

RWH/Hi

INTEGRATED REFRIGERANT CIRCUIT HEAT RECOVERY UNITS



INTRODUCTION

Any room requires the correct supply of outside air and at the same time the control of the internal thermohygrometric conditions. Through the recovery of energy from the air extracted from the environment, through the use of systems with integrated heat pump technology, an economic way in the installation of energy-efficient power plants is offered, which also ensure the degree of comfort to the occupants, both in summer and winter and without added costs in the management of primary air.

For buildings that require air exchange and are not equipped with dedicated air conditioning systems, the installation of these units allows the introduction of primary air at a controlled temperature without disturbing the internal conditions in the occupied spaces.

It is therefore not necessary to use additional systems to heat or cool the incoming primary air. Moreover, these units allow to guarantee a support to the air conditioning system in the intermediate seasons by exploiting the free-cooling or free-heating periods.

If installed on existing buildings, they guarantee the energy upgrading of the system through the management of the air exchange without additional charges. On new installations, on the other hand, the air exchange is completely carried out allowing to reduce the size of the main air conditioning system. In the intermediate seasons the building will benefit from the free or partial cooling generated by these units, which during the partial load phases allow the main system to operate with higher efficiencies.



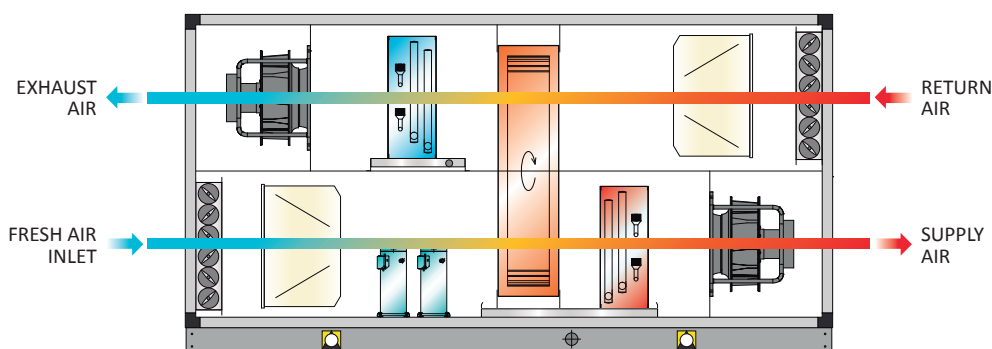
OPERATING MODE

• HEATING

The return air, after crossing the heat wheel recovery, feeds the heat pump source exchanger that acts as an evaporator. Through the steam compression refrigeration cycle, the fresh air, leaving first recovery stage, is heated by the heat pump user exchanger, which acts as a condenser. The modulation of the thermal capacity, obtained by means of the compressor, will allow the temperature of the supply air to be precisely controlled. During heating operation, the evaporator of the heat pump, may be subject to the formation of surface frost resulting in loss of efficiency.

To prevent this from happening, the unit provides for the controlled management of a defrosting cycle obtained by reversing the refrigeration cycle. During this phase, the return fans are stopped and the compressors are forced at maximum speed.

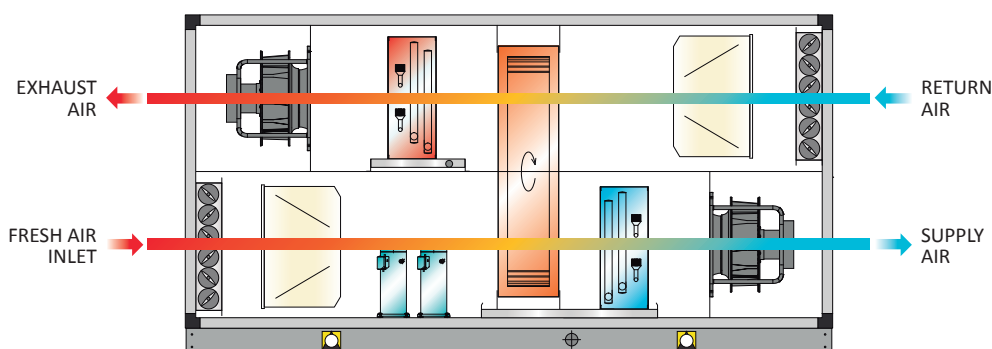
Through the other additional heating resources present in the unit, water heating coils, electric heaters or other refrigeration compressors temporarily not working, the temperature of the supply air is maintained at an appropriate value so as not to disturb the internal environment.



