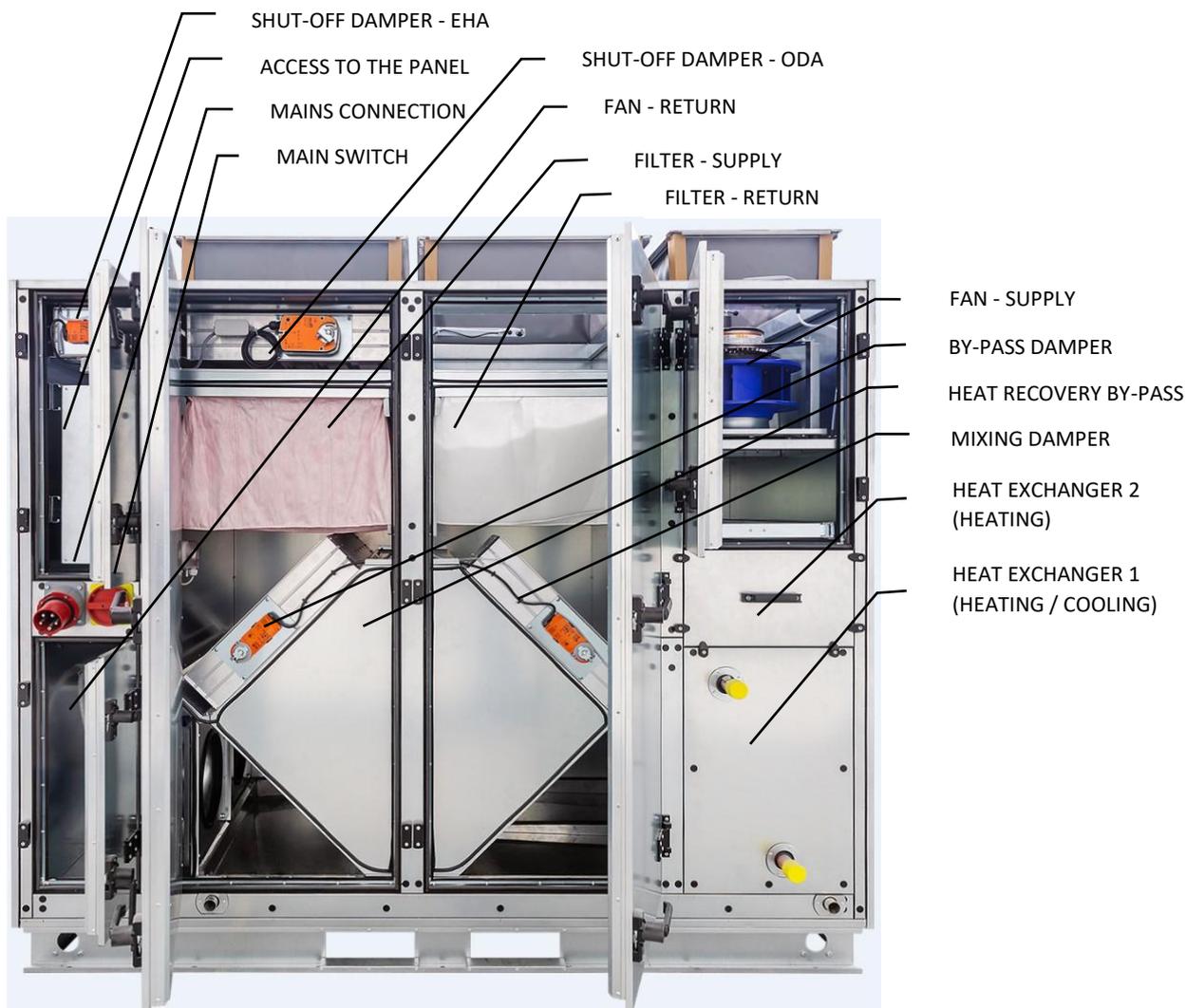


Fig 11 Components, right-hand unit design

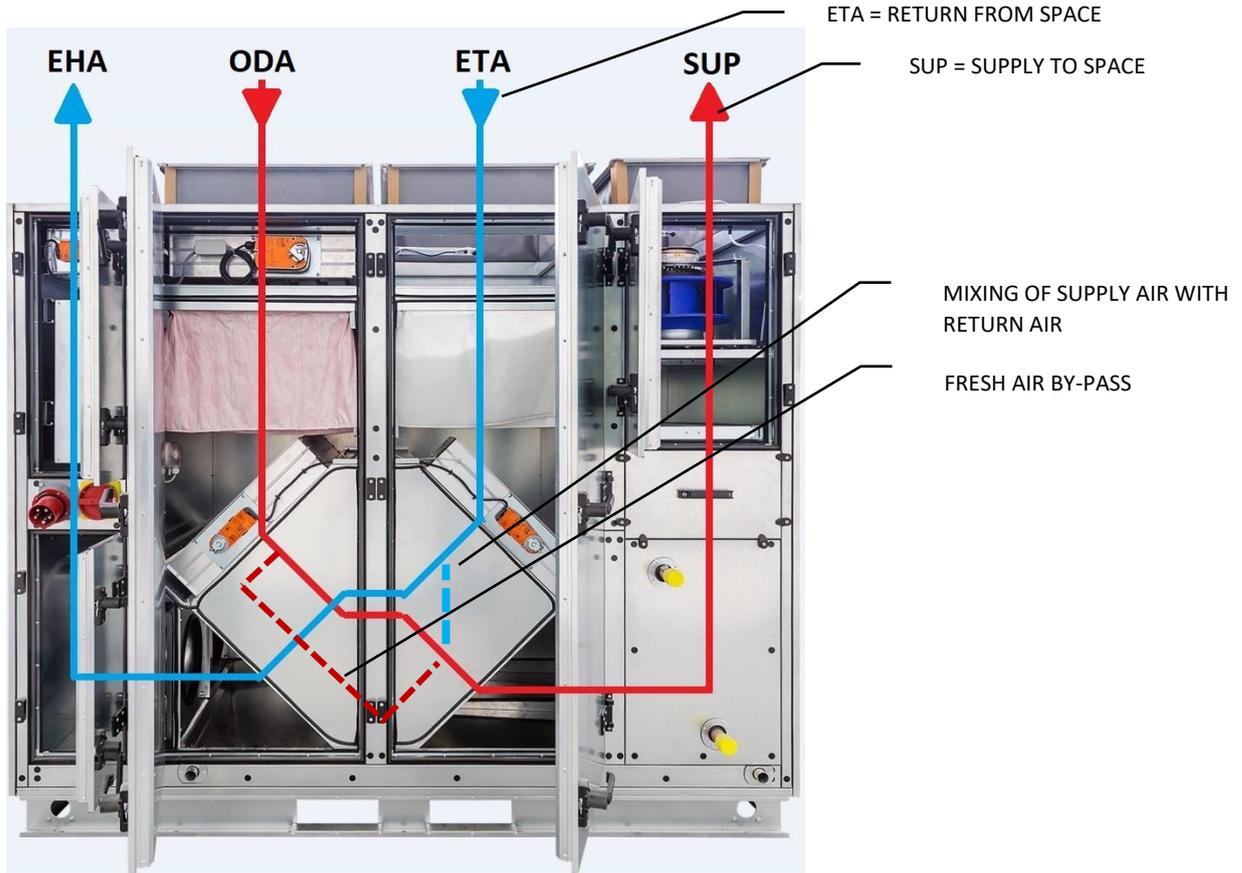
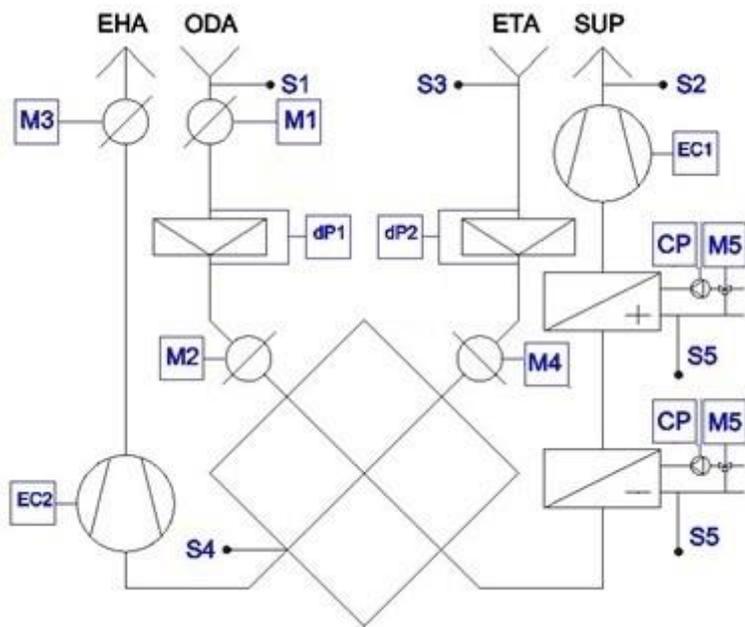


