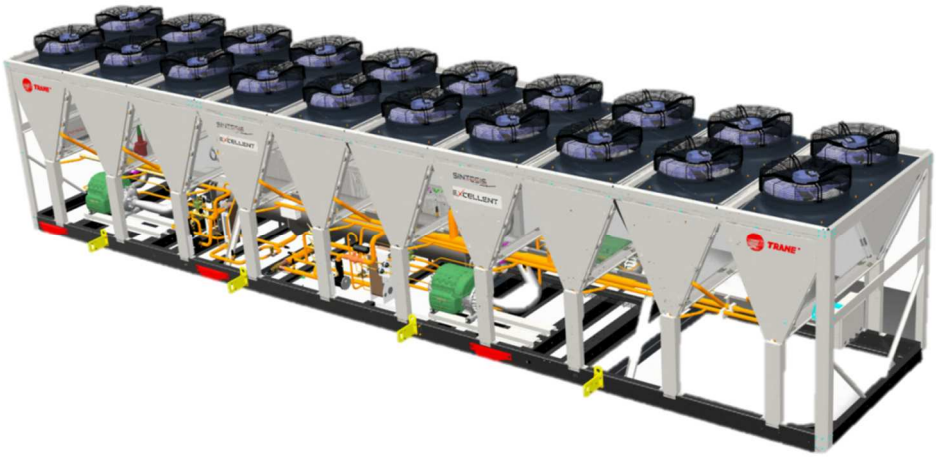
Options Guide

Sintesis Excellent Air-Cooled Chillers

Models GVAF 125 to 450 (500 to 1600kw)
Built for Industrial and Commercial Markets



June 2016

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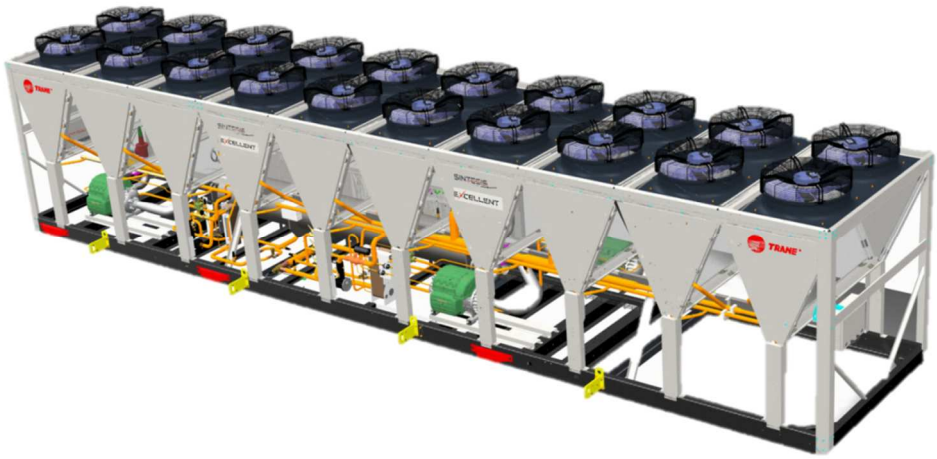
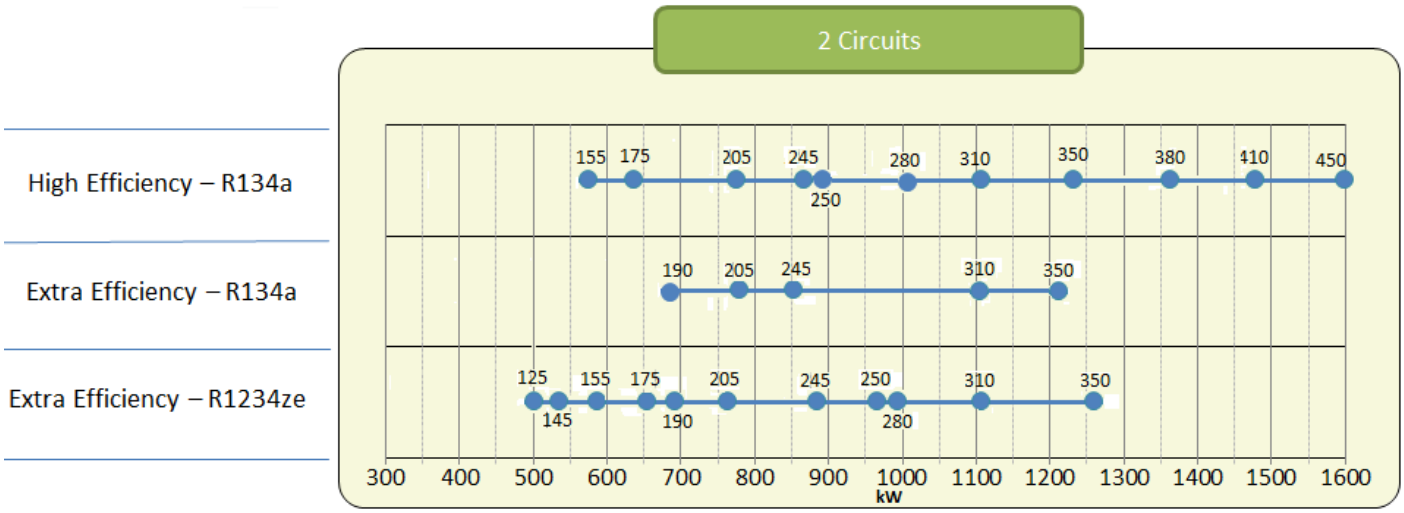
1. Range Overview and General Information

Before explaining the different options and accessories available, let's first take a look at the current range and review the definition of the GVAF chiller.

Illustration GVAF range overview





Sintesis Excellent family covers cooling capacity range from 500 to 1600kW. Numbers next to the circles define the unit size.

Painting and Corrosion Resistance

Standard units are designed to withstand 700 hours to salt spray test.

- Design and appearance: The new Trane Sintesis Excellent model GVAF chiller is the result of a research for higher reliability, energy efficiency and lower sound levels.
- Minimize the risk of corrosion: This series have a huge improvement of corrosion resistance. The condenser is made of micro channel coils, which are 100% aluminum. In consequence galvanic corrosion is avoided. Also, micro channel coils are also well adapted to dirty environments thanks to their small thickness and fins profile.
- Standard coil 700h: no leakage, no performance loss and better than traditional copper/black epoxy fins coils (500h).
- Considerable reduction of refrigerant charge: Sintesis Excellent chillers are equipped with micro channel condensing coils, which allow an excellent heat exchange in every operating condition and minimize the quantity of refrigerant used.
- Trane compressor: Helical-rotary design with legendary reliability.

Compressors and evaporators per unit

		GVAF X R134a (400V-50Hz)													
	Unit	125	145	155	175	190	205	245	250	280	310	350	380	410	450
CKT#1	Comp 1A			TT350	TT350		TT350	TT350	TT350	TT350	TT350	TT350	TT350	TT350	TT350
	Comp 1B								TT350	TT350	TT350	TT350	TT350	TT350	TT350
CKT#2	Comp 2A			TT350	TT350		TT350	TT350	TT350	TT350	TT350	TT350	TT350	TT350	TT350
	Comp 2B												TT350	TT350	TT350
	Evap			250B	250B		250B	250B	300A	300A	300A	300A	500B	500B	500B

		GVAF XP R134a (400V-50Hz)													
	Unit	125	145	155	175	190	205	245	250	280	310	350	380	410	450
CKT#1	Comp 1A					TT350	TT350	TT350			TT350	TT350			
	Comp 1B					TT350	TT350	TT350			TT350	TT350			
CKT#2	Comp 2A					TT350	TT350	TT350			TT350	TT350			
	Comp 2B										TT350	TT350			
	Evap					300A	300A	300A			500B	500B			

		GVAF XPG R1234ze(E) (400V-50Hz)										
	Unit	125	145	155	175	190	205	245	250	280	310	350
CKT#1	Comp 1A	TG310	TG310	TG310	TG310	TG310	TG310	TG310	TG310	TG310	TG310	TG310
	Comp 1B					TG310	TG310	TG310	TG310	TG310	TG310	TG310
CKT#2	Comp 2A	TG310	TG310	TG310	TG310	TG310	TG310	TG310	TG310	TG310	TG310	TG310
	Comp 2B									TG310	TG310	TG310
	Evap	250B	250B	250B	250B	300A	300A	300A	300A	500B	500B	500B

2. Unit voltage, DIGIT 8

GVAF units are only available with 400V ±10% 3 phases 50 Hz.

3. Factory, DIGIT 9

3.1 Epinal, France, digit 9 = E

4. Design Sequence, DIGIT 10/11

4.1 First production release, digit 10/11 = A0

These 2 digits are factory assigned and are changed each time we make a design change on the GVAF range.

5. Efficiency Level, DIGIT 12

5.1 High Efficiency, digit 12 = X, Extra Efficiency, digit 12 = A or Extra Efficiency HFO, digit 12 = G

GVAF units are available in 3 efficiency level:

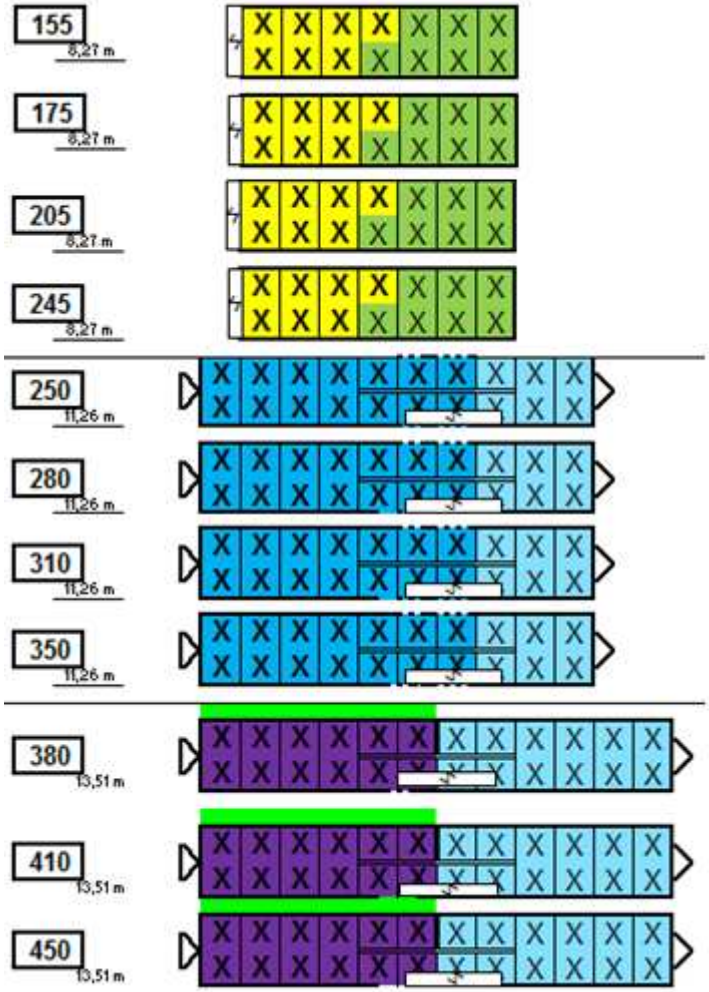
- X units have in average EER 3.3 and ESEER 5.0
- XP units have in average EER 3.5 and ESEER 5.3
- XPG units have in average EER 3.6 and ESEER 5.4

5.2 Technical Differences

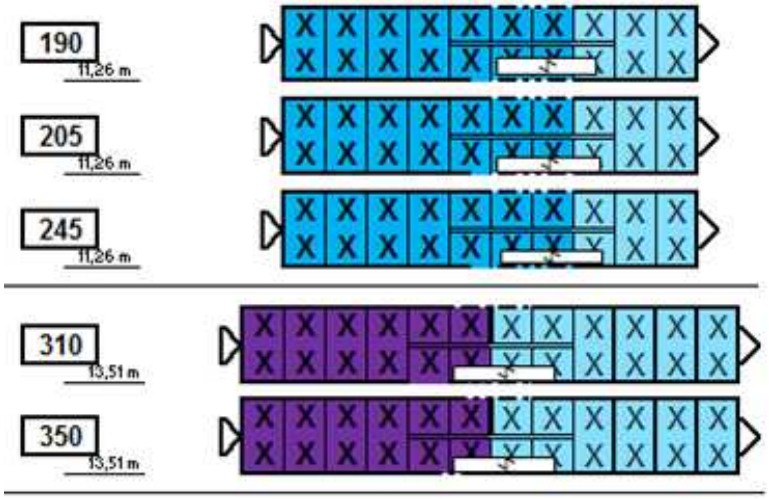
- XP units have bigger condensers and bigger evaporators than X units.

5.3 Number of fans per size

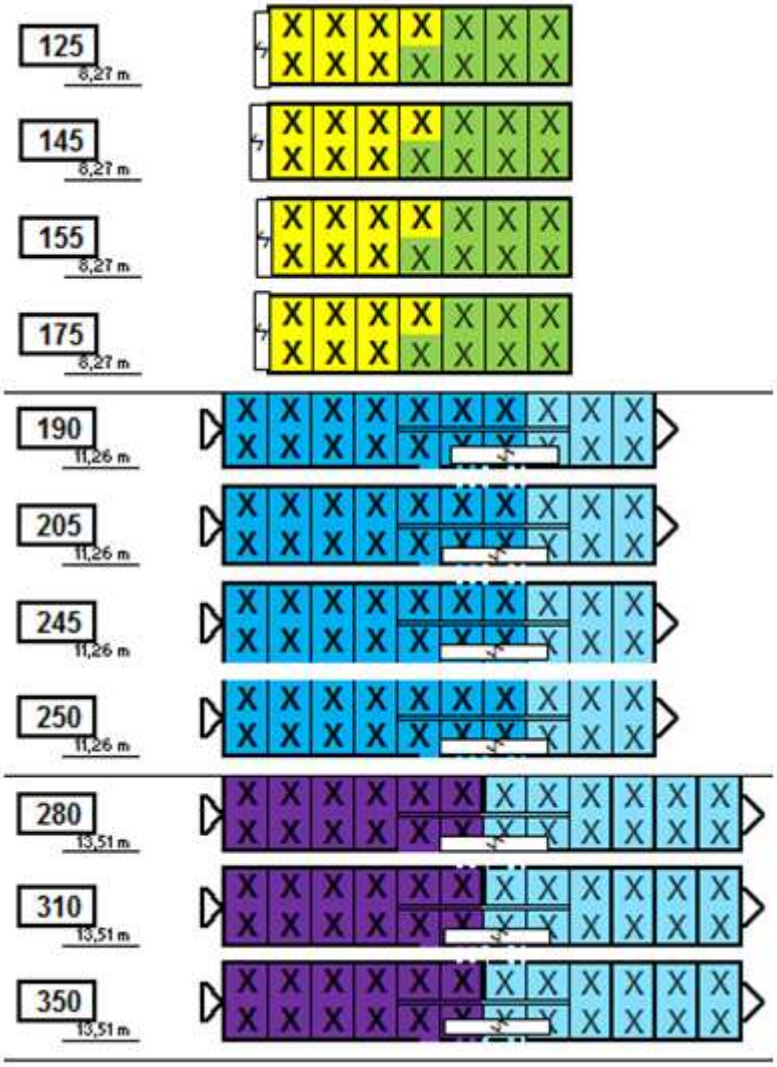
GVAF R134a High Efficiency (X)



GVAF R134a Extra Efficiency (XP)

