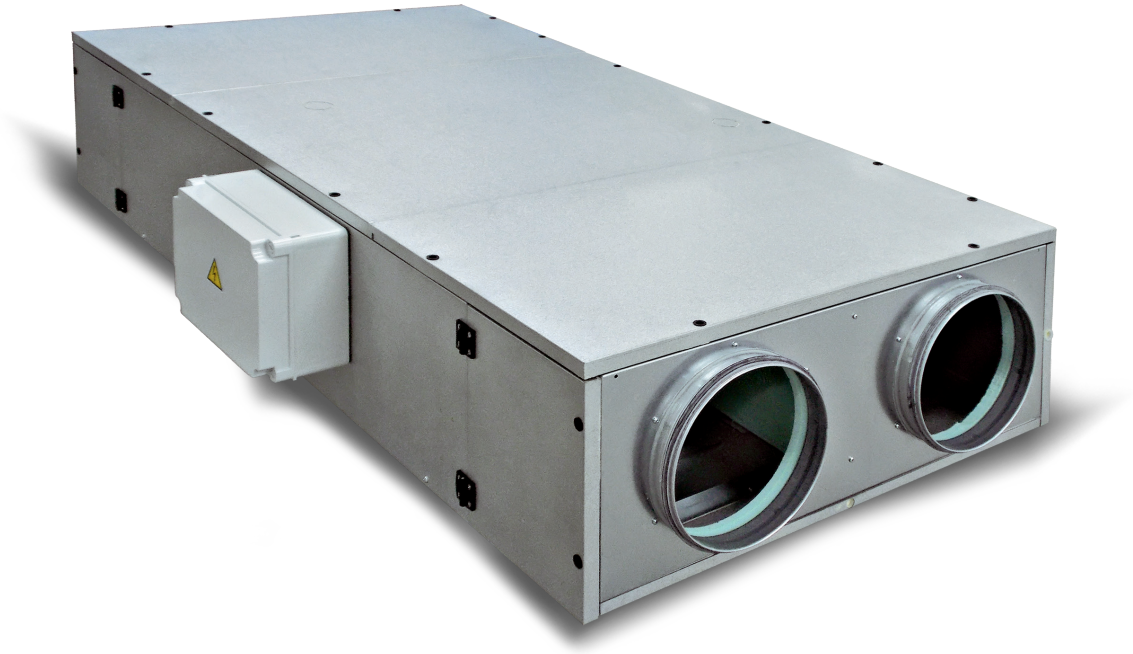
HEAT RECOVERY UNITS ***CRU***
INSTALLATION, USE
AND MAINTENANCE MANUAL



AND ***T-EP*** WALL CONTROL

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Carefully **read the following user information manual** before starting up the machine.

Warning!
Particularly important and/or delicate operations.

Operations which may be carried out by the user.

Interventions to be carried out **exclusively by an installer or authorized technician.**

FUNDAMENTAL SAFETY RULES

Installation work, electrical work and repairs must be carried out by qualified skilled personnel who have adequate training and experience and are familiar with:

- safety and health rules and regulations;
- rules and regulations applicable to the prevention of accidents;
- applicable codes and standards.

Such skilled workers must be able to understand their work and to identify and avoid potential risks.

Transportation, handling, commissioning and maintenance may be carried out by skilled persons or persons who have been given the necessary training and instructions with respect to their work and the risks implied by unsafe working.
During installation, maintenance and repairs, for safety reasons, observe the following precautions:

- Always use work gloves.
- Do not expose to inflammable gas.
- Do not place objects over the grids.

Make sure the unit is earthed.

FOR THE INSTALLATION:

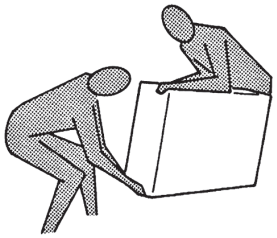
Do not install in explosive, corrosive or damp environments, outdoors or in very dusty roo ms.

Install a safety switch to turn off current to the appliance in an easily accessible position near the unit or units.

The space above the suspended ceiling must be dry and adequately protected against moisture and the ingress of humidity.

During installation, for safety reasons, observe the following precautions:

- The unit must always be handled by two people. Lift it slowly, taking care not to drop it.
- Lifting tackle and gear must have sufficient capacity.
- Defective lifting gear and tackle must not be used.
- Ropes, belts and similar lifting tackle must not be knotted or come into contact with sharp edges.

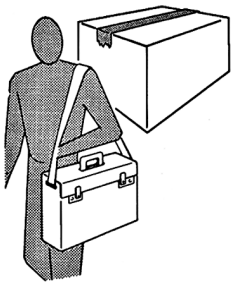


- Fork-lift trucks, elevating-platform trucks and cranes must have sufficient capacity.
- Loads must not be lifted over persons.
- Do not operate the fans until they have been connected to the air pipes.
- IN CASE OF USE OF ACCESSORY HYDRONIC COILS, MAKE SURE THAT THE HOT FLUID IS ALWAYS IN CIRCULATION IN ORDER TO AVOID FREEZING PROBLEMS.

FOR THE USE:

Some safety fundamental rules must be observed while using products with electrical energy or water:

- this appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved;
- this appliance is intended to be used by expert or trained users in shops, in light industry and on farms, or for commercial use by lay persons;
- it is dangerous to touch the unit with damp parts of the body and bare feet;
- never introduce objects or the hand into the fans;
- do not remove the safety labels inside the appliance. If you cannot read the labels, ask for replacements;
- always use original spare parts;
- never tamper or modify regulation and safety devices without prior authorisation and instructions;



- never twist, detach or pull power cables, even when the unit is unplugged from the mains power supply;
- neither throw nor spray water on the unit;
- never introduce foreign objects through the air intake and discharge grids;
- never remove protective elements without first unplugging the unit from the mains power supply.

Be sure that:

- the operating pressure and the operating temperature of possible hydronic circuits must never exceed the rated pressure and temperature (see "Operating limits");
- air intakes and air discharge openings must never be obstructed or blocked.

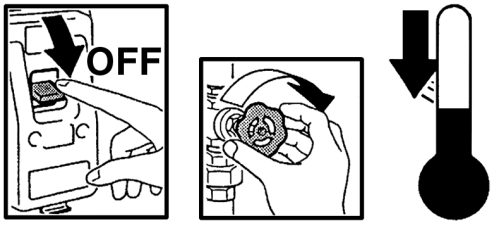
In particularly cold climates, if the appliance is not to be used for long periods, drain the hydraulic circuit.

Children shall not play with the appliance.

FOR MAINTENANCE:

Before carrying out any operation on the appliance, make sure:

1 - The unit is disconnected from the electrical power supply.
2 - The coil water supply valve is closed and the coil has cooled down.
3 - Make sure that the fan has stopped.



Flow and return valves and any isolating valves must be closed for repair and maintenance.

Never tamper with or modify regulation and safety devices without prior authorisation and instructions.

If pipe connections of the heat exchanger are handled improperly, hot heating fluid may be discharged and may cause scalding.

All panels and covers removed for repair or maintenance work must be fitted back after the completion of work.

Cleaning and user maintenance shall not be made by children without supervision.

SAFETY STANDARDS AND CE LOGO

In line with our policy of ongoing improvement, we always aim to provide state-of-the-art products compliant with current safety standards. The rules and guidelines in this document, therefore, reflect compliance with the safety regulations and provisions that apply. In addition to following the recommendations in this document, all staff potentially exposed to risks during the installation, use or maintenance of our equipment are strongly recommended to ensure that it complies with the relevant domestic safety regulations in force.
The CE marking and Declaration of conformity provided attest to the compliance of our products with the applicable Community legislation.
However, the Manufacturer declines all liability for personal injury or damage to property caused by the failure to apply these safety regulations or by unauthorised modification of the product. When installation involves other products without CE marking, the relevant certification rests with the purchaser, who assumes full responsibility for the certification of conformity of the entire system.

The products are manufactured in accordance with the following guidelines:

- **Machinery directive 2006/42/EC**
- **Low Voltage Directive 2014/35/EU**
- **Electromagnetic compatibility directive 2014/30/EU**
- **RoHS Directive 2011/65/EC**
- **Energy Related Products (ERP) directive 2009/125/EC**

GENERAL INFORMATION

Please do not remove the safety devices.
However, if you need to remove a device (for good reason), you should take immediate measures to prevent possible hazards. In addition, it is strongly recommended that you reinstall the protective device removed as soon as possible.
All (ordinary and extraordinary) maintenance procedures must always be performed with the product isolated from the power supply. To minimise the risk of accidental starting of a fan/motor during maintenance, it is recommended that you place a suitable warning sign on the control panels/control boards, e.g. **"Attention: Verify that the power supply is disconnected before performing any maintenance".**
Also, before you connect a power cable to a terminal block, check that the line voltage corresponds to that indicated on the product label. If the product labels become illegible over time, please replace them.

WARNING!
All the internal wiring is located under the top panel of the unit. For this reason, it is not permitted to drill holes in the Panel. To do so would involve a risk of electric shock and damage to the unit. This also applies to the control panel and the area of the controls.

PROVISIONS FOR MAINTENANCE

The maintenance staff must observe all the accident prevention (safety) regulations in force. The following recommendations must be observed in particular:

- wear protective clothing and appropriate protective equipment to minimise the risk of accidents;
- make sure that a safety interlock has been activated to prevent unauthorised running of the machine.

OTHER RISKS

Product-related risks were assessed as per the machinery directive 2006/42/EC. The manual associated with the directive contains information and advice for all the staff on how to minimise the risk of personal injury and damage to property.

WARNING LABELS

There are various symbols or warning labels on the machine which must not be removed.
These draw attention to the presence of live parts inside the casing on which the label is applied.

IDENTIFICATION LABEL

Serial number plate: gives details of the product and the manufacturer's address.
NOTE: *other safety labels can be added to the product according to the analysis of additional risks/other risks.*

GENERAL WARNINGS

What follows is extremely important with regard to: Handling, storage, installation, maintenance, operation, servicing of the electrical equipment, servicing of the refrigeration system:

- All the staff must be trained or instructed adequately.
- The responsibilities of the staff must be clearly defined.
- All work on the electrical equipment must be carried out by, or under the supervision of qualified electricians.
- All plumbing work must be performed by qualified installers or by staff trained for this purpose.

Assembly, disassembly, installation, work on the electrical system, commissioning and maintenance of the heat exchanger for installation in a false ceiling must be in accordance with the laws, rules, regulations, codes and health and safety standards in force, and combined with the latest technology. The wiring diagrams in this manual do not consider grounding or other electrical protection required by local rules, regulations, codes and standards or by the local electricity supplier.

Scope and Qualifications

This User Information Manual addresses the following:

- Transportation, handling and storage
- Installation
- Electrical work
- Commissioning and maintenance
- Disposal

All repairs or maintenance must be performed by qualified specialists.
The manufacturer declines all responsibility for damage caused by modifications or tampering with the unit.

USE AND PRESERVATION OF THE MANUAL

THIS BOOKLET IS AN INTEGRAL PART OF THE APPLIANCE AND MUST ALWAYS ACCOMPANY THE UNIT.

- This instruction manual is intended for the machine's user, the owner and installation technician and must always be available to be consulted, if necessary.
- The instruction manual must always be available for consultation and be preserved in a protected and dry place.
- The instruction manual aims to describe how to use the machine the way the machine is designed to be used, the machine's technical features and to provide information on how to use the machine correctly, and how to the clean, control and operate the machine; in addition, the manual provides important information about maintenance, any residual risks and however how to carry out operations to be performed with special care.
- This manual is to be considered a part of the machine and must be PRESERVED FOR FUTURE REFERENCE until the machine is finally dismantled.
- The user can request a new manual from the manufacturer or from the local retailer if the manual is lost or damaged. The request must include details of the machine model and the serial number indicated on the identifying data plate.
- This manual reflects the technical features at the date of preparation; the manufacturer reserves the right to upgrade the production and the subsequent manuals without being under an obligation to also update previous versions.
- The manufacturer accepts no liability in the following cases:

- improper or incorrect use of the unit;
- use that does not comply with the information expressly specified in this publication;
- serious shortcomings in the foreseen and recommended maintenance operations;
- changes made to the machine or any unauthorised operation;
- using non-genuine spare parts or parts not specific to the model;
- total or even partial non-compliance with the instructions;
- exceptional events.

OPERATING LIMITS

HEAT RECOVERY UNIT AND HYDRONIC COILS:

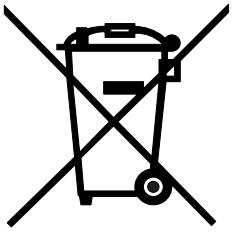
- Maximum temperature of heat vector fluid: max. 85°C
- Minimum temperature of refrigerant fluid: min. 6°C
- Maximum working pressure: 1000 kPa (10 bars)
- Power supply voltage: 230V - 50Hz
- Electric energy consumption: see technical data label
- Fan motor operating limit is at -20 / +40°C of entering air temperature

WASTE DISPOSAL

The device contains recyclable materials and substances. It must not be disposed of with unsorted waste but separated, recovered and disposed of at specialised centres depending on the type of material:
– Sheets of galvanised steel or aluzinc: sandwich panels, fans, bulkheads, condensate drip trays, nozzles.
– Aluminium or aluminium alloy: heat xchanger, fins of the coil, bypass damper, motor parts.
– Copper: motor windings, coil.
– Polyurethane foam: insulation in the sandwich panels.
– Polyethylene: insulation in the separation panels.
– Electrical and electronic equipment: control board and circuit boards.

Do not throw packaging material away or leave it with in reach of children as it may represent a hazard.

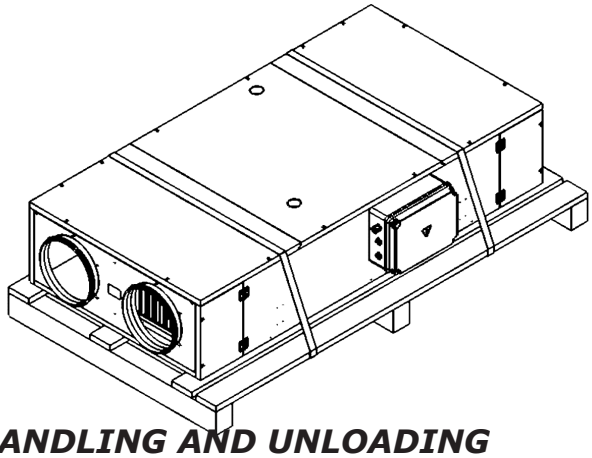
Consumables and replaced parts should be
disposed of safely and in accordance with the environmental protection legislation.



RECEIPT OF THE UNIT, HANDLING AND START

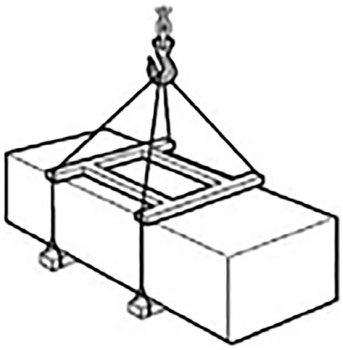
RECEIPT OF THE UNIT

Each product is carefully inspected before shipment. Upon receipt of the goods, it is recommended that you check these for any signs of damage caused during transport. If there is any damage, report it to the carrier, who is held responsible for damage during transport. Typically, the product is packed for transport on pallets. A protective film is usually also applied to minimise water infiltration.



HANDLING AND UNLOADING

Before unloading the products, ensure that the handling/lifting device is suited to the weight and size of the same. For products transported on pallets, it is recommended to use a forklift truck.
Lift the unit and put it in place with spacers, making sure the equipment is suited to the weight of the unit.



STARTING THE UNIT

Before giving to the product the power supply, check the following:
- Verify that the input/output connections of the product are not obstructed.
- Check that all the components of the product are securely attached to their seals.
- Manually turn the impellers of each fan to ensure that they do not rub and do not stick against the inside structures.
- Verify that all the inspection or access doors are closed.

ATTENTION!

If the fan inlets or outlets are not connected to a ducted system, ensure that appropriate protections are installed before starting the unit. Check that the electrical connections have been made correctly, especially the grounding.

IMPORTANT!

The electrical connections must be made by qualified staff.

DISASSEMBLY AND REASSEMBLY

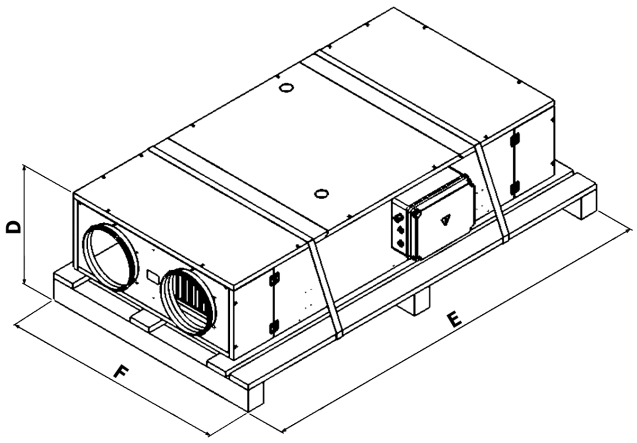
Before disassembly or reassembly, ensure the product is isolated from the power supply to prevent operation of the fans. Disassembly and reassembly must be carried out by qualified staff as they do not fall under routine maintenance.

Characteristic technical data

MODEL		CRU–P1	CRU–P2	CRU–P3	CRU–P4
Maximum supply and return air flow rate	m^3/h	720	1150	1700	2600
	m^3/s	0,20	0,32	0,47	0,72
Supply and return rated available static pressure	Pa	170	220	250	250
Minimum supply and return air flow rate	m^3/h	270	300	600	690
Thermal efficiency EU regulation 1253/14 (1)	%	80	80	80	85
Total thermal output recovered (1)	kW	3,9	6,2	9,1	14,8
Maximum recovery efficiency (2)	%	90	90	90	94
Total thermal output recovered (2)	kW	6,5	10,5	15,4	24,5
Total number of fans	–	2	2	2	2
Rated absorbed electrical power (3)	W	330	770	1060	1460
Maximum total absorbed current (3)	A	2,8	3,4	4,7	6,5
Unit power supply (3)	V-Ph	230-1 + N / 50Hz	230-1 + N / 50Hz	230-1 + N / 50Hz	230-1 + N / 50Hz
Protection rating with machine installed	–	IP20	IP20	IP20	IP20
Unit weight	kg	110	154	180	290

1) Air conditions: TAE = 5°C and t_i = 25°C, no condensate
2) Air conditions: TAE = -10°C and t_i = 20°C, RH_i 50% RH
3) Basic version without optional electric heaters

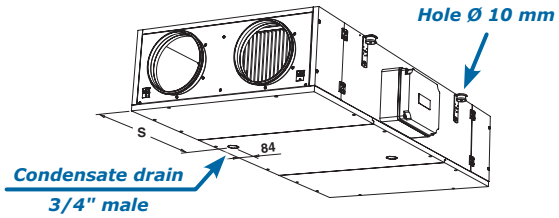
Overall dimensions of the packaged unit

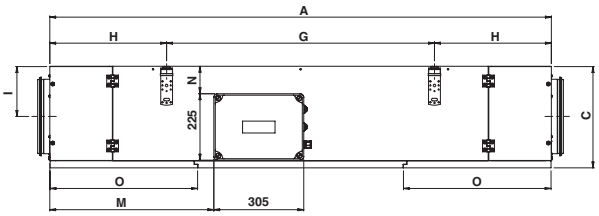


MODEL			CRU–P1	CRU–P2	CRU–P3	CRU–P4
Dimensions	D	mm	469	510	595	735
	E	mm	1845	1845	2245	2345
	F	mm	1030	1030	1430	1880
Weight		kg	120	164	190	300

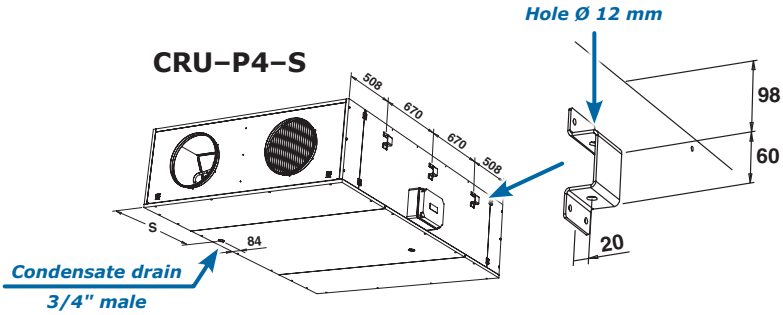
Ceiling units

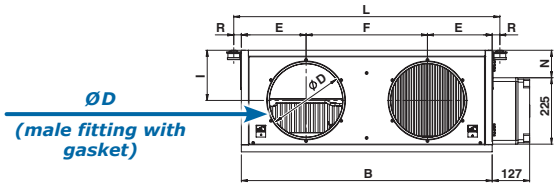
CRU–P1–S / CRU–P2–S / CRU–P3–S





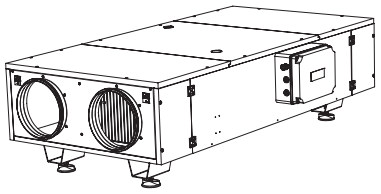
CRU–P4–S

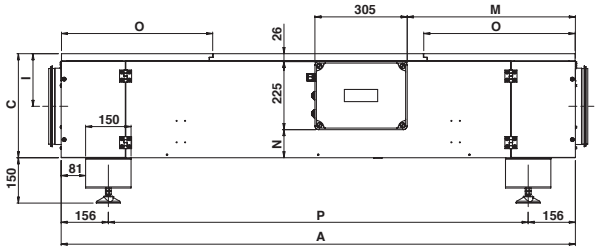




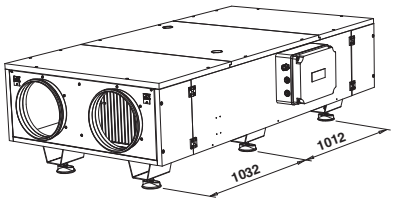
Floor units

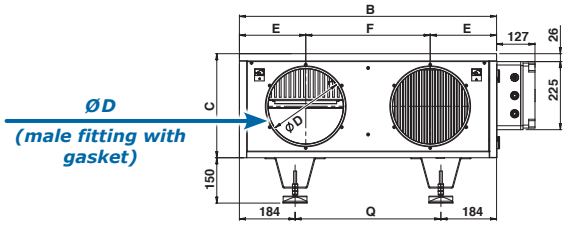
CRU–P1–P / CRU–P2–P / CRU–P3–P





CRU–P4–P

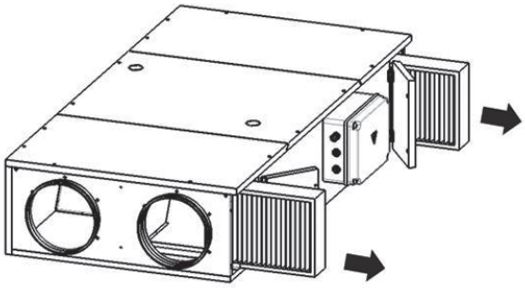




Model			CRU–P1	CRU–P2	CRU–P3	CRU–P4
Dimension	A	mm	1700	1750	2100	2355
	B	mm	850	1150	1250	1700
	C	mm	344	385	470	610
	ØD	mm	250	250	355	400
	E	mm	220	295	325	435
	F	mm	410	560	600	830
	G	mm	908	1108	1328	670 + 670
	H	mm	396	321	386	508
	I	mm	170	190	234	305
	L	mm	902	1202	1302	1740
	M	mm	556	581	758	885
	N	mm	93	134	219	359
	O	mm	500	500	580	580
	P	mm	1388	1438	1788	1032 + 1012
	Q	mm	482	782	882	1332
	R	mm	26	26	26	20
	S	mm	654	678	791	856

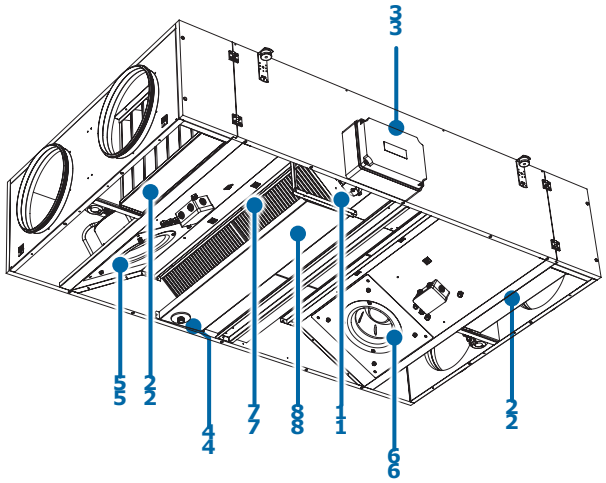
LAYOUT OF THE UNIT

SERVICE SIDE VIEW



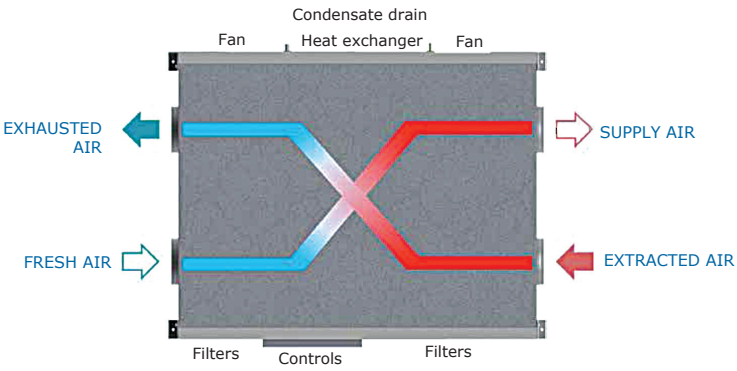
Filter.
(Filter change, see "Maintenance" chapter).

MAINTENANCE SIDE VIEW



1. Damper
2. Filters
3. Control board
4. Siphon connection
5. Air fan
6. Air fan
7. Heat recovery unit
8. Collection tray

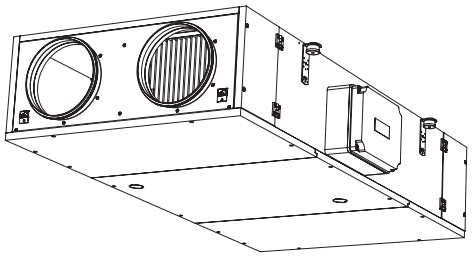
UNIT DRAWING



For maintenance and assistance
minimum space see "Maintenance" chapter.

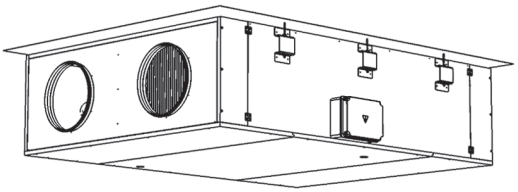
CEILING INSTALLATION

CRU–P1–S / CRU–P2–S / CRU–P3–S

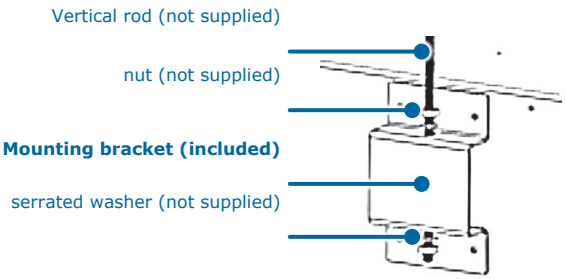


The ***CRU*** heat recovery unit comes with 4 mounting brackets which can be used together with vertical threaded rods or suspension chains to facilitate fixing to the ceiling and levelling. It is recommended to install and fix the unit in the correct position before making the connections to the ducted system or condensate discharge pipe (discharge side) and the electrical connections.
The ducted system must be secured independently from the unit. Use the terminal block in the Control Panel of the unit to make the connections to the mains power supply.

