INSTALLATION-OPERATING-SERVICE MANUAL

Air/water chillers and heat pumps with axial-flow fans and pump assembly, low noise version.

r HFC R-410A

BRAT FF SL
BRAN FF SL

0071÷0121

INDEX

The following symbols are used in this publication and inside the unit:

U **User**

I **Installe**

A **Assistance**

Important

Prohibition

Danger voltage

Danger moving blades

Danger high temperatures

Eurovent certification program.

The manufacturer reserves the right to modify the data in this manual without warning.

ENVIRONMENTAL INFORMATION: This equipment contains fluorinated greenhouse gases covered by the Kyoto Protocol. It should only be serviced or dismantled by professional trained personnel. R410A GWP=1975

GENERAL WARNINGS

These units have been designed to chill and/or heat water and must be used in applications compatible with their performance characteristics.
Incorrect installation, regulation and maintenance or improper use absolve the **manufacturer** from all liability, whether contractual or otherwise, for damage to people, animals or things. Only those applications specifically indicated in this list are permitted.
Read this manual carefully. All work must be carried out by qualified personnel in conformity with legislation in force in the country concerned.
The guarantee is invalidated if the above instructions are not respected and if the unit is started up for the first time without the presence of personnel authorised by the Company (where specified in the supply contract) who should draw up a "start-up" report.
The documentation supplied with the unit must be consigned to the owner who should keep it carefully for future consultation in the event of maintenance or service.
When the items are consigned by the carrier, check that the packaging and the unit are undamaged. If damage or missing components are noted, indicate this on the delivery note. A formal complaint should be sent via fax or registered post to the After Sales Department within eight days from the date of receipt of the items.

FUNDAMENTAL SAFETY RULES

When operating equipment involving the use of electricity and water, a number of fundamental safety rules must be observed, namely:

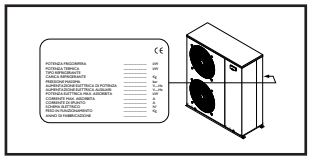
The unit must not be used by children or by unfit persons without suitable supervision.
Do not touch the unit with bare feet or with wet or damp parts of the body.
Do not carry out cleaning operations without first disconnecting the system from the electricity supply by placing the mains switch in the "off" position.
Do not modify safety or regulation devices without authorisation and instructions from the manufacturer.
Do not pull, detach or twist the electrical cables coming from the unit, even when disconnected from the mains electricity supply.
Do not open doors or panels providing access to the internal parts of the unit without first ensuring that the mains switch is in the off position.
Do not introduce pointed objects through the air intake and outlet grills.
Do not dispose of, abandon or leave within reach of children packaging materials (cardboard, staples, plastic bags, etc.) as they may represent a hazard.

Respect safety distances between the unit and other equipment or structures. Guarantee adequate space for access to the unit for maintenance and/or service operations;
Power supply: the cross section of the electrical cables must be adequate for the power of the unit and the power supply voltage must correspond with the value indicated on the respective units. All units must be earthed in conformity with legislation in force in the country concerned.
Hydraulic connections should be carried out as indicated in the instructions to guarantee correct operation of the unit. Empty the water circuit or add glycol if the unit is not used during the winter.
Handle the unit with the utmost care (see weight distribution table) to avoid damage.

IDENTIFICATION

The **BRAT/N FF SL** chiller can be identified by the:

Rating plate
Giving the technical and performance data of the unit. If this is lost, ask the After Sales Service for a replacement.



⚠ Tampering with or the removal or absence of rating plates or other means enabling the unit to be identified causes problems during installation and maintenance.

RECEIVING AND HANDLING THE PRODUCT

The **BRAT/N FF SL** chillers are supplied accompanied by:
- installation, operating and service manual;
- guarantee certificate;
- CE declaration;
- list of the main components and sub-assemblies fitted on the product

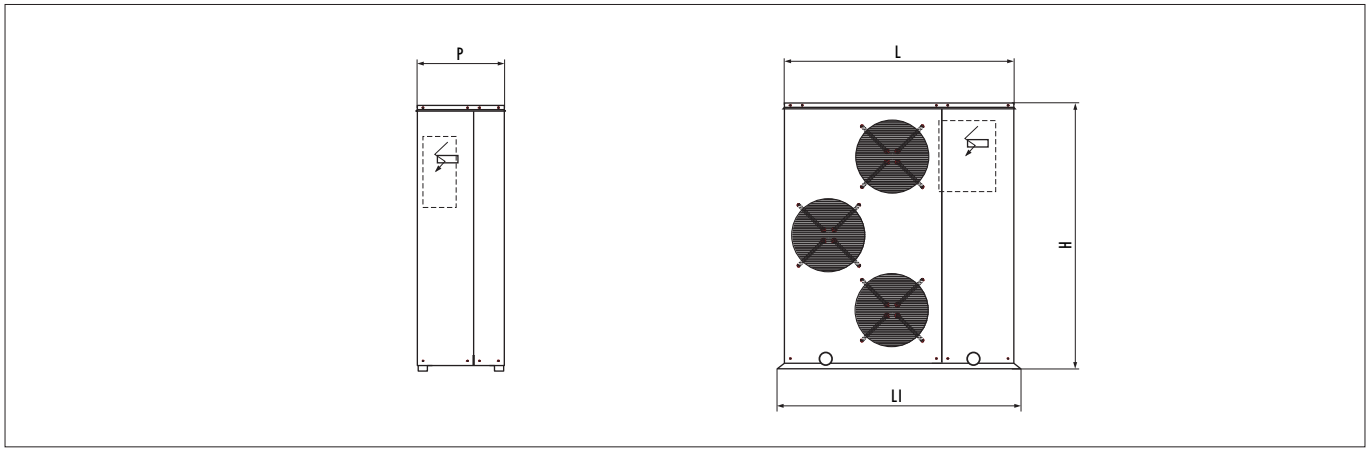
These are contained in a plastic bag attached to the top of the chiller.

The unit should always be handled by qualified personnel using equipment adequate for the weight of the chiller. If a forklift truck is used, insert the forks under the base, spacing the forks as wide apart as possible. If a crane is used, pass the cables through the bottom of the base, making sure they do not exert pressure on the unit. Once the packaging has been removed, the appliance can be lifted and moved by inserting two metal tubes (max. diameter 1") into the special holes in the base and using suitable handling equipment.

⚠ **The instruction manual** is an integral part of the unit and should therefore be read and kept carefully.
It is recommended that the packaging should not be removed until the unit is located in the installation site.

⛔ **Do not dispose** of packaging materials in the environment or leave them within reach of children as they may represent a hazard.

⚠ **The weight of the chiller** is biased towards the compressor side (side of the packaging with the bar code, see figure at the foot of the page).
During transport, the chiller should be kept in a vertical position



Dimensione	0071	0091	0101	0121	
L	1450	1450	1450	1450	mm
H	1200	1200	1700	1700	mm
P	550	550	550	550	mm
LI	1507	1507	1507	1507	mm
Gross weight BRAT FF SL	260	265	340	345	kg
Gross weight BRAN FF SL	280	285	360	365	kg

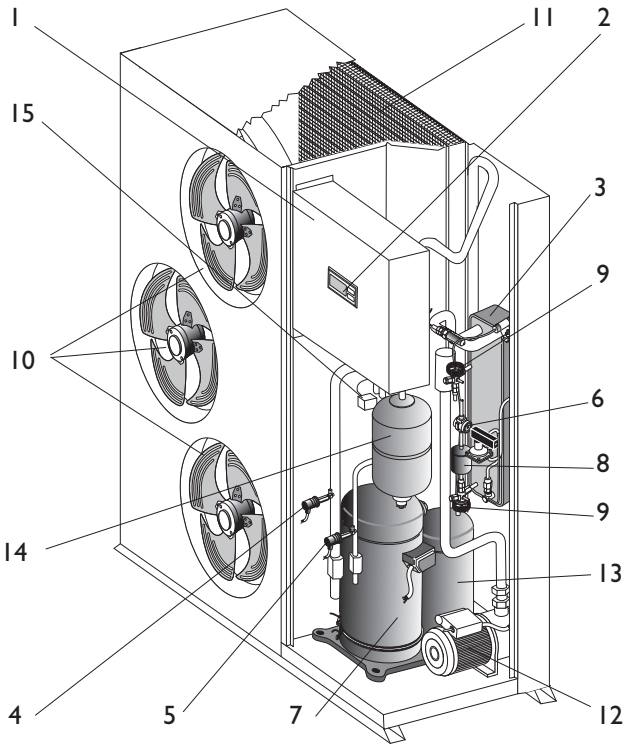
These air cooled reverse-cycle chillers with axial-flow fans operate with R410A refrigerant fluid and are suitable for outdoor installation. The units conform to the essential requisites of EEC directive 89/392. They are factory tested and on site installation is limited to water and electrical connections.

STRUCTURE
Panels and base are made from galvanised steel plate painted with epoxy powder to ensure total resistance to atmospheric agents.

COMPRESSORS
Hermetic rotary scroll compressor with thermal cut-out..

CONDENSING COILS
Made from copper tubes and aluminium fins with a large exchange surface.

EVAPORATOR
AISI 316 stainless steel plate type evaporator complete with **differential pressure switch.** Casing lined with anti-condensate closed cell neoprene cladding.



1 Electrical panel
2 Control panel
3 Heat exchanger installation side
4 Low pressure switch
5 High pressure switch
6 Flow and moisture indicator
7 Scroll compressor
8 Filter
9 Thermostatic valve
10 Axial-flow fan
11 Heat exchanger external side
12 Pump
13 Liquid receiver (BRAN FF SL only)
14 Expansion tank
15 Reversing valve (BRANFF SL only)

PUMPS
Multistage centrifugal pump with stainless steel hydraulic assembly and corrosion prevention device to prolong the working life of the pump. Over-sized watertight bearings with gasket ring resistant to thermal expansion eliminate the problem of seizure.

PUMP ASSEMBLY
Pump assembly with expansion tank, safety valve, manual filling assembly, pressure gauge and pump.

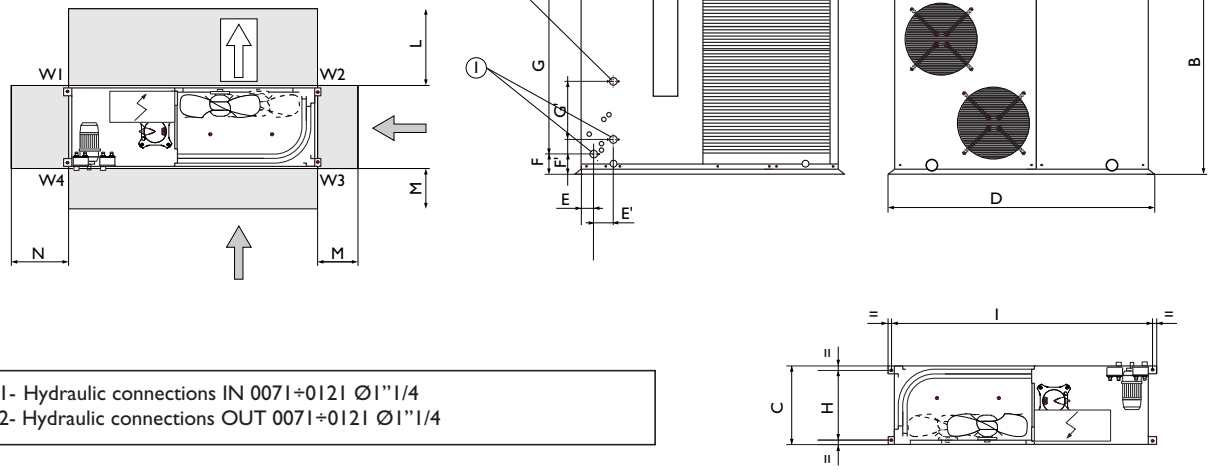
FANS
External impeller axial-flow fans. Six-pole electric motor with built-in thermal cut-out. Housed in aerodynamic tubes with accident prevention grill. **Device for operation with low outside air temperatures:** continuous fan rotation speed control via **pressure transducer.**

REFRIGERANT CIRCUIT
Refrigerant circuit featuring the following components: filter, liquid flow indicator, thermostatic expansion valve with external equaliser. Pressure switches for controlling suction and discharge pressure. Unit supplied complete with non-freezing oil and R410A refrigerant charge, **factory tested.**

POWER AND CONTROL ELECTRICAL PANEL
Power and control electrical panel constructed in accordance with IEC 204-1/EN60204-1, complete with compressor contactor and **thermal solenoid switch and door lock safety device. Control via "HSW7" control panel.**

OPTIONAL ACCESSORIES
- Removable metal mesh filter for water circuit
- Rubber vibration dampers.
- Remote keyboard kit.
- Storage tank kit, 60 l
- Condensate collection pan.
- Coil protection grill kit.