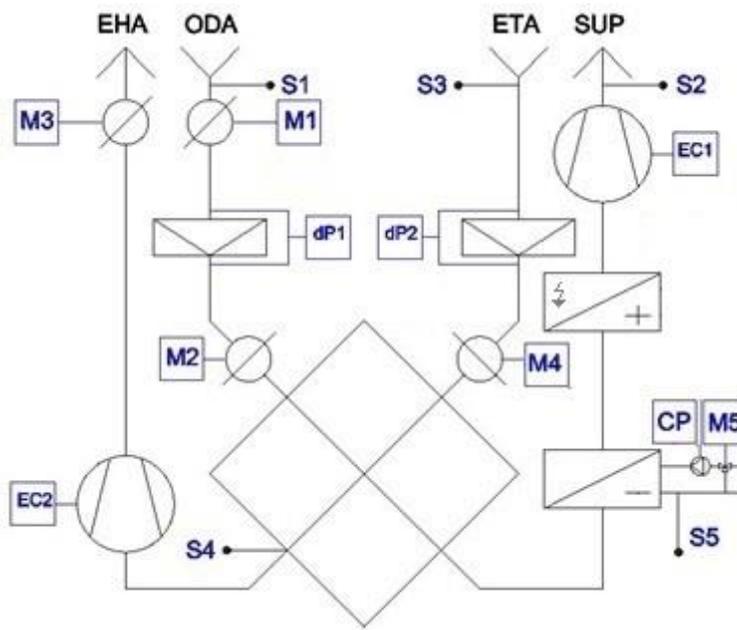
Fig 12 Airflow, right-hand unit design

## 9.2 DESCRIPTION OF THE UNIT – CONTROL SYSTEM



- EC1/EC2 – supply / return EC fan
- M1 – supply damper actuator
- M2 – by-pass damper actuator
- M3 – return damper actuator
- M4 – mixing damper actuator
- M5 – actuator on the 3-way mixing valve serving the hot/cold water coil
- dP1 – differential pressure switch on supply filters
- dP2- differential pressure switch on return filters
- S1 – outdoor air temperature sensor
- S2 – supply air temperature sensor
- S3 – return air temperature sensor
- S4 – freeze-protection temperature sensor on recuperator
- S5 – hot/cold water coil return water temperature sensor
- CP – hot/cold water coil circulating pump

Fig 13 Control system, configuration with hot water coil and mixing, right-hand unit design



EC1/EC2 – supply / return EC fan  
M1 – supply damper actuator  
M2 – by-pass damper actuator  
M3 – return damper actuator  
M4 – mixing damper actuator  
M5 – actuator on the 3-way mixing valve serving the cold water coil  
dP1 – differential pressure switch on supply filters  
dP2- differential pressure switch on return filters  
S1 – outdoor air temperature sensor  
S2 – supply air temperature sensor  
S3 – return air temperature sensor  
S4 – freeze-protection temperature sensor on recuperator  
S5 –cold water coil return water temperature sensor  
CP –cold water coil circulating pump

Fig 14 Control system, configuration with electric heater and mixing, right-hand unit design

### 9.3 GENERAL OPERATION AND MAINTENANCE



The following defined maintenance and service intervals for the individual parts of the unit must be followed to preserve the warranty provided by the manufacturer, MANDÍK, a.s., and to ensure flawless and safe operation of the unit.

These intervals are specified for standard units in normal operating conditions. For units operated differently (24/7 operation, higher working temperatures, high dust operations, etc.), these maintenance and service intervals must be shortened by a minimum of one level below. Everything is dependent upon the operating conditions based on which the intervals are defined during commissioning, training and handover of the unit.

**Any performed service work, maintenance and technical audits must be recorded in the operating log book for the unit. The person who places the unit into service is responsible for creating and maintaining the operating log book. The operator of the unit then records the individual events.**



#### SAFETY DURING MAINTENANCE:

- **ATTENTION:** ANY WORK, MAINTENANCE AND INTERFERENCE INTO THE EQUIPMENT MAY ONLY BE PERFORMED BY PERSONNEL QUALIFIED WITH APPLICABLE AUTHORISATIONS (E.G. GAS INSTALLATIONS, ELECTRICAL INSTALLATIONS, ETC.)!
- **ATTENTION:** SERVICE WORK AND MAINTENANCE ON THE EQUIPMENT MAY ONLY BE PERFORMED WITH THE EQUIPMENT SWITCHED OFF (IT MUST BE LOCKED OUT TO PREVENT ACCIDENTAL START-UP OR START-UP BY ANOTHER PERSON)!

**ATTENTION:** ALL ROTATING PARTS (FANS, ETC.) MUST HAVE STOPPED MOVING BEFORE ENTERING INTO THE EQUIPMENT!

- **ATTENTION:** ELECTRIC HEATERS, HEAT EXCHANGERS AND HYDRAULIC SYSTEM COMPONENTS MUST BE COOLED DOWN TO AMBIENT TEMPERATURE, MEANING A MAXIMUM SURFACE TEMPERATURE OF +40°C!
- **ATTENTION:** PRESSURE IN ALL PRESSURISED SYSTEMS MUST BE EQUALISED TO THE AMBIENT PRESSURE!

## 9.4 MAINTENANCE AND SERVICE INTERVALS

Detailed operating instructions and maintenance and service procedures are provided in the following paragraphs 9.5 and the individual parts of the unit.

SERVICING AND MAINTENANCE OPERATIONS							
	Check operation	Unit in operation Y/N *	Service/rectification method	Intervals (months)			
				1	3	6	12
<b>1. UNIT IN GENERAL</b>							
1.01.	Overall check of cleaning, damage and corrosion on all components of the unit (outside/inside).	N	cleaning and repair		✓		
1.02.	Overall check of the tightness of the doors, service and fixed panels on all components of the unit.	Y	repair			✓	
1.03.	Check the tightness of the connections of HVAC ducts and the condition of the damping inserts.	Y	repair			✓	
1.04.	Check the unit for excessive vibrations.	Y	repair	✓			
1.05.	Check the air output of the unit (when the unit and filters are clean inside).	Y	measuring				✓
1.06.							
1.07.							

\* status of unit operation while performing the checks

SERVICING AND MAINTENANCE OPERATIONS							
	Check operation	Unit in operation Y/N *	Service/rectification method	Intervals (months)			
				1	3	6	12
<b>2. FILTERS G2-F9, GREASE</b>							
2.01.	Check the filter pressure losses.	Y	value from the measuring and control system	✓			
2.02.	Check the integrity of the filtration medium of the filter elements.	N	replacement		✓		
2.03.	Check the integrity of the filter holder sealing profiles and the seal between the filter elements.	N	repair			✓	
2.04.	Check the setting and function of the differential pressure gauge (switches, digital, sloping tube).	Y	repositioning/replacement		✓		
2.05.	Check the fitting of pressure probes for measuring filter differential pressure.	N	repair	✓			

\* status of unit operation while performing the checks

SERVICING AND MAINTENANCE OPERATIONS							
	Check operation	Unit in operation Y/N *	Service/rectification method	Intervals (months)			
				1	3	6	12
<b>3. FANS WITH FREE IMPELLERS</b>							
3.01.	Check the cleanness and condition of the impeller and the chamber inside.	N	cleaning			✓	
3.02.	Check the impeller for free rotation.	N	repair			✓	
3.03.	Tighten the cables in the electric motor terminal board.	N	repair			✓	
3.04.	Check the assembly for excessive vibrations – the assembly must not show any visible vibrations.	Y	repair	✓			
3.05.							
3.06.							

