



DIRECT-EXPANSION DOWNFLOW AIR CONDITIONING UNITS

BDA - BDW - BDG

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Before using the unit, read this manual carefully
and keep it in a safe place for future reference

IMPORTANT SAFETY NOTICE

This unit is built to perform the functions for which it was designed without risk as long as the installation, operation and maintenance of the unit are all carried out according to the instructions in this manual and on the labels on the unit.

This unit contains refrigerant gas circuits under pressure, live electrical components, hot surfaces, sharp edges (such as the coil) and rotating devices such as the fans. **Before accessing the inside of the unit, disconnect it from the electrical power supply.**

All service and maintenance operations must be performed when the unit is off and must be done by qualified and experienced personnel who are aware of the necessary precautions.

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QUICK GUIDE

IMPORTANT: the description of the Control System and the operating logic of the unit is contained in the Control System Instruction Manual.

STARTING THE UNIT

Connect the power supply to the electrical panel of the unit: **close the main unit switch IG**, arm the **IM** automatic switch on the auxiliary circuit, switch on the power supply and check that: the yellow LINE LED (on the mP3 control panel or the mP20 circuit board) is on

- **(Only for models BD* 2002 and 2402)**

Do not start the unit for at least 12 hours to allow the preheating element to evaporate any liquid refrigerant which may have accumulated in the compressor crankcase: therefore do not press the  button on the mP3 control (or the  button on the mP20 control).

- **At least 12 hours** after turning on power supply:

- **set** all the automatic circuit breakers on the electrical panel;

- **open** all shut-off valves on the refrigerant circuits;
- **start** the unit by pressing the  button on the mP3 control (or the  button on the mP20 control): after a short delay the fans will start and the "SYSTEM ON" green LED on the control panel will come on.

- **If there is an alarm**, shown by the red "ALARM" LED on the control panel with an audible warning, consult the control panel instruction manual.

IF THE UNIT DOESN'T START

If the unit doesn't start, check that:

- 1) the power supply to the electrical panel and to the auxiliary circuit transformer is on;
- 2) the 'AUX' and 'FANS' automatic switches on the auxiliary circuit and the fan motor are armed;

- 3) the fuse of the 24V auxiliary circuit is not blown; in units with the mP20 control, check the fuse on the circuit board (see instruction manual and circuit diagrams);

- 4) the control panel connectors are correctly inserted;

- 5) the yellow LINE LED (on the mP3 control panel or the mP20 board) is on.

INSUFFICIENT COOLING

(see also Problem Solving section)

If room temperature is too high 30 minutes after starting the unit, check that there is power supply to the electrical panel and that:

- 1) the electrical panel automatic circuit breakers are set
- 2) the control panel is not showing an alarm (see control panel instruction manual)
- 3) the room temperature set point is correct and the compressor is working

- 4) the fans are rotating in the correct direction

- 5) the air flow is not obstructed (see Air Distribution);

- 6) the heat load is not more than expected.

NB: in the event of a fault, call only qualified service personnel.

STOPPING THE UNIT

- **Stop** the unit by pressing the  button on the mP3 control (or the  button on the mP20 control): after a short delay the unit will stop and the green "SYSTEM ON" LED on the control panel will go off.
- **For long shutdown periods** it is advisable to disconnect the power supply and to open the switch on the electrical panel.

N.B.: on units with the mP20 control, the stop command can also be given by a supervision system or by automatic time band operation (see control manual).

REGULAR MAINTENANCE

(see also MAINTENANCE)

- **Check** that the values displayed on the control panel are normal;
- **Check** regularly that the air filters are not clogged; change the filters when the filter alarm comes on;
- **Check** the refrigerant charge in the sight glass (the presence of a few bubbles is normal);
- **Check** that the noise made by the unit is normal;
- **Check** the flow of condensate to the drain;
- **Remove** all foreign objects (leaves, seeds, dust, etc.) from remote condensers or external radiators with a jet of compressed air or water.

GENERAL CHARACTERISTICS

These characteristics refer to standard units and may change in the case of special or modified versions.

BD*		2002	2402	3002
Fans	Number	2	2	2
	Number of poles	4	4	4
	Direct driven fans	n.a.	n.a.	n.a.
	Belt driven fans	standard	standard	standard
	Nominal power (each.) -kW	2.2	3	3
Compressors	Number	2 / SCROLL	2 / SCROLL	2 / SCROLL
	Power absorbed (each) -kW	7.2	8.9	11.1
	Nominal power (ARI) -kW	9.0	11.2	13.4
Air filters	Number	3	3	3
	Front Dimensions -mm	750x680	750x680	750x680
	Thickness EU4 Filter (standard)	150	150	150
	Thickness EU5 Filter (optional)	300	300	300
Electric heaters	Total capacity -kW	18	18	24
	Number of elements	6	6	6
	Number of stages	3	3	3
Humidifier	Nominal steam production -kg/h	9.6	9.6	9.6
	Nominal absorbed power -kW	6.9	6.9	6.9

⁽¹⁾ Data refers to room conditions 24°C / 50% R.H. and condensation at 45°C.

n.a. = *not available*.

DATA PLATE

MODEL	SERIAL No.
POWER SUPPLY VOLTAGE	
CURRENT ABSORPTION OA FLA LRA KW TOTAL	
SAFETY DEVICE SETTINGS	
REFRIGERANT	

The data plate is in the electrical panel housing and shows:

- model and serial number of the unit
- power supply voltage, number of phases and frequency
- current absorption of individual components and the whole unit
- settings of HP and LP pressostats on the refrigerant circuit and of the safety valve;
- type of refrigerant

DIMENSIONS AND WEIGHTS

FIG. 1

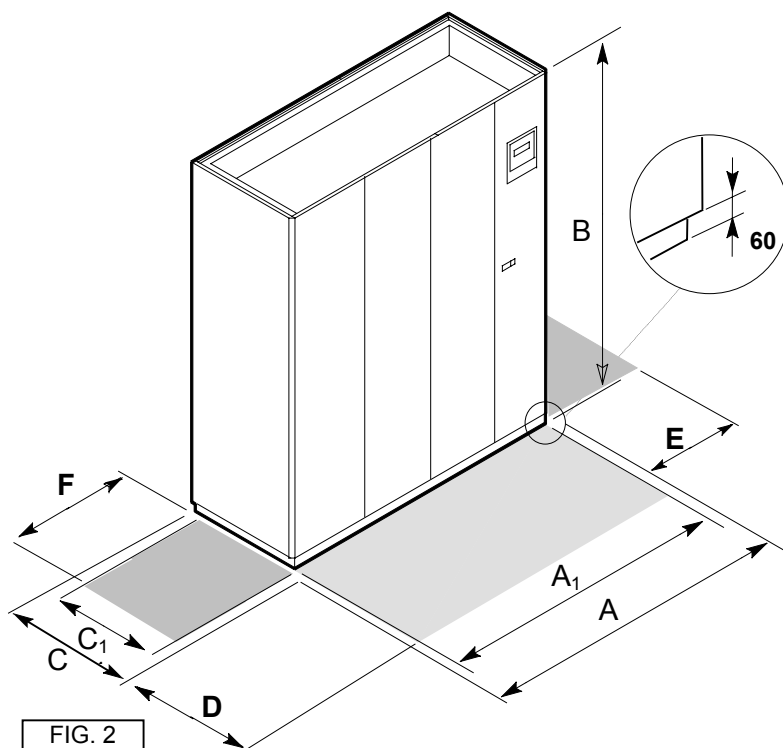


FIG. 2

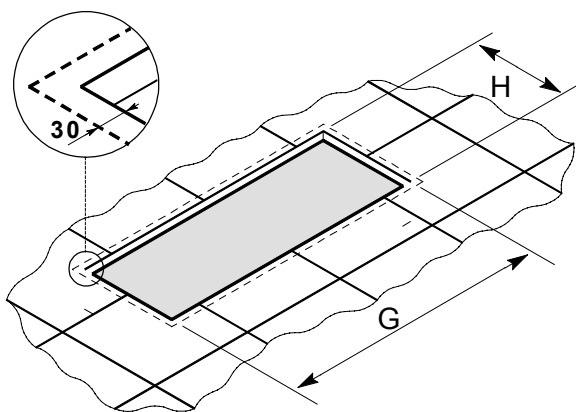
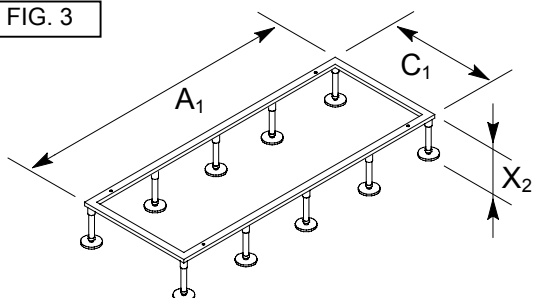


FIG. 3



BD*..	2002	2402	3002
A (mm)	2640	2640	2640
A1 (mm)	2600	2600	2600
B (mm)	1970	1970	1970
C (mm)	850	850	850
C1 (mm)	845	845	845
D (mm)	700	700	700
E *) (mm)	900	900	900
F **) (mm)	2500	2500	2500
G (mm)	2540	2540	2540
H (mm)	790	790	790
kg	850	880	930

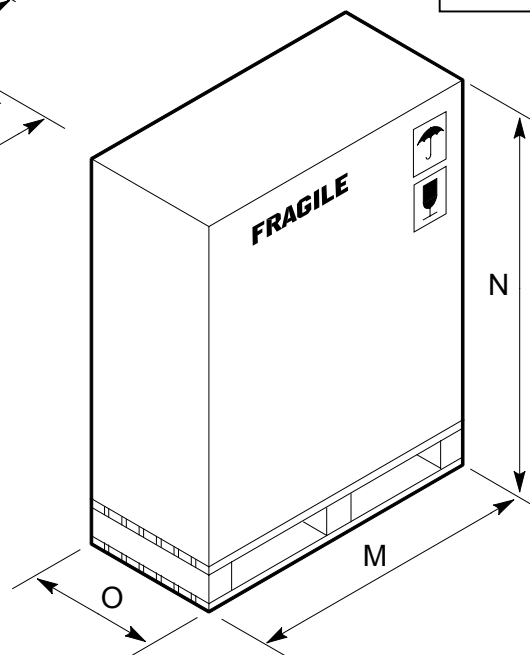
Unit weight without packaging

NOTE: Maximum tolerance on height B is 5mm (as per UNI 5307-63).

