Liebert HIROSS

High Performance Air Conditioning

H P S

SERVICE MANUAL

English

Cod. 273000

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Issued by T.D.Service

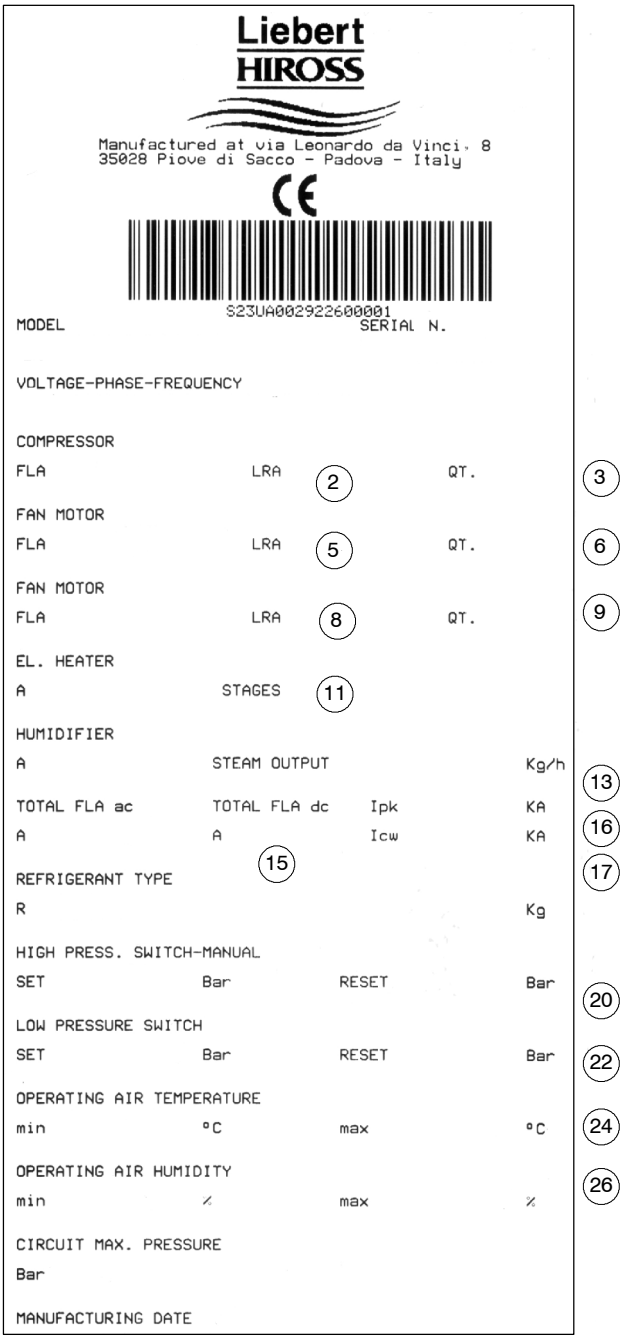
Caution

Recommendations:

- the manual is retained for the entire service life of the machine;
- the user reads the manual carefully before carrying out any operations on the machine;
- the machine is used exclusively for the purpose for which it is intended; incorrect use of the machine shall release the manufacturer from any liability.

This manual has been prepared to enable the end–user to carry out only the operations that can made with the panels closed. Any operations that require the opening of doors or equipment panels must be carried out only by qualified personnel.
Each machine is equipped with an electric isolating device which allows the operator to work in conditions of safety. This device must always be used to eliminate risks during maintenance (electric shocks, scalds, automatic restarting, moving parts and remote control).
The panel key supplied with the unit must be kept by the person responsible for maintenance.
For identification of the unit (model and serial no.) in case of the necessity for assistance or spare parts, read the identification label placed on the outside and inside of the unit.

IMPORTANT: This manual may be subject to modification; for complete and up–to–date information the user should always consult the manual supplied with the machine.



Attention: data relevant to the unit supplied is indicated on the inboard label (see the blank facsimile below).
Data in the manual is referred to standard conditions and can be modified without any advance notice.

POS.	DESCRIPTION
1	Compressor Full Load Ampere [A]
2	Compressor Locked Rotor Ampere [A]
3	Compressor quantity
4	Evaporator fan Full Load Ampere [A]
5	Evaporator fan Locked Rotor Ampere [A]
6	Evaporator fan quantity
7	Condenser fan Full Load Ampere [A]
8	Condenser fan Locked Rotor Ampere [A]
9	Condenser fan quantity
10	Electrical heating Ampere
11	Electrical heating steps
12	Humidifier Ampere
13	Steam production capacity
14	Max. unit AC Ampere
15	Max. unit DC Ampere
16	Rated peak withstand current
17	Rated short–time current
18	Refrigerant type
19	High pressure switch Stop
20	High pressure switch Restart
21	Low pressure switch Stop
22	Low pressure switch Restart
23	Min. room operation temperature
24	Max. room operation temperature
25	Min. room operation humidity
26	Max. room operation humidity
27	Max. refrigeration circuit pressure

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1 – Preliminary operations

1.1 – Foreword

This manual covers the installation, operation and maintenance of **HPS** air conditioners, which are composed of an evaporating unit (**HPSE**), positioned in the room, and a condensing unit (**HPSC**), positioned outside.

IMPORTANT:

Also consult the manual for the microprocessor control.

1.2 – Check operating limits

The units are designed to operate within specific working ranges (see Tab. 1, Tab. 2, Tab. 3, Tab. 4, Tab. 5 and Tab. 6). These limits are referred to new machines or for those that have been correctly installed and serviced. The warranty clauses are no longer valid for any damage or malfunction that may occur during or due to operation outside the application range.

1.3 – Check sound pressure levels

Tab. 1, Tab. 2, Tab. 3, Tab. 4, Tab. 5 and Tab. 6 show the internal (HPSE) and external (HPSC) sound pressure levels for units in standard configuration, in continuous operation, at 2m from the front surface of the machine, 1m above base level, and referred to free field conditions.

1.4 – Conditioner inspection

On receiving the equipment immediately inspect its condition; report any damage to the transport company at once.

1.5 – Transport

- Always keep the unit vertically upright and do not leave it in the open.
- While carrying the unit, avoid exerting any pressure on the upper corners of the package.
- Unpack the unit as close as possible to its installation position. Once unpacked, avoid any impact to its internal components.

1.6 – Sealing the room

To create stable thermohygrometric conditions within the room, proceed as follows:

- vapour seal the walls, floor and ceiling using an impermeable material;
- make sure that the room is airtight by sealing all gaps, cable entries, etc.

1.7 – Servicing areas

The unit must be provided with a suitable service area (see Fig. 4).
All maintenance of the evaporating unit can be carried out as shown in Fig. 2a and Fig. 2b.
Access to the condensing unit is provided by removable panels with screw fixings.

2 – Installation

CAUTION:

The evaporating unit (HPSE) must never be installed outdoors.

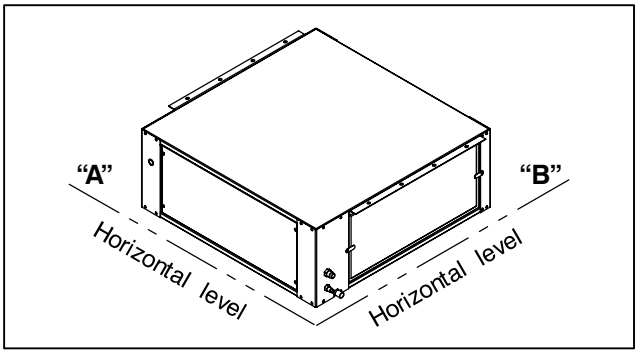
2.1 – Overall dimensions

See Fig. 1a, Fig. 1b, Fig. 1c, Fig. 1d, Fig. 1e and Fig. 1f for the overall dimensions of the evaporating unit (HPSE) and external condensing unit (HPSC).

2.2 – Positioning the HPSE indoor unit

- Unpack the unit as close as possible to the place where it has to be installed. Once unpacked, avoid stress and any impact to its internal components.
- The indoor unit can be installed in any indoor location provided it is not exposed to an aggressive environment (e.g. acid vapours).
- Position the internal evaporating unit (HPSE) so as to optimise the indoor air distribution and avoid hot spots.
- Position the indoor unit preferably in the centre of the room ceiling.
- Fix the unit to the ceiling by inserting expansion or through clamps (in this case ensure the clamp is sealed) using the slots on the two side brackets (see Fig. 2a, Fig. 2b and Fig. 2c).
- Make sure the airflow circulates freely.
- To allow the servicing of the unit, the Service Area shown in Fig. 2a and Fig. 2b, has to be left unobstructed (in Fig. 2a the 300 mm minimum clearance from the back of the evaporating unit is compulsory).
- **Check if the unit is horizontal on both sides "A" and "B" (see. Fig. a).**

Fig. a) Horizontal level control



2.3 – Positioning two inner HPSE units

The ceiling installation of two units operating in the same room must be carefully evaluated, considering the following factors:

1) each intake side of the machine must be able to intake as much as the other two;
2) possible "Freecooling" function;
3) the thermal loads to be dissipated can be true hot air flows hitting the intake sides of the machines: in this case, the two intake sides of the two machines can be arranged even at a short distance (up to 300 mm) to intake the thermal load where it is highest.

2.4 – Freecooling duct connections (optional)

The air conditioner may be supplied with an integrated Freecooling device (optional), which uses fresh air from outside to cool the room without starting up the compressor. The device provides the correct cooling capacity required, using a motorised, modulating damper. In this case, the rear of the unit is equipped with connections which draw in the outside air, as follows:

- double circular holes, for 202 mm (HPSE 06) or 252 mm (HPSE 08–10–12–14) diameter flexible ducts to be fixed with metal clamps;
- single rectangular hole with flange for 560x190 mm (HPSE 06) or 600x250 mm (HPSE 08–10–12–14) duct (not supplied by Liebert–HIROSS).

In both cases, the holes in the wall have to be protected by rainproof grilles with a prefilter, to avoid water or foreign bodies getting into the conditioner.

Outside air, taken into the room by the fan, is exhausted through an overpressure damper, which is installed on the wall of the room and protected by an external rainproof grille .

2.4.1 – External air temperature probe installation

Install the external air temperature probe at the end of the freecooling duct.

IMPORTANT:

The bulb must be positioned as much outside as possible but must not be exposed to direct sunlight or weather agents such as rain or snow. The unit operation could be jeopardized if these precautions are not applied.

2.5 – Positioning the HPSC condensing unit

Available condensing unit versions:

HPSC "0": base version
HPSC "A": advanced version
HPSC "L": long piping version (see Fig. 12)

- The condensing unit must be positioned outside to enable its cooling (see Fig. 3).
- **It is connected to the air conditioner through the refrigerant pipelines. Keep the refrigerant lines as short as possible and anyway follow the indications in Tab. a, Tab. b, Fig. 11 and Fig. 12, considering that installations with equivalent length of the refrigerant pipelines over 10 m are possible only for HPSCxxL units.**
- Install the condensing unit in a level position, able to bear its weight and vibrations and away from contaminating agents (e.g. dust, leaves) to ensure the best efficiency over time. Avoid any place containing flammable gases.
- If different locations are available, preferably install the condensing unit in places sheltered from rain, with suitable air circulation and not subject to strong sun exposure; the latter precaution enables performance optimisation and compliance with the operating limits. For installations in places with wind speeds over 5 m/s (e.g. building tops) consider that such conditions can offer resistance to the air outlet from the condensing unit, reducing the air delivery and thus the heat exchange capacity, or they can make the fan run too fast jeopardizing its operation, as well as increasing the hazard of the machine tilting if it is not properly fixed. To lessen the problem of strong gusts of wind, position the condensing unit close to a wind barrier (e.g. building or enclosing wall) and in a direction perpendicular to the flow of the discharge air. To prevent tilting ensure that the unit is securely fixed, if necessary through additional supports or tie–rods, thus ensuring stability even in case of earthquakes. Position the unit so that the ejected hot air and the sound emissions do not disturb people. In case of snow, make sure that the unit is not completely covered and that the inlet sections are always clear. To enable sufficient air delivery through the unit/s and to have sufficient space for maintenance, it is necessary not to obstruct the air inlet and discharge sections of the condensing unit, positioning it, or several machines, to maintain the minimum service areas and distances indicated in Fig. 4, for some possible installation configurations.
- Fig. 3 shows some examples of how to install the condensing unit. For wall–mounted installation the condensing unit can be supplied with an optional mounting kit, comprising a pair of galvanised steel angle brackets, painted with RAL9002 polyester powder with a smooth finish; suitable elastomer anti–vibration mounts and stainless steels fixings, including anchor screws for wall fastening (see Fig. 2d).
  NOTE: The anchor screws included in the kit are to be used only when fastening the brackets to a concrete or brick wall (including hollow bricks). Do not use them on sandwich walls (e.g. a container) or walls of unknown composition. In these cases the most suitable fastening system for the special material must be used. If the above mentioned optional kit is not used, suitable anti–vibration mounts must always be fitted between the condensing unit and the mounting brackets, to avoid the transmission of vibrations. Also make sure that the brackets used are suitable for supporting the condensing unit in all conditions (e.g. in case of temporary abnormal loads on the unit).

2.6 – Refrigeration connections

THIS OPERATION MUST BE CARRIED OUT BY AN EXPERT TECHNICIAN.

The condensing and evaporating units are pre–charged with Nitrogen and have to be charged with refrigerant (see Chap. 7.2.2 – Refrigerant charging).

a) **Pipeline positioning**

Connect the air conditioner to the condensing unit using refrigerant lines in hard or soft copper.

- Limit the number of pre–shaped bends. If this is not possible, every bend must have a radius of at least 100 mm.
- The gas line must be insulated.
- The liquid line must be kept away from heat sources. If this is not possible it has to be insulated.
- If the condensing unit is located above the evaporating unit, the last segment of the suction line (insulated pipework) must be inclined towards the condensing unit.

If, on the other hand, the condensing unit is located below the air conditioner it is advisable to create a trap on the suction line.

Tab. a – HPSCxx0/A: external standard diameters for external refrigerant pipelines – R407C

Model	Equivalent length " L "	Gas line	Liquid line	Cooling capacity drop vs. the std. installation (2m)
HPS060/A	2m < L ≤ 10m	ϕ 16 x 1	ϕ 12 x 1	1% with 10 m
HPS080/A	2m < L ≤ 10m	ϕ 16 x 1	ϕ 12 x 1	3% with 10 m
HPS100/A	2m < L ≤ 10m	ϕ 18 x 1	ϕ 12 x 1	2% with 10 m
HPS120/A	2m < L ≤ 10m	ϕ 18 x 1	ϕ 12 x 1	4% with 10 m
HPS140/A	2m < L ≤ 10m	ϕ 18 x 1	ϕ 12 x 1	5% with 10 m

Tab. b – HPSCxxL: external standard diameters for external refrigerant pipelines – R407C

Model	Equivalent length " L "	Gas line	Liquid line	Cooling capacity drop vs. the std. installation (2m)
HPS06L	2m < L ≤ 10m	ϕ 16 x 1	ϕ 12 x 1	1% with 10 m
	10m < L ≤ 20m	ϕ 16 x 1	ϕ 12 x 1	4% with 20 m
	20m < L ≤ 30m	ϕ 18 x 1	ϕ 12 x 1	3% with 30 m
	30m < L ≤ 40m	ϕ 18 x 1	ϕ 12 x 1	5% with 40 m
	40m < L ≤ 50m	ϕ 18 x 1	ϕ 12 x 1	6% with 50 m
HPS08L	2m < L ≤ 10m	ϕ 16 x 1	ϕ 12 x 1	3% with 10 m
	10m < L ≤ 20m	ϕ 18 x 1	ϕ 12 x 1	3% with 20 m
	20m < L ≤ 30m	ϕ 18 x 1	ϕ 12 x 1	5% with 30 m
	30m < L ≤ 40m	ϕ 18 x 1	ϕ 12 x 1	6% with 40 m
	40m < L ≤ 50m	ϕ 22 x 1	ϕ 16 x 1	3% with 50 m
HPS10L	2m < L ≤ 10m	ϕ 18 x 1	ϕ 12 x 1	2% with 10 m
	10m < L ≤ 20m	ϕ 22 x 1	ϕ 12 x 1	3% with 20 m
	20m < L ≤ 30m	ϕ 22 x 1	ϕ 16 x 1	5% with 30 m
	30m < L ≤ 40m	ϕ 22 x 1	ϕ 16 x 1	6% with 40 m
	40m < L ≤ 50m	ϕ 22 x 1	ϕ 16 x 1	7% with 50 m
HPS12L	2m < L ≤ 10m	ϕ 18 x 1	ϕ 12 x 1	4% with 10 m
	10m < L ≤ 20m	ϕ 22 x 1	ϕ 16 x 1	3% with 20 m
	20m < L ≤ 30m	ϕ 22 x 1	ϕ 16 x 1	4% with 30 m
	30m < L ≤ 40m	ϕ 22 x 1	ϕ 16 x 1	5% with 40 m
	40m < L ≤ 50m	ϕ 28 x 1	ϕ 16 x 1	2% with 50 m
HPS14L	2m < L ≤ 10m	ϕ 18 x 1	ϕ 12 x 1	5% with 10 m
	10m < L ≤ 20m	ϕ 22 x 1	ϕ 16 x 1	3% with 20 m
	20m < L ≤ 30m	ϕ 22 x 1	ϕ 16 x 1	5% with 30 m
	30m < L ≤ 40m	ϕ 28 x 1	ϕ 16 x 1	2% with 40 m
	40m < L ≤ 50m	ϕ 28 x 1	ϕ 16 x 1	3% with 50 m

Tab. c – Equivalent lengths (m) of: curves, shut–off and non–return valves

Nominal diameter (mm)	 90°	 45°	 180°	 90°	
12	0.50	0.25	0.75	2.10	1.90
14	0.53	0.26	0.80	2.20	2.00
16	0.55	0.27	0.85	2.40	2.10
18	0.60	0.30	0.95	2.70	2.40
22	0.70	0.35	1.10	3.20	2.80
28	0.80	0.45	1.30	4.00	3.30

b) **Evacuation of the refrigerant lines**

The evacuation operation must be carried out with a special (quality) vacuum pump, using the 1/4" SAE connectors, located on the unit on–off valves,

2.7 – Condensate drain connection

During the cooling cycle part of the moisture in the air condenses on the evaporating coil. The condensate is collected in the tank fitted under the coil and must be drained outside.

Tab. d – Condensate drain connection

CONNECTOR	DIMENSIONS
Condensate drain	ϕ 21 mm

To drain the condensate:

- Use galvanized steel, PVC or flexible polythene pipe.
- CAUTION: DO NOT INTERCONNECT THE OUTLETS OF DIFFERENT MACHINES.
- Make sure there is at least a 2% gradient towards the drain outlet.
- There must be a drain trap placed at least 30 mm below the drain tank.
- Fill the drain trap with water by pouring it into the condensate tank.

2.8 – Electrical connections and wiring diagram (supplied with the unit)

For the electric connections of the indoor units HPSE and outdoor units HPSC, refer to Fig. 5, Fig. 6 and Fig. 7.

Before connecting or disconnecting the fast couplers between the indoor unit and outdoor unit, make sure that the main switch is in the "OFF" position and that:

- all electrical components are not damaged;
- all terminal screws are tight;
- the supply voltage and frequency are as indicated on the unit;
- there are no live components.

IMPORTANT:

The 48 Vdc supply (in the version "Emergency Free Cooling") must be delivered through a shielded cable, with the connection of the shielding braid on the evaporating side.
The signal connection cable between the evaporating unit and the condensing unit must be shielded, with the connection of the shielding braid on the evaporating side.

