Installation
Operation
Maintenance

CGWF SE – CGWF HE – CXWF
Indoor water-cooled chillers and water/water heat pumps with scroll compressors, Symbio™ 800 controller and **R410A refrigerant**

CGWF SE - Cooling capacity 50-700 kW
CGWF HE - Cooling capacity 55-373 kW
CXWF - Heating capacity 60-835 kW (reversible on water side)

October 2023

CG-SVX049F-GB
Original instructions

TRANE TECHNOLOGIES

Contents

1 OVERVIEW

1.1 FOREWORD

The instructions are given as a guide to good practice in the installation, start-up, operation, and maintenance by the contractor or end-user of a CGWF chiller or CXWF heat pump unit. It does not contain full service procedures necessary for the continued successful operation of this equipment. The services of a qualified technician should be employed through the medium of a maintenance contract with a reputable service company. Read this manual thoroughly before unit start-up.

1.2 WARRANTY

Warranty is based on the general terms and conditions of the manufacturer. The warranty is void if the equipment is repaired or modified without the written approval of the manufacturer, if the operating limits are exceeded or if the control system or the electrical wiring is modified. Damage due to misuse, lack of maintenance or failure to comply with the manufacturer's instructions or recommendations is not covered by the warranty obligation. If the user does not conform to the rules of this manual, it may entail cancellation of warranty and liabilities by the manufacturer.

1.3 RECEPTION OF THE UNIT

On arrival, inspect the unit before signing the delivery note. Specify any visible damage on the delivery note, and send a registered letter of protest to the last carrier of the goods within 7 days of delivery.
Notify the local TRANE Sales office at the same time. The delivery note must be clearly signed and countersigned by the driver.
Any concealed damage shall be notified by a registered letter of protest to the last carrier of the goods within 7 days of delivery.
Notify the local TRANE sales office at the same time.

Important notice: No shipping claims will be accepted by TRANE if the above mentioned procedure is not respected.
For more information, refer to the general sales conditions of your local TRANE sales office.

Note: Unit inspection in France. Delay to send registered letter in case of visible and concealed damage is only 72 hours

1.4 FACTORY INSPECTION

Trane units are inspected in the factory, in appropriate areas, in accordance with internal procedures. Each performance test carried out on the unit is possible only if the same conditions are reproduced and maintained (charge consistency, constant temperature and evaporation - condensation and recovery capacity, quality and tolerance of the measuring instruments etc.) in the test rooms.
The inspection conditions are those indicated by the customer in the ordering phase: if not otherwise specified, reference should be made to the nominal performance indicated in the technical bulletin in force at the date of the Confirmation of the Order.

1.5 MAINTENANCE

It is strongly recommended that you sign a maintenance contract with your local Trane Service Agency. This contract provides regular maintenance of your installation by a specialist in our equipment. Regular maintenance ensures that any malfunction is detected and corrected in good time and minimizes the possibility that serious damage will occur. Finally, regular maintenance ensures the maximum operating life of your equipment. We would remind you that failure to respect these installation and maintenance instructions may result in immediate cancellation of the warranty.

2 SAFETY

All units are designed, built and inspected in compliance with Pressure Equipment Directive (PED97/23/EC or 2014/68/EU and EU Directive 2006/42/EC.

To avoid death, injury, equipment or property damages the following recommendations should be respected during maintenance and service visits:

1. The maximum allowable pressures for system leak testing on low and high pressure side are given in the chapter "Installation". Insure to do not exceed test pressure by using appropriate device
2. **Disconnect all power supplies before any servicing on the unit**
3. Service work on the refrigeration system and electrical system should be carried out by qualified and experienced personnel
4. To avoid any risk, place the unit in an area or technical room with restricted access

2.1 DEFINITIONS

Owner:
The legal representative of the company, body or natural person who owns the plant in which the Trane unit is installed: he or she is responsible for the control and respect of all the safety regulations indicated in this manual as well as the national ones in force.

Installer:

The legal representative of the company appointed by the owner to position and hydraulically, electrically etc. connect the Trane unit to the plant: he or she is responsible for moving and the correct installation of the unit in accordance with the indications in this manual and with the national regulations in force.

Operator:
A person authorized by the owner to carry out all the operations of regulation and control on the Trane unit which are specifically mentioned in this manual. He or she should keep to actions described in the manual and limit his or her action to what is explicitly allowed.

Technician:
A person who is directly authorized by Trane or, secondarily, for all EU countries except for Italy, by the distributor of the Trane product, under their own responsibility, to carry out all ordinary or extraordinary maintenance operations, as well as regulations, controls, repairs and parts replacement which may be necessary during the lifetime of the unit.

2.2 ACCESS TO DANGEROUS AREA

Access to the unit dangerous areas is usually obstructed through protection panels, which are removable, by using a tool. For all the units which allow access to the cooling piping without security gratings (optional) or closing panels, the following precautions must be taken:
- mark the areas with contact risks
- apply warning signs

The danger zone must be of a suitable size to avoid any contact, even accidental contact.
Trane declines any responsibility for damage to things and unauthorized personnel in case of absence of clear and static limiting systems of the risk area(s) and of the relevant warning and danger signs.

2.3 GENERAL PRECAUTIONS

The operator must only intervene on the unit commands; he or she must not open any panels except for the one which gives access to the command module.
The installer must only intervene on the connections between the plant and the unit; he or she must not open any unit panels nor carry out any commands.

The following precautions should be made when approaching or working on the unit:
- Do not wear jewelry, baggy clothes or any other accessory which can get caught up.
- Use appropriate protection (gloves, glasses etc.) when using an open flame (welding) or compressed air.
- If the unit is located in a closed environment, wear hearing protection.
- Before disconnecting, removing tubes, filters, joints or other line parts intercept the connection tubes, empty them until the pressure reaches that of the atmosphere.
- Do not use your hands to check for possible pressure losses.
- Always use tools which are in good condition; make sure the instructions have been fully understood before using the tools
- Make sure that any tools, electrical cables or other loose objects have been removed before closing the unit and starting it up again.

2.4 PRECAUTIONS AGAINST RISKS DUE TO THE REFRIGERANT

Safety data	
Toxicity	Not important
Risks for skin touching	Splashes or sprinkles can cause chill burns. The risk of absorptions through the skin is not relevant.
	The R410a refrigerant could take some lightly irritating effects and in liquid stage it has a strong skinning effect. In this case it is necessary to rinse with fresh water the contaminated parts of the skin
	The refrigerant in liquid stage in contact with wet fabrics cause freezing and adherence to the skin. In this case it is necessary to put off the contaminated clothes to avoid freezing. Please contact a doctor in case of irritation of the contaminated parts.
Risks for contact with the eyes	Vapors don't take any effect. Splashes or sprinklers can cause chill burns. In those cases it is necessary to rinse the eyes with water or with solution for ocular washings for 10 minutes. The intervention of a doctor is needed.
Risks for ingestion	Should it happen, it causes chill burns. It does not cause vomiting. The person must be kept awake. It is needed to rinse the mouth with fresh water and to drink almost 0.25 liters. The intervention of a doctor is needed.
Risks for inhalation	High concentration of vapors in air can lead to anesthetic effects up to a loss of conscience. Long exposures could give rise to cardiac arrhythmia and sometimes even to death.
	High concentrations can create a reduction of oxygen in air, with consequent possibility of suffocation. Should it happen the person must be taken to the open air and let him take a rest.
	Administer oxygen if needed. In case the breathing has interrupted or become irregular, it is necessary to apply the artificial breathing. In case of cardiac arrest a heart massage must be applied. Contact a doctor immediately.

Conditions to avoid	Use in presence of exposed flames, and of high levels of humidity.
Dangerous reactions	Possibility of violent reactions with the sodium, the potassium, the barium and with other alkaline substances, incompatible materials and all the alloys containing more than 2% of magnesium.
Protection wearing - Behavior in case of losses or escapes	Wear protection apparel and self-rescuer respirators. Insulate the source of the loss, if this operation can be done in safety conditions. Small quantitative of refrigerant escaped at liquid state can be allowed to evaporate only if the room is well ventilated. In case of great losses ventilate the room immediately. Plug the loss with sand, soil or other absorbent material; avoid that the liquid refrigerant can enter in water-drainages or losing pools.
Dismantlement	The best procedure is the recovery and the recycle. If this is not possible the refrigerant must be conferred to an accredited system for its destruction in order to neutralize acid and toxic by-products.

2.5 PRECAUTIONS AGAINST RESIDUAL RISKS

Prevention from risks due to the command system

- make sure the instructions for use have been understood before carrying out any work on the control panel.
- always keep the instruction manual close at hand when working on the control panel.
- start up the unit only after having certified that it is correctly connected to the plant.
- inform the technician promptly of any alarms which appear on the unit.
- do not reset the alarms to manual restart without having first identified the cause and removed it.

2.6 PREVENTION AGAINST RESIDUAL MECHANICAL RISKS

- install the unit in accordance with the provisions of the following manual.
- carry out all the maintenance operations provided for by this manual regularly.
- wear a protective helmet before entering inside the unit.
- before opening a unit panel make sure that it is firmly connected by means of a hinge.
- do not touch the air condensation batteries without having first put on protective gloves.
- do not remove the protections to the moving parts while the unit is running.
- before restarting the unit make sure that the moving part protections are in the correct position.

2.7 PREVENTION AGAINST RESIDUAL ELECTRICAL RISKS

- connect the unit to the mains in accordance with the provisions of this manual.
- carry out all maintenance operations regularly.
- before opening the control panel disconnect the unit from the mains by means of the external knife switch.

Warning: It must be taken into account especially that when soft starters instead of contactors are installed as compressors drives, one phase of any compressor remains live when the compressor is off but the main switch is closed. Do not access the compressor electrical box.

- check that the unit has been earthen correctly before starting it up.
- control all the electrical connections and the connection cables paying particular attention to the state of isolation; replace the cables which are clearly worn or damaged.
- carry out periodic checks of all wiring inside the panel.
- do not use cables with an inappropriate section or flying connections not even for a limited period or in an emergency.

2.8 PREVENTION AGAINST RESIDUAL RISKS OF A DIFFERENT NATURE

- the residual risks due to pressure are mainly coming from a failure of the safety devices. To prevent them it is necessary to check and replace them when required
- carry out the plant connections to the unit by following the indications reported on the following manual and on the panels of the unit itself.
- if a part is disassembled, make sure that it is correctly reassembled before restarting the unit.
- do not touch the discharge line of the compressor, the compressor itself or any other tube or component which is inside the unit without putting on protective gloves.
- keep a fire extinguisher which is able to put out fires on electrical equipment near the unit.
- in the event of fire either if it originates on the unit or near it make sure the power supply to the unit is promptly cut and that any person who might be near the unit at that moment is moved to a secure location.
- on units installed inside, connect the refrigerant circuit shut off valve to a network of tubes which are able to lead the possible spillage of refrigerating fluid outside.
- eliminate any fluid loss inside or outside the unit.
- collect the discharge liquid and clean up any possible oil leakage.
- periodically clean the compressor casing of the accumulated dirt deposits.
- do not keep inflammable liquids near the unit.
- do not dispose of the refrigerant fluid and the lubricating oil in the environment.
- welding should only be carried out on empty tubes; do not approach the tubes containing refrigerant fluid with flames or other sources of heat.
- do not bend or strike tubes containing pressurized fluids

2.9 PRECAUTIONS TO BE OBSERVED DURING MAINTENANCE OPERATIONS

Only authorized technicians may carry out maintenance operations. Before carrying out any maintenance the following must be performed:

- isolate the unit from the mains electricity by using the external knife switch.
- place a notice on the external knife switch which says **"do not use - maintenance in progress"**.
- make sure that any possible on-off commands are disabled.
- use appropriate safety equipment

If measurements or controls must be carried out which require the unit to be running the following observations must be followed:

- operate with the electrical panel open for as short a time as is possible.
- close the electrical panel as soon as the individual measurement or control has been carried out.
- for units which are located outside, do not carry out interventions in dangerous atmospheric conditions like rain, snow, fog etc..

The following precautions should also be taken at all times:

- never dispose of fluids contained in the refrigerant circuit into the environment.
- when replacing the electronic card always use appropriate equipment (extractor, anti-static bracelet, etc.).
- if a compressor, the evaporator, or any other heavy part is to be replaced, make sure that the lifting equipment matches the weight to be lifted.
- if the unit has an independent compressor compartment, do not open the ventilator compartment without having first isolated the unit using the knife switch on the side of the panel and only after having placed a sign which says "do not use - maintenance in progress".
- if modifications must be carried out to the cooling, hydraulic or electrical circuit of the unit, as well as to its command logic, contact Trane .
- if particularly complicated assembly or disassembly operations are to be carried out contact Trane .
- always use original spare parts bought directly from Trane or from official dealers of the companies reported in the list of recommended spare parts.
- if the unit is to be moved after a year of being in the site or if it has to be dismantled contact Trane .

IMPORTANT: No high pressure safety valve is installed on the unit.

The unit fail safe is assured by cut-out of the electrical power supply to the coils of the compressors contactors. The cut-out action is carried out by the electrical contact of a dedicated high pressure switch.
No Schrader valve is installed in the service socket the circuit high pressure switch is screwed into. This implies that the replacement of the high pressure switch requires that the relevant refrigerant circuit has been discharged of all the refrigerant inside it.

Figure 1 – Indicative position of the signs warning about the necessity of replacing the high pressure switches with the unit void of refrigerant

DO NOT PULL OUT THE HIGH PRESSURE SWITCHES (ONE PER REFRIGERANT CIRCUIT) IF THE UNIT IS NOT COMPLETELY VOID OF REFRIGERANT. FAILURE TO FOLLOW THIS INSTRUCTION COULD RESULT IN DEATH OR SERIOUS INJURY

2.10 MANUAL ALARM RESET

If there is an alarm the unit must not be manually reset before having located and eliminated the root cause of the fault. Repeated manual resets may cause the warranty to become void.

3 OPERATING LIMITS

3.1 STORAGE

The units can be stored within the following environmental conditions:

Min ambient temperature	:	-10°C
Max ambient temperature	:	53°C
Max relative humidity	:	95% not condensable

CAUTION: The storage in a very high humidity space (condensation) can damage electronic components.

CAUTION: The CGWF SE / CGWF HE / CXWF units are intended only for indoor usage and storage.
If they are installed in a machinery room they must be installed within the meaning of the EN 378-3 Standard.
Should the unit be stored outdoor it is customer's duty to implement any device aimed to protect the unit from the harsh weather effects.

3.2 OPERATING LIMITS

Unit operation is permitted within the limits indicated in the operating map provided in 3.3.
CAUTION: Operation outside the specified limits may cause the activation of the protections and disrupt the operation of the unit and, in extreme cases, damage the unit. In case of doubt please consult Trane Service department.
The operating limits shown in 3.3 apply to units operating at full load.

3.3 OPERATING MAP

CGWF SE / CGWF HE / CXWF

**LWT = Leaving water temperature*

IMPORTANT: A pressure switch cutting directly the power supply to the coils of the compressors contactors prevent refrigerant from reaching dangerously high pressure values. No safety valve is installed on the unit.

ETHYLENE GLYCOL CORRECTION TABLE

% Ethylene glycol weight		10%	15%	20%	25%	30%	35%
Lowest outlet water temperature	°C	4	2	0	-2,8	-6	-10
Suggested security limit Cooling	°C	1	-1	-4	-6	-10	-14
capacity coefficient	-	0,99	0,985	0,981	0,977	0,974	0,971
Power input coefficient	-	0,993	0,99	0,988	0,986	0,984	0,982
Flow rate coefficient	-	1,04	1,05	1,07	1,08	1,09	1,11
Pressure drop coefficient	-	1,11	1,17	1,23	1,31	1,39	1,47

In order to calculate performance with glycoled solutions multiply main sizes by respective coefficients.

GLYCOL PERCENTAGE DEPENDING ON FREEZINGTEMPERATURE

% glycol according to the freezing temperature						
Freezing temperature	0°C	-5°C	-10°C	-15°C	-20°C	-25°C
% Ethylene glycol	5%	12%	20%	28%	35%	40%
Flow rate coefficient	1,02	1,04	1,07	1,09	1,11	1,13

In order to calculate performance with glycoled solutions multiply main sizes by respective coefficients.

IMPORTANT:
An oversized water pump seal is required for operation with glycol >25%.
Contact your local Trane Sales Office for more information.

4 INSTALLATION

4.1 MOVING AND POSITIONING THE UNIT

The units have been designed to be lifted from above by means of eyebolts and holes in the base frame .
Use retractor bars to keep the lifting wires or chains away from the unit.

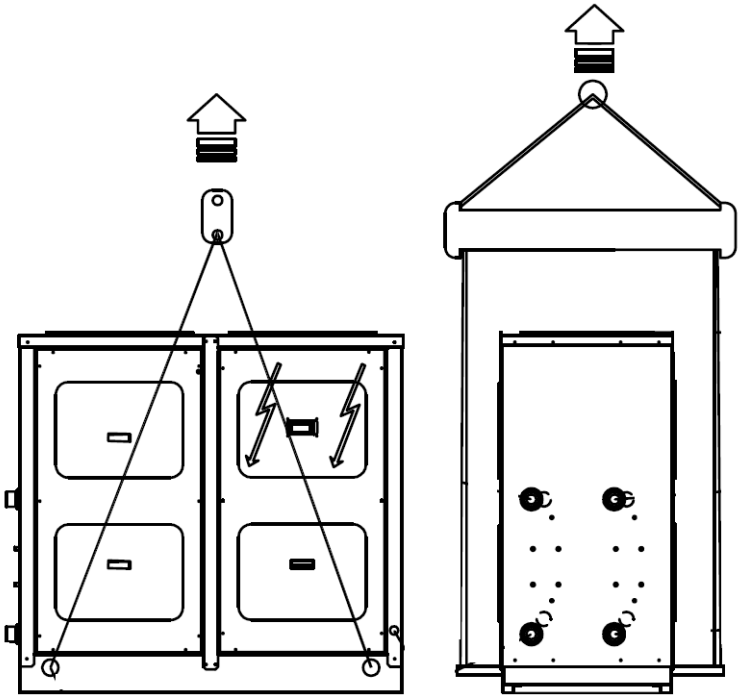


Figure 2 - Correct lifting procedure for platform 1 units
(CGWF SE, and CXWF/CGWF HE sizes from 013 to 025)

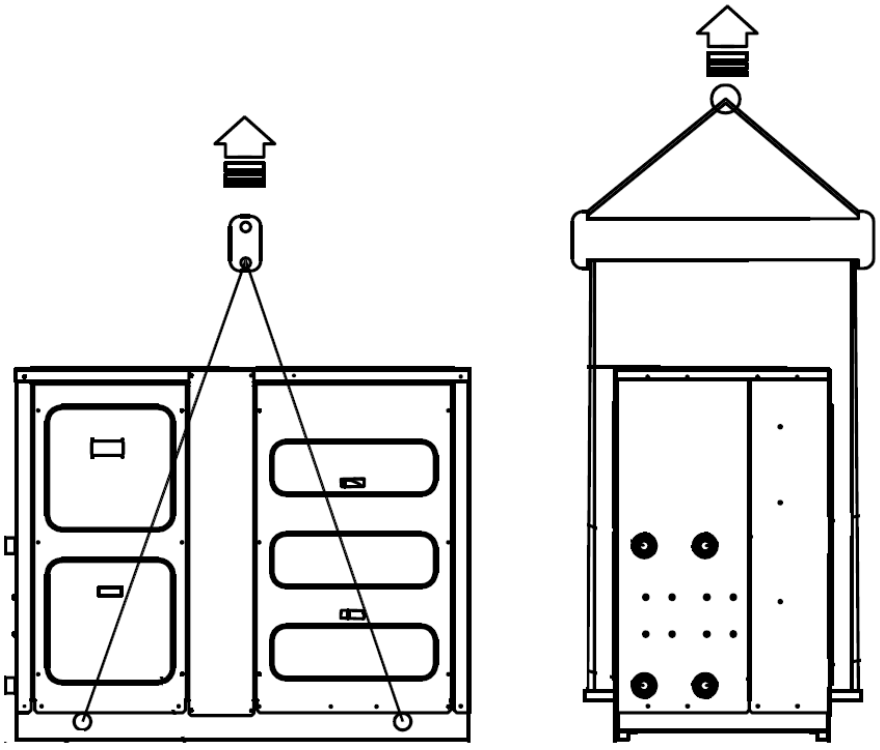


Figure 3 - Correct lifting procedure for platform 2 units
(CGWF SE and CXWF/CGWF HE sizes from 029 to 041))

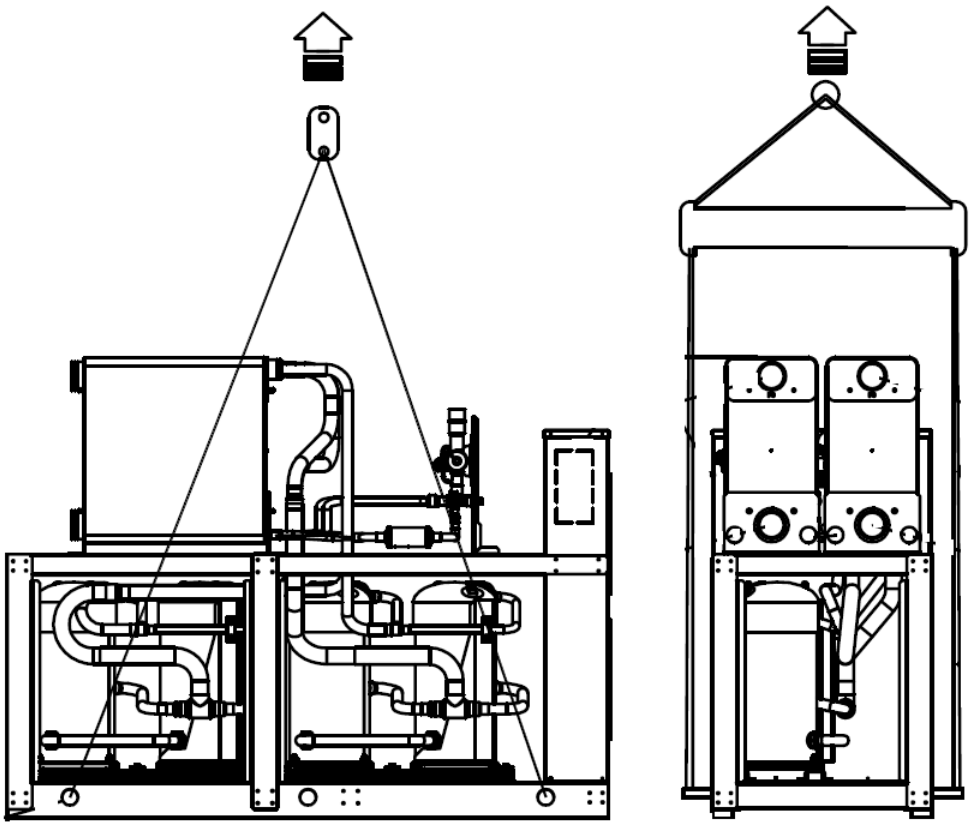


Figure 4 - Correct lifting procedure for platform 3 units (sizes with two refrigerant circuits - CGWF SE sizes from 042 to 096, CXWF/CGWF HE sizes from 042 to 128)

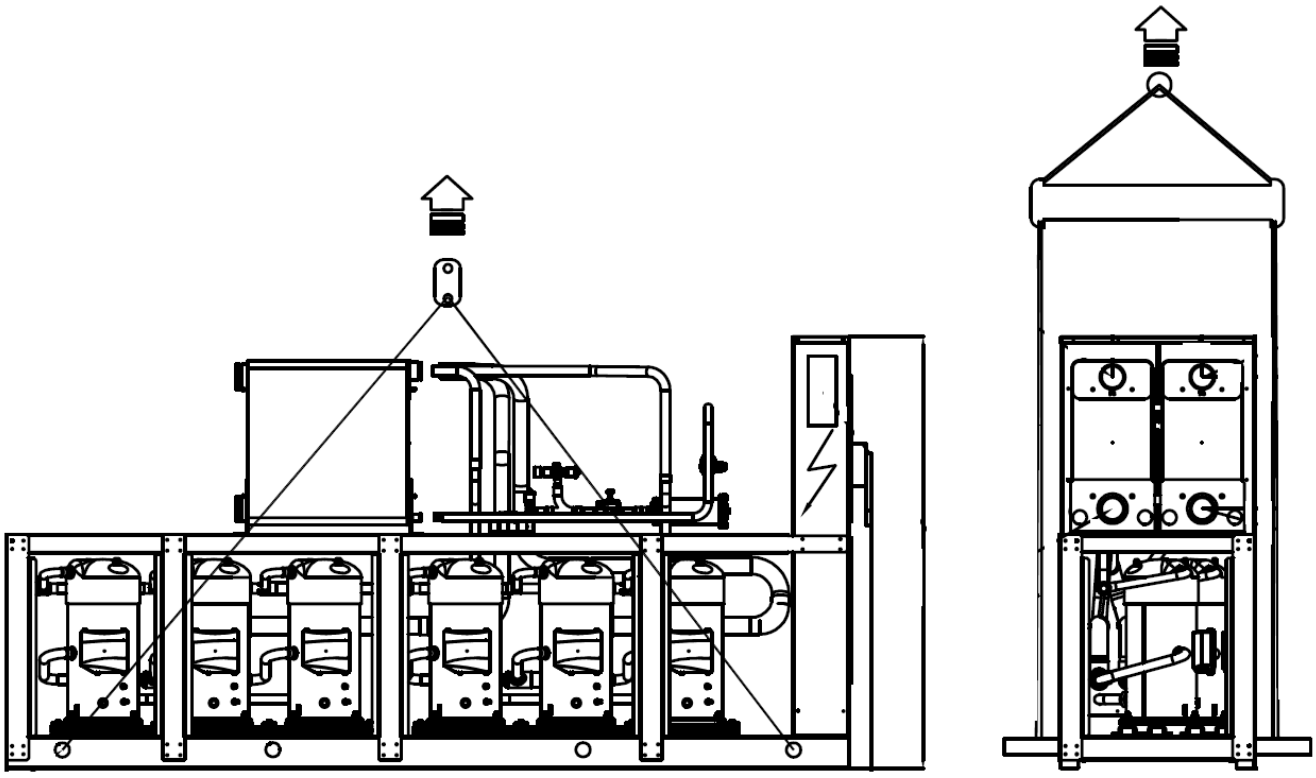


Figure 5 - Correct lifting procedure for platform 4 units (sizes with two refrigerant circuits – CXWF/CGWF HE sizes from 144 to 192)

Lifting procedures provided with the unit have to be respected.

