



TRANE®

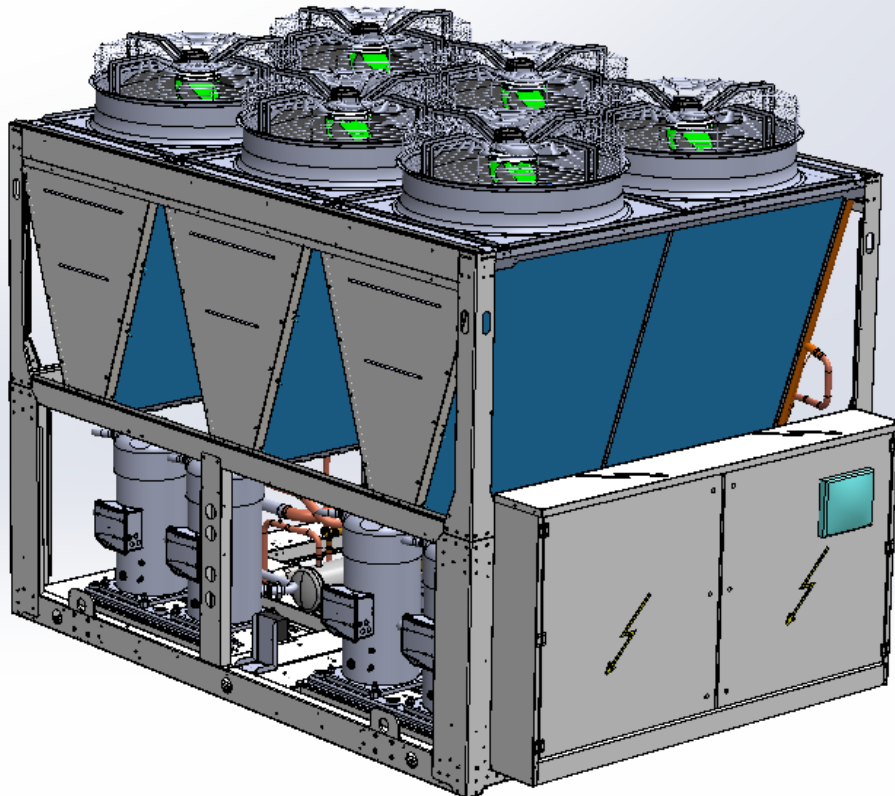
Installation Operation Maintenance

CGAF SE – CGAF HE

Air-to-water chiller with scroll compressors, Symbio™ 800 controller
R454B refrigerants

CGAF SE - Cooling capacity 137 – 420 kW

CGAF HE - Cooling capacity 137 – 419 kW



JULY 2024

CG-SVX058D-GB

TRANE
TECHNOLOGIES

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1 OVERVIEW

FOREWORD

These instructions are given as a guide to good practice in the installation, start-up, operation, and maintenance by the user of CGAF SE / CGAF HE units. They do 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.

WARNING: CGAF SE units are the same as CGAF HE ones in everything except that:

• **CGAF HE units mount electronic fans EC as a standard, CGAF SE units mount fans AC driven by a phase cut speed regulator as a standard instead.**

1.1 WARRANTY

- A. The warranty for Trane machines is 12 months from the date the machine is operated for the first time but no more than 18 months from the date of the invoice. The warranty is reduced to 6 months from the start up date for units running continuously, that is more than 12 hours a day. The date the machine is operated for the first time means the date reported in the "1st start up form" contained into the "machine log book". This form should be filled in and sent, within 8 days from the start up, to Trane.
- B. The warranty is valid if all the installation regulations have been adhered to (both those which may have come from Trane and those coming from current practice), if the "1st start up form" has been filled in and sent to the Trane after sales department.
- C. The warranty is subject to any faults or defects being reported within eight days from their discovery. The warranty will only be applied if and when the purchaser suspends use of the equipment as soon as a defect has been found. Replacement items are to be considered always ex TRANE factory. Labor costs to replace failed items either under warranty or not, will be not of TRANE care.
- D. The warranty is valid if the first running of the machine is carried out by a Trane authorized assistance center.
- E. The warranty is subject to regular maintenance of the unit which is appropriately indicated in the "machine log book" located inside the electrical panel.
- F. The warranty is automatically over in case of payments not fulfilled, non-performance of the contract and even if the units show tampering without TRANE writing approvals.
- G. Non observance of the above mentioned rules and of all the indications written on this manual, will cause the immediate loss of warranty, getting free TRANE from any responsibility for the unit and any damages to persons or things.

1.2 RECEIVING THE UNIT

It is up to the customer to check that there is no obvious damage or pieces missing. If this is so, an immediate complaint must be made to the carrier for damage or for not-delivery. Photographic evidence must be provided for macroscopic damage. The card must be sent to Trane within 8 days of receiving the goods: if it is not sent back or delayed, the complaint will not be accepted.

1.3 FACTORY INSPECTION

Trane units are inspected into 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.

2 SAFETY REGULATIONS

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

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

The access to the unit dangerous areas is usually obstructed through protection panels, which are removable, by using a tool. Axial fans are protected with accident prevention grilles.

For all the units which allow access to the cooling piping without security gratings (optional) or closing panelling, 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 areas 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 machine; he or she must not open any machine 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 them.
- 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 WARNING
Risks for skin touching	Splashes or sprinkles can cause chill burns. The risk of absorptions through the skin is not relevant. The R454B 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 machine 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 or access any electrical component installed on the unit disconnect the unit from the mains by means of the main switch.

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 the 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

The unit is equipped with high pressure safety valves which may relieve high pressure and high temperature refrigerant in close vicinity of the unit in case of an abnormal overpressure event. In order to prevent harm to people who might find themselves close to the unit, the installer should convey the escaped refrigerant by means of piping. The safety valves installed in the unit are equipped with a threaded connection that makes conveying easier.

If a piping aimed at conveying refrigerant from safety valves, as described above, has not been installed by the installer, in order to protect from safety devices exhausting it is not allowed to remove the protections while the unit is in operation and to approach the unit without wearing the right protections. In case of accidental contact with refrigerant due to the safety valves exhaust it is necessary to follow the above indicated.

- 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 machine without putting on protective gloves.
- Keep a fire extinguisher which is able to put out fires on electrical equipment near the machine.
- 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 authorised 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 (helmet, isolating gloves, protective glasses, safety shoes etc.).

If measurements or controls must be carried out which require the machine 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 such as 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, the condensation batteries 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 machine 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.

2.10 MANUAL ALARM RESET

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

3 UNIT MODEL NUMBER DESCRIPTION

Digit 1, 2, 3, 4 – Unit Model

CGAF = CGAF - Air-Cooled Scroll chiller

Digit 5-6-7 – Unit Nominal Tonnage

042 = 42 t
050 = 50 t
052 = 52 t
055 = 55 t
060 = 60 t
065 = 65 t
070 = 70 t
075 = 75 t
085 = 85 t
095 = 95 t
105 = 105 t
125 = 125 t

Digit 8 – Unit voltage

D = 400V/50Hz/3ph
G = 400V/50Hz/3ph Compatible with IT Neutral

Digit 9 – Manufacturing Location

E = Epinal, France
F = Epinal, France (ICS)
B = Epinal, France (Thermocold)
I = Bari, Italy (TRANE)
T = Bari, Italy (ICS)
Z = Bari, Thermocold

Digit 10 - P10 Design sequence

* = Major Design Sequence
A = Major Design Sequence

Digit 11 - P11 Design sequence

* = Major Design Sequence
A = Major Design Sequence
B = Minor Design Sequence
C = Minor Design Sequence
D = Minor Design Sequence
E = CGAF DSH New Deckplate
F = CGAF HE Option creation

Digit 12 – Efficiency

N = Standard Efficiency
H = High Efficiency with EC fans

Digit 13 – Agency listing

C = CE Certification (Europe)
U = UKCA mark (UK, excl Northern Ireland)

Digit 14 – Not Used

Digit 15 – Acoustic level

X = Standard noise
L = Low noise
E = Extra low noise

Digit 16 – Unit Application

X = Standard Ambient (14-115F/-10-46C)
L = Low Ambient (-4 To 115F/-20 To 46C)

Digit 17 – Relief valve option

W = Without

Digit 18 –Water connection

X = Standard Grooved pipe connection
W = Grooved pipe + welded coupling

Digit 19 – Evaporator Application

N = Standard cooling (4.5°C up to + 20°C)
P = Low Temperature Process (39,2 To 10,4F/4 To -12C)
C = Ice-Making W/ Hardwired Interface

Digit 20 – Evaporator Configurations

B = Brazed plate heat exchanger
T = Shell & Tube
A = Alternative 1
D = Alternative 2

Digit 21 –Thermal Insulation

X = Without thermal insulation
N = Standard thermal insulation (10 mm)
H = With high performance insulation (20 mm)

Digit 22 – Condenser Coating

N = Micro channel
C = E-coated MCHE

Digit 23 – Heat Recovery

X = No Heat Recovery
P = Partial Heat Recovery
T = Total Heat Recovery - Full equipment

Digit 24 – Hydraulic module (*)

X = Pump signal On/Off
1 = Dual pump standard pressure
2 = Single pump standard pressure (150 kPa)
3 = Dual pump high pressure
4 = Single pump high pressure (250 kPa)

Digit 25 – Free Cooling

X = No option

Digit 26 – Power line type connection

B = Disconnect switch

Digit 27 – Control Panel Accessories

X = No option
1 = Under/Over Voltage Protection
2 = Under/Over Voltage Protection with ground fault protection

Digit 28 – Human Interface language

C = Spanish
D = German
E = English
F = French
H = Dutch
I = Italian
M = Swedish
P = Polish
R = Russian
T = Czech
U = Greek
V = Portuguese
2 = Romanian
6 = Hungarian
8 = Turkish

Digit 29 – Remote Interface

X = None Remote Interface
B = BACnet interface RS485 (MSTP)
M = ModBus interface RS485 (RTU)
L = LonTalk interface
C = BACnet interface TCP-IP
N = ModBus interface TCP

Digit 30 – External Control Package

X = None
A = External set point & Capacity outputs

Digit 31 – Flow switch

X = No Flow Switch
F = Field installed Flow Switch (Paddle)

Digit 32 – Electrical Panel Protection

1 = Enclosure with IP 20 internal protection

Digit 33 – Master Slave

X = Without
A = With

Digit 34 – Human Interface

L = Standard, Local UI supplied

Digit 35 – Energy meter

X = No energy meter
M = Energy meter installed

Digit 36 – Mini Chiller Plan Control

X = No MiniCPC

Digit 37 – Variable Primary Flow

X = Constant speed pump_No VFD
F = Constant speed pump_VFD Adjustment

Digit 38 – Refrigerant Loss alarm

X = Not installed
V = Installed

Digit 39 – Web server

X = Not installed

Digit 40 – Power socket

X = None
P = Included (230V - 100W)

Digit 41 – Factory tests

X = None
B = Visual Inspection with customer

Digit 42 – Unit isolation

X = None
1 = Rubber Isolators
6 = Spring Isolators

Digit 43 – Literature language

B = Bulgarian
C = Spanish
D = German
E = English
F = French
H = Dutch
I = Italian
K = Finnish
L = Danish
M = Swedish
N = Norwegian
P = Polish
R = Russian
T = Czech
U = Greek
V = Portuguese
Z = Slovene
2 = Romanian
3 = Serbian
4 = Slovak
5 = Croatian
6 = Hungarian
8 = Turkish

Digit 44 – Shipping package

X = Standard protection
A = Unit containerization package

Digit 45 – Refrigerant

B = Full Factory Refrigerant charge (R454B)
3 = Nitrogen charge (N2)

Digit 46 – Isolator Valve per Manifold Compressor

X = None
A = With (Discharge and Liquid)

Digit 47 – Power Factor Correction Capacitors ()**

X = None
A = With

Digit 48 – Not used

X = None

Digit 49 – Freeze Protection (Factory Installed)

X = Without Freeze Protection
2 = With freeze protection

Digit 50 – Evaporator Buffer Tank

X = No Tank
1 = With Tank

Digit 51 – Evaporator Water Strainer

X = No strainer
B = with strainer (loose accessory to be mounted on job site)

Digit 52 – Appearance Options

X = Without
B = Complete anti-intrusion grilles
C = Condensing coil protection grilles

Digit 53 – Not used

X = None

Digit 54 – Starter type

A = Across the line starter/Direct on Line
B = Soft starter

Digit 55 – Annunciation Relay

X = None
A = With

Digit 56 – Fan type

1 = AC
2 = EC
3 = EC HESP

Digit 57 – Night Noise Setback (NNSB)

X = None
1 = NNSB (Noise reduction request) EC only

Digit 58 – Special

X = Standard Catalog

S = Special Requirement

(*) option 24 = 1,2,3,4 are incompatible with option 47 = A.

(**)option 47 = A is incompatible with option 24 = 1,2,3,4.

4 GENERAL DATA

Table 1 - General data CGAF 042-050-052-055-060-065 SE (standard efficiency):

Unit size		042	050	052	055	060	065
Total cooling capacity (1)	kW	137	156	185	198	223	236
Total power Input (1)	kW	44	54	55	60	71	76
Unit Electrical Data (2) (3) (4)							
Short Circuit Unit Capacity (9)	kA	10	10	10	10	10	10
SEER [VO/FW]	-	4,28	4,12	4,33	4,28	4,14	4,18
SEER [VO/VW]	-	4,79	4,56	4,70	4,73	4,56	4,55
SEPR HT	-	5,64	5,38	5,86	5,76	5,55	5,57
Digit 56=1 AC fan							
Max. power input	kW	57	71	77	82	93	98
Max. Amps	A	98	124	132	139	155	163
Displacement power factor (dpf)	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Digit 56=2 EC							
Max. power input	kW	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Max. Amps	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Displacement power factor (dpf)	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Digit 56=3 EC fan HESP							
Max. power input	kW	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Max. Amps	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Displacement power factor (dpf)	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Compressors							
Manifold Tonnage (Ton) Circuit 1 and 2		25+25T	30+30T	35+30T	35+35T	40+40T	45+40T
Max Comp Power input Circuit 1 / Circuit 2	kW	27/27	33/33	38/33	38/38	44/44	49/44
Rated Amps Circuit 1 / Circuit 2 (4)	A	46/46	56/56	64/56	64/64	72/72	80/72
Locked Rotor Amps Circuit 1 / Circuit 2 (4)	A	147+158	197+197	227+197	227+197	227+227	260+227
		147+158	197+197	197+197	227+197	227+227	227+227
Oil sump heater Circuit 1 / Circuit 2	W	180/180	180/180	180/180	180/180	180/180	180/180
Number or refrigerant circuits	-	2	2	2	2	2	2
Number of part load steps	-	8	4	7	8	4	7
Minimum capacity step	%	26	25	23	21	25	24
Dual Circuit Chilled Water Exchanger							
Brazed Plate Heat Exchanger Materials (model)	-	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper
Plate number	-	130	130	202	202	202	250
Water Content	l	15,275	15,275	23,735	23,735	23,735	29,375
Nominal water connection size	Inch.	3	3	3	3	3	3
(Grooved coupling) - With or without HYM	mm	88,9	88,9	88,9	88,9	88,9	88,9
Water Pressure Drop (1)	kPa	40,54	52,87	31,19	35,79	45,33	33,53
Condenser Module							
Coils							
Type	-	Microchannell	Microchannell	Microchannell	Microchannell	Microchannell	Microchannell
Total Quantity	-	4	4	4	4	4	4
Face area per circuit	m ²	5,92	5,92	5,92	5,92	5,92	5,92
Fans							
Type	-	AC					
Number of fans	-	2	2	4	4	4	4
Air flow (1), cooling mode	m ³ /h	42.630	42.331	81.614	81.424	81.052	80.869

Unit size		042	050	052	055	060	065
Digit 56 = 1 fans AC							
Max Power Input per Motor	kW	1,4	1,4	1,4	1,4	1,4	1,4
Max Amps per Motor	A	2,8	2,8	2,8	2,8	2,8	2,8
Motor RPM (Cooling mode)	rpm	870	870	870	870	870	870
Digit 56=3 EC fan HESP							
Max Power Input per Motor	kW	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Max Amps per Motor	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Motor RPM (Cooling mode field setting)	rpm	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Digit 56=2 EC							
Max Power Input per Motor	kW	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Max Amps per Motor	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Motor RPM (Cooling mode field setting)	rpm	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Chilled Water Pump Package options							
Single pump - Standard head pressure (digit 24=2) (7)							
Available Head Pressure (1)	kPa	201,4	251,5	262,6	246,6	177,8	190,5
Motor Power	kW	3,4	4,5	4,5	4,5	4,5	4,5
Rated Amps	A	6,4	8,7	8,7	8,7	8,7	8,7
Single pump - High head pressure (digit 24=4) (7)							
Available Head Pressure (1)	kPa	281,2	324,8	334,1	316,7	299,7	311,8
Motor Power	kW	4,5	6,1	6,1	6,1	8,3	8,3
Rated Amps	A	8,7	10,6	10,6	10,6	13,6	13,6
Dual pump - Standard head pressure (digit 24=1) (7)							
Available Head Pressure (1)	kPa	201,4	251,5	262,6	246,6	177,8	190,5
Motor Power	kW	3,4	4,5	4,5	4,5	4,5	4,5
Rated Amps	A	6,4	8,7	8,7	8,7	8,7	8,7
Dual pump - High head pressure (digit 24=3) (7)							
Available Head Pressure (1)	kPa	281,2	324,8	334,1	316,7	299,7	311,8
Motor Power	kW	4,5	6,1	6,1	6,1	8,3	8,3
Rated Amps	A	8,7	10,6	10,6	10,6	13,6	13,6
Dimensions and weight (basic model only)							
Length	mm	2505	2505	2505	2505	2505	2505
Width	mm	1997	1997	1997	1997	1997	1997
Height	mm	2412	2412	2412	2412	2412	2412
Pump Package Option - (Additional length)	mm	224	224	224	224	224	224
Weights							
Operating Weight	kg	958	973	1145	1183	1260	1307
Additional Weight of options							
Chilled water pump							
Single pump - Standard head pressure	kg	144	168	168	168	168	168
Single pump - High head pressure	kg	168	200	200	200	218	218
Twin pump - Standard head pressure	kg	246	294	294	294	294	294
Twin pump - High head pressure	kg	294	358	358	358	394	394
Optional Chilled Water Buffer tank	kg	250	250	250	250	250	250
Oil and Refrigerant Charge (R454B)							
Total Refrigerant charge (6)	kg	21	21	26	26	26	26
Refrigerant Charge per cooling kW (6)	kg/kW	0,154	0,134	0,141	0,131	0,116	0,110
POE Oil Type		OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E

Unit size		042	050	052	055	060	065
Oil charge Circuit 1 / 2 (6)		6.6/6.6	6.9/6.9	7.2/7.2	8.5/8.5	9.7/9.7	12.2/12.2

(1) Indicative performance at chilled water exchanger water temperature : 12 °C / 7 °C and air temperature 35 °C for cooling only mode & hot water exchanger temperature: 40 °C / 45 °C and air temperature 7 °C (6 °C) for heating only mode for- detailed performances, on a given unit, consult Order Write Up.

