



TECHNICAL MANUAL
INSTALLATION
USE
MAINTENANCE

GALAXY-ZENIT



MODELS UNIT:

**082A - 102A - 122A - 152A - 123A -
133A - 153A - 134A - 154A - 126A**

REF R410A



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SIMBOLS USED



ATTENTION



PROHIBITION



DANGER VOLTAGE



DANGER HIGH TEMPERATURE

GENERAL WARNINGS

The customer is responsible for installation. Any use which is not expressly indicated in this manual is prohibited, and thus TONONFORTY declines all responsibility for damages which may result from failure to follow these instructions. Carefully preserve the instructions manual for future reference.

The warranty is void if the above instructions are not respected and if the unit is started up for the first time without the presence of personnel authorised by TONONFORTY (C.A.A. where's possible) that must draw up a commissioning report. The documents supplied with the unit must be consigned to the owner who should keep them carefully for future consultation.

READ THIS MANUAL CAREFULLY

- The appliance must be installed by qualified and trained personnel, in compliance with current national legislation in the country of installation (M.D. 329/2004).
- Before carrying out any maintenance work or cleaning operations on the machine, disconnect the appliance from the supply mains using the appropriate shut-off devices.
- After having removed the packaging, check that the contents are intact and that the packaging materials (fasteners, plastic bags, expanded polystyrene, etc.) are not left within the reach of children as they represent a potential hazard. This appliance conforms to the current requirements concerning EC Directives, as shown in the "Declaration of Conformity" issued (2006/42/CE).

BASIC SAFETY RULES

Remember that the use of products which employ electricity and water entail the observance of some basic safety rules, such as:



PROHIBITIONS

- **The unit must not be used** by persons (including children) with reduced physical, sensory or mental capabilities or lacking experience and knowledge.
- **Do not modify safety or controls devices** without authorisation and instructions from the manufacturer.
- **Do not pull**, detach, or twist the electrical cables coming from the unit, even when disconnected from the main supply.
- **Do not touch the unit** with bare feet or with wet or damp parts of the body.
- **Do not open doors or panels** providing access to the internals parts of the unit without first switching QS1 to Off.
- **Do not dispose of**, abandon or leave within reach of children packaging materials as they may represent a hazard.
- **The liquids used in the circuit** must be compatible with the materials making up the machine's hydraulic circuit. They may be, for example, water or a mixture of water and ethylene glycol. It is recommended that you add chemical anticorrosive additives to the water and work with PH value between 7 and 8. In the case of mixtures, follow the instructions in par. 3.1



- **Respect safety distances** between the unit and other equipment or buildings. Guarantee adequate space for access to the unit for maintenance and service operations.
- **Handle the unit** with the maximum care to avoid damage.

USE OF MANUAL

The manual must always accompany the machine to which it refers. It must be kept in a safe location, protected against dust and humidity, and easily accessible to the operator who must consult it whenever there is any uncertainty concerning the use of the machine. TONONFORTY S.p.a. reserves the right to modify the manual together with the production, without any obligation to update this manual since it was delivered prior to the modification.

Any updates sent to the customer will have to be kept attached to this manual.

In any case TONONFORTY S.p.a remains ready to provide, upon request, more detailed information regarding this manual, as well as to provide information concerning the use and maintenance of its machines.

1.0 MAIN TECHNICAL FEATURES

GALAXY

High efficiency air cooled water chillers for outdoor installations.

ZENIT

High efficiency air to water heat pumps for outdoor installations.

All models GALAXY - ZENIT are equipped with scroll compressors, refrigerant R410A, and are designed for optimal energy efficiency with particularly high performance at partial load.

Before shipment, each unit is factory tested. The running test includes the control of all operating parameters and the correct behaviour of safety devices.

Main regulator functions:

- Control of compressor cut-in depending on the temperature of return water.
- Visual and acoustic alarm signals with show on display of the type of alarm occurring or, if more than one, of the sequence of such alarms in temporal order.
- Possibility of controlling one/two pumps assembled on board or to be fitted outside the unit.
- Operating time counter for the compressor and the pump.
- Memorisation of programming data in the event of black out of power to the system.
- Storage of alarms history for the unit.
- Possibility of controlling activation of the compressors depending on the external air temperature (dynamic set point).
- Terminals board for remote ON/OFF of the unit by external free voltage contact.
- Terminals board for remote summer/winter (ZENIT model) by external free voltage contact.
- General alarm contact available in electrical board.
- Modulating speed fan control (heating / cooling)

Available versions and accessories:

- P1 Water section kit with single pump;
- P2 Water section kit with double pump;
- AP1S / AP2S Hydronic kit with pump (single/double) and buffer tank connected in series to the user plant;
- AP1P / AP2P Hydronic kit with pump (single/double) and buffer tank connected in parallel to the user plant;
- HRP Partial heat recovery condenser (desuperheater) ;
- HRT 100% heat recovery condenser;

Other accessories:

- MHL Refrigerant pressure gauges;
- BCA Condenser coils with epoxy coated or copper fins;
- VTE Electronic thermostatic expansion valve;
- RPL Condenser coils protection grid;
- KRC Remote control kit (switch on/off, sum/win, remote alarm)
- KRC Remote control kit Top (LCD display with all functions);
- PMC Magnetothermic overload protection for compressors;
- SSC Compressor electronic Soft starter;
- RAE Antifreeze heaters for heat exchanger and tank;
- DCC Winter control (modulating fan speed);
- RCA Crankcase heaters compressor;
- SAB Antivibrating mounts;
- KRV Ventilation and heating elements for control panel;
- Power factor control kit (battery capacitors).

1.1 OPERATING LIMITS:

Cooling cycle (standard):

 External air temperature D.B. + 15°C ÷ + 45°C (*)
 Chilled water temperature (OUT) + 4°C ÷ + 18°C

Cooling cycle (with DCC accessory):

 External air temperature D.B. - 15 °C ÷ + 45°C (*)
 Chilled water temperature (OUT) + 4°C ÷ + 18 °C

Heating cycle:

 External air temperature D.B. - 10 °C ÷ + 25°C
 Hot water temperature (OUT) + 25°C ÷ + 55 °C (**)

(*) max air temp. limit referred to chilled water + 7 °C

(**) max water temp. referred to external air temp. 6 °C d.b.

1.3 CONFIGURATION: GALAXY P1/154 A

GALAXY ZENIT	P1	FC	154	A
TYPE UNIT	OPTIONAL WATER SECTION	OPTIONAL ENERGY SAVING	DIMENSION	TYPE REFRIGERANT
VERSION				
STANDARD			LOW NOISE	
REFRIGERANT TYPE				
A: R410a				

1.2 MAIN TECHNICAL DATA CHILLER

MODELS	GALAXY	082 A	102 A	122 A	152 A	123 A
Cooling capacity (A35/W7)	kW	39,5	49,7	58,4	75,9	84,5
Cooling capacity (A35/W18)	kW	54,1	68,1	80,2	103,9	115,9
Scroll compressors	n°	2	2	2	2	3
Refrigerant circuits	n°	1	1	1	1	1
Capacity steps	%	2	2	2	2	3
Supply voltage	V/Hz/Ph	400/50/3				
Plate heat exchanger	n°	1	1	1	1	1
Water flow	l/s	1,89	2,37	2,79	3,63	4,04
Pressure drops	kPa	21,6	26,8	25,7	25,4	18,7
USER PLANT WATER PUMP ST (OPTIONAL)						
Available externe pressure	kPa	139	130	125	117	117
Pump power input	kW	1,1	1,1	1,1	1,47	1,47
Pump current input	A	2,1	2,1	2,1	2,72	2,72
COMPRESSOR						
Max current input	A	15,9	18,2	22,3	28,7	22,3
DIMENSIONS AND WEIGHT						
Length	mm	1955	1955	1955	3005	3005
Width	mm	1123	1123	1123	1123	1123
Height	mm	1954	1954	1954	1954	1954
Weight (standard unit)	Kg	528	553	559	701	778
TOTAL ELECTRICAL ASSORBITION (FOR STANDARD VERSION)						
Nominal power (1)	kW	15,9	19,4	22,7	29,2	34,1
Nominal current (1)	A	27,0	32,9	38,6	49,6	58,0
Max current input	A	36,0	40,6	48,8	65,8	75,3
Starting current	A	112,8	131,1	142,2	172,5	166,4

(1) External air temp. 35 °C - Out water temp. 7 °C

(2) External air temp. 35 °C - Out water temp. 18 °C

MODELS		GALAXY	133 A	153 A	134 A	154 A	126 A
Cooling capacity (A35/W7)	kW		93,3	112,6	129,4	151,8	173,5
Cooling capacity (A35/W18)	kW		127,9	154,2	177,3	207,9	238,0
Scroll compressors	n°		3	3	4	4	6
Refrigerant circuits	n°		1	1	2	2	2
Capacity steps	%		3	3	4	4	6
Supply voltage	V/Hz/Ph				400/50/3		
Plate heat exchanger	n°		1	1	1	1	1
Water flow	l/s		4,46	5,38	6,18	7,25	8,29
Pressure drops	kPa		22,8	22,9	31,3	35,8	34,4

USER PLANT WATER PUMP ST (OPTIONAL)

Available externe pressure	kPa		105	84	111	80	96
Power input pump	kW		1,47	1,47	2,0	2,0	2,5
Current input pump	A		2,7	2,7	3,65	3,65	5,0

COMPRESSOR

Max current input	A		22,3	28,7	22,3	28,7	22,3
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DIMENSIONS AND WEIGHT

Length	mm		3005	3005	3005	4255	4255
Width	mm		1123	1123	1123	1123	1123
Height	mm		1954	1954	1954	1954	1954
Weight (standard unit)	Kg		780	832	941	1065	1270

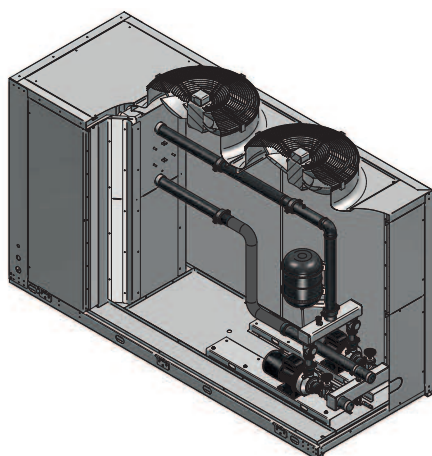
TOTAL ELECTRICAL ASSORPTION (FOR STANDARD VERSION)

Nominal power (1)	kW		37,0	42,2	50,2	57,9	66,9
Nominal current (1)	A		63,0	71,7	85,3	98,3	113,8
Max current input	A		81,7	94,5	110,4	127,4	146,4
Starting current	A		166,4	201,2	188,7	231,8	235,2

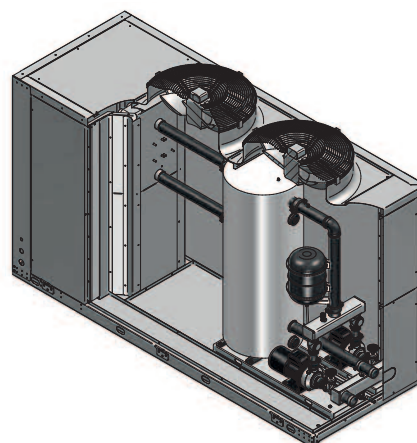
1.4 OPTIONAL STORAGE WATER TANK:

All the models can be equipped with a water buffer tank positioned into the frame with different water volume according to the model.

GALAXY WITH WATER PUMPS ONLY



GALAXY WITH WATER VESSEL AND PUMPS



1.5 MAIN TECHNICAL DATA HEAT PUMP

MODELS	ZENIT	082 A	102 A	122 A	152 A	123 A
Cooling capacity (A35/W7)	kW	38,7	48,7	57,3	74,4	82,8
Cooling capacity (A35/W18)	kW	53,0	66,7	78,6	101,9	113,6
Heating capacity (A7/W35)	kW	47,4	54,6	66,2	91,8	103,1
Heating capacity (A7/W45)	kW	46,2	53,2	64,6	83,5	100,4
Scroll compressors	n°	2	2	2	2	3
Refrigerant circuits	n°	1	1	1	1	1
Capacity steps	%	2	2	2	2	3
Supply voltage	V/Hz/Ph	400/50/3				
Plate heat exchanger	n°	1	1	1	1	1
Water flow	l/s	1,89	2,37	2,79	3,63	4,04
Pressure drops	kPa	21,6	26,8	25,7	25,4	18,7
USER PLANT WATER PUMP ST (OPTIONAL)						
Available externe pressure	kPa	139	130	125	117	117
Pump power input	kW	1,1	1,1	1,1	1,47	1,47
Pump current input	A	2,1	2,1	2,1	2,7	2,7
COMPRESSOR						
Max current input	A	15,9	18,2	22,3	28,7	22,3
DIMENSIONS AND WEIGHT						
Length	mm	1955	1955	1955	3005	3005
Width	mm	1123	1123	1123	1123	1123
Height	mm	1954	1954	1954	1954	1954
Weight (standard unit)	Kg	578	603	609	751	828
TOTAL ELECTRICAL ASSORBITION (FOR STANDARD VERSION)						
Nominal power (1)	kW	12,7	14,4	17,8	23,9	27,7
Nominal current (1)	A	20,8	26,2	32,3	43,4	55,0
Max current input	A	36,0	40,6	48,8	65,8	75,3
Starting current	A	112,8	131,1	142,2	172,5	166,4

MODELS	ZENIT	133 A	153 A	134 A	154 A	126 A
Cooling capacity (A35/W7)	kW	91,4	110,4	126,8	148,7	170,0
Cooling capacity (A35/W18)	kW	125,3	151,1	173,8	203,7	233,2
Heating capacity (A7/W35)	kW	112,9	132,8	154,1	177,1	200,2
Heating capacity (A7/W45)	kW	107,0	121,1	144,7	161,5	195,4
Scroll compressors	n°	3	3	4	4	6
Refrigerant circuits	n°	1	1	2	2	2
Capacity steps	%	3	3	4	4	6
Supply voltage	V/Hz/Ph	400/50/3				
Plate heat exchanger	n°	1	1	1	1	1
Water flow	l/s	4,46	5,38	6,18	7,25	8,29
Pressure drops	kPa	22,8	22,9	31,3	35,8	34,4
USER PLANT WATER PUMP ST (OPTIONAL)						
Available externe pressure	kPa	105	84	111	80	96
Power input pump	kW	1,47	1,47	2,0	2,0	2,5
Current input pump	A	2,7	2,7	3,65	3,65	5,0
COMPRESSOR						
Max current input	A	22,3	28,7	22,3	28,7	22,3
DIMENSIONS AND WEIGHT						
Length	mm	3005	3005	3005	4255	4255
Width	mm	1123	1123	1123	1123	1123
Height	mm	1954	1954	1954	1954	1954
Weight (standard unit)	Kg	830	882	991	1115	1320
TOTAL ELECTRICAL ASSORPTION (FOR STANDARD VERSION)						
Nominal power (1)	kW	29,7	33,9	39,8	45,8	53,5
Nominal current (1)	A	53,7	61,4	72,1	81,9	96,5
Max current input	A	81,7	94,5	110,4	127,4	146,4
Starting current	A	166,4	201,2	188,7	231,8	235,2

GENERAL INFORMATION

2.0 GENERAL INSTALLATION DATA

All installation and maintenance operations must be carried out by qualified personnel, who must follow the instructions given in this manual supplied with the machine itself.