CRU–P4–S



It is not advisable to hang the ***CRU P4*** units fromthe ceiling. If strictly necessary, the unit must be supported from underneath with structural elements and vertical rods able to withstand its weight. When supporting the unit, make sure to leave sufficient clearance for maintenance and removal of the filters.



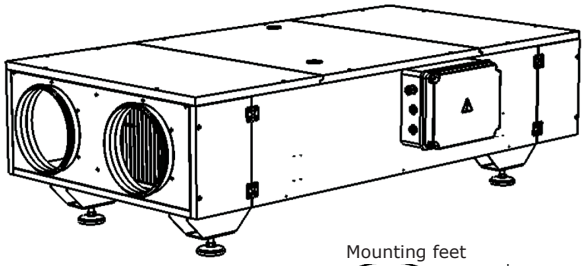
FLOOR INSTALLATION

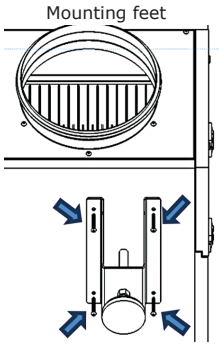
INSTALLATION ON MOUNTING FEET

All the units are supplied with brackets on the base, which can be removed to install the unit in a suspended ceiling or in environments with height restrictions.

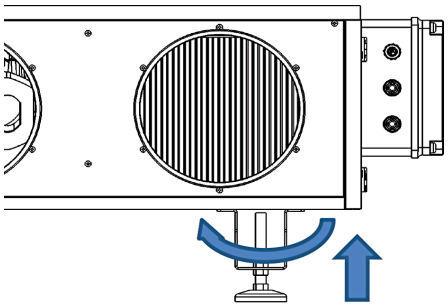
The mounting brackets can be removed by unscrewing the 4 M8 bolts in each corner of the bracket.

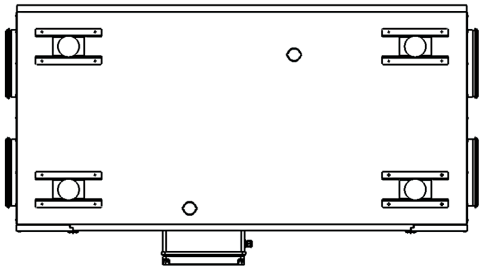
The unit can be levelled using the four mounting feet (six for sizes 4) attached to the brackets on the base.





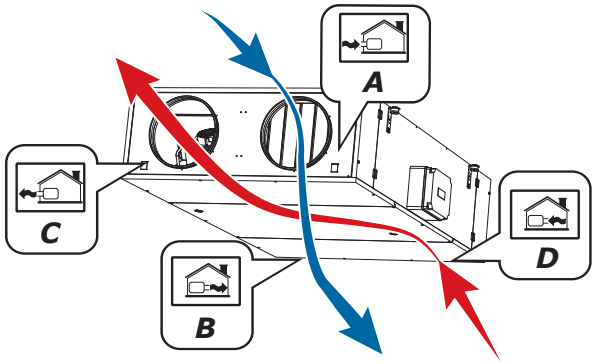
Turning the bolt in the mounting feet raises or lowers the corner of the unit. In this way, the unit can be adjusted to be made horizontal.



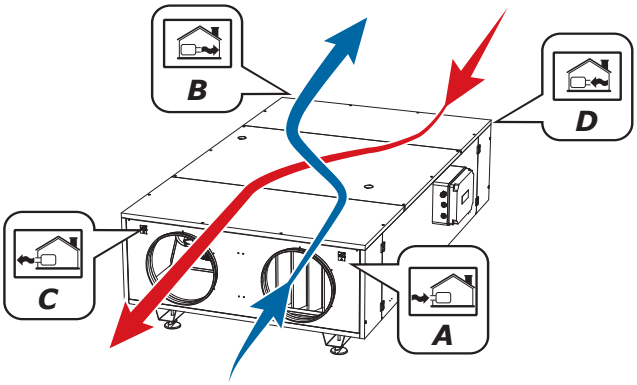


AIR DUCT CONNECTIONS

Typical Ceiling Installation



Typical Floor Installation



LEGENDA: ***A*** = Fresh air
B = Supply air
C = Exhausted air
D = Extracted air

INVERTING THE AIR FLOWS

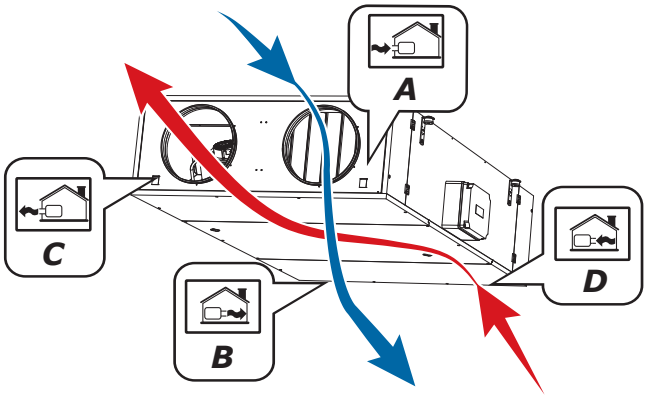
Where necessary, it is possible to invert the air flows in the pipeline at the configuration Dip switch 1 on the electronic power board. This causes the intake fan to act as an extraction fan and the board inverts the functions of the probes, so the air intake probe will be detected and considered as the extraction air probe.

Sensor Id.	Standard Air Flow Rate		Inverted Air Flow Rate	
	Rated Size	Variable Id. T-EP wall control temperature	Rated Size	Variable Id. T-EP wall control temperature
T1	Fresh Air	t1	Extracted air	t3
T2	Supply air	t2	Exhausted air	t4
T3	Extracted air	t3	Fresh Air	t1
T4	Exhausted air	t4	Supply air	t2

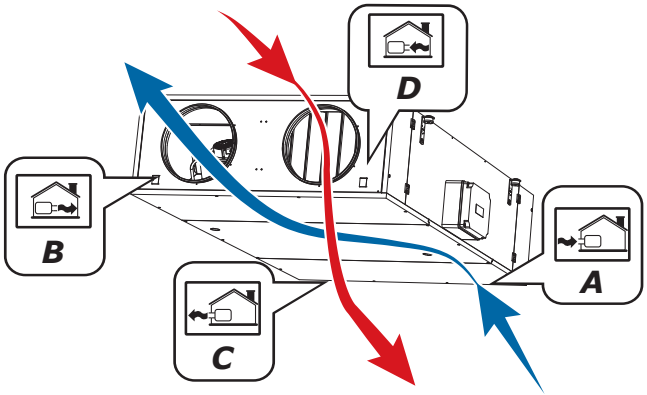
INVERTING THE AIR FLOWS OF CEILING UNITS

In the case of ceiling units, the condensate tray needs to be moved in order to invert the flows.

Typical Ceiling Installation



Inverted Air Flows of Ceiling Installation

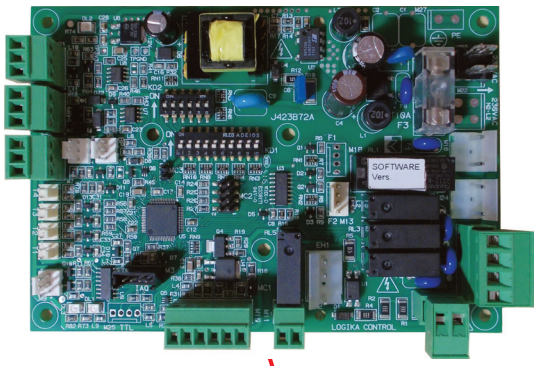


This operation is simple and involves the removal of the three lower panels and disassembly of the condensate tray for reassembly on the opposite side of the heat exchanger, turning it through 180°.

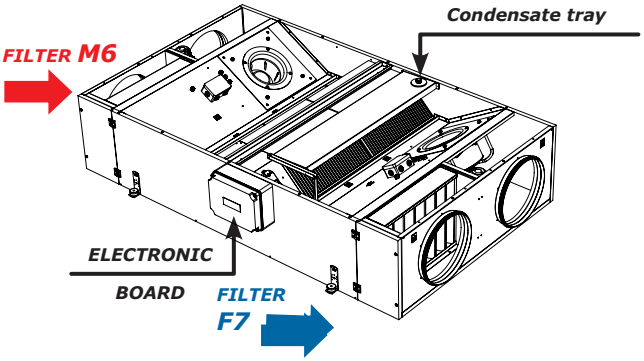
The central panel has a pre-punched hole which is to be opened for the condensate drain fitting.
When not in use, the hole must be carefully sealed with closed-cell insulation.

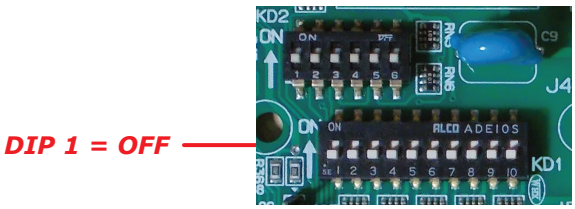
The location of the filters ePM_1 55% - F7 and ePM_{10} 55% - M6 must, therefore, be inverted **(the views below show the machine overturned).**

**FOR INVERTING THE FLOW:
INVERT THE POSITION OF THE FILTERS F7-M6,
THE LOCATION OF THE CONDENSATE TRAY
AND THE POSITION OF DIP SWITCH 1
ON THE ELECTRONIC POWER BOARD**

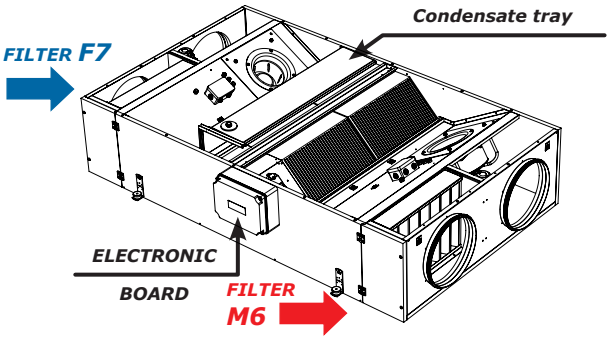


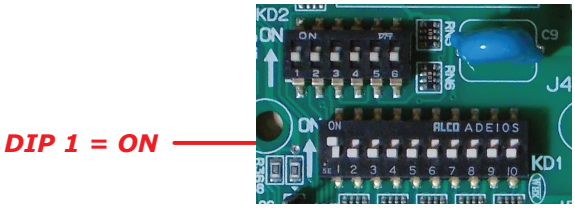
TYPICAL OPERATION





INVERTING THE AIR FLOW OPERATION

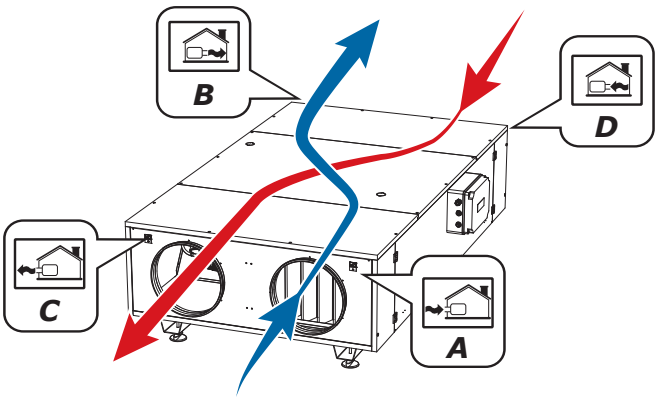




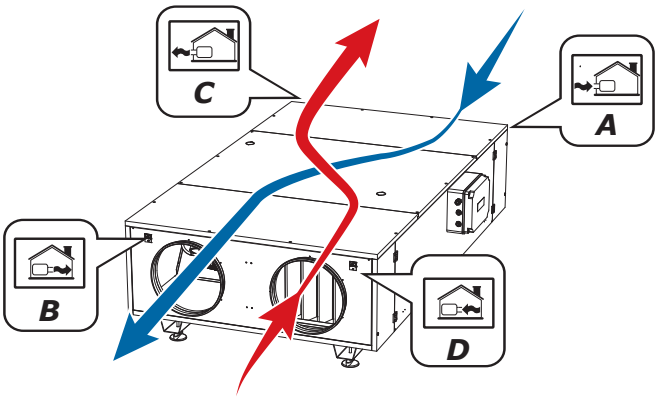
INVERTING THE AIR FLOWS OF FLOOR UNITS

The floor units are equipped with two separate condensate trays for the option of inversion of the air flows.

Typical Floor Installation

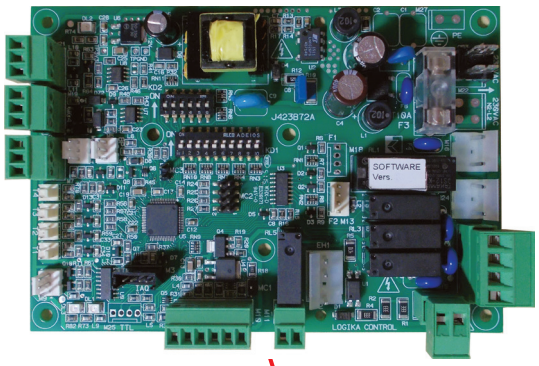


Inverted Flows of Floor Installation

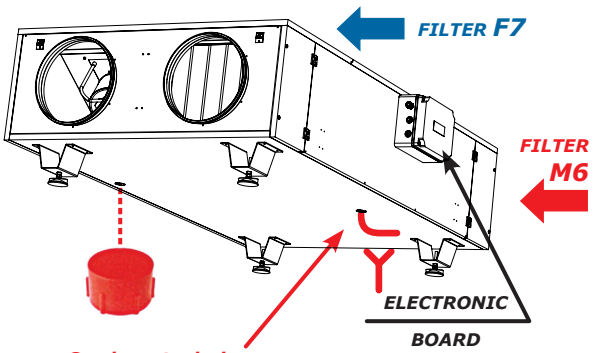


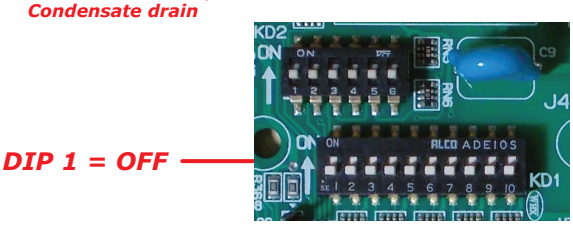
To invert the flows, therefore, set Dip 1 to ON, invert the position of the filters ePM_1 55% - F7 and ePM_{10} 55% - M6 and use the second condensate drain already set up by closing the one not in use.

**FOR INVERTING THE FLOW:
INVERT THE POSITION OF THE FILTERS F7-M6,
THE THREADED CAPSULE
AND THE POSITION OF DIP SWITCH 1
ON THE ELECTRONIC POWER BOARD**

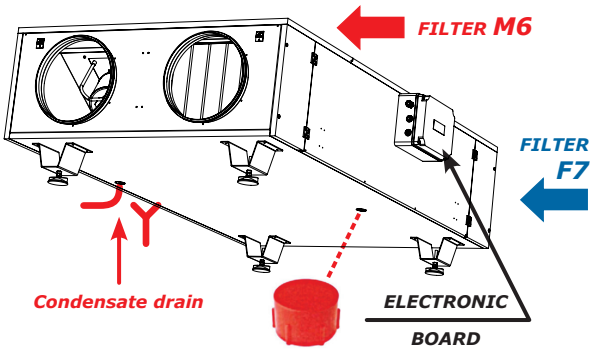


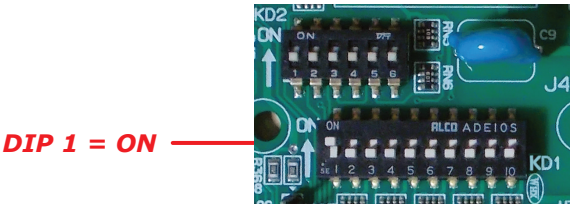
TYPICAL OPERATION





INVERTING THE AIR FLOW OPERATION

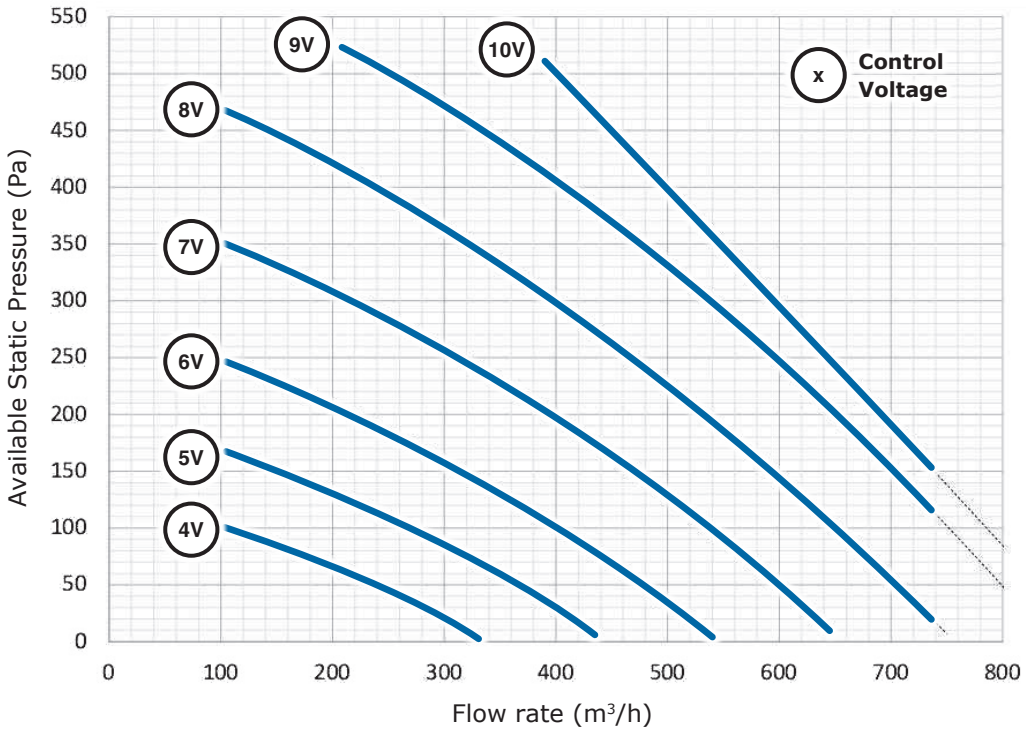




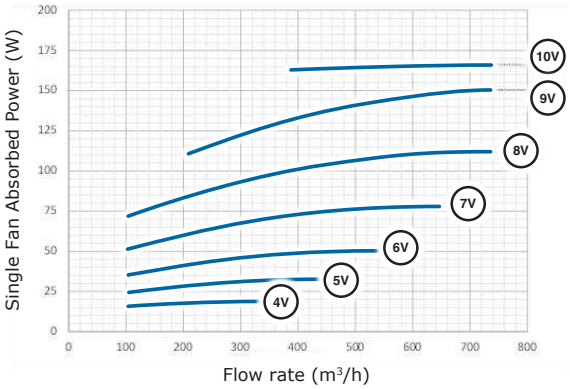
CRU-P1 AIRFLOW PERFORMANCE

SUPPLY AND RETURN VENTILATION CIRCUITS

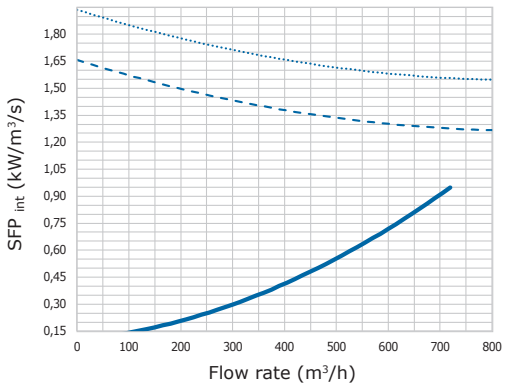
Flow rate / Available static pressure



ELECTRICAL POWER ABSORBED by the single circuit (1)



SFP int (2) UE 1253/14



SFP int (kW/m³/s)

SFP int_lim 2018 (kW/m³/s)

SFP int_lim 2016 (kW/m³/s)

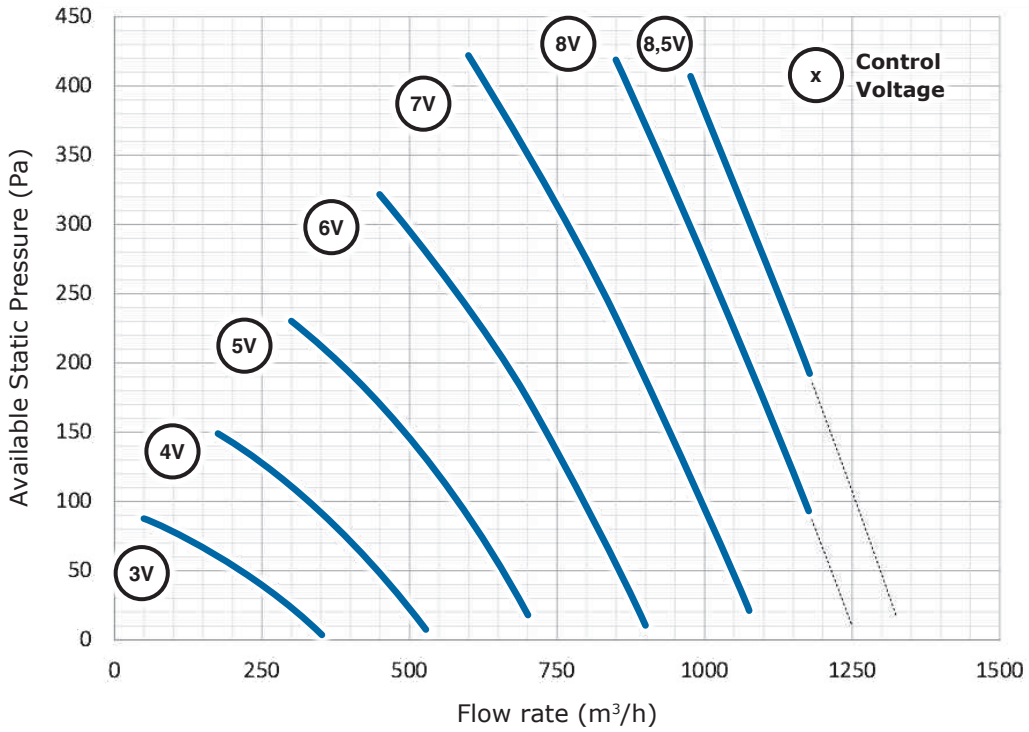
1) The indication of the power absorbed by the single fan is useful in the event that the two fans are calibrated at unbalanced flow rates and absorb different powers.

2) The charts provided in this catalogue to verify the SFPint apply in the event of flow rates balanced between supply and return.

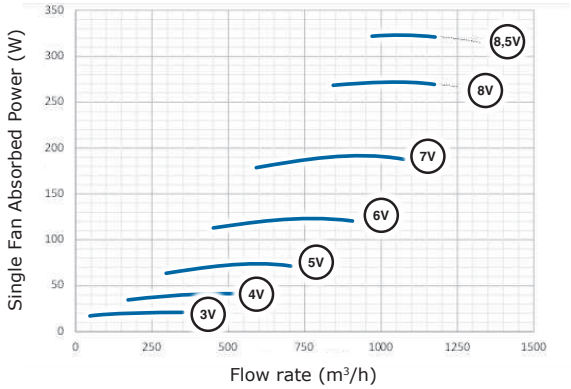
CRU-P2 AIRFLOW PERFORMANCE

SUPPLY AND RETURN VENTILATION CIRCUITS

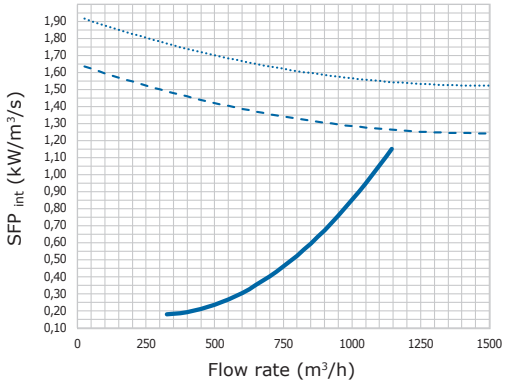
Flow rate / Available static pressure



ELECTRICAL POWER ABSORBED by the single circuit (1)



SFP int (2) UE 1253/14



SFP int (W/m³/s)

SFP int_lim 2018 (W/m³/s)

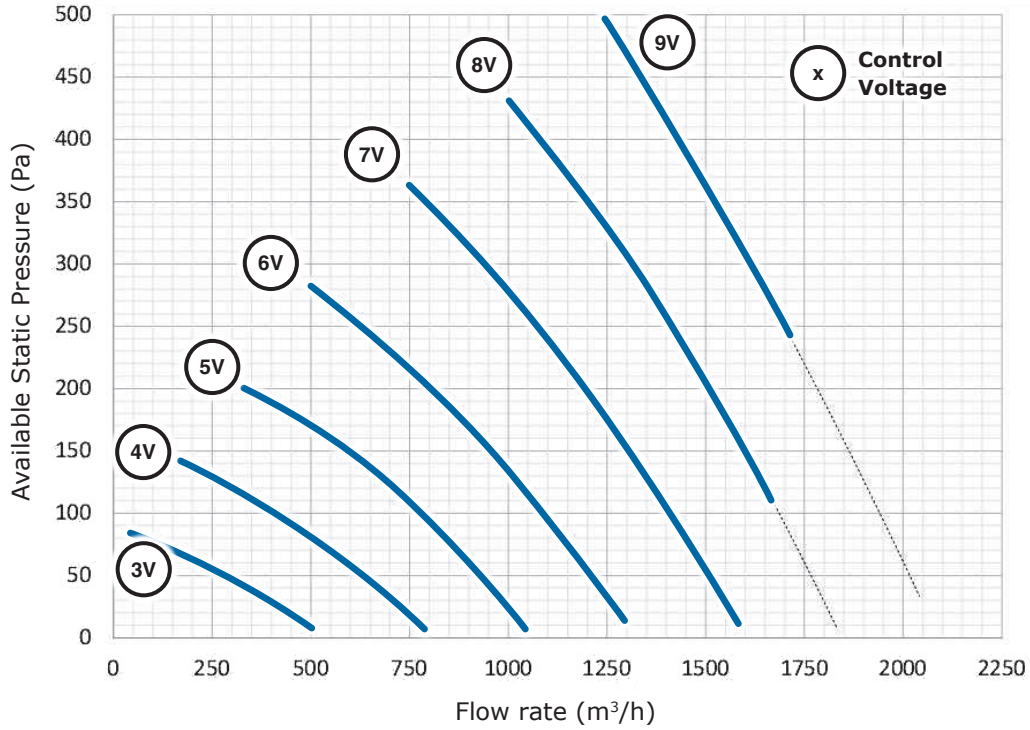
SFP int_lim 2016 (W/m³/s)

1) The indication of the power absorbed by the single fan is useful in the event that the two fans are calibrated at unbalanced flow rates and absorb different powers.
2) The charts provided in this catalogue to verify the SFPint apply in the event of flow rates balanced between supply and return.