The above accessories are optional. Consult the relative documentation for assembly instructions and technical data.



1- Hydraulic connections IN 0071÷0121 Ø1"1/4
2- Hydraulic connections OUT 0071÷0121 Ø1"1/4

Dimension	0071	0091	0101	0121
A	1450	1450	1450	1450
B	1200	1200	1700	1700
C	550	550	550	550
D	497	497	497	497
E	1477	1477	1477	1477

Weight distribution in operation BRAT FF SL	0071	0091	0101	0121
W1	83	84	110	111
W2	42	43	54	55
W3	39	40	51	52
W4	81	83	105	107
Totale	245	250	320	325

Weight distribution in operation BRAN FF SL	0071	0091	0101	0121
W1	92	93	119	120
W2	43	44	55	56
W3	40	41	52	53
W4	90	92	114	116
Totale	265	270	340	345

CHOICE OF INSTALLATION SITE

Before installing the unit, agree with the customer the site where it will be installed, taking the following points into consideration:

- check that the fixing points are adequate to support the weight of the unit;
- pay scrupulous respect to safety distances between the unit and other equipment or structures to ensure that air entering the unit and discharged by the fans is free to circulate.
- The unit must be installed in a space designed to house technical installations dimensioned according to legislation in force in the country concerned and large enough to allow access for maintenance.

POSITIONING

Before handling the unit, check the capacity of the lifting equipment used, respecting the instructions on the packaging. To move the unit in the horizontal, make appropriate use of a lift truck or similar, bearing in mind the weight distribution of the unit. To lift the unit, insert tubes long enough to allow positioning of the lifting slings and safety pins in the special holes in the base of the unit.

To avoid the slings damaging the unit, place protection between the slings and the unit. Position the unit in the site indicated by the customer. Place either a layer of rubber (min. thickness 10 mm) or vibration damper feet (optional) between the base and support surface. Fix the unit, making sure it is level and that there is easy access to hydraulic and electrical components. If the site is exposed to strong winds, fix the unit adequately to the support surface using tie rods if necessary.

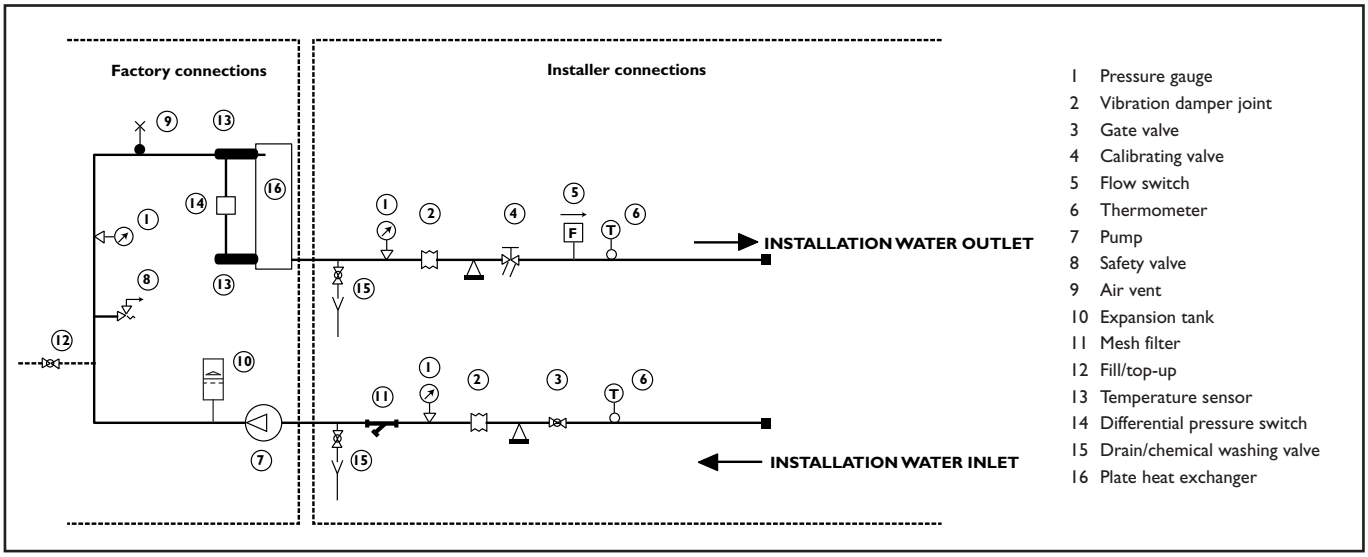
HYDRAULIC CONNECTIONS I A

The choice and installation of components is the responsibility of the installer who should follow good working practice and current legislation. Before connecting the pipes, make sure they do not contain stones, sand, rust, dross or other foreign bodies which might damage the unit. Construction of a bypass is recommended to enable the pipes to be washed through without having to disconnect the unit (see drain valves). The connection piping should be supported in such a way as to avoid it weighing on the unit. It is recommended that the following devices are installed in the water circuit of the evaporator:

1. Two pressure gauges with a suitable scale (inlet and outlet).
2. Two vibration damper joints (inlet and outlet).
3. Two gate valves (normal in inlet and calibrating in outlet).
4. A flow switch (inlet).
5. Two thermometers (inlet and outlet).
6. An inlet filter as close as possible to the evaporator and positioned to allow easy access for routine maintenance.

The flow of water to the refrigerating assembly must conform to the values given on page 12. The flow of water must be maintained constant during operation. The water content of the unit must be such as to avoid disturbing operation of the refrigerant circuits. See the values given on page 17.

CIRCUITO IDRAULICO



⚠ **Installations containing antifreeze** or covered by specific legislation must be fitted with hydraulic disconnectors.

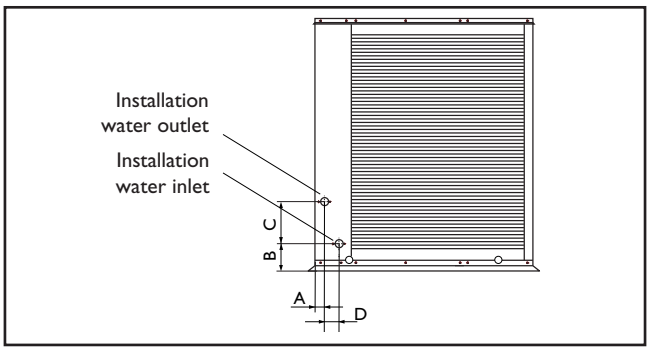
The manufacturer is not liable for obstruction, breakage or noise resulting from the failure to install filters or vibration dampers.

⚠ **Particular types of water used for filling** or topping up must be treated with appropriate treatment systems. For reference values, see the table.

SIZE AND POSITION OF CONNECTIONS

Model	0071	0091	0101	0121
A (mm)	55,5	55,5	55,5	55,5
B (mm)	181,5	181,5	181,5	181,5
C (mm)	414,5	414,5	514,5	514,5
D (mm)	60,5	60,5	60,5	60,5
Hydraulic connections (Ø)	1"1/4	1"1/4	1"1/4	1"1/4

PH	6-8
Electrical conductivity	less than 200 mV/cm (25°C)
Chlorine ions	less than 50 ppm
Sulphuric acid ions	less than 50 ppm
Total iron	less than 0,3 ppm
Alkalinity M	less than 50 ppm
Total hardness	less than 50 ppm
Sulphur ions	none
Ammonia ions	none
Silicon ions	less than 30 ppm



FILLING THE INSTALLATION

- Remove the inspection panel.
- Before filling, check that the installation drain valve is closed.
- Open all installation, appliance and terminal air vents.
- Open the gate valves.
- Begin filling, slowly opening the water filling cock inside the unit.
- When water begins to leak out of the terminal air vent valves, close them and continue filling until the pressure gauge indicates a pressure of 1.5 bar.
- Replace the inspection panel

⚠ **The installation must be filled t**o a pressure of between 1 and 2 bar.

It is recommended that this operation be repeated after the unit has been operating for a number of hours. The pressure of the installation should be checked regularly and if it drops below 1 bar, the water content should be topped-up.

Check the hydraulic tightness of joints.

EMPTYING THE INSTALLATION

- Remove the inspection panel.
- Before emptying, place the mains switch in the "off" position.
- Make sure the installation fill/top-up water cock is closed.
- Open all the installation air vent valves, the drain cock and the terminals.
- Replace the inspection panel

⚠ **If the fluid in the circuit contains antifreeze,** it should not be allowed to drain freely as it is pollutant. It should be collected for possible reuse. When draining after heat pump operation, take care as the water may be hot (up to 50°).

The **BRAT/N FF SL** chillers leave the factory already wired, and ready for connection to the mains electricity supply and for the flow switch and remote ON/OFF switch to be connected. All the above operations must be carried out by qualified personnel in compliance with the legislation in force. For all electrical work, refer to the electrical wiring diagrams in this manual. You are also recommended to check:

- That the characteristics of the mains electricity supply are adequate for the power input values indicated in the electrical characteristics table below, also bearing in mind the possible use of other equipment at the same time.

⚠ **Power to the unit** must be turned on only after installation work (mechanical, hydraulic and electrical) has been completed.

All electrical connections must be carried out by qualified personnel in accordance with legislation in force in the country concerned.

Respect instructions for connecting phase, neutral and earth conductors. The power line should be fitted upstream with a suitable device to protect against short-circuits and leakage to earth, isolating the installation from other equipment.

⚠ **Voltage** must be within a tolerance of ±10% of the rated power supply voltage for the unit (for three phase units, the unbalance between the phases must not exceed 3%). If these parameters are not respected, contact the electricity supply company.

For electrical connections, use double insulation cable in conformity with current legislation in the country concerned. **Install,** if possible near the unit, an appropriate protection device to isolate the unit from the mains supply. This should have a delayed characteristic curve, contacts opening by at least 3 mm and an adequate interruption and residual current protection capacity.

If these devices are not visible from the unit, they should be lockable.

An efficient earth connection is obligatory. Failure to earth the appliance absolves the manufacturer of all liability for damage.

In the case of three phase units, ensure the phases are connected correctly.

⛔ **Do not use** water pipes to earth the unit.

BRAT FF SL ELECTRICAL DATA

Model	Electrical power supply (V-Ph-Hz)	Rated values (1)									Max. values (3)		FUSES Glass 5x20mm 250V			
		Compressor			Fans		Pump		Total							
		F.L.I. (kW)	F.L.A. (A)	L.R.A. (A)	F.L.I. (kW)	F.L.A. (A)	F.L.I. (kW)	F.L.A. (A)	F.L.I. (kW)	F.L.A. (A)	F.L.I. (kW)	F.L.A. (A)	FU1	FU2	FU3	FU4
0071	400-3N~50	6,2	11,1	95	0,6	3,50	0,55	3,80	7,35	18,4	9,8	22,6	1A	1A	8A	6,3A
0091	400-3N~50	7,2	12,3	111	0,6	3,50	0,55	3,80	8,35	19,6	12,7	27,6	1A	1A	8A	6,3A
0101	400-3N~50	7,5	14,7	118	1,2	7,00	0,55	3,80	9,25	25,5	13,0	28,6	1A	1A	8A	6,3A
0121	400-3N~50	9,9	17,6	140	1,2	7,00	0,55	3,80	11,65	28,4	17,3	37,6	1A	1A	8A	6,3A

BRAN FF SL ELECTRICAL DATA

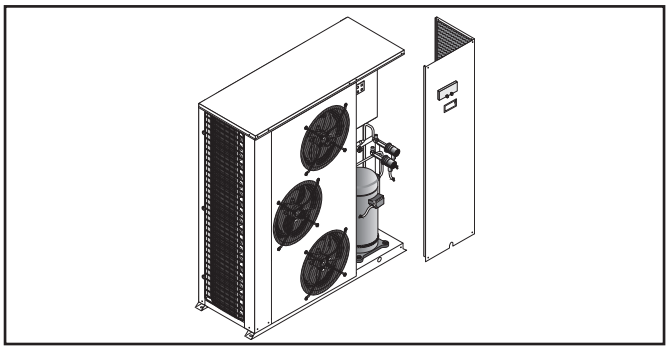
Model	Electrical power supply (V-Ph-Hz)	Rated values (2)									Max. values (3)		FUSES Glass 5x20mm 250V			
		Compressor			Fans		Pump		Total							
		F.L.I. (kW)	F.L.A. (A)	L.R.A. (A)	F.L.I. (kW)	F.L.A. (A)	F.L.I. (kW)	F.L.A. (A)	F.L.I. (kW)	F.L.A. (A)	F.L.I. (kW)	F.L.A. (A)	FU1	FU2	FU3	FU4
0071	400-3N~50	6,5	11,6	95	0,6	3,50	0,55	3,80	7,65	18,9	9,8	22,6	1A	1A	8A	6,3A
0091	400-3N~50	7,2	12,3	111	0,6	3,50	0,55	3,80	8,35	19,6	12,7	27,6	1A	1A	8A	6,3A
0101	400-3N~50	8,9	17,4	118	1,2	7,00	0,55	3,80	10,65	28,2	13,0	28,6	1A	1A	8A	6,3A
0121	400-3N~50	10,6	18,8	140	1,2	7,00	0,55	3,80	12,35	29,6	17,3	37,6	1A	1A	8A	6,3A