\* status of unit operation while performing the checks

SERVICING AND MAINTENANCE OPERATIONS							
	Check operation	Unit in operation Y/N *	Service/rectification method	Intervals (months)			
				1	3	6	12
<b>4. WATER HEATER</b>							
4.01.	Check the integrity of the exchanger heat-transfer surface.	N	repair/replacement			✓	
4.02.	Check the cleanness of the exchanger heat-transfer surface.	N	cleaning			✓	
4.03.	Check the tightness of the exchanger on the side of working fluid.	N	repair			✓	
4.04.	Check the function of the exchanger anti-freeze protection (always prior a heating season).	N	repair/measuring and control system			✓	
4.05.	Check the condition of connection of the exchanger hydraulic circuit.	N	repair			✓	
4.06.	Check the condition and function of the mixing device according to the manufacturer's instructions.	N	repair			✓	

\* status of unit operation while performing the checks

SERVICING AND MAINTENANCE OPERATIONS							
	Check operation	Unit in operation Y/N *	Service/rectification method	Intervals (months)			
				1	3	6	12
<b>5. ELECTRIC HEATER</b>							
5.01.	Check the heating rods for damage.	N	replacement			✓	
5.02.	Check the cleanness of the terminal board.	N	cleaning			✓	
5.03.	Check the heating rods for cleanness.	N	cleaning			✓	
5.04.	Check the condition of the wiring of the heating rods and protection (condition and tightening of the cables, etc.).	N	repair			✓	
5.05.	Check the function of the operating and safety thermostats.	N	value from the measuring and control system			✓	

\* status of unit operation while performing the checks

<b>6. COLD WATER COIL</b>							
6.01.	Inspection for damage to heat exchange surfaces on the heat exchanger.	N	repair / replace			✓	
6.02.	Inspection for cleanliness of heat exchange surfaces on the heat exchanger.	N	clean			✓	
6.03.	Inspection for leaks on the working media side of the coil.	N	repair			✓	
6.04.	Inspection of the condition and cleanliness of the condensate drip eliminator	N	repair / clean			✓	
6.05.	Inspection of hydraulic system connections to the coil.	N	repair			✓	
6.06.	Inspection of the condition and function of the mixing loop per the manufacturer's instructions.	N	repair			✓	
6.07.	Inspection of the cleanliness and continuity of the condensate drain.	N	clean / repair			✓	
6.08.	Inspection of the status and pouring water in the condensate drain trap	N	repair			✓	

\* unit in operation when performing this inspection

MAINTENANCE AND SERVICE ACTIVITIES							
	Inspection action	Unit in operation Y/N *	Method of service / removal	Intervals (months)			
				1	3	6	12
<b>7. EVAPORATOR</b>							
7.01.	Inspection for damage to heat exchange surfaces on the heat exchanger.	N	repair / replace			✓	
7.02.	Inspection for cleanliness of heat exchange surfaces on the heat exchanger.	N	clean			✓	
7.03.	Inspection of the condition and cleanliness of the condensate drip eliminator	N	repair / clean			✓	
7.04.	Comprehensive inspection of the condition and function of the refrigeration circuit (leaks, expansion valve, condenser unit, refrigerant level, etc.) to be conducted by a qualified refrigeration technician certified for work with refrigerants	N	repair / replace				✓
7.05.	Inspection of the cleanliness and continuity of the condensate drain.	N	clean / repair			✓	
7.06.	Inspection of the status and pouring water in the condensate drain trap	N	repair			✓	

\* unit in operation when performing this inspection

	Inspection action	Unit in operation Y/N *	Method of service / removal	Intervals (months)			
				1	3	6	12
<b>8. PLATE RECUPERATOR</b>							
8.01.	Inspection for damage to heat exchange surfaces on the heat exchanger.	N	repair / replace			✓	
8.02.	Inspection for cleanliness of heat exchange surfaces on the heat exchanger.	N	clean			✓	
8.03.	Inspection for free rotation of the by-pass / mixing dampers.	N	repair / replace			✓	
8.04.	Inspection for damper fouling.	N	clean			✓	
8.05.	Inspection of the condition and cleanliness of the condensate drip eliminator	N	repair / clean			✓	
8.06.	Inspection of the cleanliness and continuity of the condensate drain.	N	clean / repair			✓	
8.07.	Inspection of the status and pouring water in the condensate drain trap	N	repair			✓	

\* unit in operation when performing this inspection

MAINTENANCE AND SERVICE ACTIVITIES							
	Inspection action	Unit in operation Y/N*	Method of service / removal	Intervals (months)			
				1	3	6	12
<b>9. TERMINAL DAMPERS</b>							
9.01.	Inspection for free rotation of dampers.	N	repair / replace			✓	
9.02.	Inspection for damper fouling.	N	clean			✓	

\* unit in operation when performing this inspection

## 9.5 GENERAL OPERATION AND MAINTENANCE OF THE UNIT



**Anyone conducting maintenance on air handling units must be familiar with the maintenance instructions and adhere to the recommendations specified therein. These instructions are an additional source of information and anticipate knowledge of the rules of assembly and operation for CPV class air handling units from MANDÍK, a.s. and adherence to all the requirements specified therein. The manufacturer assumes no liability for any damage caused by the failure to adhere to such rules of assembly and operation and these instructions.**

Air handling units are used to condition and convey air and require regular cleaning and maintenance. Based on the scope and intended use of HVAC equipment, and the components, composition and the features of the air handler itself, we recommend operators draft local operating and maintenance regulations that fully comply with the requirements of the rules of assembly and operation and instructions for the maintenance of CPV class air handling units from MANDÍK, a.s.

Any maintenance intervals specified below are indicative only and valid for air containing normal quantities of individual pollutants. These intervals may be extended or shortened, depending on local operating conditions, the nature of the equipment, and the pollutants contained in the conveyed air. These intervals do not relieve the operator of its obligation to ensure the flawless and safe operation of the air handler on a day-to-day basis.

All elements which, by their nature, are intended to be extended, opened or easily dismantled must be positioned so that the interior of the unit can be cleaned as thoroughly as possible. Use a vacuum to remove coarse dirt and debris, or use a damp rag if necessary. Use a neutral cleaning product to remove any grease and then again wipe down the surface with a damp rag. Properly treat and repair any damage to painted surfaces or surface corrosion with a suitable coating. Moving parts (hinges, door handles, etc.) must be lubricated with a lubricating spray as needed. All inspection doors must be properly installed and checked to ensure they open freely. Per the conditions for placement of the unit, a door may need to be levelled by adjusting play on the fasteners on the handles and hinges. Check for proper mating of doors to the gasket surfaces. Door gaskets must be inspected and then repaired or replaced if they leak.

## 9.6 FANS



**Before any intervention or work on the fans, wait for the fan impeller to completely stop. They must then be locked out to prevent accidental start-up of the fan by another person! The safety switch on the front or side of the unit (depending on the specific layout of the unit itself) is designed for this purpose.**

Check the fan impeller to ensure it is clean and vacuum up any coarse dirt and debris as necessary, and then wipe up any fine dust using a damp rag.

Keeping the fan impeller clean is extremely important, especially in terms of ensuring the entire assembly remains as balanced as possible. Properly treat and repair any damage to painted surfaces or surface corrosion with a suitable coating.