CAUTION
Do not use forklift trucks to lift the unit from below.
If equipment for lifting from above is not available, using rollers may move the unit.
The surface on which the unit is placed must be flat and strong enough to withstand the weight of the unit while running.
In order to reduce the transmission of vibrations to the supporting structures, fit shock absorbers in every fastening point.
Rubber shock absorbers are recommended for units installed on the ground, spring shock absorbers for units installed on roofs. Open spaces around the unit must be provided for in order to allow normal maintenance to be carried out.

IMPORTANT: Make sure that during transport the unit ALWAYS remains in the correct position!
Horizontal positioning of the unit can lead to irreversible damage to the compressors.
Damage arising from incorrect transport will not be under warranty by the manufacturer.
Immediately report an incorrect receipt of goods.
An arrow positioned upward indicates the vertical position of the unit.

4.2 MINIMUM SPACE REQUIREMENTS

Dimensional drawing shall be respected to avoid difficult maintenance or inaccessibility to components
The following drawings are views from under the units:

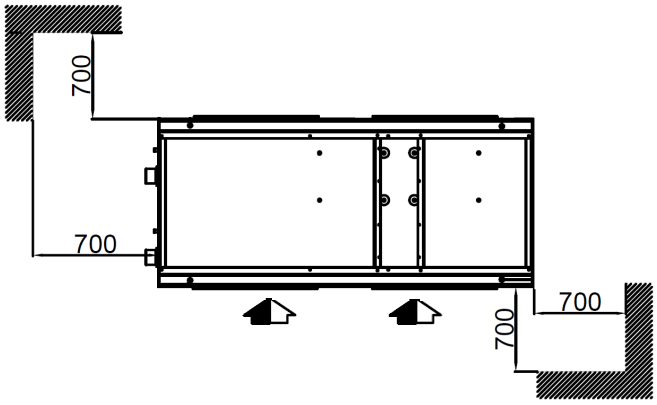


Figure 6 - minimum space requirements [mm] for platform 1 units

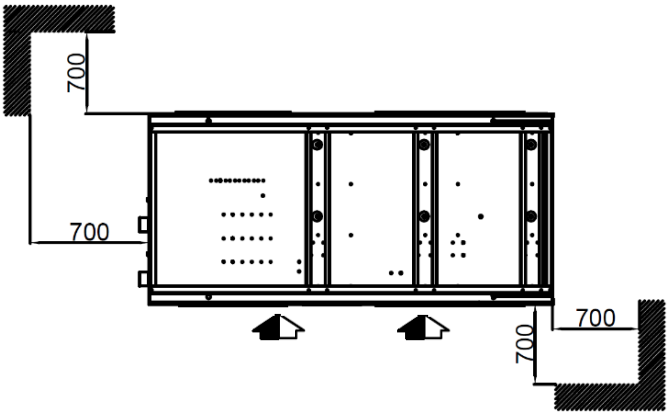


Figure 6 - minimum space requirements [mm] for platform 1 units

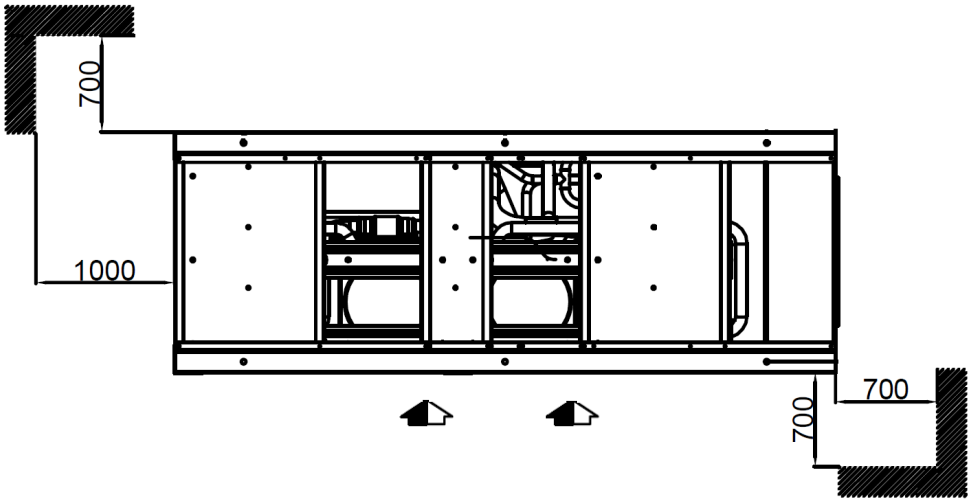


Figure 8 - minimum space requirements [mm] for platform 3 units

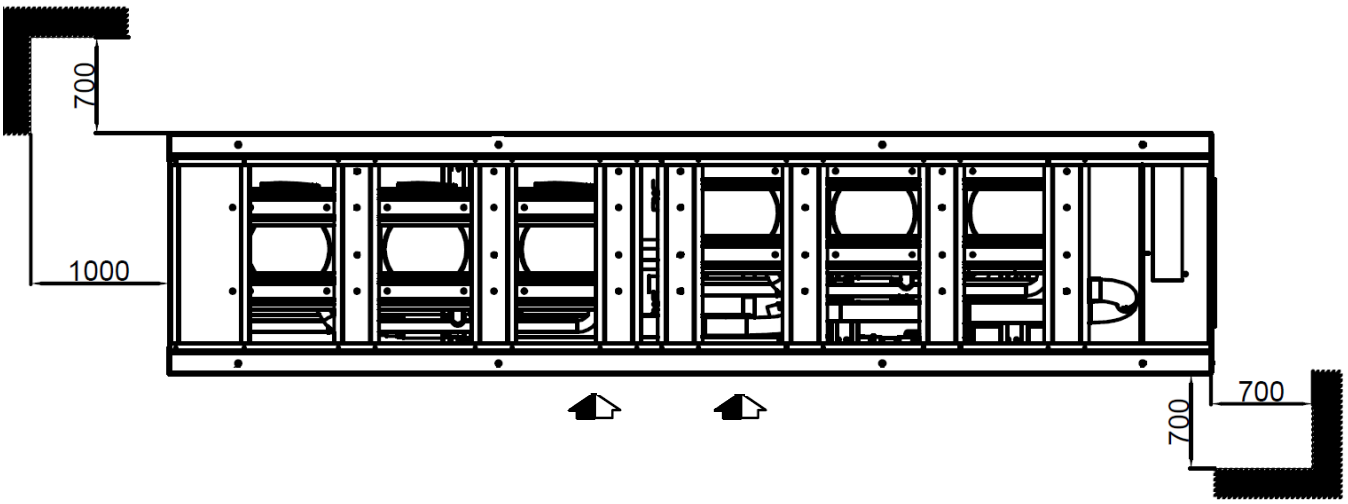


Figure 9 - minimum space requirements [mm] for platform 4 units

Side of the unit that can be placed next to the wall. This means that with the unit at a distance less than the optimal one of 700 mm the accessibility to some components is worse but in any case is ensured even if the unit is leaning against the wall.

CAUTION: in case two units have to be installed side by side, the distance of respect must be doubled.
After the unit has reached the final position, fix the anti-vibration bolts.

4.3 CONTROL OF COMPRESSOR FASTENING

Compressors are fitted on shock absorbers. For fixing through spring anti-vibration mounts, remove blockages put to fasten the compressors, as indicated on the label on compressors body.

5 ACOUSTIC PROTECTION

For maximum isolation effect, water lines and electrical conduit should also be isolated. Wall sleeves and rubber isolated piping hangers can be used to reduce the sound transmitted through water piping. To reduce the sound transmitted through electrical conduit, use flexible electrical conduit. EU and Local codes on sound emissions should always be considered. Since the environment in which a sound source is located affects sound pressure, unit placement must be carefully evaluated. Consult an acoustical engineer for critical connections.

6 ELECTRICAL POWER SUPPLY

The mains power supply characteristics have to match the unit's absorption. The mains power supply tension must correspond to the nominal value ± 10%, with a maximum difference between the phases of 2%.
All power supply wiring must be sized and selected accordingly by the project engineer in accordance with standard IEC 60364. All wiring must comply with local code.

6.1 POWER CONNECTIONS

Protect the unit electric box power supply circuit with protection devices (not included in the supplied equipment). Connect the line terminals with a three-core cable of a section which is appropriate to the unit absorption. The switch and the fuses like all the power connections must comply with the regulations in force.

6.2 IMBALANCE BETWEEN THE SUPPLY TENSION PHASES

Do not run the electrical motors when the voltage unbalance between the phases is more than 2%.
Use the following formula to check:

% Imbalance = [(Vx – Vave) x 100/Vave]

Vave = (V1 + V2 + V3)/3

Vx = phase with greatest difference from Vave (without regard to the sign)

IMPORTANT: If the mains voltage has an imbalance of above 2%, contact the company, which distributes the electrical energy. If the unit functions with **a unit voltage imbalance between the phases of above 2% the warranty is invalid.**

6.3 UNIT VOLTAGE PHASING

It is important that proper rotation of the compressors be established before the unit is started. Proper motor rotation requires confirmation of the electrical phase sequence of the power supply. The motor is internally connected for clockwise rotation with the incoming power supply phases A-B-C.

6.4 MAIN SWITCHES FEATURES

UNIT SIZES					
CGWF SE	**CGWF HE**	**CXWF**	Poli	Ampere	Type
013	013	013	3P	80 A	OT80F3
015	015	015	3P	80 A	OT80F3
019	019	019	3P	80 A	OT80F3
023	023	023	3P	100 A	OT100F3
025	025	025	3P	100 A	OT100F3
029	029	029	3P	100 A	OT100F3
033	033	033	3P	100 A	OT100F3
037	037	037	3P	125 A	OT125F3
041	041	041	3P	125 A	OT125F3
042	042	042	3P	160 A	OT160G03
048	048	048	3P	160 A	OT160G03
056	056	056	3P	200 A	OT200E03
064	064	064	3P	200 A	OT200E03
072	072	072	3P	250 A	OT250E03
078	078	078	3P	250 A	OT250E03
088	088	088	3P	250 A	OT250E03
096	096	096	3P	315 A	OT315E03
\	112	112	3P	400 A	OT400E03
\	128	128	3P	400 A	OT400E03
\	144	144	3P	630 A	OT630E03
\	162	162	3P	630 A	OT630E03
\	176	176	3P	630 A	OT630E03
\	192	192	3P	630 A	OT630E03

7 WATER CONNECTIONS

7.1 EVAPORATOR

The connections schemes relating to evaporator are featured in the paragraph *7.5 HYDRAULIC VERSIONS.*
The connection tubes have to be supported adequately in order that their weight does not damage the plant.
It is necessary that the water flow rate to the unit is compatible with the evaporator one. It is also necessary that the water flow rate is kept uniform while the unit is running: it is suggested to use always a pump system dedicated to the unit and independent from the remaining part of the plant.

Before stalling units with temperature around 0°C please evacuate the exchanger with compressed air in order to avoid breakings due to ice.
If the unit is installed in order to replace another, the entire hydraulic system must be emptied and cleaned before the new unit is installed. Regular tests and proper chemical treatment of water are recommended before starting up the new unit.
In the event that glycol is added to the hydraulic system as anti-freeze protection, pay attention to the fact that intake pressure will be lower, the unit's performance wil be lower and water pressure drops will be greater. All unit-protection methods, such as anti-freeze, and low-pressure protection will need to be reset. Before insulating water piping, check that there are no leaks.

Evaporator **nominal pressure (PN)** = 16 bar.

CAUTION: Install a mechanical water filter at the water inlet of each evaporator heat exchanger and of each condenser heat exchanger as featured in paragraph *7.5 HYDRAULIC VERSIONS.* Failure to install the filter allows access of solid particles and/or welding slag inside the heat exchanger. We recommend the installation of a filter having a filtering net with holes not exceeding 0.5 mm in diameter.
Trane cannot be held responsible for any damage to heat exchangers due to the lack of good quality water filters.

7.1.1 Calculation of total minimum water content, total optimal water content and flow rates

CGWF SE		Plant side chilled water heat exchanger				
		Vopt [m3]	Vmin [m3]	K	Q min [m3/h]	Q max [m3/h]
One refrigerant circuit sizes	013	0,45	0,26	365,3	5,6	14,9
	015	0,51	0,29	358,0	6,4	16,9
	019	0,57	0,32	352,4	7,1	18,9
	023	0,69	0,39	182,4	8,6	22,9
	025	0,78	0,45	178,5	9,8	26,1
	029	0,93	0,53	75,6	11,6	31,0
	033	1,07	0,61	73,8	13,4	35,6
	037	1,17	0,67	72,7	14,7	39,2
	041	1,28	0,73	71,7	16,0	42,6
Two refrigerant circuits sizes	042	0,95	0,54	119,4	11,9	31,6
	048	1,01	0,58	118,5	12,7	33,7
	056	1,14	0,65	117,0	14,2	37,9
	064	1,33	0,76	56,4	16,7	44,4
	072	1,57	0,90	55,3	19,6	52,3
	078	1,81	1,03	54,5	22,6	60,2
	088	2,11	1,21	30,8	26,4	70,5
	096	2,33	1,33	30,5	29,1	77,5

LEGEND:

Vmin: minimum water content of the plant

Vopt: optimal water content of the plant

Q min: minimum water flow to the heat exchanger

Q max: maximum water flow to the heat exchanger

ΔT**max chiller =** 10 °C

ΔT**min chiller =** 3 °C

dpw = K·Q² / 1000 Q = 0,86 P/ΔT

	CGWF HE	Plant side chilled water heat exchanger				
		Vopt [m3]	Vmin [m3]	K	Q min [m3/h]	Q max [m3/h]
One refrigerant circuit sizes	013	0,46	0,26	196,1	5,8	15,3
	015	0,53	0,30	191,3	6,6	17,5
	019	0,59	0,34	187,3	7,4	19,7
	023	0,72	0,41	79,0	9,1	24,1
	025	0,82	0,47	77,3	10,2	27,3
	029	0,96	0,55	41,3	12,0	32,1
	033	1,10	0,63	40,3	13,8	36,7
	037	1,22	0,70	28,5	15,3	40,8
	041	1,33	0,76	28,1	16,7	44,5
Two refrigerant circuits sizes	042	0,98	0,56	58,5	12,3	32,7
	048	1,06	0,60	58,0	13,2	35,2
	056	1,19	0,68	57,1	14,9	39,6
	064	1,36	0,78	32,4	17,0	45,4
	072	1,63	0,93	31,8	20,4	54,3
	078	1,91	1,09	19,3	23,9	63,7
	088	2,19	1,25	12,2	27,4	73,2
	096	2,44	1,39	12,0	30,5	81,3
	112	2,66	1,52	11,8	33,3	88,8
	128	3,03	1,73	6,7	37,9	101,0
	144	3,38	1,93	6,5	42,2	112,6
	162	3,87	2,21	3,8	48,4	129,1
	176	4,28	2,45	3,8	53,5	142,7
	192	5,04	2,88	2,3	63,0	168,1

LEGEND:

Vmin: minimum water content of the plant

Vopt: optimal water content of the plant

Q min: minimum water flow to the heat exchanger

Q max: maximum water flow to the heat exchanger

ΔT**max chiller =** 10 °C

ΔT**min chiller =** 3 °C

dpw = K·Q² / 1000 Q = 0,86 P/ΔT

	CXWF	Plant side chilled water heat exchanger					Plant side hot water hot exchanger				
		Vopt	Vmin	K	Q min	Q max	Vopt	Vmin	K	Q min	Q max
		[m3]	[m3]		[m3/h]	[m3/h]	[m3]	[m3]		[m3/h]	[m3/h]
One refrigerant circuit sizes	013	0,46	0,26	196,1	4,6	15,3	1,49	0,52	94,1	3,5	17,4
	015	0,53	0,30	191,3	5,3	17,5	1,70	0,60	92,0	4,0	19,9
	019	0,59	0,34	187,3	5,9	19,7	1,92	0,67	89,9	4,5	22,4
	023	0,72	0,41	79,0	7,2	24,1	2,35	0,82	87,4	5,5	27,5
	025	0,82	0,47	77,3	8,2	27,3	2,65	0,93	46,8	6,2	30,9
	029	0,96	0,55	41,3	9,6	32,1	3,13	1,09	45,6	7,3	36,5
	033	1,10	0,63	40,3	11,0	36,7	3,58	1,25	32,0	8,4	41,8
	037	1,22	0,70	28,5	12,2	40,8	3,97	1,39	31,5	9,3	46,4
	041	1,33	0,76	28,1	13,3	44,5	4,34	1,52	31,1	10,1	50,7
Two refrigerant circuits sizes	042	1,36	0,78	32,4	13,6	45,4	4,41	1,54	37,9	10,3	51,5
	048	1,63	0,93	31,8	16,3	54,3	5,30	1,85	22,7	12,4	61,8
	056	1,91	1,09	19,3	19,1	63,7	6,23	2,18	22,5	14,5	72,7
	064	2,19	1,25	12,2	21,9	73,2	7,16	2,51	13,6	16,7	83,6
	072	2,44	1,39	12,0	24,4	81,3	7,91	2,77	7,7	18,5	92,3
	078	2,66	1,52	11,8	26,6	88,8	8,65	3,03	7,6	20,2	100,9
	088	3,03	1,73	6,7	30,3	101,0	9,86	3,45	7,4	23,0	115,0
	096	3,38	1,93	6,5	33,8	112,6	11,00	3,85	4,4	25,7	128,3
	112	3,87	2,21	3,8	38,7	129,1	12,52	4,38	2,9	29,2	146,1
	128	4,28	2,45	3,8	42,8	142,7	13,92	4,87	2,8	32,5	162,4
	144	5,04	2,88	2,3	50,4	168,1	16,47	5,77	2,5	38,4	192,2
	162	5,44	3,11	2,2	54,4	181,4	17,85	6,25	2,5	41,7	208,3
	176	5,83	3,33	2,2	58,3	194,4	19,23	6,73	2,5	44,9	224,4
	192	6,02	3,44	2,3	60,2	200,7	20,58	7,20	2,4	48,0	240,1

LEGEND:

Vmin: minimum water content of the plant

Vopt: optimal water content of the plant

Q min: minimum water flow to the heat exchanger

Q max: maximum water flow to the heat exchanger

ΔT**max chiller =** 10 °C

ΔT**min chiller =** 3 °C

ΔT**max heatpump =** 15 °C

ΔT**min heatpump =** 3 °C

dpw = K·Q² / 1000 Q = 0,86 P/ΔT

IMPORTANT: In case the water pump is driven by an inverter (either an on-board pump or an external pump) secure that in every working condition the variation of the water flow rate must be as low as possible.
Flow variation must be less than 10% of the nominal flow rate per minute

7.2 CONDENSER

Condenser piping must follow the installation features represented in the paragraph *7.5 HYDRAULIC VERSIONS*
Condensing temperature and water flow rate have to be in accordance with nominal values, unless the acknowledgement order shows different indications. It is strictly necessary that in the presence of condenser side dirty or aggressive water, an intermediate heat exchanger must be installed before the condenser.

Condenser **nominal pressure (PN)** = 16 bar.

7.3 WATER TREATMENT

Before putting the unit into operation, clean the hydraulic circuit. Proper water treatment reduces the risk of corrosion, erosion, scaling, etc. Contact a local water treatment specialist.
Trane is not responsible for damage to or malfunctioning of equipment caused by failure to treat water or by improperly treated water.

Table - Acceptable water quality limits

PH (25°C)	6,8÷8,0	Total Hardness (mg $CaCO_3$ / l)	< 200
Electrical conductivity S/cm (25°C)	< 800	Iron (mg Fe / l)	< 1.0
Chloride ion (mg Cl - / l)	< 200	Sulfur ion (mg S_{2-} / l)	None
Sulphate ion (mg SO_{24-} / l)	< 200	Ammonium ion (mg NH_{4+} / l)	< 1.0
Alkalinity (mg $CaCO_3$ / l)	< 100	Silica (mg SiO_2 / l)	< 50

7.4 WINTER FREEZE PROTECTION ON THE EVAPORATOR EXCHANGER

Two or more protection methods should be foreseen when designing the system as a whole:

1. Continuous water flow circulation inside piping and exchanger when ambient air temperature is holding below 5°C. This implies what follows:
   - if the water flow inside piping and exchanger of the unit is due to an external pump installed by the customer, the on/off command of this pump must always be the one provided by the unit controller through the relevant free potential contact in the electrical cabinet.
   - as long as the ambient air temperature is holding below 5°C the unit must always be electrically supplied. Moreover the customer water pump, if present, must always be electrically supplied alike and functioning properly.
2. Addition of an appropriate amount of glycol inside the water circuit.
3. Additional heat insulation and sufficient heating of exposed piping.

IMPORTANT: Trane can provide various kits (optional) for the protection of all the components of the hydraulic circuit inside the unit (pumps, pipes and tank). For a proper selection and price please contact your local Trane Sales & Service office.

4. Emptying and cleaning of the heat exchanger during the winter season.

It is the responsibility of the installer and/or of local maintenance personnel to ensure two or more of the described anti-freeze methods. Regularly verify, through routine checks, that appropriate anti-freeze protection is maintained.
Failure to follow the instructions above could result in damage to one or more of the unit's components.
Damages caused by freezing are not covered by the warranty.

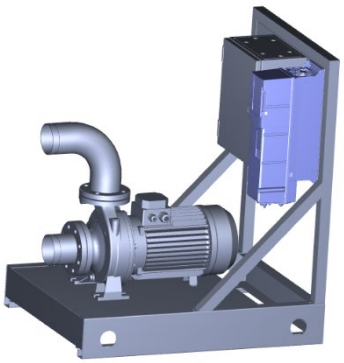
CAUTION: The unit water pipes are not protected against the risk of water freeze-up when the unit is not electrically powered and when the power and control of the external water pump is not managed by the CGWF SE/CGWF HE/CXWF unit controller. The owner or local maintenance personnel must provide appropriate solutions to prevent freezing.

CAUTION: A power loss of 15 minutes during freezing can damage the evaporator.

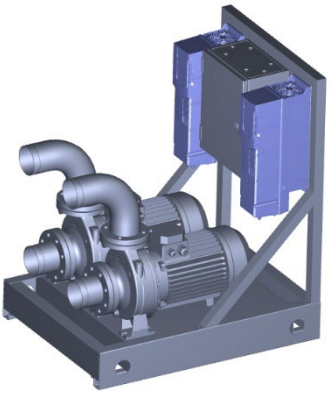
7.5 HYDRAULIC VERSIONS

CGWF SE / CGWF HE / CXWF units are available in combination with various **external hydraulic kits** which are supplied separately from the unit and supplied directly by manufacturer.

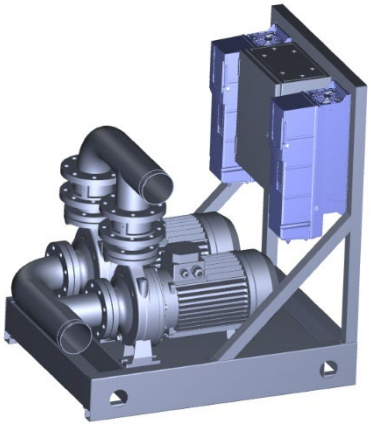
The available modules are the following ones:



Single pump hydraulic kit with or without



2 x single pumps hydraulic kit with or without inverter

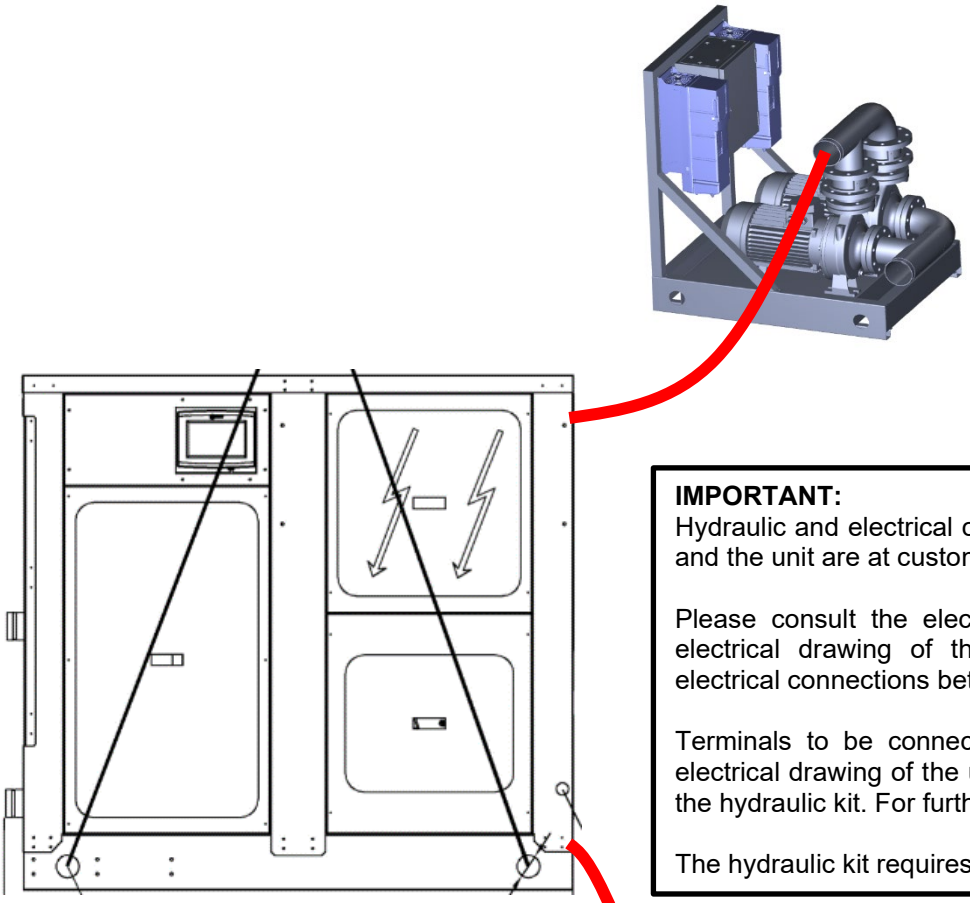


Double pump hydraulic kit with or without inverter

Tank kit

Possible combinations are all the ones that can be generated by the hydraulic kits represented above.
The combinations “single pump module with or without inverter” and “double pump module with or without inverter” can be selected for both the evaporator side and the condenser side.
The kit “2 x single pump module with or without inverter” is selected when a single pump is needed on both the evaporator side and the condenser side.
Tank module can be selected **only for the evaporator side**.

