

MANDIK CPX COMPACT AIR HANDLING UNITS



CONTENTS

1. DESCRIPTION OF THE UNIT	5
1.1 General characteristics	5
1.2 Applications and operating conditions.	5
1.3 Air handler performance class	5
1.4 Unit housing parameters.	5
1.5 Design description	6
1.6 Unit design, side of exchanger connections and condensate drainage	6
1.7 The accompanying technical documentation contains	7
1.8 Nomenclature	7
1.9 Applied standards	7
2. TRANSPORT, HANDLING, STORAGE	8
3. TYPES OF INSTALLATIONS	9
3.1 FAN CHAMBERS WITH OPEN IMPELLERS	9
3.2 FILTERS	10
3.3 HOT WATER COIL	11
3.4 ELECTRIC HEATER	11
3.5 CONDENSER COIL FOR HEATING	12
3.6 COLD WATER COIL	12
3.7 DIRECT EVAPORATOR FOR COOLING	13
3.8 RECUPERATION COUNTER-FLOW PLATE HEAT EXCHANGER	13
3.9 DAMPERS	14
3.10 DAMPENING ELEMENTS AND CONNECTION DIMENSIONS	14
4. CONTROL SYSTEM	15

1. DESCRIPTION OF THE UNIT

1.1 General characteristics

Introducing the new line of CPX compact air handlers. 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.

CPX units are completely manufactured and certified in a unique frameless design. Customers may choose from

a wide range of internal components and their combinations. The design of the units is under the ceiling. The standard features include the installation of a plate counterflow heat recovery exchanger, a choice of up to two possible heat exchangers for heating or cooling, a choice of any fans, the option to choose circular or square outlets, the ability to specify the electrical switchboard as external built-in or external for any installation, and much more.

Units deliver air output from 500 to 4,500 m³/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

CPX 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.

The 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.

Units must be suspended on threaded rods which are firmly secured with suitable anchors to take account of the weight of the unit. Threaded rods are not included. Care must be taken to hang the units horizontally. The units are vibrationally separated from the threaded rods by Silentblocks, which are included. Depending on the type and size of the unit, it is necessary to provide clear space under the unit for opening the door without obstruction. The size of this space depends on the size of the particular door of the unit. When selecting the "Sliding Door Opening System" (see Additional Equipment and Configurations), a minimum clearance of 200 mm is required. For service tasks it is necessary to allow access to the unit throughout the entire floor plan.

1.3 Air handler performance class

Units have a configurable air output from 500 to 4,500 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 × 1000 mm.

1.4 Unit 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 CPX units.

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

Parametry pláště T3 TB2:

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 Design description

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.

Units must be suspended on threaded rods which are firmly secured with suitable anchors to take account of the weight of the unit. Threaded rods are not included.

The units are vibrationally separated from the threaded rods by Silentblocks, which are included.

Stainless steel may be used, or the panels may be painted using any shade in the RAL scale.

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.

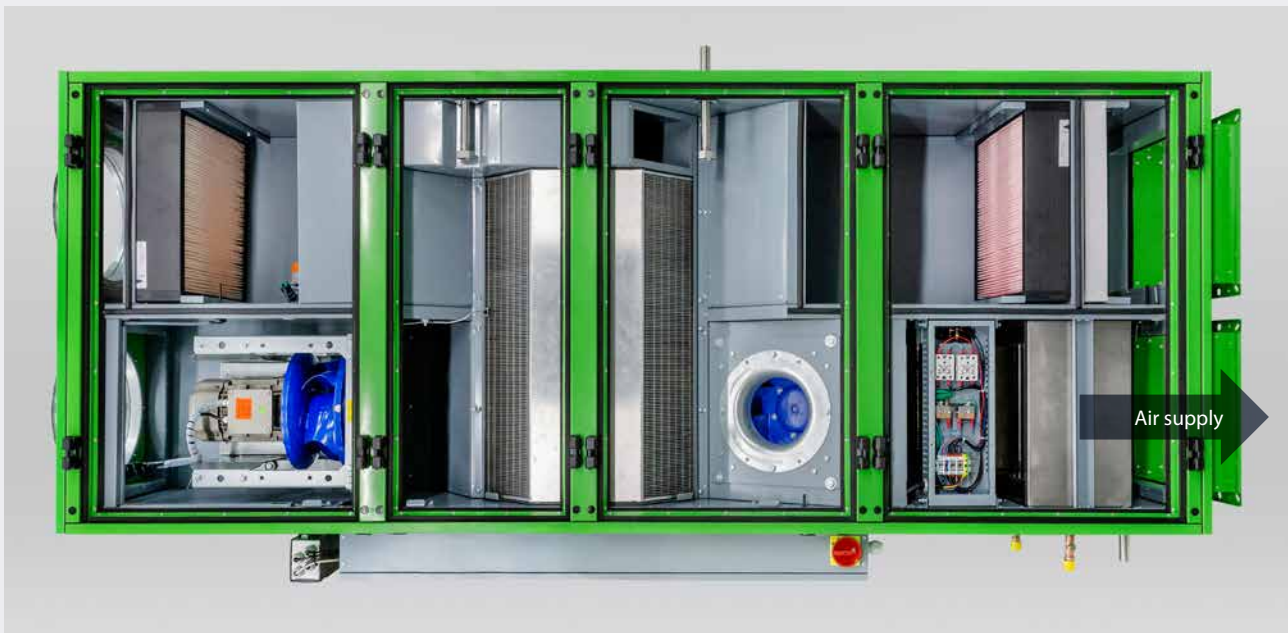
1.6 Unit design, side of exchanger connections and condensate drainage

The service side may be the left side or the right side. The design is determined by the view of the service door on the direction of supply air flow. The switch-

board and heat exchanger connections are always on the front side of the unit with the fans and the condensate drain on the opposite rear side of the unit.