Regularly inspect for an imbalance (vibrations) and the mounting of the impeller to the hub and the hub to the shaft of the electric motor. Then check the width of the gap between the open impeller and the suction inlet on the fan and tighten all fasteners on the motor and fan assembly. Check the electric motor for vibration, bearing noise, potential overheating, the torque tightness of terminals at the terminal blocks and the integrity of the conductive bonding to the frame of the chamber.

Check the phase voltage and symmetry and measure motor current during maintenance. Repair any damaged surfaces. Check for proper mounting of the electric motor to the base and all the fasteners on the fan assembly base.

## 9.7 FILTERS



**Dust captured in filter elements may cause allergic reactions if they come into contact with skin, the mucus membranes, or eyes, and may cause difficulty breathing. Avoid contact with such captured dust. Wear protective footwear during maintenance work and when replacing filter elements, as well as other protective equipment as needed (respirator mask, etc.)!**

Check the filter section to ensure it is clean and vacuum up any coarse dirt and debris as necessary, and then wipe up any fine dust using a damp rag. Then check the condition and seal around all filter elements. During filter replacement, it is necessary to avoid contaminating other parts of the unit or new filter elements with dust.

- Bag and frame filters

Per the class of filtration of the used filters and their replacement interval, it is necessary to ensure a complete set of replacement filters is kept on-hand and ensure that their maximum storage period has not been exceeded. We recommend defining a filter replacement interval based on observations during test operation of the unit. This interval may depend on local conditions and may be shorter or longer than the regular maintenance interval. In no case should the maximum allowed terminal pressure loss for the specific type of filter elements in use, or the 12-month filter replacement interval, be exceeded. All filters are changed at the same time.

A different differential pressure value may be set manually on the switching manostat for the given supply / return filter bank. The manostats are located beneath the filters on the side of the chamber, see the following illustration.

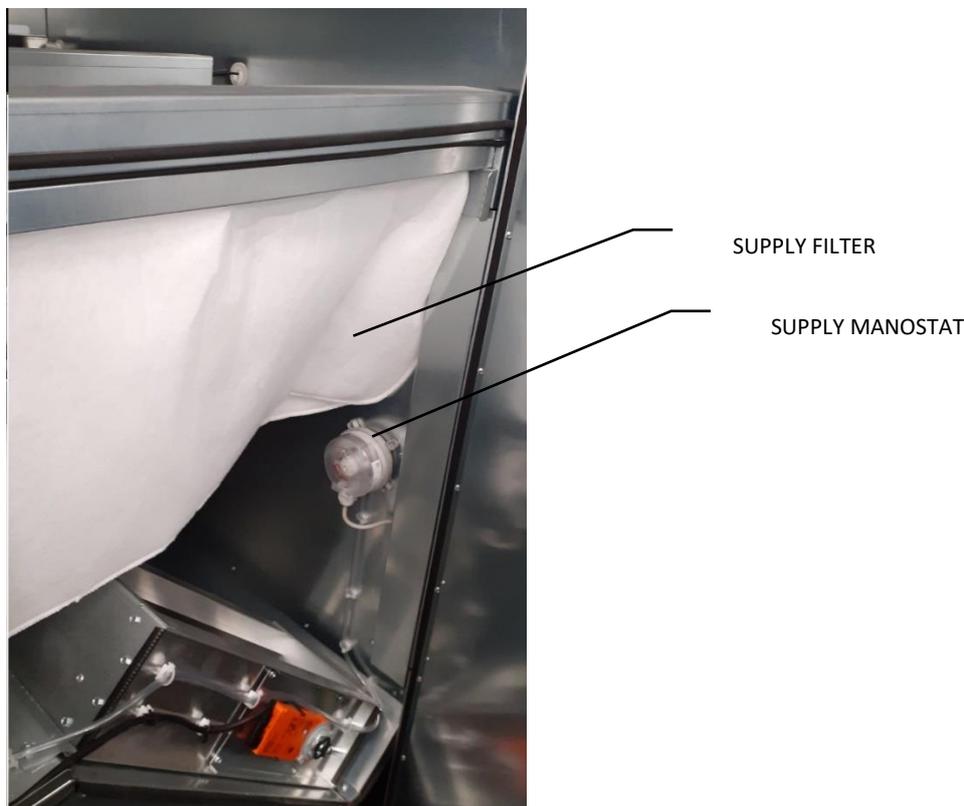


Fig 15 Manostat placement, right-hand design of CPV unit

#### Recommended filter pressure loss limits:

- The values are shown in the technical specifications for the unit based on the selected filtration class and filter type

## 9.8 DAMPERS, FLEXIBLE ELEMENTS



**Operable damper blades must be locked to prevent spontaneous or accidental closure. Never put your fingers between the blades of an open damper as this is a serious injury hazard!**

Check for dirt and grime, and any damage, and inspect the movement of the damper blades, and the proper closure of the damper in particular. Vacuum up any dust and then wipe down the surfaces of the damper blades using a damp rag. The plastic gears on dampers are manufactured from a material that does not require subsequent lubrication. Use a lubricating spray on the lever mechanism on those dampers with lubricated lever mechanisms. If a flexible cuff is installed downstream of the damper, inspect it to ensure a proper seal and its integrity, or clean if needed.

## 9.9 HOT WATER COIL, COLD WATER COIL



**The surface temperature of the hot water coil and media conditions when in use may exceed a safe contact temperature of 60°C. Before intervening or beginning any work in the chamber, wait for the heat exchanger and connections to cool sufficiently.**

**Contact between bare skin and the heat transfer medium must be avoided when filling, draining, and venting heat exchangers. When using additives or complete finished mixtures for heating or cooling systems, follow all information provided by their manufacturers for the use and handling of such substances.**

Check heat exchangers for contamination, leaks and any damage. Remove any contaminants by blowing down with compressed air or steam. In any case, ensure that the fins of the heat exchanger are not damaged. and therefore high-pressure compressed air equipment should not be used for such work.

Regularly check the connecting pipe for leaks and the functionality of all venting valves. Independently of the defined maintenance intervals, and always before colder periods of the year, check the functionality of all freeze protection devices, including a check of the antifreeze solution concentration. Drain all the medium from cold water coils before winter and from all heat exchangers prior to extended shut-downs (if not filled with an antifreeze solution of a sufficient concentration). Draining of the medium does not guarantee that all liquid has been drained from the heat exchanger and the heat exchanger must always be purged subsequently using compressed air!

For cold water coils, also check the condition and operation of all condensate pans, the functionality of the pan drains and the condition and functionality of the trap, and then clean and fill with water as needed. Before winter, check the functionality of all freeze protection measures for the condensate drain (if operated during winter and there is the potential for them to freeze). Check for any deposits or other settled materials, and the condition and cleanliness of the drip eliminator, which is to be removed and cleaned as needed.

## 9.10 CONDENSER COIL, DIRECT EVAPORATOR COIL



**The surface temperature of the hot water coil and media conditions when in use may exceed a safe contact temperature of 60°C. Before intervening or beginning any work in the chamber, wait for the heat exchanger and connections to cool sufficiently!**

**Prevent contact between skin, the mucus membranes or eyes and the refrigerant when performing any work on refrigeration systems. Use personal protective equipment and breathing devices provided at the entrance to the mechanical room if a refrigerant leak is detected. The refrigerant or compressor oil may be toxic or cause an allergic reaction. Air and refrigerant may form an explosive mixture, and refrigerant components may be heavier than air and displace oxygen in areas occupied by personnel. Always follow the instructions provided in the material safety data sheets for these substances!**



**Service activities involving refrigerant circuits, such as topping up or replacing refrigerant, replacing components in circuits (filter/dehydrators, expansion valves, pressure sensors, etc.)**

**may only be conducted by qualified refrigeration technicians certified for work with refrigerants and per the instructions of the condenser unit's manufacturer.**

Check heat exchangers for contamination, leaks and any damage. Remove any contaminants by blowing down with compressed air or steam. In any case, ensure that the fins of the heat exchanger are not damaged. and therefore high-pressure compressed air equipment should not be used for such work. Regularly check the circuit for leaks.