(2) Under 400V/3/50Hz.

(3) Rated Condition without Pump Package.

(4) Electrical system data are indicative and subject to change without notice. Please refer to unit nameplate data.

(5) Hot water exchanger temperature 40 °C / 50 °C and air temperature 7 °C (6 °C) for heating only mode.

(6) Refrigerant and oil charges are indicative. Refer to unit nameplate for real charges.

(7) The electrical contribute of 59 = 2, 4 is the same of 24 = 2, 4 respectively. So if one of 59 (2 or 4) is activate consider the electrical power and ampacity like 24 (2 or 4).

Table 2 - General data CGAF 070-075-085-095-105-125 SE (standard efficiency):

Unit size		070	075	085	095	105	125
Total cooling capacity (1)	kW	246	266	309	337	377	419
Total power Input (1)	kW	80	90	93	106	122	138
Unit Electrical Data (2) (3) (4)							
Short Circuit Unit Capacity (9)	kA	10	10	10	10	10	10
SEER [VO/FW]		4,16	4,12	4,56	4,44	4,38	4,57
SEER [VO/VW]		4,53	4,50	4,96	4,77	4,78	4,73
SEPR HT		5,50	5,43	5,55	5,47	5,18	5,52
Digit 56=1 AC fan							
Max. power input	kW	100	115	131	146	162	177
Max. Amps	A	166	194	217	240	269	298
Displacement power factor (dpf)	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Digit 56=2 EC							
Max. power input	kW	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Max. Amps	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Displacement power factor (dpf)	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Digit 56=3 EC fan HESP							
Max. power input	kW	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Max. Amps	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Displacement power factor (dpf)	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Compressors							
Manifold Tonnage (Ton) Circuit 1 and 2		45+45T	50+50T	55+55T	60+60T	65+65T	75+75T
Max Comp Power input Circuit 1 / Circuit 2	kW	49/49	53/53	61/61	69/69	76/76	84/84
Rated Amps Circuit 1 / Circuit 2 (4)	A	80/80	88/88	100/100	111/111	126/126	140/140
Locked Rotor Amps Circuit 1 / Circuit 2 (4)	A	260+227	260+260	260+294	294+294	294+344	344+344
		260+227	260+260	260+294	294+294	294+344	344+344
Oil sump heater Circuit 1 / Circuit 2	W	180/180	180/180	180/180	180/180	180/180	180/180
Number of refrigerant circuits	-	2	2	2	2	2	2
Number of part load steps	-	8	4	8	4	8	4
Minimum capacity step	%	22	25	23	25	23	29
Dual Circuit Chilled Water Exchanger							
Brazed Plate Heat Exchanger Materials (model)	-	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper
Plate number	-	250	250	138	138	138	166
Water Content	l	29,375	29,375	32,5	32,5	32,5	39
Nominal water connection size	Inch.	3	3	4	4	4	4
(Grooved coupling) - With or without HYM	mm	88,9	114,3	114,3	114,3	114,4	114,3
Water Pressure Drop (1)	kPa	36,4	42,4	29,8	34,8	42,7	37,45282
Condenser Module							
Coils							
Type	-	Microchannell	Microchannell	Microchannell	Microchannell	Microchannell	Microchannell
Total Quantity	-	4	4	6	6	6	6
Face area per circuit	m ²	5,92	5,92	8,88	8,88	8,88	8,88
Fans							
Type	-	AC					
Number of fans	-	4	4	6	6	6	6
Air flow (1), cooling mode	m ³ /h	80.717	80.418	121.859	121.432	120.841	120.218
Digit 56 = 1 fans AC							

Unit size		070	075	085	095	105	125
Max Power Input per Motor	kW	1,4	1,4	1,4	1,4	1,4	1,4
Max Amps per Motor	A	2,8	2,8	2,8	2,8	2,8	2,8
Motor RPM (Cooling mode)	rpm	870	870	870	870	870	870
Digit 56=3 EC fan HESP							
Max Power Input per Motor	kW	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Max Amps per Motor	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Motor RPM (Cooling mode field setting)	rpm	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Digit 56=2 EC							
Max Power Input per Motor	kW	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Max Amps per Motor	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Motor RPM (Cooling mode field setting)	rpm	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Chilled Water Pump Package options							
Single pump - Standard head pressure (digit 24=2)							
Available Head Pressure (1)	kPa	183,6	219,1	201,8	236,6	218,6	213,2
Motor Power	kW	4,5	6,3	6,3	8,3	8,3	8,3
Rated Amps	A	8,7	10,6	10,6	13,6	13,6	13,6
Single pump - High head pressure (digit 24=4)							
Available Head Pressure (1)	kPa	304,5	289,3	299,8	288,1	315,1	309,8
Motor Power	kW	8,3	8,3	10,1	10,1	12,0	12,0
Rated Amps	A	13,6	13,6	17,2	17,2	21,3	21,3
Dual pump - Standard head pressure (digit 24=1)							
Available Head Pressure (1)	kPa	183,6	219,1	201,8	236,6	218,6	213,2
Motor Power	kW	4,5	6,3	6,3	8,3	8,3	8,3
Rated Amps	A	8,7	10,6	10,6	13,6	13,6	13,6
Dual pump - High head pressure (digit 24=3)							
Available Head Pressure (1)	kPa	304,5	289,3	299,8	288,1	315,1	309,8
Motor Power	kW	8,3	8,3	10,1	10,1	12,0	12,0
Rated Amps	A	13,6	13,6	17,2	17,2	21,3	21,3
Dimensions and weight (basic model only)							
Length	mm	2505	2505	3255	3255	3255	3255
Width	mm	1997	1997	2232	2232	2232	2232
Height	mm	2412	2412	2531	2531	2531	2531
Pump Package Option - (Additional length)	mm	224	224	-	-	-	-
Weights							
Operating Weight	kg	1310	1317	1888	1990	2031	2015
Additional Weight of options							
Chilled water pump							
Single pump - Standard head pressure	kg	168	200	212	232	232	232
Single pump - High head pressure	kg	218	218	264	264	270	270
Twin pump - Standard head pressure	kg	294	358	382	422	422	422
Twin pump - High head pressure	kg	394	394	486	486	498	498
Optional Chilled Water Buffer tank	kg	250	250	600	600	600	600
Oil and Refrigerant Charge (R454B)							
Total Refrigerant charge (6)	kg	26	26	338	40	40	40
Refrigerant Charge per cooling kW (6)	kg/kW	0,106	0,098	1,093	0,119	0,106	0,095
POE Oil Type		OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E
Oil charge Circuit 1 / 2 (6)	l	12.2/12.2	12.2/12.2	12.2/12.2	12.2/12.2	12.2/12.2	12.2/12.2

Unit size		070	075	085	095	105	125
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(1) Indicative performance at chilled water exchanger water temperature : 12 °C / 7 °C and air temperature 35 °C for cooling only mode & hot water exchanger temperature: 40 °C / 45 °C and air temperature 7 °C (6 °C) for heating only mode for- detailed performances, on a given unit, consult Order Write Up.

(2) Under 400V/3/50Hz.

(3) Rated Condition without Pump Package.

(4) Electrical system data are indicative and subject to change without notice. Please refer to unit nameplate data.

(5) Hot water exchanger temperature 40 °C / 50 °C and air temperature 7 °C (6 °C) for heating only mode.

(6) Refrigerant and oil charges are indicative. Refer to unit nameplate for real charges.

(7) The electrical contribute of 59 = 2, 4 is the same of 24 = 2, 4 respectively. So if one of 59 (2 or 4) is activate consider the electrical power and ampacity like 24 (2 or 4).

Table 3 - General data CGAF 042-050-052-055-060-065 HE (high efficiency):

Unit size		042	050	052	055	060	065
Total cooling capacity (1)	kW	137	157	185	199	224	237
Total power Input (1)	kW	44	54	55	60	71	75
Unit Electrical Data (2) (3) (4)							
Short Circuit Unit Capacity (9)	kA	10	10	10	10	10	10
SEER [VO/FW]		4,42	4,18	4,61	4,55	4,34	4,37
SEER [VO/VW]		4,95	4,65	4,98	5,03	4,79	4,75
SEPR HT		5,82	5,52	5,95	5,87	5,73	5,74
Digit 56=1 AC fan							
Max. power input	kW	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Max. Amps	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Displacement power factor (dpf)	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Digit 56=2 EC							
Max. power input	kW	58	73	78	84	97	102
Max. Amps	A	98	124	132	140	158	166
Displacement power factor (dpf)	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Digit 56=3 EC fan HESP							
Max. power input	kW	58	73	78	84	97	102
Max. Amps	A	98	124	132	140	158	166
Displacement power factor (dpf)	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Compressors							
Manifold Tonnage (Ton) Circuit 1 and 2		25+25T	30+30T	35+30T	35+35T	40+40T	45+40T
Max Comp Power input Circuit 1 / Circuit 2	kW	27/27	33/33	38/33	38/38	44/44	49/44
Rated Amps Circuit 1 / Circuit 2 (4)	A	46/46	56/56	64/56	64/64	72/72	80/72
Locked Rotor Amps Circuit 1 / Circuit 2 (4)	A	147+158	197+197	227+197	227+197	227+227	260+227
		147+158	197+197	197+197	227+197	227+227	227+227
Oil sump heater Circuit 1 / Circuit 2	W	180/180	180/180	180/180	180/180	180/180	180/180
Number of refrigerant circuits	-	2	2	2	2	2	2
Number of part load steps	-	8	4	7	8	4	7
Minimum capacity step	%	26	25	23	21	25	24
Dual Circuit Chilled Water Exchanger							
Brazed Plate Heat Exchanger Materials (model)	-	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper
Plate number	-	130	130	202	202	202	250
Water Content	l	15,275	15,275	23,735	23,735	23,735	29,375
Nominal water connection size	Inch.	3	3	3	3	3	3
(Grooved coupling) - With or without HYM	mm	88,9	88,9	88,9	88,9	88,9	88,9
Water Pressure Drop (1)	kPa	40,83	53,30	31,27	35,90	45,49	33,67
Condenser Module							
Coils							
Type	-	Microchannell	Microchannell	Microchannell	Microchannell	Microchannell	Microchannell
Total Quantity	-	4	4	4	4	4	4
Face area per circuit	m ²	5,92	5,92	5,92	5,92	5,92	5,92
Fans							
Type	-	AC					
Number of fans	-	2	2	4	4	4	4
Air flow (1), cooling mode	m ³ /h	41.512	41.214	80.066	79.877	79.507	79.325
Digit 56 = 1 fans AC							

Unit size		042	050	052	055	060	065
Max Power Input per Motor	kW	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Max Amps per Motor	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Motor RPM (Cooling mode)	rpm	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Digit 56=3 EC fan HESP							
Max Power Input per Motor	kW	1,82	1,82	1,82	1,82	1,82	1,82
Max Amps per Motor	A	2,9	2,9	2,9	2,9	2,9	2,9
Motor RPM (Cooling mode field setting)	rpm	1020	1020	1020	1020	1020	1020
Digit 56=2 EC							
Max Power Input per Motor	kW	1,82	1,82	1,82	1,82	1,82	1,82
Max Amps per Motor	A	2,9	2,9	2,9	2,9	2,9	2,9
Motor RPM (Cooling mode field setting)	rpm	1020	1020	1020	1020	1020	1020
Chilled Water Pump Package options							
Single pump - Standard head pressure (digit 24=2)							
Available Head Pressure (1)	kPa	201,4	251,5	262,6	246,6	177,8	190,5
Motor Power	kW	3,4	4,5	4,5	4,5	4,5	4,5
Rated Amps	A	6,4	8,7	8,7	8,7	8,7	8,7
Single pump - High head pressure (digit 24=4)							
Available Head Pressure (1)	kPa	281,2	324,8	334,1	316,7	299,7	311,8
Motor Power	kW	4,5	6,1	6,1	6,1	8,3	8,3
Rated Amps	A	8,7	10,6	10,6	10,6	13,6	13,6
Dual pump - Standard head pressure (digit 24=1)							
Available Head Pressure (1)	kPa	201,4	251,5	262,6	246,6	177,8	190,5
Motor Power	kW	3,4	4,5	4,5	4,5	4,5	4,5
Rated Amps	A	6,4	8,7	8,7	8,7	8,7	8,7
Dual pump - High head pressure (digit 24=3)							
Available Head Pressure (1)	kPa	281,2	324,8	334,1	316,7	299,7	311,8
Motor Power	kW	4,5	6,1	6,1	6,1	8,3	8,3
Rated Amps	A	8,7	10,6	10,6	10,6	13,6	13,6
Dimensions and weight (basic model only)							
Length	mm	2505	2505	2505	2505	2505	2505
Width	mm	1997	1997	1997	1997	1997	1997
Height	mm	2412	2412	2412	2412	2412	2412
Pump Package Option - (Additional length)	mm	224	224	224	224	224	224
Weights							
Operating Weight	kg	958	973	1145	1183	1260	1307
Additional Weight of options							
Chilled water pump							
Single pump - Standard head pressure	kg	144	168	168	168	168	168
Single pump - High head pressure	kg	168	200	200	200	218	218
Twin pump - Standard head pressure	kg	246	294	294	294	294	294
Twin pump - High head pressure	kg	294	358	358	358	394	394
Optional Chilled Water Buffer tank	kg	250	250	250	250	250	250
Oil and Refrigerant Charge (R454B)							
Total Refrigerant charge (6)	kg	21	21	26	26	26	26
Refrigerant Charge per cooling kW (6)	kg/kW	0,153	0,134	0,140	0,131	0,116	0,110
POE Oil Type		OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E
Oil charge Circuit 1 / 2 (6)	l	6.6/6.6	6.9/6.9	7.2/7.2	8.5/8.5	9.7/9.7	12.2/12.2

Unit size		042	050	052	055	060	065
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(1) Indicative performance at chilled water exchanger water temperature : 12 °C / 7 °C and air temperature 35 °C for cooling only mode & hot water exchanger temperature: 40 °C / 45 °C and air temperature 7 °C (6 °C) for heating only mode for- detailed performances, on a given unit, consult Order Write Up.

(2) Under 400V/3/50Hz.

(3) Rated Condition without Pump Package.

(4) Electrical system data are indicative and subject to change without notice. Please refer to unit nameplate data.

(5) Hot water exchanger temperature 40 °C / 50 °C and air temperature 7 °C (6 °C) for heating only mode.

(6) Refrigerant and oil charges are indicative. Refer to unit nameplate for real charges.

(7) The electrical contribute of 59 = 2, 4 is the same of 24 = 2, 4 respectively. So if one of 59 (2 or 4) is activate consider the electrical power and ampacity like 24 (2 or 4).

