



HEAT RECOVERY UNITS WITH COOLING CIRCUIT
SELECTION, USE, INSTALLATION AND MAINTENANCE MANUAL

URHE_CF



Index

<i>General norms</i>	4
<i>Unit description</i>	5
<i>Components decription</i>	6
<i>Accessories</i>	7
<i>Technical data</i>	8
<i>Operating limits</i>	10
<i>Sound data</i>	10
<i>Cooling performance variation</i>	11
<i>Fans available static pressure</i>	11
<i>Fresh air temperature variations on the change of the external air temperature</i>	12
<i>Heating efficiencies, pressure drops on air side, accessories MBCH, MSS</i>	13
<i>Cooling scheme summer operation</i>	14
<i>Cooling scheme winter operation</i>	15
<i>Dimensions</i>	16
<i>Accessories dimensions</i>	19
<i>Accessories assembly instructions</i>	21
<i>Installation and use of the unit</i>	23
<i>Positioning of the supporting brackets</i>	24
<i>Ducts connection</i>	25
<i>Hydraulic connections, condensate drain discharge</i>	25
<i>FCH Free-cooling accessory</i>	26
<i>Electrical connections</i>	27
<i>Maintenance of the unit</i>	28
<i>Filters</i>	28
<i>Condensate drain pan</i>	28
<i>Recuperator</i>	28
<i>Fans motor assembly</i>	28
<i>Heat exchange coil</i>	29
<i>Decommissioning</i>	29
<i>Disposal</i>	29
<i>Diagnosis and fault solving</i>	30



AERMEC S.p.A.
 I-37040 Bevilacqua (VR) Italia – Via Roma, 44
 Tel. (+39) 0442 633111
 Telefax 0442 93730 – (+39) 0442 93566

AERMEC	AERMEC S.p.A. 37040 Bevilacqua (VR) – Italy Via Roma, 996 Tel. (+39) 0442 633111	CE																		
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2006/95/CE Direttiva Bassa Tensione / Low voltage Directive / Basse Tension / Niederspannungsrichtlinie																				
2004/108/CE Direttiva EMC / EMC Directive / EMC Directive / EMV-Richtlinie																				
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<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Componente / Component / Élément / Komponente</th> <th style="text-align: center;">Modulo / Module / Module / Modul</th> </tr> </thead> <tbody> <tr> <td>Pressostato di alta pressione / Pressure switch / Pressostat / Druckschalter</td> <td style="text-align: center;">B + D</td> </tr> <tr> <td>Valvola di sicurezza / Pressure relief valve / Valve de sécurité / Sicherheitsventil</td> <td style="text-align: center;">B + D</td> </tr> <tr> <td>Compressore / Compressor / Compresseur / Kompressor</td> <td style="text-align: center;">D1</td> </tr> <tr> <td>Ricevitore di liquido / Liquid receiver / Flüssigkeitssammler / Boutilles liquide</td> <td style="text-align: center;">A</td> </tr> <tr> <td>Separatore di liquido / Suction accumulator / Flüssigkeitsabscheider / Boutilles anti-coup</td> <td style="text-align: center;">A</td> </tr> <tr> <td>Filtro deidratatore / Filter / Filter / Filtres</td> <td style="text-align: center;">A</td> </tr> <tr> <td>Rubinetti / Ball valve / kleinventile / Vanes</td> <td style="text-align: center;">A</td> </tr> <tr> <td>Batteria di scambio termico / Coil / Register / Batterie</td> <td style="text-align: center;">A</td> </tr> </tbody> </table>			Componente / Component / Élément / Komponente	Modulo / Module / Module / Modul	Pressostato di alta pressione / Pressure switch / Pressostat / Druckschalter	B + D	Valvola di sicurezza / Pressure relief valve / Valve de sécurité / Sicherheitsventil	B + D	Compressore / Compressor / Compresseur / Kompressor	D1	Ricevitore di liquido / Liquid receiver / Flüssigkeitssammler / Boutilles liquide	A	Separatore di liquido / Suction accumulator / Flüssigkeitsabscheider / Boutilles anti-coup	A	Filtro deidratatore / Filter / Filter / Filtres	A	Rubinetti / Ball valve / kleinventile / Vanes	A	Batteria di scambio termico / Coil / Register / Batterie	A
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Marco Pedron via Luppia Alberi,170																				
Bevilacqua, 01/08/2012	Luigi Zucchi 																			

General norms

The present manual is an integral part of the documentation enclosed with the machine.

It must be conserved for future reference and must accompany the machine throughout its working life.

The manual defines the purpose to which the machine was built and establishes the correct installation and use limits.

- All use, installation and maintenance instructions of the unit are described in this manual as well as the main accident prevention standards.
- Read carefully and fully all information contained in this manual before the installation, starting, use, maintenance and cleaning of the unit. Pay particular attention to the use regulations that are accompanied by "DANGER" or "WARNING", because if not observed, they could cause damage to the machine and/or persons and property.
- For irregularities not contemplated by this manual, please consult the local After Sales Service.
- AERMEC S.p.A. decline any responsibility for any damage due to the improper use of the machine, and to a partial or superficial reading of the information contained in this manual.
- Installation and maintenance must be carried out by trained and qualified personnel, having the requirements laid down by law 46/90 and/or DPR 380/2001 for electric/electronic and air conditioning installations, with consequent registration at the local CHAMBER of COMMERCE. Otherwise AERMEC S.p.A. decline all responsibility regarding the safety of the product.

THE MANUFACTURER DECLINES ANY RESPONSIBILITY FOR DAMAGE TO PROPERTY, PERSONS OR ANIMALS CAUSED BY THE NON OBSERVANCE OF THE INDICATIONS AND REGULATIONS CONTAINED IN THE PRESENT MANUAL.

Even though a suitable risk analysis was carried out during the design of the HRR unit, pay ATTENTION to the pictograms on the machine that make the reading of the manual easier catching the readers attention concerning risks that can't be avoided or sufficiently limited with the adoption of protection means and measures.



GENERAL DANGER SIGNS

Carefully observe all indications at the side of the pictogram.

The non observance of the indications could cause hazardous conditions with possible injury to the operator and to the user in general.



VOLTAGE DANGER SIGN

Carefully observe all indications at the side of the pictogram.

The signs indicate components on the unit or, in the present manual, identify areas that could generate risks of an electrical nature.



GENERAL WARNING SIGNS

Carefully observe all indications to the side of the pictogram that limit some actions in order to ensure greater safety for the operator.

MAIN GUARANTEE CONDITIONS

- The guarantee does not include payment for damages due to incorrect installation by the installer.
- The guarantee does not include payment for damages due to the improper use of the unit by the user.
- The manufacturer is not responsible for injuries to the installer or user, caused by incorrect installation or improper use of the unit;
- The equipment must be installed in such a manner so as to allow maintenance and/or repair operations;
- The guarantee does not cover in any case costs due to turntable ladders, scaffolding or other similar elevating systems that are necessary to carry out operations under guarantee.

The guarantee is not valid if:

- the services and repairs have been carried out by unauthorised personnel or companies;
- the unit has been previously repaired or modified with non original parts;
- the unit has not been suitably maintained;
- the instructions illustrated in the present manual have not been observed;
- unauthorised modifications have been made.

Note:

The manufacturer reserves the right to carry out modifications at any time deemed necessary to improve their product, and are not obliged to apply the said modifications to previously manufactured machines that have already been delivered or are being constructed.

The general conditions are in any case subject to the general sale conditions included on the stipulation of the contract.

Description of the unit

The URHE_CF series is the mono-block solution to the needs of systems normally used in bars, restaurants, offices, meeting rooms. The URHE_CF units, which are divided into four sizes with a rated airflow from 1000 to 3300 m³/h, have been designed to guarantee a wellbeing conditions allowing a suitable air change in order to reduce the build-up of gas and undesired particles present in the environment to be treated (CO₂, cigarette smoke, unpleasant odours, sweat, dust,..).

The peculiarity of these series is represented by the high efficiency got thanks the use of the cross flows plate recuperator combined with a cooling circuit in heat pump operating with refrigerant R410A.

The URHE_CF unit, in addition to the ventilation, filtration and recovery of heat, also includes, in a mono-bdamper unit, a heat pump refrigerating circuit. This allows to obtain a complete machine which operates independently

in all seasons and which is capable of combining the necessary renewal of air with an efficient recovery of heat.

The accurate design of the machine combines the extremely compact size, which makes installation on suspended ceilings easier, with easy accessibility for the maintenance of all internal parts. This gives the opportunity, also thanks to the management and installation simplicity, to satisfy many system requirements.

WARNING

The URHE_CF series is made to guarantee indoor air supply and extraction. The refrigerating circuit is calculated not only for giving supply air characteristics near to that of the indoor air, with the aim of avoiding disease conditions near vents, but also for covering in part ambient thermal loads.

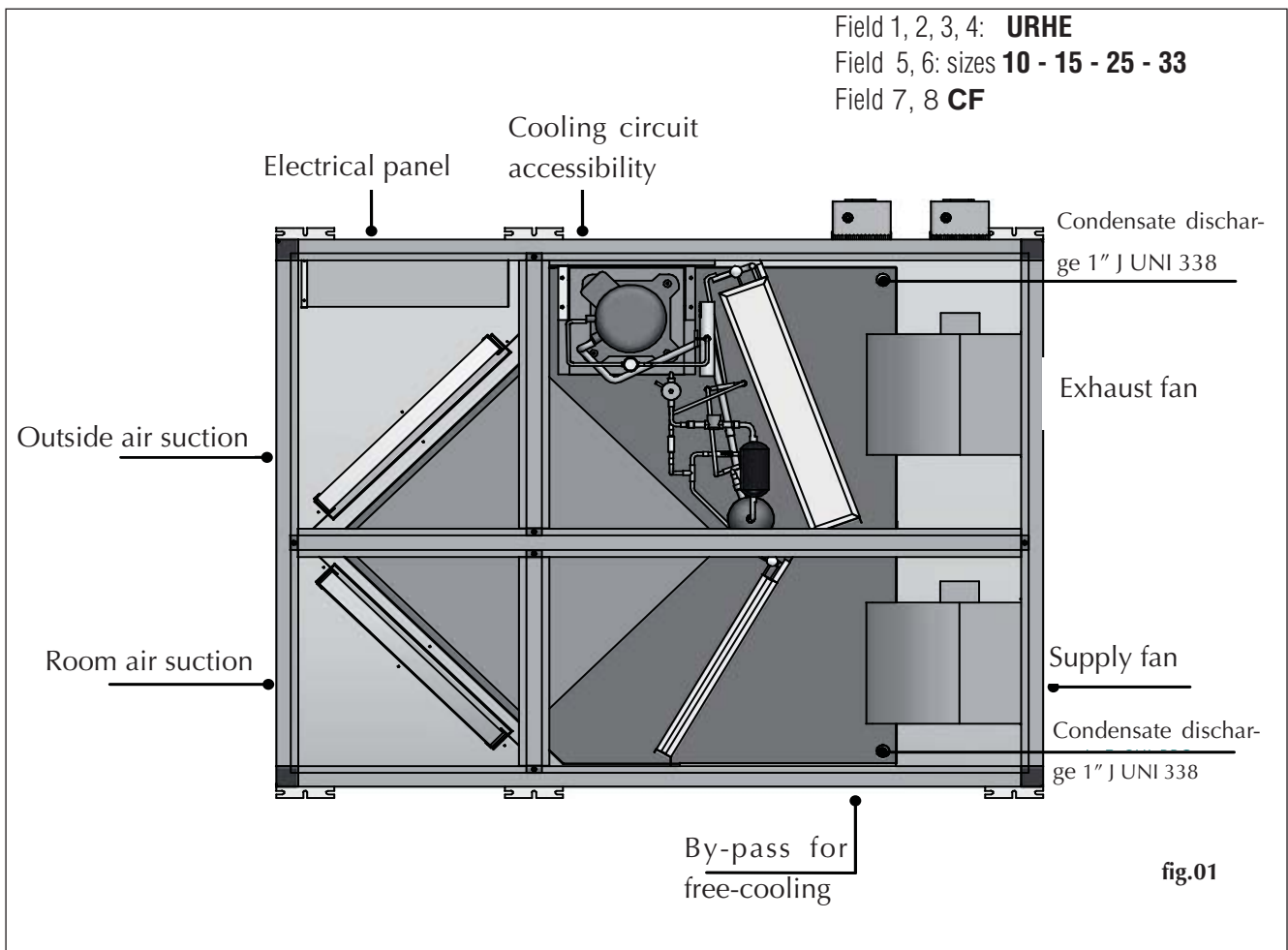
Thermal and refrigerating capacities, which carry air conditions from the indoor air ones to those who cover in

part ambient thermal loads, are referred to as **thermal available capacity and refrigerating available capacity**. These capacities are only an integration of those guaranteed by a conditioning unit.

The URHE_CF series is not a conditioning unit, and it cannot be set apart from a conditioning unit if prefixed indoor air conditions (temperature and humidity) have to be guaranteed.

Available versions

The URHE_CF units are available in 4 different sizes: Each model can be configured in such a manner to satisfy the system requirements by suitable combining the available options. The table in fig. 01 shows the procedure of the commercial acronym in the 6fields from which it is made.



Description of the components

Panels and frame:

The frame is made up of 25 mm thick galvanised self-supporting sandwich panels with injected polyurethane insulation (density of 42 kg/m³) and nylon reinforced corners with glass fibre. The construction of the casing simplifies installation and maintenance.

Fans:

They are centrifugal fans with forward-curved blades and with directly connected motor. The 230V - 50 Hz single-phase motor has one speed. The airflow in case of pressure drops changes of internal components (clogging filters) and distribution system remains constant.

Refrigerating circuit

This is a highly efficient and silent heat pump with scroll or rotative compressor operating with refrigerant R410A (according to sizes), four-way valve for cycle inversion, evaporating coil, safety valve, condensing coil, liquid receiver, thermostatic valve, liquid light, high/low pressure switch and by pass valve (for little sizes).

Condensate drain pan:

made of aluminium alloy, removable and with double discharge.

Evaporating/condensating coil:

with copper grooved tube and high efficiency aluminium fins.

