

Qualiterme

TECHNICAL INSTRUCTIONS MANUAL FOR INSTALLATION AND PREVENTIVE MAINTENANCE



HYBRID LINE

Equipment compliant with standards
NR (1012), NBR (5410, 7007 ASTM A 36, 13971).



INDEX

Qualiterme Presentation	02
Receiving your equipment / Transport / Equipment Handling.....	03
Equipment Installation / Installation suitable for Equipment with Air Condensation.....	04
Network Installation Equipment Hydraulics.....	06
Network Installation Electrical / Power Cable Sizing.....	07
Tables of Guidance.....	08
Sizing of the Protection Cable (Earth).....	10
Sizing of Neutral Conductor Three-Phase Equipment.....	11
Neutral Conductor Sizing Single-phase Equipment.....	12
Connecting the Equipment / Retightening the Electrical Components.....	13
Antifreeze Care / Cleaning the Hydraulic Network.....	14
Getting to know your Dual Hybrid Equipment.....	15
Electrical Panel Layout – Double.....	16
Getting to know your Quadruple Hybrid Equipment.....	17
Panel Layout Electric – Quadruple.....	18
Basic cycle of the Refrigeration System.....	19
Equipment Components.....	20
Condensing Systems / AR Condensation.....	24
Qualiterme Equipment Inverter System.....	25
Equipment Maintenance.....	26
Cleaning the Air Condenser (fan).....	27
Cleaning the Condenser a Water (Cooling Tower).....	28
Refrigerant Charge Inspection / Carter Oil Inspection / Refrigerant Leak.....	29
General Characteristics of Qualiterme Equipment.....	30
Technical reports.....	31
Qualiterme Warranty Term.....	32
Revisions.....	33
Important Information.....	34

Apresentação

Congratulations! You have just purchased a product produced with ISO 9001 quality control, we believe you have made an excellent investment, Qualiterme continually seeks to produce equipment with the highest efficiency, profitability and cutting-edge technology to satisfy the demands of its customers, generating profit and greater productive results for your company.



"Reservamo-nos o direito de realizar alterações, visando melhorias às máquinas, sem prévio aviso."

With more than 25 years in the market, the company Qualiterme has an area of approximately 17,127.50 m², located in the São José neighborhood in Novo Hamburgo, our company is focused and committed to developing products and services that surpass us every day and satisfy the needs of our customers!

Qualiterme is a company that operates in the area of manufacturing equipment for industrial refrigeration, developing high quality equipment, using cutting-edge technology. We offer your client equipment suitable for each area of activity within the industrial sector, such as the dairy, brewery, plastic, hospital and other sectors. We have a strong sales and after-sales team, technical assistance, quality control, product development engineering. Qualiterme is focused on meeting the needs of its customers with productivity and productive savings.

Receiving your equipment

You have just received a product with Qualiterme quality and trust. Carefully observe the items below so that your equipment is in perfect condition as requested:

Is the equipment in accordance with your purchase order?
Was the equipment not dropped or tampered with during transport?
Are the painting and structure of the equipment in perfect condition?
Is the equipment serial number exactly what is on the invoice?

NOTE: If you find any non-conformity in the equipment, contact the Qualiterme commercial department.

Transportation/Handling of Equipment

Due to the weight and height of the equipment, it must be transported with extreme care, avoiding the risk of tipping over, using appropriate equipment to avoid damage to the structure.

Adequate equipment for safe transport.

Forklift - Pallet trucks - Winch or crane - Overhead crane



CORRECT WAY Assembling the equipment with a winch.



WRONG WAY Forklift forks need to go beyond all equipment to avoid damage to components.



RIGHT WAY Forklift forks need to overtake the equipment.

Equipment Installation

As this is equipment that has larger quantities of electronic components, greater care is required in both its operation and maintenance.

Do not leave the Compressor Inverter without the protective cover;

Clean the air inlet screens on the Compressor Inverter protective cover weekly;

When washing the equipment with water, be careful not to get the Compressor Inverter wet;

Retighten the inverter and compressor power contacts every three months;

Inspect whether the compressor crankcase oil resistance is working;

Equipment installation

Suitable installation for equipment with air condensation

Air-condensed equipment can be installed in different types of environments as long as certain precautions are taken:

Do not suffocate the sides of the equipment;

Do not suffocate and/or reduce the hot air output from the fans;

Allow air to enter at room temperature on the sides of the equipment;
when the roof over equipment is required, leave an opening (little lantern) in the roof so that the air can escape;

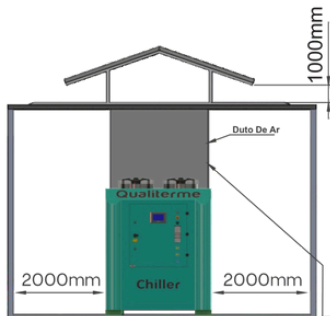
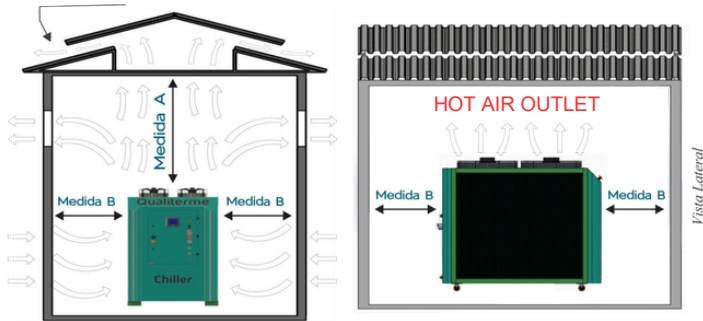
If there is a roof over the equipment where it is not possible to make an opening, it is necessary to create an air duct over the equipment taking the hot air to the outside.

Ensure that hot air from the fans does not return to the equipment.

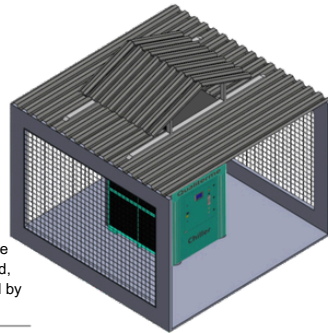
If the equipment is not properly installed, there may be an increase in energy consumption, loss of equipment efficiency and also failures that will inhibit the equipment from working.

Air Duct Illustration Drawing

Note: Minimum opening of
1 meter



Note: In cases where
air ducts will be used,
the height is defined by
the customer.



ATTENTION!!!

Qualiterme does not recommend the installation of its equipment (Chiller's), under a DIRECT HEAT EXCHANGE regime (Chiller x Product), such as in industries whose activity is food or derivatives, in a situation where contact with product handling may occur, in accordance with laws and Brazilian regulations. If cooling equipment is used for the food and derivatives segment, the company instructs that a DEMOUNTABLE SECONDARY PLATE EXCHANGER is also installed for periodic cleaning.

Equipment Hydraulic Network Installation

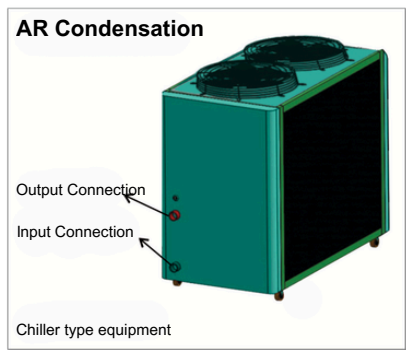
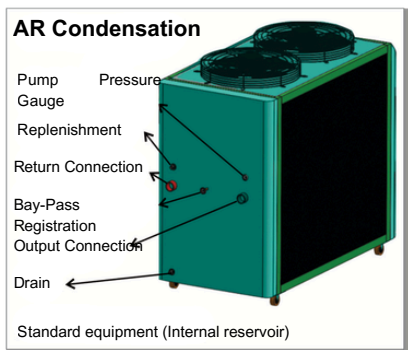
All Qualiterme coolers have connections on the outside of the cabinet, thus facilitating their installation, eliminating the need to open the sides of the equipment. Connections can be supplied in various shapes and sizes, in copper, PVC, stainless steel, galvanized, etc. This according to need. See specifications in the equipment supply proposal.

