

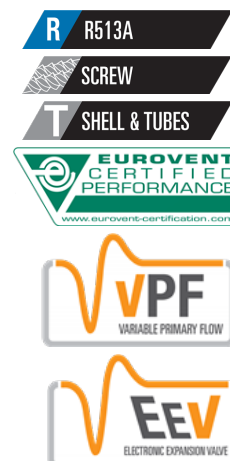
**Technical Bulletin**

**FR-W-G05-Z 0551 - 1752\_201809\_EN HFC R513A**  
ELCA\_Engine ver.4.0.5.0



# FR-W-G05-Z 0551 - 1752

| **Water cooled chiller**



(The photo of the unit is indicative and may vary depending on the model)

- ErP READY
- MAXIMUM COMPACTNESS
- ELECTRONIC EXPANSION VALVE SUPPLIED STANDARD



## CERTIFICATIONS

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### Product certifications



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### Voluntary product certifications

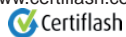


Check ongoing validity of certificate:

[www.eurovent-certification.com](http://www.eurovent-certification.com)

or

[www.certiflash.com](http://www.certiflash.com)



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### System certifications



### **mitsubishi electric hydronics & it cooling systems s.p.a.**

Quality System complying with the requirements of UNI EN ISO 9001:2008 regulation  
Environmental Management System complying with the requirements of UNI EN ISO 14001:2004 regulation  
Occupational Health and Safety Management System complying with the requirements of BS OHSAS 18001:2007



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The units highlighted in this publication contain R513A [GWP<sub>100</sub> 631] fluorinated greenhouse gases.



## LEGEND

FR-W-G05-Z 0551 - 1752

### Functions



Cooling

### Refrigerant



R513A

### Compressors



Screw compressor

### Exchangers



Shell & Tubes

### Other features



Eurovent



VPF



Electronic Expansion Valve

## 1.1 PRODUCT PRESENTATION

### GREEN CERTIFICATION RELEVANT

Mitsubishi Electric Hydronics & IT Cooling Systems S.p.A., as a major player in the world HVAC market and a leading manufacturer of energy efficient, sustainable HVAC solutions, recognizes and supports the diffusion of green certification systems, as an effective way to deliver high performance buildings and improve the quality and the sustainability of the built environment.

Since the first certification system was introduced at the beginning of the 1990s, the demand for certified buildings has grown considerably, as well as the number of standards, rating and certification programs. Operating worldwide Mitsubishi Electric Hydronics & IT Cooling Systems S.p.A., has extensive experience with many of them and is active member of Green Building Council Italy.

Mitsubishi Electric Hydronics & IT Cooling Systems S.p.A., commitment to develop responsible and sustainable HVAC solutions, is reflected by a full range of premium efficiency products and systems, designed with special care to improve building energy performance ratings, according to major certification protocols, including LEED, BREAM, GREENSTAR, BCA, NABERS, DNGB, HQE and BEAM.

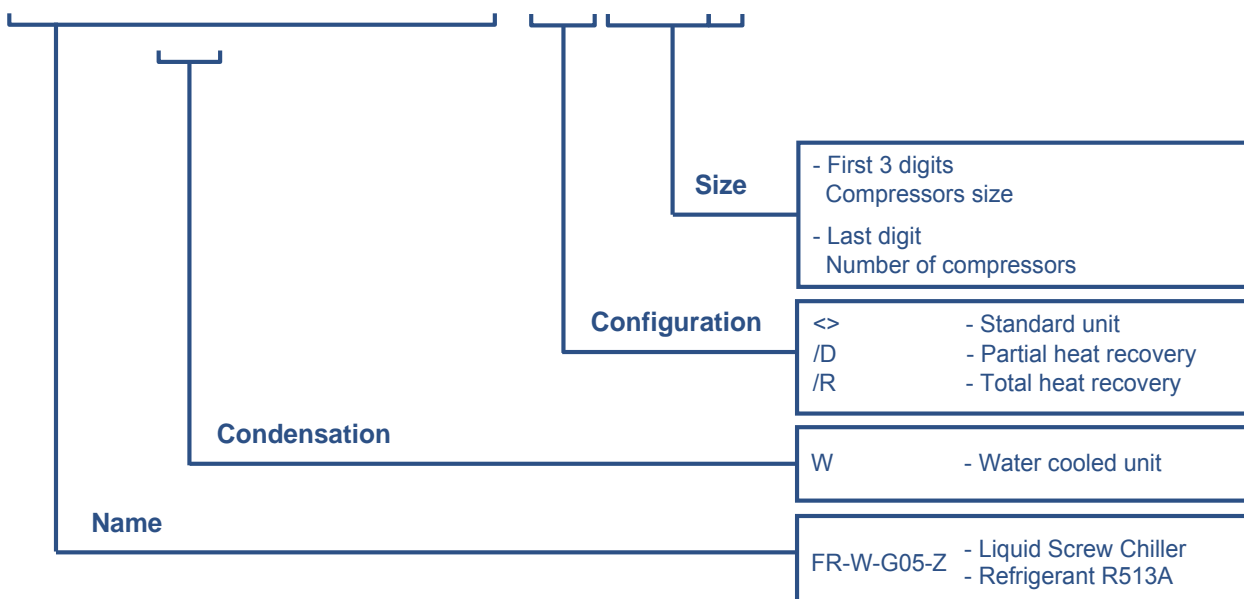
To find out more about how our products contribute to enhanced green certification rating and energy performance of a building, please refer to:

<https://www.melcohit.com/GLOBAL/Company/Green-Certifications/QR%20code/>



INCIPIT

# FR - W - G05 - Z / R 1752



## PRODUCT PRESENTATION

Indoor unit for the production of chilled water featuring semihermetic screw compressors optimized to operate with low compression ratio and R513A, shell and tubes evaporator designed by Mitsubishi Electric Hydraulics & IT Cooling Systems S.p.A. and shell and tube condenser and electronic expansion valve.

Base and supporting structure is made of polyester painted galvanized steel. Eurovent certification. The unit results extremely compact, thanks to the peculiar construction layout, without base frame and panels. The high performance's level is achieved thanks to the accurate sizing of all internal components.

### 1.3 ErP READY

Thanks to the high level of efficiency at part load, the unit can meet and exceed the minimum energy efficiency threshold rated by the Seasonal Energy Performance Ratio SEPR HT, in accordance with the eco-sustainable design requirements for all products using energy. The unit is already compliant with the minimum seasonal efficiency requirements that will start from 2021.

### 1.4 MAXIMUM COMPACTNESS

Maximum compactness to achieve a very high flexibility in the design process and installation operations, offering a premium solution in case of reduced clearances or when retrofitting existing installations.

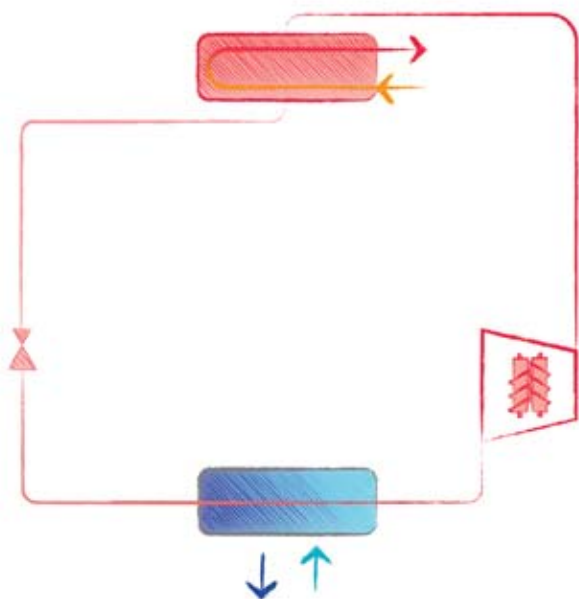
### 1.5 ELECTRONIC EXPANSION VALVE SUPPLIED STANDARD

The use of the electronic expansion valve generates considerable benefits, especially in cases of variability of the source temperature. The electronic expansion valve guarantees speed in reaching machine stability and an extension of the operating limits.

## 2.1 UNIT STANDARD COMPOSITION

### CONFIGURATIONS

- , standard unit

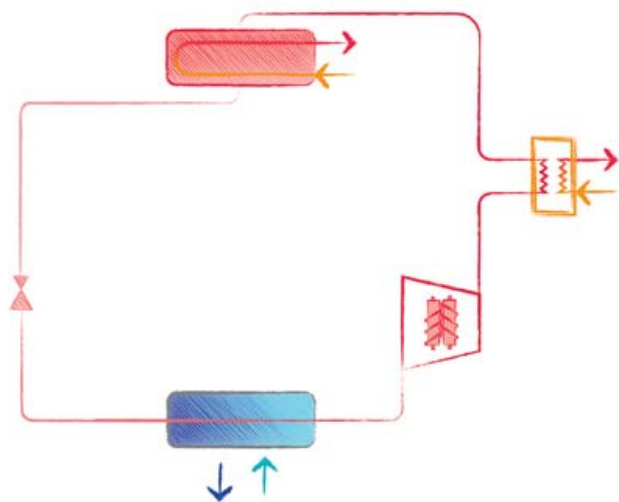


No heat recovery is possible.

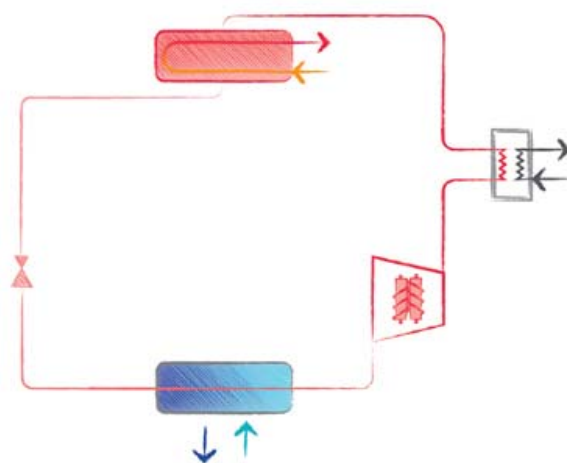
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### /D, unit with partial heat recovery

Heat recovery: ON



Heat recovery: OFF (water flow stopped)



Each refrigerant circuit is fitted with a desuperheater.

The superheating heat recovery is only possible when the temperature of the hot water circuit is lower than the compressor discharge temperature. The heat recovery and its amount depends on the unit's operating conditions, in particular the outdoor air temperature and the load percentage. It is advised to interrupt the water flow to the desuperheater when the conditions for an actual heat recovery are not met.

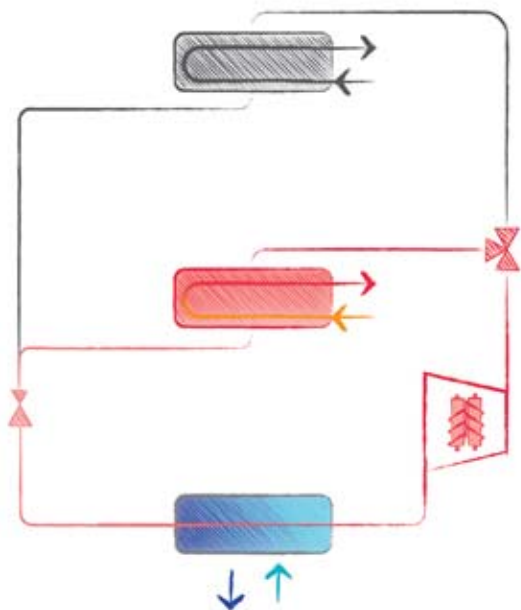
The smart management of the desuperheater pump(s) is possible with the option 3371 D – RELAY 1 PUMP (ON/OFF), further information is available in the bulletin section dedicated to accessories.



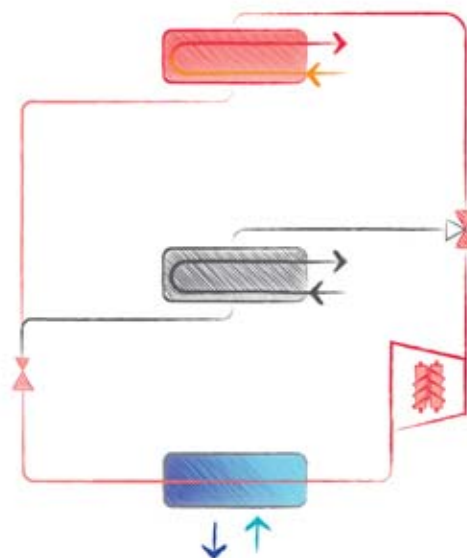
## UNIT STANDARD COMPOSITION

### /R, unit with total heat recovery

Heat recovery: ON



Heat recovery: OFF



Each refrigerant circuit is fitted with a total heat recovery exchanger.

The heat recovery mode is managed in accordance with the hot water temperature set-point.

When the heat recovery mode is active, the condensation takes place in the devoted refrigerant/water heat exchanger instead of in the standard condenser.

## UNIT STANDARD COMPOSITION

### 2.2 Water cooled chiller

Indoor unit for the production of chilled water featuring semihermetic screw compressors optimized to operate with low compression ratio and R513A, shell and tubes evaporator designed by Mitsubishi Electric Hydraulics & IT Cooling Systems S.p.A. and shell and tube condenser and electronic expansion valve.

Base and supporting structure is made of polyester painted galvanized steel. Eurovent certification. The unit results extremely compact, thanks to the peculiar construction layout, without base frame and panels, and extremely flexible to easily adapts itself to different thermal load conditions thanks to the precise thermoregulation. The high performance's level is achieved thanks to the accurate sizing of all internal components.

### 2.3 Installation note

The unit is supplied fully refrigerant charged and factory tested. On site installation only requires power and hydraulic connection.

### 2.4 Structure

Frame in polyester-painted galvanized steel.

The self-supporting frame is built to guarantee maximum accessibility for servicing and maintenance operations.

### 2.5 Refrigerant circuit

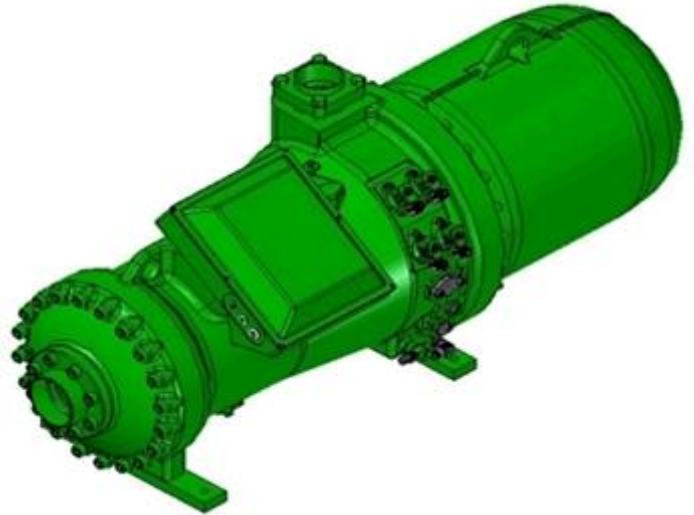
Unit designed with separate and independent refrigerant circuits in order to ensure continuous operation and easy maintenance. In addition to the main components described in the following sections, each refrigerant circuit is fitted as standard with:

- electronic expansion valve
- high and low pressure safety valve
- liquid line shut-off valve
- compressor's discharge valve
- drier filter with replaceable cartridge
- refrigerant line sight glass with humidity indicator
- safety switching device for limiting the pressure
- non -return valve in compressor's discharge line integrated in the compressor
- high and low pressure transducers
- high and low pressure gauges
- liquid line shut-off device (function performed by electronic expansion valve with ultracap)

### 2.6 Compressor

New semi-hermetic screw compressors designed for high efficiency in low condensing temperature applications.

Semi-hermetic screw compressors with 2 five- and six-lobe rotors: the five-lobe rotor is splined directly onto the motor (nominal speed 2950 rpm) without the use of interposed gears. The bearings provided along the rotor axis in a separate chamber isolated from the compression chamber, are made in carbon steel (lifetime higher than 150.000h at full load). Optimized lubrication guarantees oil's distribution between mechanical parts, without using an oil pump; the built-in oil separator has 3 stages of separation, and a 10 mm stainless steel mesh filter ensures the constant presence of oil inside. Cooling power is partialized by a slide valve which, depending on the position assumed, permits a stepless compression chamber reduction; each compressor can therefore smoothly partialize from 25% to 100% of its capacity (option available as accessory for units with 2 circuits). The two pole motors are fitted as standard with electric devices to limit the absorbed current during compressor start-up, and with unloaded start-up. Each compressor is fitted with manual-reset motor thermal protection, delivery gas temperature and oil level controls and an electric resistance for the carter's heating while the compressor is stopped. A check valve fitted on the refrigerant delivery line prevents the rotors from reversing after stopping. On-off cock on the delivery line of each compressor (external to the compressor itself) to isolate the refrigerant charge in the heat exchanger when required.



### 2.7 Plant side heat exchanger

Shell and tube heat exchanger, fully designed and manufactured by Mitsubishi Electric Hydraulics & IT Cooling Systems, working as direct expansion evaporator, with refrigerant flowing inside the pipes and water flowing in the shell side. Baffles in the shell increase turbulence and therefore enhance the heat exchange's efficiency. The steel shell is insulated with a foamed polyethylene closed-cell mat of 9 mm thickness and a thermal conductivity of 0,033 W/mK at 0°C. The copper pipes are internally grooved to improve the heat exchange and mechanically fitted onto the plates. A differential pressure switch is present as standard to control the water flow while the unit is working, avoiding the risk of ice generation. The heat exchanger complies with PED standards, concerning the operating pressures. Flexible joint water connections.

### 2.8 Source side heat exchanger

Shell and tube heat exchanger working as condenser, with water flowing inside and refrigerant flowing outside the pipes. Heads can be removed to inspect the pipes. Standard water connections are suitable for water with temperature difference of 5°C. Under request it is possible to have a 4-passes heat exchanger (water side) for applications with temperature difference higher than 10°C. The heat exchanger complies with PED standards, concerning the operating pressures. GAS threaded water connections.

### 2.9 Electrical and control panel

Electrical and control panel built to EN60204-1 and EC204-1 standards, complete with:

- power supply 400V/3ph/50Hz and part-winding compressors start-up
- electronic controller
- control circuit transformer
- general door lock isolator
- power circuit with electric bus bar distribution system
- fuses for compressors
- compressors protection with internal thermal overload
- terminals for cumulative alarm block
- remote ON/OFF terminals
- spring-type control circuit terminal board
- phases sequence control
- relays for voltage monitoring
- bottom cable entry
- IP21 BW protection (Protected against solid objects over 12 mm and vertically falling drops of water).