Filters:

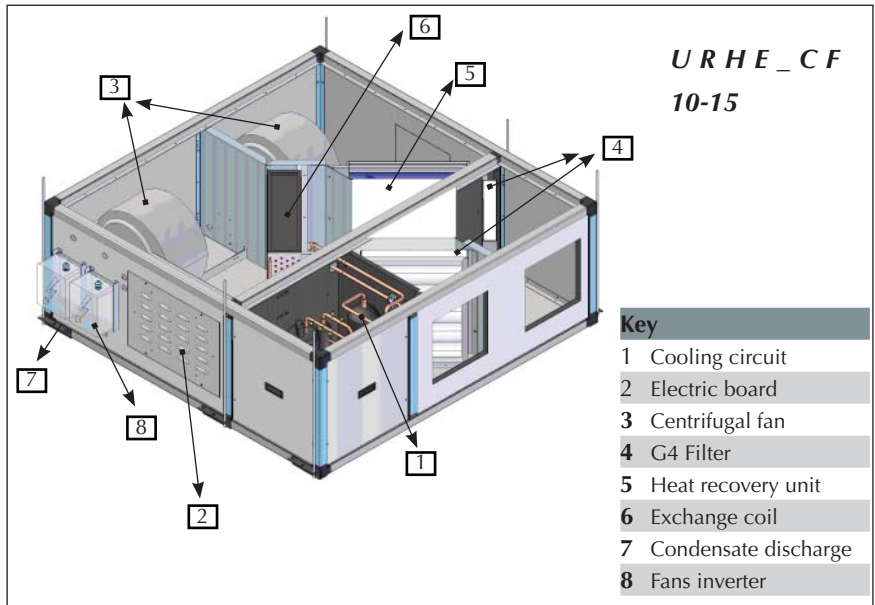
these are cell undulated type placed before the recovery unit on the supply and return airflow. The standard filters are class G4 type in accordance with classification UNI EN 779 with weighted efficiency of 90%. They are 48 mm thick and are easily removable from the top or bottom of the unit for to do the cleaning or replacement.

Dirty filters pressure switch:

A differential pressure switch is present, placed close to the electronic controllers, for the detection of the supply filter clogging. The intervention value can be set. The pressure switch includes clean contacts (NA, NC) to remote the alarm.

Heat recovery unit:

This is static cross flows recuperator made of aluminium sheets to grant high performances. During winter operation, the average efficiency is above 80% for the first



two sizes and 70% for the last two sizes, ensuring first-class energy recovery from the air expelled from the room.

Support brackets:

They allow the unit to be rapidly and securely fixed to the false ceiling.

Accessibility:

The heat recovery, the condensate tank, fans and filters are removable from the bottom, removing the two lower panels (if the unit is hanging), the same can be easily removed from the air by removing the two top panels (if units is on the ground). The inspection of the electrical panel and the circuit is guaranteed by side panels. For the inspection of the filters, in both the cabinet and the floor version, you can disassemble the openings on the top and bottom panels are fastened with flyers.

Regulation

The unit is equipped with an electrical panel with power and regulation section (including the three-way valve for the additional hot water coil and related servomotor), aimed at guaranteeing the management of all refrigerating circuit functions. Also present: NTC temperature probe on the internal air recovery, external air temperature probe, pressure switch on the supply filter.

With the free-cooling accessory are supplied dampers and servomotors.

A remote control terminal is also supplied for the automatic management of the unit, remotable up to 150 meter (cable not supplied). The unit is equipped for the management of a luminous sign (230V) which switches on in case of generic alarm or unit OFF, in conformity with the norms in force for rooms for smokers. The following operations can be performed on the microprocessor: switching on and off of the unit, summer/winter changeover, setting of set-point parameters, reading of room temperature.

N.B. For further information refer to the user manual.



Accessories

MBCH Hot water coil module

This is an external module that can be installed downstream from the motor fan assembly on the fresh air flow, equipped with:

- Two-row water heating coil with copper pipes and aluminium fins with P2519 geometry. The collectors are equipped with a 1/2" G UNI 338 threaded connector for the water inlet and outlet.
- The three-way valves and related ON/OFF actuator.

MBCX Module with battery

This is an outside module that can be installed downstream from the motor fan assembly on the fresh air flow, equipped with:

- Electric battery with armoured finned elements.
- double safety thermostat with automatic and manual reset.

FCT F7 efficiency filters

The units can be fitted with two cell-type undulated filters in class F7 according to the UNI EN 779 classification which can be placed as a replacement of the G4 filters. The filtrating cell is 48 mm thick.

MSS Module with silencers

The accessory is made up of one module that is equipped with silencer positioned on the supply or exhaust.

It is made of rockwool panels with the surfaces in contact with the air and protected by a polyester film held between two galvanised and micro-perforated laths.

FGE circular flanges

The accessory is supplied as a single unit. The accessory is made up of flanges which connect to the rectangular opening vent of the unit so as to allow the use of circular ducts.

Note: for further information, see the tables in this manual and the various accessories kits; see fig. 02 below regarding compatibility.

FCH Free-cooling kit

It allows for the unit operation in free cooling (temperature only). The "free-cooling kit" includes 2 dampers with related ON/OFF 230V servomotors.

For further information refer to the Use manual.

BIT Base for floor installation

BIM Base for floor installation of the additional modules

The accessories, equipped with a metal frame with high 120 mm, allow to transform the standard unit to a unit which can be placed on floor.

TPE Roof for outside installation

TPM Roof for outside installation of the additional modules

TPMSS Roof for outside installation of the silencers modules

This accessory, made of galvanized sheet, allows for the protection from rainings for unit and its accessories.

RS485 Interface card

Interface card necessary for the interface to supervision systems according to the MOD-BUS protocol.

		Size			
		10	15	25	33
Accessories and description					
MBCH	Module with hot water coil	MBCH1			MBCH2
MBCX	Module with electric battery	MBCX1	MBCX2	MBCX3	MBCX4
BIM	Base for addit. modules floor install	BIM1			
TPM	Roof for add. modules outside install	TPM1			TPM2
FCT	Compact filters efficiency class F7	FCT1		FCT2	FCT3
BIT	Base for floor installation	BIT1		BIT2	BIT3
TPE	Roof for outside installation	TPE1		TPE2	TPE3
FCH	Free-cooling Kit	FCH1		FCH2	
RS485	RS485 cards	RS485			
MSS	Silencers modules	MSS1			MSS2
TPMSS	Roof for silencers outside installation	TPMSS1			TPMSS2
FGE	Circular flanges	FGE1			

Technical data

URHE_CF MODEL		10	15	25	33
External nominal air flow	[m³/h]	1000	1500	2500	3300
Recovery nominal air flow	[m³/h]	1000	1500	2500	3300
Minimum air flow	[m³/h]	800	1000	2000	2500
Supply static available pressure	(1) [Pa]	320	245	140	220
Exhaust static available pressure	(1) [Pa]	320	245	140	220
Total heating capacity (rec. + compr.)	(3) [kW]	7,5	14,2	24,8	33,1
Total cooling capacity (rec. + compr.)	(2) [kW]	6,6	8,7	13,8	19,8
Available heating capacity	(3) [kW]	2,8	2,9	3,9	7,0
Available cooling capacity	(2) [kW]	1,8	3,1	3,3	5,4
Recovered heating capacity	(3) [kW]	3,6	10,0	15,3	19,6
Recovered cooling capacity	(2) [kW]	2,2	3,2	4,5	5,8
Refrigerating circuit heating capacity	(3) [kW]	3,9	4,2	9,5	13,5
Refrigerating circuit cooling capacity	(2) [kW]	4,4	5,5	9,3	14,0
Tot. input power in winter	(3) [kW]	2,2	2,4	4,2	4,9
Tot. input power in summer	(2) [kW]	2,6	2,9	5,1	6,5
Sound pressure level	(4) [db(A)]	66	69	72	75
Power supply		1-230-50	1-230-50	3+N-400-50	3+N-400-50
RECUPERATOR					
Efficiency in winter	[%]	82	80	73	71
Efficiency in summer	[%]	82	80	68	65
FANS					
Fans number		2	2	2	2
Total nominal input power	[kW]	0,9	0,9	2,1	2,1
Total max. absorbed current	[A]	7,6	7,6	10,5	10,5
Protection class	IP	55	55	55	55
FILTERS					
Classification according to EN779		G4	G4	G4	G4
Weight efficiency	[%]	90	90	90	90
Classification according to EN779 (filters, accessories)		F7	F7	F7	F7
Additional pressure drop for F7 filters (optional)	Δ [Pa]	35	59	58	63
REFRIGERATING CIRCUIT (COMPRESSOR)					
Refrigerant		R410A	R410A	R410A	R410A
Compressors input power in winter	(3) [kW]	1,3	1,5	2,1	2,8
Compressors input power in summer	(2) [kW]	1,7	2,0	2,8	4,4
Compressors max. absorbed current	[A]	10,0	11,0	7,0	10,3
CONDENSATE DRAN PANEL					
Diameter of the condensate dran panel charge	[in]	1"	1"	1"	1"

Caution: the electronic regulators that are incorporated in the machine allow to regulate the air flow in the limits indicated in the previous table in order to set the system. Once setting has been completed, the regulators no

longer need to be touched.

1) Fan power supply: 230 V; nominal airflow rate; without accessories;

(2) Operating conditions: return air 26°C 50%, external air 34°C 50%;

(3) Operating conditions: return air 20°C 50%, external air -5°C 80%;

(4) At a free field distance of 1 m with ports canalized.

ACCESSORIES

MBCH - Water heating coil		10	15	25	33
Rows	[n]	2	2	2	2
Front surfaces	[m ²]	0,238	0,238	0,238	0,314
Air side pressure drop at nominal flow rate	[Pa]	7	18	37	37
Heating capacity	(1) [kW]	7,68	10,35	15,56	19,7
Heating capacity	(2) [kW]	2,57	4,04	6,45	7,6
Water flow rate	(1) [l/h]	673	906	1363	1725
Water side pressure drop (nominal conditions)	(1) [kPa]	11	8	18	32
Water flow rate	(2) [l/h]	446	700	1118	1311
Water side pressure drop (nominal conditions)	(2) [kPa]	3	6	14	22
Water coil manifolds diameter	[in]	3/4"	3/4"	3/4"	3/4"
MBCX - Electric heating coil					
Power supply		3 ph - 400 V - 50 Hz (power supply separated from unit power supply)			
Heating capacity	[kW]	5	7,5	12,5	16,5
Air side pressure drop at nominal flow rate	[Pa]	10	10	10	10
Stages	[n]	1	1	1	1
Electric absorbed current	[A]	7,6	11,4	19,0	25,1

1) Inlet/outlet water temperature 70/60°C. Compressor running. Operating conditions: return air 20°C 50%, external air -2°C 80%;

(2) Inlet/outlet water temperature 45/40°C. Compressor running. Operating conditions: return air 20°C 50%, external air -5°C 80%;

Operating limits

In their standard set-up, the equipment is not suitable for installation in a saline environment. Refer to fig. 03 for the operating limits.

N.B: Please contact AERMEC technical sales office in the event it is necessary to operate the machine outside the limits indicated in the diagram.

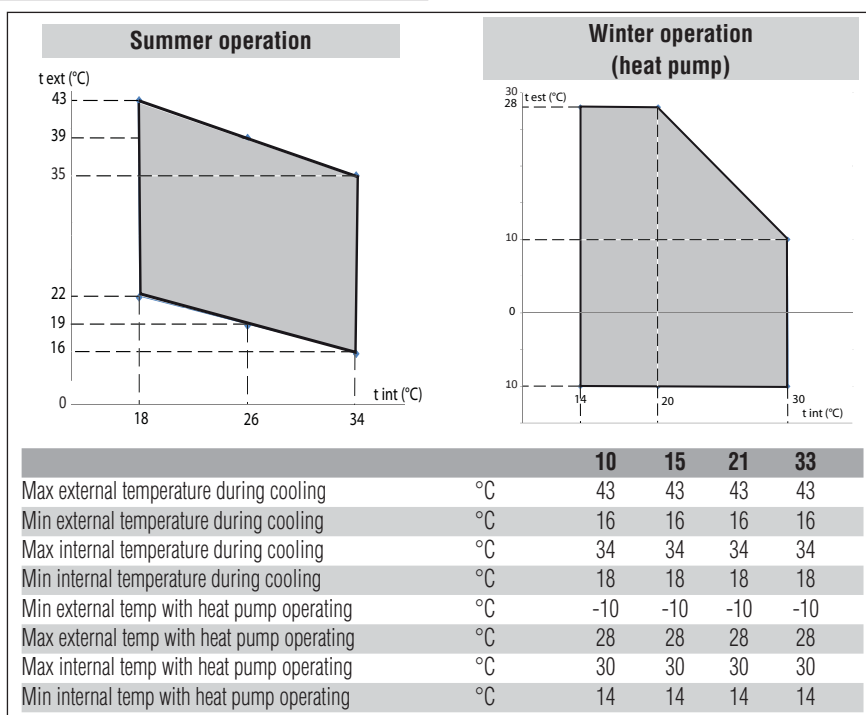


fig.03

Sound data

• **Data outside the panel:** (the data are calculated at the following conditions: 1 m. distance from the unit, ducted supply vent and in free field)

URHE_CF	Pressione sonora per frequenza centrale di banda (Hz)								Press. sonora Totale dB	Press. sonora Totale dB (A)	Pot. sonora Totale dB (A)
	63 dB	125 dB	250 dB	500 dB	1000 dB	2000 dB	4000 dB	8000 dB			
10	57	58	51	50	50	43	39	33	63	54	64
15	61	64	56	50	49	46	40	33	66	56	67
25	62	68	57	53	49	47	46	36	70	56	68
33	65	72	64	56	52	48	42	37	72	60	73

• **Sound data attenuation with SUF - Module with silencers (accessory)**

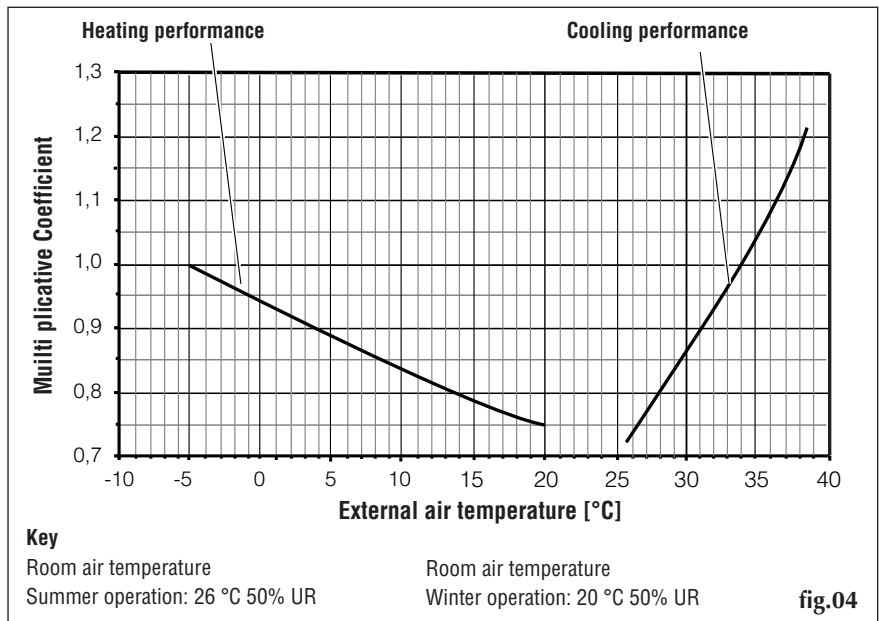
	63 dB	125 dB	250 dB	500 dB	1000 dB	2000 dB	4000 dB	8000 dB
MSS	9	0	2	5	5	9	14	11

Cooling Performance variations

The URHE_CF series heat recovery unit with refrigerating circuit allow the renewal of the internal air giving the necessary hourly change in order to obtain the ideal comfort conditions.