*) Free space for access to the compressors

**) Free space for coil replacement

FIG. 4



BD*..	2002	2402	3002
M	2710	2710	2710
N	2135	2135	2135
O	920	920	920
kg	900	930	980

Unit weight with packaging

TRANSPORT AND PREPARATION

RECEIPT OF THE UNIT

On receiving the unit, check that it is complete and in perfect condition; **notify the carrier immediately in writing of any damage** that might have been caused in transit.

TRANSPORT AND STORAGE

The unit **should not be turned on its back or upside-down, or exposed to the weather** and should be taken as near as possible to the installation location before removing the cardboard packing and the pallet.

The unit can be lifted:

- with a fork-lift, placing the forks in the appropriate slots of the pallet;

- with straps passed under the unit, making sure that they do not put pressure on the upper rim of the unit.

The unit must be stored, preferably in its packing, under cover and protected from excessive humidity (<90% R.H.) and temperature (< 50°C).

POSITIONING THE UNIT

The unit can be placed directly over the hole in the raised floor as indicated in *fig. 2*. to allow the free flow of treated air and the installation of water and electrical connections; before installation check that the floor has sufficient capacity to bear the weight of the unit (see Dimensions and Weights). **Fit a flexible gasket** to the perimeter of the base to avoid air leakage and transmission of noise and vibrations.

The unit must be perfectly level with a **maximum difference of 5 mm** between sides: an inclination could cause the condensate tray to overflow.

IMPORTANT: the unit must be installed in a closed environment and protected from adverse conditions.

BASE FRAME

To allow positioning of the unit before installing the raised floor and to dampen any vibrations, it is advisable to use a base frame, available as optional extra, whose dimensions are shown in *fig. 3*.

The height of the standard base frame, shown as **X₂**, is adjustable between 200 and 600 mm (±25 mm); other

heights are available on request. To avoid the transmission of vibrations, fit an elastic seal at least 5mm thick between the support frame and the floor panels; the frame must also be isolated from the floor structure.

WORKING SPACE

To facilitate maintenance, leave at least 700mm free space **in front of the unit** as shown in the diagram (*fig. 1. - D*).

With BDA units 1 metre free space must also be left clear to the right of the unit (*fig. 1. - E*) in order to allow access to the compressors for refrigerant charging and other maintenance operations.

Side access from **the left side** may be necessary in the unlikely event of coil replacement; leave around 2.5 metre free space for this purpose (*fig. 1. - F*).

AIR DISTRIBUTION

Treated air is delivered into the raised floor cavity and distributed through it into the room.

Since the cooling capacity of the unit depends on the air flow, pay particular attention to:

- space between the top of the unit and the ceiling**; a gap of less than 600 mm may affect the air flow rate;
- the hole in the raised floor under the unit**; a hole has to be made in the raised floor, as shown in *fig. 2*; the outlet section of the fans must not be even partially obstructed by portions of panels, stringers, pipes or other items;
- free air flow within the raised floor cavity**; the cavity under the raised floor must be sufficiently high (at least 200-250 mm not including the thickness of raised floor panels and stringers) and free from obstructions, especially near the unit;

- grilles and holes for air distribution in the room**; the air flows out of the floor through holes (for cooling of machines) or grilles (for cooling the room).

Air velocity at outlets should be between 1 and 2.5 m/s.

The total free area (the sum of the sectional areas of the holes and of the grilles) necessary for each model should be calculated dividing the total air flow rate (in m³/s: see the enclosed table) by the specified outlet velocity (in m/s).

The position and the total area of the holes and grilles should be adjusted according to the lay-out of the heat load and of the machines to be cooled.

IMPORTANT: Insufficient outlet area reduces airflow and the cooling capacity of the units.

NOMINAL AIR VOLUME (in m³/h)

STANDARD FANS

MODELLO: BD*...	20 Pa	50 Pa	75 Pa	100 Pa	125 Pa
2002	20500	19520	18630	-	-
2402	23020	22150	21380	20560	-
3002	24470	23675	22970	22230	-

HIGH POWER FANS (optional)

MODELLO: BD*...	100 Pa	125 Pa	150 Pa	200 Pa	250 Pa
2002	-	-	19660	17575	-
2402	-	-	21680	19890	-
3002	-	25470	24790	23330	21675

CONTROL PANEL

The unit is delivered with the control panel packed separately to prevent any damage during transport.

The packing containing the control panel is placed on.

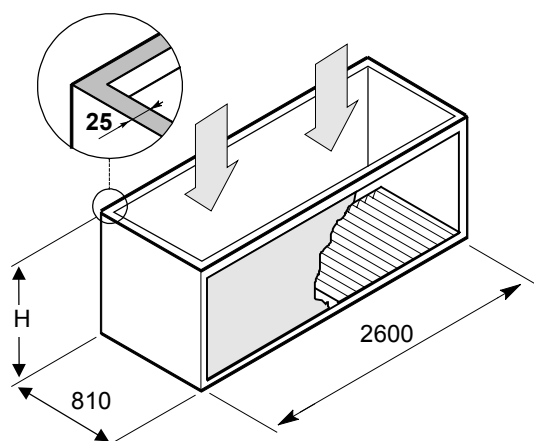
the right-hand side of the unit, inside the fan compartment For fitting see "Fitting And Connection Of Control Panel".

HIGH EFFICIENCY FILTER HOUSING

In order to conceal the high efficiency filters which are deeper than the standard type and therefore would protrude from the top of the unit, a special housing,

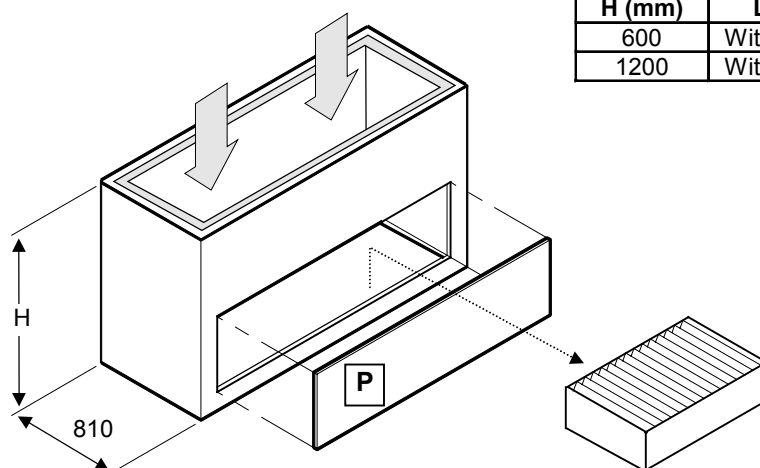
available as an optional extra, can be fitted on top of the unit. The 200mm-high housing does not allow front access for filter removal.

FIG. 5.a.



H (mm)	Intake Plenum
300-600	Without filter extraction door
600-1200	With filter extraction door

FIG. 5.b.



H (mm)	Low-noise intake plenum
600	With standard filters
1200	With high-efficiency filters

FIG. 6.

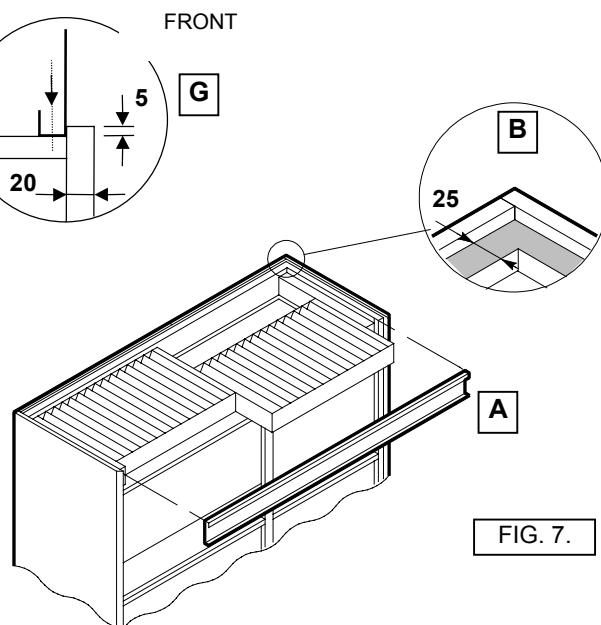
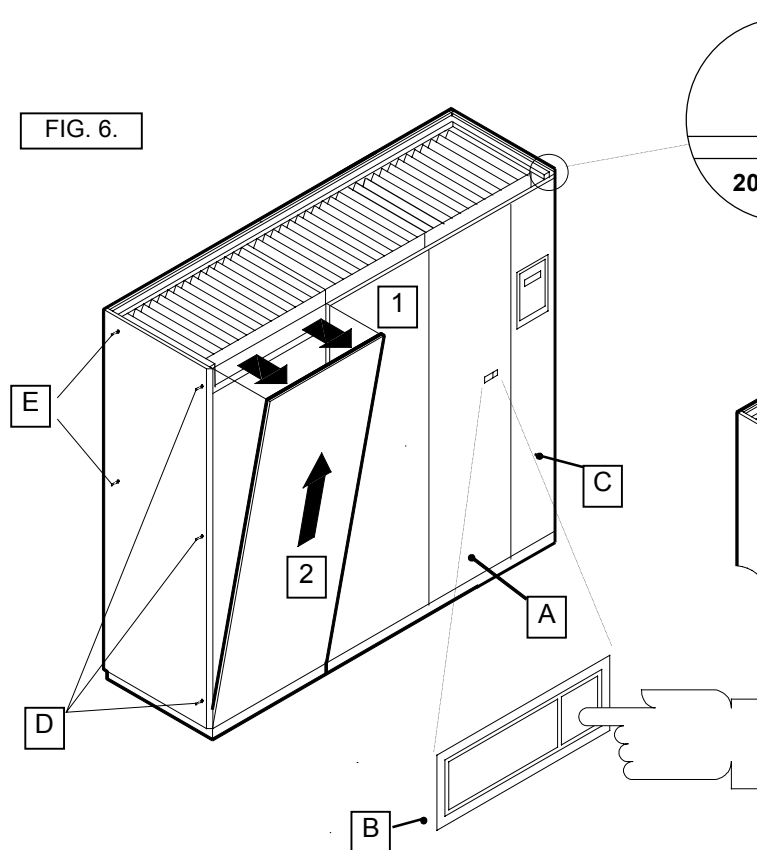


FIG. 7.