Example of a possible configuration:



SOURCE SIDE
Double pump hydraulic kit with inverter

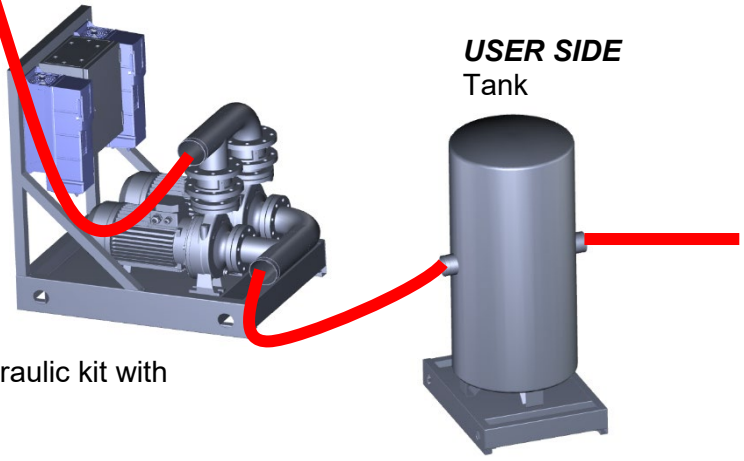
CGWF / CXWF without hydraulic kit

IMPORTANT:
Hydraulic and electrical connections between hydraulic kit(s) and the unit are at customer care.

Please consult the electrical drawing of the unit and the electrical drawing of the hydraulic kit to implement the electrical connections between them.

Terminals to be connected have the same labels on the electrical drawing of the unit and on the electrical drawing of the hydraulic kit. For further support please contact Trane.

The hydraulic kit requires a power supply line of its own.



USER SIDE
Tank

USER SIDE
Double pump hydraulic kit with inverter

IMPORTANT: No hydraulic kits are provided for the biggest 4 sizes of CGWF HE and CXWF (144 ÷ 192)

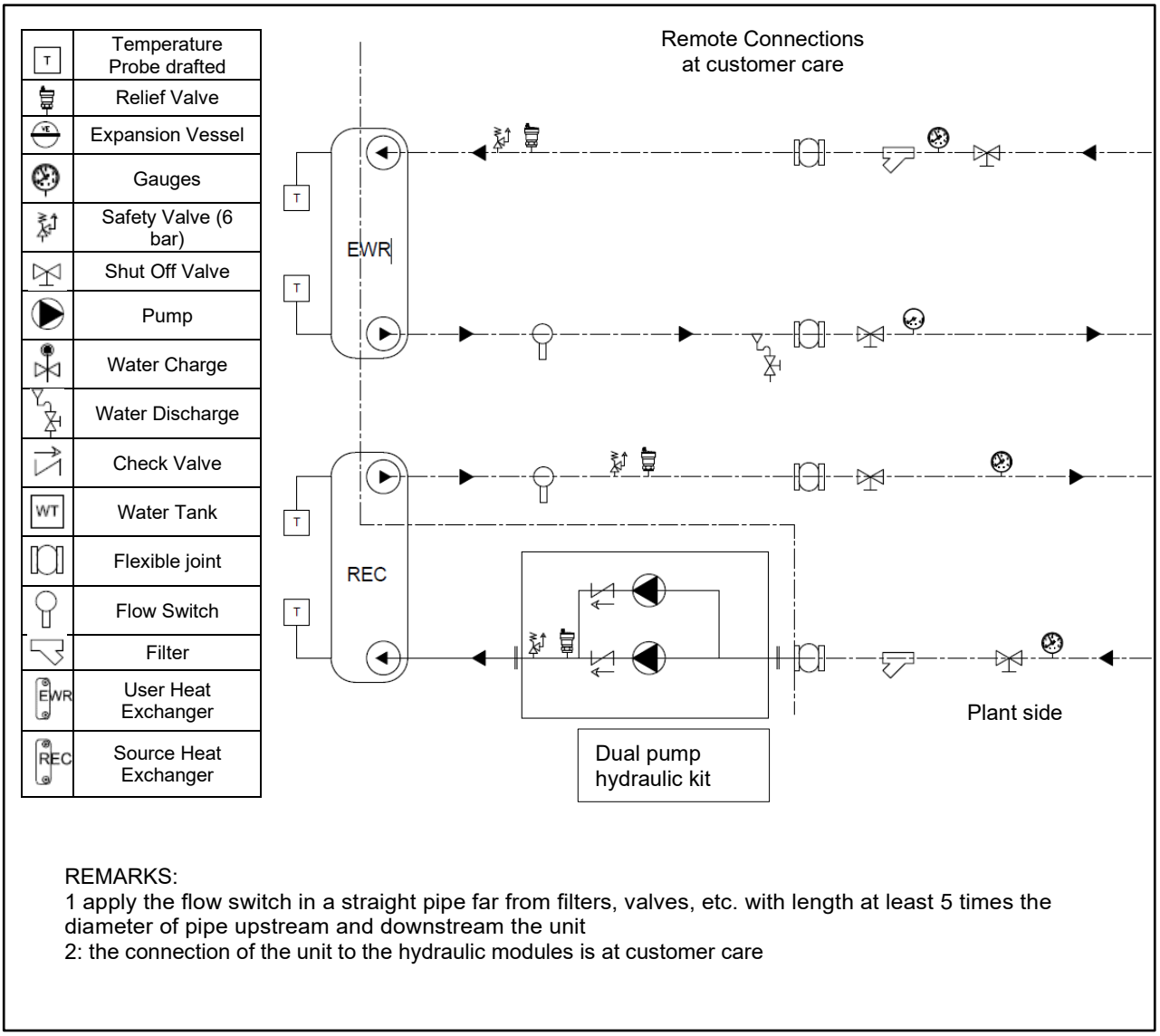
Optional Hydraulic accessories on the price list
- "Y" water strainer (sold separately), consists of body and stainless steel mesh (*), with replaceable filter through the inspection cap.
- Automatic water filling (sold separately).
- Water gauges kit
- Victaulic kit (**)

IMPORTANT: water strainer and flow switch must be installed on water circuit (user side) in order to keep the warranty. Since no water flow control device is installed on the unit, the flow switch is always provided as a loose accessory (optional) and must be installed by the customer.

(*) Water strainer with meshes not over 0.5mm

(**) A Victaulic kit must be provided for every side of the unit (user and or source one) to be connected.
In case of selection of external hydraulic kit, it is necessary to provide **1 kit for the unit and 1 kit for the external hydraulic kit module.**
E.g. : CGWF +external water kit module + water tank module + Victaulic kit on *user side*
→ **Select nr. 3 victaulic kits (1 kit for unit + 1 kit for pump hydraulic kit + 1 kit for water tank)**

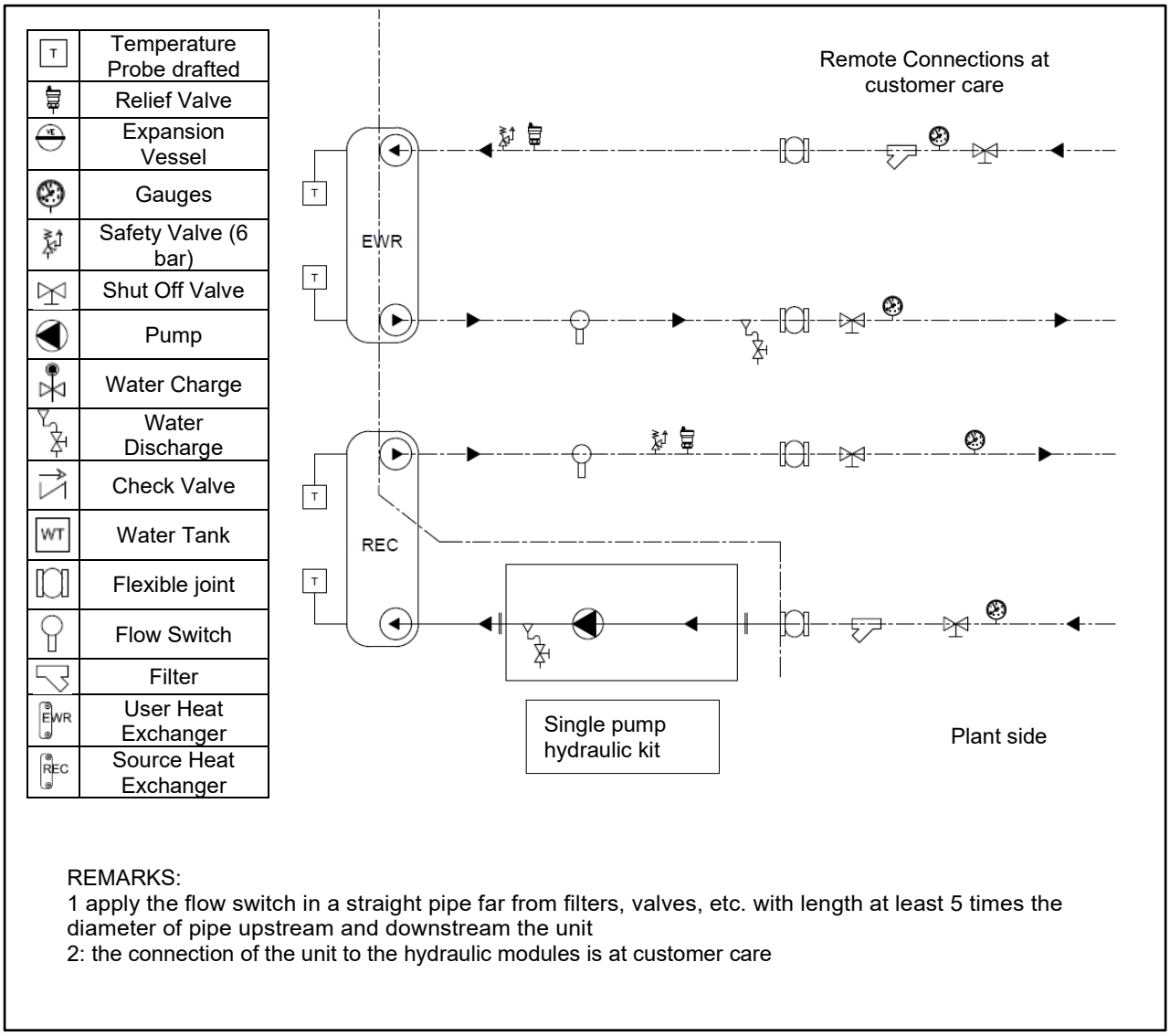
7.5.1 *Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with no pump no tank on user side, and 2 pumps without tank on source side.*



REMARKS:
1 apply the flow switch in a straight pipe far from filters, valves, etc. with length at least 5 times the diameter of pipe upstream and downstream the unit
2: the connection of the unit to the hydraulic modules is at customer care

Figure 11

7.5.2 *Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with no pump no tank on user side and 1 pump without tank on source side, with low or high head.*



REMARKS:
1 apply the flow switch in a straight pipe far from filters, valves, etc. with length at least 5 times the diameter of pipe upstream and downstream the unit
2: the connection of the unit to the hydraulic modules is at customer care

Figure 12

7.5.3 *Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with 1 pump without tank on user side with low or high head; no pump no tank on source side.*

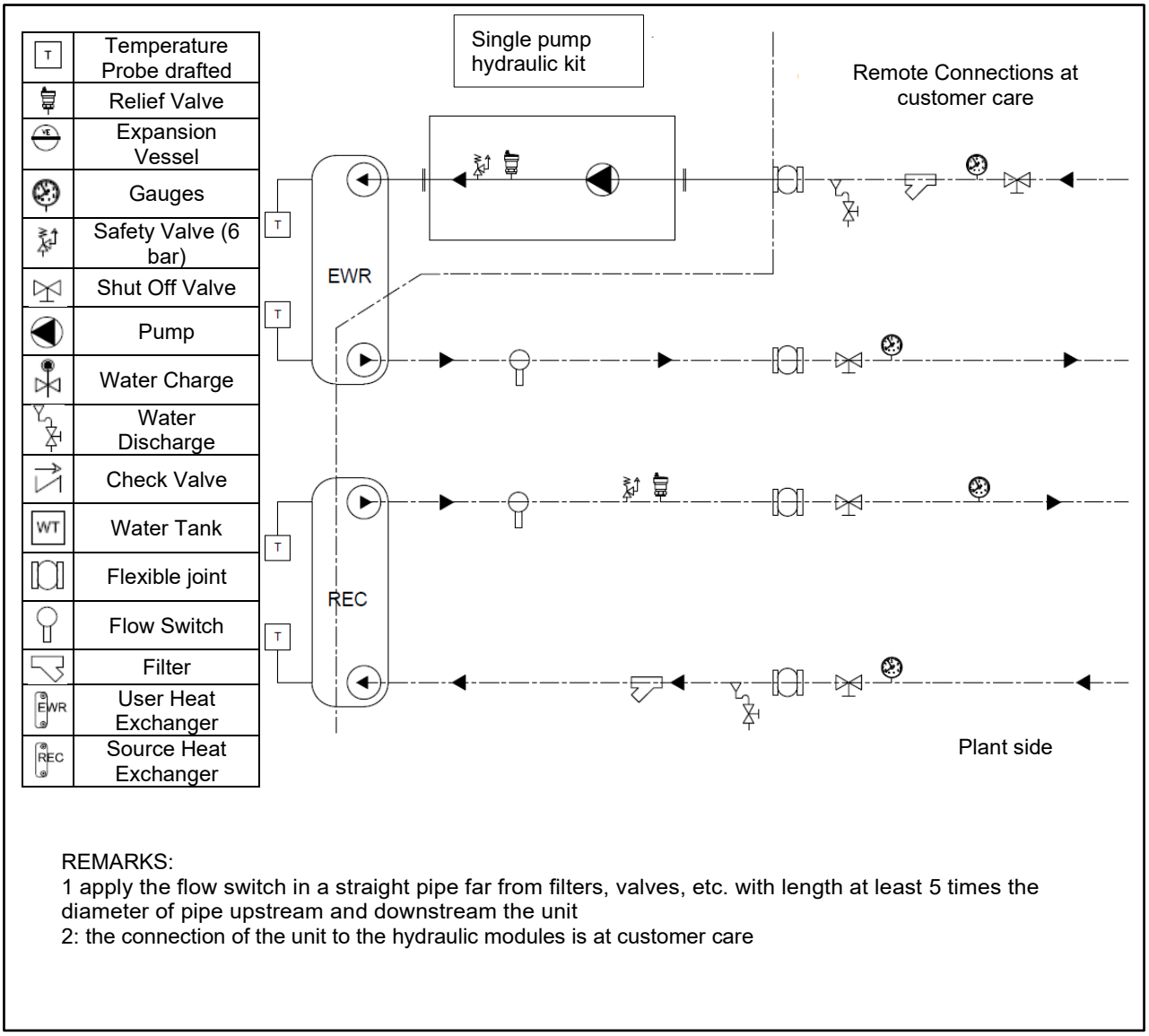


Figure 13

7.5.4 *Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with 1 pump with low or high head and tank on user side; no pump no tank on source side.*

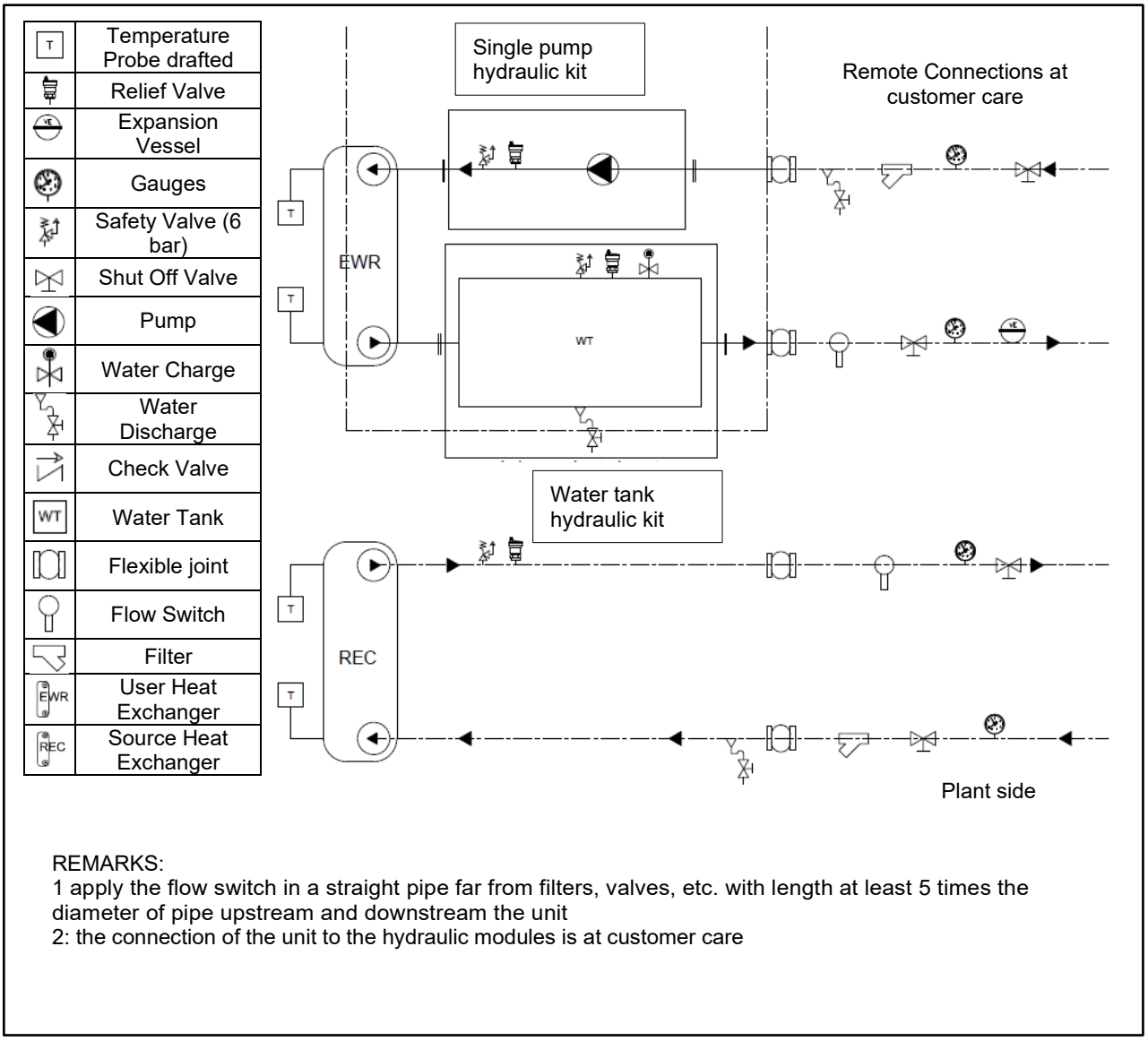


Figure 14

7.5.5 Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with 1 pump without tank on user side and 1 pump on source side.

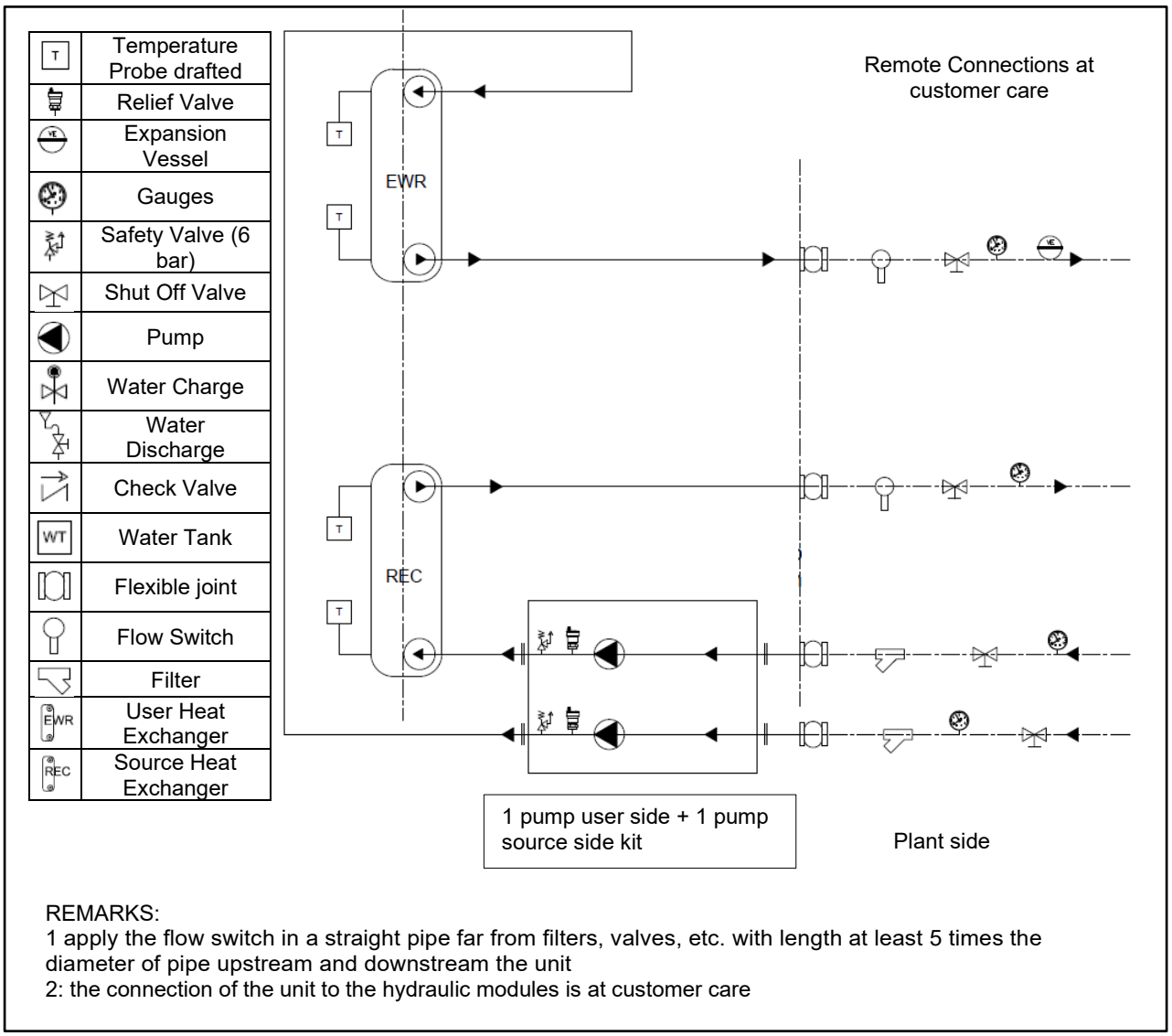
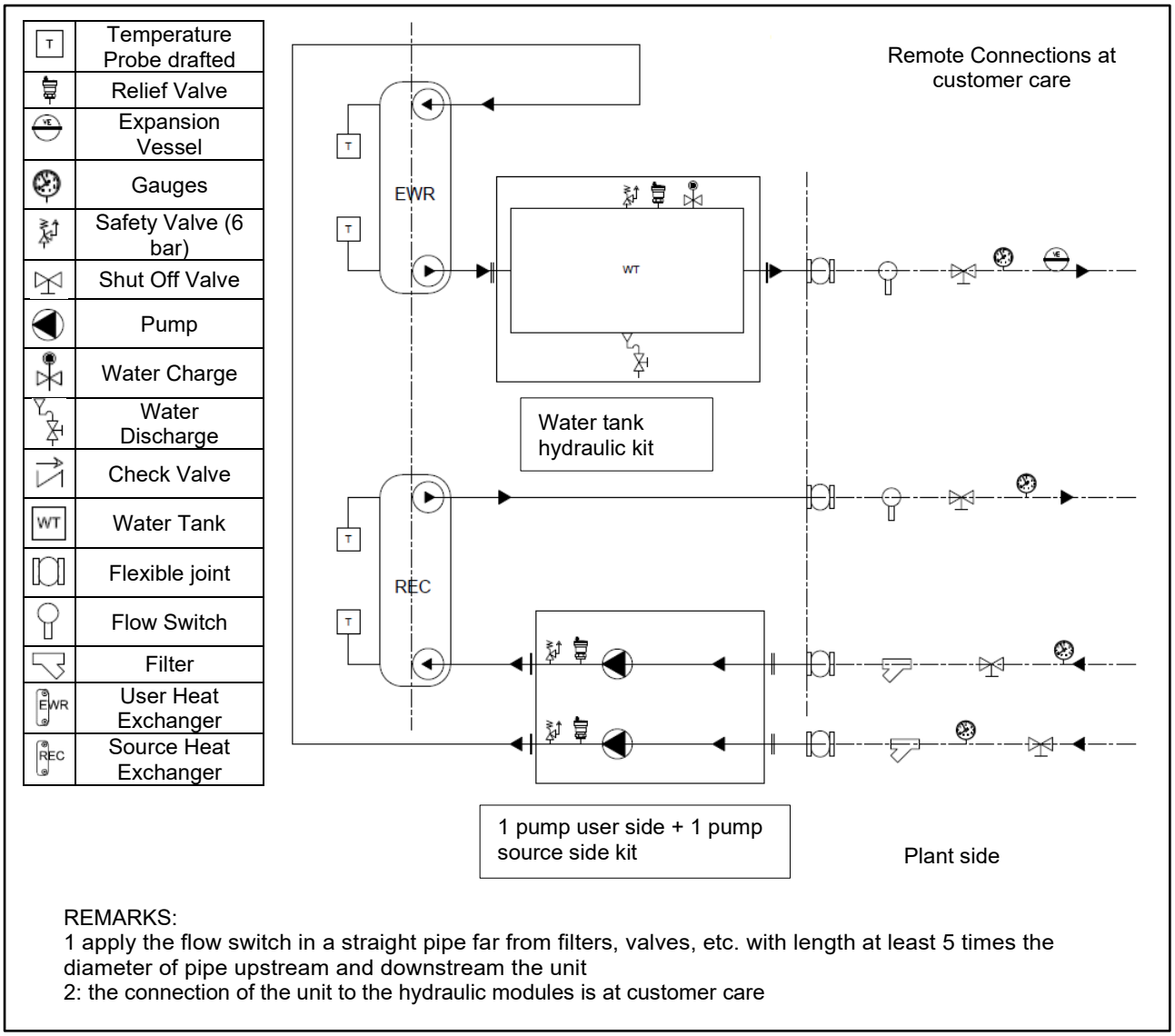