The use of a high efficiency cross-flow heat recovery unit and a heat pump refrigerating circuit allows, in most applications and in the most common external air temperature conditions, in addition to the neutralisation of the heating load of the external air, to supply an adequate heating and cooling capacity to compensate the internal heating loads.

The fig. 4 illustrates the graph from which it is possible to draw the coefficients to be multiplied by the nominal values which are present in the technical data table to determine the total refrigerating and heating performance based on the outside conditions.



MULTIPLICATIVE COEFFICIENTS FOR THE COOLING AND HEATING PERFORMANCE TO ROOM AIR TEMPERATURE VARIATION IN SUMMER/WINTER OPERATION

SUMMER OPERATION:

- Room conditions 22°C, 50% RH --> corrective coefficient = 1,050
- Room conditions 24°C, 50% RH --> corrective coefficient = 1,025
- Room conditions 26°C, 50% RH --> corrective coefficient = 1
- Room conditions 28°C, 50% RH --> corrective coefficient = 0,975

WINTER OPERATION:

- Room conditions 18°C, 50% RH --> corrective coefficient = 0,980
- Room conditions 20°C, 50% RH --> corrective coefficient = 1
- Room conditions 22°C, 50% RH --> corrective coefficient = 1,020
- Room conditions 24°C, 50% RH --> corrective coefficient = 1,040

Fans available static pressure

The variations of the static pressure used by the fans to change the air flow (which can be set by means of the electronic regulators during the setting phase) in relation to the nominal values present in the technical data table, are represented in the graph of fig. 5. The curve is valid for all sizes of the URHE_CF series. As an example, a unit of the URHE15CF series is considered, in which the feed to the fans is at the maximum value.

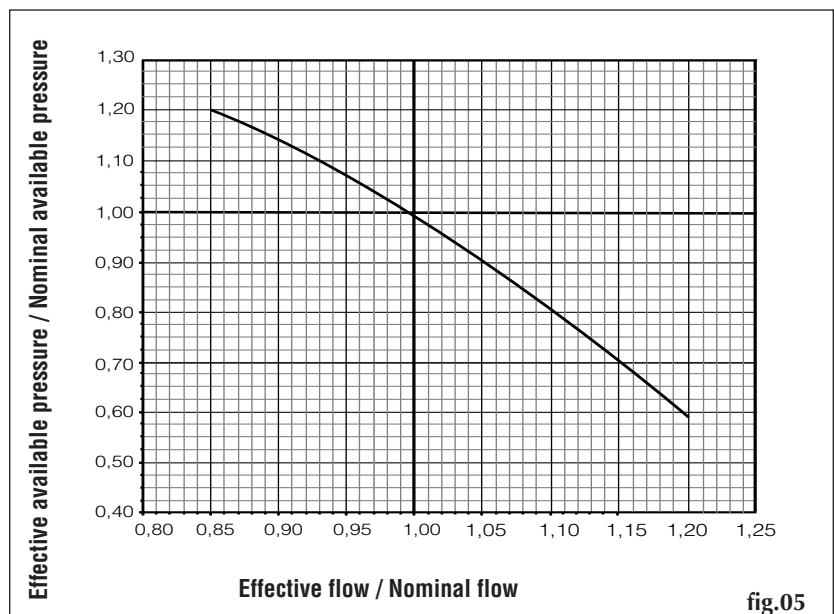
The technical data table illustrates the following performances:

- Nominal supply air flow: 1500 m³/h;**
- Nominal exhaust air flow: 1500 m³/h;**
- Available static pressure on supply= 245 Pa;**
- Available static pressure on exhaust= 245 Pa.**

It is supposed that the pressure drops of the air distribution system on the supply side are equal to 210 Pa, while the pressure drops of the air distribution system on the exhaust side are equal to 235 Pa.

The "Effective available pressure/nominal available pressure" reports are $210/245 = 0.86$ and $235/245 = 0.96$ respectively. The coefficients which can be got from the graph are 1.19 and

1.05. Therefore the effective flow rate on the supply side is $1500 \times 1.08 = 1620$ mc/h; the effective flow rate on the exhaust side is $1500 \times 1,05 = 1575$ mc/h.



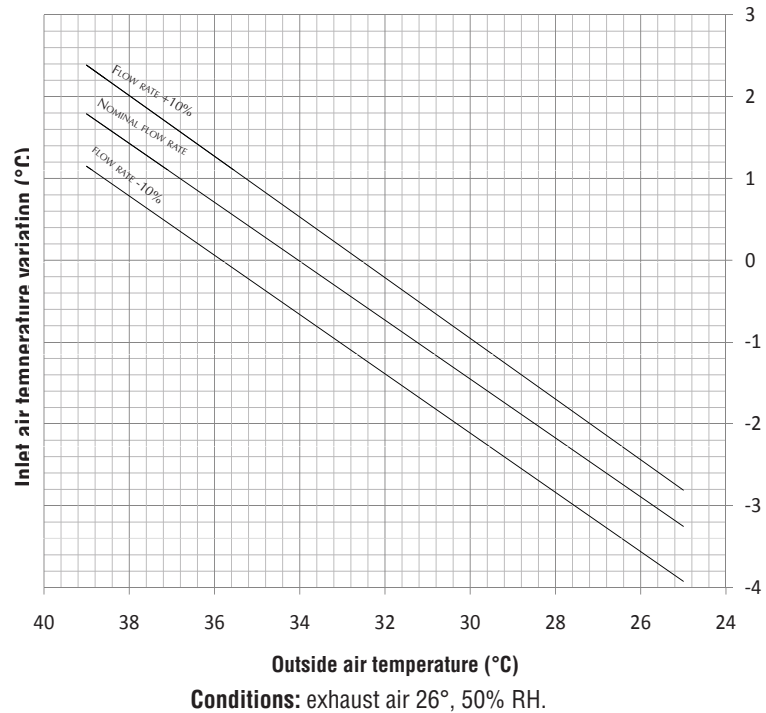
Fresh air temperature variations on the change of the external air temperature

The following charts allow to determine the variation of the temperature within the room on the variation of the external conditions. The variability of the air flows is that allowed to guarantee that the refrigerating circuit operates correctly.

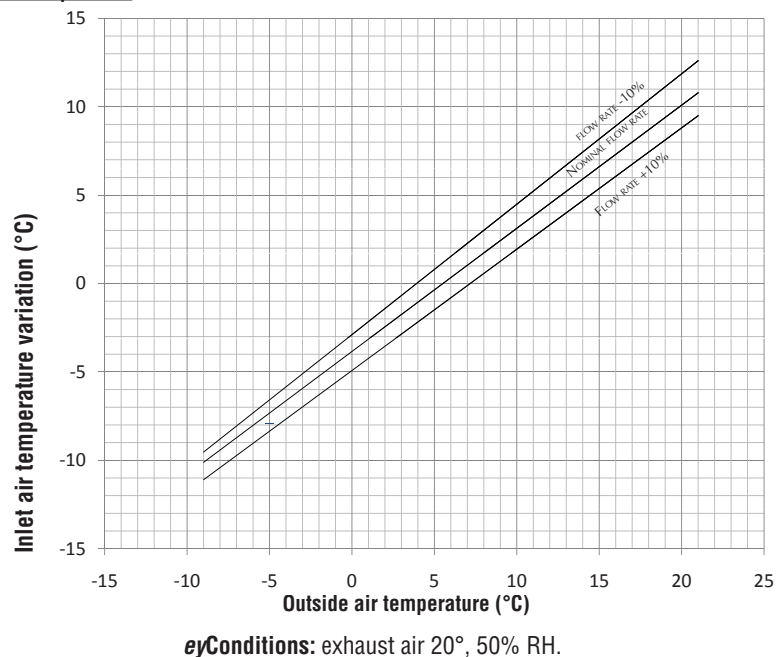
Note:

The following diagrams are representative for all sizes, but without accessories.

Summer operation



Winter operation



Heating efficiencies and accessories pressure drops BCH, MSS

The diagram in fig. 06 allows to determine for each model, according to the water temperature and outside air temperature variation the corrective factor to multiply for the nominal capacity value are present in the technical data table.

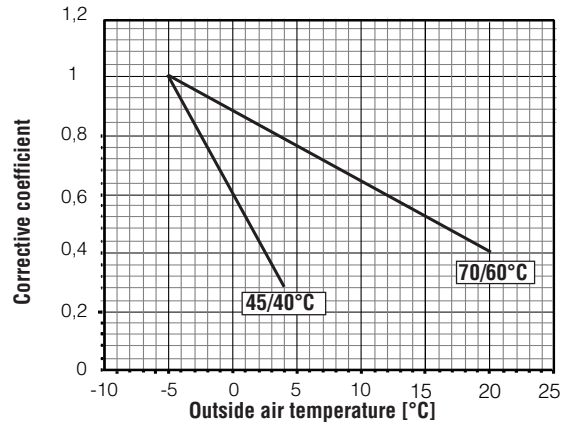


fig.06

Fig. 07 illustrates the pressure drops (Pa) on the air side based on the flow rate for the MBCH and MSS accessories

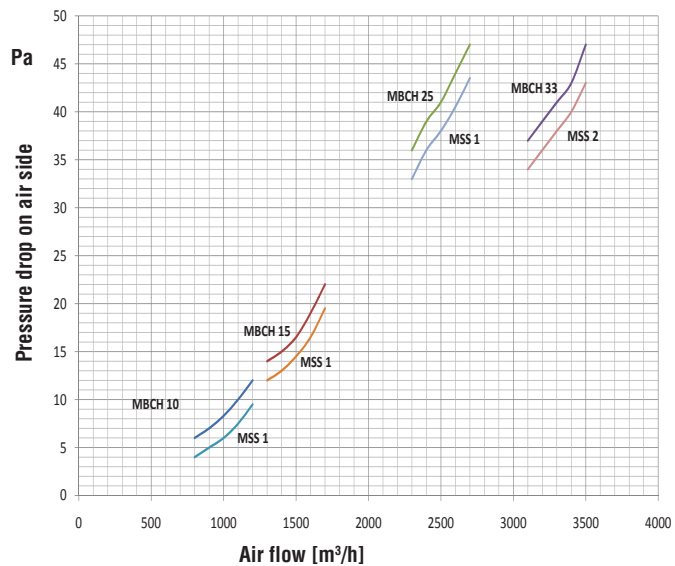


fig.07

Fig. 08 illustrates the pressure drops (kPa) water side of the MBCH accessory coil.

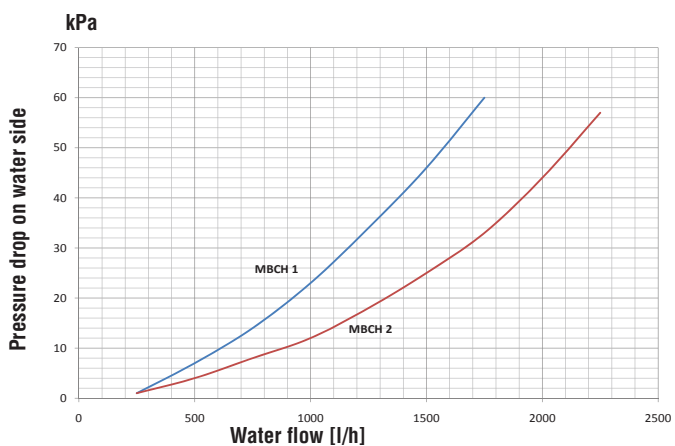
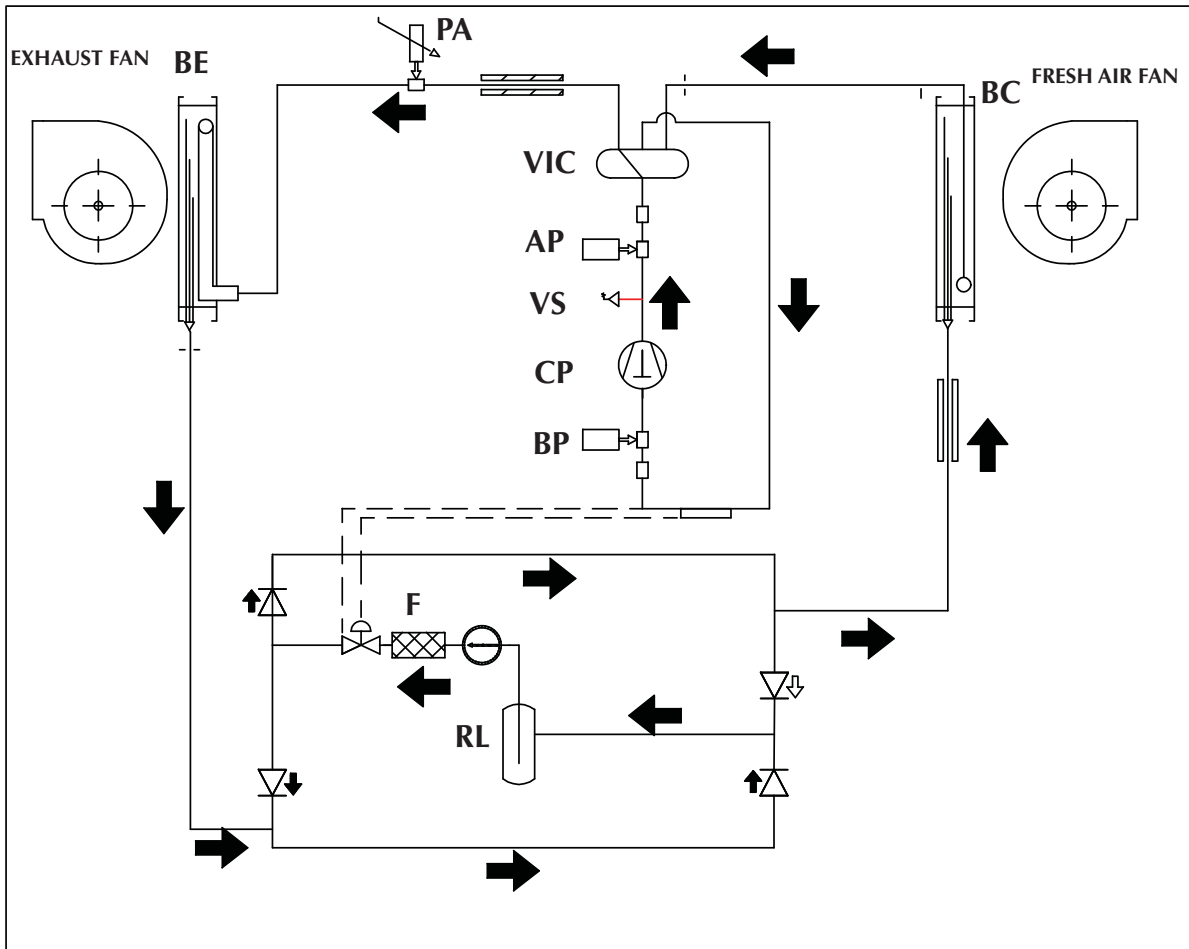


fig.08

Note:
The pressure drops illustrated in the diagram also include those of the three-way valve.