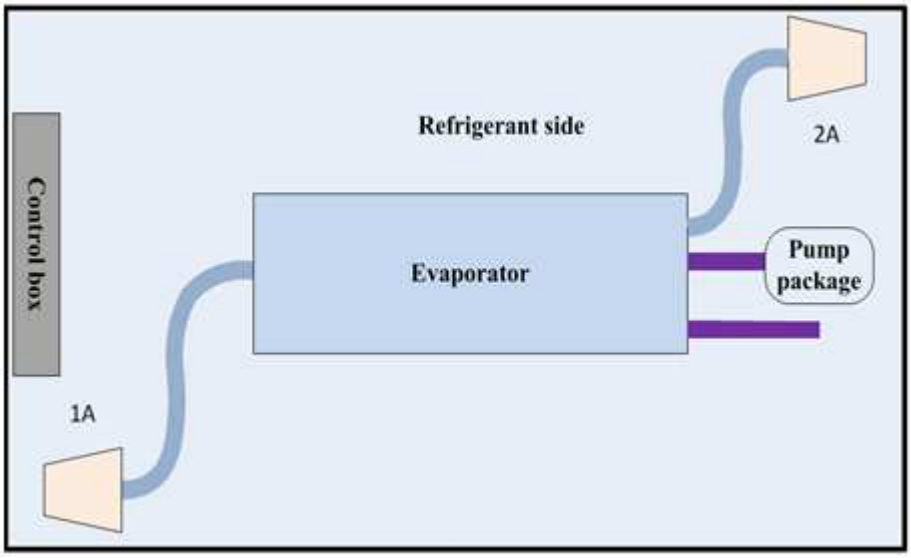


GVAF R1234ze (E) Extra Efficiency (XPG)

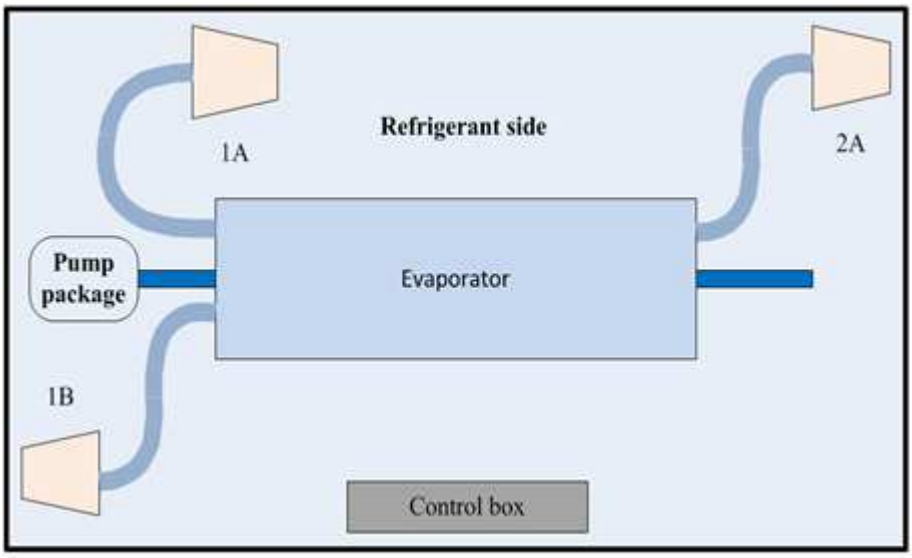


5.4 Elements configuration per unit

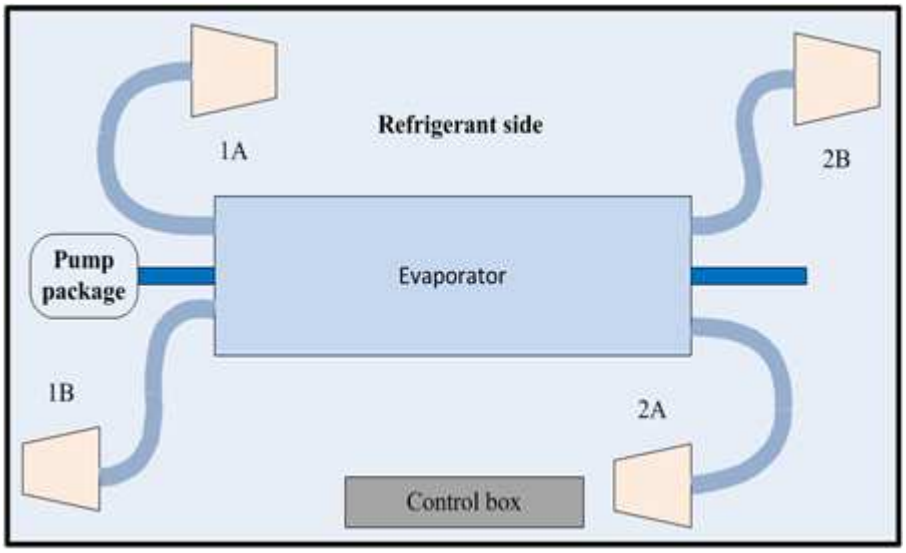
GVAF with 2 compressors



GVAF with 3 compressors



GVAF with 4 compressors



6. Agency Listing and Pressure Vessel Code, DIGIT 13 and DIGIT 14

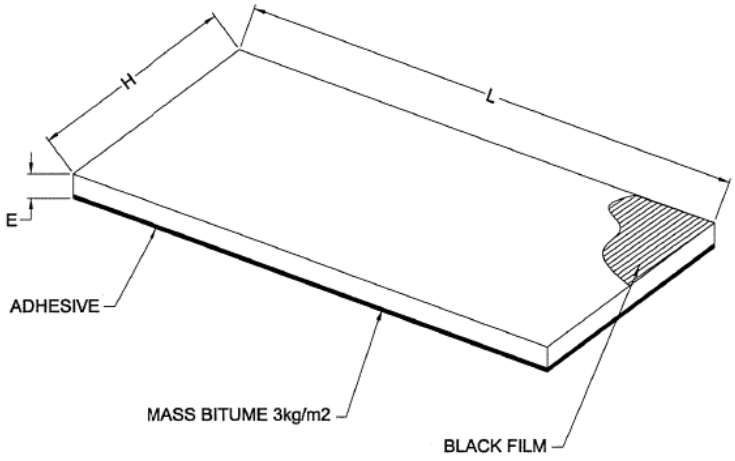
For every unit a PED dossier and CE certificates are sent to TSO (Trane Sell Office) when the unit is finished.

7. Sound Level, DIGIT 15

All GVAF units are equipped with EC fans and compressors are enclosed in a box.

Illustration compressor insulation

Illustration Sound-insulating material



Sound-insulating characteristics:

- Mass bitumen 3 kg/m^2 + foam polyurethane
- Thickness of 23 mm
- One face clad black film polyurethane and adhesive on the bitumen face
- Water adhesive resistant between bitumen and the foam

7.1 Low Noise, digit 15 = L

7.1.1 Description

- Compressor sound enclosure
- Discharge line insulation

7.1.2 Incompatibilities

No incompatibility.

7.1.3 Electrical data

FAN	Nominal Voltage range (VAC)	Frequency (Hz)	Max Speed (rpm)	Max Power input (W)	Max Current draw (A)	Overall efficiency (%)	Power factor
EC	380…480	50/60	1020	1950	3	43.4	0.93

7.1.4 Fan speed (rpm)

Noise Level	**LOW NOISE (LN)**													
Size	**125**	**145**	**155**	**175**	**190**	**205**	**245**	**250**	**280**	**310**	**350**	**380**	**410**	**450**
High Efficiency (X)	-	-	880	880	-	910	910	910	910	910	910	910	910	910
Extra Efficiency (XP)	-	-	-	-	910	910	910	-	-	910	910	-	-	-
Extra Efficiency (XPG)	760	810	860	910	760	810	860	910	810	860	910	-	-	-

7.1.5 Fan speed in night mode (rpm)

Noise Level	**LOW NOISE (LN)**													
Size	**125**	**145**	**155**	**175**	**190**	**205**	**245**	**250**	**280**	**310**	**350**	**380**	**410**	**450**
High Efficiency (X)	-	-	600	650	-	650	650	650	650	650	650	650	650	650
Extra Efficiency (XP)	-	-	-	-	650	650	650	-	-	650	650	-	-	-
Extra Efficiency (XPG)	600	600	600	650	650	650	650	650	650	650	650	-	-	-

7.2 Low Noise + Night and day operation, digit 15 = Q

7.2.1 Application

Unit installed in a noise sensitive area.

7.2.2 Description

- Compressor sound enclosure
- Discharge line insulation
- Factory setting NNSB

7.2.3 Operation / Benefits

Sound level reduced during the night.

7.2.4 Incompatibilities

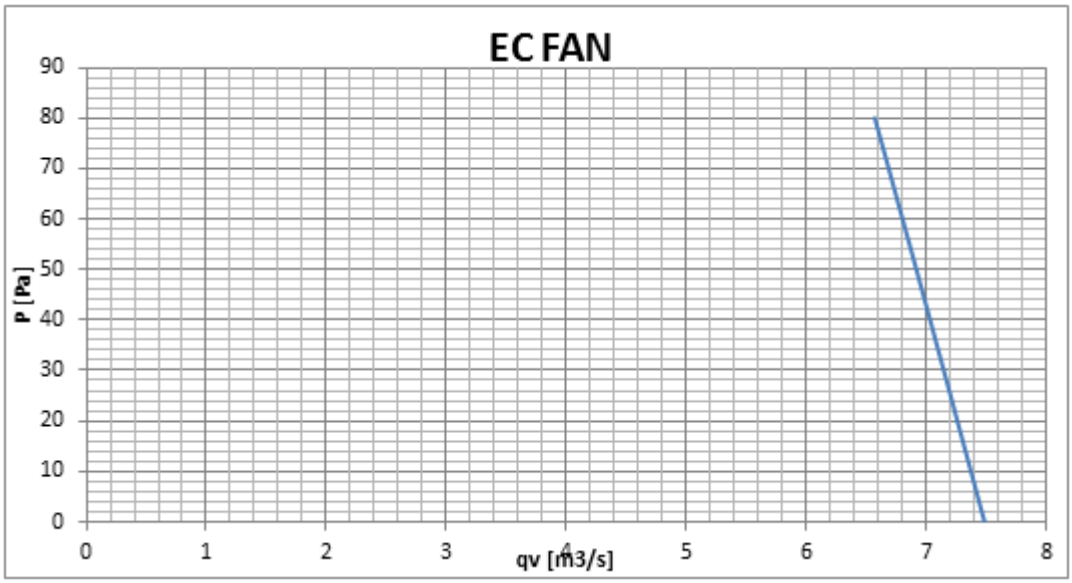
No incompatibility.

Noise Level	**LOW NOISE (LN)**													
Size	**125**	**145**	**155**	**175**	**190**	**205**	**245**	**250**	**280**	**310**	**350**	**380**	**410**	**450**
High Efficiency (X)	-	-	880	880	-	910	910	910	910	910	910	910	910	910
Extra Efficiency (XP)	-	-	-	-	910	910	910	-	-	910	910	-	-	-
Extra Efficiency (XPG)	760	810	860	910	760	810	860	910	810	860	910	-	-	-

7.2.5 Fan speed in night mode (rpm)

Noise Level	**LOW NOISE (LN)**													
Size	**125**	**145**	**155**	**175**	**190**	**205**	**245**	**250**	**280**	**310**	**350**	**380**	**410**	**450**
High Efficiency (X)	-	-	650	650	-	650	650	650	650	650	650	650	650	650
Extra Efficiency (XP)	-	-	-	-	650	650	650	-	-	650	650	-	-	-
Extra Efficiency (XPG)	650	650	650	650	650	650	650	650	650	650	650	-	-	-

7.2.6 Performance curve



7.3 Extra Low Noise, digit 15 = E

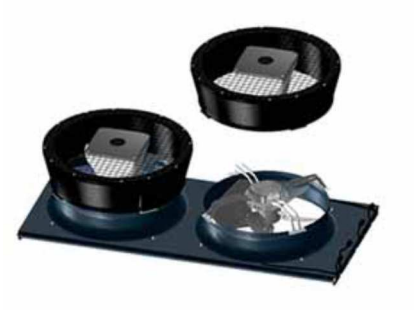
7.3.1 Application

Unit installed in a noise sensitive area.

7.3.2 Description

- Compressor sound enclosure
- Discharge line insulation
- Factory setting NNSB
- Axitop on each EC fan

Illustration XLN Fans



7.3.3 Operation / Benefits

Extremely low sound level.

7.3.4 Incompatibilities

GVAF XLN cannot be shipped in container.

7.3.5 Electrical data

FAN	Nominal Voltage range (VAC)	Frequency (Hz)	Max Speed (rpm)	Max Power input (W)	Max Current draw (A)	Overall efficiency (%)	Power factor
EC XLN	380…480	50/60	1020	1950	3	46.2	0.93

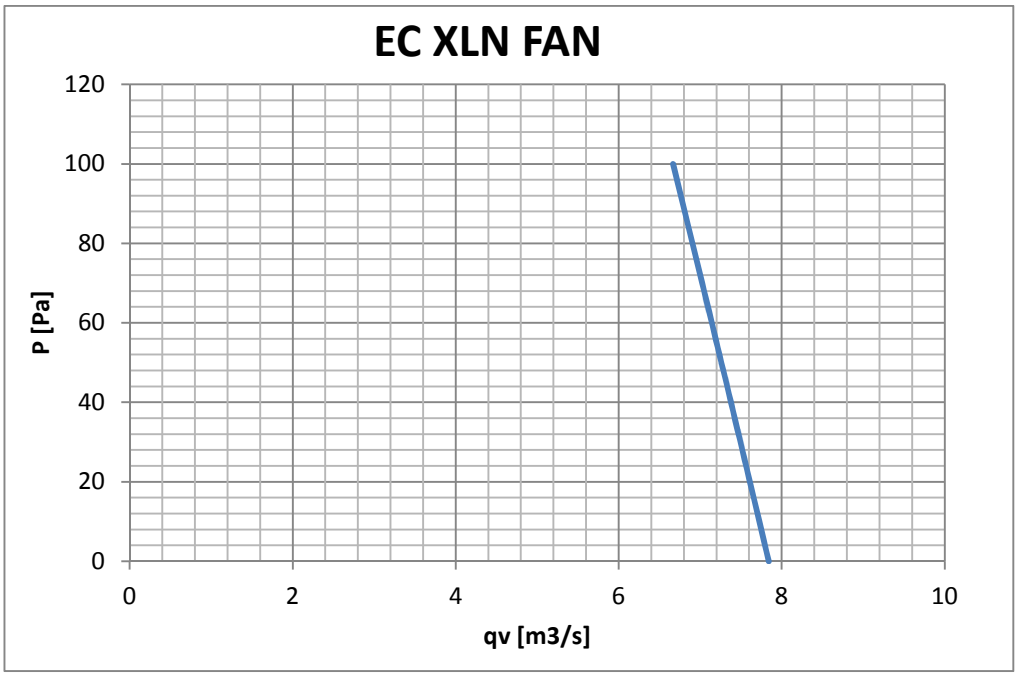
7.3.6 Fan speed (rpm)

Noise Level	**EXTRA LOW NOISE (XLN)**													
Size	**125**	**145**	**155**	**175**	**190**	**205**	**245**	**250**	**280**	**310**	**350**	**380**	**410**	**450**
High Efficiency (X)	-	-	830	830	-	860	860	860	860	860	860	860	860	860
Extra Efficiency (XP)	-	-	-	-	860	860	860	-	-	860	860	-	-	-
Extra Efficiency (XPG)	710	760	810	860	710	760	810	860	760	810	860	-	-	-