NOTE: We ask that you be careful with PVC connections when connecting the network to the equipment, especially if you use steel connections to make the connection, as excess force or thread sealing may cause the connection to break, therefore we ask Be careful when adjusting connections. The inputs, outputs, return, refueling, marked next to each connection on the equipment, must also be observed in order to avoid possible problems and damage to the equipment.

ATTENTION!!!



When carrying out the hydraulic installation, respect the size of the equipment's inlet and outlet pipes. No reductions should be made in the main process network.



Important:

The machine can be equipped with a "Y" filter, disc filter or screen filter according to the specifications of each equipment or type of application. All filters must be periodically cleaned to avoid machine downtime due to clogging or flow failure.

NOTE: It is essential that the chilled water network is correctly insulated, as incorrect insulation or even non-insulation may reduce the equipment's performance due to cold loss.



ATTENTION!!!

When installing a chiller with piping, the first return water must be thrown out of the chiller to prevent any remaining dirt inside the piping from entering the machine's tank.

Electrical Network Installation of Equipment

Installing the electrical network of your equipment requires great care, which is why it must be carried out by a technician and/or engineer qualified to carry out the service. An inadequate electrical installation generates huge problems in the equipment, such as increased energy consumption due to heating of the cables, risk of fire, burning of the motors, failures that stop its operation due to installed protections, etc...

To connect the equipment to the electrical network, some items must be observed to ensure correct operation:

Is the voltage indicated on the electrical panel compatible with that available at the factory? Check the rated current of the equipment to size the power cable; > Carefully check the power consumed in KW on the equipment's nameplate; All Qualiterme equipment has a fault and phase sequence relay installed in the electrical panel, so all motor rotation directions are tested and adjusted according to the relay. When energizing the equipment, check whether the Yellow LED on the phase relay is on, ensuring that the motors are in the correct direction. If it is not lit, the direction of the phases is incorrect, so the electrical supply phases must be reversed.



ATTENTION!!!

Qualiterme equipment only has a disconnecter for power supply in its electrical panel, which is not considered a protection circuit breaker. To do this, it is mandatory to install a general protection circuit breaker for the equipment in the factory panel. They only have a disconnecter for power supply in their electrical panel, which is not considered a protection circuit breaker. To do this, it is mandatory to install a general equipment protection circuit breaker on the factory panel.

Sizing of Power Cables

When sizing the power circuit power cables, the following must be taken into account:

1. PVC insulated cable, current as per (Table 36 of NBR 5410).
2. Method B2 (Table 33 of NBR 5410).
3. A single multipolar cable/circuit, in closed conduit (table 42 of NBR 5410).
4. Considering an ambient temperature of 40° C (Table 40 of NBR 5410)
5. Considered a voltage drop of 2% from the Electrical Panel (client) to the Refrigeration Unit panel.

Table provided guidance, within the conditions specified in items 1 to 5 above

Electrical cable capacity

CABO (mm²)	MAXIMUM CURRENT (AMPERS)	MAX LENGTH VOLTAGE DROP 2% - 380V
2,5	17,40 A	30 m
4	23,49 A	35 m
6	29,58 A	40 m
10	40,02 A	50 m
16	53,94 A	60 m
25	69,60 A	70 m
35	86,13 A	80 m
50	102,66 A	90 m
70	129,63 A	100 m
95	155,73 A	115 m
120	179,22 A	120 m
150	205,32 A	125 m
185	233,16 A	130 m
240	272,31 A	135 m
300	311,46 A	135 m

PVC insulated cables Current as per (table 36 of NBR 5410)

Nominal sections mm²	Number of loaded conductors											
	A1		A2		B1		B2		C		D	
	Reference methods indicated in table 33											
	2	3	2	3	2	3	2	3	2	3	2	3
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
COPPER												
0,5	7	7	7	7	9	8	9	8	10	9	12	10
0,75	9	9	9	9	11	10	11	10	13	11	15	12
1	11	10	11	10	14	12	13	12	15	14	18	15
1,5	14,5	13,5	14	13	17,5	15,5	16,5	15	19,5	17,5	22	18
2,5	19,5	18	18,5	17,5	24	21	23	20	27	24	29	24
4	26	24	25	23	32	28	30	27	36	32	38	31
6	34	31	32	29	41	39	38	34	46	41	47	39
10	46	42	43	39	57	50	52	46	63	57	63	52
16	61	56	57	52	76	68	69	62	85	76	81	67
25	80	73	75	68	101	89	90	80	112	96	104	86
35	99	89	92	83	125	110	111	99	138	119	125	103
50	119	108	110	99	151	134	133	118	168	144	148	122
70	151	136	139	125	192	171	168	149	213	184	183	151
95	182	164	167	150	232	207	201	179	258	223	216	179
120	210	188	192	172	269	239	232	206	299	259	246	203
150	240	216	219	196	309	275	265	236	344	299	278	230
185	273	245	248	223	353	314	300	268	392	341	312	258
240	321	286	291	261	415	370	351	313	461	403	361	297
300	367	328	334	298	477	426	401	358	530	464	408	336

Method B2 (Table 33 of NBR 5410)

ILLUSTRATIVE SCHEME	DESCRIPTION	ILLUSTRATIVE SCHEME	DESCRIPTION
	Multipolar cable in visible conduit with circular section on the wall or spaced from it, smaller than 0.3 times the diameter of the conduit.		Unipolar cables or multipolar cables in non-circular section conduits embedded in masonry.
	Multicore cable in exposed conduit with non-circular section on the wall		Multicore cable in cable tray on a wall in horizontal or vertical route.
	Multipolar cable in circular section conduit embedded in masonry		Multipolar cable in closed channel embedded in the floor.
	Single-core cable or multi-core cable in circular section conduit in construction space.		Multipolar cable in cable trays or suspended profile
	Insulated conductors in non-circular section conduits or cable trays in construction spaces. $1.5 De \leq V < 20 De$		Insulated conductors or unipolar cables in circular section conduits contained in a closed channel with horizontal/vertical path. $1.5 De V < 20 De$
	Single-core or multi-core cables in non-circular section conduits or cable trays in construction spaces.		-Insulated conductors or unipolar cables in a channel equipped with separations in the wall.
	Insulated conductors in non-circular section conduits embedded in masonry. $1.5 V < 5 De$		-Multipolar conductors in a channel equipped with separations in the wall.
			-Insulated conductors or unipolar cables in a channel embedded in the wall.
			-Multipolar conductors in channel embedded in the wall.

A single multipolar cable/circuit, in closed conduit (table 42 of NBR 5410)

REF	Way to group conductors	Number of multi-core circuits or cables												Reference Method Tables
		1	2	3	4	5	6	7	8	9 a 11	12 a 15	16 a 19	≥ 20	
1	In beam: outdoors or on a surface; sausages; in closed duct	1,00	0,80	0,70	0,65	0,60	0,57	0,54	0,52	0,50	0,45	0,41	0,38	36 to 39 methods A to F
2	Single layer on wall, floor or non-perforated tray or shelf	1,00	0,85	0,79	0,75	0,73	0,72	0,72	0,71	0,70				Methods 36 to 37 C
	Single layer on the ceiling													
3	Single layer in perforated tray	0,95	0,81	0,72	0,68	0,66	0,64	0,63	0,62	0,61				
4	Single layer on bed, support, etc...	1,00	0,88	0,82	0,77	0,75	0,73	0,73	0,72	0,72				38 to 39 methods E and F
5	Camada única sobre leito, suporte etc...	1,00	0,87	0,82	0,80	0,80	0,79	0,79	0,78	0,78				

Considering an ambient temperature of 40°C (table 40 of NBR 5410)

Room temperature	Isolation	
	PVC	EPR ou XLPE
10°C	1,22	1,15
15°C	1,17	1,12
20°C	1,12	1,08
25°C	1,06	1,04
35°C	0,94	0,96
40°C	0,87	0,91
45°C	0,79	0,87
50°C	0,71	0,82
55°C	0,61	0,76
60°C	0,50	0,71

The power supply for the Chiller power circuit is unique, regardless of the number of cycles of the equipment. Even if it is for little use, the installed power of the equipment described on the nameplate must be followed.