Table 4 - General data CGAF 070-075-085-095-105-125 HE (high efficiency):

Unit size		070	075	085	095	105	125
Total cooling capacity (1)	kW	247	266	310	337	378	420
Total power Input (1)	kW	80	89	92	105	121	137
Unit Electrical Data (2) (3) (4)							
Short Circuit Unit Capacity (9)	kA	10	10	10	10	10	10
SEER [VO/FW]		4,34	4,27	4,79	4,60	4,50	4,58
SEER [VO/VW]		4,73	4,66	5,14	4,99	4,95	4,84
SEPR HT		5,67	5,60	5,92	5,77	5,70	5,74
Digit 56=1 AC fan							
Max. power input	kW	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Max. Amps	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Displacement power factor (dpf)	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Digit 56=2 EC							
Max. power input	kW	104	118	133	149	164	179
Max. Amps	A	169,3	194,2	217,3	240,4	269,6	298,9
Displacement power factor (dpf)	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Digit 56=3 EC fan HESP							
Max. power input	kW	104	118	133	149	164	179
Max. Amps	A	169,3	194,2	217,3	240,4	269,6	298,9
Displacement power factor (dpf)	-	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Compressors							
Manifold Tonnage (Ton) Circuit 1 and 2		45+45T	50+50T	55+55T	60+60T	65+65T	75+75T
Max Comp Power input Circuit 1 / Circuit 2	kW	49/49	53/53	61/61	69/69	76/76	84/84
Rated Amps Circuit 1 / Circuit 2 (4)	A	80/80	88/88	100/100	111/111	126/126	140/140
Locked Rotor Amps Circuit 1 / Circuit 2 (4)	A	260+227	260+260	260+294	294+294	294+344	344+344
		260+227	260+260	260+294	294+294	294+344	344+344
Oil sump heater Circuit 1 / Circuit 2	W	180/180	180/180	180/180	180/180	180/180	180/180
Number or refrigerant circuits	-	2	2	2	2	2	2
Number of part load steps	-	8	4	8	4	8	4
Minimum capacity step	%	22	25	23	25	23	29
Dual Circuit Chilled Water Exchanger							
Brazed Plate Heat Exchanger Materials (model)	-	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper	Stainless steel/copper
Plate number	-	250	250	138	138	138	166
Water Content	l	29,375	29,375	32,5	32,5	32,5	39
Nominal water connection size	Inch.	3	3	4	4	4	4
(Grooved coupling) - With or without HYM	mm	88,9	114,3	114,3	114,3	114,4	114,3
Water Pressure Drop (1)	kPa	36,6	42,6	29,9	34,9	42,9	37,60589
Condenser Module							
Coils							
Type	-	Microchannell	Microchannell	Microchannell	Microchannell	Microchannell	Microchannell
Total Quantity	-	4	4	6	6	6	6
Face area per circuit	m ²	5,92	5,92	8,88	8,88	8,88	8,88
Fans							
Type	-	AC					
Number of fans	-	4	4	6	6	6	6
Air flow (1), cooling mode	m ³ /h	79.175	78.877	119.539	119.114	118.527	117.908
Digit 56 = 1 fans AC							

Unit size		070	075	085	095	105	125
Max Power Input per Motor	kW	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Max Amps per Motor	A	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Motor RPM (Cooling mode)	rpm	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Digit 56=3 EC fan HESP							
Max Power Input per Motor	kW	1,82	1,82	1,82	1,82	1,82	1,82
Max Amps per Motor	A	2,9	2,9	2,9	2,9	2,9	2,9
Motor RPM (Cooling mode field setting)	rpm	1020	1020	1020	1020	1020	1020
Digit 56=2 EC							
Max Power Input per Motor	kW	1,82	1,82	1,82	1,82	1,82	1,82
Max Amps per Motor	A	2,9	2,9	2,9	2,9	2,9	2,9
Motor RPM (Cooling mode field setting)	rpm	1020	1020	1020	1020	1020	1020
Chilled Water Pump Package options							
Single pump - Standard head pressure (digit 24=2)							
Available Head Pressure (1)	kPa	183,6	219,1	201,8	236,6	218,6	213,2
Motor Power	kW	4,5	6,3	6,3	8,3	8,3	8,3
Rated Amps	A	8,7	10,6	10,6	13,6	13,6	13,6
Single pump - High head pressure (digit 24=4)							
Available Head Pressure (1)	kPa	304,5	289,3	299,8	288,1	315,1	309,8
Motor Power	kW	8,3	8,3	10,1	10,1	12,0	12,0
Rated Amps	A	13,6	13,6	17,2	17,2	21,3	21,3
Dual pump - Standard head pressure (digit 24=1)							
Available Head Pressure (1)	kPa	183,6	219,1	201,8	236,6	218,6	213,2
Motor Power	kW	4,5	6,3	6,3	8,3	8,3	8,3
Rated Amps	A	8,7	10,6	10,6	13,6	13,6	13,6
Dual pump - High head pressure (digit 24=3)							
Available Head Pressure (1)	kPa	304,5	289,3	299,8	288,1	315,1	309,8
Motor Power	kW	8,3	8,3	10,1	10,1	12,0	12,0
Rated Amps	A	13,6	13,6	17,2	17,2	21,3	21,3
Dimensions and weight (basic model only)							
Length	mm	2505	2505	3255	3255	3255	3255
Width	mm	1997	1997	2232	2232	2232	2232
Height	mm	2412	2412	2531	2531	2531	2531
Pump Package Option - (Additional length)	mm	224	224	-	-	-	-
Weights							
Operating Weight	kg	1310	1317	1888	1990	2031	2015
Additional Weight of options							
Chilled water pump							
Single pump - Standard head pressure	kg	168	200	212	232	232	232
Single pump - High head pressure	kg	218	218	264	264	270	270
Twin pump - Standard head pressure	kg	294	358	382	422	422	422
Twin pump - High head pressure	kg	394	394	486	486	498	498
Optional Chilled Water Buffer tank	kg	250	250	600	600	600	600
Oil and Refrigerant Charge (R454B)							
Total Refrigerant charge (6)	kg	26	26	338	40	40	40
Refrigerant Charge per cooling kW (6)	kg/kW	0,105	0,098	1,091	0,119	0,106	0,095
POE Oil Type		OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E	OIL058E/OIL057E
Oil charge Circuit 1 / 2 (6)	l	12.2/12.2	12.2/12.2	12.2/12.2	12.2/12.2	12.2/12.2	12.2/12.2

Unit size		070	075	085	095	105	125
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(1) Indicative performance at chilled water exchanger water temperature : 12 °C / 7 °C and air temperature 35 °C for cooling only mode & hot water exchanger temperature: 40 °C / 45 °C and air temperature 7 °C (6 °C) for heating only mode for- detailed performances, on a given unit, consult Order Write Up.

(2) Under 400V/3/50Hz.

(3) Rated Condition without Pump Package.

(4) Electrical system data are indicative and subject to change without notice. Please refer to unit nameplate data.

(5) Hot water exchanger temperature 40 °C / 50 °C and air temperature 7 °C (6 °C) for heating only mode.

(6) Refrigerant and oil charges are indicative. Refer to unit nameplate for real charges.

(7) The electrical contribute of 59 = 2, 4 is the same of 24 = 2, 4 respectively. So if one of 59 (2 or 4) is activate consider the electrical power and ampacity like 24 (2 or 4).

5 OPERATING LIMITS

5.1 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.

5.2 OPERATING LIMITS

CGAF SE / CGAF HE unit operation is permitted within the limits indicated in the diagram provided in 3.3.

CAUTION: The operation outside the limits specified 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, consult the factory.

These operating limits apply to unit operating at full load.

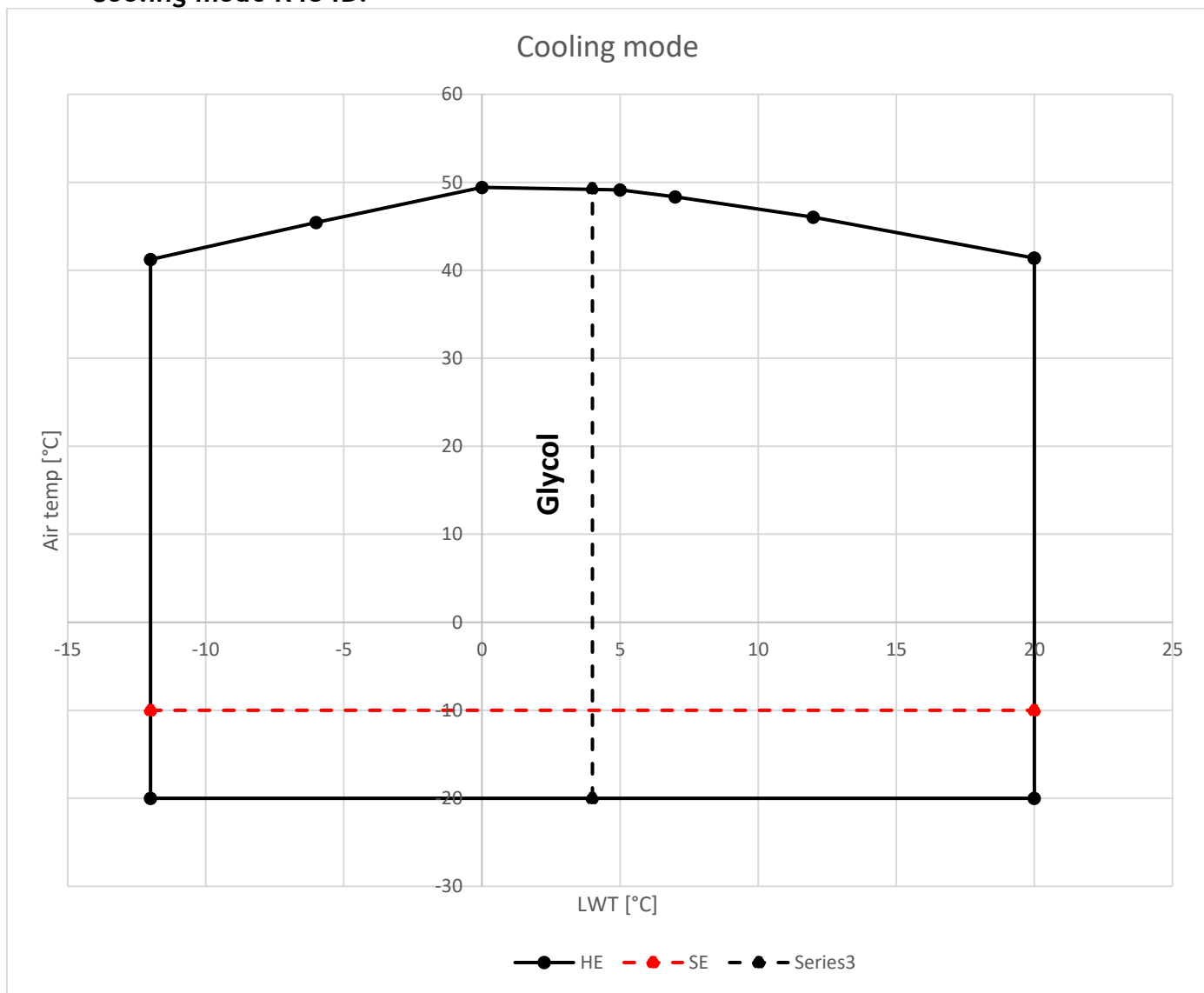
5.3 OPERATING RANGE

OAT= Outdoor air temperature

LWT= leaving water temperature

Check glycol percentage recommendations in the next tables.

- **Cooling mode R454B.**



CGAF LOW AMBIENT KIT		
UNIT APPLICATION	Temperature °C	
Low ambient in Cooling	Down to -20°C	Only CGAF HE
Low ambient in Cooling	Down to -10°C	Only CGAF SE

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: Oversized water pump as on-board unit pump is required for operation with glycol > 40%. If any doubt please contact Trane”

6 Total Heat Recovery

The total heat recovery option includes:

- A Common braze plate heat exchanger for both refrigeration circuits installed in serial between with the compressor discharge and air-cooled condenser, allowing mix of liquid and gas at the outlet leaving to condenser coil.
- MCHE Condenser coil with EC fan motor only to maintain the discharge pressure above the THR water outlet condensing temperature.
- A 3-way modulating valve factory installed on the water side to manage the leaving water temperature and required high discharge pressure.
- Two temperature sensors for inlet and outlet hot water temperature control.
- Freeze protection heaters (option).

The heat exchanger is used both as a desuperheater and a condenser of compressors discharge gas. Refrigerant leaves the total heat recovery braze plates heat exchanger as a mixture of gas and liquid. The air-cooled condenser is used to finalize the condensation and provide a subcooled refrigerant to the expansion valve.

Main stream of refrigerant flow in these units is through filter drier keeping bypass opening to 10% with THR Off. This avoid oil distillation in dead branch. During THR operation bypass valve open 100% allowing 65% of refrigerant flow via bypass line to maintain pressure.

The heating capacity is driven by the cooling demand on the chiller, the ambient temperature and the temperature of the heat recovery loop. The heating capacity is optimized by a smart control of the condensing temperature using the fans.

Water circulating inside the heat recovery heat exchanger should never be used in food processing or as drinking water. It must be used through a direct loop to heat or preheat water.

Note: Ambient temperature shall be lower than THR leaving water temperature set point to operate allowing 45% up to 116% evaporator heat recovery

Note: If the total heat recovery heat exchanger is drained, the heater must be turned off to avoid damaging the total heat recovery heat exchanger. The heater should only be on when the heat recovery heat exchanger has water in it.

CAUTION! Discharge gas temperature can reach 130°C, may resulting in overheating of the heat recovery water if there is no appropriate flow.

CAUTION! For the first start, Total Heat Recovery water temperature sensors should be checked to make sure that they are not reversed.

CAUTION! A field-installed safety or relief valve on the water side is required with the total heat recovery to prevent risks resulting from a failure of the unit control.

Piping Recommendations

A 1 to 1.6 mm strainer must be installed close to the total heat recovery heat exchanger entering water line to protect the heat exchanger.

Insulate water lines and other portions of the heat recovery water loop to prevent heat loss and potential injury due to exposure to a hot surface.

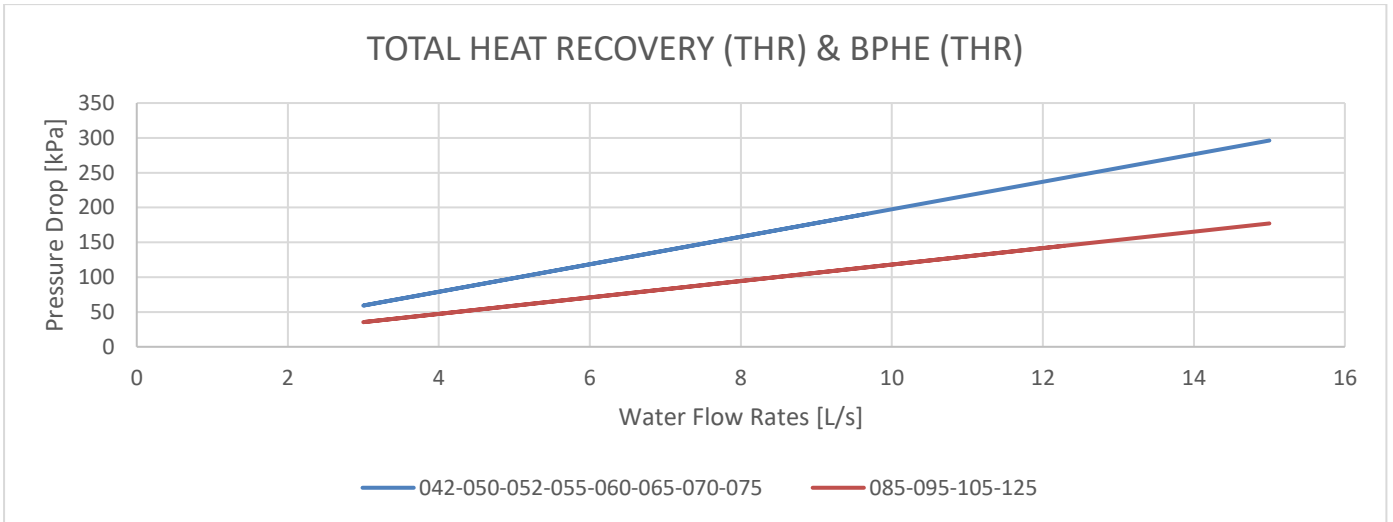
Do not use untreated or improperly treated water in the heat recovery water loop since it will cause inefficient operation and potential damage to the unit such as: reduced heat transfer between water and refrigerant, increased water pressure drop and reduced water flow.

CAUTION! : Proper Water Treatment! The use of untreated or improperly treated water in a chiller may result in scaling, erosion, corrosion, algae, or slime. It is recommended that the services of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures which result from untreated or improperly treated water, or saline or brackish water.

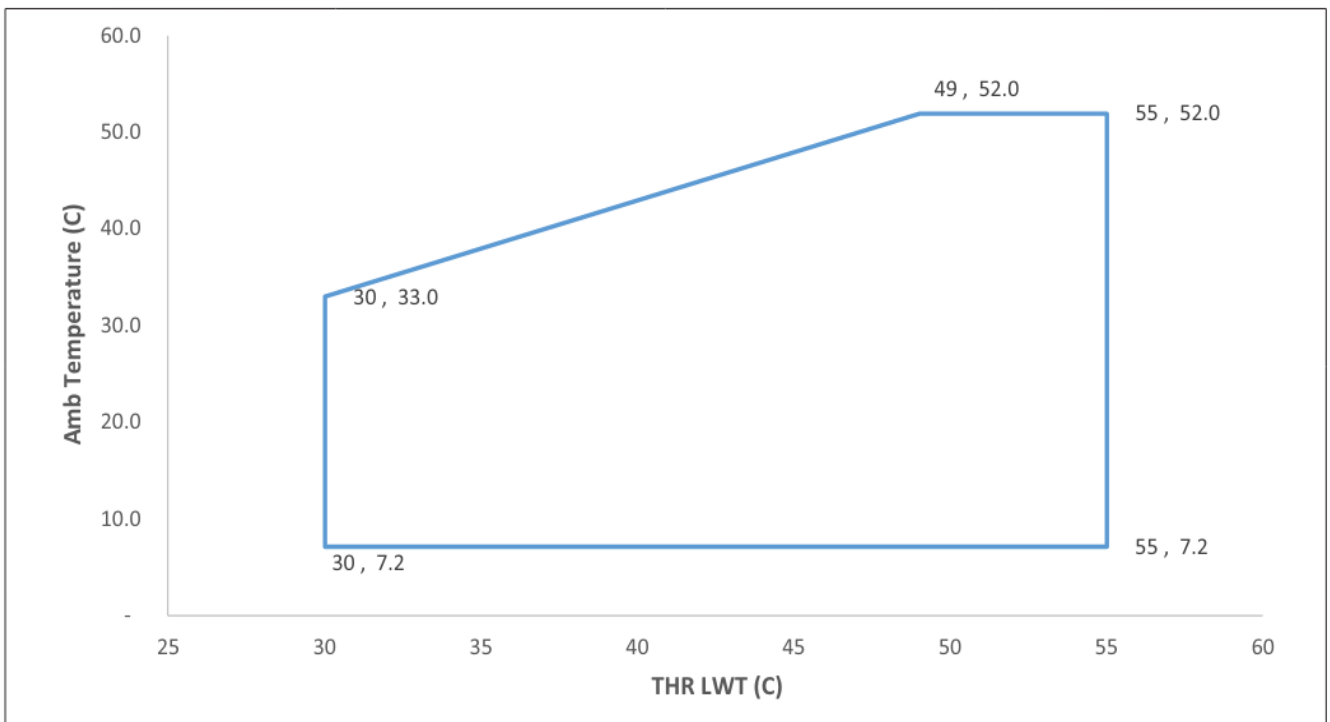
SIZE		042	050	052	055	060	065	070	075	085	095	105	125
Heat Exchanger Type		Stainless steel Copper Brazed plate Heat exchanger											
THR Heat Exchanger model		DB310 x62	DB310 x62	DB310 x78	DB310 x78	DB310 x78	DB310 x94	DB310 x94	DB310 x94	DB400 x90	DB400 x90	DB400 x90	DB400 x90
Water connection size	inch	2" 1/2	2" 1/2	2" 1/2	2" 1/2	2" 1/2	2" 1/2	2" 1/2	2" 1/2	3" DE	3" DE	3" DE	3" DE
	mm	- 62	- 62	- 62	- 62	- 62	- 62	- 62	- 62	- 76,1	- 76,1	- 76,1	- 76,1
Water content volume	L	7	7	9	9	9	10	10	10	18,5	18,5	18,5	18,5
Additional Shipping Weight	Kg	115	115	121	121	121	126	126	126	165	165	165	165

THR should not be used for glycol application on evaporator side. Minimum THR start-up water temperature should be higher than 5°C. THR should be used when leaving evaporator temperature is between 5 and 15.5°C.