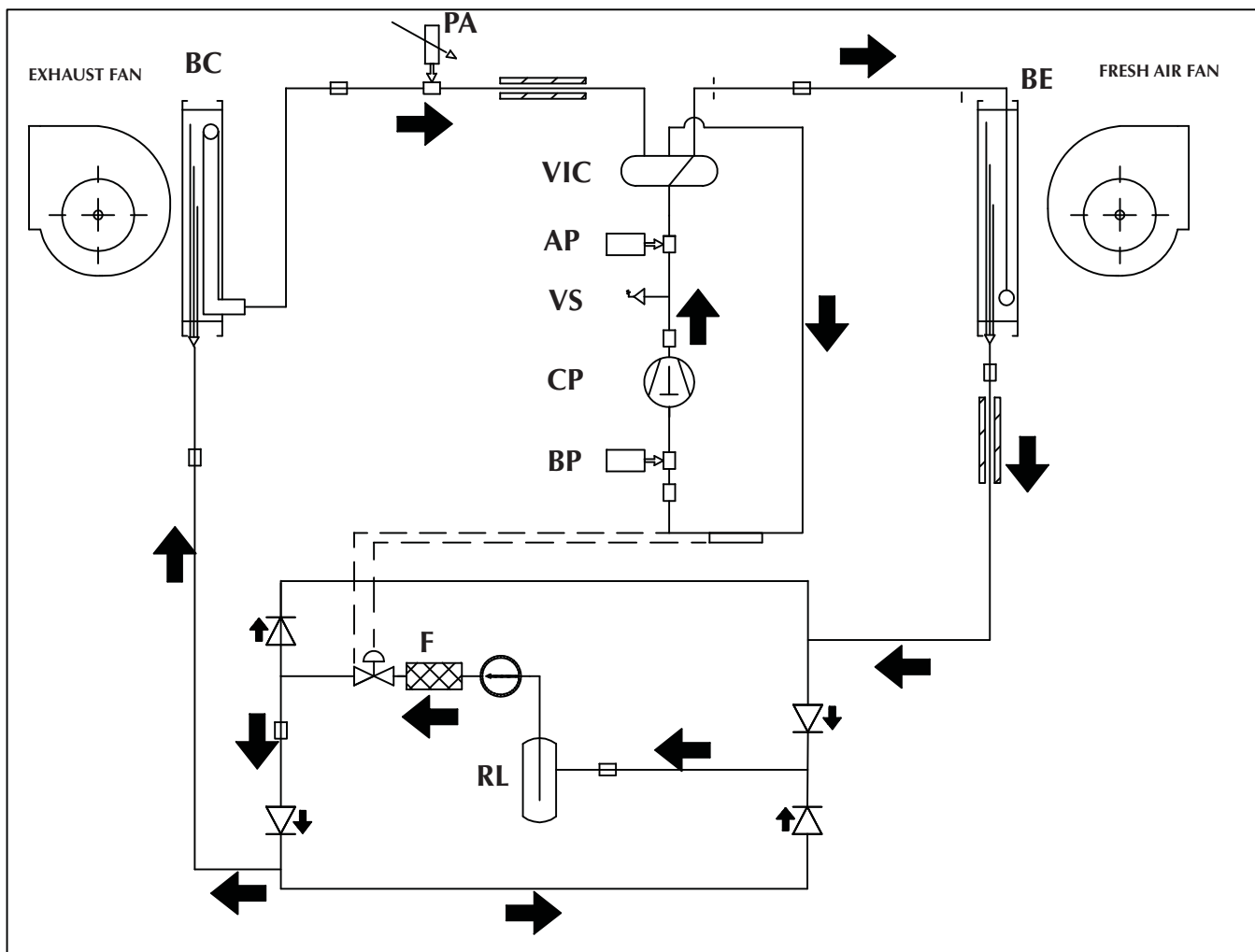
Refrigerating circuit summer operation



KEY

CP	Compressor
BC	Condensing coil
BE	Evaporating coil
VM	Supply fan
F	Filter
RL	Liquid receiver
PA	High pressure probe
VIC	Inversion valve
AP	High pressure switch
BP	Low pressure switch
VS	Safety valve

Refrigerating circuit winter operation

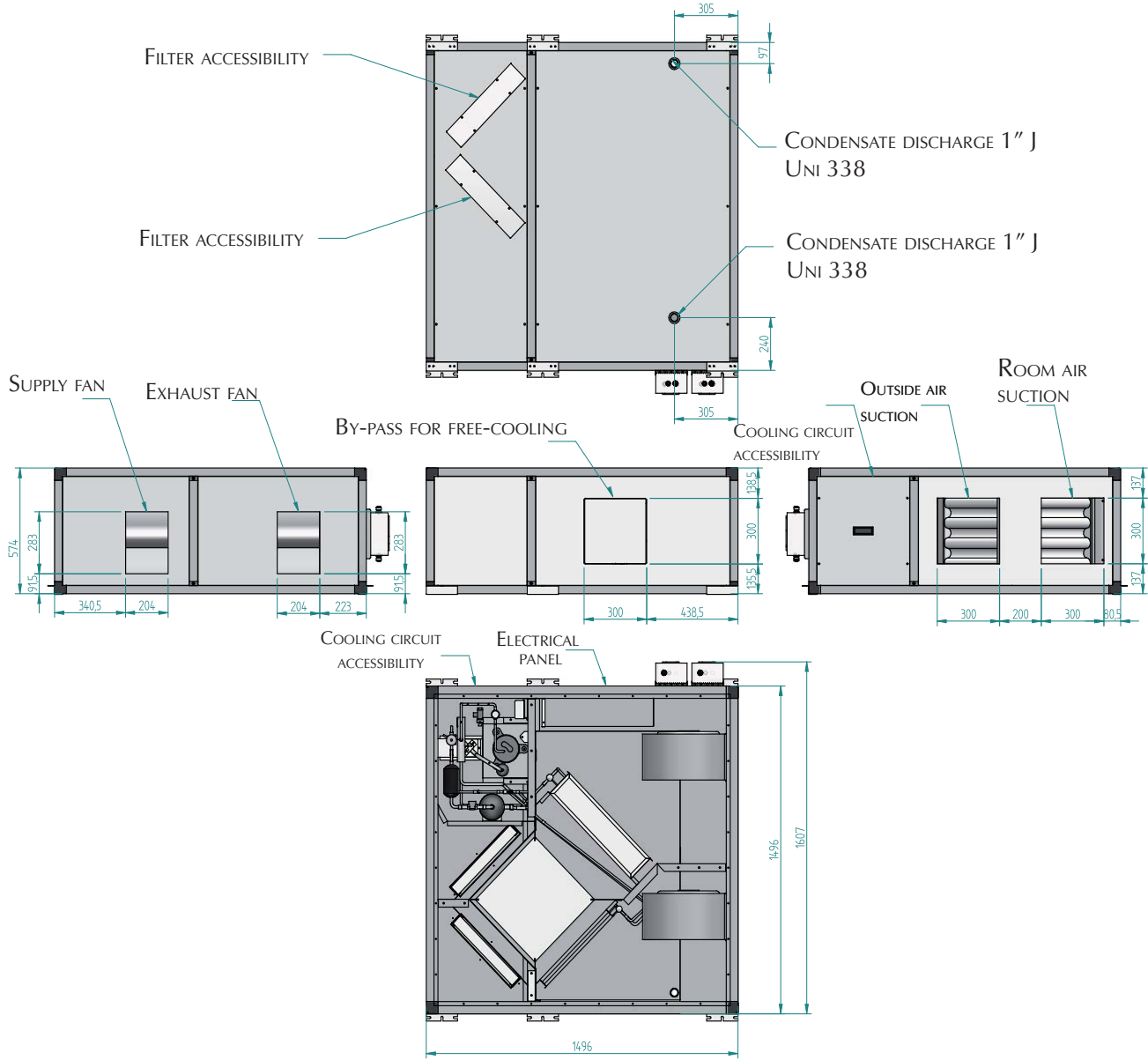


KEY

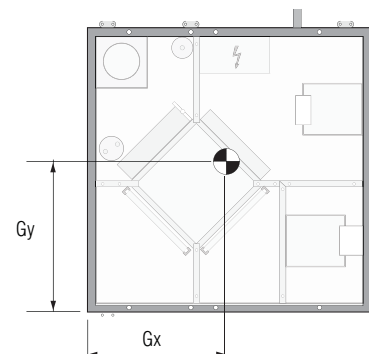
- CP Compressor
- BC Condensing coil
- BE Evaporating coil
- VM Supply fan
- F Filter
- RL Liquid receiver
- PA High pressure probe
- VIC Inversion valve
- AP High pressure switch
- BP Low pressure switch
- VS Safety valve

Dimensions

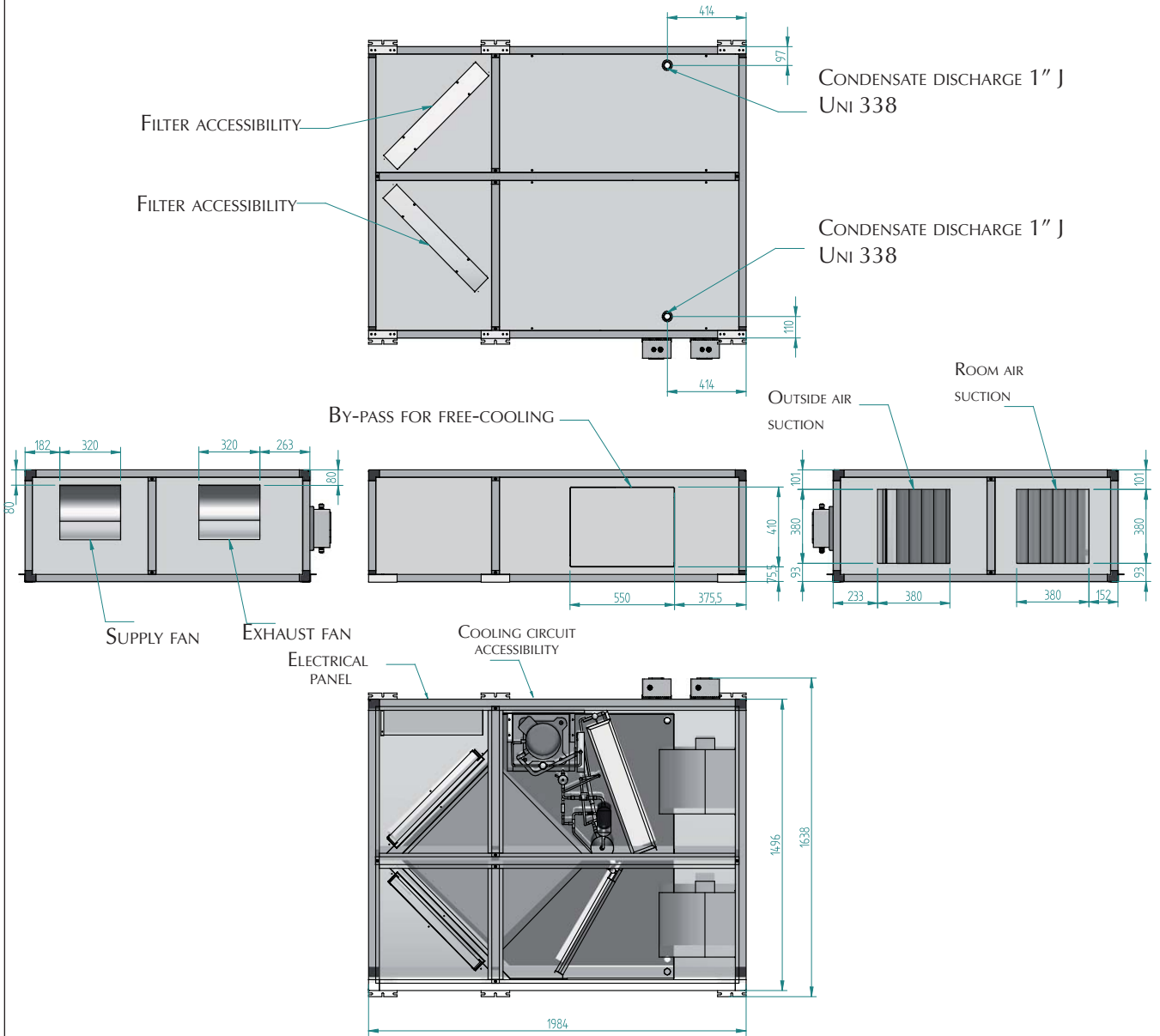
URHE10CF -URHE15CF



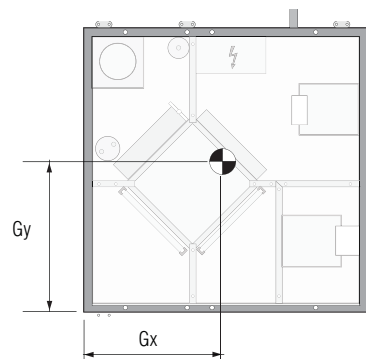
Weights and c.g.	kg	Gx	Gy
URHE10CF	300	700	650
URHE15CF	310	740	745