Failure to comply with these rules could cause damage or injury to persons, animals or property, for which the manufacturer may not be held responsible.

Before carrying out any maintenance work on the machine, make sure that the electrical panel is disconnected from the power supply by deactivating the main power isolator, which must be installed in the proximity of the machine.

All the units are built for installation outdoors and do not require any particular protection from atmospheric events.

2.1 INSPECTION

Once it has arrived at its destination, the unit must undergo a thorough visual check, looking for any damage that may have occurred during transport to its destination. Any imperfections or evident signs of damage should be reported promptly to the delivery firm and recorded on the delivery note, as well as reported in writing directly to TONONFORTY S.p.A. or its local agent in order to ensure validity of the guarantee.

2.2 HANDLING

It is best to handle the unit with its original packaging intact. The packaging should only be removed once it has reached its final destination.

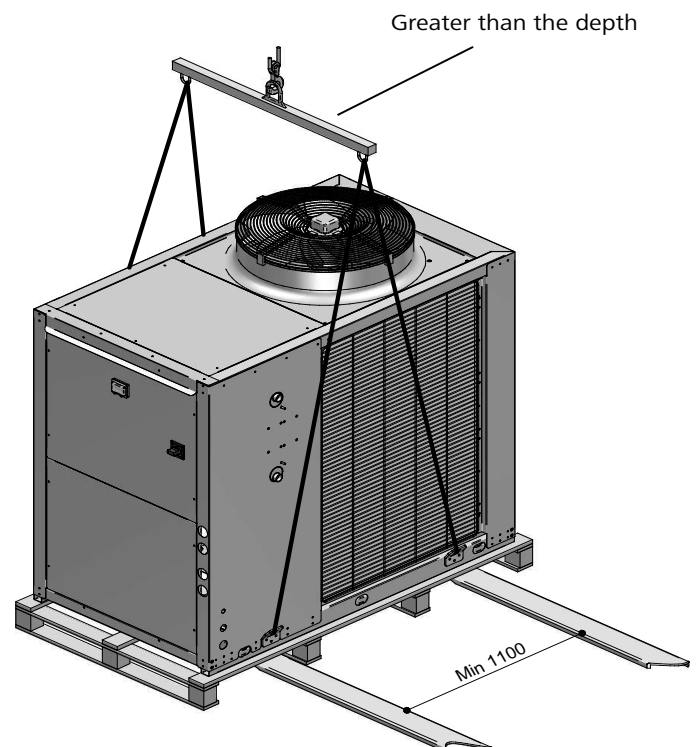
It can be handled using a standard manual transpallet, or lifted using ropes sufficiently spaced in order to prevent the possibility of the top being crushed by the cover shell.

2.3 POSITIONING

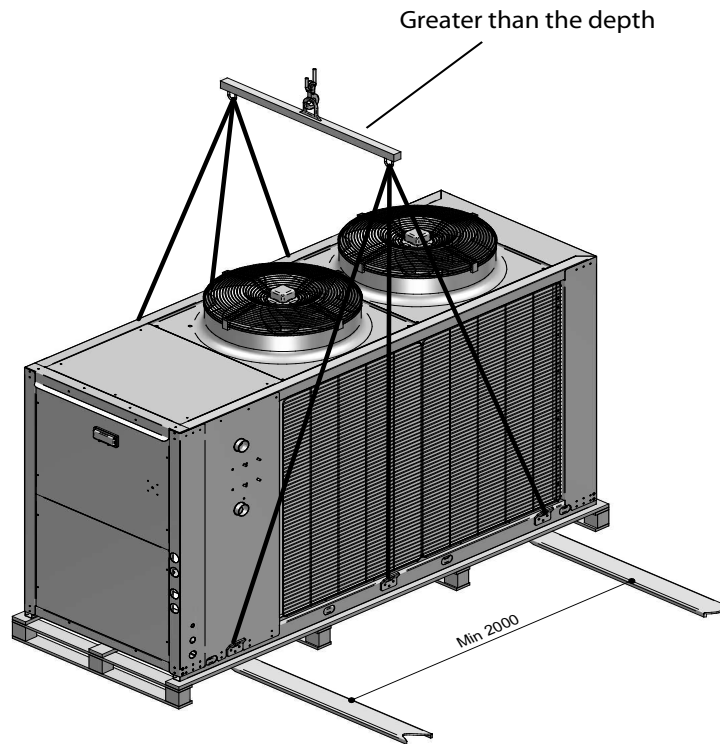
The position of the unit must be defined carefully, bearing the following precautions in mind:

- The appliance is designed to be positioned inside rooms such as central heating plants and installed on any flat surface able to support its weight.
- During placement of the machine, it is advisable to place a rubber pad or the appropriate anti-vibration mounts (available as an accessory) between the support surface and the machine in order to prevent the transmission of vibrations from the unit to the building structure.
- Respect the clearance distances indicated below in order to facilitate accessibility for machine connection and maintenance.
- Do not position the unit near chimneys, flues, ventilation or air extraction devices in order to prevent the unit from being subjected to flows of hot or polluted air.
- It is important to make sure that the air flow is not obstructed, as obstructions could cause the air to recirculate between the inlet and outlet side. Insufficient air flow or recirculation through the finned coil heat exchanger could cause the machine to malfunction or shut down.

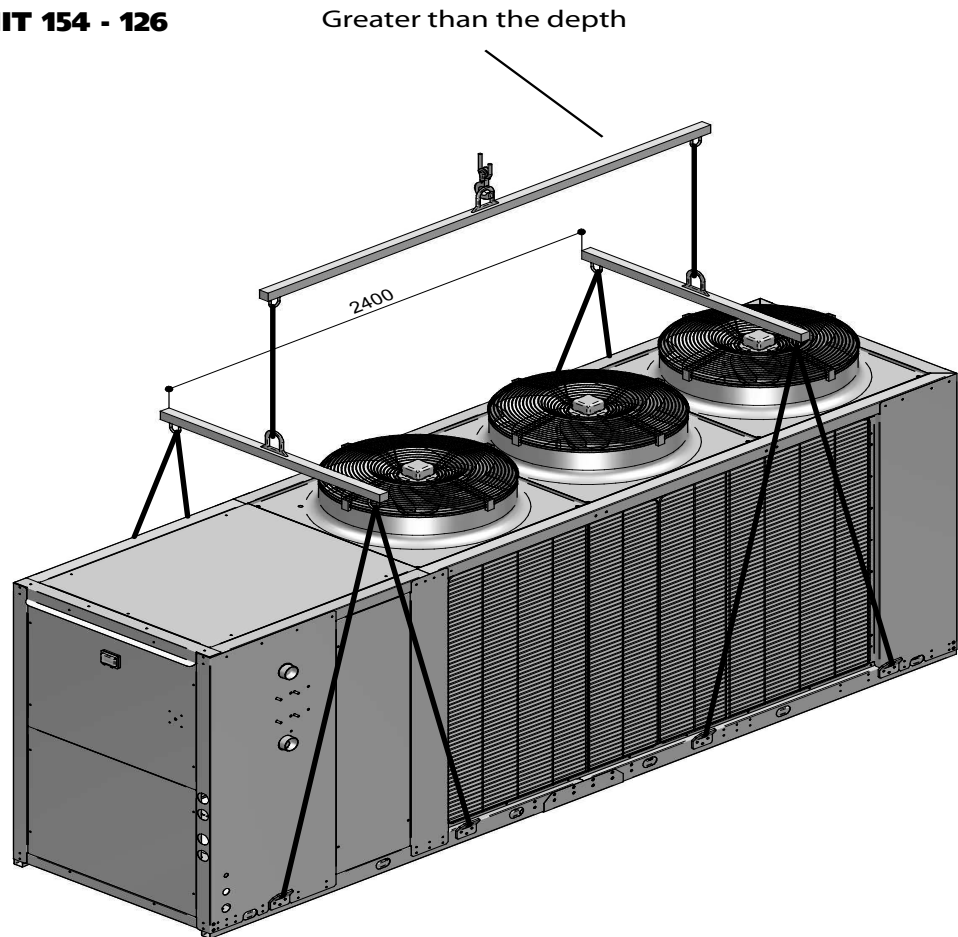
MODELS GALAXY ZENIT 082 - 122



MODELS GALAXY ZENIT 152 - 134

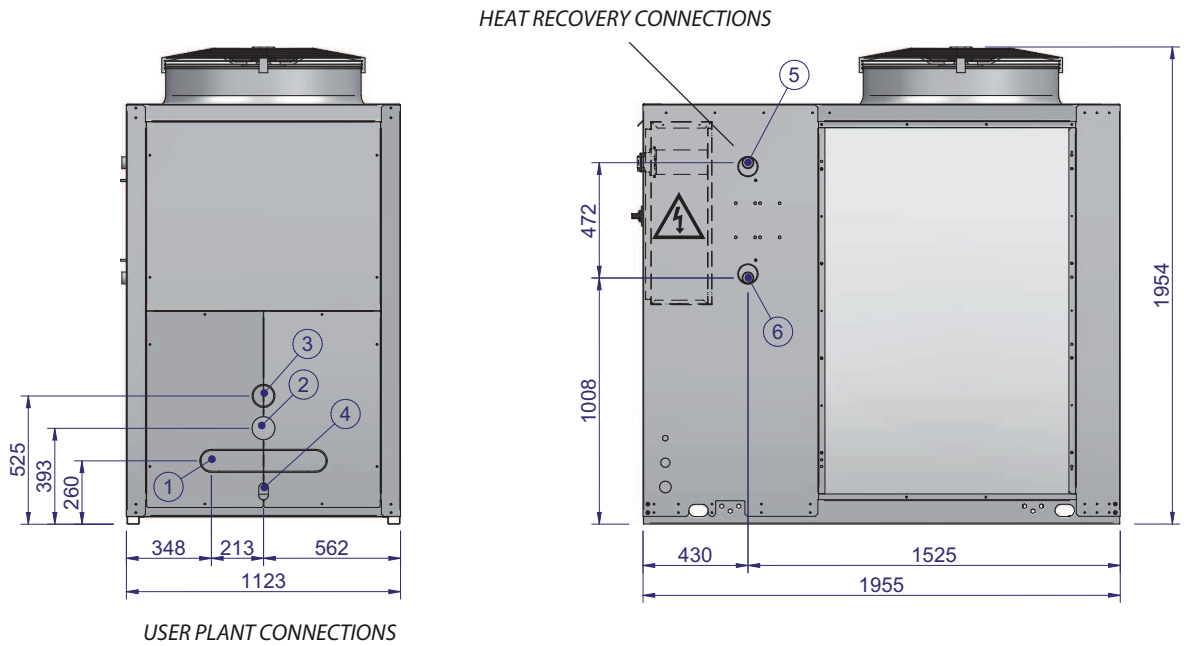


MODELS GALAXY ZENIT 154 - 126



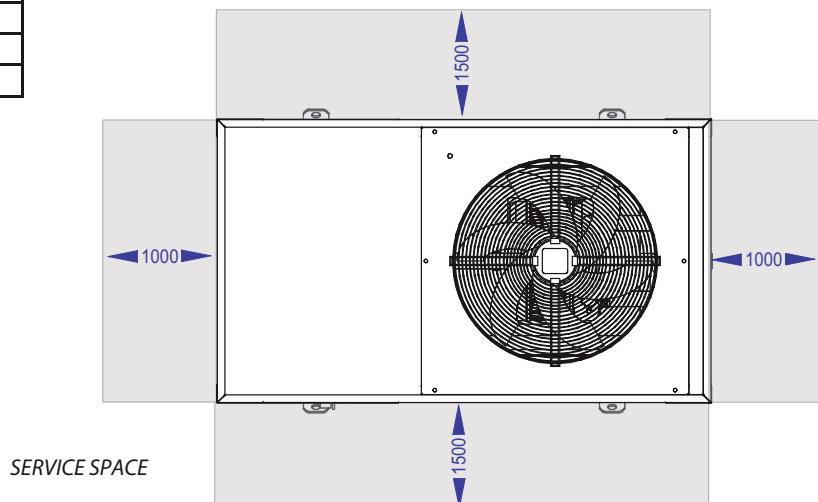
2.4 POSITIONING - CLEARANCE DISTANCES -

SMALL SIZE FRAME

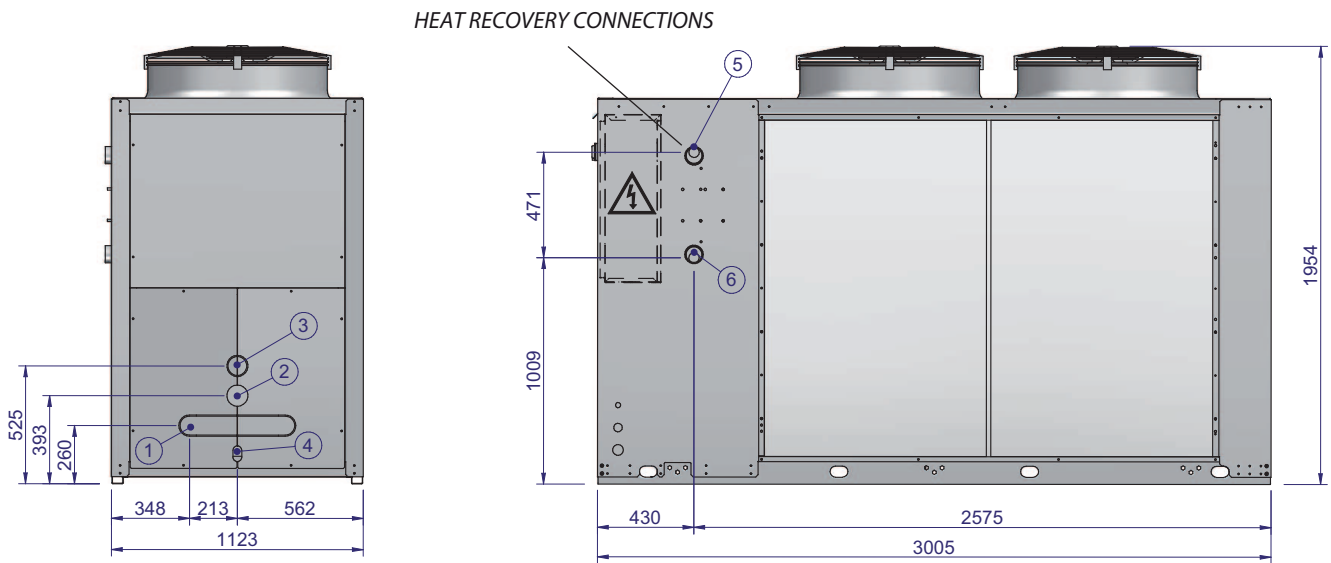


	Size	STD - SERIES		PARALLEL		DRAINAGE TANK	OUT RECOVERY	IN RECOVERY
		1	2	2	3			
Galaxy - Zenit STD	082	1"1/2	1"1/2	1"1/2	1"1/2	1/2" M	1"1/2	1"1/2
	102	1"1/2	1"1/2	1"1/2	1"1/2	1/2" M	1"1/2	1"1/2
	122	1"1/2	1"1/2	1"1/2	1"1/2	1/2" M	1"1/2	1"1/2
Galaxy - Zenit Low Noise	082	1"1/2	1"1/2	1"1/2	1"1/2	1/2" M	1"1/2	1"1/2
	102	1"1/2	1"1/2	1"1/2	1"1/2	1/2" M	1"1/2	1"1/2