- **Water pressure drop:**



- **Total heat recovery operating map:**



THR 3-Way Valve Description

The 3-way valve is divided into 2 main parts: the actuator and the valve body.

Valve body

2 types of valve are used (DN50, DN65) with a Kvs respectively of 40, **.

Kvs –value is showing the capacity of media flow of a valve, it characterizes the volume flow (m³/h) of water by measuring a differential pressure (bar). This value is related to full stroke.

The 3-way valve body is connected to the system in 3 points A, B, AB as below:

7 INSTALLATION

7.1 MOVING AND POSITIONING THE UNIT

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

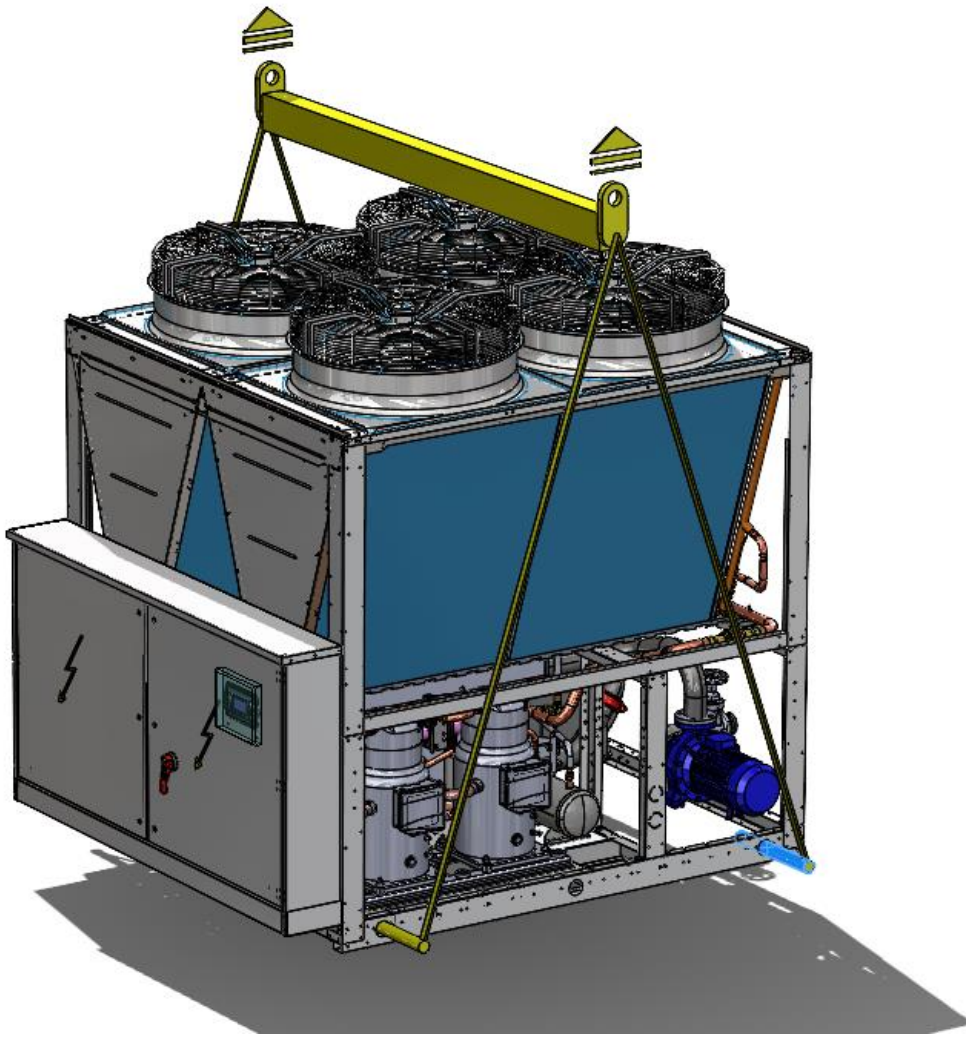


Figure 1a Correct lifting procedure 2V version

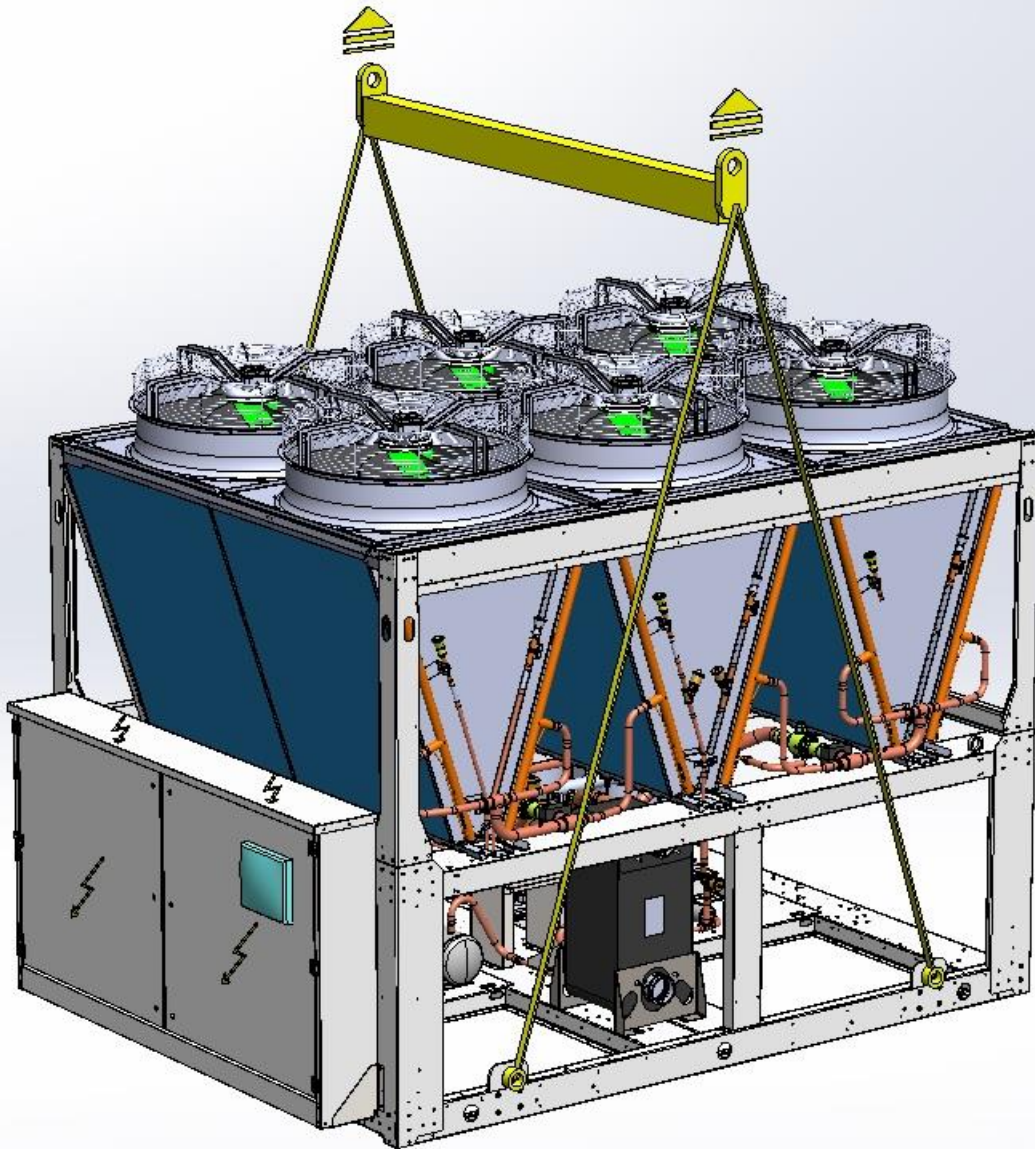


Figure 2b Correct lifting procedure 3V version

Lifting procedures provided with the unit must be respected.

Attention

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 for the passage of necessary airflow and in order to allow normal maintenance to be carried out (as shown on general catalogues).

WARNING: Make sure that during transport the CGAF SE / CGAF HE unit ALWAYS remains in the correct position!

For example 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.

7.2 MINIMUM SPACE REQUIREMENTS

Dimensional drawing shall be respected to avoid:

- Noise.
- Incorrect heat exchange and ventilation.
- Difficult maintenance or inaccessibility to components.

It is fundamental to respect minimum distances on all CGAF SE / CGAF HE units, in order to ensure optimum ventilation for the condenser coils. Limited installation space could reduce the normal air flow, thus significantly reducing the unit performance and considerably increasing consumption of electrical energy.

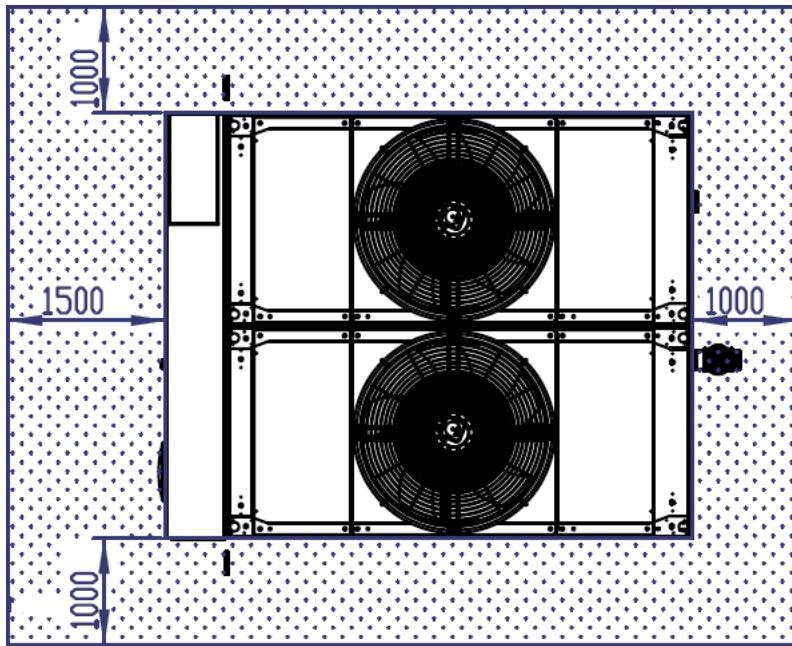


Figure 3a minimum space requirements [mm] for 1V unit

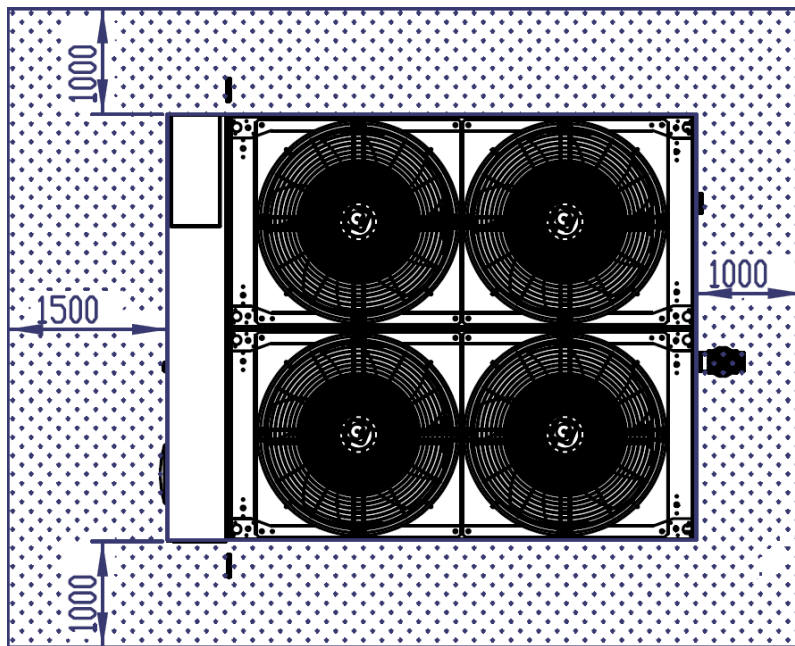


Figure 4b minimum space requirements [mm] for 2V unit

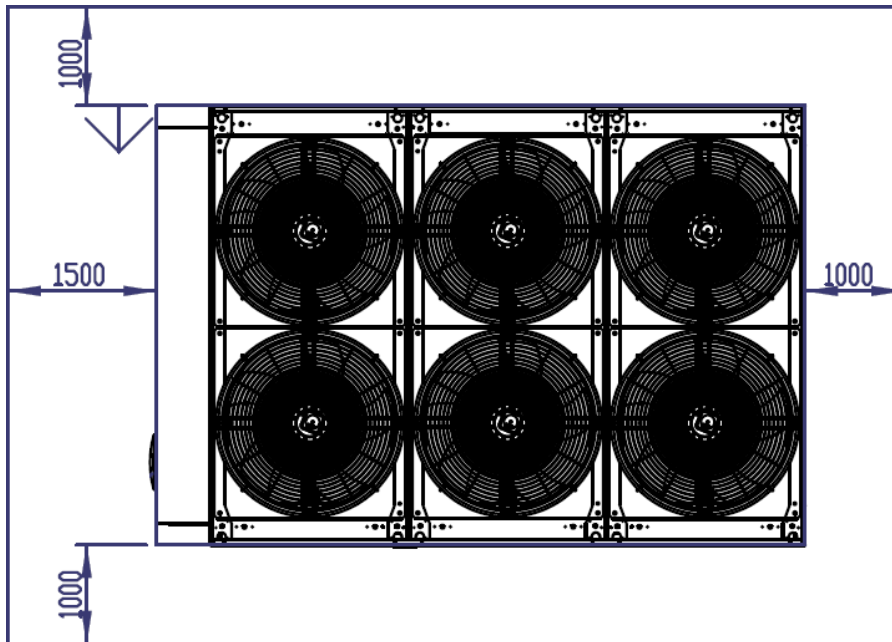


Figure 5c minimum space requirements [mm] for 3V

CAUTION: in case two units have to be installed side by side, the distance of respect must be doubled.

7.3 PRECAUTIONS FOR DOMINANT WINDS

Avoid obstacles on suction and discharge sides of the units. Respect the safety distances as shown on the units dimensional drawings.

In case of presence of dominant winds in the installation area it is strictly necessary to avoid (for units with horizontal flow fans) that such winds blow in front of the unit (fans discharge side). In case of unit with vertical flow fans it is strictly necessary to avoid installations where the dominant winds could cause rejected hot air to come back to the condensing coils.

7.4 PRECAUTIONS AGAINST DIRECT SUNSHINE

Direct solar radiation can raise the temperature of condensation until it causes the unit shutdown or failure start-up of the same by action of the high-pressure switch.

7.5 PRECAUTIONS AGAINST THE PRESENCE OF FIREPLACES AND EXHAUST HOT AIR

Avoid installation of the machines downwind of chimneys, smokestacks and different effluent discharges.

7.6 PRECAUTIONS AGAINST THE PRESENCE OF FOLIAGE AND FOREIGN BODIES

Avoid installing the unit in the immediate vicinity of plants that can prevent proper intake and discharge air.

7.7 CONTROL OF COMPRESSOR FASTENING

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

8 ACOUSTIC PROTECTION

When the sound level must be checked in particular, it is necessary to pay maximum WARNING in isolation from the base of the unit properly applying the anti-vibration mounts (provided optionally). Also, install flexible joints on water connections.

9 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 $\pm 10\%$, 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.

9.1 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 machine absorption. Connection of ground conductor is mandatory and must be delt in accordance with IEC60364-1 (sizing and cabling). The switch and the fuses like all the power connections must comply with the regulations in force.

9.2 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:

$$\% \text{ Imbalance} = [(V_x - V_{ave}) \times 100 / V_{ave}]$$

$$V_{ave} = (V_1 + V_2 + V_3) / 3$$

V_x = phase with greatest difference from V_{ave} (without regard to the sign)

WARNING: 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.

9.3 UNIT VOLTAGE PHASING

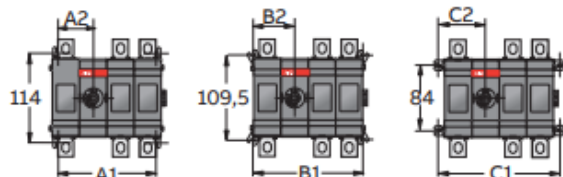
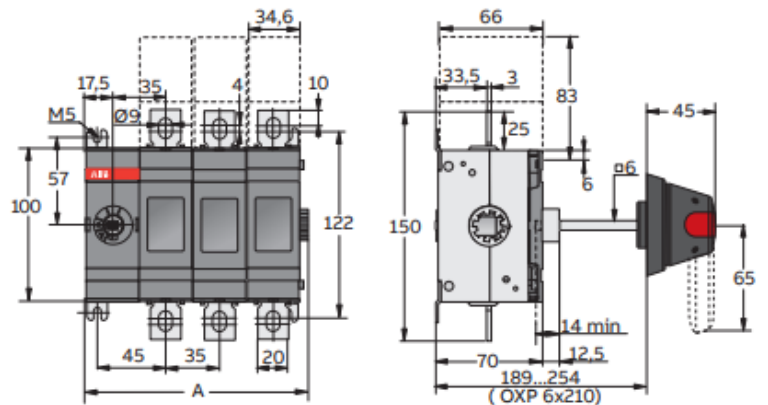
It is WARNING that proper rotation of the compressors be established before the unit is started. Proper motor rotation requires confirmation of the electrical phase sequence of the power supply. The motor is internally connected for clockwise rotation with the incoming power supply phases A-B-C.