CONNECTION TO RETURN AIR DUCTS

The air intake can be connected via an optional plenum to the suspended ceiling or a return air duct

Figs. 5a and 5b show the return air intake plenum with main dimensions.

This plenum is available in a sound-absorbing version and with a removable front panel for removing the filter.

A range of heights is available depending on the application.

Plate **A**, available as an optional extra, is necessary to guarantee air tightness (see fig.7).

The edge necessary for fixing the return air extension hood is shown in detail **B**.

NB: if high-efficiency EU4 filters are fitted in a ducted unit, the ducting must have an inspection hatch at least 400mm high immediately above the unit to enable removal of the filters (see detail **P** in fig 5.b).

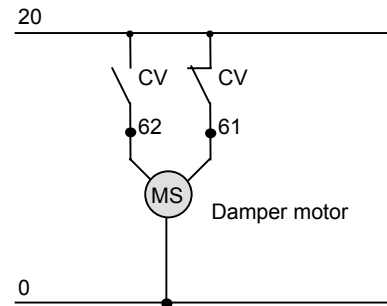
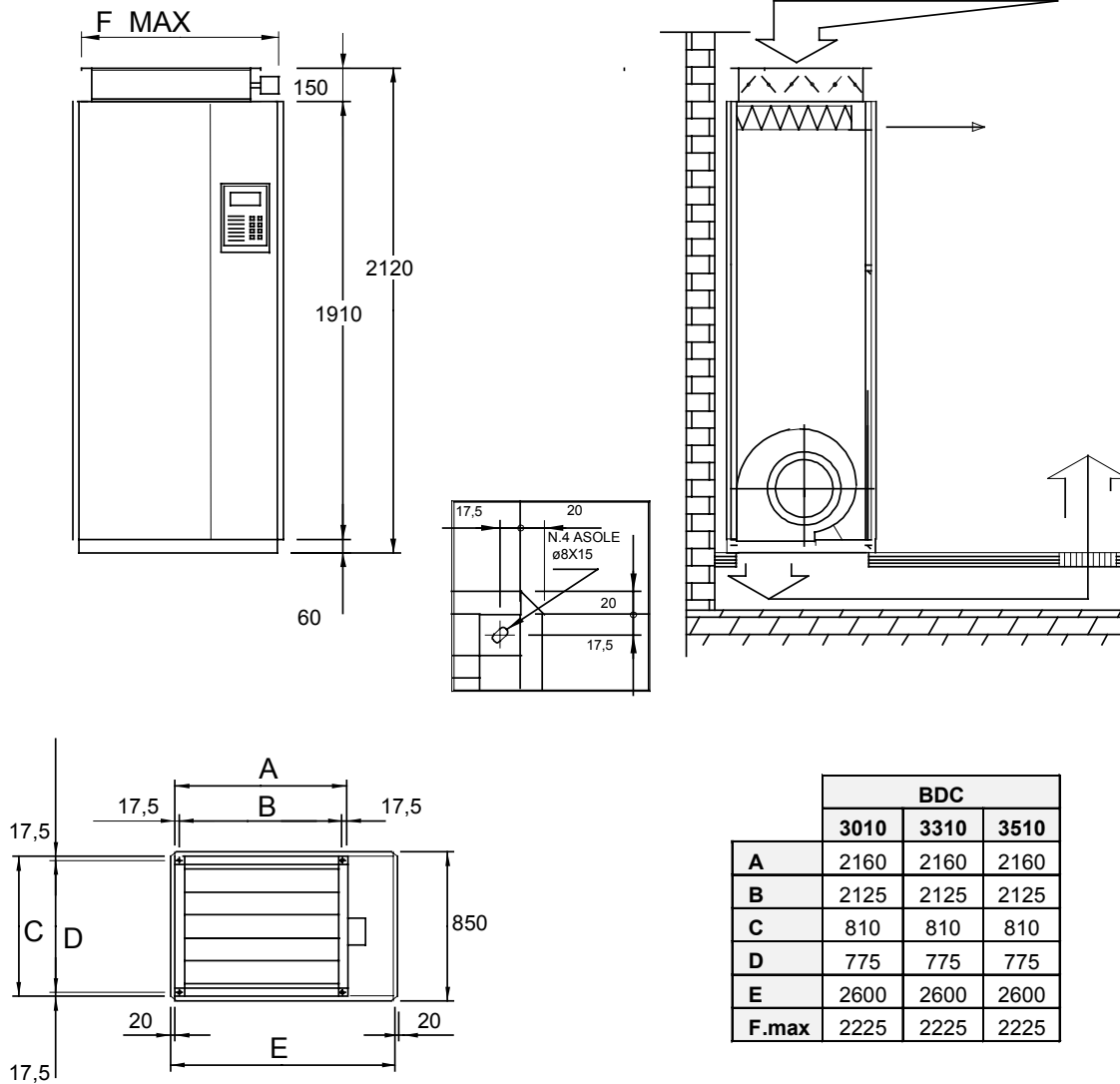


Fig. 8 shows the optional motorised intake damper. For electrical connections see electrical diagram SE OP....



OPTIONAL Motorised intake damper

FIG. 8.

ACCESS TO THE UNIT

OPENING AND REMOVAL OF PANELS

The unit is accessible on all sides by removing the covering panels (see *fig. 6*).

FRONT PANELS

Front panel removal does not require the use of tools.

The main panel **A** (*fig. 6*), is hinged and opens on release of handle **B** when pressed at the indicated point; this operation also frees the panel on the right side **C**.

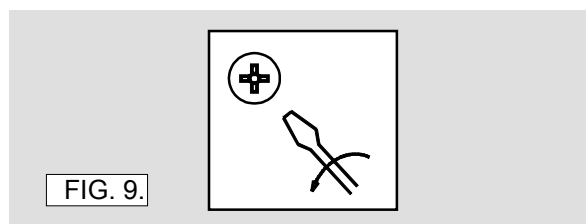
The locking pressure of the panel can be adjusted by means of the screw in the internal catch.

The remaining panels are engaged at the bottom and held to the front of the unit by spring-loaded catches; for removal, pull the top edge of the panel forward to release the catches (operation 1) and lift (operation 2). Do the opposite for assembly.

SIDE PANELS

These are fixed with five **internal** screws as follows:

- three screws **D** distributed on the front side uprights, accessible after removal of the front panels;
- two screws **E** on the rear uprights; the screws are marked with the symbol shown in *fig. 9*. and accessible at the bottom of the filter compartment (with the filters removed) and at the end of the fan compartment.



REAR PANELS

The rear panels are fixed with screws on each side.

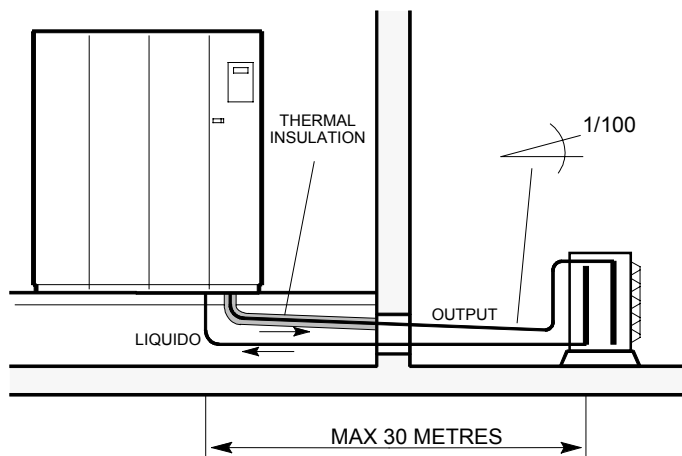


FIG. 10.a.

N.B.: liquid piping must be protected from the sun and other heat sources

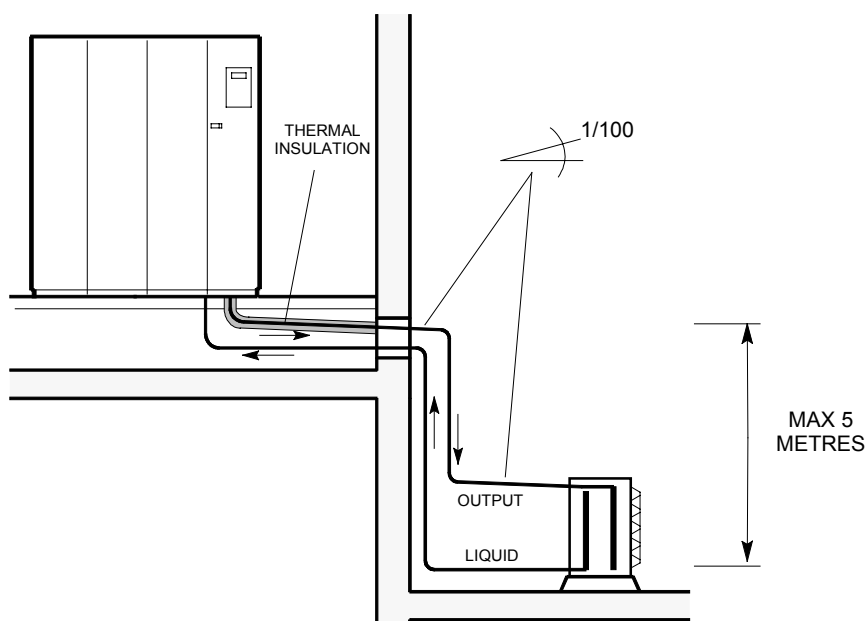


FIG. 10.b.