### 2.10 Certification and applicable directives

The unit complies with the following directives and relative amendments:

- EUROVENT Certification program
- ErP Directive 2009/125/EC
- CE Declaration of conformity certificate for the European Union
- EAC Product quality certificate for Russian Federation
- Machine directive 2006/42/EC
- PED directive 2014/68/EU
- Low Voltage directive 2006/95/EC
- ElectroMagnetic compatibility directive 2004/108/EC
- F-Gas Regulation 517/2014/EC
- 811/2013/EC and 813/2103/EC EcoLabelling Regulations
- ISO 9001 Company's Quality Management System certification
- ISO 14001 Company's Environmental Management System certification

## UNIT STANDARD COMPOSITION

### 2.11 Tests

Tests performed throughout the production process, as indicated in ISO9001.

Performance or noise tests can be performed by highly qualified staff in the presence of customers.

Performance tests comprise the measurement of:

- electrical data
- water flow rates
- working temperatures
- power input
- power output
- pressure drops on the water-side exchanger both at full load (at the conditions of selection and at the most critical conditions for the condenser) and at part load conditions.

During performance testing it is also possible to simulate the main alarm states.

Noise tests are performed to check noise emissions according to ISO9614.

### 2.12 Electronic control W3000 TE

The brand new W3000TE controller offers advanced functions and algorithms. The LARGE keyboard with a large format and the wide LCD display favour an easy and safe access to the machine setup and a complete view of unit's status. The assessment and intervention on the unit is managed through a multi-level menu, with selectable user's language. The led icons immediately show the operating status of the circuits. In addition to or as an alternative at Large Keyboard, the KIPLink - Keyboard In Your Pocket - is the innovative user interface based on WiFi technology that allows one to operate on the unit directly from the smartphone or tablet.

The diagnostics comprises a complete alarm management system, with "black box" (via PC) and alarm log functions (via display or also PC) for enhanced analysis of the unit operation.

Optional proprietary devices can perform the adjustment of the resources in systems made of several units. Consumption metering and performance measurement are possible as well. Supervision can be easily developed via proprietary devices or the integration in third party systems by means of the most common protocols as ModBus, Bacnet, Bacnet-over-IP, LonWorks.

Compatibility with the remote keyboard managing up to 8 units. The programmable timer manages a weekly schedule organised into time bands to optimise unit performance by minimising power consumption during periods of inactivity. Up to 10 daily time bands can be associated with different operating set points. The regulation operates on the water circuits featuring the step-wise regulation referred to the return water temperature with proportional logic. Optionally (VPF package), capacity modulation can be integrated with hydraulic flow modulation, thanks to inverter-driven pumps and to specific resources for the hydraulic circuit.



### 2.12 KIPLink - Keyboard In your Pocket

KIPLink - Keyboard In Your Pocket - is the innovative user interface based on WiFi technology that allows one to operate on the unit directly from the smartphone or tablet. It is available in addition to or as an alternative to the Large or Touch Keyboard. Using KIPLink, it is possible to turn the unit on and off, adjust the set-point, plot the main operating variables, monitor in detail the status of the refrigerant circuits, the compressors and display and reset the possible alarms.



### 2.12 Touch screen

As an alternative to the Large keyboard, the unit can be equipped with the Touch interface, with a 7" WVGA colour display and a front USB port. The touch-screen's technology is characterized by an easy-to-access data, and it allows an effective graphical representation of the main figures protecting the access through 3 privilege levels.

### 2.13 Configurations

#### - , standard unit

Standard unit for production of chilled water

#### /D, unit with partial heat recovery

Unit for the production of chilled water, equipped with an auxiliary heat exchanger (desuperheater) on the compressor discharge for superheat recovery. The recovered heat is approximately the 20% of the total cooling capacity and can be used for domestic hot water production or other secondary uses, such as the integration of an existing boiler.

#### /R, unit with total heat recovery

Unit for the production of chilled water, with a dedicated heat exchanger refrigerant/water for the condensation heat reclaim. The heat reclaim is managed to reach the set-point. This function is used for air treatment in applications with AHU or for domestic hot water production together with an auxiliary boiler.

### 3.1 ACCESSORIES

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
<b>1020 REGULATIONS</b>			
1016 UNIT WITH PED RULES	Unit according to PED (Pressure Equipment Directive) rules		ALL
1017 UNIT PED-UDT COMPLIANT	Unit PED-UDT compliant for Polish market		ALL
<b>380 NUMBERED WIRING</b>			
381 NUMBERED WIRING ON EL. BOARD	Electrical board wires are identified by numbered labels. The reference numbers are indicated in the unit's wiring scheme.	Facilitate maintenance interventions to the electrical board connections.	ALL
382 PWR WIRINGS ACC.TO UK REQUEST		Facilitate maintenance interventions to the electrical board connections.	ALL
383 NUMBERED WIRINGS+UK REQUESTS	Electrical board wires are identified by numbered labels. The reference numbers are indicated in the unit's wiring scheme.	Facilitate maintenance interventions to the electrical board connections.	ALL
<b>3300 COMPRESSOR REPHASING</b>			
3301 COMPR.POWER FACTOR CORR.	Capacitors on the compressors' power inlet line.	The unit's average cos(phi) increases.	ALL
<b>3410 AUTOMATIC CIRCUIT BREAKERS</b>			
3412 AUTOM. CIRCUIT BREAK. ON LOADS	Over-current switch on the major electrical loads.	In case of overcurrent allows resetting of the switch without the replacement of relative fuses.	ALL
<b>3600 ON/OFF COMPRESSOR SIGNAL</b>			
3601 COMPRESSOR OPERATION SIGNAL	Auxiliary contacts providing a voltage-free signal.	Allows remote signalling of compressor's activation or remote control of any auxiliary loads.	ALL
<b>4180 REMOTE CONNECTION ARRANGEMENT</b>			
4181 SERIAL CARD MODBUS	Interface module for ModBUS protocols.	Allows integration with BMS operating with ModBUS protocol.	ALL
4182 SERIAL CARD FOR LONWORKS	Interface module for Echelon systems.	Allows integration with BMS operating with LonWorks protocols	ALL
4184 SERIAL CARD BACNET MS/TP RS485	Interface module for BACnet protocols.	Allows integration with BMS operating with BACnet protocol.	ALL
4185 SERIAL CARD FOR BACNET OVER IP	Interface module for BACnet OVER-IP protocols.	Allows to interconnect BACnet devices over Internet Protocol within wide-area networks.	ALL
4187 M-Net W3000 INTERFACE KIT	Interface kit for M-Net protocol.	Interface module to allow the integration of the unit with Mitsubishi Electric proprietary communication protocol M-Net.	ALL
<b>6160 AUXILIARY INPUT</b>			
6161 AUXILIARY SIGNAL 4-20mA	4-20 mA analog input	Allows to change the operating set-point according to the value of current applied to the analogue input.	ALL
6162 REMOTE SIGNAL DOUBLE SP	Allows to activate the Energy Saving set-point.	Allows to change the operating set-point according to a remote switch	ALL
<b>6170 DEMAND LIMIT</b>			
6171 INPUT REMOTE DEMAND LIMIT	Digital input (voltage free)	It permits to limit the unit's power absorption for safety reasons or in temporary situation.	ALL

**ACCESSORIES**

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
<b>1510 SOFT-STARTER</b>			
1511 UNIT WITH SOFT-START	Electronic device adopted to manage the inrush current.	Break down of the inrush current compared to the direct motor start, lower motor windings' mechanical wear, avoidance of mains voltage fluctuations during starting, favourable sizing for the electrical system.	ALL
<b>5920 MANAGEMENT &amp; CONTROL SYSTEMS</b>			
5922 ClimaPRO ModBUS RS485 - MID	This option includes all following devices on-board the unit panel: - MID certified network analyzer operating on ModBUS over RS-485 - Current transformers - W3000TE controller - Software release LA09 or later version.	This accessory allows to acquire the electrical data and the power absorbed by the unit and communicate with ClimaPRO via high level communication interface based on ModBUS over EIA RS-485. More specifically, the data collected are: power supply, current, frequency, power factor ( $\cos\phi$ ), electrical power consumption, energy consumption. This specific energy meter model is MID certified and can therefore be used for billing applications. This option also ensures the compatibility between the units and ClimaPRO, thus allowing ClimaPRO to acquire all the main unit's operating variables and status by means of a high level communication interface to the controller installed onboard the unit panel.	ALL
5923 ClimaPRO BacNET over IP	This option includes all following devices on-board the unit panel: - network analyzer operating on BACnet over IP - Current transformers - W3000TE controller - Software release LA09 or later version.	This accessory allows to acquire the electrical data and the power absorbed by the unit and communicate with ClimaPRO via high level communication interface based on BACnet over IP. More specifically, the data collected are: power supply, current, frequency, power factor ( $\cos\phi$ ), electrical power consumption, energy consumption. This network analyzer is not MID certified and cannot therefore be used for billing applications. This option also ensures the compatibility between the units and ClimaPRO, thus allowing ClimaPRO to acquire all the main unit's operating variables and status by means of a high level communication interface to the controller installed onboard the unit panel.	ALL
5924 ENERGY METER FOR BMS	This option includes all following devices on-board the unit panel: - network analyzer with display operating on ModBUS protocol over RS-485 (without certification MID) - current transformers.	This accessory allows to acquire the electrical data and the power absorbed by the unit and send them via RS-485 bus to the BMS for energy metering.	ALL
<b>1900 COMPRESSOR SUCTION VALVE</b>			
1901 COMPRESSOR SUCTION VALVE	Shut-off valve on compressor's suction circuit.	Simplifies maintenance activities	ALL
<b>1280 CONDENSER CONFIGURATION</b>			
1281 2 PASS CONDENSER	Inlet and outlet water connections on the same head	Inlet and outlet water connections on the same head	ALL
1283 4 PASS CONDENSER	Water realizes 4 tube side passes	Compatible with water with high delta temperature	ALL

## ACCESSORIES

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
<b>1200 WATER CONDENSER TYPE</b>			
1201 Cu/Ni 90/10 WATER CONDENSER	Shell and tube heat exchanger recommended for applications with water with an high corrosion potential. Headers, shell, baffles and refrigerant connection in carbon steel. [Consider a penalization on the condensation temperature of 2,5°C (/CA version) and 2,0°C (/CA-E) for 90/10]		ALL
<b>1800 EVAPORATOR WATER FLOW SWITCH</b>			
1801 EVAPORATOR WATER FLOW SWITCH	Flow switch with stainless scoop AISI 316L and IP65 protection suitable for installation in industrial plant pipes. It should be installed in a straight pipe without filters, valves, etc., long at least 5 times its diameter, both upstream and downstream.	Signaling of lack of or excessive reduction of flow, it generates an alarm that is in automatic or manual reset depending on n ° alarms per hour and the maximum time of operation of the pump under conditions of low flow rate.	ALL
1802 EVAP.DIFFERENTIAL PRESS.SWITCH	Differential pressure switch in silicone membrane, compatible for water and glycolated solutions, suitable to the horizontal and vertical mounting, with an operating range between -20 ° C and + 85 ° C.		ALL
<b>2630 INSULATION ON EXCHANGERS</b>			
2631 DOUBLE INSULATION ON EXCHANGERS	Thermal insulation in closed-cell flexible elastomeric foam (FEF) of 16 mm coupled with a 3 mm layer of reticulated foam in PE and an exterior embossed finishing PE film. This option is mandatory if the unit is supposed to work with outdoor temperature below -10°C.	Reduces heat losses and prevent from condensate problems.	ALL
<b>2900 WATER CONNECTIONS</b>			
2903 EVAP.FLANGES + COUNTERFLANGES			ALL
<b>2340 UNIT ENCLOSURE</b>			
2301 COMPRESS.ACOUSTICAL ENCLOSURE	Enclosure made from hot galvanised metal plate and painted with epoxy powder coat. The acoustic insulation availability depends on unit model, see the dedicated description in "Accessories notes".	It reduces the noise emissions and improves aesthetics.	ALL
<b>4700 EV - HYDRONIC MODULE</b>			
4701 EV - NO PUMPS, NO CONTACTS	Evaporator hydronic module, compatible with constant flow control. The unit is provided without any water flow regulation device.	Constant water flow is to be provided by others.	ALL
4702 EV - RELAY 1 PUMP (ON/OFF)	Evaporator hydronic module, compatible with constant flow control. The unit is provided with 1 relay to control the activation of 1 external pump via single ON/OFF signal.	The hydronic module allows to control the external pumps with the unit controller logic.	ALL
4703 EV - RELAY 2 PUMPS (ON/OFF)	Evaporator hydronic module, compatible with constant flow control. The unit is provided with 2 relays to control the activation of 2 external pumps via double ON/OFF signal. The pumps are controlled in duty/standby, with running hours equalization and changeover on device failure.	The hydronic module allows to control the external pumps with the unit controller logic.	ALL

**ACCESSORIES**

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
4713 EV - RELAY 1 PUMP + 0-10V SIG	Evaporator hydronic module, compatible with constant or variable flow control. The unit is provided with 1 relay and a 0-10V signal terminal to control the activation and the speed of 1 external variable speed pump.	The hydronic module allows to control the external pumps with the unit controller logic.	ALL
4714 EV - RELAY 2 PUMPS + 0-10V SIG	Evaporator hydronic module, compatible with constant or variable flow control. The unit is provided with 2 relays and a 0-10V signal terminal to control the activation and the speed of 2 external variable speed pump. The pumps are controlled in duty/standby, with running hours equalization and changeover on device failure.	The hydronic module allows to control the external pumps with the unit controller logic.	ALL
<b>4860 EV - PRIMARY FLOW CONTROL</b>			
4861 EV - CONSTANT FLOW	Evaporator water flow control (plant primary circuit): constant flow. Compatible with hydronic modules without regulation devices (no pumps, no contacts), with ON/OFF regulation devices (relays) or with fixed speed pumps (codes: 4701, 4702, 4703, 4704, 4705, 4706, 4707, 4708, 4709, 4711, 4712 - hydronic modules availability depends on unit model).	The unit is set up to operate with a constant water flow in the heat exchanger (plant primary circuit). This is the only option available in case of unit without any water flow regulation devices (no pumps, no contacts), which means with water flow control provided by others. In case of unit with ON/FF regulation devices or fixed speed pumps, the unit controller manages the pump activation to reduce pump consumption.	ALL
4862 EV - CONSTANT FLOW (PARAMETER)	Evaporator water flow control (plant primary circuit): constant flow (parameter set). Compatible with hydronic modules with modulating regulation devices (0-10V signal) or with variable speed pumps (codes: 4713, 4714, 4715, 4716, 4717, 4718, 4719, 4721, 4722, 4723 - hydronic modules availability depends on unit model).	The unit is set up to operate with a constant water flow in the heat exchanger (plant primary circuit). The unit controller manages the pump activation to reduce pump consumption. The pump speed is adjusted via 0-10V signal. The option provides the possibility to set the pump speed with a controller parameter. Once set, the speed pump remains constant until the next parameter adjustment. The parameter set constant flow control is useful during the unit installation and commissioning, to adjust water flow and pressure head according to the real plant characteristics.	ALL
4864 EV - VPF (plant DP trans excl)	Evaporator water flow control (plant primary circuit): variable flow (delta P control). Only for single unit systems. Compatible with hydronic modules with modulating regulation devices (0-10V signal) or with variable speed pumps (codes: 4713, 4714, 4715, 4716, 4717, 4718, 4719, 4721, 4722, 4723 - hydronic modules availability depends on unit model). The option includes: differential pressure transducer on the unit's heat exchanger and related controller expansion board, controller expansion board to read the plant side differential pressure transducer (4-20mA signal) and manage the hydraulic by-pass valve opening (0-10V signal). Compulsory equipment, supplied by others: plant side differential pressure transducer, plant side hydraulic by-pass valve.	The unit is set up to operate with a variable water flow in the heat exchanger (plant primary circuit). The unit controller manages the pump activation to reduce pump consumption. The pump speed is adjusted via 0-10V signal. The option provides a pump speed management based on the VPF (Variable Primary Flow) function. It keeps the delta P constant on the plant side (primary circuit), thus bringing significant pump consumption reduction during part load operation. The VPF function is applicable in systems with only the primary circuit. Further information available in the dedicated bulletin section.	ALL

**ACCESSORIES**

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
4865 EV - VPF (plant DP trans incl)	<p>Evaporator water flow control (plant primary circuit): variable flow (delta P control). Only for single unit systems.</p> <p>Compatible with hydronic modules with modulating regulation devices (0-10V signal) or with variable speed pumps (codes: 4713, 4714, 4715, 4716, 4717, 4718, 4719, 4721, 4722, 4723 - hydronic modules availability depends on unit model).</p> <p>The option includes: differential pressure transducer on the unit's heat exchanger and related controller expansion board, plant side differential pressure transducer (installation by others), controller expansion board to read the plant side differential pressure transducer (4-20mA signal) and manage the hydraulic by-pass valve opening (0-10V signal).</p> <p>Compulsory equipment, supplied by others: plant side hydraulic by-pass valve.</p>	<p>The unit is set up to operate with a variable water flow in the heat exchanger (plant primary circuit).</p> <p>The unit controller manages the pump activation to reduce pump consumption. The pump speed is adjusted via 0-10V signal.</p> <p>The option provides a pump speed management based on the VPF (Variable Primary Flow) function. It keeps the delta P constant on the plant side (primary circuit), thus bringing significant pump consumption reduction during part load operation.</p> <p>The VPF function is applicable in systems with only the primary circuit.</p> <p>Further information available in the dedicated bulletin section.</p>	ALL
4866 EV - VPF MULTI-UNIT SYSTEM	<p>Evaporator water flow control (plant primary circuit): variable flow (delta P control). Only for multi-unit systems.</p> <p>Compatible with hydronic modules with modulating regulation devices (0-10V signal) or with variable speed pumps (codes: 4713, 4714, 4715, 4716, 4717, 4718, 4719, 4721, 4722, 4723 - hydronic modules availability depends on unit model).</p> <p>The option includes: differential pressure transducer on the unit's heat exchanger and related controller expansion board.</p> <p>It shall be the customer responsibility to configure the multi-unit control system (Manager3000 or ClimaPRO) with option VPF.</p>	<p>The unit is set up to operate with a variable water flow in the heat exchanger (plant primary circuit).</p> <p>The unit controller manages the pump activation to reduce pump consumption. The pump speed is adjusted via 0-10V signal.</p> <p>The option provides a pump speed management based on the VPF (Variable Primary Flow) function. It keeps the delta P constant on the plant side (primary circuit), thus bringing significant pump consumption reduction during part load operation.</p> <p>The VPF function is applicable in systems with only the primary circuit.</p> <p>Further information available in the dedicated bulletin section.</p>	ALL
4867 EV - VPF.D	<p>Evaporator water flow control (plant primary circuit): variable flow (delta T control). Only for single unit systems.</p> <p>Compatible with hydronic modules with modulating regulation devices (0-10V signal) or with variable speed pumps (codes: 4713, 4714, 4715, 4716, 4717, 4718, 4719, 4721, 4722, 4723 - hydronic modules availability depends on unit model).</p> <p>The option includes: 2 plant side NTC temperature sensors (installation by others).</p>	<p>The unit is set up to operate with a variable water flow in the heat exchanger (plant primary circuit).</p> <p>The unit controller manages the pump activation to reduce pump consumption. The pump speed is adjusted via 0-10V signal.</p> <p>The option provides a pump speed management based on the VPF.D (Variable Primary Flow with Decoupler) function. It keeps the delta T constant on the plant side (primary circuit), thus bringing significant pump consumption reduction during part load operation.</p> <p>The VPF.D function is applicable in systems with the primary and secondary circuits separated by a hydraulic decoupler.</p> <p>Further information available in the dedicated bulletin section.</p>	ALL



