Installation and operating manual

SCREWLine^3

WATER-COOLED LIQUID CHILLERS FOR INDOOR INSTALLATION.

WDH-SB3 220.2-580.2

Dear Customer,

We congratulate you on choosing this product

For many years Clivet has been offering systems that provide maximum comfort, together with high reliability, efficiency, quality and safety.

The aim of the company is to offer advanced systems, that assure the best comfort, reduce energy consumption and the installation and maintenance cost for the life cycle of the system.

The purpose of this manual is to provide you with information that is useful from reception of the equipment, through installation, operational usage and finally disposal so that this advanced system offers the beat solution.

Yours faithfully.

CLIVET Spa

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1 General description

1.1 Manual

The manual provides correct unit installation, use and maintenance.

Pay particular attention to:

⚠ Warning, identifies particularly important operations or information.

⃠ Prohibited operations that must not be carried out, that compromise the operating of the unit or may cause damage to persons or things.

- It is advisable to read it carefully so you will save time during operations.
- Follow the written indications so you will not cause damages to things and injuries people.

1.2 Preliminaries

Only qualified personnel can operate on the unit, as required by the regulation in force.

1.3 Risk situations

⚠ The unit has been designed and created to prevent injures to people.

During designing it is not possible to plane and operate on all risk situation.

Read carefully "Residual risk" section where all situation which may cause damages to things and injuries to people are reported.

Installation, starting, maintenance and repair required specific knowledge; if they are carried out by inexperienced personnel, they may cause damages to things and injuries people.

1.4 Intended use

Use the unit only:

- cooling water or a water and glycol mix for air-conditioning
- Keep to the limits foreseen in the technical schedule and in this manual

The manufacturer accepts no responsibility if the equipment is used for any purpose other than the intended use.

1.5 Installation

⚠ The positioning, hydraulic system, refrigerating, electrics and the ducting of the air must be determined by the system designer in accordance with local regulations in force.

Follow local safety regulations.

Verify that the electrical line characteristics are in compliance with data quotes on the unit serial number label.

1.6 Maintenance

Plan periodic inspection and maintenance in order to avoid or reduce repairing costs.

⚠ Turn the unit off before any operation.

1.7 Modification

⚠ All unit modifications will end the warranty coverage and the manufacturer responsibility.

1.8 Breakdown/Malfuction

⚠ Disable the unit immediately in case of breakdown or malfunction.

Contact a certified service agent.

Use original spares parts only.

⚠ Using the unit in case of breakdown or malfunction:

- voids the warranty
- it may compromise the safety of the unit
- may increase time and repair costs

1.9 User training

⚠ The installer has to train the user on:

- Start-up/shutdown
- Set points change
- Standby mode
- Maintenance
- What to do / what not to do in case of breakdown

1.10 Data update

Continual product improvements may imply manual data changes.

Visit manufacturer web site for updated data.

1.11 Indications for the User

⚠ Keep this manual with the wiring diagram in an accessible place for the operator.

Note the unit data label so you can provide them to the assistance centre in case of intervention (see "Unit identification" section).

Provide a unit notebook that allows any interventions carried out on the unit to be noted and tracked making it easier to suitably note the various interventions and aids the search for any breakdowns.

In case of breakdown or malfunction:

- Immediately deactivate the unit
- Contact a service centre authorized by the manufacturer

⚠ The installer must train the user, particularly on:

- Start-up/shutdown
- Set points change
- Standby mode
- Maintenance
- What to do / what not to do in case of breakdown

1.12 Unit indentification

The serial number label is positioned on the unit and allows to indentify all the unit features.

⊘ The matriculation plate must never be removed.

The matriculation plate shows the indications foreseen by the standards, in particular:

- unit type
- serial number (12 characters)
- year of manufacture
- wiring diagram number
- electrical data
- manufacturer logo and address

⚠ It contains fluorinated greenhouse gases

Type of refrigerant: R-134a

1.13 Serial number

It identifies uniquely each unit.

Must be quoted when ordering spare parts.

1.14 Assistance request

Note data from the serial number label and write them in the chart on side, so you will find them easily when needed.

Series
Size
Serial number
Year of manufacture
Electrical wiringdiagram

2 Reception

You have to check before accepting the delivery:

- That the unit hasn't been damaged during transport
- That the materials delivered correspond with that indicated on the transport document comparing the data with the identification label positioned on the packaging.

In case of damage or anomaly:

- Write down on the transport document the damage you found and quote this sentence: "Conditional acceptance clear evidence of deficiencies/damages during transport"
- Contact by fax and registered mail with advice of receipt to supplier and the carrier.

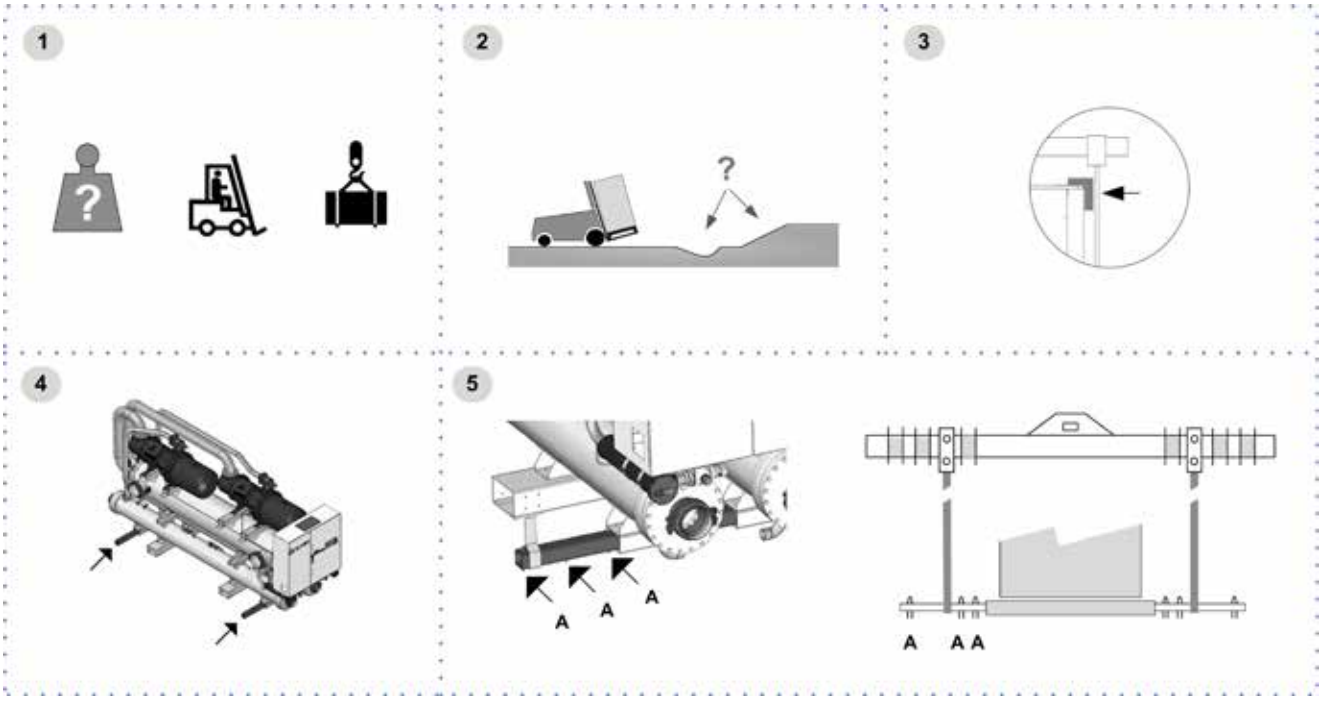
⚠ Any disputes must be made within 8 days from the date of the delivery. Complaints after this period are invalid.

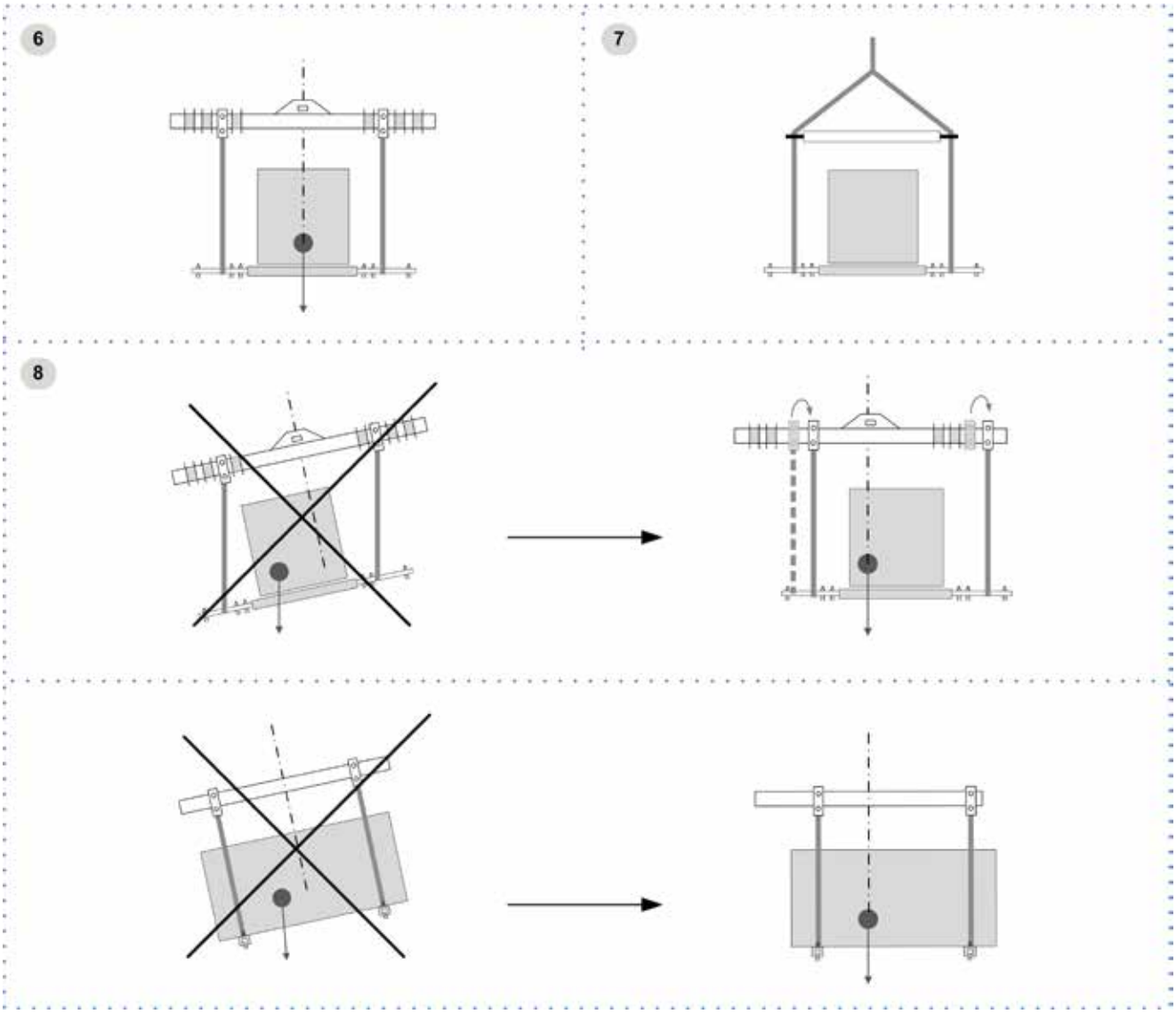
2.1 Storage

Observe external packaging instructions.

2.2 Handling

1. Verify unit weight and handling equipment lifting capacity.
2. Identify critical points during handling (disconnected routes, flights, steps, doors).
3. Suitably protect the unit to prevent damage.
4. lifting points
5. Safety pins
6. Lifting with balance
7. Lifting with spacer bar
8. Align the barycenter to the lifting point
9. Gradually bring the lifting belts under tension, making sure they are positioned correctly.
10. Before starting the handling, make sure that the unit is stable.





2.3 Packaging removing

Be careful not to damage the unit.

Keep packing material out of children's reach it may be dangerous.

Recycle and dispose of the packaging material in conformity with local regulations.

3 Positioning

During positioning consider these elements:

- Technical spaces requested by the unit
- Electrical connections
- Water connections

3.1 Functional spaces

Functional spaces are designed to:

- guarantee good unit operation
- carry out maintenance operations
- protect authorized operators and exposed people

Respect all functional spaces indicated in the DIMENSIONS section.

Double all functional spaces if two or more unit are aligned.

3.2 Positioning

⚠ Units are designed to be installed:

- INTERNAL
- in fixed positions

Limit vibration transmission:

- use antivibration devices on unit bearing points
- install flexible joints on the hydraulic connections

Choose the installation place according to the following criteria:

- safe accessible position
- avoid flood-prone places
- verify unit weight and bearing point capacity
- verify that all bearing points are aligned and leveled
- install the unit raised from the ground

3.3 Saftey valve gas side

The installer is responsible for evaluating the opportunity of installing drain tubes, in conformity with the local regulations in force (EN 378).

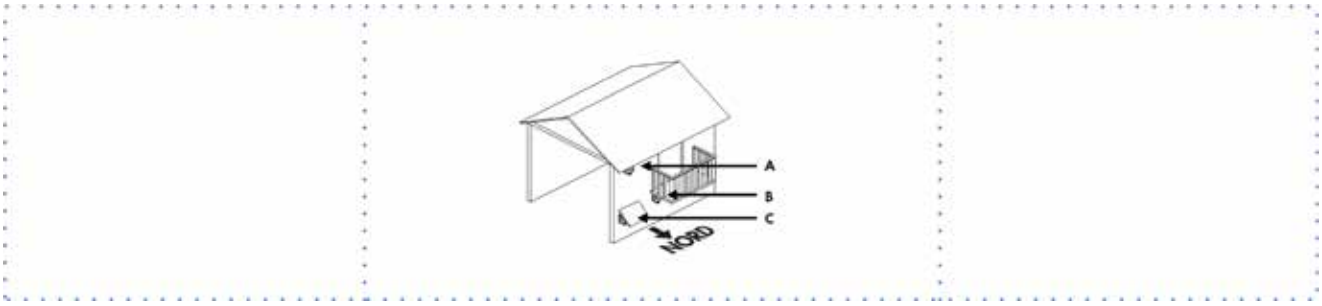
3.4 Fresh air probe

The external probe allows to automatically change the unit set point according to the external enthalpy (temperature + humidity).

It is then possible to optimize the unit energy efficiency.

Positioning

⃠ The sensor has not to be influenced by factors that can false the reading (for ex. direct solar irradiation, exhaust air by fan or other sources, contact with the unit structure or other sources of heat, accumulations of snow/ice), it has therefore to be placed in a protected place (possibly to the north), for example in an attic, under a terrace and if it is on a free wall, provide a small roofing.



Examples to position the external probe:

A. roof
B. under a terrace
C. if at free wall provide a small roofing

4 Water connections

4.1 Water quality

Water features

- confirming to local regulations
- total hardness < 14°fr
- within the limits indicated by table

The water quality must be checked by qualified personnel.

Water with inadequate characteristics can cause:

- pressure drop increase
- reduces energy efficiency
- increased corrosion potential

Provide a water treatment system if values fall outside the limits.

The warranty does not cover damages caused by limestone formations, deposits and impurities from the water supply and / or failure from failed system clearing to clean system.

ACCEPTABLE WATER QUALITY LIMITS					
PH (25°C)		6.8 - 8.0	Iron	mg Fe/l	<1.0
Electrical conductivity	µS/cm 25°C	< 800	Copper	mg Cu/l	<1.0
Chloride ion	mg Cl^-/l	<150	Sulphide ion	S^{--}/l	none
Chlorine molecular	mg Cl2/l	<5	Ammonium ion	mg NH_4^+/l	<1.0
Sulphate ion	mg SO_4^{--}/l	<100	Silica	mg SiO_2/l	<50
Alkalinity (mg $CaCO_3$/l)	mg $CaCO_3$/l	<100	Total dissolved solids	mg/l	<1500
Total Hardness	mg $CaCO_3$/l	<200	Max Ethylene, Propylene glycol		75%

4.2 Risk of freezing

If the unit or the relative water connections are subject to temperatures close to 0°C:

- mix water with glycol, or
- safeguard the pipes with heating cables placed under the insulation, or
- empty the system in cases of long non-use

4.3 Anti-freeze solution

The use of an anti-freeze solution results in an increase in pressure drop.

⚠ Make sure that the glycol type utilized is inhibited (not corrosive) and compatible with the water circuit components.

⃠ Do not use different glicol mixture (i.e. ethylene with propylene).

4.4 Water flow-rate

The project water-flow must be:

- inside the exchanger operating limits (see the TECHNICAL INFORMATION section)
- guarantee, also with variable system conditions (for example in systems where some circuits are bypassed in particular situations).

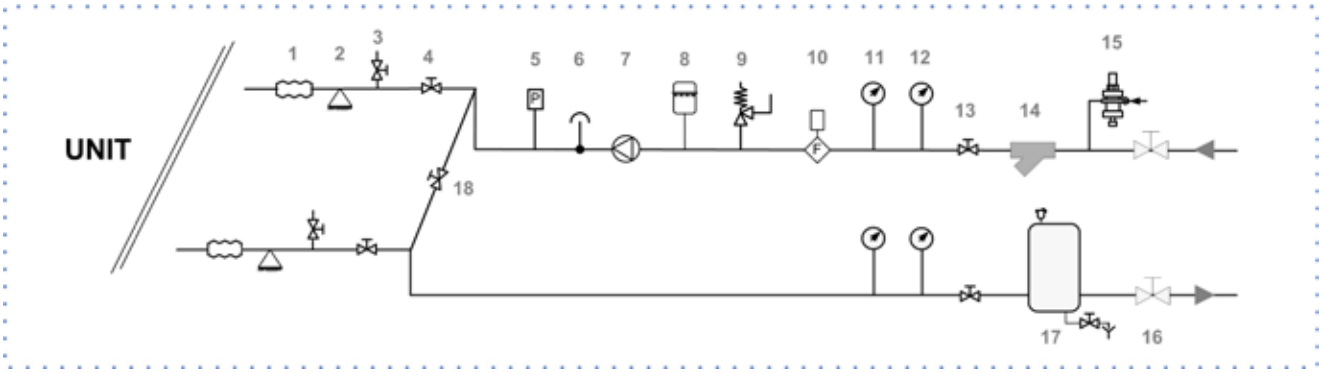
4.5 Minimum system water content

Minimum system water volumes have to be satisfied to avoid continuous compressor switching on and off.

4.6 Racommended connection

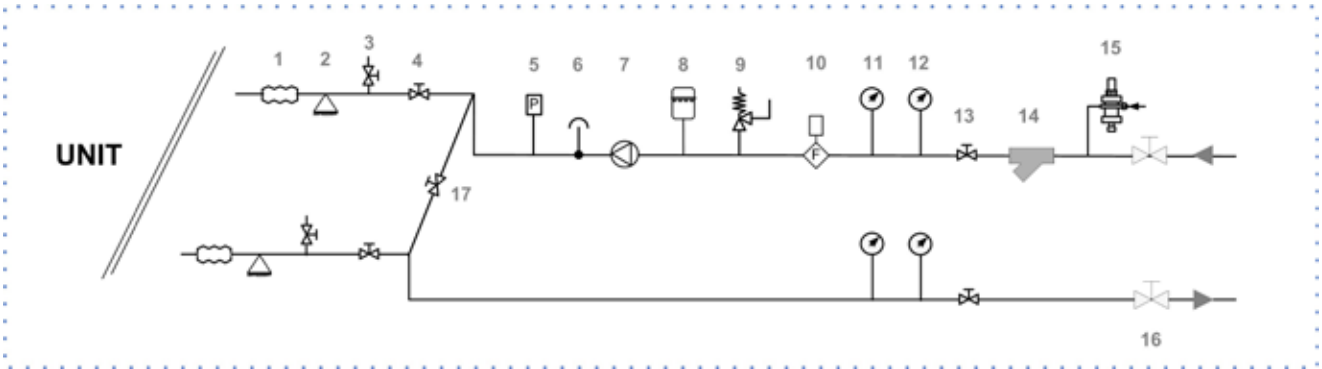
⚠ The installer must define:

- component type
- position in system



1	antivibration joints	10	Flow Switch
2	piping support	11	pressure gauge
3	exchanger chemical cleaning bypass	12	thermometer
4	shut-off valve	13	shut-off valve
5	pressure switch of the charged system	14	filter
6	vent	15	filling valve
7	Pump / circulating pump	16	shut-off valve
8	expansion vessel	17	Internal storage tank
9	safety valve	18	Cleaning system bypass

4.7 Connection source side



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7	Pump / circulating pump	16	shut-off valve
8	expansion vessel	17	Cleaning system bypass
9	safety valve		

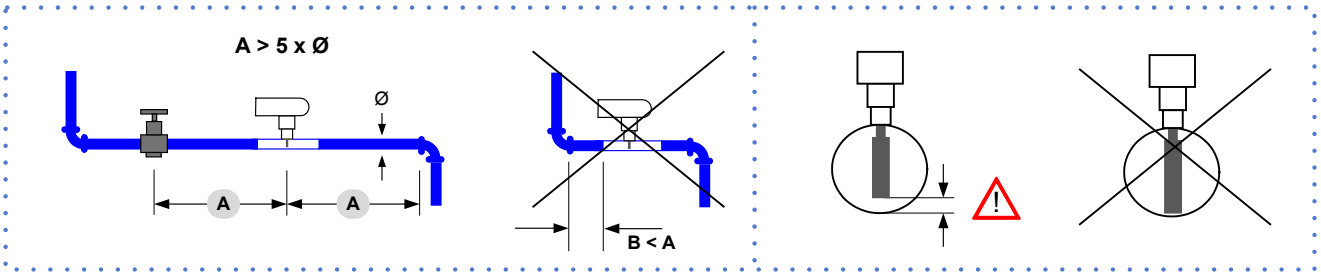
4.8 Water filter

⚠ It must be installed immediately in the water input of the unit, in a position that is easily accessible for cleaning.