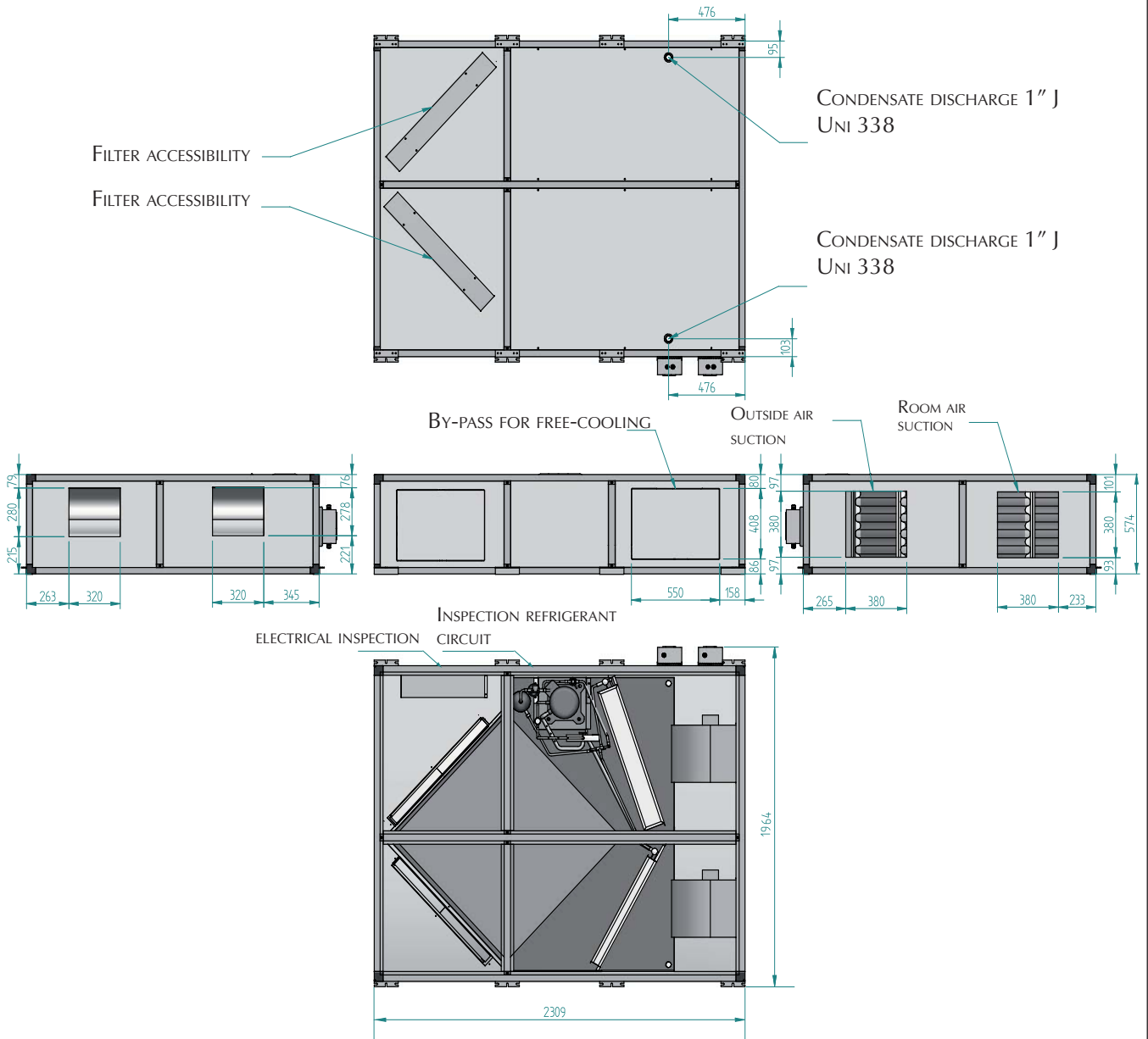
URHE25CF



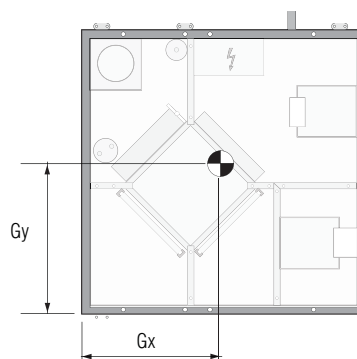
Weights and c.g.	kg	Gx	Gy
URHE25CF	373	1130	920



URHE33CF

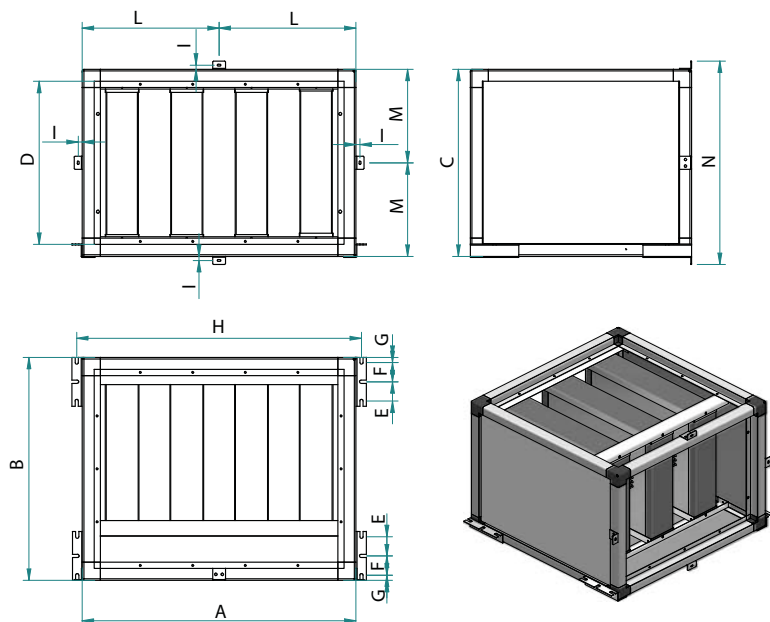


Weights and c.g.	kg	Gx	Gy
URHE33CF	410	1365	1145



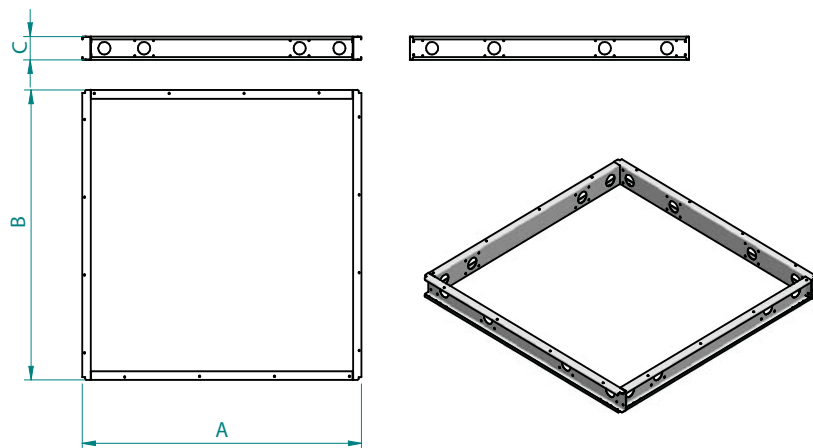
Accessories Dimensions

MSS - Silencers Modules



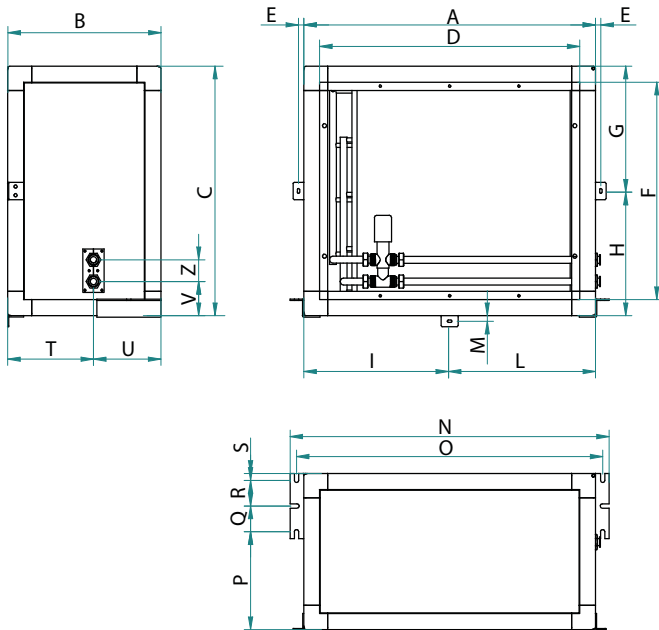
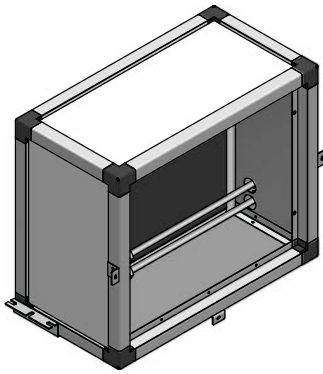
Mod. [mm]	URHE_CF	URHE33CF
	10-15-25	MSS 1
A	684	846,5
B	684	684
C	574	574
D	500	500
E	59	59
F	59	59
G	16	16
H	718	880,5
I	12,5	12,5
L	342	432,5
M	287	287
N	624	624

BIT - Base for floor installation



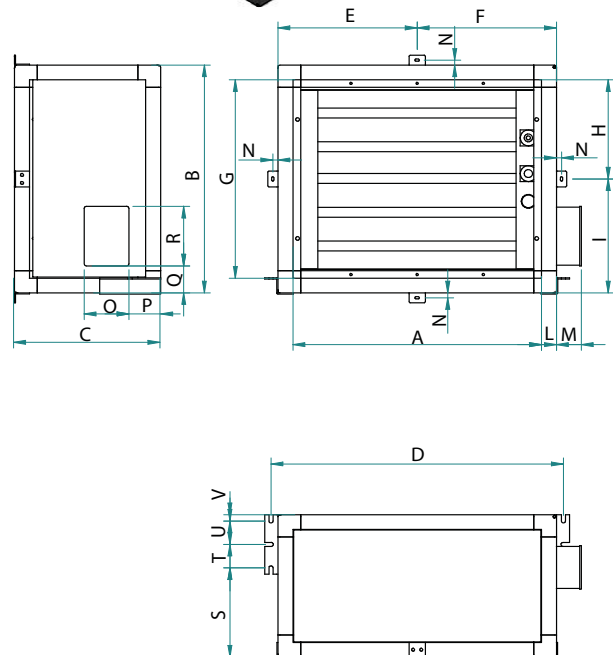
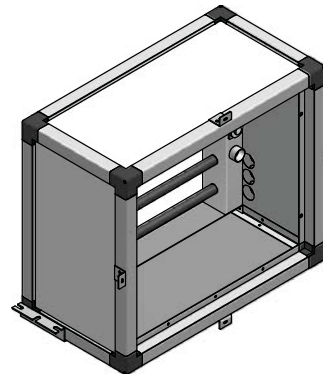
Mod. [mm]	URHE_CF	URHE25CF	URHE33CF
	10-15	BIT 2	BIT 3
A	1490,5	1978	2303
B	1490,5	1490,5	1815,5
C	120	120	120

MBCH - Module with water coil



Mod. [mm]	URHE_CF 10-15-25 MBCH 1	URHE33CF MBCH 2
A	684	846
B	359	359
C	574	574
D	610	772
E	12,5	12,5
F	500	500
G	290	287
H	284	287
I	339	423
L	345	423
M	12,5	12,5
N	748	910,5
O	718	880,5
P	225	225
Q	59	59
R	59	59
S	16	16
T	201	201
U	158	158
V	79	79
Z	50	50

MBCX - Module with electric coil



Mod. [mm]	URHE_CF 10-15-25 MBCX 1-2-3	URHE33CF MBCX 2
A	610	772,5
B	574	574
C	359	359
D	718	880,5
E	342	423
F	342	423
G	500	500
H	250	287
I	287	287
L	37	37
M	61	61
N	12,5	12,5
O	110	110
P	78	76
Q	68	71
R	150	150
S	225	225
T	59	59
U	59	59
V	16	16

MSS, MBCH, MBCX assembly

Accessories MBCH, MBCX and MSS are equipped with:

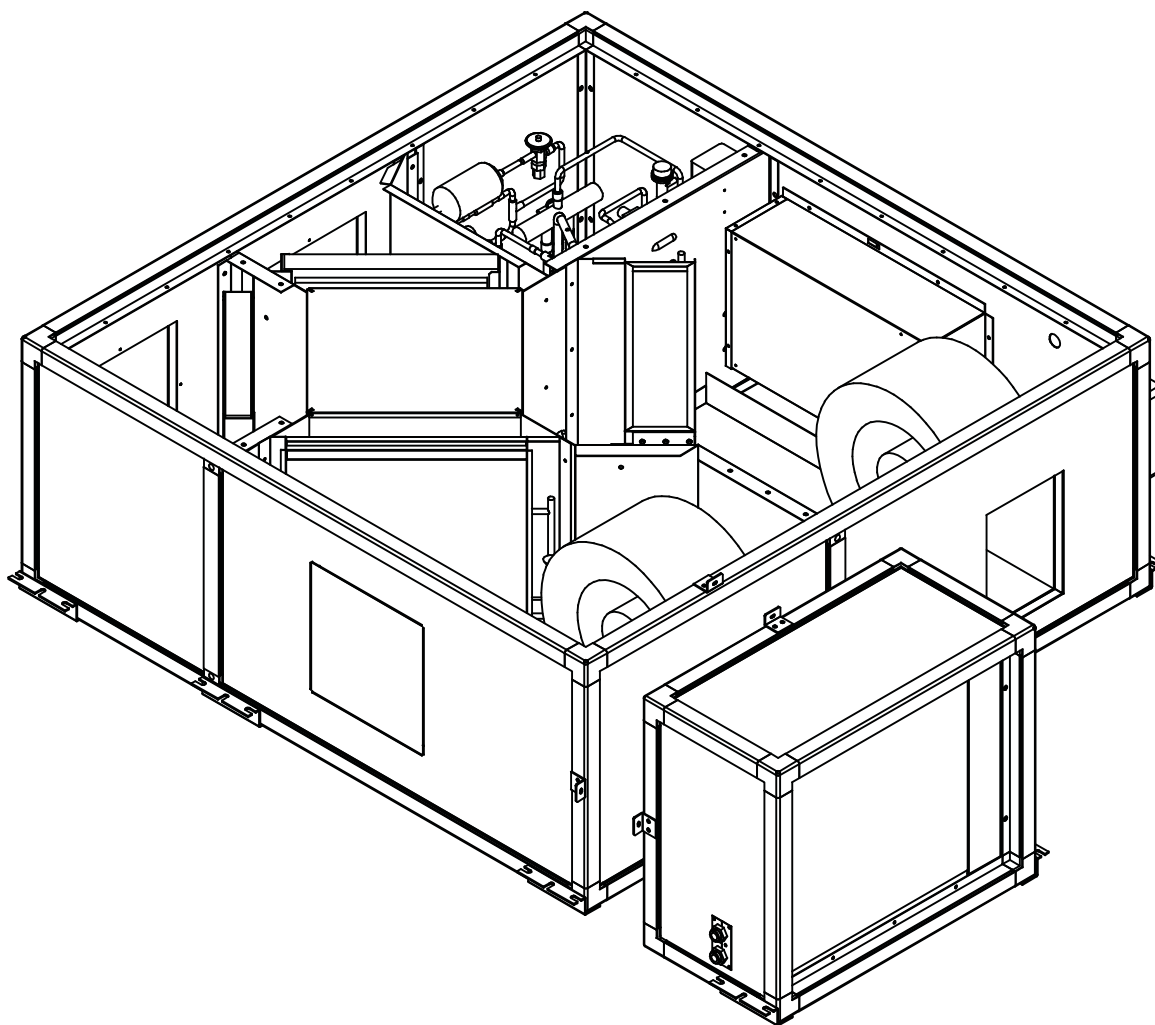
- "L" supporting brackets;
- M6 screws to draw close the accessory to unit;
- for MBCX only: electrical box put outside the accessory;
- for MBCH only: electrical cables for connection between three way valve servocontrol (230V, ON/OFF running) and electrical box and between electrical box and unit electrical panel;
- for MBCX only: electrical cables for

connection between coil and electrical box and between electrical box and unit electrical panel (electrical cables for coil electrical supply and protection differential magnetic switch are not supplied).

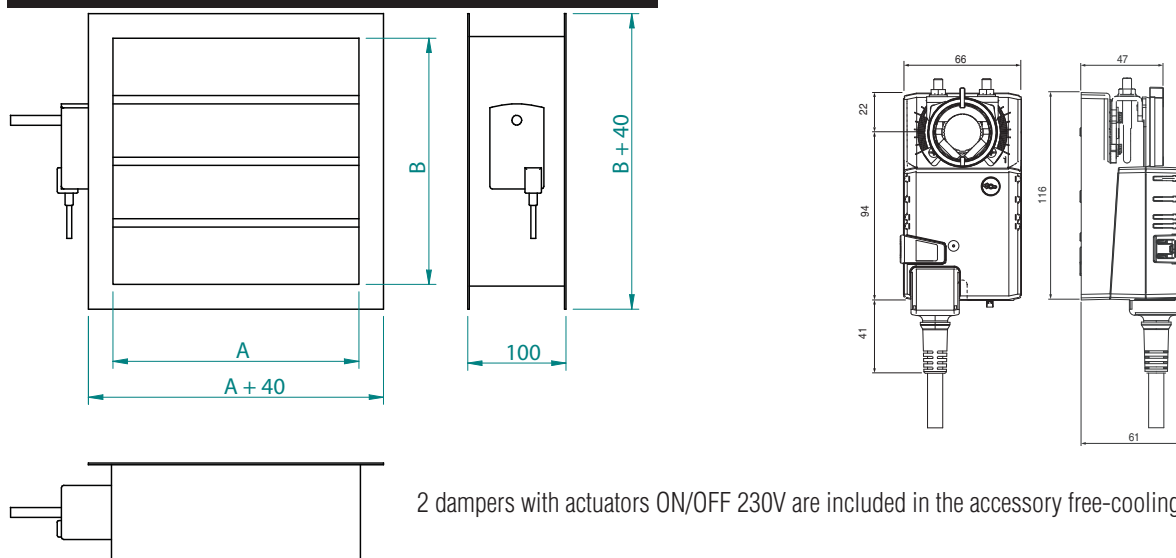
For accessories installation on the ceiling and their connection to the unit please refer to the following instructions:

- collocate the support brackets on the wall following the instructions at page 24;

- draw close to the accessory MBCH, MBCX, MSS to unit;
- fix with screws the accessory to unit prepared with threaded hexagonal inserts;
- connect electrical cables coming from the accessory electrical box to the unit electrical panel (please refer to electrical schemes equipped with the unit).

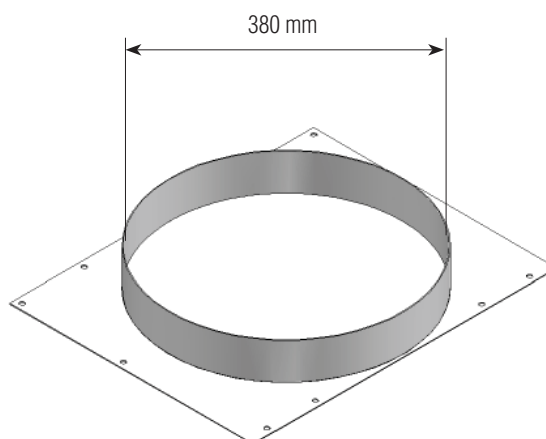


Dampers and actuators (accessory FCH)

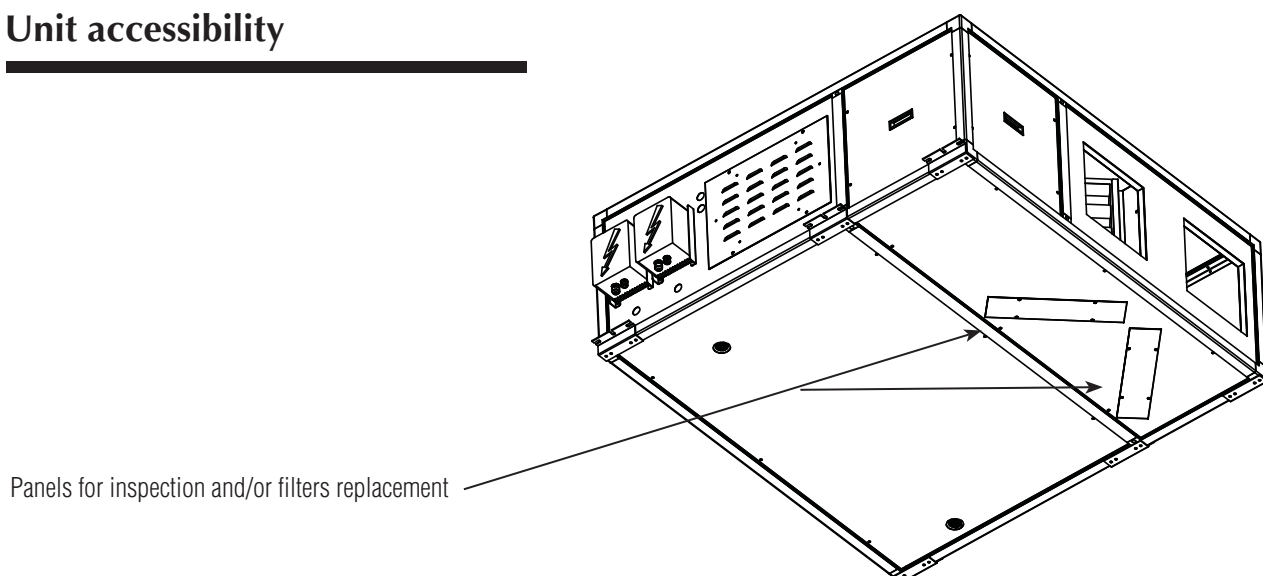


Mod. [mm]	URHE10CF	URHE_CF 15-25	URHE33CF 33
B	450	550	600
H	310	410	460

Circular flanges (FGC accessory)



Unit accessibility



General safety requirements

WARNING!

The URHE_CF series units are destined for civil and tertiary use: for all other applications (in highly corrosive environments, in potentially explosive atmospheres etc.) its use is not permitted.

- Before installation make sure that the unit has not been damaged during transportation : The use of the damaged machine might be dangerous;
- Installation and extraordinary maintenance must be performed by qualified people in accordance with the present standards;
- The unit must not be used to recover equipment, spare parts. Any use other than those indicated in this manual may generate hazards and is therefore prohibited;
- Before performing maintenance or cleaning operations, make sure that the unit is disconnected and ensure that it is not reconnected without informing the person who is working on the unit;
- During maintenance and cleaning, pay attention to possible burning of the heating coils;
- Before starting the unit make sure that the electrical parts have been connected to the earth system of the building;
- Before starting the unit make sure that the fan vents have been ducted or include safety meshes;
- The unit is not designed for external installation: external installations require particular technical characteristics and devices which these units cannot guarantee;
- During installation, maintenance and cleaning, wear suitable Individual Protection Devices (IPD).

The units are fitted with:

- an adhesive label (fig. 07a) which indicates the model, the gross weight and the customer
- an adhesive label (fig. 07b) which indicates the main technical data such as the model, nominal air volume, efficiency of the heat recovery unit, electrical data and performance of the coils.
- Each URHE_CF unit is identified by means of a serial number on the plate

Installation and use of the unit

N.B.:

The serial number must be indicated for future reference when contacting AERMEC S.p.A.

Handling

CAUTION!

During the handling phase, wear proper individual protection devices (IPD).

Before installation and use you are recommended to fully unpack the base unit and the all the components that come with it.

The units are supplied packed with polythene film and, as a standard, on wooden pallets.

For transport reasons, some accessories travel separately from the standard unit and are to be reassembled by the installer following the instructions in this manual.

Transport

Refer to the weight indications on the plate on each unit in order to transport the unit safely.

In any case, the following precautions must be taken when transporting the unit:

- The unit and its accessories, if any, must not be subject to intense knocks which could compromise the integrity of the structure and internal parts;
- The unit and possible accessories must be suitably secured to the platform of the transportation by means of cables or similar in order to prevent its movement;
- the unit and accessories must be protected in order to prevent protruding parts such as the coil connections, condensate drain, electrical components, etc., from being knocked during transport;
- the items must be protected against bad weather during transport.

Checks at material receipt

When the unit is received it is necessary to carry out an initial inspection to make sure that:

- all parts are present ;

- the unit and accessories are not damaged.

If there are signs of damage it is necessary to specify it on the carriage note.

The necessary controls are the following:

- integrity of the finned coil manifolds and condensate trays;
- water connections (that these are protected with the rubber plugs). If they are not provide suitable closure devices;
- integrity of the panels;
- integrity of the electrical panel and electrical/electronic parts.

Installation

It is recommended to carefully follow the indications in the sections below when installing the equipment. The sections are in chronological order in order to make each phase of the installation easier.

The necessary technical space must be verified before installation (fig.08):

- for the arrangement of the supply and exhaust ducts as well as those for the free-cooling;
- for the dampers with free-cooling function;
- for the passage of the power supply cables.



 Aermec S.p.A. Bevilacqua (Verona)		
Matr.	URHE_CFmmaaXXXXX	
Mod.	URHE_CF XXXX	
COLLO PACKAGE	MONOBLOCCO	
PESO LORDO - GROSS WEIGHT POIDS BRUT - BRUTTOWEIGHT	KG XXX	
CLIENTE		

fig.07 a



 Aermec S.p.A. Bevilacqua (Verona)		
L.P.	XXXXXXX	Matr URHEmmaaXXXXX
Mod.	URHE_CF XXXX	Area Year
		AAAA
Potenza frigorifera nominale Cooling nominal capacity Nominale puissance frigorifique Nennleistung (Kälteleistung)	XX kW	Potencia frigorifera Refrigerant capacity Kälteleistung R410A
Potenza termica nominale Heating nominal capacity Nominale puissance thermique Nennleistung (Heizleistung)	XX kW	kg
	P _{sup} XX [bar]	P _{min} XX [bar]
Efficienza recuperazione Recovery efficiency	Rendement de récupération Rekuperator Wirkungsgrad	
	XX %	
Partida Air flow [m³]	XXXX	XXXX
Debit d'air-Luftmenge [m³/h]	XXXX	XXXX
Pr.st.ut. [Pa]	XX	XX
V - p _h - Hz	230-1-50	
Potenza elettrica assorbita max Electric absorption max	Assorbimento elettrico max Absorption elektrisch max	
	XX kW	

fig.07 b

for the components (three-way valves, condensate drainage traps, etc.) without which the correct functioning of the unit can not be guaranteed;

In particular:

- a space of at least 200 mm must be available for the trap in correspondence with the condensate drain (fig. 11).