**ACCESSORIES**

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
4868 EV - VPF.D MULTI-UNIT SYSTEM	Evaporator water flow control (plant primary circuit): variable flow (delta T control). Only for multi-unit systems. Compatible with hydronic modules with modulating regulation devices (0-10V signal) or with variable speed pumps (codes: 4713, 4714, 4715, 4716, 4717, 4718, 4719, 4721, 4722, 4723 - hydronic modules availability depends on unit model). It shall be the customer responsibility to configure the multi-unit control system (Manager3000 or ClimaPRO) with option VPF.D.	The unit is set up to operate with a variable water flow in the heat exchanger (plant primary circuit). The unit controller manages the pump activation to reduce pump consumption. The pump speed is adjusted via 0-10V signal. The option provides a pump speed management based on the VPF.D (Variable Primary Flow with Decoupler) function. It keeps the delta T constant on the plant side (primary circuit), thus bringing significant pump consumption reduction during part load operation. The VPF.D function is applicable in systems with the primary and secondary circuits separated by a hydraulic decoupler. Further information available in the dedicated bulletin section.	ALL
<b>4760 CD - HYDRONIC MODULE</b>			
4761 CD - NO PUMPS, NO CONTACTS	Condenser hydronic module, compatible with constant flow control. The unit is provided without any water flow regulation device.	Constant water flow is to be provided by others.	ALL
4762 CD - RELAY 1 PUMP (ON/OFF)	Condenser hydronic module, compatible with constant flow control. The unit is provided with 1 relay to control the activation of 1 external pump via single ON/OFF signal.	The hydronic module allows to control the external pumps with the unit controller logic.	ALL
4763 CD - RELAY 2 PUMPS (ON/OFF)	Condenser hydronic module, compatible with constant flow control. The unit is provided with 2 relays to control the activation of 2 external pumps via double ON/OFF signal. The pumps are controlled in duty/standby, with running hours equalization and changeover on device failure.	The hydronic module allows to control the external pumps with the unit controller logic.	ALL
4773 CD - RELAY 1 PUMP + 0-10V SIG	Condenser hydronic module, compatible with constant or variable flow control. The unit is provided with 1 relay and a 0-10V signal terminal to control the activation and the speed of 1 external variable speed pump.	The hydronic module allows to control the external pumps with the unit controller logic. In case of water cooled chiller, the 0-10V signal, it allows to manage several condensing devices in order to maintain the condensing pressure in a pre-defined range in every applications: - for well water application to manage a 2 way modulating valve; - for cooling tower application to manage a 3 way modulation valve; - for dry-cooler or cooling tower application to modulate the fans' speed.	ALL
4774 CD - RELAY 2 PUMPS + 0-10V SIG	Condenser hydronic module, compatible with constant or variable flow control. The unit is provided with 2 relays and a 0-10V signal terminal to control the activation and the speed of 2 external variable speed pump. The pumps are controlled in duty/standby, with running hours equalization and changeover on device failure.	The hydronic module allows to control the external pumps with the unit controller logic. In case of water cooled chiller, the 0-10V signal, it allows to manage several condensing devices in order to maintain the condensing pressure in a pre-defined range in every applications: - for well water application to manage a 2 way modulating valve; - for cooling tower application to manage a 3 way modulation valve; - for dry-cooler or cooling tower application to modulate the fans' speed.	ALL
<b>4900 CD - COND. WATER FLOW CONTROL.</b>			
4903 CD - 2 WAY MODULATING VALVE A	Two way servo-motorized valve with steel body.	It's recommended in case of inverter pumps and water flow modulation.	ALL

## ACCESSORIES

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
4904 CD - 2 WAY MODULATING VALVE B	Two way servo-motorized valve with steel body.	It's recommended in case of inverter pumps and water flow modulation.	ALL
4905 CD - 2 WAY MODULATING VALVE C	Two way servo-motorized valve with steel body.	It's recommended in case of inverter pumps and water flow modulation.	ALL
4906 CD - 2 WAY MODULATING VALVE D	Two way servo-motorized valve with steel body.	It's recommended in case of inverter pumps and water flow modulation.	ALL
4907 CD - 2 WAY MODULATING VALVE E	Two way servo-motorized valve with steel body.	It's recommended in case of inverter pumps and water flow modulation.	ALL
4908 CD - 2 WAY MODULATING VALVE F	Two way servo-motorized valve with steel body.	It's recommended in case of inverter pumps and water flow modulation.	ALL
4909 CD - 2 WAY MODULATING VALVE G	Two way servo-motorized valve with steel body.	It's recommended in case of inverter pumps and water flow modulation.	ALL
4911 CD - 2 WAY MODULATING VALVE H	Two way servo-motorized valve with steel body.	It's recommended in case of inverter pumps and water flow modulation.	ALL
491B CD - SEG. 0-10V (1 X CIRCUITO)	0-10V signal on terminal board for the condensation control of the single circuit	The 0-10V signal, it allows to manage several condensing devices in order to maintain the condensing pressure in a pre-defined range in every applications: - for well water application to manage a 2 way modulating valve; - for cooling tower application to manage a 3 way modulation valve; - for dry-cooler or cooling tower application to modulate the fans' speed; - for geothermal probe to modulate the pumps' speed.	ALL
491C			ALL
<b>1440 USER INTERFACE</b>			
1442 KIPLink +7 INCH TOUCH SCREEN	In addition to KIPLink, the innovative user interface based on WiFi technology, the unit is equipped with the Touch interface, with a 7" WVGA colour display and a front USB port (WARNING: with outdoor temperature below 0°C the display response time may visibly increase).		ALL
1444 KIPLink + LARGE KEYBOARD	In addition to KIPLink, the innovative user interface based on WiFi technology, the unit is equipped with the Large keyboard with a wide LCD display and led icons.		ALL
6194 LARGE KEYBOARD	The unit is equipped with the Large keyboard with a wide LCD display and led icons.		ALL
6195 7 INCH TOUCH SCREEN	The unit is equipped with the Touch interface, with a 7" WVGA colour display and a front USB port (WARNING: with outdoor temperature below 0°C the display response time may visibly increase).	The touch-screen's technology is characterized by an easy-to-access data, and it allows an effective graphical representation of the main figures protecting the access through 3 privilege levels.	ALL
6196 KIPLink	The unit is equipped with KIPLink, the innovative user interface based on WiFi technology		ALL
<b>1570 POWER SOCKET</b>			
1571 POWER SOCKET 230V MAX 500VA	230V power socket in the electrical board, CEE 7/3 type (Schuko). The maximum power available is 500VA.	It allows to supply power to small electric/electronic devices (ligths, notebook, tablet, etc.) during maintenance operation.	ALL

## ACCESSORIES

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
<b>3370 D - HYDRONIC MODULE</b>			
3371 D - RELAY 1 PUMP (ON/OFF)	Desuperheater hydronic module. The unit is provided with 1 relay to control the activation of 1 external pump via single ON/OFF signal.	The hydronic module allows to control the external pumps with the unit controller logic. The partial heat recovery pumps are activated only when heat recovery is actually possible: compressors on, hot storage tank temperature lower than set-point and than compressor outlet gas temperature. The option minimizes pump consumption.	ALL
<b>1560 POWER SUPPLY CONFIGURATION</b>			
1561 DOUBLE POWER SUPPLY (ATS)	An ATS (Automatic Transfer Switch) is installed within the electrical board. The device automatically switches the electrical load between a principal power supply (i.e. mains) and an auxiliary power supply (i.e. backup generator). The ATS automatically senses if one of the sources has lost or gained power. When an outage occurs in the principal power supply, the switch autonomously switches over to the secondary line. When the main line becomes available again the supply is restored to this line. It is possible to set the line priority and frequency of checking.	It enhances system's redundancy and reliability. Reduces unit's downtime in case of mains power outage.	ALL
1562 DOUBLE P.SUPPLY (MOTOR. CH.OVER)	A motorized changeover is installed within the electrical board. The device switches the electrical load between a principal power supply (i.e. mains) and an auxiliary power supply (i.e. backup generator). The changeover is with remote control (i.e. signal of generator start up).	It enhances system's redundancy and reliability. Reduces unit's downtime in case of mains power outage.	ALL
<b>4500 FAST RESTART (UPS EXCLUDED)</b>			
4501 FAST RESTART (UPS EXCLUDED)	Unit fast restart management after power failure	The management of the fast restart allows to minimize downtimes in case of power failure, keeping all the necessary unit safeties. This option requires an external 203V AC 300VA UPS power supply, by customer.	ALL
4502 FAST RESTART (UPS INCLUDED)	Unit fast restart management after power failure	The management of the fast restart allows to minimize downtimes in case of power failure, keeping all the necessary unit safeties. This option includes an electric device capable of keeping the controller power supply uninterrupted during a power failure. For duration of the UPS longer than 30 minutes, please contact our sales department.	ALL
<b>1960 PRESSURE RELIEF VALVES</b>			
1961 DUAL RELIEF VALVES WITH SWITCH	Dual relief valve with switch	Allows to unselect a relief valve in order to service the unit avoiding medium or long inoperative periods	ALL
<b>2980 CONDENSER WATER CONN.</b>			
2981 FLANGES CONDENSER CONNECTION			ALL
2982 FLEXIBLE JOINT CONDENSER CONN.			ALL

## ACCESSORIES

ACCESSORIES	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
<b>3430 REFRIGERANT LEAK DETECTOR</b>			
3431 REFRIG. LEAK DETECTOR	Refrigerant leak detection system, supplied factory mounted and wired in the electrical board. In case of leak detection it will raise an alarm.	It promptly detects gas leakages	ALL
3432 REFRIG. LEAK DETECTOR+MIGR.	Refrigerant leak detection and migration system. In case the device detects a leakage the unit stops and stores the remaining refrigerant inside the evaporator, waiting for the intervention of a technician.	It promptly detects gas leakages, stops the unit and stores the remaining refrigerant.	ALL
<b>2100 ANTIVIBRATION MOUNTING</b>			
2101 RUBBER TYPE ANTIVIBR.MOUNTING			ALL
<b>9970 PACKING</b>			
9972 WOODEN BOX PACKING	Unit provided with wooden box		ALL
9973 WOODEN CAGE PACKING	Unit provided with wooden cage		ALL
9974 MARINE PACKING	Unit provided with barrier bag and wooden cage		ALL
9979 CONTAINER PACKING	Unit provided with container slides and covered with nylon		ALL
9995 METAL BARS, SUPPORTS AND NYLON	Unit provided with base metal bars, plastic supports and covered with nylon		ALL

## ACCESSORIES

### Additional information - IMPORTANT -

#### 1561 – Double power supply (ATS)

#### 1562 – Double power supply (motorized changeover)

These accessories entail the substitution of the standard general lock door isolator with a door microswitch that switches the changeover to 0 position (open). The transfer switch may require an enlarged electrical board. For further information, please contact our sales department.

#### 1953 – HWT KIT

The accessory entails oversized compressor motor and is available only for standard version (8355) and /D version (8356).

#### 491B – CD – 0-10V Signal (1 for circuit)

#### 491C – CD - 0-10V Signal (1 for unit)

Maximum controller in/out connections length is 30m.

#### 6161 – AUXILIARY SIGNAL 4-20mA

#### 6162 – REMOTE SIGNAL DOUBLE SP

Maximum  $\Delta T$  between the two set-points is 15°C.

#### 1511 – UNIT WITH SOFT-START

The device has an effect on 2 phases and results in an oversized electrical panel. The accessory requires the use of automatic circuit breakers on the compressors (opt. 3412).

#### 3301 – COMPRESSOR POWER FACTOR CORRECTION.

The device may require an oversized electrical panel.

#### 3431 – Refrigerant leak detector

#### 3432 – Refrigerant leak detector + migration

For the proper functioning, compressors enclosure kit is mandatory (opt. 2301).

#### 4501 – Fast restart (UPS excluded)

#### 4502 – Fast restart (UPS included)

The "fast restart" function is activated after a power failure when the voltage returns, if the thermoregulator demand is greater than or equal to 100%, or if the outlet temperature is above the upper neutral zone (in the case of neutral zone regulation) or is out of the regulation band (in the case of steps regulation).

When the power returns and the temperature is within the neutral zone or within the control band, the "fast restart" function is not activated and the machine starts normally.

The Fast Restart requires an external 230V AC UPS unit (not provided).

Tables 1 e 2 show time frames, defined from the power restoration.

Table 1 – First compressor start-up time	
Standard unit (1)	Unit with fast restart (1)
340"	25"(2)

(1) In order to protect the compressors, some safety timers are not altered: minimum shutdown time and maximum number of start-ups per hour.

Table 2 – Ramp-up time for 100% cooling capacity		
Compressor number	Standard unit (1)	Unit with fast restart (1)
1	520"	120" (2)
2	710"	130" (2)

Reference conditions: 12-7°C and 30-35°C.

(2) In case a condensing control valve were present, add 30".

The time frames in table 2 depend on:

- power outage duration
- cooling capacity required
- evaporator and condenser water temperature
- compressors' operating conditions before the power failure
- maximum number of starts per hour

For the above-mentioned elements, the data listed in table 2 are subject to a tolerance.

#### 1801 – Evaporator water flow switch

The accessory is supplied loose.

#### 2631 – Double insulation on evaporator

19mm thickness of the insulation.

#### 2301 – Compressor acoustical enclosure

Compressor enclosure is realized in peraluman panels with 30mm polyester acoustic insulation. The accessory leads to a noise reduction of 5 dB(A) (sound power level). This option entails an increase in the overall unit's dimensions.

#### 3381 – 25% minimum compressor step

The accessory implies a reduction of the unit efficiency.

#### 4864 - EV - VPF (plant DP trans excl)

#### 4865 - EV - VPF (plant DP trans incl)

#### 4866 - EV - VPF multi-unit system

With these accessories, the minimum leaving water temperature admitted is 5°C.

#### 4867 - EV - VPF.D

#### 4868 - EV - VPF.D multi-unit system

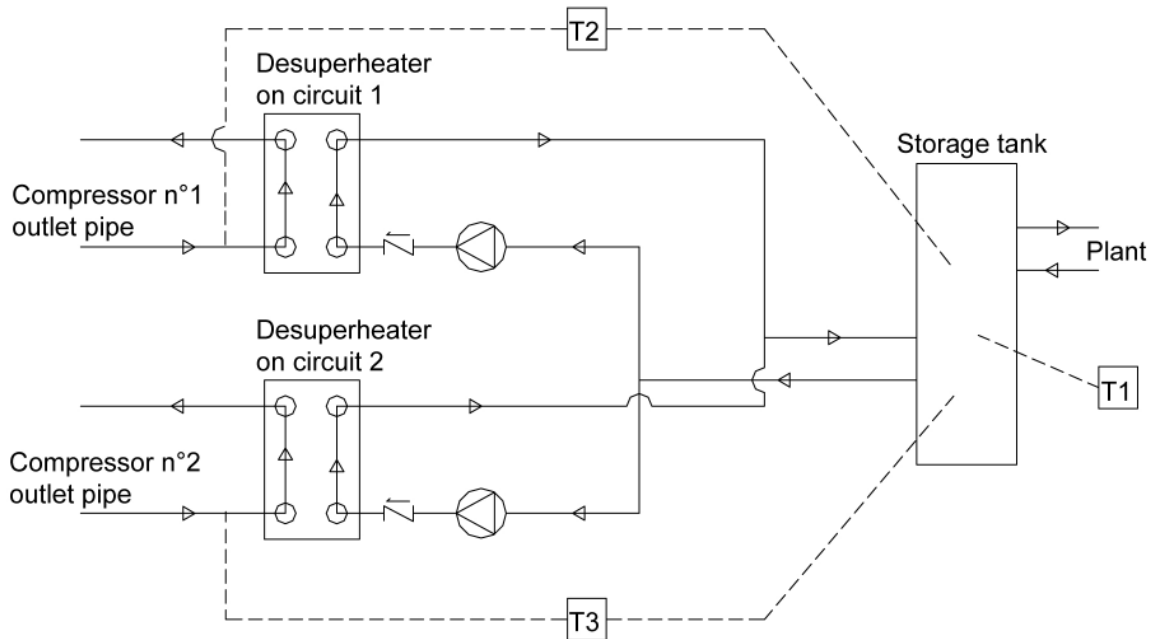
With these accessories, the minimum leaving water temperature admitted is 5°C.

#### 3371 - D - Relay 1 pump (ON/OFF)

The operating diagram of the device is provided below.

## ACCESSORIES

Figure 1 - Operating diagram of the “partial heat recovery control” device for a unit with two refrigerant circuits.



Note: the thermostats T1, T2 and T3 are supplied cabled. It is the customer's responsibility to place the temperature probes in the storage tank.

### 1201 Cu/Ni 90/10 water condenser

The use of Cu/Ni 90/10 condenser will result in an increase of the condensing temperature. For the new performance calculation please contact our sales department.

### C926108911 - KIT remote touch screen 7" (units with W3000 TE controller)

For remote touch screen user interface, the following electrical components are to be supplied by the customer:

- 24Vac or 24Vdc power supply for  $I_{max}=1A$
- Serial cable 3x1 mm<sup>2</sup> shielded and twisted, max length 500m total.

A single W3000 touch keyboard can be used for more than one unit (up to a maximum of 8) in remote mode.

In case of a multiple unit installation, maximum up to 8 units (of which maximum 6 units can be provided with +2P module) may be connected to one single remote touch screen keyboard only if the aforementioned units are provided with the same controller type and the same software version. For further information about multiple connections please refer to the Technical Manual of touch controller.

## ACCESSORIES

### Chiller Plant Control with Active Optimization System

#### ClimaPRO System Manager

ClimaPRO System Manager represents the state-of-the-art platform for chiller plant management and control.

ClimaPRO ensures to actively optimize the entire chiller plant by managing and adjusting each component directly involved in the production and the distribution of the heating and the cooling energies, therefore involving chillers and heat pumps, pumping groups as well as the source-side devices like, for example, the cooling towers.