⃠ The filter never should be removed, this operation invalidates the guaranty.

4.9 Flow Switch

The flow switch must be present to ensure shutdown of the unit if water is not circulating.
It has to be installed in a duct rectilinear part, not in proximity of curves that cause turbulences.
Electrically connect the flow switch at the inlet arranged on the XC terminal block.
The flow switch must be set to the minimum reachable flow rate.



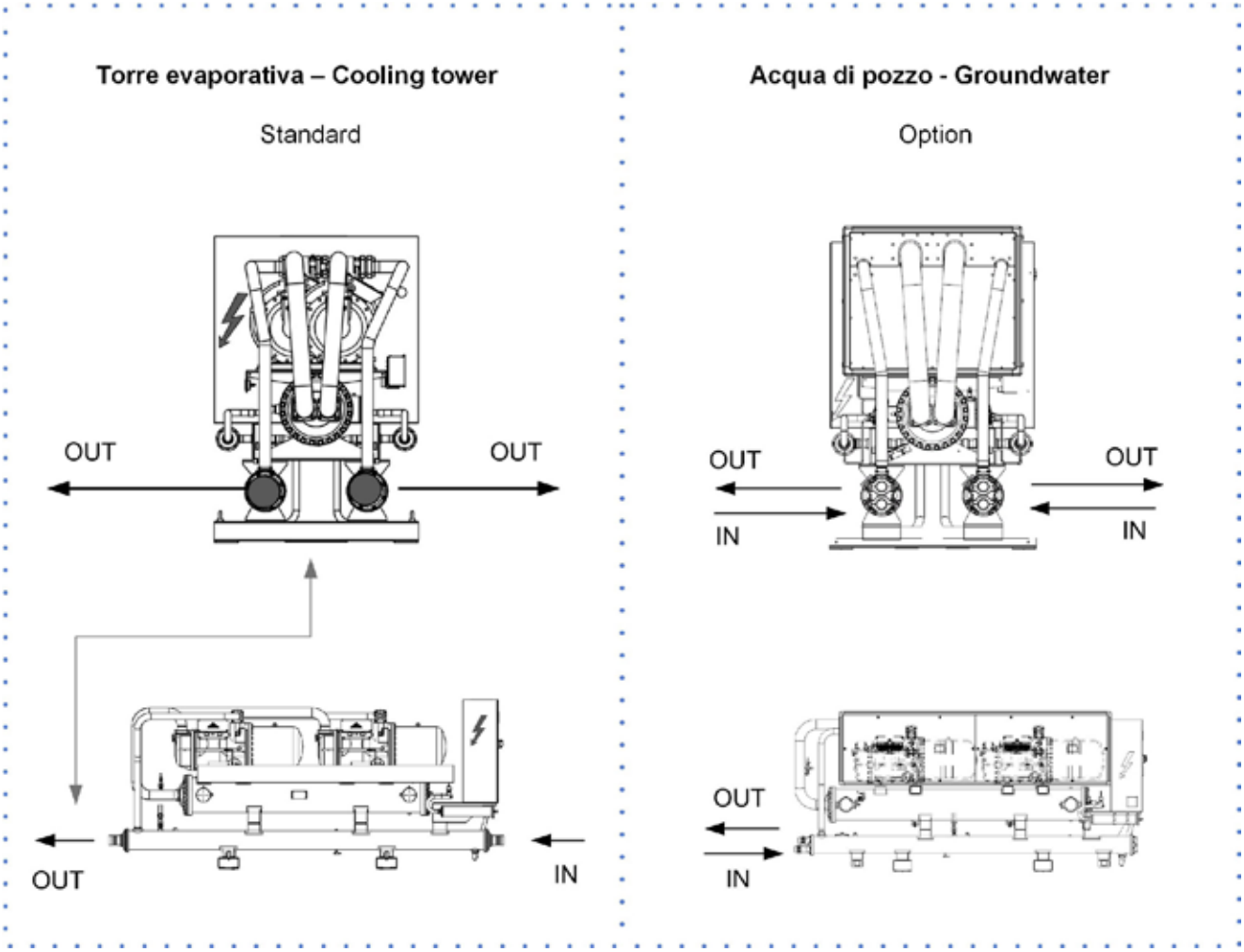
A. minimum distance

4.10 Hydraulic connections

- take away the supplied connection union by acting on the connection joint
- weld the union to the installation pipe
- perform the connection between the installation pipe and the evaporator, using the joint

Retirer le joint de connexion avant de souder le tuyau de l'installation.

The rubber gasket might be irreparably damaged.



4.11 Operation sequence

Close all drain valves in the low points of the unit hydraulic circuit:

- Heat exchangers
- Pumps
- collectors
- storage tank
- free-cooling coil

1. Carefully wash the system with clean water: fill and drain the system several times.
2. Apply additives to prevent corrosion, fouling, formation of mud and algae.
3. Fill the plant
4. Execute leakage test.
5. Isolate the pipes to avoid heat dispersions and formation of condensate.
6. Leave various point of service free (wells, vent-holes etc).

⚠ Neglecting the washing will lead to several filter cleaning interventions and at worst cases can cause damages to the exchangers and the other parts.

4.12 OHI - Operation with water circuit change-over

For details see:

10.1 OHI - Operation with water circuit change-over → 41

4.13 Partial energy recovery

For details see:

10.2 Partial energy recovery → 42

4.14 Total energy recovery

For details see:

10.3 Total energy recovery → 43

4.15 PVSX - Pressure valve

For details see:

10.4 PVSX - Pressure valve → 44

4.16 IVMSX - Modulating valve source side

For details see:

10.5 IVMSX - Modulating valve source side → 45

5 Electrical connections

The characteristics of the electrical lines must be determined by qualified electrica personnel able to design electrical installations; moreover, the lines must be in conformity with regulations in force.

The protection devices of the unit power line must be able to stop all short circuit current, the value must be determined in accordance with system features.

The power cables and the protection cable section must be defined in accordance with the characteristics of the protections adopted.

All electrical operations should be performed by trained personnel having the necessary qualifications required by the regulations in force and being informed about the risks relevant to these activities.

Operate in compliance with safety regulations in force.

5.1 Electrical data

⚠ The serial number label reports the unit specific electrical data, included any electrical accessories.

The electrical data indicated in the technical bulletin and in the manual refer to the standard unit, accessories excluded.

The matriculation plate shows the indications foreseen by the standards, in particular:

- Voltage
- F.L.A.: full load ampere, absorbed current at maximum admitted conditions
- F.L.I.: full load input, full load power input at max. admissible condition
- Electrical wiringdiagram Nr.

5.2 Connections

1. Refer to the unit electrical diagram (the number of the diagram is shown on the serial number label).
2. Verify that the electrical supply has characteristics conforming to the data shown on the serial number label.
3. Before starting work, ensure the unit is isolated, unable to be turned on and a safety sign used.
4. Ensure correct earth connection.
5. Ensure cables are suitably protected.
6. Before powering up the unit, make sure that all the protections that were removed during the electrical connection work have been restored.

5.3 Signals / data lines

Do not exceed the maximum power allowed, which varies, according to the type of signal.

Lay the cables far from power cables or cables having a different tension and that are able to emit electromagnetic disturbances.

Do not lay the cable near devices which can generate electromagnetic interferences.

Do not lay the cables parallel to other cables, cable crossings are possible, only if laid at 90°.

Connect the screen to the ground, only if there aren't disturbances.

Guarantee the continuity of the screen during the entire extension of the cable.

Respect impendency, capacity and attenuation indications.

5.4 Power input

⚠ Fix the cables: if vacated may be subject to tearing.

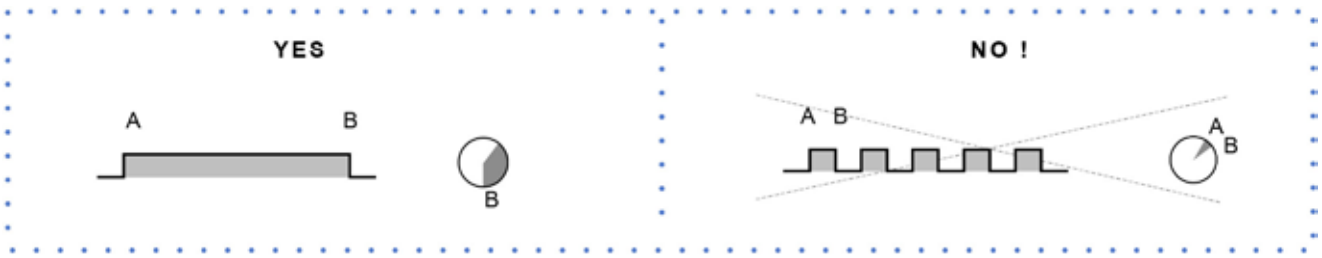
⊘ The cable must not touch the compressor and the refrigerant piping (they reach high temparatures).

XC: Customer connections

5.5 Remote ON-OFF

⊘ Do not perform short On Off cycles

⊘ Do not use the remote On Off with thermoregulation function.

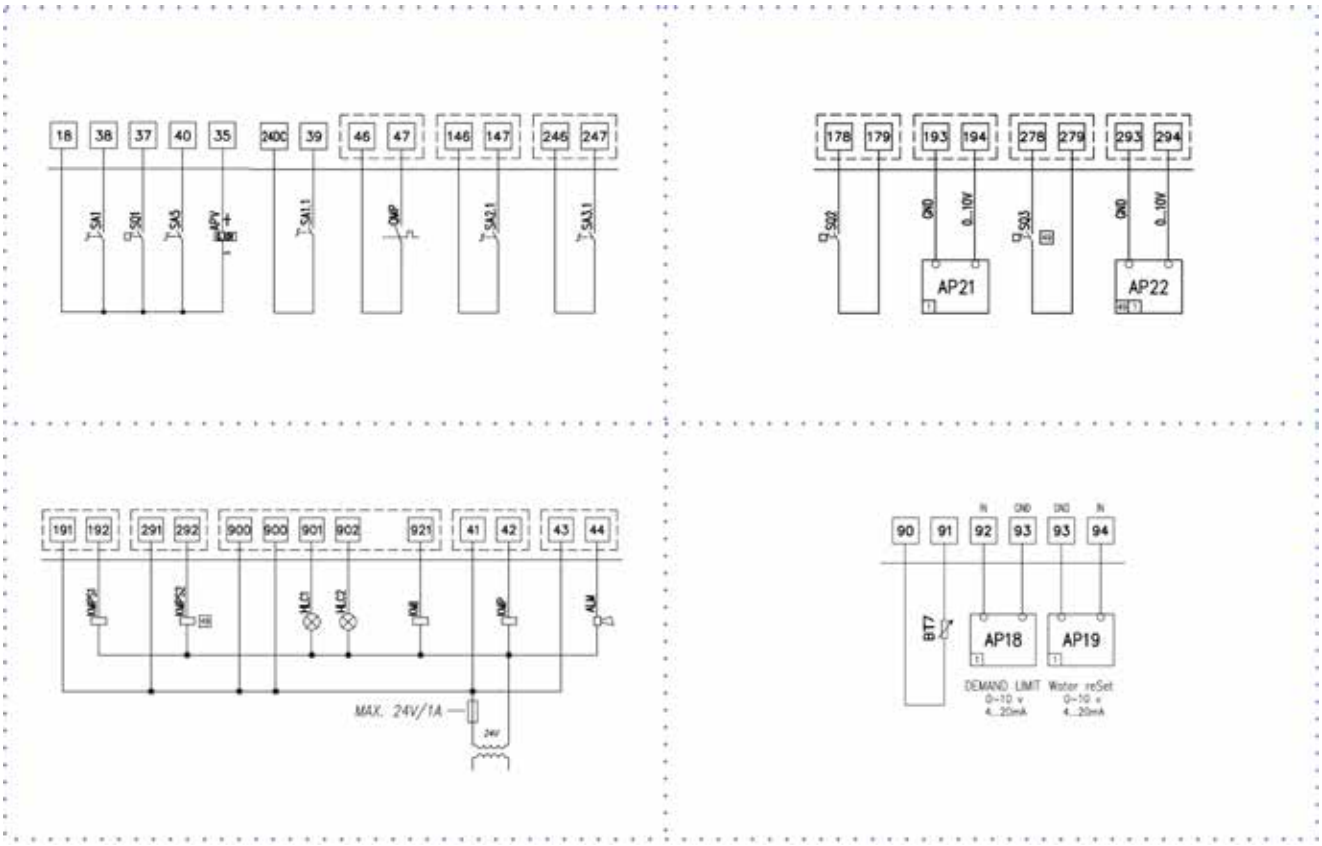


5.6 Power supply cables section

Size	220.2	240.2	280.2	320.2	360.2	440.2	500.2
Min. cable section Cu (mm^2)	1 x 150	1 x 150	1 x 240	1 x 240	2 x 150	2 x 185	2 x 185
Max. cable section Cu (mm^2)	1 x 240	1 x 240	1 x 240	1 x 240	2 x 300	2 x 300	2 x 300
Max. bar Cu width (mm)	32	32	40	40	50	63	63
Tightening torque (Nm)	20	20	20	20	20	nd	nd

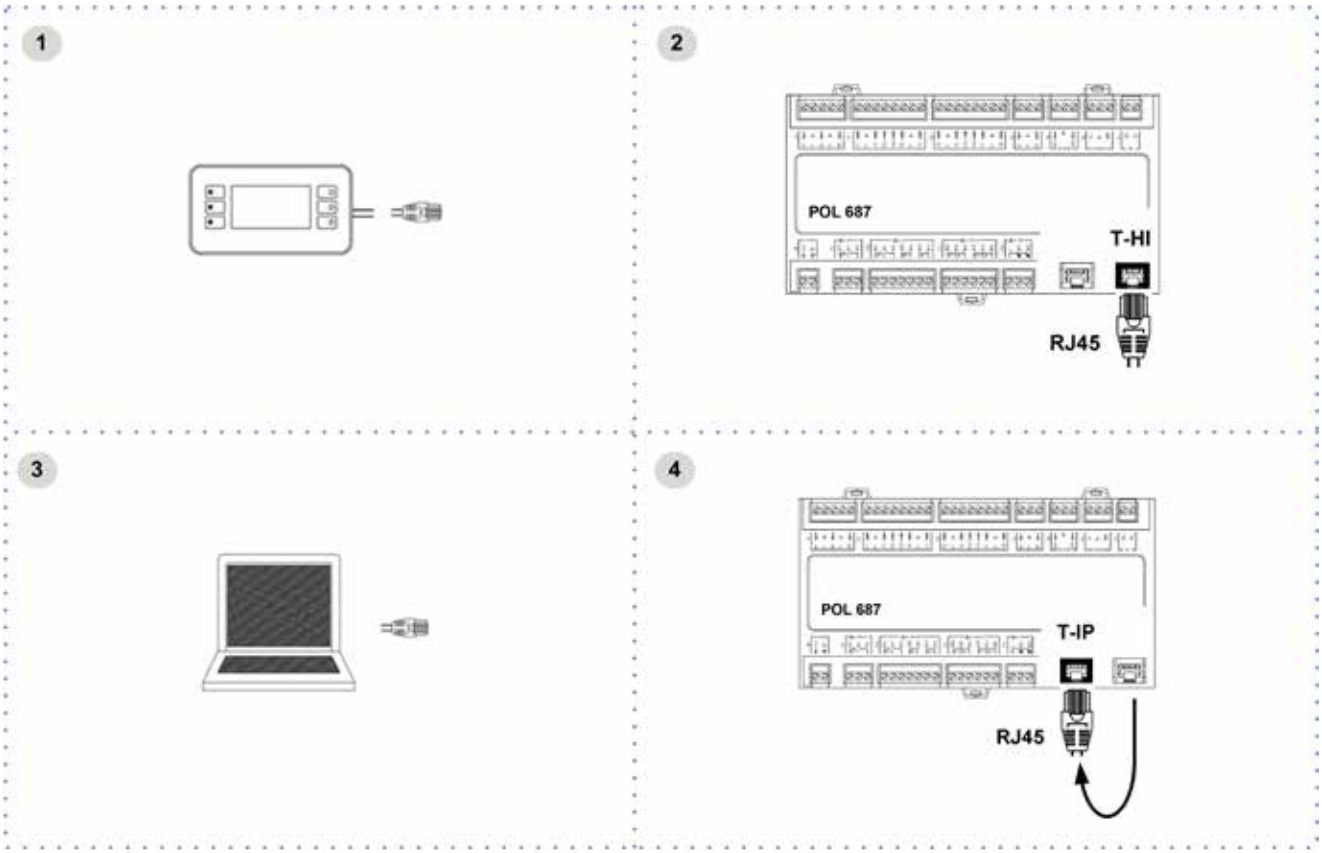
Size	540.2	580.2					
Min. cable section Cu (mm^2)	2 x 240	2 x 240					
Max. cable section Cu (mm^2)	4 x 185	4 x 185					
Max. bar Cu width (mm)	63	63					
Tightening torque (Nm)	nd	nd					

5.7 Connections performer by customer



APV	0..10V analogical output	KMP	evaporator pump contactor
AP18	Demand limit	KMI	contactor for the ext. water circuit reversal
AP19	water reset	QMP	ricirculation pump
AP21	modulating valve source side C1	SA1	remote on/off
AP22	modulating valve source side C2	SA1.1	second setpoint
ALM	cumulative fault signal	SA2.1 SA3.1	compressor enabling
BT7	Probe of the outdoor air temperature.	SA5	Remote summer/winter
HLC1-2	compressor status signal	SQ1	Flow Switch
KMPS1	source side pump control contactor C1	SQ2	source side exchanger flow switch C1
KMPS2	source side pump control contactor C2	SQ3	source side exchanger flow switch C2

5.8 Computer connection

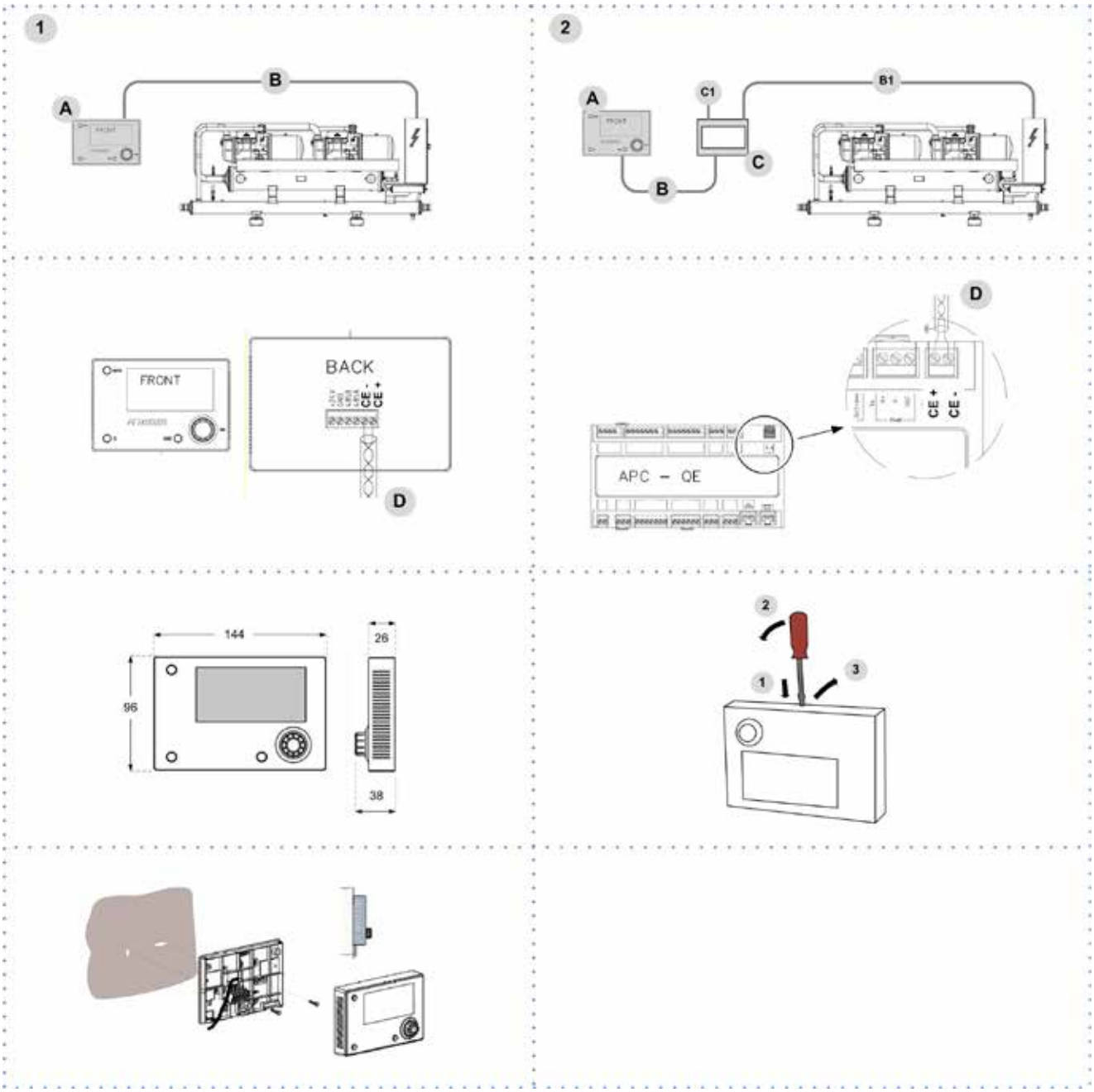


1. Service keypad
2. RJ45: standard connection
3. P.C.-not supplied
4. P.C. connection, shift RJ45 from T-HI to T-IP

Configure P.C.