• COOLING

The return air, after crossing the heat wheel recovery, feeds the heat pump source exchanger, which acts as a condenser.

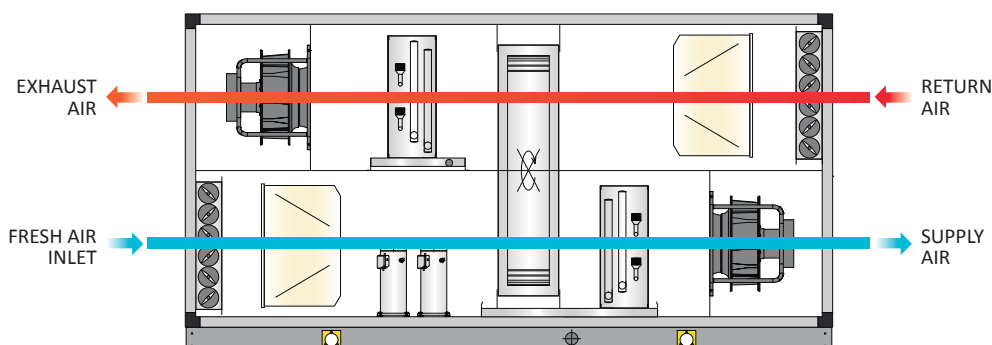
The external air, after crossing the heat wheel recovery, is cooled by the heat pump user exchanger, which acts as an evaporator.



• FREE-COOLING

When the outdoor temperature is lower than the indoor temperature of the room to be air conditioned, if this

requires cooling, the units operate in free-cooling mode and all stages of integrated heat recovery are disabled.



MAIN CHARACTERISTICS

STRUCTURE AND PANELS

The structure of the units can be realized in two versions:

VERSION 1:

Profiles 50 x 50 mm in self-supporting extruded anodized aluminium, with mechanical strength requirements in accordance with EN 1886: D1 (M). 50 mm thick double wall sandwich type paneling with exterior in pre-painted RAL 9010 galvanized sheet steel and interior in hot-dip galvanized sheet steel with interposed insulation made of polyurethane foam with a density of 40 kg/m³.

This structure has a seal class L1 while the thermal transmittance and the thermal bridge characteristic is class T3/TB4 according to EN1886.

VERSION 2:

Thermal break profiles 60 x 60 mm in self-supporting extruded anodized aluminium, with mechanical strength requirements in accordance with EN 1886: D1 (M). 63 mm thermal break sandwich-type double-walled sandwich-type panels with exterior in pre-painted RAL 9010 galvanized sheet steel and interior in hot-dip galvanized sheet steel with interposed insulation made of polyurethane foam with a density of 40 kg/m³.

This structure has a seal class L1 while the thermal transmittance and the thermal bridge characteristic is class T2/TB2 according to EN1886.

Safety microswitches are applied to the inspection doors to allow internal access to the various compartments of the unit only when the unit is completely switched off.

The main access and inspection panels consist of inspection doors with perimeter hinges made of non-corrosive polyamide and handles.

All units can be supplied in both monobloc and modular sections for on-site assembly when required.

AIR FILTERS

The filter sections on the return air are made up of panel filters class ePM₁₀ 60% (M5) while for the fresh air section bag filters class ePM₁ 55% (F7) in accordance with international norms.

As an option, the unit can be equipped with differential-type gauges for monitoring the air-side pressure drop of the filtering sections.

AIR DAMPERS

All adjustment dampers are made of aluminium with a low pressure drop wing profile and opposing wings.

Each damper is equipped with an electric actuator already assembled and directly managed by the electronic control on board.

FANS

The units are equipped with high efficiency plug-fans with built-in brushless EC motor. In this way it is possible to guarantee an accurate regulation of the air flow both in the supply and return section, ensuring that all regulatory requirements such as SFP are met.



PLUG-FANS

The airflow rate of the fan is managed through the integrated electronic control system, thus ensuring, according to the needs of the system, that the correct functioning of the unit is maintained, with consequent savings in the energy absorbed by the unit. Through a reliable pressure sensor installed on the unit it is possible to select and control the air flow through a constant flow regulation, or at a fixed useful static pressure defined on the delivery section towards the environment. The fans are fixed to the frame by means of self-centring brackets to guarantee the correct distance between the impeller and the nozzle, thus optimising performance. On request, it is possible to supply the fan sections with portholes and low consumption internal lighting elements supplied directly from the electrical panel on board the machine or from an independent external source.