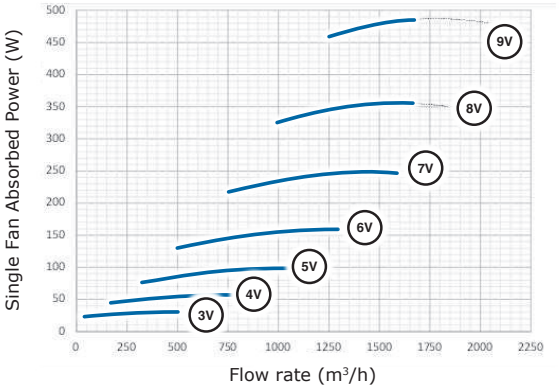
CRU-P3 AIRFLOW PERFORMANCE

SUPPLY AND RETURN VENTILATION CIRCUITS

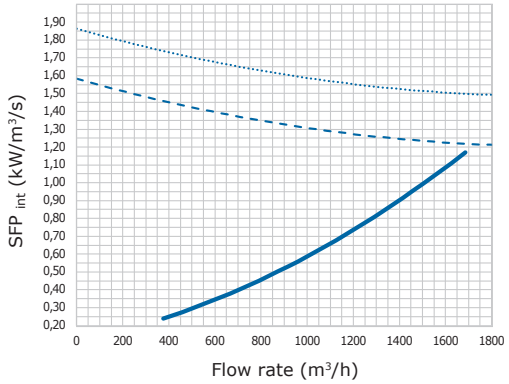
Flow rate / Available static pressure



ELECTRICAL POWER ABSORBED by the single circuit (1)



SFP int (2) UE 1253/14



SFP int (kW/m³/s)

SFP int_lim 2018 (kW/m³/s)

SFP int_lim 2016 (kW/m³/s)

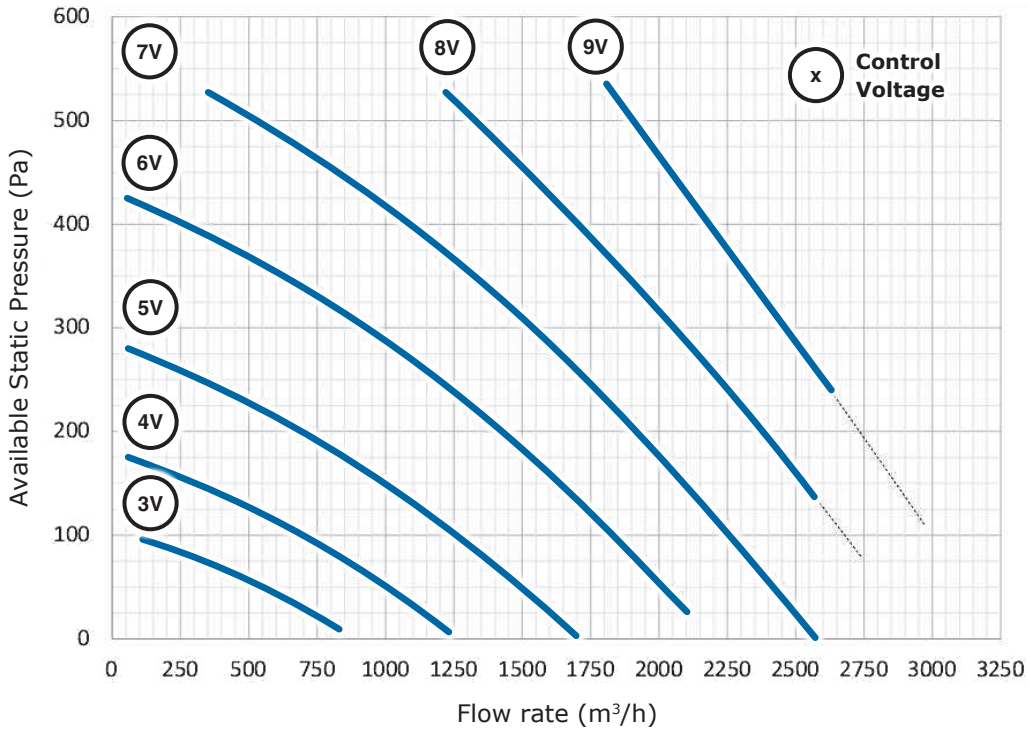
1) The indication of the power absorbed by the single fan is useful in the event that the two fans are calibrated at unbalanced flow rates and absorb different powers.

2) The charts provided in this catalogue to verify the SFPint apply in the event of flow rates balanced between supply and return.

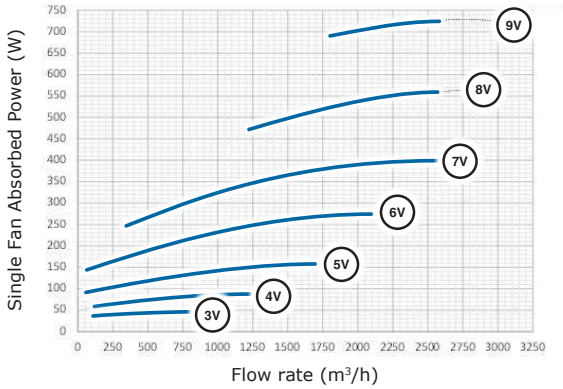
CRU-P4 AIRFLOW PERFORMANCE

SUPPLY AND RETURN VENTILATION CIRCUITS

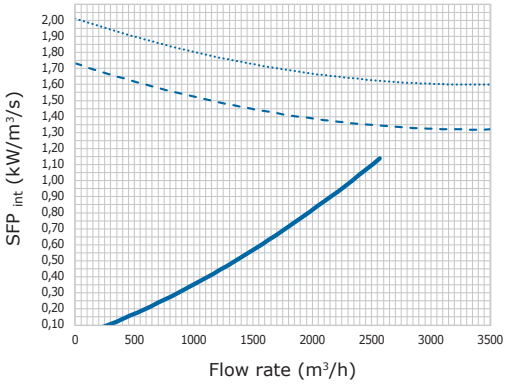
Flow rate / Available static pressure



ELECTRICAL POWER ABSORBED by the single circuit (1)



SFP int (2) UE 1253/14



SFP int (W/m³/s)

SFP int_lim 2018 (W/m³/s)

SFP int_lim 2016 (W/m³/s)

1) The indication of the power absorbed by the single fan is useful in the event that the two fans are calibrated at unbalanced flow rates and absorb different powers.
2) The charts provided in this catalogue to verify the SFPint apply in the event of flow rates balanced between supply and return.

Thermal performance

Internal air conditions: t_i = 20°C – UR_i = 50%

MODEL		TAE: 10°C			TAE: 5°C			TAE: 0°C			TAE: -5°C			TAE: -10°C		
	Q_v	P_h	ε_t	m_w	P_h	ε_t	m_w	P_h	ε_t	m_w	P_h	ε_t	m_w	P_h	ε_t	m_w
	m³/h	kW	%	kg/h	kW	%	kg/h	kW	%	kg/h	kW	%	kg/h	kW	%	kg/h
CRU–P1	100	0,30	90,4	0,00	0,46	90,5	0,15	0,62	91,7	0,26	0,79	94,3	0,36	0,97	96,5	0,44
	150	0,44	88,2	0,00	0,67	88,3	0,21	0,90	89,8	0,38	1,17	92,7	0,53	1,44	95,4	0,65
	300	0,85	84,6	0,00	1,28	84,7	0,42	1,74	86,4	0,72	2,26	90,0	1,03	2,81	93,2	1,25
	450	1,25	82,6	0,00	1,87	82,7	0,62	2,55	84,5	1,09	3,34	88,4	1,52	4,16	91,9	1,85
	600	1,63	81,2	0,00	2,45	81,3	0,81	3,35	83,2	1,43	4,39	87,3	2,01	5,49	90,9	2,47
	750	2,01	80,1	0,00	3,03	80,2	0,96	4,13	82,2	1,71	5,43	86,4	2,43	6,80	90,1	3,01
CRU–P2	200	0,60	89,4	0,00	0,90	89,5	0,29	1,22	90,8	0,51	1,57	93,5	0,70	1,93	96,0	0,86
	250	0,74	88,2	0,00	1,11	88,3	0,36	1,50	89,7	0,63	1,94	92,7	0,88	2,40	95,3	1,08
	500	1,42	84,6	0,00	2,13	84,7	0,69	2,90	86,4	1,20	3,77	90,0	1,72	4,69	93,2	2,08
	750	2,08	82,5	0,00	3,12	82,6	1,04	4,25	84,5	1,81	5,56	88,4	2,52	6,93	91,8	3,09
	1000	2,72	81,1	0,00	4,08	81,2	1,35	5,57	83,1	2,38	7,31	87,2	3,35	9,14	90,8	4,12
	1250	3,35	80,0	0,00	5,04	80,1	1,68	6,88	82,1	2,85	9,04	86,3	4,05	11,32	90,0	5,00
CRU–P3	300	0,89	88,4	0,00	1,34	88,5	0,43	1,81	89,9	0,76	2,34	92,9	1,06	2,88	95,5	1,31
	400	1,17	86,9	0,00	1,75	87,0	0,56	2,38	88,5	1,00	3,08	91,8	1,37	3,81	94,6	1,69
	800	2,24	83,4	0,00	3,36	83,5	1,10	4,57	85,2	1,91	5,97	89,0	2,66	7,44	92,4	3,36
	1200	3,27	81,4	0,00	4,92	81,5	1,64	6,71	83,4	2,88	8,79	87,4	3,90	10,99	91,0	4,97
	1650	4,42	79,8	0,00	6,63	79,9	2,20	9,06	81,9	3,88	11,91	86,1	5,31	14,92	89,9	6,57
	2000	5,29	78,9	0,00	7,95	79,0	2,53	10,87	81,0	4,54	14,31	85,4	6,49	17,95	89,2	8,05
CRU–P4	400	1,28	95,3	0,00	1,92	95,4	0,63	2,58	96,1	1,10	3,27	97,5	1,50	3,97	98,7	1,75
	550	1,72	93,5	0,00	2,59	93,6	0,84	3,49	94,5	1,49	4,44	96,4	1,98	5,42	98,0	2,43
	1100	3,31	89,7	0,00	4,97	89,8	1,61	6,72	91,1	2,82	8,65	93,8	3,89	10,64	96,1	4,74
	1700	4,98	87,4	0,00	7,48	87,5	2,45	10,14	89,0	4,34	13,13	92,1	5,87	16,23	94,9	7,25
	2300	6,62	85,8	0,00	9,94	85,9	3,22	13,50	87,5	5,77	17,53	90,9	7,90	21,74	93,9	9,83
	2900	8,23	84,6	0,00	12,36	84,7	4,02	16,81	86,4	6,97	21,88	90,0	9,99	27,19	93,2	12,09

KEY:

t_i = Internal air temperature.
UR_i = Internal relative humidity.
TAE = External air temperature.
Q_v = Intake air flow rate.
Q_r = Return air flow rate.
P_h = Thermal recovery on the intake flow.
ε_t = Recovery efficiency with balanced flow rates.
m_w = Condensate production.
b = Unbalance percentage.
ε_t^* = Recovery efficiency with unbalanced flow rates.
F_T = Correction coefficient according to EAT variation.
F_Q = Correction coefficient according to Qv variation.

FORMULAE:

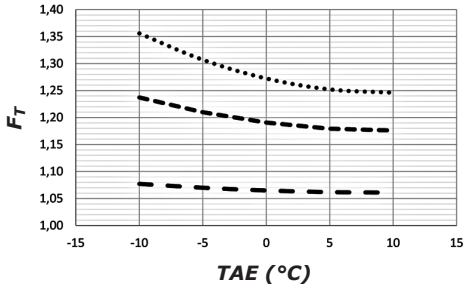
$$\varepsilon_t = \frac{2980\ P_h}{Q_v\ (t_i - TAE)}$$

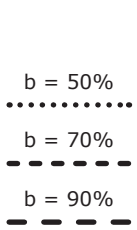
$$b = Q_r / Q_v$$

$$\varepsilon_t^* = \varepsilon_t\ \ b\ F_T\ F_Q$$

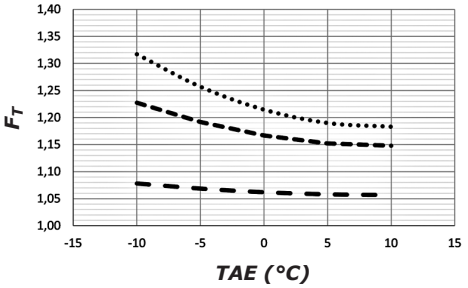
Correction coefficients of the recovery efficiency under unbalanced flow rate conditions

CRU–P1 / CRU–P2 / CRU–P3

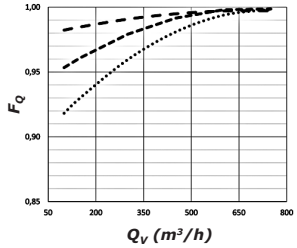




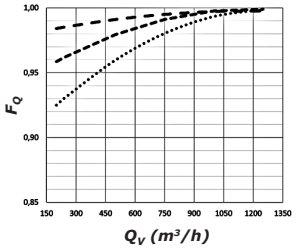
CRU–P4



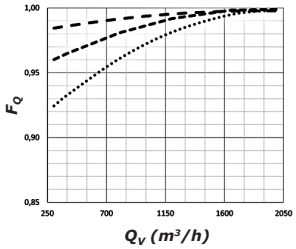
CRU–P1



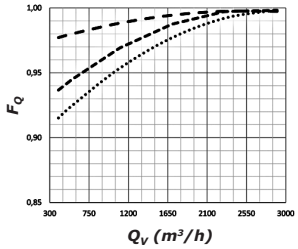
CRU–P2



CRU–P3



CRU–P4



MAIN OPERATING LOGIC

Antifreeze logic, electrical pre-heating resistance

In the event of installation in cold climates (indicatively with air temperatures below -5° C) to prevent the formation of ice inside the heat exchanger, you must install the electrical resistance accessory (BEP). This is managed automatically by the control board, mounted on the machine, by means of a PWM signal in order to optimise the electrical consumption according to the real needs.
The controller actives the resistance below a critical temperature of the external environment for the formation of ice in the heat exchanger and modulates the power of the resistance to maintain the exhaust air temperature above the freezing point. With pre-heating heater at external temperature below -20°C, the CRU-P units get blocked because of frost emergency.

Antifreeze logic, without electrical pre-heating resistance

Without electrical pre-heating heater at external temperature below -5°C, the CRU-P units are submitted every 10 min/h to defrosting cycles during which the fans work at a minimum speed. Without the electric heater the CRU-P units get blocked because of frost emergency at -10°C.

Free-cooling / free-heating management logic with by-pass gate

The following indoor air setpoint temperatures are defined managed by the air conditioning system supplied by external suppliers:

$t_{heating}$, normally 20°C
$t_{cooling}$, normally 26°C

The following are also defined:

t_i = internal air temperature (return air)
EAT = External air temperature

FREE-COOLING CONDITION
EAT > $t_{heating}$ and simultaneously t_i > EAT

Example:
In the summer, occasionally t_i = 25°C, consistent with operating setpoint $t_{cooling}$ = 26°C±2°C.
This condition may occur during an evening of a very sunny day during which, however, the outside air temperature is quite cool, EAT = 21°C. However, with TAE>20°C, there will be no request of heating supply and the fresh air helps to discharge the solar energy load picked up into the walls.
EAT=21°C >20°C and t_i = 25°C > EAT: the external air can be used to cool the premises for free.

FREE-HEATING CONDITION

EAT < $t_{cooling}$ and simultaneously t_i < EAT

Example:
In a Mediterranean winter condition, occasionally t_i = 21°C, consistent with operating setpoint $t_{heating}$ = 20°C±2°C.
This condition may occur during the sunny afternoon of a day characterised by a cold morning. The outside air temperature heats up and reaches the EAT value=23°C.
However, with TAE<26°C, there won't be a cooling request and the fresh air helps to heat the walls.
EAT=23°C <26°C and t_i = 21°C < EAT: the external air can be used to heat the premises for free.

In all the remaining conditions it is convenient to maintain the heat recovery active to save on heating in the winter and on air conditioning in the summer.

Operating logic with post-treatment elements

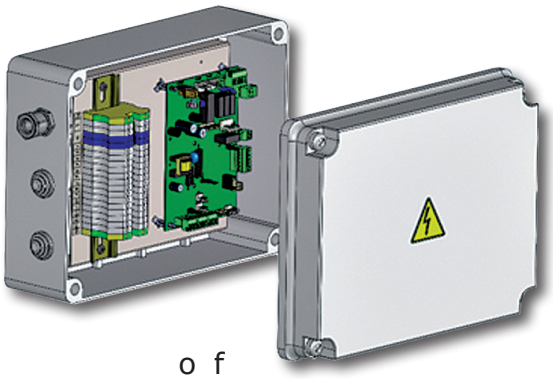
Downstream of the heat recovery unit, on the ambient air intake duct, it is possible to install a postheating resistance or a post-heating and/or cooling coil.

The machine controller can handle 230 volt outputs for ON/OFF control of the resistance or of the water shut-off valve feeding the post-treatment coil. You can manage the post-heating only or heating and/or cooling function both in the 2 and 4 pipe configuration. The control of the post-treatment elements is managed according to the exhaust air temperature.

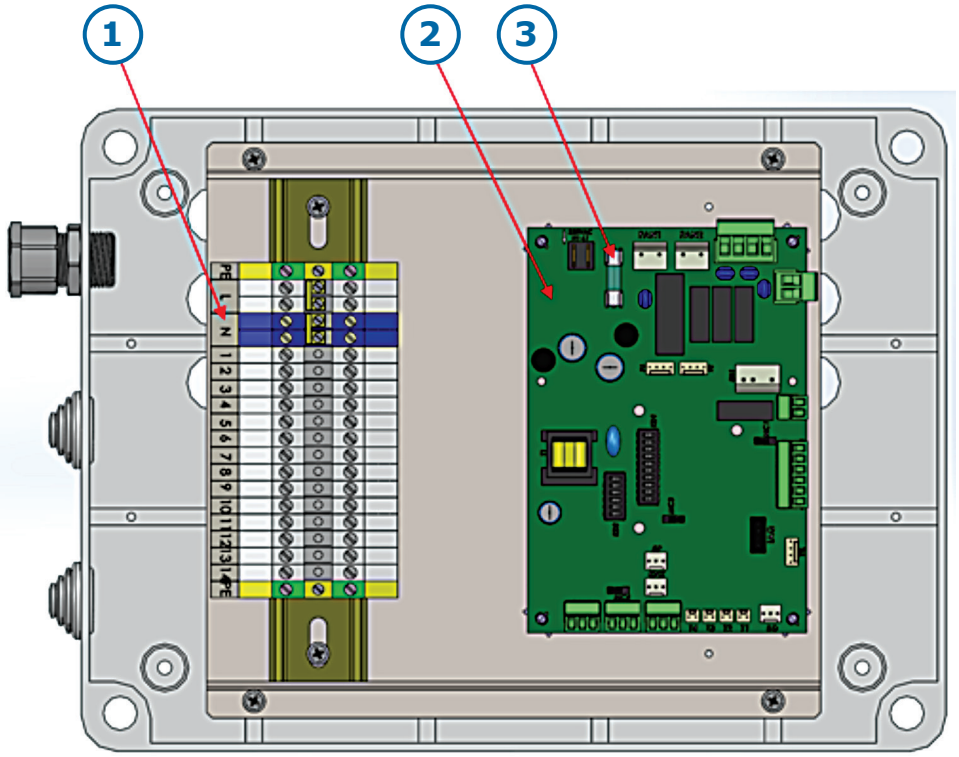
ELECTRICAL PANEL

Electrical connections

The terminals in the electrical panel are used to make the electrical connections. Upstream of the unit, a disconnection switch must be provided and shall have a contact separation in all poles, providing full disconnection under overvoltage category III condition.

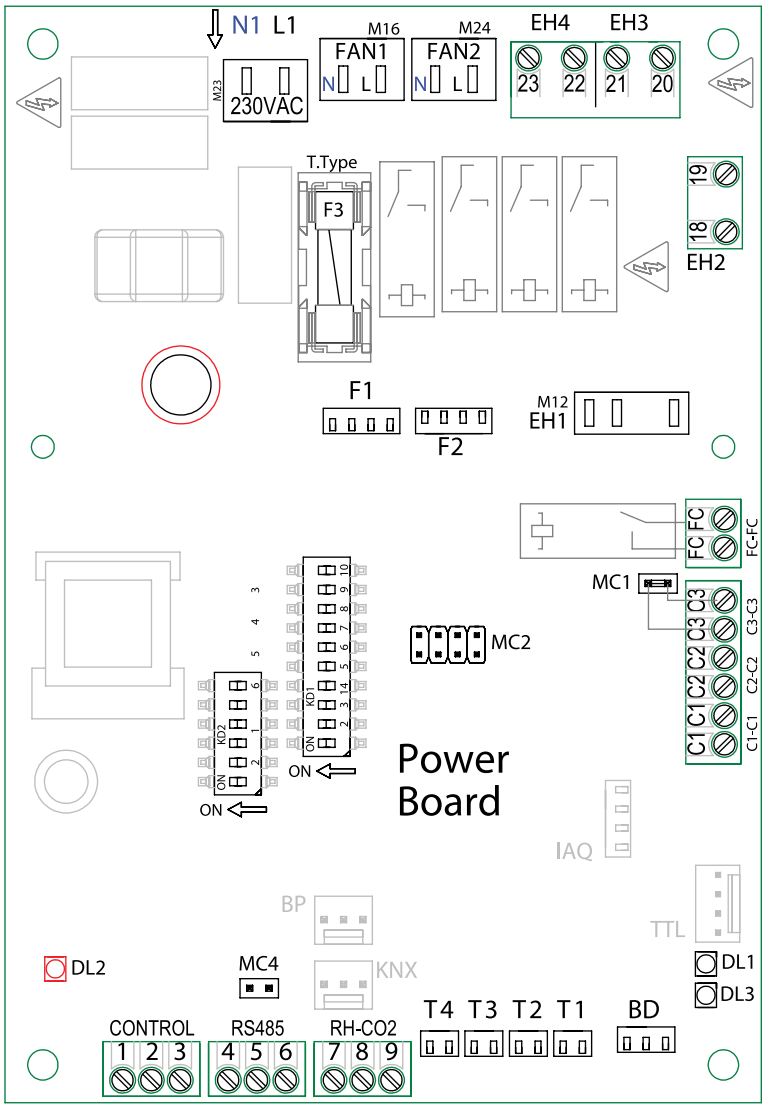


- Fully disconnect the electrical power supply before carrying out any work on the unit.
- All electrical connections of the unit should be made by a qualified electrician.
- It is the customer's responsibility to set up the ground connection using the installation device of the building and a dedicated power supply isolated and equipped with thermal protection.
- Do not connect the unit to a power supply the voltage of which is not within the specifications.

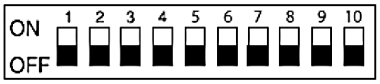


1) Main terminal block for use by the installer
2) Electronic control board
3) Fuse of the electronic power board

Electronic control board – Connections



DEFAULT



Configuration DIP switches

The electronic board is equipped with a set of 10 Dip switches for configuring the unit, i.e. the direction of use of the fans, and any accessories to be connected, such as pre- or post-air treatment coils.

The dip switches configuration must be executed once the unit has been disconnected from the power supply.

DIP	OFF	ON
1	*Installation of F1 intake to left*	*Installation of F2 intake to right*
2	*Without preheating*	*Preheating*
3	*PWM electric resistance*	*Valve actuator/E.R. ON/OFF*
4	*No post treatment*	*With post treatment*
5	*If 4 ON post heating only*	*If 4 ON post-heating/cooling*
6	*FC contact usable as remote general alarm status*	*FC contact to use as ON/OFF potential free contact for electrostatic filter*
7	*NA*	—

Electronic control board - Legend of Connections

Item	Description
N1 L1	Board Power Supply Input Terminal
M16	Fan 1 Power Supply Transfer Terminal
M24	Fan 2 Power Supply Transfer Terminal
EH1	Internal or external modulating Electric Resistance PWM control signal, depending on the selected configuration DIP-switches. Resistance safety thermostat opening return signal.
EH2	230 V output for ON-OFF pre-heating external electric resistance enabling or pre-heating coil ON-OFF valve or modulating external electric resistance, depending on the selected configuration DIP-switches.
EH3	230 V output for post-heating (1st stage) ON-OFF external electric resistance enabling or post-heating coil ON-OFF valve enabling, depending on the selected configuration DIP-switches.
EH4	230 V output for post-heating (2nd stage) ON-OFF external electric resistance enabling or post-treatment coil ON-OFF valve enabling for dehumidification, depending on the selected configuration DIP-switches.
F1	Fan 1 EC motor control output signals from board Board tachometer input signal, for CRU-P1, CRU-P2 and CRU-P3 models.
F2	Fan 2 EC motor control output signals from board Board tachometer input signal, for CRU-P1, CRU-P2 and CRU-P3 models.
FC-FC	NA output signal for the remote control of alarms or to enable electrostatic filter activation, depending on the selected configuration DIP-switches.
C1-C1	NA input signal for the remote control of machine on/off with the ON/OFF power switch.
C2-C2	NC input signal for receiving motor fault signal, available for CRU-P2, CRU-P3 and CRU-P4 models.
C3-C3	NC input signal for receiving filter replacement signal when threshold is exceeded as detected by the differential pressure switches.
DL1-DL3	Faults/alarms signal LED.
BD	By-Pass Damper Actuator for free-cooling/free-heating.
T1	Air temperature sensor*
T2	Supply air temperature sensor*
T3	Extracted air temperature sensor*
T4	Exhausted air temperature sensor*
RH-CO2	CO2 sensor 0-10 V input
RS485	Modbus RTU - RS 485 connection
CONTROL	T-EP Control
DL2	Power LED (red light)
KD1	Configuration DIP-SWITCH
KD2	Modbus RTU - RS 485 address DIP-SWITCH
F3	5X20 "T" fuse