N.B.: liquid piping must be protected from the sun and other heat sources

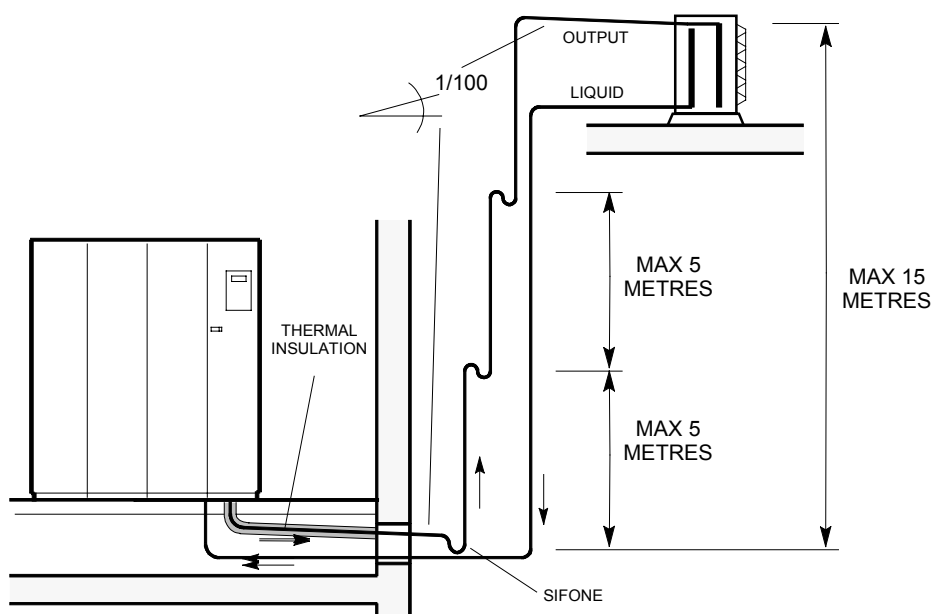


FIG. 10.c.

N.B.: liquid piping must be protected from the sun and other heat sources

REFRIGERANT CONNECTIONS

(air-cooled models - BDA)

Each refrigeration circuit must be connected to its remote air-cooled condenser with one copper pipe for the gas output and one for the liquid return.

The total length of the piping should not exceed 30 metres; it should be laid by an expert refrigeration engineer in accordance with *fig. 10.a. - 10.b. and 10.c.*

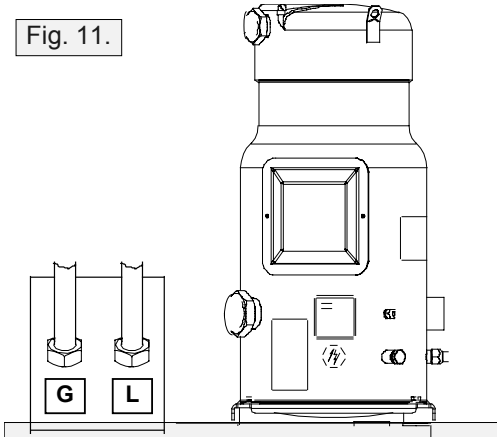
special attention should be paid to:

- insulating the hot gas pipes in the raised floor cavity;
- protecting the liquid refrigerant pipes from solar radiation or other heat sources.

The flare connections of each refrigeration circuit are placed at the end of the two non-return valves, on the right hand side of the respective compressor (see *fig. 11.*).

Sealant is used on the threaded compressor intake and output connections: AREXONS 35A42 for diameters up to 3/4" and AREXONS 35A72 for larger diameters.

REFRIGERANT CONNECTIONS (BDA units only)		TYPE
L	Liquid intake line	3/4"
G	Gas output line	3/4"



The table "REFRIGERANT PIPING: SUGGESTED SIZES" indicates the most suitable sizes for the discharge and liquid lines and for distances up to 30m.

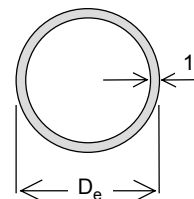
Fig. 12d shows the holes for the liquid **L** and gas **G** lines and the relative dimensions.

REFRIGERANT PIPING: SUGGESTED SIZES (mm) *

MODEL	2002	2402	3002
NUMBER OF LINES	2		

EQUIVALENT LENGTH UP TO 30 m

GAS DISCHARGE LINE	28 mm	28 mm	28 mm
LIQUID LINE	18 mm	18 mm	22 mm



* values given in the table refer to external diameter in mm; pipe thickness is 1 mm.

FIG. 12.a.

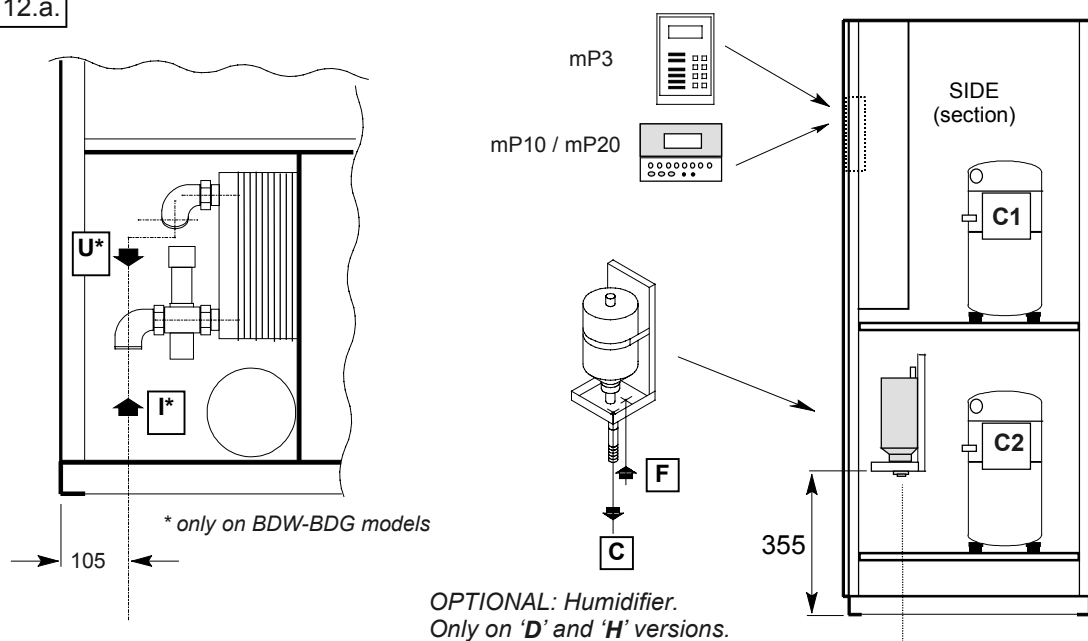


FIG. 12.b.

FIG. 12.c.

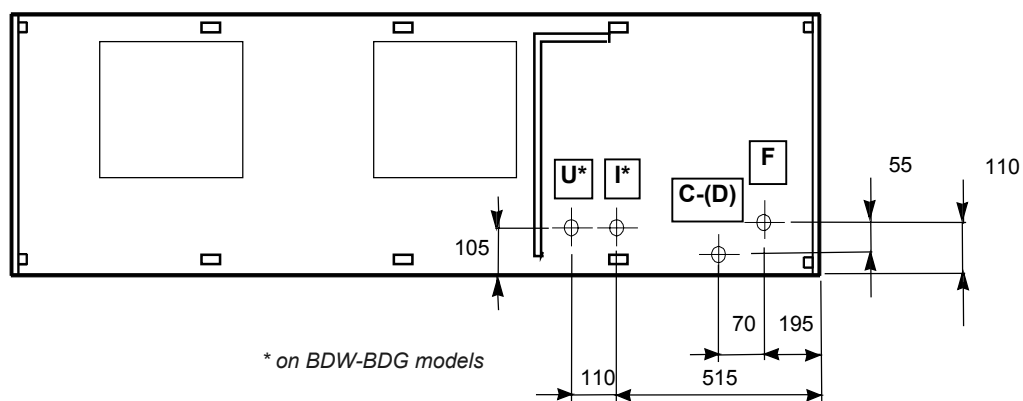
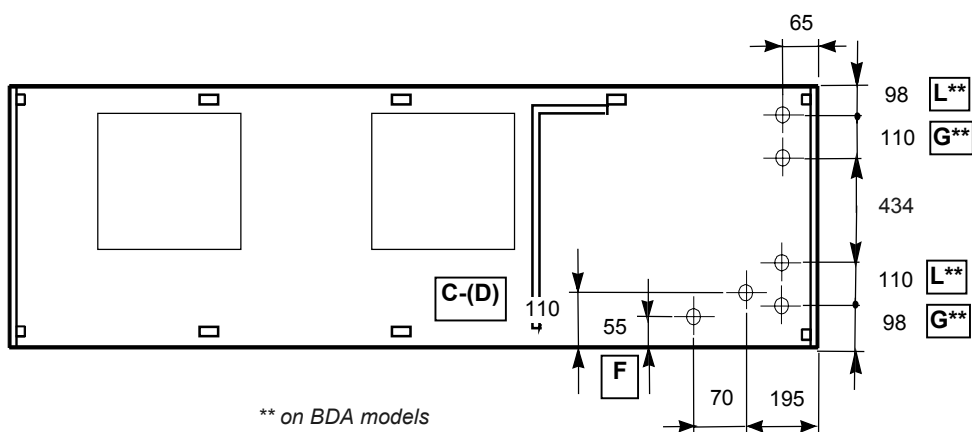


FIG. 12.d.



WATER CONNECTIONS

CONDENSATE DRAIN CONNECTION

During installation, the water drain (**D**) is connected to the building's waste water drain by means of a rubber or plastic tube with an internal diameter of 25 mm with a resistance to temperatures reaching 100 °C.