F.L.I. power input
F.L.A. current input
L.R.A. compressor start-up current

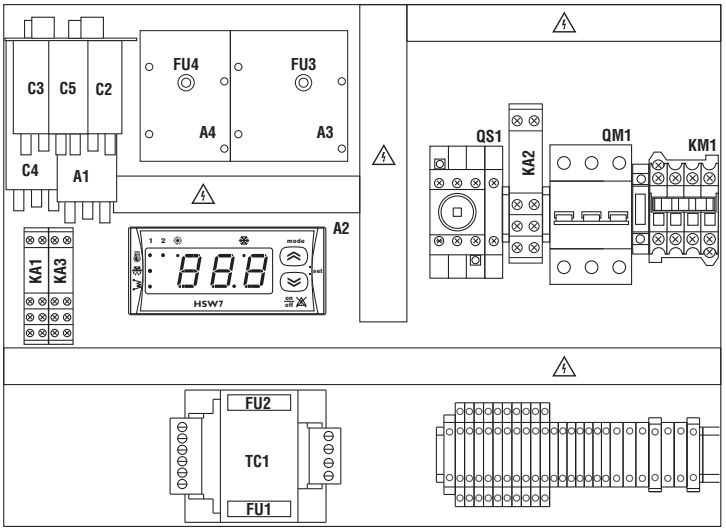
(1) Temperatura aria esterna 35°C - Temperatura d'acqua all'evaporatore 12/7°C.
(2) Temperatura aria esterna 7°C - Temperatura d'acqua al condensatore 40/45°C.
(3) Questi valori dovranno essere considerati per dimensionare gli interruttori di protezione ed i cavi di alimentazione.

ACCESSING THE ELECTRICAL PANEL

The electrical panel is located inside the unit at the top of the technical compartment where the various components of the refrigerant circuit are also to be found. To access the electrical panel, remove the front panel of the unit by undoing the metric screws. To access the components in the electrical panel and the terminal boards, undo the screws and remove the part of the panel.



ELECTRICAL PANEL LAYOUT



A1 Radio interference suppresser
A2 Electronic controller
A3 Fan electronic control board
A4 Pump electronic control board
C2-3-5 Fan start capacitor
C4 Interference suppresser capacitor
FU1 Transformer protection fuse
FU2 Auxiliary circuit protection fuse
FU3 Fan protection fuse
FU4 Water pump protection fuse
KA1 High pressure switch relay
KA2 Phase control relay
KA3 Alarm relay
KM1 Compressor contactor
QM1 Compressor thermal overload switch
QS1 Door lock disconnector switch
TC1 Safety transformer

Conduits containing live wires, even when the door lock disconnecting switch is off

ELECTRICAL POWER CONNECTIONS

For the functional connection of the unit, bring the power supply cable to the electrical panel inside the unit and connect it to terminals U-V-W N and ⏚, respecting (U-V-W) phases, (N) neutral and (⏚) earth.

AUXILIARY CONNECTIONS

All terminals referred to in the explanations below are to be found on the terminal board inside the electrical panel and described as "installer terminals".

REMOTE START UP AND SHUT DOWN

To fit a remote on/off device, the jumper must be replaced with a switch connected to terminals 6 and 7 on the installer terminal board. For timed operation, connect a daily or weekly timer between terminals 6 and 7.

REMOTE HEATING/COOLING CONTROL

To fit a remote heating/cooling selector, the jumper must be replaced with a switch connected to terminals 8 and 9 on the installer terminal board. To activate the command, proceed as follows:

- Select the parameter H27 on the HSW7 control panel and set it to 1.

REMOTE ALARM

For remote display of unit shut-down due to malfunction, an audible or visual alarm warning device can be connected between terminals 10 and 11. Connect the phase to terminal 11 and the alarm signal device between terminal 10 and the neutral.

REMOTE KEYBOARD KIT

The remote keyboard kit can be used to display all unit functions and access the parameters of the electronic board from a point located at some distance from the unit itself. This consists of a remote control module and a transformer.

To install the kit, proceed as follows:

- disconnect the power supply (using the door lock disconnector switch QS1) and then access the inside of the electrical panel;
- connect the remote control module with 3 wires to terminals 18, 19 and 20 on the installer terminal board:
  connect terminal 18 to terminal 26 on the module
  connect terminal 19 to terminal 24 on the module
  connect terminal 20 to terminal 25 on the module

Make sure that parameter H27 is set to 0.

⚠ **To avoid interference due to magnetic fields,** the use of shielded cable is recommended. The cable should not be more than 100m long.

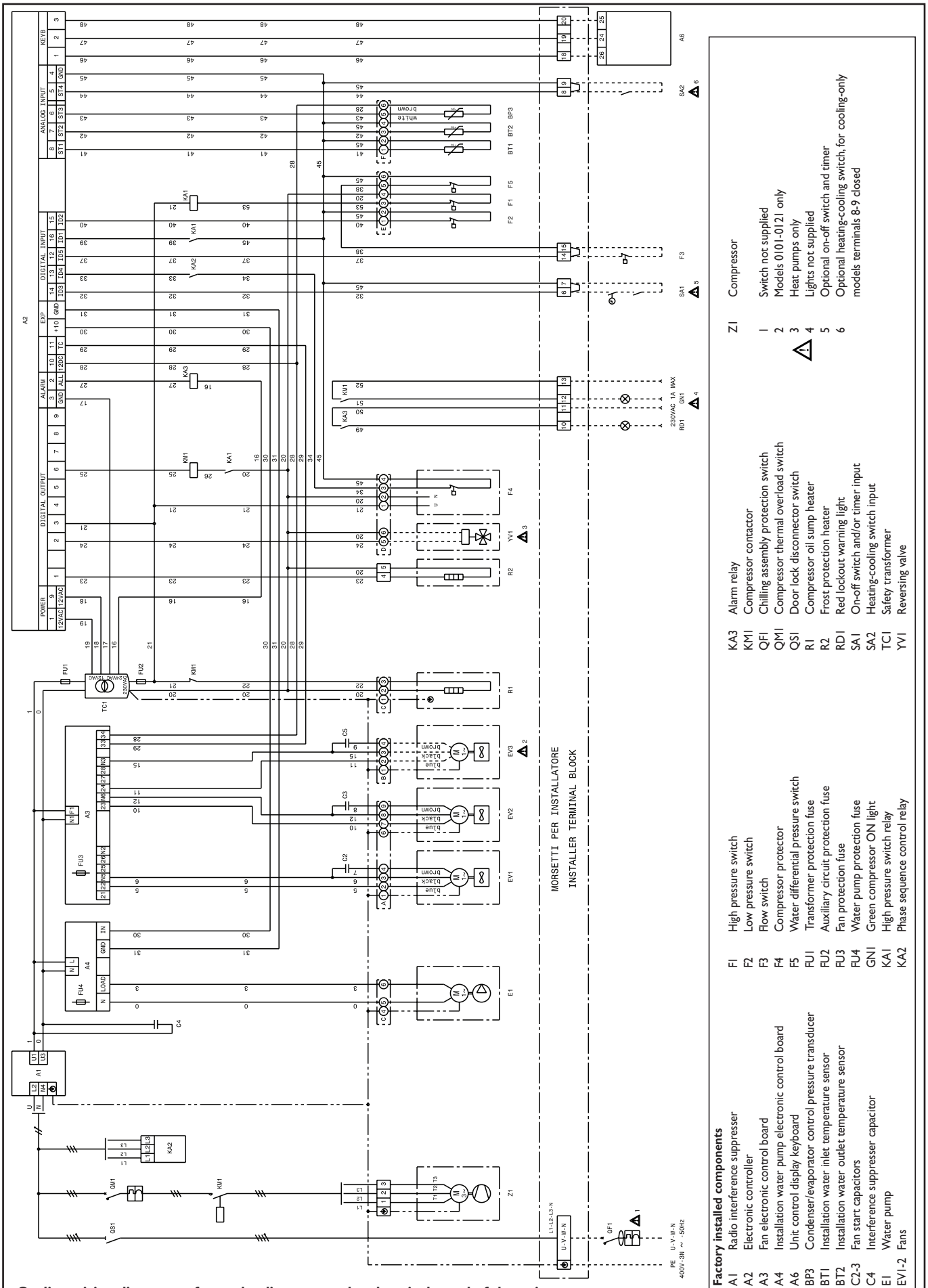
CONNECTING A FLOW SWITCH

If a flow switch is to be used, connect it to terminals 14 and 15 on the installer terminal board, after removing the jumper.

COMPRESSOR ON SIGNAL

If the operation of the compressor needs to be signalled in a remote position, terminals 12 and 13 can be connected to an audible or visual signal device. Connect the phase to terminal 13 and the signal device between terminal 12 and the neutral.

WIRING DIAGRAM



Outline wiring diagram, refer to the diagram on the electrical panel of the unit.

BRAN FF SL		0071	0091	0101	0121
Cooling capacity **(1)**	kW	18,4	20,8	25,1	31,3
Compressor power input **(1)**	kW	6,2	7,2	7,5	9,9
Heating capacity **(2)**	kW	21,0	23,6	28,8	35,5
Compressor power input **(2)**	kW	6,5	7,2	8,9	10,6
Compressors	n°	1	1	1	1
Rated water flow **(1)**	m^3/h	3,2	3,6	4,3	5,4
Rated water flow **(2)**	m^3/h	3,6	4,1	5,0	6,2
Residual head	kPa	116	90	130	108
Maximum allowable pressure PS L H **(4)**	MPa	2,80 3,93	2,80 3,93	2,80 3,93	2,80 3,93
Electrical power supply	V/ph/Hz	400-3 N ~ 50			
Total power input **(2)** *	kW	7,1	7,8	10,1	11,8
Electrical index of protection	IP	X4			
Fans	n°	2	2	3	3
Min. rotation speed	g/min	430	430	430	430
Max. rotation speed	g/min	910	870	905	905
Max. air flow	m3/s	2,4	2,4	4,4	4,4
Noise level **(3)**	dB(A)	62	62	63	63
R410A refrigerant charge	kg	6,30	7,00	8,60	8,70
Olio Mobil EAL Arctic 22 cc ** ICI Emkarate RL 32 CF **	Lt	2,50	3,25	3,25	4,00
Operating weight	kg	265	270	340	345

BRAT FF SL		0071	0091	0101	0121
Cooling capacity **(1)**	kW	19,3	21,9	26,4	32,9
Compressor power input **(1)**	kW	6,2	7,2	7,5	9,9
Compressors	n°	1	1	1	1
Rated water flow **(1)**	m^3/h	3,3	3,8	4,5	5,7
Residual head	kPa	116	90	130	108
Maximum allowable pressure PS L H **(4)**	MPa	2,80 3,93	2,80 3,93	2,80 3,93	2,80 3,93
Electrical power supply	V/ph/Hz	400-3 N ~ 50			
Total power input **(1)** *	kW	6,8	7,8	8,7	11,1
Electrical index of protection	IP	X4			
Fans	n°	2	2	3	3
Min. rotation speed	g/min	430	430	430	430
Max. rotation speed	g/min	910	870	905	905
Max. air flow	m3/s	2,4	2,4	4,4	4,4
Noise level **(3)**	dB(A)	62	62	63	63
R410A refrigerant charge	kg	4,20	4,76	5,90	6,00
Olio Mobil EAL Arctic 22 cc ** ICI Emkarate RL 32 CF **	Lt	2,50	3,25	3,25	4,00
Operating weight	kg	245	250	320	325

(1) condenser air in 35°C,evaporator water in/out 12/7°C

(2) evaporator air in 7°C ,condenser water in/out 40/45°C

(3) at 1m in open field fan side

(4) the maximum and minimum operating pressure values refer to the activation of the pressure switches