1. connect P.C. and main module with LAN cable
2. check in the taskbar that the connection is active
3. open Control Panel and select Network and sharing center
4. select Modify board setting
5. select Local area connection (LAN)
6. select Internet protocol version 4 (TPC) IPV4 and enter Property
7. set the IP address 192.168.1.100
8. set Subnet mask as 255.255.255.0
9. confirm (OK)
10. enter Start (Windows button)
11. write the command cmd and enter/do it
12. write and run the command Ping 192.168.1.42
13. the message, connection is OK, will appear when successful
14. enter the browser (Crhome, Firefox ecc)
15. write and run the command http:/192.168.1.42
16. Userid = WEB
17. Password = SBTAdmin!

5.9 RCMRX - Remote control via microprocessor remote control

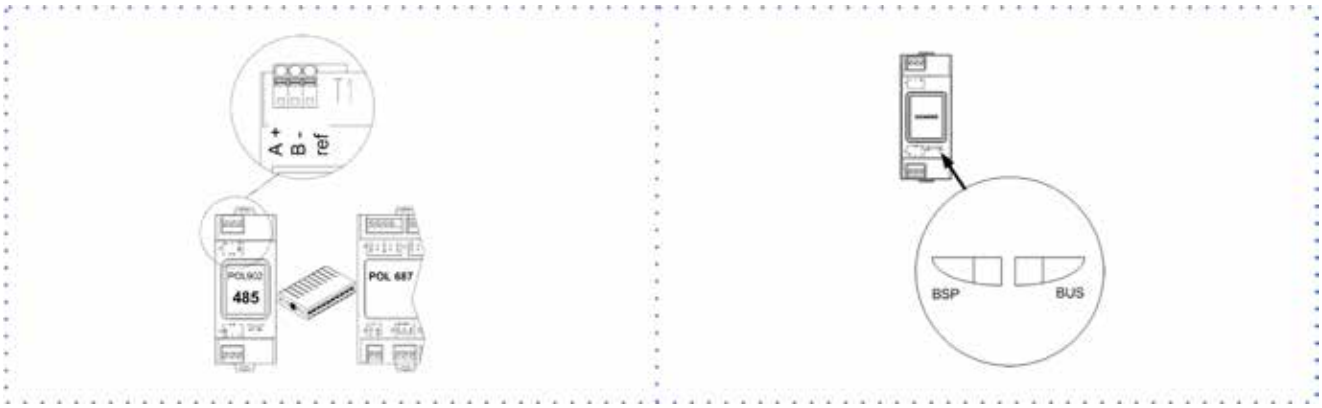


1 Distance up to 350 mt

2 Distance up to 700 mt

A	User interface
B = B1	KNX bus, max 350 mt twisted pair with shield, ø 0,8 mm EIB/KNX cable marking recommende
C	PSX - Mains power supply unit pwer supply unit N125/11 5WG1 125-1AB11
C1	AC 120...230V, 50...60Hz
D	KNX bus, max 350 mt

5.10 Modbus - RS485

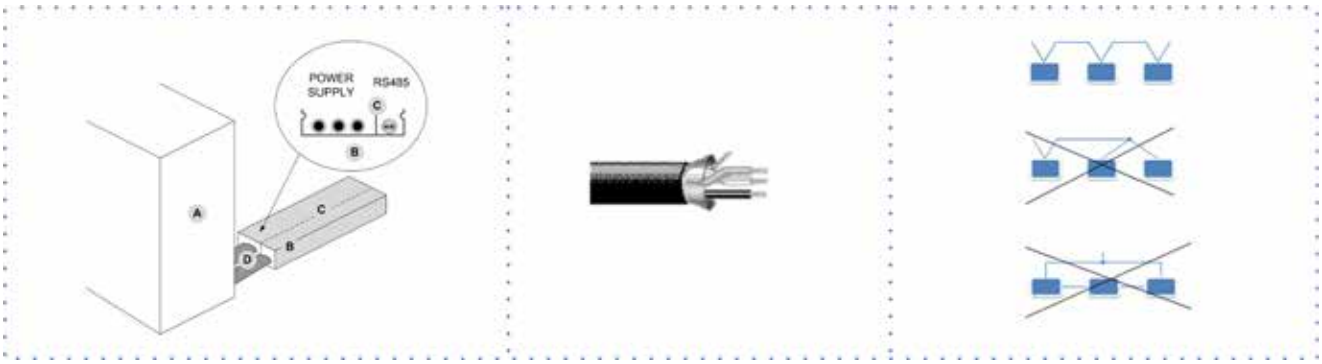


LED BSP	communication with AP1 module	LED BUS	communication with Modbus
green	communication ok	green	communication ok
yellow	software ok but communication with AP1 down	yellow	startup / channel not communicating
red	flashing: software error fixed: hardware error	red	communication down

Path

Main menu → Unit Parameters → Modbus

Parameters	Short description	Description
P0445:	T1 bus termination	Termination resistor activation on T1 POL902 [0] port = Passive [1] = Active
P0446:	T2 bus termination	Termination resistor activation on T2 POL902 [0] port = Passive [1] = Active



A. Unit
B. Metal conduit
C. Metal septums
D. Metal-lined sheath (sleeve)

Modbus Cable requirements

Conductors twisted and shielded

Section of conductor 0,22mm2…0,35mm2

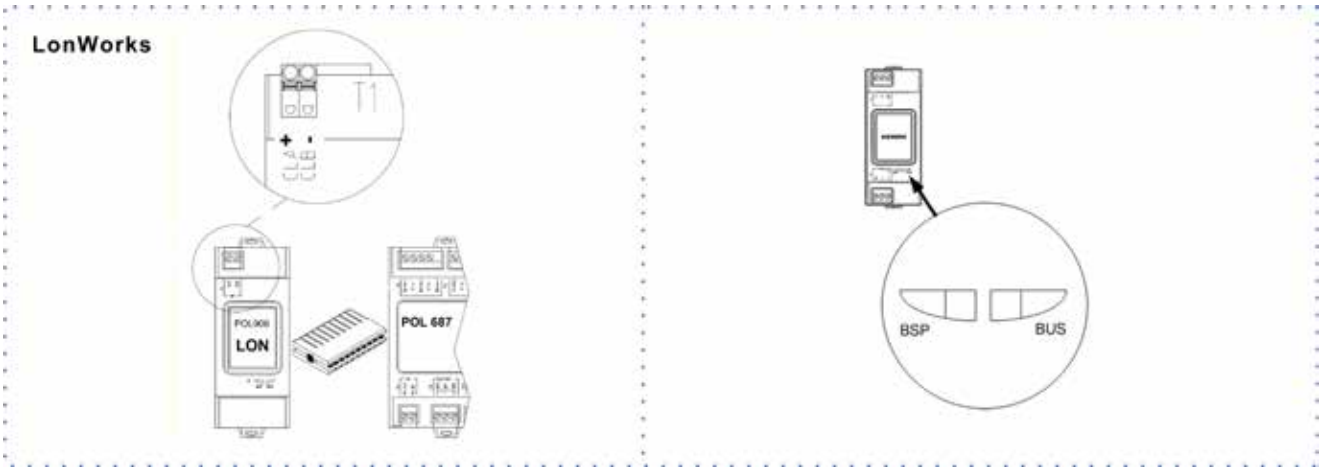
Nominal capacity between conductors < 50 pF/m

Nominal impedance 120 Ω

Recommended cable BELDEN 3106A

- Every RS485 serial line must be set up using the 'In/Out' bus system.
- Other types of networks are not allowed, such as Star or Ring networks.
- The difference in potential between the earth of the two RS485 devices that the cable shielding needs to be connected to must be lower than 7 V
- There must be suitable arresters to protect the serial lines from the effects of atmospheric discharges
- A 120 ohm resistance must be located on the end of the serial line. Alternatively, when the last serial board is equipped with an internal terminator, it must be enabled using the specific jumper, dip switch or link.
- The cable must have insulation features and non-flame propagation in accordance with applicable regulations.
- The RS485 serial line must be kept as far away as possible from sources of electromagnetic interference.

5.11 LonWorks



LED BSP	communication with AP1 module
green	communication ok
yellow	software ok but communication with AP1 down
red	flashing: software error
	fixed: hardware error

LED BUS	communication with LonWorks
green	ready for communication
yellow	startup
red	flashing: communicating not possible
	communication down

LONWORK CABLE TYPES

Echelon allows three cable types for channel type TP/FT-10, including the

Category 5 network cable used commonly in building automation and control (TIA 568A Cat-5).

CAT-5 SPECIFICATIONS

Unshielded cable, twisted pair with at least 18 beats per meter:

Cross-sectional area Min. ø 0.5mm, AWG24, 0.22mm²

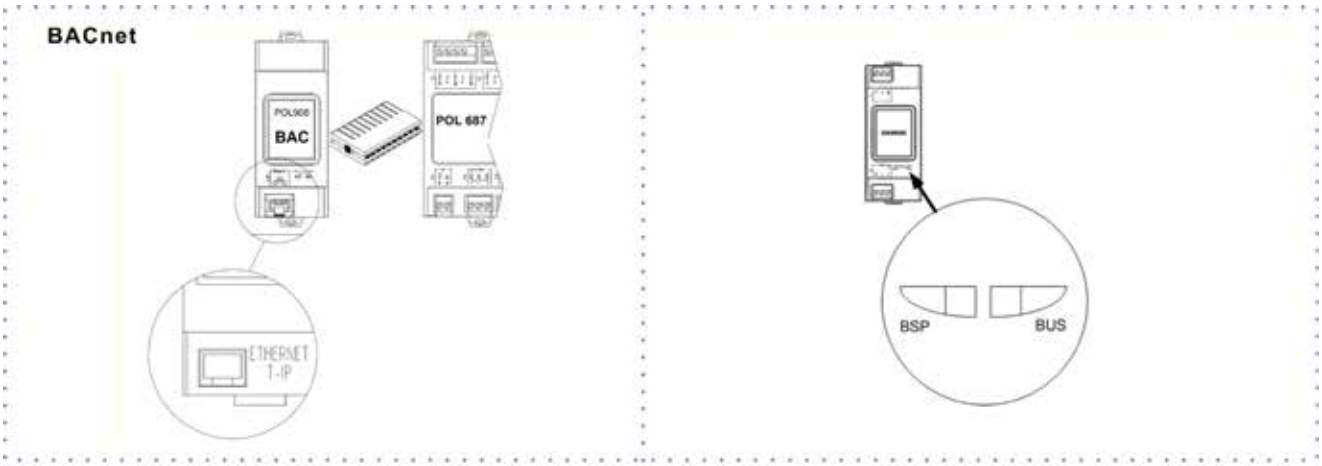
Impedance 100 Ω +/- 15 % @ f > 1 MHz

Operating capacity between two wires of a pair < 46 nF/km

Capacity pair to ground, asymmetric. < 3.3 nF/km

DC loop resistance < 168 Ω

5.12 BACnet IP



LED BSP	communication with AP1 module
green	communication ok
yellow	software ok but communication with AP1 down
red	flashing: software error
	fixed: hardware error

LED BUS	communication with BACnet
green	ready for communication
yellow	startup
red	BACnet server down
	restart after 3 sec

6 Start-up

6.1 General description

The indicated operations should be done by qualified technician with specific training on the product.
Upon request, the service centres performing the start-up.
The electrical, water connections and the other system works are by the installer.
Agree upon in advance the star-up data with the service centre.
Before checking, please verify the following:

- the unit should be installed properly and in conformity with this manual
- the electrical power supply line should be isolated at the beginning
- the unit isolator is open, locked and equipped with the suitable warning
- make sure no tension is present

⚠ After turning off the power, wait at least 5 minutes before accessing to the electrical panel or any other electrical component.

⚠ Before accessing check with a multimeter that there are no residual stresses.

6.2 Preliminary checks

For details refer to the different manual sections.

Unit OFF power supply

1. safety access
2. functional spaces
3. structure integrity
4. unit on vibration isolators
5. unit input water filter + shut-off valves for cleaning
6. vibration isolators on water connections
7. expansion tank (indicative volume = 5% system content)
8. Close all drain valves in the low points of the unit hydraulic circuit:
9. cleaned system
10. loaded system + possible glycol solution + corrosion inhibitor
11. system under pressure
12. vented system
13. fresh air probe
14. refrigerant circuit visual check
15. earthing connection
16. power supply features
17. electrical connections provided by the customer

6.3 Start-up sequence

For details refer to the different manual sections.

Unit ON power supply

1. compressor crankcase heaters operating at least since 8 hours
2. off-load voltage measure
3. phase sequence check
4. pump manual start-up and flow check
5. shut-off valve refrigerant circuit open
6. unit ON
7. load voltage measure and absorptions
8. liquid sight glass check (no bubbles)
9. measure return and supply water temperature
10. measure super-heating and sub-cooling
11. check no anomalous vibrations are present
12. climatic curve personalization
13. climatic curve personalization
14. scheduling personalization
15. complete and available unit documentation

6.4 Refrigeration circuit

1. Check carefully the refrigerating circuit: the presence of oil stains can mean leakage caused by transportation, movements or other).
2. Verify that the refrigerating circuit is in pressure: Using the unit manometers, if present, or service manometers.
3. Make sure that all the service outlets are closed with proper caps; if caps are not present a leak of refrigerant can be possible.
4. Open the valves of the refrigerant circuit, if there are any.

6.5 Water circuit

1. Before realizing the unit connection make sure that the hydraulic system has been cleaned up and the cleaning water has been drained.
2. Check that the water circuit has been filled and pressurized.
3. Check that the shut-off valves in the circuit are in the "OPEN" position.
4. Check that there isn't air in the circuit, if required, evacuate it using the air bleed valve placed in the system high points.
5. When using antifreeze solutions, make sure the glycol percentage is suitable for the type of use envisaged.

⚠ Neglecting the washing will lead to several filter cleaning interventions and at worst cases can cause damages to the exchangers and the other parts.

Weight of glycol (%)	10	20	30	40
Freezing temperature (°C)	-3.9	-8.9	-15.6	-23.4
Safety temperature (°C)	-1	-4	-10	-19

6.6 Electric Circuit

⚠ Verify that the unit is connected to the ground plant.

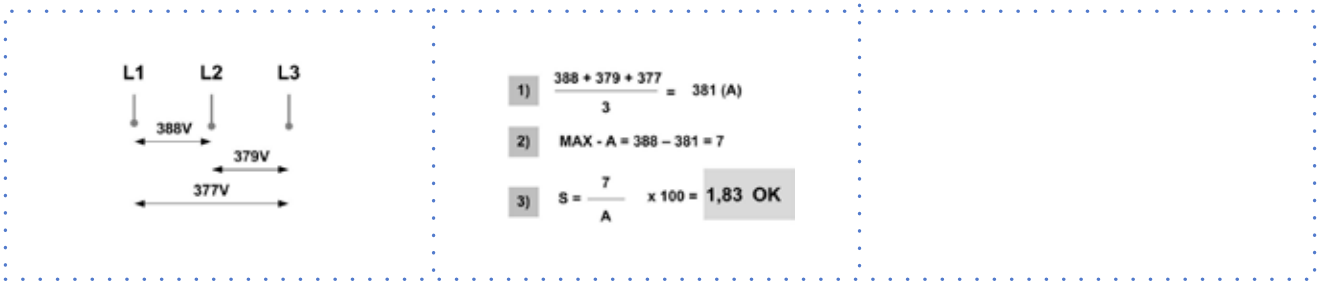
Check the conductors are tightened as: the vibrations caused by handling and transport might cause these to come loose.

Connect the unit by closing the sectioning device, but leave it on OFF.

Check the voltage and line frequency values which must be within the limits: 400/3/50 +/- 10%

Check and adjust the phase balance as necessary: it must be lower than 2%

Example



⚠ Working outside of these limits can cause irreversible damages and voids the warranty.

6.7 Compressor crankcase heaters

Connect the oil resistances on the compressor crankcase at least 8 hours before the compressor is to be starter:

- at the first unit start-up
- after each prolonged period of inactivity

1. Supply the resistances switching off the unit isolator switch.
2. To make sure that heaters are working, check the power input.
3. At start-up the compressor crank-case temperature on the lower side must be higher at least of 10°C than the outside temperature.

⊘ Do not start the compressor with the crankcase oil below operating temperature.

6.8 Voltages

Check that the air and water temperatures are within in the operating limits.

Start-up the unit.

With unit operating in stable conditions, check:

- Voltage
- Total absorption of the unit
- Absorption of the single electric loads

6.9 Remote controls

Check that the remote controls (ON-OFF etc) are connected and, if necessary, enabled with the respective parameters as indicated in the "electrical connections" section.

Check that probes and optional components are connected and enabled with the respective parameters ("electrical connections" section and following pages).

6.10 Demand limit

⚠ Menu accessible only after having entered the password.

⚠ Access reserved only to specifically trained personnel.

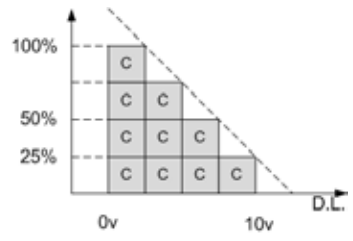
⚠ The parameter modification can cause irreversible damages.

It is possible to limit the absorbed electric power with an external signal 0-10 Vcc.

The higher the signal is, the lower the number of compressors available to meet the thermal need.

Only if P0050:En DemandLimit ≠ 0

Path: Main Menu / Unit parameters / Demand limit



Step	Display	Action	Menu/Variable	Keys		Notes
1		Press 3 sec.		✓		
2	Password	Set	Password	▲	✓	
3		Press		ℹ		
4	Main menu	Select	Unit parameters	▼	✓	
5	Unit parameters	Select	Set Point	▼	✓	
6	Set Point	Select	Demand limit	▼	✓	
7		Set	Demand limit	▲	▼	
8		Confirm		✓		
9		Press 3 sec.		⏻		
10		Select	Local connections	✓		

Path: Main Menu / Unit parameters / Demand limit

Parameters	Short description	Description
P0009:	set demand limit	Parameter setting of the value % of demand limit

6.11 Climatic TExt

⚠ Menu accessible only after having entered the password.

⚠ Access reserved only to specifically trained personnel.