A siphon must be provided on the piping on the outside of the unit, to avoid that water levels can rise and overflow the condensate tray.

At the end of the siphon the pipe should have an inclination that is sufficient to provide water discharge (at least equal to 1%).

If used, the optional condensate pump should be placed at a lower level than the output connection; the pump head pressure must be sufficient to deliver the condensate to the drain.

If used, the optional condensate pump should be placed at a lower level than the discharge connection; the pump head pressure must be sufficient to deliver the condensate to the drain.

CONNECTION OF THE HUMIDIFIER

Connect the humidifier feed valve (fig. 12 **F**) to the building water main using the 6mm internal diameter flexible plastic pipe supplied with the unit and a shut-off valve.

The characteristics of the water supply must be within the following limits:

Characteristic	Minimum	Maximum
Mains pressure	1 bar	10 bar
Electrical conductivity at 25°C	125 µS/cm	1250 µS/cm
Impurity size	-	0.1mm

A mechanical filter with wire mesh size less than 50µm should be installed.

Do not use demineralized or softened water.

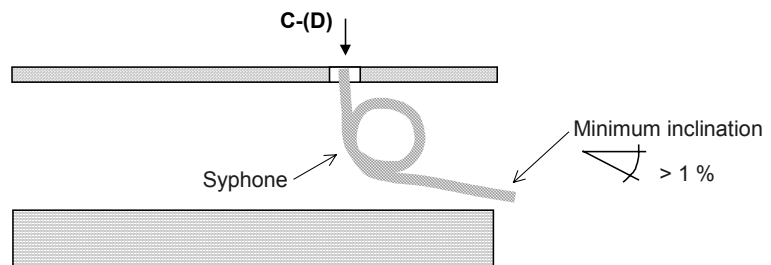
During installation, the humidifier drain (**C**) connection is connected to the building's waste water drain by means of a rubber or plastic tube with a resistance to temperatures reaching 100 °C.

A siphon must be provided on the piping on the outside of the unit, to avoid that water levels can rise and overflow the humidifier tray.

At the end of the siphon the pipe should have an inclination that is sufficient to provide water discharge (at least equal to 1%).

Further details regarding the humidifier are contained in the hp3 or mP20 control system instruction manual.

WATER CONNECTIONS (BDA - BD.W-G)		TYPE
C	Humidifier drain	Ø 25 mm
D	Condensate drain	Ø 25 mm
F	Humidifier supply	Ø 6 mm



CONDENSER CONNECTIONS (water-cooled models)

The water-cooled condenser of each refrigerant circuit (modello BDW oppure BDG) must be connected to the cooling water piping system, making sure that water flows into the condenser through the lower connection (fig.11a. point **L**) and leaves through the upper connection (point **U**).

Use:

- **flexible** pipes to avoid vibration transmission;
- **3 piece junctions** near the connections, to permit removal of the unit;
- **shut-off valves** to isolate the unit from the water circuit: if possible use full flow sphere valves to minimize pressure drop.

If the water temperature may drop below the dew point of the treated air, insulate the water pipes with closed cell insulating material (e.g. Armaflex or equivalent) to avoid condensation; insulation must allow access to valves and joints.

Seal the holes where the pipes pass through the base of the unit in order to avoid by-pass of air.

N.B.: the cooling water pressure should not exceed 1000 kPa (10 bar).

WATER CONNECTIONS (BD.W-G units only)		TYPE
I	Condenser water intake	2" G.f.
U	Condenser water outlet	2" G.f.

NOTES RELATING TO BDW UNITS (water in open circuit)

If the cooling water temperature is not regulated and may drop below 25°C, the use of a pressure operated water regulating valve (available as an optional extra) for each condenser is required; in this case the water pressure should not fall below 200 kPa (2 bar).

IMPORTANT: the use of an evaporating cooling tower without an efficient water treatment is not recommended since the scale build-up could rapidly clog the condensers.

NOTES RELATING TO BDG UNITS (water in closed circuit)

The condensers of BDG units are supplied with water pumped in closed circuit and cooled by external radiators; check the cooling water piping size and the circulating pump characteristics: insufficient water flow reduces unit performance.

The cooling water temperature should be controlled in order to maintain a minimum value of 28°C, i.e. with the system shown in *fig 13*.

This function is already provided on the mP20 control, measuring the water temperature with the optional sensor [A] and modulating the servomotor of the valve [B] or activating the fans [C] of the external radiators (see 'RAN/RAL' Instruction Manual).

If the cooling water temperature is not controlled, a full water flow head pressure control system (available as optional extra) should be fitted on each refrigeration circuit.

IMPORTANT: BDG units should operate with a mixture of water and ethylene glycol (containing passivating inhibitors to prevent corrosion) in proportion to the external minimum design temperature.

Percentage in weight of ethylene glycol	10%	20%	30%	40%	50%
Freezing temperature	-4°C	-10°C	-17°C	-25°C	-37°C

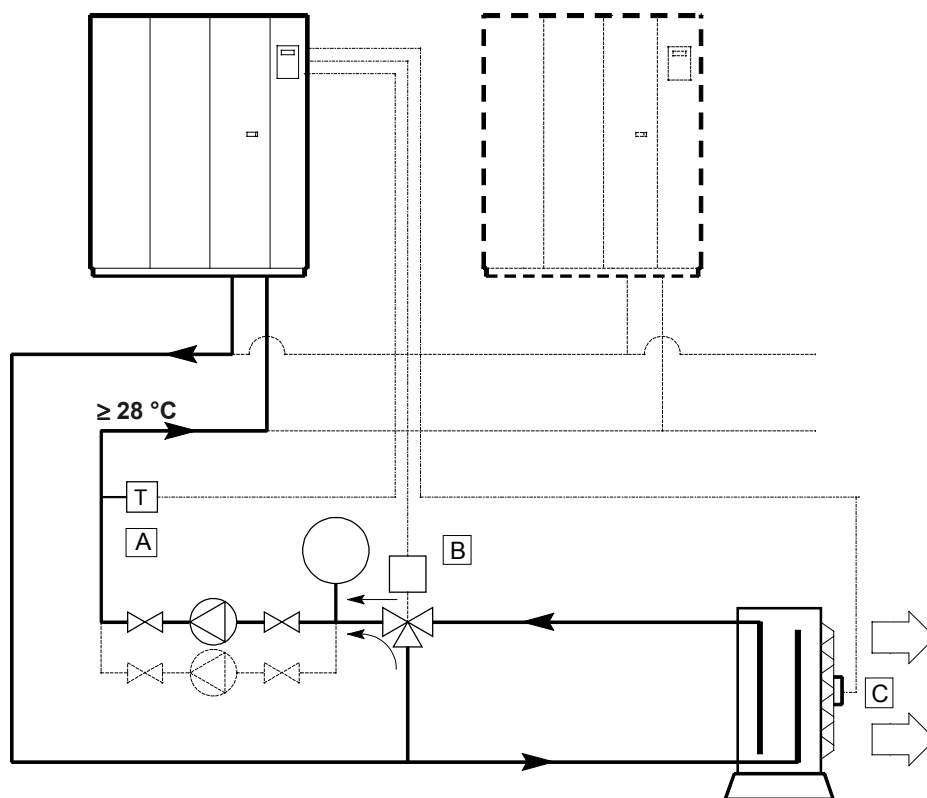
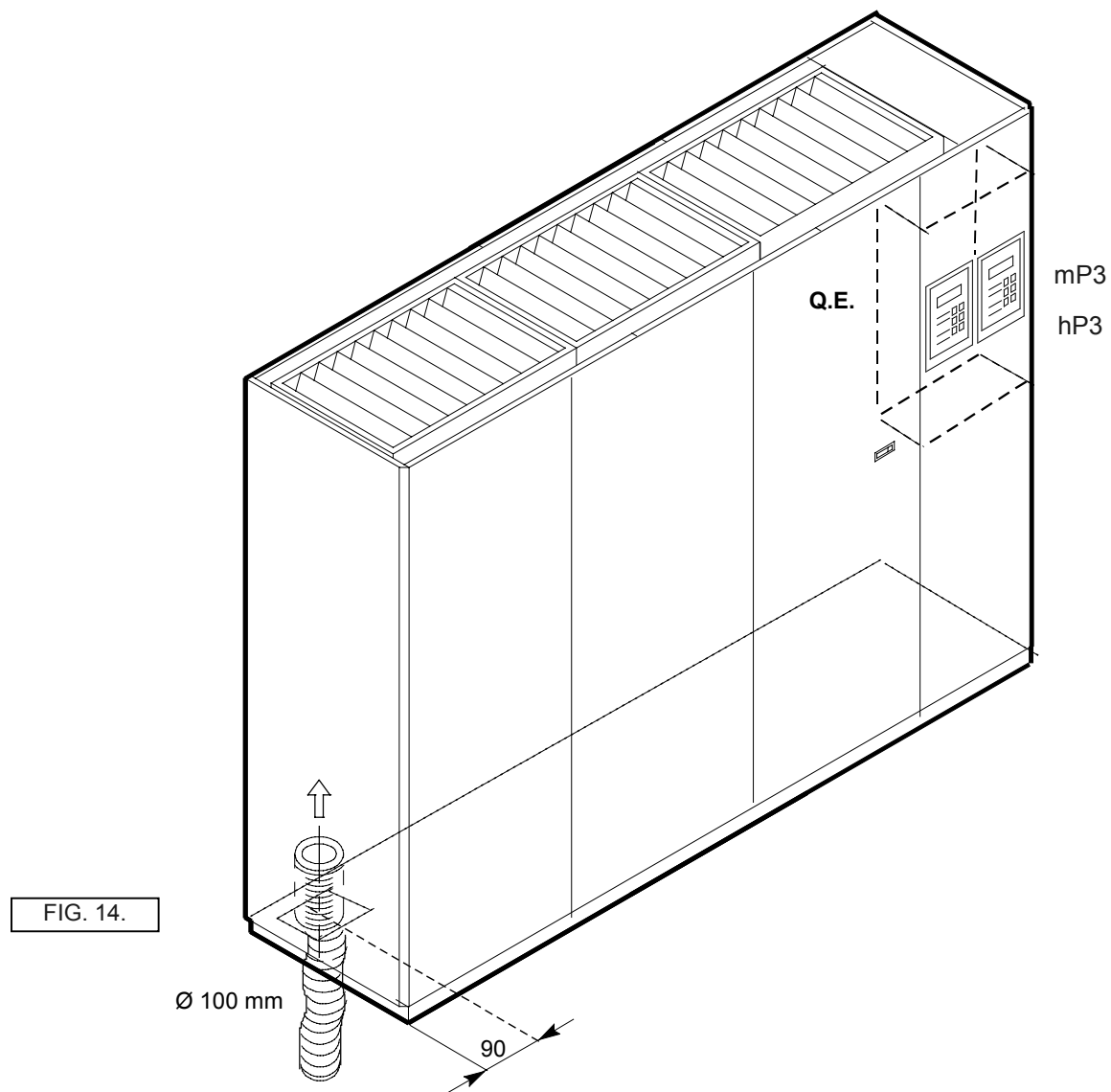


FIG. 13.