For cold water coils, also check the condition and operation of all condensate pans, the functionality of the pan drains and the condition and functionality of the trap, and then clean and fill with water as needed. Before winter, check the functionality of all freeze protection measures for the condensate drain (if operated during winter and there is the potential for them to freeze). Check for any deposits or other settled materials, and the condition and cleanliness of the drip eliminator, which is to be removed and cleaned as needed.

For direct evaporators, check for any freezing of the heat exchanger itself while cooling.

Comply with all applicable environmental protection regulations when disposing of refrigerants and compressor oil.

## 9.11 PLATE RECUPERATOR



**Operable damper blades must be locked to prevent spontaneous or accidental closure. Never put your fingers between the blades of an open damper as this is a serious injury hazard!**

Check the condition of the recuperator and for contamination, check the functionality of the dampers, and condensate drain.

Blow down the recuperator with compressed air, steam or a hot water pressure washer to clean. Ensure that the fins of the heat exchanger are not deformed or damaged by this process.

Check for contamination and damage and the movement of the damper blades. Vacuum up any dirt deposits. Then clean the surfaces of the damper blades using a damp rag. The plastic gears on dampers are manufactured from a material that does not require subsequent lubrication. Use a lubricating spray on the lever mechanism on those dampers with lubricated lever mechanisms.

Check the condition and operation of all condensate pans, the functionality of the pan drains and the condition and functionality of the trap, and then clean and fill with water as needed. Before winter, check the functionality of all freeze protection measures for the condensate drain (if there is the potential for them to freeze).

## 9.12 ELECTRIC HEATER

The heating unit contains a heat exchanger with resistor elements, an operating thermostat set to a fixed value of +50°C and alarm thermostat set to +80°C. The resistor rods are already wired from the factory and are connected to the terminal blocks with the thermostats. The terminal block is mounted to the heat exchanger on the operator's side.

Airflow of 1 m/s must be maintained at a minimum at all times for electric heaters under all operating conditions and modes to ensure the heat from the heating elements is dissipated.

The electric heat exchanger is sized for 3~400 V / 50 Hz mains and may contain multiple sections.



**The surface temperature of the heating rods under operating conditions significantly exceeds the safe contact temperature of 60°C. Allow a sufficient amount of time to enable the heating rods to cool before starting any work or activities on the heaters!**

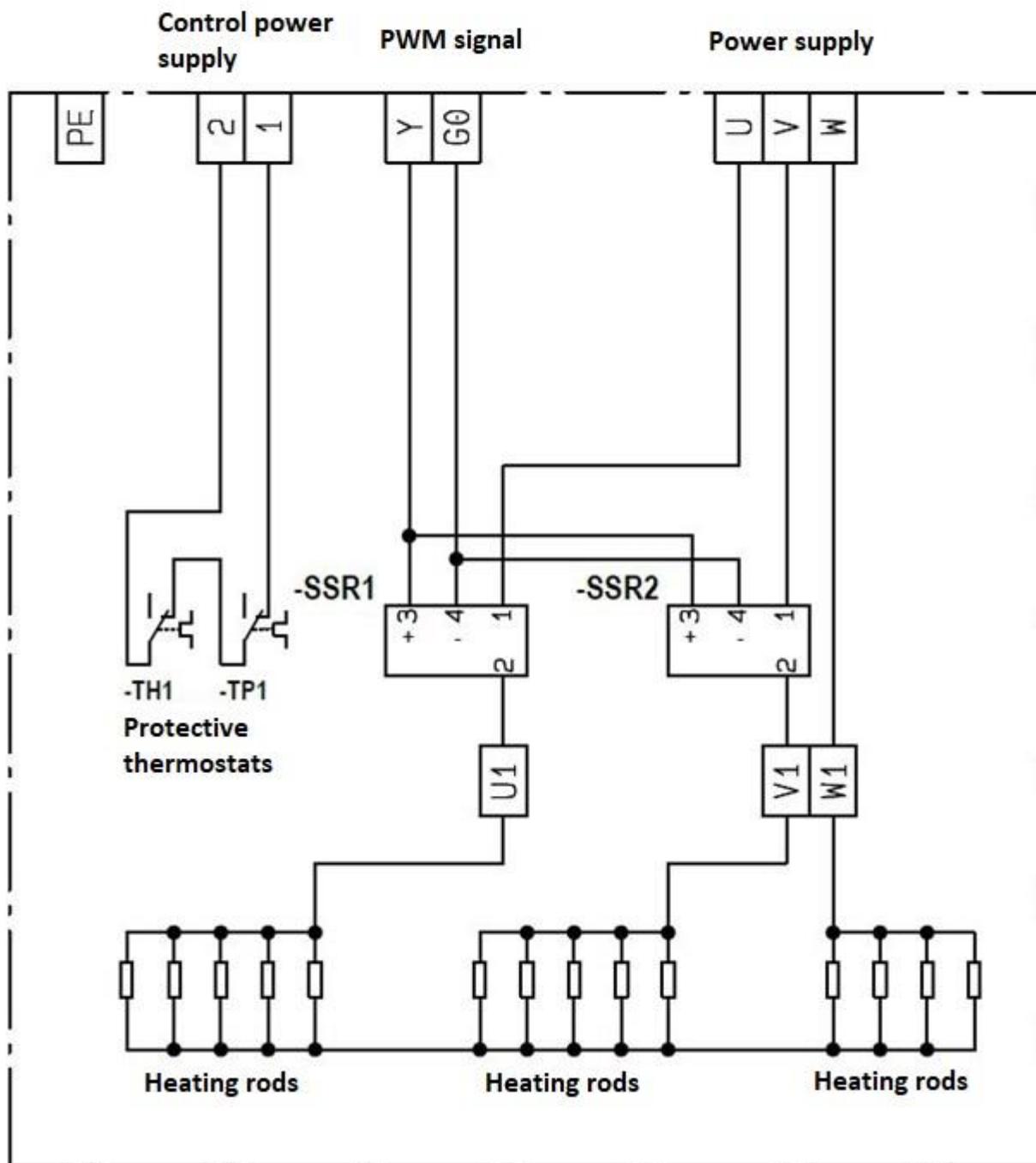


**Any intervention into electrical heaters may only be performed by personnel with professional qualifications under the valid legislation in the country of installation of the equipment.**

Check the condition of the heating elements and for any contamination, vacuum to clean as needed.

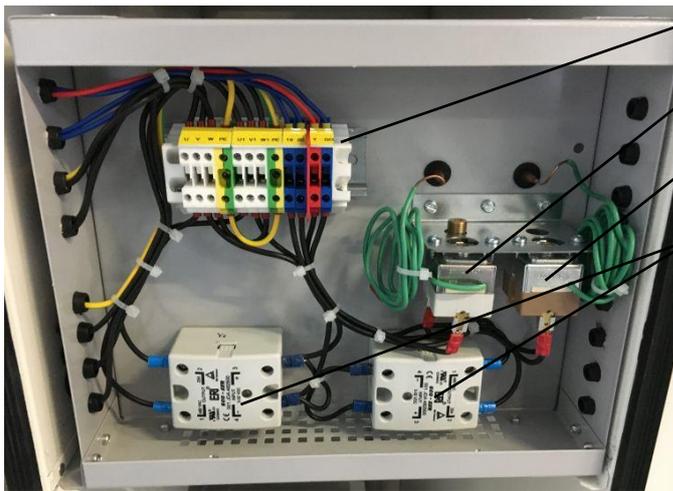
It is necessary to check the operation of the operating thermostat and the alarm thermostat, e.g. by manually adjusting the airflow.

# Electric heating General scheme



Access to the terminal block is provided by removing the 5.0 mm screws from the cover using a hex key.