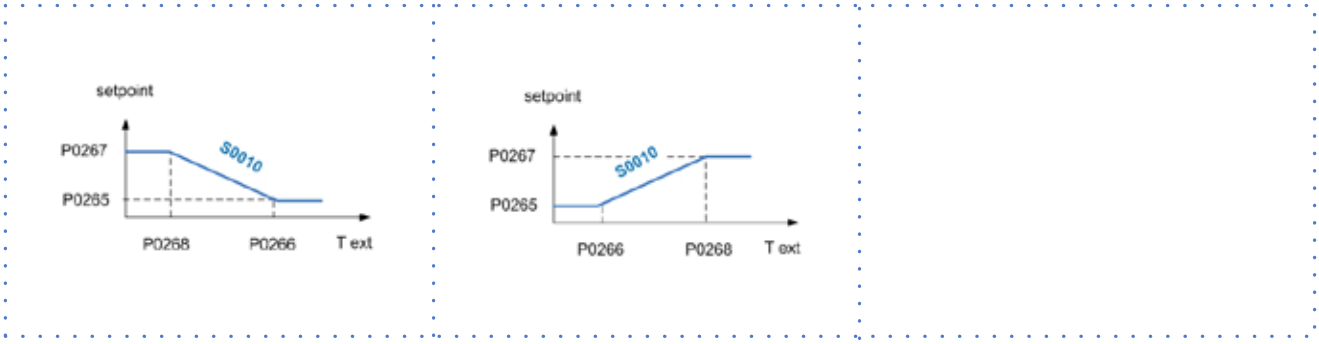
⚠ The parameter modification can cause irreversible damages.

The setpoint defined by the temperature curve is shown at status S0010: ActualSptTExt

Only if P0053: En Climatica ≠ 0

Path: Main Menu / Unit parameters / Climatica TExt

Example



Step	Display	Action	Menu/Variable	Keys		Notes
1		Press 3 sec.		✓		
2	Password	Set	Password	▲	✓	
3		Press		i		
4	Main menu	Select	Unit parameters	▼	✓	
5	Unit parameters	Select	Climatic TExt	▼	✓	
6	Climatic TExt (pwd)	Select	Parameter	▼	✓	
7		Set		▼	▲	
8		Confirm		✓		
9		Press 3 sec.				
10		Select	Local connections	▼	✓	

Path: Main Menu / Unit parameters / Climatica TExt

Parameters	Short description	Description
P0265:	CSptLow	setpoint temperature value when the air temperature value is AirAtSptLowC
P0266:	AirAtSptLowC	external air temperature value where the calculated setpoint takes on the value given by SptLowC
P0267:	CSptHigh	setpoint temperature value when the air temperature value is AirAtSptHigC
P0268:	AirAtSptHigC	external air temperature value where the calculated setpoint takes on the value given by SptHigC

6.12 Water reset

⚠ Menu accessible only after having entered the password.

⚠ Access reserved only to specifically trained personnel.

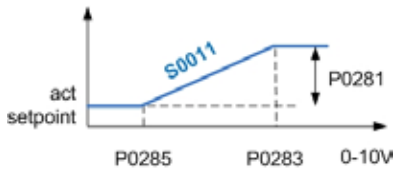
⚠ The parameter modification can cause irreversible damages.

The water reset correction affects the setpoint defined by the Climate curve TExt (actual setpoint).

The setpoint is shown at status S0011: ActualSptWR

Only if P0051: En WaterReset ≠ 0

Path: Main Menu / Unit parameters / Water reset



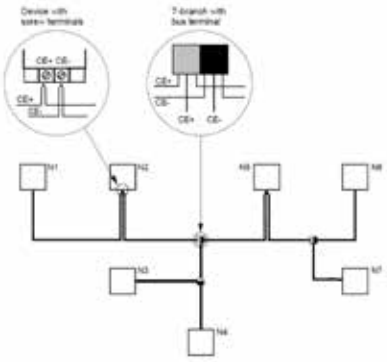
Step	Display	Action	Menu/Variable	Keys		Notes
1		Press 3 sec.		✓		
2	Password	Set	Password	▼	✓	
3		Press		ℹ		
4	Main menu	Select	Unit parameters	▼	✓	
5	Unit parameters	Select	Water reset	▼	✓	
6	Water reset	Select	Parameter	▼	✓	
7		Set		▼	▲	
8		Confirm		✓		
9		Press 3 sec.		⏏		
10		Select	Local connections	✓		

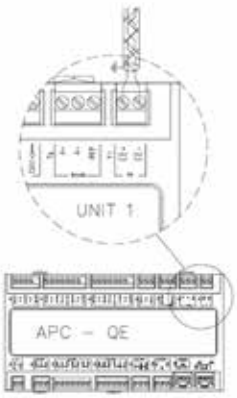
Path: Main Menu / Unit parameters / Water reset

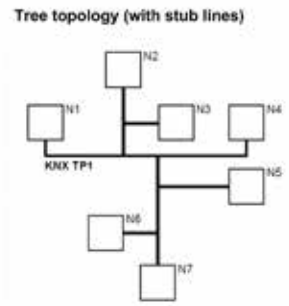
Parameters	Short description	Description
P0281:	MaxCWRC	Maximum correction to be applied to the setpoint
P0283:	SWRMaxC	Value of the WR control signal corresponding to the correction of the set COOL equal to the parameter P0281
P0285	SWRMinC	Value of the WR control signal corresponding to the correction of the set COOL equal to 0

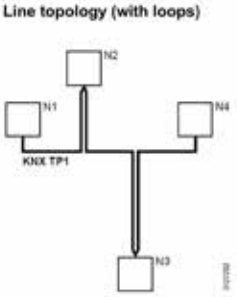
6.13 ECS - ECOSHARE function for the automatic management of a group of units

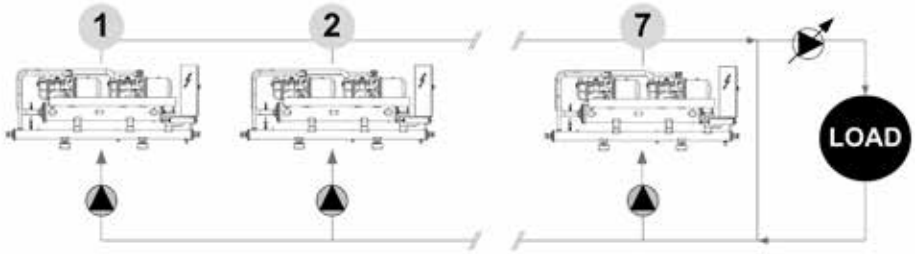
- Max 7 units
- Maximum length of the bus line: 1000 m.
- Maximum distance between 2 units: 700 m.
- Type of cable: shielded twisted pair cable Ø 0,8 mm. use an EIB/KNX cable
- Possible connections: Tree, star, in/out bus, mixed
- It is not possible to use a ring connection
- No end-of-line resistor or terminator required
- There must be suitable arresters to protect the serial lines from the effects of atmospheric discharges
- The data line must be kept separate from the power conductors or powered at different voltage values and away from possible sources of electrical interference











If there are more units connected in a local network set the mode of operation.

MODE A

Every unit manages its own compressors according to the setpoint.

Every unit optimizes its refrigeration circuits.

Pumps always active, even with compressor stoped.

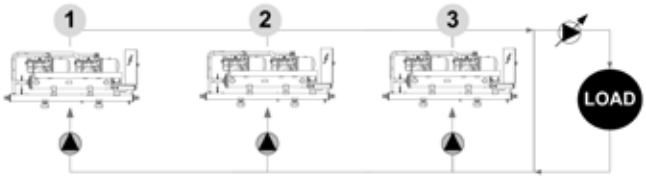
P0343 = 0

P0344 > 0 °C

setpoint1 > setpoint2 > setpoint3

or

setpoint1 < setpoint2 < setpoint3



MODE B

The master manages the single cooling.

The master optimizes individual refrigerant circuits.

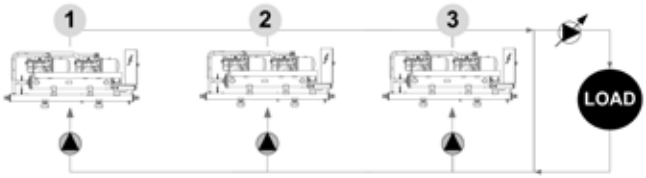
Pumps always active, even with compressor stoped.

P0343 = 1

P0344 = 0 °C

setpoint1 = setpoint2 = setpoint3

plus: optimal H2O temperature control



MODE C

The master manages the single cooling.

The master optimizes individual refrigerant circuits.

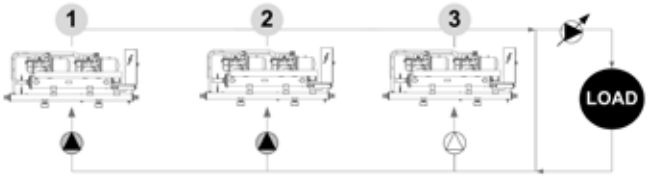
Active pumps only with active compressors.

P0343 = 2

P0344 = 0 °C

setpoint1 = setpoint2 = setpoint3

plus: minimum pumps consumption need balanced system (t1 = t2 = t3)



Path: Main Menu / Unit parameters / Master Slave

Parameters	Short description	Description
P0340:	Address unit	ProcessBus address unit
P0341:	Unit network	Number of network-connected units including the master
P0342:	Standby unit	Number of units kept in standby
P0343:	TypeRegMS	Operation mode: 0=mode A; 1=mode B; 2=mode C
P0344:	Offset Trm MS	Temperature Offset the master sum or subtract, depending on the way you set, in order of priority, to the set point of the slave

6.14 Evaporator water flow-rate

Check that the difference between the temperature of exchanger return and supply water corresponds to power according to this formula:

unit cooling power (kW) x 860 = Dt (°C) x flow rate (L/h)

The cooling power is shown in the table of the GENERAL TECHNICAL DATA included in this manual, referred to specific conditions, or in the tables on COOLING PERFORMANCE in the TECHNICAL BULLETIN referred to various conditions of use.

Check for water side exchanger pressure drops:

- determine the water flow rate
- measure the difference in pressure between exchanger input and output and compare it with the graph on WATER SIDE EXCHANGER PRESSURE DROPS

The measurement of pressure will be easier if pressure gauges are installed as indicated in the DIAGRAM OF SUGGESTED WATER CONNECTIONS.

6.15 Condenser water flow-rate

Check that the difference between the temperature of exchanger return and supply water corresponds to power according to this formula:

unit cooling power + power absorbed by compressors (kW)x 860 = Dt(°C)xflow rate (L/h).

The data is shown in the table of the GENERAL TECHNICAL DATA included in this manual, referred to specific conditions, or in the tables on HEATING PERFORMANCE in the TECHNICAL BULLETIN referred to various conditions of use.

Check for water side exchanger pressure drops:

- determine the water flow rate
- measure the difference in pressure between exchanger input and output and compare it with the graph on WATER SIDE EXCHANGER PRESSURE DROPS

The measurement of pressure will be easier if pressure gauges are installed as indicated in the DIAGRAM OF SUGGESTED WATER CONNECTIONS.

6.16 Start-up report

Identifying the operating objective conditions is useful to control the unit over time.

With unit at steady state, i.e. in stable and close-to-work conditions, identify the following data:

- total voltages and absorptions with unit at full load
- absorptions of the different electric loads (compressors, fans, pumps etc)
- temperatures and flows of the different fluids (water, air) both in input and in output from the unit
- temperature and pressures on the characteristic points of the refrigerating circuit (compressor discharge, liquid, intake)

The measurements must be kept and made available during maintenance interventions.

6.17 Operating at reduced load

The units are equipped with partialization steps and they can, therefore, operate with reduced loads.

However a constant and long operation with reduced load with frequent stop and start-up of the compressor/s can cause serious damages for the lack of oil return.

The above-described operating conditions must be considered outside the operating limits.

In the event of compressor breakdown, due to operating in the above-mentioned conditions, the guarantee will not be valid and Clivet spa declines any responsibility.

Check periodically the average operating times and the frequency of the compressors starts: approximately the minimum thermal load should be such as to need the operating of a compressor for at least ten minutes.

If the average times are close to this limit, take the proper corrective actions.

6.18 97/23 CE PED directive

97/23 CE PED DIRECTIVE gives instructions for installers, users and maintenance technicians as well.

Refer to local regulations; briefly and as an example, see the following:

Compulsory verification of the first installation:

- only for units assembled on the installer's building site (for ex. Condensing circuit + direct expansion unit)

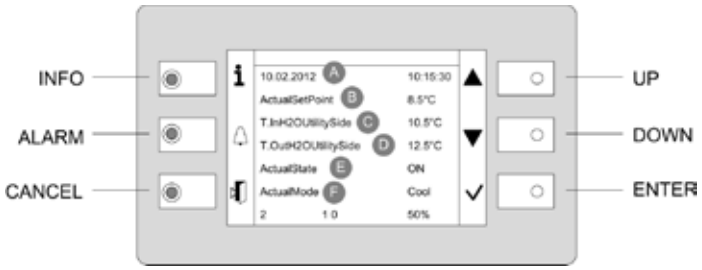
Certification of setting in service:

- for all the units

Periodical verifications:

- to be executed with the frequency indicated by the Manufacturer (see the "maintenance inspections" paragraph)

7 Control



7.1 Led

INFO	Not used
ALARM	Blink / fixed = alarm present
CANCEL	not used currently

7.2 Display

Ref.	Variable	Description
A		Date - Time
B	**ActualSetPoint**	Temperature setting
C	**T.InH2OUtilitySide**	Water inlet temperature utility side
D	**T.OutH2OUtilitySide**	Water outlet temperature utility side
E	**ActualState**	On / off / eco / pmp On
F	**ActualMode**	Cool: water cooling Heat: water heating (option)
	2	Installed compressors
	1 - 0	Compressors ON example: circuit 1 = 1 compr. On circuit 2 = 0 compr. On
	50%	Heating capacity

7.3 Keys

Symbol	Name	Description
	Info	Main menu
	Alarm	Alarm display
	Cancel	Exit Previous level Keyboard settings
	Up	Increases value
	Down	Decreases value
	Enter	Confirm Password

7.4 Change unit state

Step	Display	Action	Menu/Variable	Keys		Notes
1		Press				
2	Main menu	Select	Cmd Local state			
3		Set	OFF - ECO - ON - Pump On			*
4		Confirm				
6		Exit				

* Local state

ECO: recurrent pump ON-OFF; compressors keep water system at setpoint ECO

Pmp ON: pump ON, compressor OFF

7.5 Change the mode

Step	Display	Action	Menu/Variable	Keys		Notes
1		Press				
2	Main menu	Select	Cmd Local mode			
3		Set	Cool: water cooling Heat: water heating (option)			
4		Confirm				
5		Exit				

7.6 Modify setpoint

Step	Display	Action	Menu/Variable	Keys		Notes
1		Press				
2	Main menu	Select	Unit parameters			
3	Unit parameters	Confirm	Set Point			
4		Select	Set Point			
5		Set	Set Point			
6		Confirm				
7		Exit				

Parameters	Short description	Description	
P0001	SetPoint Cool	Setpoint Cool	
P0002	SetPoint Heat	Setpoint Heat	Option
P0003	2°SetPoint Cool	2° Setpoint Cool	Enable by remote switch
P0004	2°SetPoint Heat	2° Setpoint Heat	Option
P0005	SetPoint ECOCool	Economic summer SetPoint	
P0006	SetPoint ECOHeat	Economic winter SetPoint	Option
P0007	SetPointRec	Recovery Set Point	

7.7 Display the status

Step	Display	Action	Menu/Variable	Keys		Notes
1		Press				
2	Main menu	Select	Unit Status			
3		Select	General, circuit, ecc..			
4		Exit				

For details see:
9.1 Status → 36

7.8 Scheduler

It is possible to set 6 events (Off, Eco, On, Recirculating) for each week day.

Step	Display	Action	Menu/Variable	Keys		Notes
1		Press				
2	Main menu	Select	Scheduler			
3	Scheduler	Select	Day			
4		Select	Time			
5		Set	Event time			
6		Confirm				
7		Select	Value			
8		Set	On/Eco..			
9		Confirm				
10		Exit				

Enable Scheduler

Step	Display	Action	Menu/Variable	Keys		Notes
1		Press 3 sec.				
2	Password	Set	Password			
3		Press				*
4	Main menu	Select	Unit Parameters			
5		Select	Unit Option			
6		Set	P0061=1			
7		Press 3 sec.				
		Select	Local connections			

* Unit Parameters menu is displayed

7.9 Alarms

⚠ Before resetting an alarm identify and remove its cause.
Repeated resets can cause irreversible damage.
Example:
+ eE001: Monitore fase: Fault = active alarm
- EE003: Guasto P1 Util: Ok = resetted alarm
Display of alarm: step 1-3
Reset allarm: step 4-10

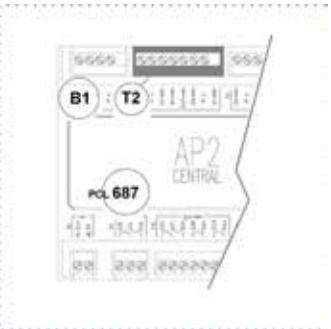
Step	Display	Action	Menu/Variable	Keys		Notes
1		Press				
2	Alarm list detail	Press				
3	Alarm list	Select	Alarm	▼	✓	
4	Alarm list detail	Press 3 sec.		✓		
5	Password	Set	Enter password	▼	✓	
6	Alarm list detail	Press				
7	Alarm list	Select	Alarm	▼	✓	
8		Select	Reset Executed	▼	✓	
9		Press 3 sec.				
10	Password management	Select	Log off	▼	✓	

7.10 Keyboard settings

Step	Display	Action	Menu/Variable	Keys		Notes
1		Press 3 sec.				
2		Press		✓		
3	HMI Settings	Select		▼	✓	
4		Press		✓	▼	
5		Press				
6		Select	Local connections	▼	✓	

7.11 Alarms

The alarm code identifies the concerned circuit:
Example:
ee 1 01:TimeOutModCirc = circuit 1
ee 2 01:TimeOutModCirc = circuit 2
The number of refrigerant circuits depends on series and size of the unit.



t.i. input type:
DI = digital input
AI = analogic input

Module:
687 = main module
985 = circuit module
94U = thermostatic driver module

Input:
Connector number:
T1, T2, T3.....
PIN code:
X1, X2, Q13, DO1.....

t.a. alarm type:
A automatic reset
M manual reset
A/M automatic reset, (after N alarm interventions becomes manual reset)

code	detailed description	t.i.	module	input	t.a.
eE001	Phase monitor	DI	687 central	T13 DL1	A/M
EE003	Pump 1 overload	DI	687 central	T13 DL2	M
EE004	Pump 2 overload	DI	687 central	T4 D1	M
EE005	Pump 3 overload	DI	687 central	T13 DL2	M
ee010	Master Offline - Master Slave network enabled				A
ee011	Unit 2 in alarm - Master Slave network enabled				A
ee012	Unit 2 OffLine - Master Slave network enabled				A
ee013	Unit 3 in alarm - Master Slave network enabled				A
ee014	Unit 3 OffLine - Master Slave network enabled				A
ee015	Unit 4 in alarm - Master Slave network enabled				A
ee016	Unit 4 OffLine - Master Slave network enabled				A
ee017	Unit 5 in alarm - Master Slave network enabled				A
ee018	Unit 5 OffLine - Master Slave network enabled				A
ee019	Unit 6 in alarm - Master Slave network enabled				A
ee020	Unit 6 OffLine - Master Slave network enabled				A
ee021	Unit 7 in alarm - Master Slave network enabled				A
ee022	Unit 7 OffLine - Master Slave network enabled				A
EE023	Pump 1 thermal protection	DI	965 hydronic	T1 X4	M
EE024	Pump 2 thermal protection	DI	965 hydronic	T1 X5	M
EE025	Pump 3 thermal protection	DI	965 hydronic	T1 X6	A
EE026	Inverter thermal protection	DI	965 hydronic	T5 DL1	A
ee027	Water inlet temperature probe faulty	AI	687 central	T1 B1	A
ee028	Water outlet temperature probe faulty	AI	687 central	T1 B2	A
ee029	External air temperature probe faulty	AI	687 central	T1 B3	A
ee030	Signal logoff or short circuit	AI	687 central	T2 X1	A
ee031	Signal logoff or short circuit	AI	687 central	T2 X2	A
ee032:	External Humidity probe faulty	AI	687 central	T2 X3	A
ee033:	Cabinet temperature probe faulty	AI	687 central	T2 X4	A
ee034:	Hydronic module on the ProcessBus is disconnected			periperal bus	A
ee035:	Cool opening valve: error limit	DI	945 4P	X2	A
ee036:	Heat opening valve: error limit	DI	945 4P	X4	A
ee037:	Cool closing valve: error limit	DI	945 4P	X1	A
ee038:	Heat closing valve: error limit	DI	945 4P	X3	A
ee039:	Communication timeout 4P module	Logico	945 4P	periperal bus	A
ee040:	FCI module water temperature probe fault	AI	955 FCI	X1	A
ee041:	Communication timeout FCI module	Logico	955 FCI	periperal bus	A
EE044:	FCI module P1 thermal protection	DI	955 FCI	X5	M
EE045:	FCI module P2 thermal protection	DI	955 FCI	X6	M
EE046:	FCI module P3 thermal protection	DI	955 FCI	X7	M
ee050:	User side exchanger, differential pressure probe fault		965 hydronic	X3	A
ee054:	Recovery pump thermal protection	DI	955 FCI	X6	A
ee101:	Circuit 1 module on the ProcessBus is disconnected			periperal bus	A
ee102:	Driver 1 module on the ProcessBus is disconnected			periperal bus	A
ee103:	Recovery 1 module on the ProcessBus is disconnected			periperal bus	A
ee104:	Driver 1 blocked		94U driver		A