The current to be used as a reference for sizing power cables is the MAXIMUM OPERATING CURRENT, already identified in the electrical cable table, even in installations where the air entry temperature into the condensers is normally low, this current can be reached during the start of operation, for example in the case of a high chilled water inlet temperature that originates from the continuous operation of the water pump with the Chiller stopped.

Sizing of the Protection Cable (Earth)

When sizing the Chiller grounding cable, the following must be taken into account:

In some cases, Electromagnetic Interference may occur in the Chiller control circuits, making its operation difficult due to the variation in pressure and temperature signals caused by it. To avoid this Electromagnetic Interference in the Chiller's operation, it is necessary to ensure that the grounding level is not higher than 5 ohms;

The protection cable must be sized taking into account the maximum operating current of each circuit. Always follow the NBR 5410 recommendations to complement the sizing of protection cables (ground) and power circuit supply

TABLE 58 OF ABNT NBR5410 STANDARD

Minimum protective conductor section

Section of phase conductors S mm²	Minimum section of the corresponding protective conductor mm²
S ≤ 16	S
16< S ≤ 35	16
S > 35	S/2



ATTENTION!!!

This machine requires grounding! Grounding is essential for both the operator's safety and the proper functioning of the installed electronic components.

Neutral Conductor Sizing Three-Phase Equipment

In three-phase equipment, the neutral conductor is used only for electrical control, generating low currents, so check the number of refrigeration circuits in your equipment to size the neutral conductor according to the following table:

Equipment Circuit	Neutral Conductor Section mm²
Simple (1 circuito)	2,5
Dupla (2 circuito)	4
Quadrupla (4 circuitos)	6

Neutral Conductor Sizing for Single-Phase Equipment

The neutral conductor may have a reduced section in relation to the phase conductors in accordance with table 48 and other conditions of NBR 5410.

Table 48 - Reduced section of the neutral conductor

Section of phase conductors mm ²	Reduced neutral conductor section mm ²
$S \leq 25$	S
35	25
50	25
70	35
95	50
120	70
150	70
185	95
240	120
300	150
400	185
The conditions for using this table are given in 6.2.6.2.6. of NBR 5410.	



ATTENTION!!!

The electrical installation project to power the Liquid Refrigeration Unit must be signed by a professional qualified by CREA, with the issuance of a Technical Responsibility Note (ART)

Retightening of Electrical Components

Before starting up the equipment, the power circuits and electrical controls must be retightened, as they may become loose during transport due to vibration. As stated in Standard NBR 5410 item 8.3.2.2, the components must be retightened within a maximum of 90 days after the equipment starts operating, and repeated at regular intervals. During the operation of your equipment, there will certainly be an expansion and contraction of the electrical conductors, causing the components to loosen, causing poor electrical contact, causing damage to the components and conductors.

This retightening is not the responsibility of Qualiterme, which does so in factory before and after testing.



ATTENTION!!!

Make sure that the main switch has been disabled and that there is no electrical voltage in the circuit.

Be responsible!

For any electrical maintenance on your equipment, correctly follow the 5 de-energization steps

1 step: Sectioning

2nd step preventing re-energization,

3rd step: Verification of the absence of tension.

4th step: Installation of temporary grounding with equipotentialization of the circuit conductors,

5th step: Protection of energized elements in the controlled area.

Turning on the Equipment

After correctly following the installation procedure, you will be able to start the equipment, always respecting other instructions. It is the sole responsibility of the customer to carry out the STARTUP of the equipment, with Qualiterme being able to perform this function as per prior agreement on the purchase of the equipment, or request for a quote after entry,

The equipment leaves the factory with its standard configuration, being able to work from 4°C to 15°C with water, that is, in applications where it operates at temperatures outside the standard configuration, a new configuration must be carried out in the field or by telephone with a Qualiterme technician and/or authorized technician (read the controller's instruction manual). in order to adapt all existing components and protections in the software to the controller



ATTENTION!!!

CAREFUL!! It is necessary to turn on the power supply to the gear control 24 hours before operating the compressors.

This is necessary so that the compressor crankcase resistors eliminate the accumulation of liquid refrigerant inside it, which is close to the crankcase heat.

prevents the compressor from breaking due to dilution of the oil with the refrigerant fluid, or a liquid spill

Antifreeze Ratio for Low Working Temperatures

For equipment with a working temperature below 4°C, it is necessary to add antifreeze fluid to the circulating liquid, its addition must be proportional, depending on the desired working temperature.

Antifreeze Care

Proportion of Antifreeze for Low working temperatures for equipment with working temperatures below 4°C, it is necessary to add antifreeze fluid to the circulating liquid, its addition must be proportional according to the desired working temperature, and the usage specifications of the product manufacturer. Compliance standards must be observed, in which application is authorized, according to the needs of each client and with the observance of using a product that is not aggressive to the materials used in Qualiterme equipment, such as PVC steel and copper. These precautions will prevent any type of corrosion or wear on the components. The antifreeze will prevent the equipment's evaporator from freezing, which could lead to its breakdown. In regions where the ambient temperature is below 0 °C, it is also necessary to use some antifreeze: The proportion of antifreeze to be used must be in accordance with the manufacturer's instructions, adjusting the proportion according to the equipment's working temperature.



ATTENTION!!!

An antifreeze substance that does not react with: copper, stainless steel and PVC must be used. Qualiterme does not recommend any specific product or manufacturer.

Cleaning the Hydraulic Network

In new systems, before initial operation, the following precautions must be taken:

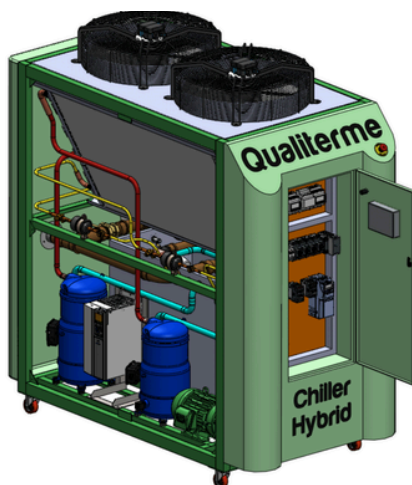
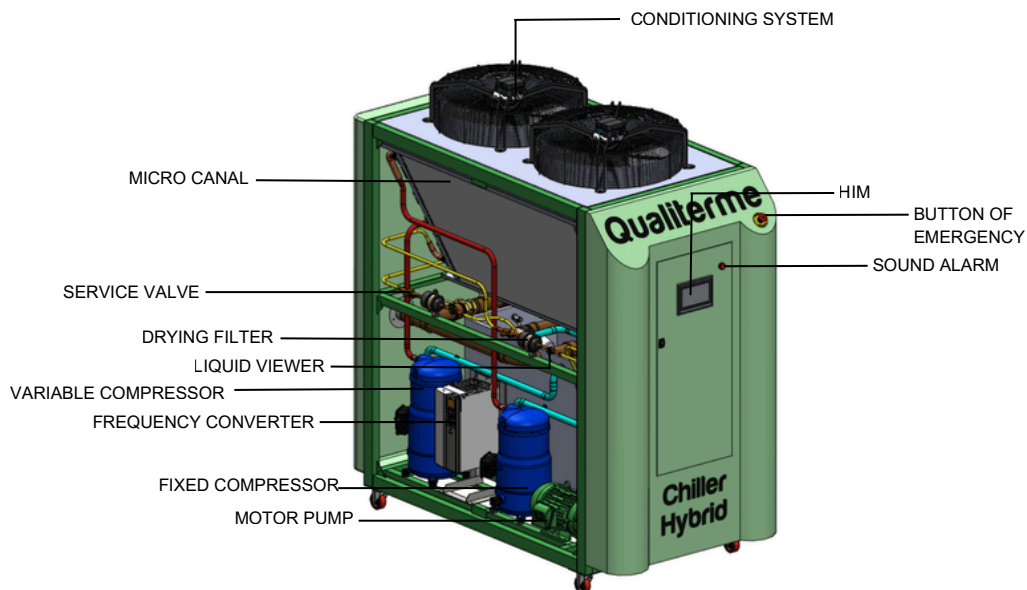
- > Fill the reservoir with clean water;
- > Eliminate water from the first circulation, as it may contain dirt and other debris in the hydraulic network;
- > Clean the filters after the first water circulation:
- > Make sure that false air does not remain in the hydraulic system;
- > Consult a chemical company to treat the water, avoiding the generation of impurities without a system;



ATTENTION!!!