7.3.7 Fan speed in night mode (rpm)

Noise Level	**EXTRA LOW NOISE (XLN)**													
Size	**125**	**145**	**155**	**175**	**190**	**205**	**245**	**250**	**280**	**310**	**350**	**380**	**410**	**450**
High Efficiency (X)	-	-	550	600	-	600	600	600	600	600	600	600	600	600
Extra Efficiency (XP)	-	-	-	-	600	600	600	-	-	600	600	-	-	-
Extra Efficiency (XPG)	550	550	550	600	600	600	600	600	600	600	600	-	-	-

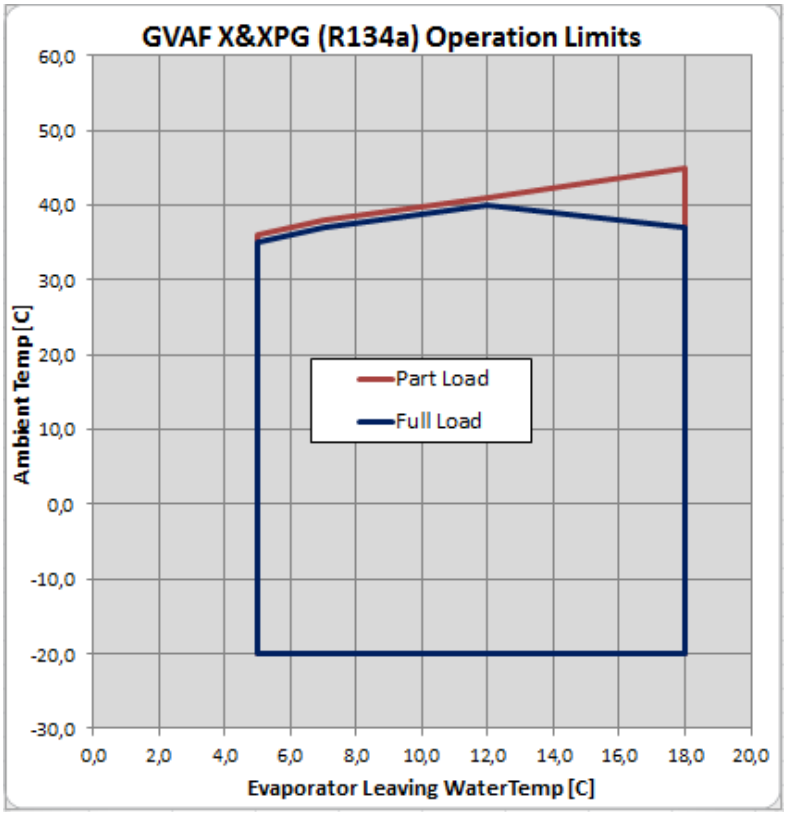
7.3.8 Performance curve

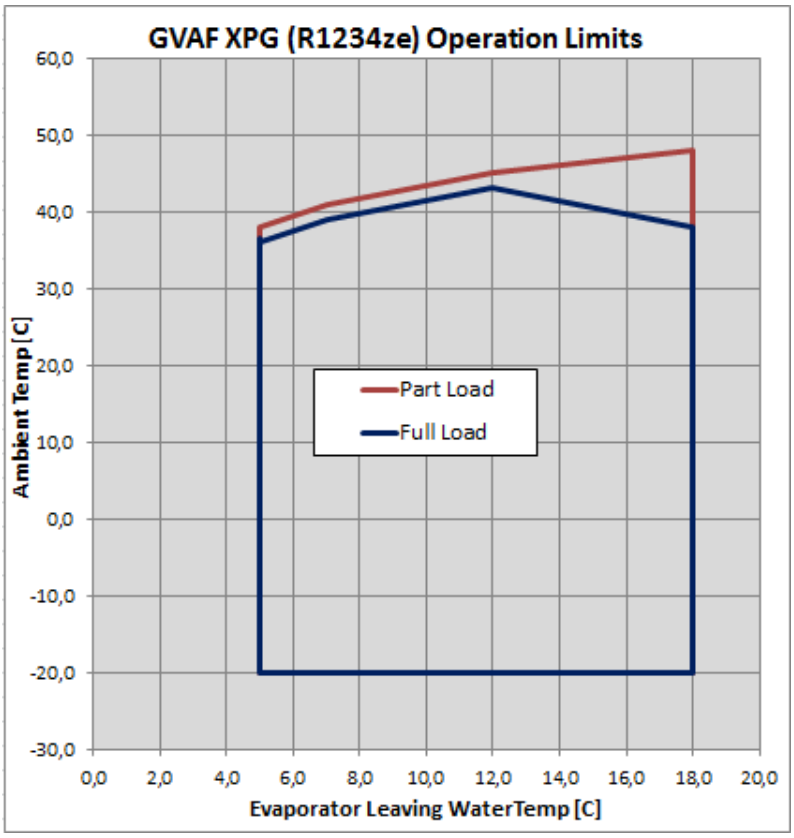


8. Operating Maps: Airside, DIGIT 16

To choose the unit configuration, refer to operating map: Low ambient or High ambient for both refrigerants R134a and R1234ze:

Illustrations GVAF operating maps





9. Relief Valve Option, DIGIT 17

9.1 Single Relief Valve High & Low Pressure Side, digit 17 = L

GVAF chillers are equipped with one safety valve on low pressure side and one safety valve on high pressure side as standard on each refrigerant circuit.
This valve is used to protect the unit from being exposed to pressures above the max rating (LP=14 Bars & HP=25 Bars).

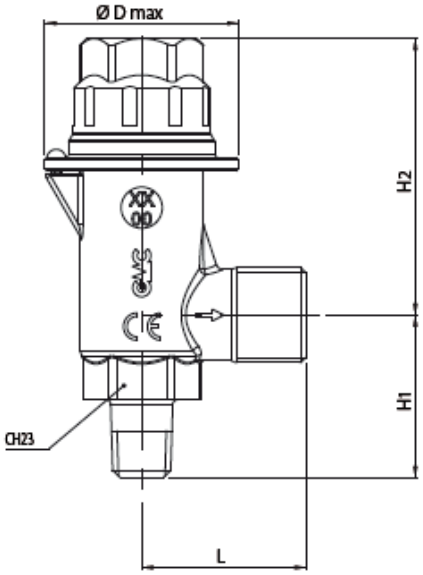
9.1.1 Application

The safety valve is installed on low and high pressure side. It operates to relieve the overpressure in the chiller.
During the maintenance work or when the valve needs to be replaced, the unit needs to be stopped first from operating and the client has to drain the refrigerant from the circuit for servicing.

9.1.2 Description

Illustration SAFETY VALVES SV1 - SV2 Series

Type			SV2/44
Connections	Inlet male:		1/2"NPT
	Outlet male:		G1/2"
Flow diameter [mm]:			10
Maximum outlet diameter [mm]			14
Flow area "A" [mm2]:			78,5
Discharge coefficient Kd			0,605
Maximum lift [mm]			7
Maximum allowable pressure PS [bar]:			50
Allowable temperature range TS [°C]:			-50 ÷ 150
Set pressure range [bar]:			9 ÷ 45
Overpressure			10% di Pset
Dimensions	H1	[mm]	38,5
	H2	[mm]	60,5
	L	[mm]	36
	ØD	[mm]	42,5
Weight [g]			320



Low pressure valve

High pressure valve

9.1.3 Operation / Benefits

- Condenser is protected against overpressure as per PED requirements
- However, if the safety relief valve is broken or has to be replaced for local regulations reasons, the corresponding circuit must be stopped and drained to change the valve

9.1.4 Incompatibilities

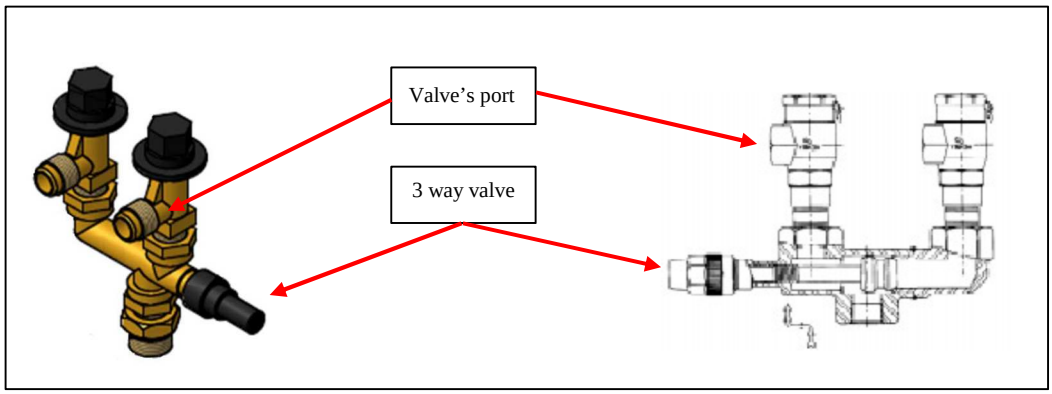
No incompatibility.

9.2 Dual Relief Valve with 3 Way Valve HP & LP Side, digit 17 = D

9.2.1 Application

Applicable when a safety valve needs to be replaced without removing refrigerant charge.

Illustration Dual safety valve layout



9.2.2 Description

For this option, we have two (2) relief valves connected to a 3-way valve, allowing switching between each when needed.

- Factory-installed on the evaporator (low pressure side)
- 2 safety valves are mounted on a 3 way valve (each safety valve has a separate exhaust port)

Illustration Dual safety valve on evaporator

9.2.3 Operation / Benefits

Used to relieve a potential overpressure as well as protect the equipment from damages and explosion.

- Only one safety valve works at a time and the other acts as a standby allowing the replacement of the safety valve
- 3 way valves are used to direct the gas flow to only one of the two safety valves
- Unit is protected against overpressure as per PED requirements
- Eliminates the need to remove the refrigerant for servicing
- Reduces maintenance work

9.2.4 Incompatibilities

No incompatibility.

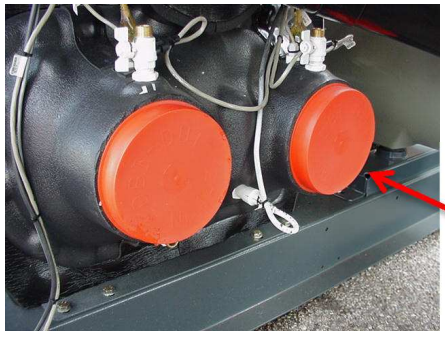
10. Water Connection, DIGIT 18

10.1 Standard Grooved Pipe, digit 18 = X

For standard units, Trane supplies grooved pipe connection without Victaulic coupling. Water connection has to be done on site.

Illustration Standard connection

Illustration Evaporator water connection



10.2 Grooved Pipe and Weld Couplings, digit 18 =W

Option includes pipe stub and Victaulic couplings. Used when tubes are welded.

Illustration Optional pipe stub and coupling

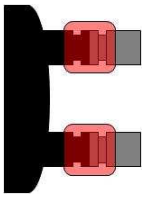
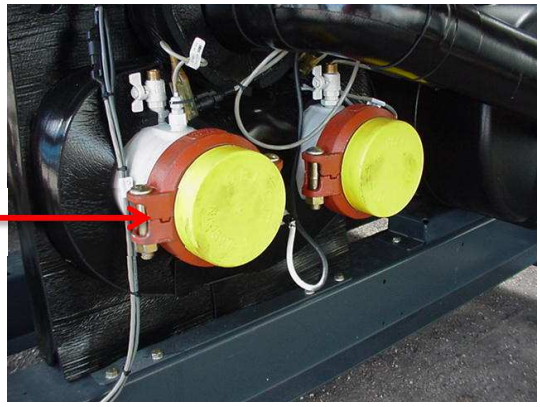
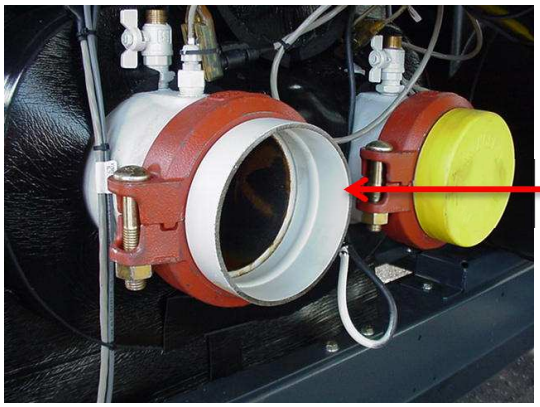


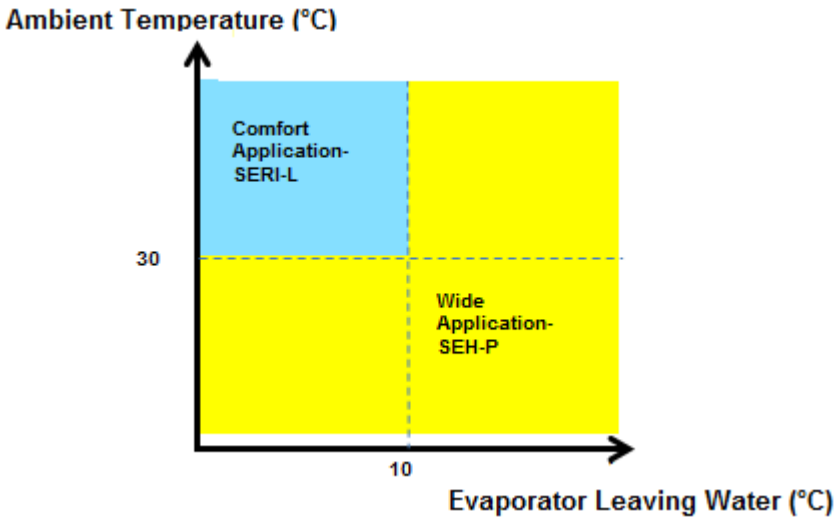
Illustration Grooved pipe connection + Victaulic





11. Operating Map Water Side, DIGIT 19

Operating limits:



In fonction of the application, the type of expansion valve used is different: if LWT is below 10℃ and the unit selected ambient temperature over 30℃, we select SERI-L expansion valve from Parker. In any other case, we select SEH-P expansion valve from Parker.

11.1 Comfort application (below 10℃ water temperature and above 30℃ ambient temperature), digit 19 = S

Units will run with a leaving water temperature below +10℃ and the unit is selected with an air temp above 30°.

11.2 Wide application (above 10℃ water temperature), digit 19 = L

Units will run with a leaving water temperature below +10℃ and the unit is selected with an air temp below 30° or the unit will run with a leaving water temperature above +10℃.

12. Evaporator Configuration, DIGIT 20

12.1 Two Passes Evaporator, digit 20 = 2

12.1.1 Description

Air-cooled Series Sintesis Excellent has a new concept simple design evaporator. New evaporator technology Compact-High performance-Integrated design-Low Charge: CHIL™ design optimizes refrigerant flow for improved efficiency and better cooling performance, while using up to 40 percent less refrigerant than traditional flooded designs.

For the sizes 125 to 245 the water goes in and goes out of the evaporator on the same side, and for the sizes 250 to 450 the water enters on one side and goes out for the other side of the evaporator.