Positioning of the supporting brackets

The unit must be positioned on a horizontal surface to avoid:

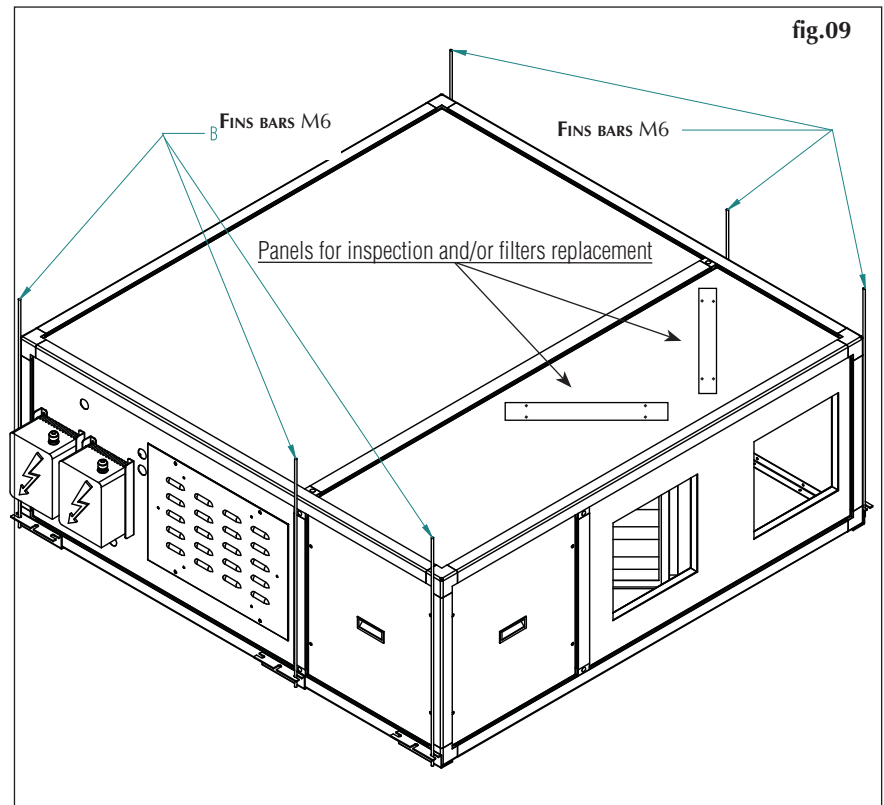
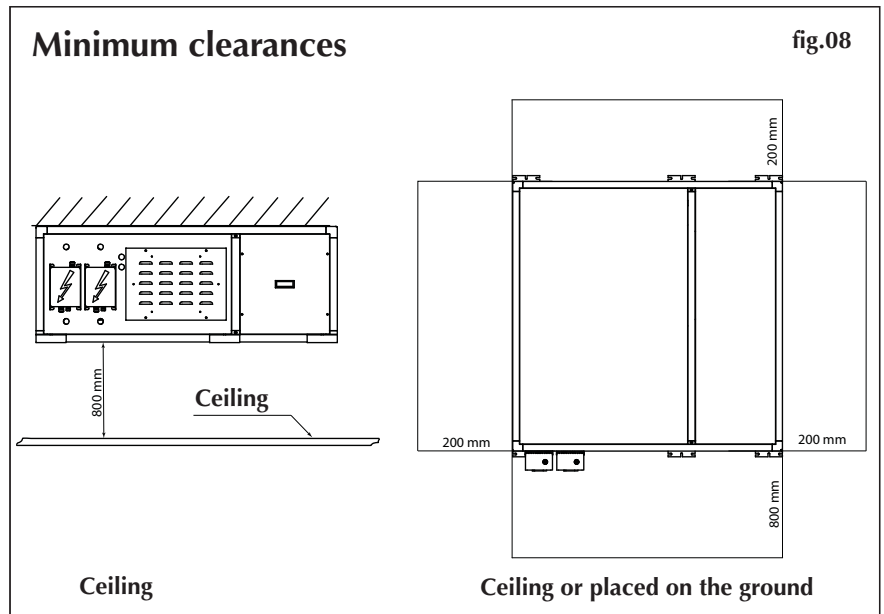
- the damage of the motor fan assemblies caused by weight imbalance
- the incorrect operation of the condensate drain.

The unit and the coil and silencer module are equipped with "L" supporting brackets for horizontal installation.

The unit can be fixed by means of fins bars by steel M6 of suitable length, blocked through nuts and washers to support brackets assembled to unit; it must be used one bar for each bracket (n.6 bars in all). It is advisable to use fins bars with resistancy class at least 4.6. In alternative, can be used tiranti with equal or higher mechanical resistancy.

If they are used fins bars with high resistancy (class 8.8 at least), it is possible to use n.4 fins bars for the blocking of unit, not connecting the central brackets.

N.B.: It is recommended to place rubber dampers to decrease the vibrations generated by the unit.



Ducts connection

CAUTION!

Never start up the unit when the fan opening vents are not ducted or covered by protective mesh.

See fig. 10 for the installation of the ducts:

- use adequate brackets to support the ducts in order to avoid that the recovery unit is overloaded by their weight;
- in order to prevent the transmission of vibrations and noise, AERMEC S.p.A. suggests the use of ducts with a frontal mass higher than 10 kg/m^2 ;
- connect the supply and exhaust vents to the ducts using vibration-damping joints (canvas). The vibration-damping joint must be screwed to the panel with self-tapping screws, positioning the screws inside the border highlighted in the following layout avoiding that the canvas joints are over stretched (point 1);
- connect a earth wire to the vibration-damping joint to act as a jumper to guarantee the unipotentiality between the ducts and the recovery unit;
- place the supply duct with a straight section of at least one meter, before the bends, branches, etc., and make sure that the ductling does not have inclinations of the divergent sections greater than 7° .

Hydraulic connections of the condensate drain

The condensate drain pan is provided with a 1" diameter threaded discharge pipe G UNI 338.

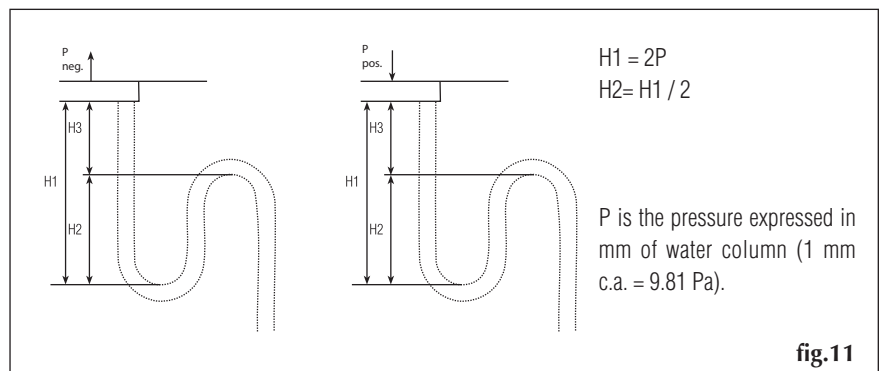
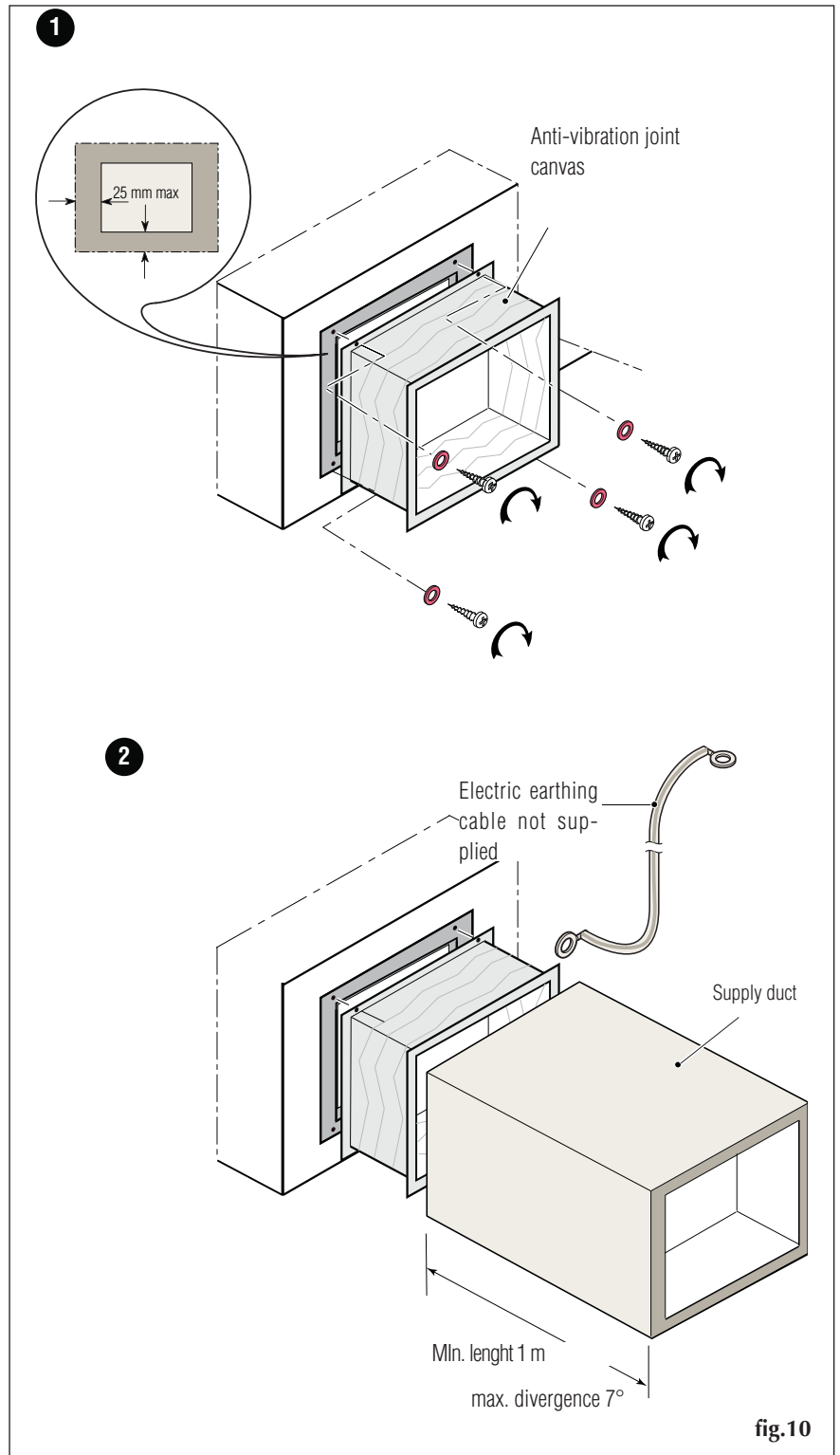
The drainage system should feature an adequately sized trap to:

- freely discharge the condensate;
- prevent the undesired entry of air into the vacuum systems;
- prevent the undesired exit of air from the pressure systems;
- prevent the infiltration of odours or insects.

In the lower part of the syphon must have a bleed cap or must anyway permit fast dismantling for its cleaning.

Rules to follow for the scaling and production of the syphon are given below.

NB. DURING INSTALLATION INCLINE THE UNIT TO FACILITATE DRAINAGE OF CONDENSATE FROM THE SIPHON.



FCH free-cooling accessory

The assembly of the "free-cooling kit" accessory must be performed by qualified personnel in accordance with the present standards and must be made following the indications in the electrical layout supplied with the unit. The compressor is off during the functioning of the unit in the free-cooling mode. The temperature settings are pre-set at fixed values (on request these values can be changed by contacting the After-Sales office).

Operation

The free-cooling function foresees that the air expelled from the room does not affect the heat recovery unit, passing directly to the outside through a duct connected to the damper B.

In order to use the free-cooling function a duct is required to connect to damper A and another to connect to damper B. The two dampers A and B have an opposing function. When the outside temperature is close to the ideal temperature of the room, damper A is closed while damper B is open.

Accessory assembly

For the assembly of the free-cooling accessory please refer to fig. 12:

- place the two dampers with servomotors as indicated in the figure;
- make sure that the damper is closed during the free-cooling function while the damper is open (opposing functions);
- connect the damper servomotors;

CAUTION!

Before assembling the free-cooling kit, make sure that the power is not connected to the unit.

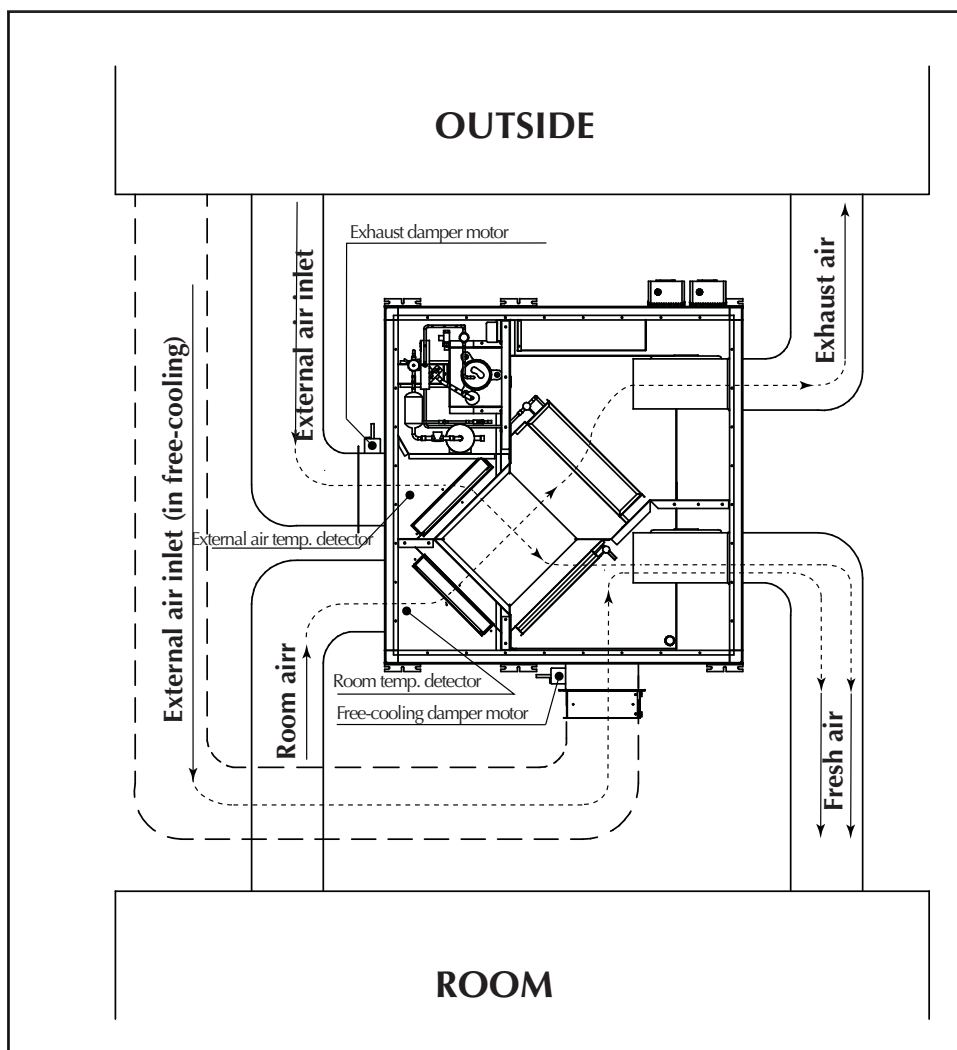


fig.12

Electrical connections

The unit is completely wired in the factory and requires the power supply, intercepted with inline protections, indicated on the unit specification plate in order to be started.

The installer should define the power supply line based on the length, the type of cable, the absorption of the unit and the displacement. (TAB.3)

All electrical connections must be in accordance with the present standard at the moment of installation.