** The temperature sensors change logic function depending on DIP-SWITCH 1 setting*

Legend of general schemes

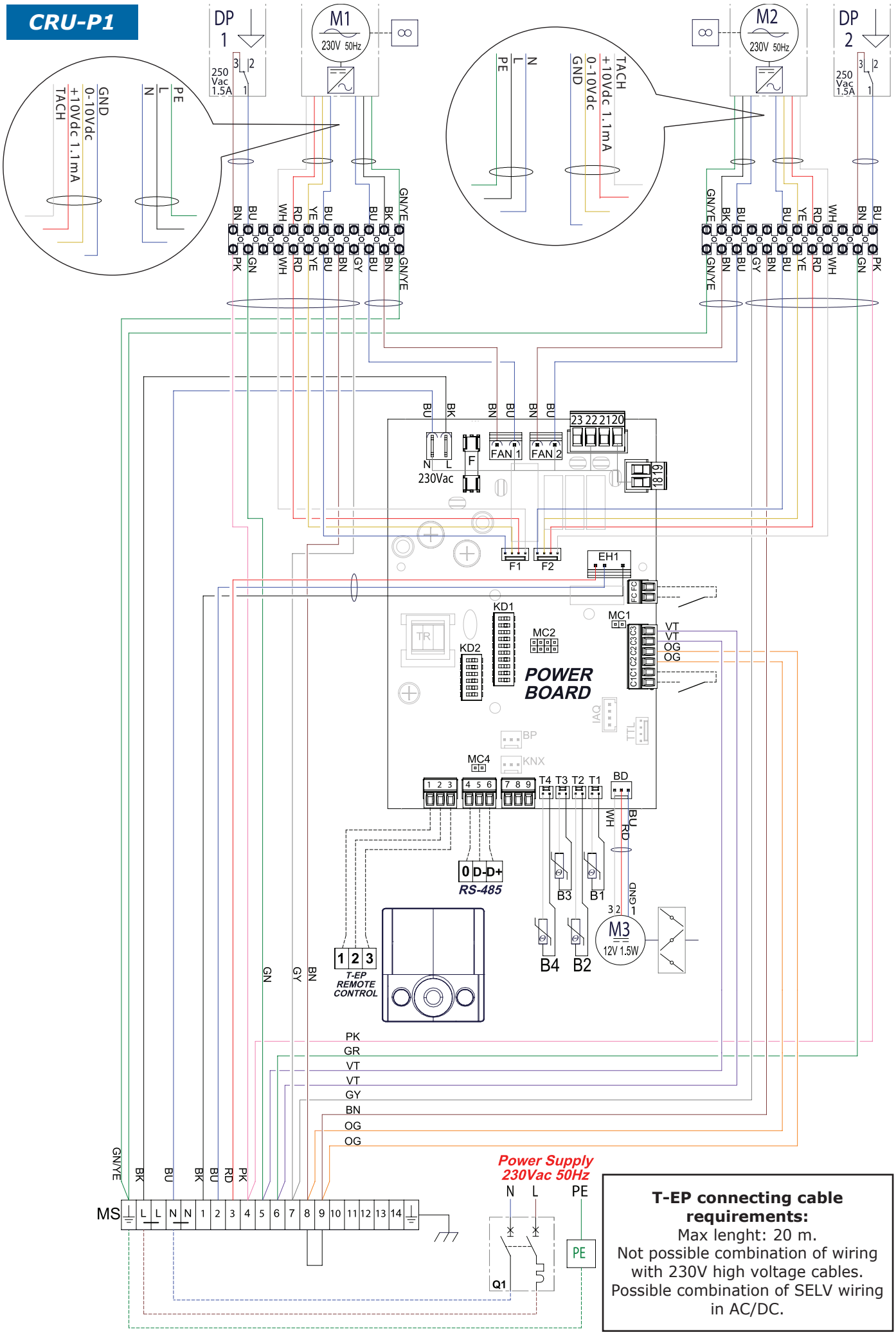
Item	Description	Note
Q1	Automatic circuit breaker/isolator	At the customer's expense
M1-M1	Fan 1 and 2	—
DP1-DP2	Differential pressure switch 1 and 2	—
POWER BOARD	Electronic control board	—
F	Fuse of the electronic power board	—
18-19	Resistance preheating ON/OFF or hot valve actuator for preheating 230 Vac output	—
20-21	Post-heating 230 Vac output	For possible control of the electric coil section or valve actuator of the hot coil
22-23	Post-cooling 230 Vac output	For possible control of the valve actuator of the cold coil
FC-FC	NO potential free contact	Usable depending on the position of Dip 6
C1-C1	NO potential free contact for remote ON/OFF	If closed the machine stops
C2-C2	NC contact connected to the fan motor circuit breaker	—
C3-C3	NC contact connected to the filter differential pressure switches	Opens at the calibration value of the pressure switches
M3	Bypass damper actuator connection	—
B1/B2/B3/B4	PT1000 air probes	—
4-5-6	RS-485 connection	—
7-8-9	External sensors 0-10 V inputs	Optional connection of CO_2 sensor

MS	Terminal Block for Installer
1-2-3	Terminals for connection of ducted electric heater controlled by PWM signal
5-6	Terminals for connecting filter differential pressure switches
8-9	NC terminals for connecting the fan motor thermal protection

Fuses Table "F" form	
CRU-P1	5x20F 4 A 250V
CRU-P2	5x20F 6,3 A 250V
CRU-P3	5x20F 6,3 A 250V
CRU-P4	5x20F 8 A 250V

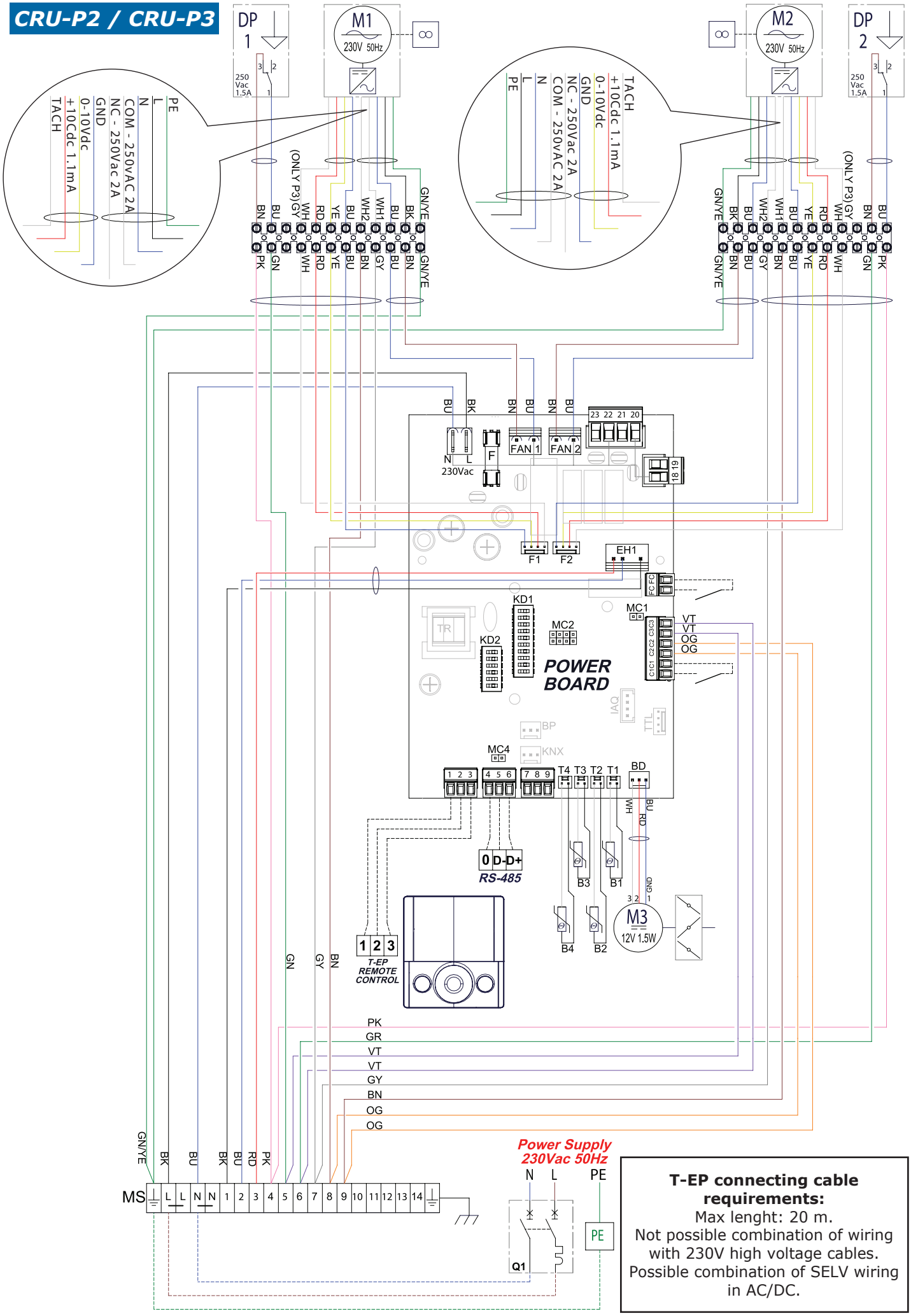
Code Table / CEI 16-6 colour			
BK	Black	GY	Grey
BN	Brown	WH	White
RD	Red	PK	Pink
OG	Orange	GD	Gold
YE	Yellow	TQ	Turquoise
GN	Green	SR	Silver
BU	Blue/light blue	GNYE	Green-yellow
VT	Purple	—	—

CRU-P1



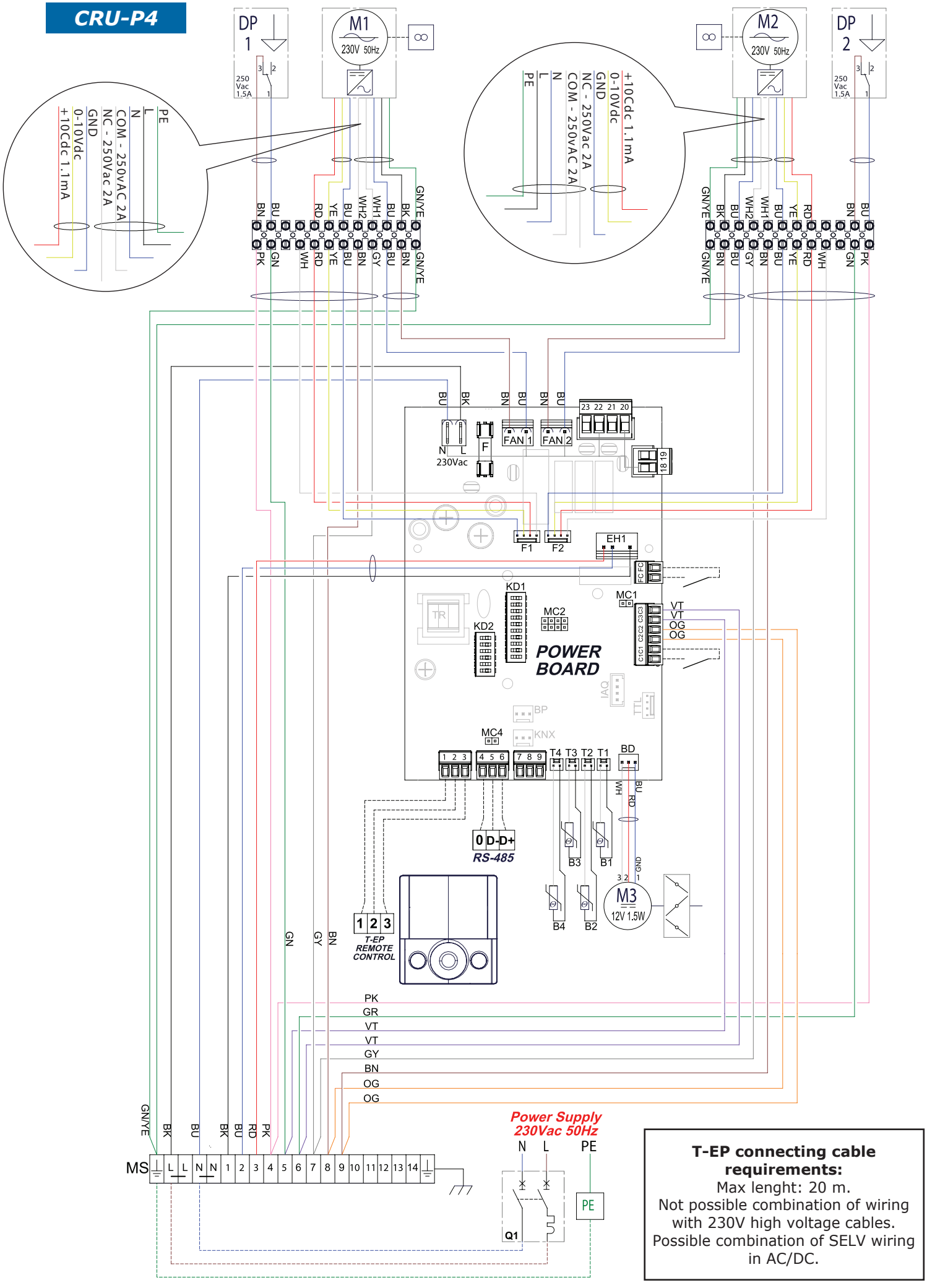
T-EP connecting cable requirements:

Max lenght: 20 m.
Not possible combination of wiring with 230V high voltage cables.
Possible combination of SELV wiring in AC/DC.



T-EP connecting cable requirements:
Max lenght: 20 m.
Not possible combination of wiring with 230V high voltage cables.
Possible combination of SELV wiring in AC/DC.

CRU-P4

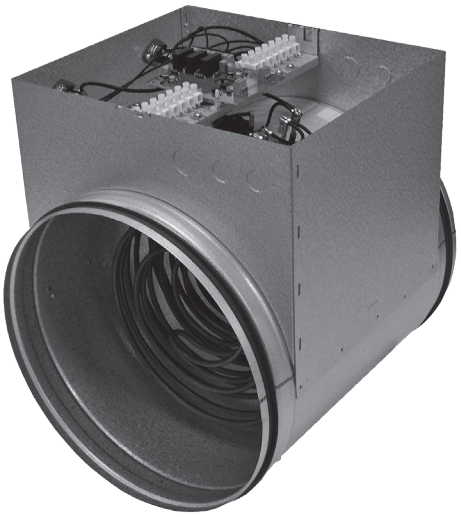


T-EP connecting cable requirements:
Max lenght: 20 m.
Not possible combination of wiring with 230V high voltage cables.
Possible combination of SELV wiring in AC/DC.

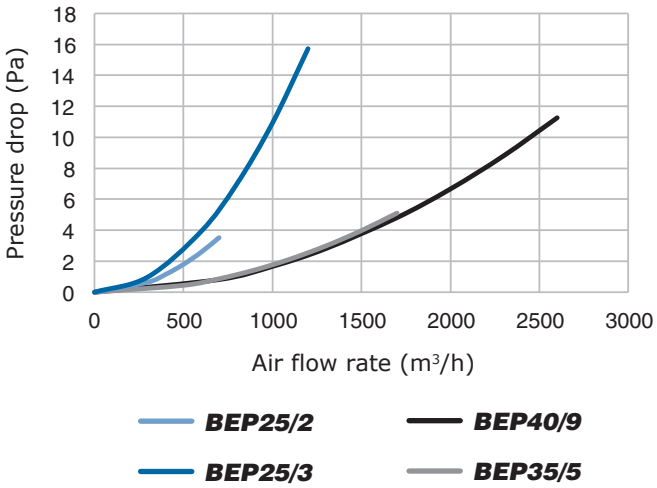
ELECTRIC ANTIFREEZE COIL BEP

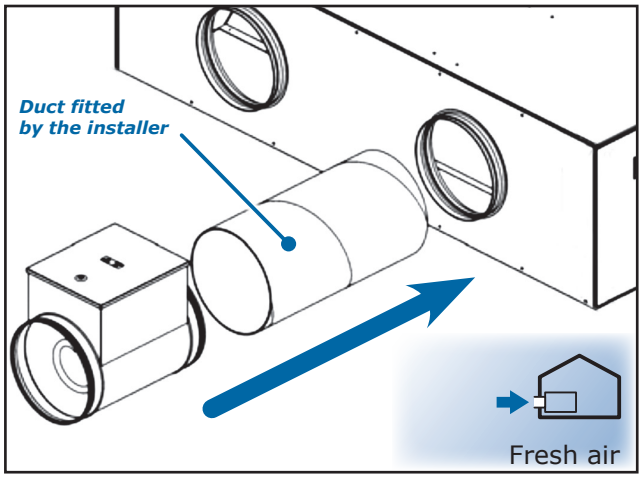
(to be placed on the "External air" intake duct)

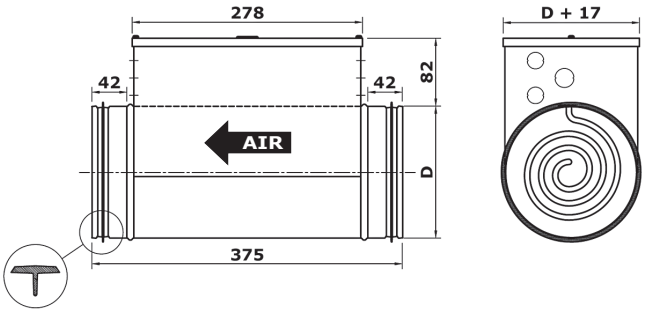
Electric heating coil consisting of armored elements inserted inside a galvanised sheet metal duct section with circular flanges and rubber gasket. The electric coil can be used in premises with air temperature between -20° C and +40° C and is equipped with double safety thermostat: one with automatic reset and one with manual reset. The purpose of the pre-heating resistance is to prevent the heat exchanger from freezing and is controlled from the control board with PWM modulating logic in order to maintain the exaust air temperature over the freezing value. Protection class IP 43.



Pressure drop *BEP*





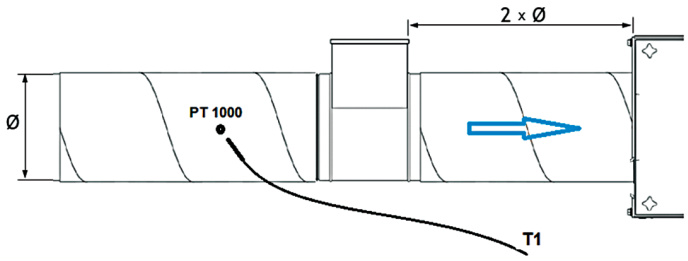


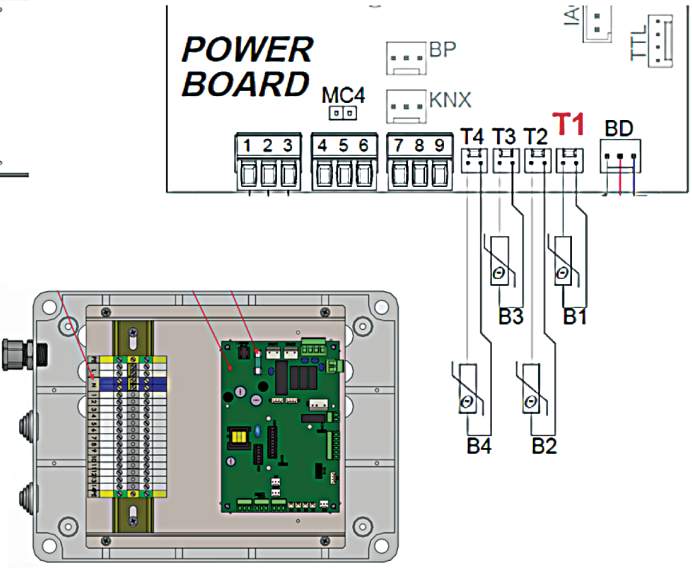
FOR HEAT RECOVERY UNIT		CRU–P1	CRU–P2	CRU–P3	CRU–P4
RESISTANCE IDENTIFICATION		BEP 25/2/M	BEP 25/3/M	BEP 35/6/T	BEP 40/9/T
CODE		9022113	9022213	9022313	9022413
Rated power	kW	2,1	3,0	6,0	9,0
Power supply voltage	V/Hz/Ph	230V 50Hz 1Ph + Pe		400V 50Hz 3Ph + Pe	
Amperes absorbed by the resistance	A	9,1	13,0	8,7	13,0
Circular Flange Diameter **D**	mm	250	250	355	400
Minimum air flow rate	m³/h	270	300	600	690

Positioning probe T1 for antifreeze control

When using the electric coil, BEP or a preheating hydronic coil, it is necessary to move the PT 1000 sensor on the fresh air intake to upstream of the preheating element.

The PT 1000 sensor is provided in the preheating accessory. You must drill a hole in the external air intake duct and then insert the sensitive element in the channel and then seal the hole.
The probe cable must be taken to the electrical equipment and connected to Terminal T1 in the place of the standard probe mounted inside the unit. Then disconnect connector T1 of the internal probe and connect the connector T1 of the external probe. When DIP 1 is ON, the connector to replace is the T3.





Notes on mounting the electric coil

The inlet of the heater must be fitted with a fixed mesh or device that prevents touching the air intake of the element.
The distance between the heater and an elbow, a valve, a filter etc. must be at least twice the diameter of the duct, otherwise the flow of air through the heater might be irregular and cause activation of the thermal overheat protection.
The heater must be insulated as per the regulations relating to ventilation ducts. The insulation material must always be flame retardant.
The cover of the heater must be free of insulation, so that the identification tag can be clearly seen and the cover can be removed.
The installation area of the heater must remain accessible to permit replacement and servicing.
The minimum distance between the metal casing of the heater and any wood or other combustible material must be 30 mm.

MAINTENANCE

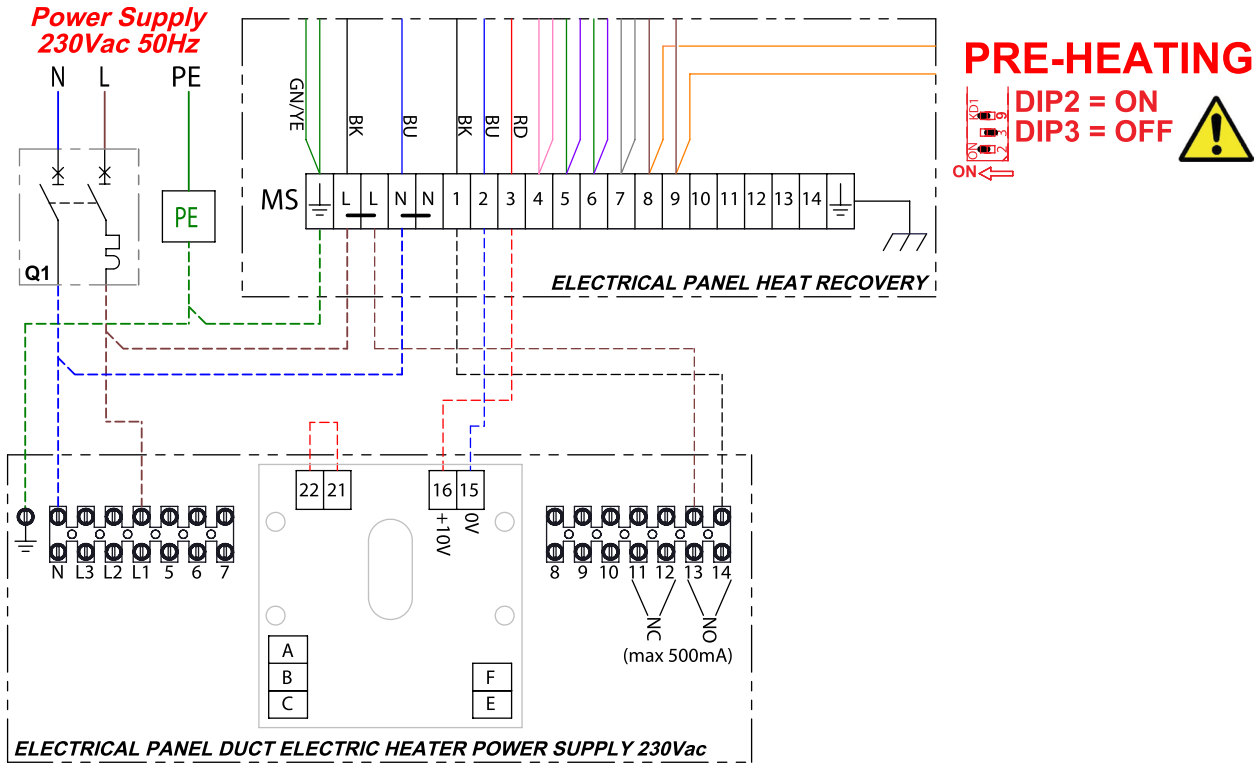
The unit is maintenance-free and requires only a periodic field test.

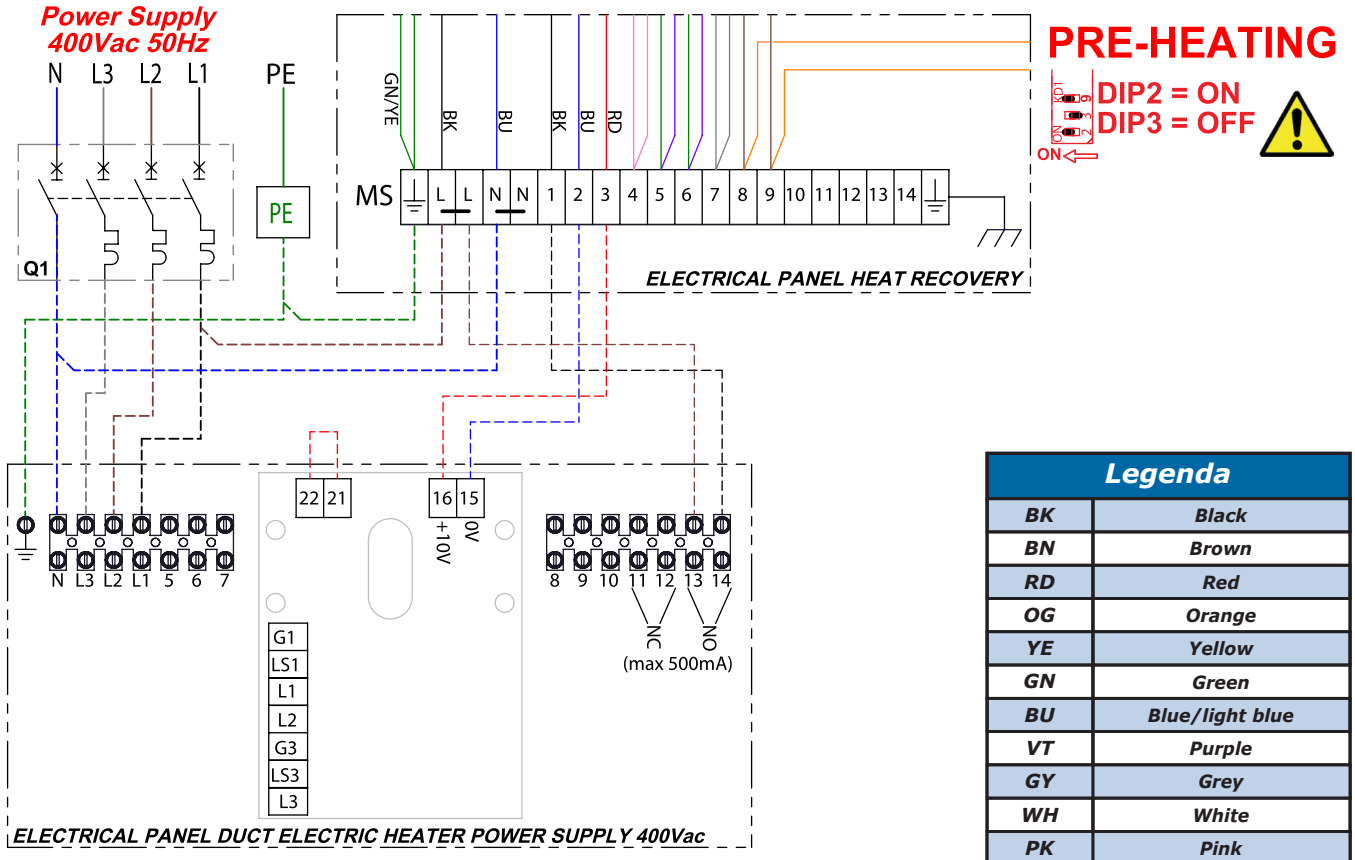
The electrical panel can be facing upwards or sideways, at an angle of 90° max.
The panel must **NOT** face downwards.

OVERHEATING

When the thermal overheat protection with manual reset is activated, you must take the following measures: do not tamper with the heater in any way, e.g. do not remove the cover. Refer to an authorised electrician. Disconnect from the mains power supply and identify the cause for activation of the overload device. The overload device can be reset once the fault has been resolved.