Illustration Evaporator with 2 water passes and 2 refrigerant circuits

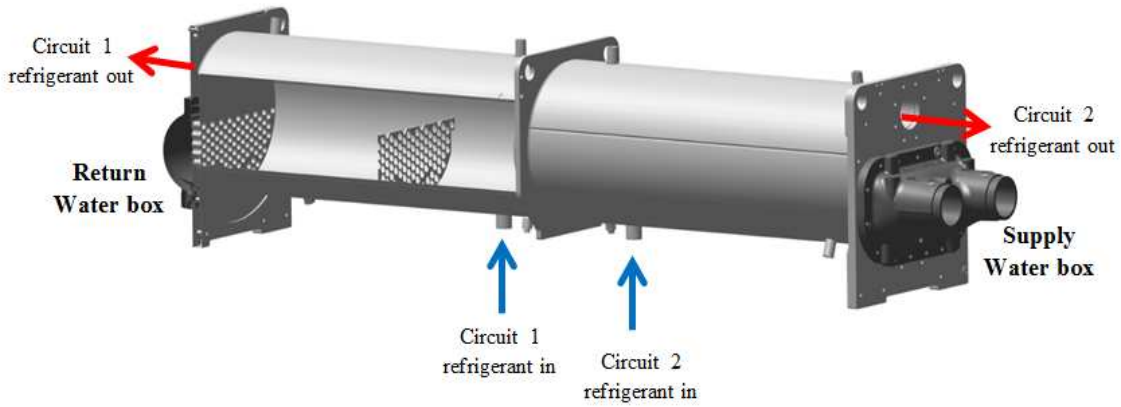
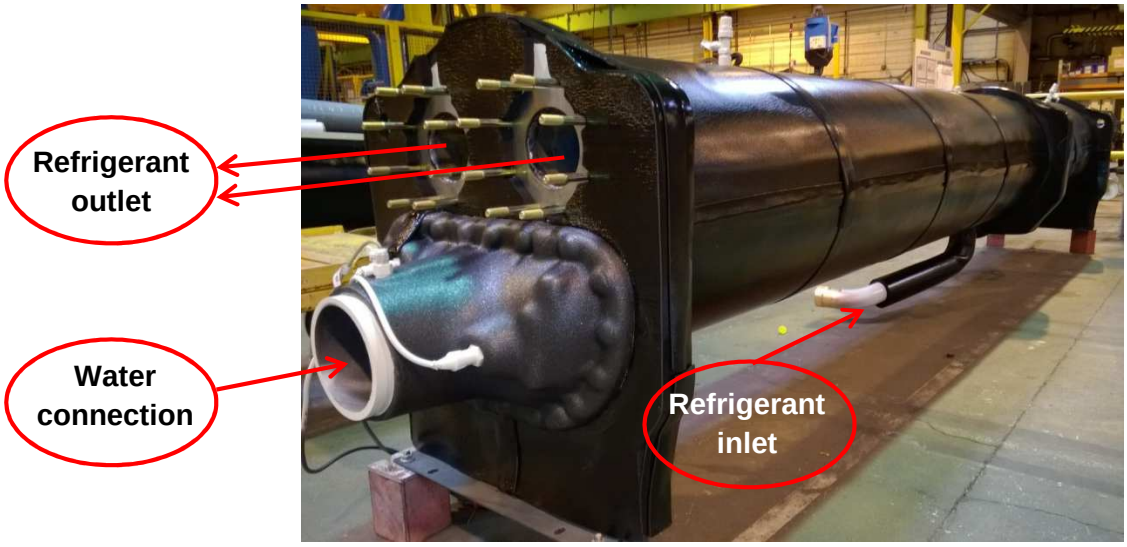


Illustration Evaporator with 1 water pass and 2 refrigerant circuits



12.1.2 Operation/Benefits

Evaporator on sizes 125 to 245 is equipped with two water passes. For the sizes 250 to 450 there is one only water passes. For all the sizes, the maximum pressure on the water side is 10 bars.

12.1.3 Incompatibilities

No incompatibility.

12.2 Evaporator with Turbulators, digit 20 = T

12.2.1 Application/Description

- Turbulators permit to have better heat exchange when leaving water temperature is low or when there is a high differential temperature
- Using turbulators increase heat transfer in evaporator tubes at coolant side by creating a turbulent flow
- Evaporator equipped with turbulators presents better approach especially at low water flow

12.2.2 Incompatibilities

No incompatibility.

13. Thermal Insulation, DIGIT 21

13.1 None Thermal Insulation, digit 21 = X

Evaporator is not insulated. The customer will implement his own insulation at jobsite.

13.2 Standard Thermal Insulation, digit 21 = N

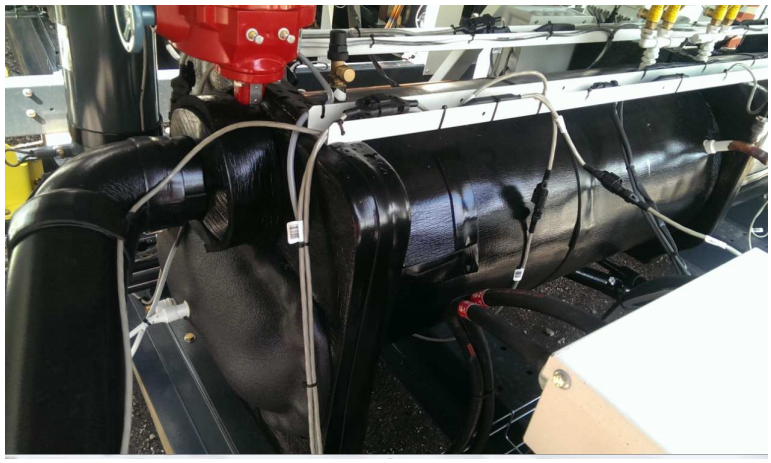
13.2.1 Application

Avoids condensation on the cold parts.

13.2.2 Description

Evaporator and water boxes parts are covered with factory-installed 19mm foam insulation:

Illustration Evaporator insulation



The flexible insulating base to self-adhesive elastomeric with closed cellular structure allows evaporators insulation and combines a very low thermal conductivity at a high diffusion resistance to water vapor. The water box is also insulated.

13.2.3 Operation/Benefits

The evaporator is insulated with foam insulation. This insulation prevents condensation on the cold parts.

13.2.4 Incompatibilities

No incompatibility.

13.2.5 Technical characteristics

Temperature using range	from -45℃ to +85℃
Temperature setting range	from +10℃ to +30℃
Color	black
Utilization	Outside, life > 5 years
Thermal conductivity coefficient certified and check by F.I.W.	λ to +20℃: 0,0038 W/(m·K) EN 12667
	λ to 0℃: 0,036 (DIN 52612)
	λ to -20℃: 0,034 (DIN 52612)
Water vapor permeability	μ > 7000 EN 12086 (DIN 52615)
Corrosion risk assessment	In accordance with DIN 1988/7 requirements neutral pH
Resistance to chemical agents, to moistures, to parasites, to ozone	Excellent
Health, environment	Asbestos free, CFC free, without expansion gases
Odor	Neutral
Resistance to the atmospheric agents	Excellent
Technology adapted to our insulation	Developed with BASF
Fire reaction	Material for outside use, fire reaction not necessary

14. Condenser Coating, DIGIT 22

14.1 Aluminium Micro Channel, digit 22 = N

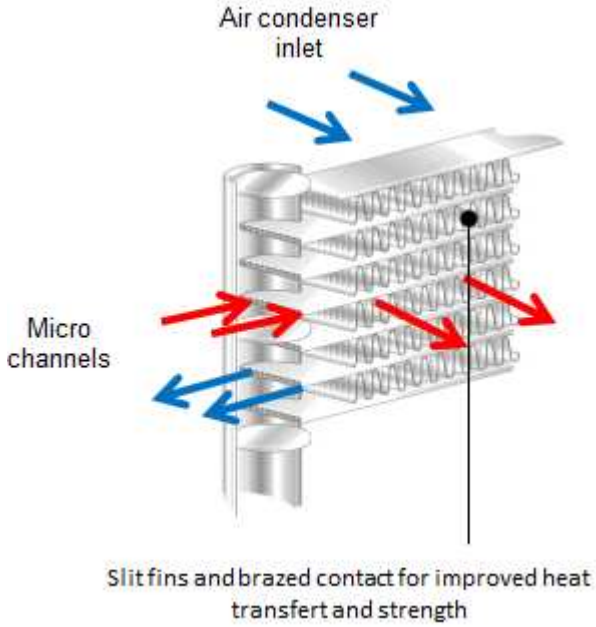
14.1.1 Application

Unit application: when the chiller is installed in a non-polluted area.

14.1.2 Description

The fully-brazed construction micro channel coil increases the coil rigidity making them more rugged to resist the rigors of job site handling and damage due to shipping. The micro channel coil's headers, tubes and fins are assembled and then sprayed with a powder flux bonding agent. The coil is then sent through a large controlled air automated brazing furnace that completely joins these separate pieces as one solid micro channel coil.

Illustration micro channel coil



14.1.3 Operation / Benefits

This process substantially decreases the chances of leaks due to improper brazing techniques. Within each tube are ports that serve as paths for the refrigerant to flow through the micro channel coil. The bottom and top tubes of each coil section are always inactive refrigerant paths. This is done to prevent refrigerant leaks due to corrosion that may be present from moisture resting between the top or bottom tube and the gasket material and also serve as a buffer during the installation and removal of the coil section.

Each fin surface is angled and louvered to create air turbulence through the coil which provides more efficient and enhanced heat transfer without additional air pressure drop through the coil.

14.1.4 More details

The following table explains when a coating has to be applied on the coils:

Severity of environmental factors

Coastal Environment	***Inland*** *Coast* *Distance from* ***Coastline***				
	Unit to Coast *Direction of Prevailing Winds* ***Coast to unit***				
	None *Corrosion on other equipment* ***Severe***				
Al-Fin/Copper-Tube	X	B-Epoxy	B-Epoxy	B-Epoxy	OTHER
Microchannel coil	X	X	e-coat	e-coat	e-coat

Industrial Environment	***Low*** *Concentration* *Chemical agent* ***High***				
	None *Corrosion on other equipment* ***Severe corrosion***				
Al-Fin/Copper-Tube	X	B-Epoxy	B-Epoxy	B-Epoxy	OTHER
Microchannel coil	X	X	e-coat	e-coat	e-coat

Combined Coastal/Industrial Environment	***Inland*** *Coast* *Distance from* ***Coastline***				
	Unit to Coast *Direction of Prevailing Winds* ***Coast to unit***				
	Low *Concentration* *Chemical agent* ***High***				
	None *Corrosion on other equipment* ***Severe***				
Al-Fin/Copper-Tube	X	B-Epoxy	B-Epoxy	B-Epoxy	OTHER
Microchannel coil	X	e-coat	e-coat	e-coat	e-coat

Urban Environment	***None*** *Corrosion on other equipment* ***Severe***				
Al-Fin/Copper-Tube	X	B-Epoxy	B-Epoxy	B-Epoxy	OTHER
Microchannel coil	X	X	X	e-coat	e-coat

"X": Applicable

“B-Epoxy”: Black epoxy protection required

“OTHER”: example = impregnated polyurethane coating with periodic on field re-treatment

Chemical agent includes all acid, Chlorin, Sodium, Ethyl, Coal and Petroleum compound

Concrete dust emission must here be considered as a chemical agent.

14.2 E-coated Aluminium condenser only, digit 22 = C

See document EB RLC-PRG029C available on Litweb to have detailed information.

15. Hydraulic Module, DIGIT 24

The hydraulic module option includes:

- Twin water pump: Low pressure or High pressure
- Water strainer to protect the water circuit against fouling
- Expansion vessel and pressure relief valve to protect the water circuit against over pressure
- Thermal insulation and electrical heater for antifreeze protection
- Balancing valve to adjust the water flow
- Drain valve

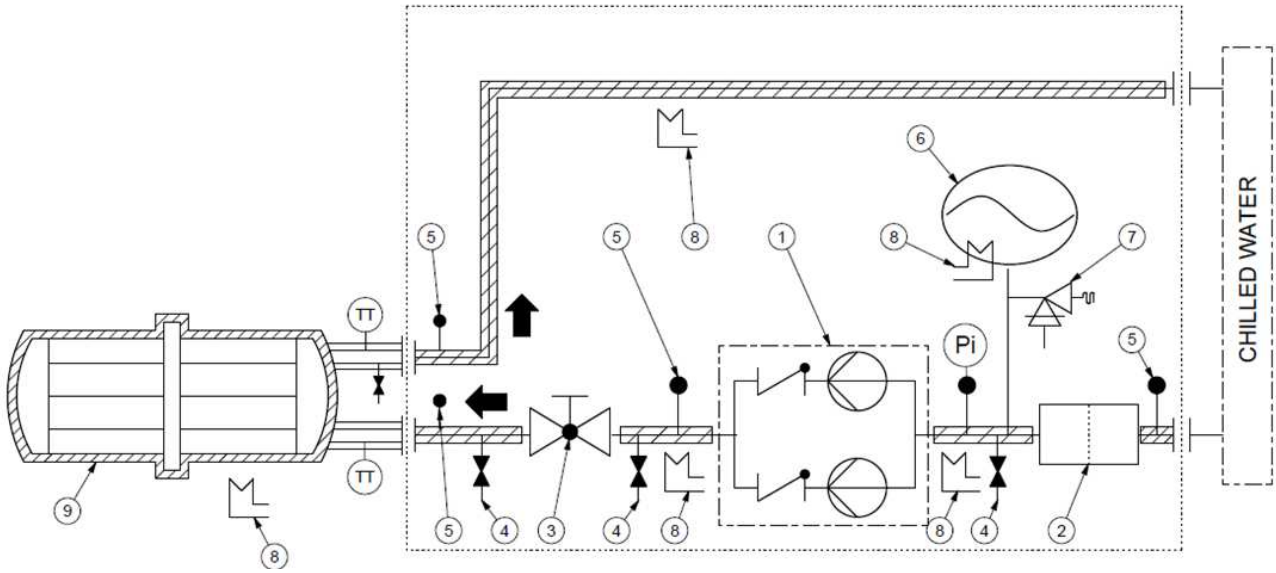
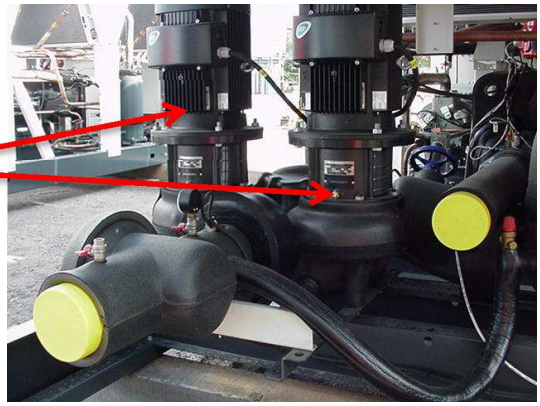
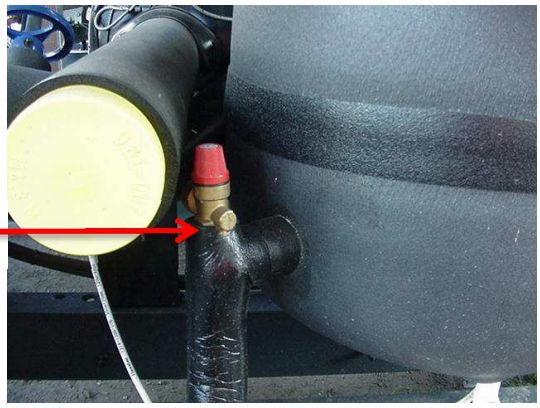