* total power doesn't include value of water pump. See table pag.8

** the two types of oil are equivalents

	Model	0071							Model	0091					
Ta.	Tw	5	6	7	8	9	10	Ta.	Tw	5	6	7	8	9	10
	Pf	20,4	21,1	21,7	22,4	23,0	23,6		Pf	23,2	23,9	24,6	25,2	25,9	26,6
	Pa	4,8	4,8	4,9	4,9	5,0	5,0		Pa	5,7	5,7	5,8	5,9	5,9	6,0
25	Pat	5,4	5,4	5,5	5,5	5,6	5,6	25	Pat	6,3	6,3	6,4	6,5	6,5	6,6
	Qev	3,5	3,6	3,7	3,9	4,0	4,1		Qev	4,0	4,1	4,2	4,3	4,5	4,6
	ΔPev	27	29	30	34	35	37		ΔPev	33	35	37	38	42	44
	Pf	19,4	20,0	20,6	21,2	21,8	22,5		Pf	22,9	22,6	23,3	23,9	24,6	25,2
	Pa	5,4	5,4	5,5	5,5	5,6	5,6		Pa	6,3	6,4	6,5	6,5	6,6	6,7
30	Pat	6,0	6,0	6,1	6,1	6,2	6,2	30	Pat	6,9	7,0	7,1	7,1	7,2	7,3
	Qev	3,3	3,4	3,5	3,7	3,8	3,9		Qev	3,8	3,9	4,0	4,1	4,2	4,3
	ΔPev	24	25	27	30	32	34		ΔPev	30	32	33	35	37	38
	Pf	18,9	19,5	20,1	20,7	21,3	21,9		Pf	21,4	22,1	22,7	23,4	24,0	24,7
	Pa	5,7	5,7	5,8	5,8	5,9	5,9		Pa	6,6	6,7	6,8	6,8	6,9	7,0
32	Pat	6,3	6,3	6,4	6,4	6,5	6,5	32	Pat	7,2	7,3	7,4	7,4	7,5	7,6
	Qev	3,3	3,4	3,5	3,6	3,7	3,8		Qev	3,7	3,8	3,9	4,0	4,1	4,2
	ΔPev	24	25	27	29	30	32		ΔPev	28	30	32	33	35	37
	Pf	18,2	18,8	19,3	19,9	20,5	21,1		Pf	20,6	21,3	21,9	22,5	23,2	23,8
	Pa	6,1	6,1	6,2	6,2	6,3	6,3		Pa	7,0	7,1	7,2	7,3	7,3	7,4
35	Pat	6,7	6,7	6,8	6,8	6,9	6,9	35	Pat	7,6	7,7	7,8	7,9	7,9	8,0
	Qev	3,1	3,2	3,3	3,4	3,5	3,6		Qev	3,5	3,7	3,8	3,9	4,0	4,1
	ΔPev	21	23	24	25	27	29		ΔPev	25	28	30	32	33	35
	Pf	16,9	17,4	18,0	18,5	19,1	19,6		Pf	19,2	19,9	20,5	21,1	21,8	22,4
	Pa	6,8	6,9	6,9	7,0	7,0	7,1		Pa	7,8	7,9	8,0	8,0	8,1	8,2
40	Pat	7,4	7,5	7,5	7,6	7,6	7,7	40	Pat	8,4	8,5	8,6	8,6	8,7	8,8
	Qev	2,9	3,0	3,1	3,2	3,3	3,4		Qev	3,3	3,4	3,5	3,6	3,8	3,9
	ΔPev	19	20	21	23	24	25		ΔPev	23	24	25	27	30	32
	Pf	16,0	16,6	17,1	17,6	18,1	18,6		Pf	18,4	19,0	19,6	20,3	20,9	21,6
	Pa	7,3	7,4	7,4	7,5	7,5	7,5		Pa	8,3	8,4	8,4	8,5	8,6	8,7
43	Pat	7,9	8,0	8,0	8,1	8,1	8,1	43	Pat	8,9	9,0	9,0	9,1	9,2	9,3
	Qev	2,8	2,8	2,9	3,0	3,1	3,2		Qev	3,2	3,3	3,4	3,5	3,6	3,7
	ΔPev	17	17	19	20	21	23		ΔPev	21	23	24	25	27	28

	Model	0101							Model	0121					
Ta.	Tw	5	6	7	8	9	10	Ta.	Tw	5	6	7	8	9	10
	Pf	27,5	28,3	29,1	30,0	30,8	31,6		Pf	34,3	35,3	36,4	37,4	38,5	39,5
	Pa	5,8	5,9	5,9	6,0	6,0	6,1		Pa	7,9	7,9	8,0	8,1	8,2	8,2
25	Pat	7,0	7,1	7,1	7,2	7,2	7,3	25	Pat	9,1	9,1	9,2	9,3	9,4	9,4
	Qev	4,7	4,9	5,0	5,2	5,3	5,4		Qev	5,9	6,1	6,3	6,4	6,6	6,8
	ΔPev	36	39	41	44	46	47		ΔPev	34	37	39	40	43	46
	Pf	26,2	27,0	27,9	28,7	29,5	30,3		Pf	32,7	33,7	34,7	35,7	36,7	37,7
	Pa	6,6	6,6	6,7	6,7	6,7	6,8		Pa	8,8	8,8	8,9	9,0	9,1	9,1
30	Pat	7,8	7,8	7,9	7,9	7,9	8,0	30	Pat	10,0	10,0	10,1	10,2	10,3	10,3
	Qev	4,5	4,7	4,8	4,9	5,1	5,2		Qev	5,6	5,8	6,0	6,2	6,3	6,5
	ΔPev	33	36	37	39	42	44		ΔPev	31	33	35	38	39	42
	Pf	25,7	26,5	27,3	28,1	28,9	29,7		Pf	32,1	33,0	34,0	35,0	36,0	37,0
	Pa	6,9	6,9	7,0	7,0	7,1	7,1		Pa	9,1	9,2	9,3	9,4	9,5	9,5
32	Pat	8,1	8,1	8,2	8,2	8,3	8,3	32	Pat	10,3	10,4	10,5	10,6	10,7	10,7
	Qev	4,4	4,6	4,7	4,8	5,0	5,1		Qev	5,5	5,7	5,9	6,0	6,2	6,4
	ΔPev	31	34	36	37	41	42		ΔPev	30	32	34	35	38	40
	Pf	24,8	25,6	26,4	27,2	27,9	28,7		Pf	31,0	32,0	32,9	33,9	34,8	35,8
	Pa	7,4	7,4	7,5	7,5	7,6	7,6		Pa	9,8	9,9	9,9	10,0	10,1	10,2
35	Pat	8,6	8,6	8,7	8,7	8,8	8,8	35	Pat	11,0	11,1	11,1	11,2	11,3	11,4
	Qev	4,0	4,1	4,3	4,4	4,8	4,9		Qev	5,3	5,5	5,7	5,8	6,0	6,2
	ΔPev	26	27	30	31	37	39		ΔPev	28	30	32	33	35	38
	Pf	23,2	23,9	24,7	25,5	26,2	27,0		Pf	29,1	30,0	30,9	31,8	32,7	33,6
	Pa	8,3	8,3	8,4	8,4	8,5	8,5		Pa	10,9	11,0	11,1	11,2	11,3	11,3
40	Pat	9,5	9,5	9,6	9,6	9,7	9,7	40	Pat	12,1	12,2	12,3	12,4	12,5	12,5
	Qev	4,0	4,1	4,3	4,4	4,5	4,6		Qev	5,0	5,2	5,3	5,5	5,6	5,8
	ΔPev	26	27	30	31	33	34		ΔPev	25	27	28	30	31	33
	Pf	22,1	22,9	23,6	24,3	25,1	25,8		Pf	27,9	28,8	29,6	30,5	31,3	32,2
	Pa	8,9	8,9	9,0	9,0	9,1	9,1		Pa	11,7	11,8	11,9	12,0	12,0	12,1
43	Pat	10,1	10,1	10,2	10,2	10,3	10,3	43	Pat	12,9	13,0	13,1	13,2	13,2	13,3
	Qev	3,8	3,9	4,1	4,2	4,3	4,4		Qev	4,8	5,0	5,1	5,2	5,4	5,5
	ΔPev	23	25	27	29	30	31		ΔPev	23	25	26	27	29	30

Ta: outside air temperature (°C)
Pa: compressor power input (kW)
ΔPev: evaporator pressure drop (kPa)
Tw: evaporator water outlet temperature (°C)
Pat: total power input (kW)
(compressor + fan)
Pf: cooling capacity (kW)
Qev: evaporator water flow (m^3/h)

	Model 0071								Model 0091						
Ta.	Tw	5	6	7	8	9	10	Ta.	Tw	5	6	7	8	9	10
	Pf	19,4	20,0	20,6	21,2	21,9	22,5		Pf	22,0	22,7	23,3	24,0	24,6	25,3
	Pa	4,8	4,8	4,9	4,9	5,0	5,0		Pa	5,7	5,7	5,8	5,9	5,9	6,0
25	Pat	5,4	5,4	5,5	5,5	5,6	5,6	25	Pat	6,3	6,3	6,4	6,5	6,5	6,6
	Qev	3,3	3,4	3,6	3,7	3,8	3,9		Qev	3,8	3,9	4,0	4,1	4,2	4,4
	ΔPev	31	33	37	39	41	43		ΔPev	45	47	49	52	54	60
	Pf	18,4	19,0	19,6	20,2	20,7	21,3		Pf	20,8	21,5	22,1	22,7	23,3	24,0
	Pa	5,4	5,4	5,5	5,5	5,6	5,6		Pa	6,3	6,4	6,5	6,5	6,6	6,7
30	Pat	6,0	6,0	6,1	6,1	6,2	6,2	30	Pat	6,9	7,0	7,1	7,1	7,2	7,3
	Qev	3,2	3,3	3,4	3,5	3,6	3,7		Qev	3,6	3,7	3,8	3,9	4,0	4,1
	ΔPev	29	31	33	35	37	39		ΔPev	40	42	45	47	49	52
	Pf	18,0	18,5	19,1	19,7	20,3	20,8		Pf	20,3	21,0	21,6	22,2	22,8	23,4
	Pa	5,7	5,7	5,8	5,8	5,9	5,9		Pa	6,6	6,7	6,8	6,8	6,9	7,0
32	Pat	6,3	6,3	6,4	6,4	6,5	6,5	32	Pat	7,2	7,3	7,4	7,4	7,5	7,6
	Qev	3,1	3,2	3,3	3,4	3,5	3,6		Qev	3,5	3,6	3,7	3,8	3,9	4,0
	ΔPev	27	29	31	33	35	37		ΔPev	38	40	42	45	47	49
	Pf	17,3	17,8	18,4	18,9	19,5	20,1		Pf	19,6	20,2	20,8	21,4	22,0	22,6
	Pa	6,1	6,1	6,2	6,2	6,3	6,3		Pa	7,0	7,1	7,2	7,3	7,3	7,4
35	Pat	6,7	6,7	6,8	6,8	6,9	6,9	35	Pat	7,6	7,7	7,8	7,9	7,9	8,0
	Qev	3,0	3,1	3,2	3,3	3,4	3,5		Qev	3,4	3,5	3,6	3,7	3,8	3,9
	ΔPev	25	27	29	31	33	35		ΔPev	36	38	40	42	45	47
	Pf	16,0	16,5	17,1	17,6	18,1	18,6		Pf	18,3	18,9	19,5	20,1	20,7	21,3
	Pa	6,8	6,9	6,9	7,0	7,0	7,1		Pa	7,8	7,9	8,0	8,0	8,1	8,2
40	Pat	7,4	7,5	7,5	7,6	7,6	7,7	40	Pat	8,4	8,5	8,6	8,6	8,7	8,8
	Qev	2,8	2,8	2,9	3,0	3,1	3,2		Qev	3,1	3,2	3,4	3,5	3,6	3,7
	ΔPev	22	22	24	25	27	29		ΔPev	30	32	36	38	40	42
	Pf	15,2	15,7	16,2	16,7	17,2	17,7		Pf	17,5	18,1	18,7	19,3	19,9	20,5
	Pa	7,3	7,4	7,4	7,5	7,5	7,5		Pa	8,3	8,4	8,4	8,5	8,6	8,7
43	Pat	7,9	8,0	8,0	8,1	8,1	8,1	43	Pat	8,9	9,0	9,0	9,1	9,2	9,3
	Qev	2,6	2,7	2,8	2,9	3,0	3,0		Qev	3,0	3,1	3,2	3,3	3,4	3,5
	ΔPev	19	21	22	24	25	25		ΔPev	28	30	32	34	36	38