2.9 – User interface

The standard control system on HPS is based on a microprocessor board mounted inside the electrical panel, which can be connected to a user interface (remote display) that can be positioned inside the room as required. The user interface (remote display), when installed, is mounted in a painted metal box and connected to the air conditioner using a multi–pole screened cable (optional accessory).

2.10 – Emergency cooling version (EFC 48 VDC / 230 VAC)

When this option is used install the supply cable as described in the electrical diagram.

In the 48VDC units respect the polarity "+" and "–".

2.11 – Electrical protection

CAUTION: For the electrical protection of the conditioner an adequate switch with current protection must be installed in the power supply line. For the selection of the disconnect switch please refer to Tab. 7.

3 – Starting and stopping

3.1 – First start–up (or after a long halt)

Before starting the air conditioner check if the power supply voltage and frequency comply with those on the identification plate of the unit. After this, it is possible to power the unit by operating the main switch. For units equipped with PowerFace microprocessor control, it is possible to start and stop the unit by following the instructions given below.

For units equipped with **POWERFACE** interface only:

- The unit is started by pressing the main switch ON.
- The unit is stopped by pressing the main switch OFF.

For units equipped with a **local or remote display** interface:

- The unit is started by pressing the switch with LED.
- The unit is stopped by pressing the switch with LED.

For units supplied with a **HIROMATIC** interface:

- Start by pressing the ON–OFF push button on the Hiromatic (confirmed by SYS.ON on the display).
- Stop by pressing the ON–OFF push button on the Hiromatic (confirmed by SYS.OFF. on the display).

IMPORTANT:

In both cases it is extremely important to consider the status of the digital input to the PowerFace microprocessor control managing the unit ON–OFF (see relevant handbook and wiring diagram). Indeed, for the unit to start (operating on the unit main switch, or on the ON–OFF button of the HIROMATIC interface), the digital input must be bridged (see wiring diagram). Check that there are no active alarms; wait until the system reaches the standard operation and then make the following checks:

- Check that the fans are working correctly.
- Make sure that the temperature is controlled and the compressor and the heaters (optional) work when required.
- Make sure that the condensing unit fan speed controller regulates the fan operation (only on "HPSCxxA/L" models).

3.2 – Start–up with low outside temperature (only on "HPSCxxA/L" models)

In case of low outside temperature (<0°C), the unit start–up is helped by the delay time of the low pressure alarm, within which the pressures in the refrigerating circuit reach the standard operation values.

3.3 – Self test

The self–test function is possible only when a unit has the remote or local display installed. The self–test function, performs a sequential, automatic check of components such as the compressor, fan, heaters, Freecooling damper, alarm relay and warning relay. This eliminates the need for manual control and leads to a remarkable decrease in the time needed for starting the unit, with the ability to carry out a quick check of the main components for the correct conditioner operation.

3.4 – Starting and stopping

For the units provided with the **POWERFACE** control, you can switch on/off using the main switch.
For the units provided with **HIROMATIC interface:**

- Start up the unit by pressing the Hiromatic ON–OFF push button (confirmed by **SYS.ON** on the display).
- Stop the unit by pressing the Hiromatic ON–OFF push button (confirmed by **SYS.OFF** on the display).

4 – Operation

The unit operation is completely automatic. The sequence below explains (with the assistance of Fig. 8 –**Operation diagram**) how the unit operates (see also Fig. 9 and Fig. 10 – **Refrigerating circuit**):

1) The temperature sensor, positioned inside the HPSE evaporating unit, informs the control about the condition of the return air.
2) The control compares the information received with the programmed **Set Point** value (= minimum indoor temperature) and Proportional Band (and Differential in the versions with optional Freecooling), activating the conditioner's air treatment modes as follows:

Cooling (Fig. 8a)

After switching the unit on, the evaporator fan starts immediately whereas the compressor is started only when the temperature of the room to be conditioned exceeds the set value. In the HPSCxxA/L unit versions, the condensing unit fan starts automatically if the condensing pressure increases (control through Variex), while in the other versions the fan/s is/are controlled by a pressure switch ensuring a limit lower than the condensing pressure. The air taken in by the evaporator fan enters the unit through the side intakes, passing through the filters, and then reaches the evaporator. The cold refrigerant flows inside the evaporator pipes, thus cooling the air passing through it. The treated air is conveyed into the conditioned room through the supply outlet. The heat taken from the room and that generated by the conditioner motor operation is rejected through condensing coil located in the external condensing unit and cooled with outside air by the condenser fan. For the operation logic of the controls see chapter 5.

Heating (optional)

Heating of the air is achieved by means of electric heaters, located in the air flow and activated according to the logic set on the controls (see chapter 5).

Freecooling (optional)

When the temperature of the outside air is sufficiently below that of the inside air it is possible to use this difference to provide cooling inside the room by direct intake of the outside air, i.e. without using the compressor. In this way it is possible to achieve considerable energy savings. When the required conditions occur, the servo–motor, managed by the PowerFace control, opens the modulating damper which separates the flow of the inside air and outside air. Outside air, drawn into the room by the fan, is exhausted through an overpressure damper* which is installed on an outside wall of the room and is protected by an external rainproof grille*. The degree of opening of the damper is determined as a function of the temperature set point and the return air temperature.

4.1 – Control of the condenser fan speed ("HPSCxxA/L" models only)

A sensor is positioned so as to detect the condensing pressure of the refrigeration gas. On the basis of this information, an electronic device (**Variex**) modulates the fan speed in order to keep the condensing pressure within the permitted range. In this way, besides optimizing the compressor operation, you can have a reduction of the sound pressure level (mainly during the night), easier start–up of the compressor at low temperatures and some energy saving.

For the calibration of the speed controller refer to chap. 6.

4.2 – Emergency cooling (optional)

4.2.1 – Emergency cooling 48VDC

With the 48VDC emergency cooling option, the evaporator fan, freecooling damper actuator and controls are always supplied at 48VDC, while the compressor, the condenser fan and the heaters are connected to the AC mains. If the AC mains supply fails, the conditioner does not stop but continues to circulate the air, activating the Freecooling as soon as the relevant conditions are reached, automatically optimized in the event of mains failure.

IMPORTANT:

For proper operation, the unit must always be fed by 48VDC.

4.2.2 – Emergency cooling 230VAC–50Hz

In case of AC mains failure, the evaporator fan, freecooling damper actuator and controls are supplied by a second 230V/1Ph/50Hz supply, arranged by the user (UPS/generator), ensuring operation in the same way as the 48VDC version.

CAUTION:

For safety reasons open the main switch.

5 – Operating logic

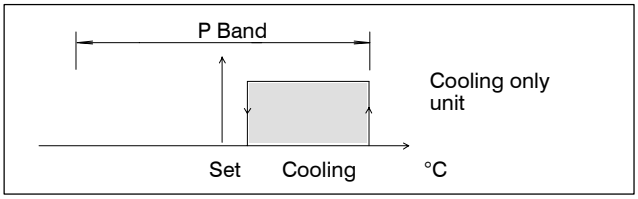
The different unit versions feature different automatic operating logic, as described below.

5.1 – Cooling only unit

5.1.1 – Control logic

The control algorithm is based on single–step regulation for the mechanical cooling, i.e. compressor start/stop. The control manages all the activation delays, ensuring correct operation and extending the operating life as much as possible.

Fig. a) Operation of the cooling only unit



5.2 – Unit with electric heating

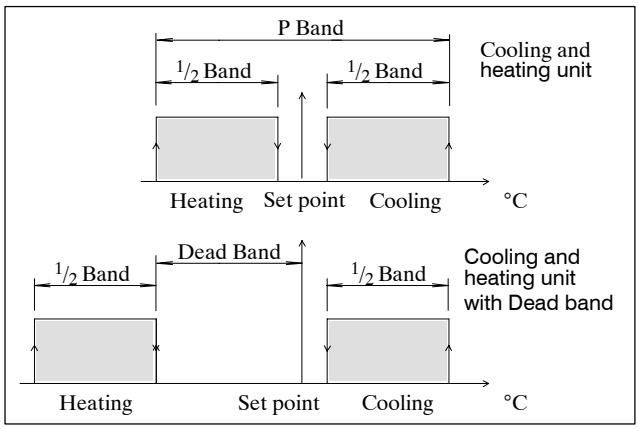
5.2.1 – Control logic

For the heating and cooling version the control algorithm is based on single–step regulation for the electric heating and single step regulation for the compressor (mechanical cooling). The control manages all of the compressor activation delays as previously described, ensuring its correct operation and maximising run times.

5.2.2 – Dead band

In this version the "Dead band" parameter, in the "optional devices" menu of the PowerFace microprocessor control is very important, enabling the heating semi–band to be shirted by inserting a non–sensitive area (ventilation only) between the set point temperature and the start of the heating semi–band (see Fig. b). In this way, without having to alter the proportional band, the electric heating can be activated at lower temperatures (according to the value set for the dead band) compared to the standard setting, consequently reducing the energy consumption of the heaters and optimizing their operation according to the site requirements.

Fig. b) Unit operation with electrical heating



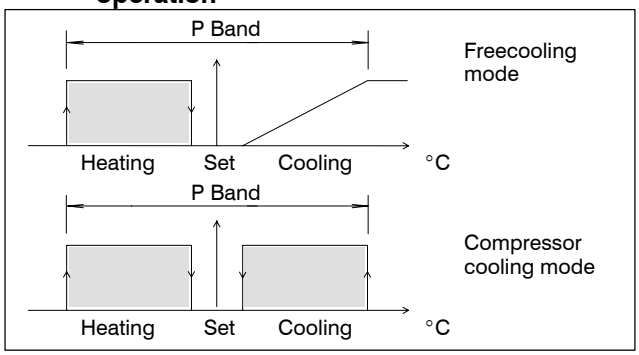
5.3 – Unit with freecooling

5.3.1 – Control logic

The control algorithm is based on single–stage regulation for the heating and mechanical cooling (compressor), with modulating proportional–integral control for the Freecooling (see Fig. c). The control manages all of the compressor activation delays, as we have seen in the 2 previous cases, in order to guarantee the proper operation and to extend its life.

The activation of the Freecooling mode occurs as a function of the difference (that can be set) between the inside temperature and the outside temperature. This means that if the difference between the two temperatures increases beyond the set value, the unit automatically initiates the Freecooling function; the compressor is deactivated and an analogue output controls the 3–point servomotor of the damper. The damper opening is determined as a function of the difference between the outdoor and indoor temperatures and as a function of the intake air temperature, which cannot be lower than a preset safety value. If the indoor temperature exceeds the proportional band by more than 20% for over 10 minutes, the unit reverts to compressor–aided cooling and the Freecooling mode remains de–activated for $^1/_2$ hour. If the inside temperature exceeds the proportional band by more than 50% for over 2 minutes, the Freecooling mode is de–activated for 1 hour, and the unit reverts to cooling by means of the refrigeration circuit.

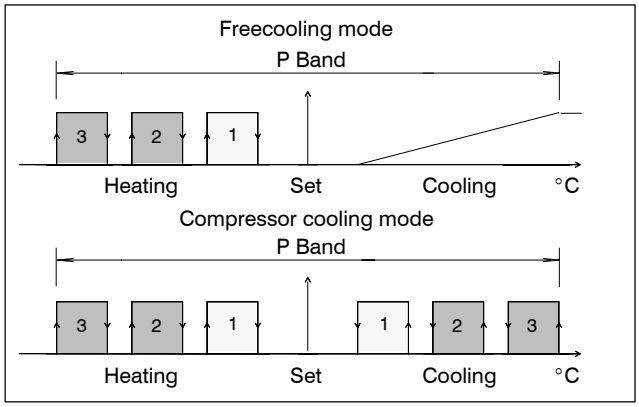
Fig. c) Compressor, heater and damper opening operation



5.4 – LAN local network management: Stand–by and Cascade modes

The control of the units in stand–by can be completely automatic, thanks to the possibility of connection with the PowerFace control. A unit in stand–by is automatically activated in case of an alarm causing the main unit to lock–out. This also occurs if the main unit is switched off or disappears from the system due to a failure on the control connecting network (bus). Rotation of the stand–by units can be set to occur automatically every 24 hours, so as to enable an even wear of the system components. If the system is connected to a Hiromatic interface, it is possible to set timed daily or weekly rotation functions. When the Cascade function is activated, if several units are simultaneously on, with the same Set Point, the temperature used for the control is the average of those detected. In mechanical cooling mode, the proportional semi–band is divided by the number of units in the system, in order to share the total available cooling capacity. The activation of the Freecooling mode (if installed) is sequential on the different units forming the system, and precedes the possible activation of compressor for mechanical cooling.
Fig. d) shows an example, illustrating the operation of a system formed by three units.

Fig. d) System with 3 units in cascade – PowerFace control



5.5 – Alarm control

Two sets of alarm contacts (each n.c. or n.o.) are available on the terminal board of the electrical panel board for:

1) General Alarm (highest priority), including:
- Compressor alarm (high and low pressure).
- Sensor fault.
- Memory fault.
- Evaporator fan fault.

2) General Warning (lowest priority), including:
- High temperature.
- Low temperature.

A further General Warning is available in the unit equipped with heating, signalling the following abnormal condition:
- Electrical heater fault.

NOTE:
- An alarm causes the unit to stop and the unit in stand–by (if available) to intervene.
- A warning does not stop the unit.
- Both the alarm and the warning activate visual and audible indication (on unit with Hiromatic).
- Both the alarm and the warning must be reset manually on the PowerFace (or Hiromatic if installed).

Should the thermofuse intervene, the electrical heaters must be replaced.

6 – Settings

- The air conditioner has already been factory–tested and set as described below (see Tab. 8).
- For the microprocessor control settings please refer to the relevant manual (to avoid incorrect operation do not use temperature and relative humidity set points or proportional bands which differ excessively from the standard settings).

7 – Maintenance / Spare parts

For safety reasons, always isolate the unit using the mains switch OFF, before opening the panels.

If installed:
AS THE MICROPROCESSOR CONTROL FEATURES AUTOMATIC RESTART (AFTER A SUPPLY INTERRUPTION), IT IS RECOMMENDED THAT THIS FUNCTION IS DISABLED AND THE MAINS SWITCH IS OPENED WHEN PERFORMING ANY MAINTENANCE.

- On a daily basis, check the control readings for temperature and, if shown, relative humidity.
- The Maintenance Programme described below should be carried out by a skilled technician, preferably working under a maintenance contract.

7.1 – Routine maintenance

Maintenance program – Monthly check

FANS	Check that the fan motor rotates freely without any abnormal noise, and ensure that the bearings are not running hot. Also check the current absorption.
AIR FILTERS	Check the conditions of the filters (3 for the recirculation air and 1 for the freecooling air, if this option is included), if necessary, clean or replace them. To replace the filters for the recirculation air: • Rotate the two filter–locking fasteners securing each filter. • Remove the filters. • Fit the spare parts. • Lock the filters by rotating the two fasteners in the opposite direction to secure each filter. To replace the filter for the freecooling air (if this option is included): • Remove the unit lower panel. • Remove the fastening bracket and pull the filter vertically downwards. • Fit the spare part. • Reposition the bracket and close the panel.
ELECTRICAL CIRCUIT	• Check the power supply on all phases. • Ensure that all electrical connections are tight.
REFRIGERATION CIRCUIT	• Check the evaporating pressures (to be performed by a refrigeration technician). • Check the compressor current absorption, the head pressure and the presence of any unusual noise. • Ensure that there is no ice formation on the evaporator.

7.2 – Extraordinary maintenance

CAUTION:

If you need to intervene immediately after the unit stops, wait 5 minutes before accessing the inner parts, as you could get burnt.

7.2.1 – Check of the system vacuum and leaks

NOTE:

Before proceeding, recover all the refrigerant, according to the local laws.

1) Switch the unit off (main switch on OFF).
2) Remove the panels necessary for inspecting the refrigerating circuit.
3) Connect a high efficiency vacuum pump to the needle valves (Schräder) on the gas and liquid lines; also arrange a connection with a nitrogen bottle.
4) Load the circuit with nitrogen (7 bar/700 kPa). Find possible leaks in the circuit by soapy water or other specific product (foaming agents), and repair as necessary.
5) Drain the circuit by a vacuum of 0.3 mbar absolute.
6) After 3 hours check not to have exceeded 1.3 mbar absolute; this condition ensures a humidity lower than 50 ppm inside the system. If the vacuum is not kept there are still leaks; repeat the operations from point 4.

7.2.2 – Refrigerant charging

<u>After having eliminated the humidity from the refrigerating circuit (see 7.2.1), proceed as follows:</u>

1) Make sure all the unit components are in operating order.
2) Using a charging hose, connect the cylinder to the liquid line of the circuit. Drain the substances that cannot be condensed from the hose.

Charge the circuit exclusively with the refrigerant indicated on the identification label.

Charge the quantity of refrigerant indicated in Tab. e.

3) Set the main switch on ON.
4) Start the compressor.
5) The charge operation can be considered finished when, keeping the condensation temperature at a steady level (~ 50°C, if necessary partially clog the condensing coil), no more bubbles appear for at least ten minutes. Check if the superheat in these conditions is 7–8 degrees.

Superheat calculation

a) With the unit operating in standard conditions, measure the temperature of the suction line in the point where the bulb of the thermal expansion valve is fastened, in case of "HPSCxxA/L" version unit, in the compressor inlet, in case of other versions.
b) Detect the evaporation pressure gauge temperature from a pressure gauge placed on the compressor suction.
c) Subtract the obtained temperature value from the one measured in point a).
The difference is the superheat value.

7.2.3 – R407C refrigerant units

7.2.3.1 – Features of the refrigerating fluid R407C

At standard temperature and pressure it is a colourless gas with low toxicity, non–flammable, and it has an allowed exposure limit value (AEL/TLV) corresponding to 1000 ppm (average value measured on 8 hours/day). In the event of leakage, air the room before use.

Tab. e – R407C refrigerant charge

Internal unit	External unit	R407C charge (kg)
HPSE 06 Only cooling / FC / EFC	HPSC 060	2.2
	HPSC 06A	2.7
	HPSC 06L	3.7
HPSE 08 Only cooling	HPSC 080	2.7
	HPSC 08A	2.7
	HPSC 08L	3.7
HPSE 08 FC / EFC	HPSC 080	3.0
	HPSC 08A	3.0
	HPSC 08L	4.0
HPSE 10 Only cooling	HPSC 10A	2.7
	HPSC 10L	3.7
HPSE 10 FC / EFC	HPSC 10A	3.0
	HPSC 10L	4.0
HPSE 12 Only cooling / FC / EFC	HPSC 12A	3.6
	HPSC 12L	4.6
HPSE 14 Only cooling / FC / EFC	HPSC 14A	3.6
	HPSC 14L	4.6

IMPORTANT:

The charges indicated in Tab. e refer to a 2 m length for the gas and liquid pipes: Tab. f shows the indications for longer measures on the additional charge in grams of refrigerant R407C by each pipe meter of the gas and liquid lines, according to the diameters indicated in Tab. a.

Tab. f – Additional charge in grams of refrigerant R407C by meter of each line

Liquid line		Gas line	
Ø pipeline (mm)	Add charge R407C g/m	Ø pipeline (mm)	Add charge R407C g/m
ϕ 12 x 1	85.0	ϕ 16 x 1	4.0
ϕ 16 x 1	160.0	ϕ 18 x 1	5.5
–	–	ϕ 22 x 1	8.5
–	–	ϕ 28 x 1	14.5

The oil to be used when topping up is **EMKARATE RL 32–3MA** or **MOBIL EAL ARTIC 22CC**, if it's unavailable use an oil with the same characteristics (see Tab. g and Tab. h). NEVER MIX DIFFERENT OILS TOGETHER. CLEAN THE PIPING COMPLETELY BEFORE CHANGING THE TYPE OF OIL USED.