CONNECTION TO FRESH AIR INTAKE

(optional extra)

Connect the intake of the fresh air filter (see *fig 14*) to the nearest external air inlet with a flexible hose (Ø100mm minimum) following the shortest and straightest path. Secure the hose to the fresh air intake with a fastening collar.

ELECTRICAL CONNECTIONS – ROOM UNIT

Correct and accurate electrical connections, carried out in compliance with local regulations, are extremely important for the prevention of accidents and for ensuring long, trouble-free operation.

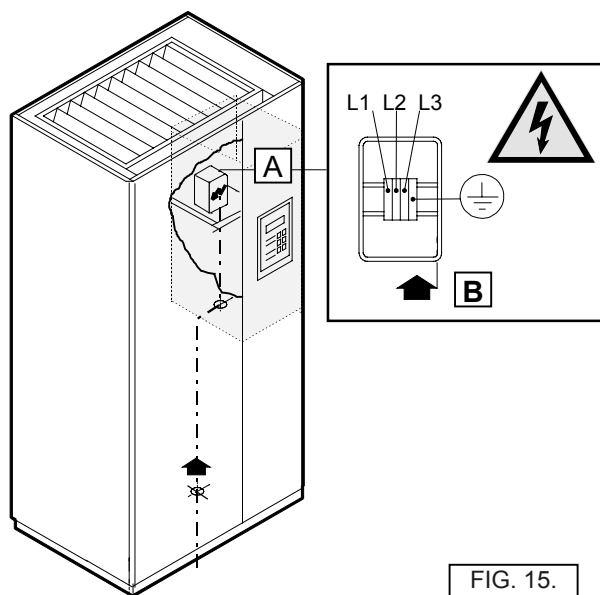


FIG. 15.

POWER CONNECTION

Before working on the electrical parts of the unit, make sure that the power is off and that the isolator switch on the electrical panel is open (position "O").

After checking that the mains voltage corresponds to the nominal data of the unit (voltage, phases, frequency) shown on the protective cover of the electrical panel, pass the electrical supply cable through the hole in the bottom of the unit and up to terminal box **A** (see fig. 15.) containing the terminals of the 3 phase wires and of the yellow-green earth wire (detail **B**).

Power supply voltage must be within $\pm 6\%$ of the nominal value. With tri-phase units the difference between the phases must be less than **2%**: unit operation with power supplies outside these limits may invalidate the guarantee

INSTALLATION AND CONNECTION OF THE CONTROL PANEL

The control panel should be fixed in the hole (in the two holes in the case of mP3+hP3 system) on the front left panel.

Fix the control panel(s) in accordance with the enclosed instructions and insert the cable connectors in the

respective slots without forcing them (see control panel instruction manual).

IMPORTANT: the connection of the control panel must always be carried out when the power is off (electrical panel switch in position "O").

ACCESS TO THE ELECTRICAL PANEL

The power section of the electrical panel, at mains voltage, is protected by a plastic cover.

To remove it:

- turn off the switch to release the cover lock;
- unscrew the four fixing screws.

INSTRUMENTS AND ALARMS

The unit is equipped with the following devices (see fig. 16):

- **STU Room temperature and humidity sensor**; made up of:
 - a) a NTC sensor on the mP3 control plus a humidity sensor on the hP3 panel (if fitted);
 - b) a single combined sensor in the units equipped with mP20 panels;
- **FS Air flow sensor** differential pressure switch in the electrical panel
- **AP High pressure switch** with a manual reset button in the compressor housing
- **BP Low pressure switch** in the compressor housing
- **PFS Dirty filter sensor** differential pressure switch in the electrical panel
- **TSR Electric heater safety thermostat** with manual reset button in the electrical panel

The following optional instruments can be connected to the microprocessor control (see fig. 16.):

- **Under floor flooding detector** consisting of:
 - a) **SAS device** inserted in the appropriate socket of the electrical panel;
 - b) **RAS sensor** (or sensors, connected in parallel) installed at the points to be monitored;
- **ATA and BTA High/low room temperature sensors**: to be installed close to the unit;
- **AUA and BUA High/low room humidity sensors**: to be installed close to the room unit
- **SFF Fire and smoke sensors**: to be installed in the room or under the raised floor, in a low air-speed zone.

The following optional instruments can be connected to units with mP20 panel (see mP20 instruction manual):

- **External air temperature** sensor (read-only): to be installed outdoors, in the shade;
- **Closed circuit water temperature** sensor (for reading and control of water and glycol supply temperature): to be inserted in a pocket on the water supply pipe to the unit;
- **Hot water temperature** sensor (for reading and control of hot water reheating): to be inserted in a pocket on the hot water supply pipe to the unit;
- **Air delivery temperature** sensor (for monitoring and regulation of the room unit cooling capacity as a function of the air delivery temperature): to be installed downstream of the fan outlet.

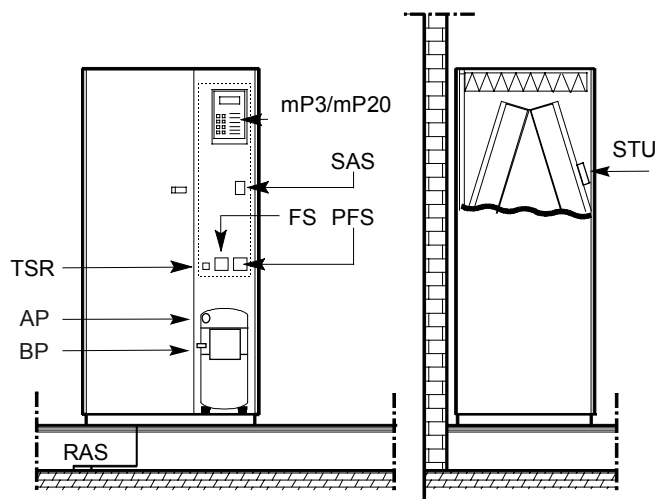


FIG. 16.

REMOTE CONTROL

Every unit is equipped with a volt-free contact for remote signalling of alarm conditions.

The mP3 control panel can be connected to a remote control and monitoring system. It can:

- be started and stopped from a remote control system by the addition of an optional extra ancillary relay **R1** which must be fitted as shown in *fig 17*;
- transmit a general alarm signal to a remote location using the standard changeover relay in the control.

For more details on the above, check the unit wiring diagram and the control panel instruction manual.

mP20 controls feature as standard the automatic management of two units, one operating and one in stand-by, without the need for additional devices. To enable this, connect terminals **NC10-C10** on the 2nd level alarm relay on the first unit to remote control terminals **20-50** on the second unit, and vice versa. The electrical diagram included with the unit shows the terminal for the interconnection of the units

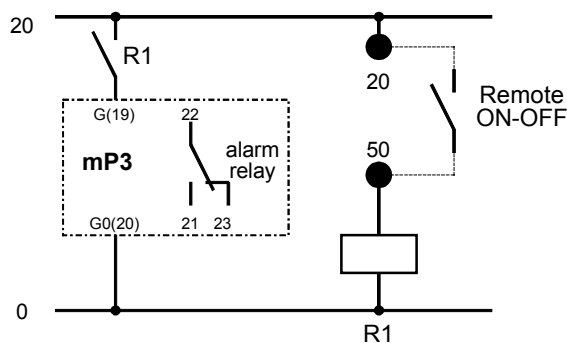


FIG. 17.a.

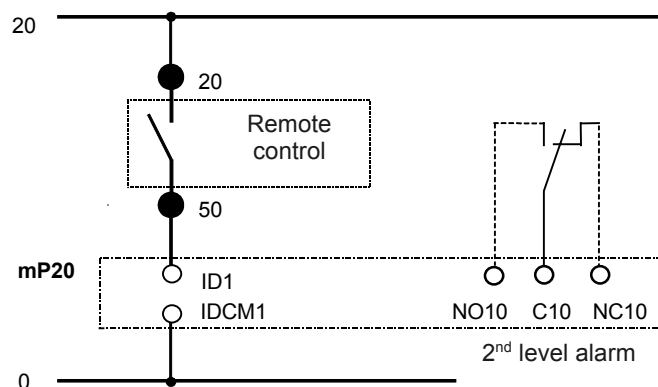


FIG. 17.b.