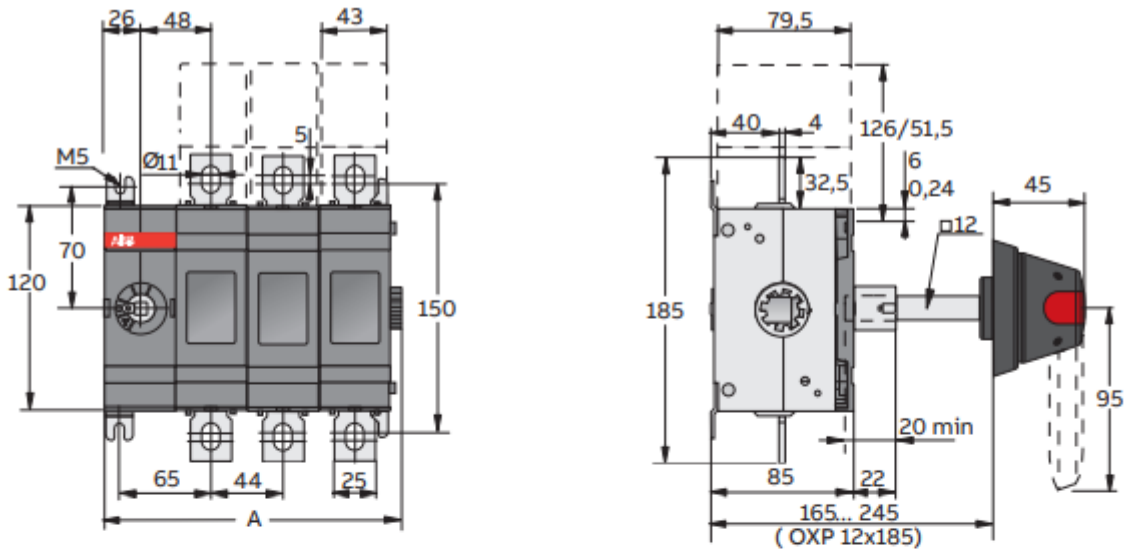
9.4 MAIN SWITCHED FEATURES

Following switch disconnectors are used according to the unit and the accessories selected. All two types of switches have the same dimensions:

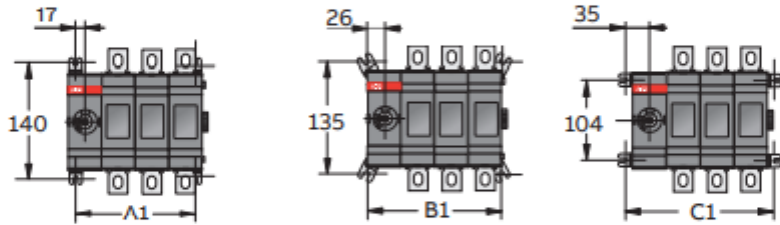
OT160EV_/200E_/250E_				
[mm]	E01	E02	E03	E04
A	75,5	110,5	145,5	180,5
A1	55	90	125	160
B1	71	106	141	176
C1	85	120	155	190

M00011/S01843 OT200_250E01_04 F





M00012/M00072 OT315_400E01_04 H



OT315/400/500_				
mm	E01	E02	E03	E04
A	103	147	191	235
A1	78	122	166	210
B1	96	140	184	228
C1	114	158	202	246

Here below the correspondence table for standard units, without accessories

SE units (AC fans)

CGAF SE		Poli	Ampere	Type
042		3P	160A	OT160EV03
050		3P	160A	OT160EV03
052		3P	200A	OT200E03
055		3P	200A	OT200E03
060		3P	200A	OT200E03
065		3P	250A	OT250E03
070		3P	250A	OT250E03
075		3P	250A	OT250E03
085		3P	315A	OT315E03
095		3P	315A	OT315E03
105		3P	400A	OT400E03
125		3P	400A	OT400E03

HE units (EC fans)

CGAF HE		Poli	Ampere	Type
042		3P	160A	OT160EV03
050		3P	160A	OT160EV03
052		3P	200A	OT200E03
055		3P	200A	OT200E03
060		3P	200A	OT200E03
065		3P	250A	OT250E03
070		3P	250A	OT250E03
075		3P	250A	OT250E03
085		3P	315A	OT315E03
095		3P	315A	OT315E03
105		3P	400A	OT400E03
125		3P	400A	OT400E03

10 WATER CONNECTIONS

10.1 EVAPORATOR

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. If 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 will 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.

CAUTION: Install a mechanical water filter at the water outlet of each heat exchanger. 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.

Maximum operating pressure: 6 bar

Calculation of total recommended water content and flow rates

To grant a perfect running, the machine needs a water content according to the following values:

- Standard and high efficiency version:

CGAF SE/HE	Cold water production		
	V	Q min	Q max
R454B	[m3]	[m3/h]	[m3/h]
042	0,34	11,7	47,0
050	0,37	13,4	53,7
052	0,54	15,9	63,6
055	0,54	17,0	68,1
060	0,53	19,2	76,8
065	0,66	20,3	81,2
070	0,65	21,2	84,6
075	0,64	22,8	91,3
085	0,81	26,6	106,3
095	0,81	28,9	115,7
105	1,03	32,4	129,5
125	1,01	36,2	144,9

LEGEND:

V: recommended 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 mode = 8 °C

$dpw = K \cdot Q^2 / 1000 Q = 0,86 P / \square T$

WARNING: 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.

10.2 WATER TREATMENT

Before putting the unit into operation, clean the hydraulic circuit. Dirt, scale, products of corrosion and other foreign material will adversely affect heat transfer between the water and system components. Foreign matter in the chilled water system can also increase pressure drop and consequently, reduce water flow. Proper water treatment must be determined locally, depending on the type of system and local water characteristics. Trane is not responsible for damage to or malfunctioning of equipment caused by failure to treat water or by improperly treated water.

CAUTION Proper Water Treatment!

The use of untreated or improperly treated water in a chiller may result in scaling, erosion, corrosion, algae or slime. It is recommended that the service of a qualified water treatment specialist be engaged to determine what water treatment, if any, is required. Trane assumes no responsibility for equipment failures which results from untreated or improperly treated water or saline or brackish water.

CAUTION Equipment Damage!

If using an acidic commercial flushing solution, construct a temporary bypass around the unit to prevent damage to internal components of the evaporator.

10.3 PRECAUTION AGAINST FROST RISK OF THE HYDRAULIC PIPES

It is necessary to insulate pipes in the plant to avoid extreme heat loss and to protect them from weather conditions. The problem of water pipes freezing could appear in two different situations:

1. Stand by, with mode on, but electrically connected: in this case, the unit has frost resistances, which protect the water locally contained in the exchangers and in the pipes from ice formation. These resistances do not ensure the protection against the frost in the outdoor connection pipes, to be prevented by frost protection systems. Trane suggest to insert frost thermostatic resistances on every outdoor pipes. In the following table there are the indicative electric powers per pipe linear meter

Heating cable required power

dn	inch	W / m
8	1/4"	5
10	3/8"	5
15	1/2"	5
20	3/4"	10
25	1"	13
40	1" 1/2	30
50	2"	50
65	2" 1/2	80
80	3"	120
100	4"	200
125	5"	300
150	6"	450

2. Electrically unconnected unit: in this case the frost resistances of the unit could not ensure the protection. It is necessary to add the correct glycol quantity indicated in the chapter: "ethylene glycol correction table" (§3.3). Please consult Trane service for % of glycol required.

7.3.1 Precaution for very low outdoor temperatures

In case of installation conditions with a very low temperature:

1. If there is a storage on board the unit, insert electric resistances to be calculated by:
 $PrWatt = V \times (10 - t_{min}) / 860$
where: *PrWatt* is the resistance power (Watt) and *tmin* is the lower temperature (°C)
2. If there is no storage, maintain the water temperature higher than 10°C by inserting thermostatic resistance with power calculated as in case 1.

10.4 ANTIFREEZE PROTECTION ON THE HEAT 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. The customer 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.

WARNING: Trane can provide various optional kits (they are not included in the Low ambient kit down to -10°C) 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 antifreeze methods. Continuously verify, through routine checks, that appropriate anti-freeze protection is maintained.

Failure to follow the instructions above could result in damage to some of the unit's components. Damage from freezing is 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 pumps is not managed by the CGAF SE / CGAF HE unit controller. The owner or local maintenance personnel must provide appropriate solutions to prevent freezing.

10.5 HYDRAULIC VERSIONS

CGAF SE / CGAF HE units are available in four hydraulic versions characterized by complete kits of all major hydraulic components for an easier installation, with reduced time, cost and space.

- single pump
- single pump and tank
- double pump
- double pump and tank

Hydronic accessories on request

- "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 antifreeze protection kits
- Water gauges kit

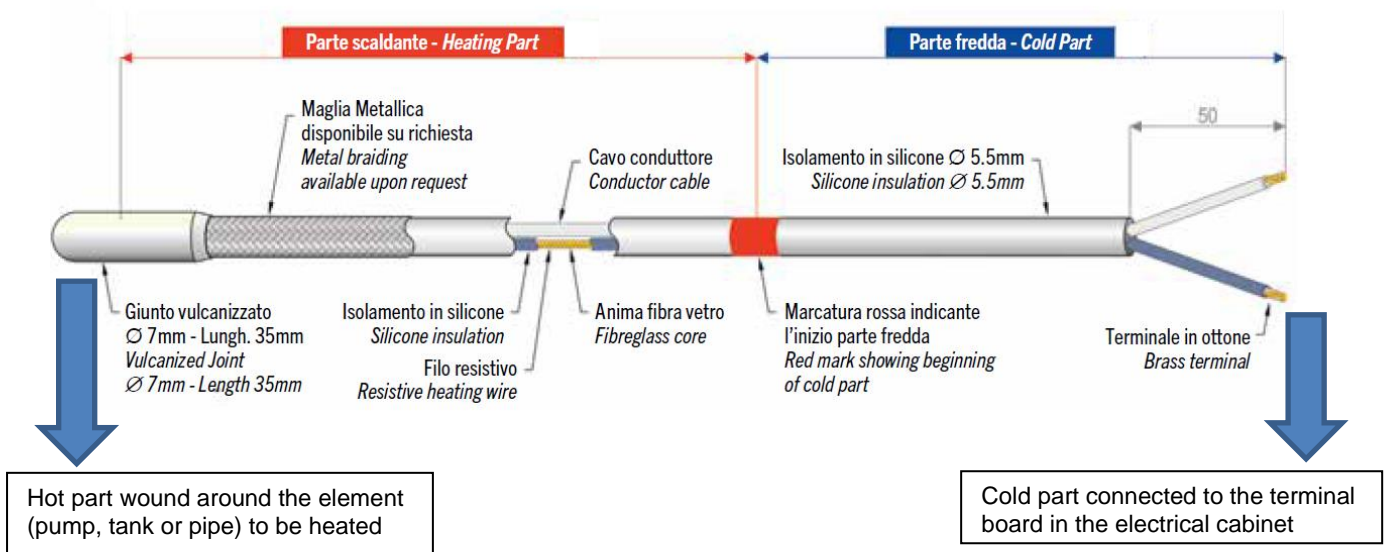
(*) Water strainer with meshes not over 0.5mm

WARNING: 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 antifreeze protection kits

These kits, aimed at avoiding the freezing of all the components of the hydraulic circuit inside the unit (pumps, pipes and tank) are optional and are coupled to the unit hydraulic versions.

The heating cable type used for the kits mentioned above is featured in the figure below (in figure is shown 230 V version):



Hydraulic diagram for CGAF SE / CGAF HE units with single pump

	Predisposizione Sonda Temperatura Probe predisposition
	Valvola di sfiato Vent valve
	Vaso Espansione Expansion vessel
	Manometro Water pressure gauge
	Valvola Sicurezza (6 bar) Safety valve (6 bar)
	Valvola Intercettazione Shut off valve
	Elettropompa Pump
	Rubinetto di Carico Filling valve
	Rubinetto di Scarico Drain valve
	Valvola di Ritegno Check valve
	Seratoio di Accumulo Water tank
	Antivibrante Rubber isolator
	Flussostato Flow switch
	Filtro Water strainer
	Valvola 2 vie con servomotore on/off 2 way valve electroactuated on/off
	Scambiatore sorgente Source heat exchanger
	Scambiatore utenza Users heat exchanger
	Pozzetto sonda 1/4" NPT femmina Sensor enclosure 1/4"NPT female

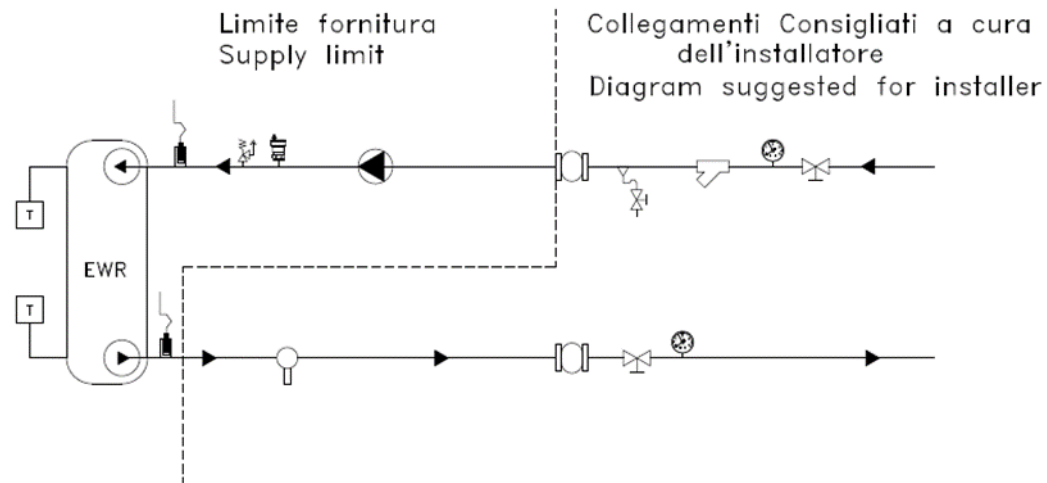


Figure 4

Hydraulic diagram for CGAF SE / CGAF HE units with single pump and tank

	Predisposizione Sonda Temperatura Probe predisposition
	Valvola di sfiato Vent valve
	Vaso Espansione Expansion vessel
	Manometro Water pressure gauge
	Valvola Sicurezza (6 bar) Safety valve (6 bar)
	Valvola Intercettazione Shut off valve
	Elettropompa Pump
	Rubinetto di Carico Filling valve
	Rubinetto di Scarico Drain valve
	Valvola di Ritegno Check valve
	Seratoio di Accumulo Water tank
	Antivibrante Rubber isolator
	Flussostato Flow switch
	Filtro Water strainer
	Valvola 2 vie con servomotore on/off 2 way valve electroactuated on/off
	Scambiatore sorgente Source heat exchanger
	Scambiatore utenza Users heat exchanger
	Pozzetto sonda 1/4" NPT femmina Sensor enclosure 1/4"NPT female

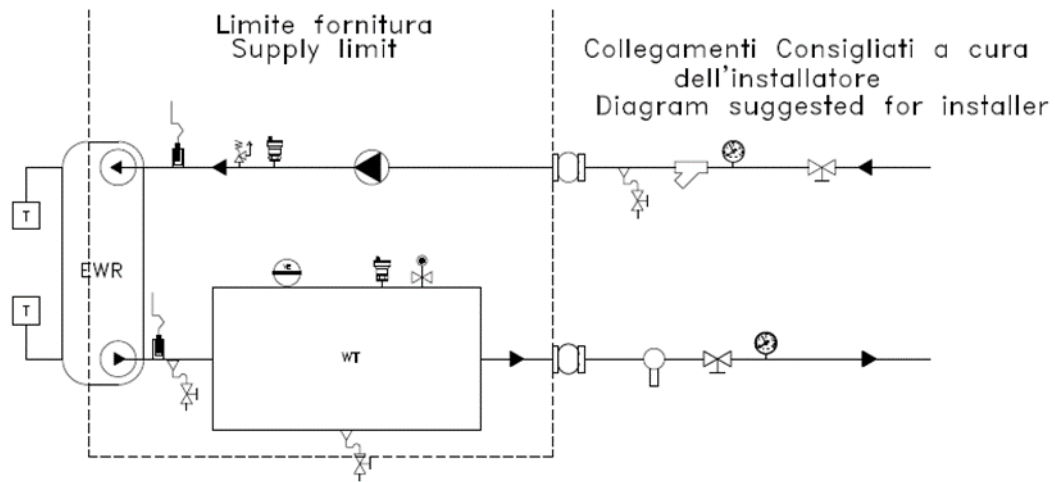


Figure 6

Hydraulic diagram for CGAF SE / CGAF HE units with dual pump

	Predisposizione Sonda Temperatura Probe predisposition
	Valvola di sfiato Vent valve
	Vaso Espansione Expansion vessel
	Manometro Water pressure gauge
	Valvola Sicurezza (6 bar) Safety valve (6 bar)
	Valvola Intercettazione Shut off valve
	Elettropompa Pump
	Rubinetto di Carico Filling valve
	Rubinetto di Scarico Drain valve
	Valvola di Rilegno Check valve
	Serbatoio di Accumulo Water tank
	Antivibrante Rubber Isolator
	Flussostato Flow switch
	Filtro Water strainer
	Valvola 2 vie con servomotore on/off 2 way valve electroactuated on/off
	Scambiatore sorgente Source heat exchanger
	Scambiatore utenza Users heat exchanger
	Pozzetto sonda 1/4" NPT femmina Sensor enclosure 1/4"NPT female

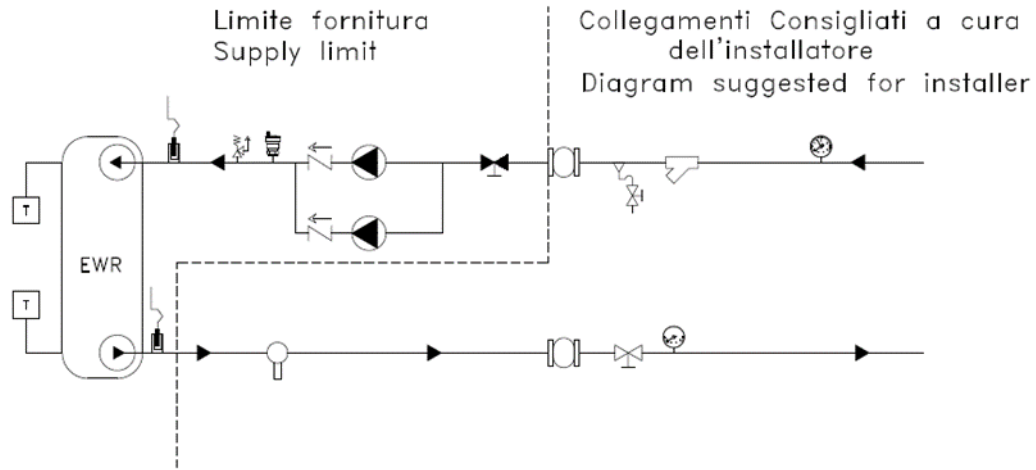


Figure 7

Hydraulic diagram for CGAF SE / CGAF HE units with dual pump and tank

	Predisposizione Sonda Temperatura Probe predisposition
	Valvola di sfiato Vent valve
	Vaso Espansione Expansion vessel
	Manometro Water pressure gauge
	Valvola Sicurezza (6 bar) Safety valve (6 bar)
	Valvola Intercettazione Shut off valve
	Elettropompa Pump
	Rubinetto di Carico Filling valve
	Rubinetto di Scarico Drain valve
	Valvola di Rilegno Check valve
	Serbatoio di Accumulo Water tank
	Antivibrante Rubber Isolator
	Flussostato Flow switch
	Filtro Water strainer
	Valvola 2 vie con servomotore on/off 2 way valve electroactuated on/off
	Scambiatore sorgente Source heat exchanger
	Scambiatore utenza Users heat exchanger
	Pozzetto sonda 1/4" NPT femmina Sensor enclosure 1/4"NPT female