Figure 15

7.5.6 *Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with 1 pump and tank on user side and 1 pump without tank on source side.*



REMARKS:
1 apply the flow switch in a straight pipe far from filters, valves, etc. with length at least 5 times the diameter of pipe upstream and downstream the unit
2: the connection of the unit to the hydraulic modules is at customer care

Figure 16

7.5.7 Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with 1 pump without tank on user side and 2 pumps without tank on source side

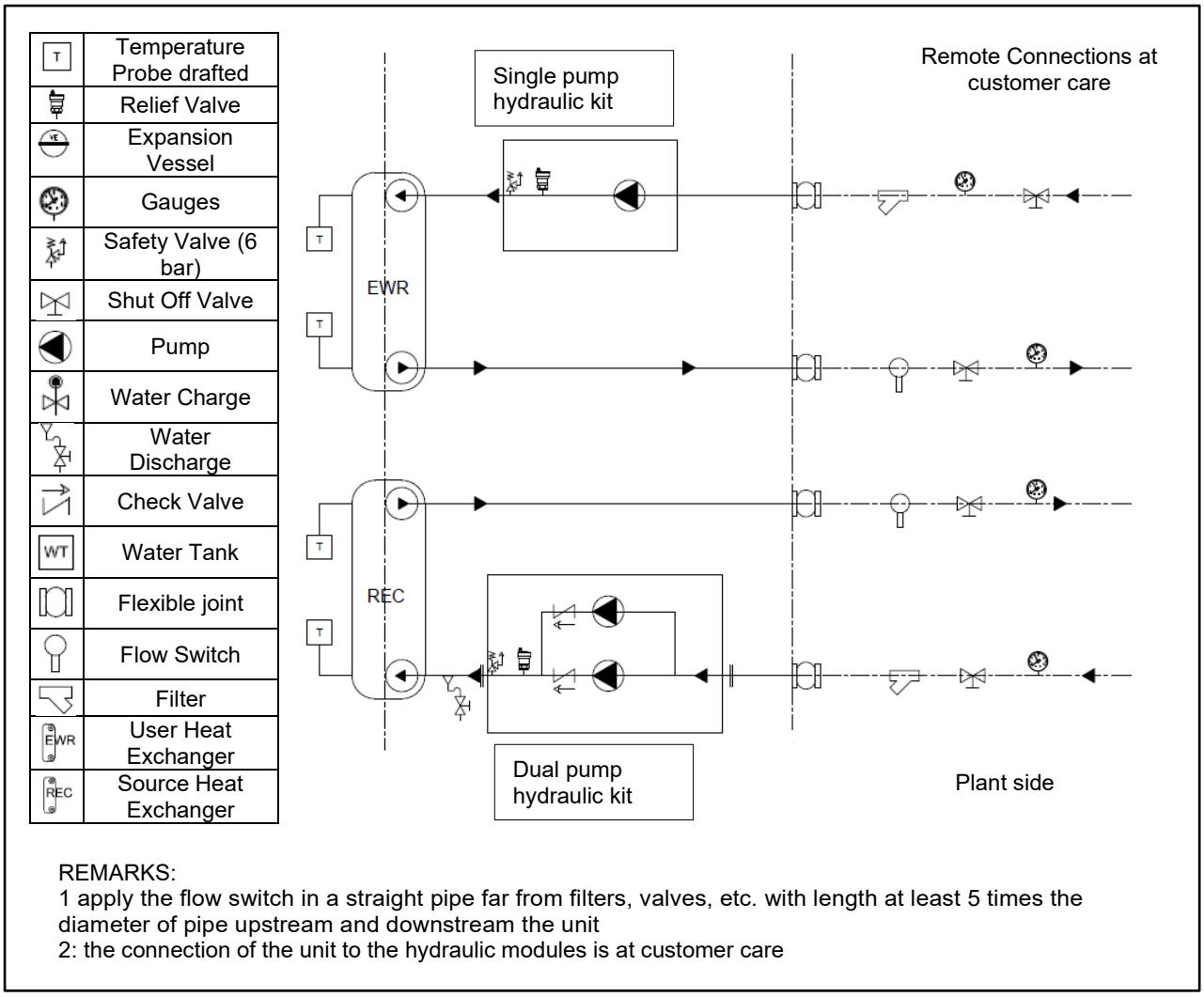
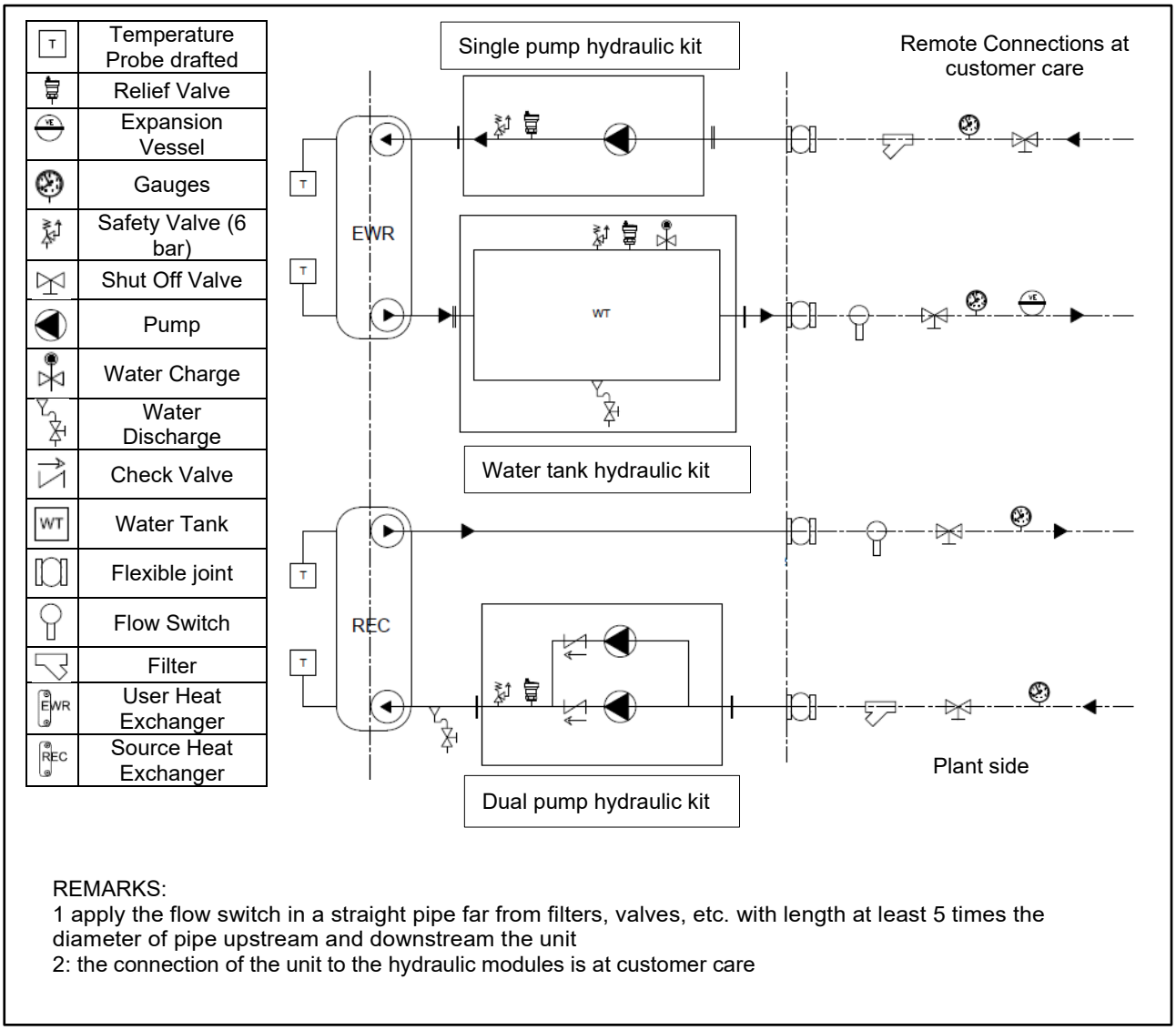


Figure 17

7.5.8 *Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with pump and tank on user side and 2 pumps without tank on source side.*



REMARKS:
1 apply the flow switch in a straight pipe far from filters, valves, etc. with length at least 5 times the diameter of pipe upstream and downstream the unit
2: the connection of the unit to the hydraulic modules is at customer care

Figure 18

7.5.9 Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with 2 pumps without tank on user side and no pump no tank on source side.

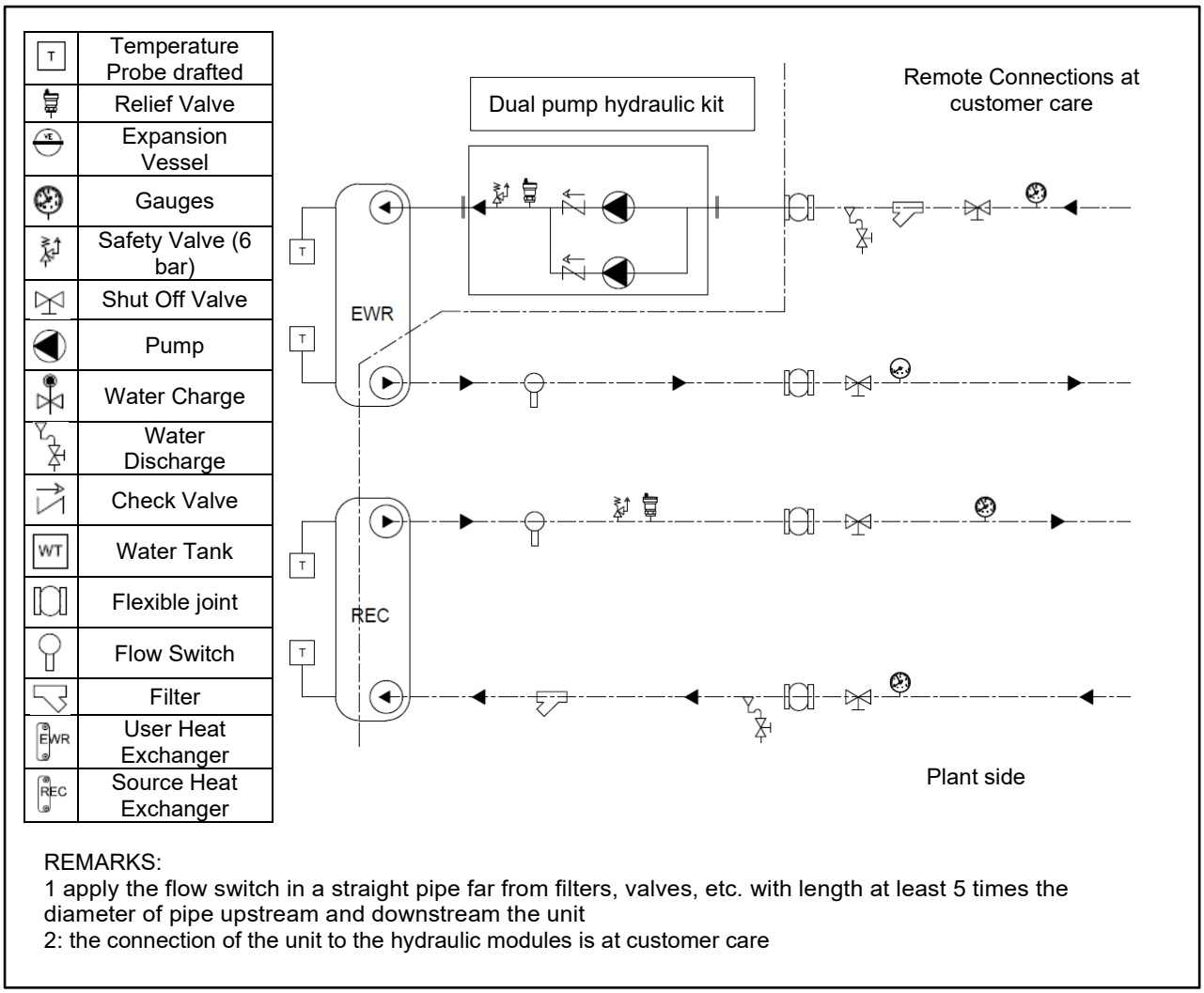


Figure 19

7.5.10 *Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with 2 pumps and tank on user side and no pump no tank on source side.*

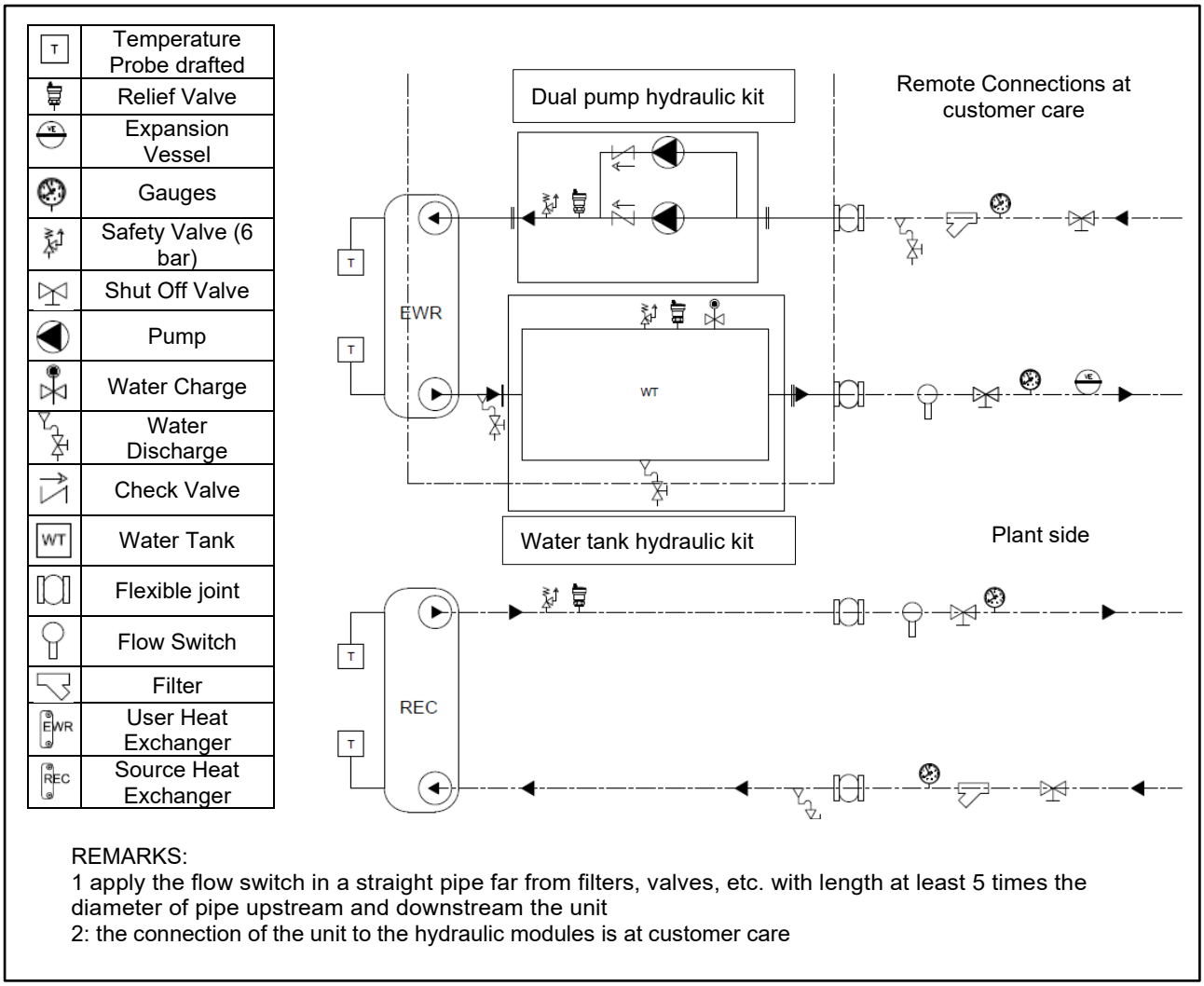


Figure 20

7.5.11 Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with 2 pumps without tank on user side and 1 pump without tank on source side .

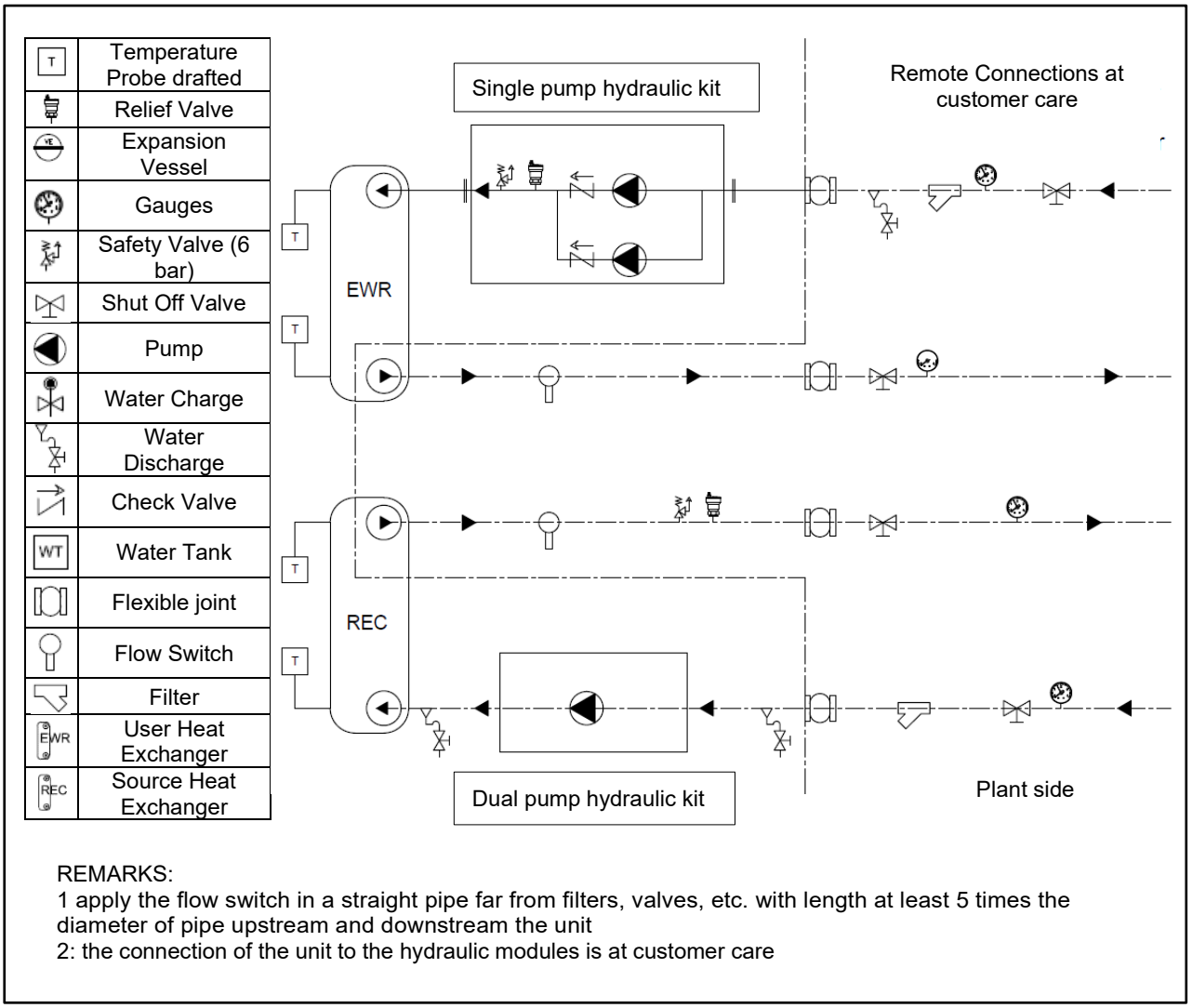


Figure 21

7.5.12 *Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with 2 pumps and tank on user side and 1 pump without tank on source side .*

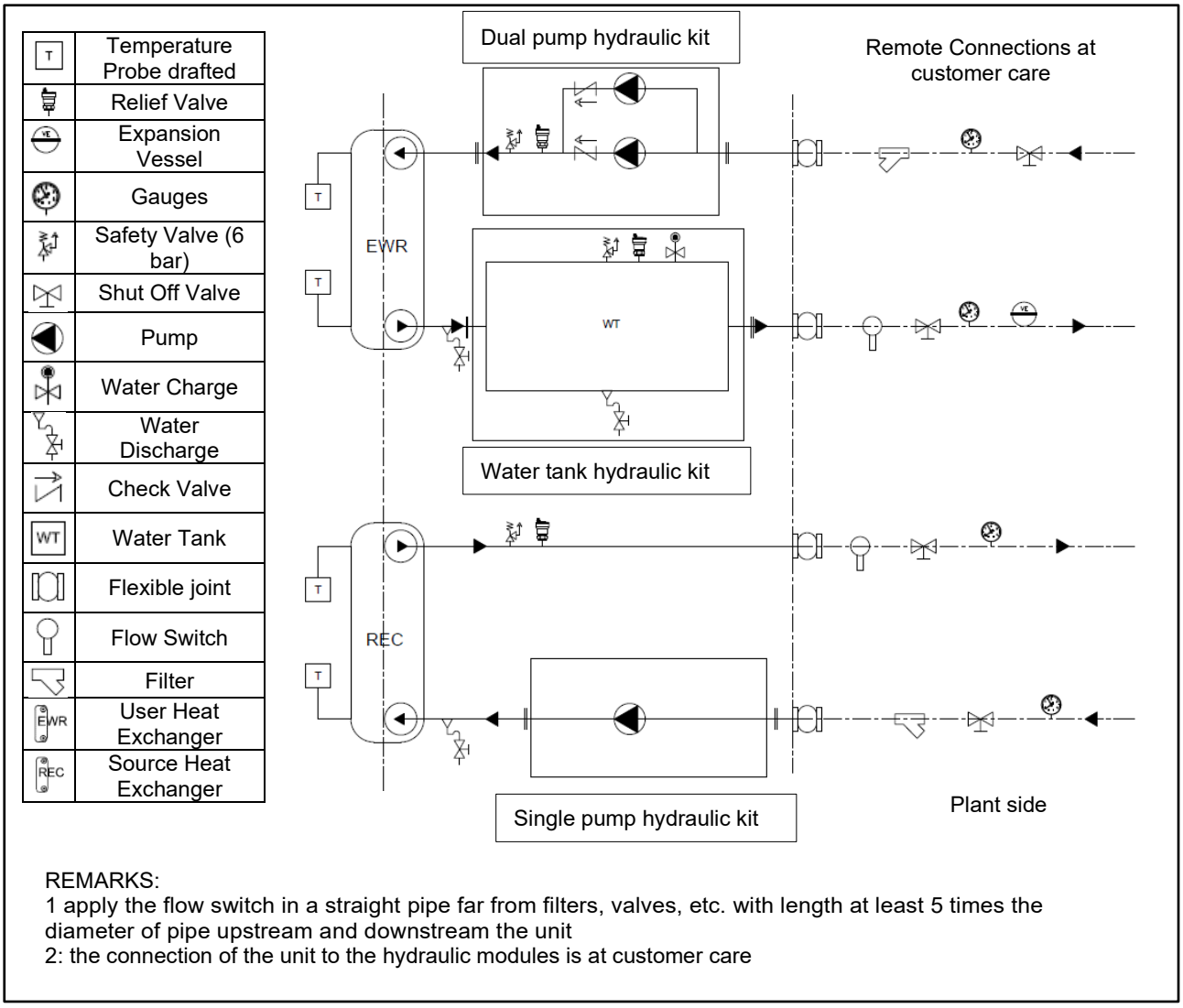


Figure 22

7.5.13 *Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with 2 pumps without tank on user side and 2 pumps without tank on source side.*

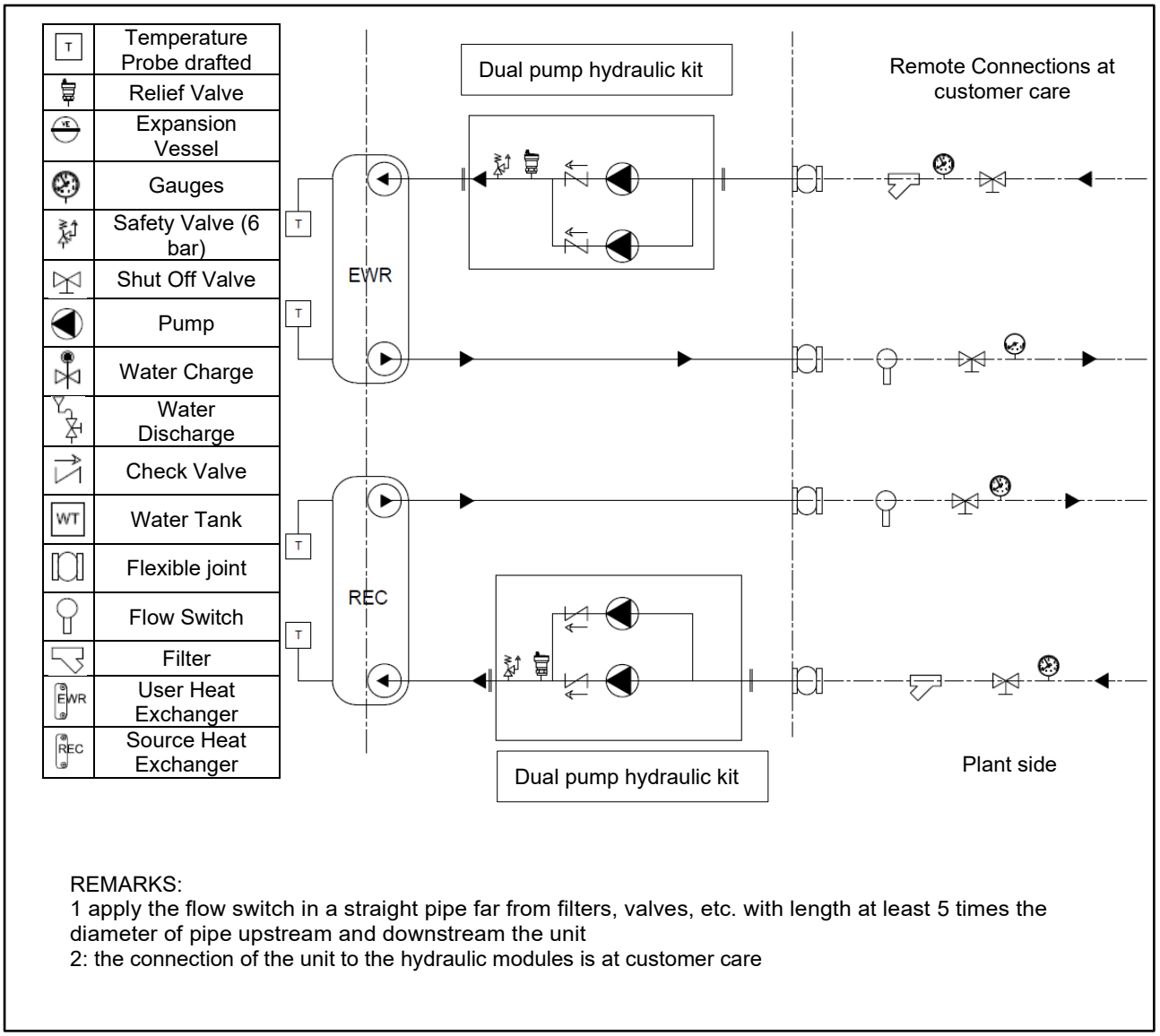


Figure 23

7.5.14 *Hydraulic diagram for CGWF (SE and HE) - CXWF units and hydraulic modules with 2 pumps and tank on user side and 2 pumps without tank on source side.*