In particular, ClimaPRO measures in real-time all the operating variables from the field, for each individual device and each of the main system branches, by using serial communication lines as well as dedicated analogue signals.

The acquired data are then compared with the design data of each single unit at any different working conditions, thus allowing to implement control strategies based on dynamic algorithms which take into account the real operating conditions.

On the basis of these values, an advanced diagnostic module also allows to assess the level of efficiency for each individual unit, translating data into easy-to-read information in order to simplify and optimize the maintenance activities.

The "Chart Builder" software module allows to display the trends of the main operating variables. The "Reporting" module allows to send reports to selected users, including data and system's status of the main devices as well as to perform calculation of the energy indexes for each single unit and for the entire chiller plant.

The accessibility to ClimaPRO System Manager is ensured by an integrated web server that makes it visible from any computer equipped with a web browser, either locally or remotely.



4.1 GENERAL TECHNICAL DATA

FR-W-G05-Z

[ SI System ]

FR-W-G05-Z		0551	0651	0751	0851	0951	1102	1302	1402	1502	1602	
Power supply		V/ph/Hz 400/3/50 400/3/50 400/3/50 400/3/50 400/3/50 400/3/50 400/3/50 400/3/50 400/3/50 400/3/50										
<b>PERFORMANCE</b>												
<b>COOLING ONLY (GROSS VALUE)</b>												
Cooling capacity	(1)	kW	124,3	140,5	166,3	198,2	221,7	252,4	285,1	311,9	345,2	366,2
Total power input	(1)	kW	25,50	28,41	35,57	40,52	46,10	51,04	56,86	64,04	71,26	76,05
EER	(1)	kW/kW	4,875	4,947	4,671	4,894	4,809	4,949	5,011	4,873	4,842	4,812
ESEER	(1)	kW/kW	5,970	5,950	5,960	5,940	5,930	6,320	6,240	6,220	6,120	6,110
<b>COOLING ONLY (EN14511 VALUE)</b>												
Cooling capacity	(1)(2)	kW	123,9	140,1	165,8	197,5	220,8	251,4	284,1	310,7	344,2	365,1
EER	(1)(2)	kW/kW	4,710	4,780	4,500	4,720	4,630	4,770	4,840	4,690	4,690	4,660
ESEER	(1)(2)	kW/kW	5,530	5,510	5,480	5,460	5,440	5,730	5,670	5,630	5,600	5,630
Cooling energy class			B	B	C	B	C	B	B	B	B	B
<b>COOLING WITH PARTIAL RECOVERY</b>												
Cooling capacity	(3)	kW	129,0	145,8	172,6	205,6	230,0	261,9	295,7	323,6	358,1	379,9
Total power input	(3)	kW	24,61	27,42	34,33	39,11	44,48	49,26	54,87	61,80	68,76	73,39
Desuperheater heating capacity	(3)	kW	11,02	12,27	15,37	17,51	19,91	22,05	24,57	27,67	30,78	32,86
<b>COOLING WITH TOTAL HEAT RECOVERY</b>												
Cooling capacity	(4)	kW	111,1	126,8	149,2	177,4	198,6	225,4	257,1	280,3	308,9	328,0
Total power input	(4)	kW	33,24	37,16	45,11	51,32	58,46	66,52	74,35	82,36	90,39	96,36
Recovery heat exchanger capacity	(4)	kW	142,4	161,8	191,6	225,6	253,5	287,9	327,0	357,7	393,8	418,6
<b>EXCHANGERS</b>												
<b>HEAT EXCHANGER USER SIDE IN REFRIGERATION</b>												
Water flow	(1)	l/s	5,944	6,719	7,954	9,479	10,60	12,07	13,63	14,91	16,51	17,51
Pressure drop	(1)	kPa	19,8	19,7	27,6	33,0	41,2	41,0	38,5	46,1	32,0	36,0
<b>HEAT EXCHANGER SOURCE SIDE IN REFRIGERATION</b>												
Water flow	(1)	l/s	7,133	8,045	9,611	11,37	12,75	14,45	16,29	17,90	19,83	21,06
Pressure drop	(1)	kPa	22,1	25,9	31,0	27,0	26,5	22,7	26,6	29,3	33,0	28,9
<b>PARTIAL RECOVERY USER SIDE IN REFRIGERATION</b>												
Water flow	(3)	l/s	0,532	0,592	0,742	0,845	0,961	1,064	1,186	1,336	1,486	1,586
Pressure drop	(3)	kPa	11,0	13,6	11,0	14,3	11,0	11,0	13,6	12,1	11,0	12,6
<b>HEAT EXCHANGER RECOVERY USER SIDE IN REFRIGERATION</b>												
Water flow	(4)	l/s	6,871	7,808	9,249	10,89	12,24	13,90	15,79	17,27	19,01	20,21
Pressure drop	(4)	kPa	20,5	24,4	28,7	24,7	24,5	21,0	25,0	27,2	30,3	26,6
<b>REFRIGERANT CIRCUIT</b>												
Compressors nr.		N°	1	1	1	1	1	2	2	2	2	2
Number of capacity steps		N°	0	0	0	0	0	0	0	0	0	0
No. Circuits		N°	1	1	1	1	1	2	2	2	2	2
Regulation			STEPLESS STEPLESS STEPLESS STEPLESS STEPLESS STEPLESS STEPLESS STEPLESS STEPLESS STEPLESS									
Min. capacity step		%	25	25	25	25	25	25	25	25	25	25
Refrigerant			R513A	R513A	R513A	R513A	R513A	R513A	R513A	R513A	R513A	R513A
Refrigerant charge		kg	24,0	34,0	32,0	59,0	57,0	47,0	68,0	66,0	63,0	91,0
Oil charge		kg	10,0	10,0	15,0	15,0	15,0	20,0	20,0	25,0	30,0	30,0
Rc (ASHRAE)	(5)	kg/kW	0,20	0,25	0,20	0,30	0,26	0,19	0,24	0,22	0,19	0,25
<b>NOISE LEVEL</b>												
Sound Pressure	(6)	dB(A)	75	75	76	76	76	78	77	78	78	78
Sound power level in cooling	(7)(8)	dB(A)	92	92	93	93	93	95	95	96	96	96
<b>SIZE AND WEIGHT</b>												
A	(9)	mm	2400	2600	2700	3000	3000	3000	3100	3100	3200	3200
B	(9)	mm	920	920	950	960	960	1100	1100	1100	1100	1200
H	(9)	mm	1500	1500	1500	1500	1500	1500	1500	1500	1600	1600
Operating weight	(9)	kg	1050	1110	1280	1450	1460	1710	1820	1990	2280	2430

Notes:

- 1 Plant (side) cooling exchanger water (in/out) 12,00°C/7,00°C; Source (side) heat exchanger water (in/out) 30,00°C/35,00°C.
- 2 Values in compliance with EN14511-3:2013.
- 3 Plant (side) cooling exchanger water (in/out): 12,00°C/7,00°C; Source (side) heat exchanger water (in/out): 30,00°C/35,00°C; Plant (side) heat exchanger recovery water (in/out): 40,00°C/45,00°C.
- 4 Plant (side) cooling exchanger water (in/out) 12,00°C/7,00°C; Plant (side) heat exchanger recovery water (in/out) 40,00°C/45,00°C.
- 5 Rated in accordance with AHRI Standard 550/590 (2011 with addendum 1).
- 6 Average sound pressure level at 1m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
- 7 Sound power on the basis of measurements made in compliance with ISO 9614.
- 8 Sound power level in cooling, indoors.
- 9 Unit in standard configuration/execution, without optional accessories.

- Not available

Certified data in EUROVENT



**GENERAL TECHNICAL DATA**
**FR-W-G05-Z**

[ SI System ]

<b>FR-W-G05-Z</b>		<b>1752</b>
Power supply		V/ph/Hz 400/3/50
<b>PERFORMANCE</b>		
<b>COOLING ONLY (GROSS VALUE)</b>		
Cooling capacity	(1)	kW 400,6
Total power input	(1)	kW 86,66
EER	(1)	kW/kW 4,621
ESEER	(1)	kW/kW 6,090
<b>COOLING ONLY (EN14511 VALUE)</b>		
Cooling capacity	(1)(2)	kW 399,2
EER	(1)(2)	kW/kW 4,480
ESEER	(1)(2)	kW/kW 5,580
Cooling energy class		C
<b>COOLING WITH PARTIAL RECOVERY</b>		
Cooling capacity	(3)	kW 415,6
Total power input	(3)	kW 83,63
Desuperheater heating capacity	(3)	kW 37,44
<b>COOLING WITH TOTAL HEAT RECOVERY</b>		
Cooling capacity	(4)	kW 359,3
Total power input	(4)	kW 109,8
Recovery heat exchanger capacity	(4)	kW 462,5
<b>EXCHANGERS</b>		
<b>HEAT EXCHANGER USER SIDE IN REFRIGERATION</b>		
Water flow	(1)	l/s 19,16
Pressure drop	(1)	kPa 43,0
<b>HEAT EXCHANGER SOURCE SIDE IN REFRIGERATION</b>		
Water flow	(1)	l/s 23,19
Pressure drop	(1)	kPa 24,8
<b>PARTIAL RECOVERY USER SIDE IN REFRIGERATION</b>		
Water flow	(3)	l/s 1,807
Pressure drop	(3)	kPa 12,4
<b>HEAT EXCHANGER RECOVERY USER SIDE IN REFRIGERATION</b>		
Water flow	(4)	l/s 22,32
Pressure drop	(4)	kPa 23,0
<b>REFRIGERANT CIRCUIT</b>		
Compressors nr.		N° 2
Number of capacity steps		N° 0
No. Circuits		N° 2
Regulation		STEPLESS
Min. capacity step		% 25
Refrigerant		R513A
Refrigerant charge		kg 116
Oil charge		kg 30,0
Rc (ASHRAE)	(5)	kg/kW 0,29
<b>NOISE LEVEL</b>		
Sound Pressure	(6)	dB(A) 78
Sound power level in cooling	(7)(8)	dB(A) 96
<b>SIZE AND WEIGHT</b>		
A	(9)	mm 3200
B	(9)	mm 1200
H	(9)	mm 1600
Operating weight	(9)	kg 2590

**Notes:**

1 Plant (side) cooling exchanger water (in/out) 12,00°C/7,00°C; Source (side) heat exchanger water (in/out) 30,00°C/35,00°C.

2 Values in compliance with EN14511-3:2013.

3 Plant (side) cooling exchanger water (in/out): 12,00°C/7,00°C; Source (side) heat exchanger water (in/out): 30,00°C/35,00°C; Plant (side) heat exchanger recovery water (in/out): 40,00°C/45,00°C.

4 Plant (side) cooling exchanger water (in/out) 12,00°C/7,00°C; Plant (side) heat exchanger recovery water (in/out) 40,00°C/45,00°C.

5 Rated in accordance with AHRI Standard 550/590 (2011 with addendum 1).

6 Average sound pressure level at 1m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.

7 Sound power on the basis of measurements made in compliance with ISO 9614.

8 Sound power level in cooling, indoors.

9 Unit in standard configuration/execution, without optional accessories.

- Not available

Certified data in EUROVENT

## GENERAL TECHNICAL DATA

### ENERGY EFFICIENCY

#### SEASONAL EFFICIENCY IN COOLING (Reg. EU 2016/2281) Process refrigeration at high temperature

FR-W-G05-Z			0551	0651	0751	0851	0951	1102	1302	1402	1502	1602	1752
Prated,c	(1)	kW	123,90	140,10	165,80	197,50	220,80	251,40	284,10	310,70	344,20	365,10	399,20
SEPR	(1)(2)		7,00	7,04	7,00	7,02	7,00	7,01	7,03	7,02	7,02	7,00	7,00

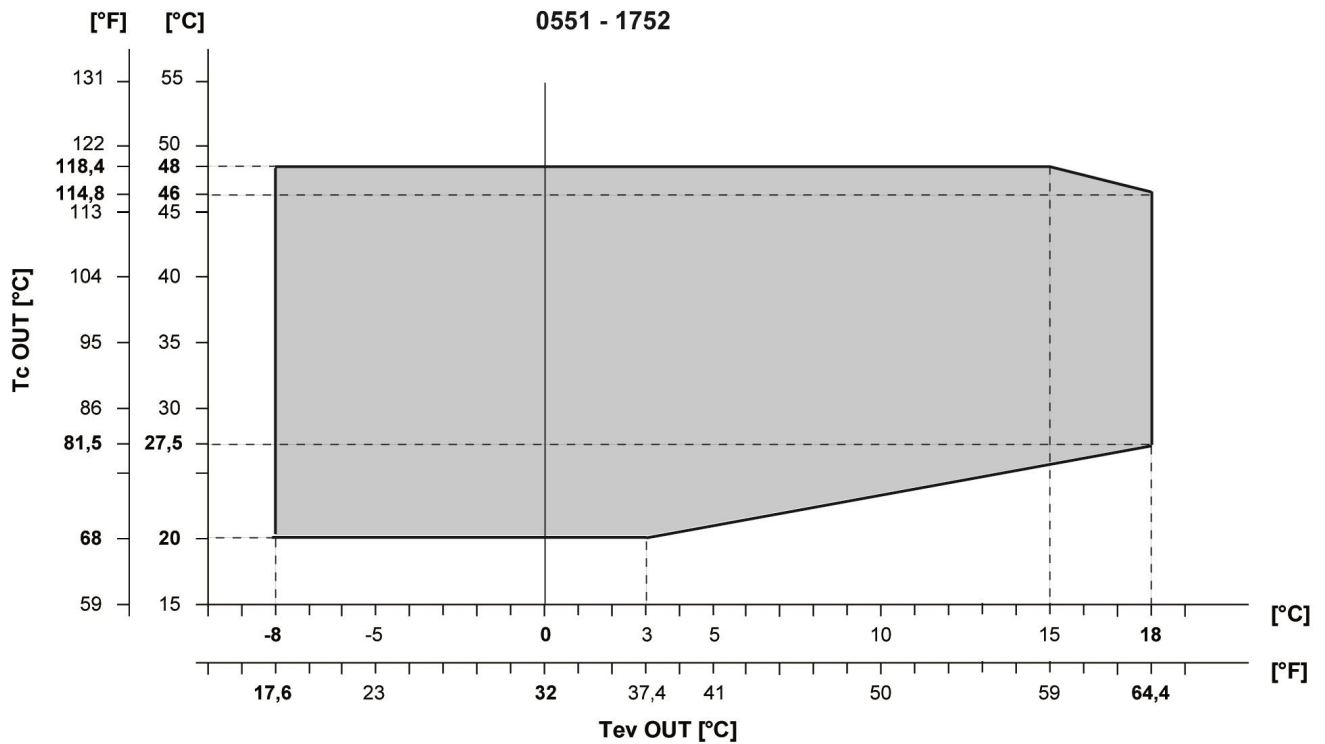
Notes:

(1) Seasonal energy efficiency of high temperature process cooling [REGULATION (EU) N. 2016/2281]

(2) Seasonal space heating energy index

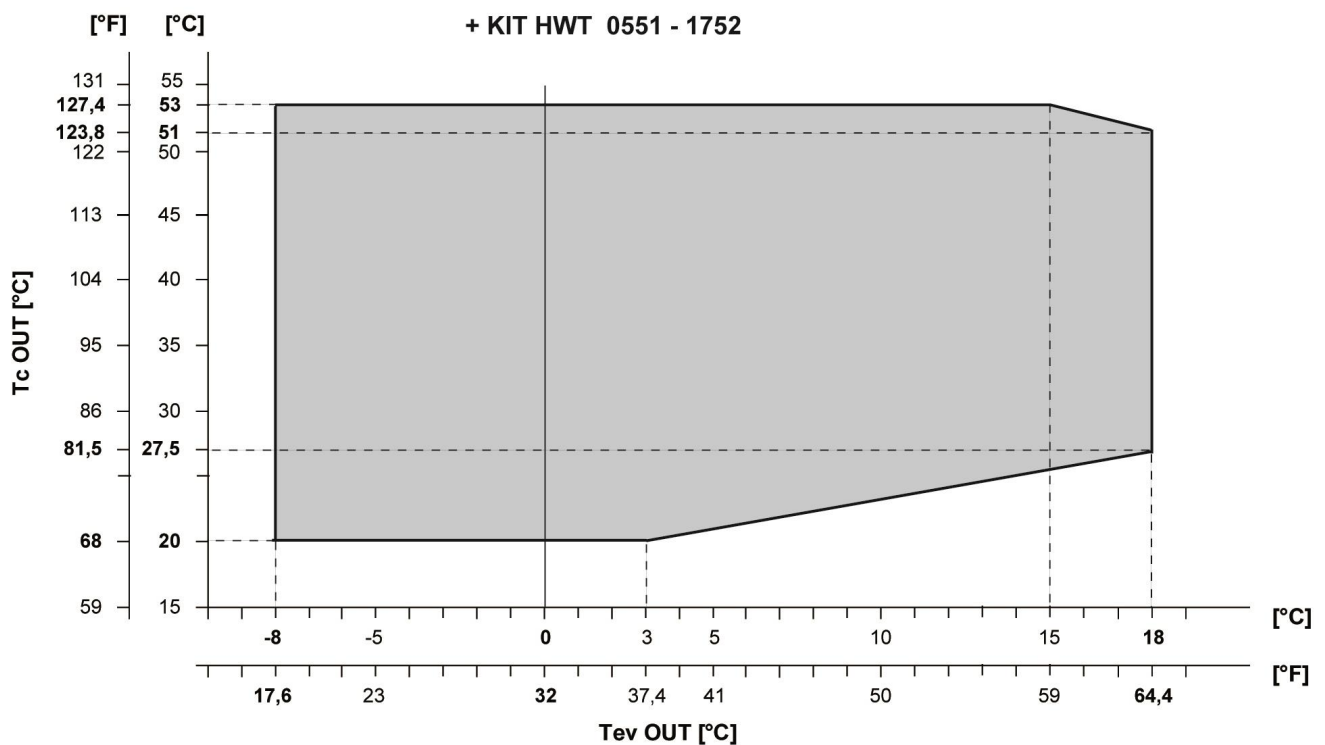
Certified data in EUROVENT

## 5.1 OPERATING LIMITS



**Tc out** Source (side) heat exchanger water  
**Tev out** Plant (side) cooling exchanger water

For the limits of single size and version refer to software ELCA.



**Tc out** Source (side) heat exchanger water  
**Tev out** Plant (side) cooling exchanger water

For the limits of single size and version refer to software ELCA.