code	detailed description	t.i.	module	input	t.a.
EE106:	Compressor 1 thermal protection	DI	985 circuit 1	T4 D1	M
EE107:	Compressor 2 thermal protection	DI	985 circuit 1	T4 D2	M
EE108:	Compressor 3 thermal protection	DI	985 circuit 1	T4 D3	M
EE118:	Source side protection	DI	985 circuit 1	T9 DL2	M
ee122:	Faulty probe - discharge temperature compressor 1	AI	985 circuit 1	T1 B1	A
ee123:	Faulty probe - discharge temperature compressor 2	AI	985 circuit 1	T1 B2	A
ee124:	Faulty probe - discharge temperature compressor 3	AI	985 circuit 1	T2 X2	A
ee125:	Faulty probe - source 1 temperature	AI	985 circuit 1	T1 B3	A
ee126:	Faulty probe - source 2 temperature	AI	985 circuit 1	T2 X1	A
ee127:	Faulty probe - Suction temperature	AI	94U driver	T2 X2	A
ee128:	Faulty probe - discharge pressure	AI	985 circuit 1	T2 X3	A
ee129:	Faulty probe - suction pressure	AI	94U driver	T1 X1	A
ee130:	Faulty probe - Recovery gas temperature	AI	965 recovery	T1 X1	A
ee131:	Faulty probe - Recovery pressure	AI	965 recovery	T2 X7	A
ee132:	Faulty probe - Water recovery inlet	AI	965 recovery	T1 X2	A
ee133:	Faulty probe - Water recovery outlet	AI	965 recovery	T1 X3	A
ee135:	Bios wrong version		985 circuit 1		A
ff105:	Low overheating Thermostatic C1				A
fF109:	Low pressure from analogic input	DI	985 circuit 1	T3 X7	A/M
ff110:	Pre-alarm - low pressure COOL mode				A
ff111:	Pre-alarm - low pressure HEAT mode				A
fF112:	Low pressure from analogic input	AI	94U driver	T1 X1	A/M
fF113:	High pressure from digital input	DI	985 circuit 1	T3 X8	A/M
ff114:	Pre-alarm - high pressure				A
fF115:	High pressure from analogic input	AI	985 circuit 1	T2 X3	A/M
ff116:	Pre-alarm max. compression ratio (high pressure / low pressure)				A
fF117:	Min. compression ratio (high pressure / low pressure)				A/M
FF119:	Alarm max. compression ratio (high pressure / low pressure)				M
FF134	Empty circuit	AI	94U driver	T1 X1	M
ff136:	Defrost: low gas temperature	Logico	985	X2	M
fF137:	Oil pressure	DI	985	DL1	A/M
ff138:	Low condensing pressure	Logico	985	X3	A
fF139:	Maximum saturated condensation temperature	Logico			A/M
fF140:	Minimum saturated condensation temperature	Logico			A/M
fF141:	Maximum saturated evaporation temperatur	Logico			A/M
fF142:	Minimum saturated evaporation temperatur	Logico			A/M
fF143:	Maximum compression ratio	Logico			A/M
FF144:	Minimum compression ratio	Logico			M
fF145:	Maximum engine torque	Logico			A/M
iI002:	Low water pressure	DI	687 central	T5 DU1	A/M
iI006:	Flow switch utility side	DI	687 central	T3 X8	A/M
II007:	Freeze alarm utility side				M
ii008:	Utility side pumps On for antifreeze alarm				A
II009:	COOL: outlet temperature higher than inlet temperature HEAT: inlet temperature higher than outlet temperature				A
iI120:	Flow switch source side	DI	985 circuit 1	T2 X4	A/M
II121:	Freeze alarm source side				A
II042:	FCI module, system pressure	DI	955 FCI	X3	M
II043:	FCI module, antifreeze alarm	Logico	955 FCI	X1	M
ii047:	FCI module, water flow alarm	DI	955 FCI	X4	A
ii052:	Recosery module, flow alarm	DI	965 REC	X6	A
ii053:	Recovery module, system pressure	DI	965 REC	X6	A

8 Maintenance

8.1 General description

Maintenance must be done by authorized centres or by qualified personnel.

The maintenance allows to:

- maintain the unit efficiency
- increase the life span of the equipment
- assemble information and data to understand the state of the unit efficiency and avoid possible damages

Before checking, please verify the following:

- the electrical power supply line should be isolated at the beginning
- the unit isolator is open, locked and equipped with the suitable warning
- make sure no tension is present

⚠ After turning off the power, wait at least 5 minutes before accessing to the electrical panel or any other electrical component.

⚠ Before accessing check with a multimeter that there are no residual stresses.

8.2 Inspections frequency

Perform an inspection every 6 months minimum.

The frequency, however, depends on the use.

⚠ In the event of frequent use it is recommended to plan inspections at shorter intervals:

- frequent use (continuous or very intermittent use, near the operating limits, etc)
- critical use (service necessary)

√	intervention frequency (months)	1	6	12
1	presence corrosion			X
2	panel fixing			X
3	fan fixing		X	
4	coil cleaning		X	
5	water filter cleaning		X	
6	water: quality, ph, weight of glycol (%)		X	
7	check the exchanger efficiency			X
8	circulating pumps		X	
9	check of the fixing and the insulation of the power lead			X
10	check of the earthing cable			X
11	electric panel cleaning			X
12	capacity contactor status			X
13	termina closing, cable insulation integrity			X
14	voltage and phase unbalancing (no load and on-load)		X	
15	absorptions of the single electrical loads		X	
16	test of the compressor crankcase heaters		X	
17	Checking for leaks			*
18	survey of the refrigerant circuit operating parameters		X	
19	safety valve			*
20	protective device test: safety valves, pressure switches, thermostats, flow switches etc..		X	
21	control system test: setpoint, climatic compensations, capacity stepping, water / air flow-rate variations		X	
22	control device test: alarm signalling, thermometers, probes, pressure gauges etc..		X	

* Refer to the local regulations; and ensure correct adherance. Companies and technicians that effect interventions of installation, maintenance/repairs, leak control and recovery must be CERTIFIED as expected by the local regulations. The leak control must be effected with annual renewal.

8.3 Unit booklet

It's advisable to create a unit booklet to take notes of the unit interventions.

In this way it will be easier to adequately note the various interventions and aid any troubleshooting.

Report on the booklet:

- date
- type of intervention effected
- intervention description
- carried out measures etc.

8.4 Standby mode

If a long period of inactivity is foreseen:

- turn off the power
- avoid the risk of frost (empty the system or add glycol)

Turn off the power to avoid electrical risks or damages by lightning strikes.

⚠ With lower temperatures keep heaters turned on in of the electrical panel (option).

It's recommended that the re-start after the stopping period is performed by a qualified technician, especially after seasonal stops or seasonal switching.

When restarting, refer to what is indicated in the "start-up" section.

Schedule technical assistance in advance to avoid hitches and to guarantee that the system can be used when required.

8.5 Water filter

Check that no impurities prevent the correct passage of water.

8.6 Flow Switch

- controls the operations
- remove incrustations from the palette

8.7 Water side exchanger

It is very important for the exchanger to be able to provide the maximum thermal exchange, therefore it is essential for the inner surfaces to be clean of dirt and incrustations.

Periodically check the difference between the temperature of the supply water and the condensation temperature: if the difference is greater than 8°C–10°C it is advisable to clean the exchanger.

The clearing must be effected:

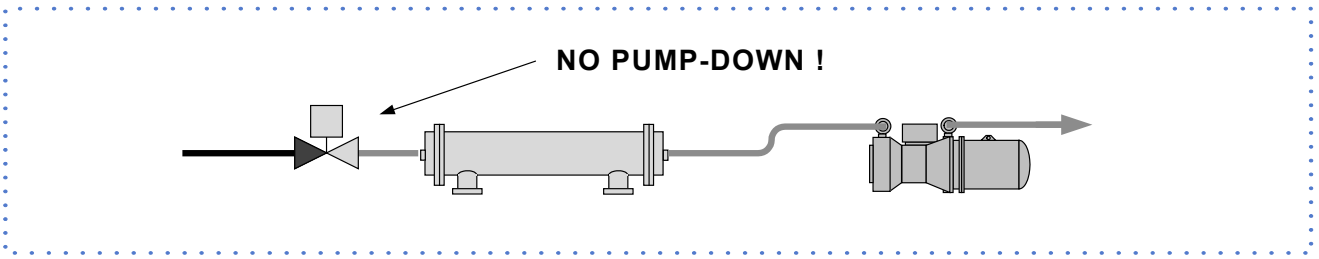
- with circulation opposite to the usual one
- with a speed at least 1,5 times higher than the nominal one
- with an appropriate product moderately acid (95% water + 5% phosphoric acid)
- after the cleaning rinse with water to inhibit the action of any residual product

8.8 Screw compressors - Periodical checks

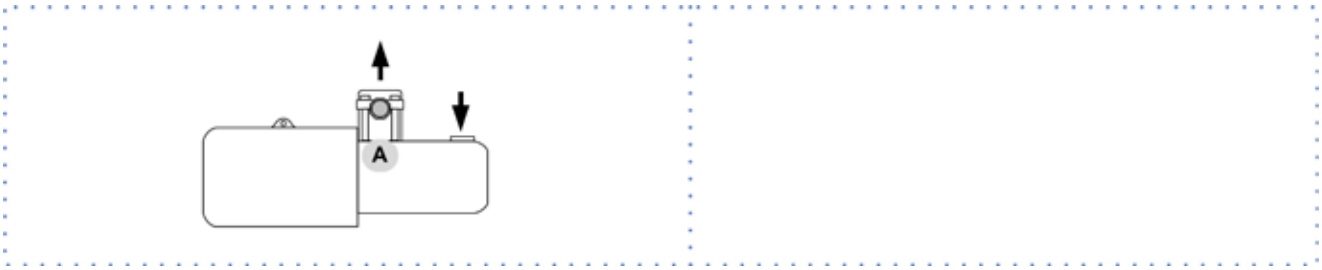
Operating hours	100	1000	5000	10000	15000	20000	25000	30000
Vibrations / Noise	C	C	C	C	C	C	C	C
Oil level	C	C	C	C	C	C	C	C/R
Oil filter	C		C		C		C	C/R
Filter the suction			C		C		C	C
Electric insulation		C	C	C	C	C	C	C
Bearings								C/R
check valve		C	C	C	C	C	C	C

C = CHECK

R = replace



8.9 Compressor supply line shut-off valve



Only if present

A. Supply line shut-off valve

Do not remove the seal

Remove only if authorized by the manufacturer.

Please contact the maker for informations

8.10 Circulating pumps

Check:

- no leaks
- bearing status (anomalies are highlighted by abnormal noise and vibration)
- the terminal protection covers are closed and the cable holders are properly positioned

8.11 System discharge

1. evacuate the system
2. evacuate the exchanger, use all the cocks presents
3. use compressed air to blow the exchanger
4. dry completely the exchanger by an hot air jet; for greater safety fill the exchanger with glycoled solution
5. protect the exchanger from the air
6. remove the drain plugs to the pumps

Any anti-freeze liquid contained in the system should not be discharged freely as it is a pollutant.

It must be collected and reused.

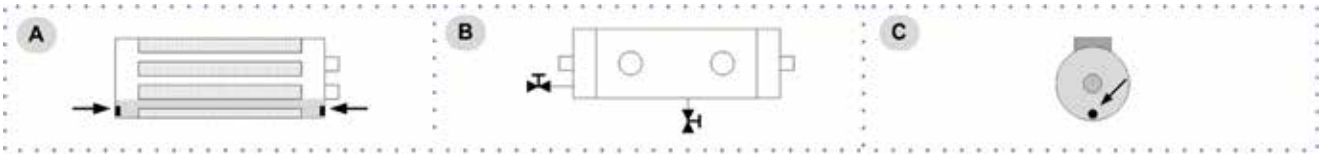
Before starting a washing the plant.

Example

A. emptying condenser

B. emptying evaporator

C. emptying pump



It's recommended that the re-start after the stopping period is performed by a qualified technician, especially after seasonal stops or seasonal switching.

When restarting, refer to what is indicated in the "start-up" section.

Schedule technical assistance in advance to avoid hitches and to guarantee that the system can be used when required.

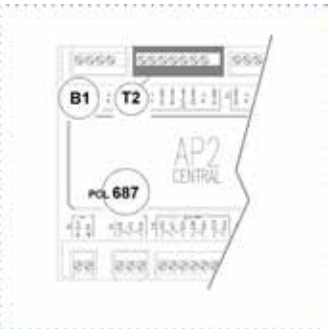
8.12 Insulations

Check the condition of the insulations: if necessary apply glue and and renew the seals.re.

9 Status

The status code identifies the concerned circuit:
Example:
S 1 100:CMP1 compressor1 starts = circuit 1
S 2 100:CMP1 compressor1 starts = circuit 2
The number of refrigerant circuits depends on series and size of the unit.
Example:

AI-687 T.IN H2OUtil_B1 Inlet water temperature
AI = analogic input
687 = main module
B1 = PIN



9.1 General stata and central module

code	description	detailed description
AI-687	T.IN H2OUtil_B1	Inlet water temperature utility side
AI-687	T.OUT H2OUtil_B2	Outlet water temperature user side
AI-687	Ext.Air temp_B3	Outdoor air temperature
AI-687	S.DemandLimit_X1	Signal of the demand limit function controls
AI-687	S.WaterReset_X2	Signal of the water reset function controls
AI-687	RHExt_X3	Outside relative humidity
AI-687	El.CabinetTemp_X4	Electrical panel temperature
AO-687	%FREE-COOLING _X5	Percentage value of the status of the external control signal of the ventilation/FREE-COOLING valve
DI-687	Sel.SetPoint_DU2	Status of the second digital input setpoint 0=1°set 1=2°Set
DI-687	SystemPressure_DU1	Status of the system water pressure sensor 0=OK 1=Fault
DI-687	FlowUser_X8	Status of the differential pressure switch/utilisation flow 0=OK 1=Fault
DI-687	ON-OFFRem_X7	Status of the unit status digital input 0=OFF 1=On
DI-687	Heat/CoolRem_X6	Status of the unit mode digital input 0=Heat 1=Cool
DI-687	PhaseMonitor_DL1	Status of the phase monitor input 0=OK 1=Fault
DI-687	OvlP1Util_D2	Status of thermal protection contact of utilisation pump 1 0=OK 1=Fault
DI-687	OvlP2Util_D1	Status of thermal protection contact of utilisation pump 2 0=OK 1=Fault
DI-687	OvlP3Util_DL2	Status of thermal protection contact of utilisation pump 3 0=OK 1=Fault
DO-687	El.CabinetFAN_DO1	Status of the ventilation control of the electrical panel: 0=Off 1=On
DO-687	El.CabinetHEAT_DO2	Status of the heating control of the electrical panel: 0=Off 1=On
DO-687	UnitMode_Q1	Status of the digital output related to the operating mode (N.O. Open=Cool N.O. Closed=Heat): 0=Cool 1=Heat
DO-687	Cumul.Alarm_Q2	Unit cumulative alarm status (N.0.Open=All OFF N.O. Closed=All ON): 0=Off 1=On
DO-687	CmdP1User_Q3	Command pump 1 utility side: 0=Off 1=On
DO-687	CmdP2User_Q4	Command pump 2 utility side: 0=Off 1=On
DO-687	CmdP3User_Q5	Command pump 3 utility side: 0=Off 1=On
DO-687	OpenYV FC_Q7	Opening control of the FREE-COOLING valve FC Closed = ON: 0=Off 1=On
DO-687	CloseYV FC_Q8	Closure control of the FREE-COOLING valve FC Closed = OFF: 0=Off 1=On
DO-687	AntifreezeHeater_Q6	Status of the control of the antifreeze heaters: 0=Off 1=On
S0001	StartsP1User	Number of startup totalized from Pump 1
S0002	StartsP2User	Number of startup totalized from Pump 2
S0003	StartsP3User	Number of startup totalized from Pump 3
S0004	Pump1 running hours	Utilisation pump 1 hours
S0005	Pump2 running hours	Utilisation pump 2 hours
S0006	Pump3 running hours	Utilisation pump 3 hours
S0007	Antifreeze heat.	Antifreeze heater status 0=Off 1=On
S0008	Pump in antifreeze	Status of the utilisation pump for antifreeze protection 0=Off 1=On
S0009	Recovery	Recovery status: 0=Off 1=On
S0010	ActualSptTExt	Setpoint value calculated by the Text climate curve
S0011	ActualSptWR	Setpoint value calculated by the WaterReset function

code	description	detailed description
S0012	StatusFREE-COOLING	FREE-COOLING status 0=Off 1=On
S0013	GenWarning	0=Off 1=On
S0014	GenBlock	0=Off 1=On
S0015	NCompOnUnit	Number of compressors currently active on the machine

9.2 Circuit 1 status

code	description	detailed description
AI-94U	SuctionTemp_X2	Suction temperature
AI-94U	SuctionPressureX1	Low pressure transducer
AI-985	DischargeTC1_B1	Compressor 1 discharge temperature
AI-985	DischargeTC2_B2	Compressor 2 discharge temperature
AI-985	DischargeTC3_X2	Compressor 3 discharge temperature
AI-985	SourceTemp1_B3	Source 1 temperature (for machines with air-based sources and reversible on gas = Probe 1 on source battery. For machines with water-based source = Source input probe)
AI-985	SourceTemp2_X1	Source 2 temperature (for machines with air-based sources and reversible on gas = Probe 2 on source battery. For machines with water-based source = Source outlet probe)
AI-985	DischargePressure_X3	High pressure transducer
AO-985	%Cmd Cmp_X5	Percentage value of the status of the control signal of the modulating compressor
AO-985	%Cmd Source_X6	% value source modulating signal control
DI-985	Source WaterFlow_X4	Status of the source flow contact (Only active on machines with water-based source): 0=Fault 1=OK
DI-985	LP Pressure switch_X7	Status of the LP-pressure switch contact: 0=Fault 1=OK
DI-985	Ovl Inverter_DL1	Status of the inverter compressor heater contact: 0=Fault 1=OK
DI-985	HP Pressure switch_X8	Status of the HP-pressure switch contact: 0=Fault 1=OK
DI-985	Ovl Source_DL2	Status of the contact of the thermal protection of the source motors: 0=Fault 1=OK
DI-985	Ovl Cmp1_D1	Status of the contact of the thermal protection of compressor 1: 0=Fault 1=OK
DI-985	Ovl Cmp2_D2	Status of the contact of the thermal protection of compressor 2: 0=Fault 1=OK
DI-985	Ovl Cmp3_D3	Status of the contact of the thermal protection of compressor 3: 0=Fault 1=OK
DI-985	Diff.PressureOilS-crew_D2	Status of the oil differential pressure switch contact (Active if compressor = Screw): 0=Fault 1=OK
DI-985	EnCircScrew_D3	Status of the circuit enabling input contact (Active if compressor = Screw): 0=Fault 1=OK
DO-985	Cmd Cmp1_Q2	Status of the compressor 1 control: 0=Off 1=On
DO-985	Cmd Cmp2_Q3	Status of the compressor 2 control: 0=Off 1=On
DO-985	Cmd Cmp3_Q4	Status of the compressor 3 control: 0=Off 1=On
DO-985	Cmd Source_Q1	Status of the source motor control: 0=Off 1=On
DO-985	Cmd Inj.Cmp1_Q5	Status of the compressor 1 liquid injection valve control: 0=Off 1=On
DO-985	Cmd Inj.Cmp2_Q7	Status of the compressor 2 liquid injection valve control: 0=Off 1=On
DO-985	Cmd Inj.Cmp3_Q8	Status of the compressor 3 liquid injection valve control: 0=Off 1=On
DO-985	Cmd YV4 reversing-Valve_Q6	Status of the cycle inversion valve control: 0=Off 1=On
DO-985	Cmd Digital_DO2	Status of the button valve control for compressors PWM: 0=Off 1=On
DO-985	Cmd KMLine_Q2	Status of the line counter control for the power supply Cmp (Active if compressor = Screw): 0=Off 1=On
DO-985	Cmd KMPW1_Q3	Status of the control of the motor's 1st winding (with PartWiding start-up) / Status of the star contactor control (with delta start-up)(Active if compressor = Screw): 0=Off 1=On
DO-985	Cmd KMPW2_Q4	Status of the control of the motor's 2nd winding (with PartWiding start-up) / Status of the control of the triangle contactor (with delta start-up)(Active if compressor = Screw): 0=Off 1=On
DO-985	Cmd YV25%_Q7	Status of the start e stop valve YV25%(Active if compressor = Screw): 0=Off 1=On
DO-985	Cmd YV75%_Q8	Status of the valve control of the YV75%(CR3_Bitzer) (14_Refcomp) (Active if compressor = Screw): 0=Off 1=On
DO-985	Cmd YVUP_DO1	Status of the power increase valve control (CR4_Bitzer) (16_RefComp) (Active if compressor = Screw): 0=Off 1=On
DO-985	Cmd YVDW_DO2	Status of the power decrease valve control (CR2_Bitzer) (15_RefComp) (Active if compressor = Screw): 0=Off 1=On
S1100	CMP1 starts	Number of startup totalized from Compressor 1
S1101	CMP2 starts	Number of startup totalized from Compressor 2
S1102	CMP3 starts	Number of startup totalized from Compressor 3
S1103	StartsScrew	Number of startup totalized from Compressor
S1104	Source starts	Number of startup totalized from source Fan or pump
S1105	Hours Comp.1	Compressor 1 hours

code	description	detailed description
S1106	Hours Comp.2	Compressor 2 hours
S1107	Hours Comp.3	Compressor 3 hours
S1108	HoursScrew	Screw compressor hours
S1109	HoursSource	Screw compressor hours
S1110	Total steps	Total number of active steps on the circuit
S1111	Comp.1 status	Compressor 1: 0=free 1=on 2=timing 3=Disabled
S1112	Comp.2 status	Compressor 2: 0=free 1=on 2=timing 3=Disabled
S1113	Comp.3 status	Compressor 3: 0=free 1=on 2=timing 3=Disabled
S1114	Current cap.	Capacity currently used up on the circuit
S1115	Requested cap.	Capacity required on the circuit
S1116	Pressure ratio	Compression ratio status (1+HP/1+LP)
S1117	FANPreAlarm	Status of the current maximum ventilation pre-alarm 0=Off 1=On
S1118	Defrost delay	Current value of the countdown towards the cycle inversion due to defrosting. (defrosting starts when the value reaches zero)
S1119	Defrosting status	Indicates the defrosting status 0=DfrOff (Cycle inversion phase for defrosting phase NOT active) 1=DfrON (Cycle inversion phase for defrosting phase ACTIVE)
S1120	HWErr	Hardware error of the POL94U module that does not preclude the possibility of moving the valve or closing it. Possible causes: anomalous voltage values in the valve motor 0=Off 1=On
S1121	BlckingHWErr	Hardware error of the POL94U module that prevents the electronic valve from moving. Possible causes: UPS not available, wrong POL94U Bios, HW POL94U Error, Disconnected EEV Motor, calibration error associated with configuration parameters. 0=Off 1=On
S1122	FailSafeSta	Active block status: 0=Off 1=On
S1123	UPSNotAval	UPS failure: 0=Off 1=On
S1124	CircWarning	Status associated with circuit block alarm
S1125	CircBlock	Lock alarm circuit
S1126	ThTDischarge	Theoretical discharge temperature

