CPV MANDÍK
COMPACT AIR HANDLING UNITS

CONTENTS

ABOUT MANDÍK a. s.

MANDÍK, a. s. is a family-owned Czech company established in 1990. It is currently one of the leading manufacturers of ventilation and fire suppression system components, air handling units and industrial heating systems.

The company continues to expand on the European market with its emphasis on the highest quality, adaptability, flexibility, and services related to the support for delivered products. Deliveries for European metro systems, tunnels and nuclear power plants speaks to the company's current technical maturity.

The company complies with quality management rules established under ISO 9001, KTA 1401, and 10CFR APP10, and is a member of the RLT, the German Air Handling Unit Manufacturers Association It has all the necessary certificates under European standards and holds an RLT-TÜV-01 energy efficiency determination certificate and is certified by TÜV SÜD Industrie Service GmbH pursuant to EN 1886.

The MANDÍK, a. s. sales territory covers the domestic market and many other European countries where products are delivered in collaboration with our foreign partners.

Emphasis in day-to-day operations is on environmental protection and work safety. Adherence to strict European standards in these areas are the standard for our company and towards which company management has taken an uncompromising stance. Our company also contributes to the protection of the environment by operating its own renewable energy sources and making the widest possible use of energy-efficient appliances.

Our goal is maximum customer satisfaction and, last but not least, the creation of a quality work environment for the company's employees.

Certificates

ISO 9001

Product certificate

Declaration of conformity

1. DESCRIPTION OF THE UNIT

1.1 General characteristics

Introducing the new line of CPV compact air handling units. Thanks to innovative software and clever design, it is now possible to design the units dynamically. This opens up unique possibilities for designing units with external dimensions with a step of 1 mm. The ideal components are selected based on air quality and quantity requirements, along with specific options, and spatial restrictions, and the smallest possible external dimensions are then designed based on these components.
CPV units are completely manufactured and certified in a unique frameless design. Customers may choose from a wide range of internal components and their combinations. Units feature a vertical design (the outlets point upward). A standard installation includes fitting a recuperation counter-flow plate heat exchanger; up to two heating and cooling heat exchangers; a choice of any fan, including a fan wall, optional mixing/circulation function on the return air side and square or round duct outlets; also, customers may configure whether the switchboard have a built-in or external design, and many other options.
Units deliver air output from 500 to 10,000 m^3/hour; as a standard, they are supplied as a plug&play solution, i.e. including the integrated control system.

1.2 Applications and operating conditions

CPV air handlers are designed for central distribution and conditioning of air in ventilation and air-conditioning systems. Conveyed air 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 indoor environments without an explosion hazard with an ambient temperature of -30 °C to +40 °C. The units are equipped 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.

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. Open space must be maintained on the service side of the unit equal to the width of the door on the unit, or at least 600 mm, depending on the type and size of unit involved.

1.3 Air handler performance class

Units have a configurable air output from 500 to 10,000 m3/h. Unit dimensions depend on the exact specifications and selected internal components, while the maximum production dimensions specified for the external housing are: length × width × height = 3880 × 2000 × 2200 mm.

1.4 External housing parameters

Two types of housings certified by the TÜV-SÜD Munich test facility per EN 1886 are available.
The parameters apply to the full line of CPV air handlers.

T2 TB1 housing parameters:

Housing panel thickness: ..... 50 mm
Mechanical stability: D1
Housing leakage class: L1
Leakage between filter and frame: ..... < 0,5 % – F9
Thermal transmittance: T2
Thermal bridging coefficient: TB1

Noise-damping properties of the housing at the following frequencies

Hz:	125	250	500	1000	2000	4000	8000
dB	12	20	31	36	36	40	50

T3 TB2 housing parameters:

Housing panel thickness: ..... 50 mm
Mechanical stability: D1
Housing leakage class: L1
Leakage between filter and frame: ..... < 0,5 % – F9
Thermal transmittance: T3
Thermal bridging coefficient: TB2