**OPERATING LIMITS****FR-W-G05-Z 0551 - 1752**

SIZE
FR-W-G05-Z /0551
FR-W-G05-Z /0651
FR-W-G05-Z /0751
FR-W-G05-Z /0851
FR-W-G05-Z /0951
FR-W-G05-Z /1102
FR-W-G05-Z /1302
FR-W-G05-Z /1402
FR-W-G05-Z /1502
FR-W-G05-Z /1602
FR-W-G05-Z /1752
FR-W-G05-Z /D /0551
FR-W-G05-Z /D /0651
FR-W-G05-Z /D /0751
FR-W-G05-Z /D /0851
FR-W-G05-Z /D /0951
FR-W-G05-Z /D /1102
FR-W-G05-Z /D /1302
FR-W-G05-Z /D /1402
FR-W-G05-Z /D /1502
FR-W-G05-Z /D /1602
FR-W-G05-Z /D /1752
FR-W-G05-Z /R /0551
FR-W-G05-Z /R /0651
FR-W-G05-Z /R /0751
FR-W-G05-Z /R /0851
FR-W-G05-Z /R /0951
FR-W-G05-Z /R /1102
FR-W-G05-Z /R /1302
FR-W-G05-Z /R /1402
FR-W-G05-Z /R /1502
FR-W-G05-Z /R /1602
FR-W-G05-Z /R /1752

**5.2 ETHYLENE GLYCOL MIXTURE**

Ethylene glycol and water mixture, used as a heat-conveying fluid, cause a variation in unit performance. For correct data, use the factors indicated in the following tabel.

	Freezing point (°C)							
	0	-5	-10	-15	-20	-25	-30	-35
	Ethylene glycol percentage by weight							
	0%	12%	20%	30%	35%	40%	45%	50%
cPf	1	0,985	0,98	0,974	0,97	0,965	0,964	0,96
cQ	1	1,02	1,04	1,075	1,11	1,14	1,17	1,2
cdp	1	1,07	1,11	1,18	1,22	1,24	1,27	1,3

cPf: cooling power correction factor  
 cQ: flow correction factor  
 cdp: pressure drop correction factor

For data concerning other kind of anti-freeze solutions (e.g. propylene glycol) please contact our Sale Department.

**5.3 FOULING FACTORS**

Performances are based on clean condition of tubes (fouling factor = 1). For different fouling values, performance should be adjusted using the correction factors shown in the following table.

SERIES	FOULING FACTORS	EVAPORATOR			CONDENSER/RECOVERY			DESUPERHEATER
	ff (m <sup>2</sup> °CW)	F1	FK1	KE [°C]	F2	FK2	KC [°C]	R3
VARIOUS	0	1,000	1,000	0,0	1,000	1,000	0,0	1,000
VARIOUS	1,80 x 10 <sup>-5</sup>	1,000	1,000	0,0	1,000	1,000	0,0	1,000
VARIOUS	4,40 x 10 <sup>-5</sup>	1,000	1,000	0,0	0,990	1,030	1,0	0,990
VARIOUS	8,80 x 10 <sup>-5</sup>	0,960	0,990	0,7	0,980	1,040	1,5	0,980
VARIOUS	13,20 x 10 <sup>-5</sup>	0,944	0,985	1,0	0,964	1,050	2,3	0,964
VARIOUS	17,20 x 10 <sup>-5</sup>	0,930	0,980	1,5	0,950	1,060	3,0	0,950

ff: fouling factors  
 F1 - F2: potential correction factors  
 FK1 - FK2: compressor power input correction factors  
 R3: capacity correction factors  
 KE: minimum evaporator outlet temperature increase  
 KC: maximum condenser outlet temperature decrease

## 6.1 HYDRAULIC DATA

[ SI System ]

### Water flow and pressure drop

Water flow in the plant (side) exchanger is given by:

$$Q = P / (4,186 \times \Delta t)$$

Q: water flow (l/s)

$\Delta t$ : difference between inlet and outlet water temp. (°C)

P: heat exchanger capacity (kW)

Pressure drop is given by:

$$\Delta p = K \times (3,6 \times Q)^2 / 1000$$

Q: water flow (l/s)

$\Delta p$ : pressure drop (kPa)

K: unit size ratio

SIZE	Power supply V/ph/Hz	HEAT EXCHANGER USER SIDE					HEAT EXCHANGER SOURCE SIDE				HEAT RECOVERY EX. USER SIDE			
		K	Q min l/s	Q max l/s	C.A.S. l	C.a. min l	K [1]	Q min [2] l/s	Q max l/s	C.A.S. l	K	Q min l/s	Q max l/s	C.A.S. l
FR-W-G05-Z /0551	400/3/50	43,3	4,417	20,47	67,7	620	33,5	2,122	12,22	21,9	-	-	-	-
FR-W-G05-Z /0651	400/3/50	33,7	4,417	20,47	61,8	700	30,9	2,333	13,44	26,3	-	-	-	-
FR-W-G05-Z /0751	400/3/50	33,7	4,417	20,47	61,8	830	25,9	2,544	14,67	28,7	-	-	-	-
FR-W-G05-Z /0851	400/3/50	28,3	6,389	14,72	90,0	990	16,1	3,194	18,33	35,8	-	-	-	-
FR-W-G05-Z /0951	400/3/50	28,3	6,389	14,72	90,0	1110	12,6	3,611	20,78	40,6	-	-	-	-
FR-W-G05-Z /1102	400/3/50	21,7	7,222	16,67	85,0	880	8,38	4,250	24,44	43,8	-	-	-	-
FR-W-G05-Z /1302	400/3/50	16,0	8,333	19,44	80,0	1000	7,74	4,667	26,89	52,6	-	-	-	-
FR-W-G05-Z /1402	400/3/50	16,0	8,333	19,44	80,0	1090	7,05	4,889	28,11	55,0	-	-	-	-
FR-W-G05-Z /1502	400/3/50	9,05	9,167	26,94	116	1210	6,47	5,083	29,33	57,4	-	-	-	-
FR-W-G05-Z /1602	400/3/50	9,05	9,167	26,94	116	1280	5,03	5,722	33,00	64,5	-	-	-	-
FR-W-G05-Z /1752	400/3/50	9,05	9,167	26,94	116	1400	3,56	6,778	39,11	76,4	-	-	-	-
FR-W-G05-Z /D /0551	400/3/50	43,3	4,417	20,47	67,7	620	33,5	2,122	12,22	21,9	2990	-	1,583	2,80
FR-W-G05-Z /D /0651	400/3/50	33,7	4,417	20,47	61,8	700	30,9	2,333	13,44	26,3	2990	-	1,583	2,80
FR-W-G05-Z /D /0751	400/3/50	33,7	4,417	20,47	61,8	830	25,9	2,544	14,67	28,7	1542	-	2,222	3,40
FR-W-G05-Z /D /0851	400/3/50	28,3	6,389	14,72	90,0	990	16,1	3,194	18,33	35,8	1542	-	2,222	3,40
FR-W-G05-Z /D /0951	400/3/50	28,3	6,389	14,72	90,0	1110	12,6	3,611	20,78	40,6	920	-	2,861	4,00
FR-W-G05-Z /D /1102	400/3/50	21,7	7,222	16,67	85,0	880	8,38	4,250	24,44	43,8	748	-	3,167	5,60
FR-W-G05-Z /D /1302	400/3/50	16,0	8,333	19,44	80,0	1000	7,74	4,667	26,89	52,6	748	-	3,167	5,60
FR-W-G05-Z /D /1402	400/3/50	16,0	8,333	19,44	80,0	1090	7,05	4,889	28,11	55,0	522	-	3,806	6,20
FR-W-G05-Z /D /1502	400/3/50	9,05	9,167	26,94	116	1210	6,47	5,083	29,33	57,4	386	-	4,444	6,80
FR-W-G05-Z /D /1602	400/3/50	9,05	9,167	26,94	116	1280	5,03	5,722	33,00	64,5	386	-	4,444	6,80
FR-W-G05-Z /D /1752	400/3/50	9,05	9,167	26,94	116	1400	3,56	6,778	39,11	76,4	293	-	5,083	7,40
FR-W-G05-Z /R /0551	400/3/50	43,3	4,417	20,47	67,7	620	33,5	4,250	12,22	21,9	33,5	4,250	12,22	21,9
FR-W-G05-Z /R /0651	400/3/50	33,7	4,417	20,47	61,8	700	30,9	4,667	13,44	26,3	30,9	4,667	13,44	26,3
FR-W-G05-Z /R /0751	400/3/50	33,7	4,417	20,47	61,8	830	25,9	5,083	14,67	28,7	25,9	5,083	14,67	28,7
FR-W-G05-Z /R /0851	400/3/50	28,3	6,389	14,72	90,0	990	16,1	6,361	18,33	35,8	16,1	6,361	18,33	35,8
FR-W-G05-Z /R /0951	400/3/50	28,3	6,389	14,72	90,0	1110	12,6	7,222	20,78	40,6	12,6	7,222	20,78	40,6
FR-W-G05-Z /R /1102	400/3/50	21,7	7,222	16,67	85,0	880	8,38	8,472	24,44	43,8	8,38	8,472	24,44	43,8
FR-W-G05-Z /R /1302	400/3/50	16,0	8,333	19,44	80,0	1000	7,74	9,333	26,89	52,6	7,74	9,333	26,89	52,6
FR-W-G05-Z /R /1402	400/3/50	16,0	8,333	19,44	80,0	1090	7,05	9,750	28,11	55,0	7,05	9,750	28,11	55,0
FR-W-G05-Z /R /1502	400/3/50	9,05	9,167	26,94	116	1210	6,47	10,17	29,33	57,4	6,47	10,17	29,33	57,4
FR-W-G05-Z /R /1602	400/3/50	9,05	9,167	26,94	116	1280	5,03	11,44	33,00	64,5	5,03	11,44	33,00	64,5
FR-W-G05-Z /R /1752	400/3/50	9,05	9,167	26,94	116	1400	3,56	13,58	39,11	76,4	3,56	13,58	39,11	76,4

The coefficient "K" on the source side heat exchanger is referred to its standart selection. When it's required to move to an higher number of steps water side (with  $\Delta T \geq 10^\circ\text{C}$ ), "K" coefficient as to be multiplied for 8,5 ( $K_{\text{new}} = K \times 8,5$ )

Q min: minimum water flow admitted to the heat exchanger

Q min [2]: minimum water flow admitted to the heat exchanger

Q max: maximum water flow admitted to the heat exchanger

C.a. min: minimum water content admitted in the plant

C.A.S.: Exchanger water content

## 7.1 ELECTRICAL DATA

## FR-W-G05-Z

[ SI System ]

SIZE	Power supply V/ph/Hz	Maximum values						
		Compressor			Total (1)			
		n	F.L.I. [kW]	F.L.A. [A]	L.R.A. [A]	F.L.I. [kW]	F.L.A. [A]	S.A. [A]
0551	400/3/50	1	1x38,3	1x63,8	1x169	38,30	64	169
0651	400/3/50	1	1x43,2	1x72,1	1x218	43,00	72	218
0751	400/3/50	1	1x50,9	1x84,4	1x267	51,00	84	267
0851	400/3/50	1	1x58,2	1x95,7	1x290	58,00	96	290
0951	400/3/50	1	1x66,3	1x109,2	1x350	66,00	109	350
1102	400/3/50	2	2x38,3	2x63,8	2x169	77,00	128	211
1302	400/3/50	2	2x43,2	2x72,1	2x218	86,00	144	265
1402	400/3/50	2	1x43,2+1x50,9	1x72,1+1x84,4	1x218+1x267	94,00	157	314
1502	400/3/50	2	2x50,9	2x84,4	2x267	102,0	169	326
1602	400/3/50	2	1x50,9+1x58,2	1x84,4+1x95,7	1x267+1x290	109,0	180	349
1752	400/3/50	2	1x58,2+1x66,3	1x95,7+1x109,2	1x290+1x350	125,0	205	415

F.L.I.: Full load power

F.L.A.: Full load current

L.R.A.: Locked rotor amperes for single compressor

S.A.: Inrush current

(1) Safety values to be considered when cabling the unit for power supply and line-protections

Data valid for standard units without any additional option.

Plant (side) cooling exchanger water (in/out) 12,00°C/7,00°C; Source (side) heat exchanger water (in/out) 30,00°C/35,00°C.

Voltage tolerance: 10%

Maximum voltage unbalance: 3%

Given the typical operating conditions of units designed for indoor installation, which can be associated (according to reference document IEC 60721) to the following classes:

- climatic conditions class AA4: air temperature range from 5 up to 42°C (\*)
- special climatic conditions negligible
- presence of water class AD2: possibility of water dripping inside the technical room
- biological conditions class 4B1 and 4C2: negligible presence of corrosive and polluting substances
- mechanically active substances class 4S2: locations in areas with sand or dust sources

The required protection level for safe operation, according to reference document IEC 60529, is IP21 BW (protection against access of external devices with diameter larger than 12 mm and water falling vertically).

The unit can be considered IP21 CW protected, thus fulfilling the above operating conditions.

(\*) for the unit's operating limits, see "selection limits" section

## 8.1 FULL LOAD SOUND LEVEL

## FR-W-G05-Z

SOUND POWER LEVEL IN COOLING									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound power level dB								
0551	70	73	88	87	89	84	78	67	92
0651	70	73	88	87	89	84	78	67	92
0751	71	74	89	88	90	85	79	68	93
0851	71	74	89	88	90	85	79	68	93
0951	71	74	89	88	90	85	79	68	93
1102	73	76	91	90	92	87	81	71	95
1302	73	76	91	90	92	87	81	71	95
1402	74	77	92	91	93	88	82	72	96
1502	74	77	92	91	93	88	82	72	96
1602	74	77	92	91	93	88	82	72	96
1752	74	77	92	91	93	88	82	72	96

### Working conditions

Plant (side) cooling exchanger water (in/out) 12,00°C/7,00°C; Source (side) heat exchanger water (in/out) 30,00°C/35,00°C.

Sound power on the basis of measurements made in compliance with ISO 9614.

Such certification refers specifically to the sound Power Level in dB(A). This is therefore the only acoustic data to be considered as binding.

Sound power level in cooling, indoors.

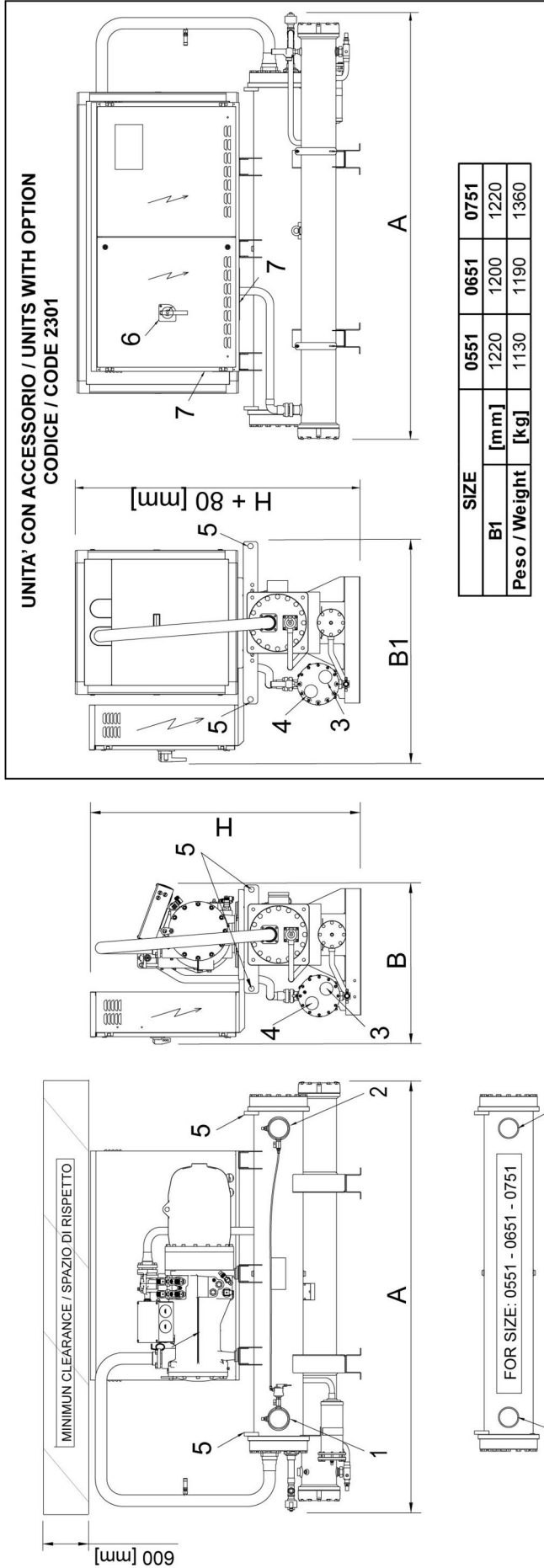
SOUND PRESSURE LEVEL									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound pressure level dB								
0551	53	56	71	70	72	67	61	50	75
0651	53	56	71	70	72	67	61	50	75
0751	54	57	72	71	73	68	62	51	76
0851	54	57	72	71	73	68	62	51	76
0951	54	57	72	71	73	68	62	51	76
1102	56	59	74	73	75	70	64	54	78
1302	55	58	73	72	74	69	63	53	77
1402	56	59	74	73	75	70	64	54	78
1502	56	59	74	73	75	70	64	54	78
1602	56	59	74	73	75	70	64	54	78
1752	56	59	74	73	75	70	64	54	78

### Working conditions

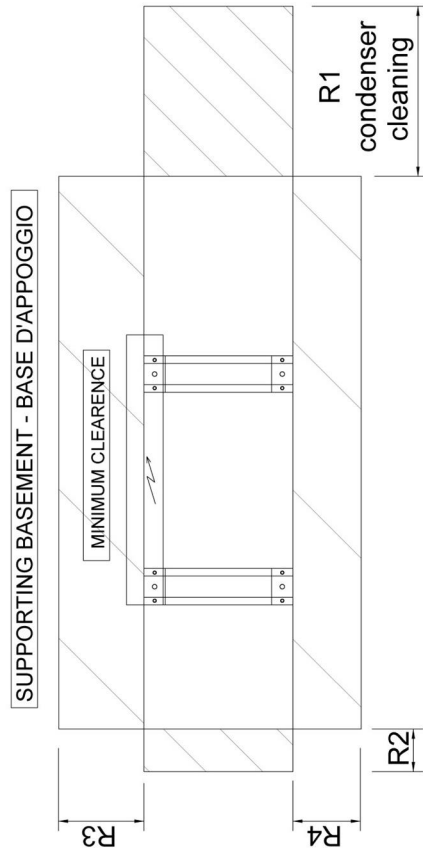
Plant (side) cooling exchanger water (in/out) 12,00°C/7,00°C; Source (side) heat exchanger water (in/out) 30,00°C/35,00°C.

Average sound pressure level at 1m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.