Tab. g – EMKARATE RL 32–3MA oil

viscosity at 40 °C	:	31.2 cST
viscosity at 100 °C	:	5.6 cST
viscosity index (ISO Grade)	:	32

Tab. h – MOBIL EAL ARTIC 22CC oil

approx. specific weight (at 15°C)	:	0.99 kg/l
flash point (C.O.C.)	:	245 °C
pour point	:	<–54°C
viscosity index	:	116
viscosity at 40°C	:	23.6 cST
viscosity at 100°C	:	4.7 cST

7.3 – Dismantling the unit

The machine has been designed and built to ensure continuous operation.
The working life of some of the main components, such as the fan and the compressor, depends on their maintenance.
If the unit has to be dismantled, this must be done by skilled refrigerator technicians.
The refrigerating fluid and the lubricating oil in the circuit must be disposed of in conformity with the laws in force in your country.

7.4 – Spare parts

We recommend the use of original spare parts.
When placing an order please refer to "Component List" enclosed with the machine and specify the unit model and serial no.

8 – Appendix

8.1 – Check the unit after the installation

The following list includes the checks to carry out to verify that HPS is intact after the installation.

IMPORTANT:

EVERY UNIT IS TESTED IN OUR PLANTS BEFORE DELIVERY.

A) STATIC CHECK

A.1) Evaporating unit HPSE

- A.1.a) Sight check that the panels and rivets are intact and well fixed.
- A.1.b) Check for the presence of a condensate drain for each machine and of the discharge pipe supplied separately.
- A.1.c) Check that the (optional) Freecooling air intake ducts (rigid or flexible) and the rainproof external grille, with metallic prefilter (optional) are available and fixed.
- A.1.d) Check that the unit is fixed firmly to the ceiling or to the wall, and that any fastening devices passing along the walls of the room to be conditioned are sealed.
- A.1.e) Put the electrical board of the room in the "OFF" position.
- A.1.f) Check for the correct connection of the supply cables and of the Bus cable between the PowerFace card and the remote display or between the PowerFace and Hiromatic (if installed, optional).
- A.1.g) Check the fastening of cables, electronic components and fuses.
- A.1.h) Check the correct position of the air filter.

A.2) Motor–condensing unit HPSC

- A.2.a) Remove the panels of the compressor compartment to access the refrigerating circuit (if the weather conditions allow this; prevent water from entering the electric board and the compressor compartment).
- A.2.b) Check that the refrigerating circuit is intact and that there are no oil stains in the compressor compartment and along the ducts.
- A.2.c) Check the evaporating fan by turning it by means of a screwdriver: it must be free to rotate without any abnormal noise.
- A.2.d) Check that the electrical board is free from foreign bodies, the correct connection to the evaporating unit and that all electrical connections are tightened.

The unit is ready for the dynamic check.

B) DYNAMIC CHECK

- B.1) Check the ground connection.
- B.2) Put the electrical board of the room in the "ON" position.
- B.3) Set the main switch of the indoor unit "ON".
- B.4) Check the voltage at the main supply cables.
- B.5) Check the voltage at the emergency supply cables.
- B.6) Only for the units equipped with Hiromatic remote interface, set the wished system configuration, such as set point, network (only for "Advanced" versions, by assigning an identification number for each unit), parameter sharing, stand–by, freecooling differentials (if installed), and so on.
- B.7) Measure the current absorbed by the evaporating fan only.
- B.8) Start up the compressor (if necessary force the system via the control) and wait until the system is stable. Measure the absorbed current, with both fan and compressor operating.
- B.9) Check all these values comparing them with those shown in the machine plate.
- B.10) Check the delivery temperature with a digital thermometer.
- B.11) Verify the superheating, according to par. 7.2.3.
- B.12) Close the panels of the evaporating and motor–condensing units.

Tab. 1 – 50 Hz Technical data for "COOLING ONLY" and "COOLING + HEATING" unit versions (F and F + C) coupled with "HPSCxx0"

Model		HPS 06	HPS 08
Operating limits			
Main power supply voltage		230V ±10% / 1Ph / 50Hz	400V±10% / 3Ph+N+PE / 50Hz
Outdoor conditions *(*)*	from:	10°C	
	to:	47°C	45°C
Indoor conditions with compressor running	from:	24°C, 30% R.H. / 80% R.H. *(**)*	
	to:	35°C, 40% R.H.	30°C, 40% R.H.
Storage conditions	from:	–40°C, 5% R.H.	
	to:	55°C, 90% R.H.	
Sound pressure level			
Outdoor sound pressure level *(1)*	dB(A)	50	
Indoor sound pressure level	dB(A)	58.0	62.5
Standard electrical features			
Compressor – AC power input *(2)*	kW	1.58	2.18
Compressor – AC operative current (OA) *(2)*	A	7.6	3.9
Compressor – AC max. current (FLA)	A	11.4	5.1
Compressor – AC starting current (LRA)	A	47.0	32.0
Condenser fan – AC power input *(2)*	kW	0.08	0.10
Condenser fan – AC max. power input	kW	0.08	0.10
Condenser fan – AC operative current (OA) *(2)*	A	0.6	0.7
Condenser fan – AC max. current (FLA)	A	1.4	1.4
Condenser fan – AC starting current	A	1.6	1.6
Evaporator fan – AC power input *(2)*	kW	0.18	0.35
Evaporator fan – AC operative current (OA) *(2)*	A	0.8	1.5
Evaporator fan – AC max. current (FLA) *(3)*	A	1.0	2.0
Evaporator fan – AC starting current	A	1.3	2.7
Electric heating (optional)			
Heating capacity	kW	1.5	3.0
Heating – max. current	A	6.5	

OA: Standard Operating Ampère
FLA: Full Load Ampère
LRA: Locked Rotor Ampère

Notes:

(*) Maximum outdoor temperature referred to 30˚C / 35% R.H. indoor unit air suction (HPSE).

(**) Conditions referred to the suction sections of the inner unit (HPSE); the min. indoor temperature is referred to 30% of indoor relative humidity and to the min. outdoor temperature; for higher relative humidity and/or outdoor temperatures, the min. indoor temperature is higher than the table data.

(1) Measured with 35˚C outdoor temperature at 2m far from the unit; free field conditions.

(2) Indoor reference conditions: 30˚C / 35% R.H. at the HPSE indoor unit air suction sides; 35˚C outdoor. Nominal power supply.

(3) It refers to nominal speed (Factory setting).

Tab. 2 -- 50 Hz Technical data for "FREECOOLING" and "230V/1Ph/50Hz EMERGENCY FREECOOLING" unit versions (FC and EFC--AC) coupled with "HPSCxx0"

Model		HPS 06	HPS 08
Operating limits			
Main power supply voltage		230V ±10% / 1Ph / 50Hz	400V±10% / 3Ph+N+PE / 50Hz
Emergency power supply voltage		230V ±10% / 1Ph+PE / 50Hz (with emergency cooling) *(*)*	
Outdoor conditions *(**)*	from:	10°C	
	to:	48°C	45°C
Indoor conditions with compressor running	from:	24°C, 30% R.H. / 80% R.H. *(***)*	
	to:	35°C, 40% R.H.	30°C, 40% R.H.
Storage conditions	from:	–40°C, 5% R.H.	
	to:	55°C, 90% R.H.	
Sound pressure level			
Outdoor sound pressure level *(1)*	dB(A)	50	
Indoor sound pressure level	dB(A)	59.0	62.5
Standard electrical features			
Compressor – AC power input *(2)*	kW	1.57	2.18
Compressor – AC operative current (OA) *(2)*	A	7.3	3.9
Compressor – AC max. current (FLA)	A	11.4	5.1
Compressor – AC starting current (LRA)	A	47.0	32.0
Condenser fan – AC power input *(2)*	kW	0.08	0.10
Condenser fan – AC max. power input	kW	0.08	0.10
Condenser fan – AC operative current (OA) *(2)*	A	0.6	0.7
Condenser fan – AC max. current (FLA)	A	1.4	1.4
Condenser fan – AC max. current (FLA)	A	1.6	1.6
Evaporator fan – AC power input *(2)*	kW	0.14	0.39
Evaporator fan – AC operative current (OA) *(2)*	A	0.6	2.8
Evaporator fan – AC max. current (FLA) *(3)*	A	0.6	2.4
Evaporator fan – AC starting current	A	1.2	5.3
Electric heating (optional)			
Heating capacity	kW	1.5	3.0
Heating – max. current	A	6.5	
OA: Standard Operating Ampère FLA: Full Load Ampère LRA: Locked Rotor Ampère			

Notes:

(*) *The emergency cooling option (EFC) is required.*

(**) *Maximum outdoor temperature referred to 30°C / 35% R.H. indoor unit air suction (HPSE).*

(***) *Conditions referred to the suction sections of the inner unit (HPSE); the min. indoor temperature is referred to 30% of indoor relative humidity and to the min. outdoor temperature; for higher relative humidity and/or outdoor temperatures, the min. indoor temperature is higher than the table data.*

(1) *Measured with 35°C outdoor temperature at 2m far from the unit; free field conditions.*

(2) *Indoor reference conditions: 30°C / 35% R.H. at the HPSE indoor unit air suction sides; 35°C outdoor. Nominal power supply.*

(3) *It refers to nominal speed (Factory setting).*

Tab. 3 -- 50 Hz Technical data for "FREECOOLING" and "48Vdc EMERGENCY FREECOOLING" unit versions (FC and EFC--DC) coupled with "HPSCxx0"

Model		HPS 06	HPS 08
Operating limits			
Main power supply voltage		230V ±10% / 1Ph / 50Hz	400V±10% / 3Ph+N+PE / 50Hz
Emergency power supply voltage		48VDC ±17% (with emergency cooling) *(*)*	
Outdoor conditions *(**)*	from:	10°C	
	to:	48°C	45°C
Indoor conditions with compressor running	from:	24°C, 30% R.H.. / 80% R.H. *(***)*	
	to:	35°C, 40% R.H.	30°C, 40% R.H.
Storage conditions	from:	–40°C, 5% R.H.	
	to:	55°C, 90% R.H.	
Sound pressure level			
Outdoor sound pressure level *(1)*	dB(A)	50	
Indoor sound pressure level	dB(A)	57	62
Standard electrical features			
Compressor – AC power input *(2)*	kW	1.57	2.17
Compressor – AC operative current (OA) *(2)*	A	7.3	3.9
Compressor – AC max. current (FLA)	A	11.4	5.1
Compressor – AC starting current (LRA)	A	47.0	32.0
Condenser fan – AC power input *(2)*	kW	0.08	0.10
Condenser fan – AC max. power input	kW	0.08	0.10
Condenser fan – AC operative current (OA) *(2)*	A	0.6	0.7
Condenser fan – AC max. current (FLA)	A	1.4	1.4
Condenser fan – AC max. current (FLA)	A	1.6	1.6
Evaporator fan – DC power input *(2)*	kW	0.10	0.28
Evaporator fan – DC operative current (OA) *(2)*	A	2.6	5.8
Evaporator fan – DC max. current (FLA) *(3)*	A	2.6	9.6
Evaporator fan – DC starting current	A	0.1	0.1
Electric heating (optional)			
Heating capacity	kW	1.5	3.0
Heating – max. current	A	6.5	
OA: Standard Operating Ampère FLA: Full Load Ampère LRA: Locked Rotor Ampère			

Notes:

(*) *The emergency cooling option (EFC) is required.*

(**) *Maximum outdoor temperature referred to 30°C / 35% R.H. indoor unit air suction (HPSE).*

(***) *Conditions referred to the suction sections of the inner unit (HPSE); the min. indoor temperature is referred to 30% of indoor relative humidity and to the min. outdoor temperature; for higher relative humidity and/or outdoor temperatures, the min. indoor temperature is higher than the table data.*

(1) *Measured with 35°C outdoor temperature at 2m far from the unit; free field conditions.*

(2) *Indoor reference conditions: 30°C / 35% R.H. at the HPSE indoor unit air suction sides; 35°C outdoor. Nominal power supply.*

(3) *It refers to nominal speed (Factory setting).*

Tab. 4 -- 50 Hz Technical data for "COOLING ONLY" and "COOLING + HEATING" unit versions (F and F+C) coupled with "HPSCxxA/L"

Model		HPS 06	HPS 08	HPS 10	HPS 12	HPS 14
Operating limits						
Main power supply voltage		230V ±10% / 1Ph / 50Hz	400V ±10% / 3Ph+N+PE / 50Hz			
Outdoor conditions *(*)*	from:	−30°C				
	to:	51°C	50°C			
Indoor conditions with compressor running	from:	24°C, 30% R.H / 80% R.H. *(**)*				
	to:	34°C, 40% R.H.	30°C, 40% R.H.			
Storage conditions	from:	−40°C, 5% R.H.				
	to:	55°C, 90% R.H.				
Sound pressure level						
Outdoor sound pressure level *(1)*	dB(A)	48.5	48.5	52.5	53.5	55.0
Indoor sound pressure level	dB(A)	58.0	62.5	62.5	64.0	64.0
Standard electrical features						
Compressor – AC power input *(2)*	kW	1.73	2.23	3.06	3.75	4.68
Compressor – AC operative current (OA) *(2)*	A	8.0	4.0	5.5	6.6	8.6
Compressor – AC max. current (FLA)	A	11.4	5.1	7.0	10.0	10.2
Compressor – AC starting current (LRA)	A	47.0	32.0	46.0	50.0	63.0
Condenser fan – AC power input *(2)*	kW	0.07	0.10	0.22	0.22	0.28
Condenser fan – AC max. power input	kW	0.24	0.24	0.48	0.48	0.48
Condenser fan – AC operative current (OA) *(2)*	A	0.6	0.7	1.5	1.5	1.7
Condenser fan – AC max. current (FLA)	A	1.4	1.4	2.8	2.8	2.8
Condenser fan – AC max. current (FLA)	A	1.6	1.6	3.3	3.3	3.3
Evaporator fan – AC power input *(2)*	kW	0.18	0.35	0.35	0.34	0.34
Evaporator fan – AC operative current (OA) *(2)*	A	0.8	1.5	1.5	2.0	2.0
Evaporator fan – AC max. current (FLA) *(3)*	A	1.0	2.0	2.0	2.0	2.0
Evaporator fan – AC starting current	A	1.3	2.7	2.7	2.7	2.7
Electric heating (optional)						
Heating capacity	kW	1.5	3.0	3.0	4.5	6.0
Heating – max. current	A	6.5				13.0

OA: Standard Operating Ampère
FLA: Full Load Ampère
LRA: Locked Rotor Ampère

Notes:

(*) *Maximum outdoor temperature referred to 30°C / 35% R.H. indoor unit air suction (HPSE).*

(**) *Conditions referred to the suction sections of the inner unit (HPSE); the min. indoor temperature is referred to 30% of indoor relative humidity and to the min. outdoor temperature; for higher relative humidity and/or outdoor temperatures, the min. indoor temperature is higher than the table data.*

(1) *Measured with 35°C outdoor temperature at 2m far from the unit; free field conditions.*

(2) *Indoor reference conditions: 30°C / 35% R.H. at the HPSE indoor unit air suction sides; 35°C outdoor. Nominal power supply.*

(3) *It refers to nominal speed (Factory setting).*

Tab. 5 -- 50 Hz Technical data for "FREECOOLING" and "230V/1Ph/50Hz EMERGENCY FREECOOLING" unit versions (FC and EFC--AC) coupled with "HPSCxxA/L"

Model		HPS 06	HPS 08	HPS 10	HPS 12	HPS 14
Operating limits						
Main power supply voltage		230V ±10% / 1Ph / 50Hz	400V ±10% / 3Ph+N+PE / 50Hz			
Emergency power supply voltage		230V ±10% / 1Ph+PE / 50Hz (with emergency cooling) *(*)*				
Outdoor conditions *(**)*	from:	−30°C				
	to:	52°C	50°C			
Indoor conditions with compressor running	from:	24°C, 30% R.H / 80% R.H. *(***)*				
	to:	35°C, 40% R.H.	30°C, 40% R.H			
Storage conditions	from:	−40°C, 5% R.H.				
	to:	55°C, 90% R.H.				
Sound pressure level						
Outdoor sound pressure level *(1)*	dB(A)	48.5	48.5	52.5	53.5	55.0
Indoor sound pressure level	dB(A)	59.0	62.5	62.5	64.5	66.0
Standard electrical features						
Compressor – AC power input *(2)*	kW	1.74	2.22	3.06	3.75	4.66
Compressor – AC operative current (OA) *(2)*	A	8.1	4.0	5.5	6.6	8.5
Compressor – AC max. current (FLA)	A	11.4	5.1	7.0	10.0	10.2
Compressor – AC starting current (LRA)	A	47.0	32.0	46.0	50.0	63.0
Condenser fan – AC power input *(2)*	kW	0.07	0.10	0.22	0.22	0.28
Condenser fan – AC max. power input	kW	0.24	0.24	0.48	0.48	0.48
Condenser fan – AC operative current (OA) *(2)*	A	0.6	0.7	1.5	1.5	1.7
Condenser fan – AC max. current (FLA)	A	1.4	1.4	2.8	2.8	2.8
Condenser fan – AC max. current (FLA)	A	1.6	1.6	3.3	3.3	3.3
Evaporator fan – AC power input *(2)*	kW	0.14	0.39	0.39	0.45	0.48
Evaporator fan – AC operative current (OA) *(2)*	A	0.6	2.8	2.8	2.9	2.4
Evaporator fan – AC max. current (FLA) *(3)*	A	0.7	2.4	2.4	2.4	2.4
Evaporator fan – AC starting current	A	1.2	5.3	5.3	5.3	5.3
Electric heating (optional)						
Heating capacity	kW	1.5	3.0	3.0	4.5	6.0
Heating – max. current	A	6.5				13.0

OA: Standard Operating Ampère
FLA: Full Load Ampère
LRA: Locked Rotor Ampère

Notes:

(*) The emergency cooling option (EFC) is required.

(**) Maximum outdoor temperature referred to 30°C / 35% R.H. indoor unit air suction (HPSE).

(***) Conditions referred to the suction sections of the inner unit (HPSE); the min. indoor temperature is referred to 30% of indoor relative humidity and to the min. outdoor temperature; for higher relative humidity and/or outdoor temperatures, the min. indoor temperature is higher than the table data.

(1) Measured with 35°C outdoor temperature at 2m far from the unit; free field conditions.

(2) Indoor reference conditions: 30°C / 35% R.H. at the HPSE indoor unit air suction sides; 35°C outdoor. Nominal power supply.

(3) It refers to nominal speed (Factory setting).