9.3 Thermostatic C1 status

code	description	detailed description
S1200	SHSpOp	Operating overheating setpoint net with SH and MET adjustments
S1201	AICalSuctSprHtP	Actual Overheating SetPoint
S1202	ECVState	0 = Idle 1 = ECVAlarm 2 = FailSafe 3 = Referencing 4 = Positioning 5 = Positioned 6 = ECVWaiting 7 = FastClosing
S1203	EEV:SH_Limiter	Maximum valve opening determined by the minimum SH control function
S1204	EEV:LET_Limiter	Status of the minimum LET intake temperature control
S1205	EEVMode	0=Idle (motor off) 1=Init (valve initialised when completely closed) 2=Manual (valve controlled in manual mode) 3=Control (the valve conducts adjustments to control SH)
S1206	Prepos	Thermostatic requested positioning %
S1207	ECVSetPos	% Opening valve if EEVMod = Manual
S1208	ECVMode	0 = Idle 1 = Init 2 = Position 3 = FastClose
S1209	SHPIDOut	% value of the PID output to adjust the valve
S1210	EEVStatus	0 - Closed (Ready) 1 - StartUpPositioning 2 - StartUpPositioned 3 - SuperHeat 4 - Prepositioning 5 - MET 6 - LET 7 - Closing 8 - PumpDown 9 - DangAlarm 10 - PumpDownStartUp 11 - ECVAlarm 12 - MinSHLmtr 13 - WaitValveClose 255 - Warning
S1211	SetPosSteps	Control of the number of steps the valve must reach to adjust overheating
S1212	SetPos%	Opening % control of the valve to adjust overheating
S1213	Pol94xCommOK	Connection status of the POL94U module on processbus: 0=NotOK 1=OK
S1214	ActPos%	% value of the actual position valve EEV
S1215	ActPosSteps	Current number of steps of the EEV valve
S1216	ECVMode	0 = Idle 1 = Init 2 = Position 3 = FastClose
S1217	ECVState	0 = Idle 1 = ECVAlarm 2 = FailSafe 3 = Referencing 4 = Positioning 5 = Positioned 6 = ECVWaiting 7 = FastClosing

9.4 Recovery circuit 1 status

code	description	detailed description
AI-965	P.OutRec_X7	Pressure value recovery circuit
AI-965	T.InH2ORec_X2	Recovery inlet water temperature

code	description	detailed description
AI-965	T.OutH2ORec_X3	Recovery outlet water temperature
AI-965	T.OutGasRec_X1	Recovery gas outlet temperature (liquid)
AO-965	%CmdPmpRec_X8	% 0-10vcc signal value recovery variable pump
DI-965	EnableRec_X4	Enabling recosvery input: 0=Fault 1=OK
DI-965	Ovl PmpRec_X5	Recovey thermal protection pump 0=Fault 1=OK
DI-965	FlowRec_X6	Flow recovery 0=Fault 1=OK
DI-965	SystemPress.Recovery_DL1	State of the water pressure switch contact of the system 0=Fault 1=OK
DO-965	YV1Rec_DO1	Command valve YV1 0=Off 1=On
DO-965	YV2Rec_DO2	Command valve YV2 0=Off 1=On
DO-965	YV3Rec_Q1	Command valve YV3 0=Off 1=On
DO-965	YV4Rec_Q2	Command valve YV4 0=Off 1=On
DO-965	YV5Rec_Q3	Command valve YV5 0=Off 1=On
DO-965	PmpRec_Q4	Recovery pump command 0=Off 1=On

9.5 Master slave status

code	description	detailed description
S0600	SetPoint Unit1	Value accessible from the display of the unit machine network master. Working setpoint master unit (Address 1 on periferalbus)
S0601	SetPoint Unit2	Value accessible from the display of the unit machine network master. Working setpoint unit 2 (Address 2 on periferalbus)
S0602	SetPoint Unit3	Value accessible from the display of the unit machine network master. Working setpoint unit 3 (Address 3 on periferalbus)
S0603	SetPoint Unit4	Value accessible from the display of the unit machine network master. Working setpoint unit 4 (Address 4 on periferalbus)
S0604	SetPoint Unit5	Value accessible from the display of the unit machine network master. Working setpoint unit 5 (Address 5 on periferalbus)
S0605	SetPoint Unit6	Value accessible from the display of the unit machine network master. Working setpoint unit 6 (Address 6 on periferalbus)
S0606	SetPoint Unit7	Value accessible from the display of the unit machine network master. Working setpoint unit 7 (Address 7 on periferalbus)
S0607	statusUnit1	Value accessible from the display of the unit machine network master. Status master unit 7 0=Off 1=Eco 2=On 3=PmpOn
S0608	StatusUnit2	Value accessible from the display of the unit machine network master. Status unit 2 0=Off 1=Eco 2=On 3=PmpOn
S0609	StatusUnit3	Value accessible from the display of the unit machine network master. Status unit 3 0=Off 1=Eco 2=On 3=PmpOn
S0610	StatusUnit4	Value accessible from the display of the unit machine network master. Status unit 4 0=Off 1=Eco 2=On 3=PmpOn
S0611	StatusUnit5	Value accessible from the display of the unit machine network master. Status unit 5 0=Off 1=Eco 2=On 3=PmpOn
S0612	StatusUnit6	Value accessible from the display of the unit machine network master. Status unit 6 0=Off 1=Eco 2=On 3=PmpOn
S0613	StatusUnit7	Value accessible from the display of the unit machine network master. Status unit 7 0=Off 1=Eco 2=On 3=PmpOn

9.6 Hydronic module status

code	description	detailed description
AO-965	%CmdInverter_X7	% value inverter command signal
DI-965	OvlP1.Hid_X4	Pump 1 overload 1: 0=OK 1=Fault
DI-965	OvlP2.Hid_X5	Pump 2 overload: 0=OK 1=Fault
DI-965	OvlP3.Hid_X6	Pump 3 overload: 0=OK 1=Fault
DI-965	OvlInv.Hid_DL1	Inverter overload: 0=OK 1=Fault
DO-965	CmdP1.Hid_DO1	Pump 1 command: 0=Off 1=On
DO-965	CmdP1Inv.Hid_Q2	Pump 1 inverter command: 0=Off 1=On
DO-965	CmdP2.Hid_DO2	Pump 2 command: 0=Off 1=On
DO-965	CmdP2Inv.Hid_Q3	Pump 2 inverter command: 0=Off 1=On

code	description	detailed description
DO-965	CmdP3.Hid_Q1	Pump 3 command: 0=Off 1=On
DO-965	ComdP3Inv.Hid_Q4	Pump 3 inverter command: 0=Off 1=On
DO-965	CmdInverter:X8	Hydronic inverter command: 0=Off 1=On
S0500	StartsP1Hidro	Hydronic module pump 1 starts
S0501	StartsP2Hidro	Hydronic module pump 2 starts
S0502	StartsP3Hidro	Hydronic module pump 3 starts
S0503	HoursP1.Hid	Hydronic module pump 1 hours
S0504	HoursP32.Hid	Hydronic module pump 2 hours
S0505	HoursP3.Hid	Hydronic module pump 3 hours
S0506	HoursInverter.Hid	Hydronic module inverter hours

9.7 Energy meter status

code	description	detailed description
S0720	U12	L1 - L2 voltage
S0721	U23	L2 - L3 voltage
S0722	U31	L3 - L1 voltage
S0723	Freq	Frequency
S0724	IL1	L1 current
S0725	IL2	L2 current
S0726	IL3	L3 current
S0727	Ptotale	Current active power
S0728	Cosfi	Total power factor
S0729	Energy	Active energy totalized
S0730	THD-U12	Sum of harmonic components of voltage between L1 e L2
S0731	THD-U23	Sum of harmonic components of voltage between L2 e L3
S0732	THD-U31	Sum of harmonic components of voltage between L3 e L1

10 Accessories

10.1 OHI - Operation with water circuit change-over

Configuration that allows operation as water-water heat pump to produce hot water.

The system must be fitted with switching valves.

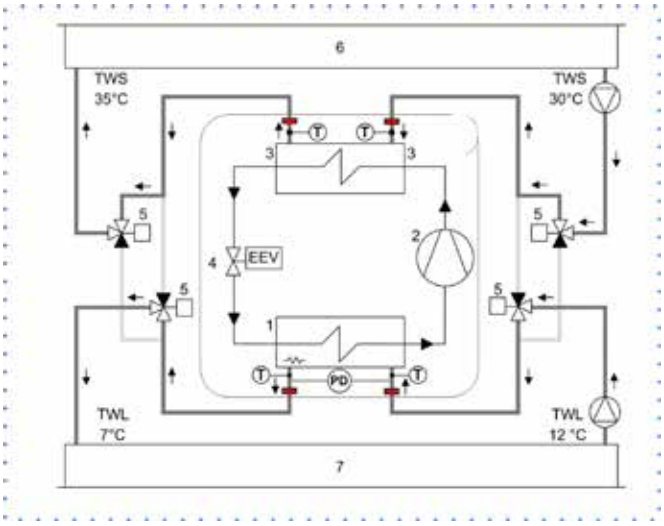
The hydraulic switching must be carried out when the unit's operating mode is changed.

The Customer can change the operating mode using the interface built-in the unit or the designated potential-free contact.

Possible non-freeze solutions must be fitted both on the utilisation circuit and the source circuit, as hydraulic switching involves mixing fluids.

The device includes 2 temperature probes to be fitted at the condenser inlet and outlet. Probe installation provided by the customer. The connection cable length is 3m.

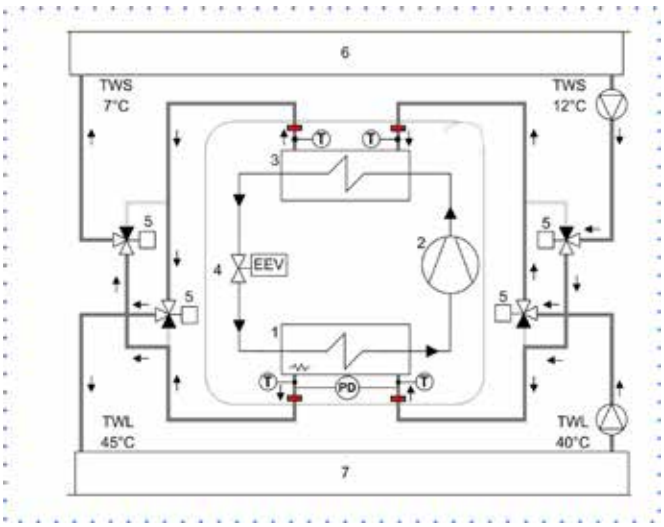
Cooling



1. Internal exchanger (evaporator)
2. Compressor
3. External exchanger (condenser)
4. Electronic expansion valve
5. Switching valves (provided by Customer)
6. Thermal source (heat rejection)
7. Use (cold)

T - Temperature probe
PD - Differential pressure switch
TWS - Water source side
TWL - Water user side

Heating



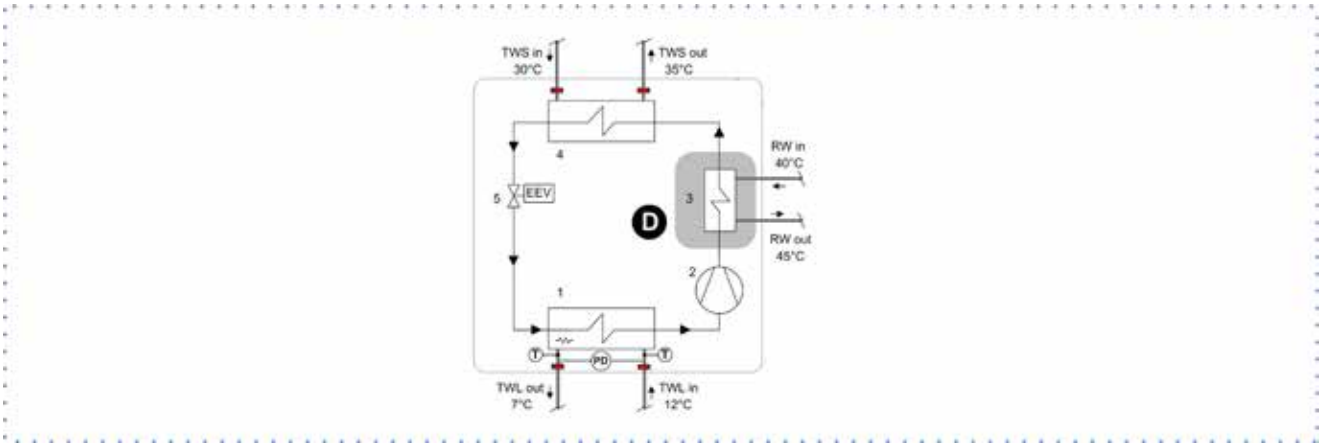
1. Internal exchanger (evaporator)
2. Compressor
3. External exchanger (condenser)
4. Electronic expansion valve
5. Switching valves (provided by Customer)
6. Thermal source (heat withdrawal)
7. Use (hot)

T - Temperature probe
PD - Differential pressure switch
TWS - Water source side
TWL - Water user side

10.2 Partial energy recovery

A configuration which enables the production of hot water free-of-charge while operating in the cooling mode, thanks to the partial recovery of condensation heat that would otherwise be rejected to the external heat source.

⚠ When the temperature of the water to be heated is particularly low, it is wise to insert a flow-rate control valve into the system water circuit, in order to maintain the temperature at the recovery output at above 35°C and thus avoid the condensation of the refrigerant into the partial energy recovery device.



D - Partial recovery device

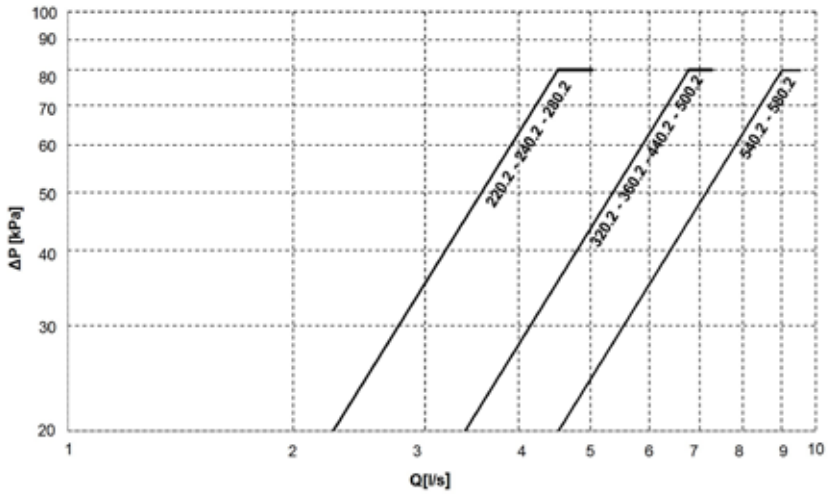
1. Internal exchanger (evaporator)
2. Compressor
3. Recovery exchanger
4. External exchanger (condenser)
5. Electronic expansion valve

TWS in - Water inlet source side
TWS out - Water outlet source side
TWL in - Water inlet user side
TWL out - Water output user side

RW in - Recovery water inlet
RW out - Recovery water outlet

T - Temperature probe
PD - Differential pressure switch

Pressure drops of partial energy recovery exchanger



Q = Water flow rate (l/s)
DP = Water side pressure drops (kPa)

The maximum capacity available from the partial recovery is equal to the 5% of the rejected heating capacity (cooling capacity + compressor power input)

Admissible water flow rates

Min. (Qmin) and max. (Qmax) water flow-rates admissibles for the correct unit operation..

Size		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Qmin	[l/s]	2,3	2,3	2,3	3,4	3,4	3,4	3,5	4,5	4,5
Qmax	[l/s]	4,5	4,5	4,5	6,8	6,8	6,8	6,8	9,0	9,0

10.3 Total energy recovery

A configuration which enables the production of hot water free-of-charge while operating in the cooling mode, thanks to the partial recovery of condensation heat that would otherwise be rejected to the external heat source.

⚠ Hot water availability is always subordinate to the production of chilled water.
See the following example:

Refrigeration capacity request	Heat capacity request	
100%	0%	Production of refrigeration capacity only
100%	100%	Production of refrigeration capacity and Production of heat capacity using recovery
50%	100%	Production of refrigeration capacity and Production of heat capacity using recovery, equals 50% of the heat capacity request

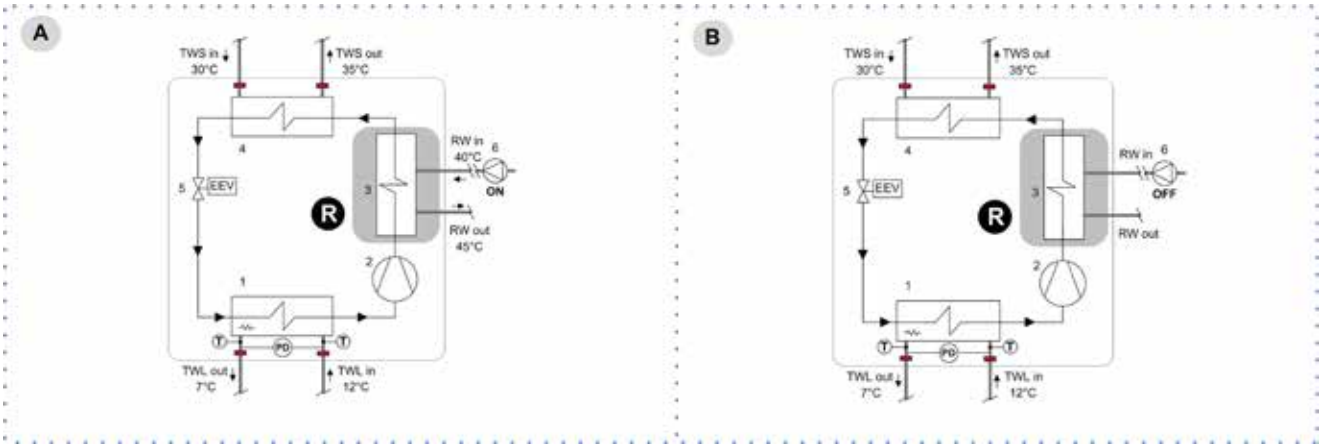
⚠ To prevent constant switching in the unit's refrigeration circuit, it is necessary to install a storage tank with an adequate capacity in the system's hot water circuit.