Model	GALAXY		ZENIT	
	Std.	SLN	Std.	SLN
082	X	X	X	X
102	X	X	X	X
122	X		X	



MEDIUM SIZE FRAME

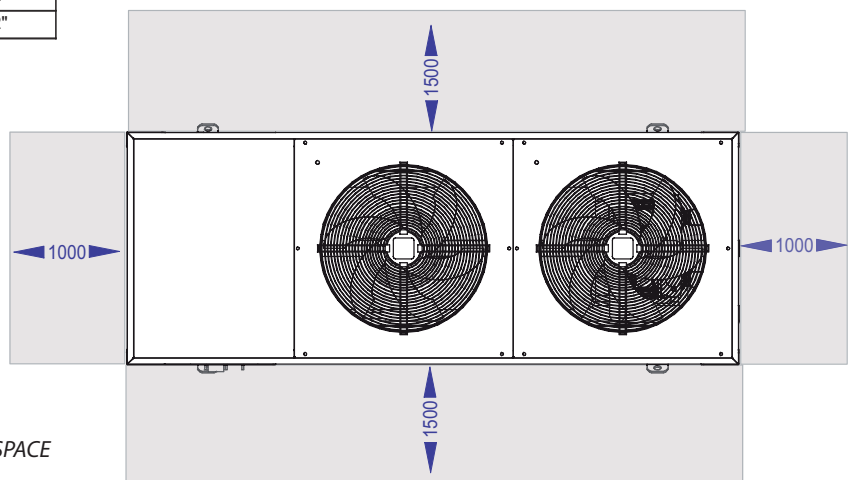


USER PLANT CONNECTIONS

	Size	STD - SERIES		PARALLEL			DRAINAGE TANK	OUT RECOVERY	IN RECOVERY
		1	2	2	3	4			
Galaxy - Zenit STD	152	2"	2"	2"	2"	1/2" M	2"	2"	
	123	2"	2"	2"	2"	1/2" M	2"	2"	
	133	2"	2"	2"	2"	1/2" M	2"	2"	
	153	2"	2"	2"	2"	1/2" M	2"	2"	
	134	2"1/2	2"1/2	2"1/2	2"1/2	1/2" M	2"1/2	2"1/2	
Galaxy - Zenit Low Noise	122	1"1/2	1"1/2	1"1/2	1"1/2	1/2" M	1"1/2	1"1/2	
	152	2"	2"	2"	2"	1/2" M	2"	2"	
	123	2"	2"	2"	2"	1/2" M	2"	2"	
	133	2"	2"	2"	2"	1/2" M	2"	2"	

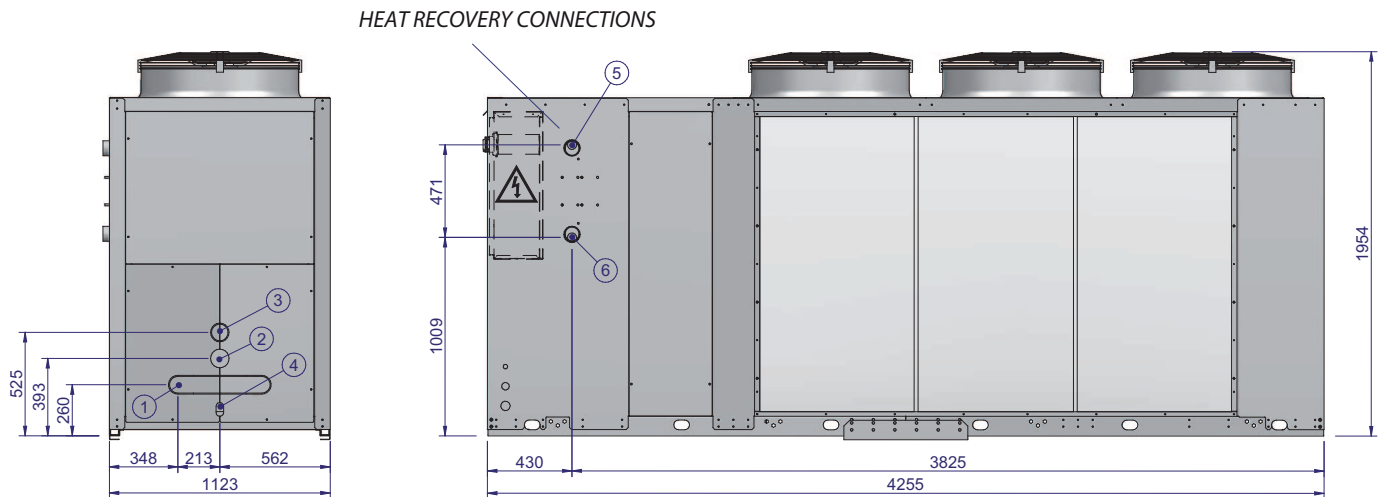
		IN	OUT
Galaxy Free Cooling	102	1"1/2	1"1/2
	122	1"1/2	1"1/2
	152	2"	2"
	123	2"	2"
Galaxy Free Cooling - Low Noise	102	1"1/2	1"1/2
	122	1"1/2	1"1/2
	152	2"	2"
	123	2"	2"

Models	GALAXY		ZENIT		GALAXY F.C.	
	Std.	SLN	Std.	SLN	Std.	SLN
102					X	X
122		X		X	X	X
152	X	X	X	X	X	X
123	X	X	X	X	X	X
133	X	X	X	X		
153	X	X	X	X		
134	X		X			



SERVICE SPACE

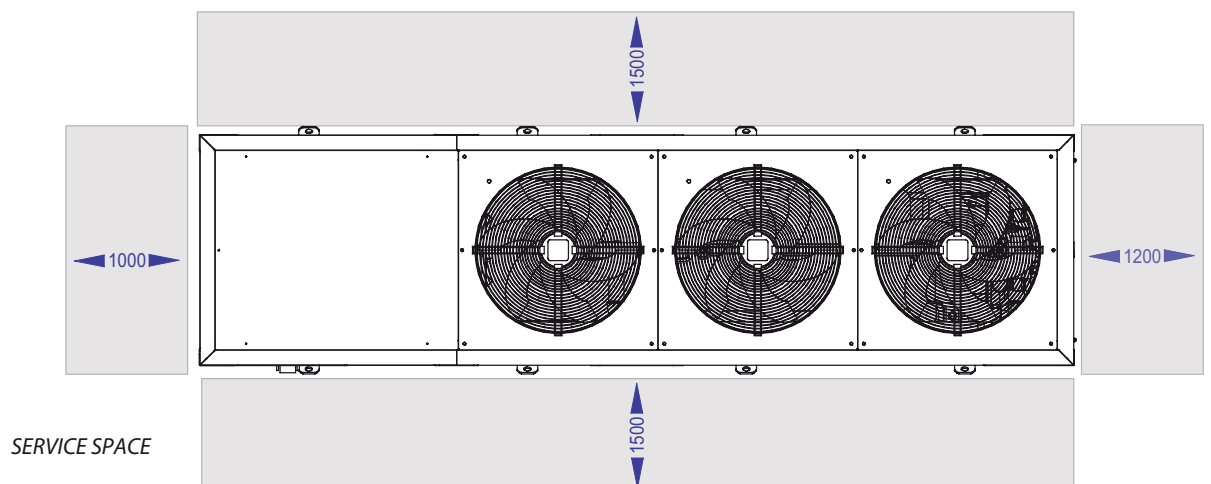
LARGE SIZE FRAME



USER PLANT CONNECTIONS

	Size	STD - SERIES		PARALLEL		DRAINAGE TANK	OUT RECOVERY	IN RECOVERY
		1	2	2	3			
Galaxy - Zenit STD	154	2"1/2	2"1/2	2"1/2	2"1/2	1/2" M	2"1/2	2"1/2
	126	2"1/2	2"1/2	2"1/2	2"1/2	1/2" M	2"1/2	2"1/2
Galaxy Low Noise	134	2"1/2	2"1/2	2"1/2	2"1/2	1/2" M	2"1/2	2"1/2
	154	2"1/2	2"1/2	2"1/2	2"1/2	1/2" M	2"1/2	2"1/2
	126	2"1/2	2"1/2	2"1/2	2"1/2	1/2" M	2"1/2	2"1/2
Zenit Low Noise	134	2"1/2	2"1/2	2"1/2	2"1/2	1/2" M	2"1/2	2"1/2
	154	2"1/2	2"1/2	2"1/2	2"1/2	1/2" M	2"1/2	2"1/2
Galaxy Free Cooling		IN	OUT					
	153	2"	2"					
Galaxy Free Cooling - Low Noise		IN	OUT					
	154	2"1/2	2"1/2					

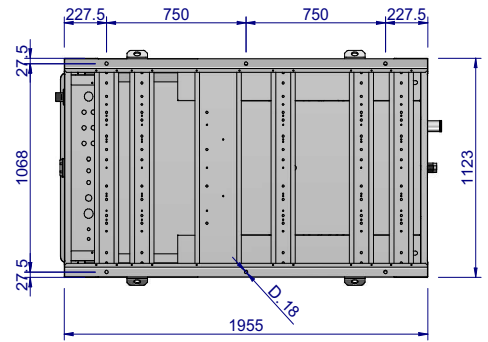
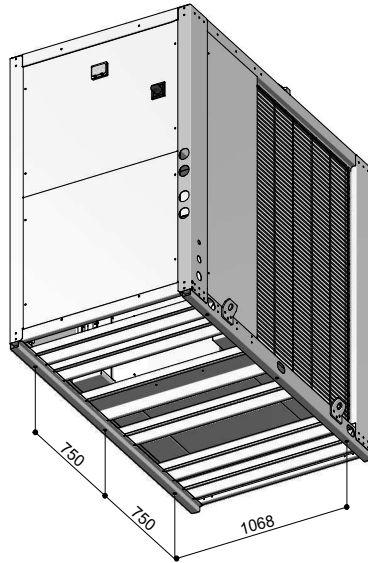
Modello	GALAXY		ZENIT		GALAXY F.C.	
	Std.	SLN	Std.	SLN	Std.	SLN
153					X	X
134		X		X		
154	X	X	X	X	X	
126	X	X	X			



SERVICE SPACE

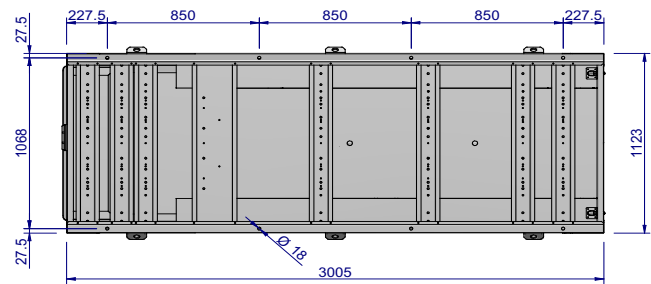
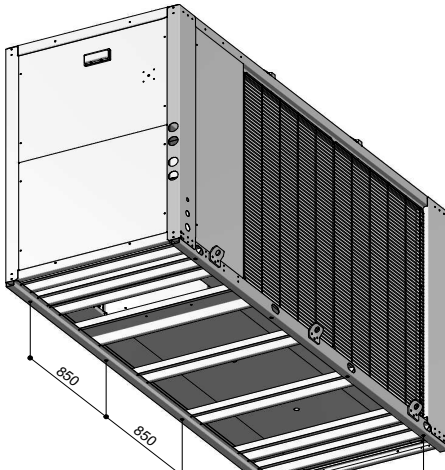
ANTI-VIBRATION MOUNTS POSITION

SMALL SIZE FRAME



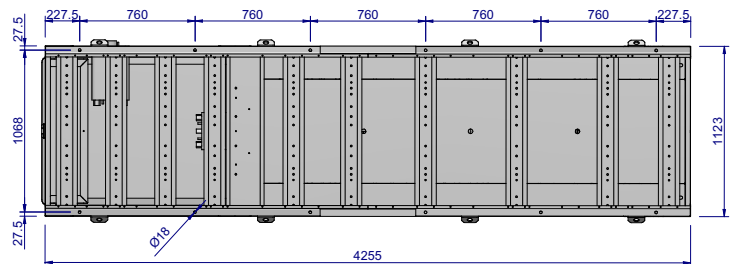
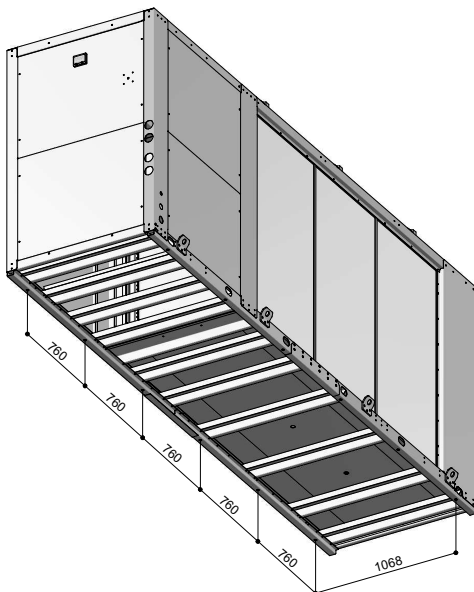
VIEW BELOW BASEMENT

MEDIUM SIZE FRAME



VIEW BELOW BASEMENT

LARGE SIZE FRAME



PLUMBING CONNECTIONS

3.0 PIPING

The system pipes may be made from steel, galvanised steel, polyethylene or PVC.

The pipes must be sized based on the nominal water flow, the system pressure drops and the characteristics of the circulating pump or other pump used in the system.

The units equipped with a pump able to guarantee the useful static pressure indicated in the enclosed table. In this case, the pipes must necessarily be sized based on the pump performance, carefully evaluating the pressure drops present in the system.

All the pipes should be suitably insulated to prevent heat build-ups (with a consequent decline in unit performance) and the formation of condensation on the outer surface.

Use closed-cell insulation material with a thickness of at least 10 mm for this purpose.

In order to prevent vibrations being transmitted from the unit to the user system and to compensate for thermal expansion, it is good practice to install elastic joints on the unit's plumbing connections.

The system should be developed in keeping with national regulations or those of the country of installation.

In any case, it is good practice **to install the following devices in order to guarantee correct use and maintenance of the unit.**

- anti-vibration elastic joints (in/out);
 - shut-off cocks;
 - **metal mesh filter, must be installed as possible to the unit and positioned to allow easy access for routine maintenance;**
 - air bleed devices;
 - automatic filling assembly;
 - drain cock;
 - expansion tank (1);
- control volume of the expansion vessel with the maximum capacity of user plant water at working conditions;
- safety water valve (1)

(1) - These devices are already installed on the machine only AP versions.

In order for correct working order and high performance to be guaranteed, every unit requires a constant nominal water flow as indicated in the table below.

The use of lower water flows could generate an operating anomaly, leading to serious consequences and damage to some important components such as the compressor.