Tab. 6 -- 50Hz Technical data for "FREECOOLING" and "48Vdc EMERGENCY FREECOOLING" unit versions (FC and EFC--DC) coupled with "HPSCxxA/L"

Model		HPS 06	HPS 08	HPS 10	HPS 12	HPS 14
Operating limits						
Main power supply voltage		230V ±10% / 1Ph / 50Hz	400V ±10% / 3Ph+N+PE / 50Hz			
Emergency power supply voltage		48VDC ±17% (with emergency cooling) *(*)*				
Outdoor conditions *(**)*	from:	−30°C				
	to:	52°C	50°C			
Indoor conditions with compressor running	from:	24°C, 30% R.H. / 80% R.H. *(***)*				
	to:	35°C, 40% R.H.	30°C, 40% R.H.			
Storage conditions	from:	−40°C, 5% R.H.				
	to:	55°C, 90% R.H.				
Sound pressure level						
Outdoor sound pressure level *(1)*	dB(A)	48.5	48.5	52.5	53.5	55.0
Indoor sound pressure level	dB(A)	57.0	62.0	62.0	67.0	68.5
Standard electrical features						
Compressor – AC power input *(2)*	kW	1.74	2.23	3.06	3.75	4.66
Compressor – AC operative current (OA) *(2)*	A	8.1	4.0	5.5	6.6	8.5
Compressor – AC max. current (FLA)	A	11.4	5.1	7.0	10.0	10.2
Compressor – AC starting current (LRA)	A	47.0	32.0	46.0	50.0	63.0
Condenser fan – AC power input *(2)*	kW	0.07	0.10	0.22	0.22	0.28
Condenser fan – AC max. power input	kW	0.24	0.24	0.48	0.48	0.48
Condenser fan – AC operative current (OA) *(2)*	A	0.6	0.7	1.5	1.5	1.7
Condenser fan – AC max. current (FLA)	A	1.4	1.4	2.8	2.8	2.8
Condenser fan – AC max. current (FLA)	A	1.6	1.6	3.3	3.3	3.3
Evaporator fan – DC power input *(2)*	kW	0.10	0.28	0.28	0.39	0.45
Evaporator fan – DC operative current (OA) *(2)*	A	2.6	5.8	5.8	8.1	9.5
Evaporator fan – DC max. current (FLA) *(3)*	A	2.6	9.6	9.6	9.6	9.6
Evaporator fan – DC starting current	A	0.1	0.1	0.1	0.1	0.1
Electric heating (optional)						
Heating capacity	kW	1.5	3.0	3.0	4.5	6.0
Heating – max. current	A	6.5				13.0

OA: Standard Operating Ampère
FLA: Full Load Ampère
LRA: Locked Rotor Ampère

Notes:

(*) The emergency cooling option (EFC) is required.

(**) Maximum outdoor temperature referred to 30°C / 35% R.H. indoor unit air suction (HPSE).

(***) Conditions referred to the suction sections of the inner unit (HPSE); the min. indoor temperature is referred to 30% of indoor relative humidity and to the min. outdoor temperature; for higher relative humidity and/or outdoor temperatures, the min. indoor temperature is higher than the table data.

(1) Measured with 35°C outdoor temperature at 2m far from the unit; free field conditions.

(2) Indoor reference conditions: 30°C / 35% R.H. at the HPSE indoor unit air suction sides; 35°C outdoor. Nominal power supply.

(3) It refers to nominal speed (Factory setting).

Tab. 7 -- Differential current protection switch

50Hz unit versions ("cooling only", "cooling+heating" and "freecooling")	Differential current protection switch I Δn = 0.03A		Cable sizing
	2 poles	4 poles	
Unit power supply	230V / 1Ph / 50Hz	400V / 3Ph / 50Hz + N	
HPS 06	20A ("C" curve)	–	2 x 2.5mm^2 + T x 2.5mm^2
HPS 08 HPS 10 HPS 12 HPS 14	–	20A ("C" curve)	4 x 2.5mm^2 + T x 2.5mm^2

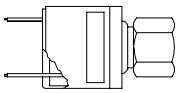
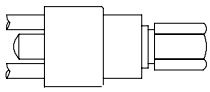
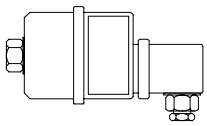
230V/1Ph/50Hz Emergency freecooling" unit version	Differential current protection switch I Δn = 0.03A				Cable sizing	
	2 poles		4 poles			
Main line power supply	230V / 1Ph / 50Hz		400V / 3Ph / 50Hz + N			
Unit EFC–AC line power supply			230V / 1Ph / 50Hz + N			
	main line	**EFC–AC line**	**main line**	**EFC–AC line**	**main line**	**EFC–AC line**
HPS 06	20A ("C" curve)	10A ("C" curve)	–		2 x 2.5mm^2 + T x 2.5mm^2	
HPS 08 HPS 10 HPS 12 HPS 14	–		20A ("C" curve)		4 x 2.5mm^2 + T x 2.5mm^2	2 x 2.5mm^2 + T x 2.5mm^2

48VDC "Emergency freecooling" unit version	Differential current protection switch I Δn = 0.03A				Cable sizing	
	2 poles		4 poles			
Main line power supply	230V / 1Ph / 50Hz		400V / 3Ph / 50Hz + N			
Unit EFC–DC line power supply	48VDC					
	main line	**EFC–DC line**	**main line**	**EFC–DC line**	**main line**	**EFC–DC line**
HPS 06	20A ("C" curve)	6A ("C" curve)	–		2 x 2.5mm^2 + T x 2.5mm^2	
HPS 08 HPS 10 HPS 12 HPS 14	–		20A ("C" curve)		4 x 2.5mm^2 + T x 2.5mm^2	2 x 2.5mm^2 + T x 2.5mm^2

Notes:

- *The cables have to be sized in compliance with local standards and according to the type and characteristics (e.g. Amperes) of installation.*
- *The specific power of the user–installed switch, must be lower than 300.000 (A^2 x s).*
- *Prescriptions on the differential relay required to the user:*
  - *for special places (healthcare facilities, etc.) comply with the local regulations;*
  - *For ordinary places, a low sensitivity is suggested (30 mA) coordinated with the value of the ground heater (IEC 364): Ra ≤ 50/I_a (Art. 413.1.4.1, CEI 64–8);*
  - *In case of frequent over–voltages with mains impulse, it is advisable to install a selective differential and to evaluate the need for adopting other devices.*

Tab. 8 -- Settings

Component	Setting	Notes
Low pressure switch (LP)	STOP: 1.0 bar START: 2.0 bar (fixed settings)	Automatic reset 
High pressure switch (HP)	STOP: 28.0 bar START: 20.0 bar (fixed settings)	Manual reset pressing the push button 
Fan speed controller (BV) (only for “HPSCxxA/L” configuration unit)	SET: 25.0 bar BANDA P: 3.8 bar (for the adjustment refer to the instructions supplied with the machine)	

Tab. 9 -- Fire proof classification of electrical/electronic components
(according to UL 94 normative – vertical burning)

Electrical/electronic components	Fire proof classification
Contactors	V1
Automatic switches	V1
Cables	V1
PC Board (PowerFace)	V0
HP and LP pressure switches	V1
Clogged filter	V2
Terminal block for internal unit (HPSE)	V0
Terminal block for external unit (HPSC)	V1
Ducts	V1
Soft – Starter	V1
Connectors	V0
Auxiliary relais	V1
Electrical heater safety thermostat	V1
Sensors	V1
Servomotor	V1

Fig. 1 – Overall dimensions

Fig. 1a – Evaporating unit HPSE 06 (version with freecooling)

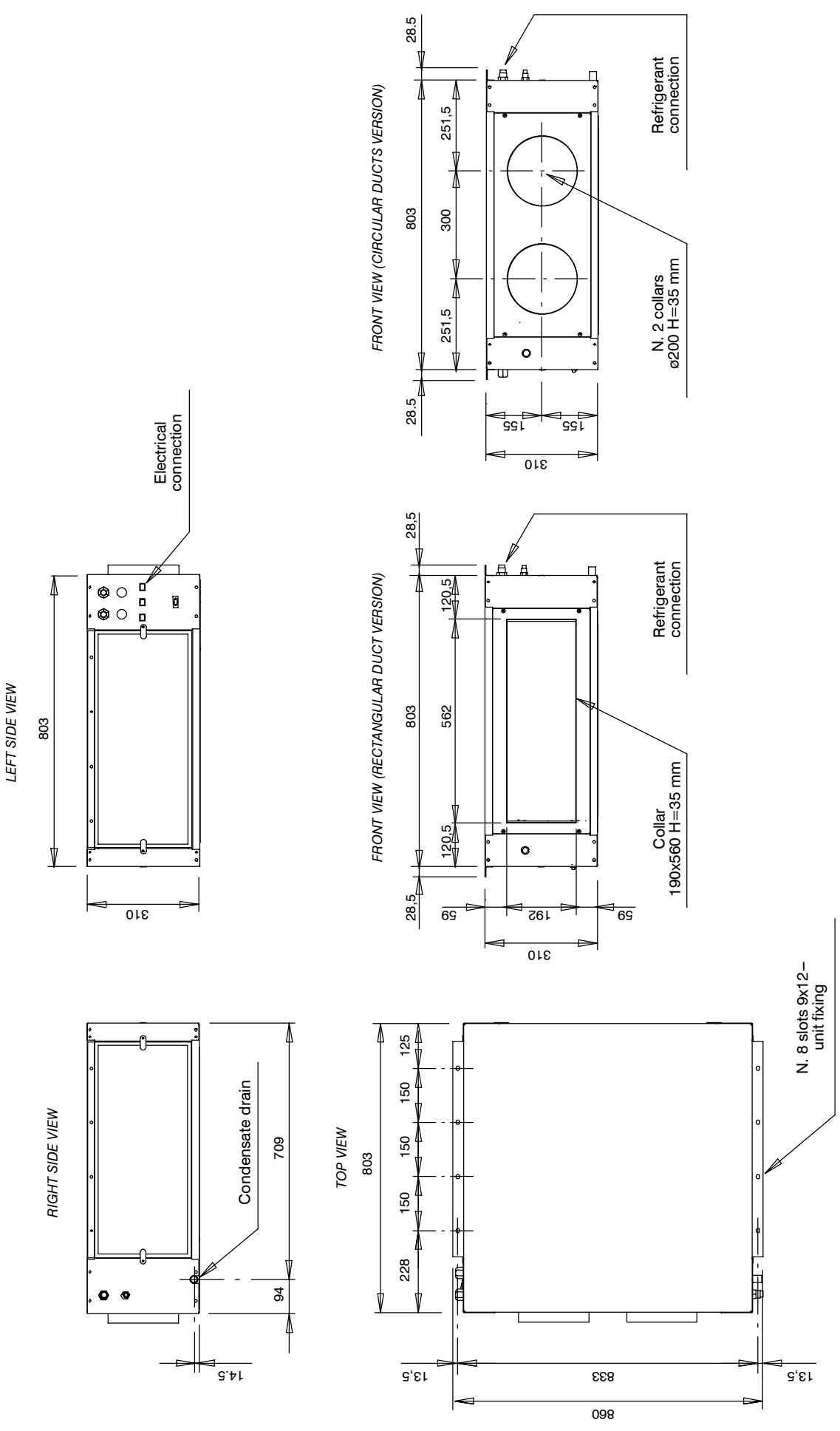


Fig. 1b – Evaporating unit HPSE 08–10–12–14 (version with freecooling)

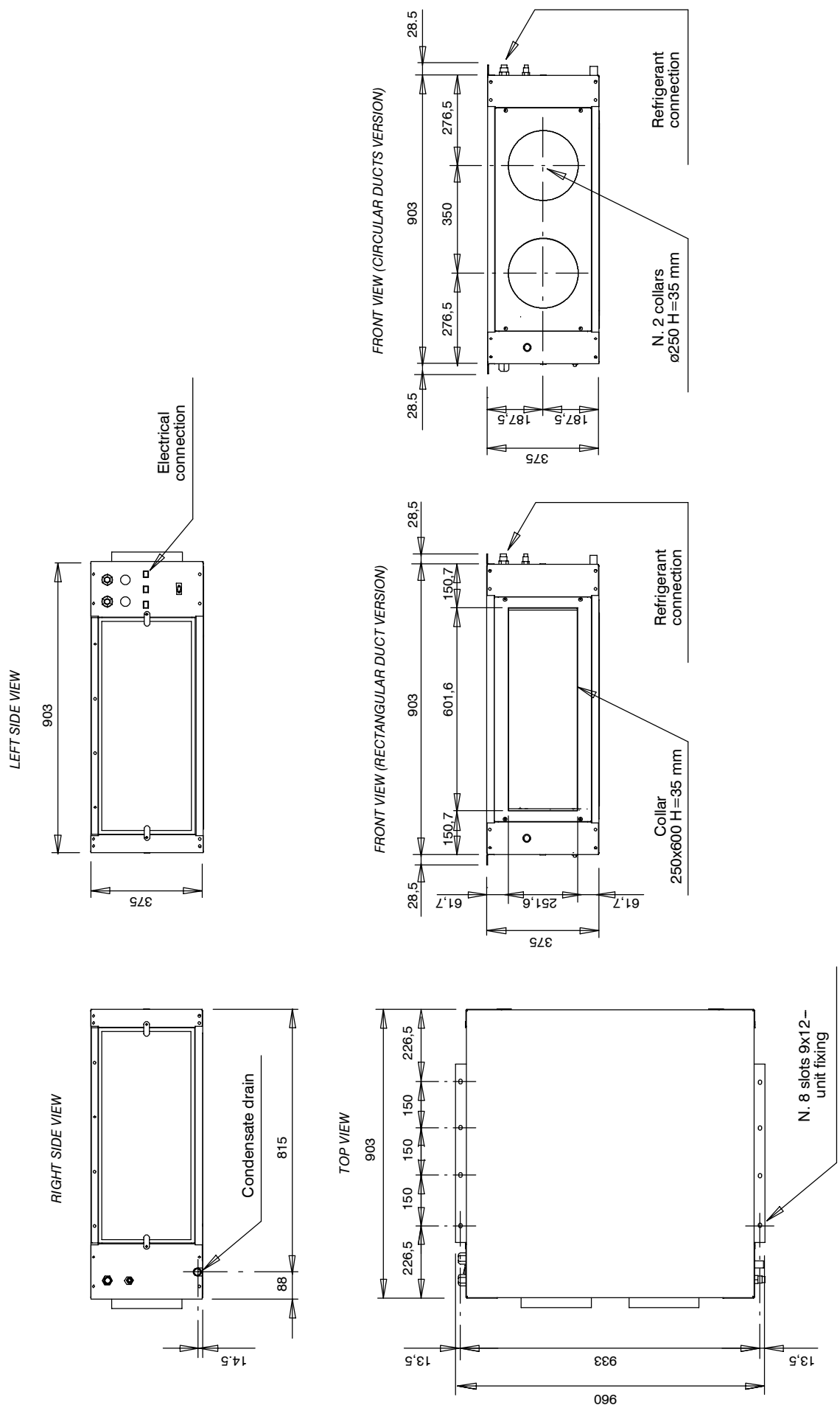


Fig. 1c – Evaporating unit HPSE 06–08–10 (version without freecooling)

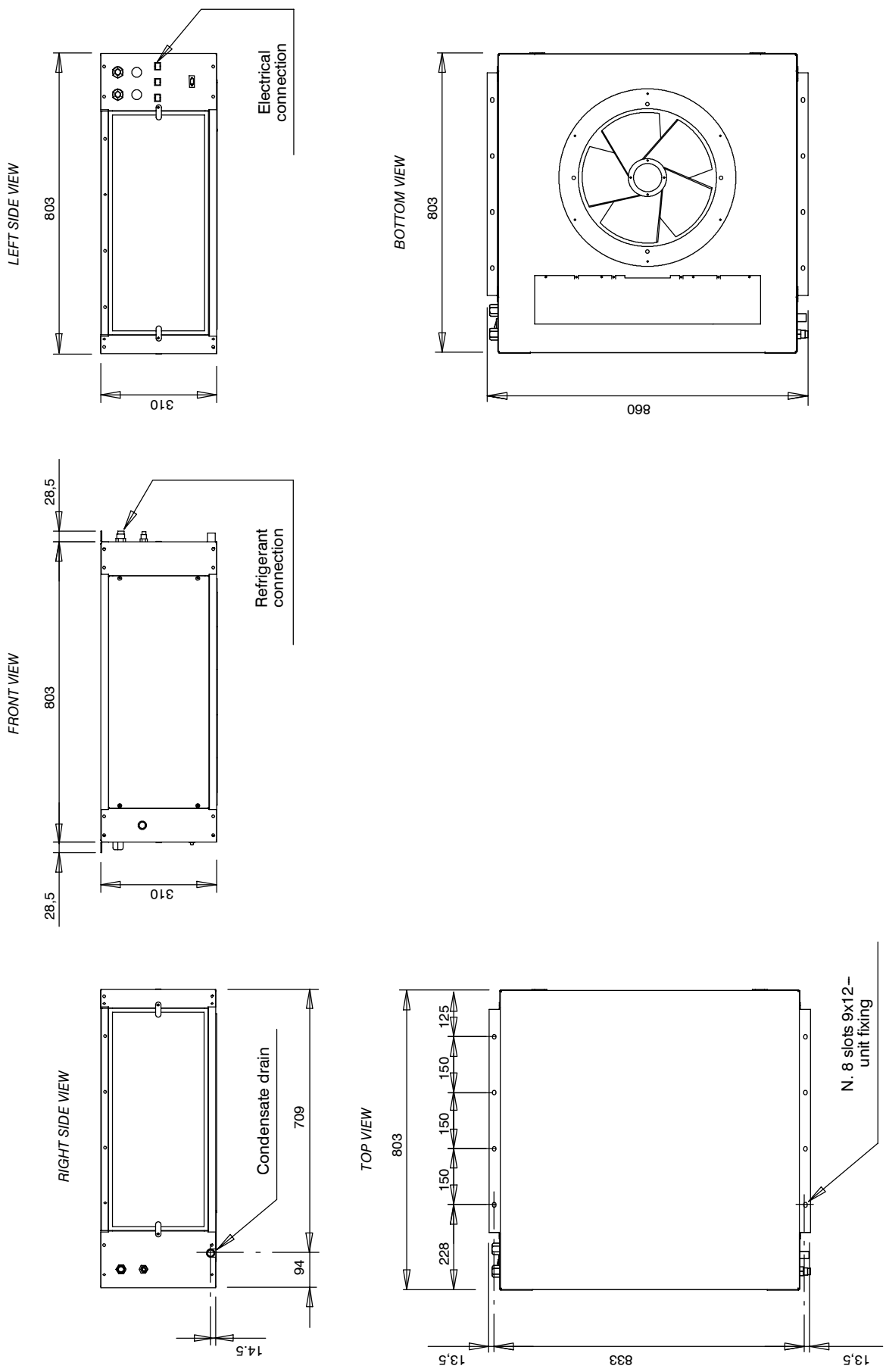
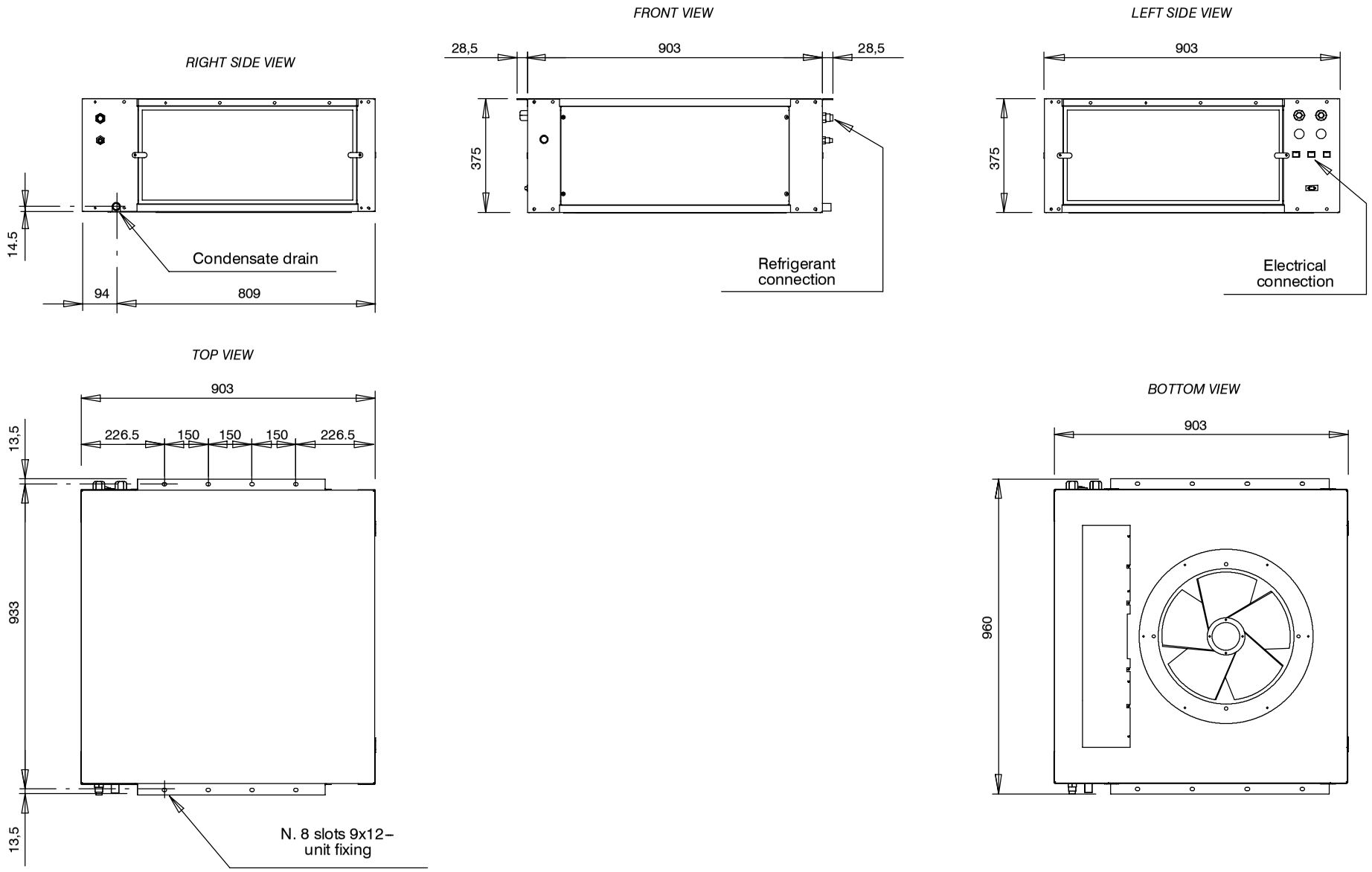