ELECTRICAL CHARACTERISTICS

COMPONENTS

COMPLETE UNIT

		BELT DRIVE FANS					HERMETIC COMPRESSORS					ELECTRIC RE-HEAT			ELECTRODE HUMIDIFIER		UNIT VERSION (c)							
		(a)					(a)										C		T		D		H	
MODEL	VOLTAGE	No.	kW	OA	FLA	LRA	No.	kW	OA	FLA	LRA	No.	kW	OA	kW	OA	kW	OA	kW	OA	kW	OA	kW	OA
BD* 2002	400V/3ph/50Hz	2	2.2	4.0	5.2	26	2	9.0	16.1	18.9	127	6	3	13.0	6.9	10.0	22.4	40.2	22.4	40.2	29.3	50.2	31.4	50.2
BD* 2402	400V/3ph/50Hz	2	3.1	5.5	6.9	35	2	11.2	20.3	23.5	159	6	3	13.0	6.9	10.0	28.6	51.6	28.6	51.6	35.5	61.6	35.5	61.6
BD* 3002	400V/3ph/50Hz	2	3.6	6.8	6.9	35	2	13.3	22.2	25.2	190	6	4	17.4	6.9	10.0	33.8	58	33.8	58	40.7	68	44.5	70.6

LEGEND

kW: nominal power;

OA: nominal operating current;

FLA: full load current;

LRA: locked rotor current;

VERSION C: cooling only;

VERSION T: cooling + electric heating;

VERSION D: cooling + humidity control;

VERSION H: cooling+el. reheat.+hum. control.

NOTES

(a): data refers to each element;

(b): single phase at 220 or 240V

(c): maximum simultaneous consumption on the most heavily loaded phase in normal operating conditions

RECOMMENDED SIZES OF POWER SUPPLY CABLES AND LINE FUSES

MODEL	UNIT - VERSION C		UNIT - VERSION T		UNIT - VERSION D		UNIT - VERSION H	
	LINE	FUSES (a)	LINE	FUSES (a)	LINE	FUSES (a)	LINE	FUSES (a)
BD* 2002	4x10+10PE	63A	4x10+10PE	63A	4x16+16PE	80A	4x16+16PE	80A
BD* 2402	4x16+16PE	80A	4x16+16PE	80A	4x16+16PE	80A	4x16+16PE	80A
BD* 3002	4x16+16PE	80A	4x16+16PE	80A	4x25+25PE	80A	4x25+25PE	80A

ELECTRICAL CONNECTIONS – REMOTE CONDENSERS

The remote air-cooled condensers are electrically independent since the fan motors are operated by their own pressure sensors: it is therefore possible to connect the condensers (with single phase 220-240 V

in the standard version) to the nearest power supply socket, even independently of the unit. (See remote condenser instruction manual)

START-UP AND TESTING

EVACUATION OF REFRIGERANT LINES

(BDA air-cooled models)

Create a vacuum in the refrigerant lines and the remote condenser; maintain pressure below 100 Pa absolute (0,7 mmHg) for several hours (preferably overnight) in order to evacuate air and any moisture traces.

Charge the system until the pressure in the lines is stable.

Check the type of refrigerant to use on the unit data plate and on the compressor.

START-UP PROCEDURE

- a) **Check** that the auxiliary transformer is supplied through the terminal (220/240/380/415) corresponding to the effective mains voltage;
- b) **Connect** the power supply to the electrical panel, set the auxiliary automatic circuit breakers, turn on the current and check that the yellow LINE LED on the mP20 circuit board or mP3 control panel is on.
- c) **Do not** start the unit for at least 12 hours to allow the preheating element to evaporate any liquid refrigerant which may have accumulated in the compressor (*models 2002 and 2402 only*).

AT LEAST 12 HOURS AFTER TURNING ON THE POWER SUPPLY:

- d) **Arm** all the automatic switches on the electrical panel

- e) **Open** all shut-off valves on the refrigerant circuits;
- f1) **Check** that power is on to the remote air-cooled condensers (BDA units)
- f2) **Check** that the condensation water shut-off valves are open (BDW and BDG water-cooled models)
- f3) **Check** that the cooling water circulating pump is working and power is on to the external radiators (BDG water-cooled models)

- g) Start the unit by pressing the **I** button on the mP3

control panel or the  button on the control terminal; after a short delay the fan will start and the green LED on the control panel will come on.

If an alarm is signalled by the red ALARM LED and the buzzer, consult the microprocessor control manual.

REFRIGERANT CHARGING

(BDA air-cooled models)

BDA units **are precharged with Nitrogen N2** to prevent the presence of humidity within the refrigerant circuit tubes. After evacuation it is necessary to charge the gas circuit with refrigerant.

Start the compressor then **slowly** charge the refrigerant circuit through the charging valve, downstream of the thermostatic expansion valve, until the gas bubbles in the sight glass disappear.



Check the refrigerant type indicated on the unit data plate and on the compressor label.

Charging must be done under normal room conditions and with an output pressure of around 18 bar (equivalent to a saturation temperature of 48°C); If the unit has on-off condensation control, make sure that the condenser fan does not keep switching on and off, if necessary by partially obstructing the intake area.

Check that the supercooling of the liquid at the thermostatic valve intake is between 3 and 5°C less than the condensation temperature reading on the manometer scale and that the superheating of the vapour at the evaporator output is around 5°C. The dilution ratio of the system is around 5% by weight of oil to refrigerant. In the event that it is necessary to top up the oil use only these types:

BDA 2002-2402 (ZR compressors)			
Refrigerant	Recommended Oil		
R22 (Mineral oil)	Suniso 3 GS	Texaco WF 32	Fuchs KM
R407C (POE)	Mobil EAL Arctic 22 CC	ICI EMKARATE RL 32S	

BDA 3002 (SM compressors)	
Refrigerant	Recommended Oil
R22 (Mineral oil)	Maneurop 160P
R407C (POE)	Maneurop 160SZ

SETTING THE REGULATION AND SAFETY DEVICES

(see also Measurement and Alarm Devices)

The regulation and safety devices are set in the factory as shown in the table below. They must be checked at least twice a year and must not be changed without good reason.

SETTING VALUES

Rif	Description	Intervention	Differential	Re-set
-----	-------------	--------------	--------------	--------

ALL MODELS

AP	HP Pressostat	27.5 bar	-	manual
BP	LP Pressostat	2.0 bar	1.5 bar	3.5 bar
TSR	Safety Thermostat (optional)	320 °C	-	manual
VS	Safety valve	29 bar	-	-

WATER-COOLED MODELS

VP	Pressostatic valve	15 bar	-	-
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REMOTE AIR-COOLED CONDENSERS

PV	Fan Pressostat	18 bar	4 bar	14 bar
RV	Speed regulator	20 bar	4 bar	16 bar

SETTING THE AIRFLOW SENSOR

The FS differential pressostat should intervene if the fan is not working (if the unit has one fan only) or if one of the fans is not working (in the case of multiple fans).

The setting of the airflow differential pressostat is 1.0 mbar (100 Pa). Since the difference in pressure between the fan intake and delivery depends on the airflow, it is necessary to set the pressostat after installation, making sure that the contact closes when the fan is in normal operation. To set the pressostat:

- simulate a fan fault (stop the fan, or one of the fans if multiple); check that the pressostat intervenes;
- if the pressostat does not intervene, gradually lower the setting until it does.

The FS differential pressostat can be set on a scale from 0.5 to 5.0 mbar (from 50 to 500 Pa).

SETTING THE DIRTY FILTER SENSOR

(optional)

The PFS pressostat must be set as a function of the pressure drop; this depends not only on how dirty the filter is but also on the airflow and therefore on the setting of the fan speed regulator. The setting must be done when the filter is clean:

- set the pressostat intervention at 1.5 mbar;
- gradually cover the surface of the air filter and check that the pressostat intervenes when the filter is about 50-60% covered
- if the pressostat does not intervene, gradually lower its setting; if it cuts in too soon, increase the setting.

ELECTRICAL CURRENT ABSORPTION

Check that current absorption conforms to the values shown in the "Electrical Characteristics" table.

VALVE AND SERVOMOTOR

(units with optional hot water coil)

IMPORTANT: Disconnect the power supply before working on the servomotor.:

The hot water valve can be

1) **floating** in units with mP3 control panel.

The floating servomotor opens or closes by connecting one of the two sets of terminals shown in the electrical diagram; the servomotor automatically stops:

- at the end of its travel (mechanically limited)
- in its current position if the power supply is cut.

2) **modulating** in units with mP20 microprocessor control.

With 24V AC power supply the servomotor moves in proportion to the control signal which varies between 0 and 10V DC; the servomotor automatically stops:

- at the end of its travel;
- in the position corresponding to the control signal;
- in the position in which it is situated whenever power is disconnected.

The instructions for the valve and servomotor are on the enclosed sheet

MAINTENANCE

The following maintenance operations should be done regularly:

WEEKLY:

- check that room conditions on the control panel display are normal;
- check the refrigerant charge; the sight glass should be clear (however the presence of a few bubbles is normal);
- check normal temperature and noise levels of compressor and fans;
- check the air filters; clean or change the filters when the dirty filter alarm comes on;
- check that power supply voltage is within design limits.

MONTHLY:

- check normal condensation and evaporation pressures;
- check the cylinder and the feed and drain valves of the humidifier: replace the cylinder when the specific alarm comes on (see microprocessor instruction manual);
- check the flow of condensate to the drain;
- check remote condensers or external radiators: remove all foreign objects (leaves, seeds, dust, etc.) with a jet of compressed air or water;
- check correct pressostatic valve operation (option for BDW water-cooled models).

ANNUALLY:

- check that the concentration of ethylene glycol and passivating inhibitor complies with the supplier's instructions (water-cooled models).

CHANGING THE PRESSOSTAT

The refrigerant circuits of UNIFLAIR B-series units have schrader needle valves for connecting manometers or transducers and for refrigerant charging.

All schrader valves are fitted with needles except the valve for connecting the High Pressure pressostat.

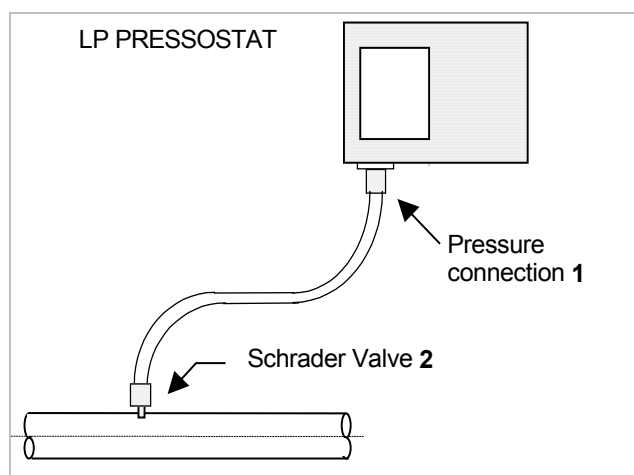
If there is a fault, the refrigerant circuit must be drained to change the HP pressostat.