Noise-damping properties of the housing at the following frequencies

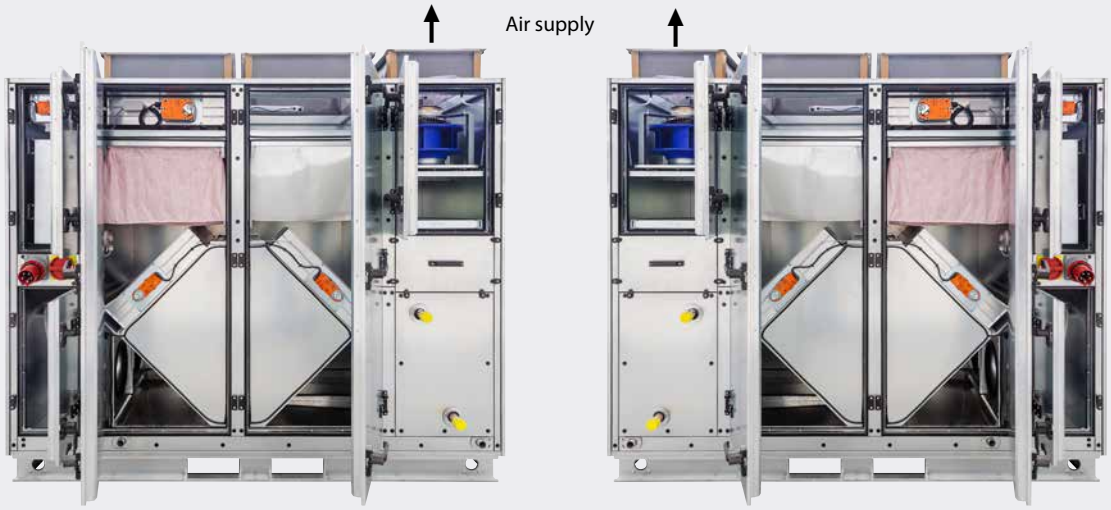
Hz:	125	250	500	1000	2000	4000	8000
dB	14	23	26	36	38	40	47

1.5 Description of the design

Units are completely manufactured and certified in a unique frameless design. The chamber of the unit is constructed of insulated sandwich panels made from galvanised steel sheet metal 0.8 mm thick per Z275 EN 10346 specifications connected with fasteners.
Stainless steel may be used, or the panels may be painted using any shade in the RAL scale.
Units are installed on a galvanised frame that may be equipped with adjustable feet.
Panels are filled with thermal insulation and soundproofing with a density of 50 or 65 kg/m3 (depending on the specific parameters of the unit). Doors are installed on the service side of the unit.
Closed pore EPDM gaskets are used as seals between the panels.
The discharge and intake openings on the units are equipped with flexible inserts of standard dimensions for connecting square ductwork or flanges with seals for round ductwork.
No materials containing silicone are used in the overall structure of the unit.

1.6 Service side of the unit, heat exchanger connections and condensate drain side

Two designs are available, with the service side on the first (meaning the unit may be embedded on three sides, i.e. built into a niche), or with front and side service access (if a side switchboard is installed).
The service side of the chamber is the side on which the service doors providing access to the chamber for inspection, maintenance and assembly of mechanical components or elements used in the operation of the unit (e.g. control devices) are located.
The service side may be the left side or the right side. The design is determined relative to the direction of supply airflow.
The condensate drain and heat exchanger connections are always located on the right side.



Service side on the RIGHT

Service side on the LEFT

1.7 Accompanying technical documentation contains:

- Warranty sheet
- Technical specifications of the unit
- Declaration of conformity
- Drawing documentation for the control system
- Installation, operation and maintenance manual for CPV air handlers
- Manual for installation, operation and maintenance of the control system

1.8 Nomenclature

Chamber – a metal, thermally insulated box with integrated air conditioning elements or a fan unit to convey air.

Compact air handler – an assembly of individual components into a single chamber. Such a unit conditions and conveys air (referred to simply as unit).

Base frame – an assembled structure, 120/150 mm tall based on the specific properties of the selected unit and to which the separate chamber / unit is fastened.

Rigid panel – a load-bearing element of the chamber forming the walls and the housing.