ELECTRONIC FLOW RATE CONTROL

MAIN CHARACTERISTICS

FINNED PACK HEAT EXCHANGERS

The evaporative-condensing coils positioned inside the supply and exhaust air sections consist of internally and mechanically expanded striped copper tubes and pre-painted aluminium fins. The direct expansion coil is equipped with an electronic expansion valve managed by the control integrated in the unit and operated in such a way as to guarantee the correct overheating of the refrigerant that reaches the refrigeration compressor in the various operating situations. The use of hydrophilic painted aluminium finned coils guarantees rapid drainage of

condensation and dragging effects condensation and dragging effects both during dehumidification and defrosting. The same surface coating of the exchanger allows to increase the resistance to corrosion, due to acids or pollutants contained in the treated air.

All coils are tested before being installed with a pressure test with dry air at 42 bar.

The stainless steel condensate drain pan is tilted internally and complies with ASHRAE 62-89 self-draining standards with ductable outlet.

HEAT RECOVERY

The units are equipped with an air-to-air rotary heat recovery unit, consisting by a cylindrical rotor containing thousands of channels and characterised by an extremely elevate surface development, a supporting frame (complete di brush seals to minimize the air leakage between supply and exhaust air flows), and an electric motor drive system. The heat exchange surface, very high in relation to the volume, allows very high thermal performances when compared to other types of heat recovery systems, reaching efficiencies even above 80%.

In rotary wheel heat recovery units the heat exchange takes place by accumulating the heat in the rotor; as a matter of fact while the cylinder rotates slowly, the exhaust air volume crosses half of the casing and gives its heat to the rotor matrix, which accumulates it.

The fresh air, crossing the other half, absorbs the accumulated heat. The parts absorbing and releasing the heat are continuously inverted, as the rotation proceeds, and the process may continue indefinitely. The heat exchanger participates to the **Eurovent Certification** program and it

is sized according to the **ECO Design** specification.



HEAT RECOVERY

CONTROL

The unit is complete with regulation by means of a microprocessor electronic board with dedicated software and external LCD display as user interface.

Through the external or remote LCD display it is possible to set all the working set-points of the unit and display the operating status and any alarm conditions present. Through the values acquired by the room temperature probe and the supply air, the thermoregulation will be managed by activating the compressors with reference to the winter and summer set-points. The unit can manage the automatic change of cooling or room heating modes, free-cooling and

free-heating conditions by comparing them with the outside air temperature.

The thermal capacity delivered by the heat pump unit will be continuously modulated through the speed variation of the DC brushless rotary or scroll refrigeration compressor.

This variable depends mainly on the value of the supply air temperature with reference to the external air conditions.

This characteristic allows the operation at partial loads with a much higher energy saving compared to a traditional system equipped with ON/OFF compressors.



CONTROL

THERMODYNAMIC RECOVERY (2nd stage of cascade recovery)

The efficiency of the unit is further improved thanks to a second phase of indirect recovery, obtained through a compression system of the refrigeration circuit in heat pump. The thermodynamic recovery sections integrated in the unit are equipped with variable speed compressors so as to continuously regulate the thermal capacity transferred to the fresh air. In this way it is possible to adjust the temperature of the supply air to the correct value, thus optimising the energy efficiency of the air handling unit.

COMPRESSORS

The main refrigerant circuit is equipped with hermetic Twin or Scroll rotary compressors with a single brushless DC motor suitable to be managed by an inverter, for a continuous control of the refrigeration capacity. The compressor is complete with thermal protection, crankcase heating, low and high pressure switches and vibration dampers suitable for isolating vibrations.

The additional cooling circuits are supplied with hermetic rotary compressors and ON/OFF scrolls.

These compressors allow you to increase the cooling or heating capacity by being used as boosters with inverter, which will allow you to precisely adjust the capacity with respect to the required load. On request, the compressors can be equipped with a soundproofing hood to lower the noise level emitted by the unit.

REFRIGERATION CIRCUIT

The refrigerant circuit is of direct expansion type loaded with refrigerant R410a. Each refrigerant circuit is tested at the factory with reference to both its tightness (pressure test) and its functionality.