To change the LP pressostat, simply undo the capillary connection shown at (2) in the diagram.



IMPORTANT: DO NOT UNDO THE PRESSOSTAT SHOWN AT (1) IN THE DIAGRAM

THIS WOULD ALLOW GAS TO ESCAPE FROM THE REFRIGERANT CIRCUIT.



PROBLEM SOLVING

Problem solving is made easier by the microprocessor control display; if there is an alarm, consult the control panel instruction manual.

If necessary, call the nearest service centre describing the nature of the fault displayed on the control.

PROBLEM	POSSIBLE CAUSE	CHECK / REMEDY
NO POWER (The yellow LED on the mP3 control panel or the mP20 board is off)	A) No power to the unit electrical panel	Check that power is on and the unit main switch on the electrical panel is closed.
	B) No power to the auxiliary circuit	1) Check that the IM automatic circuit breaker on the AUX circuit is set. 2) Check the auxiliary circuit 24V fuse; check the fuse on mP20 board.
THE UNIT DOES NOT WORK	A) The control panel does not start the unit.	Check that the control panel connectors are correctly located in their sockets; see control panel instruction manual.
	B) Check the control panel for alarms	See the control panel instruction manual
ROOM TEMPERATURE TOO HIGH (high room temperature alarm)	The unit does not work.	See "The unit does not work".
	A) The parameter settings on the control panel are not correct	Check the room temperature setting; see control panel instruction manual.
	B) Lack of air flow.	See "Lack Of Air Flow".
	The compressor does not work when called by the control panel.	See "The Compressor Does Not Work".
	C) Insufficient compressor output	See "Compressor High Output Pressure", "Compressor Low Intake Pressure".
	E) Heat load higher than expected.	Check: fresh air conditions and volume, external air infiltration and latent load, particularly with dehumidification.
ROOM TEMPERATURE TOO LOW (Low room temperature alarm)	A) The parameter settings on the control panel are not correct.	Check the room temperature setting; see the control panel instruction manual
	B) Electric heater (if fitted) does not work.	1) Check electric heater operation
		2) Check electric heater power supply
		3) If there is a heater alarm, remove the cause and re-set the safety thermostat
	C) The hot gas coil (if fitted) is not working during dehumidification with re-heat.	1) Check the hot gas three-way valve function 2) Check the compressor serving the re-heat: see "The Compressor Doesn't Work"
	D) The hot water coil is not working..	1) Check the flow of hot water
		2) Check the function of the regulation valve (see Valve and Servomotor).
	E) The control system is not working.	See control panel instruction manual; check that control panel and/or sensors work properly.
	F) Thermal leakage higher than expected	Check thermal leakage and entry of external air.
ROOM HUMIDITY TOO HIGH (High room humidity alarm)	A) The parameter settings on the control panel are not correct.	Check room humidity settings; see the control panel instruction manual.
	B) Latent load higher than expected	Check: latent load, fresh air conditions and volume, external air infiltration
	C) The compressor does not function during dehumidification.	See "The Compressor Doesn't Work"
	D) Dehumidification valve does not close.	Check the function of the dehumidification circuit solenoid valve.
	E) The control system is not working.	See control panel instruction manual; check that control panel and sensors work properly.

PROBLEM	POSSIBLE CAUSE	CHECK / REMEDY
ROOM HUMIDITY TOO LOW (Low room humidity alarm)	A) The parameter settings on the control panel are not correct.	Check the room temperature setting; see also the control panel instruction manual.
	B) Latent load lower than expected.	Check: quantity of the latent load, fresh air conditions and volume, external air infiltration
	C) The humidifier is not working.	1) Check water supply pressure 2) Check function of manual control system and steam production group (see microprocessor control manual).
	D) The control system is not working.	See control panel instruction manual; check that control panel and/or sensors work properly.
LACK OF AIRFLOW	A) No power to the fans	Check power supply to the fan motors
	B) The filters are dirty	Shake dust out of the cartridge and clean with a vacuum cleaner. Change filter if blocked. Check correct setting of the dirty filter pressostat.
	C) The fans are rotating in the wrong direction	Swap two power supply phases and check correct rotation direction. (See electrical diagrams, RSF phase sequence relay).
	D) The airflow is obstructed	Read the section on Air Distribution
	E) Intervention of fan thermal protection.	Check the resistance of the fan windings. Re-set then measure voltage and current.
HIGH COMPRESSOR OUTPUT PRESSURE	A) Non-condensable air or gas in the circuit, with bubbles in the flow sight glass; supercooling of the liquid is high.	Evacuate the refrigerant circuit and re-charge
	B) Airflow is insufficient or air in the remote condenser is too warm.	1) Check fan operation and rotation direction in the remote heat exchanger. (See condenser/radiator instruction manual). 2) Remove any obstructions from the remote condenser with compressed air or water. 3) Check pressure drop if air output is ducted 4) Check for obstructions to unit airflow and for recirculation of air; 5) Check that the temperature of the cooling air is within the projected limits
HIGH COMPRESSOR OUTPUT PRESSURE	C) Water flow to remote condenser insufficient or too warm.	1) Check condensation water flow, pressure and temperature; 2) Check setting and function of water temperature regulation system
	D) Too much refrigerant in the circuit; condenser partially flooded. Refrigerant supercooling too high at condenser output	Remove some refrigerant from the circuit.
	E) High-pressure valves partially closed	Check the opening of the valves..
	F) Intake pressure too high.	See "High compressor intake pressure".
HIGH PRESSURE PRESSOSTAT INTERVENES	A) The condensation pressure control system is not functioning efficiently (BDA air-cooled models.	1) Check condenser fan and fuses; re-set or replace the faulty fans; 2) Check setting and function of the condenser fan pressostat and the speed regulator
	B) The HP pressostat is incorrectly set.	Re-set the pressostat to the value shown on the unit data plate.
	C) System output pressure is too high.	See High Compressor Output Pressure
LOW COMPRESSOR OUTPUT PRESSURE	A) The condensation pressure control system is not working (see microprocessor control instruction manual).	1) Check the function and setting of the condenser fan pressostat and speed regulator (BDA models) 2) Check the setting and function of the pressostatic valve (BDW models) 3) Check the function and setting of the closed circuit water temperature regulation system (BDG models).
	B) Intake pressure too low	See Low Compressor Intake Pressure.

PROBLEM	POSSIBLE CAUSE	CHECK / REMEDY
HIGH COMPRESSOR INTAKE PRESSURE	A) Thermal load higher than expected	Check: room thermal load especially during dehumidification; the flow and conditions of external air; external air leaks
	B) System output pressure is too high	See High Compressor Output Pressure
	C) Too much refrigerant in the circuit	Remove some refrigerant from the circuit.
	D) Liquid refrigerant return to compressor intake	Check correct thermostatic valve superheating (around 8-10°C); Check that the valve sensor bulb is correctly positioned, fixed and insulated
LOW COMPRESSOR INTAKE PRESSURE (possible freezing of the coil)	A) Room temperature too low	See "Room temperature too low"
	B) Low or zero airflow	See "Lack of airflow"
	C) Liquid receiver output valve not fully open	Check the opening of the valve
	D) Refrigerant filter blocked	Check the refrigerant filter
	E) Thermostatic valve incorrectly set or defective	Check correct thermostatic valve superheating (around 8-10°C); Check that the valve sensor bulb is correctly positioned, fixed and insulated.
	F) Insufficient refrigerant charge	Check for leaks and re-charge the unit until supercooling at the condenser output is 3-5°C.
	G) Output pressure too low	See "Low compressor output pressure"
COMPRESSOR INTAKE LP PRESSOSTAT INTERVENES	A) Thermostatic valve incorrectly set or defective	Check that superheating of the thermostatic valve is correct (around 5-8°C).
	B) Low liquid refrigerant flow to the thermostatic valve.	Check the opening of the liquid receiver output valve; check the function of the refrigerant shut-off solenoid valve.
	C) The filter dryer cartridge is dirty	Check whether the cartridge needs to be changed; temperature difference before and after the cartridge should be less than 2°C.
	D) The low pressure pressostat is incorrectly set.	Re-set low pressure pressostat.
	E) System output pressure is too low	See "Low compressor output pressure".
THE COMPRESSOR DOESN'T WORK	A) Short circuit protection has intervened	Re-set the automatic switch and check the cause of the short circuit. Before starting the compressor check the resistance and continuity of the compressor winding.
	B) intervention of compressor's internal protection	See Compressor internal protection has intervened
	C) The contactor is not working	Check the contacts and the contactor coil.
COMPRESSOR INTERNAL PROTECTION INTERVENES	A) A phase is missing	Check the resistance of the compressor winding. After re-setting, measure the voltage and current
	B) The motor is overloaded	Check that unit is operating within normal limits
	C) Power supply voltage too high or too low	Check that the difference between the three power supply phases is less than 2%. With monophase units, voltage must be within -10% and +6% of the nominal value.
	D) The rotor is blocked	Replace the compressor
THE COMPRESSOR IS NOISY	A) The compressor is damaged	Call an authorised service centre to replace the compressor.
	High compressor output pressure	Non-condensable air or gas in the circuit. Drain and re-charge the condenser.
	B) Air/water flow in the remote heat exchanger is insufficient or too warm.	Check fan operation and rotation direction in the remote heat exchanger (see condenser / radiator instruction manual). Remove obstructions from remote condenser with compressed air or water.
	B) Liquid return to the compressor	Check expansion valve function and superheating.
ELECTRIC HEATER SAFETY THERMOSTAT INTERVENES	A) Insufficient airflow	See Lack of Airflow
	B) Thermostat connection wire is interrupted	Check the continuity of the connection between the safety thermostat and the control system
	C) The safety thermostat is faulty	Change the thermostat.