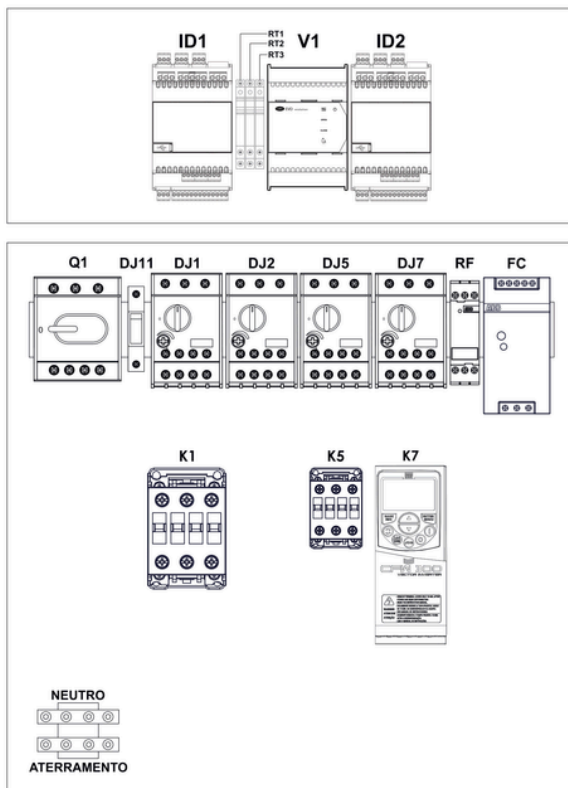
Clean the filters periodically.

Overview



Hybrid – Dupla

Electrical Panel Layout - Double

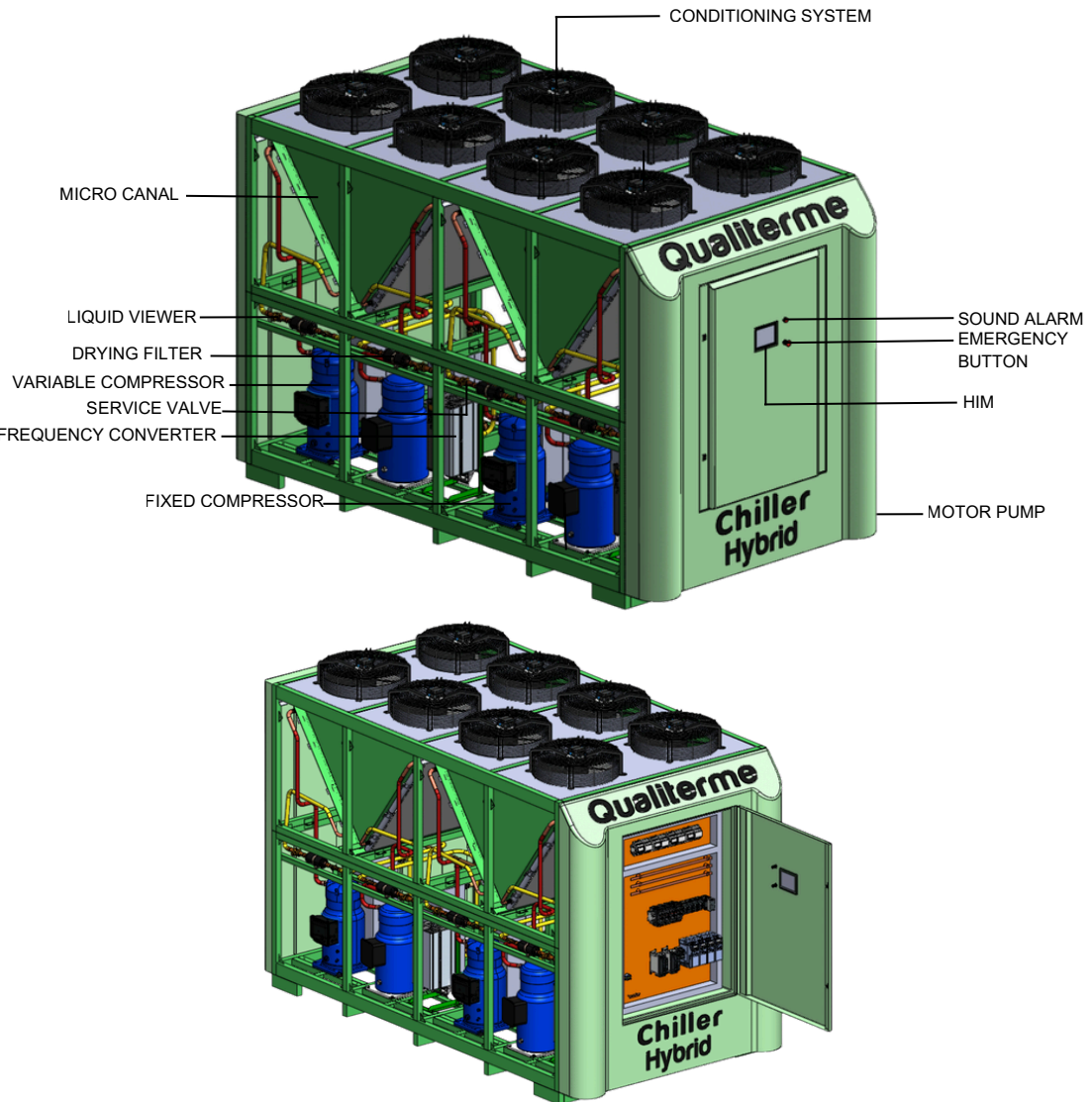


LEGEND

ID1 - COMPRESSOR CONTROLLER 1 - C1
 RT1 - RAIL RELAY DRIVE INVERTER COMPRESSOR C2
 RT2 - FAN INVERTER DRIVE RELAY
 RT3 - CRANKCASE RESISTANCE RAIL RELAY
 V1 - ELECTRONIC VALVE CONTROLLER C2
 ID2 - COMPRESSOR CONTROLLER 1 - C2
 Dj11 - MOTOR CIRCUIT BREAKER 1 X 10A COMMAND
 DJ1 - COMPRESSOR MOTOR CIRCUIT BREAKER 1
 DJ2 - COMPRESSOR MOTOR BREAKER 2
 DJ5 - INTERNAL MOTOR PUMP MOTOR BREAKER
 DJ7 - FAN MOTOR CIRCUIT BREAKER 1.2
 RF - PHASE LACK RELAY

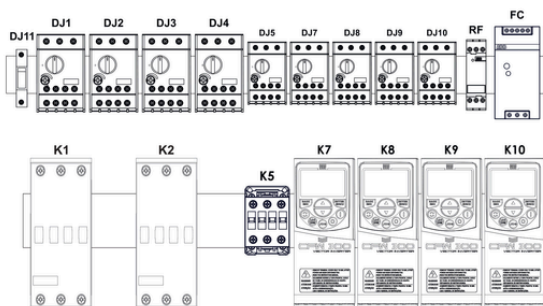
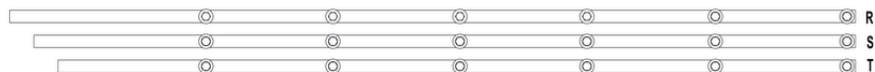
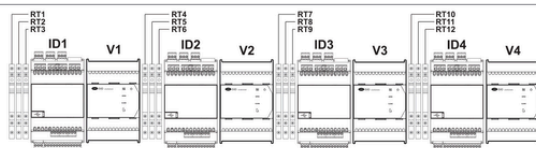
FC - KEYED SOURCE
 K1 - COMPRESSOR 1 INVERTER CONTACTOR
 K2 - COMPRESSOR 2 INVERTER CONTACTOR
 K5 - INTERNAL PUMP CONTACTOR
 K7 - FAN INVERTER 1.2