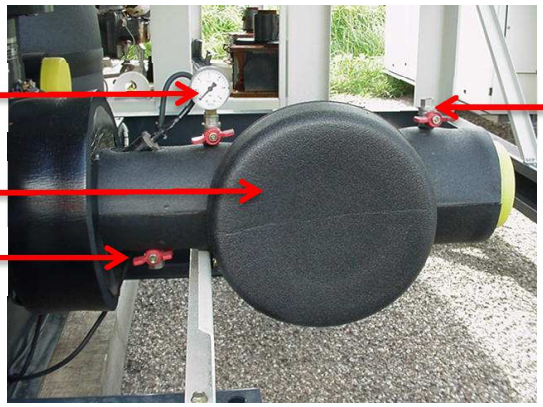
Figure – Hydraulic module option

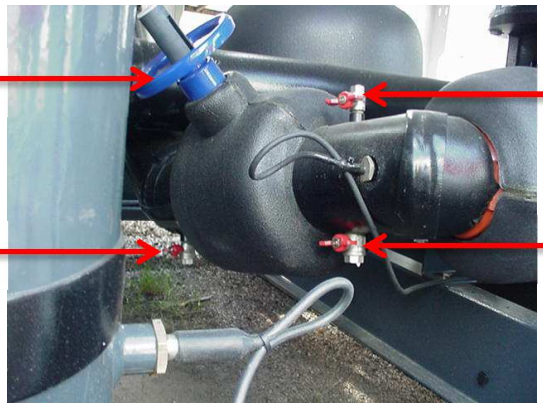
1 = Twin centrifugal pump
2 = Water strainer (Diameter=4”; Mesh=1mm)
3 = Balancing valve
4 = Drain valve
5 = Valve for pressure
6 = Expansion tank
7 = Pressure relief valve (P_{set}=5 bars)
8 = Antifreeze protection (400W)
9 = Evaporator
Pi = Gauge
TT = Temperature sensor

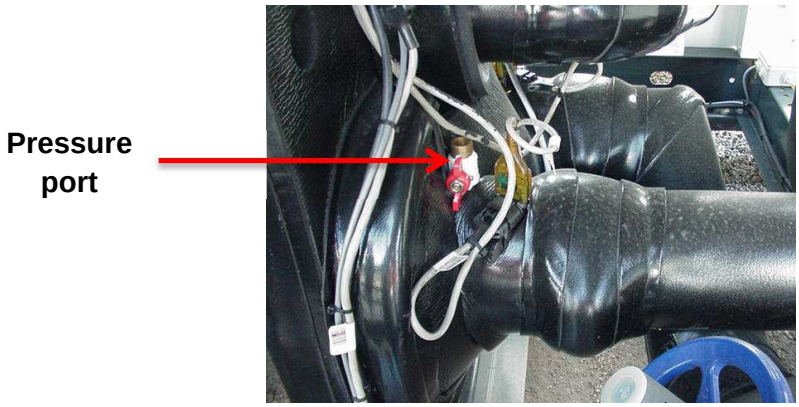
Design:


Pumps


Safety valve


Gauge
Pressure port
Strainer
Drain valve


Balancing valve
Pressure port
Pressure port
Drain valve



15.1 Pump Signal On/Off, digit 24 = X

GVAF standard unit without hydraulic module option.
Note: The customer is providing the pump.

15.2 Dual Pump Standard Pressure, digit 24 = 1

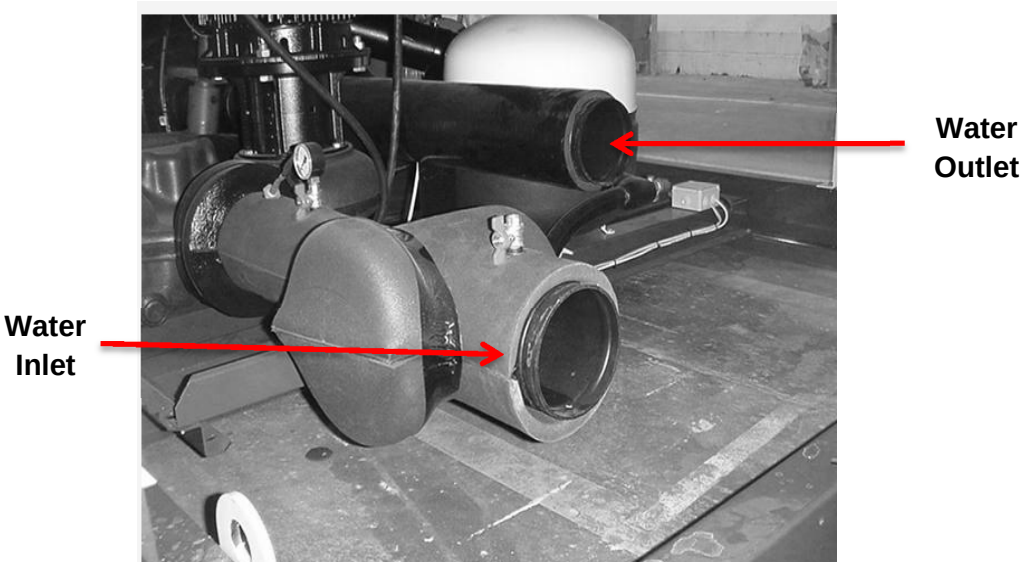
15.2.1 Application

- The supplier is Grundfos
- The pump is integrated into unit
- The pump is a part of the chiller and is used for chilled water circulation in air conditioning systems with water and freeze inhibitor solution

15.2.2 Description

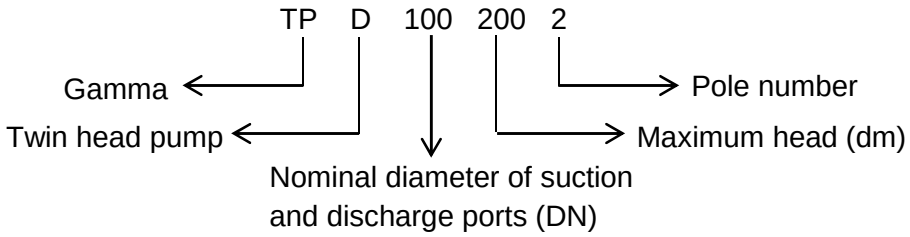
The pump package will be always designed with 2 pumps with the same capacity. In this case, when the chiller is on, only one pump is operating and when the chiller is not cooling and starts again, the second pump is on and the other one is off.

Illustration Hydraulic Module



Freeze protection and insulation: the freeze protection is part of the standard model with hydraulic module for GVAF units. The power of the antifreeze heater is 1060 W.

Pump reference:



Pumps available:

	Efficiency	Unit sizes	Low head Pump	Qmax (kW)	Efficiency Class		Imax (A)	Max flow (m3/h)
					IE (Motor)	MEI>		
Low Head	X	**155**	TPD 100-250-2	7,4	IE3	0,7	20,8	157
		175	TPD 100-250-2	7,4	IE3	0,7	20,8	157
		205	TPD 100-250-2	7,4	IE3	0,7	20,8	157
		245	TPD 125-230-4	7,4	IE3	0,7	29	208
		250	TPD 125-230-4	9,9	IE3	0,7	29	208
		280	TPD 125-230-4	9,9	IE3	0,7	29	208
		310	TPD 125-230-4	9,9	IE3	0,7	29	208
		350	TPD 125-230-4	9,9	IE3	0,7	29	208
		380	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		410	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		450	TPD 150-250-4	13,6	IE3	0,7	39,69	350
	XP	**190**	TPD 125-230-4	9,9	IE3	0,7	29	208
		205	TPD 125-230-4	9,9	IE3	0,7	29	208
		245	TPD 125-230-4	9,9	IE3	0,7	29	208
		310	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		350	TPD 150-250-4	13,6	IE3	0,7	39,69	350
	XPG	**155**	TPD 100-250-2	7,4	IE3	0,7	20,8	157
		175	TPD 100-250-2	7,4	IE3	0,7	20,8	157
		205	TPD 100-250-2	7,4	IE3	0,7	20,8	157
		245	TPD 125-230-4	7,4	IE3	0,7	29	208
		250	TPD 125-230-4	9,9	IE3	0,7	29	208
		280	TPD 125-230-4	9,9	IE3	0,7	29	208
		310	TPD 125-230-4	9,9	IE3	0,7	29	208
		350	TPD 125-230-4	9,9	IE3	0,7	29	208
		380	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		410	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		450	TPD 150-250-4	13,6	IE3	0,7	39,69	350

MEI = Minimum Efficiency Index

15.2.3 Operation / Benefits

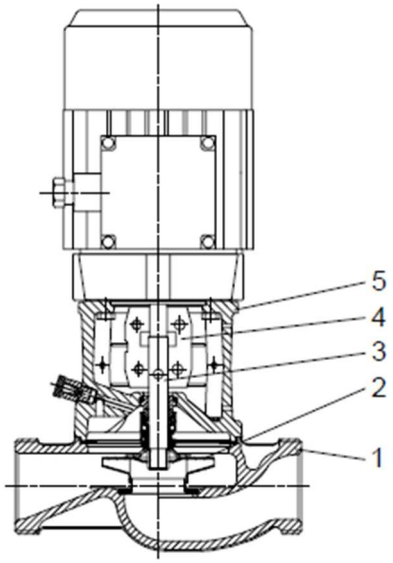
- This module is directly controlled by the chiller.
- The hydraulic module is installed on the chassis of the GVAF.
- The high efficiency pumps mounted on GVAF reduce power consumption.
- Pumps allow a straight pipework and thus reduce installation costs.

15.2.4 Incompatibilities

No incompatibilities.

15.2.5 Material specification

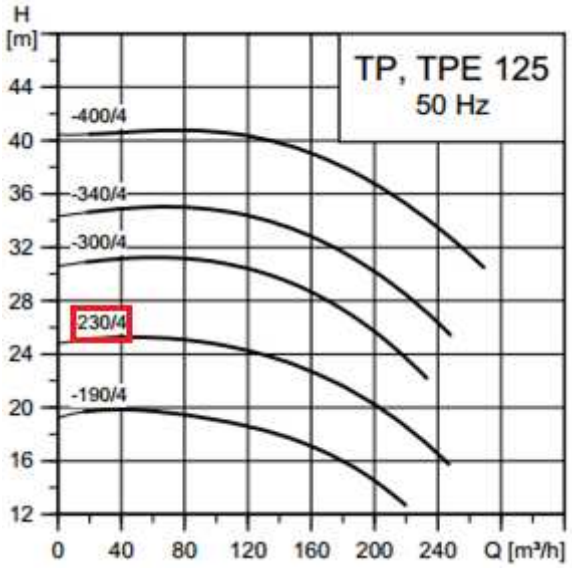
Figure – Sectional drawing of a pump with union connection

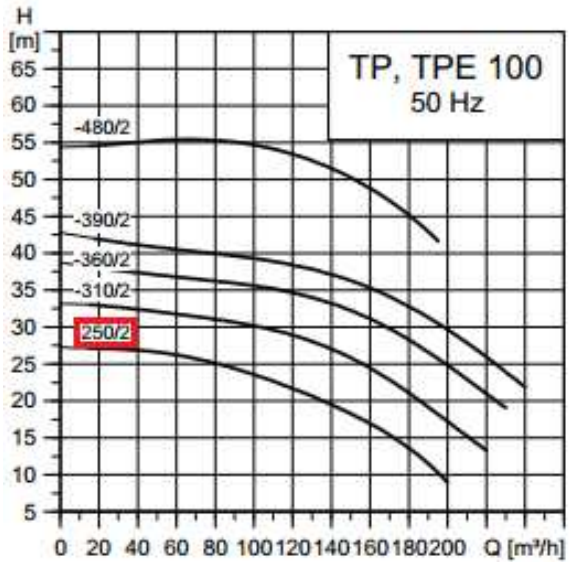


Material specification:

Pos.	Component	Material	EN/DIN
1	Pump housing	Cast iron EN-GJL-200, bronze CuSn10	EN-JL 1030 2.1093
2	Impeller	Stainless steel	1.4301
3	Shaft	Stainless steel	1.4057
4	Coupling	Cast iron EN-GJL-400	0.7040
5	Pump head	Cast iron EN-GJL-250, bronze	0.6025 2.1093
	Secondary seals	EPDM	
	Rotating seal face	Tungsten carbide silicon carbide	
	Stationary seat	Carbon (synthetic resin impregnated) silicon carbide	

15.2.6 Performance curves





15.2.7 More details

- The pumps are equipped with a fan-cooled asynchronous motor. Motor and pump shafts are connected via a rigid two-part coupling
- Easy dismantling in case of service
- High corrosion resistance
- Pumps are made in Hungary

15.3 Dual Pump High Pressure, digit 24 = 3

15.3.1 Application

Same as dual pump standard pressure.

15.3.2 Description

Pumps available:

	Efficiency	Unit sizes	High head Pump	Qmax (kW)	Efficiency Class		Imax (A)	Max flow (m3/h)
					IE (Motor)	MEI>		
High Head	X	**155**	TPD 100-360-2	11,8	IE3	0,7	34,5	175
		175	TPD 100-360-2	11,8	IE3	0,7	34,5	175
		205	TPD 100-360-2	11,8	IE3	0,7	34,5	175
		245	TPD 100-360-2	11,8	IE3	0,7	34,5	175
		250	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		280	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		310	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		350	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		380	-	-	-	-	-	-
		410	-	-	-	-	-	-
		450	-	-	-	-	-	-
	XP	**190**	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		205	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		245	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		310	-	-	-	-	-	-
		350	-	-	-	-	-	-
	XPG	**155**	TPD 100-360-2	11,8	IE3	0,7	34,5	175
		175	TPD 100-360-2	11,8	IE3	0,7	34,5	175
		205	TPD 100-360-2	11,8	IE3	0,7	34,5	175
		245	TPD 100-360-2	11,8	IE3	0,7	34,5	175
		250	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		280	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		310	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		350	TPD 150-250-4	13,6	IE3	0,7	39,69	350
		380	-	-	-	-	-	-
		410	-	-	-	-	-	-
		450	-	-	-	-	-	-

15.3.3 Operation / Benefits

Same as dual pump standard pressure.

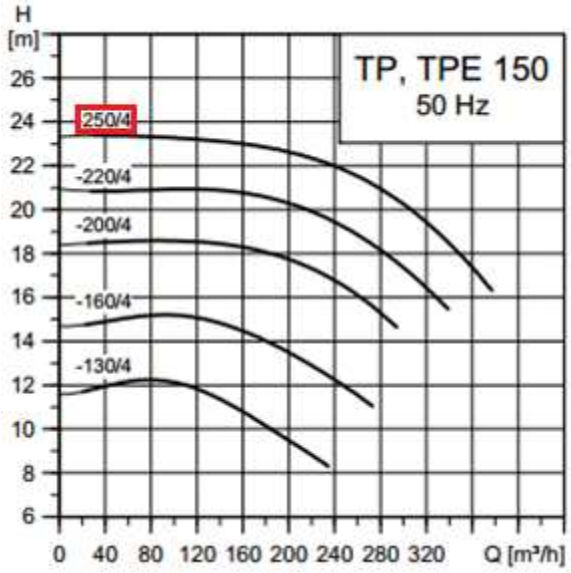
15.3.4 Incompatibilities

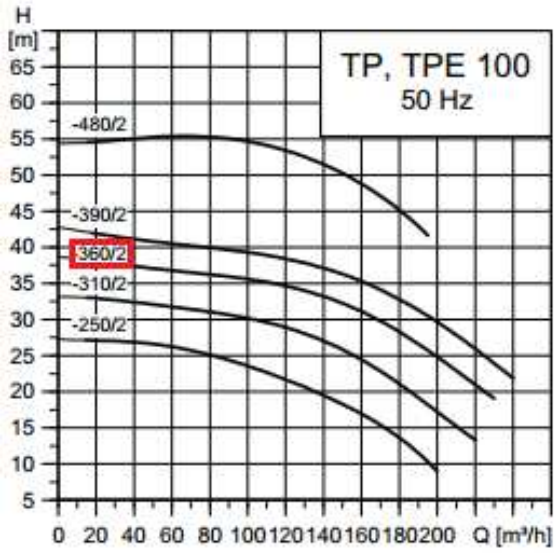
No incompatibility.