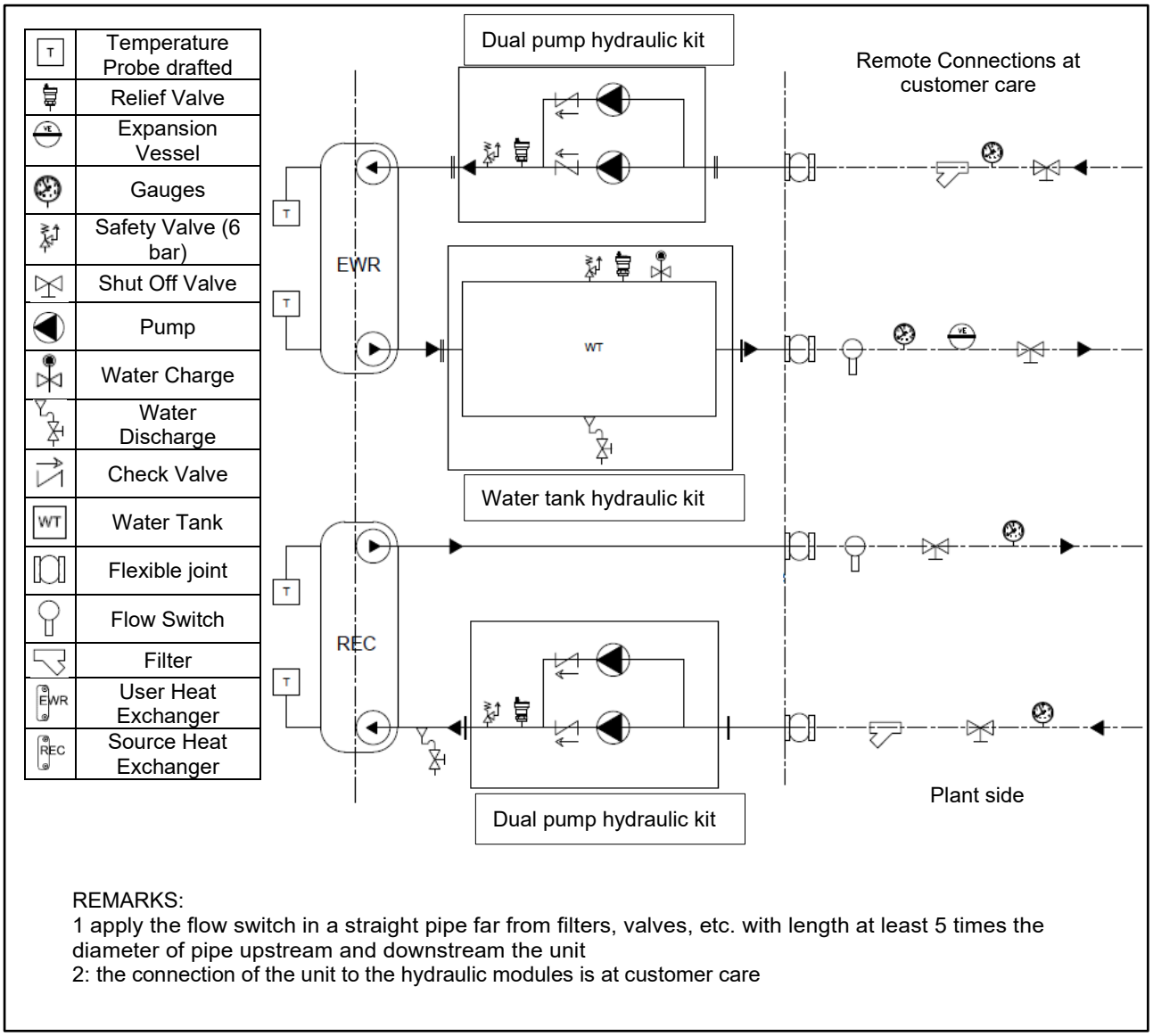
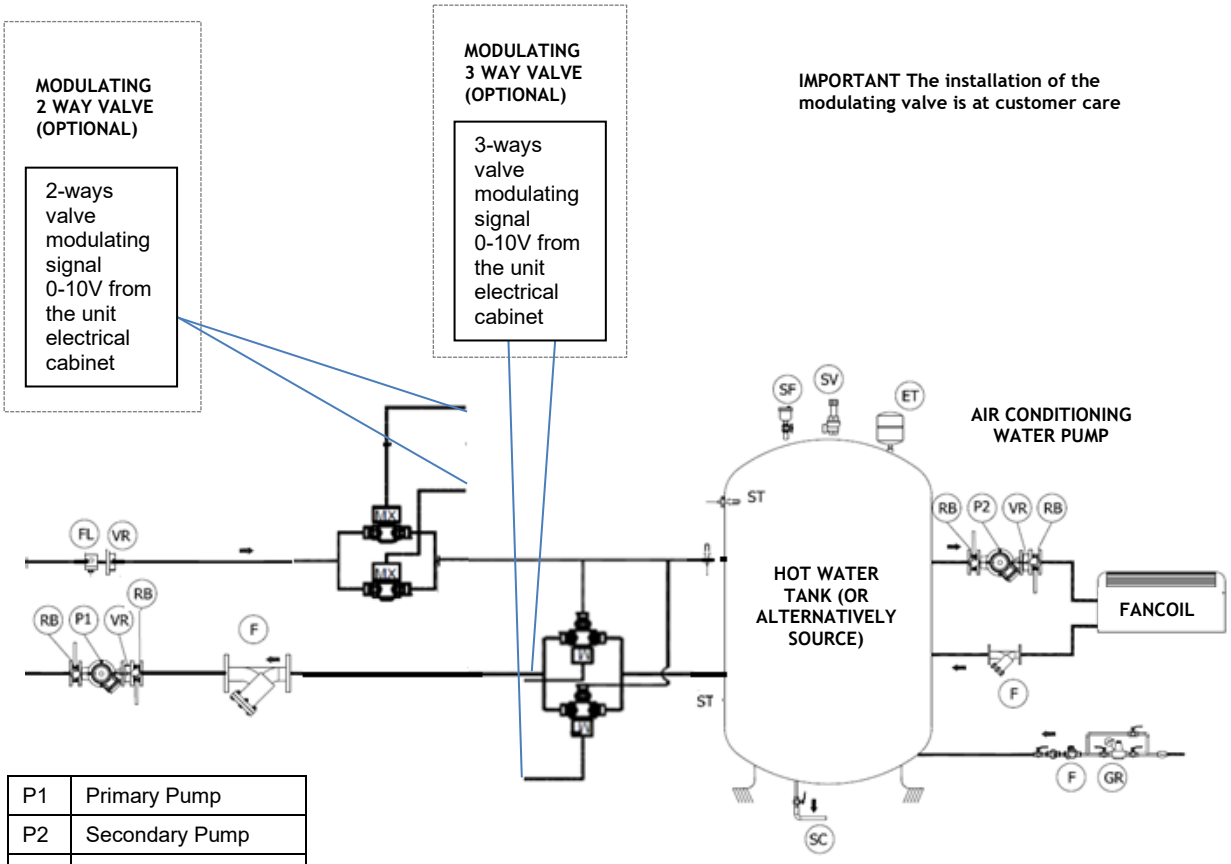


Figure 24

7.6 CUSTOMER PLANT SKETCHES

7.6.1 Customer plant sketch on the condenser side of CGWF SE / CGWF HE / CXWF units with no on board unit pump

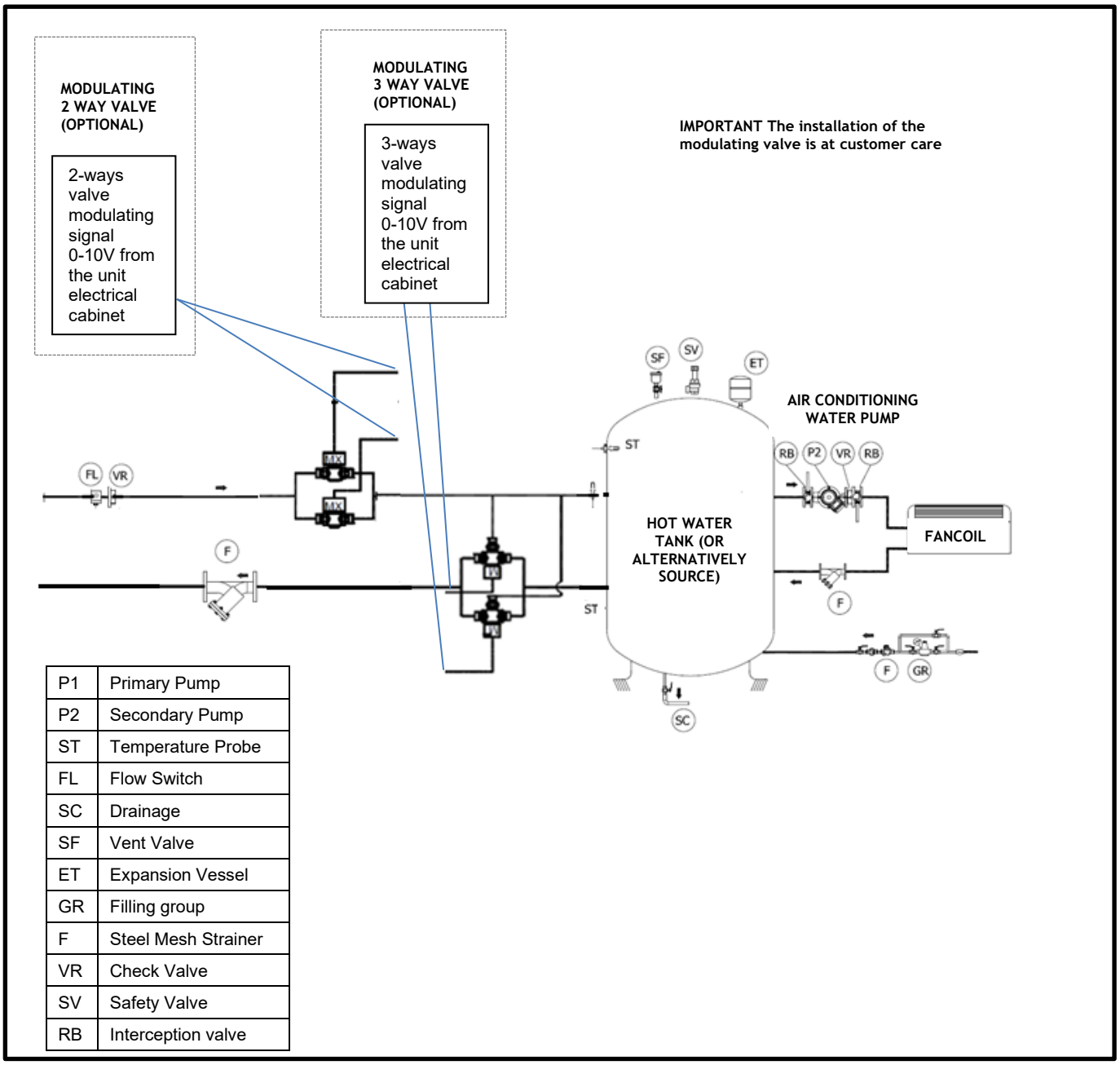


P1	Primary Pump
P2	Secondary Pump
ST	Temperature Probe
FL	Flow Switch
SC	Drainage
SF	Vent Valve
ET	Expansion Vessel
GR	Filling group
F	Steel Mesh Strainer
VR	Check Valve
SV	Safety Valve
RB	Interception valve

Figure 23

IMPORTANT: the steel mesh strainer in the customer plant is obligatory in order to keep the warranty, the flow switch is optional

7.6.2 Customer plant sketch without primary pump on the condenser side of CGWF SE / CGWF HE / CXWF units



P1	Primary Pump
P2	Secondary Pump
ST	Temperature Probe
FL	Flow Switch
SC	Drainage
SF	Vent Valve
ET	Expansion Vessel
GR	Filling group
F	Steel Mesh Strainer
VR	Check Valve
SV	Safety Valve
RB	Interception valve

Figure 24

IMPORTANT: the steel mesh strainer in the customer plant is obligatory in order to keep the warranty, the flow switch is optional

7.6.3 Customer plant sketch on the condenser side of CGWF SE / CGWF HE / CXWF units with no on board unit pump

P1	Primary Pump
P2	Secondary Pump
ST	Temperature Probe
FL	Flow Switch
SC	Drainage
SF	Vent Valve
ET	Expansion Vessel
GR	Filling group
F	Steel Mesh Strainer
VR	Check Valve
SV	Safety Valve
RB	Interception valve

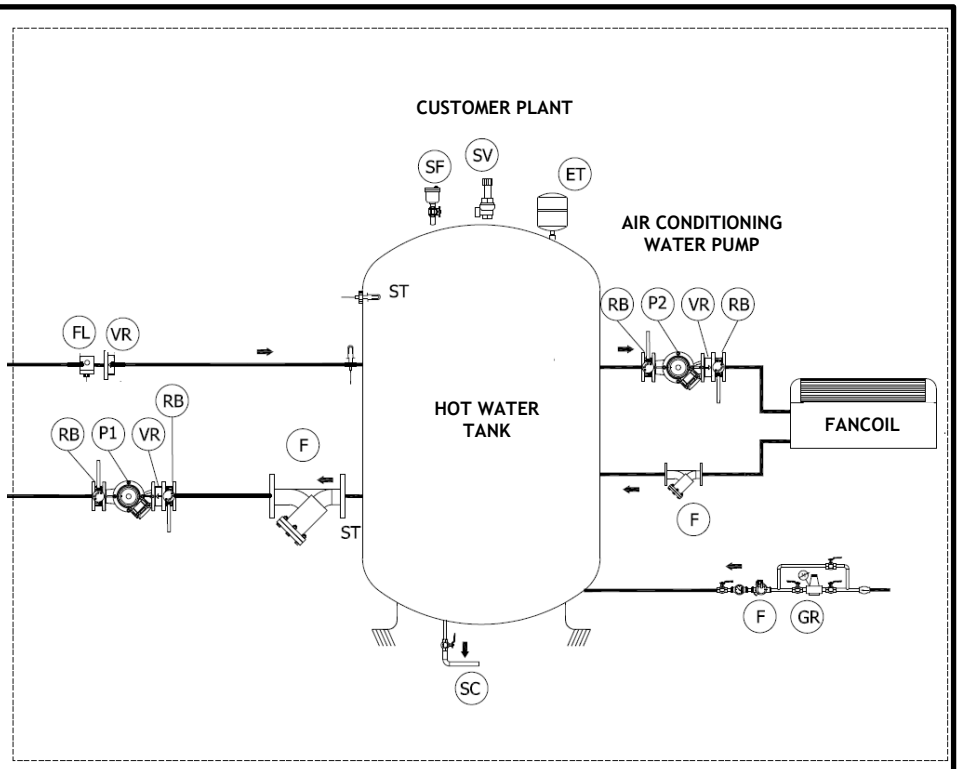
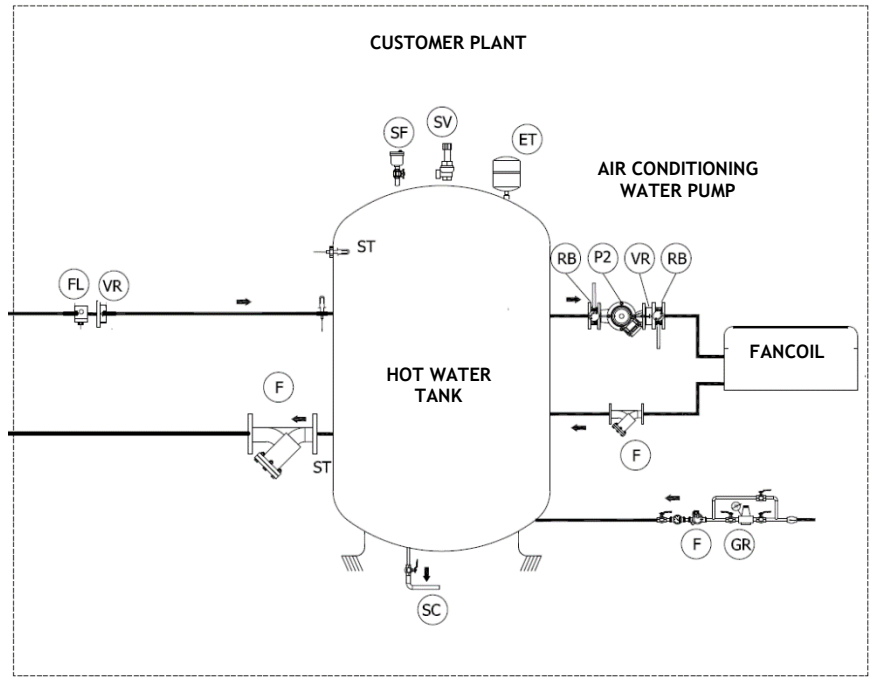


Figure 25

IMPORTANT: the steel mesh strainer in the customer plant is obligatory in order to keep the warranty, the flow switch is optional

7.6.4 Customer plant sketch without primary pump on the condenser side of CGWF SE / CGWF HE / CXWF units



P1	Primary Pump
P2	Secondary Pump
ST	Temperature Probe
FL	Flow Switch
SC	Drainage
SF	Vent Valve
ET	Expansion Vessel
GR	Filling group
F	Steel Mesh Strainer
VR	Check Valve
SV	Safety Valve
RB	Interception valve

Figure 26

IMPORTANT: the steel mesh strainer in the customer plant is obligatory in order to keep the warranty, the flow switch is optional

7.6.5 *Flow switch installation*

To ensure adequate water flow through the evaporator, install a flow switch on the water circuit. The flow switch must be installed according to the relevant hydraulic diagram among those reported in 7.5 HYDRAULIC VERSIONS . The purpose of the flow switch is to stop the unit in case of an interruption of the water flow while protecting the evaporator from freezing. Since no water flow control is installed on board the unit, the installation of the flow switch, always provided as a loose accessory by Trane, in the customer's plant is mandatory.

The flow switch installation can be horizontal and vertical, screw-in thread, RP 1" (ISO7/1). It should be installed far from elbows or throttling with an arrow on flow direction. If pipe is vertical recalibrate range to balance paddle weight. If the device is downwards mounted take care to slags, and apply it in a straight pipe far from filters, valves, etc with length at least 5 times the diameter of pipe upstream and downstream the unit. The paddles must be installed starting from the shortest.

Blade type flow switches are available as loose accessories and are suitable for harsh environments and for pipes with diameters from 1" to 8". The flow switch has a contact which must be wired, by the contractor, on the jobsite. Check the unit wiring diagram for more information. See the instruction sheet inside the flow switch box for information about positioning and settings.

Dimensions (mm)

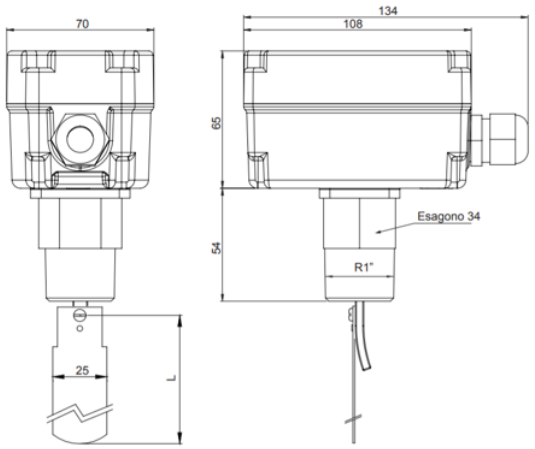


Figure 30

Paddle

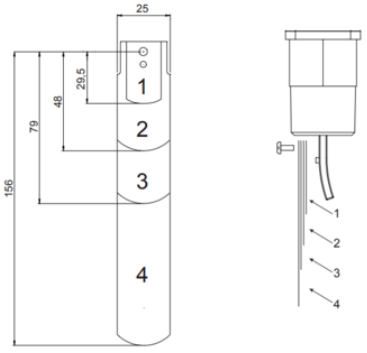


Figure 27

PIPES	TABLES
1″	1
1 1/4″	1
1 1/2″	1, 2
2″	1, 2
2 1/2″	1, 2, 3
3″	1, 2, 3
4″	1, 2, 3
5″	1, 2, 3
6″	1, 2, 3, 4 1, 2, 3
8″	1, 2, 3, 4 1, 2, 3

7.7 PUMPS CHARACTERISTICS

7.7.1 CGWF SE low head pressure pumps characteristics

USER SIDE

	Mod.	Pf [kW]	qw [m^3/h]	dpw [kPa]	Ref. Curve	F.L.I. [kW]	F.L.A. [A]	Hp [kPa]	Hu [kPa]
One refrigerant circuit sizes	**013**	52	9	19	A	1,72	3,8	216	196
	015	60	10	25	A	1,72	3,8	209	184
	019	67	12	32	A	1,72	3,8	203	171
	023	79	14	45	B	2,55	5,1	226	181
	025	92	16	25	B	2,55	5,1	220	195
	029	108	19	35	B	2,55	5,1	212	177
	033	126	22	26	B	2,55	5,1	202	176
	037	140	24	32	B	2,55	5,1	195	163
	041	152	26	38	B	2,55	5,1	187	149
Two refrigerant circuits sizes	**042**	152	26	37	D	4,52	8,7	256	219
	048	176	30	49	D	4,52	8,7	251	202
	056	208	36	69	D	4,52	8,7	243	174
	064	246	42	41	D	4,52	8,7	231	190
	072	273	47	50	E	6,09	10,6	244	194
	078	297	51	59	E	6,09	10,6	238	179
	088	329	57	53	E	6,09	10,6	230	177
	096	357	61	61	E	6,09	10,6	223	162

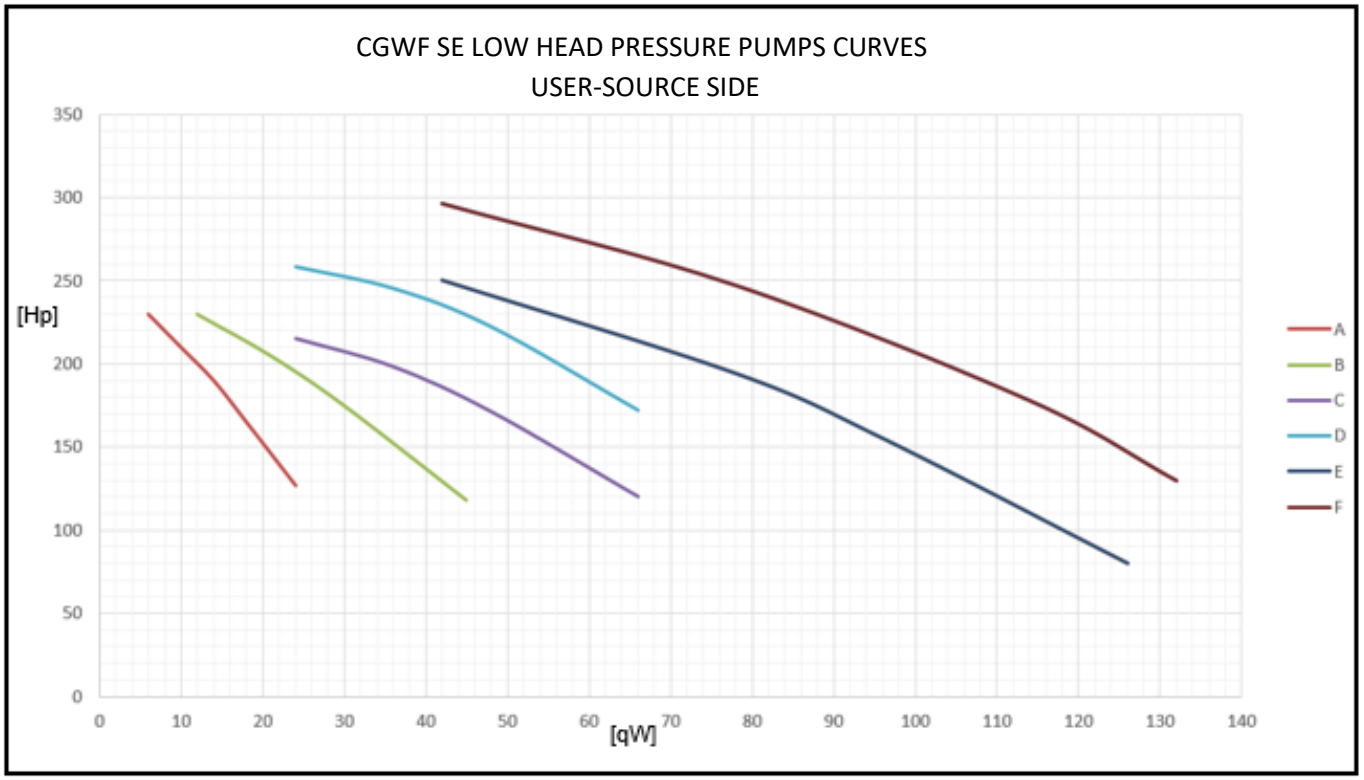
Pf = cooling capacity (kW)
qw = water flow (m3/h)
dpw = pressure drop (kPa)
F.L.I. = full load electrical power
F.L.A. = full load operating current
Hp = water pump head pressure
Hu = water pump available pressure