Overview



Hybrid - Quadruple

Electrical Panel Layout - Quadruple

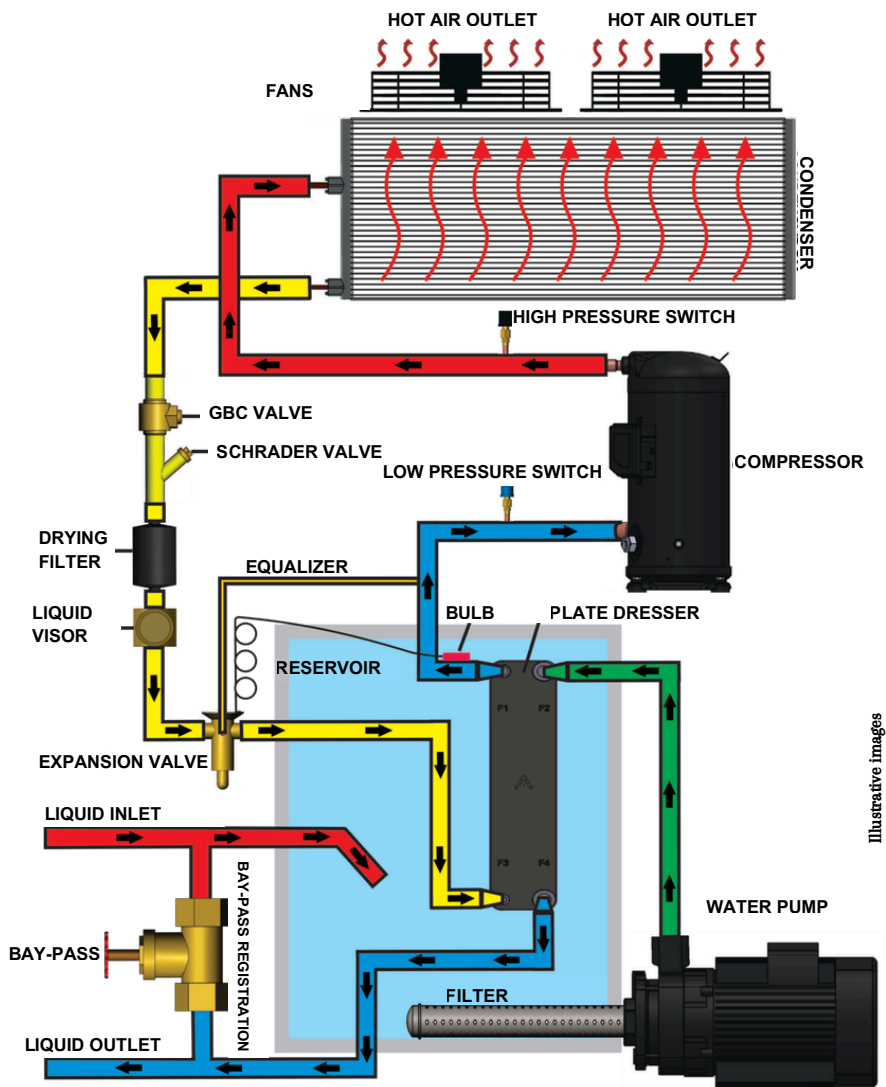


LEGEND

RT1 - RAIL RELAY COMPRESSOR DRIVE C1
 RT2 - CRANKCASE RESISTANCE RAIL RELAY C1
 RT3 - FAN DRIVE RAIL RELAY 1.2
 ID1 - C1 CONTROLLER
 V1 - ELECTRONIC VALVE CONTROLLER C1
 RT4 - C2 COMPRESSOR DRIVE RAIL RELAY
 RT5 - CRANKCASE RESISTANCE RAIL RELAY C2
 RT3 - FAN DRIVE RAIL RELAY 3.4
 ID2 - C2 CONTROLLER
 V2 - C2 ELECTRONIC VALVE CONTROLLER
 RT7 - C3 COMPRESSOR DRIVE RAIL RELAY
 RT8 - CRANKCASE RESISTANCE RAIL RELAY C3
 RT9 - FAN DRIVE RAIL RELAY 5.6
 ID3 - C3 CONTROLLER
 V2 - C3 ELECTRONIC VALVE CONTROLLER
 RT7 - C4 COMPRESSOR DRIVE RAIL RELAY
 RT8 - CRANKCASE RESISTANCE RAIL RELAY C4
 RT9 - FAN DRIVE RAIL RELAY 7.8
 ID3 - C4 CONTROLLER
 V2 - C4 ELECTRONIC VALVE CONTROLLER
 DJ11 - MOTOR CIRCUIT BREAKER 1 X 10A COMMAND
 DJM1 - COMPRESSOR MOTOR CIRCUIT BREAKER 1
 DJM2 - COMPRESSOR MOTOR BREAKER 2
 DJM3 - COMPRESSOR MOTOR CIRCUIT BREAKER 3
 DJM4 - COMPRESSOR MOTOR CIRCUIT BREAKER 4

DJ5 - INTERNAL PUMP MOTOR CIRCUIT
 DJ7 - FAN MOTOR CIRCUIT 1.2
 DJ8 - FAN MOTOR CIRCUIT 3.4
 DJ9 - FAN MOTOR CIRCUIT 5.6
 DJ10 - FAN MOTOR CIRCUIT 7.8
 RF - PHASE MISSING RELAY
 FC - KEYED SOURCE
 K1 - SOFT START COMPRESSOR 1
 K2 - SOFT START COMPRESSOR 3
 K5 - INTERNAL PUMP CONTACTOR
 K7 - FAN INVERTER 1.2
 K8 - FAN INVERTER 3.4
 K9 - FAN INVERTER 5.6
 K10 - FAN INVERTER 7.8

Basic cycle of the refrigeration system



Equipment components

Compressor Inverter

Frequency converter used to modulate the speed of the compressor, where the PLC sends a signal from 0 to 10V, alternating its speed according to the existing demand of the process.



Illustrative images

Compressor Scroll

Qualiterme Chillers and Chilled Water Units are equipped with Scroll compressors and have a single direction of rotation to compress the gas from suction to discharge (low and high pressure). To define the direction of rotation of the compressor, it is necessary to energize the equipment by turning on the disconnecter and starting the PLC or general ON/OFF Button. If there is an RST Phase Lack alarm, the direction of the phases is reversed. For the correct direction of the phases, simply invert two of the three phases. All Qualiterme equipment has a fault relay and phase sequence, indicating the correct direction of rotation of all motors.



Illustrative images

Compressor Scroll Inverter

Scroll Inverter compressors offer variable speed technology for industrial applications, and can be AC or DC, depending on the manufacturer. It has a permanent magnet motor, ensuring its rotation varies from 1500 rpm to 6000 rpm (25hz to 100hz). Scroll Inverter compressors, which have a single direction of rotation to compress the gas from suction to discharge (low and high pressure). To define the direction of rotation of the compressor it is necessary to energize the equipment by turning on the disconnecter and starting the PLC or General ON/OFF button, if an RST phase lack alarm occurs, the direction of the phases is reversed. For the correct direction of the phases, simply invert two of the three phases. All Qualiterme equipment has a fault relay and phase sequence, indicating the correct direction of rotation of all motors.



Illustrative images

ATTENTION!!!



The compressor should never be left on for more than 30 seconds with its rotation reversed, as it will wear out due to lack of lubrication of the snails, leading to immediate burnout.



Illustrative images

Water pump

The pump has the function of circulating water/antifreeze both in the internal circuit of the equipment and in the factory process network. Qualiterme standard equipment has only one water pump, circulating the equipment and process. In specific cases (special projects) two or more pumps are used, for internal circulation and another for external circulation.