The main components are: evaporative-condensing finned pack heat exchangers, electronic expansion devices, solid cartridge acid filters, high and low refrigerant pressure switches, receiver and suction liquid separator, liquid/humidity indicator light, cycle reversal valve, non-return valves, high pressure safety valves. The circuit is complete with a hot gas injection defrosting system that operate on the source heat exchanger.

ELECTRIC BOX

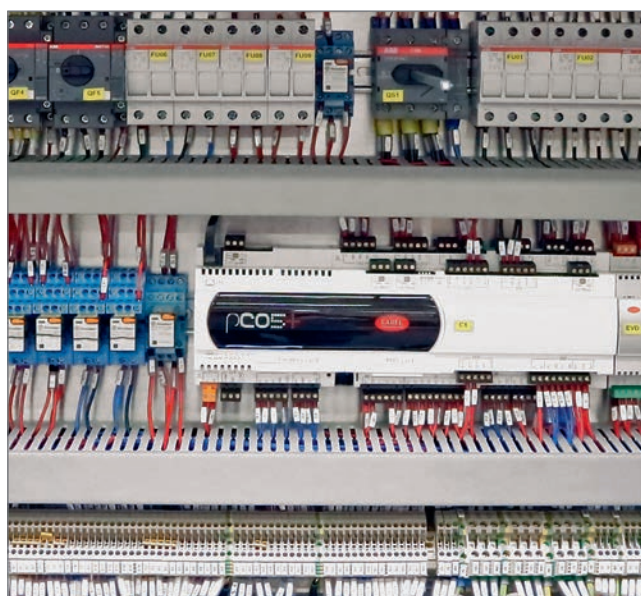
It is housed in a dedicated IP54 technical compartment, equipped with a double door to ensure both internal and external installation of the unit.

The electrical panel is manufactured according to IEC 204-1 / EN 60204-1 standards and complete with door block disconnecter, CE isolation transformer and internal thermostated anti-condensation resistors for outdoor units.

All motors and auxiliary circuits are protected against overload and short circuit by fuses and/or circuit breakers.



REFRIGERATION CIRCUIT



ELECTRIC BOX

TECHNICAL DATA

MODEL		011	021	031	041	061	081	101
Nominal airflow rate	m ³ /h	1000	2000	3000	4500	6000	8000	10000
Thermal efficiency recovery in cooling mode ⁽¹⁾	%	81,70	80,90	80,00	80,10	80,30	80,40	80,10
Total unit cooling capacity ⁽¹⁾	kW	7,35	15,10	23,12	33,94	45,20	54,70	66,50
Total EER of unit ⁽¹⁾	-	5,53	5,43	5,82	6,06	5,43	5,76	5,54
Electrical power absorbed in cooling mode ⁽¹⁾	kW	1,97	3,91	5,68	8,34	11,70	13,95	17,39
Heating recovery thermal efficiency ⁽²⁾	%	81,90	81,20	80,50	80,40	80,60	80,80	80,50
Total thermal power of unit ⁽²⁾	kW	16,15	29,89	44,78	68,22	91,60	114,40	139,10
Total COP of unit ⁽²⁾	-	11,88	15,33	15,66	14,27	15,02	16,39	18,80
Electrical power absorbed in heating ⁽²⁾	kW	1,99	3,04	4,52	7,41	9,39	11,25	12,60
Supply fan available static pressure	Pa	250	250	250	250	250	250	250
Return fan available static pressure	Pa	200	200	200	200	200	200	200
N° of refrigerant circuits	n°	1	1	1	1	1	1	1
Type of refrigerant		R410A						
Number of compressors: Inverter	n°	1	1	1	1	1	1	1
Max. electricity absorbed by the unit	A	26,90	26,80	34,00	44,40	53,50	59,80	62,60
Power supply	V/ph/Hz	400 V +- 10% / 3 / 50 + N + $\underline{\underline{\text{G}}}$						
Type of filters for fresh air section		F7	F7	F7	F7	F7	F7	F7
Type of filters for return air section		M5	M5	M5	M5	M5	M5	M5
SFP factor filters	W/(l/s)	2,02	1,82	1,86	1,98	1,86	1,83	1,76
Supply sound power level ⁽³⁾	dB(A)	80	79	79	83	82	84	84
Return sound power level ⁽³⁾	dB(A)	72	71	75	68	72	71	71
Sound pressure level in scale A (ISO EN 3744) ⁽⁴⁾	dB(A)	57	55	53	58	57	58	59