Fig. 1d – Evaporating unit HPSE 12–14 (version without freecooling)



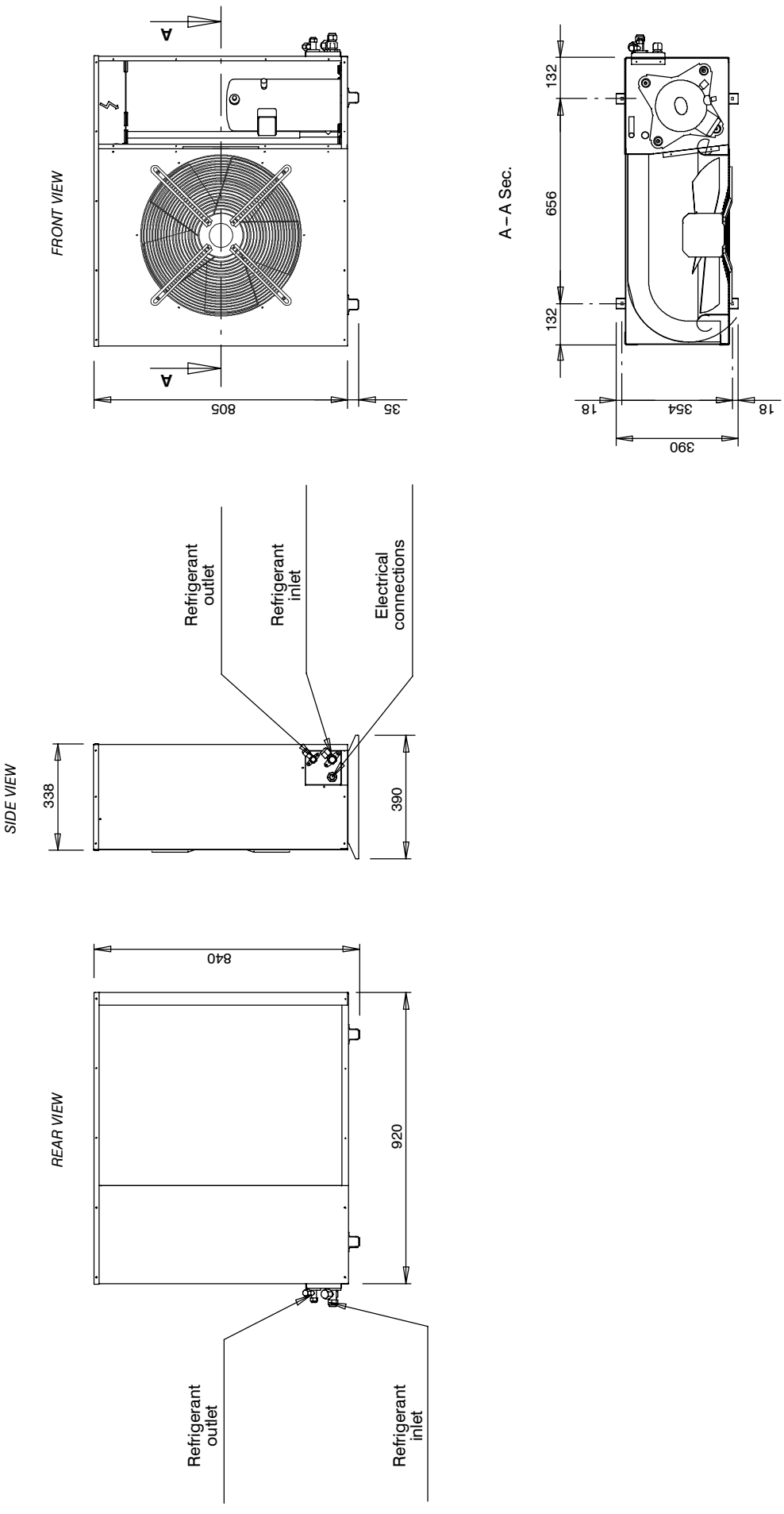


Fig. 1e – Condensing unit HPSC 06–08

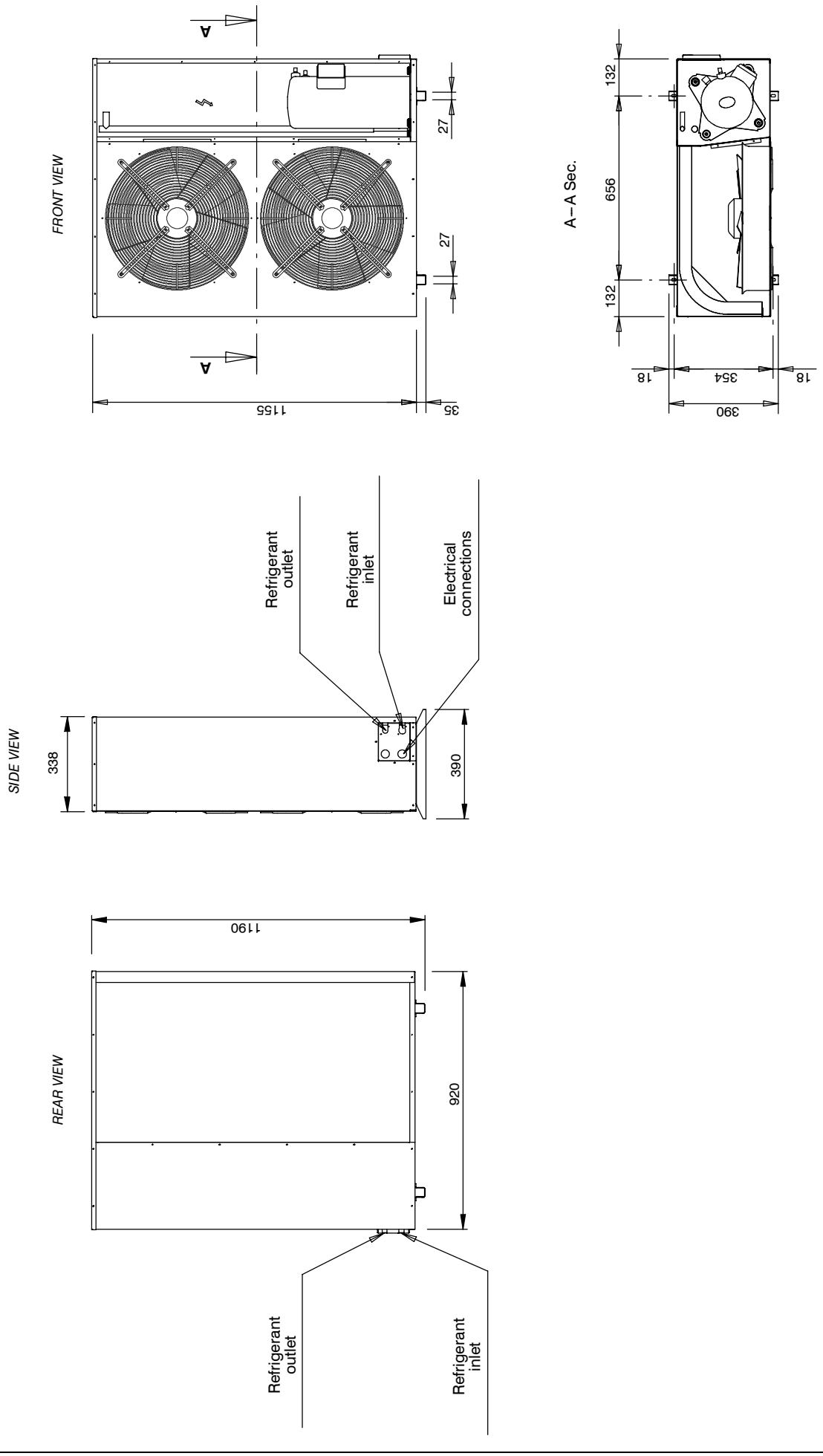
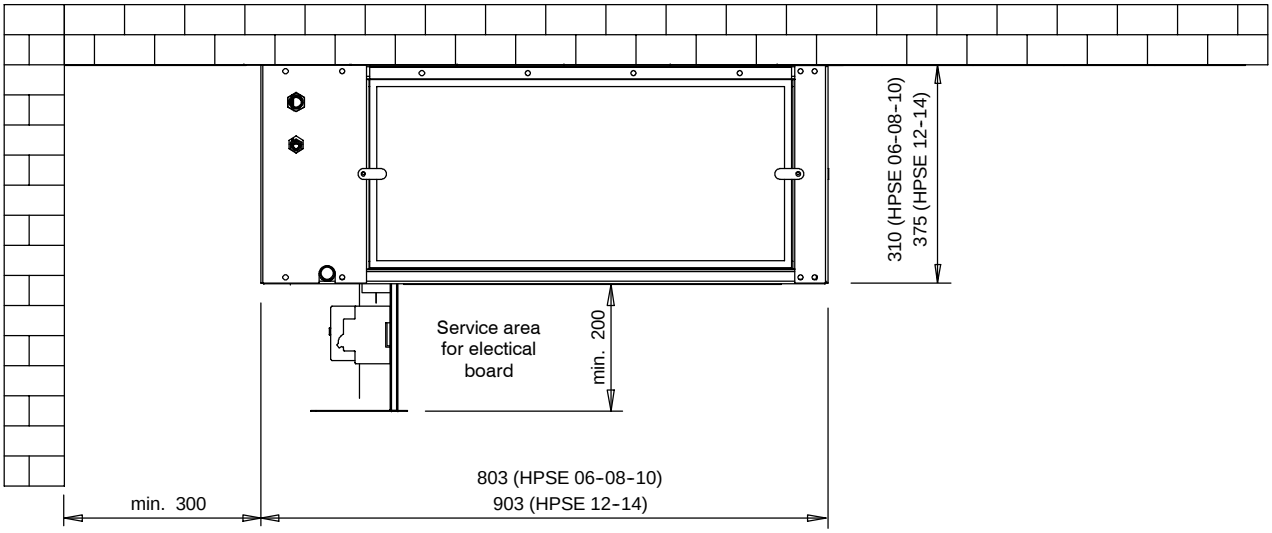


Fig. 1f – Condensing unit HPSC 10–12–14

Fig. 2 – Installation

Fig. 2a – Evaporating unit ceiling installation HPSE 06–08–10–12–14
(version without freecooling)



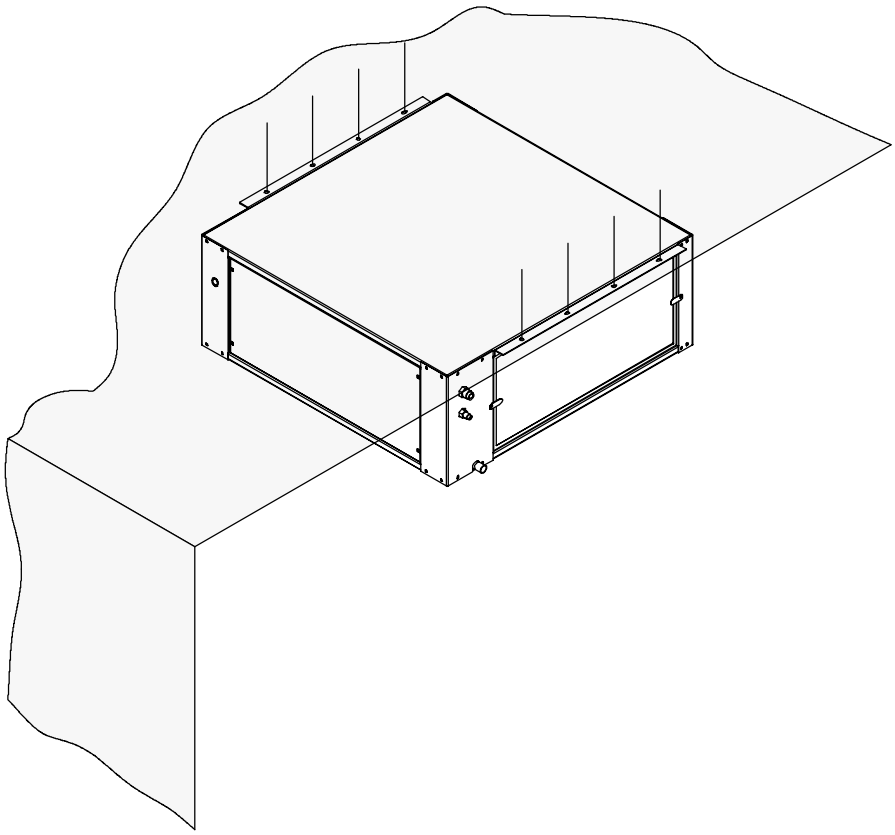
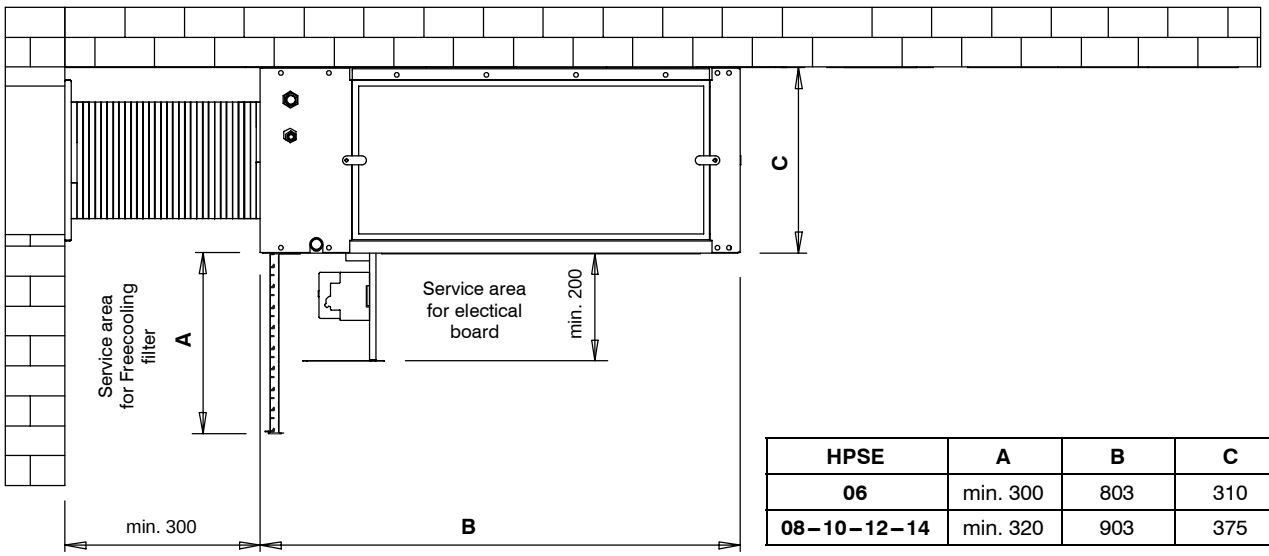
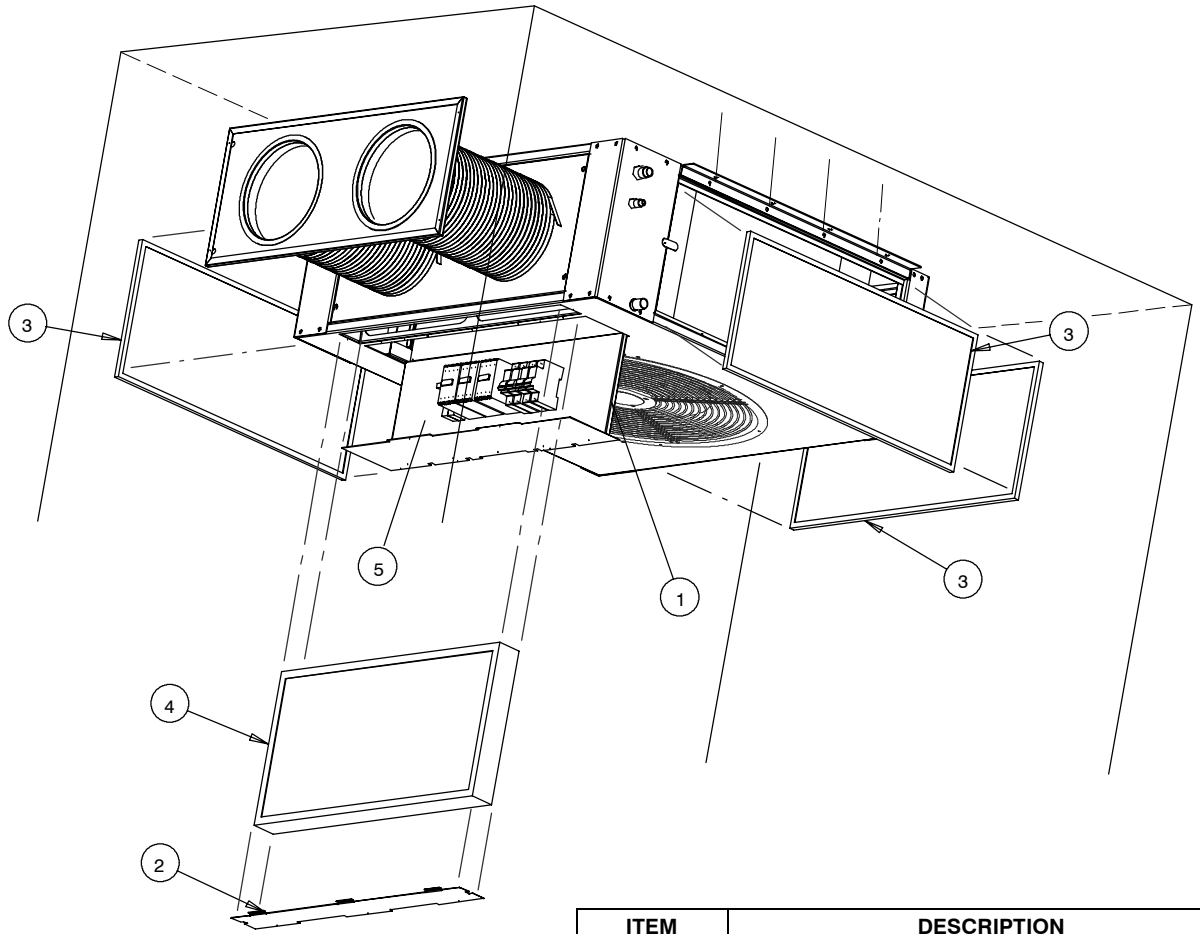


