

FRIGO TURBO FL: Packaged water cooled liquid chillers in "A" class energy efficiency for indoor installation, equipped with oil-free centrifugal compressors with magnetic levitation bearings, flooded evaporator and shall and tube condenser. Cooling Capacity: 280 ÷ 1840 kW











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MAIN FEATURES

- · Water cooled liquid chiller in A class energy efficiency.
- 11 models available, for a wide selection opportunity.
- Average step of 150kW.
- EER up to 5,24.
- ESEER up to 8,91.
- · Oil-free centrifugal compressors with magnetic levitation bearings.
- · Inverter driven.
- R134a Refrigerant charge.
- Single refrigerant circuit.
- · Electronic expansion valve.
- Shell and tube condenser.
- · Flooded evaporator.
- · Suitable for indoor installation.

MAIN BENEFITS

- Up to four centrifugal compressors with magnetic levitation bearings on the refrigerant circuit for an high efficiency.
- · No need of power factor correction.
- Minimum starting current (LRA)
- High EER and ESEER. A Class energy efficiency.
- Quiet operation.
- · Microprocessor control system with 7" touch screen display.
- · Extremely easily of maintenance.
- Complete set of components dedicated to the safety of the unity.
- · Eurovent Certification.



INDOOR INSTALLATION

The machines are designed for indoor installation.

MAGNETIC LEVITATION CENTRIFUGAL COMPRESSOR

The TURBO FL liquid chillers are equipped with two-stage centrifugal compressor with variable speed, which is able to follow punctually plant demands, obtaining values of energy efficiency ratio (EER) growing in a narrowing of the cooling load. The compressors of the TURBO FL liquid chillers are equipped with magnetic levitation oil-free bearings which compared to traditional ball bearings, completely eliminate all the maintenance procedures of lubrication.

A CLASS ENERGY EFFICIENCY

The best and most accurate components applied to the chillers.

WORKING LIMITS IN COOLING MODE

Chilled water outlet temperature: 4÷18°C Condenser outlet water temperature: 20÷52°C



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FRAMEWORK

• Base and self supporting frame in steel plate with protective surfaces treatment in compliance with UNI ISO 9227/ASTMB117 and ISO 7253, and painted with epoxy powders.

Colour: RAL 9002

COMPRESSORS

- Twin-turbine centrifugal compressor, oil-free type, optimized for R134a refrigerant. The term "oil-free" refers to the total absence of lubricating oil within the compressor
- Magnetic levitation bearings.
- Manometric compression ratio: 1.5 ÷ 5.0
- · Stepless capacity control trough integrated inverter.
- High efficiency permanent-magnet synchronous motor with integrated Soft-Start system (starting current limited to 5A).
- Power factor motor $\cos \phi > 0.9$ for a large part of the operating range
- Motor and electronic power section cooling by liquid refrigerant injection into the integrated cooling circuit.
- Electric motor thermal protection via internal winding temperature sensors.
- · Electronic integrated control for operation and alarms status.
- · Sensor on refrigerant discharge for temperature monitoring.
- Inner sensors for electronic components and inverter temperature control.
 Security system to protect the crankshaft and magnetic bearings in the
- event of failure of power supply.
- Degree of protection: IP54.

EVAPORATOR

- Flooded shell and tube evaporator, optimized for R134a refrigerant.
- Version two passes, characterized by low pressure losses on the water side.
- · Water tubes with a helical rifled internal surface.
- · Integrated liquid drop separator.
- Shell, header, tube sheets made of carbon steel, tubes in Cu.
- Anticondensate insulation made of polyurethane.
- Temperature sensors on water inlet and outlet.Water flow switch for water flow control.
- Large liquid level indicator

CONDENSER

- · Shell and tube 2-passes condenser optimized for R134a refrigerant.
- Machine type P4: 4-passes condenser.
- Shell, header, tube sheets made of carbon steel, tubes in Cu.

REFRIGERANT CIRCUIT

Components for each refrigerant circuit:

- · Capacitive level sensor connected to the driver of the expansion valve.
- Electronic expansion valve that allows high performance and system efficiency and for the refrigerant level control in the evaporator. Double electronic expansion valve from model 1140 T3 included up to model 1840 T4.
- · Electronic by-pass valve for compressor start.
- Non return valve on by-pass line for compressor start.
- Sight glass.
- Filter dryer on liquid line.
- Service valve on liquid line.
- Service valve on gas discharge.
- · Non return valve on gas discharge.
- Safety valve on low pressure side.
- Safety valve on high pressure side.
- Pressure transducers with indication, control and protection functions, on low and high refrigerant pressure.
- · High pressure safety switch with manual reset.
- Refrigerant circuit with copper tubing with anticondensate insulation of the suction line for models 280 T1, 560 T2, 840 T3.
- Refrigerant circuit with steel tubing with anticondensate insulation of the suction line for models 380 T1, 460 T1, 760 T2, 920 T2, 1140 T3, 1380 T3, 1520 T4, 1840 T4..
- · Plastic capillary hoses for pressure sensors connection.
- R134a refrigerant charge.