MODEL		062	082	102	132	172	242
Nominal airflow rate	m ³ /h	6000	8000	10000	13000	17000	24000
Thermal efficiency recovery in cooling mode ⁽¹⁾	%	80,30	80,40	80,10	80,00	79,00	78,00
Total unit cooling capacity ⁽¹⁾	kW	45,20	55,58	67,80	95,20	113,61	151,40
Total EER of unit ⁽¹⁾	-	5,39	5,77	5,53	5,34	5,64	5,97
Electrical power absorbed in cooling mode ⁽¹⁾	kW	11,76	14,09	17,66	25,78	30,93	40,97
Heating recovery thermal efficiency ⁽²⁾	%	80,60	80,80	80,50	80,00	78,00	78,00
Total thermal power of unit ⁽²⁾	kW	95,77	124,10	154,77	173,19	228,93	300,90
Total COP of unit ⁽²⁾	-	11,44	13,13	12,96	14,08	17,89	19,29
Electrical power absorbed in heating ⁽²⁾	kW	11,66	13,72	17,14	19,92	23,10	30,42
Supply fan available static pressure	Pa	250	250	250	250	250	250
Return fan available static pressure	Pa	200	200	200	200	200	200
N° of refrigerant circuits	n°	2	2	2	2	2	2
Type of refrigerant		R410A					
Number of compressors: Inverter + On/Off	n°	1 + 1	1 + 1	1 + 1	1 + 2	1 + 2	1 + 2
Max. electricity absorbed by the unit	A	51,40	53,40	73,60	84,70	99,70	103,70
Power supply	V/ph/Hz	400 V +- 10% / 3 / 50 + N + $\underline{\underline{\text{G}}}$					
Type of filters for fresh air section		F7	F7	F7	F7	F7	F7
Type of filters for return air section		M5	M5	M5	M5	M5	M5
SFP factor filters	W/(l/s)	1,86	1,83	1,76	2,04	2,13	2,20
Supply sound power level ⁽³⁾	dB(A)	82	84	84	92	94	96
Return sound power level ⁽³⁾	dB(A)	72	71	71	75	77	85
Sound pressure level in scale A (ISO EN 3744) ⁽⁴⁾	dB(A)	57	58	59	61	63	63

⁽¹⁾ fresh air inlet +35 °C / 40% RH, return air +26 °C / 50% RH

⁽²⁾ fresh air inlet -10 °C / 90% RH, return air +20 °C / 50% RH

⁽³⁾ sound power level calculated in accordance with EN 3744

⁽⁴⁾ sound pressure level measured at 1 m free field distance, in accordance with EN 3744