	Model 0101								Model 0121						
Ta.	Tw	5	6	7	8	9	10	Ta.	Tw	5	6	7	8	9	10
	Pf	26,1	26,9	27,7	28,5	29,3	30,0		Pf	32,6	33,6	34,6	35,5	36,5	37,5
	Pa	5,8	5,9	5,9	6,0	6,0	6,1		Pa	7,9	7,9	8,0	8,1	8,2	8,2
25	Pat	7,0	7,1	7,1	7,2	7,2	7,3	25	Pat	9,1	9,1	9,2	9,3	9,4	9,4
	Qev	4,5	4,6	4,8	4,9	5,0	5,2		Qev	5,6	5,8	5,9	6,1	6,3	6,5
	ΔPev	36	38	41	43	45	48		ΔPev	40	43	44	47	50	54
	Pf	24,9	25,7	26,5	27,2	28,0	28,8		Pf	31,1	32,0	33,0	34,0	34,9	35,9
	Pa	6,6	6,6	6,7	6,7	6,7	6,8		Pa	8,8	8,8	8,9	9,0	9,1	9,1
30	Pat	7,8	7,8	7,9	7,9	7,9	8,0	30	Pat	10,0	10,0	10,1	10,2	10,3	10,3
	Qev	4,3	4,4	4,6	4,7	4,8	5,0		Qev	5,4	5,5	5,7	5,8	6,0	6,2
	ΔPev	33	35	38	39	41	45		ΔPev	37	38	41	43	46	49
	Pf	24,4	25,2	25,9	26,7	27,4	28,2		Pf	30,5	31,4	32,3	33,3	34,2	35,1
	Pa	6,9	6,9	7,0	7,0	7,1	7,1		Pa	9,1	9,2	9,3	9,4	9,5	9,5
32	Pat	8,1	8,1	8,2	8,2	8,3	8,3	32	Pat	10,3	10,4	10,5	10,6	10,7	10,7
	Qev	4,2	4,3	4,5	4,6	4,7	4,9		Qev	5,2	5,4	5,6	5,7	5,9	6,1
	ΔPev	31	33	36	38	39	43		ΔPev	34	37	40	41	44	47
	Pf	23,6	24,3	25,1	25,8	26,5	27,3		Pf	29,5	30,4	31,3	32,2	33,1	34,0
	Pa	7,4	7,4	7,5	7,5	7,6	7,6		Pa	9,8	9,9	9,9	10,0	10,1	10,2
35	Pat	8,6	8,6	8,7	8,7	8,8	8,8	35	Pat	11,0	11,1	11,1	11,2	11,2	11,3
	Qev	4,1	4,2	4,3	4,4	4,6	4,7		Qev	5,1	5,2	5,4	5,5	5,7	5,9
	ΔPev	30	31	33	35	38	39		ΔPev	33	34	37	38	41	44
	Pf	22,0	22,7	23,5	24,2	24,9	25,6		Pf	27,7	28,5	29,4	30,2	31,1	31,9
	Pa	8,3	8,3	8,4	8,4	8,5	8,5		Pa	10,9	11,0	11,1	11,2	11,3	11,3
40	Pat	9,5	9,5	9,6	9,6	9,7	9,7	40	Pat	12,1	12,2	12,3	12,4	12,5	12,5
	Qev	3,8	3,9	4,0	4,2	4,3	4,4		Qev	4,8	4,9	5,1	5,2	5,4	5,5
	ΔPev	26	27	29	31	33	35		ΔPev	29	30	33	34	37	38
	Pf	21,0	21,7	22,4	23,1	23,8	24,5		Pf	26,5	27,3	28,1	29,0	29,8	30,6
	Pa	8,9	8,9	9,0	9,0	9,1	9,1		Pa	11,7	11,8	11,9	12,0	12,0	12,1
43	Pat	10,1	10,1	10,2	10,2	10,3	10,3	43	Pat	12,9	13,0	13,1	13,2	13,2	13,3
	Qev	3,6	3,7	3,9	4,0	4,1	4,2		Qev	4,6	4,7	4,8	5,0	5,1	5,3
	ΔPev	23	24	27	29	30	31		ΔPev	27	28	29	32	33	36

Ta: outside air temperature (°C)
Pa: compressor power input (kW)
ΔPev: evaporator pressure drop (kPa)
Tw: evaporator water outlet temperature (°C)
Pat: total power input (kW)
(compressor + fan)
Pf: cooling capacity (kW)
Qev: evaporator water flow (m^3/h)

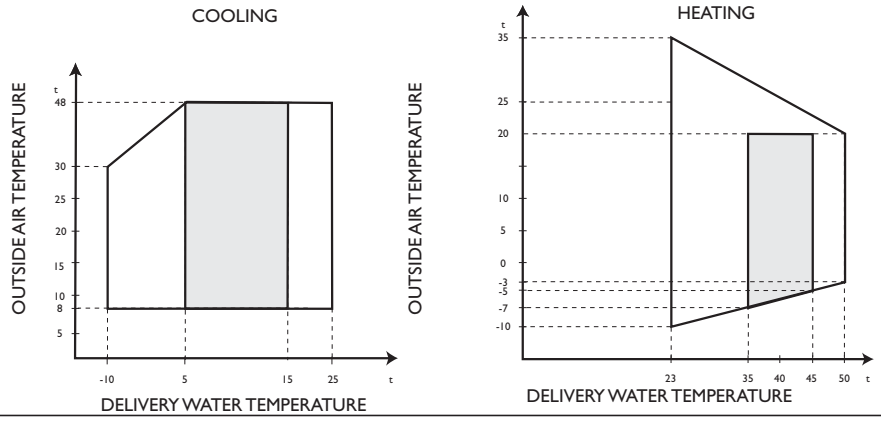
Ta.	Model	0071				Ta.	Model	0091			
U.R.87%	Tw	35	40	45	50	U.R.87%	Tw	35	40	45	50
	Pt	15,8	15,8	15,8	-		Pt	17,5	17,6	17,8	-
	Pa	5,0	5,6	6,4	-		Pa	5,5	6,3	7,2	-
-5	Pat	5,6	6,2	7,0	-	-5	Pat	6,1	6,9	7,8	-
	Qc	2,7	2,8	2,8	-		Qc	3,0	3,1	3,1	-
	ΔPc	10	11	11	-		ΔPc	11	11	11	-
	Pt	17,9	17,8	17,8	17,7		Pt	20,0	20,0	20,0	19,9
	Pa	5,0	5,7	6,4	7,2		Pa	5,6	6,3	7,2	8,1
0	Pat	5,6	6,3	7,0	7,8	0	Pat	6,2	6,9	7,8	8,7
	Qc	3,1	3,1	3,1	3,1		Qc	3,5	3,5	3,5	3,5
	ΔPc	13	13	13	13		ΔPc	15	15	15	15
	Pt	21,5	21,2	21,0	20,8		Pt	24,0	23,8	23,6	23,3
	Pa	5,1	5,8	6,5	7,3		Pa	5,7	6,4	7,2	8,0
7	Pat	5,7	6,4	7,1	7,9	7	Pat	6,3	7,0	7,8	8,6
	Qc	3,7	3,7	3,7	3,6		Qc	4,2	4,1	4,1	4,1
	ΔPc	19	19	19	18		ΔPc	21	20	20	20
	Pt	23,2	22,9	22,6	22,3		Pt	25,9	25,6	25,3	25,0
	Pa	5,2	5,8	6,6	7,4		Pa	5,8	6,5	7,2	8,0
10	Pat	5,8	6,4	7,2	8,0	10	Pat	6,4	7,1	7,8	8,6
	Qc	4,0	4,0	3,9	3,9		Qc	4,5	4,5	4,4	4,4
	ΔPc	22	22	21	21		ΔPc	24	24	23	23
	Pt	26,2	25,9	25,5	25,0		Pt	29,2	28,8	28,5	28,2
	Pa	5,3	6,0	6,7	7,5		Pa	6,0	6,6	7,3	8,1
15	Pat	5,9	6,6	7,3	8,1	15	Pat	6,6	7,2	7,9	8,7
	Qc	4,6	4,5	4,4	4,4		Qc	5,1	5,0	5,0	4,9
	ΔPc	29	28	27	27		ΔPc	31	30	30	29

Ta.	Model	0101				Ta.	Model	0121			
U.R.87%	Tw	35	40	45	50	U.R.87%	Tw	35	40	45	50
	Pt	21,8	21,6	21,5	-		Pt	27,0	26,8	26,6	-
	Pa	6,7	7,6	8,6	-		Pa	8,3	9,1	10,0	-
-5	Pat	7,9	8,8	9,8	-	-5	Pat	9,5	10,3	11,2	-
	Qc	3,8	3,8	3,7	-		Qc	4,7	4,7	4,6	-
	ΔPc	13	13	12	-		ΔPc	11	11	11	-
	Pt	24,9	24,7	24,4	24,1		Pt	30,5	30,3	30,1	29,9
	Pa	6,9	7,7	8,7	9,8		Pa	8,4	9,3	10,2	11,3
0	Pat	8,1	8,9	9,9	11,0	0	Pat	9,6	10,5	11,4	12,5
	Qc	4,3	4,3	4,2	4,2		Qc	5,3	5,3	5,2	5,2
	ΔPc	16	16	16	16		ΔPc	15	15	14	14
	Pt	29,7	29,3	28,8	28,2		Pt	36,0	35,8	35,5	35,2
	Pa	7,1	7,9	8,9	9,9		Pa	8,6	9,5	10,6	11,9
7	Pat	8,3	9,1	10,1	11,1	7	Pat	9,8	10,7	11,8	13,1
	Qc	5,2	5,1	5,0	4,9		Qc	6,2	6,2	6,2	6,1
	ΔPc	24	23	22	21		ΔPc	20	20	20	19
	Pt	31,9	31,4	30,8	30,1		Pt	38,7	38,3	37,9	37,5
	Pa	7,2	8,1	9,0	10,0		Pa	8,7	9,7	10,8	12,1
10	Pat	8,4	9,3	10,2	11,2	10	Pat	9,9	10,9	12,0	13,3
	Qc	5,5	5,5	5,4	5,2		Qc	6,7	6,7	6,6	6,5
	ΔPc	27	27	26	24		ΔPc	23	23	23	22
	Pt	35,8	35,1	34,3	33,4		Pt	43,5	42,9	42,3	41,6
	Pa	7,4	8,3	9,2	10,2		Pa	8,9	10,0	11,1	12,4
15	Pat	8,6	9,5	10,4	11,4	15	Pat	10,1	11,2	12,3	13,6
	Qc	6,2	6,1	6,0	5,8		Qc	7,5	7,5	7,4	7,3
	ΔPc	34	33	32	30		ΔPc	29	29	28	28

Ta: outside air temperature (°C)
Pa: compressor power input (kW)
ΔPc: evaporator pressure drop (kPa)
Tw: evaporator water outlet temperature (°C)
Pat: total power input (kW)
- conditions outside of operating limits
Pt: cooling capacity (kW)
Qc: condenser water flow (m^3/h)

To operate the chiller, it is vital to respect the conditions given in the table:

RECOMMENDED OPERATING AREA



Thermal head min. max	3÷8
Water circuit pressure (bar)	1÷6
Max. storage temperature (°C)	63

ETHYLENE GLYCOL SOLUTIONS

Water and ethylene glycol solutions used as a thermal vector in the place of water reduce the performance of the unit. Multiply the performance figures by the values given in the following table.

Freezing point (°C)						
	0	-5	-10	-15	-20	-25
Percentuale di glicole etilenico in peso						
	0	12%	20%	28%	35%	40%
cPf	1	0,985	0,98	0,974	0,97	0,965
cQ	1	1,02	1,04	1,075	1,11	1,14
cdp	1	1,07	1,11	1,18	1,22	1,24

cPf: cooling capacity correction factor
cQ: flow rate correction factor
cdp: pressure drop correction factor

FOULING FACTORS

The performance data given refer to conditions with clean evaporator plates (fouling factor=1). For different fouling factors, multiply the figures in the performance tables by the coefficient given in the following table.