BEP resistance - Electrical connection



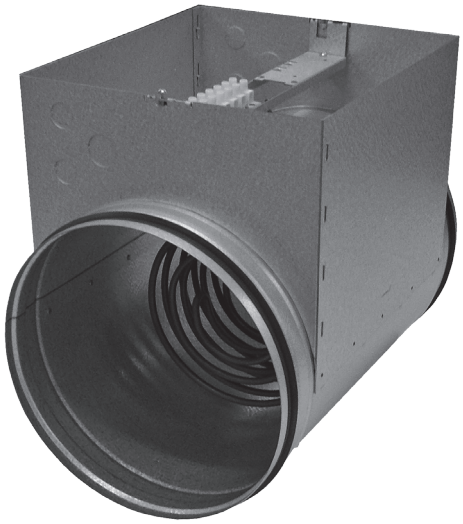


Legenda	
BK	Black
BN	Brown
RD	Red
OG	Orange
YE	Yellow
GN	Green
BU	Blue/light blue
VT	Purple
GY	Grey
WH	White
PK	Pink
GD	Gold
TQ	Turquoise
SR	Silver
GNYE	Green-yellow
———	Production wiring
- - - - - -	Connection responsibility of the installer

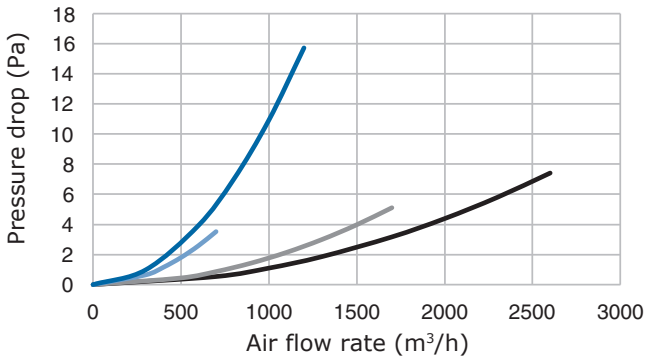
ELECTRIC POST-HEATING COIL BER

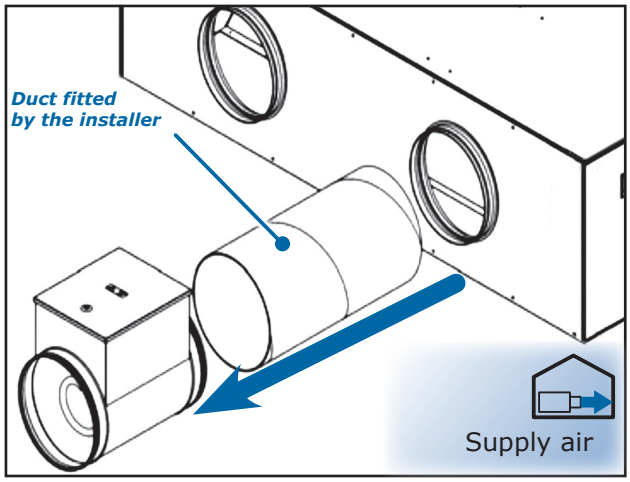
(to be placed on the "Intake air" duct)

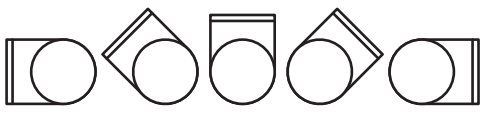
Electric heating coil consisting of armored elements inserted inside a galvanised sheet metal duct section with circular flanges and rubber gasket. The electric coil can be used in premises with air temperature between -20° C and +40° C and is equipped with double safety thermostat: one with automatic reset and one with manual reset. Operation is controlled by the ON/OFF logic in order to reach the setpoint of the indoor air heating controlled by the temperature probe on the return air flux. The resistance supply circuit is fitted with an adjustable thermostat, which has a limiting function. Protection class IP 43.

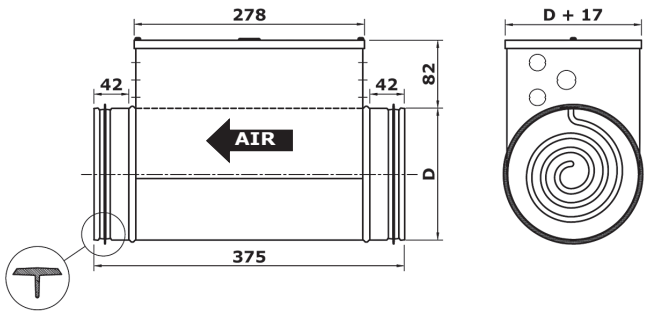


Pressure drop *BER*









For heat recovery unit		CRU–P1	CRU–P2	CRU–P3	CRU–P4
Resistance Identification		BER 25/2/M	BER 25/3/M	BER 35/5/T	BER 40/6/T
Code		9022114	9022214	9022314	9022414
Rated power	kW	2,1	3,0	4,5	6,0
Power supply voltage	V/Hz/Ph	230V 50Hz 1Ph + Pe		400V 50Hz 3Ph + Pe	
Amperes absorbed by the resistance	A	9,1	13,0	7,2	8,7
Circular Flange Diameter **D**	mm	250	250	355	400
Minimum air flow rate	m³/h	270	300	600	690

The post-heating electric coil prevents the temperature of the intake air from being too low and ensures environmental comfort.

Operation of the resistance is controlled according to the temperature of the intake air.

FASTENING

The resistance is connected to the system on the air supply channel. The air that passes through the heater must flow in the direction indicated by the arrow on the side of the heater, near the terminal block. The heater can be installed in a vertical or horizontal duct, and must be made of fire retardant material resistant to both heat and cold.

The distance between the heater and an elbow, a valve, a filter etc. must be at least twice the diameter of the duct, otherwise the flow of air through the heater might be irregular and cause activation of the thermal overheat protection.

The heater must be insulated as per the regulations relating to ventilation ducts. The insulation material must always be flame retardant. The cover of the heater must be free of insulation, so that the name tag can be clearly seen and the cover can be removed.

The installation area of the heater must remain accessible to permit replacement and servicing.
The minimum distance between the metal casing of the heater and any wood or other combustible material must be 30 mm.

MAINTENANCE

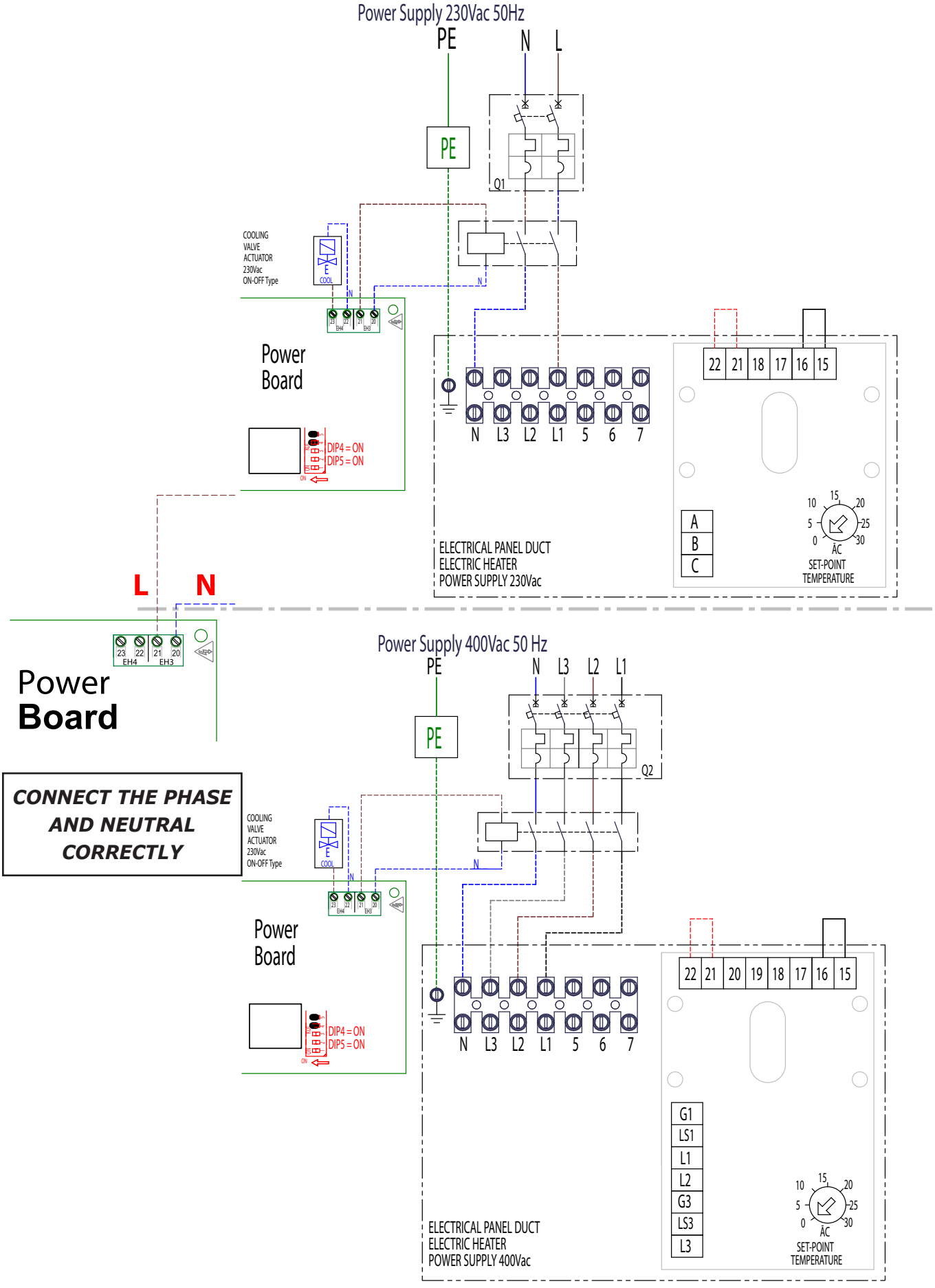
The unit is maintenance-free and requires only a periodic field test.

The electrical panel can be facing upwards or sideways, at an angle of 90° max.
The panel must **NOT** face downwards.

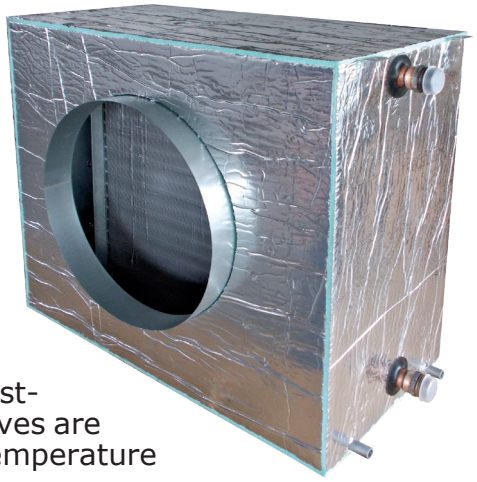
OVERHEATING

When the thermal overheat protection with manual reset is activated, you must take the following measures: do not tamper with the heater in any way, e.g. do not remove the cover. Refer to an authorised electrician. Disconnect from the main power supply and identify the cause for activation of the overload device. The overload device can be reset once the fault has been resolved.

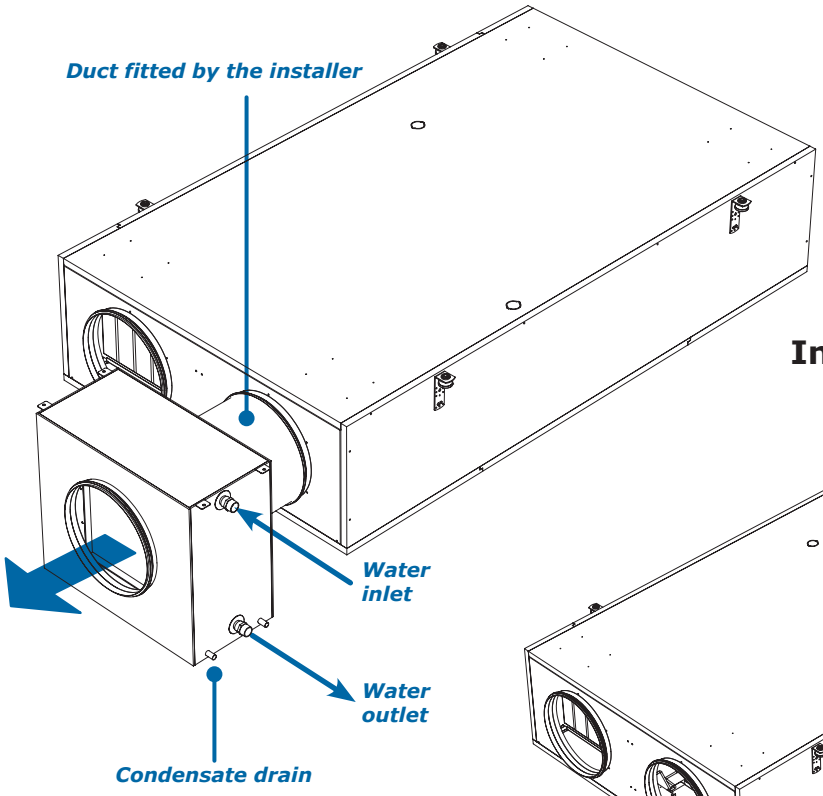
BER resistance - Electrical connection



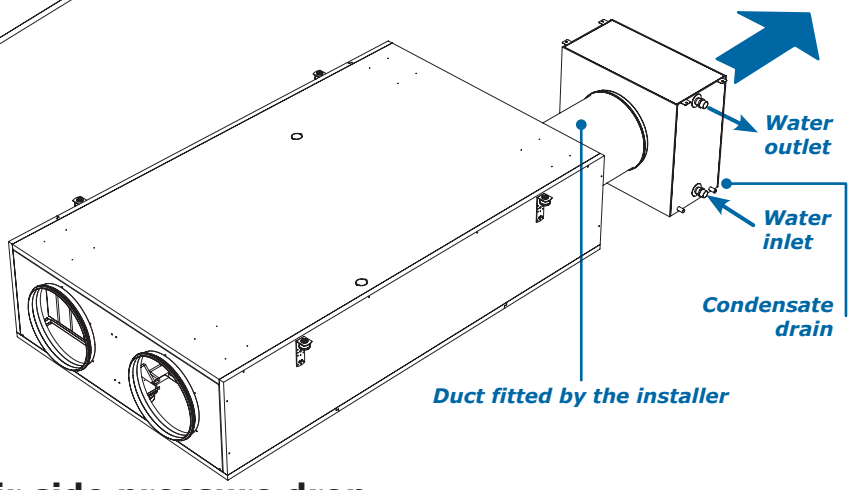
WATER COIL



It consists of a galvanised steel structure insulated externally complete with circular flanges which facilitate its connection to the heat recovery unit or application to the circular duct. The interior of the section is fitted with a finned coil mounted on a special supporting frame made of galvanised sheet metal, expanded 3/8" copper tubes, aluminium fins pitch 2.5 mm, brass manifolds protruding at the sides. The interior of the section contains the condensate collection tray with 16 mm drain fitting. The treatment section is suitable both for post-heating and for cooling the intake air. The sections of post-treatment valves can be managed by the main board. The valves are open when the setpoint of the winter or summer cooling temperature on return air is not reached and closed if it is.

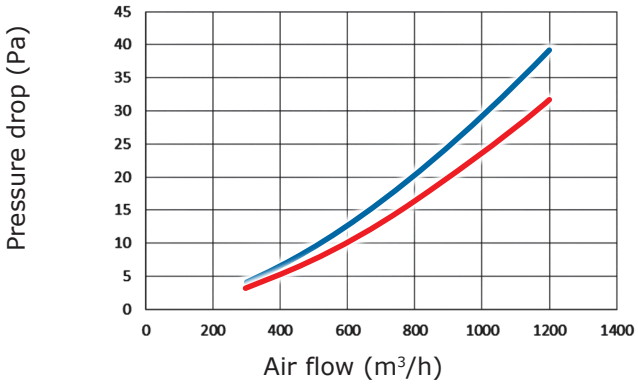


Inverted-flow version

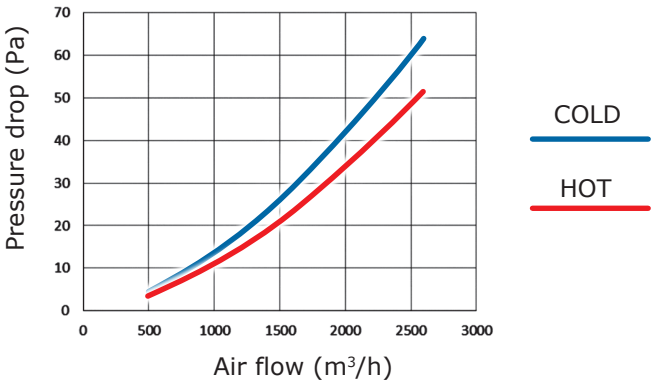


Air side pressure drop

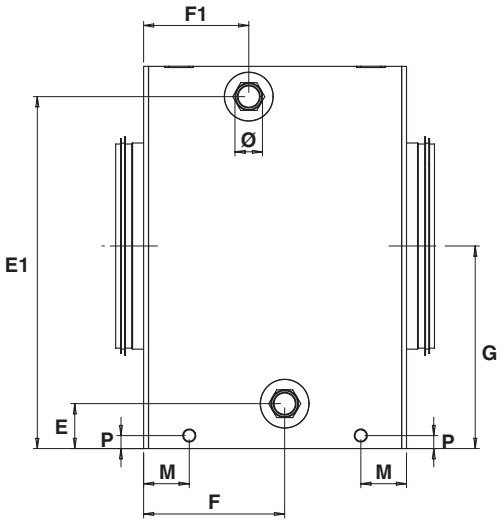
CRU–P1 / CRU–P2

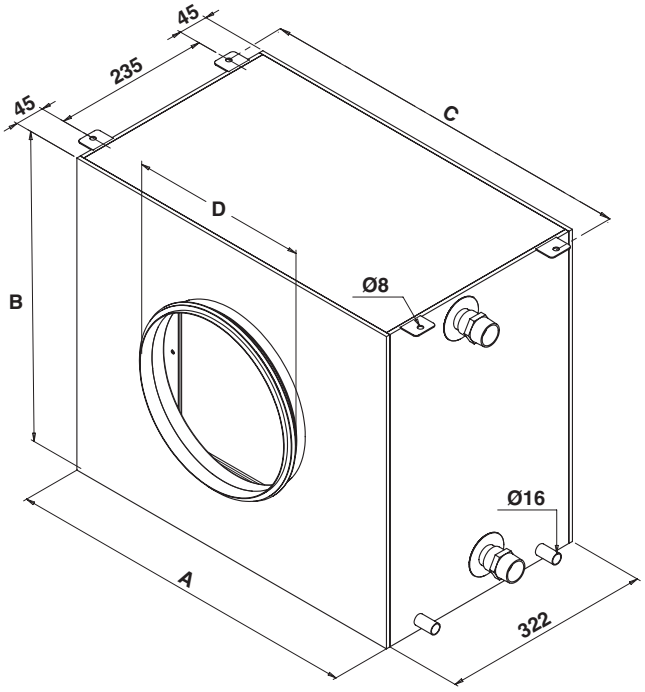


CRU–P3 / CRU–P4

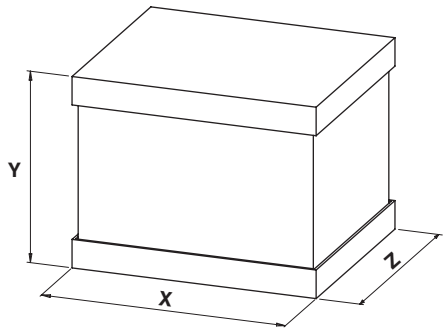


For heat recovery unit			CRU–P1	CRU–P2	CRU–P3	CRU–P4
Coil Identification			BAE 1–2	BAE 1–2	BAE 3	BAE 4
	Code		9022012	9022012	9022013	9022014
Dimensions	A	mm	536	536	645	645
	B	mm	468	468	568	568
	C	mm	567	567	676	676
	D	mm	250	250	355	400
	E	mm	55	55	55	55
	F	mm	180	180	180	180
	E1	mm	431	431	531	531
	F1	mm	133	133	133	133
	G	mm	250	250	300	300
Diameter	Ø		1"	1"	1"	1"
Condensate drain	M		56	56	56	56
	P		16	16	16	16





Packaging dimensions



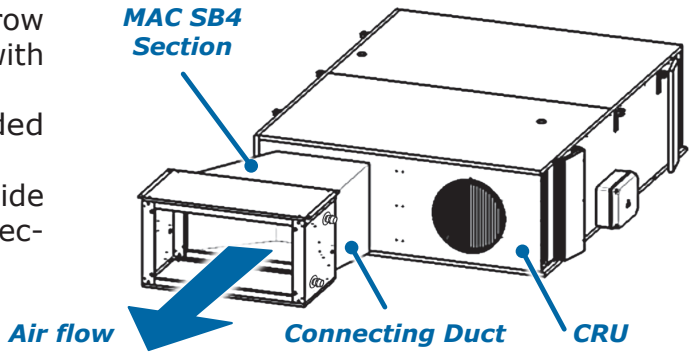
Model			CRU–P1 / P2	CRU–P3	CRU–P4
Dimensions	X	mm	690	800	800
	Y	mm	540	540	540
	Z	mm	590	700	700

AUXILIARY SECTIONS

The CRU heat recovery units can be matched with the MAC SB4 + BCR sections (condensate collection tray) or with the MAC SFE sections; this is achieved by using the special Connecting Duct.

MAC air handling section with 4 row coil – MAC SB4

The SB4 sections are equipped with a 4-row heat exchange coil suitable to be fed with chilled water.
The table below shows the recommended combinations.
When ordering indicate the connections side of the coil section; in the picture the connections side is on the left.



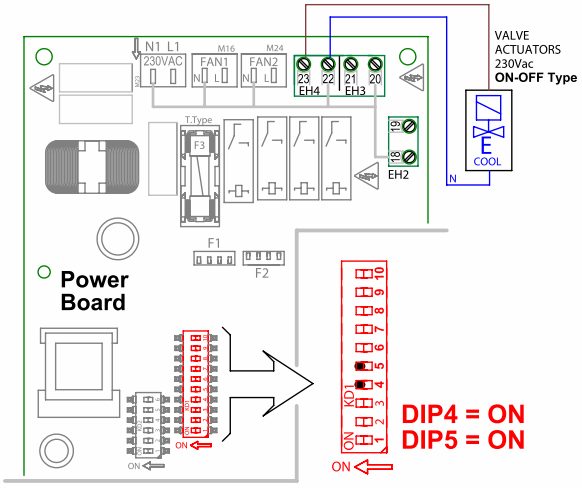
For Heat Recovery Unit	Connecting Duct			MAC air handling section with 4 row coil			MAC condensate collection tray	
	Identification	Code		Identification	Code		Identification	Code
CRU–P1	CRU 1-2	9022116	+	SB4 1-2	0035004	+	BRC 1-2	9035020
CRU–P2	CRU 1-2	9022116	+	SB4 1-2	0035004	+	BRC 1-2	9035020
CRU–P3	CRU 3	9022316	+	SB4 3	0035019	+	BRC 3	9035021
CRU–P4	CRU 4	9022416	+	SB4 4	0035034	+	BRC 4	9035022

Connecting the valve actuator of the post-treatment coil

The coil section can be used to cool the air before release into the room, using a 2-pipe system for cooling only, or to cool/heat, using a reversible 2-pipe system. It is equally possible to connect a dual coil, in the case of a 4-pipe system, or a cooling coil in combination with a post-heating electric coil. The sections of post-treatment valves can be managed by the main board. The valves are open when the setpoint of the winter or summer cooling temperature on return air is not reached and closed if it is.

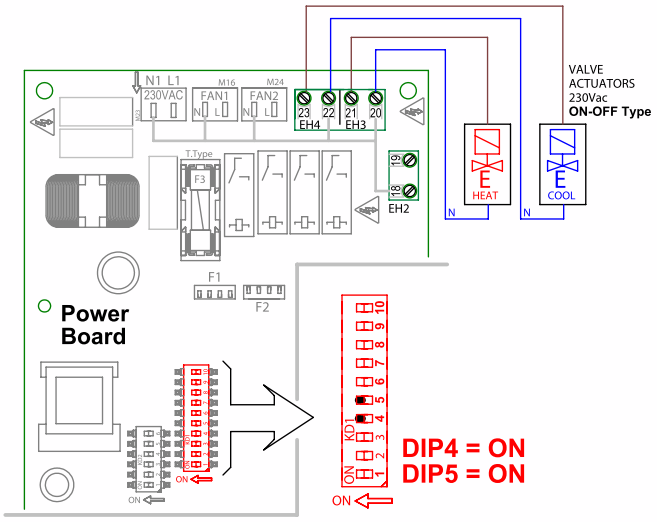
POST-TREATMENT COOLING MODE

- COOLING MODE WITH EXTERNAL ON-OFF 230Vac VALVE ACTUATOR



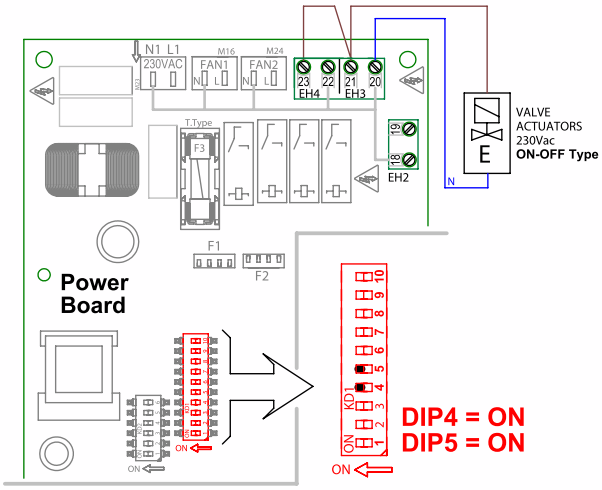
POST-TREATMENT 4 PIPES MODE

- COOLING MODE WITH EXTERNAL ON-OFF 230Vac VALVE ACTUATOR
- HEATING MODE WITH EXTERNAL ON-OFF 230Vac VALVE ACTUATOR



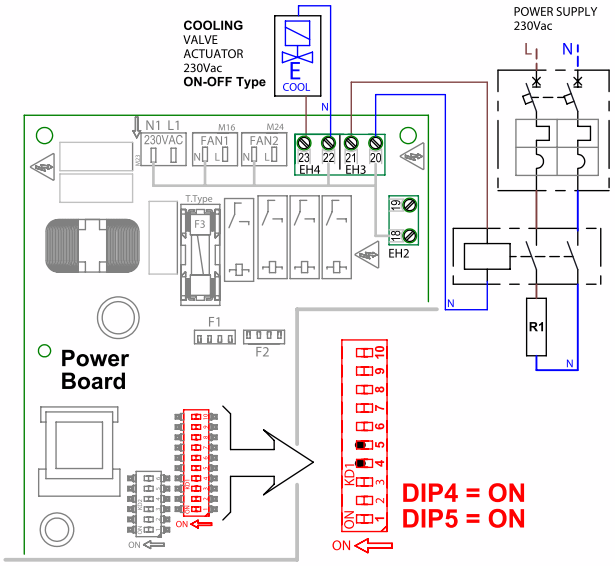
POST-TREATMENT 2 PIPES MODE

- TREATING MODE WITH EXTERNAL ON-OFF 230Vac VALVE ACTUATOR



POST-TREATMENT 4 PIPES MODE (Heating mode with electric heater)

- COOLING MODE WITH EXTERNAL ON-OFF 230Vac VALVE ACTUATOR
- HEATING MODE WITH EXTERNAL ON-OFF SINGLE PHASE 230Vac ELECTRIC HEATER (POWER ON 230Vac SIGNAL)



Note:
In case the valve kit is supplied by the Manufacturer, see the kit attached instructions.

MAINTENANCE OF THE WATER COIL

HYDRAULIC CONNECTIONS FOR WATER COIL

The connections for the pipes of the heater should not be forced to bear the entire weight of the outer pipes. The pipes should not be subject to forces due to the thermal expansion. The connections must be protected against shock, external loads and mechanical stresses.
Mechanical loads and shocks may damage the manifold.