Fig. 2b – Evaporating unit installation HPSE 06–08–10–12–14
(version with freecooling)

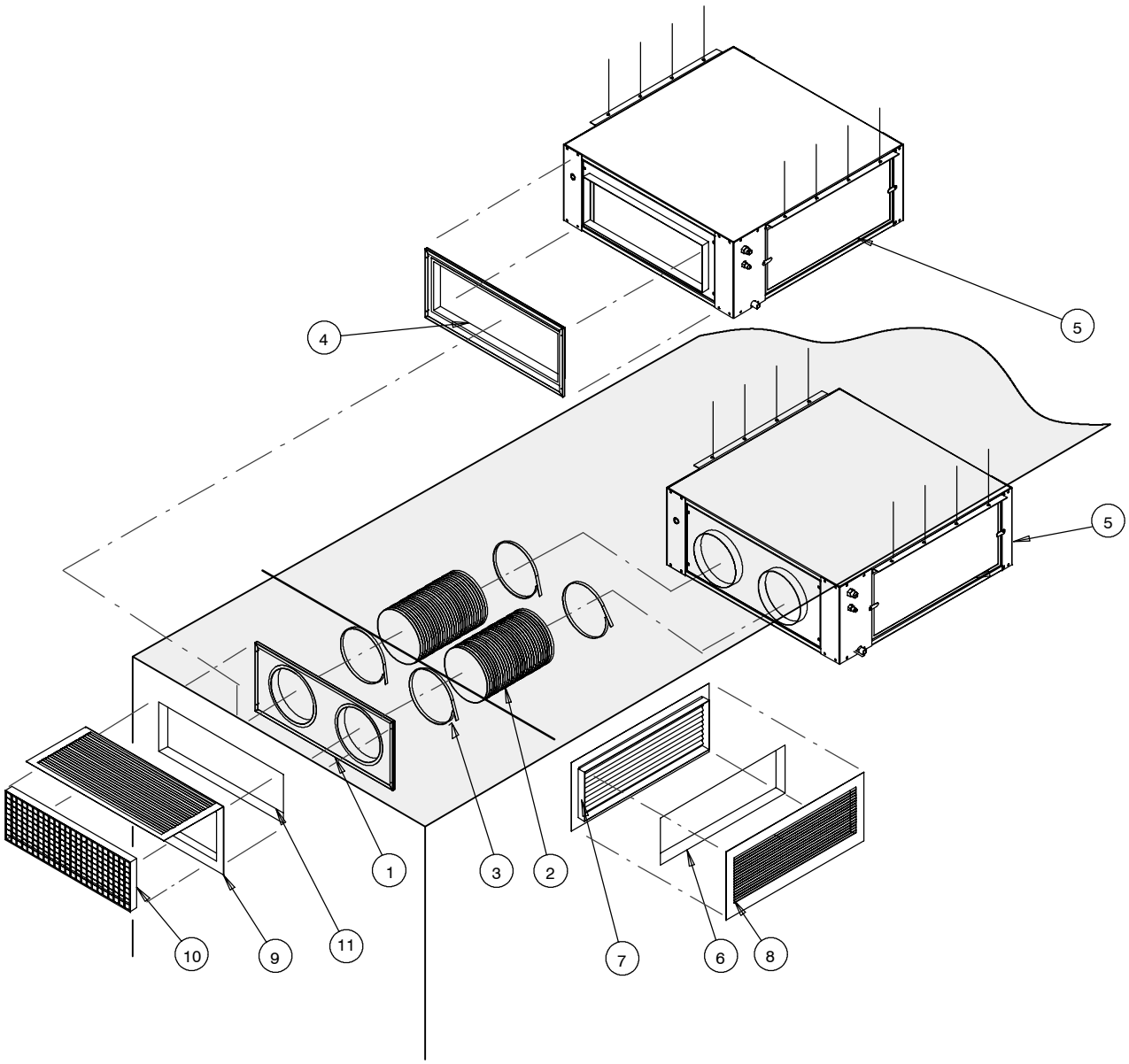


HPSE	A	B	C
06	min. 300	803	310
08–10–12–14	min. 320	903	375



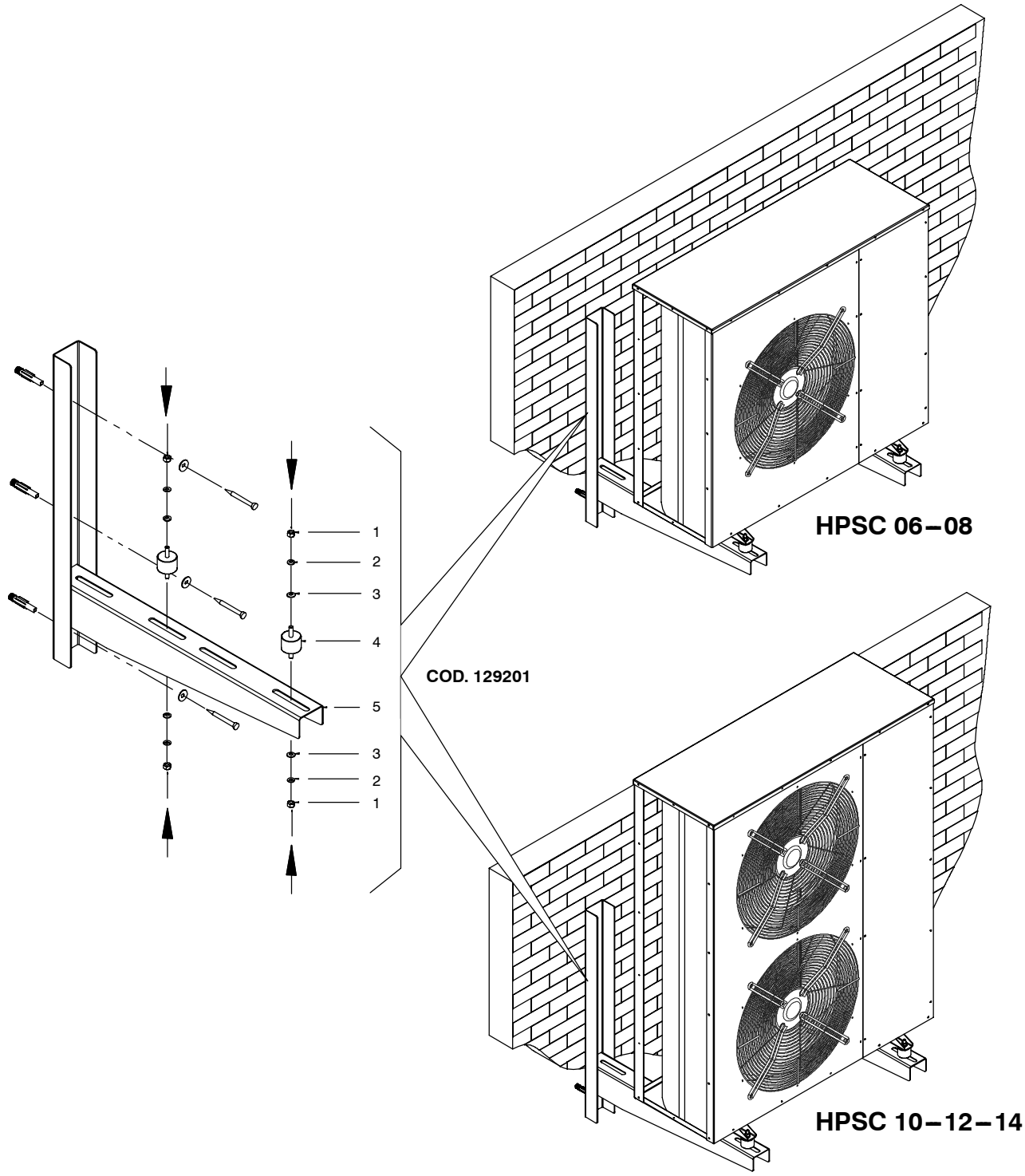
ITEM	DESCRIPTION
1	Electrical box accessibility
2	Support for filter
3	Air filter
4	Freecooling filter accessibility
5	Electrical box

Fig. 2c – Evaporating unit ceiling installation HPSE 06–08–10–12–14
(version with freecooling)



ITEM	DESCRIPTION	CODE HPSE 06	CODE HPSE 08–10–12–14
1	Wall plate for circular ducts	13503801	13536101
2	2 flexible ducts with fixing clamps, L = 0.5 m	270190 (Ø 202mm)	270191 (Ø 254mm)
3	Fixing clamps	–	–
4	Wall plate for rectangular duct	13501801	13536001
5	Circular / rectangular version	–	–
6	Wall hole	400 x 200mm	600 x 400mm
7	Overpressure damper	134948	134992
8	Grille for overpressure damper	270206	117832
9	Aluminium grille with metallic prefilter	270202	270219
10	Metallic prefilter (included in item 9)	–	–
11	Wall hole	550 x 210mm	590 x 230mm

Fig. 2d – Condensing unit wall installation



ITEM	KIT DESCRIPTION COD. 129201
1	Nut
2	Serrated lock washer
3	Washer
4	Anti–vibrating mount
5	Bracket

Fig. 3 – Condenser positions

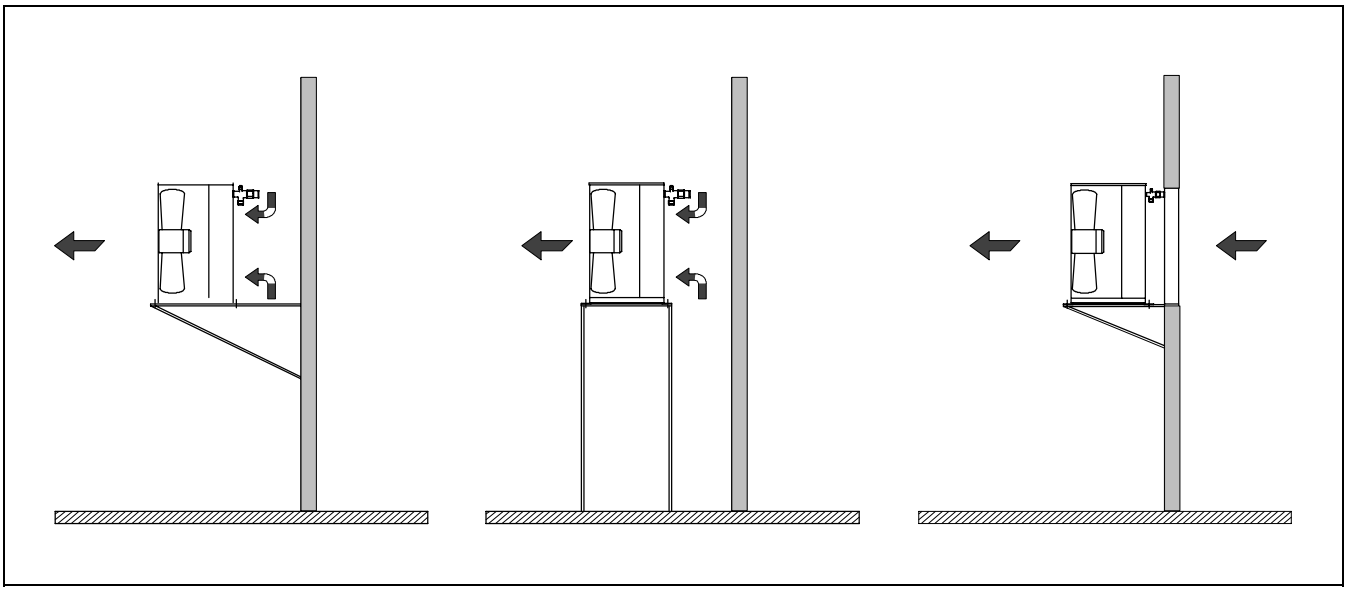


Fig. 4 – Service area HPSC 06–08–10–12–14

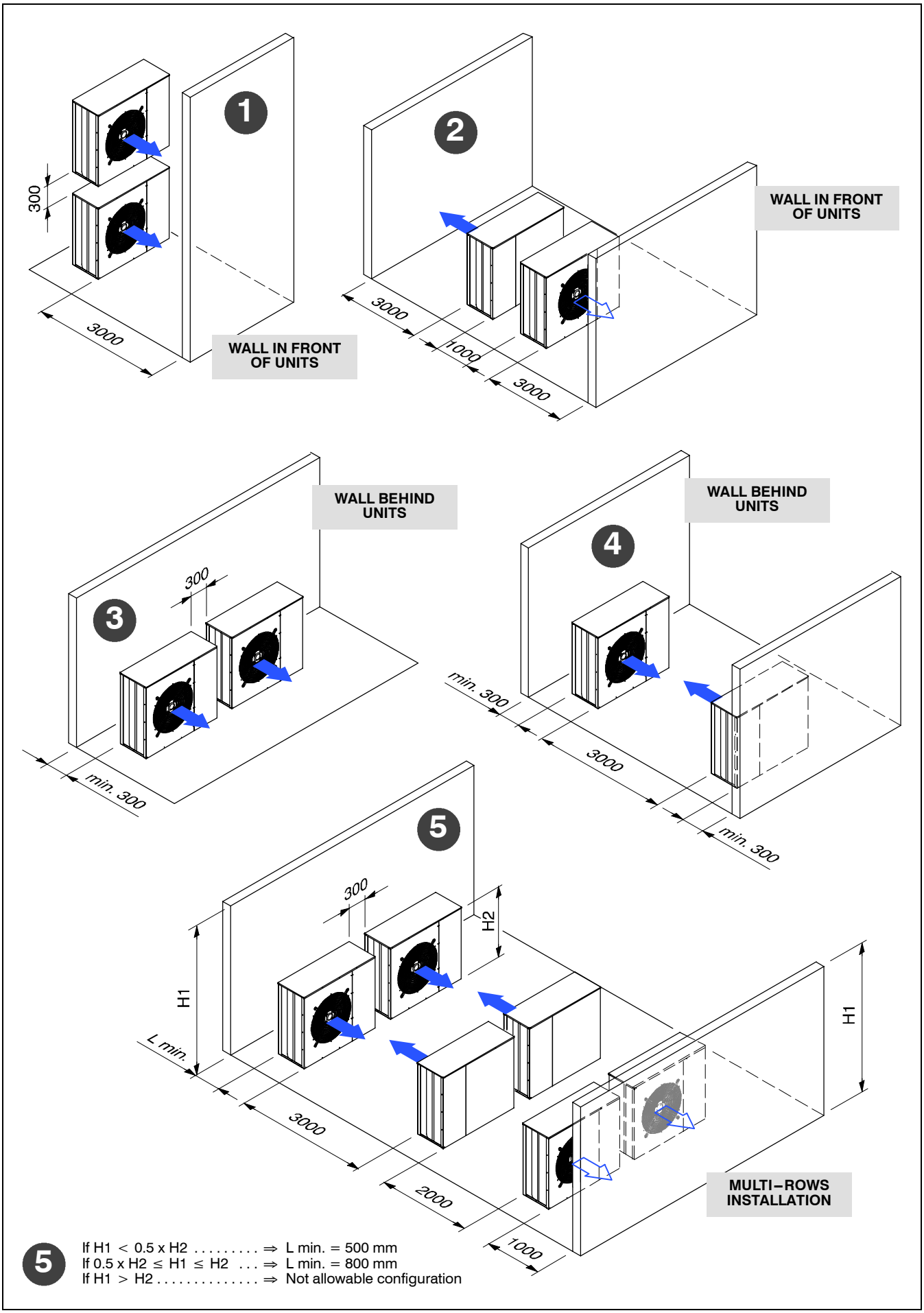
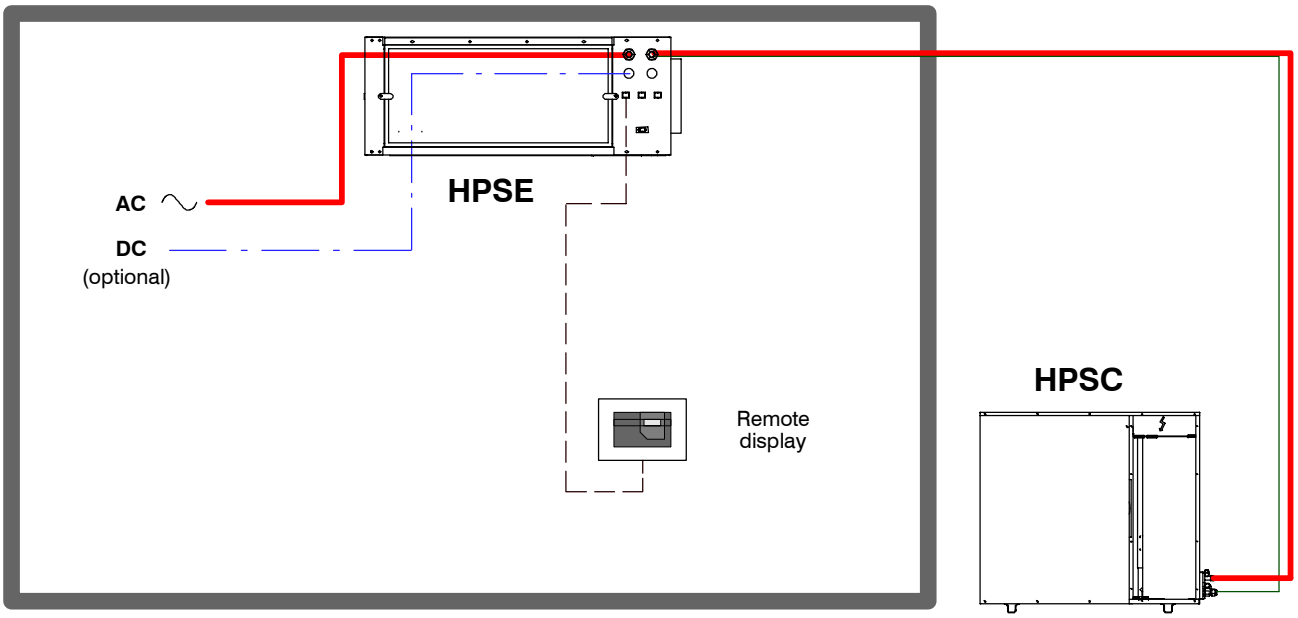
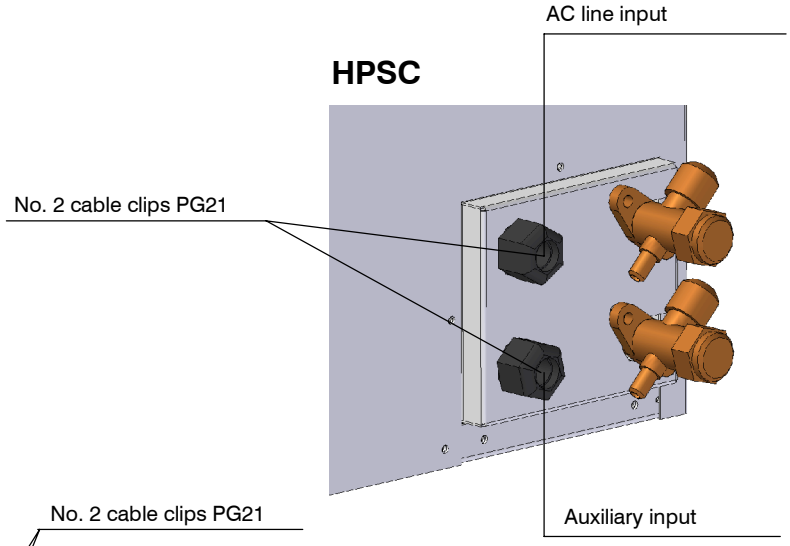