Internal Circulation Pump

It is responsible for circulating the liquid through the equipment's evaporator, carrying out constant thermal exchange with the refrigerant fluid. Due to the exchange efficiency of plate evaporators, there must be constant and adequate circulation of the liquid, preventing it from freezing and losing efficiency.

External Circulation Pump

It is responsible for taking the cooled liquid to the process, which requires very high pressure, or there are several bypasses in the network, taking this liquid to different processes within the factory. It is generally used in equipment with greater cooling capacities, not requiring the cooling system to be turned off, but only the pump for a given process.



ATTENTION!!!

All pumps have a rotation direction, check the correct direction on the pump label, working in the incorrect direction will damage the equipment. Do not let the pump work without liquid. This results in wear of the mechanical shaft seal and loss of warranty.



Illustrative images

Fan

The fans have the function of removing heat from the gas in the Microcanal condenser and releasing it into the external environment. The fans are only used in equipment with air condensation. If the direction of rotation is reversed, a High Pressure failure may occur in the equipment.

Fan Inverter

Frequency inverter used to modulate fan speed, ensuring total control of equipment condensation. The PLC receives a 4 - 220 mA signal from the discharge pressure transducer, the conversion, sending a 0 to 10V signal to the fan inverter.





NTC 10K Stainless Steel Tip Sensors

Temperature sensors have the function of taking an actual reading of the temperature in the place where they are installed. Each refrigeration circuit is composed of four sensors: Aqua Inlet, Water Outlet Super Cold (gas suction) and Super Hot (gas discharge)

In Chilled Water Units, a pressure gauge is installed to adjust this By-pass. This setting (in standard equipment) cannot exceed 2 Kg F/m. Inadequately adjusted registers cause interruption in the water flow from the evaporator (brazen exchanger), causing power failures, flow and internal freezing.



Carel Electronic Controller (CLP)

The PLC is responsible for all of the equipment's control logic, using Carel hardware with software entirely dedicated to Qualiterme equipment. Each refrigeration circuit has an independent PLC, reducing the risk of completely stopping the equipment in the event of a breakdown.



Brazed Plate Changer

The exchangers (evaporator) are components made up of several stainless steel sheets, pressed with copper at a high temperature. In equipment they are used to transfer heat from water or glycol to cold (expanded) gas. Each refrigeration circuit consists of an exchanger that meets the demand of the compressor. It is a compact component that has a large thermal exchange area, generating efficiency and practicality in your equipment. This exchanger requires the installation of a filter at its water inlet, ensuring its protection and safety. If the filter is not installed, the channels between the plates may become blocked, inhibiting thermal exchange, causing the water to freeze internally, breaking the plates.

Attention: If it is necessary to work at a temperature of 4°, it is necessary to use antifreeze fluid as per page 14.



Illustrative images

Y Filter

Y-shaped brass filter, equipped with a stainless steel screen with micro-holes inside. It is installed in the pump suction inside the equipment, in order to filter impurities and debris that may be in the water. This filter is only used in equipment without an internal reservoir, called Chiller.



Illustrative images

Tubular Fabric Filter / Tubular PVC Filter

PVC filter and/or Tubular screen with several micro holes, filtering impurities and debris that may be in the water. It is used in equipment that has an internal reservoir, being installed submerged inside the reservoir in the pump suction.



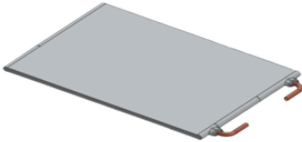
Illustrative images

Electronic Expansion Valve

The electronic expansion valve's function is to control the amount of refrigerant that enters the evaporator, reducing its pressure and considerably reducing its temperature, so that there is heat exchange with the water and/or glycol, allowing refrigeration. Opening and closing control is carried out automatically by a microcontroller by adjusting the necessary Sub Heating for the compressor. This valve is extremely precise, adjusting quickly to process variations, guaranteeing protection and longer useful life for the compressor.

Condensation Systems

MICRO CANAL



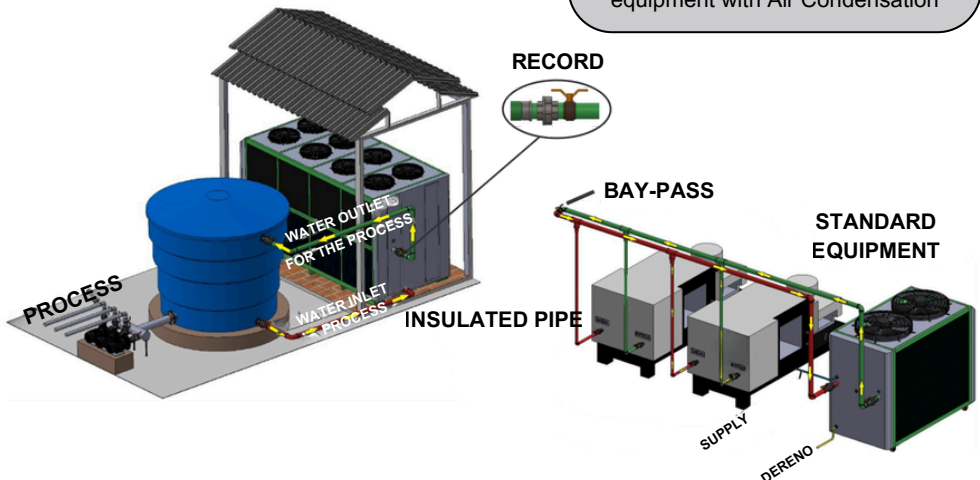
Illustrative images

Air Condensation

Ultra-resistant aluminum condenser equipped with micro channels, removing heat from the gas through axial fans, forcing ambient air to pass between its fins, dissipating heat to the outside environment. Due to its high efficiency and practicality in installing the equipment, this technology is increasingly being used in refrigeration equipment, generating satisfactory results for the customer. Cleaning of microchannel condensers must be carried out periodically at least every three months (where there is a lot of dirt, clean the condenser monthly), avoiding obstruction of the fins, reducing the passage of ambient air, causing loss of equipment efficiency and pressure failures. high, compressor overheating, fan circuit breaker tripping and compressor circuit breaker tripping

Chiller type equipment

Illustrative process containing equipment with Air Condensation



Qualiterme Equipment Inverte System

Inverter Technology Concept

Using inverter technology, the compressors only work at the necessary speed to maintain the heating or cooling of the process, with little energy fluctuation. The inverter system is responsible for controlling the rotation speed of the equipment's compressor, according to the refrigeration needs required by the process.

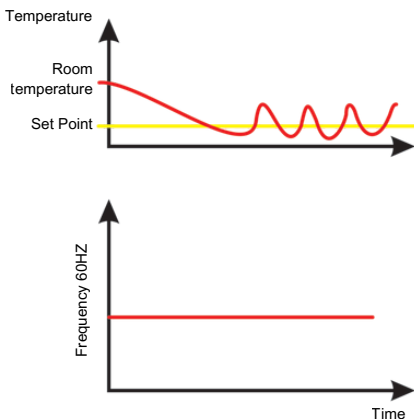
Advantage and Benefits of Inverter Technology

Inverter technology brings with it numerous advantages and benefits, obtaining a return on investment in the short term. Here are some advantages of this technology:

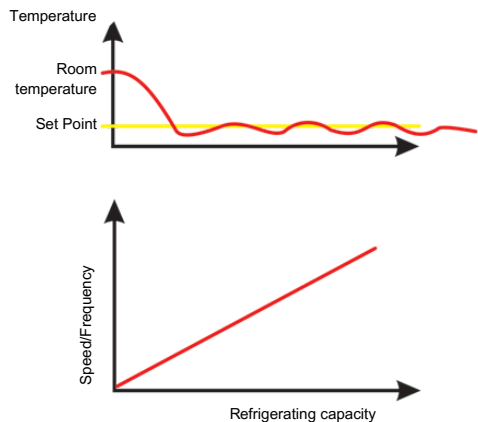
- »Reduced noise level;
- »Better oil management;
- »Accurate temperature/humidity control;
- »The compressor never turns off, avoiding energy peaks;
- »The compressor rotation speed is variable, saving energy;
- »The temperature practically does not fluctuate during the process;
- »30% energy savings, due to capacity modulation for efficient partial load;
- »Return on investment, stipulated in less than a year of operation.