ANTIFREEZE PROTECTION

In case of freezing risk and consequent damage to the pipes, one of the two following measures must be taken:
• Top up the coil with a suitable anti-freeze. The coil capacity is stated on the rating plate affixed to the side of the coil connections.
• Drain all the water from the pipes and coil. Do not mount the plugs on the coil before topping the system up again with water. Blow compressed air in the coil to make sure it is completely free of water.

HIGH TEMPERATURES

During installation and maintenance of a coil that uses water as a medium and in which the temperature of the water can exceed 100°C, use extreme caution when opening the vent valves and shut-off valves of the system. The escape of hot water or steam can cause serious personal injury. The Manufacturer accepts no responsibility for the connection of the heater to the heating system or for any damage due to the design, installation or incorrect maintenance of this system. Pipes,
valves etc. must be appropriately sized taking account of the pressure drop and correct operation, and not the size of the coil connections.

FILLING,VENTING AND DRAINAGE

The connecting pipes of the water coil are not equipped with a vent valve and a drain valve.
The vent and drain valves should be fitted during installation of the system, positioning them appropriately at the highest and lowest points of the system. The air must be vented completely from the system to ensure proper operation. To check that the heater is vented completely, blow compressed air in the pipes.

CONDENSATE DRAIN

In the case of use of the coil section with cooling water, it will be necessary to connect the condensate drain fitting on the bottom of the tray of the coil section. The section is equipped with: 2 x 16 mm fittings.

NOTE!

All liquids potentially harmful to the environment must be collected in suitable containers and then sent to an authorised disposal or recycling facility. Never lift the heater before draining all the liquid. Regularly inspect the connections to verify that none of the screws or threads subject to loads are damaged. Check that the fin structure is clean and undamaged.

CLEANING

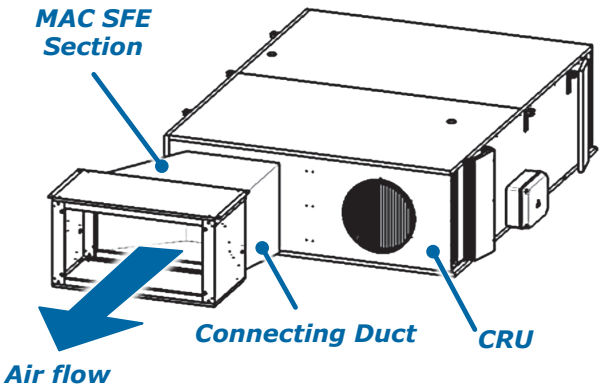
The accumulation of dust on the surfaces of the heater reduces the air flow and slows heat transmission. It is, therefore, important to keep the coils clean following one of the procedures below (or a combination of these):
• Cleaning with a vacuum cleaner.
• Cleaning with compressed air.
• Cleaning with steam.
• Washing or rinsing with water. In the case of hot surfaces covered with grease, first spray the entire heater with a ecological solvent at low pressure. After 10-12 minutes, wash with water at high pressure.
Cleaning should be done in the opposite direction to normal air flow.

NOTE!

It is important to keep the nozzle perpendicular to the surface of the fins and at a minimum distance of 150 mm to prevent damage to the fins. Deformed fins can be straightened with a special comb. Make sure to remove all traces of solvent on the body of the pipe with fins in order to prevent the build-up of dust. After cleaning, remove all dust deposits before starting the fan.

MAC Section with pre-filter and electrostatic filter – MAC SFE

SFE section are equipped with an electrostatic filter suitable for purifying air.
The table below shows the recommended combinations.

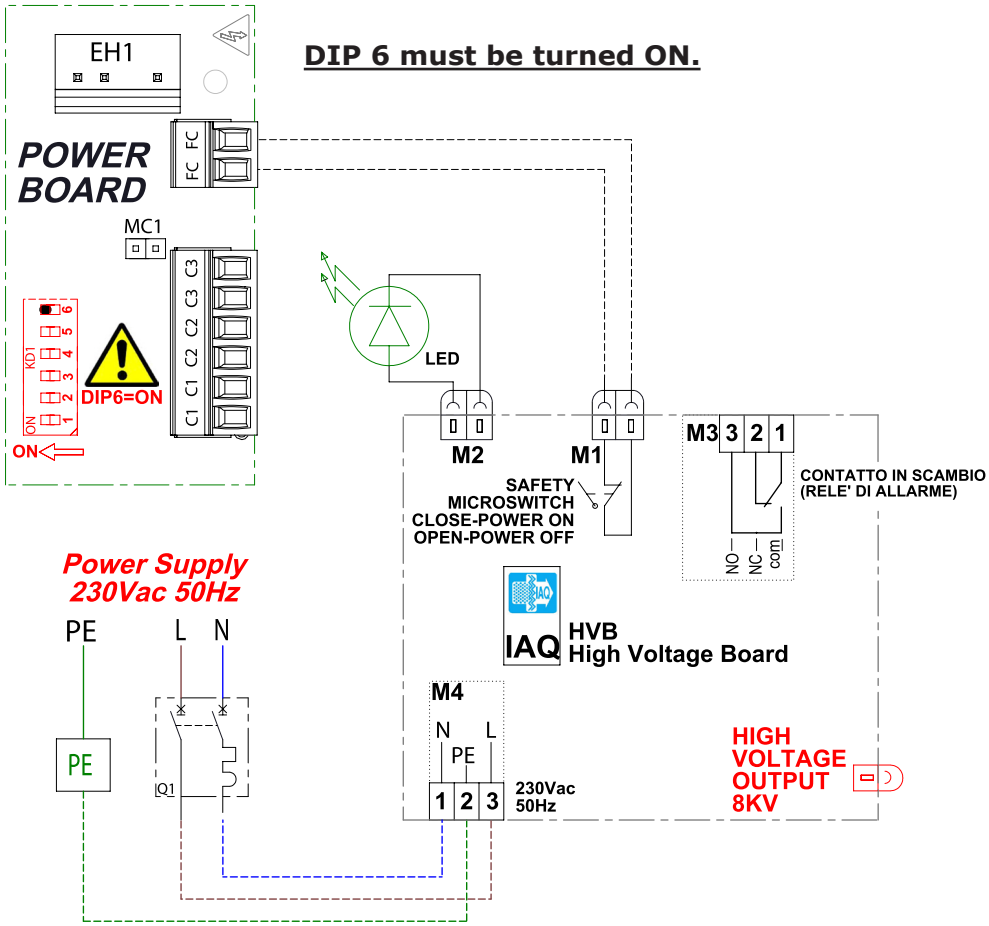


Installation notes

The MAC SFE section can be connected to the CRU unit using the CRU plenum accessory (codes 9022116/9022316/9022416).

FOR HEAT RECOVERY UNIT	CONNECTING DUCT		MAC SECTION WITH PRE-FILTER AND ELECTROSTATIC FILTER
	IDENTIFICATION CODE		IDENTIFICATION CODE
CRU–P1	CRU 1-2 9022116	+	SFE 1-2 0035012
CRU–P2	CRU 1-2 9022116	+	SFE 1-2 0035012
CRU–P3	CRU 3 9022316	+	SFE 3 0035027
CRU–P4	CRU 4 9022416	+	SFE 4 0035042

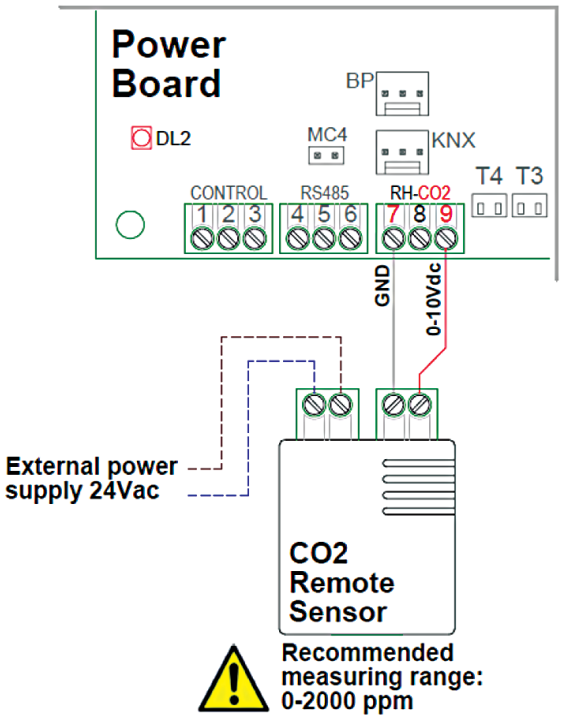
Wiring diagram



CO_2 SENSOR (accessory to be installed by the Customer)

The control board of the CRU units is designed to receive a 0-10 V signal from a CO_2 sensor. The characteristics of the sensor that can be connected are:
- Recommended operating range: 0-2000 ppm
- Signal output: 0-10 V

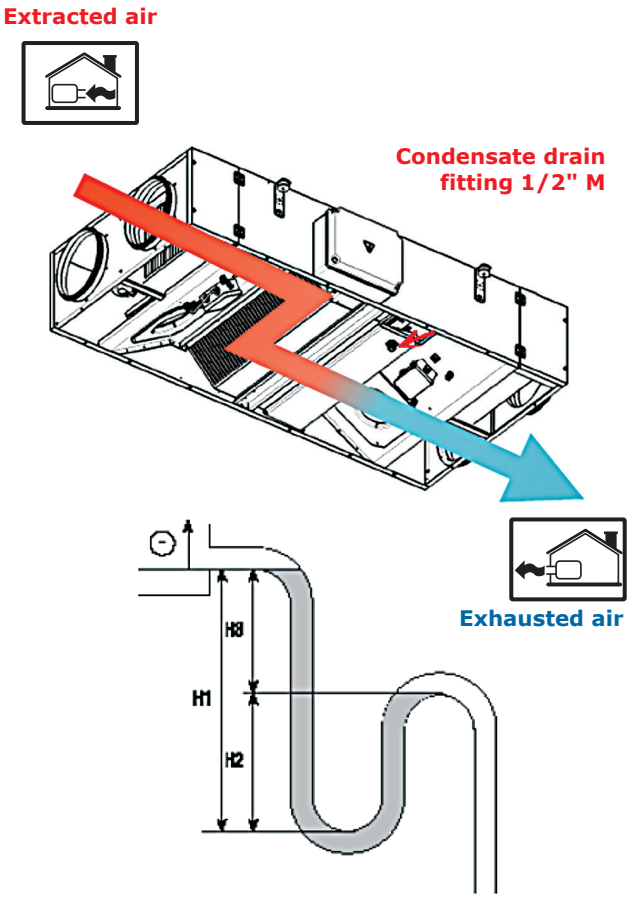
The Customer shall set up the sensor power supply according to the specifications of the selected product. It is usually a power supply with these specifications:
- 24 V AC
- 15-35 V DC.



CONDENSATE DRAIN SIPHON

The unit has a condensate drain at the bottom to which must be fixed a siphon which can ensure the efficient draining of water during normal operation.
The siphon must always meet the following specifications and the discharge pipe have to be at a minimum gradient of 3°.
The siphon is essential for correct operation of the energy recovery unit as it prevents the infiltration of air and yet ensures the natural flow of the condensate. The siphon must be filled with water and sized according to the function to prevent that the air in the discharge system will be drawn by the heat recovery unit and doing so obstructs the proper drainage of the condensate.

The system must be pressurised as follows:
H1 = 2P
H2 = H1 /2
Where P = max operating pressure of the heat recovery unit in mm, approx (1 mm approx = 9,81 Pa).



MAINTENANCE

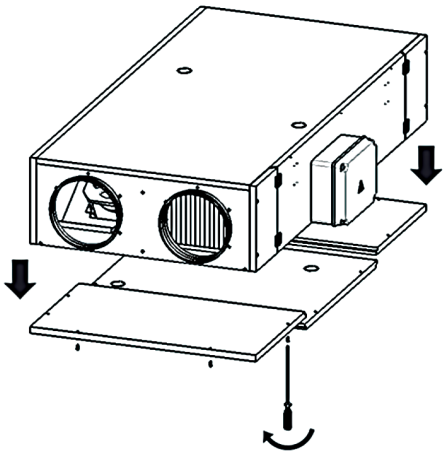
CLEANING THE EXCHANGER AND ACCESS TO THE FILTERS FROM THE SIDE

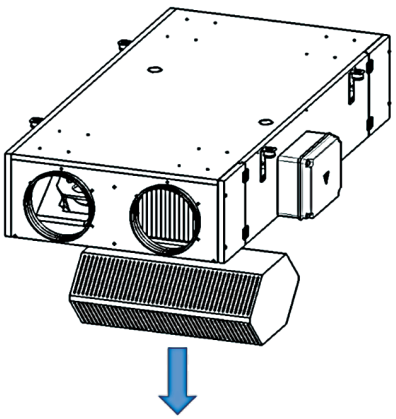
To remove the heat exchanger for cleaning, remove the plastic caps on the panel of the heat exchanger. Undo the screws in the panel with a Phillips screwdriver.

Remove the panel from the casing of the unit and take out the heat exchanger. The heat exchanger comprises 1/2/3 modules and these must all be taken out for cleaning. Make sure not to touch the fins when handling the heat exchangers, in order to avoid damaging them.

For normal ventilation applications, it is sufficient to clean the inlet and outlet with a brush or water and, if necessary, a neutral detergent. If there is a lot of dirt, you may use compressed air or wash with a jet of water, but only with a flat spray nozzle at a washing pressure of no more than 100 bar. Remember not to aim high pressure jets directly at the plates!

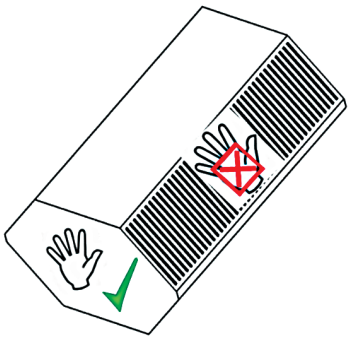
After maintenance, put the heat exchanger and panel back in place. Make sure to tighten all the bolts at a torque of 25 Nm.





RECOMMENDED MAINTENANCE SCHEDULE

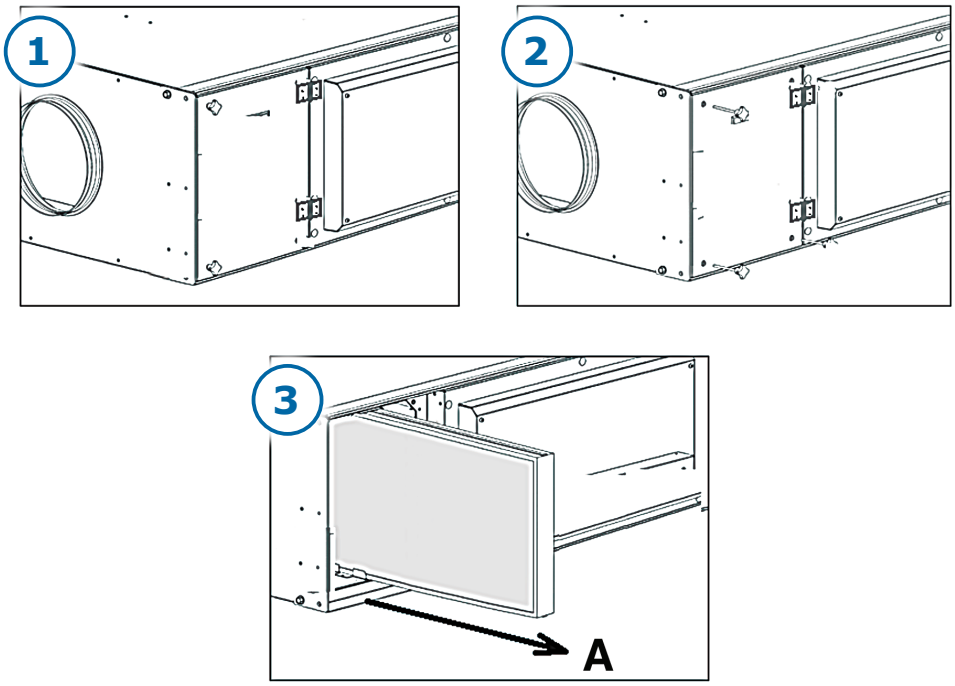
Cleaning the exchanger:
every 6 months, preferably at the beginning of each winter and summer season.



REPLACING THE FILTERS (SIDE ACCESS)

Undo the Phillips head screws in the panels of the filters. Open the filter inspection hatch and take the filter out sideways.

Install the new filter and then close the panel and secure it with the Philips screws.



Filters dimension Table		IN	OUT	A
CRU-P1	Filter, thickness 98, 285x405	F 7	M 6	425
CRU-P2	Filter, thickness 98, 326x555	F 7	M 6	572
CRU-P3	Filter, thickness 98, 408x595	F 7	M 6	615
CRU-P4	Filter, thickness 98, 547x830	F 7	M 6	850

RECOMMENDED MAINTENANCE SCHEDULE

Replacing the filters: this depends on the level of pollution in the air (dust, fumes, etc.).

The units are fitted with differential pressure switches that control the pressure drop of the filter.

The default setting of the differential pressure switch is 120 Pa.

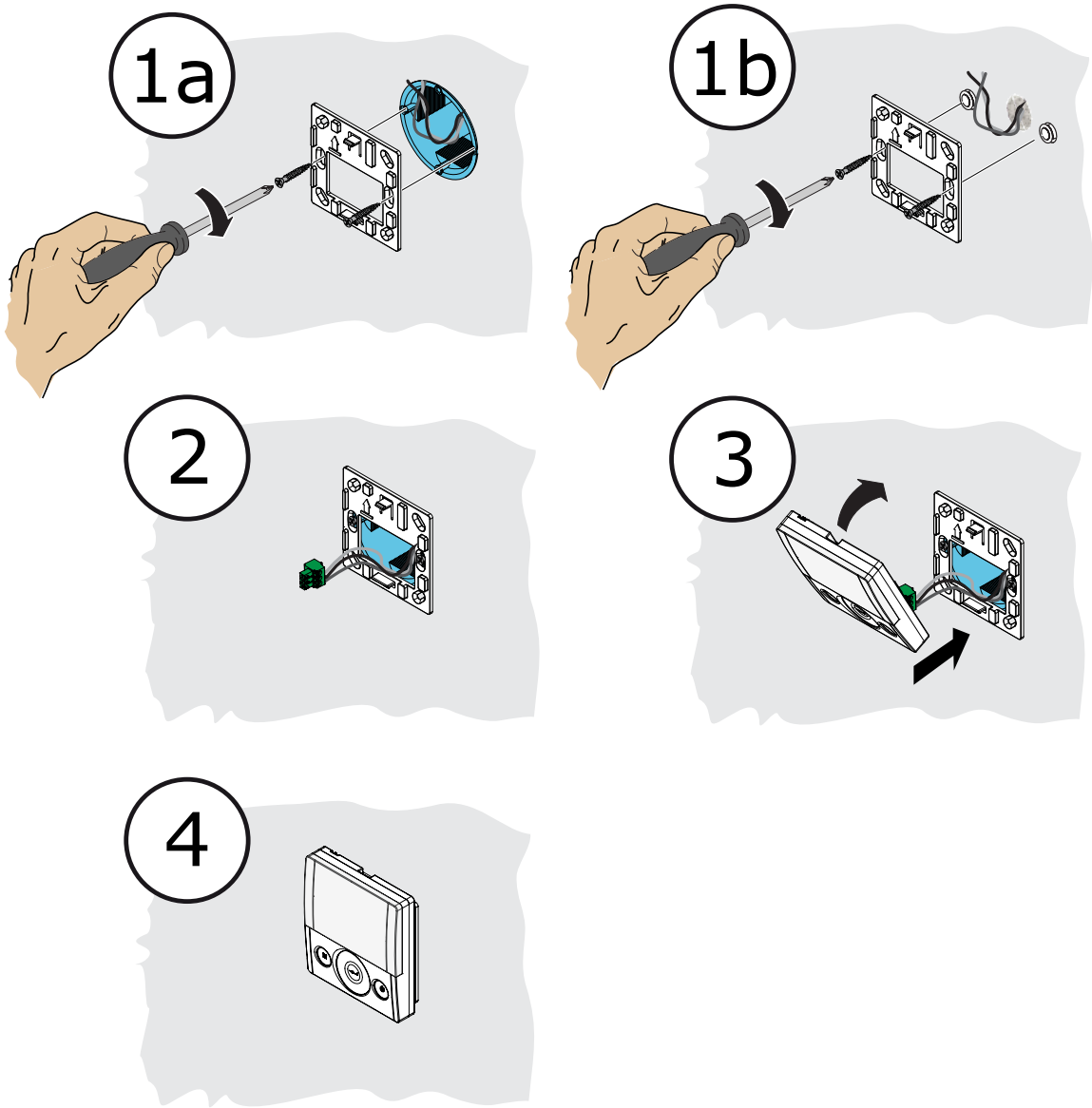
When this value is reached, the control board sends a maintenance alert message to the wall controller and the alarm symbol and filter pictogram appear on the display (see the **T-EP** controller chapter).

TROUBLESHOOTING

Malfunction	Possible causes	Corrective action
Unit starts up with difficulty	*Low power supply voltage*	*Check the voltage against that on the engine's rating plate*
Insufficient air flow ***Insufficient pressure***	*Clogged ducted system and/or extraction points*	*Clean the ducted system and the intake point*
	Formation of frost on the exchanger	*Assess the use of the preheating coil*
	Underestimated pressure drops	*Double-check the operating point on the graph of the recovery unit*
	Insufficient rotation speed	*Check and recalibrate the operating voltage of the fans*
	Dirty filter	*Clean or replace the filter media. Note: always use original filter media to guarantee the efficiency of the unit*
	Clogged heat exchanger	*Clean the mouth of the heat exchan*
The air flow decreases after a reasonable period of operation (see above)	*Pressure drops upstream and/or downstream of the fan*	*Check the connections and casing of the unit and restore the initial conditions*
	Damaged impeller	*Check the impeller. Replace with an original spare part, if necessary*
Temperature of air supply air temperature too low	*External air below -5°C*	*Use a post-heating device*
Insufficient performance of the heat exchanger	*Build-up of dirt on the fins of the heat exchanger*	*Clean the heat exchanger*
Formation of ice on the heat exchanger	*External air below -5°C*	*Use a preheating device (heater to protect against freezing)*
Leaking and/or dripping of water from the casing	*Clogged siphon*	*Clean the siphon*
	Missing or improperly fitted siphon	*Set up a siphon to standard*

T-EP

Wall control installation



T-EP TOUCH CONTROLLER

Introduction

This device was designed for the control of controlled mechanical ventilation units.
It is suitable for CRU units.

The Main Screen on the control panel permits access to two settings sub-menus:

1. USER Settings Menu where the user can select the operating mode and set the clock;
2. TECHNICAL Settings Menu where the installer can calibrate the flow rate, change the standard unit operating parameters and monitor the operating state.

On the main screen, the user can view alarm reports and main readings of the temperature and humidity.

The User Settings Menu offers these options:

1. ***Customised Selection*** of desired air flow rate in manual mode:

a) 100% - Nominal ventilation (standard)
b) 70% - Reduced ventilation (nighttime)
c) 45% - Humidity Control for High Humidity Rate Environments
d) 25% - Humidity Control for Low Humidity Rate Environments

2. ***Automatic Mode***, available for units equipped with air quality sensor (CO2).

3. Weekly Programming.

The MAIN SCREEN features the following options:

1. The preheating icon indicates activation of Antifreeze mode.

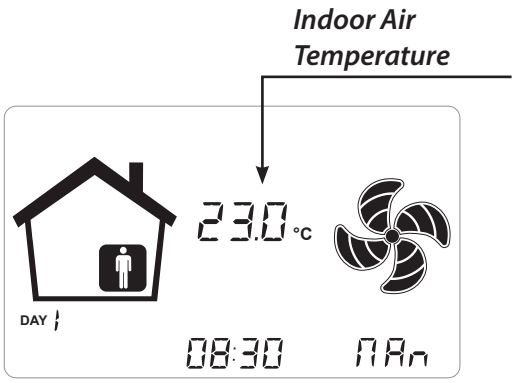
2. A timed warning icon blinks to suggest replacing the filters.

3. A damper bypass icon indicates automatic activation of free-cooling mode.

4. Weekly Program Display [A].

5. The post-heating icon indicates activation of this mode (WINTER mode icon).

6. The cooling icon indicates use of the dehumidifying unit (SUMMER mode icon).



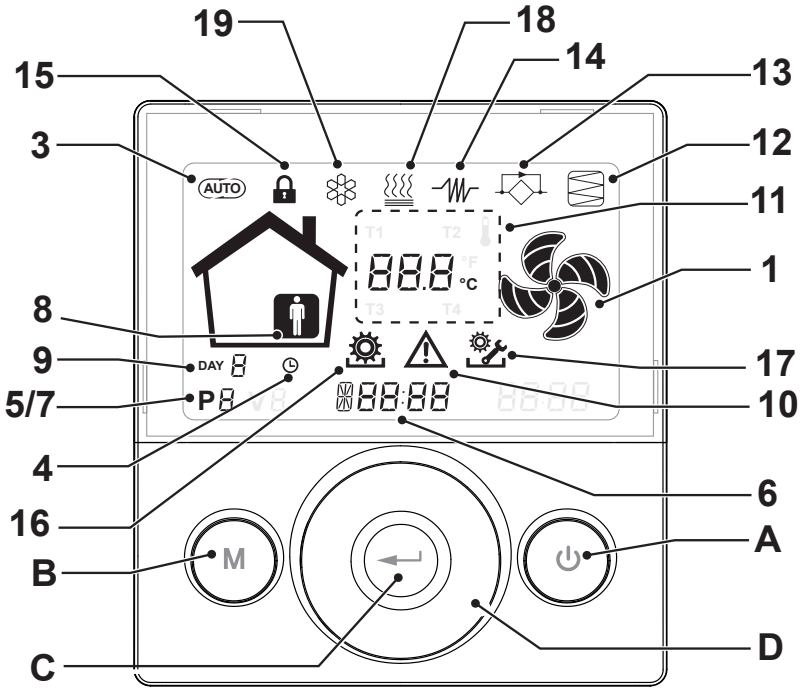
The Technical Menu offers these options:

1. Option of confirming or editing the operating parameters.
2. Monitoring the operating sizes.
3. Setting the nominal calibration speed of the fans.
4. Input and Selection of the Weekly Program available to the user.

[A] The 4 Weekly Programs can be set by the installer and another 4 weekly programs can be set up according to the user's specific requirements.

The User Settings menu allows the user to enable or disable the Weekly Program configured by the installer.

Overview of the controller



Keys:

A		• Start and Stop the machine; • Access Technical Menu (only authorised staff): when the unit is ON, press the keys and at the same time for 5 seconds to access the menu.
B	M	• Access User Menu; • Access Technical Menu (only authorised staff): when the unit is ON, press the keys and at the same time for 5 seconds to access the menu; • Exit Menu.
C		• Confirm.
D		• Move a finger on the ***TOUCH PAD*** to: • Increase/decrease the ventilation speed; or the parameters; • Scroll between functions.