A - Total operating energy recovery

The pump on the recovery exchanger must be activated when hot water is required. Condensation takes place entirely in the recovery circuit.

B - Total non-operating energy recovery

When the recovery is achieved, the pump on the recovery side must be disabled.



R - Total recovery device

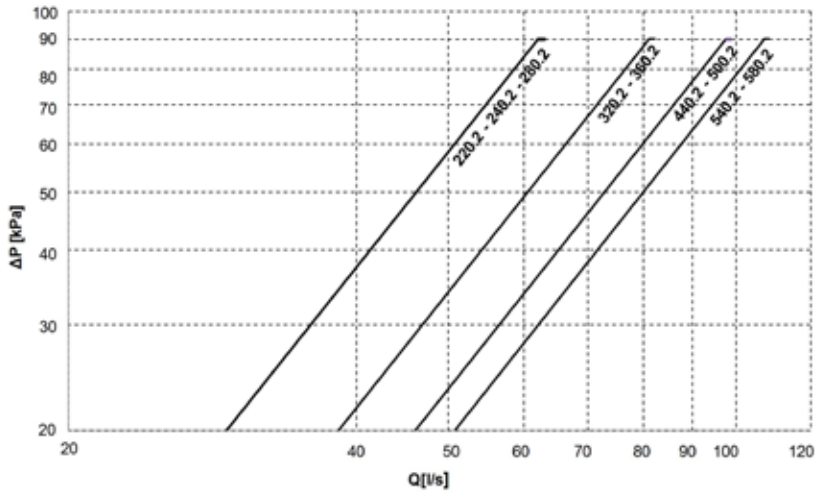
1. Internal exchanger (evaporator)
2. Compressor
3. Recovery exchanger
4. External exchanger (condenser)
5. Electronic expansion valve
6. Pum recovery side (provided by customer)

TWS in - Water inlet source side
TWS out - Water outlet source side
TWL in - Water inlet user side
TWL out - Water output user side

RW in - Recovery water inlet
RW out - Recovery water outlet

T - Temperature probe
PD - Differential pressure switch

Pressure drops of the total energy recovery exchanger



Q = Water flow rate (l/s)
DP = Water side pressure drops (kPa)

The return exchanger outlet water has the same temperature limits shown in the operating range of the standard unit under this entry: "TWS (°C) = external exchanger leaving water temperature (condenser)"..

Admissible water flow rates

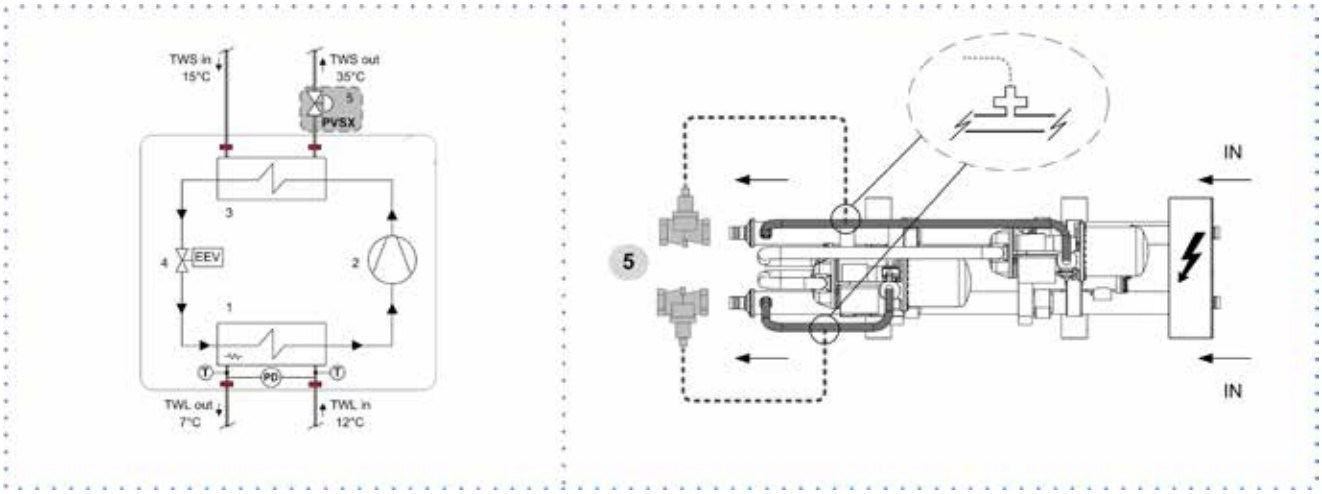
Min. (Qmin) and max. (Qmax) water flow-rates admissibles for the correct unit operation..

Size		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Qmin	[l/s]	29,3	29,3	29,3	38,3	38,3	46,2	46,2	50,8	50,8
Qmax	[l/s]	62,0	62,0	62,0	81,2	81,2	97,7	97,7	107,2	107,2

10.4 PVSX - Pressure valve

It allows the modulation of the water flow-rate depending on its temperature.

It must be connected to the outlet line of the compressor with a capillary pipe.



1. Internal exchanger (evaporator)
2. Compressor
3. External exchanger (condenser)
4. Electronic expansion valve
5. Pressure valve (PVSX accessory)

TWS - Water source side
TWL - Water user side

T - water temperature probe
PD - Differential pressure switch

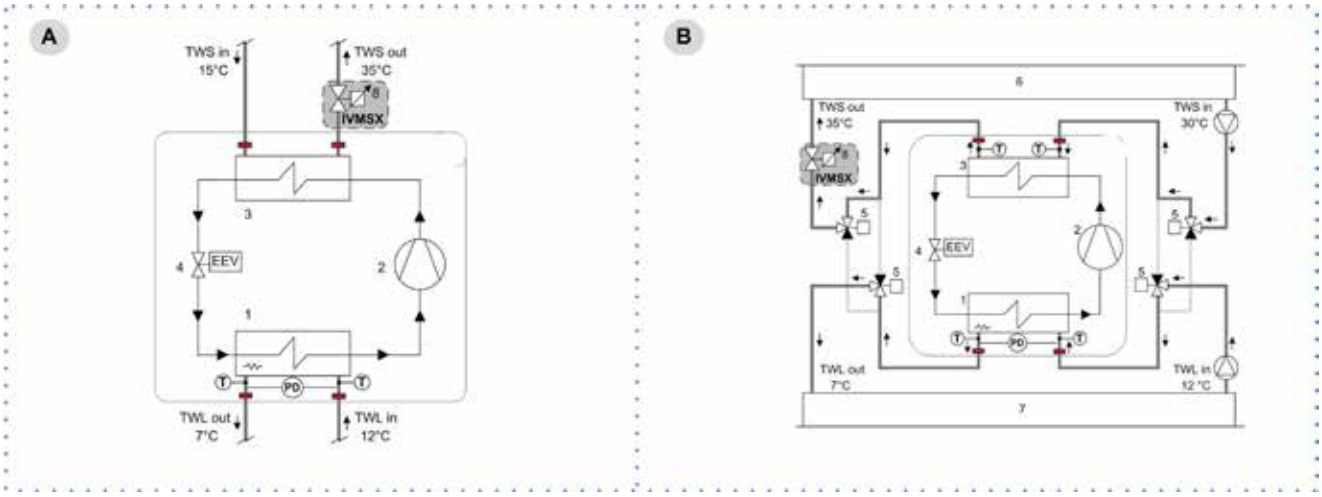
10.5 IVMSX - Modulating valve source side

The motorised two-way modulating valve is placed on the thermal source side and is controlled by the unit.

It operates in conjunction with the refrigeration circuit: the modulation via the 0-10V signal - based on the pressure of the refrigerant in the exchanger on the source side - reduces water consumption and ensures the units stays in the expected operating range.

A. Unit in "OCO - Cold only" configuration

B. Unit in 'OHI - Operation with water circuit change-over' configuration



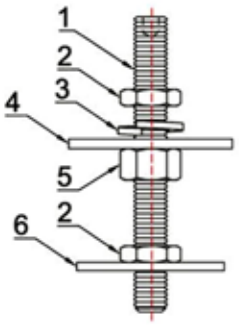
1. Internal exchanger (evaporator)
2. Compressor
3. External exchanger (condenser)
4. Electronic expansion valve
5. Switching valves (provided by Customer)
6. Thermal source (heat rejection)
7. Use (cold)
8. Modulating valve source side (IVMSX accessory)

T - water temperature probe
PD - Differential pressure switch
TWS in - Water inlet source side
TWS out - Water outlet source side
TWL in - Water inlet user side
TWL out - Water output user side

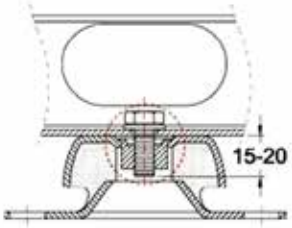
10.6 AMRX - Rubber antivibration mounts

PE980006 - PE980008 - PE1W3333

The rubber antivibration mounts reduce the vibrations of compressor during its operation and they are installed at the base toe.



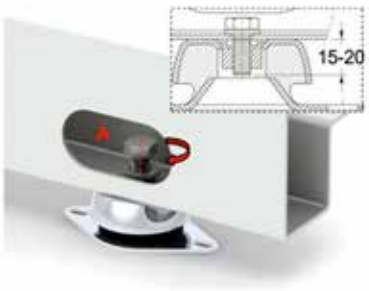
A



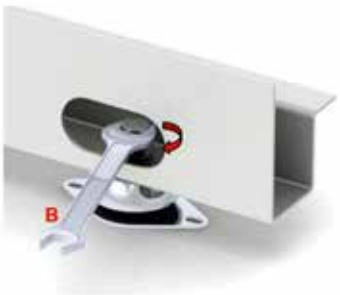
1a

2a

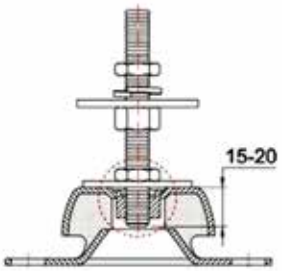
3a



4a



B



1b

2b

3b

4b

5b

6b

11 Decommissioning

11.1 Disconnecting

Only authorised personnel must disconnect the unit.

Avoid leak or spills into the environment.

Before disconnecting the unit, the following must be recovered, if present:

- refrigerant gas
- anti-freeze solutions in the water circuit

Awaiting dismantling and disposal, the unit can also be stored outdoors, if the electrical, cooling and water circuits of the unit have 100% integrity and are isolated, bad weather and rapid change in temperature will not result in any environmental impact.

11.2 Dismantling and disposal

The unit must always be sent to authorised centres for dismantling and disposal.

When dismantling the unit, the fan, the motor and the coil, if operating, may be recovered by the specialist centres for reuse.

All the materials must be recovered or disposed of in compliance with the corresponding national standards in force.

For further information on the decommissioning of the unit, contact the manufacturer.

11.3 Directive EC RAEE

The manufacturer is registered on the EEE National Register, in compliance with implementation of Directive 2012/19/EU and relevant national regulations on waste electrical and electronic equipment.

This Directive requires electrical and electronic equipment to be disposed of properly.

Equipment bearing the crossed-out wheelie bin mark must be disposed of separately at the end of its life cycle to prevent damage to human health and to the environment.

Electrical and electronic equipment must be disposed of together with all of its parts.

To dispose of "household" electrical and electronic equipment, the manufacturer recommends you contact an authorised dealer or an authorised ecological area.

"Professional" electrical and electronic equipment must be disposed of by authorised personnel through established waste disposal authorities around the country.

In this regard, here is the definition of household WEEE and professional WEEE:

WEEE from private households: WEEE originating from private households and WEEE which comes from commercial, industrial, institutional and other sources which, because of its nature and quantity, is similar to that from private households. Subject to the nature and quantity, where the waste from EEE was likely to have been by both a private household and users of other than private households, it will be classed as private household WEEE;

Professional WEEE: all WEEE which comes from users other than private households.

This equipment may contain:

refrigerant gas, the entire contents of which must be recovered in suitable containers by specialised personnel with the necessary qualifications;

• lubrication oil contained in compressors and in the cooling circuit to be collected;

• mixtures with antifreeze in the water circuit, the contents of which are to be collected;

• mechanical and electrical parts to be separated and disposed of as authorised.

When machine components to be replaced for maintenance purposes are removed or when the entire unit reaches the end of its life and needs to be removed from the installation, waste should be separated by its nature and disposed of by authorised personnel at existing collection centres.

12 Residual risks

General description
In this section the most common situations are indicated,as these cannot be controlled by the manufacturer and could be a source of risk situations for people or things.
Danger zone
This is an area in which only an authorised operator may work.
The danger zone is the area inside the unit which is accessible only with the deliberate removal of protections or parts thereof.
Handling
The handling operations, if implemented without all of the protection necesssary and without due caution, may cause the drop or the tipping of the unit with the consequent damage, even serious, to persons, things or the unit itself.
Handle the unit following the instructions provided in the present manual regarding the packaging and in compliance with the local regulations in force.
Should the refrigerant leak please refer to the refrigerant "Safety sheet".
Installation
The incorrect installation of the unit could cause water leaks, condensate accumulation, leaking of the refrigerant, electric shock, poor operation or damage to the unit itself.
Check that the installation has been implemented by qualified technical personnel only and that the instructions contained in the present manual and the local regulations in force have been adhered to.
The installation of the unit in a place where even infrequent leaks of inflammable gas and the accumulation of this gas in the area surrounding the area occur could cause explosions or fires.
Carefully check the positioning of the unit.
The installation of the unit in a place unsuited to support its weight and/or guarantee adequate anchorage may result in consequent damage to things, people or the unit itself.
Carefully check the positioning and the anchoring of the unit.
Easy access to the unit by children, unauthorised persons or animals may be the source of accidents, some serious.
Install the unit in areas which are only accessible to authorised person and/or provide protection against intrusion into the danger zone.
General risks
Smell of burning, smoke or other signals of serious anomalies may indicate a situation which could cause damage to people, things or the unit itself.
Electrically isolate the unit (yellow-red isolator).
Contact the authorised service centre to identify and resolve the problem at the source of the anomaly.
Accidental contact with exchange batteries, compressors, air delivery tubes or other components may cause injuries and/or burns.
Always wear suitable clothing including protective gloves to work inside the danger zone.
Maintenance and repair operations carried out by non-qualified personnel may cause damage to persons, things or the unit itself.
Always contact the qualified assistance centre.
Failing to close the unit panels or failure to check the correct tightening of all of the panelling fixing screws may cause damage to persons, things or the unit itself.
Periodically check that all of the panels are correctly closed and fixed.
If there is a fire the temperature of the refrigerant could reach values that increase the pressure to beyond the safety valve with the consequent possible projection of the refrigerant itself or explosion of the circuit parts that remain isolated by the closure of the tap.
Do not remain in the vicinity of the safety valve and never leave the refrigerating system taps closed.

Electric parts
An incomplete attachment line to the electric network or with incorrectly sized cables and/or unsuitable protective devices can cause electric shocks, intoxication, damage to the unit or fires.
Carry out all of the work on the electric system referring to the electric layout and the present manual ensuring the use of a system thereto dedicated.
An incorrect fixing of the electric components cover may lead to the entry of dust, water etc inside and may consequently electric shocks, damage to the unit or fires.
Always fix the unit cover properly.
When the metallic mass of the unit is under voltage and is not correctly connected to the earthing system it may be as source of electric shock and electrocution.
Always pay particular attention to the implementation of the earthing system connections.
Contact with parts under voltage accessible inside the unit after the removal of the guards can cause electric shocks, burns and electrocution.
Open and padlock the general isolator prior to removing the guards and signal work in progress with the appropriate sign.
Contact with parts that could be under voltage due to the start up of the unit may cause electric shocks, burns and electrocution.
When voltage is necessary for the circuit open the isolator on the attachment line of the unit itself, padlock it and display the appropriate warning sign.
Moving parts
Contact with the transmissions or with the fan aspiration can cause injuries.
Prior to entering the inside of the unit open the isolater situated on the connection line of the unit itself, padlock and display the appropriate warning sign.
Contact with the fans can cause injury.
Prior to removing the protective grill or the fans, open the isolator on the attachment line of the unit itself, padlock it and display the appropriate warning sign.
Refrigerant
The intervention of the safety valve and the consequent expulsion of the gas refrigerant may cause injuries and intoxication.
Always wear suitable clothing including protective gloves and eyeglasses for operations inside the danger zone.
Should the refrigerant leak please refer to the refrigerant "Safety sheet".
Contact between open flames or heat sources with the refrigerant or the heating of the gas circuit under pressure (e.g. during welding operations) may cause explosions or fires.
Do not place any heat source inside the danger zone.
The maintenance or repair interventions which include welding must be carried out with the system off.
Hydraulic parts
Defects in tubing, the attachments or the removal parts may cause a leak or water projection with the consequent damages to people, things or shortcircuit the unit.

13 Technical information

Performance

Size			220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Cooling											
Cooling capacity	1	[kW]	573	614	711	848	979	1128	1309	1404	1502
Compressor power input	1	[kW]	108	118	136	164	187	208	238	269	293
Total power input	2	[kW]	108	119	136	165	188	209	239	269	294
Partial recovery heating capacity	3	[kW]	34,1	36,6	42,3	50,6	58,3	66,8	77,4	83,6	89,8
Total recovery heating capacity	3	[kW]	651	703	811	966	1106	1285	1472	1579	1701
EER	1		5,30	5,18	5,23	5,15	5,22	5,41	5,48	5,22	5,12
Water flow rate (User side)	1	[l/s]	27,4	29,4	34,0	40,5	46,8	53,9	62,5	67,1	71,8
Pressure drops (User side)	1	[kPa]	37	42	45	61	47	58	46	52	31
Water flow rate (Source side)	1	[l/s]	32,5	35,0	40,5	48,4	55,7	63,8	73,9	79,9	85,87
Pressure drops (Source side)	1	[kPa]	25	29	38	32	42	38	51	50	57
Cooling capacity (EN14511:2013)	4	[kW]	572	612	709	844	976	1123	1305	1399	1499
Total power input (EN14511:2013)	4	[kW]	111	122	141	171	194	217	248	279	304
EER (EN 14511:2013)	4		5,14	5,01	5,03	4,95	5,02	5,19	5,26	5,01	4,94
SEER	8		6,11	6,20	6,23	5,92	6,09	6,23	6,36	6,15	6,26
SEPR			7,37	7,34	7,40	6,84	6,99	7,19	7,31	7,14	7,22
Cooling capacity (AHRI 551/591)	5	[kW]	573	614	711	848	979	1128	1309	1404	1502
Total power input (AHRI 551/591)	5	[kW]	108	119	136	165	188	209	239	269	294
COP_R	5		5,30	5,18	5,23	5,15	5,22	5,41	5,48	5,22	5,12
IPLV	5		6,67	6,93	6,98	6,71	6,84	7,04	7,14	6,91	6,90
Heating											
Heating capacity	6	[kW]	651	703	811	966	1106	1286	1472	1579	1702
Compressor power input	6	[kW]	137	151	173	207	235	262	299	335	365
Total power input	2	[kW]	138	151	174	207	236	263	300	335	365
COP	6		4,73	4,65	4,67	4,66	4,69	4,90	4,91	4,71	4,66
Water flow rate (User side)	6	[l/s]	24,6	24,6	30,5	36,3	41,6	48,9	56,1	59,4	63,8
Pressure drops (User side)	6	[kPa]	31	35	37	50	38	49	39	42	25
Water flow rate (Source side)	6	[l/s]	31,1	33,6	38,8	46,2	52,8	61,4	70,3	75,4	81,3
Pressure drops (Source side)	6	[kPa]	23	26	35	29	38	35	47	44	52
Heating capacity (EN14511:2013)	7	[kW]	653	705	813	969	1109	1289	1477	1583	1708
Total power input (EN14511:2013)	7	[kW]	140	154	178	212	241	269	308	343	374
COP (EN 14511:2013)	7		4,65	4,57	4,58	4,56	4,59	4,78	4,80	4,61	4,57

The Product is compliant with the Erp (Energy Related Products) European Directive. It includes the Commission delegated Regulation (EU) No 2016/2281, also known as Ecodesign LOT21

1. Data referred to the following conditions: Internal exchanger water temperature = 12/7 °C. External exchanger water temperature = 30/35 °C. . Evaporator fouling factor = 0.44 x 10^(-4) m2 K/W
2. The Total Power Input value does not take into account the part related to the pumps and required to overcome the pressure drops for the circulation of the solution inside the exchangers.
3. Option. Recovery exchanger water=40/45°C
4. Data calculated in conformity to the EN 14511:2013 referred to the following conditions: Internal exchanger water temperature = 12/7°C External exchanger water temperature = 30/35°C
5. Data compliant to Standard AHRI 551/591 referred to the following conditions: Internal exchanger water 12/7°C. Water flow rate 0,043 l/s per kW. Water entering the external exchanger 30/35°C. Fattore di incrostazione evaporatore = 0.18 x 10^(-4) m2 K/W
6. Data referred to the following conditions: Internal exchanger water temperature = 40/45°C External exchanger water temperature =12/7°C Evaporator fouling factor 0.44 x 10^(-4) m2 K/W
7. Data calculated in conformity to the EN 14511:2013 referred to the following conditions: Internal exchanger water temperature = 40/45°C External exchanger water temperature = 12/7°C
8. Data calculated in compliance with Standard EN 14825:2016

Construction

Size			220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Compressor											
Type of compressors	1		DSW								
Refrigerant			R-134a								
No. of compressors		[Nr]	2	2	2	2	2	2	2	2	2
Rated power (C1)		[HP]	110	125	140	160	180	210	240	280	320
Rated power (C2)		[HP]	110	125	140	160	180	210	240	280	320
Std Capacity control steps	2		25-100%	25-100%	25-100%	25-100%	25-100%	25-100%	25-100%	25-100%	25-100%
Oil charge (C1)		l	22	19	19	30	30	30	30	32	32
Oil charge (C2)		l	22	19	19	30	30	30	30	32	32
Refrigerant charge (C1)	3	[Kg]	45	45	50	65	65	70	75	75	80
Refrigerant charge (C2)	3	[Kg]	45	45	50	65	65	70	75	75	80
Refrigeration circuits		[Nr]	2	2	2	2	2	2	2	2	2
Internal exchanger (evaporator)											
No. of exchanger			1	1	1	1	1	1	1	1	1
Type of internal exchanger	4		S&T								
Water content		l	307	307	280	280	481	514	917	917	917
Minimum system water content	5		5963	6389	7396	8820	10181	11728	13615	14605	15607
External exchanger (condenser)											
No. of exchanger		[Nr]	2	2	2	2	2	2	2	2	2
Type of external exchanger	4		S&T								
Water content		l	112	112	112	146	146	182	182	192	192
Connections											
Internal exchanger water connections (Evaporator)			6"	6"	6"	6"	8"	8"	10"	10"	10"
External exchanger water connections (Condenser)			4"	4"	4"	5"	5"	5"	5"	5"	5"
Power supply											
Standard power supply		V	400/3~/50								

The Product is compliant with the Erp (Energy Related Products) European Directive. It includes the Commission delegated Regulation (EU) No 2016/2281, also known as Ecodesign LOT21
«It contains fluorinated greenhouse gases» (GWP 1430)

1. DSW = Double-screw compressors
2. The unit is able to modulate STEPLESS continuously. The following data refers to a continuous operation of the unit.
3. Indicative values for standard units with possible variation / - 10%. Actual data are shown on the unit's matricular label.
4. S&T = Shell and tube
5. The calculated water volume to the system does not consider the volume of water contained in the internal exchanger. With applications at low outdoor air temperature or low average loads requested, the minimum water volume to the system is obtained by increasing the indicated value by 40%.