15.3.5 Material specification

Same as dual pump standard pressure.

15.3.6 Performance curves





15.3.7 More details

Same as dual pump standard pressure.

16. Free Cooling, DIGIT 25

16.1 No Option, digit 25 = X

GVAF unit without remote communication option.

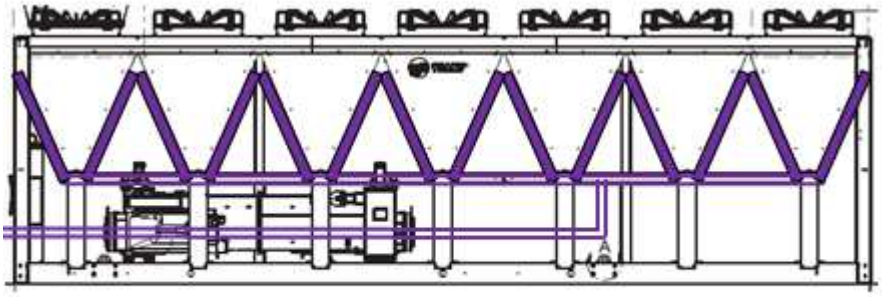
16.2 Total Free Cooling Direct, digit 25 = F

16.2.1 Application

Used when the customer needs to cool down a process when ambient air temp is low, typically used in data centers.

16.2.2 Description

- Glycol is necessary
- All aluminum flat channel dry cooler coils installed in front of refrigerant micro channel coils



Total Free cooling

Direct free cooling version (With glycol on customer loop)

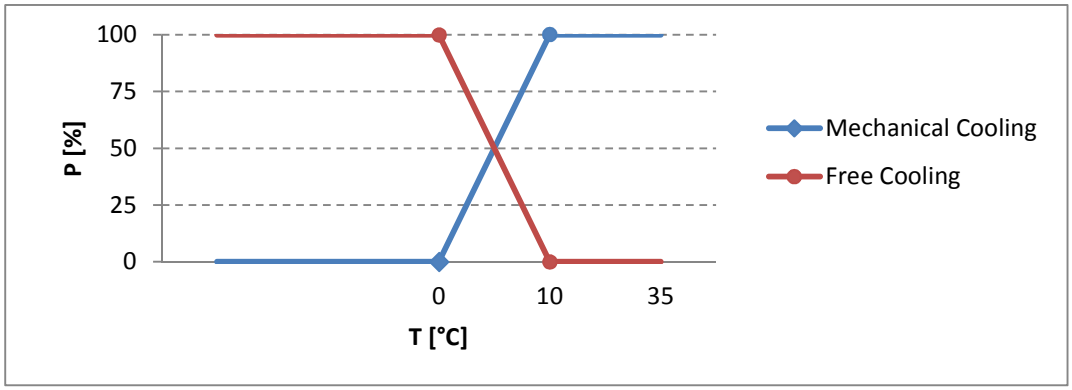
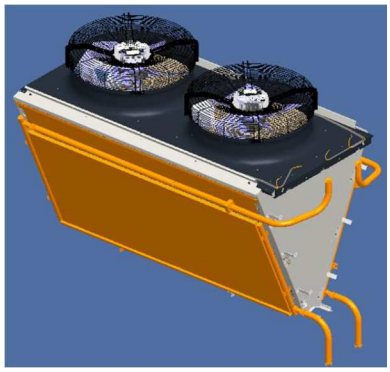


Illustration Condenser fans



16.2.3 Operation/Benefits

- Save energy when air temp is low
- One single equipment control
- A wide range of capacities

16.2.4 Incompatibilities

Hydraulic module.

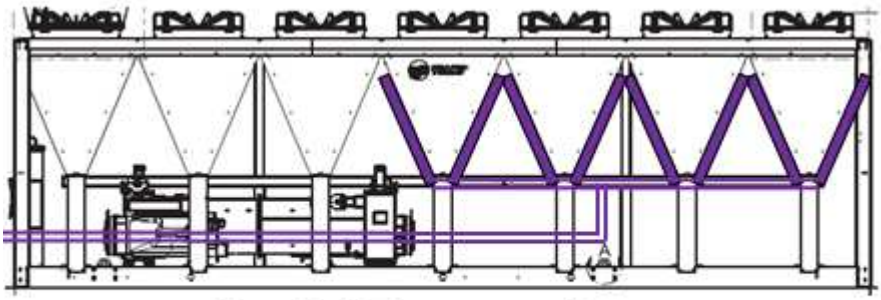
16.3 Partial Free Cooling Direct, digit 25 = G

16.3.1 Application

Used when the customer needs to cool down a process that requires a small capacity when ambient air temperature is low.

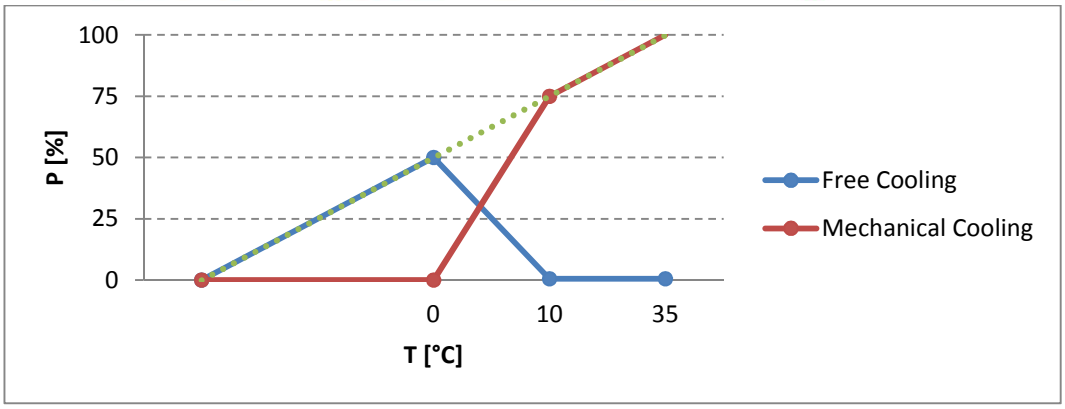
16.3.2 Description

- Glycol is necessary
- All aluminum flat channel dry cooler coils installed in front of 50% of refrigerant micro channel coils



Partial Free cooling

Direct free cooling version (With glycol on customer loop)



16.3.3 Operation/Benefits

- Save energy when air temp is low
- One single equipment control
- A wide range of capacities

16.3.4 Incompatibilities

Hydraulic module.

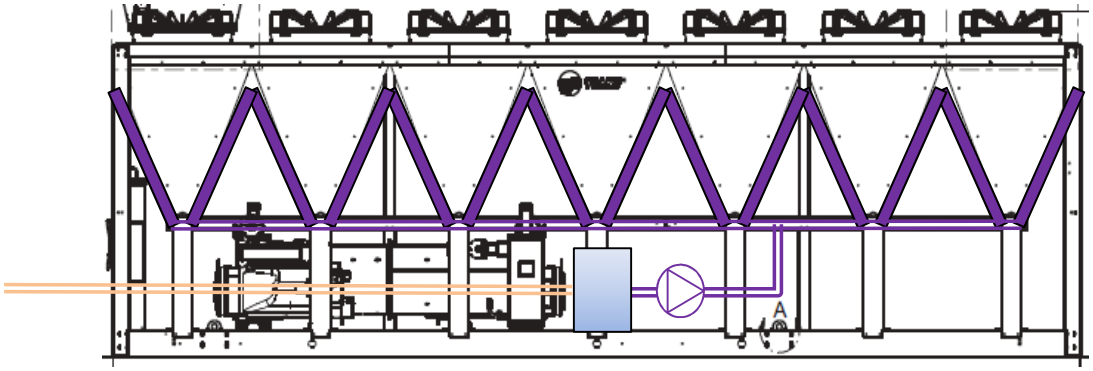
16.4 Total Free Cooling – Glycol-Free, digit 25 = H

16.4.1 Application

Free-cooling is activated when the outdoor temperature is low enough. The free-cooling function will be enabled when outdoor temperature is below the “active chilled water cooling set point” – Free-Cooling Offset.

Some hysteresis should be also applied to avoid short cycling of the free-cooling enabling logic. The Free-Cooling Offset set point can be adjusted by the operator.

16.4.2 Description



Total Free cooling

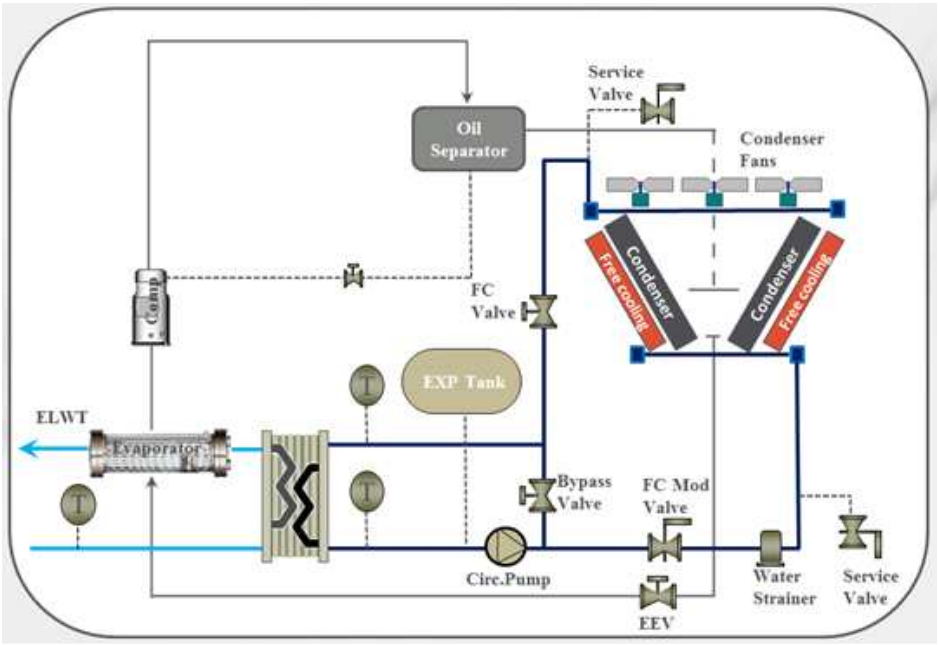
Glycol Free version (With water on customer loop)

Below a certain ambient temperature, and depending on the chilled water set point requested, the entire cooling duty is delivered by the free-cooling system.

16.4.3 Operation/Benefits

Compressors do not operate, since the free-cooling coils will be able to deliver the requested chilled water temperature. In this mode, only fans are running.

Illustration Free cooling – Glycol-free version



16.4.4 Incompatibilities

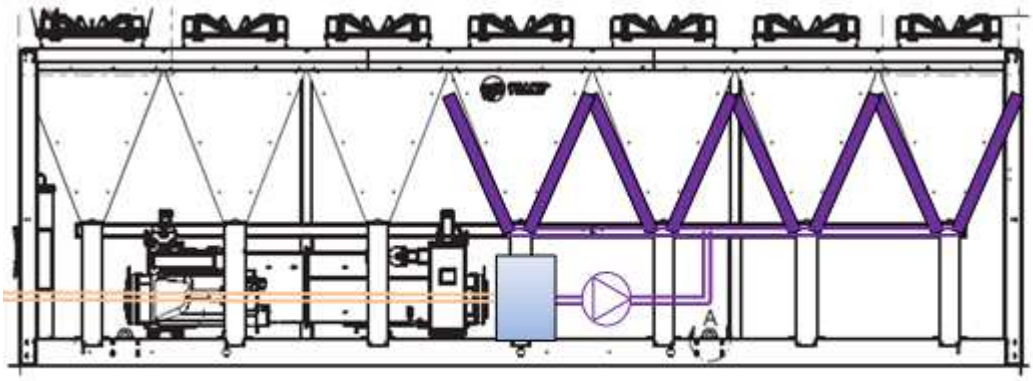
- Not compatible with PHR/THR – possible with special design. Hydraulic module for customer side loop (no space inside of unit and inlet from the long side of a chiller – too complicated piping)
- Other incompatibilities as on direct Free Cooling

16.5 Partial Free Cooling – Glycol-Free, digit 25 = J

16.5.1 Application

In this operation mode, free-cooling will be enabled whenever the outdoor temperature is below the evaporator entering water temperature.

16.5.2 Description



Partial Free cooling

Glycol Free version (With water on customer loop)

Mechanical refrigeration will complete what has already been delivered by free-cooling.

16.5.3 Operation/Benefits

The free-cooling system operates combined with the mechanical compressor refrigeration. Most of the time, free-cooling will only partially cover the required cooling duty.

16.5.4 Incompatibilities

See topic 17.4.

17. Disconnect Switch, DIGIT 26

17.1 With fuse, digit 26 = F

This is a standard component supplied by Trane.

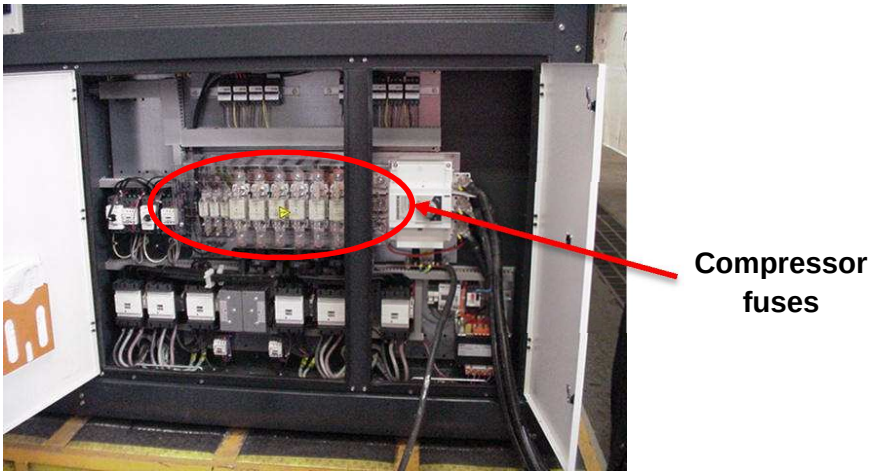
17.1.1 Application

Component used to stop the chiller when there is a short circuit in the system.

17.1.2 Description

- Factory-mounted, located in electrical panel
- 3 copper blocks
- Fuses for chiller components

Illustration Terminal blocks with fuses



17.1.3 Operation/Benefits

If there is a short circuit in the system, an excessive current occurs; the fuse will interrupt excessive current to stop the unit to protect it from damages.

17.1.4 Incompatibilities

No incompatibility.