TECHNICAL DATA TABLE FOR
PLUMBING CIRCUIT SIZING:

MODEL		082 A	102 A	122 A	152 A	123 A	133 A	153 A	134 A	154 A	126A
Plate heat exchanger	n°	1	1	1	1	1	1	1	1	1	1
Water flow	l/s	1,89	2,37	2,79	3,63	4,04	4,46	5,38	6,18	7,25	8,29
Pressure drops	kPa	21,6	26,8	25,7	25,4	18,7	22,8	22,9	31,3	35,8	34,4
Pump external static pressure (version STD)	kPa	139	130	125	117	117	105	84	111	80	80
Pump external static pressure (version HIGH)	kPa	172	160	154	156	157	146	127	152	123	154

DEPENDING ON THE MODELS AND TYPE OF USER SYSTEM CONFIGURATION, THE MACHINES SHOULD BE EQUIPPED WITH A SERIES OF COMPONENTS, LISTED ABOVE, IN ORDER TO ENSURE THE WORKING ORDER OF THE SYSTEM. HOWEVER, THESE DEVICES MUST BE CHECKED FROM TIME TO TIME TO MAKE SURE THAT THEY ARE WORKING PROPERLY.

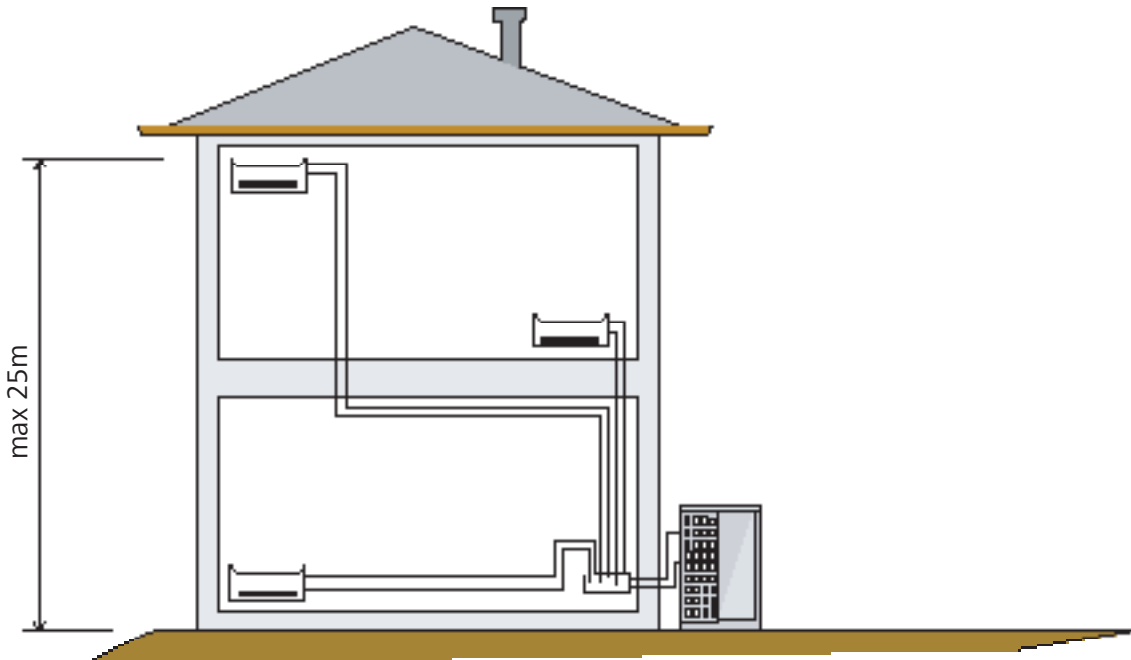
* CHECK THE INTERVENTION OF THE WATER DIFFERENTIAL PRESSURE SWITCH PERIODICALLY.

* CHECK THE READING ON THE ANTIFREEZE PROBE AND COMPARE IT WITH A CERTIFIED INSTRUMENT. IF THE VALUE IS WRONG, CALIBRATE THE PROBE.

* PERIODICALLY CLEAN THE MESH FILTER INSTALLED ON THE MACHINE HEAT EXCHANGER INLET.

* MAKE SURE THAT THE PLUMBING SYSTEM PRESSURE IS WITHIN THE SAFETY LIMITS (MAX 6 bar).

DIFFERENCE IN HEIGHT BETWEEN THE CHILLER ASSEMBLY AND THE HIGHEST PART OF THE SYSTEM



3.1 ANTIFREEZE MIXTURES (ETHY. GLYCOL)

If the plumbing is not drained during the winter break the water needs to be mixed with antifreeze liquids in suitable percentage parts.

The use of antifreeze liquids causes a slight reduction in cooling capacity, but a considerable variation in the system's water flow values and pressure drops.

It is important to check the performance of the pump carefully so as to prevent of the pump carefully so as to prevent malfunctions nominal water flow is not guaranteed.

The following table indicates the mix percentages suggested in event of use of ethylene glycol on the basis of the min. external ambient temperature in which the unit may find itself.

ATTENTION:

The pumps installed as standard can work with a maximum of 30% Ethylene glycol. If you wish to use the machine with mixes of over 30%, please contact Service TONONFORTY.



Winter external air temperature (machine off)	°C	5	2	-3	-10	-15
Recommended ethylene glycol percentage (in weight)	%	0	10	20	30	40
Cooling capacity correction coefficient *	-	1	0,97	0,95	0,93	0,9
Absorbed power correction coefficient *	-	1	0,99	0,98	0,97	0,96
Water flow correction coefficient	-	1	1,02	1,1	1,14	1,3
Evaporator pressure drops correction coefficient	-	1	1,08	1,3	1,39	1,6
Mixture freezing point	°C	0	-3	-8	-15	-23

* respect operation in nominal conditions (external air temperature 35°C / chilled water temperature 7°C)

WIRING

4.0 GENERAL INDICATIONS

All the units are supplied with an electrical panel complete with all the elements needed for the machine to operate and to control the safety features present. The wiring to the unit must be carried out in compliance with current national CEI regulations or with the indications given in the wiring diagram.



ATTENTION:

Before doing any operations on the unit's internal or external electrical parts, make sure that it is disconnected from the power supply. Size the section of the power-supply cables according to the maximum total current absorbed (F.L.I). The wiring diagram shows the recommended sections for installations with an isolator with fuse protection installed near the unit. Make sure the unit is adequately connect to earth, using the corresponding terminal found inside the electrical panel.

The power supply voltage must be comply with the unit's caratheristic data (voltage / frequency / n° phases / presence of Neutral conductor).

The voltage value must be within a tolerance of ± 10% of the rated power supply voltage for the unit (according CEI EN 50160) , **for three phase units, the unbalance between phases must not exceed 3%.**

If these parameters are not respected, contact the electricity supply company.

The use of electricity sources that do not comply with the manufacturer's instructions may have a negative effect upon the working order and integrity of the machine and cause the guarantee to become null and void.

4.1 WIRING CONNECTIONS

The wiring to be carried out by the user is shown in the wiring diagram and can be summed up as follows:

- Power-supply line connections:

Connections on electrical board or under main switch Q1:
L1 - L2 - L3 - PE

All the units are designed for a power supply type:
400V /50Hz /3PH+PE.

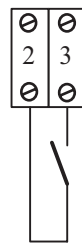
- Remote consent on/off:

USE A FREE VOLTAGE CLEAN CONTACT

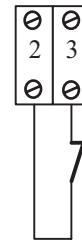
It's possible to control the ON/OFF activation of the unit by remote control using a non-powered contact to be connected to terminals 2-3 located inside the electrical panel.

The "REMOTE ON/OFF CONTROL" function must be enabled by intervening on the setting of parameter in the "sio.conf" file parameters. Please contact TONON FORTY Spa Technical service office.

REMOTE ON/OFF CONTROL LOGIC



Contact OPEN
OFF remote unit



Contact CLOSE
ON remote unit

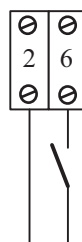
- SUMMER / WINTER REMOTE (only ZENIT unit):

It's possible switch the Summer/Winter modality from remote comand by a contact free voltage must be connected to terminals 2 -6 in the electrical panel board.

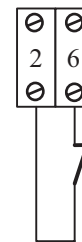
"SUMMER / WINTER REMOTE CONTROL" function must be enable by intervening on the setting of parameters setting **SP9=1** present in the "Menu parameter Set up".

Access to Parameter SP9 is password-protected. If you need to activate this function, please contact the TONON FORTY technical support office.

"SUMMER / WINTER REMOTE CONTROL" LOGIC



Contact OPEN
Unit in HEATING



Contact CLOSE
Unit in COOLING

• **REMOTE SIGNAL ALARM:**

Galaxy models Electrical board 4 - 5

- Consist in a remote signal for general alarm output.
Terminal board n° 4 - 5 are connected at free voltage contact NO that switch-on when occur one of alarms in the electronic controller. Eventually it's possible connect to terminal board 4 - 5 a signal device for alarms with supply 12 or 24 Vac.

4.2 WIRING CONNECTIONS FOR EXTERNAL DEVICES

REMOTE ON/OFF INPUT:

terminals - 2 - 3
Type of signal - free voltage

SUMMER / WINTER REMOTE INPUT (ONLY ZENIT UNIT)

terminals - 2 - 6
Type of signal - free voltage

GENERAL ALARM OUTPUT:

terminals - 4 - 5
Type of signal - free voltage

REMOTE KEYBOARD CONNECTION

terminals - 9 - 10 - 11
Type of signal - active signal from IPRO

RS 485 INTERFACE CONNECTION

terminals - 12 - 13
Type of signal - active signal from IPRO

WATER PUMP OUTPUT (models 082A - 152A -133A)

terminals - 46 - 47
Type of signal - 230 Vac voltage

WATER PUMP OUTPUT (models 154A - 126A)

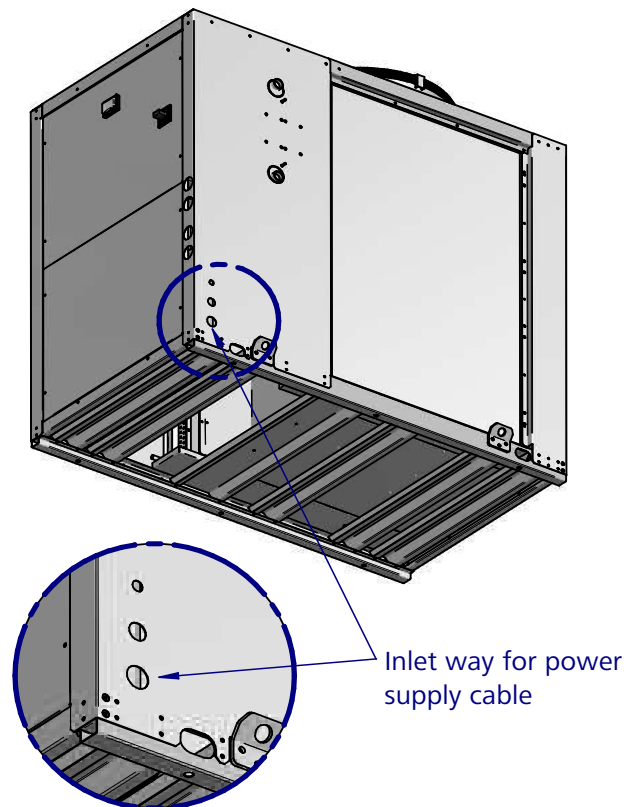
terminals - 60 - 61
Type of signal - 230 Vac voltage

• **INLET ELECTRICAL CABLE POWER SUPPLY**



Before connect the machine to power line supply (400V/50Hz/3PH) must be sure that the main switch is in OFF position, so do not have electric voltage in cable power in the unit.

The holes to inlet power cable supply and external signal are positioned in the bottom at left side (as shown below)



4.3 ELECTRICAL DATA INPUTS

ELECTRICAL ASSORBITION AT MAXIMUM WORKING CONDITIONS

MODELS GALAXY / ZENIT	POWER SUPPLY (V-PH-Hz)	Max value (standard unit)			Max value (unit with water section)			Section cable (mmq)
		F.L.I. (kW)	F.L.A. (A)	L.R.A. (A)	F.L.I. (kW)	F.L.A. (A)	L.R.A. (A)	
082 A	400 - 3 - 50	20	36	112,8	21,4	40,5	114,8	16
102 A		22,5	40,6	131,1	23,9	45,1	133,1	16
122 A		27,1	48,8	142,2	28,5	53,3	144,2	16
152 A		36,5	65,8	172,5	38,3	71,9	174,5	25
123 A		41,7	75,3	166,4	43,5	81,4	168,4	25
133 A		45,3	81,7	166,4	47,1	87,8	168,4	35
153 A		52,4	94,5	201	54,6	100	203,1	35
134 A		61,3	110,4	188,7	63,5	118,5	190,7	50
154 A		70,6	127,4	231,8	72,8	135,4	233,8	50
126 A		81,1	146,4	235,2	83,3	154,4	237,2	70

F.L.I. = (Full load input)

F.L.A. = (Full load ampere)

L.R.A. = (Locked rotor current)

Minimum power supply wires section (cables with pvc or rubber insulation) to be used for 20 m max wires lenght. For longer supply cable line, the section have to be design according to the voltage loss along the line.

ELECTRONIC CONTROLLER

5.0 DISPLAY


All units Galaxy-Zenit are equipped with electronic microprocessor controller (IPRO series) which manages all the unit logic functions through the software coding sets.


Controller with led display built-in and 6 key function:







menu : On with navigation menu enabled.


Flow! : On when there is a flow alarm

 : On if there is one pump active


 : On if there is a fan/s active

  : On if the compressors (1 or 2) is active; flashing if the compressor is on delay counting.

  : On when the unit is active, icon "ice" indicate heating mode, icon "sun" indicate chiller mode.

 : On if one of auxiliary outlet of controller is active

Cir1 Cir2 : "Cir1" on if display shows the information of circuit 1; "Cir2" on if display shows the information of circuit 2

 : On flashing during counting interval between 2 defrost; the icon is on steady during the defrost

VISUALIZATION ON DISPLAY FOR STAND-BY UNIT:

Stand-by modality is active if the unit is switched-off by the keypad (through the "sun" or "ice" buttons) or by a remote control.

Stand by: code "Stby" on the display screen

5.1 USER INTERFACE

• Upper display :

Visualization INLET water temperature user plant (return of user plant)

• Lower display :

Visualization value of condensation or evaporator pressure (Cir1 o Circ2)


• Left part:


Icon of segnalation

ICONS SIGNALING

°C : On when the value in display is a temperature measurement (°C) or a pressure (bar).

bar

 : On in programming menu if date / time or loads hour counter are enabled.

 : On flashing if there are some alarms not identified by specific icons




Vset : On if the water set point change function is enabled. (Dynamic setpoint).






5.2 KEYPAD AND FUNCTIONS



Functions keys



KEY	ACTION	FUNCTION
	Push and release during default visualization	Show set-point in chiller mode (label SetC) and/or in heating mode (label SetH)
	Push and release in menù SetS	With unit in chiller or heating mode, if the energy saving function or dynamic set-point is enable, show the real set point (SetS); l'icona Vset è accesa
	During the SET POINT menù push for 3 second and release	Modify set point chiller / heating pump (only chiller if unit is on in cooling, only heating pump if unit is on in heating mode, both set point value if unit is stand-by)
	Push and release in ALRM menù	Permits reset an alarm
	Push and release	Lets you view temperatures and pressures in the display upper/lower
	Push and release on programming	Lets to change the groups of parameters and single parameters. Increasing parameter value when in modify mode.
	Push and release	Lets you view temperatures and pressures in the display upper/lower
	Push and release on programming	Lets to change the groups of parameters and single parameters. Increasing parameter value when in modify mode.