Sound levels - ST

Standard acoustic configuration (ST)

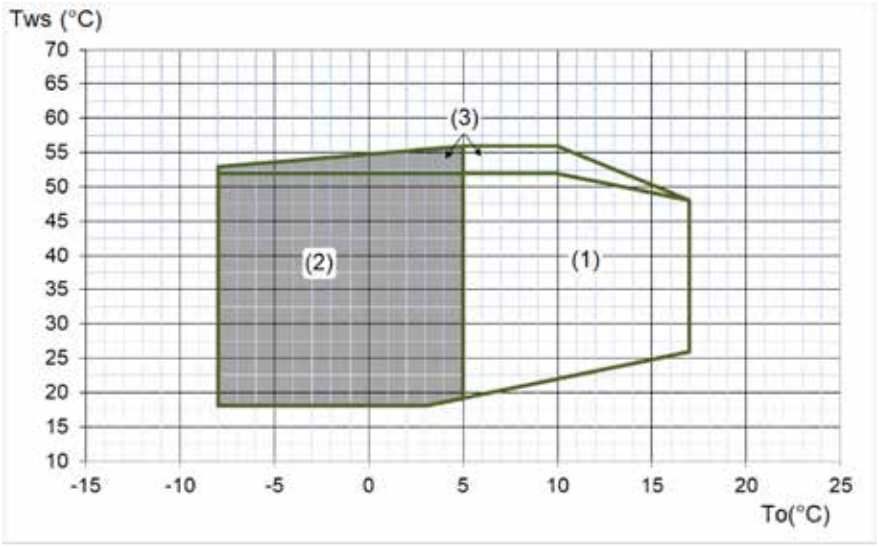
Size	Sound power level (dB)								Sound power level	Sound pressure level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
220.2	72	70	93	101	91	88	75	63	80	99
240.2	70	74	92	100	96	91	78	70	81	100
280.2	65	75	92	97	97	94	77	64	81	100
320.2	74	84	98	98	98	91	89	76	82	101
360.2	75	85	98	99	98	92	87	77	82	101
440.2	82	73	101	98	100	92	83	74	83	103
500.2	103	96	93	103	99	94	83	77	83	103
540.2	77	87	99	103	102	96	82	64	85	105
580.2	81	76	99	103	102	94	83	70	85	105

Sound levels - EN

Size	Sound power level (dB)								Sound power level	Sound pressure level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
220.2	71	69	96	95	88	78	71	60	76	95
240.2	68	72	95	94	93	81	75	67	77	96
280.2	63	74	95	91	94	84	73	60	77	96
320.2	72	83	100	92	95	81	85	72	78	98
360.2	73	84	101	93	94	81	83	73	78	98
440.2	80	72	103	92	97	82	80	70	80	100
500.2	102	96	98	98	97	85	81	75	80	100
540.2	75	85	102	97	98	86	79	60	81	101
580.2	79	74	101	97	99	84	79	66	81	101

Sound levels refer to full load units, in test nominal conditions. The sound pressure level refers to 1 m. from the standard unit outer surface operating in open field. Measurements are carried out according to the UNI EN ISO 9614-2 standard, in compliance with the EUROVENT 8/1 certification.
data referred to the following conditions:
internal exchanger water = 12/7°C
external exchanger water = 30/35°C

Operating range



1. standard unit
2. Operation field extension for unit in 'Low water temperature (Brine)' configuration
3. Operating range with automatic staging of the compressor capacity.

To (°C) = leaving internal exchanger water temperature (evaporator)
Tws (°C) = leaving external exchanger water temperature (condenser)

Minimum system water content

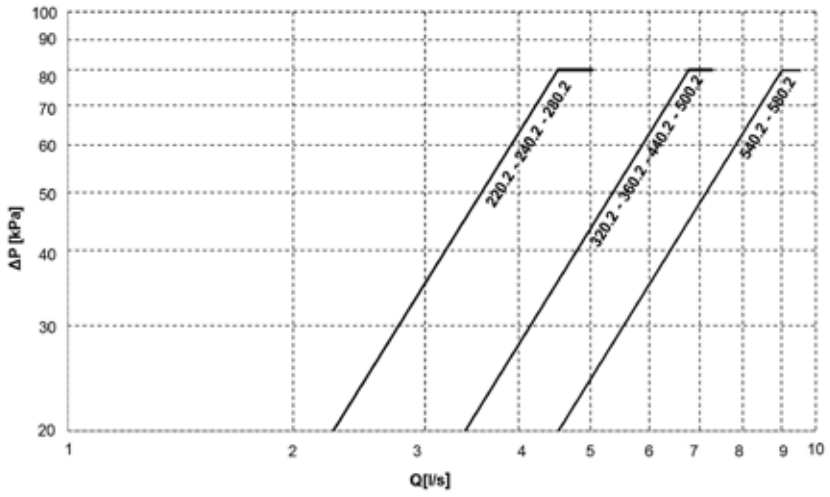
For a proper functioning of the unit a minimum water content has to the provided to the system, using the formula:

Minimum water content [l] = 10 x kWf (air conditioning application)
= 14 x kWf (application with low outdoor temperature or low loads required

kWf = Nominal cooling capacity unit

Volume calculated does not consider internal heat exchanger (evaporator) water content.

Internal exchanger (evaporator) pressure drop



The pressure drops are calculated considering a water temperature of 7°C

Q = water flow rate[l/s]
DP = water side pressure drops (kPa)

The water flow rate must be calculated with the following formula
Q [l/s] = kWf / (4,186 x DT)

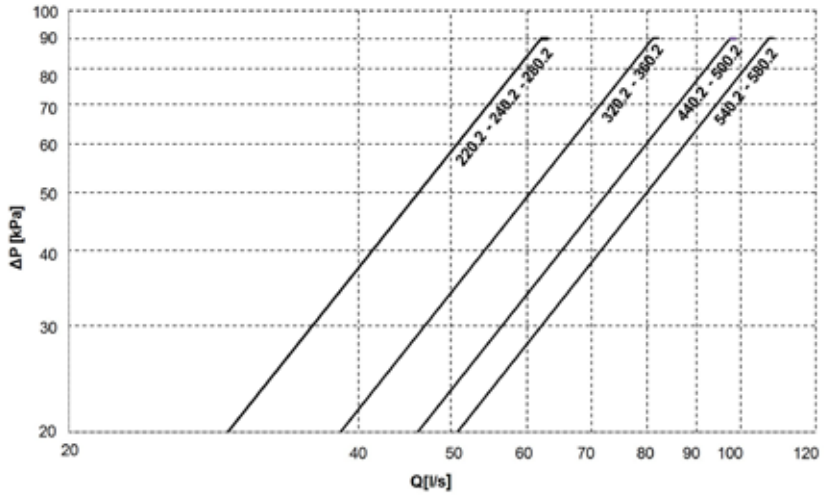
kWf = Cooling capacity in kW
DT = Temperature difference between inlet / outlet water

Admissible water flow rates

Minimum (Qmin) and maximum (Qmax) admissible water flow for the unit to operate correctly.

Size		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Qmin	[l/s]	19,0	19,0	21,4	21,4	28,2	28,7	37,5	37,5	55,6
Qmax	[l/s]	47,2	47,2	59,2	59,2	70,0	76,7	95,0	95,0	127,2

External exchanger pressure drop - Condenser



The pressure drops are calculated considering a water temperature of 7°C

Q = water flow rate[l/s]
DP = water side pressure drops (kPa)

The water flow rate must be calculated with the following formula
Q [l/s] = kWt / (4,186 x DT)

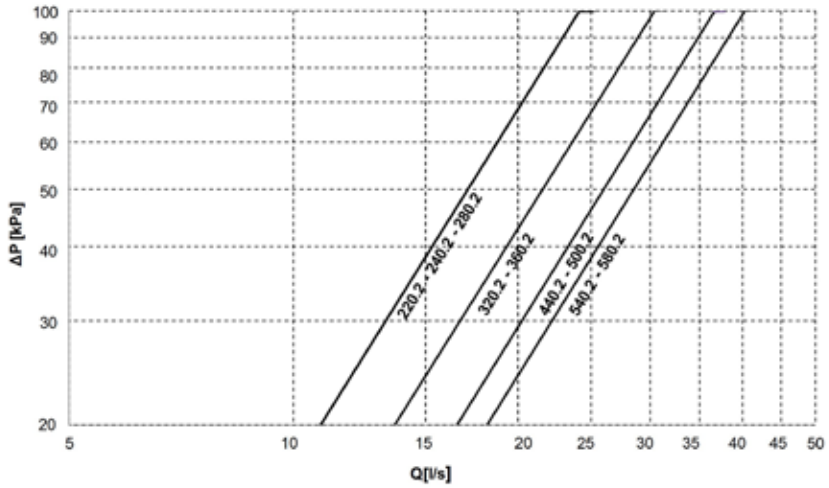
kWt = Thermal power in kW
DT = Temperature difference between inlet / outlet water

Admissible water flow rates

Minimum (Qmin) and maximum (Qmax) admissible water flow for the unit to operate correctly.

Size		220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
Qmin	[l/s]	29,3	29,3	29,3	38,3	38,3	46,2	46,2	50,8	50,8
Qmax	[l/s]	62,0	62,0	62,0	81,2	81,2	97,7	97,7	107,2	107,2

External exchanger (condenser) pressure drop with groundwater



The pressure drops are calculated considering a water temperature of 7°C
Q = water flow rate[l/s]
DP = water side pressure drops (kPa)

The water flow rate must be calculated with the following formula
Q [l/s] = kWt / (4,186 x DT)

kWt = Thermal power in kW
DT = Temperature difference between inlet / outlet water

Fouling Correction Factors

Size	Internal exchanger (evaporator)		External exchanger (condenser)	
m^2 C / W	F1	FK1	F2	FK2
0.44 x 10 (-4)	1,0	1,0	1,0	1,0
0.88 x 10 (-4)	0,97	0,99	0,97	1,08
1.76 x 10 (-4)	0,94	0,98	0,92	1,05

F1 = Cooling capacity correction factors
FK1 = Compressor power input correction factor
F2 = Cooling capacity correction factors
FK2 = Compressors input power correction factors

Exchanger operating range

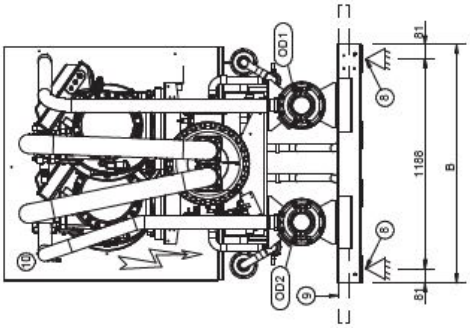
	Internal exchanger		External exchanger	
	DPr (500.2-540.2-580.2)	DPw	DPr	DPw
PED (CE)	1650	1050	2500	1600

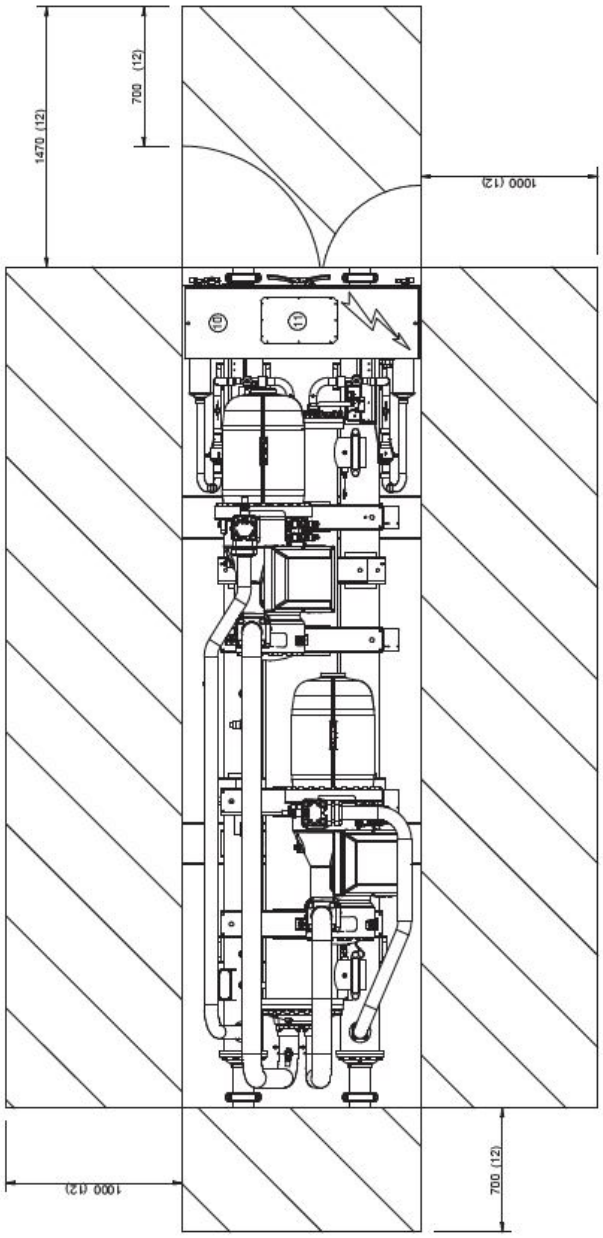
DPr = Max. operating pressure referigerant gas side
DPw = Max. operating pressure water side (utility)

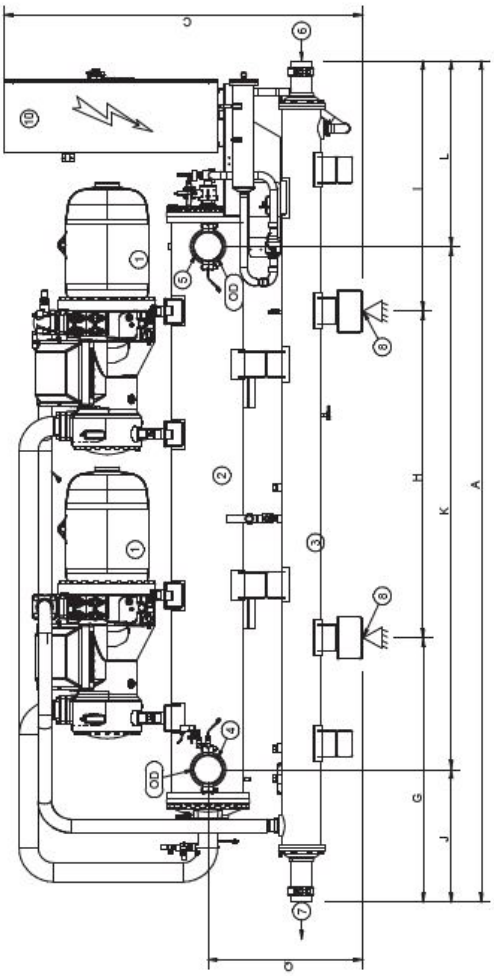
Overload and control device calibrations

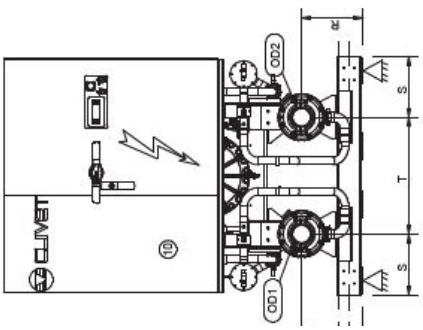
		open	closed	value
High pressure switch	[kPa]	1580	1280	-
Antifreeze protection	[°C]	4	5,5	-
High pressure safety valve	[kPa]	-	-	2500
Low pressure safety valve	[kPa]	-	-	1650 (1600)
Max no. of compressor starts per hour	[n°]	-	-	6
Discharge safety thermostat	[°C]	-	-	120

14 Dimensional drawings









Size			220.2	240.2	280.2	320.2	360.2	440.2	500.2	540.2	580.2
A - Length		mm	4766	4766	4766	4900	4926	5027	5234	5234	5234
B - Depth		mm	1350	1350	1350	1350	1350	1350	1350	1350	1350
C - Height		mm	2028	2028	2028	2109	2182	2180	2299	2299	2299
G		mm	1498	1498	1498	1628	1654	1656	1863	1863	1863
H		mm	1850	1850	1850	1850	1850	1850	1850	1850	1850
I		mm	1418	1418	1418	1422	1422	1521	1521	1521	1521
J		mm	752	752	752	658	700	718	844	844	844
K		mm	2962	2962	2962	2962	2910	3210	3130	3130	3130
L		mm	1052	1052	1052	1280	1316	1099	1260	1260	1260
Q		mm	877	877	877	955	955	955	1025	1025	1025
R		mm	347	347	347	398	398	398	398	398	398
S		mm	344	344	344	344	344	344	344	344	344
T		mm	661	661	661	661	661	661	661	661	661
OD		mm	168,3	168,3	168,3	168,3	219,1	219,1	273	273	273
OD1		mm	114,3	114,3	114,3	139,7	139,7	139,7	139,7	139,7	139,7
OD2		mm	114,3	114,3	114,3	139,7	139,7	139,7	139,7	139,7	139,7
Operating weight - EXC-ST		kg	3939	3959	3996	5092	5557	5983	6796	6959	7072
Shipping weight - EXC-ST		kg	3590	3610	3674	4736	5000	5357	5767	5920	6033
Operating weight - EXC-EN		kg	4216	4236	4273	5369	5834	6267	7080	7243	7356
Shipping weight - EXC-EN		kg	3867	3887	3951	5013	5277	5641	6051	6204	6317

The presence of optional accessories may result in a substantial variation of the weights shown in the table

1. Compressor
2. Internal exchanger (Evaporator)
3. External exchanger (Condenser)
4. Internal exchanger water inlet
5. Internal exchanger water outlet
6. External exchanger water inlet
7. External exchanger water outlet
8. Anti-vibration mounting holes Ø25
9. Lifting tubes
10. Electrical panel
11. Power input
12. Minimum dimension for Maintenance.

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