Inverter Technology

Fixed Speed



Variable Speed



Equipment Maintenance

Preventive/Corrective Maintenance

The equipment must be inspected periodically to ensure its proper functioning and reliability in the process. The following warnings should be given special attention.

Completing and stamping the Mandatory Revision sheet (page 36) is essential to avoid losing the equipment warranty

The best way to avoid equipment problems is to carry out a preventive maintenance program, which includes periodic recording of the operating conditions of the system in general, so that its performance can be analyzed over time and, in this way, detect signs of problems that may occur. will cause future damage.

In this way, the system's data record provides a means of detecting imminent failures or, if one is occurring, serving as a subsidy to build a picture of events that cause them.



ATTENTION!!!

The equipment has hot parts, such as the discharge side of the compressor, discharge tubes and condenser collectors that require care so that they are not touched, as they could cause a risk of serious burns.

In the event of any failure in the equipment or system in general, it is important to locate and correct the main cause of the failure, before any repair or replacement. Without correcting the root cause, the problem will repeat itself again.

Below we suggest a basic program to guide preventive maintenance of the equipment, which can be changed according to the needs of the installation, taking into account operational safety:

- » Superficial visual inspection of the condenser(s) weekly;
- » Monthly inspection of electrical cables and components;
- » Monthly cleaning of the condenser;
- » Inspect monthly for possible leaks in the hydraulic network;
- » Comb the crumpled fins when necessary;
- » Apply anti-corrosion varnish (when available) every six months or when necessary;
- » De-energize the equipment, to retighten the electrical contacts on the panel;



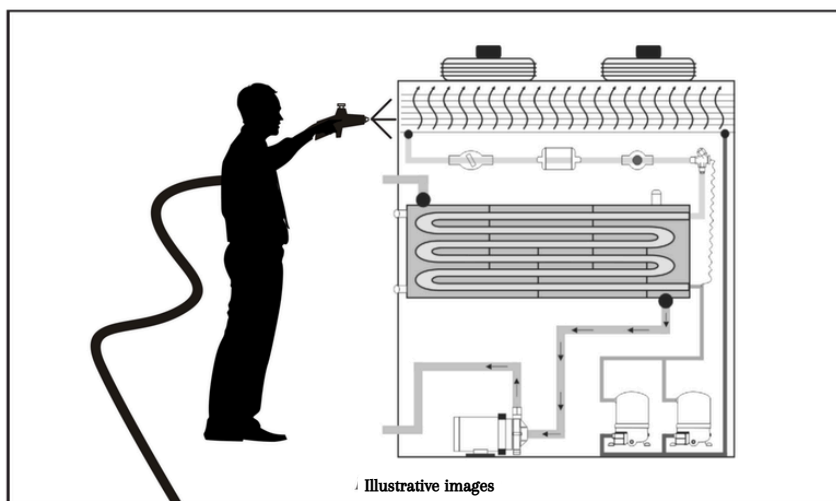
ATTENTION!!!

The disposal of chemical product(s) used in maintenance and/or cleaning of the equipment must be carried out in accordance with local legislation.

Cleaning the Air Condenser (Fan)

The condenser must always be clean as a lack of air circulation causes loss of cooler performance, failure due to high pressure, and fan motor tripping (as it needs air for its own cooling). We request that this component be cleaned every three months, or as necessary. This cleaning must be carried out with compressed air and running water, in order to remove any solid residue or dust that could hinder air circulation. It is recommended that the equipment is stopped every 12 months and the system is cleaned more effectively, if necessary, using a specific product for this purpose. The lack of cleaning in this component, in addition to causing alarms and unexpected stops in the production process, will result in an increase in energy consumption and a loss in the effective capacity of the equipment. When cleaning with water, care must be taken with the motors and electrical components.

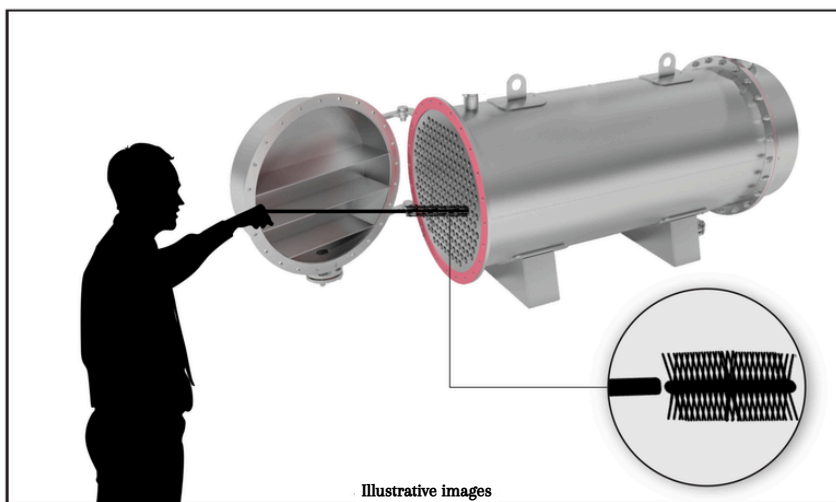
SEE THE FIGURE BELOW HOW TO CLEANING THIS PART:



Cleaning the Water Condenser (Cooling Tower)

This component requires some cleaning care. We recommend that they be cleaned every 3 months or according to the condensation temperature, as this should not exceed 5 degrees above the ambient temperature in each region. If this happens before 3 months, it must be cleaned as soon as this increase in temperature is seen. because in each region the equipment behaves differently or even the type of water used, whether they have treatment or not. Treated water makes the equipment last longer, which is why we ask that your water be sent for analysis at the laboratory of your choice and this can provide the best treatment for your needs. Turn off the liquid cooler, also the cooling tower motor pump, then open the two covers at the ends of the condenser, with a tubular brush up to 2mm larger than the diameter of the copper tube, pass them one by one, rinse and repeat the procedure.

SEE THE FIGURE BELOW HOW TO CLEANING THIS PART:



Once clean, return the two covers to their respective places, taking care not to reverse the position. Check that the sealing gasket is in perfect condition, as if it is damaged on the inside, it could cause poor water circulation, causing little calorie removal by the water.

Refrigerant Charge Inspection

Inspecting the equipment's refrigerant charge prevents unscheduled shutdowns: Periodically check the suction and discharge pressures of each refrigeration circuit using a manifold.

Carter Oil Inspection

Checking the compressor oil ensures that it does not wear out due to lack of lubrication, which could cause it to jam. The compressors have an oil sight glass attached to their housing, where it is easy and quick to check the correct oil level, it should be at 75% of the sight glass full, if it is below it it is necessary to top it up as shown in the figure below



Refrigerant Leak

Before charging the refrigerant fluid into the circuit, it must be completely dehydrated and evacuated. To carry out this work, a Manifold and a Vacuum Pump are required. Follow step by step for correct execution

- » Find the leak point, pressurizing the circuit with oxygen;
- » Repair the leak;
- » Pressurize the circuit again with oxygen, leaving it for 12 hours, ensuring it is sealed;

- » Vacuum the circuit until it reaches 500 microns;
- » Carry out the first charge of refrigerant through the liquid line, filling 80% of the total volume;
- » Fill the remaining refrigerant fluid through suction, with the compressor on;

The refrigerant charge for each piece of equipment is included in the Quality Control Spreadsheet.

Note: To carry out any work on the equipment, look for a specialized technician.



ATTENTION!!!
For additional information or any questions, always contact the Qualiterme Technical Department.