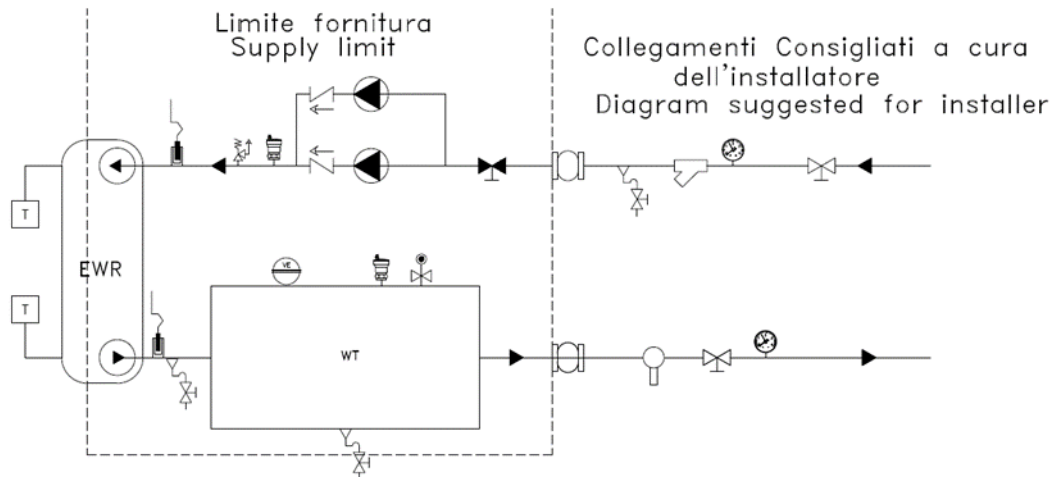


Figure 8

Flow switch installation

To ensure adequate water flow through the evaporator, it is essential to install a flow switch on the water circuit. The flow switch must be installed according to the relevant hydraulic diagram among those reported in the par 10.510.5 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.

ATTENTION

- Avoid direct exposure to sunlight.
- Protect your device from atmospheric agents. (Protection rating IP65).
- Protect your device from high thermal changes to avoid condensation inside.
- For the electrical connection, use a cable with a suitable diameter for the cable gland to avoid liquid infiltration.
- We recommend continuing the cable downwards out of the cable gland to prevent liquid routing inside.
- Use the same tightening torque for all cover screws.
- For a correct seal, the gasket must never be damaged or too compressed.
- Based on the diameter of the pipe, if multiple blades are used, these must always be mounted in sequence, starting from the smallest.

For example, if the paddle 3 is required, paddles 1+2+3 must ALWAYS be mounted, as defined in the technical data sheet.

- Use a suitable tool when assembling, never force the cover to fix the flow switch.

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 slugs 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)

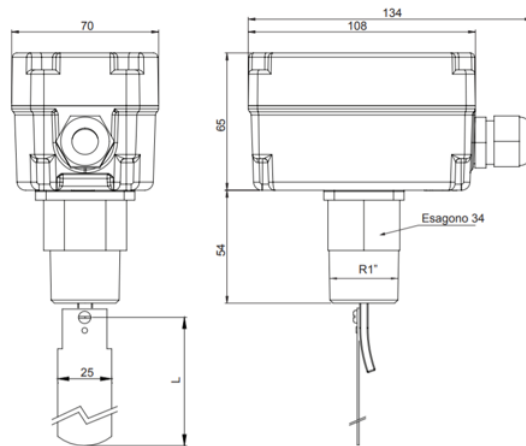


Figure 8

Paddle

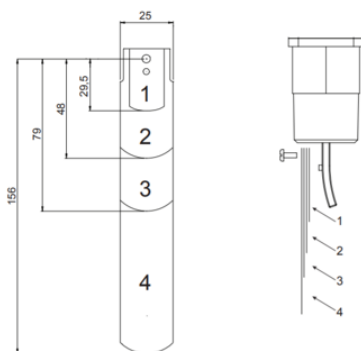


Figure 9

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

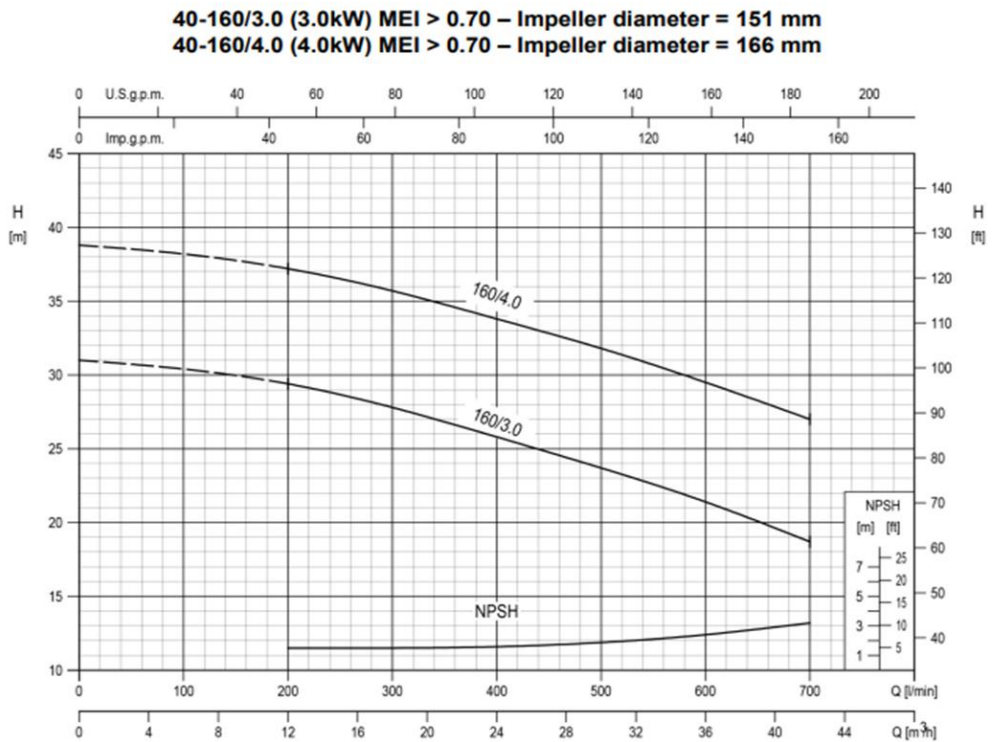
PUMPS CHARACTERISTICS

CGAF SE / CGAF HE standard head pressure pump characteristics for all sizes

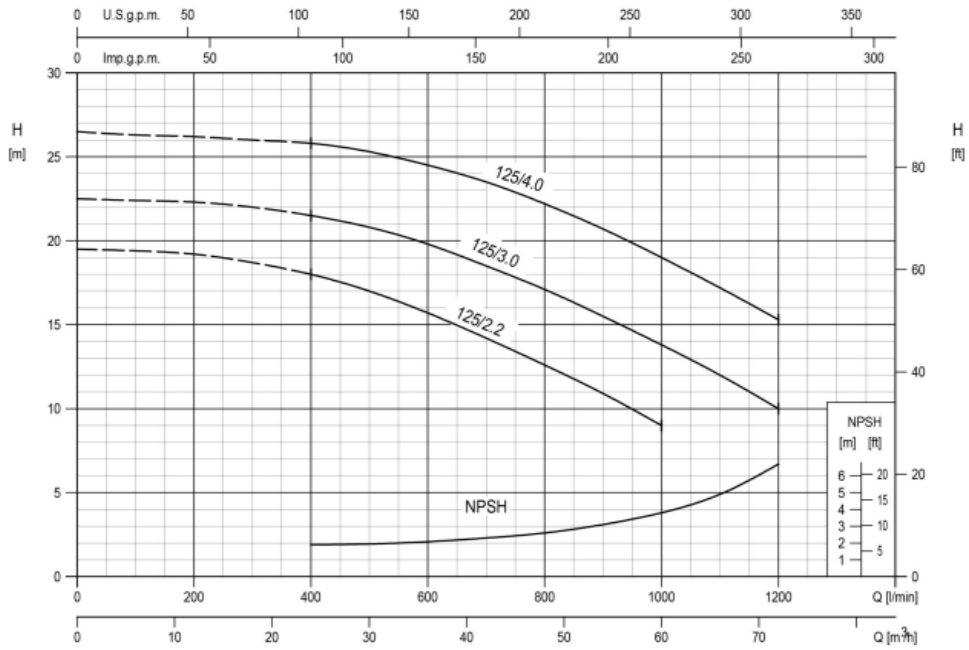
Unit sizes	Standard head Pump	P2 [kW]	I [A]
CGAF 042	3D-40-160/3,0	3,44	6,4
CGAF 050	3D-40-160/4,0	4,52	8,7
CGAF 052			
CGAF 055			
CGAF 060	3D 50-125/4	4,52	8,7
CGAF 065			
CGAF 070			
CGAF 075	3D 65-125/5,5	6,29	10,6
CGAF 085			
CGAF 095	3D 65-125/7,5	8,26	13,6
CGAF 105			
CGAF 125			

P2 = full load electrical power
I = full load operating current

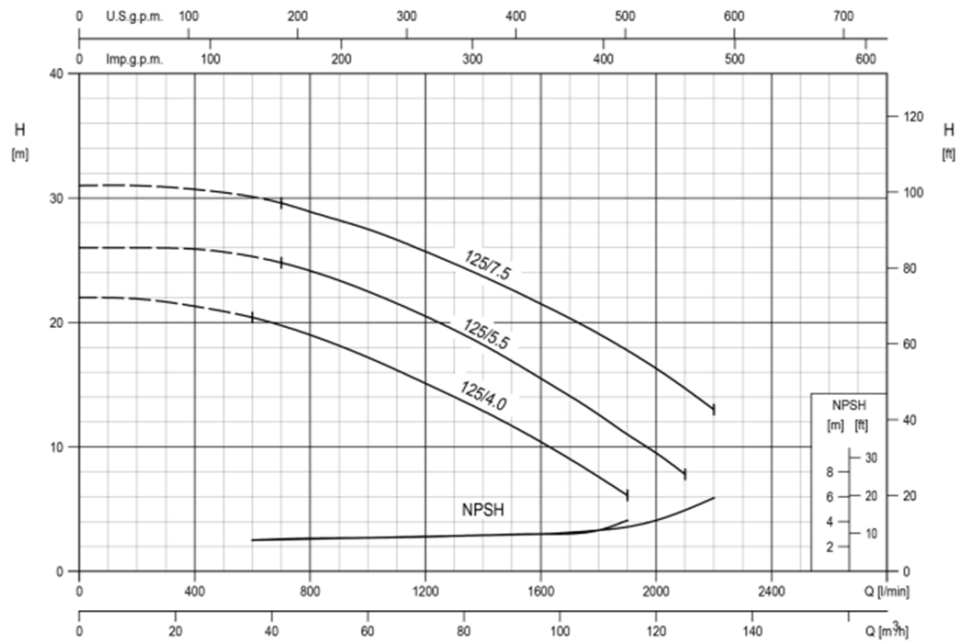
- Pumps characteristics:



50-125/2.2 (2.2kW) MEI > 0.60 – Impeller diameter = 126 mm
50-125/3.0 (3.0kW) MEI > 0.60 – Impeller diameter = 131 mm
50-125/4.0 (4.0kW) MEI > 0.60 – Impeller diameter = 140 mm



65-125/4.0 (4.0kW) MEI > 0.70 – Impeller diameter = 128 mm
65-125/5.5 (5.5kW) MEI > 0.70 – Impeller diameter = 138 mm
65-125/7.5 (7.5kW) MEI > 0.70 – Impeller diameter = 149 mm

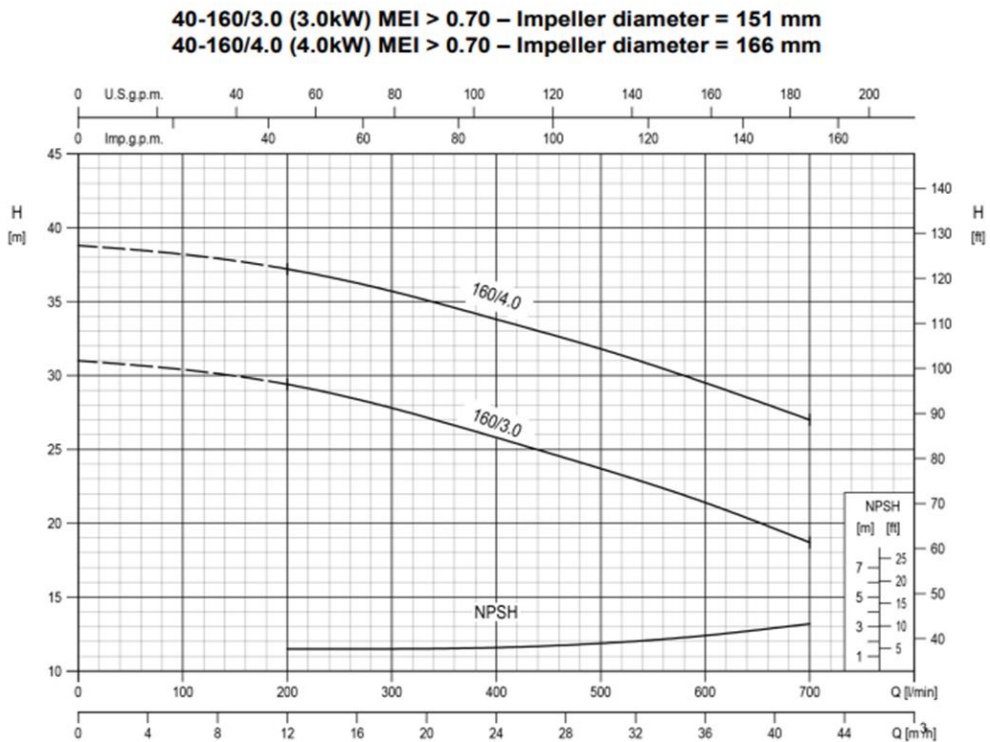


CGAF SE / CGAF HE high head pressure pump characteristics for all sizes

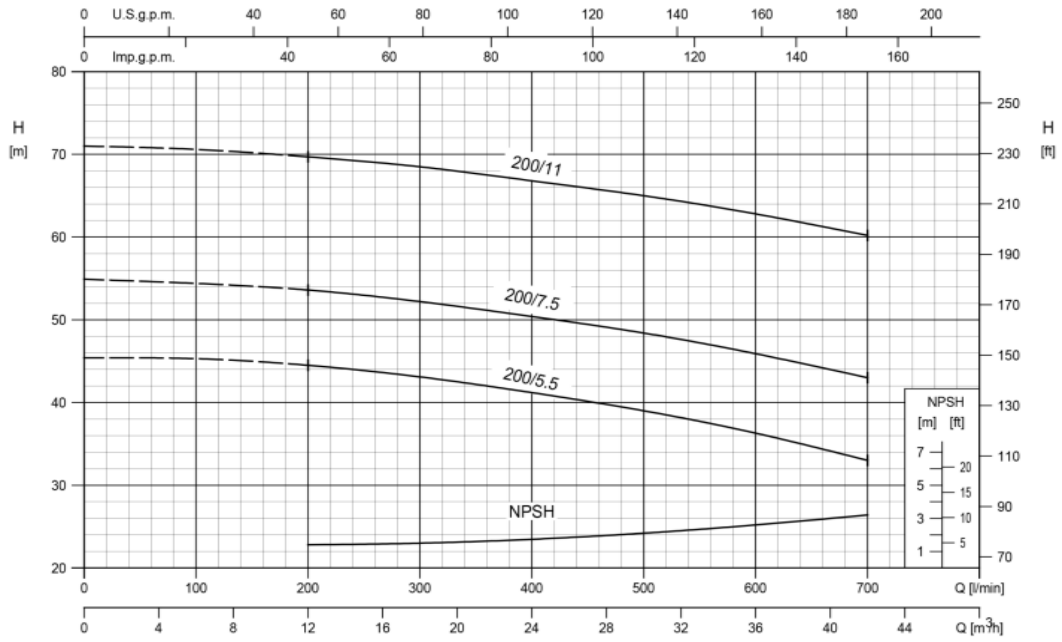
Unit sizes	High head Pump	P2 [kW]	I [A]
CGAF 042	3D-40-160/4,0	4,52	8,7
CGAF 050	3D-40-200/5,5	6,09	10,6
CGAF 052			
CGAF 055			
CGAF 060	3D-50-160/7,5	8,26	13,6
CGAF 065			
CGAF 070			
CGAF 075			
CGAF 085	3D 65-160/9.2	10,12	17,2
CGAF 095			
CGAF 105	3D 65-160/11	11,98	21,3
CGAF 125			