Display - Functions

1		• Manual Ventilation function.
3	AUTO	• Automatic mode.
4		• Time setting • Current day setting
5	P	• Weekly program activation • Weekly program deactivation

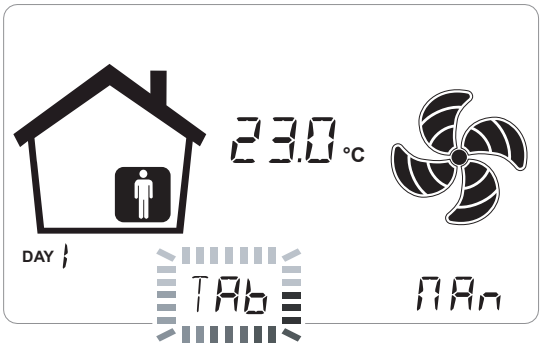
Display - Alerts and alarms

6		• Display of current time • Text field
7	P	• Number of current program
8		• Presence of Person
9	DAY	• Current day
10		• Alarm alert
11	°C	• Temperature Value alert
12		• Filter Maintenance/Dirty filter
13		• Bypass in use - Free-cooling mode
14		• Preheating - Antifreeze mode icon
15		• Function lock activated
16		• User Menu active
17		• Installer settings menu active
18		• WINTER mode icon (Post-heating)
19		• SUMMER mode icon (Dehumidifying)

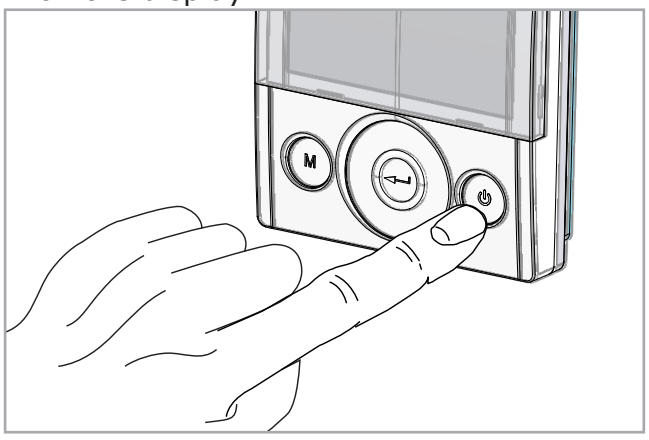
COMMISSIONING

Before carrying out the calibration, the fans are set to the factory speed.
Before the calibration, any speed modification performed from the TOUCH PAD is inhibited and the word "**Tab**" will flash on the display, alternating with the time field.

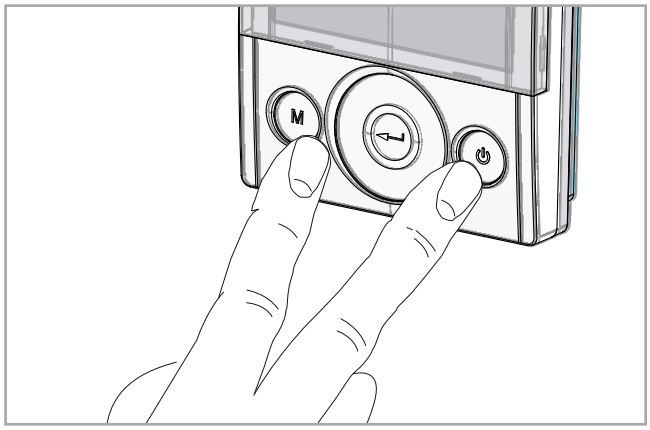
ATTENTION! Without the initial calibration, it is not possible to change the fan speed.



1. Turn on the appliance at the ON/OFF key on the display.



2. Press the ON/OFF and "M" Menu keys at the same time.



3. The symbol flashes on the display.

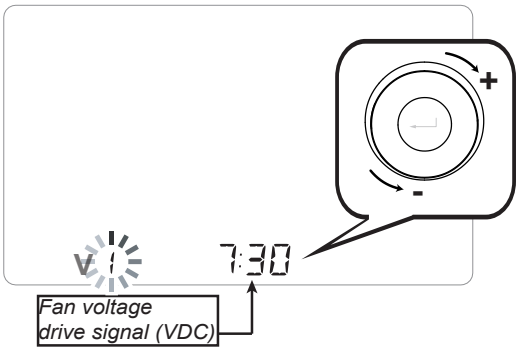
Press **Enter** to confirm .

Use the ***TOUCH PAD*** to select the symbol "**V**" and confirm .

Use the ***TOUCH PAD*** to select fan **V1** or **V2** and confirm .

Set **fan V1 (this is the default intake air fan)**:

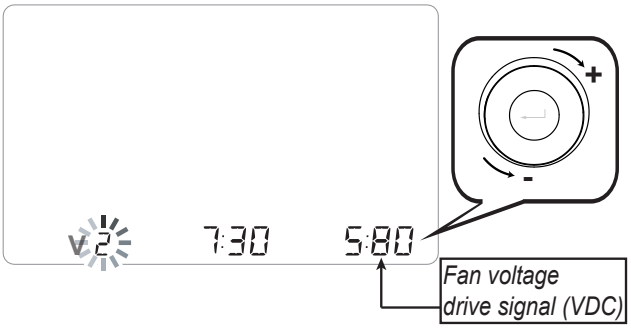
a) Using the ***TOUCH PAD***, set the required control voltage according to the detected operation field on the operating diagrams.



b) Confirm using the ***Enter*** .

ATTENTION!: once the confirmation is sent, the controller waits just a few moments that the fan speed reaches the necessary value before the V2 calibration or the exit from the calibration flow rate menu.

Now set **fan V2** following the same procedure above.



b) Confirm using the ***Enter*** .

ATTENTION!: once the confirmation is sent, the controller waits just a few moments that the fan speed reaches the necessary value before the V2 calibration or the exit from the calibration flow rate menu.

Example of commissioning

Below is an example of selection of the machine that can help to explain calibration:

The aim here is to install a primary air ventilation system with very high thermal recovery performance in an average-sized store.

The ventilation unit is to be inserted in a 4-pipe central air conditioning system provided by the owner and used for water terminals.

The store is located in a climate area characterised by cold winter temperatures (climate area E, design temperature -8°C).

Primary air is to be used as the energy carrier for summer air conditioning.

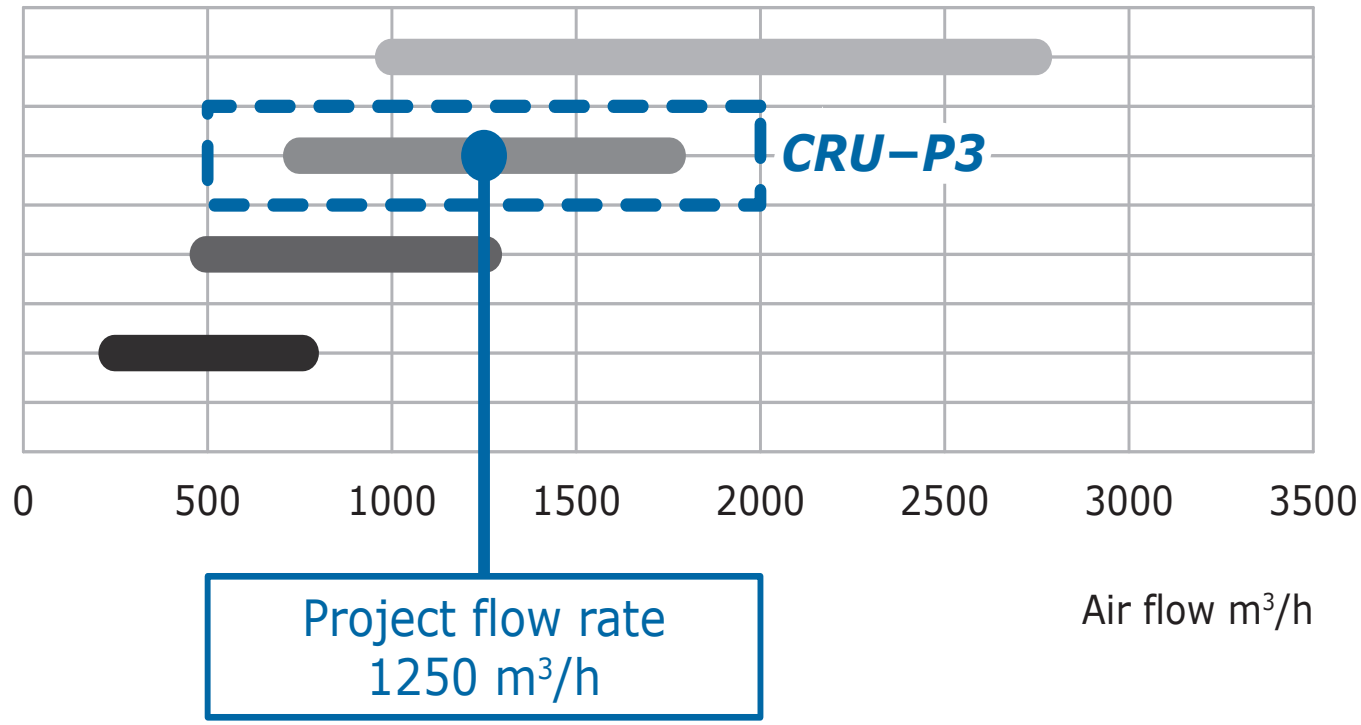
The design data for selection of the machine are summarised below:

On the basis of the calculated flow rate, the CRU model is selected as the most suitable, together with all the necessary accessories.

Supply configuration selected:

Useful surface area:	200	m^2
Crowding index:	0,25	pers/ m^2
Circulation flow pro capite:	25	m^3/h pers
Total circulation flow:	1250	m^3/h

- *Model =* ***CRU-P3***
- *Antifreeze resistance =* ***EXTERNAL***
- *Cooling water coil =* ***EXTERNAL***

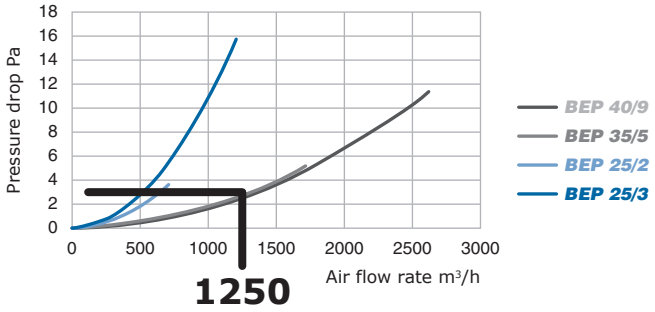


After selecting the most appropriate model in the CRU range, it is possible to identify the parameters for correct calibration of the machine and, therefore, the characteristic performance parameters.
The control voltage at which to control the EC fan motors depends on:

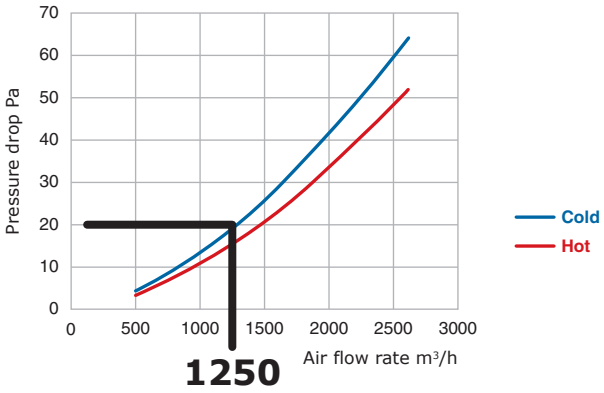
- *the design static pressure of the supply and return air circuits of the machine with the addition of the pressure drops due to the accessories.*

	SUPPLY	RETURN	COMMENTS
External system pressure losses	200 Pa	100 Pa	-
Antifreeze electric heater	3 Pa	-	IN THE CATALOGUE
Cold Coil	20 Pa	-	IN THE CATALOGUE
Safety Factor	1,05	1,05	It is up to the person who operates the program selection
Available Static Pressure	≈ 230 Pa	≈ 110 Pa	-

Pressure drop *BEP*



Air side pressure drop *CRU–P3/P4*

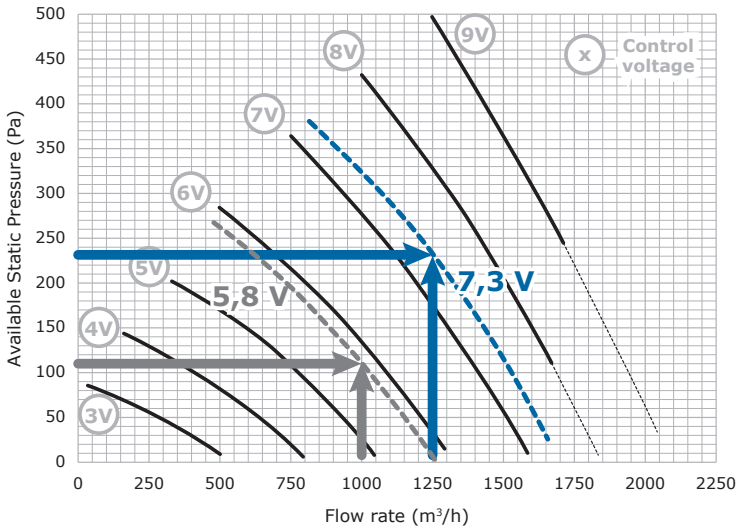


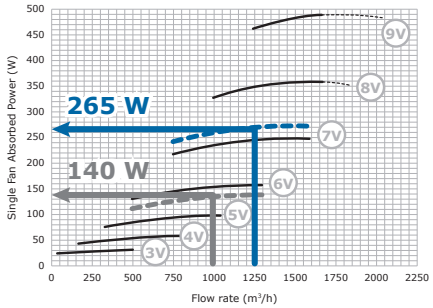
- *Design imbalance between the supply and return air flow rate.*

In this case, the supply/return ratio is 80% due to the presence of extractors in the bathrooms and the desire to ensure overpressure in the space in relation to outside.

$$Q_r = 1250*0,8 = 1000\ m^3/h$$

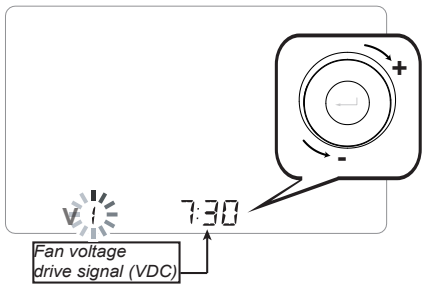
The Flow Rate/Available Static Pressure diagrams allow you to identify the calibration control voltage for the two circuits and estimate the power absorbed by the machine with the resistance disabled.

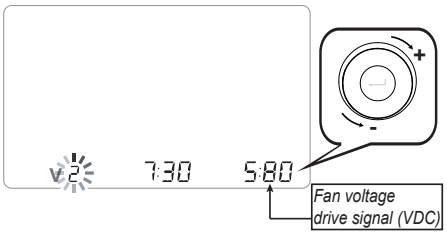




SUPPLY control voltage: **7,3 V**
RETURN control voltage: **5,8 V**

Electrical power absorbed:
P_{el} = 140+260 = 400 W





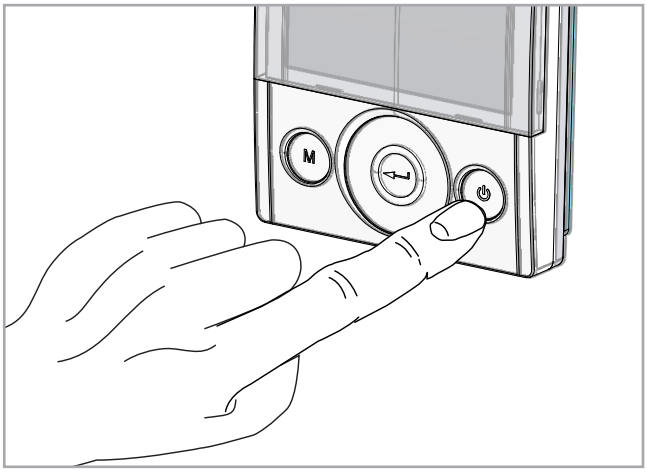
NOTE: these are the voltage values for initial calibration and must be correct in relation to the actual flow rate measurements carried out during commissioning of the system.

Setting of the weekly program

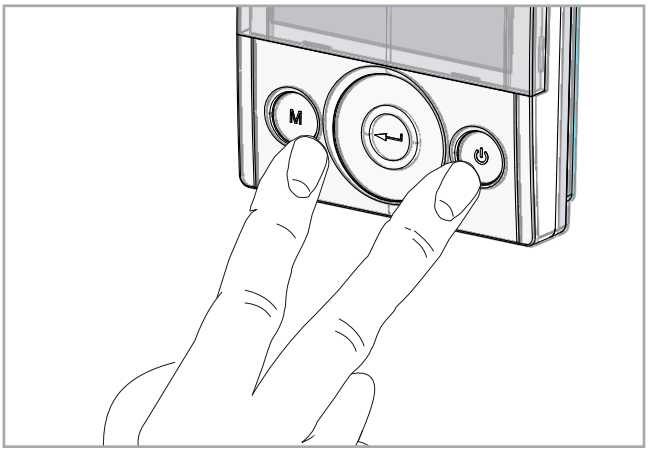
There is a choice of 8 weekly programs: 4 preset programs and 4 free programs that can be modified at will.

Selection of the preset weekly program: Programs P1-P2-P3-P4

1. Turn on the appliance at the ON/OFF key.



2. Press the ON/OFF and "M" Menu keys at the same time.

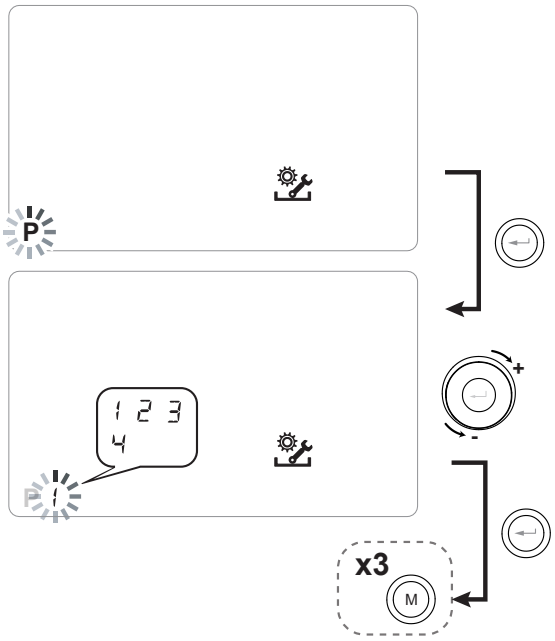


3. The symbol flashes on the display.

Press ***Enter*** to confirm .

Use the ***TOUCH PAD*** to select the symbol **"P"** and confirm .

4. Now choose the program to be set from P1 - P2 - P3 and P4 (see the schedules on the next page).



5. Press "M" (M) three times to return to the main screen.

Tables of settings for the preset weekly program

Weekly Program P1

DAY	Monday - Friday																							
TIME	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12	12 - 13	13 - 14	14 - 15	15 - 16	16 - 17	17 - 18	18 - 19	19 - 20	20 - 21	21 - 22	22 - 23	23 - 24
SPEED																								
45%									■	■	■	■	■	■	■	■								
70%	■	■	■	■	■	■																	■	■
100%							■	■									■	■	■	■	■	■		

DAY	Saturday - Sunday																							
TIME	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12	12 - 13	13 - 14	14 - 15	15 - 16	16 - 17	17 - 18	18 - 19	19 - 20	20 - 21	21 - 22	22 - 23	23 - 24
SPEED																								
45%																								
70%	■	■	■	■	■	■	■	■																■
100%									■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

Weekly Program P2

DAY	Monday - Sunday																							
TIME	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12	12 - 13	13 - 14	14 - 15	15 - 16	16 - 17	17 - 18	18 - 19	19 - 20	20 - 21	21 - 22	22 - 23	23 - 24
SPEED																								
45%																								
70%	■	■	■	■	■	■	■	■																■
100%									■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

Weekly Program P3

DAY	Monday - Friday																							
TIME	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12		12 - 13	13 - 14	14 - 15	15 - 16	16 - 17	17 - 18	18 - 19	19 - 20	20 - 21	21 - 22	22 - 24
SPEED																								
45%									■	■	■	■				■	■	■	■					
70%	■	■	■	■	■	■																		■
100%							■	■					■	■	■					■	■	■	■	

DAY	Saturday - Sunday																							
TIME	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12	12 - 13	13 - 14	14 - 15	15 - 16	16 - 17	17 - 18	18 - 19	19 - 20	20 - 21	21 - 22	22 - 23	23 - 24
SPEED																								
45%																								
70%	■	■	■	■	■	■	■	■																■
100%									■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

Weekly Program P4

DAY	Monday - Friday																							
TIME	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12	12 - 13	13 - 14	14 - 15	15 - 16	16 - 17	17 - 18	18 - 19	19 - 20	20 - 21	21 - 22	22 - 23	23 - 24
SPEED																								
45%	■	■	■	■	■	■	■												■	■	■	■	■	■
70%																								
100%								■	■	■	■	■	■	■	■	■	■	■						

■ active status

□ inactive status

Creation of the free weekly program: Programs P5-P6-P7-P8.

It is possible to create 4 weekly programs at will, according to your habits and needs.

Proceed as follows:

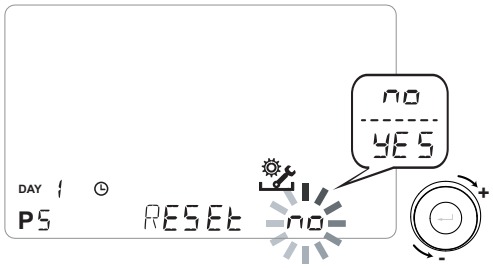
1. Turn on the appliance at the ON/OFF key.
2. Press the ON/OFF and "M" Menu keys at the same time.
3. Use the ***TOUCH PAD*** to select the installer menu .

   Press the ***Enter*** key to confirm .
4. Select the symbol **"P"** and confirm

   Now select the first free program to be created from among P5 - P6 - P7 o P8.

   Press the ***Enter*** key to confirm .

*NOTE: There is a "**Reset**" function, that allows to cancel the pre-existing program on a specific day, before to set up a new function.*



5 . Once the program number is selected, the programming procedure begins:

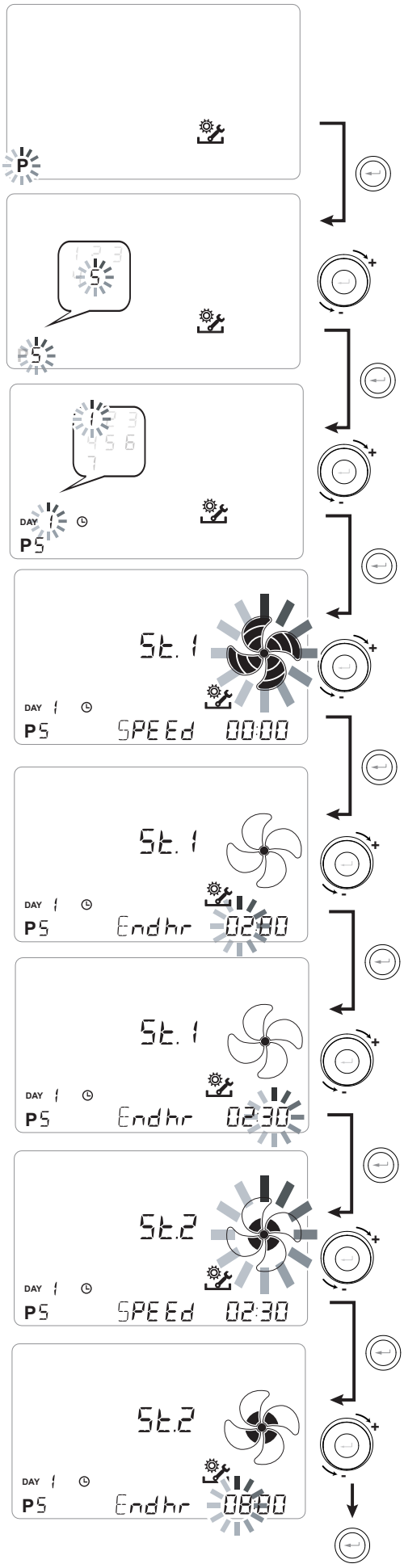
- enter the day of the week;
- enter the desired speed for the first time slot.

NOTE: the first time slot starts at 00:00.

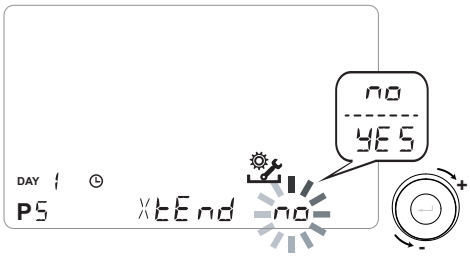
Use the TOUCH PAD to choose between the 4 standard speeds or the "Party" hyperventilation speed.

The Display will show the fan settings according to the selection.

- enter the end time of the first time slot;
- go to the next time slot and repeat the programming operation;
- the maximum number of time slots for each day is 8.



6. After programming the first day, press "M" (M) to move to the next day; it is possible to extend the program created for the first day to the other days of the week (Xtend= extend):



If you select **"YES"** the program is automatically copied to the other days of the week; if instead you select **"no"**, you can then use the ***TOUCH PAD*** to select a day and repeat the programming process.

NOTE: the daily hourly program is set by default to OFF.

In case you want to modify the OFF setting so that corresponds to the holding minimum flow rate, see "PAr" parameters menu and modify the "mstop" parameter settings.

NOTE: once created, the free weekly programs can be modified as necessary at any time.

Weekly Program P.....

DAY	Monday - Friday																							
TIME	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12	12 - 13	13 - 14	14 - 15	15 - 16	16 - 17	17 - 18	18 - 19	19 - 20	20 - 21	21 - 22	22 - 23	23 - 24
SPEED																								
Low																								
Nominal																								

DAY	Saturday - Sunday																							
TIME	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12	12 - 13	13 - 14	14 - 15	15 - 16	16 - 17	17 - 18	18 - 19	19 - 20	20 - 21	21 - 22	22 - 23	23 - 24
SPEED																								
Low																								
Nominal																								

Weekly Program P.....

DAY	Monday - Friday																							
TIME	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12	12 - 13	13 - 14	14 - 15	15 - 16	16 - 17	17 - 18	18 - 19	19 - 20	20 - 21	21 - 22	22 - 23	23 - 24
SPEED																								
Low																								
Nominal																								

DAY	Saturday - Sunday																							
TIME	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10 - 11	11 - 12	12 - 13	13 - 14	14 - 15	15 - 16	16 - 17	17 - 18	18 - 19	19 - 20	20 - 21	21 - 22	22 - 23	23 - 24
SPEED																								
Low																								
Nominal																								

IMPORTANT!: complete the table(s) with the configuration of the program created.

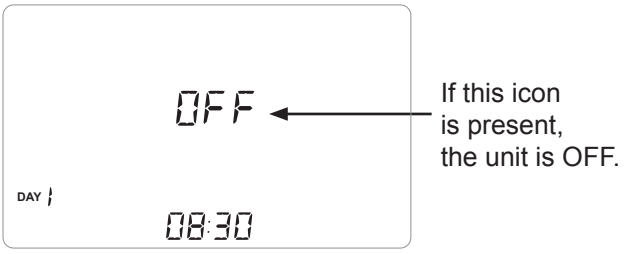
active status

inactive status

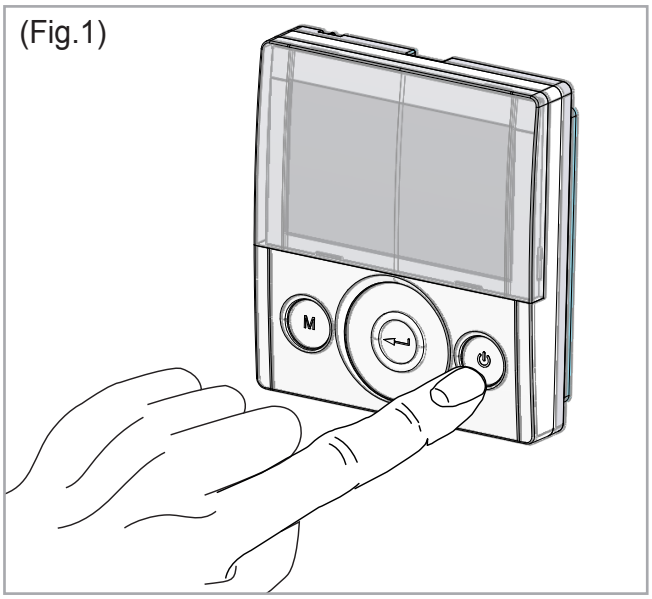
OPERATIONAL PROCEDURES

STARTING AND STOPPING THE CRU

To turn the unit on, press the ON/OFF power key as shown in the figure to the right (Fig. 1).