TECHNICAL SPECIFICATIONS

DUAL HYBRID LINE WITH 2 COMPRESSORS

Air Condensation - Calculations performed at a working temperature of 10°C

MODEL	KCAL/H CAPACITY	TRIPHASIC			MONOPHASE	COMPRESSOR SCROLL	WATER PUMP	DIMENSIONS			CONNECTIONS	
		220V	380V	440V	220V			WIDTH (MM)	COMPRIM. (MM)	HEIGHT (MM)	CHILLED WATER INLET/OUTLET	ABASTEC. PROHIBITED
E035	35000	✓	✓	✓	✓	2X5TR	5CV	950	1400	2100	1 ½"	½ "
E065	65000	✓	✓	✓	✓	2X10TR	7.5CV	950	1800	2100	2"	½ "
E105	105000	✓	✓	✓	✓	2X15TR	10 CV	1300	2400	2350	2 ½"	½ "
E125	125000	✓	✓	✓	✓	2X20TR	10 CV	1300	2400	2350	2 ½"	½ "

DUAL HYBRID LINE WITH 2 COMPRESSORS

Air Condensation - Calculations performed at a working temperature of 10°C

MODEL	KCAL/H CAPACITY	TRIPHASIC			MONOPHASE	COMPRESSOR SCROLL	WATER PUMP	DIMENSIONS			CONNECTIONS	
		220V	380V	440V	220V			WIDTH (MM)	COMPRIM. (MM)	HEIGHT (MM)	CHILLED WATER INLET/OUTLET	ABASTEC. PROHIBITED
E205	205000	✓	✓	✓	✓	4X15TR	15CV	2000	2600	2700	2 ½ "	½ "
E250	250000	✓	✓	✓	✓	4X20TR	20CV	2000	2600	2700	3"	½ "

NOTE: FOR EQUIPMENT ABOVE THESE CAPACITIES, CONSULT THE ENGINEERING DEPARTMENT
QUALITERME RESERVES THE RIGHT TO CHANGE EQUIPMENT SPECIFICATIONS WITHOUT PRIOR NOTICE.

Technical Reports for Design and Construction of Equipment

NR-10

We certify that the model Refrigeration Unit acquired meets the premises of Regulatory Standard NR-10 in electrical design and assembly, highlighting:

- 1- All non-electrically conductive metal housings are grounded
- 2- Access to the electrical panel components, only when it is de-energized;
- 3- Compatibility of electrical components with the nominal power of the loads;
- 4- Compatibility of electrical wiring with the nominal power of the loads;
- 5- Updated electrical diagrams.

Technical responsible: Julio Cezar Schenkel - CREA-RS 032469 - ART 11100083


Julio Cezar Schenkel
CREA-RS 032469
ART 11100083

NR-12

A-Manufacturing and safety system.

- 1-The operation, maintenance, inspection and other interventions on machines and equipment must be carried out by workers inhabited, qualified, trained or authorized for this purpose.
- 2-The fixed protection must not be removed during the operation of the refrigeration unit
- 3-Do not have skin contact with the red piping to avoid the risk of burns
- 4-Do not insert limbs or objects inside the hood grille
- 5-Do not open the water pipe with the pump turned on
- 6-Do not open the vent cover (schneiden valve) on the yellow piping, there is a risk of burns
- 7-Perform maintenance on the electrical part only with the unit de-energized
- 8-Installation of grounding in the metal structure.
- 9-Mandatory use of the necessary PPE when carrying out maintenance, especially glasses.
- 10- Standards for machine design and construction NBR 7007 ASTM A 36, NBR 13971, NR10 and NR12. and protective gloves

B-Maintenance, inspection, preparation, adjustments and repairs.

- 1-Clean the condenser quarterly.
 - 2-Check for abnormal noise from the extractor fan and water pump quarterly.
 - 3-Check the amperage quarterly.
 - 4-Check the conditions of fixed protections quarterly
 - 5-When removing fixed protections for maintenance, reinstall for operation
- Technical responsible:
Jocarli Itamirã Duarte Alencastro - CREA-RS 11115362

WARRANTY CERTIFICATE – QUALITERME

When you purchase Qualiterme products, you are choosing a company that has been developing technology applied to refrigeration systems for over 25 years, consolidating tradition, reliability and durability across all our lines.

To ensure the longest lifespan of your equipment, it's essential that you follow the manufacturer's instructions carefully. Failure to follow these guidelines will void your warranty.

WARRANTY CONDITIONS

The equipment has a 12-month warranty, 3 of which are legal and another 9 months granted by Qualiterme, counting from the date of billing and issuance of the Invoice.

The warranty exclusively covers manufacturing defects in parts and components, subject to analysis and verification by authorized Qualiterme technicians.

Excluded are: built-in accessories, items subject to natural wear and tear and faults resulting from misuse.

Qualiterme is not responsible, under any circumstances, for losses and damages resulting from equipment downtime, even in the event of a manufacturing defect.

LOSS OF WARRANTY

- The warranty will be automatically void in the following cases:
- Repairs, adjustments or alterations made by a professional not authorized by Qualiterme Technical Assistance.
- Replacement or modification of components without prior authorization from the Qualiterme Technical Department.
- Manipulation, removal or alteration of the equipment identification plate.
- Operation outside the technical specifications provided, or installation in an unsuitable location.
- Damage caused by corrosive environments or liquids without proper treatment.
- Changes in the hydraulic system.
- Damage resulting from inadequate transportation, falls, accidents or force majeure (lightning, sudden power surges, floods, storms, etc.).

WARRANTY SERVICE

All obligations arising from this certificate will be fulfilled by Qualiterme at its factory in Novo Hamburgo – RS.

The following are not included in this warranty:

Travel, accommodation or food expenses for technicians.

Transportation costs, freight of parts, packaging, insurance or any tax charges.

Qualiterme's responsibility is limited to the supply of parts and labor for repairs, exclusively at its factory.

Revisions (Optional)

To ensure optimal performance and extend the service life of your equipment, Qualiterme recommends periodic servicing; these services are optional and the responsibility of the equipment owner. Qualiterme recommends that servicing be performed according to the table below:

REVISION PLAN	
Equipment: _____	Serial No : _____
Client: _____	Delivery Date: ____ / ____ / ____
1st Revision Prevailing over what occurs first: 720 hours of operation or 4 months.	
Service order number:	Stamp or Responsible Signature
Revision performed by:	
Revision date:	
2nd Revision Prevailing over what occurs first: 1440 hours of operation or 8 months.	
Service order number:	Stamp or Responsible Signature
Revision performed by:	
Service date:	
3rd Revision Prevailing over what occurs first: 2160 hours of operation or 12 months.	
Service order number:	Stamp or Responsible Signature
Revision performed by:	
Service date:	
4th Revision Prevailing over what occurs first: 2880 hours of operation or 16 months.	
Service order number:	Stamp or Responsible Signature
Revision performed by:	
Service date:	
5th Revision Prevailing over what occurs first: 3600 hours of operation or 20 months.	
Service order number:	Stamp or Responsible Signature
Revision performed by:	
Service date:	
6th Revision Prevailing over what occurs first: 4320 hours of operation or 24 months.	
Service order number:	Stamp or Responsible Signature
Revision performed by:	
Service date:	

Important informations

Attention:

Weekly Observe:

- » **Wear of parts;**
- » **Refrigerant gas level;**
- » **Equipment cleaning;**
- » **Loose screws and parts;**
- » Equipment safety items;
- » Tighten the electrical panel screws;
- » Leaks, vibrations and strange noises:

Loss of Warranty:

- » Failure to carry out revisions within the stipulated deadline, whether due to time or working hours;
- » Carry out any review in a company without prior authorization from Qualiterme:
- » Change characteristics or parts of the equipment;
- » Installing parts outside of specifications in your equipment;
- » Using the equipment for purposes for which it was not designed.

Attention !!! It is mandatory to present the owner's manual at inspections.

Always schedule revisions in advance to avoid possible inconveniences.

General Notes

[illegible]

Qualiterme

Equipamentos de Refrigeração

Site: www.qualiterme.com.br

Fone: 51 3066.2030 / 51 3587.5152

Telefone Assistência: 51 98119.3000

Email: atendimento@qualiterme.com.br

Email: assistencia@qualiterme.com.br

RS 239, Nº 500 - Bairro São José / CEP 93.530-534 Novo Hamburgo - RS - Brasil