P2 = full load electrical power
I = full load operating current

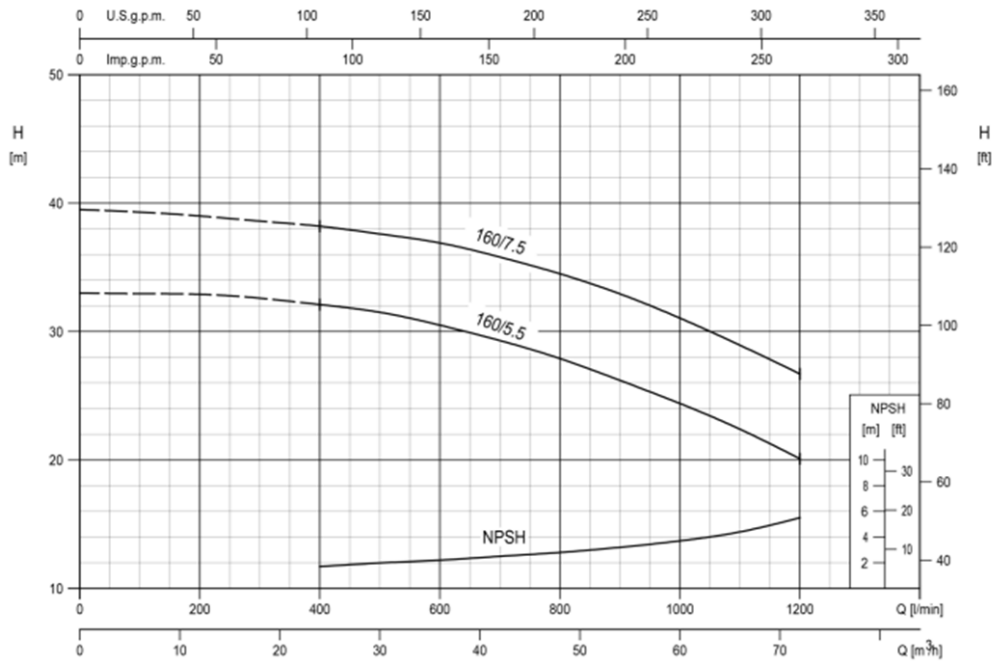
- Pumps characteristics:



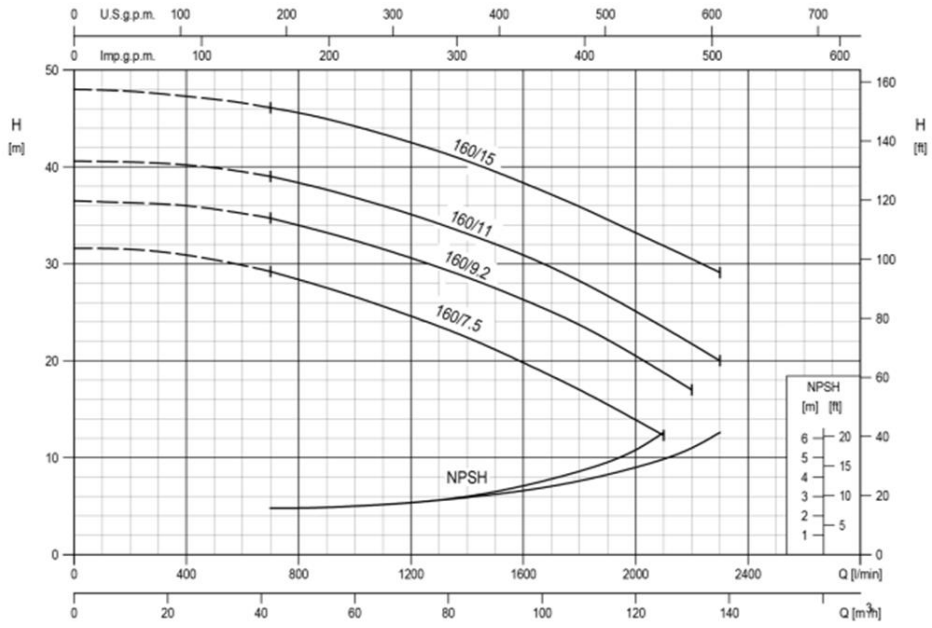
40-200/5.5 (5.5kW) MEI > 0.70 – Impeller diameter = 183 mm
40-200/7.5 (7.5kW) MEI > 0.70 – Impeller diameter = 200 mm
40-200/11 (11kW) MEI > 0.70 – Impeller diameter = 224 mm



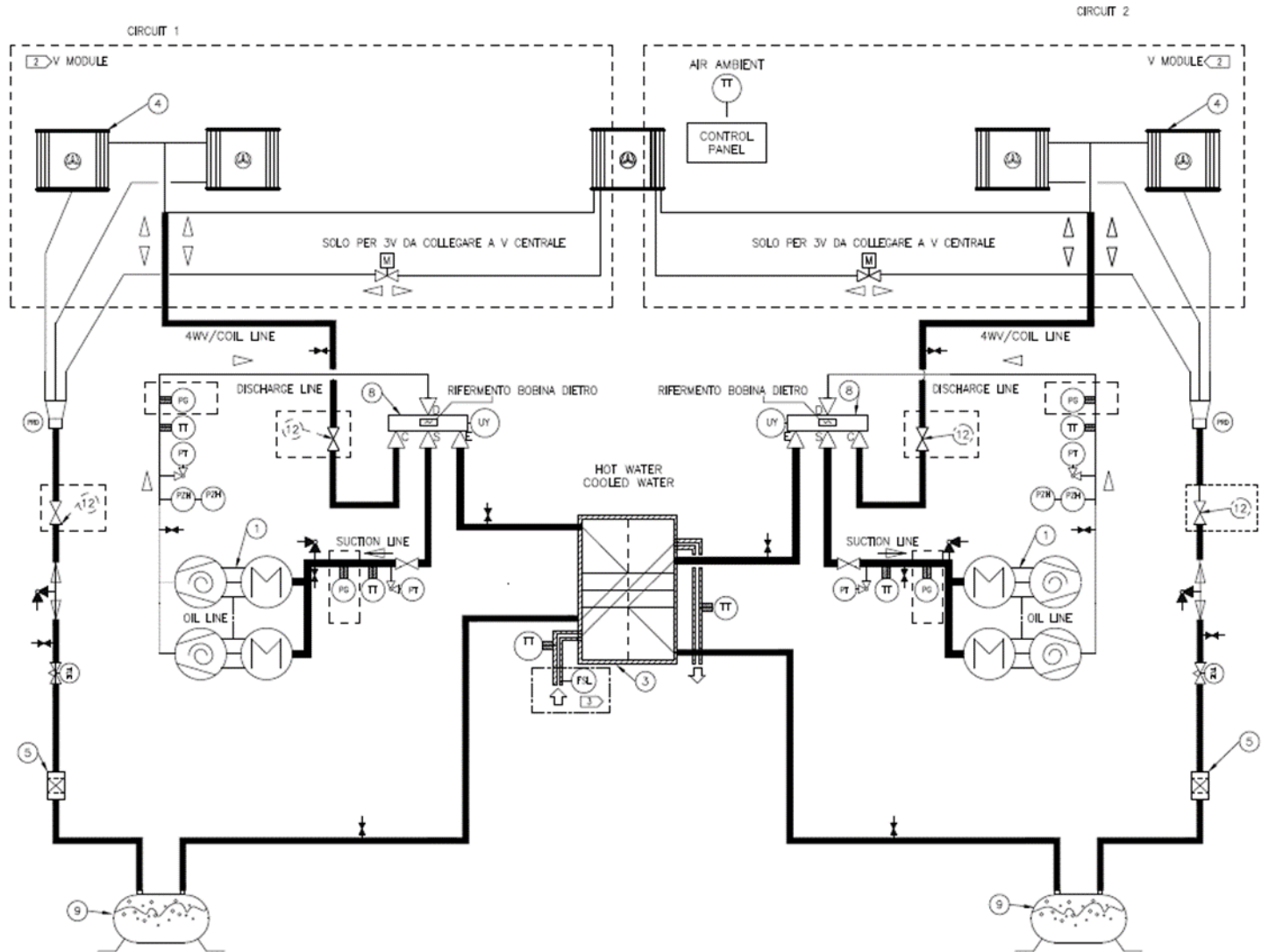
50-160/5.5 (5.5kW) MEI > 0.70 – Impeller diameter = 154 mm
50-160/7.5 (7.5kW) MEI > 0.70 – Impeller diameter = 166 mm



65-160/7.5 (7.5kW) MEI > 0.70 – Impeller diameter = 153 mm
65-160/9.2 (9.2kW) MEI > 0.70 – Impeller diameter = 160 mm
65-160/11 (11kW) MEI > 0.70 – Impeller diameter = 168 mm
65-160/15 (15kW) MEI > 0.70 – Impeller diameter = 178 mm



11 CGAF SE / CGAF HE STANDARD REFRIGERANT SCHEMATIC



ITEM	DESIGNATION	DESCRIZIONE
1	SCROLL COMPRESSOR	COMPRESSORE SCROLL
2	EVAPORATOR (COOLED WATER)	EVAPORATORE
3	HEAT RECOVERY (HOT WATER)	RECUPERO
4	CONDENSER (AIR COOLED EXCHANGER)	BATTERIA AD ARIA
5	FILTER DRIER	FILTRO DISIDRATATORE
6	SERVICE VALVE	VALVOLA VUOTO- CARICA
7	PRESSURE TAP	VALVOLA SRHADER - PRESA SERVIZIO
8	4 WAY REVERSING VALVE	VALVOLA 4 VIE
9	RECEIVER	RICEVITORE DI LIQUIDO
10	FILL UP / DRAIN OUT VALVE	VALVOLA DI CARICO-SCARICO
11	CHECK VALVE	VALVOLA DI NON RITORNO
12	SERVICE ISOLATION VALVE	RUBINETTO
13	COOLING STEP MOTOR VALVE	VALVOLA PASSO PASSO FREDDO
14	DEFROST STEP MOTOR VALVE	VALVOLA PASSO PASSO DEFROST
15	H/P STEP MOTOR VALVE	VALVOLA PASSO PASSO CHIELELR-POMPA
16	EVAPORATOR ISOLATION VALVE WITH ACTUATOR	RUBINETTO MOTORIZZATO EVAPORATORE
17	HR ISOLATION VALVE WITH ACTUATOR	RUBINETTO MOTORIZZATO RECUPERO
19	HOT GAZ SOLENOID VALVE	SOLENOIDE HOT GAS
20	FLOATING RESTRICTOR	RESTRICTOR FLOTTANTE
21	EVAPORATOR OIL RETURN SOLENOID	SOLENOIDE RECUPERO OLIO

ITEM	DESIGNATION	DESCRIZIONE
PT	PRESSURE TRANSDUCER	TRASDUTTORE DI PRESSIONE
P2H	HIGH PRESSURE SWITCH	PRESSOSTATO DI ALTA
TT	TEMPERATURE SENSOR	SENSORE DI TEMPERATURA
TCE	ELECTRIC EXPANSION VALVE	VALVOLA ESPANSIONE ELETTRONICA
FSL	EVAPORATOR WATER FLOW SWITCH	FLUSSOSTATO EVAPORATORE
M	VALVE MOTOR	MOTORE VALVOLA
UY	SOLENOID	SOLENOIDE
PG	PRESSURE GAUGE	MANOMETRO
PRD	PRE-DISTRIBUTOR	PRE DISTRIBUTORE

	REFRIGERANT LINE	REFRIGERANT LINE
	OIL LINE	LINEA OLIO
	CHILLED / HOT WATER LINE	ACQUA REFRIGERATA / ACQUA CALDA
	INSULATION	ISOLAMENTO

OPTIONS

FLOW SWITCH FSL

REFRIGERANT FLOW DIRECTION IS SHOWN FOR COOLING MODE

12 ELECTRICAL PANEL

When reviewing this manual keep in mind.

- All field-installed wiring must be in accordance with local regulations, CE directives and guidelines. Be sure to satisfy proper equipment grounding requirements according to CE
- The standardized values - Maximum Amps –Maximum kWatts are displayed on 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/GND 50Hz and so, no additional power supply is necessary. 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 27 VDC. Each unit is provided with auxiliary transformer control circuit 230/27VAC. 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 The selection of the optional 47=A (power factor correction) is incompatible with the presence of pumps regardless of their number, therefore digit 24 = 1,2,3,4 and 59 = 1,2,3,4 excludes digit 47 = A. Digit 8 = G and 47=A are incompatible.

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 five (5) minutes for units which 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.

WARNING 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 WARNING 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.**

13 OPERATOR RESPONSABILITIES

It is WARNING 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.

14 START-UP PRELIMINARY PROCEDURES

14.1 STARTING CHECK

Before starting the unit, even only momentarily, all the machinery supplied by the chilled water, like the air handling units, pumps, 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 jumper and strain the solenoid valve on the liquid line. 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.

14.2 REFRIGERANT SEALS CONTROL

Trane units are sent 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.

14.3 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

13 CHECK LIST – MANDATORY OPERATION CONTROL BEFORE START-UP

DATE		N.	
UNIT			

CUSTOMER:	SITE:
	ADDRESS:
	POSTCODE:
	COUNTRY:

THE INTENDED PURPOSE OF CGAF SE / CGAF HE UNITS IS NOT FOR INDUSTRIAL PROCESS APPLICATION. PLEASE CONTACT TRANE TECHNICAL DEPARTMENT IN CASE OF INDUSTRIAL PROCESS APPLICATION.

GENERAL

		COMPLIANCE	
		YES	NO
1	<p>THE HYDRAULIC CIRCUIT IS COMPLETE AND READY TO BE USED AND THE THERMAL LOAD IS AVAILABLE.</p> <p>PLEASE NOTE THAT THE FIRST START-UP SHALL NOT BE CARRIED OUT UNLESS THE PLANT IS READY AND THE WATER LOAD IS AVAILABLE.</p>		
2	<p>THE UNIT DISPLAYS DENTS OR DAMAGES ON THE EXTERNAL CASING OCCURRED DURING THE TRANSPORTATION OR POSITIONING.</p> <p>IF ANY, SPECIFY BELOW:</p> <p>WARNING: PLEASE BE AWARE THAT RELEVANT DAMAGES CAUSED BY THE QUOTED CIRCUMSTANCES MAY RESULT IN THE CALL-OFF OF THE WARRANTY.</p>		
3	<p>THE UNIT HAS BEEN INSTALLED IN ACCORDANCE WITH THE MINIMUM DISTANCE PROVIDED IN THE DIMENSIONAL DRAWING AND TECHNICAL DOCUMENTATION PROVIDED.</p>		
4	<p>THE UNIT IS INSTALLED NEXT TO THE: PHOTOVOLTAIC SYSTEM, ELECTRONIC TRANSMITTERS, ANTENNAS OR SIMILAR DEVICES.</p>		
5	<p>THE UNIT IS POSITIONED ON A PERFECTLY FLAT (NOT INCLINED) SURFACE.</p>		
6	<p>ANTI-VIBRATIONS DAMPERS HAVE BEEN INSTALLED BETWEEN THE UNIT AND THE FLOOR.</p>		
7	<p>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 PLEASE CONTACT TRANE.</p> <p>WARNING: PLEASE BE AWARE THAT RELEVANT DAMAGES CAUSED BY THE QUOTED CIRCUMSTANCES MAY RESULT IN THE CALL-OFF OF THE WARRANTY.</p>		
8	<p>THE UNIT HAS BEEN INSTALLED VERY CLOSE TO A MARINE ENVIRONMENT OR AN AGGRESSIVE INSTALLATION ENVIRONMENT (HIGHLY CORROSIVE CHEMICAL AGENT).</p> <p>WARNING: PLEASE BE AWARE THAT RELEVANT DAMAGES CAUSED BY THE QUOTED CIRCUMSTANCES MAY RESULT IN THE CALL-OFF OF THE WARRANTY.</p>		
9	<p>SPOTTED PRESENCE OF MOLD, MUSHROOMS, BACTERIA, MICROBIAL OF ANY TYPE.</p>		
10	<p>THE UNIT DISPLAYS DAMAGES CAUSED BY: FLOODS, LIGHTNING, FIRE, ANY ACCIDENT BEYOND TRANE CONTROL.</p>		

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. IN THIS CASE PLEASE CONTACT TRANE.		

WATER CIRCUIT

		COMPLIANCE	
		YES	NO
27	<p>THE FILTER IS INSTALLED ON THE HEAT EXCHANGER INLET PIPES, AT A MAXIMUM DISTANCE OF 2 METERS FROM THE UNIT.</p> <p>PLEASE NOTE THAT THE FILTER INSTALLATION IS MANDATORY. FOR FURTHER TECHNICAL INFORMATION RELATING THE FILTER PLEASE REFER TO THE TECHNICAL DOCUMENTATIONS.</p>		
28	<p>THE FLOW SWITCH HAS BEEN INSTALLED AND ELECTRICALLY CONNECTED. PLEASE NOTE THAT FLOW SWITCH INSTALLATION IS MANDATORY.</p>		
29	<p>THE VALVES ON THE WATER PLANT MUST BE OPENED. PLEASE BE AWARE THAT IF THE MACHINE 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.</p>		
30	<p>DRAINAGE VALVES ARE INSTALLED. THE DRAINAGE VALVES ARE INSTALLED ON THE LOWEST POINT. THE UTILIZATION OF AUTOMATIC DRAINAGE VALVES IS RECOMMENDED.</p>		
31	<p>AUTOMATIC OR MANUAL PURGE VALVES ARE INSTALLED.</p> <p>AUTOMATIC OR MANUAL PURGE VALVES ARE INSTALLED ON THE HIGHEST POINT.</p>		
32	<p>THE HYDRAULIC CIRCUIT HAS BEEN FILLED AND PURGED.</p> <p>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 TECHICAL INFORMATIONS PLEASE REFER TO TRANE DOCUMENTATIONS AND PROCEDURE FOR THE FIRST START UP.</p>		
33	<p>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.).</p>		
34	<p>RUBBER JOINTS ARE INSTALLED ON THE HYDRAULIC CONNECTIONS, IN ORDER TO MINIMIZE VIBRATIONS BETWEEN THE UNIT AND WATER PIPES.</p>		
35	<p>SHUTOFF VALVES ARE INSTALLED ON THE HYDRAULIC CIRCUIT.</p>		
36	<p>THE EXPANSION TANK IS INSTALLED ON THE HYDRAULIC CIRCUIT. EXPANSION TANK CAPACITY CONCURS WITH THE WATER PLANT CAPACITY.</p>		
37	<p>TEMPERATURE PROBES AND PRESSURE GAUGES ARE INSTALLED ON THE HYDRAULIC CIRCUIT, BOTH INLET AND OUTLET SIDE.</p>		
38	<p>THE HYDRAULIC CIRCUIT IS FREE FROM OBSTRUCTION OR ANY KIND OF CONSTRAINT.</p>		
39	<p>BUFFER TANKS ARE INSTALLED IN THE HYDRAULIC CIRCUIT. THE BUFFER TANKS INSTALLATION IS STRONGLY RECOMMENDED IN ORDER TO WARRANTY THE OPTIMAL UNIT OPERATION.</p> <p>SPECIFY BUFFER TANK CAPACITY:LT</p>		
40	<p>THE PRESSURE RELIEF VALVE IS INSTALLED BETWEEN DELIVERY AND RETURN PIPES.</p> <p>WARNING: IN ORDER TO AVOID <u>WATER-HAMMER</u>, THE RELIEF VALVE PRESSURE SHALL BE SET UP IN ACCORDANCE WITH THE STANDARD OPERATING PRESSURE OF THE WATER CIRCUIT.</p>		
41	<p>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.</p> <p>WARNING: THE UNIT SHALL NEVER WORK (NOT EVEN FOR SHORT PERIODS) WITH AN INLET WATER TEMPERATURE LOWER THAN 18°C.</p>		

		COMPLIANCE	
		YES	NO
42	ANTIFREEZE PROTECTIONS ARE INSTALLED IN THE WATER CIRCUIT (ELECTRICAL HEATERS ARE INSTALLED ON WATER PIPES AND TANKS). FOR FURTHER TECHNICAL INFORMATION PLEASE REFER TO TECHNICAL DOCUMENTATION PROVIDED. PLEASE NOTE THAT 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 WITH THE DATA PROVIDED IN THE TECHNICAL 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 TECHNICAL 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.)		