Fouling factors	Evaporator		
(m^2 °C/W)	**fI**	**fkI**	**fxI**
$4,4 \times 10^{-5}$	-	-	-
$0,86 \times 10^{-4}$	0,96	0,99	0,99
$1,72 \times 10^{-4}$	0,93	0,98	0,98

fI capacity correction factor
fkI compressor power input correction factor
fxI total power input correction factor

SOUND PRESSURE LEVEL

Model	**Octave band (Hz)**								
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**Total dB(A)**
	Sound pressure level (dB)								
0071	29	44	57	55	58	53	46	38	62
0091	29	44	57	55	58	53	46	38	62
0101	30	45	58	56	59	54	47	39	63
0121	30	45	58	56	59	54	47	39	63

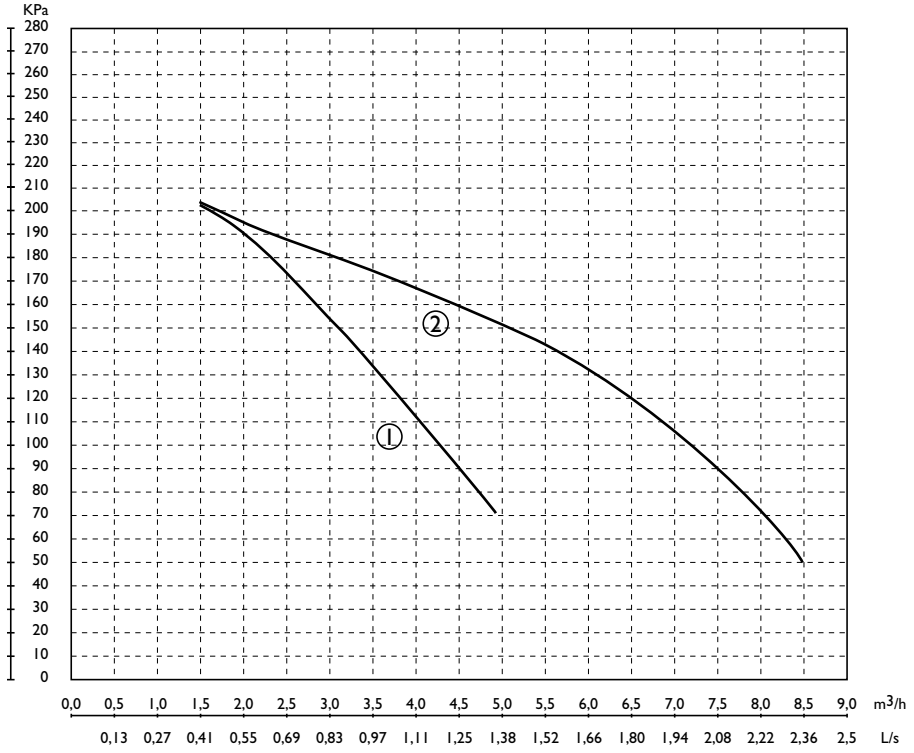
Metres / Model	**1**	**5**	**10**	**15**	**20**
0071	62	48	42	38	36
0091	62	48	42	38	36
0101	63	49	43	39	37
0121	63	49	43	39	37

Reference point: in open field at 1m from the surface of the unit on the coil side and 1m above the support surface.

MINIMUM WATER CONTENT

Model		0071	0091	0101	0121
Minimum water content BRAT FF SL	Litri	55	65	78	94
Minimum water content BRAN FF SL	Litri	74	85	103	124

USEFUL PUMP HEAD CURVES (*)



(1) BRAT/N FF SL 0071÷0091
(2) BRAT/N FF SL 0101÷0121

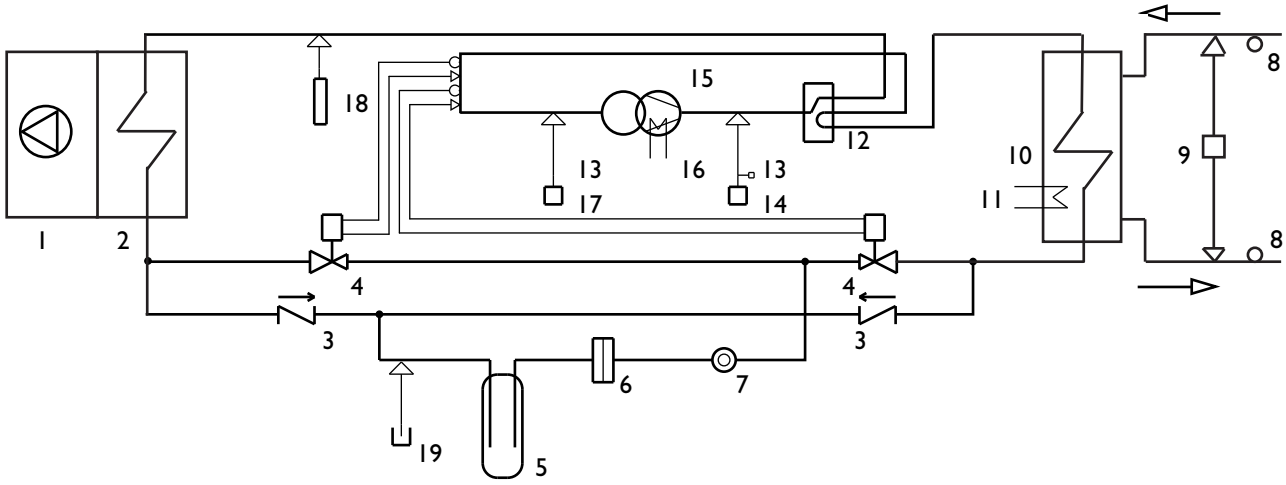
(*) To obtain the useful head of the installation, subtract the pressure drop of the plate heat exchanger

HEAT EXCHANGER PRESSURE DROP (WATER SIDE)

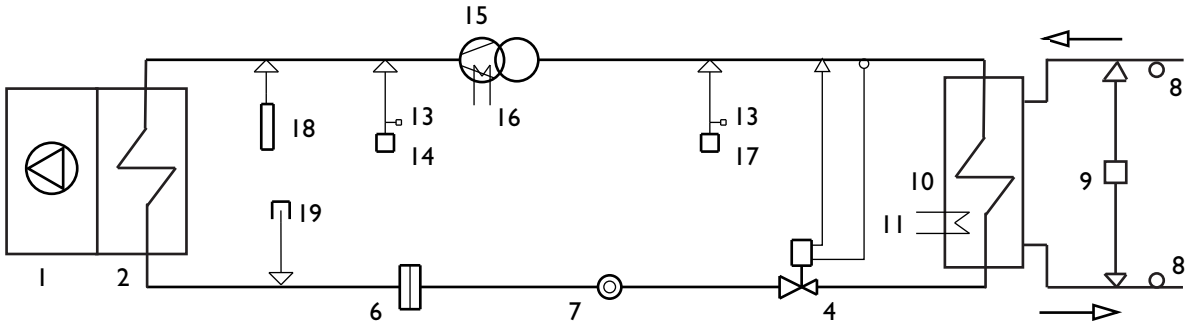
Model	Water flow	m³/h	3,0	3,3	3,8	4,5	5,2	5,7	6,2	7,0	7,8
		l/sec	0,833	0,917	1,055	1,25	1,44	1,55	1,722	1,944	2,167
0071	Pressure drop	kPa	20	24	32	45	-	-	-	-	-
0091		kPa	19	23	30	42	56	-	-	-	-
0101		kPa	-	13	21	30	40	48	57	-	-
0121		kPa	-	-	14	20	27	32	38	48	60

Note: the values highlighted refer to the rated flow

BRAN FF SL



BRAT FF SL



1 fan	6 filter	11 frost heater	16 sump heater
2 finned coil	7 liquid indicator	12 reversing valve	17 low pressure switch
3 check valve	8 water temperature sensor	13 fill connections	18 pressure transducer
4 thermostatic valve	9 water differential pressure switch	14 high pressure switch	19 R410A fill-drain connector
5 liquid receiver	10 plate heat exchanger	15 compressor	

PREPARING FOR FIRST START UP

or restarting after shutting down for long periods.

The chiller must be started up for the first time by the **Technical Service.**

Before starting up the chillers, make sure that:

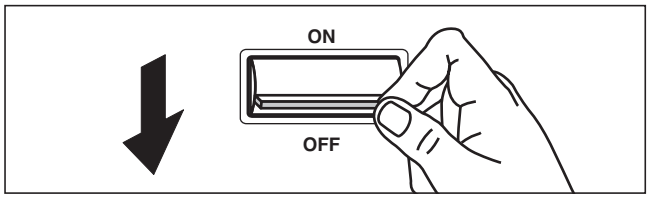
- All safety conditions have been respected
- The chiller is adequately fixed to the surface it rests on
- Functional distances have been respected;
- Hydraulic connections have been carried out as indicated in the instruction manual
- The water circuit is filled and vented;
- The water circuit valves are open
- Electrical connections have been carried out correctly
- Voltage is within a tolerance of 10% of the rated voltage for the unit
- The unit is correctly earthed
- All electrical and hydraulic connections are tight and have been completed correctly.

⚠ The unit must be started up for the first time with standard settings. Set point values may be modified only after testing has been completed. Before starting up, power the unit for at least two hours by switching QF1 and QS1 to ON and setting the control panel "HSW7" to OFF to allow the oil in the compressor sump to heat up.

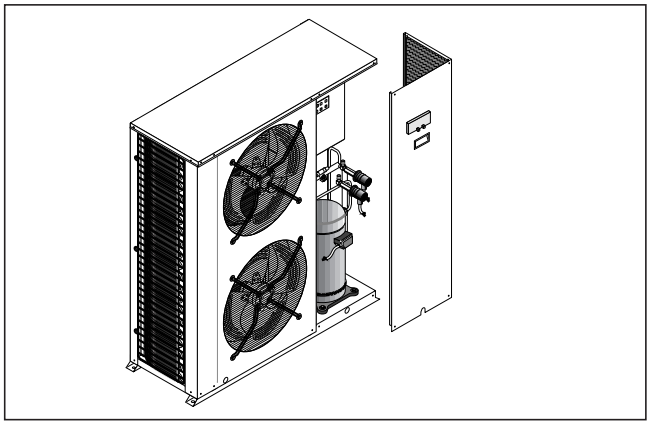
STARTING UP FOR THE FIRST TIME (after two hours)

Before activating the chiller:

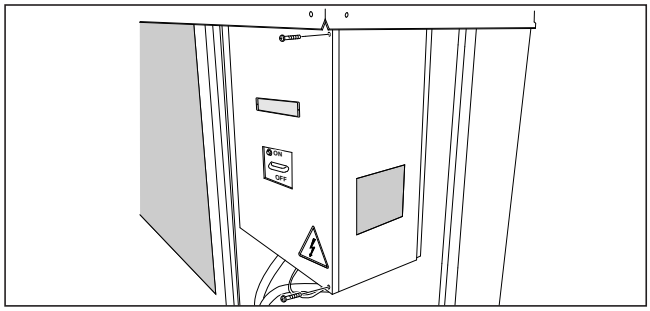
- Make sure the main remote switch QF1 is in the OFF position;



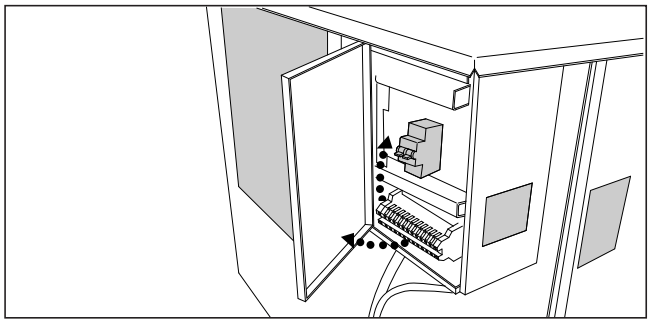
- Make sure the remote secondary switch SA1 is in the OFF position
- Make sure the remote keyboard "A6" (if present) is set to OFF
- Remove the inspection panel



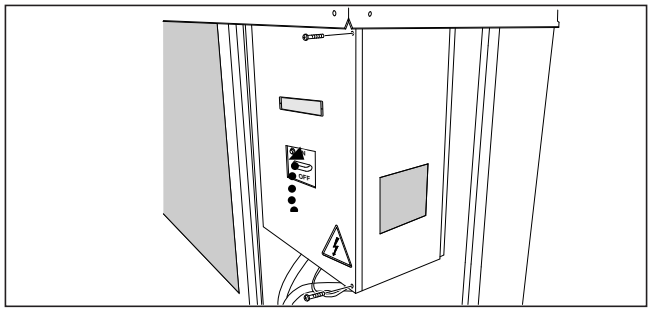
- Open the door of the electrical panel, moving QS1 to OFF



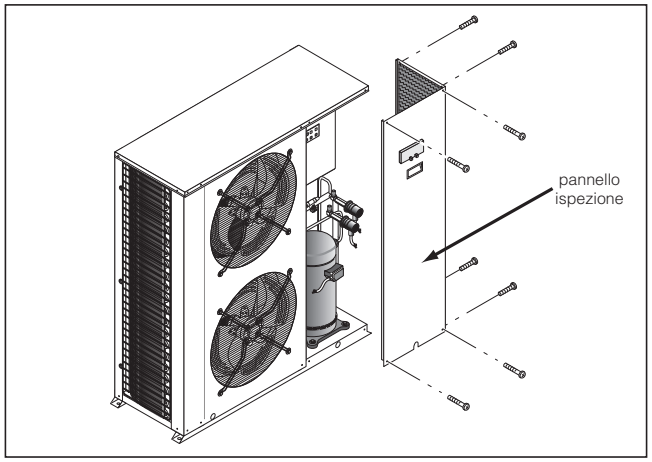
- Place the compressor thermal overload switch QM1 in the ON position



- Close the electrical panel and tighten the closing screws
- Position the main unit switch QS1 in the ON position



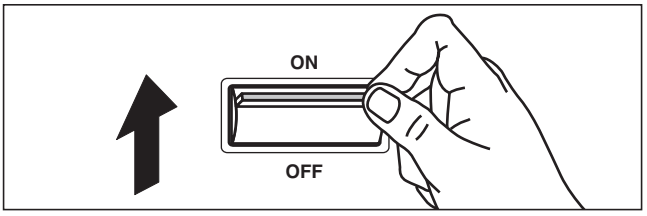
- Replace the inspection panel



- Position the main switch QF1 (outside the unit) in the "ON" position
- The "POWER" LED on the control panel "HSW7" comes on to signal that voltage is present.