	Push and release	Switch-On or switch-off the unit in heating mode
	Push and release	Switch-On or switch-off the unit in chiller mode
	Push and release	Permits enter in "function menù"
	Push for 3 second and release	Set time clock parameters (if RTC inside)
	Push and release in programming	Permits exit from a group of parameters or in modify parameters.

KEY COMBINATION FUNCTION




TASTI	AZIONE	FUNZIONE
	Push for 3 second and release	Enter in menù program
	Push for 5 second	Manual defrost (only in heating)


UNIT ACTIVATION

6.0 SWITCH ON / SWITCH OFF THE UNIT IN "COOLING" MODE


By pressing the  key for 5 seconds, the unit switches from stand-by mode to chiller mode and back again.

Switch-on phase:

- press the cooling mode key for 5 seconds;
- the green led near icon "Sun" lights up and in display show inlet/outlet water temperature;
- the pump switch on (active  icon);
- if required by the temperature control , the compressors switch on (ex. active compressors icon n.1 - n.2  ).




To turn off the machine (stand-by mode) from cooling mode press the  key for 5 seconds.


6.1 SWITCH ON / SWITCH OFF THE UNIT IN "HEATING" MODE

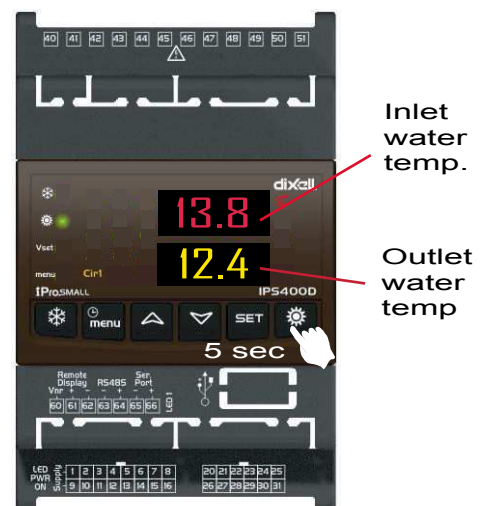
By pressing the  key for 5 seconds, the unit switches from stand-by mode to "heating" mode and back again.

Switch-on phase:

- press the heating mode key for 5 seconds;

- the green led near icon "Ice" lights up and in display show inlet/outlet water temperature;
- the pump switch on (active  icon);
- if required by the temperature control, the compressors switch on (ex. active compressors icon n.1 - n.2  ).

To turn off the machine (stand-by mode) from heating mode press the  key for 5 seconds.

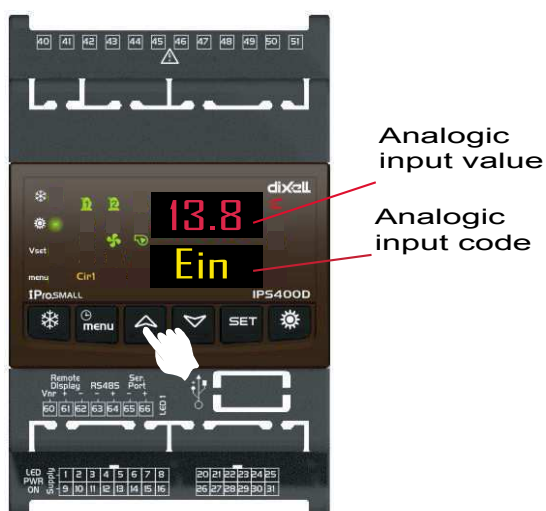


6.2 DISPLAY LAYOUT VISUALIZATION

As default, in normal running condition the display screen shows the refrigerant circuit n° 1. The displayed circuit is marked by the icon **Cir1** (circuit 1) or **Cir2** (circuit 2). Each measurement corresponds to a label that identifies the values of temperature and pressure shown on the display screen (see the table below). To scroll the information between the two circuits use the UP or DOWN keys to select the icon Cir1 or Cir2 and then push **SET**.

DISPLAY LABELS

During unit running or in stand-by mode, the information as for the following label can be displayed. Push the UP button to enable the display labels view and use the UP/DOWN buttons to scroll the labels.



LABEL ON DISPLAY	DESCRIPTION
Ein	NTC temperature probe evaporator water inlet
EOut	NTC temperature probe evaporator water outlet
FCIn	NTC temperature probe of free-cooling water inlet
Et	NTC temperature probe of dynamic set-point external temperature
FCEt	NTC temperature probe external temperature for free-cooling
CdP1	Pressure probe of the condenser 0-5Vdc circuit 1
CdP2	Pressure probe of the condenser 0-5Vdc circuit 2
LP1	Pressure probe of the evaporator 0-5Vdc circuito 1
LP2	Pressure probe of the evaporator 0-5Vdc circuit 2

SET POINT SETTING

7.0 VISUALIZATION "SET POINT"

All the units in the "system side" are managed on the basis of the temperature measured by the probe **pB1**: Temperature of evaporator water inlet acqua. This value is compared with the set-point unit.

Unit in stand-by mode press the **SET** key, and the bottom screen will display **SetC** (set chiller) and by pressing a second time it will display **SetH** (set heating pump if configured). With the unit ON only the set point relative to the state of operation will be displayed.

To exit the set point Menu press the SET key.

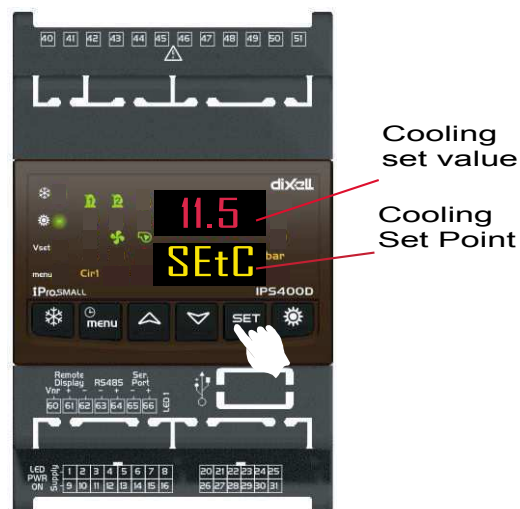
7.1 CHILLER SET POINT

Inside the SET point visualization, press the **SET** key for at least 3 seconds, until the set point value will flash. To change the value act on the UP or DOWN keys.

It's possible to change the set-point chiller value inside the limits setting in the factory:

- 9°C** Minimum summer set point
- 20°C** Maximum summer set point

To memorise the new set point (modified) press the **SET** key or wait for the time out to exit programming.



7.2 HEAT PUMP SET POINT

Inside the SET point visualization, press the **SET** key for at least 3 seconds, until the set point value will flash. To change the value act on the UP or DOWN keys.

It's possible to change the set-point heat pump value inside the limits setting in the factory:

- 30°C** Minimum winter set point
- 48°C** Maximum winter set point

To memorise the new set point (modified) press the **SET** key or wait for the time out to exit programming.

SETTING THE BAND REGULATION ON CHILLER / HEAT PUMP MODE:

Enter to the Set point menù and setting the parameters


- ST7** Temperature hystereis in chiller mode
- ST8** Temperature hysteresis in heat pump mode.

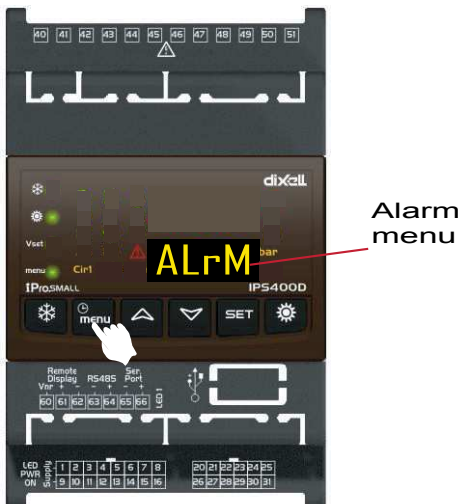
7.3 FUNCTION MENU “M” KEY


By pressing “Menu” key  you can enter the Menu function and scroll thr following submenu:

- a) **ALrM** - Show and reset the alarms;
- b) **ALOG** - Show and reset the alarm log;
- c) **COEn** - Enable – disable by key one of the compressors;
- d) **COSn** - Show and reset the number of compressor starts-up;
- e) **HOUR** - Show and reset the number of compressor running hours ;
- f) **Pump** - Show the status of outlet pump on evaporator side;
- g) **Cond** - Show the condensing fan speed percentage of the proportional output;
- h) **InOu** - Show the status (On - Off) for digital and analog input/output in the unit;
- i) **FC** - Show the status (On - Off) free-cooling mode, if it’s configured;
- l) **Conf** - Show the configuration status;
- m) **Info** - Show the software information (Address, application SW, internet TCP/IP);

FUNCTION MENU “M”

Enter pressing the  key. With UP or DOWN button you can scroll the list of the functions listed above. Press SET key for enter in the function (for es. ALrM) that you want to see.

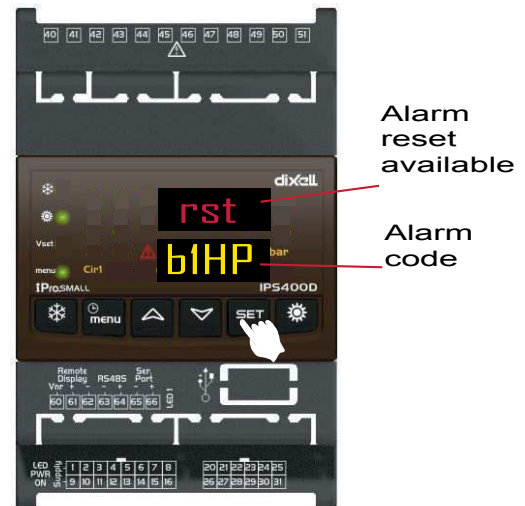


To exit thr Menu function push  key or waiting for the time out to exit.

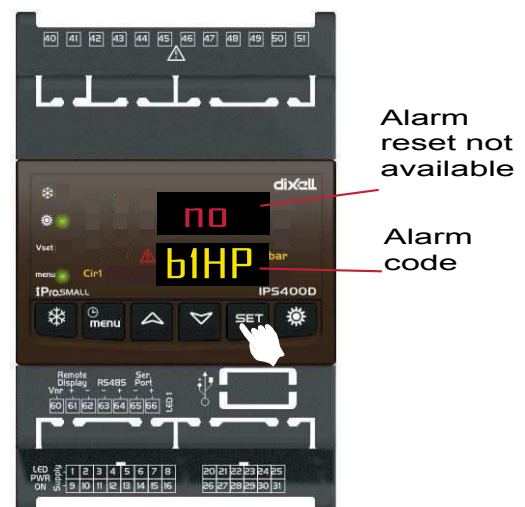
7.4 ALARMS STATUS: SHOW AND RESET


“ALRM” FUNCTION

- Enter in function menù pressing “menù” key one time,
- By pressing UP or DOWN keys to select the **ALrM** label,
- Push **SET** key (nothing happens if there are no active alarm events).
- Bottom display show alarm label code; Top display label **rST** if you want to reset, or **NO** if it is not possible,




- Pushing **SET** when the **rST** label is displayed that corresponding alarm will be reset, then the display shows next alarm in the list, pushing **SET** again for reset the alarm, and the display shows next alarm etc..Nothing happens by pressing **SET** when the label **NO** is displayed, in this case push UP or DOWN to move to another alarm label.



- To exit the ALRM reset function push  key one time or wait the time out.

“ALOG” FUNCTION (ALARM HISTORY)

- Enter in function menù pressing “menù” key one time,
- By pressing UP or DOWN keys to select the **ALOG** function,
- Push **SET** key (nothing happens if there are no active alarm events),
- Bottom display show alarm label code; Top display label “n” and progressive number from 00 to 99,
- Push UP - DOWN to scroll all the alarms present,
- To exit the ALRM reset function push  key more times or wait the time out.

7.5 ALARMS LIST

The alarm codes and signals are defined by letters and numbers that identify the different types.

Type of alarm:

* **A** = alarm of unit (flow, pumps, fans ...)

* **B** = alarm of the circuit (*n*) (Hp, Lp pressostat...)

* **C** = alarm of the compressor (*n*)

Code Alarm	Alarm Description	Comp.	Fan	Pumps	Reset
AP1 - AP10	Probe alarms PB1 ÷ PB10	OFF	OFF		Autom.
AEFL	Evaporator Flow switch alarm	OFF	OFF	OFF	Manual
AtE1 - AtE2	Evaporator pump overload alarm n°1 or n°2	OFF	OFF	OFF	Manual
AEP1 - AEP2	Evaporator water pump maintenance request n°1 or n°2				Manual
AEht	Evaporator water inlet high temperature alarm	OFF	OFF		Autom.
ArtF	Time clock failure				
ArtC	Alarm clock failure				
APS	Sequency phase relay alarm	OFF	OFF	OFF	Manual
ALc1	Unit n°1 block general alarm	OFF	OFF	OFF	Autom.
b(n)HP	High pressure pressostat (n) alarm	OFF	OFF (60")	OFF	Manual
b(n)LP	Low pressure pressostats (n) alarm	OFF	OFF	OFF	Manual
b(n)AC	Antifreeze alarm circuit (n) on chiller	OFF	OFF	OFF	Manual
b(n)AH	Antifreeze alarm circuit (n) on heat pump	OFF	OFF	OFF	Manual
b(n)tF	Condenser fan overload alarm of the circuit (n)	OFF	OFF		Manual
b(n)hP	Condensing High pressure of the circuit (n) alarm (with pressure trasducer only)	OFF	OFF	OFF	Autom.
b(n)lP	Evaporating Low pressure of the circuit (n) alarm (with pressure trasducer only)	OFF	OFF	OFF	Autom.
C(n)tr	Compressor (n) overload	OFF (n)			Manual
C(n)Mn	Maintenance alarm for compressor (n)				Autom.
b(n)dF	Defrost alarm of the circuit (n)				
noL	Remote terminal alarm (No Link)	OFF	OFF	OFF	Autom.

REMOTE KEYBOARD KRC

8.0 WIRE CONNECTIONS

As accessory, an additional keyboard can be used to control the unit from a remote site.

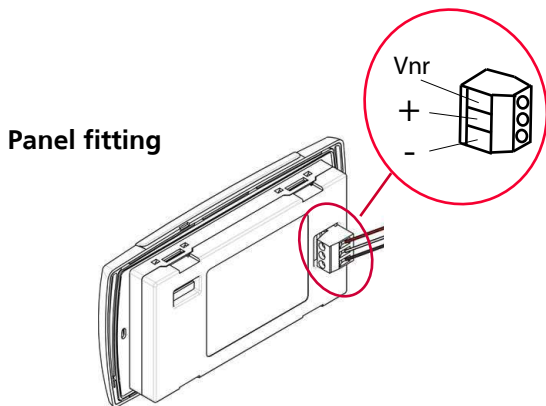
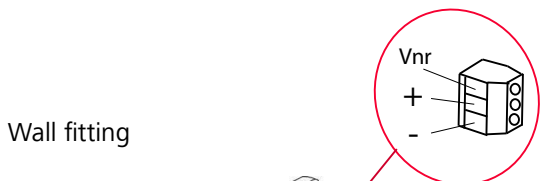
The max distance between the unit and the remote keyboard have to be no higher than 150 m.