ACCESSORIES

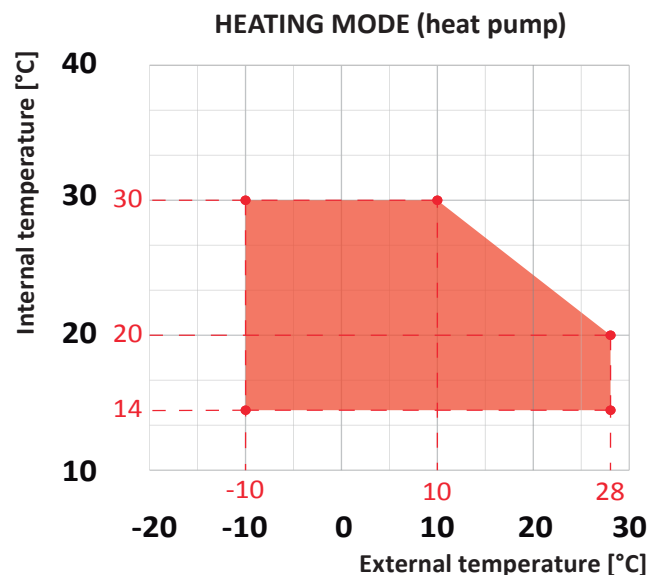
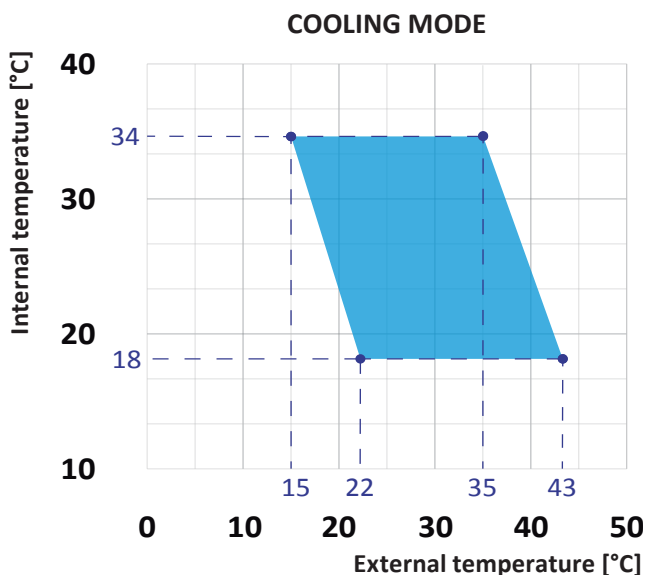
MODEL	011	021	031	041	061	062	081	082	101	102	132	172	242
Supply and return EC fans	■	■	■	■	■	■	■	■	■	■	■	■	■
Rotary heat recovery	■	■	■	■	■	■	■	■	■	■	■	■	■
ePM ₁₀ 60% (M5) return filter / ePM ₁ 55% (F7) supply filter	■	■	■	■	■	■	■	■	■	■	■	■	■
Inverter compressor	■	■	■	■	■	■	■	■	■	■	■	■	■
Filters differential pressure switches	■	■	■	■	■	■	■	■	■	■	■	■	■
Fans differential pressure transducers	■	■	■	■	■	■	■	■	■	■	■	■	■
Microprocessor control system with display	■	■	■	■	■	■	■	■	■	■	■	■	■
Hot gas injection defrost system	■	■	■	■	■	■	■	■	■	■	■	■	■
RS-485 serial port Modbus protocol	■	■	■	■	■	■	■	■	■	■	■	■	■
50 mm frame or 60 mm thermal break frame	□	□	□	□	□	□	□	□	□	□	□	□	□
40 kg/m ³ polyurethane panels thermal insulation	□	□	□	□	□	□	□	□	□	□	□	□	□
90 kg/m ³ mineral wool panels thermal insulation	□	□	□	□	□	□	□	□	□	□	□	□	□
Filters ePM ₁ 55% (F7) return and/or ePM ₁ 80% (F9) supply/return	□	□	□	□	□	□	□	□	□	□	□	□	□
Pre-filters ePM ₁₀ 50% (G4) on supply/return	□	□	□	□	□	□	□	□	□	□	□	□	□
Return grease ISO Coarse 40% (G2) filter	□	□	□	□	□	□	□	□	□	□	□	□	□
Electric frost coil protection	□	□	□	□	□	□	□	□	□	□	□	□	□
Electric heating coil ⁽¹⁾	□	□	□	□	□	□	□	□	□	□	□	□	□
Hot water / cold water / direct expansion coil ⁽¹⁾	□	□	□	□	□	□	□	□	□	□	□	□	□
3 way modulating valve ⁽¹⁾	□	□	□	□	□	□	□	□	□	□	□	□	□
Circular duct flanges (4 pcs)	□	□	□	□	□	□	□	□	□	□	□	□	□
Exhaust/Fresh air damper	□	□	□	□	□	□	□	□	□	□	□	□	□
ON/OFF damper actuator	□	□	□	□	□	□	□	□	□	□	□	□	□
Sound attenuator ⁽¹⁾	□	□	□	□	□	□	□	□	□	□	□	□	□
Roof for outdoor installation	□	□	□	□	□	□	□	□	□	□	□	□	□
45° hoods with bird trap (2 pcs)	□	□	□	□	□	□	□	□	□	□	□	□	□
Remote control panel ⁽²⁾	□	□	□	□	□	□	□	□	□	□	□	□	□