ELECTRICALPANEL

In accordance with EN60204-1 norms, suitable for indoor installation, complete with:

- · Main switch with door lock safety.
- · Fuses for compressors.
- Contactors for compressors.
- · Transformer for auxiliary circuit and microprocessor supply.
- Panel with machine controls.
- Power supply 400/3/50.

CONTROL SYSTEM

- Microprocessor system with "Touch Screen" graphic display for control and monitor of operating and alarms status. The system includes:
 - Voltage free contact for remote general alarm.
 - Main components hour-meter.
 - Integrated "Data logger" function for the recording of events and alarms.
 - Nonvolatile "Flash" memory for data storage.
 - Menu with protection password.

HYDRAULIC CONNECTIONS OF HEAT EXCHANGERS

- The hydraulic connections with flange (FL) are not supplied with counter flange.
- The hydraulic connections with grooved end are not supplied with flexible joint (optional accessory).



OPTIONAL ACCESSORIES

| FRIGO TURBO FL | 280 T1 | 380 T1 | 460 T1 | 560 T2 | 760 T2 | 840 T3 | 920 T2 | 1140 T3 | 1380 T3 | 1520 T4 | 1840 T4 |
|----------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|---------|---------|---------|---------|
| 172 - Rubber support (kit) | ٠ | ٠ | • | ٠ | ٠ | ٠ | ٠ | ٠ | ٠ | ٠ | • |
| 611 - Noise absorption cap | ٠ | ٠ | • | ٠ | ٠ | ٠ | ٠ | ٠ | ٠ | ٠ | • |
| Service valve on compressor group suction | • | • | • | • | • | • | • | • | • | • | • |
| 923 - RC-Com MBUS/JBUS Serial board | • | • | • | • | • | • | • | • | • | • | • |
| 926 - LON Serial board | • | • | • | • | • | • | • | • | • | • | • |
| 931 - BACnet Ethernet - SNMP - TCP/IP Serial board | ٠ | • | • | • | • | • | • | • | • | ٠ | • |
| 932 - BACnet MS/TP Serial board | • | ٠ | ٠ | • | ٠ | • | • | ٠ | ٠ | ٠ | • |
| 942 - Serial card for GSM Modem | • | • | • | ٠ | ٠ | ٠ | • | ٠ | • | ٠ | • |
| 889 - Master plant SEQUENCER | ٠ | • | • | ٠ | ٠ | ٠ | • | ٠ | ٠ | • | • |
| 962 - Kit modem GSM | ٠ | • | • | • | • | • | • | • | • | • | • |
| 957 - Plantwatch without modem | • | • | • | • | • | • | • | • | • | • | • |
| 930 - Remote graphic terminal kit | • | • | • | • | • | • | • | • | • | • | • |

• available accessory; - not available accessory

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TECHNICAL DATA FRIGO TURBO FL (*)

| | FRIGO TURBO FL | | 280 T1 | 380 T1 | 460 T1 | 560 T2 | 760 T2 | 840 T3 | 920 T2 | 1140 T3 |
|--------|----------------------------------------------|---------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | Cooling capacity (1) | kW | 280 | 380 | 460 | 560 | 760 | 840 | 920 | 1140 |
| | Unit power input | kW | 55,4 | 75,2 | 90,7 | 110,9 | 149,0 | 166,0 | 179,0 | 218,0 |
| | Evaporator water flow rate | m³/h | 48,2 | 65,4 | 79,1 | 96,3 | 131,0 | 144,0 | 158,0 | 196,0 |
| | Evaporator pressure drop | kPa | 37 | 29 | 27 | 31 | 27 | 32 | 57 | 35 |
| | Condenser water flow rate | m³/h | 57,7 | 78,3 | 94,7 | 115,0 | 156,0 | 173,0 | 189,0 | 234,0 |
| | Condenser pressure drop | kPa | 13 | 22 | 21 | 19 | 22 | 26 | 22 | 29 |
| | Compressors | | centrifugal |
| | Quantity | n. | 1 | 1 | 1 | 2 | 2 | 3 | 2 | 3 |
| | Capacity control | % | 44100% | 42100% | 34100% | 22100% | 23100% | 20100% | 18100% | 13100% |
| ANDARD | Refrigerant | | R134a |
| | Total refrigerant charge (optional excluded) | kg | 125 | 165 | 120 | 160 | 240 | 268 | 250 | 400 |
| | Gas circuits | n. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| ST | Power supply | V/Ph/Hz | 400/3/50 | 400/3/50 | 400/3/50 | 400/3/50 | 400/3/50 | 400/3/50 | 400/3/50 | 400/3/50 |
| | Max unit operating current (FLA) | A | 139 | 210 | 172 | 279 | 420 | 418 | 344 | 630 |
| | Unit starting current (LRA) | A | 5 | 5 | 5 | 10 | 10 | 15 | 10 | 15 |
| | EER (1) | kW/kW | 5,05 | 5,05 | 5,07 | 5,05 | 5,10 | 5,06 | 5,14 | 5,23 |
| | ESEER | | 8,41 | 8,36 | 8,53 | 8,59 | 8,69 | 8,45 | 8,54 | 8,65 |
| | Sound power level [Lw] (2) | dB(A) | 92,5 | 92,9 | 94,7 | 94,7 | 94,9 | 95,7 | 96,8 | 96,6 |
| | Average sound pressure level [Lpm] (3) | dB(A) | 73,9 | 74,3 | 76,1 | 76,1 | 76,3 | 77,1 | 77,8 | 77,1 |
| | Net weight | kg | 1800 | 1871 | 2111 | 2573 | 2939 | 3771 | 3077 | 4628 |
| | Hydraulic connections | | | | | | | | | |
| | Evaporator IN/OUT - OD (4) | Ømm | 114,3 | 168,3 | 168,3 | 168,3 | 168,3 | 168,3 | 168,3 | 219,1 |