The heater terminal block is equipped with a DIN rail for power connection terminals, SSR relays for output switching, and the operating and alarm thermostats for safe operation, see the illustration:



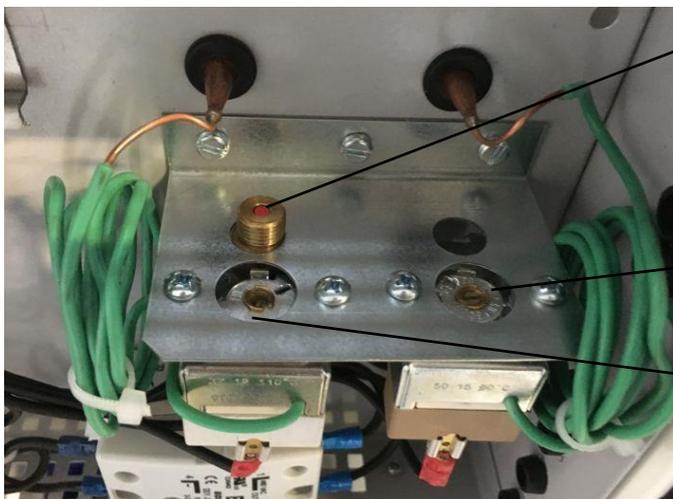
DIN RAIL WITH TERMINALS

ALARM THERMOSTAT

OPERATING THERMOSTAT

SSR RELAYS

The operating and alarm thermostats must always be properly connected to the control system. The thermostats are wired in series and the contacts are closed at safe air temperatures inside the heater. When the contacts open, the electric heaters are forced to disconnect. The operating thermostat resets automatically once the heater has cooled, but the alarm thermostat must be reset manually. The temperature must fall back below the setting on the thermostat after the thermostat overheats to permit manual reset of this safety circuit. Elimination of the source of such overheating is required to restart the heaters. The operating thermostat is set to  $\sim 50^{\circ}\text{C}$  within the air stream as standard, while the alarm thermostat is set to a temperature of  $\sim 80^{\circ}\text{C}$  in close proximity to the heaters as it is affected by the radiant heat from the heating elements.



LOCATION OF THE ALARM THERMOSTAT AT REST.

THE RED RESET BUTTON MUST BE PUSHED IF A MALFUNCTION OCCURS

SWITCHING TEMPERATURE ADJUSTMENT ON THE OPERATING THERMOSTAT

SWITCHING TEMPERATURE ADJUSTMENT ON THE ALARM THERMOSTAT



Heater electrical connections are specified in the provided “MANDÍK Controls” documentation.

The airflow velocity inside the active cross-section of the unit may not be less than 1 m/s as the heating elements will overheat. For units with variable airflow, it is necessary to set the minimum speed higher than this required airflow velocity.

**Operation of the electric heaters:**

**ATTENTION:** The heater must not be switched on until the fan is running!

Airflow through the heater is required at all times, and therefore start the fan and then wait for its warm-up period until it reaches its normal working point. The heater may only be switched on once such state is achieved. The fan must also run for a minimum of five minutes after the heater has switched off to ensure the heating elements are cooled sufficiently. The manufacturer has no liability for any damage caused by the heat build-up in the electric heater elements due to the failure to comply with these conditions.

The standard electric heater may not be installed in an area with an explosion hazard, and no explosive or easily combustible substances may be stored in close proximity to an electric heater.

## ANNEX A. QUICK FAN ADJUSTMENT - POL871 HMI CONTROLLER

These instructions are the same for the web interface, the display on the controller and the POL871 HMI controller.

Buttons on the POL871 HMI controller:



- 1) PASSWORD: **enter "2222"** to access the service level

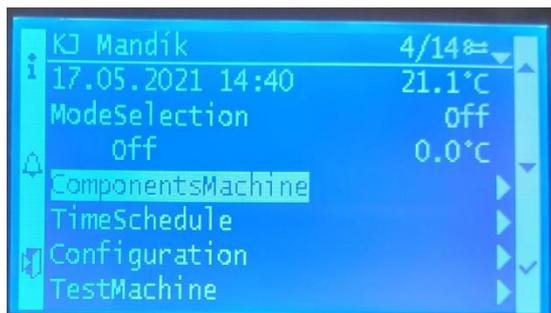


(main menu, press enter to confirm)



(use the up / down arrows and press enter to confirm, and go back to the main menu)

- 2) COMPONENT DEVICES -> FANS -> OUTPUT SET POINT [%] PARAMETER



(main menu, press enter to confirm)



(press enter to confirm)



Press enter on the Comfort supply / return fan row and use the arrows to adjust the fan output value [%] – use the arrows to change the value and the press enter to confirm.

The Comfort [%] value is the upper speed limit on the POL822 remote control.

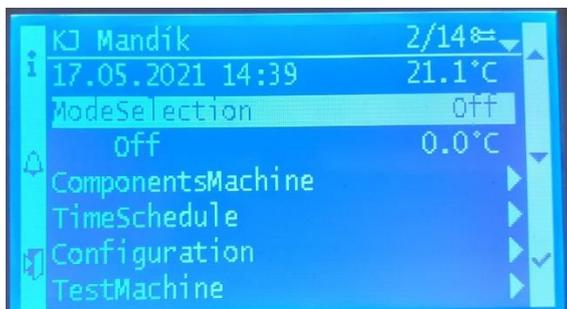
The Economy [%] value is the lower speed limit on the POL822 remote control.

## ANNEX B. QUICK STARTING THE UNIT – WEB / POL871 HMI CONTROLLER



The unit must be put in "Economy" or "Comfort" mode to start the unit.

The default setting from the factory is "Off" for safety reasons.



(main menu -> SelectMode)



(SelectMode -> mode selection, the modes are set by default from the factory)

## ANNEX C. QUICK STARTING THE UNIT – POL822 ROOM UNIT

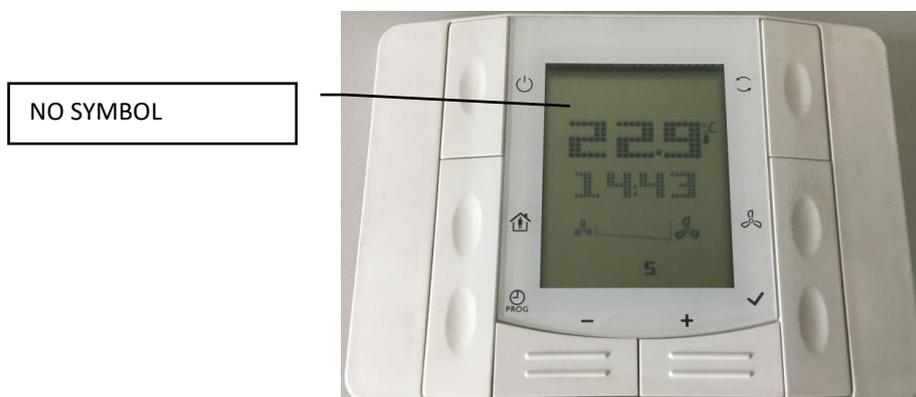
Buttons on the POL822 room unit:



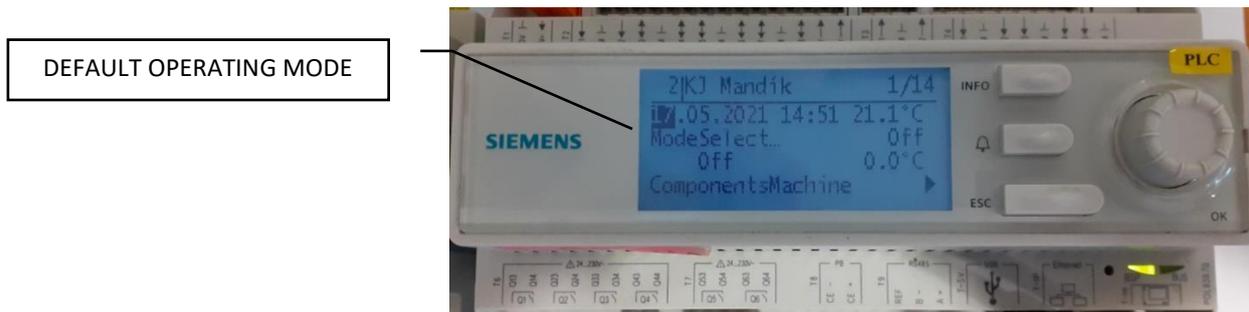
- 1) ROOM UNIT UPDATE - When power is connected and the connection is made to the controller, the room unit updates its data for a few seconds with the Climatix controller and the “P-” symbol is shown on the display.