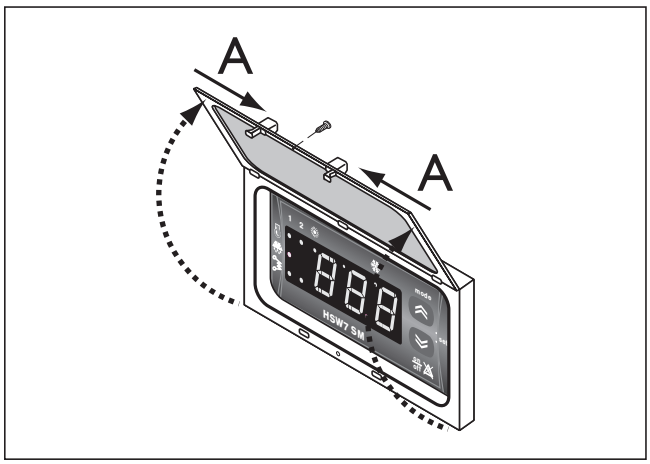
ACTIVATING AND DEACTIVATING THE UNIT

- Set the remote keyboard "A6" (if present) to ON.



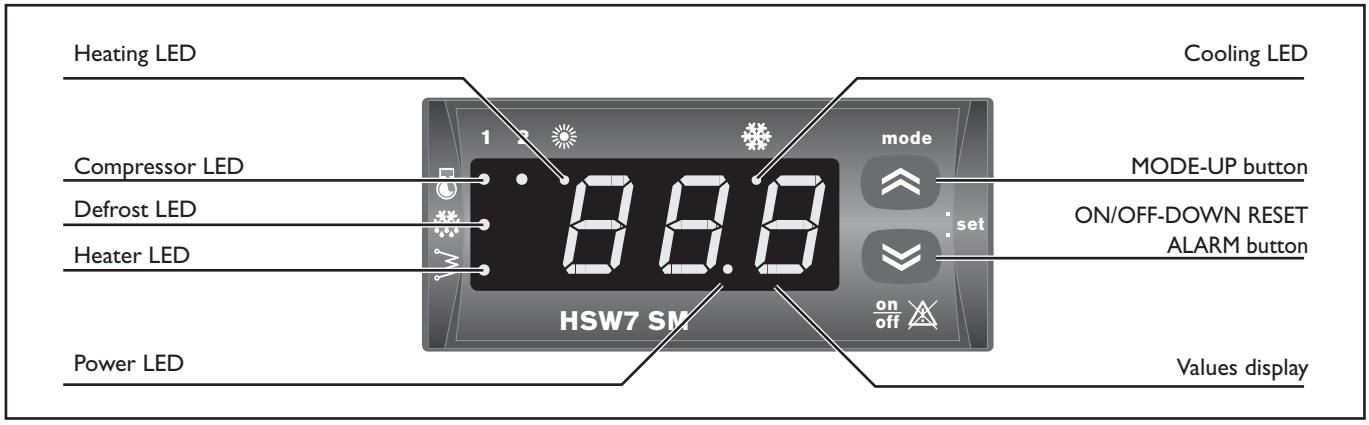
- To ACTIVATE and DEACTIVATE the COOLING and HEATING functions, use the "HSW7" control panel or the remote keyboard "A6" if present.

⚠ During this phase, if the following indications appear on the display, follow the instructions:
- E41 check water flow rate and the connections (14 - 15) of the flow switch or differential pressure switch.



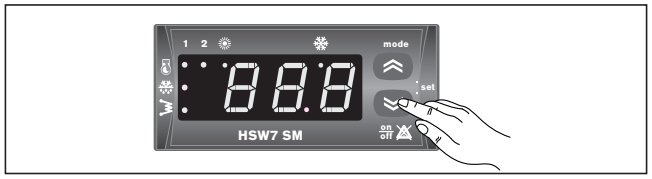
To access the control panel, open the door:

- remove the screw 1;
- press the points 2 simultaneously and lift the door 3.



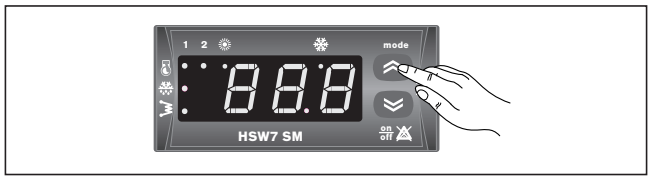
Activating:

- Press the ON/OFF button on the keyboard in the figure.



The temperature of water returning from the installation appears on the "values display".

- Press the MODE button once.

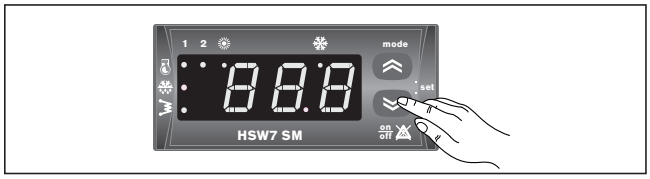


The cooling LED comes on.

After a couple of seconds, the compressor 1 LED flashes until the compressor comes on

Deactivating:

- Press the ON/OFF button on the keyboard in the figure.



the "values display" goes off and the "POWER" LED remains on.

⚠ **At every change of season,** make sure the operating conditions fall within the limits specified on page 19.

Check that the compressor current input is less than the maximum indicated in the table of technical data.

In three-phase models, check that the noise levels of the compressor are not abnormal. If this is the case, reverse one phase.

Make sure the voltage is within the established limits and that, for three phase units, the unbalance between the phases is less than 3%. Check that the cover is closed again following the setting procedure

Heating and cooling are activated and deactivated via the control panel. To activate and deactivate the unit, see page 20.

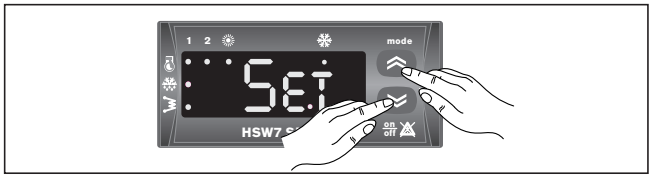
A SETTING SERVICE PARAMETERS

SETTING THE SET POINTS

The factory Set Point settings are: cooling 12°C, heating 40°C.

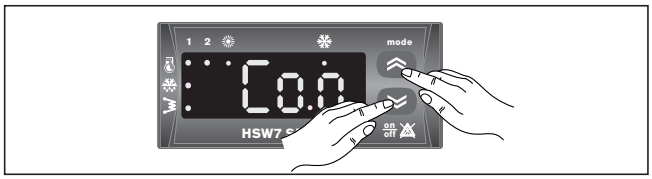
To modify the set points, proceed as follows:

- press the ON/OFF and MODE buttons simultaneously for 1 second



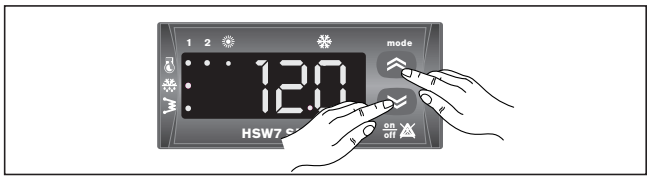
the parameter SEt appears on the display;

- press the ON/OFF and MODE buttons simultaneously for 1 second;



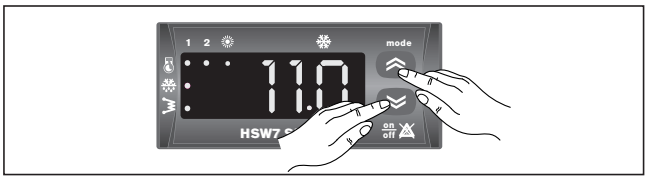
the parameter Coo appears on the display;

- press the ∧ and ∨ buttons to display heating mode;
- press the ON/OFF and MODE buttons simultaneously for 1 second:

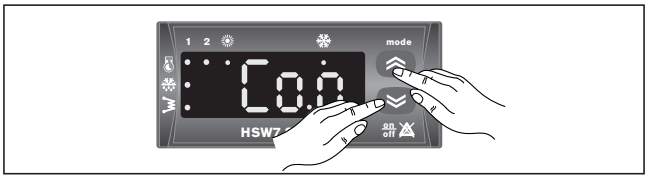


the parameter G01 appears on the display.

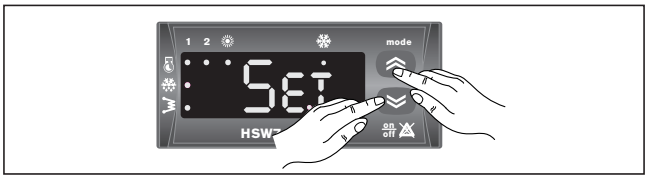
Use the ∧ and ∨ buttons to set the new Set Point;



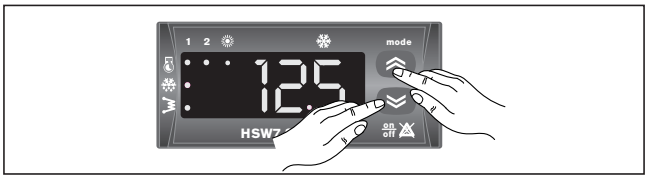
- to exit the Set Point setting phase, proceed as follows:
- press the ON/OFF and MODE buttons simultaneously for 2 seconds;



- press the ON/OFF and MODE buttons simultaneously again for more than 2 seconds;



- press the ON/OFF and MODE buttons simultaneously again for more than 2 seconds;



The water return temperature is displayed: the settings are complete. To display the status of the unit, the alarms and the operating hours, return to the SEt level, and then perform the procedure described above, selecting the desired index using the ∧ and ∨ buttons.

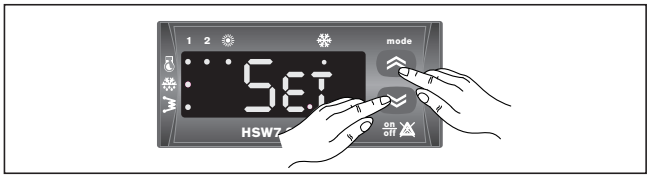
LIST OF ACCESSIBLE PARAMETERS

Parameter	Description	Unit of measure	Factory set point
SEt	Cooling Set Point	°C	12
SEt	Heating Set Point	°C	40
TP	Operating status	value	-
Err	Alarm	value	-
PAr	Operating parameters	value	-
Pss	Password	value	-
OHr	Operating hours	value	-

Note: when setting the parameters the COMPRESSOR and HEATER LEDs will flash alternating with the DEFROST LED.

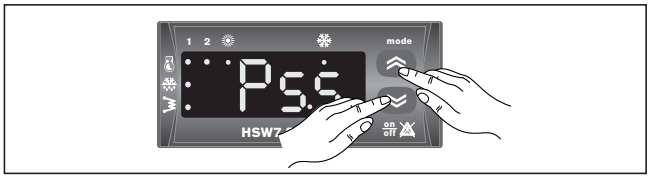
If the parameters set on the microprocessor need to be checked or modified, a password is necessary to enter a higher level, accessible only to authorised service centres. Proceed as follows:

- press the ON/OFF button;
- press the ON/OFF and MODE buttons simultaneously;

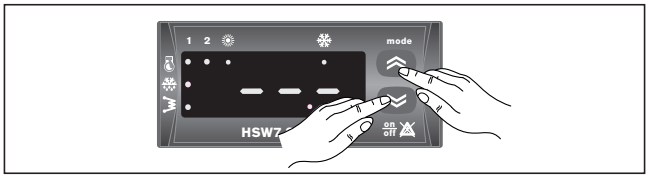


the parameter SEt appears on the display;

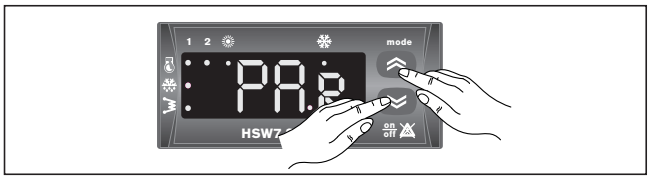
- press the ∧ and ∨ buttons to select the parameter Pss;



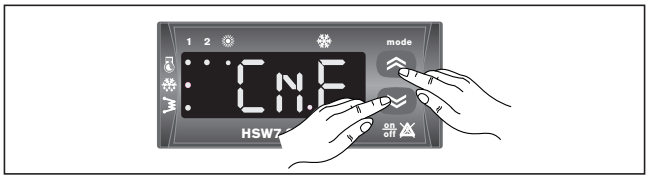
- press the ON/OFF and MODE buttons simultaneously;