- 1 - EVAPORATOR WATER INLET  
ENTRATA ACQUA EVAPORATORE
- 2 - EVAPORATOR WATER OUTLET  
USCITA ACQUA EVAPORATORE
- 3 - CONDENSER WATER INLET  
ENTRATA ACQUA CONDENSATORE
- 4 - CONDENSER WATER OUTLET  
USCITA ACQUA CONDENSATORE
- 5 - LIFTING POINTS  
PUNTI DI SOLLEVAMENTO
- 6 - MAIN ISOLATOR  
SEZIONATORE PRINCIPALE
- 7 - POWER INLET  
INGRESSO LINEA ELETTRICA

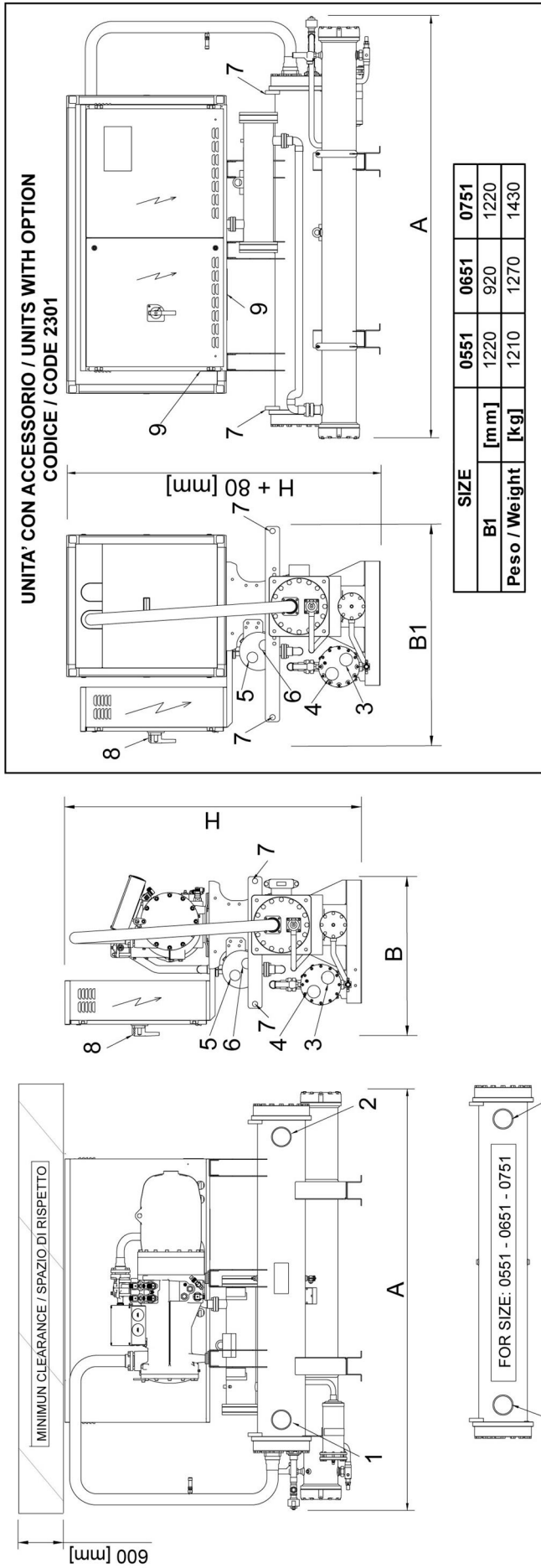


**DIMENSIONAL DRAWINGS**

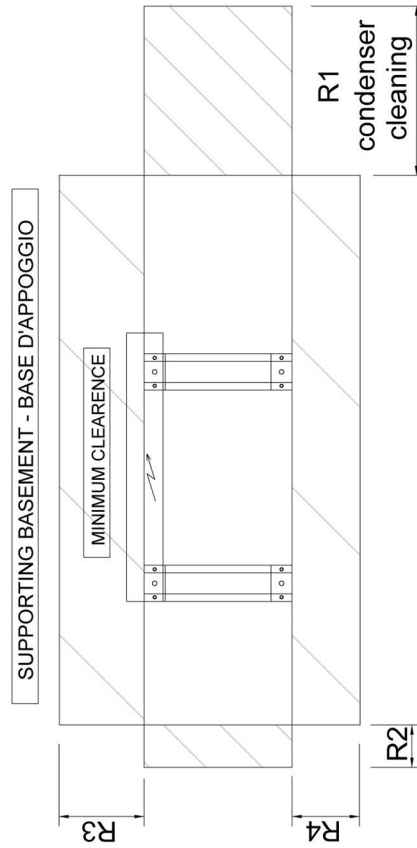
**FR-W-G05-Z 0551 - 1752**

[ SI System ]

SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE		HEAT EXCHANGER SOURCE SIDE		HEAT RECOVERY EX. USER SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT		IN/OUT		IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø	TYPE	Ø	TYPE	Ø
<b>FR-W-G05-Z /0551</b>	2400	920	1500	1050	2000	500	1000	800	H	4"	E	2" 1/2	-	-
<b>FR-W-G05-Z /0651</b>	2600	920	1500	1110	2000	500	1000	800	H	4"	E	2" 1/2	-	-
<b>FR-W-G05-Z /0751</b>	2700	950	1500	1280	2000	500	1000	800	H	4"	E	2" 1/2	-	-



- 1 - EVAPORATOR WATER INLET  
ENTRATA ACQUA EVAPORATORE
- 2 - EVAPORATOR WATER OUTLET  
USCITA ACQUA EVAPORATORE
- 3 - CONDENSER WATER INLET  
ENTRATA ACQUA CONDENSATORE
- 4 - CONDENSER WATER OUTLET  
USCITA ACQUA CONDENSATORE
- 5 - DESUPERHEATER WATER INLET  
ENTRATA ACQUA DESURRISCALDATORE
- 6 - DESUPERHEATER WATER OUTLET  
USCITA ACQUA DESURRISCALDATORE
- 7 - LIFTING POINTS  
PUNTI DI SOLLEVAMENTO
- 8 - MAIN ISOLATOR  
SEZIONATORE PRINCIPALE
- 9 - POWER INLET  
INGRESSO LINEA ELETTRICA

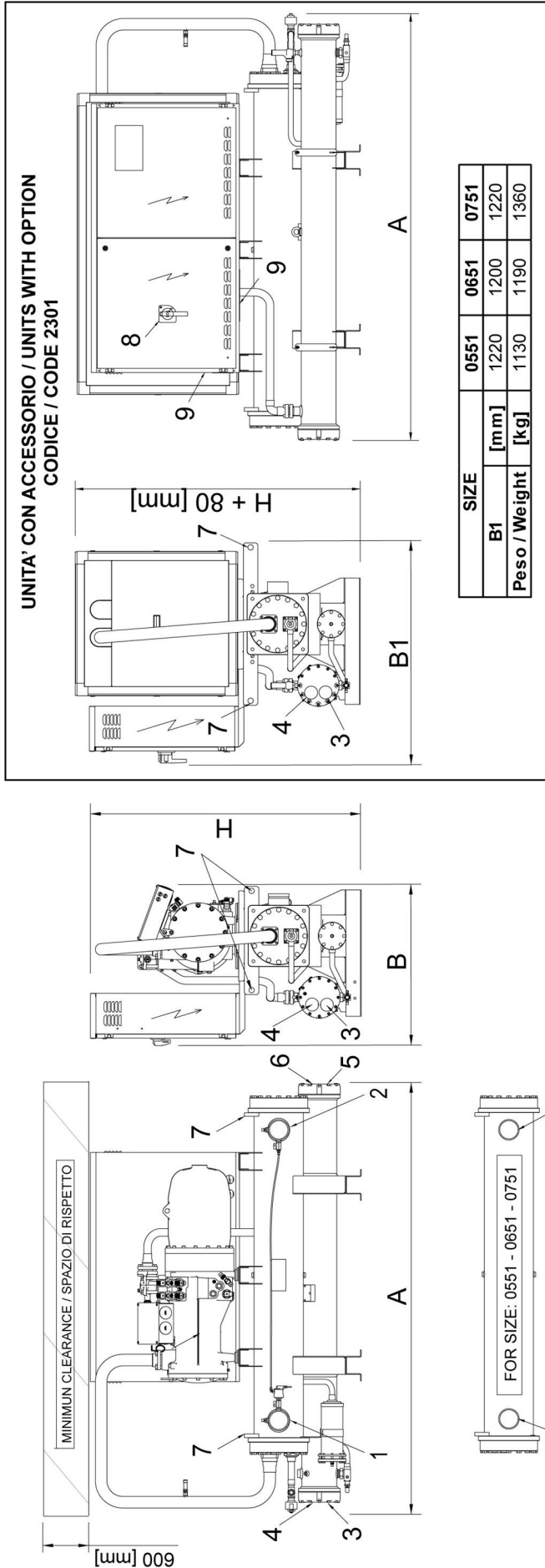


**DIMENSIONAL DRAWINGS**

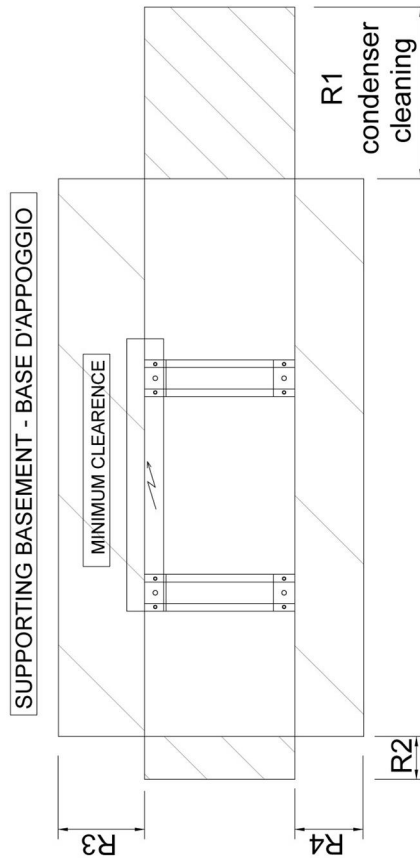
**FR-W-G05-Z 0551 - 1752**

[ SI System ]

SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE		HEAT EXCHANGER SOURCE SIDE		HEAT RECOVERY EX. USER SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT		IN/OUT		IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø	TYPE	Ø	TYPE	Ø
FR-W-G05-Z /D /0551	2400	920	1690	1120	2000	500	1000	800	H	4"	E	2" 1/2	E	2"
FR-W-G05-Z /D /0651	2600	920	1690	1180	2000	500	1000	800	H	4"	E	2" 1/2	E	2"
FR-W-G05-Z /D /0751	2700	950	1690	1350	2000	500	1000	800	H	4"	E	2" 1/2	E	2"



- 1 - EVAPORATOR WATER INLET  
ENTRATA ACQUA EVAPORATORE
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USCITA ACQUA EVAPORATORE
- 3 - CONDENSER WATER INLET  
ENTRATA ACQUA CONDENSATORE
- 4 - CONDENSER WATER OUTLET  
USCITA ACQUA CONDENSATORE
- 5 - HEAT RECOVERY WATER INLET  
ENTRATA ACQUA RECUPERATORE
- 6 - HEAT RECOVERY WATER OUTLET  
USCITA ACQUA RECUPERATORE
- 7 - LIFTING POINTS  
PUNTI DI SOLLEVAMENTO
- 8 - MAIN ISOLATOR  
SEZIONATORE PRINCIPALE
- 9 - POWER INLET  
INGRESSO LINEA ELETTRICA

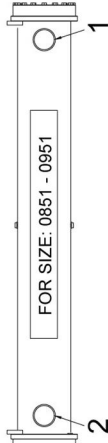
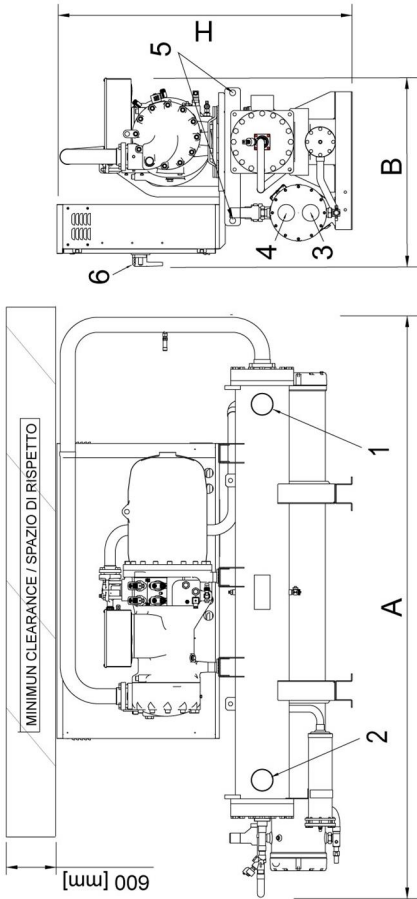
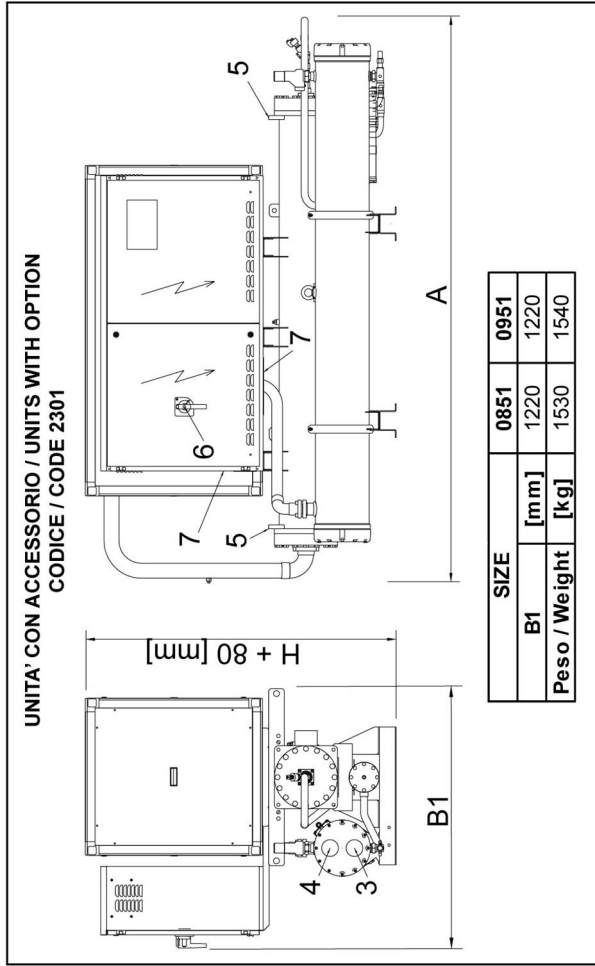


**DIMENSIONAL DRAWINGS**

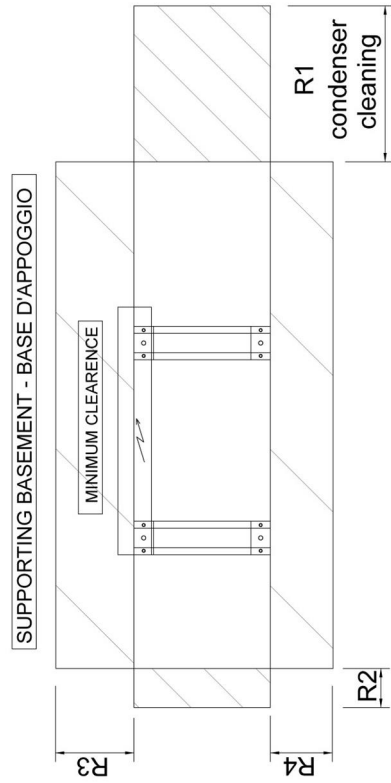
**FR-W-G05-Z 0551 - 1752**

[ SI System ]

SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE		HEAT EXCHANGER SOURCE SIDE		HEAT RECOVERY EX. USER SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT		IN/OUT		IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø	TYPE	Ø	TYPE	Ø
FR-W-G05-Z /R /0551	2400	920	1650	1218	2000	500	1000	800	H	4"	E	2" 1/2	E	2" 1/2
FR-W-G05-Z /R /0651	2600	920	1650	1276	2000	500	1000	800	H	4"	E	2" 1/2	E	2" 1/2
FR-W-G05-Z /R /0751	2700	950	1650	1560	2000	500	1000	800	H	4"	E	3"	E	3"



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INGRESSO LINEA ELETTRICA



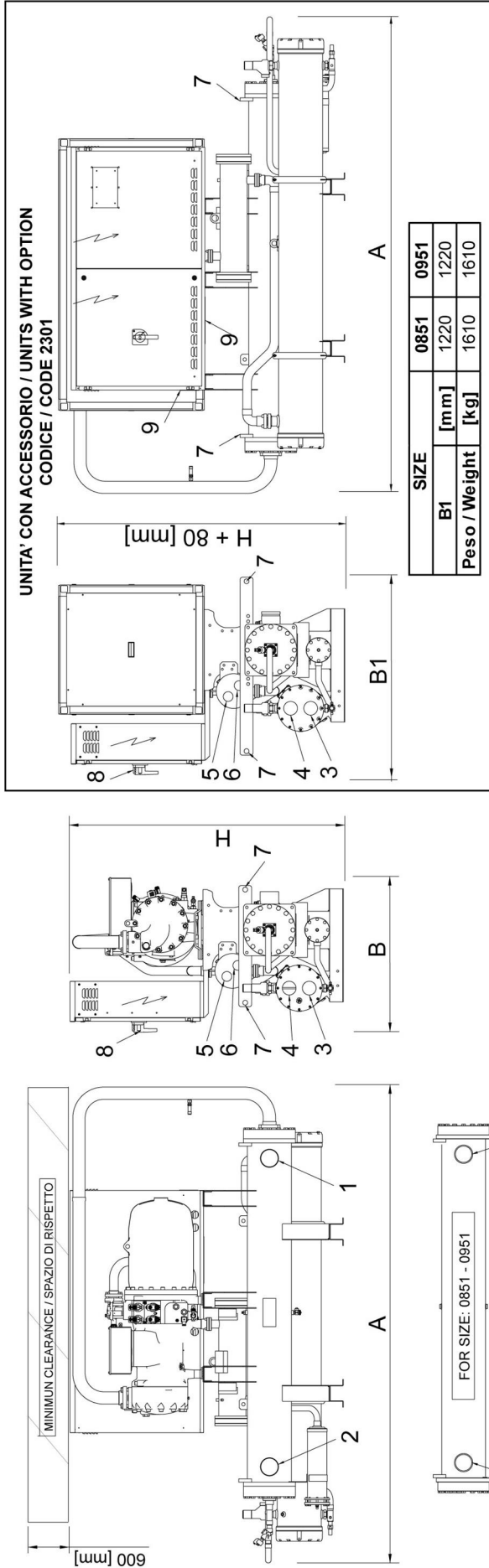
**DIMENSIONAL DRAWINGS**

**FR-W-G05-Z 0551 - 1752**

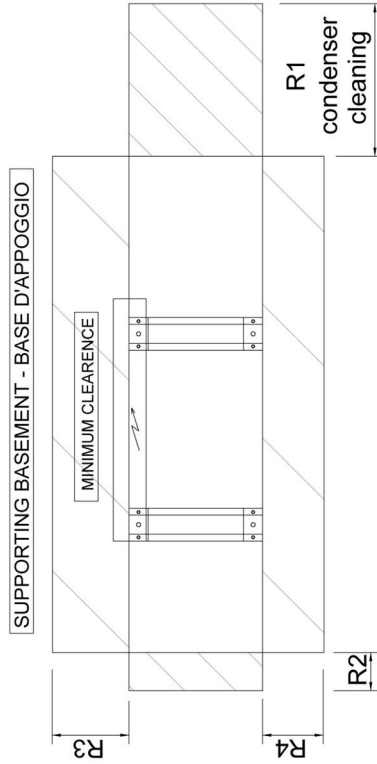
[ SI System ]

SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE		HEAT EXCHANGER SOURCE SIDE		HEAT RECOVERY EX. USER SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT		IN/OUT		IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø	TYPE	Ø	TYPE	Ø
<b>FR-W-G05-Z /0851</b>	3000	960	1500	1450	2000	500	1000	800	H	4"	E	3"	-	-
<b>FR-W-G05-Z /0951</b>	3000	960	1500	1460	2000	500	1000	800	H	4"	E	3"	-	-





- 1 - EVAPORATOR WATER INLET  
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USCITA ACQUA CONDENSATORE
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ENTRATA ACQUA DESURRISCALDATORE
- 6 - DESUPERHEATER WATER OUTLET  
USCITA ACQUA DESURRISCALDATORE
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PUNTI DI SOLLEVAMENTO
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SEZIONATORE PRINCIPALE
- 9 - POWER INLET  
INGRESSO LINEA ELETTRICA

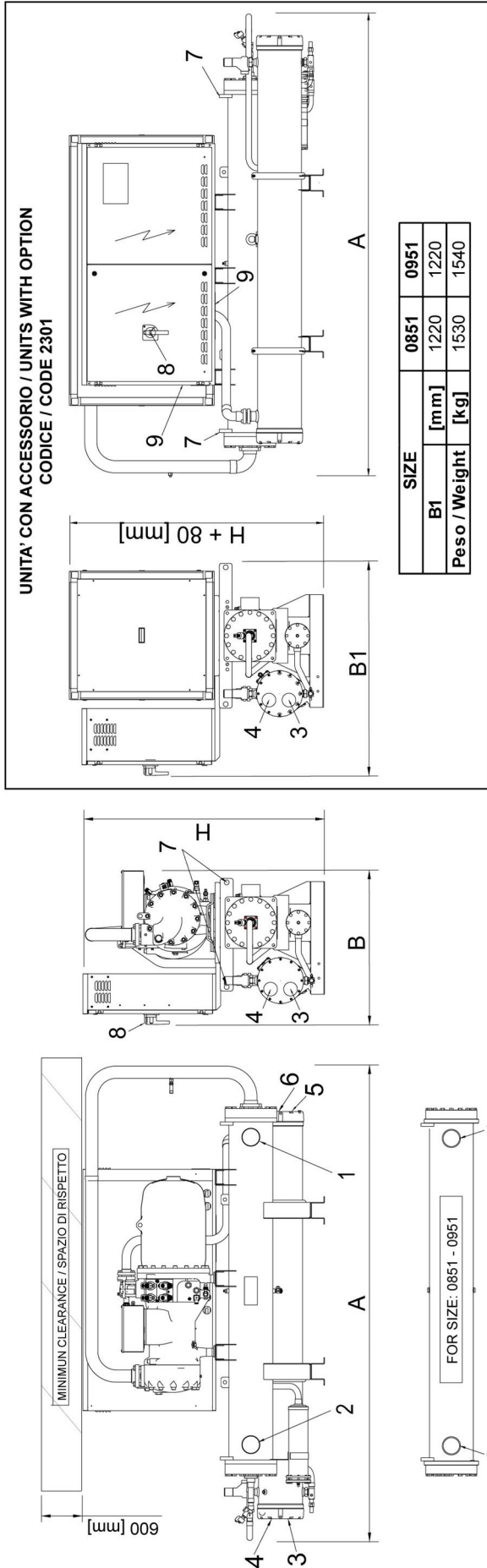


**DIMENSIONAL DRAWINGS**

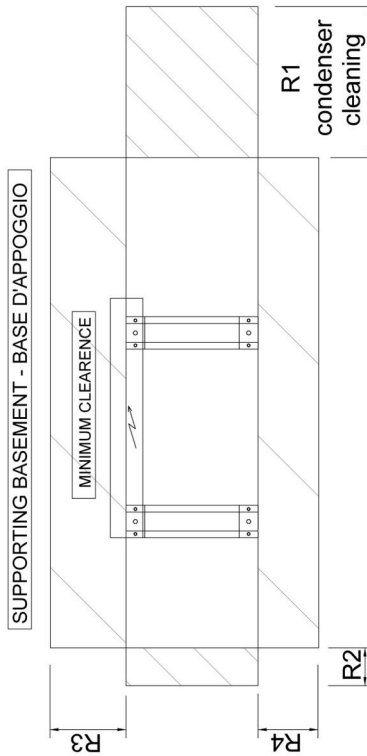
**FR-W-G05-Z 0551 - 1752**

[ SI System ]

SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE		HEAT EXCHANGER SOURCE SIDE		HEAT RECOVERY EX. USER SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT		IN/OUT		IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø	TYPE	Ø	TYPE	Ø
FR-W-G05-Z /D /0851	3000	960	1690	1520	2000	500	1000	800	H	4"	E	3"	E	2"
FR-W-G05-Z /D /0951	3000	960	1690	1530	2000	500	1000	800	H	4"	E	3"	E	2"



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ENTRATA ACQUA CONDENSATORE
- 4 - CONDENSER WATER OUTLET  
USCITA ACQUA CONDENSATORE
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ENTRATA ACQUA RECUPERATORE
- 6 - HEAT RECOVERY WATER OUTLET  
USCITA ACQUA RECUPERATORE
- 7 - LIFTING POINTS  
PUNTI DI SOLLEVAMENTO
- 8 - MAIN ISOLATOR  
SEZIONATORE PRINCIPALE
- 9 - POWER INLET  
INGRESSO LINEA ELETTRICA



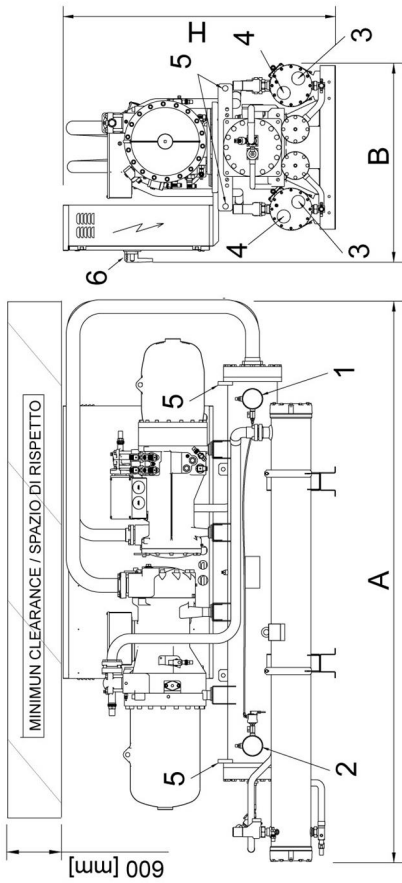
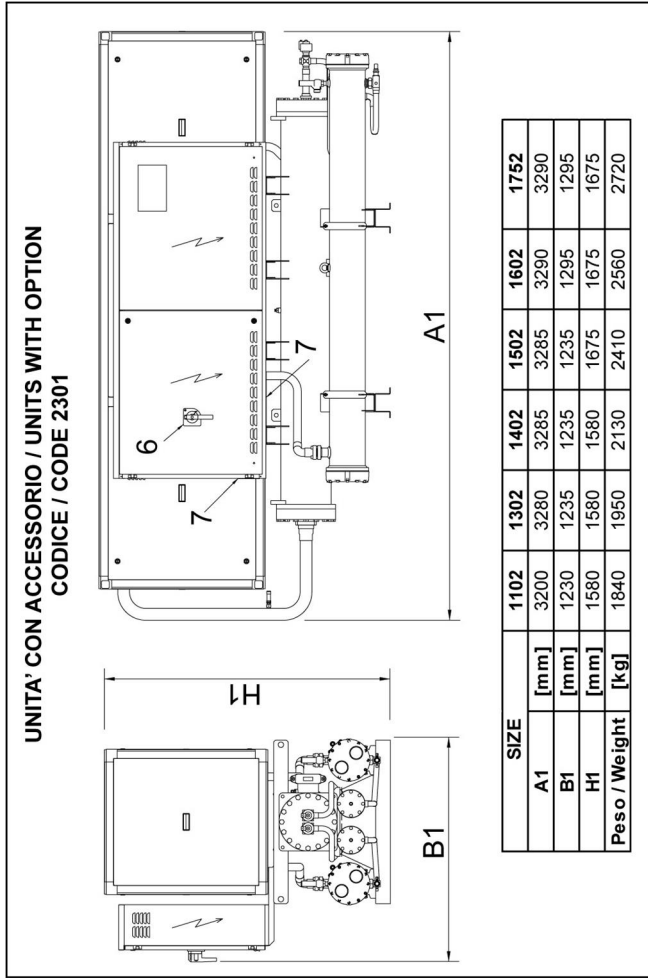
REMARKS: For installation purposes, please refer to the documentation sent after the purchase contract. This technical data should be considered as indicative. Mitsubishi Electric Hydraulics & IT Cooling Systems S.p.A. may modify them at any moment. Data valid for standard units without any additional option.

**DIMENSIONAL DRAWINGS**

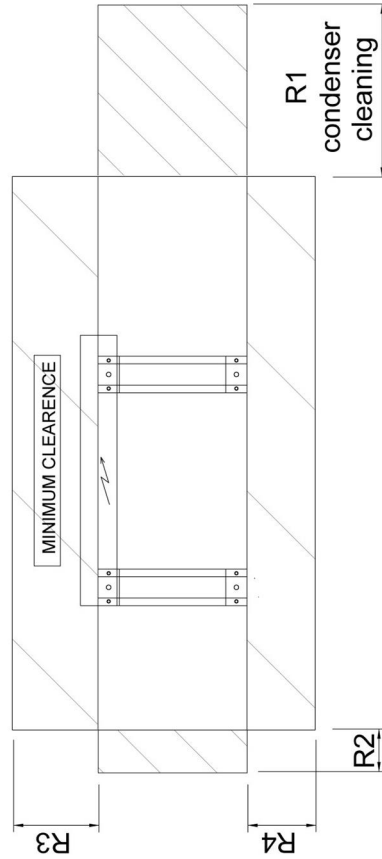
**FR-W-G05-Z 0551 - 1752**

[ SI System ]

SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE		HEAT EXCHANGER SOURCE SIDE		HEAT RECOVERY EX. USER SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT		IN/OUT		IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø	TYPE	Ø	TYPE	Ø
FR-W-G05-Z /R /0851	3000	960	1650	1656	2000	500	1000	800	H	4"	E	3"	E	3"
FR-W-G05-Z /R /0951	3000	960	1650	1774	2000	500	1000	800	H	4"	E	3"	E	3"



SUPPORTING BASEMENT - BASE D'APPoggio



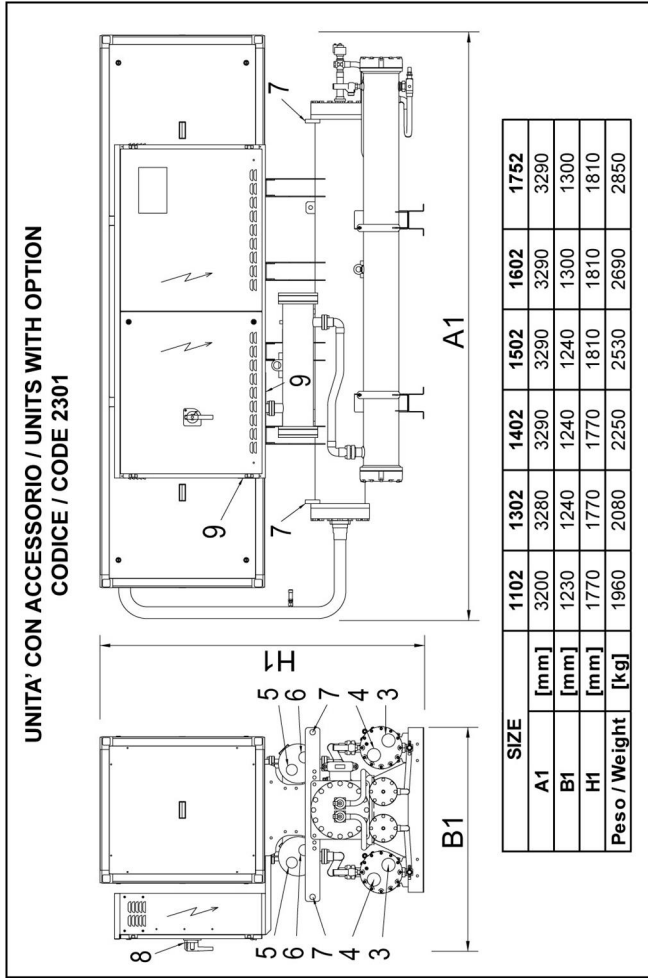
- 1 - EVAPORATOR WATER INLET  
ENTRATA ACQUA EVAPORATORE
- 2 - EVAPORATOR WATER OUTLET  
USCITA ACQUA EVAPORATORE
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USCITA ACQUA CONDENSATORE
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PUNTI DI SOLLEVAMENTO
- 6 - MAIN ISOLATOR  
SEZIONATORE PRINCIPALE
- 7 - POWER INLET  
INGRESSO LINEA ELETTRICA

**DIMENSIONAL DRAWINGS**

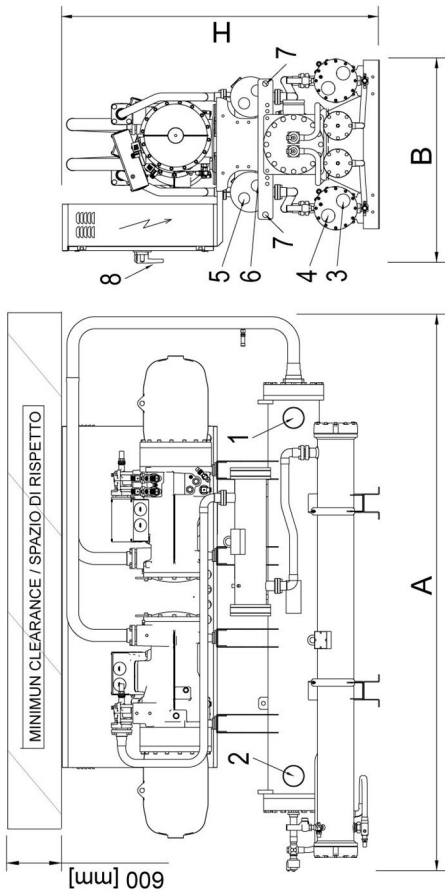
**FR-W-G05-Z 0551 - 1752**

[ SI System ]

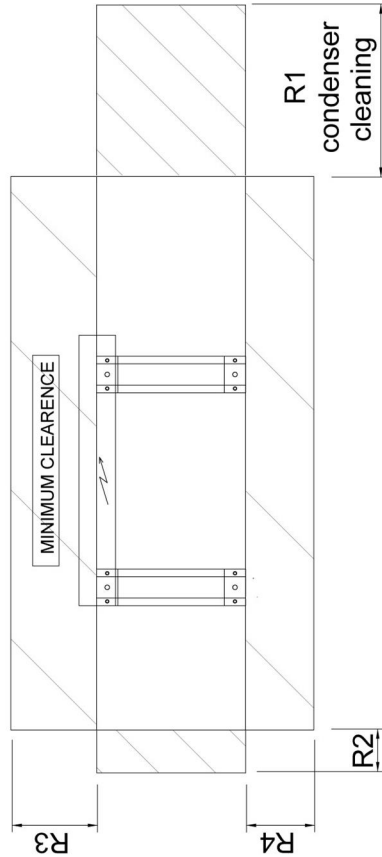
SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE		HEAT EXCHANGER SOURCE SIDE		HEAT RECOVERY EX. USER SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT		IN/OUT		IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø	TYPE	Ø	TYPE	Ø
FR-W-G05-Z /1102	3000	1100	1500	1710	2000	500	1000	800	H	4"	E	2" 1/2	-	-
FR-W-G05-Z /1302	3100	1100	1500	1820	2000	500	1000	800	H	4"	E	2" 1/2	-	-
FR-W-G05-Z /1402	3100	1100	1500	1990	2000	500	1000	800	H	4"	E	2" 1/2	-	-
FR-W-G05-Z /1502	3200	1100	1600	2280	2000	500	1000	800	H	5"	E	2" 1/2	-	-
FR-W-G05-Z /1602	3200	1200	1600	2430	2000	500	1000	800	H	5"	E	2" 1/2 / 3"	-	-
FR-W-G05-Z /1752	3200	1200	1600	2590	2000	500	1000	800	H	5"	E	3"	-	-



- 1 - EVAPORATOR WATER INLET  
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- 2 - EVAPORATOR WATER OUTLET  
USCITA ACQUA EVAPORATORE
- 3 - CONDENSER WATER INLET  
ENTRATA ACQUA CONDENSATORE
- 4 - CONDENSER WATER OUTLET  
USCITA ACQUA CONDENSATORE
- 5 - DESUPERHEATER WATER INLET  
ENTRATA ACQUA DESURRISCALDATORE
- 6 - DESUPERHEATER WATER OUTLET  
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INGRESSO LINEA ELETTRICA