For the el. connections use a 3-wire shielded cable with 1mm section.

The IPRO SMALL regulator allows the connection of ONE remote keyboard only.



The remote keyboard is available for wall or panel fitting:



WARNING

Special care must be taken when connecting the keyboard to the IPRO regulator, to avoid irreparable damage to the controller or/and keyboard. The respect of the following connection numbering is mandatory.

El. connections

Vnr : to terminal n° of Galaxy control box

+ : to terminal n° of Galaxy control box

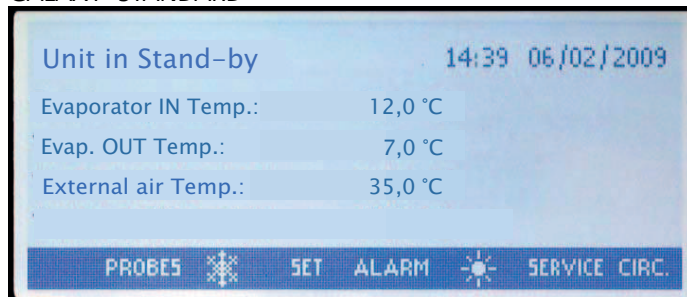
- : to terminal n° of Galaxy control box

8.1 USER INTERFACE

The remote keyboard consist in one LCD graphic display screen and n° 8 buttons.

In standby mode, the display will show the following items:

GALAXY STANDARD

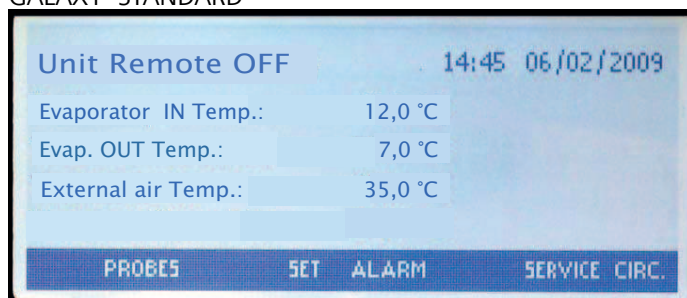


GALAXY FREE COOLING



If the unit is managed by a remote On/Off signal, the display will be as follow:

GALAXY STANDARD



GALAXY FREE COOLING



8.2 UNIT SWITCH-ON IN COOLING OR HEATING MODEing

To switch the unit, from stand-by mode to unit ON, press:



for the heating mode (heat pump)



for the cooling mode (chiller)

INFORMATION IN THE MAIN SCREEN:



indicate that at least one of the compressors is working



indicate that evaporator pump is working



indicate that the condenser fans are working

If the alarms occur or particular working modes sub-enter, the following icons will be shown on the display:



flashing to indicate that an alarm is active



ON to indicate that the defrost cycle is in progress, flashing during the count



Indicate that the anti-freeze heaters are active

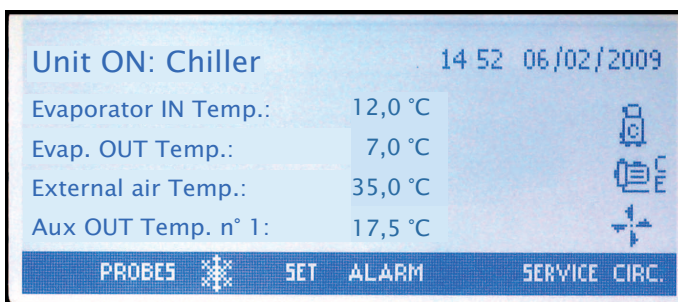


Automatic switch-off and/or energy saving is enabled during the current day



Indicate that the unit is working within the energy saving period or that the dynamic set-point is active.

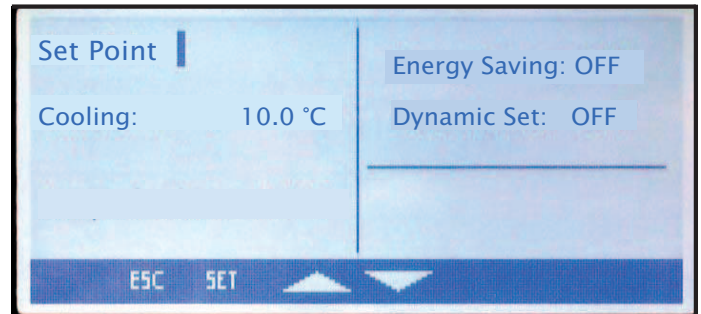
Below find a typical screen during working in cooling mode:



8.3 SET POINT

To adjust the set-point of the cooling or heating mode from the main view, press **SET**.

The following mask shows the set-point view:



To modify the set point values, move the cursor on the element by the UP / down key, then press the **SET** key:

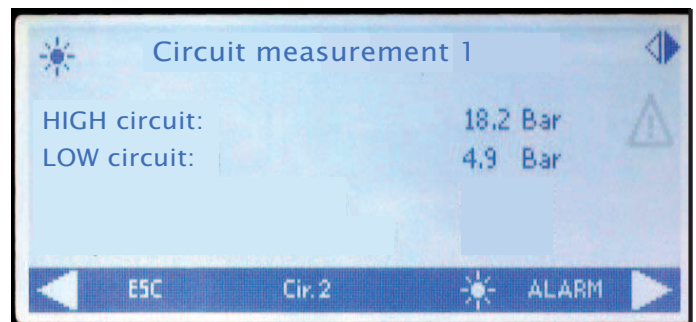
- The value starts to flash.
- Increase or decrease the value using the **UP** and **DOWN** keys.
- Confirm the modification by pressing the **SET** key again.



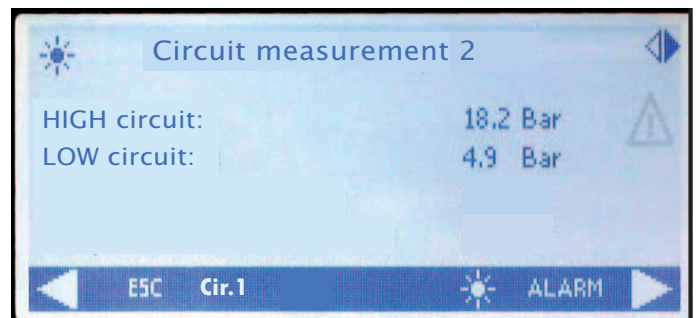
The cursor will automatically position itself on the next element, to modify it repeat the operation just described.


To see the variables of the circuits from the main screen, press the PROBES key

In order to display the variables relative to the individual circuit, press the relative key. For example, if the variable of circuit 1 is to be displayed, press **Cir.1**:



Press **Cir.2**:

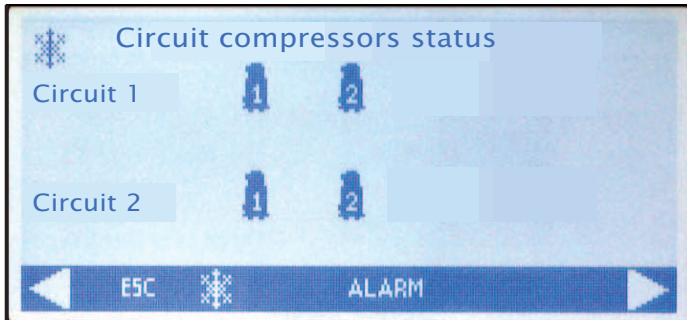


By pressing the  key, the other variables (temperature/pressure) of the circuit selected can be seen.

8.4 CIRCUIT VISUALIZATION

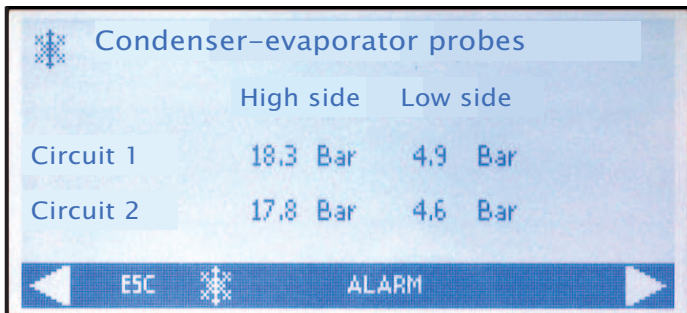
Using the CIRC key it is possible to monitor the situation of the unit. The information refers to:

- **CIRCUITS COMPRESSORS STATUS**, the screen shows the compressors present for each circuit and the activation status of the compressor (numbers active). If the compressor has no number on the right, it means that it is at full power.

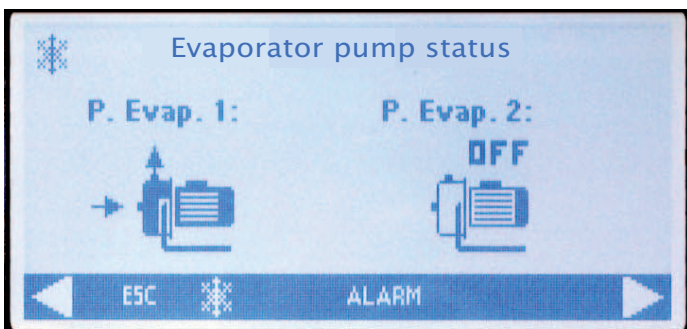


By pressing the  or  keys, pass from one screen to another.

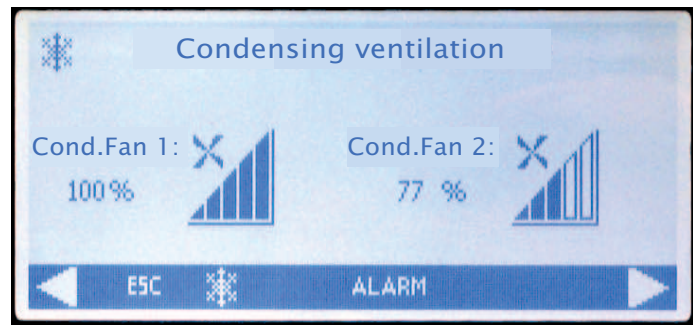
- **CONDENSATION-EVAPORATION TRANSDUCER**. The screen shows the condensation and evaporation pressures of every circuit present.



- **STATUS OF THE EVAPORATOR PUMP** (or evaporator pumps 1/2 if the secondary pump is present).



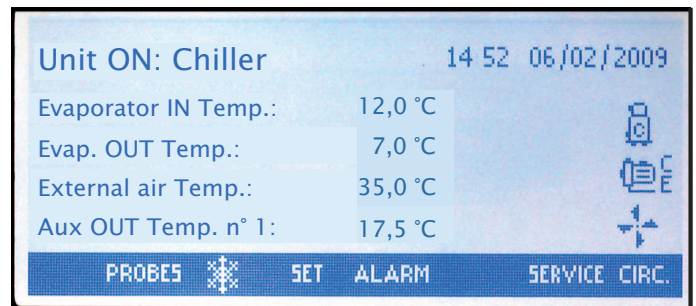
- **CONDENSATION FANS** (speed regulation proportional - optional DCP)



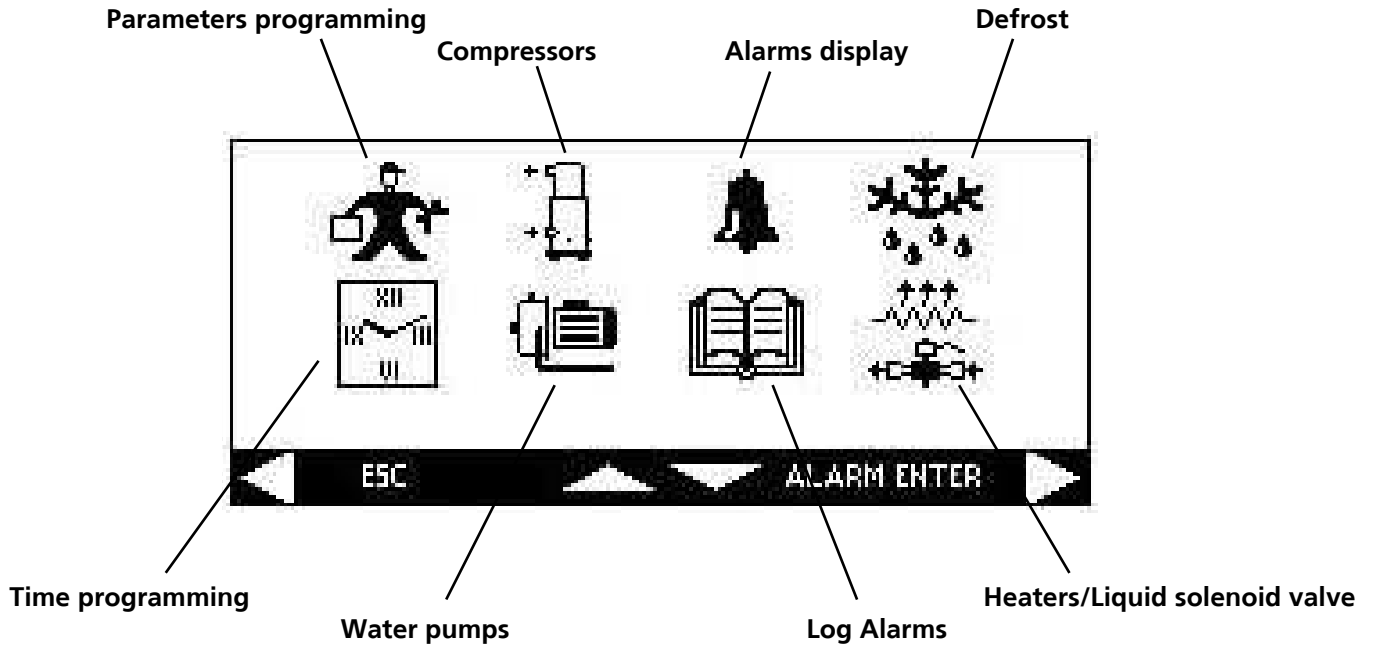
8.5 SERVICE MENU'

With unit in stand-by mode, by pressing the **SERVICE** key you can enter the service menu and select the following sub.menu:

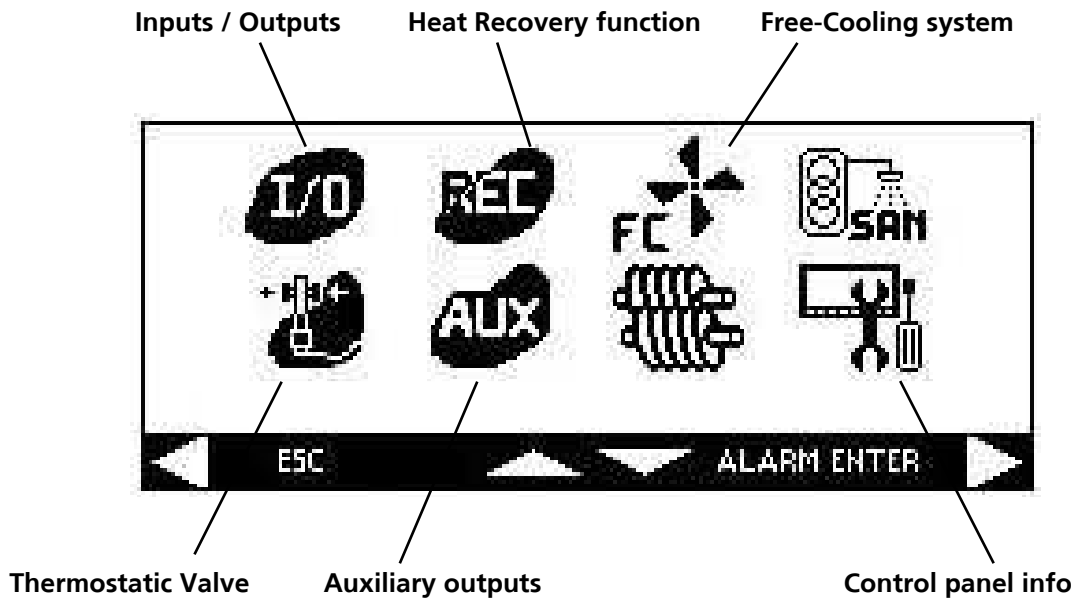
- Parameters Programming (protect by Password)
- Time / Time bands Programming
- Compressors
- Water pump
- Alarms display
- Historical alarms
- Defrost
- Heaters/Liquid solenoid valve
- I/O status (Inputs and Outputs)
- Thermostatic Valve
- Heat recovery function
- Auxiliary outputs
- Free-cooling
- Control panel information



SERVICE MENÙ :



Pressing  and view is :

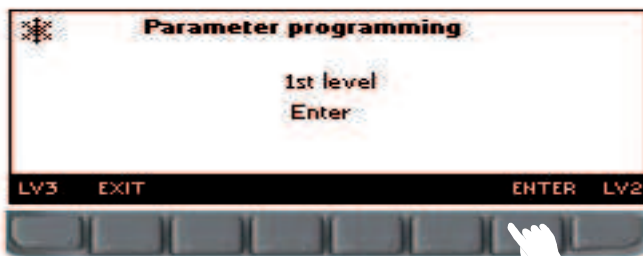


8.6 PARAMETER PROGRAMMING

With the UP/DOWN key move the cursor on the icon as for the following

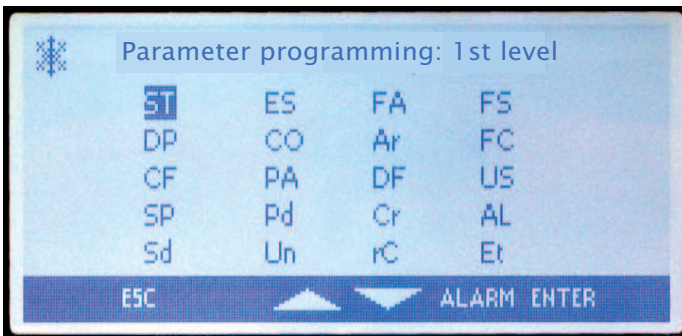


Push ENTER key to enter the P.P menu

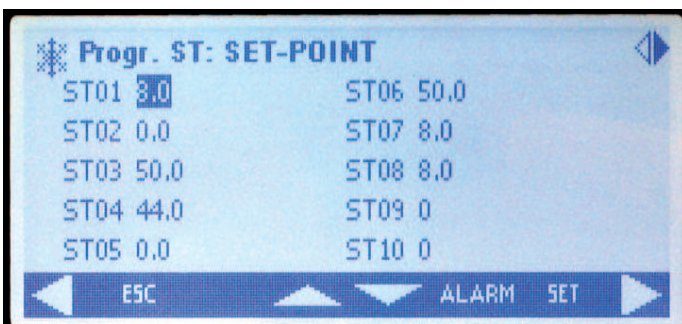


This mask allows you to enter some of the ST parameters only. All the other parameters are protected by password and they can be selected by authorized personnel only.

Push ENTER key to enter ST parameter list.

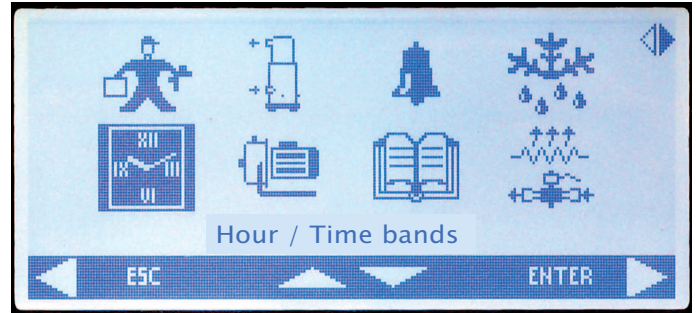


Move the cursor with UP/DOWN key to select the need parameter. Push ENTER key to enter the parameter and update the value through UP/DOWN key. Push ENTER key to confirm.



8.7 CLOCK / TIME BANDS

For setting the time and date, press the SERVICE key.



Use the UP and DOWN keys to select the "CLOCK /TIME PERIOD" icon and press ENTER.



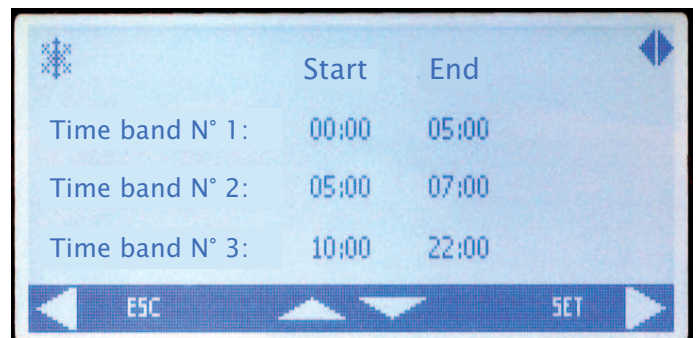
To update date and time, move the cursor using the UP and DOWN cursors and press SET:

- The element starts to flash.
- Increase or decrease the value using the UP and DOWN keys.
- Confirm the modification by pressing the SET key again.

The cursor will automatically position itself on the next element, to modify it repeat the operation just described. **ONCE THE CLOCK AND DATE HAVE BEEN MODIFIED, RE-START SUPPLY TO THE CONTROLLER.**

Press the ESC key two times to go back to the main screen.

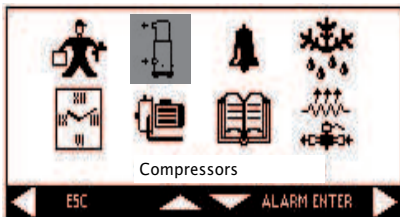
You can use the same approach to enable or disable the Energy Saving and/or the time bands.



8.8 COMPRESSORS

The following information is available for each circuit in this menu:

- Working hours for each individual compressor
- Number of start-ups for each individual compressor
- For each individual compressor it is possible
 - To reset the working hours
 - Reset the number of start-ups
 - Disable compressor working (e.g. perform maintenance)



Circuit 1	Working hours	Start-up nr.
Comp.1:	48	20
Comp.2:	40	20
Comp.3:	45	19
Comp.4:	43	21

To reset the values, move the cursor on the element and press the RESET HOURS or RESET STARTS key:

The cursor will automatically position itself on the next element, to modify it repeat the operation just described.

To enable or disable a compressor, position the cursor on the element and press the ENB/DIS key:

The cursor will automatically position itself on the next element, to modify it repeat the operation just described.

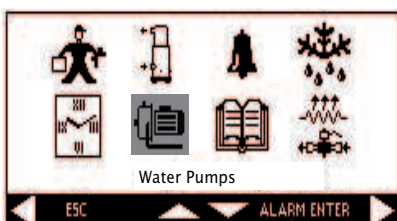
8.9 WATER PUMPS

The following information are available in this menu:

- Working hours for each individual pump (evaporator and condenser)

For each individual pump it is possible:

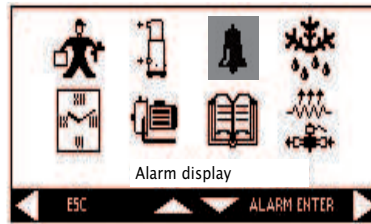
- To reset the working hours
- To disable the pump (e.g. perform maintenance)
- To reset working hours or disable/enable the pumps, follow the procedure described for the compressors.



Water Pumps	Working hours
Evaporator water pump	11
Support evap. water pump	10
Condenser water pump	10
Support cond. water pump	9

8.10 ALARMS

This Menu allows the view of the alarms arisen.



Alarm display		1 / 1
Compressor 2 overload	Resettable	⚠
Compressor 1 overload	Password	
High pressure circuit 1	Active	

When the safety device is returned to run normally, the alarm can be reset by keyboard pushing the button **RESET**.

8.11 ALARMS LOG

All alarms occurring are memorised in this screen.

Differently to the alarms Menu, where the alarms can be reset once the event has returned, in this menu all types of alarms remain memorised and can be reset only by the Service through a password.



Alarm log display		1 / 7
Low pressure circuit 2	Unit ON: Cooling Mode	14:43 06/02/2009
Low pressure circuit 1	Unit ON: Cooling Mode	14:43 06/02/2009

FREE COOLING

9.0 GENERAL INFORMATIONS

Free-Cooling kit consists of the following main components wich integrate the equipments already assembled on the standard Galaxy unit:

- air to water finned coils,
- three-way valve for automatic switching of the water to be cooled,
- electronic control and external air probe.

ANALOG INPUTS CONFIGURED (for GALAXY 153-154)

Evaporator inlet NTC temperature probe **B1**

Water inlet (Free-cooling) NTC temperature probe **B4E**

External air temperature (Free-cooling) NTC temperature probe **B1E**

DIGITAL OUTPUTS

Relay output configured as free-cooling ON/OFF valve **V3**

Relay outputs configured as fractioned coil solenoid EVFC

ANALOG OUTPUTS

0-10V analogue output for fan speed modulating.

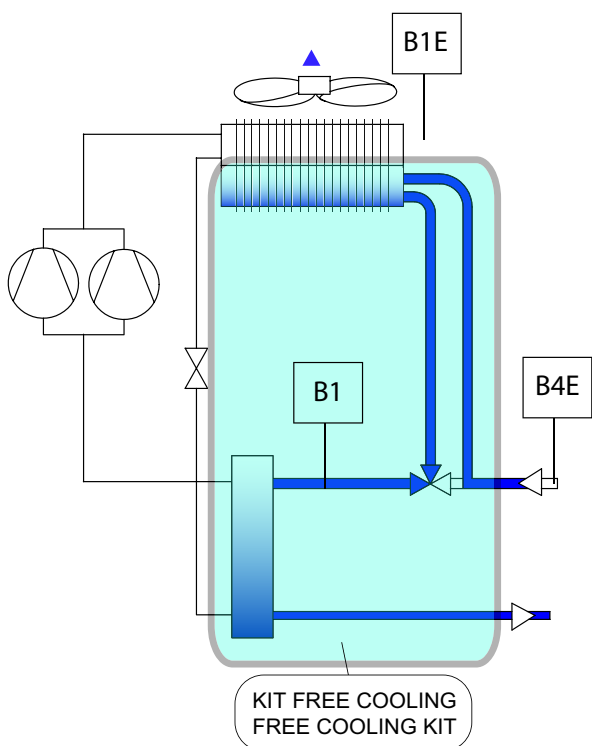
9.1 WORKING LOGIC

Chilled water free cooling is provided if the externe air temperature is lower than the water temperature coming back from the user plant (unit inlet temp.)

The minimun temperature difference between air and water side have to be at least 2 °C (belonging to Parameter FC02). As bigger is this temperature difference, as higher is the free cooling performance.


On the average the Galaxy Free Cooling Chillers reaches 100% of free cooling capacity with 15 - 18 °C temp. difference according to the models.

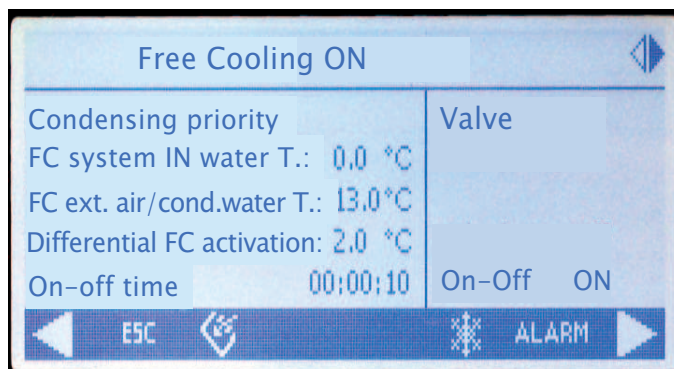
The free cooling water coils, pre-treats the water before it enters the evaporator, independently from the compressor managing.



If the temperature difference between the value detected by the plant water inlet probe (B10) and that detected by the external air probe (B7) is grater than or the same as the value set in the **"input/output free cooling differential" (FC02) parameter** for the **"input/output free cooling delay time" (FC03)** the free cooling ON/OFF relay outlet (comand the relative ON/OFF 3-way valve) is activated and assumes the ON or OFF status depending on the temperature detected by the temperature control probe as per diagram below:

If the temperature difference between the value detected by the system water inlet probe and that detected by the external air probe drops below the value set FC02, the free-cooling ON/OFF output is unexcited, while the free-cooling analogue output assumes the value of 0V.

If the unit have the remote terminal panel when the icon  is active (in lcd display), free-cooling mode is enabled



FC05: Water temperature differential which controls the fan speed modulation. (Related to B1 temp. Sensor)

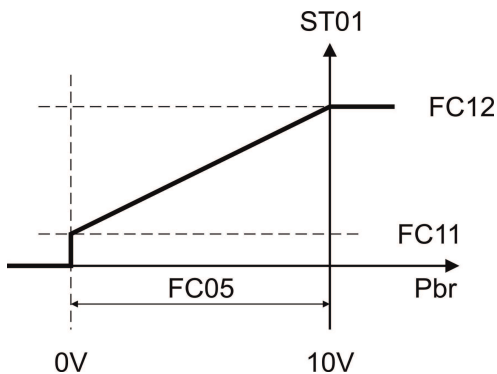
9.2 FRACTIONED CONDENSING COILS

To get max free cooling efficiency, when free cooling is enabled, the fans run at maximum speed. If the compressor are enabled, to avoid an extremely low condensing pressure (due to the low ambient temperature) the condensing coils are split in 2 sections in order to use a smaller heat exchanging surface. The electronic controller enables automatically this function through a solenoid valves on refrigerant side.

9.3 VENTILATION AND 3 WAY VALVE CONTROL

The Galaxy Free Cooling chillers are equipped with modulating fan speed as standard. If the unit is running with very low ambient temperature with 100% free cooling mode, the ventilation speed control will be enabled to avoid water temperature dropping above the set point (ST1).

When the water temperature entering the evaporator (B1) reaches the set point ST1, the ventilation speed control will reduce proportionally the air flow in order to keep the water temperature at the design level. If the reduced air flow is not enough to keep the right water temperature, the Free cooling 3 way valve will be shut off.



10.0 PRELIMINARY CHECKS

Before starting the unit, it is essential to carry out some general checks in order to ensure that it is in good working order.

1) Make sure that the plumbing is correctly connected in keeping with the general diagrams enclosed with this manual. Make sure that the user system return water pipe is connected to the **"SYSTEM WATER INLET"** connection, while the water delivery pipe to the system should be connected to the **"SYSTEM WATER OUTLET"** connection.