| | FRIGO TURBO FL | | 1380 T3 | 1520 T4 | 1840 T4 | |
|----|----------------------------------------------|---------|-------------|-------------|-------------|--|
| | Cooling capacity (1) | kW | 1380 | 1520 | 1840 | |
| | Unit power input | kW | 270,1 | 290,1 | 358,0 | |
| | Evaporator water flow rate | m³/h | 237,0 | 261,0 | 316,0 | |
| | Evaporator pressure drop | kPa | 38 | 28 | 36 | |
| | Condenser water flow rate | m³/h | 284,0 | 311,0 | 378,0 | |
| | Condenser pressure drop | kPa | 30 | 25 | 36 | |
| | Compressors | | centrifugal | centrifugal | centrifugal | |
| | Quantity | n. | 3 | 4 | 4 | |
| _ | Capacity control | % | 11100% | 11100% | 11100% | |
| RD | Refrigerant | | R134a | R134a | R134a | |
| PA | Total refrigerant charge (optional excluded) | kg | 406 | 400 | 415 | |
| AN | Gas circuits | n. | 1 | 1 | 1 | |
| ST | Power supply | V/Ph/Hz | 400/3/50 | 400/3/50 | 400/3/50 | |
| | Max unit operating current (FLA) | A | 517 | 840 | 689 | |
| | Unit starting current (LRA) | A | 15 | 20 | 20 | |
| | EER (1) | kW/kW | 5,11 | 5,24 | 5,14 | |
| | ESEER | | 8,54 | 8,91 | 8,72 | |
| | Sound power level [Lw] (2) | dB(A) | 97,2 | 97,5 | 99,0 | |
| | Average sound pressure level [Lpm] (3) | dB(A) | 77,7 | 78,0 | 79,5 | |
| | Net weight | kg | 4749 | 5787 | 6674 | |
| | Hydraulic connections | | | | | |
| | Evaporator IN/OUT - OD (4) | Ømm | 219,1 | 219,1 | 219,1 | |

Referred to chilled water temperature 12/7°C and condenser water temperature 30/35°C according to Eurovent standard Sound power level [Lw] according to ISO EN 9614 - 2 Average sound pressure level [LPm] 1m far according to ISO EN 3744. Hydraulic connection with grooved end. The flexible joint is an optional accessory. Technical data refer to units equipped with 2-passes condenser.

1. 2. 3. 4. (*)



DIMENSIONS (mm)

| | а | b | С | | | | | | |
|---------|------|------|------|--|--|--|--|--|--|
| 280 T1 | 3050 | 1320 | 1870 | | | | | | |
| 380 T1 | 3050 | 1320 | 1870 | | | | | | |
| 460 T1 | 3050 | 1320 | 1870 | | | | | | |
| 560 T2 | 3050 | 1320 | 2040 | | | | | | |
| 760 T2 | 3050 | 1355 | 2040 | | | | | | |
| 840 T3 | 4500 | 1406 | 2090 | | | | | | |
| 920 T2 | 3820 | 1406 | 2040 | | | | | | |
| 1140 T3 | 4500 | 1406 | 2090 | | | | | | |
| 1380 T3 | 4500 | 1406 | 2090 | | | | | | |
| 1520 T4 | 4990 | 1406 | 2090 | | | | | | |
| 1840 T4 | 4990 | 1406 | 2090 | | | | | | |
| | | | | | | | | | |