Fig. 5 – Electric connections



AC power supply
DC power supply (optional)
SC unit control
Powerface display



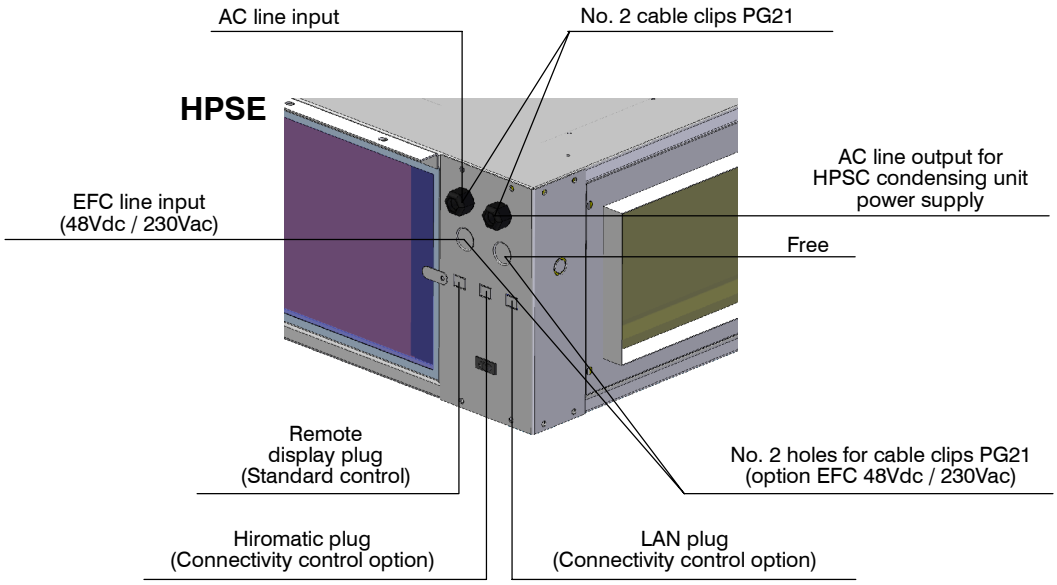


Fig. 6 – Electric connections between indoor unit HPSE and outdoor unit HPSC

Fig. 6a – HPSE + HPSC 06
(version with freecooling and EFC 230 Vac or EFC 48 Vdc)

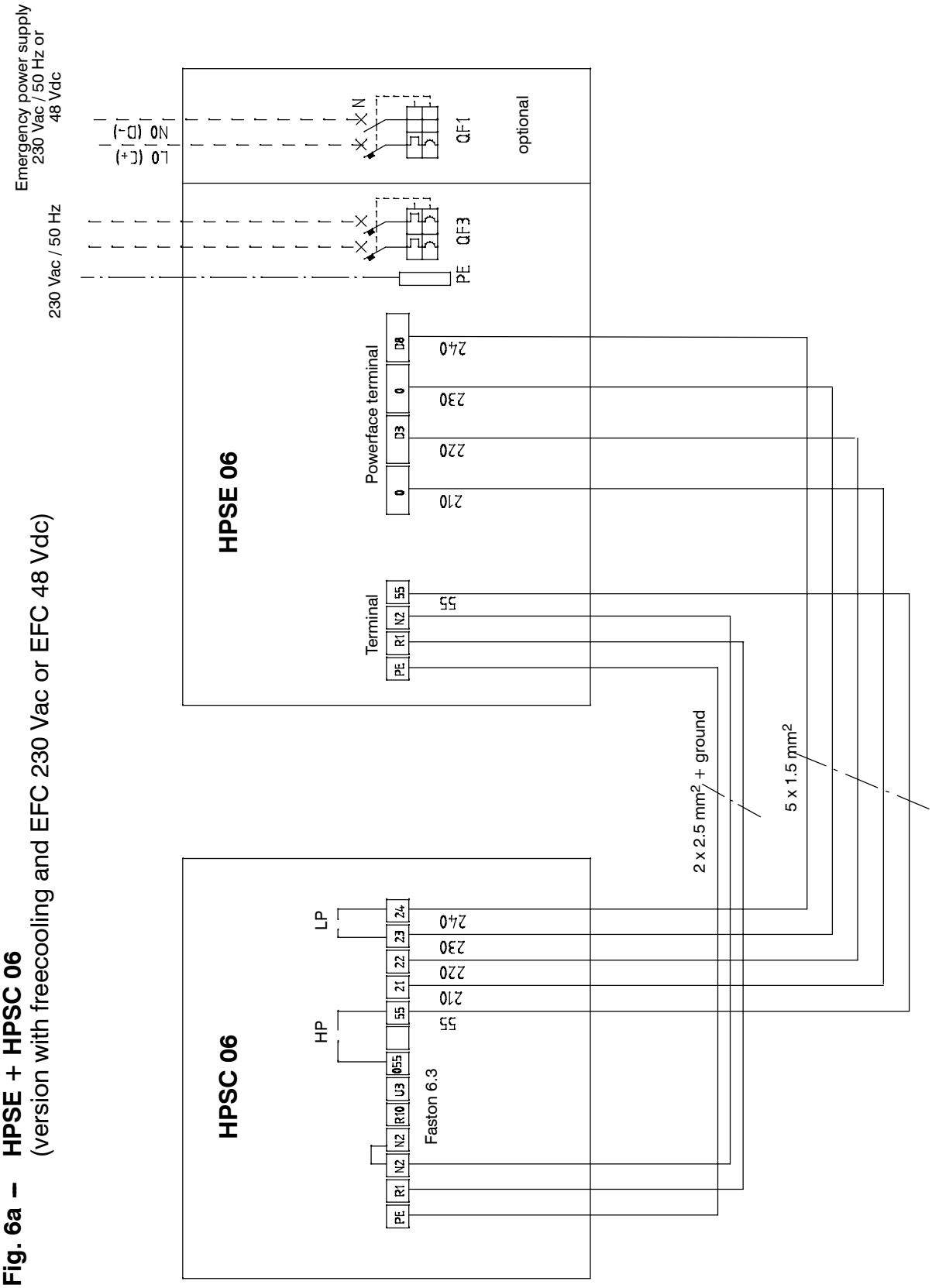


Fig. 6b – HPSE + HPSC 08–10–12–14
(version with freecooling and EFC 230 Vac or EFC 48 Vdc)

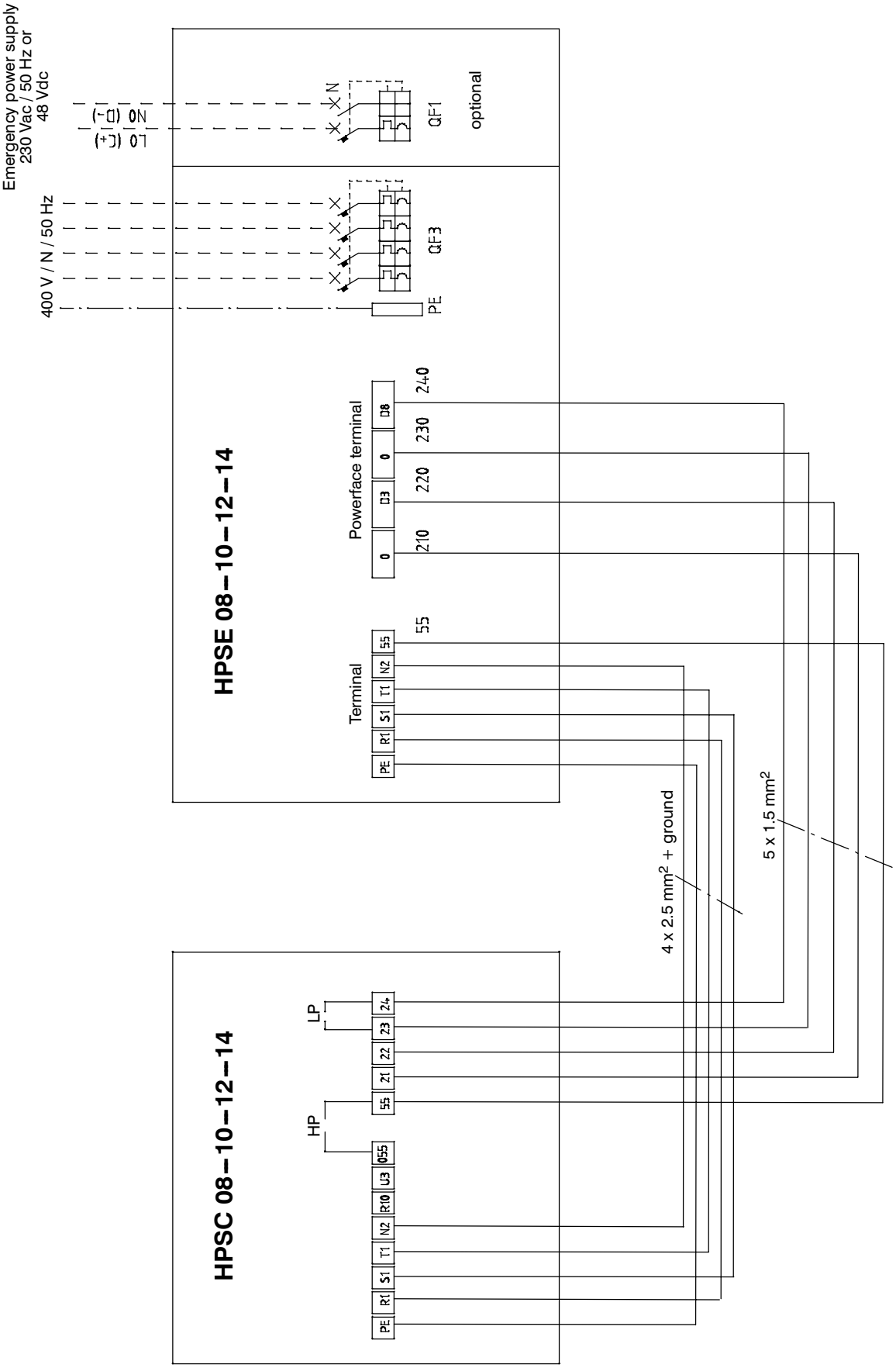


Fig. 7 – Connections of the display and of the alarm board HPSE (optional)

Fig. 7a – HPSE 06–08–10–12–14
(version without freecooling or in version EFC 230 Vac)

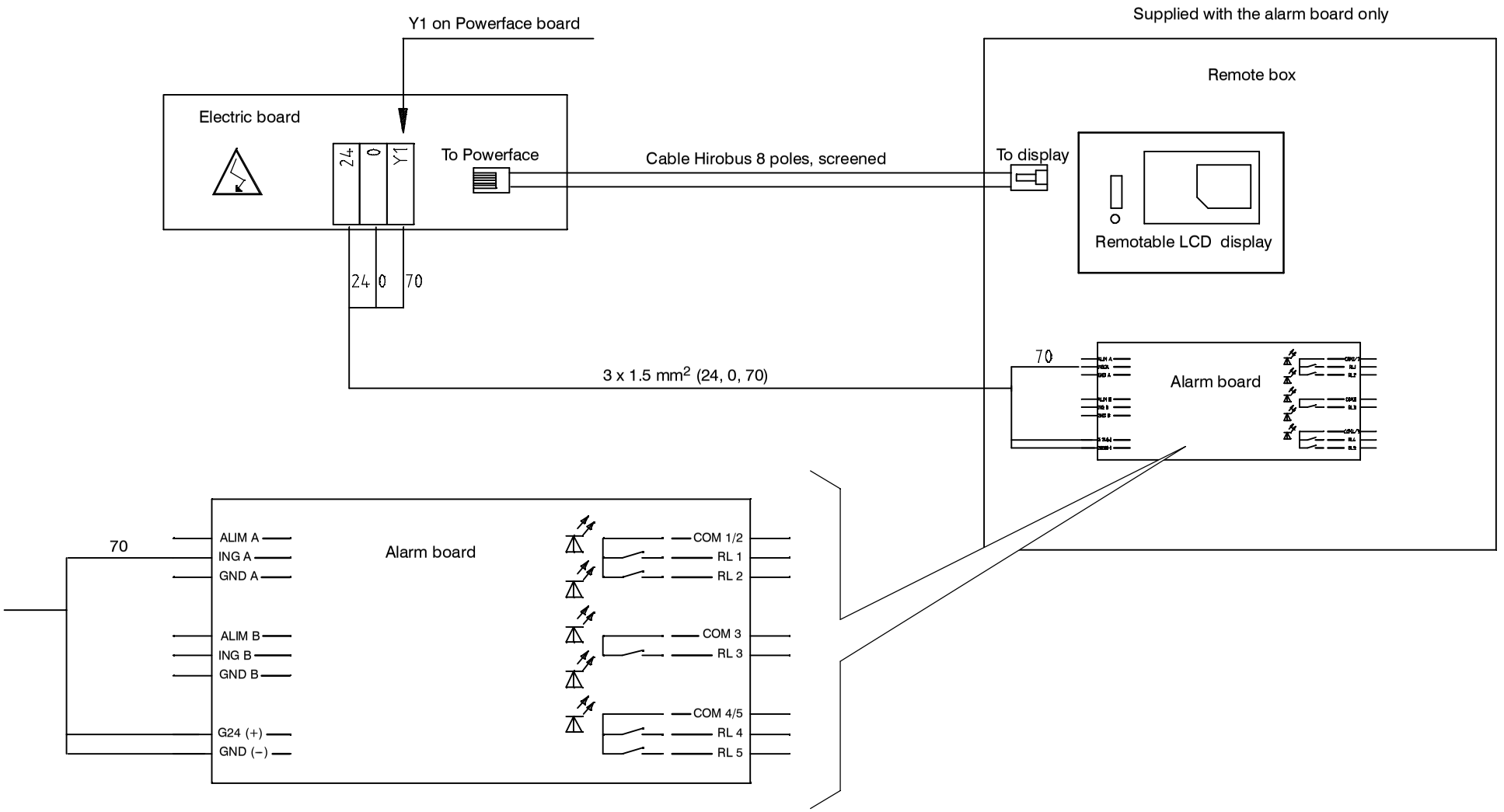


Fig. 7b – HPSE 06–08–10–12–14
(version without freecooling or in version EFC 48 Vdc)

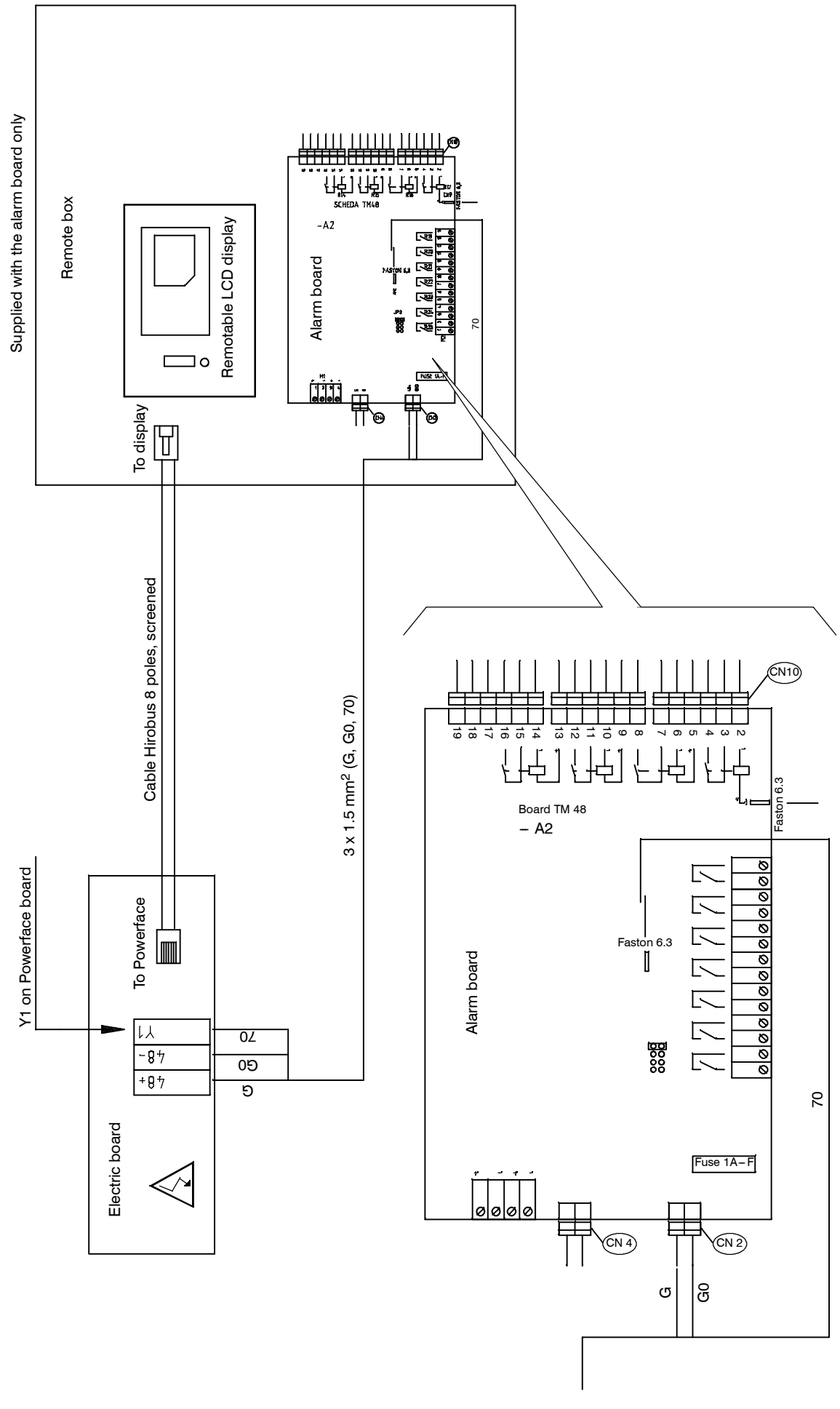
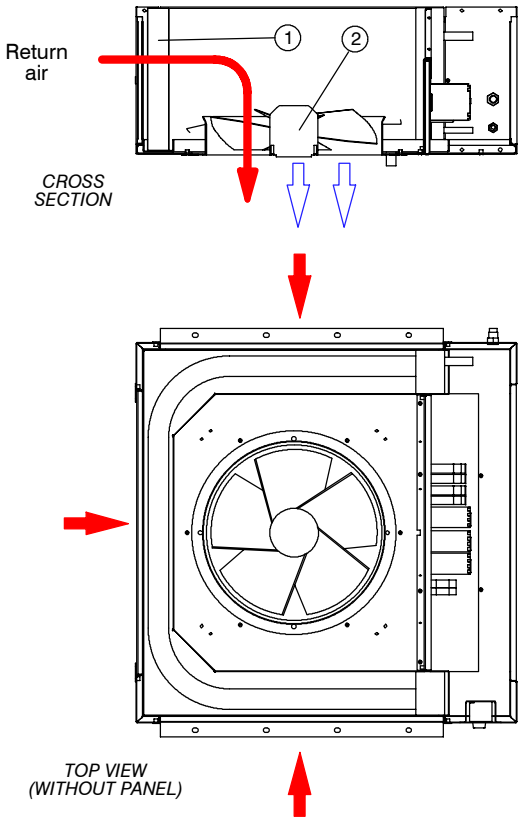
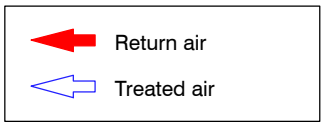