18. Under/over Voltage Protection, DIGIT 27

18.1 No Option, digit 27 = X

The GVAF chiller is designed to be powered with 400V +/- 10%. In case of voltages out of tolerances, the motor lifetime will reduce exponentially with the increase or decrease of voltage. If the voltage keeps on deviating from the nominal value, the motor windings could be damaged, leading the unit to stop until being repaired.

18.2 Included, digit 27 = 1

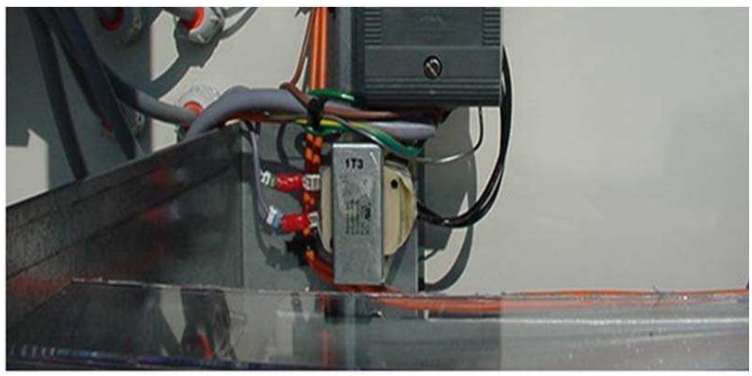
18.2.1 Application

In case which the unit needs to be protected from under/over voltage.

18.2.2 Description

Factory installed and located in the electrical panel.

Illustration under/over voltage transformer



18.2.3 Operation / Benefits

UC800 shall continuously monitor chiller voltage to provide under and over voltage protection while any compressor is either starting or running.

- If the value of voltage exceeds the minimum or maximum value in the unit, the unit will be shut down.
- Unit receives protection against variation in voltage.

18.3 Included with Ground Fault Protection, digit 27 = 2

18.3.1 Application

Applicable when the electrical components need to be protected from a detectable current in the electrical panel.

18.3.2 Description

- The relay which is used to connect the tore is factory-installed, located in the electrical panel.
- The tore is installed on site, shipped in a box located in the electrical panel.

Illustrations tore of the ground relay/name and port connection of the tore

18.3.3 Operation /Benefits

Protect the electrical distribution system from ground faults.

18.3.4 Incompatibilities

No incompatibility.

19. Human Interface Language, DIGIT 28

19.1 Select Language, digit 28 = C-D-E-F-H-I-M-P-R-T-U-V-2-6-8

IOM and user guides language.

Digit number	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

20. Smart Communication Protocol, DIGIT 29

20.1 None, digit 29 = X

GVAF unit without remote communication option.

20.2 BACnet Interface, digit 29 = B

We use BACnet over MSTP. See the integration guide to get information in this option.

20.3 ModBus interface digit 29=M

See the integration guide to get information in this option.

20.4 LonTalk interface digit 29= L

LonTalk communication is made with an LCI-C card. See the integration guide to get information in this option.

21. Communication Customer Input/Output, DIGIT 30

21.1 None, digit 30 = X

GVAF unit without external set points and capacity outputs option.

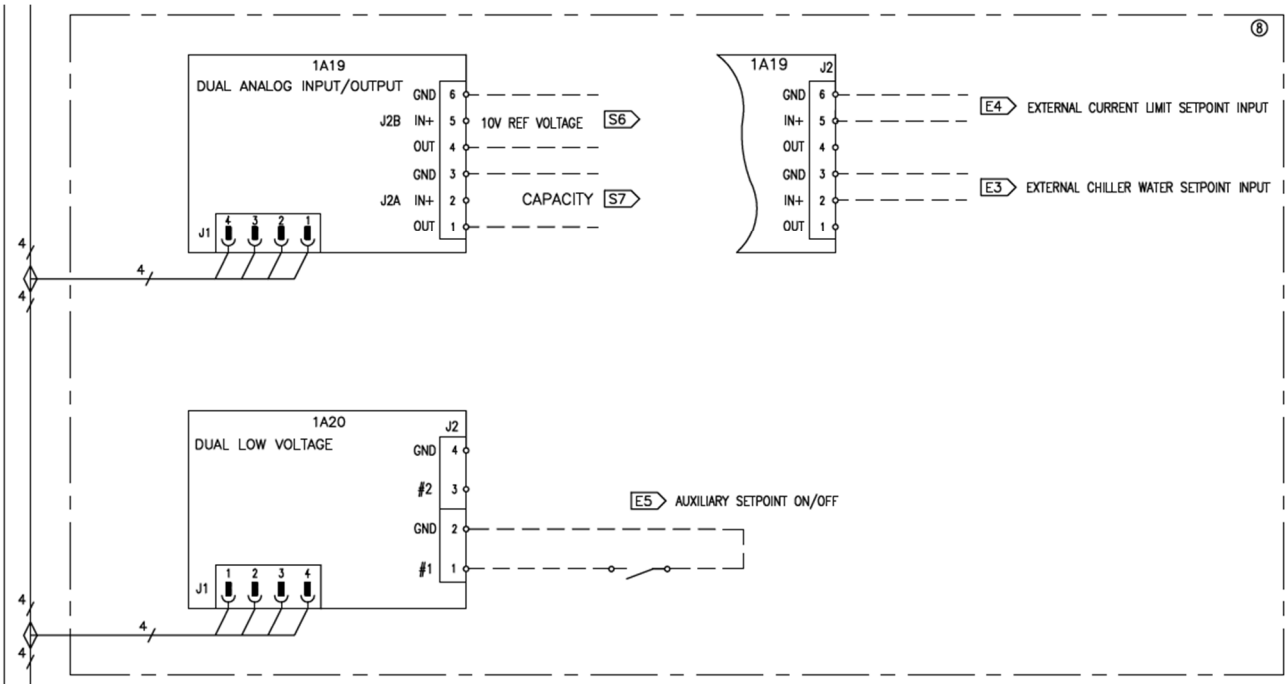
21.2 External Set Points & Capacity Outputs, digit 30 = A

21.2.1 Application

- External signal used to set the Chilled Eater Setpoint (E4)
- External signal used to set the Current Limit Setpoint (E3)

21.2.2 Description

- The external signal input provided by customer to both functions is either a 2-10 V or 4-20 mA
- There is one input to set the Chilled Water Setpoint and one input to set the Current limit point
- External set points are taken into account only if the contact auxiliary setpoint ON/OFF is closed



21.2.3 Operation

See the user guide to get more information on this option.

21.2.4 Benefits

- Energy savings
- Provides the possibility to set the chilled water and the current limit setpoint from an external signal from remote location
- Adaptation to customer power supply (for example, customers can remotely schedule a limitation of the chiller absorbed current when he has other high energy-consuming processes to run at a given time of the day)

21.2.5 Incompatibilities

No incompatibility.

22. Flow Switch, DIGIT 31

22.1 None, digit 31 = X

GVAF unit without flow switch option.

22.2 Field Installed Flow Switch, digit 31 = F

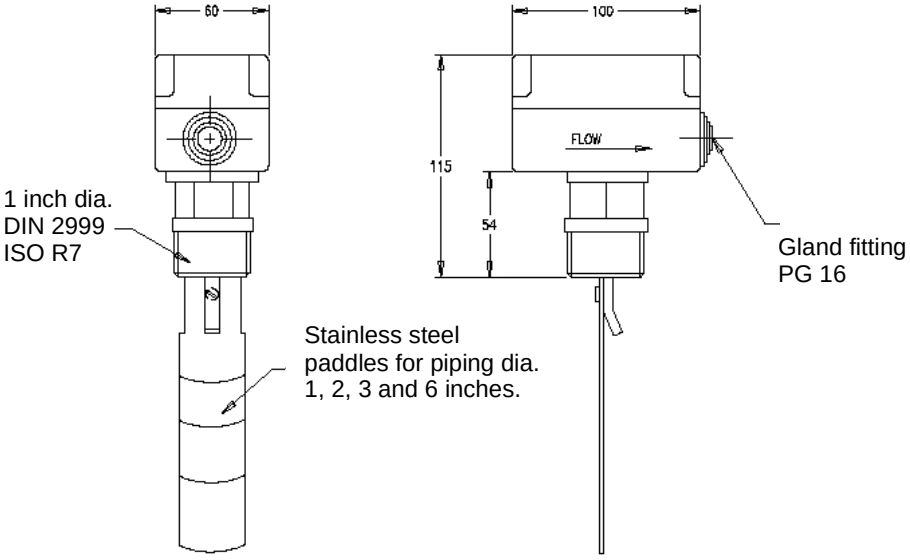
22.2.1 Description

It is mandatory to use a flow switch with liquid chillers to stop the unit in case of water flow loss to avoid any water freezing in the evaporator. It must be placed on the evaporator water piping the IOM recommendations.

When flow switch detects water flow, the unit is allowed to start if any cooling demand is detected. This safety accessory is shipped into the electrical panel.

Illustration Flow switch

Illustration Dimension



22.2.2 Operation / Benefits

Chiller protection interlocks the chiller with the customer provided evaporator water pump and a flow switch so chiller will not be allowed to run without proven flow. Software filter or delay on flow switch input avoids nuisance trips and provides freeze protection.

22.2.3 Incompatibilities

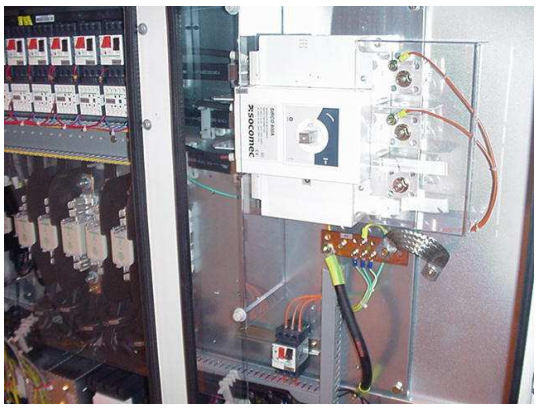
Incompatibilities with hydraulic module: flow switch is always supplied as an accessory even when the unit is ordered with the hydraulic module.

23. Electrical IP Protection, DIGIT 32

The electrical protection is used to provide a protection against direct contacts to the power line connection inside the electrical panel.

23.1 Enclosure with Deadfront Protection, digit 32 = X

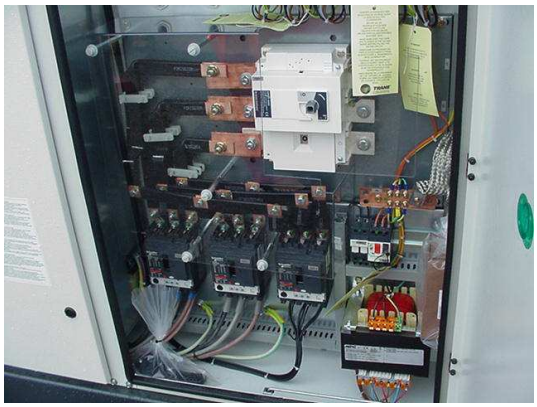
Illustration Dead front



23.2 Enclosure with IP 20 Internal Protection, digit 32 = 1

Better protection in electrical panel: protect against finger contact.

Illustration IP 20



24. Human Interface, DIGIT 34

24.1 Embedded, digit 34 = L

24.1.1 Application

Shows the most important data and allows the communication with the chiller.

24.1.2 Description

7” color touch screen.

24.1.3 Technical characteristics:

- Freescale iMX35
  - ARM11 @ 532MHz
- 1GB Flash Memory
- 256MB of RAM
- 10/100 Ethernet
- Touch screen
- Display:
  - 7” Diagonal
  - TFT LCD
  - LED Backlight
  - 600 nits brightness
  - 800x480 pixels
  - 16 bit Color

24.1.4 Operation/Benefits

- Shows all active alarms
- Headings are sortable
- Three custom reports and eight standard reports
- Eight standard graphs and four custom graphs
- 9 diferent languages
- UC 800 security allows users to edit pre-defines setpoints and has two levels of pre-defined security.
- Outdoor capable:
    - UV Exposure
    - -40C to 70C Operating Temperature
    - High Vibration
    - IP56 (Power Jets of Water from all directions)

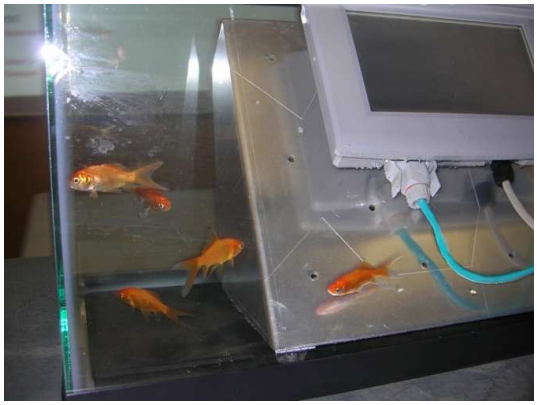
24.1.5 More details

- Displays functioned in a block of ice for 3 days over a weekend.

Before freeze:

After freeze:

- Enclosure exceeds requirements



- TD7 passes IP56 test

  5 = Dust Rating = Dust Protected

  6 = Water Rating = Powerful Jets of Water
    - Water =100 LPM (26 GPM)/ Minute
    - Pressure: 100 kPa (14.5 PSI)
    - Distance: 3m (9.8 ft)
    - Time: 3 Minutes / Side (all 6 sides)

25. Energy meter, DIGIT 35

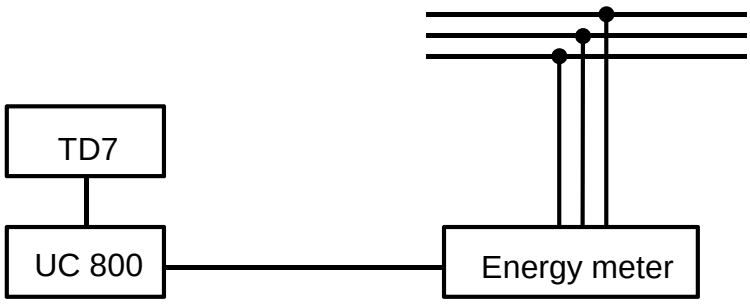
25.1 Not installed, digit 35 = X

25.2 Installed, digit 35 = M

25.2.1 Description

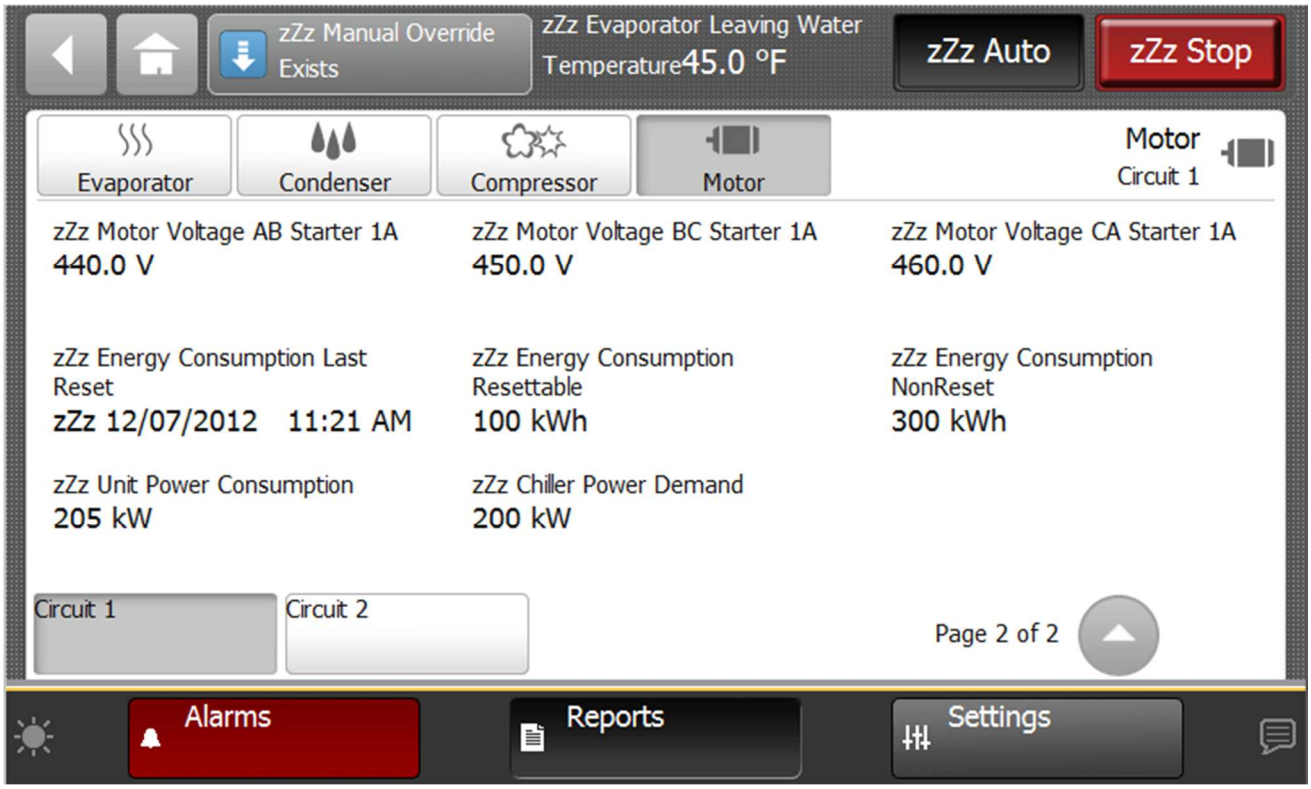
The supplier is SOCOMEC and its reference is COUNTIS E42 4850 3015.