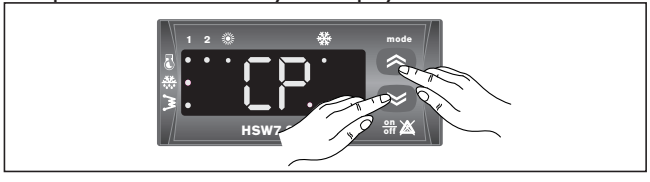
- press the ∧ and ∨ buttons to select the value of the password;
- press the ON/OFF and MODE buttons simultaneously for more than 2 seconds to confirm the password;
- press the ∧ and ∨ buttons to select the parameter PAr;



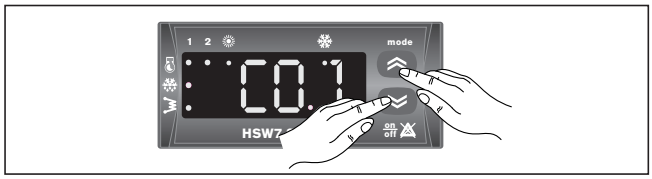
- press the ON/OFF and MODE buttons simultaneously;



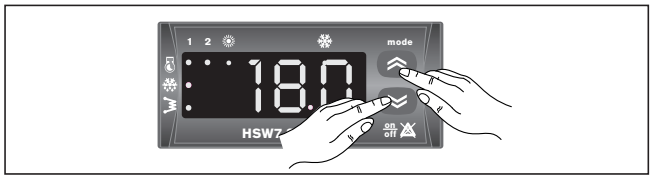
- press the ∧ and ∨ buttons to select the family of parameters to modify or display;



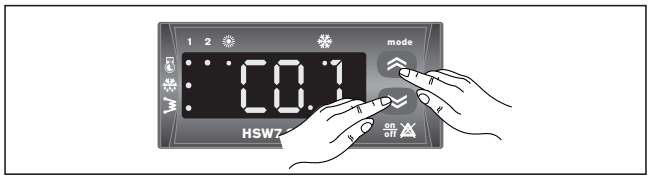
- press the ON/OFF and MODE buttons simultaneously;



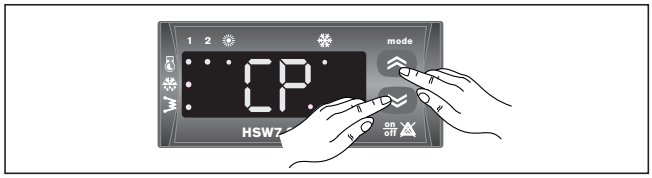
- press the ∧ and ∨ buttons to display the index of the selected parameter;



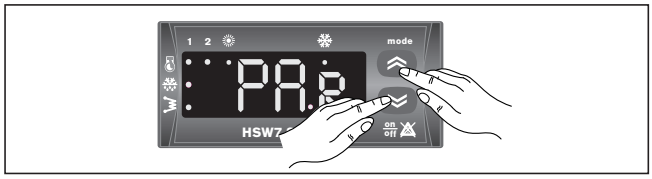
- press the ∧ and ∨ buttons to modify the value of the selected parameter;
- the settings are complete.
- To exit the upper level, proceed as follows:
- press the ON/OFF and MODE buttons simultaneously for more than 2 seconds



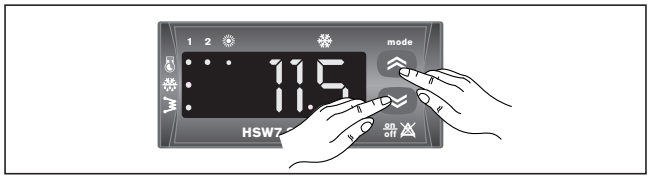
- press the ON/OFF and MODE buttons simultaneously for more than 2 seconds;



- press the ON/OFF and MODE buttons simultaneously for more than 2 seconds;



- press the ON/OFF and MODE buttons simultaneously for more than 2 seconds;



- the temperature of the water returning from the installation is shown on the display.

⚠ For the list of parameters contact an authorised service centre.

LIST OF ACCESSIBLE PARAMETERS		
Parameter	**Description**	**Unit of measure**
CnF*	Machine configuration parameters	value
CP	Compressor parameters	value
FAn	Fan parameters	value
ALL	Alarm parameters	value
PUP	Pump parameters	value
Fro	Frost parameters	value
dFr	Defrost parameters	value

Note: when setting the parameters the COMPRESSOR and HEATER LEDs will flash alternating with the DEFROST LED.

*** To enable the remote heating-cooling switch set parameter H27 to 1.**

I A DISPLAYING ALARMS

FAULT	CAUSE	REMEDY
Values display indication E00	Remote switch in OFF position (automatic reset)	Position the remote switch to ON Reset the switch Reset the jumper between terminals 10-11
Values display indication E01	High pressure switch tripped manual reset after 3 activations in one hour	Check fault (see high discharge pressure page 27) Reset manually
Values display indication E02	Low pressure switch tripped automatic reset for the first three trips in an hour	Check fault
Values display indication E03	Thermal cut-out tripped (manual reset)	Check compressor motor Reset manually
Values display indication E05	Compressor thermal cut-out tripped (manual reset)	Check water outlet temperature Check water flow Check set point temperature
Values display indication E06	Water delivery sensor BT2 malfunction (automatic reset)	Check electrical connections Replace component
Values display indication E07	Coil sensor BT3 malfunction (automatic reset)	Check electrical connections Replace component
Values display indication E40	Water return sensor BT1 malfunction (automatic reset)	Check electrical connections Replace component
Values display indication E41	Differential pressure switch or flow switch tripped automatic reset for the first six trips in an hour	Check for inadequate water flow Check presence of air in water circuit

Set point in cooling
(factory set) = 12°C, Hysteresis = 3°C.
The compressor starts with water temperatures above 15°C.
The compressor shuts down with water temperatures of less than 12°C.

Set point in heating
(factory set) = 40°C, hysteresis = 3°C.
The compressor starts with water temperatures below 37°C.
The compressor shuts down with water temperatures above 40°C.

In the event of a temporary power failure, when power returns, the mode set previously will be retained in the memory.

COMPRESSOR START UP DELAY

Two functions prevent the compressor from starting up too frequently.
- Minimum time since last shut-down 180 seconds.
- Minimum time since last start-up 300 seconds.

PUMP

The electronic board includes a pump control output. The pump starts when the assembly is powered up and at least 60 seconds before the compressor starts up and stops 60 seconds after the assembly shuts down.
After the first 60 seconds of pump operation when the water flow is at full speed, the water flow alarm functions are activated (differential pressure switch and flow switch).

FAN SPEED CONTROL

For correct operation of the unit with different outside temperatures, the microprocessor controls the fan speed based on the pressure reading from the pressure transducer, thus enabling heat exchange to be increased and/or decreased, maintaining the condensing or evaporation pressures practically constant.
The fan functions independently of the compressor.

FROST PREVENTION ALARM

To prevent the water in plate heat exchanger freezing and damaging the exchanger, the microprocessor shuts down the compressor if the temperature measured by the heat exchanger outlet temperature sensor is less than +3C.
The frost prevention temperature set point can be modified by an authorised service centre only and only after verifying that the water circuit contains antifreeze.
Tripping of this alarm shuts down the compressor but not the pump, which remains active.
To reset normal functions, the outlet water temperature must rise to more than +7°C. Reset is manual.

WATER FLOW ALARM

The microprocessor provides for management of a water flow alarm controlled by a differential pressure switch fitted as standard on the appliance and a flow switch to be installed on the water delivery piping.
This safety device may trip after the first 60 seconds of pump operation when the water flow is up to speed.
Tripping of this alarm shuts down the compressor but not the pump, which remains active.
To reset normal functions, the alarm contact must be deactivated for at least five seconds.

A SHUTTING DOWN FOR LONG PERIODS

After deactivating the chiller:
- Make sure the remote switch SA (if present) is in the "OFF" position.
- Make sure the remote keyboard (if present) is set to "OFF".
- Position QF and QS on OFF
- Deactivate the indoor terminal units by placing the switch of each unit in the "OFF" position.
- Close the water valves

⚠ **If there is a possibility** that the outside temperature may drop below zero, there is the risk of freezing.
The water circuit MUST BE EMPTIED AND CLOSED or antifreeze must be added in the proportion recommended by the manufacturer.

A ROUTINE MAINTENANCE

Regular maintenance is fundamental to maintain the efficiency of the unit both in terms of operation and energy consumption.
The Technical Assistance Service maintenance plan must be observed, with an annual service which includes the following operations and checks:
- Filling of the water circuit
- Presence of air bubbles in the water circuit
- Efficiency of safety devices
- Power supply voltage
- Power input
- Tightness of electrical and hydraulic connections
- Condition of the compressor contactor
- Checking of operating pressure, superheating and subcooling
- Cleaning of finned coil
- Cleaning of fan grills

⚠ For units installed near the sea, the intervals between maintenance should be halved.

A MANUTENZIONE STRAORDINARIA

CHEMICAL WASHING

You are recommended to chemically wash the plate heat exchanger after every 3 years of operation. For instructions on how to carry out this operation, contact De' Longhi Spa.

REFRIGERANT GAS CONTENT

The chillers are filled R410A refrigerant gas and tested in the factory. In normal conditions, there should be no need for the Technical Assistance Service to intervene to check the refrigerant gas. However, over time, small leaks may develop at the joints leading to loss of refrigerant and draining of the circuit, causing the unit to function poorly. In this case, the leaks of refrigerant must be identified and repaired and the refrigerant circuit refilled. Proceed as follows:
- Empty and dry the entire refrigerant circuit using a vacuum pump connected to the low and high pressure tap until the vacuometer reads about 10 Pa. Wait a couple of minutes and check that this value does not rise to more than 50 Pa.
- Connect the refrigerant gas cylinder or a filling cylinder to the low pressure line pressure gauge connection.
- Fill with the quantity of refrigerant gas indicated on the rating plate of the unit.
- Always check the superheating and subcooling values. In the nominal operating conditions for the appliance, these should be between 4 and 8°C respectively.

⚠ **In the event of partial leaks,** the circuit must be completely emptied before being refilled.
The refrigerant must only be filled in the liquid state.
Operating conditions other than nominal conditions may produce considerably different values.
Seal testing or identification of leaks must only be carried out using R410A refrigerant gas, checking with a suitable leak detector.

⛔ **The refrigerant circuit must not be filled** with a refrigerant other than R410A. The use of a refrigerant other than R410A may cause serious damage to the compressor.
Oxygen, acetylene or other flammable or poisonous gases must never be used in the refrigerant circuit as they may cause explosion.
Oils other than those indicated on page 14 must not be used. The use of different oils may cause serious damage to the compressor.

FAULT	CAUSE	REMEDY
The chiller does not start up	No voltage	- Check presence of voltage - Check safety systems upstream of the appliance
	Mains switch in OFF position Remote switch (if present) in OFF position Control panel set to OFF Main unit switch in OFF position Compressor thermal solenoid switch OFF	Switch ON
	Supply voltage too low	Check power line
	Contactor coil faulty Electronic board faulty Start-up capacitor faulty (if present) Compressor faulty	Replace the component
Insufficient output	Insufficient refrigerant Sizing of unit Operation outside recommended limits	Check
Compressor noisy	Liquid returning to compressor Inadequate fixing	Check
	Reversed phase (three phase units only)	Reverse one phase
Noise and vibrations	Contact between metal bodies	Check
	Weak foundations	Repair
	Loose screws	Tighten screws
The compressor stops due to the activation of the protection devices	Excessive discharge pressure Low suction pressure Low voltage Electrical connections not sufficiently tight Operation outside permitted limits	Check
	Faulty operation of pressure switches	Replace the component
	Thermal cut-out tripped	Check supply voltage Check electrical insulation of windings

FAULT	CAUSE	REMEDY
High discharge pressure (greater than 3,5 MPa)*	High external water temperature High water inlet temperature	Check fan operation
	Insufficient water flow Insufficient air flow	Check pump operation
	Faulty fan regulation	Check
	Air in water circuit	Vent air
	Excessive refrigerant charge	Check
Low discharge pressure (less than 1,8 MPa)*	Low outside air temperature Low water inlet temperature	Check
	Moisture in the refrigerant circuit (liquid indicator - moisture yellow)	Empty and refill
	Faulty fan regulation	Check
	Air in water circuit	Vent air
	Insufficient gas content	Check
High suction pressure (greater than 1,7 MPa)*	High outside air temperature High inflow water temperature Thermostatic expansion valve faulty or excessively open	Check
Low suction pressure (less than 0,62 MPa)*	Low utility water inlet temperature Low external water inlet temperature Thermostatic expansion valve faulty or blocked Clogged water filter Blocked plate heat exchanger	Check

*Values indicative only

For information on technical assistance and obtaining spare parts, contact

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