Fig. 8 – Operating diagram

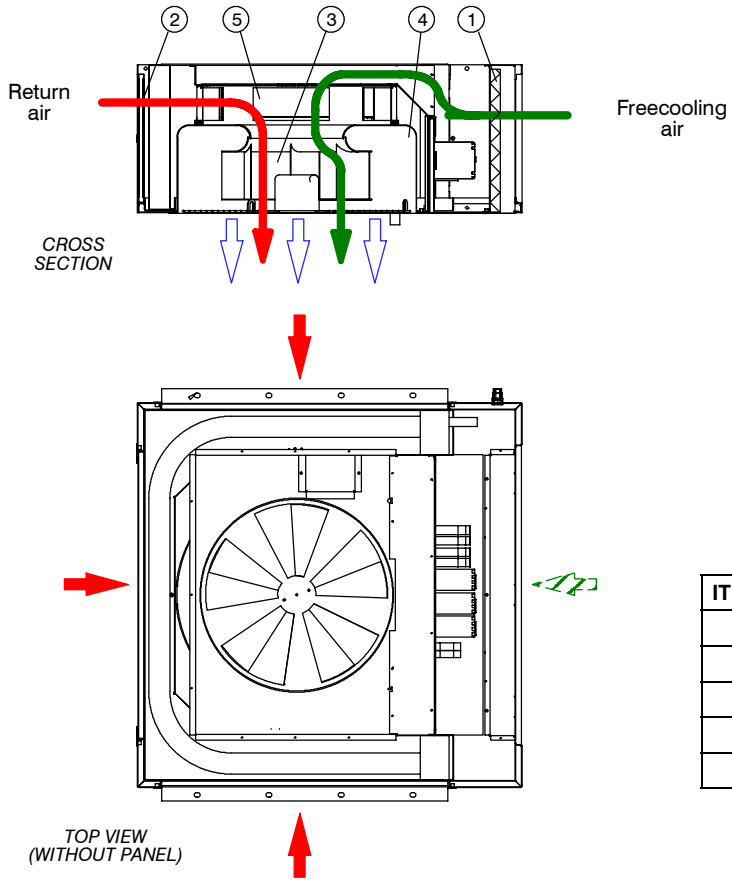
Fig. 8a – **Operating diagram** (without freecooling)

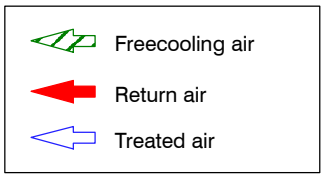




ITEM	DESCRIPTION
1	Evaporating coil
2	Fan

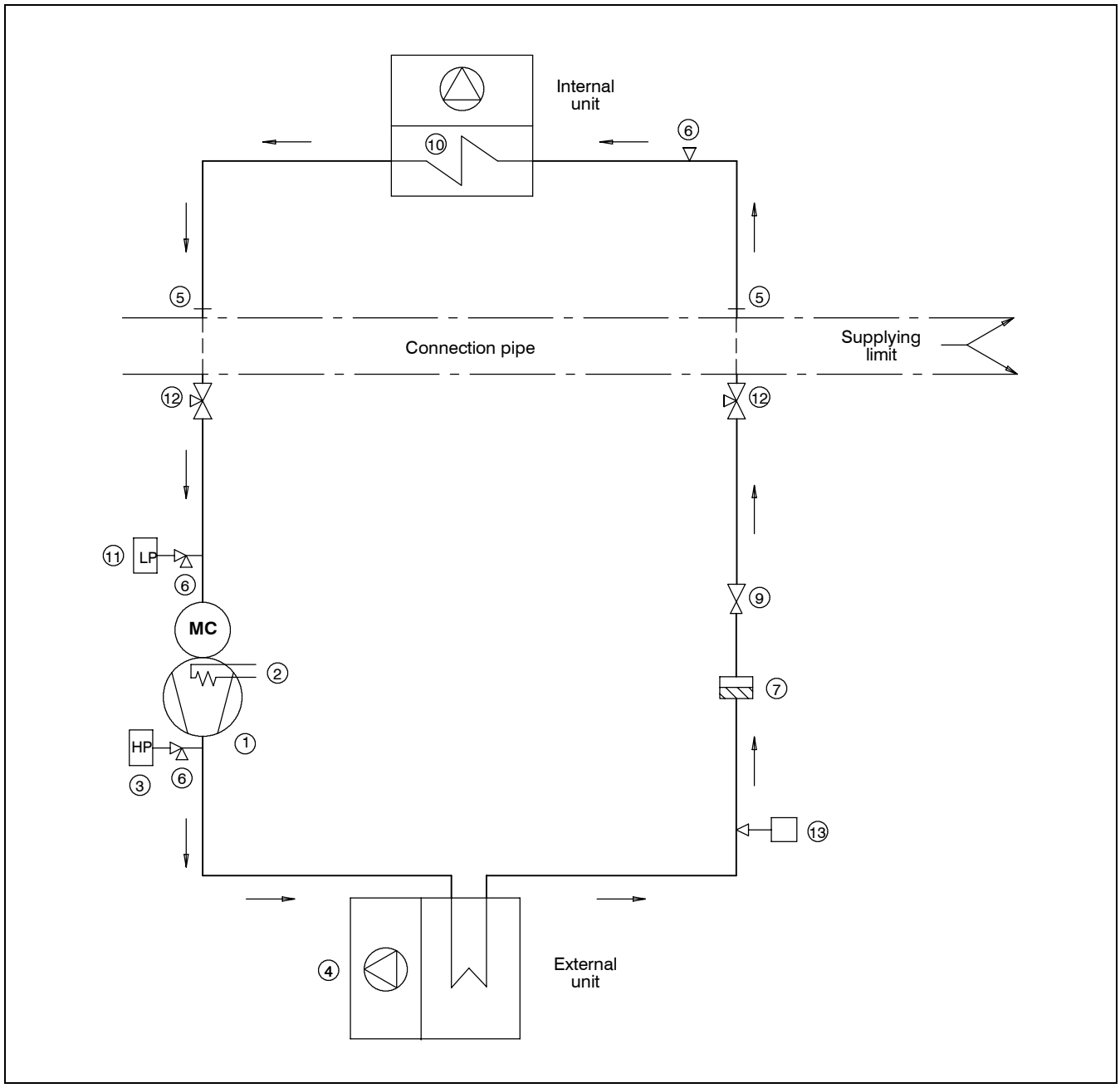
Fig. 8b – **Operating diagram** (with freecooling)





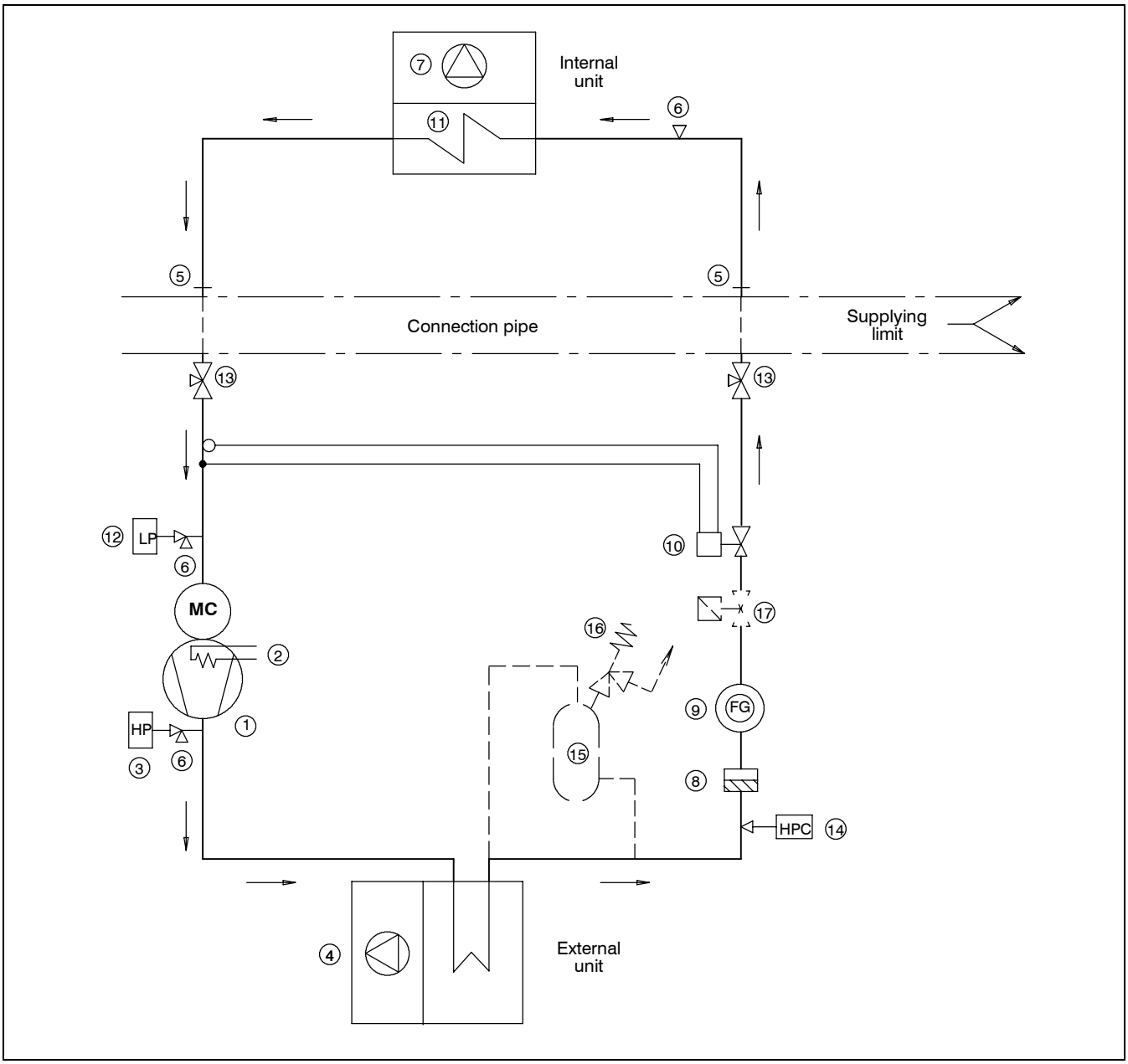
ITEM	DESCRIPTION
1	Fresh air filter
2	Evaporating coil
3	Fan
4	Fan nozzle
5	Freecooling damper

Fig. 9 – HPS 06–08 (HPSCxx0) – Refrigerating diagram



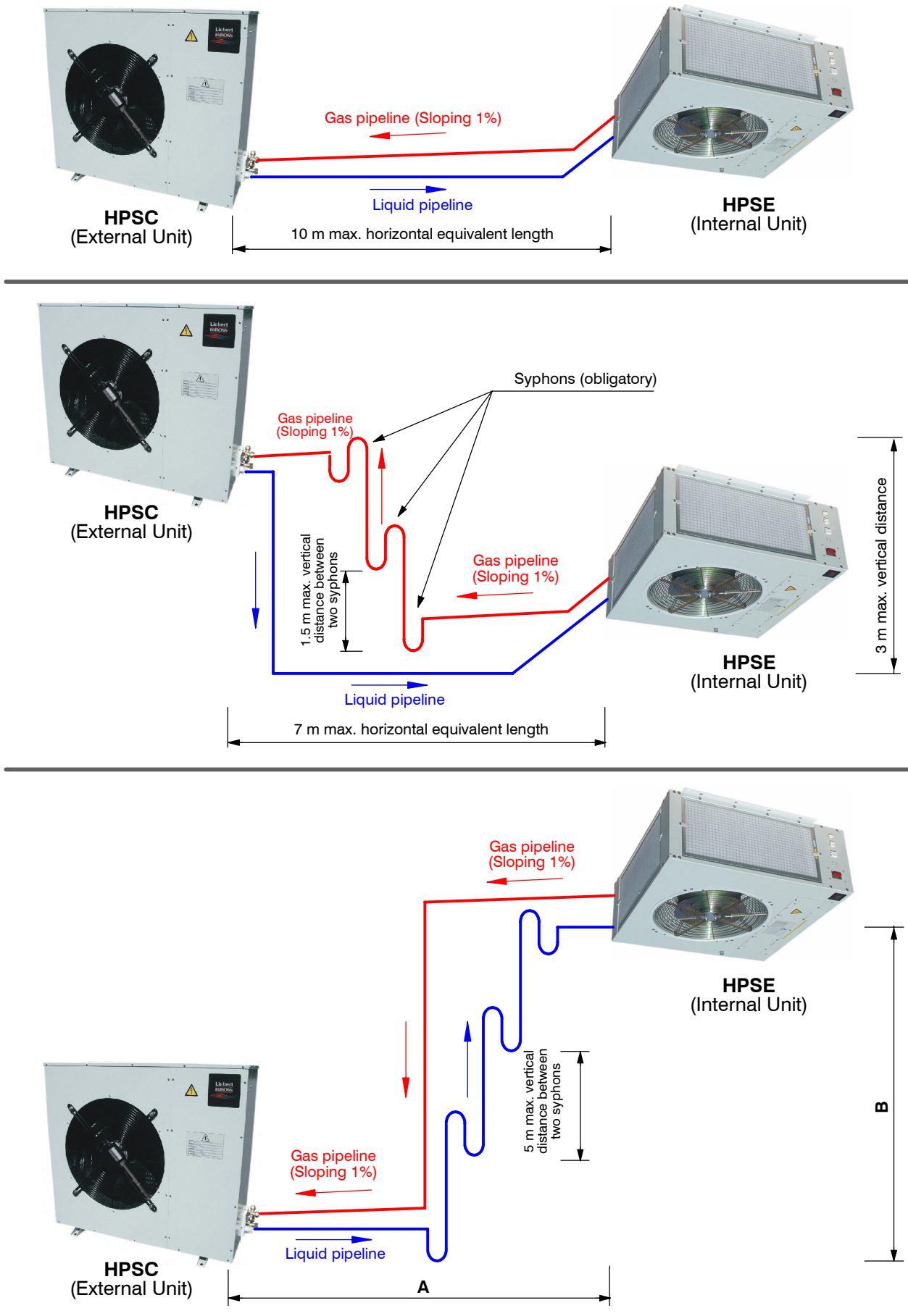
ITEM	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Weld joint
6	Access valve
7	Filter dryer
8	–
9	Expansion capillary
10	Evaporator
11	Low pressure switch (LP)
12	Shut–off valve
13	On–Off fan pressure switch

Fig. 10 – HPS 06–08–10–12–14 (HPSCxxA/L) – Refrigerating diagram



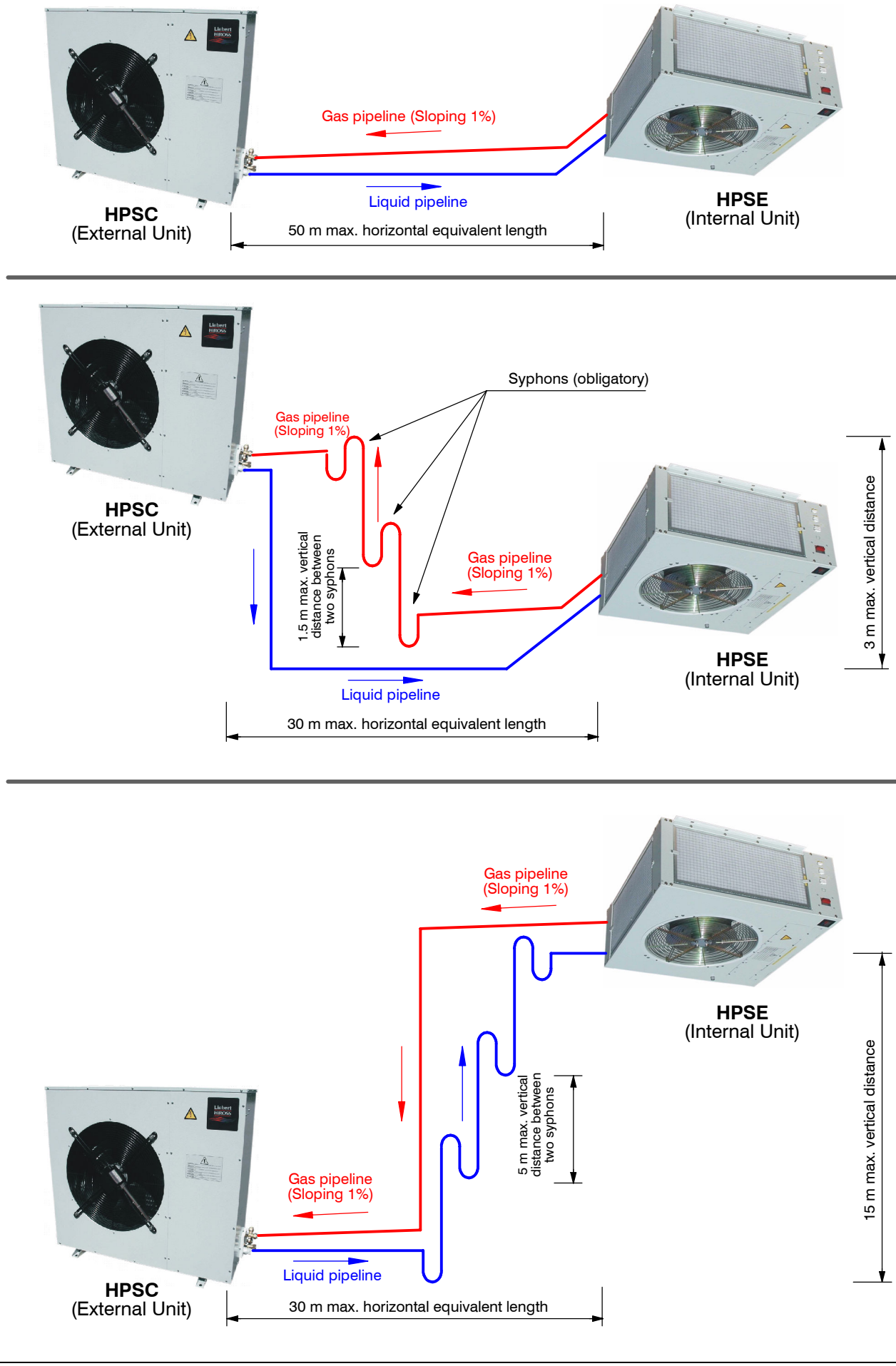
ITEM	DESCRIPTION
1	Compressor
2	Crankcase heater
3	High pressure switch (HP)
4	Air cooled condenser
5	Weld joint
6	Access valve
7	Evaporator fan
8	Filter dryer
9	Sight glass (FG)
10	Thermostatic expansion valve
11	Evaporator
12	Low pressure switch (LP)
13	Shut–off valve
14	Fan pressure switch control
15	Liquid receiver (Opt.–"L" Digit)
16	Safety valve (Opt.–"L" Digit)
17	Shut–off solenoid valve (Opt.–"L" Digit)

Fig. 11 – Suggested refrigerant connections (HPSCxx0/A + HPSE)



NOTE:
Max. equivalent length for refrigerant line **A** + **B** = 10 m

Fig. 12 – Suggested refrigerant connections (HPSCxxL + HPSE)



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