SOURCE SIDE

	Mod.	Pf [kW]	qw [m^3/h]	dpw [kPa]	Ref. Curve	F.L.I. [kW]	F.L.A. [A]	Hp [kPa]	Hu [kPa]
One refrigerant circuit sizes	**013**	63	11	30	A	1,72	3,8	206	176
	015	73	12	40	A	1,72	3,8	198	157
	019	82	14	50	B	2,55	5,1	225	174
	023	97	17	30	B	2,55	5,1	218	187
	025	111	19	40	B	2,55	5,1	210	171
	029	130	22	30	B	2,55	5,1	200	170
	033	153	26	41	B	2,55	5,1	187	146
	037	169	29	34	C	3,44	6,4	210	176
	041	184	32	40	C	3,44	6,4	207	166
Two refrigerant circuits sizes	**042**	185	32	66	E	6,09	10,6	240	173
	048	216	37	90	D	4,52	8,7	241	151
	056	254	44	53	D	4,52	8,7	228	175
	064	300	52	73	E	6,09	10,6	238	165
	072	331	57	59	E	6,09	10,6	230	171
	078	361	62	70	E	6,09	10,6	222	151
	088	401	69	69	F	8,26	13,6	260	191
	096	438	75	81	F	8,26	13,6	250	170

Pf = cooling capacity (kW)
qw = water flow (m3/h)
dpw = pressure drop (kPa)

F.L.I. = full load electrical power
F.L.A. = full load operating current
Hp = water pump head pressure
Hu = water pump available pressure



7.7.2 CGWF SE high head pressure pumps characteristics

USER SIDE

	Mod.	Pf [kW]	qw [m^3/h]	dpw [kPa]	Ref. Curve	F.L.I. [kW]	F.L.A. [A]	Hp [kPa]	Hu [kPa]
One refrigerant circuit sizes	**013**	52	9	19	A	2,55	4,7	341	322
	015	60	10	25	A	2,55	4,7	333	308
	019	67	12	32	A	2,55	4,7	325	293
	023	79	14	45	B	3,44	6,4	376	331
	025	92	16	25	B	3,44	6,4	356	331
	029	108	19	35	C	4,52	8,7	353	318
	033	126	22	26	C	4,52	8,7	342	315
	037	140	24	32	C	4,52	8,7	333	301
	041	152	26	38	C	4,52	8,7	325	287
Two refrigerant circuits sizes	**042**	152	26	37	D	8,26	13,6	381	344
	048	176	30	49	D	8,26	13,6	377	327
	056	208	36	69	D	8,26	13,6	369	300
	064	246	42	41	D	8,26	13,6	358	317
	072	273	47	50	D	8,26	13,6	347	297
	078	297	51	59	D	8,26	13,6	337	278
	088	329	57	53	D	8,26	13,6	321	268
	096	357	61	61	E	10,12	17,2	229	168

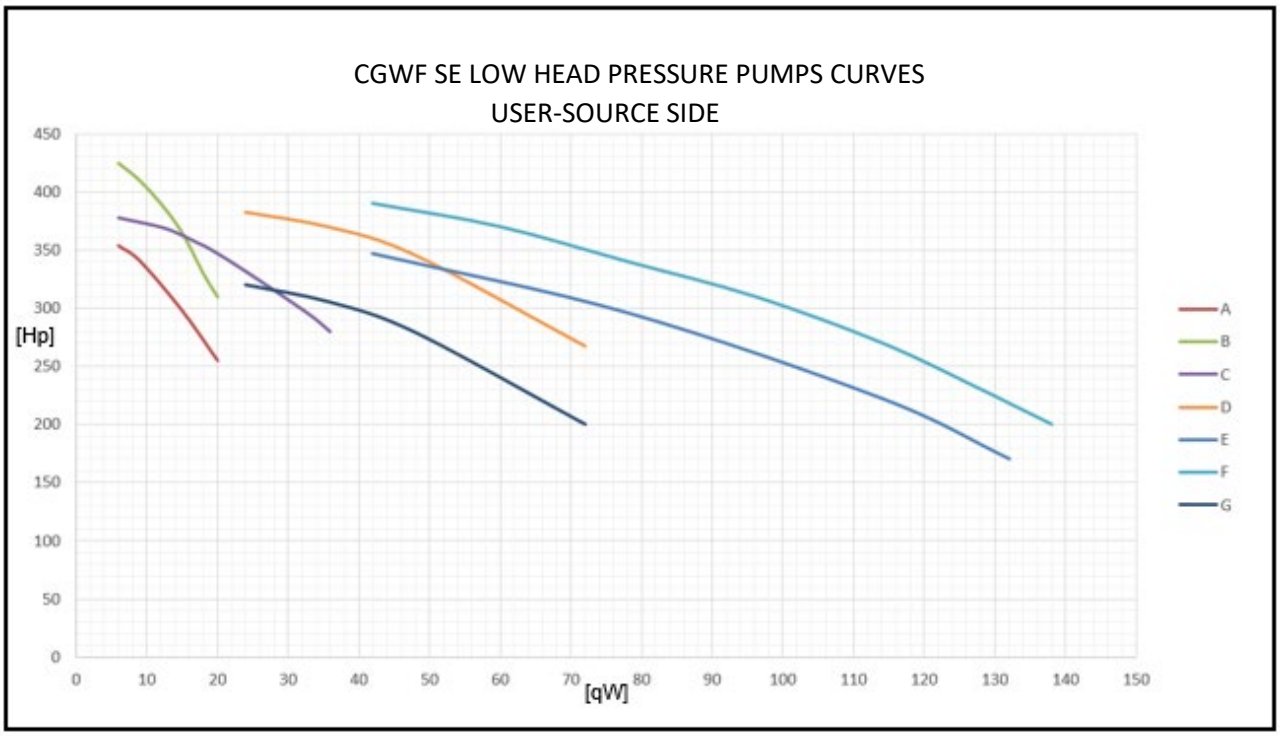
Pf = cooling capacity (kW)
qw = water flow (m3/h)
dpw = pressure drop (kPa)
F.L.I. = full load electrical power
F.L.A. = full load operating current
Hp = water pump head pressure
Hu = water pump available pressure

SOURCE SIDE

	Mod.	Pf [kW]	qw [m³/h]	dpw [kPa]	Ref. Curve	F.L.I. [kW]	F.L.A. [A]	Hp [kPa]	Hu [kPa]
One refrigerant circuit sizes	**013**	63	11	30	A	2,55	4,7	330	299
	015	73	12	40	A	2,55	4,7	318	278
	019	82	14	50	A	2,55	4,7	306	256
	023	97	17	30	B	3,44	6,4	347	317
	025	111	19	40	B	3,44	6,4	320	280
	029	130	22	30	C	4,52	8,7	339	309
	033	153	26	41	C	4,52	8,7	324	284
	037	169	29	34	C	4,52	8,7	313	279
	041	184	32	40	C	4,52	8,7	302	261
Two refrigerant circuits sizes	**042**	185	32	66	D	8,26	13,6	375	308
	048	216	37	90	D	8,26	13,6	367	277
	056	254	44	53	D	8,26	13,6	355	302
	064	300	52	73	D	8,26	13,6	336	263
	072	331	57	59	D	8,26	13,6	320	261
	078	361	62	70	D	8,26	13,6	303	233
	088	401	69	69	E	10,12	17,2	197	129
	096	438	75	81	E	10,12	17,2	168	87

Pf = cooling capacity (kW)
qw = water flow (m3/h)
dpw = pressure drop (kPa)

F.L.I. = full load electrical power
F.L.A. = full load operating current
Hp = water pump head pressure
Hu = water pump available pressure



7.7.3 CGWF HE low head pressure pumps characteristics

CGWF HE USER SIDE (CXWF SOURCE SIDE)

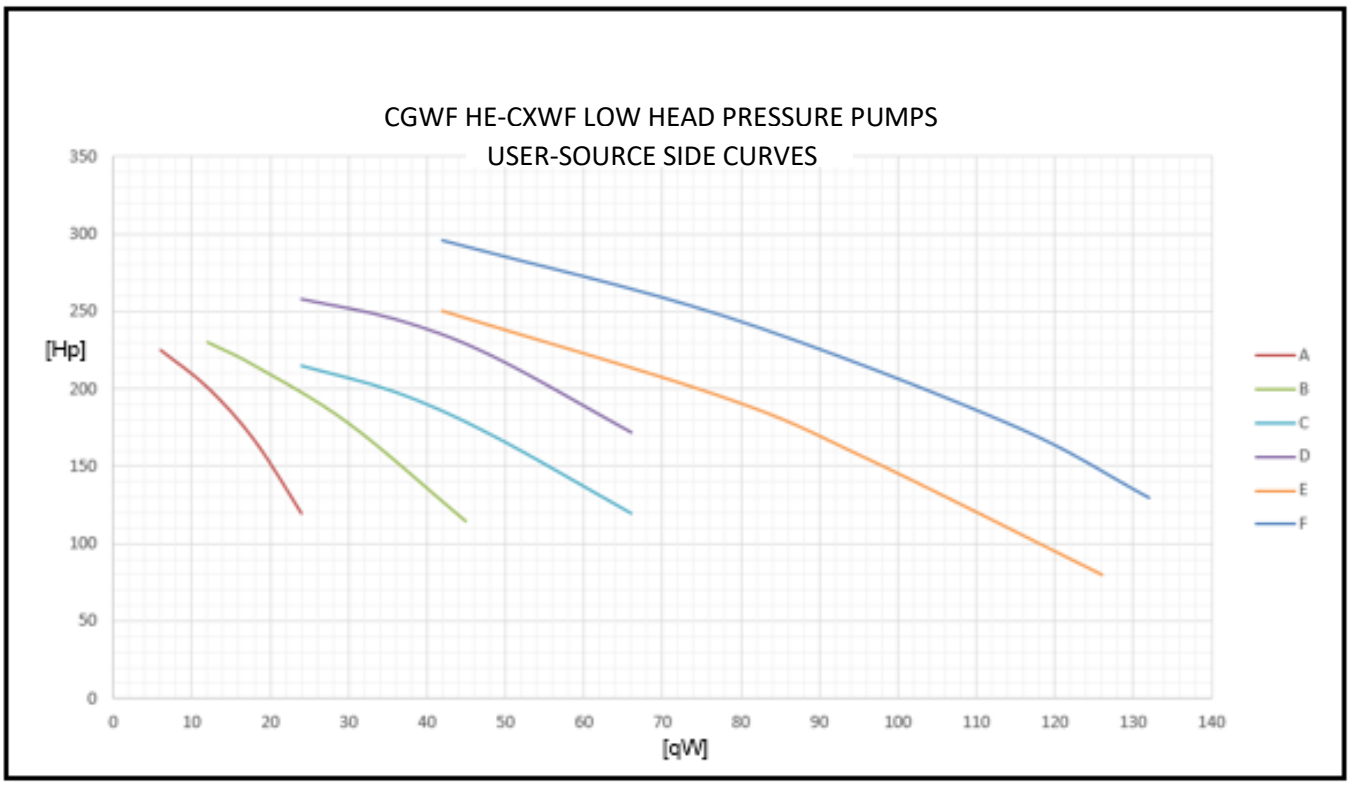
	Mod.		Pf	qw	dpw	Ref. Curve	F.L.I.	F.L.A.	Hp	Hu
	CGWF HE	**CXWF**	[kW]	[m^3/h]	[kPa]		[kW]	[A]	[kPa]	[kPa]
One refrigerant circuit sizes	**013**	**013**	52,7	9	20	A	1,72	3,8	214	194
	015	**015**	60,4	10	26	A	1,72	3,8	208	182
	019	**019**	69,8	12	15	A	1,72	3,8	201	186
	023	**023**	83,7	14	21	B	2,55	5,1	224	203
	025	**025**	94,2	16	15	B	2,55	5,1	220	205
	029	**029**	111,3	19	21	B	2,55	5,1	212	191
	033	**033**	130,0	22	19	B	2,55	5,1	202	183
	037	**037**	143,2	25	23	B	2,55	5,1	195	172
	041	**041**	155,9	27	28	B	2,55	5,1	188	161
Two refrigerant circuits sizes	**042**	**042**	154,0	26	38	B	2,55	5,1	189	151
	048	**048**	185,1	32	23	C	3,44	6,4	206	183
	056	**056**	219,6	38	22	D	4,52	8,7	240	218
	064	**064**	250,6	43	32	D	4,52	8,7	229	197
	072	**072**	277,8	48	39	E	6,09	10,6	243	204
	078	**078**	302,8	52	45	E	6,09	10,6	237	191
	088	**088**	331,4	57	53	E	6,09	10,6	229	176
	096	**096**	372,4	64	38	E	6,09	10,6	218	180
	112	**112**	431,5	74	30	F	8,26	13,6	252	222
	128	**128**	484,0	83	37	F	8,26	13,6	238	201

Pf = cooling capacity (kW)
qw = water flow (m3/h)
dpw = pressure drop (kPa)
F.L.I. = full load electrical power
F.L.A. = full load operating current
Hp = water pump head pressure
Hu = water pump available pressure

CGWF HE SOURCE SIDE (CXWF USER SIDE)

	Mod. CGWF HE	Mod. CXWF	Pf [kW]	qw [m^3/h]	dpw [kPa]	Ref. Curve	F.L.I. [kW]	F.L.A. [A]	Hp [kPa]	Hu [kPa]
One refrigerant circuit sizes	**013**	**013**	63	11	13	A	1,72	3,8	206	193
	015	**015**	73	13	17	A	1,72	3,8	199	181
	019	**019**	84	14	23	A	1,72	3,8	189	166
	023	**023**	100	17	18	B	2,55	5,1	217	199
	025	**025**	113	19	23	B	2,55	5,1	211	188
	029	**029**	133	23	22	B	2,55	5,1	201	179
	033	**033**	155	27	20	B	2,55	5,1	189	169
	037	**037**	171	29	24	B	2,55	5,1	179	155
	041	**041**	187	32	29	C	3,44	6,4	206	177
Two refrigerant circuits sizes	**042**	**042**	186	32	28	C	3,44	6,4	206	178
	048	**048**	222	38	27	C	3,44	6,4	196	169
	056	**056**	264	45	38	E	6,09	10,6	246	208
	064	**064**	301	52	41	E	6,09	10,6	237	196
	072	**072**	333	57	28	E	6,09	10,6	229	201
	078	**078**	363	63	33	E	6,09	10,6	221	188
	088	**088**	401	69	39	E	6,09	10,6	210	171
	096	**096**	449	77	29	E	6,09	10,6	195	166
	112	**112**	518	89	38	F	8,26	13,6	227	190
	128	**128**	580	100	31	F	8,26	13,6	207	176

Pf = cooling capacity (kW)
qw = water flow (m3/h)
dpw = pressure drop (kPa)
F.L.I. = full load electrical power
F.L.A. = full load operating current
Hp = water pump head pressure
Hu = water pump available pressure


CGWF HE-CXWF LOW HEAD PRESSURE PUMPS
USER-SOURCE SIDE CURVES
[Hp]
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
[qW]
A
B
C
D
E
F

7.7.4 CGWF HE high head pressure pumps characteristics

CGWF HE USER SIDE (CXWF SOURCE SIDE)

	Mod. CGWF HE	Mod. CXWF	Pf [kW]	qw [m^3/h]	dpw [kPa]	Ref. Curve	F.L.I. [kW]	F.L.A. [A]	Hp [kPa]	Hu [kPa]
One refrigerant circuit sizes	**013**	**013**	53	9	20	A	2,55	4,7	339	319
	015	**015**	60	10	26	A	2,55	4,7	331	305
	019	**019**	70	12	15	A	2,55	4,7	321	306
	023	**023**	84	14	21	B	3,44	6,4	369	348
	025	**025**	94	16	15	B	3,44	6,4	352	337
	029	**029**	111	19	21	C	4,52	8,7	351	330
	033	**033**	130	22	19	C	4,52	8,7	340	320
	037	**037**	143	25	23	C	4,52	8,7	331	308
	041	**041**	156	27	28	C	4,52	8,7	322	295
Two refrigerant circuits sizes	**042**	**042**	154	26	38	E	8,26	13,6	380	342
	048	**048**	185	32	23	E	8,26	13,6	375	352
	056	**056**	220	38	22	E	8,26	13,6	366	344
	064	**064**	251	43	32	E	8,26	13,6	356	324
	072	**072**	278	48	39	E	8,26	13,6	345	307
	078	**078**	303	52	45	E	8,26	13,6	334	289
	088	**088**	331	57	53	E	8,26	13,6	320	266
	096	**096**	372	64	38	F	10,12	17,2	318	280
	112	**112**	431	74	30	G	11,98	21,3	349	319
	128	**128**	484	83	37	G	11,98	21,3	334	297

Pf = cooling capacity (kW)
qw = water flow (m3/h)
dpw = pressure drop (kPa)
F.L.I. = full load electrical power
F.L.A. = full load operating current
Hp = water pump head pressure
Hu = water pump available pressure

CGWF HE SOURCE SIDE (CXWF USER SIDE)

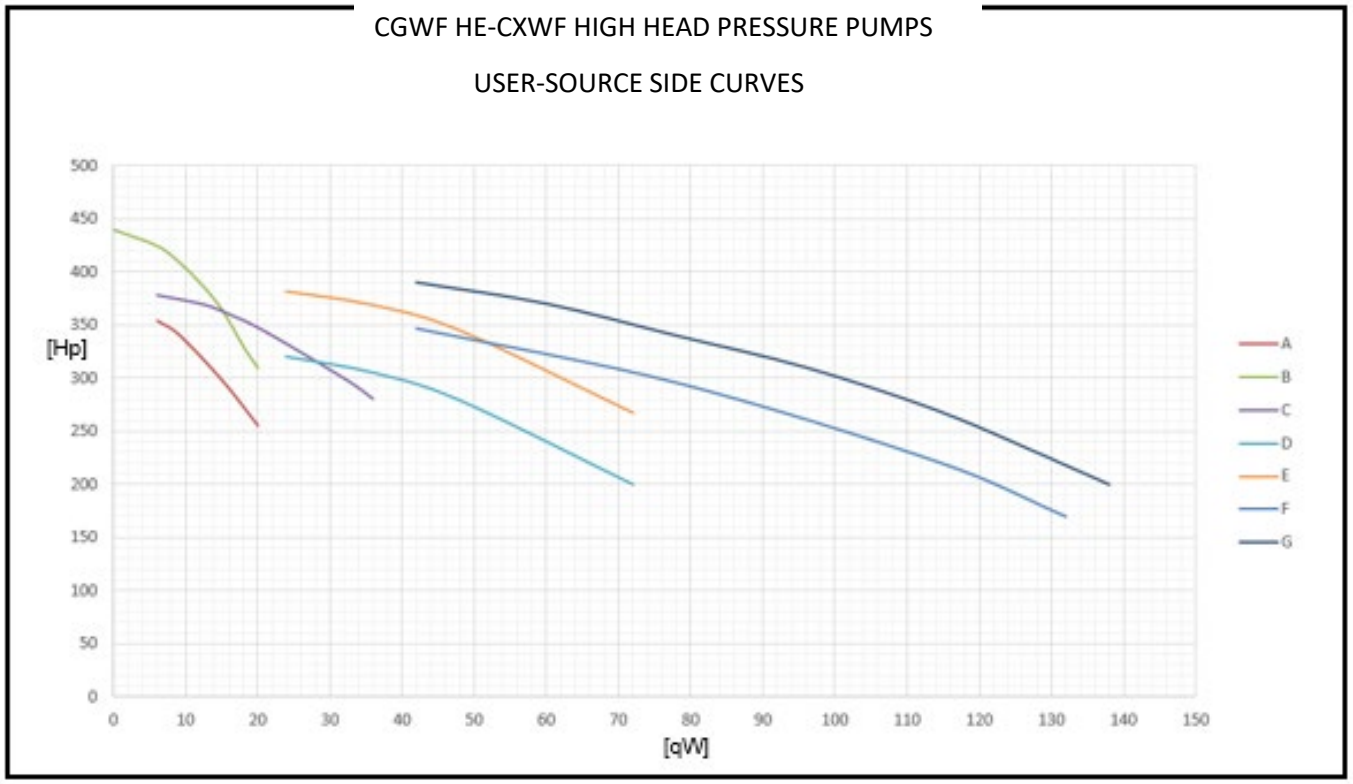
	Mod. CGWF HE	Mod. CXWF	Pf [kW]	qw [m^3/h]	dpw [kPa]	Ref. Curve	F.L.I. [kW]	F.L.A. [A]	Hp [kPa]	Hu [kPa]
One refrigerant circuit sizes	013	013	63	11	13	A	2,55	4,7	328	315
	015	015	73	13	17	A	2,55	4,7	318	300
	019	019	84	14	23	A	2,55	4,7	304	281
	023	023	100	17	18	B	3,44	6,4	341	323
	025	025	113	19	23	B	3,44	6,4	316	293
	029	029	133	23	22	C	4,52	8,7	337	316
	033	033	155	27	20	C	4,52	8,7	323	303
	037	037	171	29	24	C	4,52	8,7	311	287
	041	041	187	32	29	C	4,52	8,7	300	271
Two refrigerant circuits sizes	042	042	186	32	28	C	4,52	8,7	301	272
	048	048	222	38	27	E	8,26	13,6	365	338
	056	056	264	45	38	E	8,26	13,6	351	313
	064	064	301	52	41	E	8,26	13,6	335	294
	072	072	333	57	28	E	8,26	13,6	319	291
	078	078	363	63	33	E	8,26	13,6	302	269
	088	088	401	69	39	F	10,12	17,2	311	272
	096	096	449	77	29	F	10,12	17,2	299	270
	112	112	518	89	38	G	11,98	21,3	324	286
	128	128	580	100	31	G	11,98	21,3	303	271

Pf = cooling capacity (kW)
qw = water flow (m3/h)
dpw = pressure drop (kPa)

F.L.I. = full load electrical power
F.L.A. = full load operating current
Hp = water pump head pressure
Hu = water pump available pressure

CGWF HE-CXWF HIGH HEAD PRESSURE PUMPS

USER-SOURCE SIDE CURVES



8 REFRIGERANT SCHEME

The following drawing is valid for CGWF SE, CGWF HE and CXWF. No cycle reversing valve is shown since the switch from chiller mode to heat pump mode for CXWF is made by modifying the customer plant water circuit as described in the diagram on the following page.

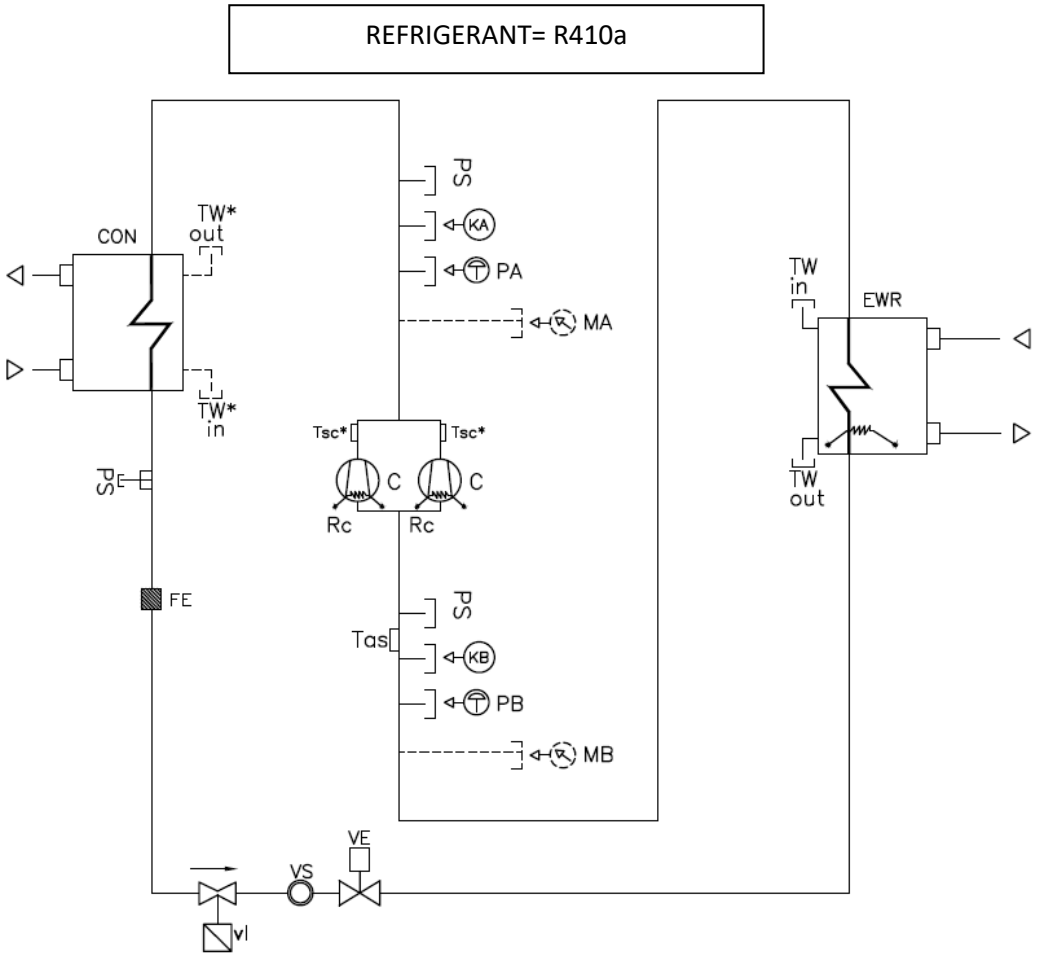


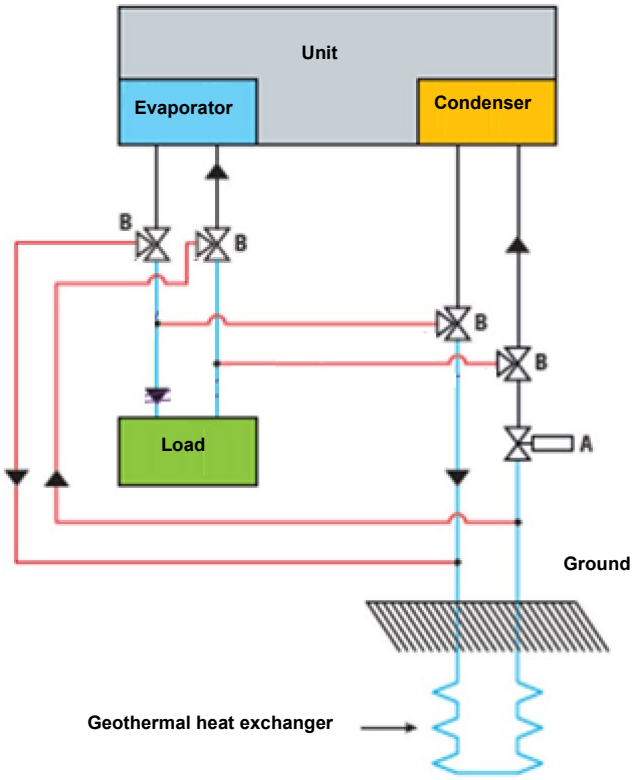
Figure 28

INDEX	
C	COMPRESSOR
PA	HIGH PRESSURE SWITCH
PB	LOW PRESSURE SWITCH
RC	COMPRESSOR CARTER HEATER
MA	HIGH PRESSURE GAUGE
MB	LOW PRESSURE GAUGE
PS	SERVICE VALVE
VS	SIGHT GLASS
Tsc	DISCHARGE TEMPERATURE PROBE
Tas	SUCTION TEMPERATURE PROBE

INDEX	
VI	SOLENOID VALVE
VE	ELECTRONIC EXPANSION VALVE
EWR	EVAPORATOR
CON	CONDENSER
FE	DRIER FILTER
KA	HIGH PRESSURE TRANSDUCER
KB	LOW PRESSURE TRANSDUCER
TW in	INLET WATER TEMPERATURE PROBE
TW out	OUTLET WATER TEMPERATURE PROBE

CXWF reversing on water cycle

In order to activate the CXWF heat pump mode must be set the winter mode on the display of the unit Symbio controller.
The electrovalves installed on the customer plant and providing the customer water plant reversing action over the chiller-heat pump switch (these electrovalves are the ones featured in the diagram below and labeled by the letter B will not be commanded (energyzed) by the CXWF electrcial cabinet but their activation will be managed externally.