CAUTION:

Refer to the electrical layout supplied with the equipment for installation needs.

Check that all power cables are correctly secured to the terminals when switched on for the first time and after 30 days of use. Afterwards, check the connection of the power cables every six months. Slack terminals could cause the cables and components to overheat.

The electrical wiring and connections must be done by qualified persons in accordance with regulations currently in force.

Every electrical user must be

connected to the system's earthing system.

Use the connectors with the earth symbol to connect the earthing of the unit and possible accessories to the earthing of the building.

Respect the installation power supply and environment conditions.

Keep the panel and wiring away from electric and magnetic fields that could disturb, such as inverters, high voltage power supply lines, etc.

CAUTION!

Once the connections have been made,

check that:

all the cables have been correctly connected, and that there are no short circuits between terminals and the terminals and ground.

the electrical terminals both within the electrical panel as well as in the terminal board of the compressor are secured and that the mobile and fixed contacts of the remote control switches do not show signs of wear.

Do not block the air intake of the panel.

Never connect or disconnect the remote terminal with energised main board.

TABLE 3

Voltage	± 10% the nominal voltage (EN60204)
Frequency	± 1% frequency in continuous way
	± 2% for breve periodo
Room humidity during operation	from 30% to 95%, without condensate or icebuild-up (EN60204)
Room humidity during operation	included between +5 and +40°C (EN60204)
Altitude	Up to 1000 m s.l.m (EN60204)

Before the start-up

Before start-up check that:

- the system has been charged and the air has been blown out;
- the electrical connections have been made correctly;
- the line voltage is within the permitted allowance (±10% of the rated value);

Unit start-up

For detailed information regarding the operating parameter settings and all other machine or control card operations, please refer to the user manual.

CAUTION!

Make sure that all the instructions have been complied with before carrying out the commissioning checks.

Before the first start-up of the heat recovery unit check the following points:

- the exact positioning of the panels in correspondence with the motor ventilating assembly that require opening by means of a screw-driver;
- the fixing of the unit to the wall;
- the earthing of the unit to the buildings earth system;
- the connection to the ducts;
- the condensate drain connection to the trap;
- the insulation of the tubes to the coils ;
- the ground wires of the electrical components;
- the absence of air in the water coils.

In particular check that:

- the electrical connection has been performed correctly and that all terminals have been sufficiently tightened;
- the voltage on the terminals is 230 V ± 10% (for units with single-phase power) or 400 V ± 10% (for units with three-phase power):

If the voltage is subject to frequent change, contact our Technical department in order to select the necessary protection;

- there are no leaks of refrigerant through the use of a leak detector.

CAUTION!

Before start-up, check that all the panels of the unit are in place and secured with the screws.

WARNING!

If, at the time of the first start, the compressor don' t start, the cause can be attributed to a wrong wiring of the sequence of the phases L1-L2-L3 or to the interruption of one of them, resulting in the intervention of the relay of the phase sequence.

Checks during operation

The air flow rate values must not be lower than 15% of the nominal values indicated in the technical specifications table. If an electrical resistance is present, check the cut-in by measuring its electrical absorption.

Requirements for R407C gas

The circuit chillers that work on R407C cooling gas require particular attention during assembly and maintenance, to prevent operating faults.

Therefore it is necessary to:

- Avoid refilling with oil different from the one specified and already used in the compressor.
- If there are gas leaks causing the unit to be even partially empty, do not refill with refrigerant, but empty the unit completely and refill it with the foreseen amount.
- **In the event of replacement of one of the refrigerating circuit parts, do not leave the circuit open for more than 15 minutes.**
- **In particular, in the event of replacing the compressor, complete the installation within the above-mentioned time after the rubber plugs have been removed.**
- When empty, do not switch on the

compressor; do not compress the air within the compressor.

- When using R407C gas bottles, it is recommended to take care of the maximum number of drawings permitted in order to guarantee the correct ratio of components of the R407C gas.

Refrigerant charge

For data related to refrigerant gas quantity R410A to charge, please refer to the identification plate on the unit.

Unit maintenance

CAUTION !

- **During the maintenance phase, wear proper individual protection devices (IPD)**
- **Before performing maintenance and/or cleaning operations on the unit, make sure the unit is disconnected from the power supply and that it can not be turned back on without the knowledge of the person performing maintenance, and that the heat exchanger coils are not working.**
- **During maintenance the weight of the inspection panelling could hinder the work.**

The URHE_CF series recovery units have been designed to require very little maintenance and to make every operation easy. Some simple pieces of advice follow for the proper maintenance of the unit.

Filters

Filter cleaning is imperative to maintain high air quality in the room. The synthetic filters installed in the URHE_CF unit can be regenerated with compressed air or can be washed with cold water. To disassemble the filters:

- remove the inspection panel with knobs;
- remove the filters;
- clean the filters;
- replace all parts in reverse order.

Condensate drain pan

Dirt can hoard up in the condensate drain pan. You are therefore recommended to clean the pan regularly and check that the discharge pipe is not clogged.

To remove the condensate drain pan of the heat recovery unit.

If the unit is placed in the ceiling:

- remove all bottom panels;
- disassemble the cross bar;
- disconnect the pan from the condensate drain pipes;
- disassemble the pan supporting brackets;
- clean the pan;
- replace all parts in reverse order.

If the unit is placed on the ground:

- remove all above panels;
- disassemble the cross bar;
- disconnect the pan from the condensate drain pipes;
- disassemble the pan supporting brackets;
- clean the pan;
- replace all parts in reverse order.

In order to access the condensate drain pan on the coil module, detach the module from the unit and disassemble it.

Heat recovery unit

The heat recovery unit can be cleaned with a jet of compressed air or cold water. To disassemble the heat recovery unit:

- remove the condensate drain pan (if the unit is placed in the ceiling);
- remove the heat recovery unit supporting brackets;
- clean the heat recovery unit;
- replace all parts in reverse order.

Fans-motor assembly

The fans motor assembly needs to be checked to see how clean the rotor is, whether there is corrosion or damage, and whether there are abnormal noises. If necessary disassemble the motor fan assembly as follows:

- remove all inspection panels;
- disconnect the power supply cable;
- unscrew the four screws that hold each of the motor fan assemblies to the frame;
- check the motor fan assemblies and replace them if necessary;
- replace all parts in reverse order.

Heat exchanger coils

To maintain an efficient heat exchange the coils must be cleaned with a jet of compressed air and the circuit (water coil) must be free from air.

To access the heat exchanger coil of the MBC accessory, disconnect the module from the unit and disassemble it .

COMPONENT	OPERATION	FREQUENCY
Filters	cleanliness control	twice a week
Heat exchanger coil	coil claning control	each year
Condensate pan	cleanliness control	each year
Heat recovery unit	coil claning control	each year

The table indicates the maintenance operations concerning each component, indicating the type of check to perform and when it should be performed.

The frequency is approximate and varies depending on the working and environmental conditions in which the heat recovery unit operates.

Decommissioning

Disconnect the unit

All decommissioning operations must be performed by authorized personnel in accordance with the national legislation in force in the country where the unit is located.

- Avoid spills or leaks into the environment.
- Before disconnecting the machine please recover:
 - the refrigerant gas;
 - Glycol mixture in the hydraulic circuit;
 - the compressor lubricating oil.

Before decommissioning the machine can be stored outdoors, providing that it has the electrical box, refrigerant circuit and hydraulic circuit intact and closed.

Disposal, recovery and recycling

The frame and components, if unusable, should be taken apart and sorted by type, especially copper and aluminum that are present in large quantities in the machine.

All materials must be recovered or disposed in accordance with national regulations.

RAEE Directive (only UE)



- The RAEE Directive requires that the disposal and recycling of electrical and electronic equipment must be handled through a special collection, in appropriate centers, separate from that used for the disposal of mixed urban waste.
- The user has the obligation not to dispose of the equipment at the end of the useful life as municipal waste, but to send it to a special collection center.
- The units covered by the RAEE Directive are marked with the symbol shown above.
- The potential effects on the environment and human health are detailed in this manual.

Additional information can be obtained from the manufacturer.

Disposal

All units are checked and tested at the factory before shipment, however, during operation an anomaly or failure can occur.

BE SURE TO RESET AN ALARM ONLY AFTER YOU HAVE REMOVED THE CAUSE OF THE FAULT; REPEATED RESET MAY RESULT IN IRREVOCABLE DAMAGE TO THE UNIT.

At the end of their operating life, the URHE_CF units must be disposed of according to the present laws.

The main components including the unit of the URFC series are made from:

- Galvanised sheet steel (panels , condensate drain pan, fans);
- aluminium sheet metal (coil fins, dampers, electrical motor casing);
- copper (coil tubes, electric motor winding);
- polyurethane foam (insulation of the sandwich panels);
- rock wool (silencers);
- the cooling gas is recuperated by specialised personnel and forwarded to the disposal centre;
- the compressor oil is also recovered and forwarded for disposal.

Diagnosis and fault solving

1. Insufficient air flow rate	<ul style="list-style-type: none"> • Fans rotation speed too low • Pressure drop of the distribution system underestimated • Blocked filters • Blocked intake grating • Coil incrustation 	<ul style="list-style-type: none"> • Clean the components increase the fan speed
2. Excessive air flow rate	<ul style="list-style-type: none"> • Fans rotation speed too high • Pressure drop of the distribution system overestimated • Filters not fitted 	<ul style="list-style-type: none"> • reduce the fan speed • Fit filters
3. No air flow rate	<ul style="list-style-type: none"> • Power supply off • Electric motor burnt out 	<ul style="list-style-type: none"> • Make sure power supply is available • Replace the electric motor
4. Abnormal noise	<ul style="list-style-type: none"> • Excessive flow rate • Bearings worn or defective • Foreign objects on the fan blades 	<ul style="list-style-type: none"> • Reduce flow rate • Replace bearings • Clean blades
5. Water movement	<ul style="list-style-type: none"> • Trap Blocked • No trap or incorrectly carried out 	<ul style="list-style-type: none"> • Clean trap • Use an adequate trap
6. The compressor does not start	<ul style="list-style-type: none"> • Defective connection or contacts open • Thermostat does not respond functioning • Safety device does not respond • Defective compressor 	<ul style="list-style-type: none"> • Check the voltage and close the contact • System at temperature, no request; check the setting and the • See point 9) and 10) • Replace compressor
7. The compressor does not start	<ul style="list-style-type: none"> • Compressor burnt out or seized • Compressor remote control switch de-energised • Power circuit open 	<ul style="list-style-type: none"> • Replace compressor • Check the voltage across the operating time of the protection; automatic compressor shutdown • Check why the protection cut in compressor; automatic shutdown
8. The compressor starts and then sroofs	<ul style="list-style-type: none"> • Defective compressor remote control switch • Defective compressor 	<ul style="list-style-type: none"> • Check and if necessary replace it • Check and if necessary replace it
9. The compressor does not start due to the intervention of the high pressure switch	<ul style="list-style-type: none"> • Pressure switch out of order • Excessive refrigerant • Presence of incondensable gas in the refrigerating circuit • The condensate coil is not sufficiently covered in air • Blocked refrigerant filter 	<ul style="list-style-type: none"> • Check and replace • Discharge excess gas • Refill the circuit after having discharged and placed in vacuum. • (See point 1) • Check and replace

10. The compressor does not start due to the intervention of the low pressure switch	<ul style="list-style-type: none"> • Pressure switch out of order • Machine completely empty • Poor air flow • Blocked refrigerant filter • The thermal expansion valve does not function correctly 	<ul style="list-style-type: none"> • Check and replace • See point 11) • Check the air duct and the state of the filters. • Check and replace • Check, clean or if necessary replace it.
11. Lack of gas	<ul style="list-style-type: none"> • Leak in the refrigerating circuit 	<ul style="list-style-type: none"> • Check the refrigerating circuit with a leak detector
12. Hot liquid pipe	<ul style="list-style-type: none"> • Lack of refrigerant 	<ul style="list-style-type: none"> • See point 11)
13. The refrigerating circuit functions correctly but with insufficient proficiency	<ul style="list-style-type: none"> • Lack of refrigerant • Presence of humidity or incondensable in the refrigerating circuit 	<ul style="list-style-type: none"> • See point 11) • Replace the filter and if necessary drain and refill the circuit
14. Compressor suction tube frosted	<ul style="list-style-type: none"> • Thermal expansion valve • Poor air flow • Lack of refrigerant • Blocked liquid filter 	<ul style="list-style-type: none"> • Check the valve and if it is not working correctly replace it • Check filters, fans and ducts. • See point 11) • Clean or replace
15. Abnormal noise in the system	<ul style="list-style-type: none"> • Vibrations in the pipes • Noisy compressor • Noisy thermostatic valve 	<ul style="list-style-type: none"> • Secure the pipes • Check electrical phases connection • Check and add refrigerant
16. Evaporator coil	<ul style="list-style-type: none"> • Lack of refrigerant in the circuit: before bubbles visible in the indicator. • Thermostatic expansion valve over closed: suction pipe too hot • Thermostatic expansion valve over closed: expansion valve bulb partially blocked or pressure intake pipe blocked • Filter-drier blocked: bubbles in the flow indicator and liquid pipe colder at the filter drier outlet • The manifold feed pipes are blocked or oil has accumulated in the coil: not all of the evaporator circuits are working 	<ul style="list-style-type: none"> • Check for leaks and eliminate them roofing up with refrigerant. • Reduce the overheating of the thermostatic expansion valve turn the valve stem and check the suction pressure . • Change the valve or free the control pipe. • Change the filter-drier. • Remove the obstruction; clean or change the evaporator.
17. Compressor too hot	<ul style="list-style-type: none"> • Thermostatic expansion valve over closed: excessive overheating of the evaporator discharge gas 	<ul style="list-style-type: none"> • Reduce the overheating of the thermostatic valve
18. Compressor too cold and noisy	<ul style="list-style-type: none"> • Expansion valve over open: the system works with the overheating to low (return of liquid to the compressor). • Thermostatic valve out of order: the stem or the seat of the expansion valve is corroded. Pressure inlet pipe blocked. • Foreign objects between the stem and the seat of the thermostatic valve: abnormal function of the thermostatic valve 	<ul style="list-style-type: none"> • Measure and reset the overheating by closing the valve • Replace the valve or free the pressure inlet pipe • Clean the stem and the holes of the thermostatic valve



35040 Bevilacqua (Vr) - Italy
Via Roma, 996
Tel. (+39) 0442 633111
Fax (+39) 0442 93730 - (+39) 0442 93566



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