The energy meter is installed in the electrical panel



25.2.2 Operation / Benefits

The following information can be displayed on the TD7:



- "Energy consumption last reset" displays the date and time when the last "Clear Energy Consumption" was set

- "Energy Consumption Resettable" displays accumulated energy consumptions in kilowatt-hours. This value is stored every 30 seconds and is updated on the next rising pulse which could be anywhere from a few seconds to hours depending on how the weight and width are configured. The user can clear this value by using the "Clear Energy Consumption" feature, implemented within the "Settings" /"Manual Control Settings" menu

- "Energy Consumption Non-Resettable" displays accumulated energy consumption over the life of the UC800 in kilowatt-hours. The value displayed is energy consumed since the UC800 was first initialized / programmed. The value is stored every 30 seconds and the displayed data is updated on the next rising pulse which could be anywhere from a few seconds to hours depending on how the weight and width are configured. This value is stored in non-volatile memory and cannot be reset

- "Chiller Power Demand" displays the power demand

- "Unit Power Consumption" displays the instantaneous power consumption

25.2.3 Electrical characteristics

Current measurement	
Type	Three-phase on CT/5A up to 6000 A
Input consumption	0,2 VA per phase
Startup current (I_{st})	10 mA
Minimum current (I_{min})	50 mA(1)
Transition current (I_{tr})	250 mA(2)
Reference current (I_{ref})	5 A(3)
Permanent overload (I_{max})	6 A
Short-time over-current	120 A for 0,5 s
Voltage measurement	
Range of measurement	230….400V +/- 20%
Consumption (VA)	2 VA
Sustained overload	280 V phase-neutral / 480 V phase-phase
Energy accuracy	
Active (according to IEC 62053-21)	Class 1
Active (according to EN 50470)	Class B
Power supply	
Self-supplied	Yes
Frequency	50 / 60 Hz
Output (pulsed)	
Number	1 (except E43)
Type of opt coupler	IEC 62053-31 Class A (20….30 VDC)
Fixed weight of impulses	100 Wh, 1 KWh, 10 KWh, 100 KWh
Pulse duration	50 ms, 100 ms, 200 ms, 400 ms, 800 ms, 1000 ms, 1500 ms

(1) $I_{(\min)} \leq 0.5 * I_{(tr)}$
(2) The accuracy class is guaranteed between I_{tr} and I_{max}
(3) $I_{(ref)} \leq I_{(b)}(base\ current)) = 10 * I_{(tr)}$

26. Smart Flow Control, DIGIT 37

26.1 None, digit 37 = X

GVAF unit without flow switch option.

26.2 Constant Speed Pump VPF Adjustment, digit 37 = F

26.2.1 Description

To provide appropriate flow rate and hydraulic balance, without the need of mechanical balancing valve, but, taking advantage of the energy consumption optimization of the pump.

26.2.2 Operation/Benefits

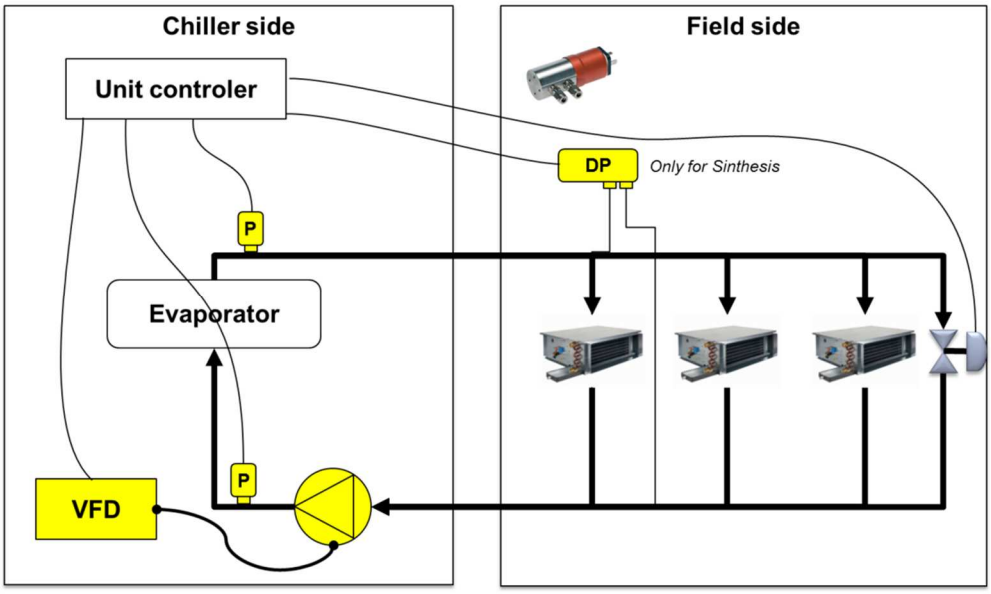
- Economize in between 40% to 59% of the electrical power dedicated to pumping
- Eliminate the secondary pumping

26.2.3 Incompatibilities
Option is incompatible with multiple chillers plant.

26.3 Variable Primary Flow with Constant ΔP, digit 37 = P

26.3.1 Application
To be used with 2 ways water regulation valves within customer hydraulic system.

26.3.2 Description
Differential Pressure (DP) remains constant within the system. Customer must install the differential pressure sensor on the water loop, in a freeze protected area.



26.3.3 Technical characteristics
Differential pressure sensor is delivered by Trane loosen and installed by customer. The bypass valve itself is not included within the chiller, need to be provided and installed by customer.

26.3.4 Operation/Benefits
Economize in between 40% to 59% of the electrical power dedicated to pumping. Eliminate the secondary pumping.

26.3.5 Incompatibilities
This option is incompatible with multiple chillers plant.

26.4 Variable Primary Flow with Constant ΔT, digit 37 = T

26.4.1 Application
To be used with 3 ways valves on water systems, or 2 ways valves on water system but constant flow at the by-pass.

26.4.2 Description
Keep constant temperature difference between entering and leaving temperature at the chiller plant.

26.4.3 Operation/Benefits
- Provide higher energy saving than constant DP in the majority of the comfort applications
- Economize in between 40% to 59% of the electrical power dedicated to pumping
- Eliminate the secondary pumping

26.4.4 Incompatibilities

This option is incompatible with multiple chillers plant.

27. Electrical Accessories, DIGIT 40

27.1 None, digit 40 = X

GVAF unit without power socket option.

27.2 Included (230V-100W), digit 40 = P

A socket French standard is available to supply a 230V-100W device.

28. Factory Tests, DIGIT 41

28.1 Run tests without customer, digit 41 = X

Trane runs tests according to customer's demand without customer's presence.

28.2 Test A + Visual inspection, digit 41 = B

28.3 Performance test without customer, digit 41 = E

See document SASU-RLC-EB-001 available on Litweb to have detailed information on the limits of the test loop.

29. Unit Isolation, DIGIT 42

29.1 None, digit 42 = X

The standard unit is without isolator.

29.2 Neoprene Isolators, digit 42 = 1

29.2.1 Application

Used to minimize the vibrations transmissions to the building.

29.2.2 Description

- They are installed under the chiller.
- Shipped with the chiller.

Illustration Neoprene isolators

29.2.3 Operation / Benefits

Eliminate/minimize vibration and noise transmission throughout the building.

Neoprene isolator deflection:

Color	Max. load lbs.	Deflection at max. load	
		kg	mm
Brown	1500	680	12,7
Red	2250	1020	
Green	3000	1360	
Gray	4000	1815	

29.2.4 Incompatibilities

No incompatibility.

29.3 Neoprene Pads, digit 42 = 4

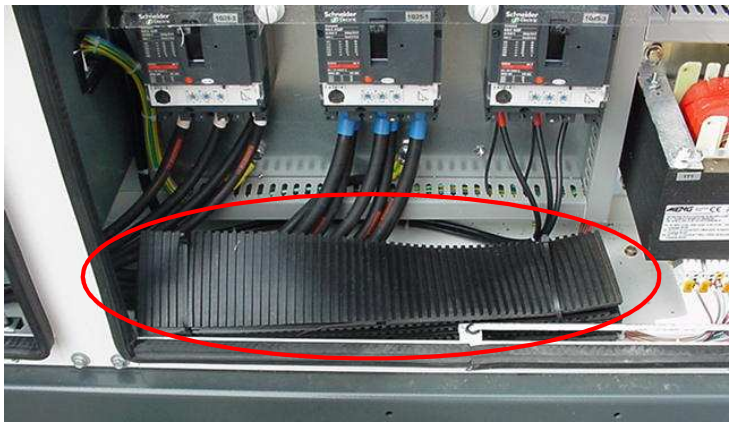
29.3.1 Application

Isolator used to avoid direct contact of the chiller with the ground.

29.3.2 Description

- They are installed under the chiller.
- Shipped in the control panel.

Illustration Neoprene pads



29.3.3 Operation / Benefits

- Neoprene pad do not filter vibrations.
- Avoid direct contact of the base frame with the ground.

29.3.4 Incompatibilities

No incompatibility.

30. Label and literature language, DIGIT 43

30.1 Language, digit 43 = B-C-D-E-F-H-I-K-L-M-N-P-R-T-U-V-Z-2-3-4-5-6-8

Digit number	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

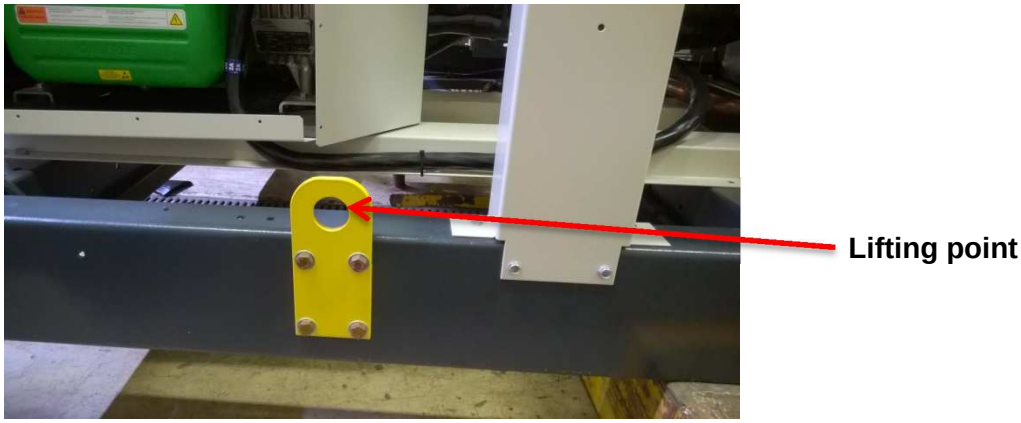
Digit number	Language
R	Russian
T	Czech
U	Greek
V	Portuguese
Z	Slovene
2	Romanian
3	Serbian
4	Slovak
5	Croatian
6	Hungarian
8	Turkish

31. Shipping Package, DIGIT 44

31.1 Without protection - Standard, digit 44 = X

The unit can be moved by using sligs and spread bar. Lifting points are built in the machine and painted in yellow.
See IOM for detailed information.

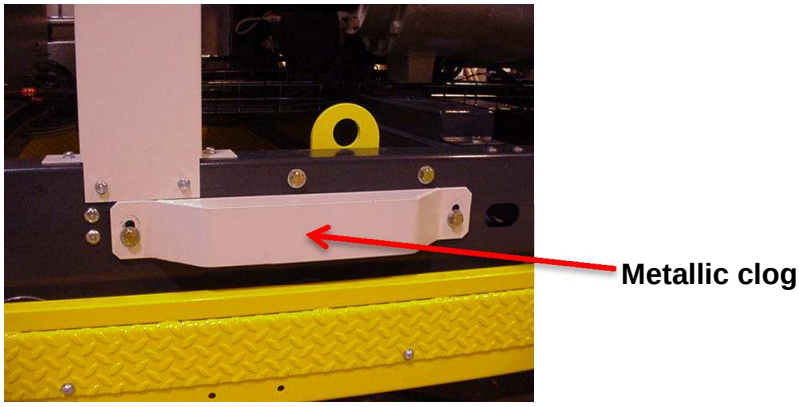
Illustration unit without protection



31.2 Containerization Package, digit 44 = A

When the chiller is shipped in a container, Trane adds 4 metallic clogs on the side of the unit to prevent contact between chiller and container while loading and unloading and during transport.

Illustration metallic clogs



32. Refrigerant, DIGIT 45

32.1 Refrigerant R134a, digit 45 = 1

32.2 Refrigerant R1234ze, digit 45 = Z

It has a GWP <1 and carries the ASHRAE safety classification A1.

33. Special, DIGIT 48

Inform on model number if the unit has a special demand or not.

33.1 Without special, digit 48 = X

33.2 With special, digit 48 = S

34. Acronyms

SE	Standard Efficiency
HE	High Efficiency
XE	eXtra Efficiency
HSE	High Seasonable Efficiency
HSS	High Seasonal Efficiency Short
LN	Low noise
NNSB	Nigh Noise SetBack
XLN	eXtra Low Noise
LWT	Leaving Water Temperature
MS/TP	Master Slave Token Processing
BCI-C	BACnet Communication Interface for Chiller
LLIDs	Low Level Intelligent Devices
LCI-C	LonTalk Communication Interface for Chiller
BAS	Building Automation System
IPC3	Intra Processor Communication
ECWS	External Chilled Water Setpoint
ECLS	External Current Limit Setpoint
LP	Low Pressure
HP	High Pressure

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