The red lines feature the water paths in heat-pump mode with the condenser connected to the load and the evaporator connected to the geothermal heat exchanger.
The light blue lines feature the water paths in chiller mode with the evaporator connected to the load instead and the condenser connected to the geothermal heat exchanger

9 ELECTRICAL PANEL AND ELECTRICAL DATA

• All field-installed wiring must be in accordance with local regulations, CE directives and guidelines. Be sure to satisfy proper equipment grounding requirements according CE

• The standardized values - Maximum Amps –Maximum kilo Watts are displayed on the unit nameplate.

• All field-installed wiring must be checked for proper terminations, and for possible shorts or grounds.

Ensure total protection against the possible penetration of water into the connection point.

All the cables and the terminals are univocally numbered according to the electrical scheme in order to avoid possible misinterpretation. The identification system of the cables connected to the components allow also an easy and intuitive recognition of the component. Each component of the electrical panel is provided with an identification plate according to what is shown on the electrical scheme. All the connections to the electrical panel are made from the bottom and are equipped with cover preventing from break. The electrical panel supply is 400V/3ph+n/50Hz suitable for TN-S system and no additional power supply is necessary. If the unit is powered by a TN-C, TT or IT power supply system the Trane catalogue option “power supply without neutral 400V/3ph/50Hz” must have been ordered and implemented in the unit’s electrical cabinet. The entrance for the power cables is provided on the bottom of the box where a dismountable flange suitable for the purpose is provided.

The control circuit is powered with 24 VAC. Each unit is provided with auxiliary transformer control circuit 230/24V. It requires no additional power cable for the control equipment.
The unit has an antifreeze heater installed directly into the evaporator. The circuit also has an electric resistance installed in the compressor in order to keep warm the oil and thus avoid the transmigration of the refrigerant in its interior. Obviously the operation of the electrical resistors is ensured as long as the unit is power supplied.
The unit is equipped with an alarm relay, which changes state every time an alarm occurs in one of the cooling circuits. Connect the terminals as per the wiring diagram on the unit - terminal “X” - a visual or audible alarm or any external supervision system.

BMS to monitor its operation is allowed. See the wiring diagram of the unit for wiring.

WARNING To avoid corrosion, overheating or general damage, at terminal connections, unit is designed for copper conductors only. In case of aluminum conductors an intermediate connection box must be added. In case of aluminum cable bi material connecting device is mandatory. Cable routing inside control panel should be made case by case by installer.

WARNING Hazardous Voltage with Capacitor! Disconnect all electric power, including remote disconnects and discharge all motor start/run and capacitors before servicing. Follow proper lock out/tag out procedures to ensure the power cannot be inadvertently energized.

For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer’s literature for allowable waiting periods for discharges capacitors. Verify with an appropriate voltmeter that all capacitors have discharged.
After disconnecting input power, wait 5 minutes for units that are equipped with variable frequency drive (0V DC) before touching any internal components. Failure to follow these instructions could result in death or serious injury.

IMPORTANT if the unit is powered by a TT power supply system a differential protection should be suited for industrial machinery with current leak than can be higher than 500 mA (several motors and frequency drives)

VERY IMPORTANT due to the fact that the unit doesn’t mount a refrigerant high pressure safety valve and therefore the safety device for a high pressure event is the high pressure switch, shunt trip coils are installed on compressors automatic circuit breakers in order to ensure the compressors stop in case a high pressure event should occur and in the same moment the electronic control shouldn’t work properly. **This implies that if a high pressure event should occur a manual reset of the compressors automatic circuit breakers is needed.**

Electrical data

		NOMINAL VALUES condenser water temperature in/out 30/35°C, evaporator water temperature in/out 12/7°C							MAXIMUM VALUES				
		Compressors			TOTAL				TOTAL				
	CGWF SE	F.L.I.	F.L.A.	L.R.A.	F.L.I.	F.L.A.	S.A.	S.A. with softstarter	F.L.I.	F.L.A.	S.A.	L.R.A. with softstarter	S.A. with softstarter
		kW	A	A	kW	A	A	A	kW	A	A	A	A
One refrigerant circuit sizes	**013**	11,0	19,2	142,0	11,0	19,2	151,6	80,6	18,5	32,4	156,9	71,0	100,1
	015	12,9	22,5	147,0	12,9	22,5	158,3	84,8	21,5	36,6	161,9	73,5	103,1
	019	14,6	25,6	147,0	14,6	25,6	159,8	86,3	24,1	41,2	166,5	73,5	107,7
	023	17,4	30,4	197,0	17,4	30,4	212,2	113,7	29,2	49,9	218,7	98,5	139,9
	025	19,5	34,1	197,0	19,5	34,1	214,0	115,5	32,8	56,3	225,2	98,5	146,4
	029	22,7	39,8	197,0	22,7	39,8	216,9	118,4	38,4	64,1	255,2	98,5	164,4
	033	26,4	46,1	227,0	26,4	46,1	250,1	136,6	43,9	71,8	262,9	107,5	172,1
	037	28,8	50,4	260,0	28,8	50,4	285,2	155,2	48,6	80,1	295,9	130,0	191,9
	041	31,8	55,6	260,0	31,8	55,6	287,8	157,8	53,3	88,4	304,2	130,0	200,2
Two refrigerant circuits sizes	**042**	33,3	58,3	344,0	33,3	58,3	387,7	215,7	54,7	92,1	225,8	172,0	162,6
	048	40,7	71,2	197,0	40,7	71,2	250,4	151,9	65,6	112,6	281,5	98,5	202,7
	056	46,1	80,7	227,0	46,1	80,7	287,5	174,0	76,8	128,1	334,7	107,5	243,9
	064	53,6	93,7	227,0	53,6	93,7	297,3	183,8	87,9	143,6	334,7	107,5	243,9
	072	58,2	101,8	260,0	58,2	101,8	336,4	206,4	97,3	160,2	351,3	130,0	260,5
	078	64,4	112,8	260,0	64,4	112,8	344,6	214,6	106,7	176,8	392,6	130,0	288,6
	088	71,6	125,3	320,0	71,6	125,3	414,0	254,0	122,3	199,9	438,2	160,0	320,6
	096	81,1	141,9	320,0	81,1	141,9	426,4	266,4	137,9	223,0	222,3	160,0	183,1

Electrical data referred to 400V - 3Phases+N - 50Hz
Maximum operating admitted conditions: 10%
Maximum phase unbalance: 2%

F.L.I. = Full load electrical power
F.L.A. = Full load operating current
S.A. = Sum of compressor motor locked rotor current (L.R.A) of most powerful compressor plus F.L.A of other compressor(s)

	NOMINAL VALUES condenser water temperature in/out 30/35°C, evaporator water temperature in/out 12/7°C									MAXIMUM VALUES				
			Compressors			TOTAL				TOTAL				
	CGWF HE	CXWF	F.L.I.	F.L.A.	L.R.A.	F.L.I.	F.L.A.	S.A.	S.A. with softstarter	F.L.I.	F.L.A.	S.A.	L.R.A. with softstarter	S.A. with softstarter
			kW	A	A	kW	A	A	A	kW	A	A	A	A
One refrigerant circuit sizes	013	013	10,5	18,3	142,0	10,5	18,3	151,1	80,1	18,5	32,4	156,9	71,0	100,1
	015	015	12,3	21,5	147,0	12,3	21,5	157,7	84,2	21,5	36,6	161,9	73,5	103,1
	019	019	13,9	24,3	147,0	13,9	24,3	159,1	85,6	24,1	41,2	166,5	73,5	107,7
	023	023	16,6	29,0	197,0	16,6	29,0	211,5	113,0	29,2	49,9	218,7	98,5	139,9
	025	025	18,8	32,9	197,0	18,8	32,9	213,5	115,0	32,8	56,3	225,2	98,5	146,4
	029	029	22,1	38,6	197,0	22,1	38,6	216,3	117,8	38,4	64,1	255,2	98,5	164,4
	033	033	25,1	44,0	227,0	25,1	44,0	249,0	135,5	43,9	71,8	262,9	107,5	172,1
	037	037	28,0	49,0	260,0	28,0	49,0	284,5	154,5	48,6	80,1	295,9	130,0	191,9
	041	041	31,1	54,4	260,0	31,1	54,4	287,2	157,2	53,3	88,4	304,2	130,0	200,2
Two refrigerant circuits sizes	042	042	31,7	55,4	158,0	31,7	55,4	199,6	120,6	54,7	92,1	225,8	79,0	162,6
	048	048	37,3	65,3	197,0	37,3	65,3	246,0	147,5	65,6	112,6	281,5	98,5	202,7
	056	056	44,5	77,9	227,0	44,5	77,9	285,4	171,9	76,8	128,1	334,7	107,5	243,9
	064	064	50,8	88,8	227,0	50,8	88,8	293,6	180,1	87,9	143,6	334,7	107,5	243,9
	072	072	55,1	96,4	260,0	55,1	96,4	332,3	202,3	97,3	160,2	351,3	130,0	260,5
	078	078	60,7	106,2	260,0	60,7	106,2	339,6	209,6	106,7	176,8	392,6	130,0	288,6
	088	088	69,5	121,7	320,0	69,5	121,7	411,2	251,2	122,3	199,9	438,2	160,0	320,6
	096	096	76,2	133,4	320,0	76,2	133,4	420,0	260,0	137,9	223,0	222,3	160,0	183,1
	112	112	86,8	151,9	344,0	86,8	151,9	457,9	285,9	153,1	252,2	525,9	172,0	388,3
	128	128	96,3	168,6	344,0	96,3	168,6	470,4	298,4	168,3	281,5	555,1	172,0	417,5
	144	144	114,9	201,1	320,0	114,9	201,1	487,6	327,6	206,9	334,5	572,8	160,0	455,2
	162	162	126,1	220,7	344,0	126,1	220,7	527,9	355,9	222,1	363,7	637,4	172,0	499,8
	176	176	137,5	240,5	344,0	137,5	240,5	544,5	372,5	237,3	393,0	666,6	172,0	529,0
	192	192	148,7	260,2	344,0	148,7	260,2	560,8	388,8	252,5	422,2	695,9	172,0	558,3

Electrical data referred to 400V - 3Phases+N - 50Hz
Maximum operating admitted conditions: 10%
Maximum phase unbalance: 2%

F.L.I. = Full load electrical power
F.L.A. = Full load operating current
S.A. = Sum of compressor motor locked rotor current (L.R.A) of most powerful compressor plus F.L.A of other compressor(s)

10 OPERATOR RESPONSIBILITIES

It is important that the operator is properly trained and familiar with the equipment before working on the unit. In addition to reading this manual, the operator must study the manual operation of the microprocessor and the wiring diagram to understand the sequence of start- up, operation, shutdown sequences, and the criterion of operation of all safety devices. During the initial start-up of the unit an authorized technician is available to answer any questions and educate on the proper functioning. We recommend the operator to maintain a record of the operating data for each unit installed and all maintenance activities and periodic service. If the operator observes abnormal or unusual operating conditions, consult the authorized service technician.

11 START-UP PRELIMINARY PROCEDURES

11.1 STARTING CHECK

Before starting the unit, even only momentarily, all the equipment part of the chilled water/hot water loops, like the air handling units, water pumps, strainers, valves etc. have to be checked. The pump auxiliary contacts and the flow switch have to be connected to the control panel as indicated in the electrical diagram. Before carrying out interventions on the valve regulations, loosen the relevant valve gland. Open the discharge valve of the compressor. Open the liquid shutoff valve placed on the liquid line. Measure the suction pressure. If it is lower than 0.42 MPa pry open the solenoid valve on the liquid line by means of an electrical bridge. Bring the suction pressure to 0.45 MPa, then remove the jumper. Charge all the water circuit progressively. Starts up the water pump of the evaporator with the calibration valve shut and then slowly open it.

Discharge the air from the high points of the water circuit and check the direction of the water flow. Carry out calibration of the flow by using a measurer (if present or available) or by means of a combination of the readings of the manometers and the thermometers. In the starting phase calibrate the valve on the pressure difference read on the manometers, carry out drainage of the tubes and then carry out fine calibration on the temperature difference between the water in and the water out. The regulation is calibrated in the factory for water in to the evaporator at 12°C and water out at 7°C. With the general switch open, check that the electrical connections are tightly clamped. Check for any possible refrigerant leaks. Check that the electrical data on the label correspond to those of the mains supply. Check that the thermal charge available is appropriate for starting.

11.2 REFRIGERANT SEALS CONTROL

Trane units are factory charged with the complete charge of refrigerant and are at a sufficient pressure to check the seal after installing. If the system were not under pressure, blow refrigerants (vapour) into it until pressure is reached and look for leakage.

After having eliminated the leakage, the system has to be dehydrated with a vacuum pump up to at least 1mm Hg - absolute pressure (1 Torr o 133.3 Pa). This is the minimum recommended value to dehydrate the plant.

Danger: Do not use the compressor to vacuum the system.

11.3 REFRIGERANT CHARGE CHECK

Trane units are supplied with a complete charge of refrigerant. If bubbles can be seen through the peephole with the compressor running with a full charge and steadily, it means that the refrigerant charge is insufficient.

12 CHECK LIST – MANDATORY OPERATION CONTROL BEFORE START-UP

DATE		**N.**	
UNIT			

CUSTOMER:	SITE: ADDRESS: POSTCODE: COUNTRY:

THE INTENDED PURPOSE OF CGWF SE / CGWF HE / CXWF UNITS IS NOT FOR INDUSTRIAL PROCESS APPLICATION WHICH REQUIRE CHILLED WATER BELOW -7° CELSIUS. PLEASE CONTACT TRANE TECHNICAL DEPARTMENT IN CASE OF INDUSTRIAL PROCESS

GENERAL

		COMPLIANCE	
		YES	NO
1	THE HYDRAULIC CIRCUIT IS COMPLETE AND READY TO BE USED AND THE THERMAL LOAD IS AVAILABLE. **THE FIRST START-UP SHALL NOT BE CARRIED OUT UNLESS THE PLANT IS READY AND THE WATER LOAD IS AVAILABLE**.		
2	THE UNIT DISPLAYS DENTS OR DAMAGES ON THE EXTERNAL CASING OCCURRED DURING THE TRANSPORTATION OR POSITIONING. IF ANY, SPECIFY BELOW: **WARNING:** RELEVANT DAMAGES CAUSED BY THE QUOTED CIRCUMSTANCES MAY RESULT IN THE CALL-OFF OF THE WARRANTY.		
3	THE UNIT HAS BEEN INSTALLED IN ACCORDANCE WITH THE MINIMUM DISTANCE PROVIDED IN THE DIMENSIONAL DRAWING AND TECHNICAL DOCUMENTATION PROVIDED.		
4	THE UNIT IS INSTALLED NEXT TO THE PHOTOVOLTAIC SYSTEM, ELECTRONIC TRANSMITTERS ANTENNAS OR SIMILAR DEVICES.		
5	THE UNIT IS POSITIONED ON A PERFECTLY FLAT (NOT INCLINED) SURFACE.		
6	ANTI-VIBRATIONS DAMPERS HAVE BEEN INSTALLED BETWEEN THE UNIT AND THE FLOOR.		
7	THE UNIT DISPLAYS DEFECTS OR DAMAGES RESULTING FROM MODIFICATIONS OR CHANGES (UNIT TAMPERING / UNAUTHORIZED MODIFICATIONS TO THE REFRIGERANT CIRCUIT OR THE HYDRAULIC CIRCUIT OR THE ELECTRICAL PANEL OR CHANGES TO THE UNIT OPERATING PARAMETERS) MADE BY A THIRD PERSON WITHOUT A WRITTEN AUTHORIZATION ISSUED BY TRANE. THE UNIT SHALL BE CONFORM TO TRANE WIRING DIAGRAMS AND TECHNICAL DOCUMENTATION) IN CASE OF RELEVANT DIFFERENCE BETWEEN THE UNIT AND TRANE STANDARD CONFIGURATION CONTACT TRANE. **WARNING:** PLEASE BE AWARE THAT RELEVANT DAMAGES CAUSED BY THE QUOTED CIRCUMSTANCES MAY RESULT IN THE CALL-OFF OF THE WARRANTY.		
8	THE UNIT HAS BEEN INSTALLED VERY CLOSE TO **A MARINE ENVIRONMENT** OR AN **AGGRESSIVE INSTALLATION ENVIRONMENT** (HIGHLY CORROSIVE CHEMICAL AGENT). **WARNING:** PLEASE BE AWARE THAT RELEVANT DAMAGES CAUSED BY THE QUOTED CIRCUMSTANCES MAY RESULT IN THE CALL-OFF OF THE WARRANTY.		
9	SPOTTED PRESENCE OF MOLD, MUSHROOMS, BACTERIA, MICROBIAL OF ANY TYPE.		
10	THE UNIT DISPLAYS DAMAGES CAUSED BY: FLOODS, LIGHTNING, FIRE, ANY ACCIDENT BEYOND TRANE CONTROL.		

ELECTRIC AND ELECTRONIC

		COMPLIANCE	
		YES	NO
11	THE UNIT IS ELECTRICALLY POWERED AND ALL THE RELEVANT ELECTRICAL WIRES ARE PROPERLY CONNECTED.		
12	ELECTRICAL SUPPLY HAS BEEN INSTALLED IN ACCORDANCE WITH THE INSTRUCTIONS PROVIDED IN THE NAME PLATE AND IN THE TECHNICAL DOCUMENTATION. (ELECTRICAL POWER SUPPLY: 230V/400V +/- 10% - MAXIMUM “%” OF PHASE IMBALANCE: +/- 2%). IT IS RECOMMENDABLE TO CHECK BY USING A TESTER THE VOLTAGE VALUE (BETWEEN PHASES AND BETWEEN PHASE AND NEUTRAL)		
13	PHASES ARE CONNECTED IN THE PROPER SEQUENCE.		
14	ELECTRICAL CABLES SIZE ARE CONFORM TO FLA MAX VALUE.		
15	BOTH EXTERNAL AND INTERNAL ELECTRICAL WIRES ARE WELL TIGHTENED.		
16	THE COMPRESSOR CRANCKCASE HEATERS HAVE BEEN POWERED AND HEATED AT LEAST 8 HOURS BEFORE THE START-UP		
17	AN ELECTRONIC SUPERVISOR (OR ANY ADDITIONAL CONTROLLER) HAS BEEN INSTALLED.		
18	THE CONNECTION WIRES ARE SHIELDED.		
19	REMOTE CONTROL DEVICES OR INTERFACES ARE CONNECTED TO THE ELECTRICAL PANEL IN CONFORMITY WITH TRANE WIRING DIAGRAMS		
20	ELECTRONIC DEVICES ARE INTACT AND DON'T DISPLAY ANY DAMAGE.		
21	AN EXTERNAL WATER PUMP IS ELECTRICALLY CONNECTED TO THE ELECTRICAL PANEL IN ACCORDANCE WITH THE WIRING DIAGRAMS PROVIDED BY TRANE		
22	THE ELECTRICAL ABSORPTION AND THE WATER PUMP OVERHEATING ARE STANDARD.		

REFRIGERANT CIRCUIT

		COMPLIANCE	
		YES	NO
23	ALL CONNECTIONS ON THE REFRIGERANT CIRCUITS ARE WELL TIGHTENED.		
24	THE ELECTRONIC LEAKAGE DETECTOR OR THE PRESSURE GAUGE LEVEL INSTALLED ON THE REFRIGERANT CIRCUIT HAVE DETECTED ANY LEAKAGE. IF ANY, SPECIFY BELOW:		
25	THE COMPRESSOR OIL INDICATOR LIGHT POINTS THE MAXIMUM LEVEL.		
26	THE FILTER INDICATOR LIGHT ON THE LIQUID LINE IS GREEN. WARNING: THE YELLOW INDICATOR LIGHT INDICATES PRESENCE OF MOISTURE IN THE CIRCUIT. CONTACT TRANE.		

WATER CIRCUIT

		COMPLIANCE	
		YES	NO
27	THE FILTER IS INSTALLED ON THE HEAT EXCHANGER PIPES (INLET PIPES FOR THE EVAPORATOR OUTLET PIPES FOR THE RECOVERY) AT A MAXIMUM DISTANCE OF 2 METERS FROM THE UNIT. PLEASE NOTE THAT THE FILTER INSTALLATION IS **MANDATORY**. FOR FURTHER TECHNICAL INFORMATION RELATING THE FILTER REFER TO THE TECHNICAL DOCUMENTATION.		
28	THE FLOW SWITCH (EVAPORATOR SIDE) HAS BEEN INSTALLED AND ELECTRICALLY CONNECTED. FLOW SWITCH INSTALLATION IS **MANDATORY**.		
29	THE VALVES ON THE WATER PLANT MUST BE OPENED. PLEASE BE AWARE THAT IF THE UNIT IS POWERED (OR IN STAND-BY MODE) PUMPS WILL START IF THE WATER TEMPERATURE IS EQUAL OR BELOW 4°C. CLOSING THE VALVES MAY THEREFORE CAUSE SEVERE DAMAGES.		
30	DRAINAGE VALVES ARE INSTALLED. THE DRAINAGE VALVES ARE INSTALLED ON THE LOWEST POINT. THE UTILIZATION OF AUTOMATIC DRAINAGE VALVES IS RECOMMENDED.		
31	AUTOMATIC OR MANUAL PURGE VALVES ARE INSTALLED ON THE HIGHEST POINT.		
32	THE HYDRAULIC CIRCUIT HAS BEEN FILLED AND PURGED. THE PLANT SHALL BE PURGED SEVERAL TIMES BEFORE STARTING UP THE UNIT. THE FILTER INSTALLED NEXT TO THE HEAT EXCHANGER SHALL BE CLEANED SEVERAL TIMES BEFORE STARTING UP THE UNIT, UNTIL THE CORRECT DELTA T IS ASSURED AND THE HYDRAULIC PRESSURE IS CONFORM TO THE PLANT AND TO THE WATER PRESSURE DROPS. FOR FURTHER INFORMATION, REFER TO TRANE DOCUMENTATIONS AND PROCEDURE FOR THE FIRST START UP.		
33	HYDRAULIC CONNECTIONS TO THE UNIT ARE COMPLIANT WITH THE UNIT NAME PLATE AND DIMENSIONAL DRAWINGS (HOT WATER INLET, HOT WATER OUTLET, COLD WATER INLET, COLD WATER OUTLET, EXT.).		
34	RUBBER JOINTS ARE INSTALLED ON THE HYDRAULIC CONNECTIONS, IN ORDER TO MINIMIZE VIBRATIONS BETWEEN THE UNIT AND WATER PIPES.		
35	SHUTOFF VALVES ARE INSTALLED ON THE HYDRAULIC CIRCUIT.		
36	THE EXPANSION TANK IS INSTALLED ON THE HYDRAULIC CIRCUIT. EXPANSION TANK CAPACITY CONCURS WITH THE WATER PLANT CAPACITY.		
37	TEMPERATURE PROBES AND PRESSURE GAUGES ARE INSTALLED ON THE HYDRAULIC CIRCUIT, BOTH INLET AND OUTLET SIDE.		
38	THE HYDRAULIC CIRCUIT IS FREE FROM OBSTRUCTION OR ANY KIND OF CONSTRAINT.		
39	BUFFER TANKS ARE INSTALLED IN THE HYDRAULIC CIRCUIT. THE BUFFER TANKS INSTALLATION IS STRONGLY RECOMMENDED IN ORDER TO WARRANTY THE OPTIMAL UNIT OPERATION. SPECIFY BUFFER TANK CAPACITY:LT		
40	THE PRESSURE RELIEF VALVE IS INSTALLED BETWEEN DELIVERY AND RETURN PIPES. **WARNING:** IN ORDER TO AVOID WATER-HAMMER, THE RELIEF VALVE PRESSURE SHALL BE SET UP IN ACCORDANCE WITH THE STANDARD OPERATING PRESSURE OF THE WATER CIRCUIT.		
41	THE AUXILIARY HEATING SYSTEM IS INSTALLED IN THE WATER CIRCUIT IN ORDER TO AVOID THE START-UP OF THE UNIT WITH WATER TEMPERATURE BELOW 18°C. BEFORE STARTING UP THE UNIT THE INLET WATER TEMPERATURE MUST BE EQUAL OR HIGHER THAN 18°C. **WARNING:** THE UNIT SHALL NEVER WORK (NOT EVEN FOR SHORT PERIODS) WITH AN INLET WATER TEMPERATURE LOWER THAN 18°C.		
42	ANTIFREEZE PROTECTIONS ARE INSTALLED IN THE WATER CIRCUIT (ELECTRICAL HEATERS ARE INSTALLED ON WATER PIPES AND TANKS).		