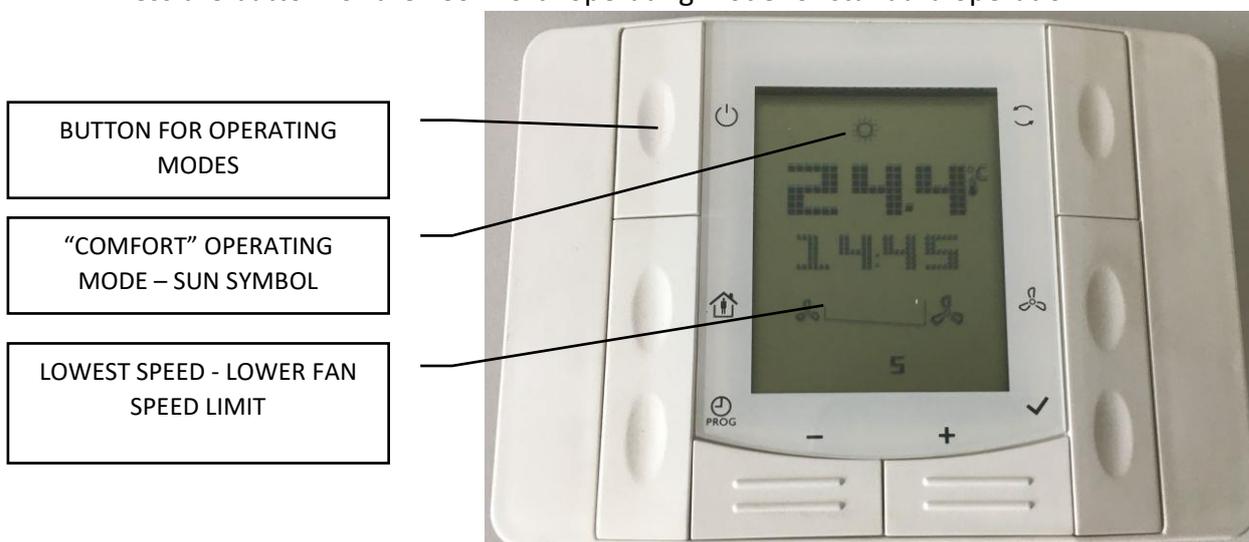
- 2) DEFAULT SETTINGS - After initial start-up of the unit, the default setting from the factor is “Off” for safety reasons:



If the unit is equipped with a Climatix controller with a display or POL871 HMI controller, the default operating mode is shown on the main screen:

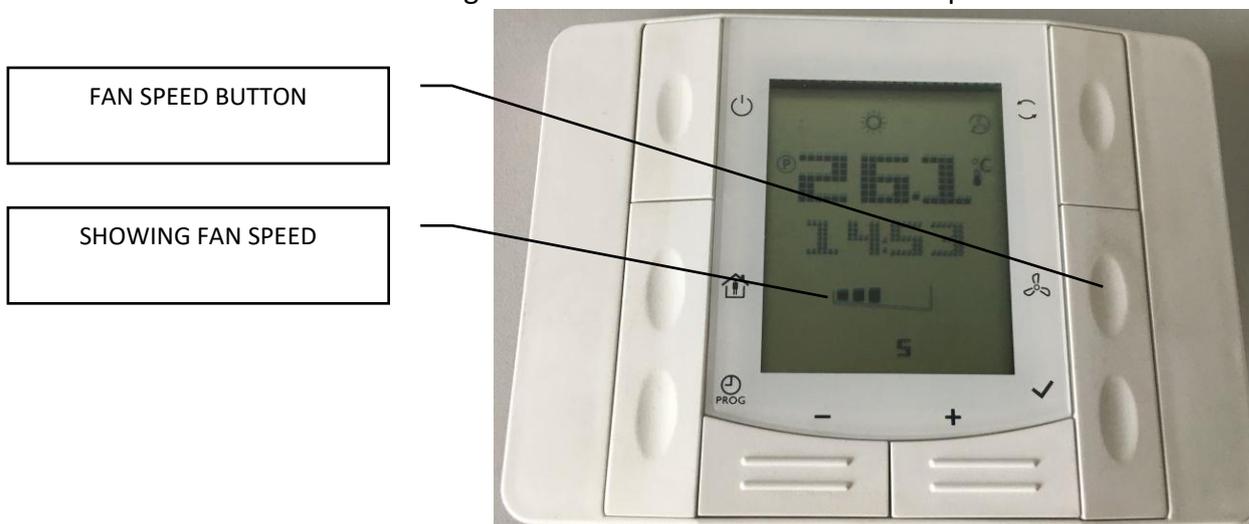


- 3) ADJUSTING THE OPERATING MODE – The “Protection” / “Economy” / “Comfort” / “Schedule” operating mode must be selected to start the unit  
 Press the button for the “Comfort” operating mode for standard operation.



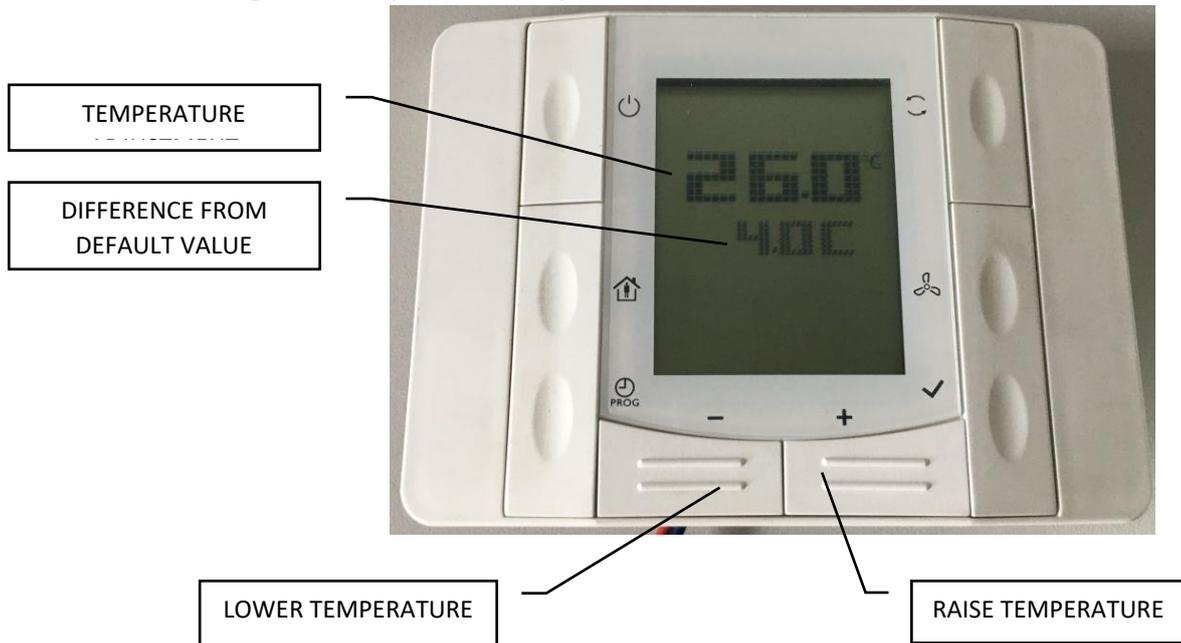
4) FAN SPEED ADJUSTMENT

As a default, the unit is started with a defined lower speed limit (35% of output).  
 Use the fan button to set higher and the maximum allowed fan speeds:

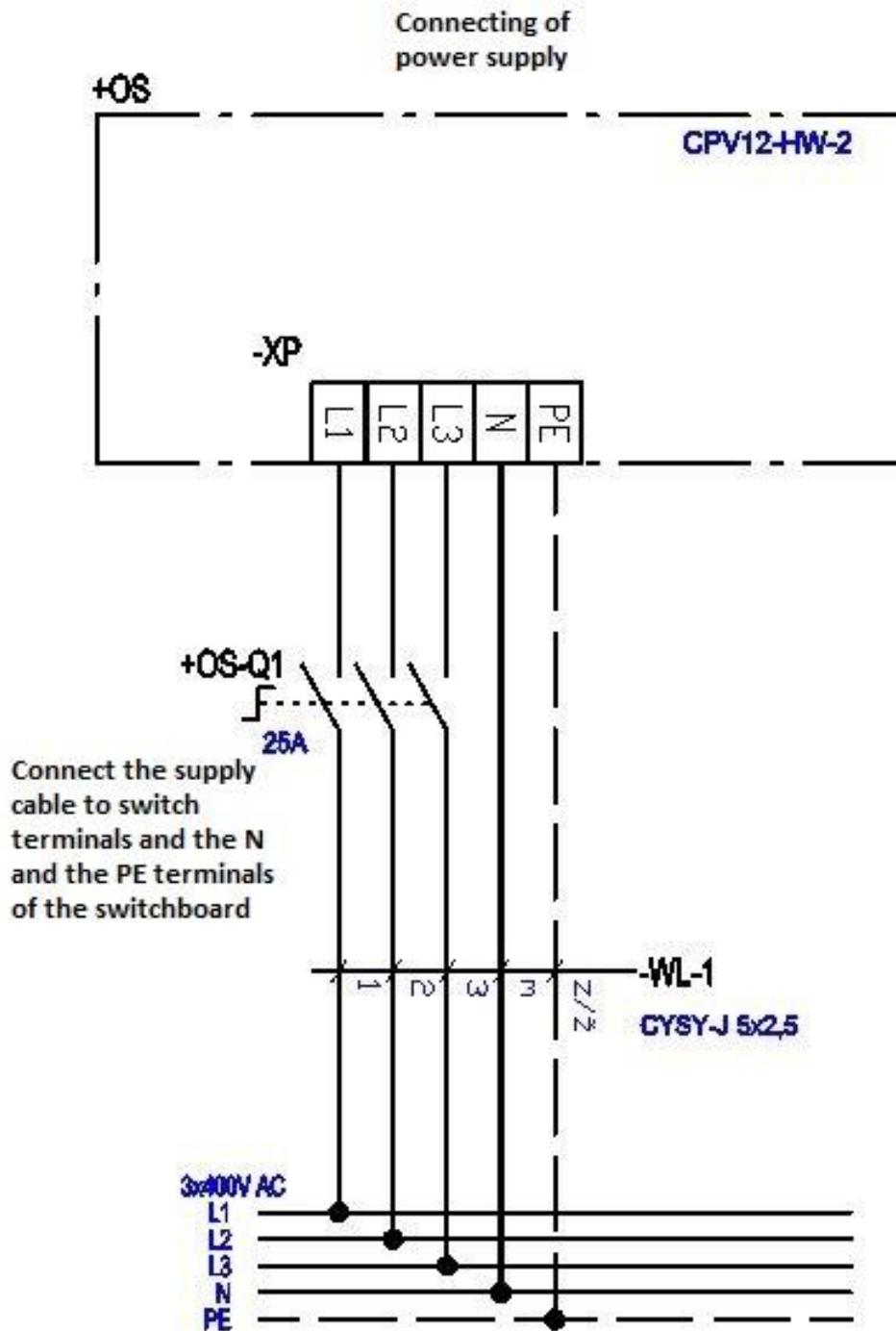


5) TEMPERATURE SET POINT ADJUSTMENT

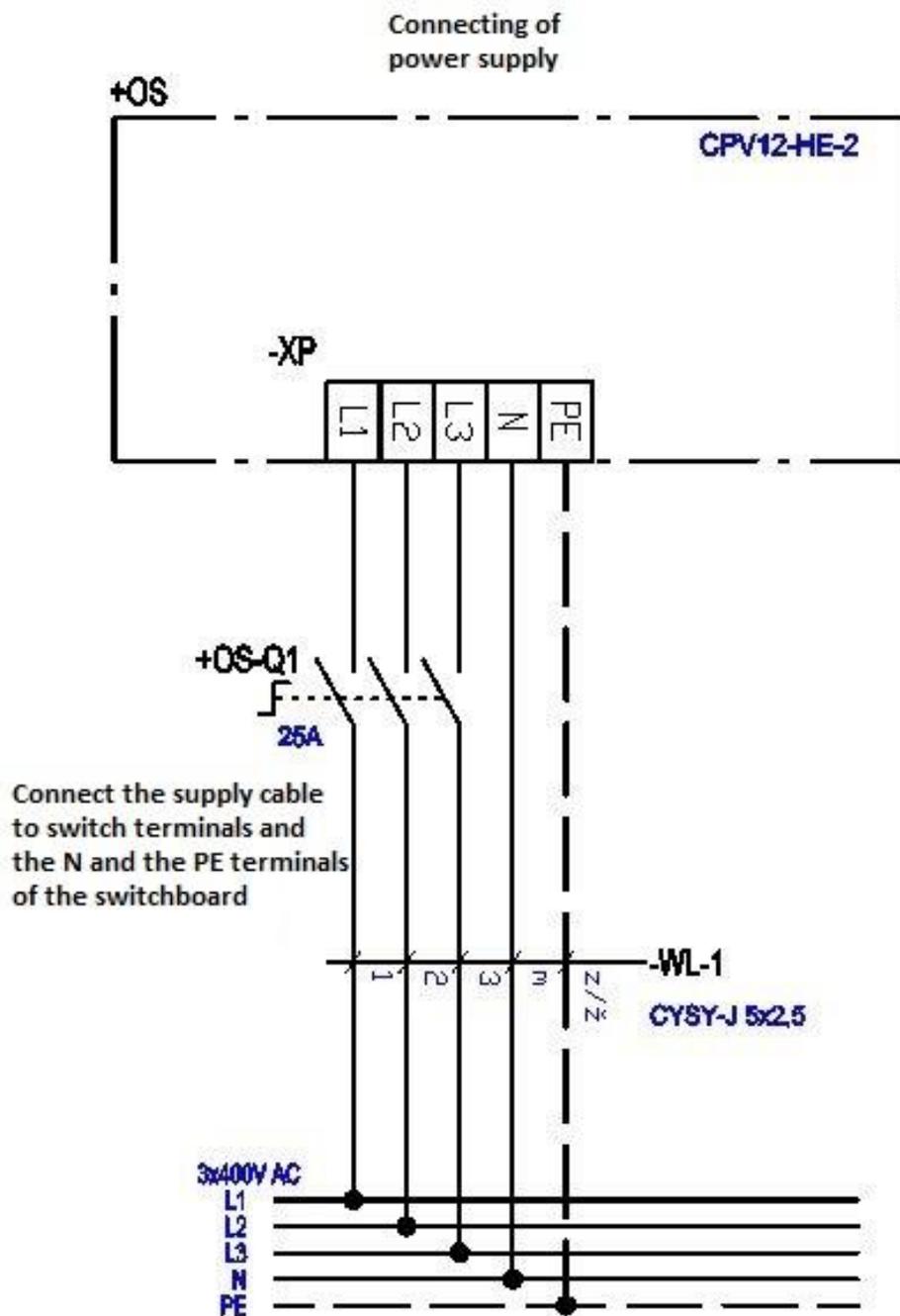
To change the temperature set point depending on the operating mode, use the “+” and “-” buttons to change the temperature set point.



**ANNEX D. MAINS CONNECTION – HOT WATER HEATING**



**ANNEX E. MAINS CONNECTION – ELECTRIC HEATING**



**ANNEX F. PERIPHERALS – CO2 SENSOR, POL822 ROOM UNIT, PIPING TEMPERATURE SENSOR**