LEFT-hand configuration



RIGHT-hand configuration

1.7 The 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 CPX 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).

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 hinges, damping inserts and unit control system are supplied already fitted with the unit.
- 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).
- The units are stored on pallets designed to be handled by forks of a forklift or pallet truck. In use, the forks of the forklift must always be under the entire chamber.
- 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 a forklift, support the chamber along the entire width of the chamber to prevent damage to the bottom of the unit.
- 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

- Fans with EC or AC motors with frequency inverters can be selected for both the supply and discharge section
- 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 EC fan version includes the IP54 EC motor.
- The motor has built-in active temperature management.

Types of fans – open impeller:

- Composite impeller.
- Impellers come in diameters from 250 to 310 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.

AC motors with fan impeller

- Efficiency class IE3.
- Nominal voltage: 3~400 VD / 50 Hz.
- Temperature class THCL 155.
- Ingress protection rating IP55 per DIN EN 60529.

3.2 FILTERS

Filters remove solid particulates from the conveyed air.



Composition

The composition of filter elements is determined based on the exact specifications (dimensions) of the given unit. The filter dimensions considered for the calcula-

tion of the filter cartridge composition can be selected from standardised Euro/Unifil dimensions or from atypical dimensions in 10 mm increments.

Design

- Filters comply with standards per 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.
- Pre-filter can be selected in the range G3 to F9.
- 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 hot water coil modules contain a heat exchanger with a finned heat exchanger surface in Cu/Al design (Cu tubes and Al fins) with cladding.
- The inlet and outlet connections are threaded.
- Connections are routed to the front panel of the unit.
- The module can be removed to the front if necessary (servicing, 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 HEATER

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

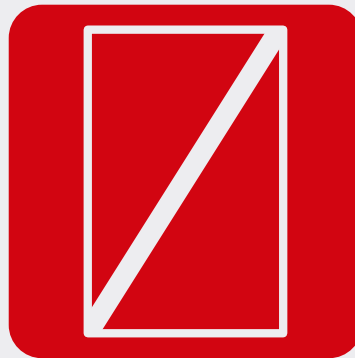


Design

- Heating rods are connected inside the chamber into a number of sections. Heating output of 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 terminal block by removing the cover on the side of the chamber door.

3.5 CONDENSER COIL FOR HEATING

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



Design

- The condenser coil for the heating module contains a heat exchanger with a finned heat exchanger surface in Cu/Al design with cladding.
- (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 module can be jointly removed to the front if necessary (servicing, 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.

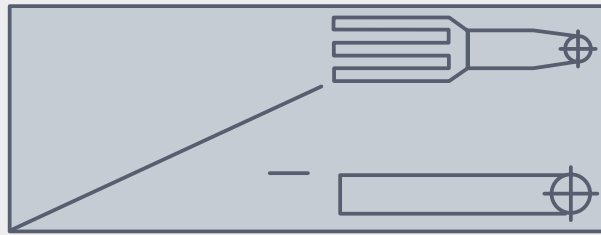


Design

- The cold water coil module contains a heat exchanger with a finned heat exchanger surface in Cu/Al design (Cu tubes and Al fins), a condensing bath, droplet separator, and stainless steel cladding.
- The inlet and outlet connections are threaded.
- Outlet connections to the front panel of the module.
- The module can be removed to the front if necessary (servicing, 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.

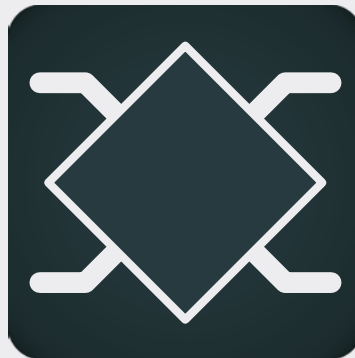


Design

- The cold water coil module contains a heat exchanger with a finned heat exchanger surface in Cu/Al design (Cu tubes and Al fins), a condensing bath, droplet separator, and stainless steel cladding.
- Input and output connections are prepared for brazing.
- Outlet connections to the front panel of the module.
- The module can be removed to the front if necessary (servicing, 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.
- Under the plate heat exchanger, there two separate stainless-steel tanks are installed with condensate drainage outside the unit.
- There is a removable fixed panel on the side of the door. 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.

Extra equipment (Accessories)

- 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

- The units are fitted with internal bypass dampers and optional external shut-off dampers.
- Control dampers have a rated service temperature of max. 80 °C.
- Damper sealing performance is Class 2 per 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 bypass damper and actuator is through the unit door.
- 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 handlers; 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.

The power switchboard can be designed as an external built-in at the front of the unit, or external for any installation outside the unit. The external built-in power switchboard requires service access from the front of the unit, at least 400 mm.

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.



MANDÍK, a. s.

Dobříšská 550

267 24 HOSTOMICE

Czech Republic

Tel.: +420 311 706 706

Fax: +420 311 584 810

E-mail: mandik@mandik.czwww.mandik.cz

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