	FOR FURTHER INFORMATION REFER TO DOCUMENTATION PROVIDED. ANTIFREEZE PROTECTIONS ARE **MANDATORY** FOR OUTDOOR AIR TEMPERATURE LOWER THAN 3°C.		
43	THE WATER CIRCUIT IS FILLED WITH ETHYLENE GLYCOL. ETHYLENE GLYCOL “%” SHALL CONFORM TO THE DATA PROVIDED IN THE DOCUMENTATION.		
44	ALL WATER PIPES ARE GROUND CONNECTED (IN ORDER TO AVOID ABNORMAL VOLTAGES THAT CAN CAUSE DANGEROUS CORROSIONS).		
45	THE EVAPORATOR WATER FLOW IS COMPLIANT TO THE DOCUMENTATION PROVIDED BY TRANE .		
46	THE WATER PUMPS ARE CORRECTLY SET UP IN ACCORDANCE WITH THE PLANT WATER FLOW, AVAILABLE HEAD PRESSURE AND PRESSURE DROP.		
47	THE PUMP IMPELLERS ARE MECHANICALLY UNBLOCKED AND UNCLOGGED (FREE FROM ANY KIND OF CONSTRAINTS.)		

DATE:	**AUTHORIZED SERVICE:** **NAME AND SIGNATURE**	**CUSTOMER:** **NAME AND SIGNATURE**

12.1 REFRIGERANT CHARGE

12.1.1 Refrigerant replacement procedure with unit stopped and in vacuum (refrigerant charge in the liquid phase)

Open the shut off valve as far as possible so that it closes the service coupling. Connect the refrigerant cylinder to the service coupling without tightening the coupling. Half close the liquid shut off valve. If the circuit has been dehydrated and is in vacuum, charge the liquid by turning the cylinder upside down. Weigh and charge the appropriate quantity. Open the valve completely. Start up the unit and leave it running at full charge for some minutes. Check that the indicator is clear with no bubbles. Make sure that the transparency condition without bubbles is due to the liquid and not to the vapour. Correct functioning of the unit allows for overheating of 4 - 7° C and subcooling of 4 - 8°C. Values of overheating which are too high may be caused by a lack of refrigerant, whereas high subcooling values may mean an excess of charge. After intervention on the charge, it is appropriate to check that the unit runs within the declared values: with unit steadily running on a full charge, measure the temperature of the suction line downstream of the thermostatic valve bulb; read the balance pressure to the evaporator on the low pressure manometer and the corresponding saturation temperature.
Overheating is equal to the difference between the temperatures measured in this way. Then measure the temperature of the liquid line coming out of the condenser and read the balance pressure to the condenser on the high -pressure manometer and the corresponding saturation temperature. The subcooling is the difference between these temperatures.

Danger While refrigerant is being added do not exclude any control system and let the water circulate in the evaporator to avoid the formation of ice*.*

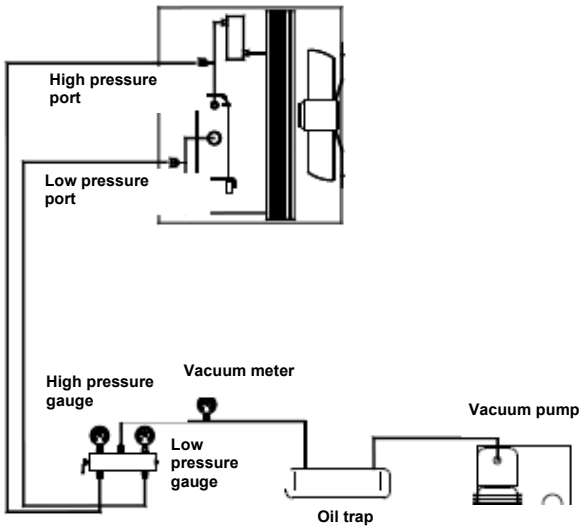


Figure 29

Refrigerant circuit diagram connection to vacuum pump

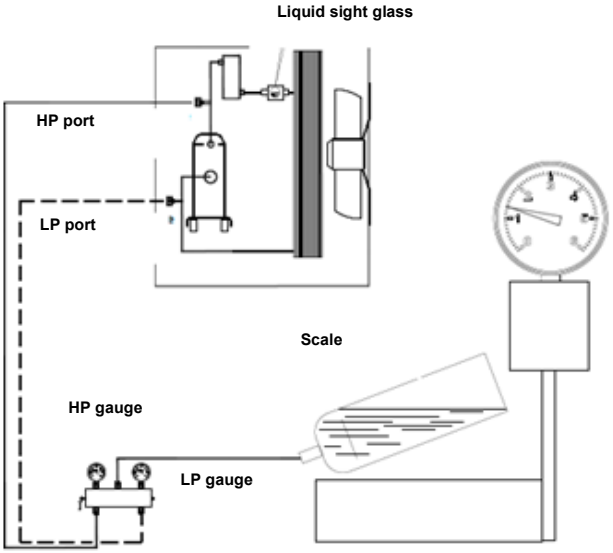


Figure 30

Refrigerant charge in the liquid phase

12.1.2 Refrigerant replacement procedure with unit running (refrigerant charge in the vapour phase)

Caution: charge vapour only. Do not charge liquid because it may damage the compressor.

Connect the refrigerant cylinder to the service valve without tightening the coupling. Drain the connection piping and tighten the coupling. Charge the circuit until the indicator indicates liquid without bubbles. Now the unit has the required charge. Make sure not to overcharge the circuit. Charging more than necessary leads to a higher delivery pressure, greater power consumption and possible damage to the compressor.

The symptoms of a low refrigerant charge are:
Low evaporation pressure.
High value of superheating.
Low value of subcooling.
In this case, add refrigerant R410A. The system is provided with a charging port between the expansion valve and the evaporator. Charge refrigerant until conditions return to work normal. Remember to replace the cap closing the valve at the end.
IMPORTANT!
If the unit has not been provided with integrated pump on board, do not turn off the external pump before 3 minutes have elapsed after turning off the last compressor. The early shutdown of the pump causes a water flow alarm failure.

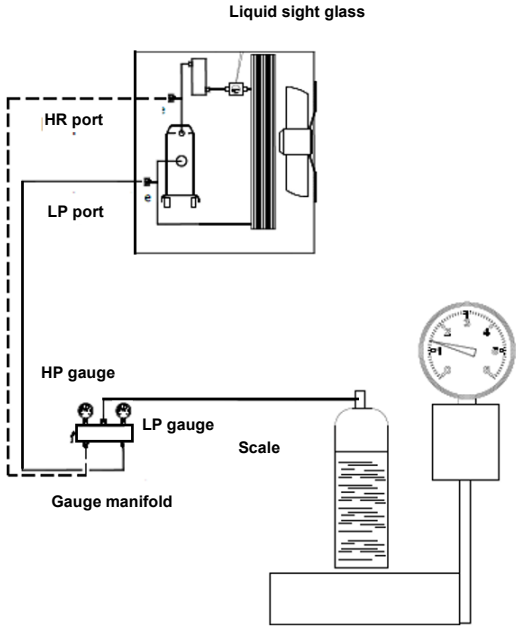


Figure 31

Refrigerant charge in the vapour phase

13 START-UP

13.1 PRELIMINARY CONTROLS

Before starting up the equipment, check that all the operations described in the paragraph “CHECK LIST – MANDATORY OPERATION CONTROL BEFORE START UP” have been carried out correctly.

Check that all the mechanical and electrical equipment has been tightened perfectly. Particular attention should be paid to the main components (compressor, exchangers, ventilators, electrical motors, and pump) if loose fastenings are found, tighten them well before starting up the unit.

The oil heaters have to be inserted at least 8 hours before starting up. Ensure that the compressors’ carter is hot. Open the compressor valve and the cooling circuit one, which may have been shut for charging. Control all the unitry connected to the unit.

WARNING! The chilled water circuit may be under pressure. Bring down this pressure before opening up the system to rinse out or fill up the water circuit. Failure to comply with this instruction may cause accidental injury to maintenance personnel. If a cleaning solution is used in the chilled water circuit, the chiller must be isolated from the water circuit to avoid all the damage risks of the chiller and evaporator water pipes.

13.2 STARTING UP

Start up the unit by pressing the ON/OFF button. About 20 seconds pass from the moment in which the start-up request of the unit is given to the moment in which the (first) compressor starts. Three hundred and sixty seconds will pass from the last shut down to the next start-up of the same compressor.
Check the rotation direction of the compressors. If it is not the right one, invert two supply phases. Ensure that all the safety and control equipment is functioning correctly. Control the temperature of the water coming out of the evaporator and regulate the control setting if necessary. Control the oil level.
The oil type is POE.

13.3 WARM UP OF THE PLANT

In order to keep all the unit components in good condition and to optimize their use, during the warm up it is necessary to bring the circuit to the right temperature before releasing cooling or heating energy to the utilities.
The following steps must be followed for this to be carried out:
* start up the unit
* wait for the water temperature to reach the running temperature
* start up the consumers

Follow the above mentioned procedure every time the plant is stopped long enough for the water temperature contained in it to vary considerably.

13.4 CONTROL OF THE OIL CHARGE

All the compressors mounted on Trane units are factory charged with oil whose chemical characteristic of stability are very good, so it is not necessary to change frequently the lubricant oil.
The scroll compressors are equipped with an oil sight glass from which you can control the level. In tandem or trio performances, pay particular attention to oil level. Not perfectly leveled sight glasses between compressors in parallel, but falling in the upper and lower limits, are considered normal.

In case of burns for the electrical motor or fault of the compressor, it is necessary to make a test to check the acidity of the lubricant oil and, eventually, clean the circuit to reduce the acidity to correct values, mounting for instance an antiacid filter and changing the oil in the circuit.

13.5 START UP PROCEDURE

1) With the switch closed, open the electrical panel and exclude compressor (refer to the wiring diagram on the unit). Close the panel, set switch to “ON” (to give power to the unit).

2) Wait for the start of the microprocessor and control. Make sure that the temperature of the oil is hot enough. The oil temperature must be at least 5°C higher than the saturation temperature of the refrigerant inside the compressor.

3) Place the unit in the “ON” and wait until the unit is indicated on thedisplay-On.

4) Turn on the pumps (at max speed if with inverter).

5) Verify that the loss of load of the evaporator is equal to that of the project and correct if necessary. The pressure drop on the evaporator must be read on the service valves installed on the evaporator piping as a standard. Do not measure the load losses in points where any valves and / or filters are interposed.

6) Check for air in cleaning filters, and then drain the system.

7) Return the pump to the factory setting.

8) Turn off the power (into standby mode) and make sure the pumps stop after about 2 minutes.

Verify that the local temperature setpoint is set to the required value by pressing the Set button.

9) Turn the main switch to “OFF”. Open the cabinet. Reactivate the compressors. Close the cabinet. Turn the main switch to “ON” (to give power to the unit).

10) Wait for the start of the microprocessor and control.

11) When the compressor is started, wait about 1 minute for the system begins to stabilize.

12) Check the pressure of evaporation and condensation of refrigerant.

13) Verify that, after a period of time necessary for the stabilization of the refrigerant circuit, the liquid indicator placed on the inlet pipe to the expansion valve is completely filled (no bubbles), and that the moisture indicator signs ‘Dry’. The passage of bubbles within the liquid indicator may indicate a low amount of refrigerant, or an excessive pressure drop through the filter drier, or an expansion valve blocked at the maximum opening position

14) In addition to checking the sight glass, check the operating parameters of the circuit controlling:
a) Overheating compressor
b) Overheating compressor discharge
c) Sub cooling of the liquid exiting the condenser
d) Evaporation pressure
c) Condensing pressure

15) Measure the values of pressure and temperature by means of the suitable instrumentation and make comparison by reading the corresponding values directly on the display of the microprocessor on board

16) To temporarily turn off the unit put on standby the unit key or open the remote contact (terminals shown in the wiring diagram provided with the unit) of the terminal X (by means of a remote switch installed by the customer) or set time zones. The microprocessor will activate the shutdown procedure that will take a few seconds. The unit water pump will be running on for two minutes after the unit has been switched off. Do not remove the main power to not turn off the electrical resistances of the compressor and the evaporator.

14 MAINTENANCE

Maintenance operations are fundamental in order to keep the units running properly, from both a purely functional and an energetic points of view.
Every Trane unit comes with a logbook, in which the user or the person delegated to unit maintenance can keep all the required notes, in order to keep a historical log of the Trane unit.
A lack of notes in the logbook could be considered proof of careless maintenance.

14.1 GENERAL

IMPORTANT

Beyond the cadences of checks recommended in the following, in order to keep the unit at optimum levels of performance and efficiency and prevent incipient failures, we recommend periodic visits of inspection and control of the unit by qualified personnel.
In particular, we recommend:
4 annual visits to units that operate about 365 days / year (quarterly)
2 visits per year for units with seasonal operation about 180 days / year (one at the start of the season and another one at mid-season)
1 annual visit for units with seasonal operation of about 90 days / year (starting seasonal)
It's important that during the initial start-up and periodically during operation routine checks are carried out. Among them you must also check the suction and condensation as well as the sight glass located on the liquid line.
Check through the microprocessor installed on the unit if the unit is working within normal parameters of superheating and sub-cooling. A routine maintenance program recommended is shown at the end of this chapter while a card collection of operating data is at the end of this manual. It is suggested to record on a weekly basis all the operating parameters of the unit. The collection of these data will be very useful to technicians, in case technical assistance is requested

Compressor Maintenance IMPORTANT!
This inspection must be performed by qualified and trained personnel.
The analysis of vibration is a great tool for checking the mechanical conditions of the compressor.
It is recommended to check the value of the vibration immediately after starting and periodically on an annual basis.

Compressor Electrical Connections
It is very important that all the compressors are wired correctly for proper rotation. These compressors will not tolerate reverse rotation. Verify correct rotation/phasing using a rotation meter.
If wired incorrectly the compressor will make excessive noise, will not pump and will draw about half the normal current. It will also become very hot if allowed to run for an extended period.

NOTE: Do not "bump" the compressor to check rotation as incorrect rotation could cause compressor motor failure in as little as 4 to 5 seconds!
Improper rotation of the compressors is indicated by a compressor module trip, noisy operation, no pressure difference on manifold gauges and low amp draw.

Compressor Replacement
If the chiller suffers a failed compressor, use these steps for replacement:
Each compressor has lifting eyes. Both lifting eyes must be used to lift the failed compressor.
After a mechanical failure of a compressor, it is necessary to change the oil in the remaining compressor and also replace the liquid line filter drier. After an electrical failure of a compressor, it will also be necessary to change the oil in the remaining compressor, replace the filters driers and add a suction filter drier with clean-up cores.
Make sure that a heater is correctly installed on the compressor. The heater helps prevent dry starts.
Note: Do not alter the refrigerant piping in any way as this can affect compressor lubrication.

Refrigerant System Open Time
Units use oil and therefore refrigerant system open time must be kept to a minimum. The following procedure is recommended:
Leave a new compressor sealed until it is ready to be installed in the unit. Maximum system open time is dependent upon ambient conditions, but do not exceed one hour open time.
Plug the open refrigerant line to minimize moisture absorption. Always change the liquid line filter drier.
Do not leave oil containers open to the atmosphere. Always keep them sealed.

14.2 STANDARD CHECKS

Operations description	Recommended basis
Compressors oil level check	monthly
Inlet temperature check (overheating)	monthly
Water circuits filling check	monthly
Compressors motors electrical input check	monthly
Power supply and auxiliary power voltage check	monthly
Refrigerant charge check through sight glass	monthly
Compressors carter heaters operation check	monthly
Tightening all electrical connections	monthly
Compressors and liquid circuit solenoid valve check	semiannual
Compressors contactors state check	quarterly
Evaporator heater operation check	quarterly
Pressure vessels conditions check	yearly
Check glycol concentration in the chilled water circuit if glycol presence is required	monthly
Check and clean the strainer	monthly
Check operation of all safety devices	annual
Carry out oil analysis and change the oil if necessary	annual

Temperature and pressure probes – The unit comes factory-equipped with all the sensors listed below. Periodically check that their measurements are correct by means of sample instruments (manometers, thermometers); correct readings if necessary using the microprocessor keyboard. Well- calibrated sensors ensure better efficiency for the unit and a longer lifetime.

Note: refer to the microprocessor use and maintenance manual for a complete description of applications, setting and adjustments.

All sensors are preassembled and connected to the microprocessor. The descriptions of each sensor are listed below:

Evaporator outgoing water temperature sensor –This sensor is located on the evaporator outgoing water connection and is used by the microprocessor for antifreeze protection and to control the unit load according to the system thermal load.

IMPORTANT
In case a temperature control based on ingoing water temperature is needed please contact Trane before carrying out any trying to set it autonomously**.**

Evaporator ingoing water temperature sensor –This sensor is located on the evaporator ingoing water connection and is used for monitoring the return water temperature.

Condenser outgoing water temperature sensor –This sensor is located on the condenser ingoing water connection and is used for monitoring the condenser delivery water temperature.

Condenser ingoing water temperature sensor –This sensor is located on the condenser ingoing water connection and is used for monitoring the condenser return water temperature.

External air temperature sensor –This sensor allows to monitor the external air temperature on the microprocessor display and to manage the activation/deactivation of the compressors crankcase heaters

High pressure transducer –This allows to monitor the delivery pressure and to control the ventilators. Should an increase in condensation pressure occur, the microprocessor will control the circuit load in order to allow it to function even if choked. It contributes to complementing the oil control logic.

Low-pressure transducer –This allows to monitor the compressor suction pressure along with low pressure alarms. It contributes to complement the oil control logic and to manage the electronic expansion valve.

Suction temperature sensor –This allows to monitor the compressor suction temperature. It contributes to manage the electronic expansion valve.

Compressor discharge temperature sensor – This allows to monitor compressor discharge temperature and oil temperature. The microprocessor shuts down the compressor in case of alarm in the event that the discharge temperature reaches 120°C.

14.3 ORDINARY MAINTENANCE

Activities list	Week	Month (1)	Year (2)
General:			
Data collection operation (3)	X		
Visually inspect the unit for any damage and / or looseness		X	
Verifying the integrity of the thermal insulation			X
Clean and paint where needed			X
Water Analysis (4)			X
Electric:			
Check the correct operation of the equipment on the unit			X
Check the wear of contactors - Replace if necessary			X
Check tightness of all electrical terminals - Tighten if necessary			X
Clean the inside of the electrical panel			X
Visual inspection of the components for signs of overheating		X	
Check the operation of the compressor and the electric resistance		X	
Measurement using a Megger insulation of the compressor motor			X
Refrigerant circuit:			
Perform a test of refrigerant leaks		X	
Check through the sight glass coolant flow - Full Indicator	X		
Carry out the analysis of the vibrations of the compressor			X
Carry out the analysis of the acidity of the oil of the compressor (5)			X

1) Monthly activities include all those weekly.
2) The annual activity (or earlier in the season), include all activities weekly and monthly.
3) The values of the unit should be recorded each day for a high level of observation.
4) Check for dissolved metals.
5) TAN (Total Acid Number):

0.10	No action
From 0.10 to 0.19	Repositioning filters antacid and occurs after 1000 hours of operation. Continue to replace the filters until the TAN not falls below 0.10
> 0.19	Changing the oil, oil filter and the filter drier, Refer to regular intervals

15 RECOMMENDED SPARE PARTS

Here below is shown a list of the recommended spare parts for units with several years of operation.
Your local Trane Sales & Service office is at your disposal to recommend a customized list of spare parts and accessories according to the commissioned order and based on the installed unit with its specific serial number

1 YEAR	
COMPONENTS	**QUANTITY**
fuses	(all)
filter dryers	(all)
solenoid valves	(1 per type)
electronic expansion valves	(1 per type)
pressure switches	(1 per type)
gas gauges	(1 per type)
contactors and relays	(1 per type)
thermal protectors	(1 per type)
carter electric heaters	(1 per type)
check valve	(1 per type)
sight glass	(1 per type)

2 YEAR	
COMPONENTS	**QUANTITY**
fuses	(all)
filter dryers	(all)
solenoid valves	(all)
electronic expansion valves	(all)
pressure switches	(all)
gas gauges	(all)
contactors and relays	(all)
thermal protectors	(all)
carter electric heaters	(all)
check valve	(1 per type)
sight glass	(1 per type)
electrical components	(all)
compressors	(1 per type)

5 YEAR	
COMPONENTS	**QUANTITY**
fuses	(all)
filter dryers	(all)
solenoid valves	(all)
electronic expansion valves	(all)
pressure switches	(all)
gas gauges	(all)
contactors and relays	(all)
thermal protectors	(all)
carter electric heaters	(all)
check valve	(all)
sight glass	(all)
electrical components	(all)
compressors	(all)
heat exchanger	(1 per type)

16 TROUBLESHOOTING

Symptom	Cooling	Heating	Who can take corrective action U = User S = specialised personnel	Probable cause	Possible remedy
A The unit does not start	X	X	S	Probe faulty service	Check and replace if necessary.
	X	X	S	Lack of consent of the high or low pressure	See points D-E
	X	X	S	Defective compressor	See point B.
B The compressor does not start	X	X	S	Compressor burnt or seized	Replace the compressor.
	X	X	S	Compressor contactor de-energized	Check the voltage across the coil of the compressor contactor and the continuity of the coil.
	X	X	S	Power circuit open	Investigate the cause of the protection, and check if there are any short circuits in the wiring or in the windings of the motors of pump, compressor and transformer
	X	X	S	Motor thermal protection open	The compressor has operated in critical condition or there is a lack of charge in the circuit: Make sure that working conditions are within the limits of operation. Loss of coolant: see section G.
C The compressor starts up and stops repeatedly	X	X	S	Intervention of the minimum	See point E.
	X	X	S	Compressor contactor defective	Check and replace if necessary.
	X	X	U	Calibration values of the set- point or differential	Modify them as reported in the in the tables.
	X	X	S	Lack of coolant	See point G
D The compressor does not start because the maximum pressure switch has tripped	X	X	S	Pressure switch out of order	Check and replace.
	X	X	S	Overcharge of refrigerant	Download the excess refrigerant
		X	S	Water pump circulation blocked	Unblock the pump.
		X	X	Water circulation pump and defective	Check and replace if necessary.
	X	X	S	Presence of non condensable gases in the refrigerant circuit	Prime the circuit after it has been downloaded and put under vacuum.
	X	X	S	Refrigerant filter clogged	Check and replace.

Symptom	Cooling	Heating	Who can take corrective action U = User S = specialised personnel	Probable cause	Possible remedy
E The compressor does not start because the minimum pressure switch has tripped	X	X	S	Pressure switch out of order	Check and replace.
	X	X	S	Unit completely void of refrigerant	See point G.
	X		U	Water circulation pump blocked	Unlock the pump
	X		S	Water circulation pump blocked and defective	Check the pump and replace if necessary
		X	S	Presence of frost on the evaporator coil	See point N.
	X	X	S	Refrigerant filter clogged	Check and replace.
	X	X	S	Expansion device that is not working properly	Check and replace if necessary.
	X	X	S	Presence of moisture in the refrigerant circuit	Replace the filter, dry and recharge
G Lack of gas	X	X	S	Loss in the refrigerant circuit	Check the cooling circuit using a leak detector after pressurising the circuit to approximately 4 bars. Repair, evacuate and refill.
H Frost in the liquid line downstream from a filter	X	X	S	The filter is clogged	Replace the filter
I The unit works continuously without ever stopping	X	X	S	Lack of refrigerant gas	See item G.
	X	X	U	Incorrect tuning of the operating thermostat	Check and set.
	X	X	S	Excessive thermal load	Reduce the thermal load
	X	X	S	Compressor does not give the thermal output	Check, change or revise
	X	X	S	The liquid filter is clogged	Replace.
L The unit works regularly but with an insufficient capacity	X	X	S	Low refrigerant charge	See point G.
	X	X	S	4-way reversing valve defective	Check the power supply and the coil of the valve and replace the valve

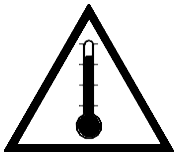
Symptom	Cooling	Heating	Who can take corrective action U = User S = specialised personnel	Probable cause	Possible remedy
M Frost in the compressor intake pipe	X	X	S	Expansion device that is not working properly	Verify and replace.
	X	X	S	Water circulation pump blocked	Unlock the pump.
	X	X	S	Water circulation pump defective	Check the pump and replace if necessary.
	X	X	S	Low refrigerant charge	See point G.
	X	X	S	The liquid filter is clogged	Replace.
N Abnormal noise detected in the system	X	X	S	Compressor noisy	Check and replace if necessary.
	X	X	S	The panel vibrate	Fasten properly.
O The unit does not start	X	X	S	Phases of the supply network reversed	Invert two phases.

17 IMPROPER USE

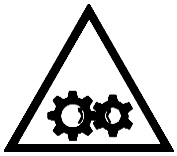
The unit is projected and built up to grant the maximum safety in its proximity, as well as to resist to aggressive environmental conditions.
Residual risks are indicated with warning labels.

SAFETY SYMBOLS

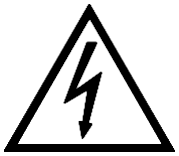
DANGER:
General danger



DANGER:
Temperature



DANGER:
Moving parts



DANGER:
Cutoff voltage

Trane – by Trane Technologies (NYSE: TT), a global climate innovator – creates comfortable, energy efficient indoor environments through a broad portfolio of heating, ventilating and air conditioning systems and controls, services, parts and supply. For more information, please visit trane.eu or tranetechnologies.com.

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