(Fig.1)

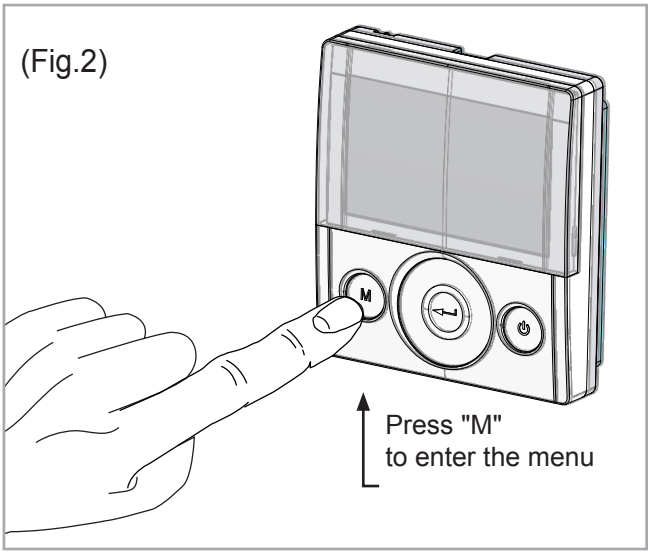


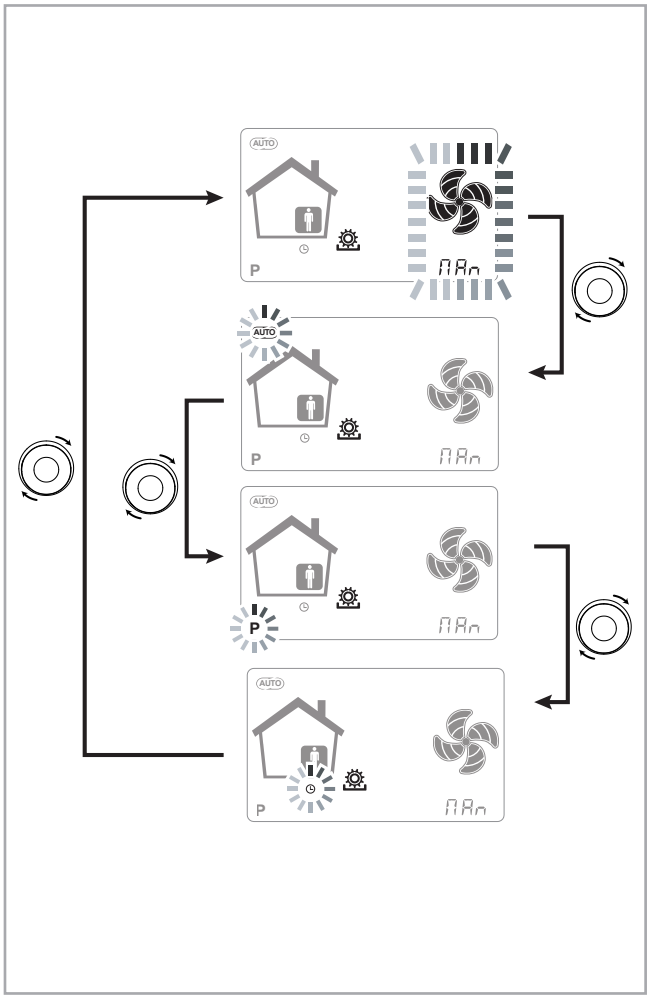
SELECTING THE OPERATING MODE ON THE T-EP CONTROLLER

Press “M” to access the User Settings Menu (Fig. 2). The following options are available:

- MANUAL VENTILATION MODE;
- AUTO AUTOMATIC MODE;
- WEEKLY PROGRAM MODE;
- CURRENT DAY and TIME SETTING.

(Fig.2)





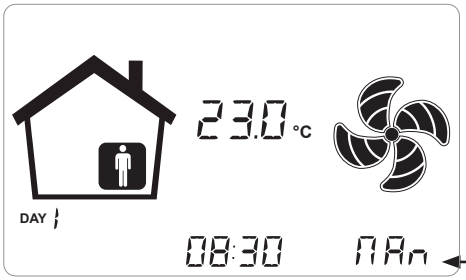
Use the ***TOUCH PAD***  to pass from one function to another.

To access the desired function, please press the confirmation button  .

• *MANUAL VENTILATION MODE*

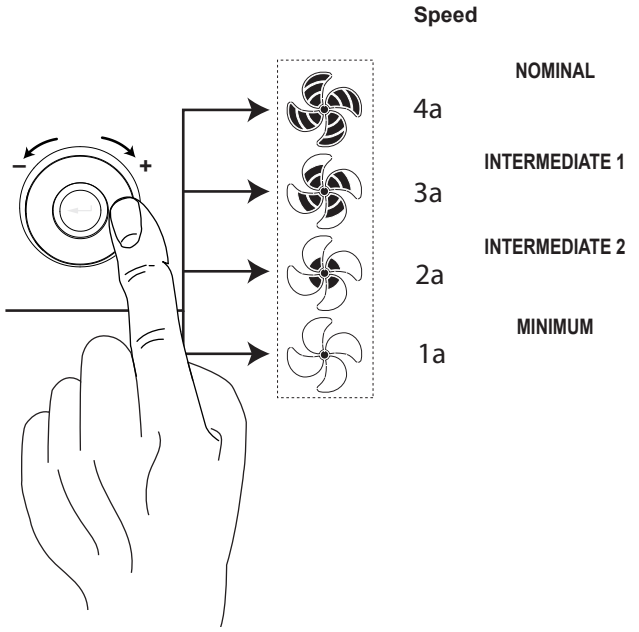
Press "M" and scroll with the TOUCH PAD until the "Manual ventilation" mode starts flashing.

Then press "Confirm" .



If this icon is present, the operating mode is MANUAL

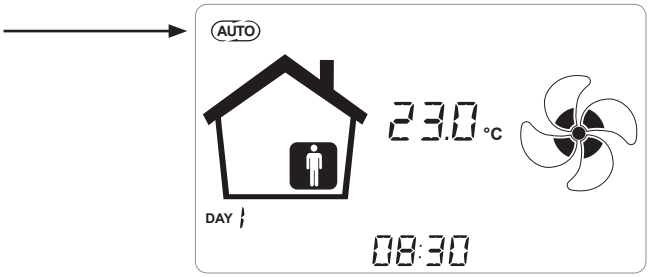
With the "Manual ventilation" mode enabled, the speed of the fan at the various points can be adjusted by turning a finger round on the ***TOUCH PAD***. Turning a finger clockwise on the pad increases the speed of the fan while moving a finger anti-clockwise decreases the speed of the fan.



• *AUTOMATIC MODE*

Press "M" and scroll with the ***TOUCH PAD*** until the "AUTOMATIC" mode starts flashing.
Then press "Confirm" .

If this icon is present, the operating mode is AUTOMATIC

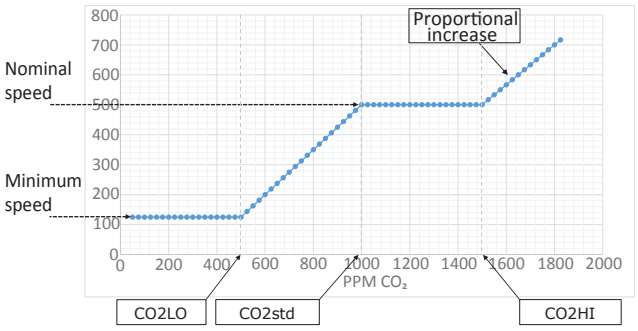


The "Automatic" mode can be enabled only when the units are equipped with advanced centralised control systems.

The advanced centralised control systems are ready for connection of a CO_2 Sensor (accessory not supplied).

When "Automatic" mode is enabled, an automatic control loop adapts the fan speed according to the desired air quality.

FLOW MANAGEMENT LOGIC CHART IN RELATION TO PPM CO_2

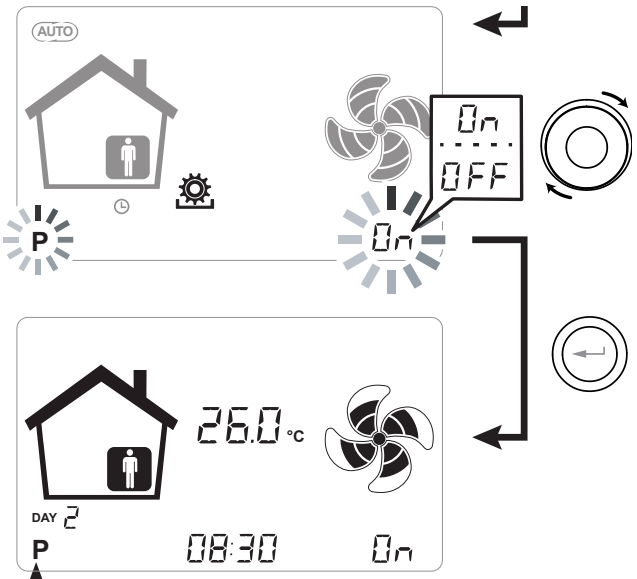


- ***WEEKLY PROGRAM ACTIVATION MODE***

Press "M" (M); scroll with the ***TOUCH PAD*** until the mode " **P** " starts flashing and confirm by pressing "Confirm" (↵).

When confirmed, the preset program is activated.

The display shows the chosen program number when the unit is "commissioning"



If this icon is present, it means that a scheduled program is active.

The number identifies the growth program chosen when commissioning the unit.

The activation of the weekly program does not preclude the user's ability to manually change the speed of the fans.

In fact, despite a program in time slots is active, the user can still operate on the TOUCH PAD, increasing or decreasing the speed as desired.

The manual override applied to the weekly program will remain operational until the next time slot, when automatic programming will become active again.

- ***SETTING THE CLOCK AND DAY OF THE WEEK***

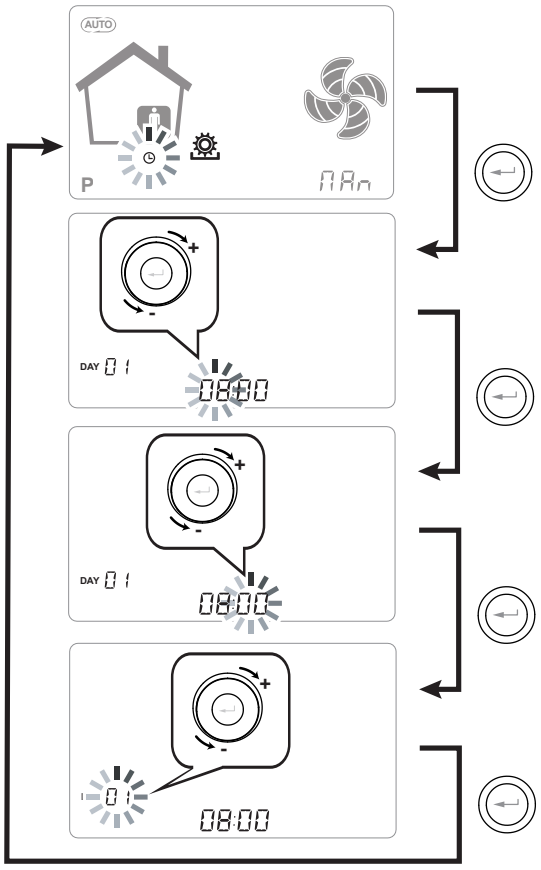
Press "**M**"; scroll with the wheel until the "**clock**" icon starts flashing (🕒).

Then press "**Confirm**" (↵).

Scroll with the wheel to set the hour.

Press "**Confirm**" (↵) and scroll again to set the minutes.

Press "**Confirm**" (↵) and scroll again to set the current day.



Use the ***TOUCH PAD*** to increase or decrease the value

Use the Confirm button to confirm and move to the next setting

Set the day of the week as follows:

day 1 = Monday / day 2 = Tuesday
day 3 = Wednesday ... ... day 7 = Sunday

AUTOMATIC FUNCTION

- ***ANTIFREEZE FUNCTION***

With Electric Resistance

In the event that the unit is installed in a cold climate, we recommend the use of versions with an electric antifreeze resistance on the external air intake circuit.

The electric resistances available for CRU units preheat the air entering the exchanger in order to avoid freezing of the humid air extracted and discharged by the exchanger in the circuit opposite.

In fact, when the external air drops below the critical temperature, posing the risk of freezing of the discharged air, the resistance is activated and modulates the heat output to keep the temperature of the discharged air within the desired fluctuation range.

The electric resistances should be selected in order to maintain the minimum conditions of indoor comfort at outdoor temperatures down to -10°C, and in order to avoid the degenerative formation of ice at discharge down to -15°C outside.

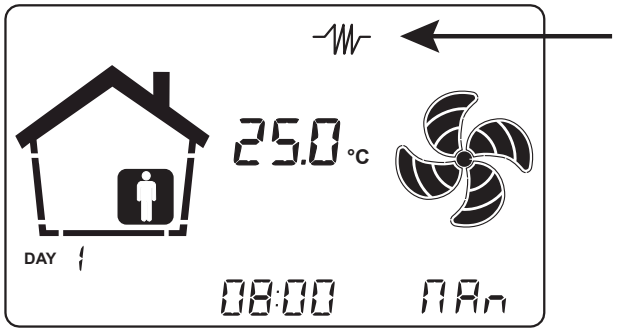
The electric resistance is fitted with a safety thermostat that turns off the unit in case of uncontrolled heating. In case the resistance does not start up, instead, the unit will turn off if the intake air temperature falls below 5°C.

Activation of the resistance as a result of the antifreeze function is represented by the icon .

Without Electric Resistance

In case the unit is without an electric antifreeze resistance, the ***CRU*** unit has preventive operation logic which, below -5°C, automatically sets running of the intake fan at minimum for 10 minutes every hour.

Also, in case the temperature falls below -10° C, the unit stops automatically and an alert appears on the display of the controller: "**FROST**".



- ***FREE COOLING FUNCTION***

There can be climatic conditions during the year that make it impractical to recover heat from extracted air for treating fresh air from outside.

For example, in midseason, the outdoor air temperature can be lower than the indoor air temperature due to solar and internal factors, and this tends to occur when the indoor temperature is between 22 and 26°C so there is more of a need for cooling than for heating. In this case it is advisable to use free-cooling, i.e. fresh air from outdoors to cool for free, bypassing the heat recovery unit. Conversely, it is possible to use fresh air for heating during a change in season, in which case the process is known as free-heating.

CRU units are equipped with a bypass damper that disables use of the recovery exchanger to permit free-cooling (or free-heating).

The damper is controlled on the basis of a logic subject to the feedback of the integrated temperature probes.
The logic is as follows:

The indoor air temperature setpoints of the air conditioning system in winter and summer are defined in order to maintain conditions of comfort:

$t_{heating} \longmapsto$ normally $t_{heating}$ = 20°C

$t_{cooling} \longmapsto$ normally $t_{cooling}$ = 26°C

The following are also defined:

t_i = internal air temperature (return air)

EAT = External air temperature

FREE-COOLING CONDITION

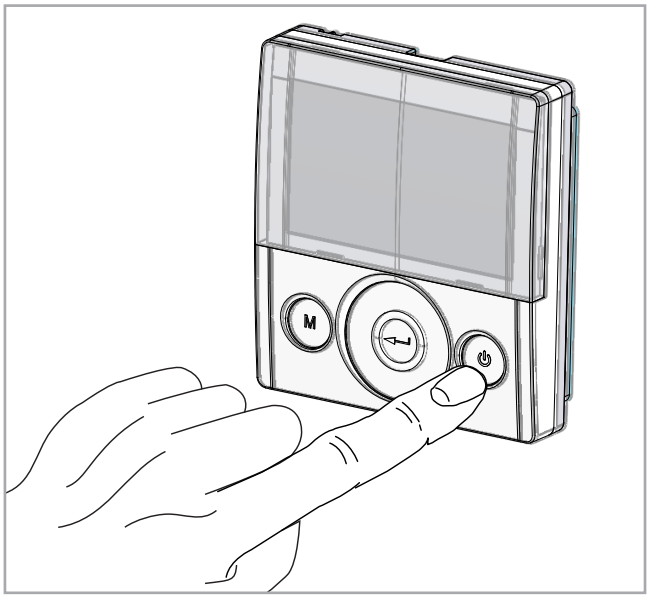
EAT > $t_{heating}$ and simultaneously t_i>EAT

FREE-HEATING CONDITION

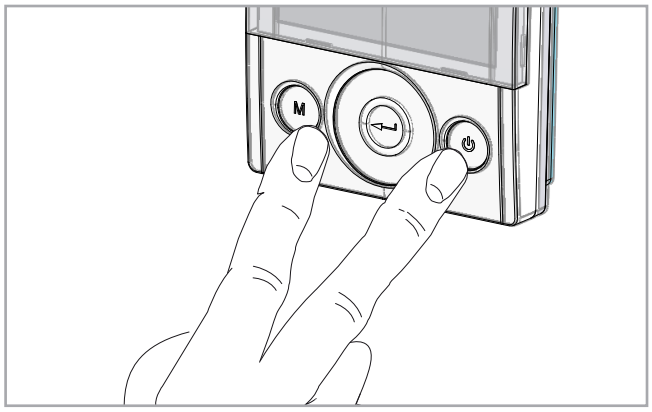
EAT < $t_{cooling}$ and simultaneously t_i<EAT

TECHNICAL MENU

1. Turn on the appliance at the ON/OFF key.



2. Press the ON/OFF and "M" Menu keys at the same time.



3. The symbol flashes on the display;
Use the ***TOUCH PAD*** to choose the desired function between:

- Installer menu (initial setting menu);
- "PAr" parameters;
- rEAd menu;

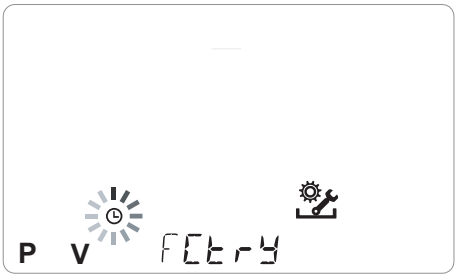
Press the Enter key to confirm .

Installer menu

The symbol flashes on the display when the installer menu is open; Use the ***TOUCH PAD*** to choose the desired function between:

- day and time setting ;
- setting/initial configuration of the fans "**V**";
- Selection/Setting of the chosen weekly program "**P**";
- FCtry menu (FACTORY);

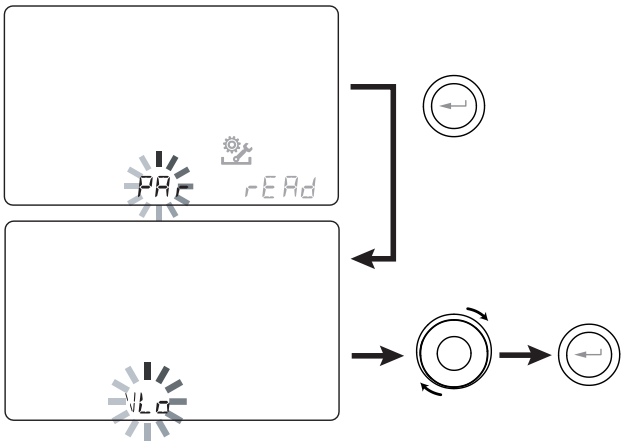
Press the Enter key to confirm .



NOTE: the FACTORY menu is for the exclusive use of the manufacturer. Password-protected menu.

Press the "**M**" button once to return to parameter selection; to exit the menu, press the "**M**" button 3 times.

"PAr" parameters menu



This menu allows you to modify the operating parameters of the appliance.

With the controller "**ON**", press "**M**" and ON/OFF simultaneously for 3 seconds.

Select the "**PAr**" menu using the TOUCH PAD and confirm with "**Enter**".

Select the parameter to be changed using the TOUCH PAD and confirm with "**Enter**". Once you have selected the parameter, the value will appear on the display.
The value can be modified using the TOUCH PAD.

Press the "**M**" button once to return to parameter selection; to exit the menu, press the "**M**" button 3 times.

Table 1

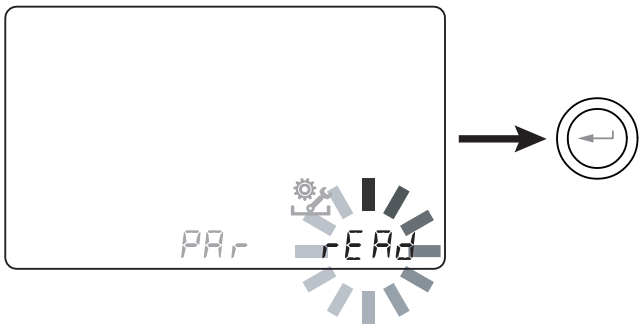
FUNCTION	*DESCRIPTION*	*RANGE*	*DEFAULT*
VLO	Minimum control voltage	-10% ÷ 0	see table 2
VHI	Maximum control voltage	0 ÷ 10%	see table 2
nLO	Minimum speed	-10% ÷ 0	see table 2
nHI	Maximum speed	0 ÷ 10%	see table 2
PStd	Percentage of standard modulation of nominal speed	100% ÷ 110%	100%
PMEd	Percentage of intermediate modulation	35% ÷ 70%	45%
PnGt	Percentage of night modulation	45% ÷ 100%	70%
Phol	Percentage of minimum - holiday modulation	0 ÷ 35%	25%
TCOOL	Temperature setpoint for free-cooling/climate with cold coil	10 / 30°C	26°C
THEAt	Temperature setpoint for free-cooling/climate with post-heating coil	min 18°C	20°C
CO2hi	Maximum CO_2 level	1500 ÷ 2000 ppm	1500 ppm
CO2lo	Minimum CO_2 level	400 ÷ 600 ppm	500 ppm
CO2st	Nominal CO_2 level	900 ÷1100 ppm	1000 ppm
MSTOP	Weekly programs "OFF" operating mode	ON / OFF	OFF
Tinv	Winter season transition temperature for antifreeze management geothermical coil	10 / 30°C	18°C
Test	Summer season transition temperature for pre-cooling management geothermical coil	10 / 30°C	26°C

Table 2

Unit model	*VLO (Volt)*	*VHI (Volt)*	*nLO (rpm)*	*nHI (rpm)*
CRU 1	4	10	800	2960
CRU 2	3	8,5	500	3220
CRU 3	3	9	500	2630
CRU 4	3	9	500	2090

***NOTE**:*
***Tinv** and **Test** parameters are visible only if the post-heating treatments are related to the machine.*
The heating and cooling icons on the display show that the sections of post-heating treatment are available.The actual control on valves or firing of electric heaters takes place only when the Theating and Tcooling setpoint temperatures differ from the one recorded by the T3.

"Read" menu



This menu allows you to read some the operating parameters of the appliance

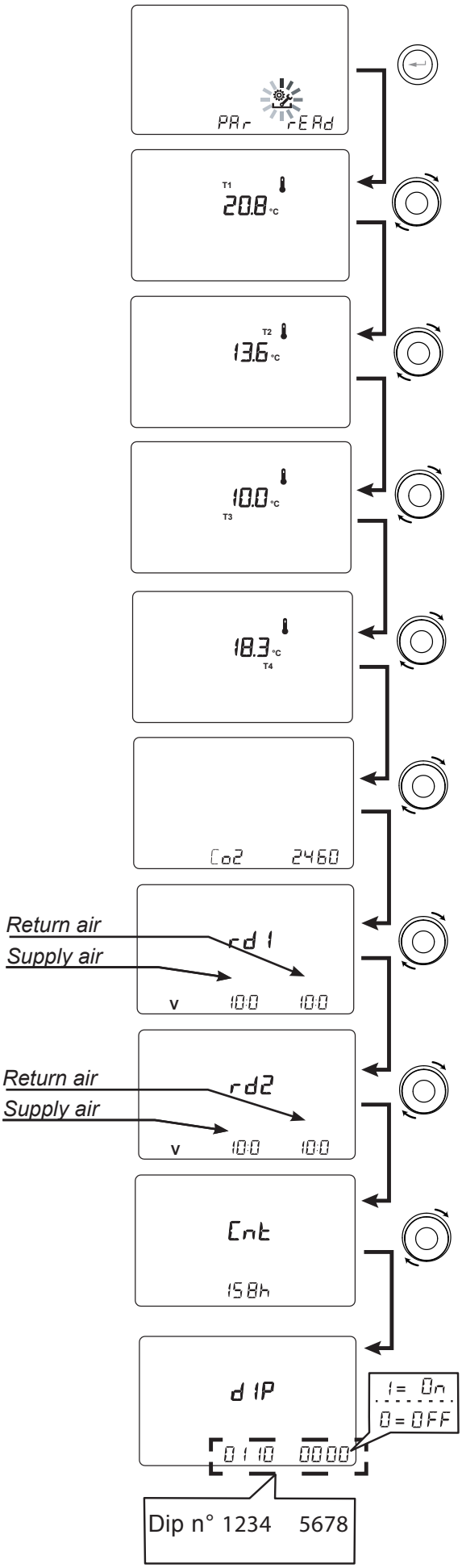
With the controller "**ON**", press "**M**" and ON/OFF simultaneously for 3 seconds.

Select the "**rEAd**" menu using the TOUCH PAD and confirm with "**Enter**".

Select the parameter to be read using the TOUCH PAD. Once you have selected the parameter, the value will appear on the display.

Press the "**M**" button once to return to parameter selection; to exit the menu, press the "**M**" button 3 times.

	DESCRIPTION
T1	value of external air temperature probe T1
T2	value of intake air temperature probe T2
T3	value of stale extracted air temperature probe T3
T4	value of disposed air temperature probe T4
CO2	value of CO_2 detected
RD1	Fan voltage
RD2	fan speed
Cnt	Numero di ore di funzionamento dell'apparecchio (ore con numero giri > 0)
DIP	Configuration of power board dip switch



ALARMS

Below is a table for troubleshooting the faults that may occur during operation of the machine.

Type of Alert	*Flashing Time LED DL3*	*Description of Fault*	*Notes/Solution*
	-	General Alarm.	Present in case of any fault.
	5	FAN thermal contact. One of the fans is not working.	It is recommended to enter the ***Read*** Menu to check the FAN operating parameters and identify which FAN is not working.
	4	FAN voltage/speed limits exceeded.	It is recommended to enter the ***Read*** Menu to check the FAN operating parameters and identify which FAN is not working.
	2	Faulty temperature probe.	It is recommended to enter the ***Read*** Menu to check the probe data and identify which probe is faulty.
	6	Faulty CO_2 probe.	It is recommended to enter the ***Read*** Menu to check the probe data and identify which probe is faulty
	1	Replacement of filters (alerted by differential pressure switches) .	Clean or replace the filters of the machine. At cleaned filter the icon automatically disappears.
	1	IAQ filter fault.	
	3	Electric defrost resistance fault.	Check the resistance reset thermostat; Check the electrical connections; It is recommended to enter the ***Read*** Menu to check the probe data and identify which probe is faulty.
FROST	-	Antifreeze Alarm.	Without antifreeze pre-treatment: <-10°C outdoor temperature. With antifreeze pre-treatment: <-20°C outdoor temperature.
	7	T-EP Controller Error.	Check the electrical connections between the controller and the power board of the machine.