⁽¹⁾ mounted in a separated box

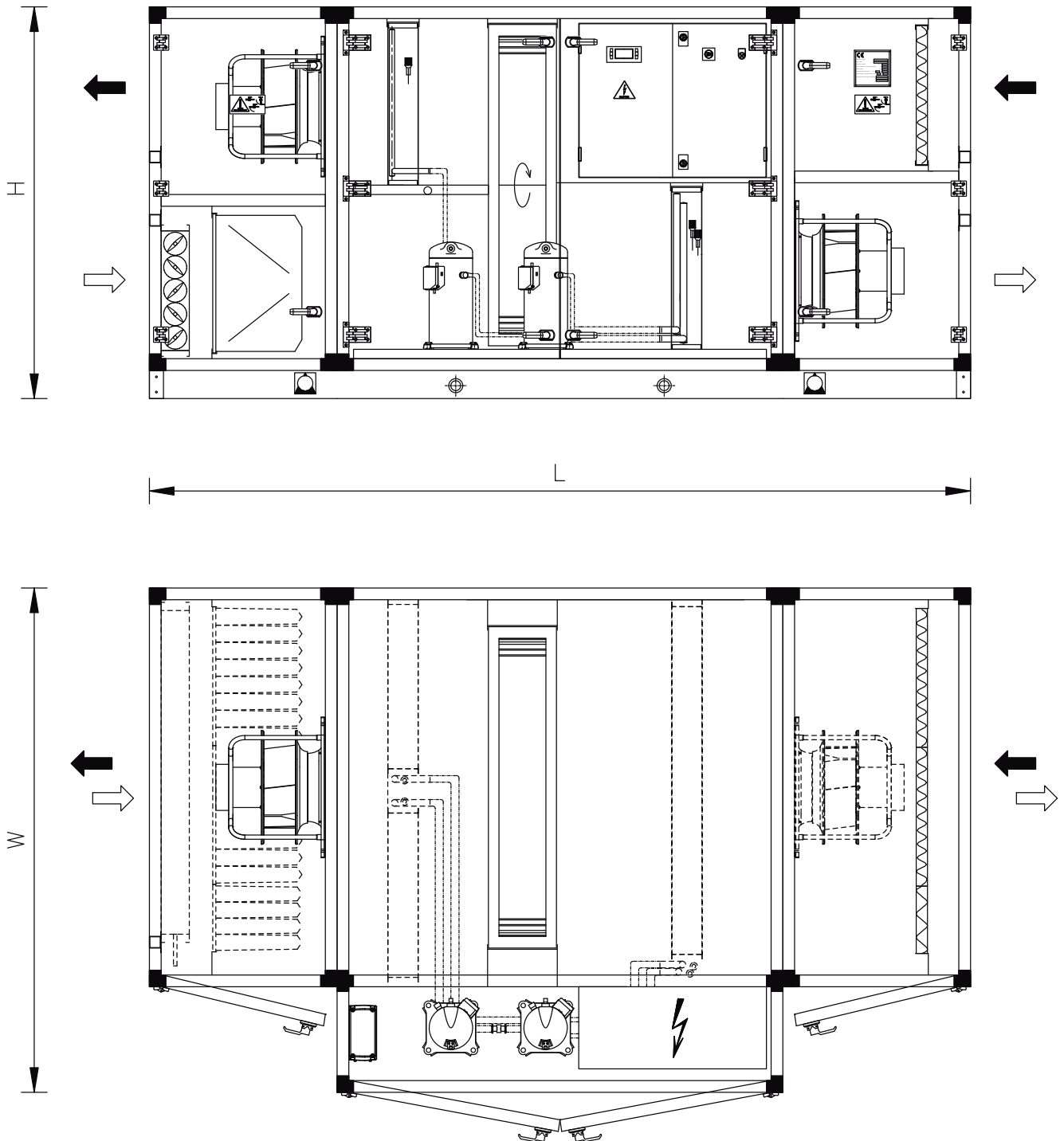
⁽²⁾ supplied loose

■ Standard □ Optional – Not available

OPERATING LIMITS



DIMENSIONAL DRAWING



DIMENSIONS AND WEIGHTS

MODEL	011	021	031	041	061	062	081	082	101	102	132	172	242
L (mm)	2860	2900	3250	3250	3450	3450	3450	3450	3550	3550	3300	3500	4900
W (mm)	1150	1350	1500	1650	1900	1900	2150	2150	2250	2250	2280	2380	2380
H (mm)	1020	1270	1300	1550	1700	1700	1900	1900	2050	2050	2220	2550	2750
Weight (kg)	330	469	589	699	871	871	998	998	1197	1197	1269	1499	1887

Dimensions and weights referred to the standard configuration