Doors – panels equipped with closures and hinges.

1.9 Applied standards

EN 13053 – Ventilation for buildings – Air handling units – Rating and performance for units, components and sections

EN 13779 – Ventilation for non-residential buildings – Performance requirements for ventilation and room-conditioning systems

EN 1886 – Ventilation for buildings – Air handling units – Mechanical performance

VDI 6022 – Ventilation and indoor-air quality – Hygienic requirements for ventilation and room-conditioning systems and equipment

2. TRANSPORT, HANDLING, STORAGE

- Units are delivered as a single compact assembly. The base frame, dampening elements and control system for the unit are delivered assembled with the unit itself.
- 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 functions as 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 inside the packaging 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; these straps require a spacer from above to ensure the strap does not 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 chamber.
- 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!**

3. TYPES OF INSTALLATIONS

3.1 FAN CHAMBERS WITH OPEN IMPELLERS

Such fans convey air through the unit and the connected ductwork.

Design

- The fan impeller with backward curved blades and equipped with a hub is mounted directly on the shaft of the electric motor.
- The impeller itself is statically and dynamically balanced (vibration intensity less than 2.8 mm/s per DIN ISO 14694).
- Fans are directly connected to the motors, which are installed inside the fan impeller itself.
- Access to the fan unit is provided by service doors.
- The static pressure probes are connected to a differential pressure sensor.
- The fan contains an IP54 EC motor.
- The motor has built-in active temperature management.

Types of fans – open impeller:

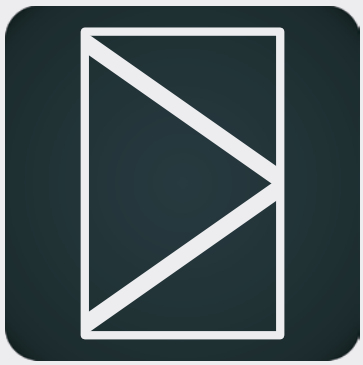
- Impellers come in diameters from 250 to 500 mm, and feature an integrated hub, and suction diffuser with measurement nozzle.
- Impellers are balanced per to DIN ISO 8821.
- Rated service temperatures: -20/+40 °C.

Type of motors in use:

- EC motors with rotor and electronics embedded inside the fan impeller.
- Efficiency class IE3.
- Rated voltage up to 1.5 kW: 1~230 VD / 50 Hz.
- Rated voltage above 1.5 kW: 3~400 VD / 50 Hz
- Temperature class THCL 155.
- Ingress protection rating IP54 per DIN EN 60529
- All motors are equipped with maintenance free bearings (at max. load, bearing service life is min. 20,000 working hours).
- Rated service temperatures: -20/+40 °C.

3.2 FILTERS

Filters remove solid particulate from the conveyed air.



Composition

The composition of filter elements is determined based on the exact specifications (dimensions) of the given unit. The design filter dimensions for the calculation of filter element composition may be selected using standardised Euro/Unifil dimensions, or using custom dimensions with a step of 10 mm.

Design

- Filters comply with standards per ČSN EN 779:2011.
- Filter elements are secured in trays and are removable through the doors on the service side of the unit.
- Filtration classes are available in a range from G3 to F9 (depending on the type of filter), for supply and return in any configuration.
- The following types of filter elements are available: frame (MPP) 46/98 mm / compact (plastic) / bag 360/500/600 mm, for supply and return in any configuration.
- Heat resistance is up to 80 °C.

3.3 HOT WATER COIL

This is used to heat the supply air downstream of recuperation.