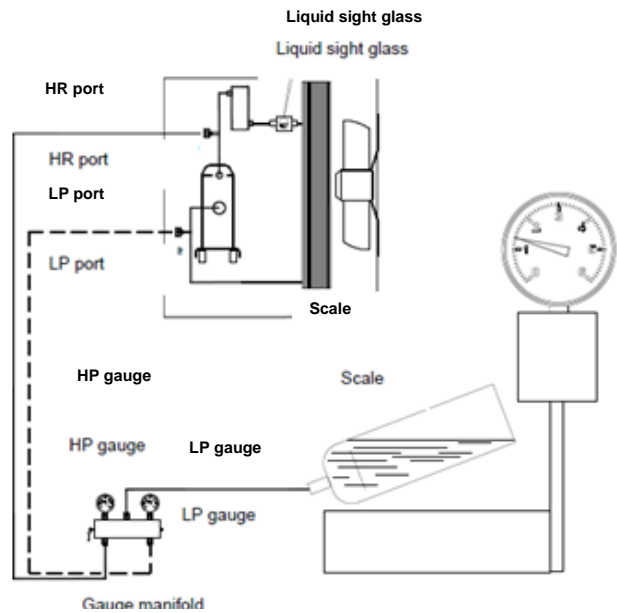
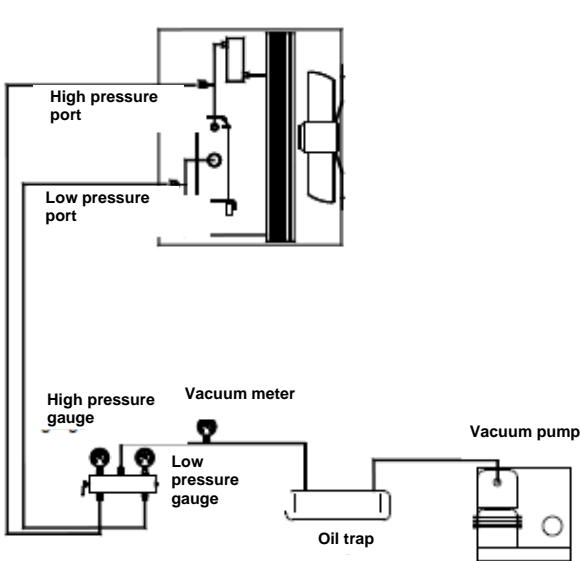
DATE:	<u>AUTHORIZED SERVICE:</u> <u>NAME AND SIGNATURE</u>	<u>CUSTOMER:</u> <u>NAME AND SIGNATURE</u>
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13.1 REFRIGERANT CHARGE

13.1.1 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 sub cooling of 4 - 8°C. Values of overheating which are too high may be caused by a lack of refrigerant, whereas high sub cooling 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 sub cooling 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.



Refrigerant charge in the liquid phase

Refrigerant circuit diagram connection to vacuum pump

13.1.2 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 over charge 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.

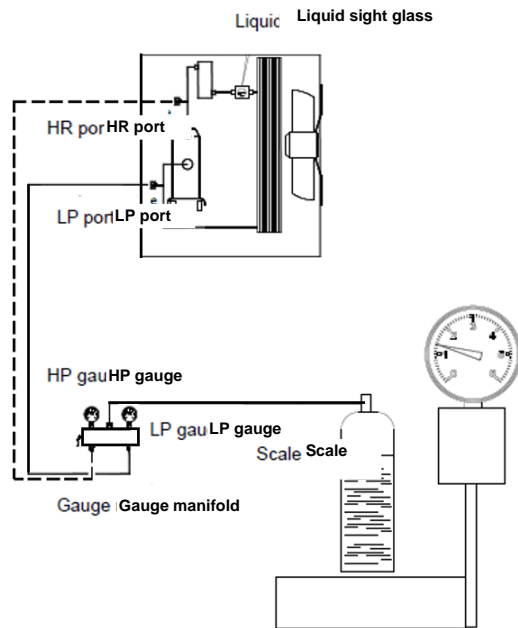
High value of superheating.

Low value of sub cooling.

In this case, add refrigerant R454B. 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.

WARNING!

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.



Refrigerant charge in the vapour phase

14 START-UP

14.1 PRELIMINARY CONTROLS

Before starting up the equipment it is very **WARNING** to 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 electric 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 machine.

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 machinery connected to the unit.

14.2 STARTING UP

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.

Next to the lamp there is a connection on every compressor for draining the oil and a connection for refilling.

To refill oil, there is a 1/4" Schrader connection.

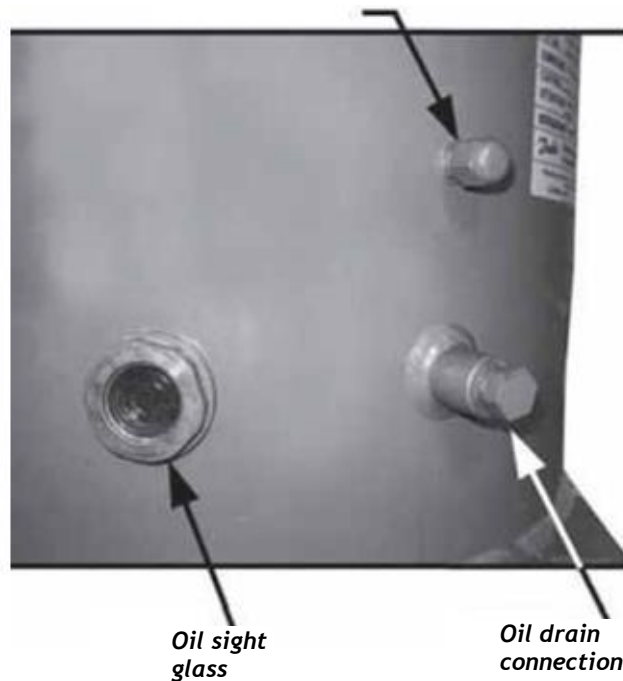
To refill oil, it is necessary to discharge the refrigerant in the unit, recovering it in adequate cylinders. Then vacuum until you reach a pressure of about 6 Pa to remove any trace of humidity from the circuit. Then load the unit with a small amount of refrigerant and fill oil from the proper connection for refilling.

Add oil until the oil sight glass is flat within the upper and lower limits indicated by the corresponding notches.

At this point refill the previously discharged amount of refrigerant as in the indications above. Restart the compressor.

Run for 20 minutes at full load and check the oil level. The CGAF SE / CGAF HE units use POE oil.

Oil fill connection and gauge port



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.

14.3 WARM UP OF THE PLANT

In order to keep all the machine components in good condition and to optimise their use, during the warm up it is necessary to bring the circuit to the right temperature before releasing cooling energy to the utilities.

The following steps must be followed for this to be carried out:

- * start up the machine
- * wait for the water in 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.

14.4 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 the display-On.
- 4) Turn on the pump (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 subcooling 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 coil
- d) - Evaporation pressure
- e) - 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.

15 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 machine 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.

15.1 GENERAL

WARNING!

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 (at the start of the season)

It's WARNING that during the initial start-up and periodically during operation routine checks are carried out. Among them we 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 WARNING!

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 WARNING 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.

NOTICE: 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.

Change filters and oil until the oil no longer test acidic.

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

The CGAF SE / CGAF HE units use POE 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 POE oil containers open to the atmosphere. Always keep them sealed.

15.2 SIGHT CHECK OF THE LIQUID RECEIVER

The risks due to the pressure inside the circuit have been eliminated or (when it is not possible) reduced by means of safety devices. It is WARNING to check periodically the status of this device and to carry out the components inspections and repositioning as follows.

Check the liquid receiver state at least one a year.

It is WARNING to check that the surface does not get rusty and that neither corrosion nor deformations are visible.

In case the superficial oxidation and the corrosion are not properly controlled and stopped in time, cause a thickness reduction with a consequent reduction of the receiver mechanical resistance.

Use antioxidant paint or products to protect.

15.3 STANDARD CONTROLS

It is mandatory to clean regularly the coils for a proper unit operation. Inclusion and other residual material clearing helps extend the life of the coils and the whole unit

Operations description	Recommended basis
Compressors oil level check	monthly
Inlet temperature check (overheating)	monthly
Water circuits filling check	monthly
Fans and 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
Coils cleanliness	monthly
Compressors and liquid circuit solenoid valve check	semiannual
Fans and compressors contactors state check	quarterly
Evaporator heater operation check	quarterly
Motor and fan bearing noise check	semiannual
Pressure vessels conditions check	yearly

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:

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.

WARNING

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

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

External air temperature sensor –This sensor allows to monitor the external air temperature on the microprocessor display.

High pressure transducer –This allows to monitor the delivery pressure and to control the ventilators on each circuit. 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 on each circuit. It contributes to complementing the oil control logic.

15.4 MICROCHANNEL CONDENSER COIL – CLEANING PROCEDURES

It is mandatory to clean regularly the coils for a proper unit operation. Eliminate Inclusion and other residual material help to extend the life of the coils and the unit

CAUTION! Equipment Damage! Do not use coil cleaning agents to clean uncoated CGAF SE / CGAF HE coils. Use clean water only. Use of coil cleaning agents on uncoated CGAF SE / CGAF HE coils could cause damage to coils.

- Regular coil maintenance, including annual cleaning enhances the unit operating efficiency by minimizing compressor head pressure and amperage draw. The condenser coil should be cleaned at least once each quarter or more if the unit is located in a "dirty" or corrosive environment. Cleaning with cleansers or detergents is strongly discouraged due to the all-aluminum construction; straight water should prove sufficient, if not please contact Trane. Any breach in the tubes can result in refrigerant leaks

WARNING: *Only in extreme cases should any type of chemical cleaner or detergent be used on microchannel coils. If it becomes absolutely necessary because water alone did not clean the coil, specify a cleaner that is:*

- A is pH neutral cleaner.
- An alkaline cleaner that is no higher than 8 on the pH scale.
- An acidic cleaner that is no lower than 6 on the pH scale.
- Does not contain any hydrofluoric acids.

Be sure to follow the instructions provided with any cleaner chosen. Keep in mind that it is still MANDATORY that the coils are thoroughly rinsed with water after the application of the cleaner even if the instructions specify a “No Rinse” cleaner. Cleaners or detergents that are left on the coil due to improper rinsing will significantly increase the possibility of corrosion damage on the microchannel coil.

Note: Quarterly cleaning is essential to extend the life of an E-coated coil and is required to maintain warranty coverage. Failure to clean an E-coated coil will void the warranty and may result in reduced efficiency and durability in the environment.

WARNING! Hazardous Voltage!

Disconnect all electric power, including remote disconnects before servicing. Follow proper lockout/ tagout procedures to ensure the power cannot be inadvertently energized. Failure to disconnect power before servicing could result in death or serious injury.

1. Disconnect Power to the unit.
2. Wear proper personal protection equipment such as a face shield, gloves and waterproof clothing.
3. Remove enough panels from the unit to gain safe access to the microchannel coil.

15.5 ORDINARY MAINTENANCE

Activities list	week	Month (note 1)	Year (note 2)
General:			
Data collection operation (Note 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 (6)			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		
Check the pressure drop of the filter drier		X	
Check the pressure drop of the oil filter (Note 5)		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 (7)			X
Condensing section:			
Cleaning the condenser coils (Note 4)			X
Check that the fans are tightened			X
Check the fins of coils – comb it if necessary			X

Notes:

- 1) The 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) The coil cleaning may be required more frequently in areas with a high percentage of particles in the air.
- 5) Replace the oil filter when its pressure drop reaches 2.0 bar.
- 6) Check for dissolved metals.

7) 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.

16 RECOMMENDED SPARE PARTS

There follows a list of the recommended parts for several years' running. Trane is at your disposal to recommend a personalised list of accessories according to the commissioned order, including the part number of the equipment.

1 YEAR		2 YEAR		5 YEAR	
COMPONENTS	QUANTITY	COMPONENTS	QUANTITY	COMPONENTS	QUANTITY
fuses	(all)	fuses	(all)	fuses	(all)
filter dryers	(all)	filter dryers	(all)	filter dryers	(all)
solenoid valves	(1 per type)	solenoid valves	(all)	solenoid valves	(all)
electronic expansion valves	(1 per type)	electronic expansion valves	(all)	electronic expansion valves	(all)
pressure switches	(1 per type)	pressure switches	(all)	pressure switches	(all)
gas gauges	(1 per type)	gas gauges	(all)	gas gauges	(all)
contactors and relays	(1 per type)	contactors and relays	(all)	contactors and relays	(all)
thermal protectors	(1 per type)	thermal protectors	(all)	thermal protectors	(all)
carter electric heaters	(1 per type)	carter electric heaters	(all)	carter electric heaters	(all)
check valve	(1 per type)	check valve	(1 per type)	check valve	(all)
sight glass	(1 per type)	sight glass	(1 per type)	sight glass	(all)
fans and engines	(1 per type)	fans and engines	(1 per type)	fans and engines	(all)
		electrical components	(all)	electrical components	(all)
		compressors	(1 per type)	compressors	(all)
				heat exchanger	(1 per type)

17 TROUBLESHOOTING

Symptom	Cooling	Who can take corrective action U = User S = specialized personnel	Probable cause	Possible remedy
A The unit does not start	X	S	Probe faulty service	Check and replace if necessary.
	X	S	Lack of consent of the high or low pressure	See points D-E
	X	S	Defective compressor	See point B.
B The compressor does not start	X	S	Compressor burnt or seized	Replace the compressor.
	X	S	Compressor contactor de-energized	Check the voltage across the coil of the compressor contactor and the continuity of the coil.
	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, fan, compressor and transformer
	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	S	Intervention of the minimum	See point E.
	X	S	Compressor contactor defective	Check and replace if necessary.
	X	U	Calibration values of the set- point or differential	Modify them as reported in the in the tables.
	X	S	Lack of coolant	See point G
D The compressor does not start because the maximum pressure switch has tripped	X	S	Pressure switch out of order	Check and replace.
	X	S	Overcharge of refrigerant	Download the excess refrigerant
	X	U	Finned coil clogged, air flow rate is too low	Remove dirt from the coil and obstructions to the air flow
	X	S	Fan not working	See point F.
		S	Water pump circulation blocked	Unblock the pump.
		X	Water circulation pump and defective	Check and replace if necessary.
	X	S	Presence of non condensable gases in the refrigerant circuit	Prime the circuit after it has been downloaded and put under vacuum.
X	S	Refrigerant filter clogged	Check and replace.	

Symptom	Cooling	Who can take corrective action U = User S = specialized personnel	Probable cause	Possible remedy
E The compressor does not start because the minimum pressure switch has tripped	X	S	Pressure switch out of order	Check and replace.
	X	S	Machine completely void of refrigerant	See point G.
		U	Finned coil clogged, airflow rate is too low	Remove dirt from the coil.
	X	U	Water circulation pump blocked	Unlock the pump
	X	S	Water circulation pump blocked and defective	Check the pump and replace if necessary
		S	Presence of frost on the evaporator coil	See point N.
		S	Evaporator fan not working	See point F.
	X	S	Refrigerant filter clogged	Check and replace.
	X	S	Expansion device that is not working properly	Check and replace if necessary.
	X	S	Presence of moisture in the refrigerant circuit	Replace the filter, dry and recharge
F The fans do not start	X	S	Fan contactor de-energized	Check the voltage across the coil of the contactor and the continuity of the coil.
	X	S	Lack of output voltage from the control fan speed	Check the contacts, replace if necessary.
	X	S	Thermal protection inside the fan	Check the condition of the fan and the air temperature during operation of the unit.
	X	S	Fan motor faulty	Check and replace.
	X	S	Loose electrical connections	Check and replace.
G Lack of gas	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	S	The filter is clogged	Replace the filter
I The unit works continuously without ever stopping	X	S	Lack of refrigerant gas	See item G.
	X	U	Incorrect tuning of the operating thermostat	Check and set.
	X	S	Excessive thermal load	Reduce the thermal load
	X	S	Compressor does not give the thermal output	Check, change or revise
	X	S	The liquid filter is clogged	Replace.
L The unit works regularly but with an insufficient capacity	X	S	Low refrigerant charge	See point G.

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

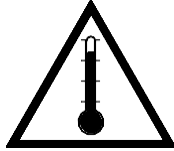
18 IMPROPER USES

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

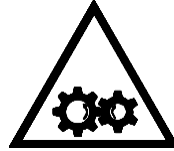
SYMBOLS



DANGER:
General danger



DANGER:
Temperature



DANGER:
Moving parts



DANGER:
Cutoff voltage



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