2) Bleed the plumbing carefully with the pump off. The presence of air bubbles could have a negative effect on the operation of the unit and could also cause ice to form in the evaporator, perhaps causing it to break and pollute the cooling circuit.

3) Make sure that all the intercept valves in the system are open, that the system is pressurised and that water circulation is normal.

4) Check the wiring, making sure that the conductor sections and their housings correspond to the indications in the wiring diagram enclosed.

5) Check that the terminals are tightened.

6) Make sure that the power supply corresponds to that indicated on the wiring diagram. Also check that the voltage is constant and is not more than 10% over or under the required value.

7) All the units are equipped with three-phase compressors and have a sequence phase control relay. The machine will not start if the connections are wrong. The LED on the relay lights up if the connections and phase sequence are correct. The LED goes out if the phases are incorrectly connected. In this case it will be sufficient to invert the connection of two of the three phases to ensure that the compressor rotates in the right direction.

8) Units with compressor oil heater (crankcase heating element) must be activated for at least 8 hours before the compressor starts. To supply the crankcase heating element, you need to activate the main switch while seeking to avoid activating the compressor using the On/Off control on the display panel.

9) Make sure that the air flow is not obstructed through the finned coil condenser (presence of foreign bodies, packaging, leaves, etc.).

10.1 COMMISSIONING

Once all the checks described above have been carried out, the unit is ready to be started up.

The controller can be accessed directly through the PVC door on the front panel of the machine.

All the thermal switches on the electrical panel QM1, etc., must be inserted in order to power all the various users.



When the IPRO regulator is electrically supplied, be aware that it takes about 20-30 seconds before to activate the display screen.

After this waiting time, if the regulator display is not on, make sure that the phase control relay is active. If it is not, invert the phases at the line terminal board entrance.

The regulator shows the system return temperature (system water inlet) on the top display and the leaving water temperature on the bottom.

The machine waits for a command, with the unit in stand-by, and the icon on. To activate the unit in summer (chiller) mode, press the "sun" key for 5 seconds. For the winter (heat pump) mode, press the "snowflake" key for 5 seconds.

See the instructions in paragraph 6.0 or 6.1.

SUMMER COMMISSIONING

The regulation device is factory-calibrated with the summer operating (cooling) setpoint of 12°C and a differential of 3°C. This means that the unit will be enabled to operate when the return water temperature is over 15°C and will automatically stop when it reaches the temperature of 12°C.

Before starting up the unit, it is good practice to check the setpoint value.

To modify the value see paragraph 7.1.

WINTER COMMISSIONING

The regulation device is factory-calibrated with the winter operating (heating) setpoint of 40.0°C and a differential of 3°C. This means that the unit will be enabled to operate when the return water temperature is below 37°C and will automatically stop when it reaches the temperature of 40.0°C.

Before starting up the unit, it is good practice to check the setpoint value by proceeding as follows:

To modify the value see paragraph 7.2.

10.2 USER SYSTEM INTERFACE

The TONON® chiller and heat pump units can be interfaced with different types of systems. Thus it is important to respect certain technical plumbing and electrical aspects in order to avoid problems of varying degrees of severity during operation.

1. All the units are automatically temperature-controlled. During the operating period, it is preferable for the unit to be constantly active, so as to keep the water in the user system at the right temperature.

DO NOT USE THE AMBIENT THERMOSTAT TO SWITCH THE MACHINE ON AND OFF.

2. All the units require a constant water flow to the heat exchanger. It is therefore important that there is no variation in the flow during unit operation.

NEVER INTERCEPT THE MACHINE DELIVERY AND RETURN PLUMBING IN ANY WAY.

3. All the units require a nominal water flow which guarantees a temperature differential of approximately 5 °C between the heat exchanger inlet and outlet. One of the most simple controls involves checking that there are no excessively high pressure drops in the system.

CHECKS DURING OPERATION

11.0 GENERAL INDICATIONS

- Units supplied complete with a "winter control" (accessory DCP condensation control) permit operation even at low external air temperatures (min. -10°C).

This device runs by activating the fan rotation speed modulation on the basis of the condensed refrigerant pressure.

When the compressor is started up, the fan is immediately engaged at maximum rotation speed.

After a short time, the regulation device automatically enables air flow modulation in order to keep the condensation temperature / pressure constant within the values established on the basis of the external air temperature.

The regulation device is set to avoid damaging simultaneous compressor start-ups, meaning that timers are active during the normal operating cycle.

11.1 CHECKS

- Water temperature

Once normal operating conditions have been reached, check the difference between the inlet and outlet water temperature. The inlet and outlet water temperatures B1 - B2 are normally shown on the display.

The temperature difference should be between **4.5 and 5.5 °C**.

Greater differences indicate a lack of water circulation in the system (in this case, check the pump characteristics).

Lower differences indicate excessive water circulation in the system (in this case, you can reduce the water flow using the intercept valves in the system).

- Operating temperatures / pressures

With the Galaxy chiller running regularly, use the pressure gauges (supplied as accessories or to be connected in the field) to check the condensation (high pressure side) and evaporation (low pressure side) temperatures.

High pressure side:

Ambient temp. °C	30	-	35
Pressure Bar	22/23	-	31/32

Low pressure side:

Chilled water T. °C	15	-	7
Pressure Bar	9,4/10	-	7,5/7,8

- Refrigerant charge

The temporary presence of bubbles visible through the liquid indicator (if present) should be considered normal. The persistence of the phenomenon indicates a lack of refrigerant inside the cooling circuit.

The refrigerant charge is indicated on the identification label stuck to the machine.

- Presence of humidity

After a few hours of operation, check the colour of the crown inside the liquid indicator (if present):

- a fairly yellow colour indicates the presence of humidity in the refrigerant circuit. In this case the circuit needs to be dried out by qualified personnel.

- Refrigerant gas overheating temperature

Corresponds to difference between the gas temperature in the suction pipe and the evaporation temperature read on the pressure gauge.

Good working order is envisaged for the unit at values between 4 and 10 °C.

- Refrigerant liquid undercooling temperature

Corresponds to the difference between the condensation temperature read on the pressure gauge and the temperature measured in the liquid pipe.

- Electrical absorption

Check that the electrical absorption corresponds to the values in the electrical data table.

11.2 CONTROL AND SAFETY FEATURES

All the units have a regulation device and a series of safety features, as described in the regulator parameters table. These devices are factory-calibrated and checked during the testing phase before delivery. Once the unit has been installed and after a reasonable period of operation, it is good practice to check the effectiveness of the control / safety devices and their correspondence to the calibration values provided in the following tables.

Safety features

Device	setpoint	diff. band
Antifreeze thermostat	4°C	3°C

- alarm activation temperature: setpoint
- re-enablement temperature: setpoint + diff.

Device	setpoint	diff. band
High pressure switch	42 Bar	7 Bar

- alarm activation pressure: setpoint
- re-enablement pressure: setpoint - diff.

Device	setpoint	diff. band
Low pressure switch	2 Bar	1.3 Bar

- alarm activation pressure: setpoint
- re-enablement pressure: setpoint + diff.

Comp. overload prot. 1.33 x I nom. comp.

The antifreeze and high pressure alarms must be reset manually. Before restoring the blocked unit, check the cause of the fault. If the alarm persists, contact the **TONONFORTY® Authorised Service Centre** for assistance.

MAINTENANCE

12.0 GENERAL INFORMATION

Before leaving the factory, all the machines are carefully tested during operation for a sufficient period of time to ascertain that the components are in good working order and that all the control and safety features intervene effectively.

Once it has been correctly installed, no further fine tuning will be required unless repairs are made or anomalous operating conditions arise.

However, it is indispensable to carry out periodic checks in order to ensure that it is in good working order, especially after prolonged periods out of use.

This maintenance work should only be carried out by qualified TONONFORTY® personnel, following the instructions given in this manual.

The maintenance operations described below should be considered "routine" and play an extremely important role with regard to the operating quality and working life of the machine.

12.1 PERIODIC MAINTENANCE AND CHECKS

Monthly checks

- Check the operating pressures on the high and low pressure side using a common pressure gauge assembly or, if provided, the pressure gauges wired into the machine itself.

Nominal operating pressures:

External air temperature: 35°C
High pressure side Bar 31/32

Water temperature: 12-7 °C
Low pressure side Bar 7,5 / 7,8

Check that the safety devices are in good working order and make sure that the intervention values correspond its own set.

Check the refrigerant charge through the liquid indicator if present on the unit. In normal operating conditions, the presence of bubbles seen through the indicator could suggest a potential lack of refrigerant.

Also check the colour of the crown inside the liquid indicator. A yellowish colour indicates the presence of moisture, meaning that the filter needs to be replaced and, if this is not sufficient, the cooling circuit may need to be dried out.

Check the level of oil in the compressor crankcase. After continuous operation for several hours, the level must settle slightly below the centre line of the sight glass.

Check that the electrical absorption corresponds to the values in the electrical data table.

Check the contents of the plumbing circuit, carefully eliminating any remaining air bubbles through the appropriate bleed devices.

Check the tightness of the electric terminals inside the electrical panel and on the user parts outside the electrical panel.

Six-monthly checks and maintenance

Carry out all the monthly maintenance operations.

Check the cleanliness of the condenser coil. If necessary, clean the fins using compressed air directed against the air flow or, in the event of significant blockages, use a moderate pressure jet of water.

Check the regularity of the noise and vibrations of the moving parts (compressor / fan / pump).

12.2 SEASONAL SHUTDOWN

The GALAXY and ZENIT water chillers and heat pumps are normally used in building air conditioning systems and thus remain inactive during the winter period.

If the machine is installed in zones where there is a possibility of frost during the winter, it is indispensable to drain the water contained in this system or mix it with antifreeze solutions in suitable percentage parts. In the latter case, the performances of the machine will be penalised slightly and the pump must be sized taking into consideration the variation of the water flow rate parameters and pressure drops of the evaporator. (see table in par. 3.1).

N.B. IF THE UNIT IS EQUIPPED WITH THE EVAPORATOR ANTIFREEZE HEATING ELEMENT, DO NOT DISCONNECT THE LINE VOLTAGE SO AS TO ENSURE THE SAFETY DEVICE IS NOT EXCLUDED DURING THE COLD PERIODS.
The antifreeze heating elements are also active with the machine in Stand-by.

12.3 SAFETY INFORMATION

All the maintenance and repair operations, the replacement of any component, topping up with refrigerant gas and dismantling the unit should be carried out by personnel qualified to work on air conditioning units.

Electrical wiring

Install an automatic differential switch near the unit. The switch must be of adequate capacity for the electrical absorption. Earth the unit and check the effectiveness of this connection.

Refrigerant fluids

The type of refrigerant used is identified on the technical data label on the plumbing connection side.
The lubricant oil used is identified on the compressor label.

Warnings

In the event of accidental leakage of the refrigerant gas, please observe the following precautions:

- The refrigerant gas can cause cold burns if it comes into contact with your skin or eyes. In this case it is advisable to use gloves and protective clothing as well as protection for the eyes and face.
- The inhalation of refrigerant gas over a long period of time can cause loss of consciousness and cardiac problems. Higher concentrations can cause asphyxia due to the lack of oxygen present in the surrounding atmosphere.
- Avoid the use of open flames, which could cause the formation of toxic substances through combustion.

12.4 DEMOLITION OF THE MACHINE AND DISPOSAL OF HARMFUL SUBSTANCES

The demolition and handling of the substances used in the machine must be carried out by authorised personnel, in keeping with current legislation. Harmful substances such as compressor oil and refrigerant fluid must not be disposed of directly into the environment, but recovered and delivered to specific collection centres. All the identification labels and technical documentation accompanying the machine must be destroyed.

12.5 TROUBLE SHOTTING

FAULT	SYMPTOM	PROBABLE CAUSE	RECOMMENDED OPERATION
The machine does not start	The display panel does not light up	No power	Check the wiring to the general power-supply terminals and check the voltage values. Check the fuses on the secondary side of the auxiliary transformer.
		Display screen delay time in progress.	Wait 20 /30 seconds after provide supply voltage
		Phase direction inverted. The phase control relay KA3 does not give consent. Signal LED inactive.	Invert the electrical panel terminal board input phases.
	The display panel is on, but the machine does not start	Unit in STAND_BY	See paragraph 6.0 for machine activation.
	The display panel shows the label OFF	No external consent	Check the connections to external consent terminals 2-3.
	The machine does not start and the comp. LED on the display panel starts to flash	Timer on	Wait for the timer to run its course (max. 360 seconds) after which the compressor should start
	The bottom display on the control panel flashes, indicating one or more alphanumerical codes alternating with the temperature value	One or more safety devices have triggered an alarm	Check the type of safety device that has intervened, remove the causes of the alarms and reset the safety device (see list of alarm codes)
The compressor stops and starts continuously	Normal operation, excessively frequent stops and starts due to intervention of the low pressure switch	Lack of refrigerant	Identify and eliminate the refrigerant leak and top up
	Suction pressure too low and frost on the filter	Liquid line filter blocked	Replace the filter
The compressor operates without ever stopping	Excessively high temperature in the air-conditioned room	Excessive thermal load	Check the infiltrations and insulation
	Excessively low temperature in the air-conditioned room	The thermostat is triggered at a temperature that is too low	Recalibrate or repair the thermostat
	Bubbles on the refrigerant passage indicator	Lack of refrigerant	Identify and eliminate the refrigerant leak and top up
The compressor is noisy	The compressor is noisy, or the delivery pressure is too low and the suction pressure is too high	Wear or fault in the compressor compression spirals	Overhaul the compressor
	The compressor makes a hammering noise. The suction pipe is abnormally cold	Broken parts inside the compressor	Overhaul the compressor
		Liquid return	Check for overheating and the position of the expansion valve bulb
		Expansion valve stuck in the open position	Repair or replace the expansion valve

FAULT	SYMPTOM	PROBABLE CAUSE	RECOMMENDED OPERATION
The system performance is below normal	The thermostatic valve whistles	Vaporisation of the refrigerant liquid	Add refrigerant
	Temperature difference in the refrigerant pipe near the filter or the expansion valve	Filter or solenoid valve blocked	Clean or replace
	Intermittent or continuous operation	Expansion valve blocked or obstructed	Repair or replace.
	Excessive overheating	Poorly regulated overheating	Regulate the expansion valve and check for overheating
Excessive pressure drop in the evaporator		Check for overheating and recalibrate the expansion valve	
Excessively high delivery pressure	Excessively hot air at the condenser outlet	Lack of refrigerant	Check the state of the fan and look for any obstacles to the air flow
		Dirty condenser	Remove the material blocking the condenser (leaves, paper, etc.)
	Cold air at the condenser outlet	Circuit with too much refrigerant, condenser partially flooded	Remove refrigerant from the condenser
Suction pressure too high	The compressor operates without ever stopping	Excessive evaporator load	Check for excessive external air infiltrating into the air-conditioned room
	Abnormally cold suction pipe Liquid return to the compressor	Over-supply to the expansion valve	Regulate the degree of overheating and check the bulb position
		Expansion valve stuck in the open position	Repair or replace the valve
	Noisy compressor	Damaged compressor compression spirals	Overhaul the compressor

WIRINGS DIAGRAM

**AZIENDA CON SISTEMA DI
GESTIONE PER LA QUALITÀ
CERTIFICATO DA DNV
=UNI EN ISO 9001:2000=**

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