Design

- The unit contains a heat exchanger with a ribbed heat exchange surface in a Cu/Al design (copper tubes and aluminium fins).
- The inlet and outlet connections are threaded.
- Connections are routed to the front panel of the unit.
- The heat exchanger may be removed from the service side if necessary (for maintenance or cleaning).
- Operating temperature of the water 150 °C, operating pressure 0.8 MPa (heat exchangers are tested to a pressure of 2 MPa).
- Heat transfer medium: water/antifreeze mixture

3.4 ELECTRIC HEAT

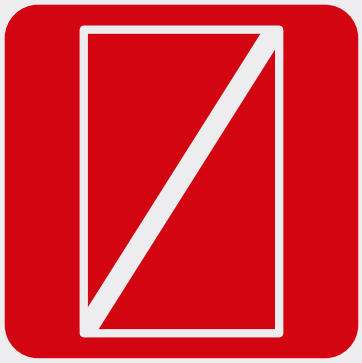
This is used to heat the supply air downstream of recuperation.

Design

- Heating rods are connected inside the chamber into a number of sections. Heationg output from the heater is regulated by pulse width modulation with a solid state relay.
- Minimum velocity of air through the heater is 1 m/s.
- Two thermostats (operating at +50 °C and alarm at +80 °C) and a fan cool down period protect the electric heater from overheating the heating coils.
- Access to the terminals is under a cover on the service side of the chamber.

3.5 CONDENSER COIL FOR HEATING

This is used to heat the supply air downstream of recuperation.



Design

- The unit contains a heat exchanger with a ribbed heat exchange surface in a Cu/Al design
- (copper tubes and aluminium fins).
- Types of refrigerants: R407c, R410a, and others.
- Input and output connections are copper and prepared for brazing.
- Connections are routed to the front panel of the unit.
- The refrigerant manifold is located inside the chamber.
- The heat exchanger may be removed as a unit from the service side if necessary (for maintenance or cleaning).
- Operating pressure is determined by the type of refrigerant in use (heat exchangers are tested to a pressure of 3.1 MPa).

3.6 COLD WATER COIL

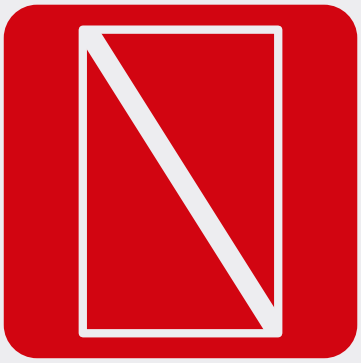
This is used to cool the supply air downstream of recuperation.

Design

- The unit contains a heat exchanger with a ribbed heat exchange surface in a Cu/Al design (copper tubes and aluminium fins).
- The inlet and outlet connections are threaded.
- Connections are routed to the front panel of the unit.
- The heat exchanger may be removed from the service side if necessary (for maintenance or cleaning).
- Heat transfer medium: water/antifreeze mixture,
- Operating pressure is 0.8 MPa (heat exchangers are tested to a pressure of 2 MPa).

3.7 DIRECT EVAPORATOR FOR COOLING

This is used to cool the supply air downstream of recuperation.

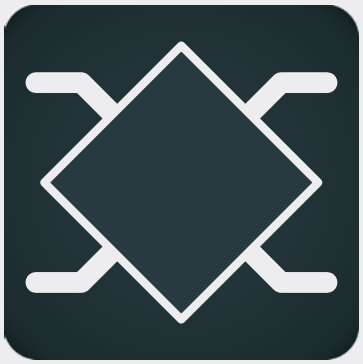


Design

- The unit contains a heat exchanger with a ribbed heat exchange surface in a Cu/Al design (copper tubes and aluminium fins).
- Input and output connections are prepared for brazing.
- Connections are routed to the front panel of the unit.
- The heat exchanger may be removed from the service side if necessary (for maintenance or cleaning).
- Types of refrigerants: R407c, R410a, and others.
- Operating pressure is determined by the type of refrigerant in use (heat exchangers are tested to a pressure of 3.1 MPa).

3.8 RECUPERATION COUNTER-FLOW PLATE HEAT EXCHANGER

Recuperation scavenges waste heat from the return air stream and supplies it to the supply air stream. The fresh intake air and the return air sections are completely isolated from one another.



Design

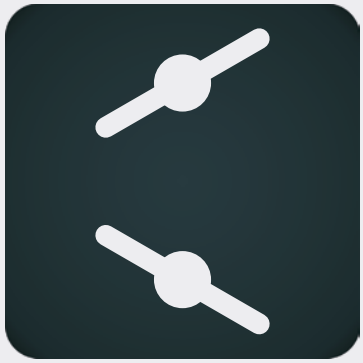
- The heat exchanger is constructed of aluminium fins and a galvanised housing.
- The return and supply sides of recuperation are equipped with a stainless steel tub to drain condensate away from the unit.
- The removable rigid panel is located on the service side. Once removed, the entire recuperation unit may be removed (for maintenance or cleaning).
- The input side of the fresh (supply) air feed into the recuperator is equipped with a by-pass damper with an actuator.
- Delivery includes a drain trap for the condensate drain line.

Optional equipment (at customer request)

- The input side of the return air feed into the recuperator may be equipped with a mixing damper with an actuator.

3.9 DAMPERS

These are used to regulate airflow, for mixing air, and to prevent heat loss from the building through the ductwork when the unit is out of service.

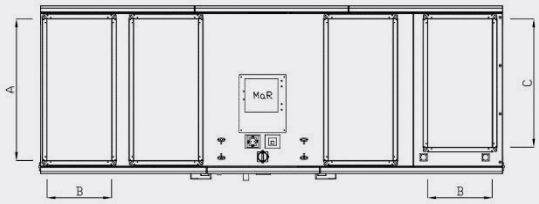


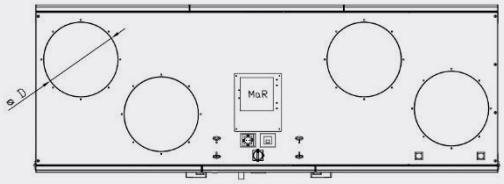
Design

- Units have control dampers installed inside the chamber.
- Control dampers have a rated service temperature of max. 80 °C.
- Damper sealing performance is Class 2 per ČSN EN 1751:2003.
- Dampers are equipped with actuators (the type and size of which depend on the size of the damper). Standard actuators without springs or safety-type actuators with springs may be selected for dampers on the duct outlets.
- Access to the dampers and actuators is provided through the doors of the unit.
- The dampers are constructed of aluminium structural members with plastic bearings and wheels.
- The edges of the individual blades are equipped with rubber gaskets to ensure a proper seal when the dampers are closed.

3.10 DAMPENING ELEMENTS AND CONNECTION DIMENSIONS

Units may be ordered with square or round connection openings. Square openings are equipped with flexible inserts for connecting to square ducts, while the round openings have flanges with gaskets for connecting to round ducts.
Dampening elements eliminate the transfer of vibrations from the unit to the ductwork.
Connection dimensions are determined based on the specific size of the unit and are specified in the relevant technical specifications of the unit.





4. Control system

Units are delivered with an integrated control system. Delivery includes all control system components required to control operation of the air handler in the given configuration.
Components located inside the unit are installed, wired and pre-set to factory settings. Extra components installed outside of the unit (e.g. a mixing loop for a water coil) are delivered separately but with pre-wired connections in the switchboard.
A freely programmable Climatix PLC sourced from Siemens is used to control Mandík air handling units; this controller meets the latest requirements arising from economic, environmental and social needs.
The controller facilitates convenient control, safe and energy-efficient operation of HVAC equipment and absolute adaptability to the customer's final design requirements. A considerable quality is the wide range of communication options, enabling easy control and cooperation with most superior systems and integration into building technology systems.
We manufacture power switchboards with integrated Climatix controllers, including circuit protection devices, in various sizes in both metal and plastic designs depending on the configuration of the air handler, its operating environment, and the total power requirements.
Power switchboards integrated into the unit or external to the unit may be selected. An integrated switchboard is located inside the return plenum and is accessible from the side or from the front (depending on the type of installation).

Control system with Climatix controller:

- Excellent ratio of price/performance.
- Simple installation.
- Simple control in several variants.
- Local and remote control.
- Annual and weekly schedule.
- Text display with clear depiction of all data.
- Displays come equipped with support for all European languages (Czech is standard).
- Ability to select from multiple operating modes.
- Temperature and humidity control in supply or space.

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