SUPPORTING BASEMENT - BASE D'APPoggio



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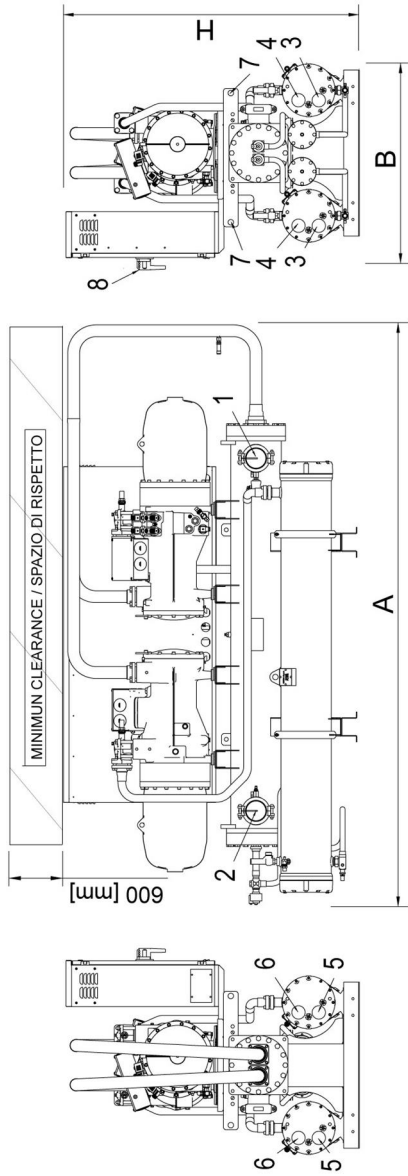
**DIMENSIONAL DRAWINGS**

**FR-W-G05-Z 0551 - 1752**

[ SI System ]

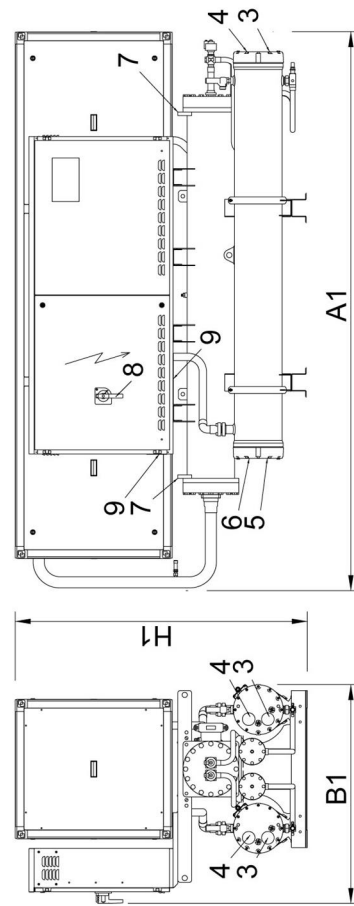
SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE		HEAT EXCHANGER SOURCE SIDE		HEAT RECOVERY EX. USER SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT		IN/OUT		IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø	TYPE	Ø	TYPE	Ø
FR-W-G05-Z /D /1102	3000	1100	1690	1830	2000	500	1000	800	H	4"	E	2" 1/2	E	2"
FR-W-G05-Z /D /1302	3100	1100	1690	1940	2000	500	1000	800	H	4"	E	2" 1/2	E	2"
FR-W-G05-Z /D /1402	3100	1100	1690	2110	2000	500	1000	800	H	4"	E	2" 1/2	E	2"
FR-W-G05-Z /D /1502	3200	1100	1725	2390	2000	500	1000	800	H	5"	E	2" 1/2	E	2"
FR-W-G05-Z /D /1602	3200	1200	1725	2550	2000	500	1000	800	H	5"	E	2" 1/2 / 3"	E	2"
FR-W-G05-Z /D /1752	3200	1200	1725	2710	2000	500	1000	800	H	5"	E	3"	E	2"



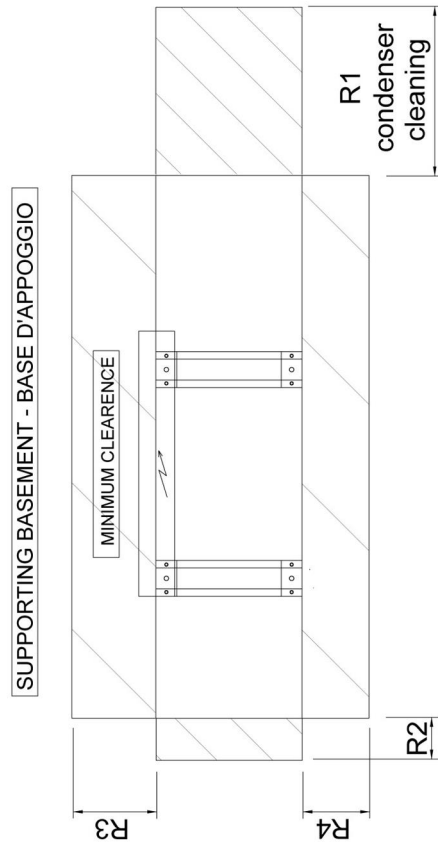


- 1 - EVAPORATOR WATER INLET  
ENTRATA ACQUA EVAPORATORE
- 2 - EVAPORATOR WATER OUTLET  
USCITA ACQUA EVAPORATORE
- 3 - CONDENSER WATER INLET  
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- 7 - LIFTING POINTS  
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SEZIONATORE PRINCIPALE
- 9 - POWER INLET  
INGRESSO LINEA ELETTRICA

UNITA' CON ACCESSORIO / UNITS WITH OPTION  
CODICE / CODE 2301



SIZE	1102	1302	1402	1502	1602	1752
A1 [mm]	3200	3280	3285	3285	3290	3290
B1 [mm]	1230	1235	1235	1235	1295	1295
H1 [mm]	1580	1580	1580	1675	1675	1675
Peso / Weight [kg]	1840	1950	2130	2410	2560	2720



REMARKS: For installation purposes, please refer to the documentation sent after the purchase contract. This technical data should be considered as indicative. Mitsubishi Electric Hydraulics & IT Cooling Systems S.p.A. may modify them at any moment. Data valid for standard units without any additional option.

**DIMENSIONAL DRAWINGS**

**FR-W-G05-Z 0551 - 1752**

[ SI System ]

SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE		HEAT EXCHANGER SOURCE SIDE		HEAT RECOVERY EX. USER SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT		IN/OUT		IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø	TYPE	Ø	TYPE	Ø
FR-W-G05-Z /R /1102	3000	1250	1650	2019	2000	500	1000	800	H	4"	E	2" 1/2	E	2" 1/2
FR-W-G05-Z /R /1302	3100	1250	1650	2123	2000	500	1000	800	H	4"	E	2" 1/2	E	2" 1/2
FR-W-G05-Z /R /1402	3100	1250	1650	2406	2000	500	1000	800	H	4"	E	2" 1/2 / 3"	E	2" 1/2 / 3"
FR-W-G05-Z /R /1502	3200	1250	1750	2806	2000	500	1000	800	H	5"	E	3"	E	3"
FR-W-G05-Z /R /1602	3200	1350	1750	2892	2000	500	1000	800	H	5"	E	3"	E	3"
FR-W-G05-Z /R /1752	3200	1350	1750	3082	2000	500	1000	800	H	5"	E	3"	E	3"

**DIMENSIONAL DRAWINGS**

**LEGEND OF PIPE CONNECTIONS**



**TYPE = H**  
Grooved coupling with weld end counter-pipe user side



**TYPE = E**  
Female threaded pipe

NOMINAL PIPE SIZE	PIPE OUTSIDE DIAMETER
ø inches	ø mm
¾	26,7
1	33,7
1 ¼	42,4
1 ½	48,3
2	60,3
2 ½	76,1
3	88,9
3 ½	101,6

NOMINAL PIPE SIZE	PIPE OUTSIDE DIAMETER
ø inches	ø mm
4	114,3
4 ½	127,0
5	139,7
6	168,3
8	219,1
10	273,0
12	323,9
14	355,6

**UNI ISO 228/13**

Pipe threads where pressure-tight joints are not made on the threads - Designation, dimensions and tolerances

**Used terminology:**

G: Pipe threads where pressure-tight joints are not made on the threads

A: Close tolerance class for external pipe threads where pressure-tight joints are not made on the threads

B: Wider tolerance class for external pipe threads where pressure-tight joints are not made on the threads

Internal threads: G letter followed by thread mark (only tolerance class)

External threads: G letter followed by thread mark and by A letter for A class external threads or by B letter for B class external threads.

**UNI EN 10226-1**

Pipe threads where pressure-tight joints are made on the threads - Designation, dimensions and tolerances

**Used terminology:**

Rp: Internal cylindrical threads where pressure-tight joints are made on the threads

Rc: Internal conical threads where pressure-tight joints are made on the threads

R: External conical threads where pressure-tight joints are made on the threads

Internal cylindrical threads: R letter followed by p letter

Internal conical threads: R letter followed by c letter

External conical threads: R letter

DESIGNATION	DESCRIPTION
UNI EN 10226-1 - Rp 1 1/2	Internal cylindrical threads where pressure-tight joints are made on the threads, defined by standard UNI ISO 7/1 Conventional ø 1 1/2"
UNI EN 10226-1 - Rp 2 1/2	Internal cylindrical threads where pressure-tight joints are made on the threads, defined by standard UNI ISO 7/1 Conventional ø 2 1/2"
UNI EN 10226-1 - Rp 3	Internal cylindrical threads where pressure-tight joints are made on the threads, defined by standard UNI ISO 7/1 Conventional ø 3"
UNI EN 10226-1 - R 3	External conical threads where pressure-tight joints are made on the threads, defined by standard UNI ISO 7/1 Conventional ø 3"
UNI ISO 228/1 - G 4 B	Internal cylindrical threads where pressure-tight joints are not made on the threads, defined by standard UNI ISO 228/1 Tolerance class B for external thread Conventional ø 4"
DN 80 PN 16	Flange Nominal Diameter: 80 mm Nominal Pressure: 16 bar

**NOTE:**

Conventional diameter value [in inches] identifies short thread designation, based upon the relative standard.

All relative values are defined by standards.

As example, here below some values:

	UNI EN 10226-1	UNI ISO 228/1
Conventional ø	1"	1"
Pitch	2.309 mm	2.309 mm
External ø	33.249 mm	33.249 mm
Core ø	30.291 mm	30.291 mm
Thread height	1.479 mm	1.479 mm

## VARIABLE FLOW CONTROL

Pump energy consumption significantly impacts plant running costs, but it can be considerably reduced thanks to the use of variable speed pumps (inverter driven pumps), capable of adjusting the water flow rate according to the actual plant thermal load.

Mitsubishi Electric Hydronics & Cooling Systems has developed the VPF control series (Variable Primary Flow), that provides different water flow regulation logics specifically devoted to various hydraulic

plant solutions: only a primary circuit, primary and secondary circuits, single unit or multi-unit systems.

The VPF systems adjust the pump speeds on the basis of the plant's thermal load and optimize the unit's thermoregulation algorithm for variable flow operation, in a dynamic and simultaneous way. This ensures the highest energy savings, stable operation, and complete reliability.

### VPF SYSTEM (delta P control)

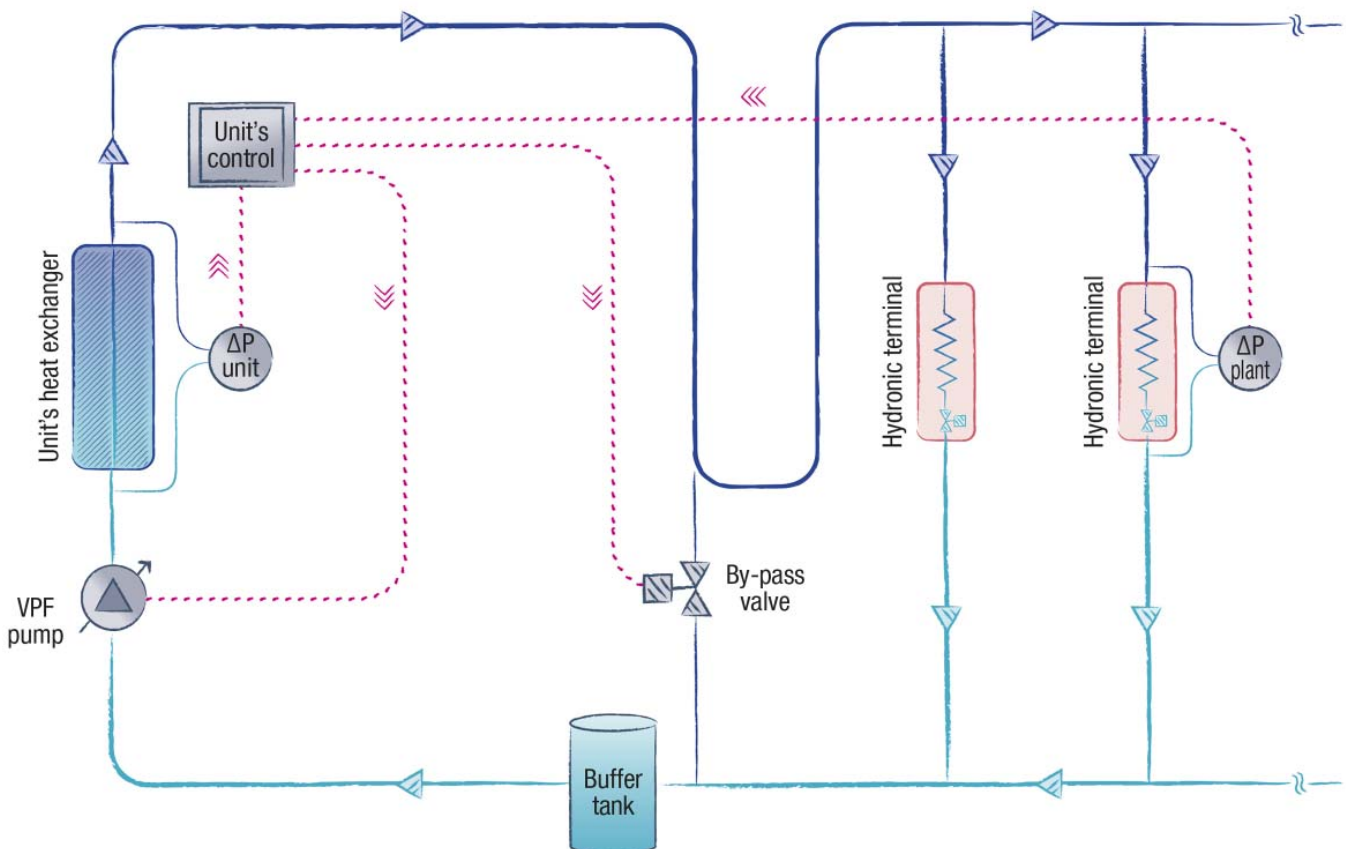
For plants with only a primary circuit

#### VPF - Plant and unit requirements

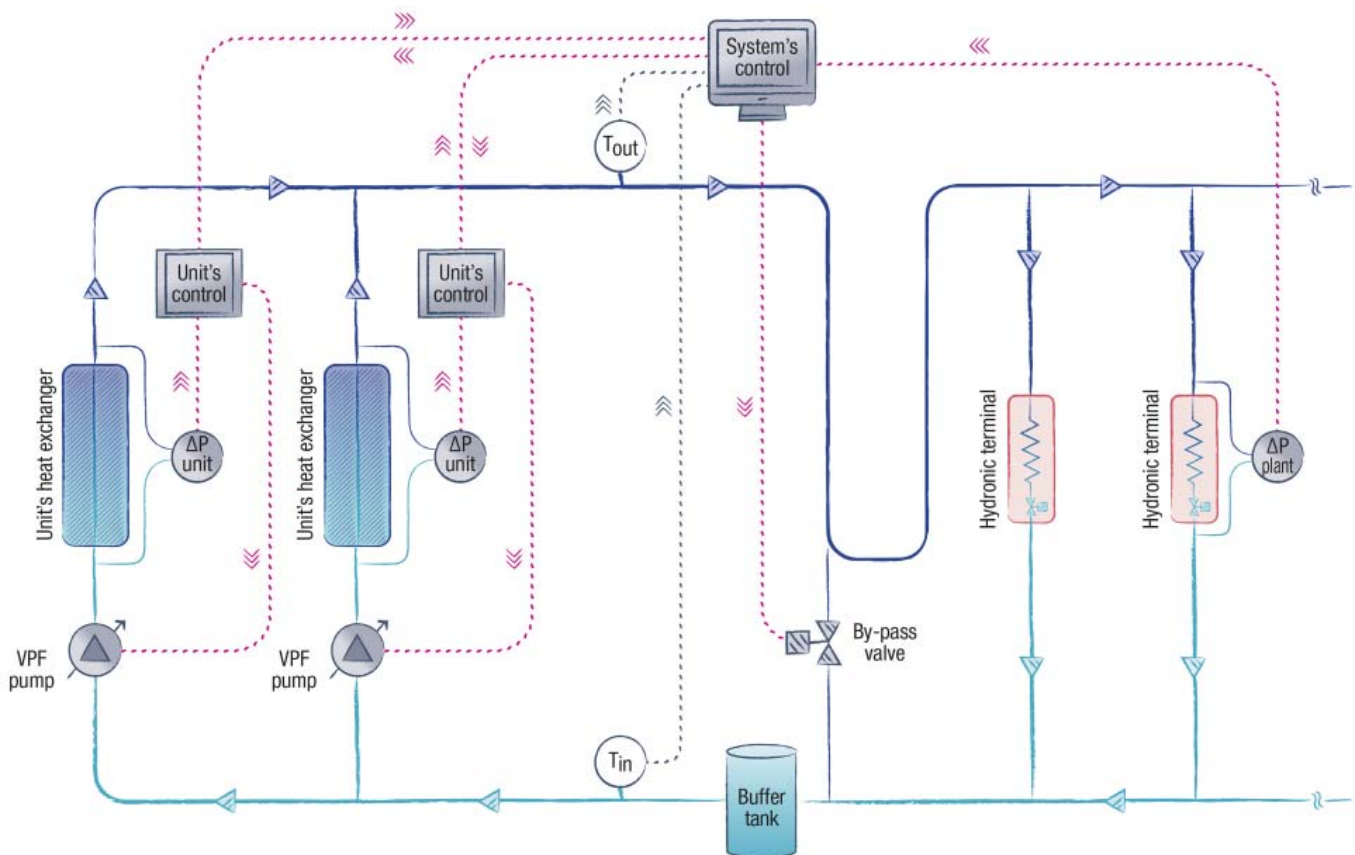
The VPF logic provides the variable flow control for the plant's primary circuit.

- Type of plant: primary circuit only, that feeds hydronic terminals fitted with a 2-way regulating valve
- Hydronic module: modulating regulation devices (0-10V signal) or variable speed pumps
- Unit thermoregulation: control of the leaving water temperature
- Monitored parameter: delta P on relevant users' hydronic terminal

Plant diagram for single unit system



## Plant diagram for multi-unit system



### VPF - Operating logic

#### Water flow regulation

The VPF system monitors the differential pressure on the plant side ( $\Delta P$ ) and adjusts the pump speed in order to keep it within a defined range ( $\Delta P_{min} \leftrightarrow \Delta P_{max}$ ).

- If  $\Delta P_{min} \leq \Delta P \leq \Delta P_{max}$   
The plant water flow is appropriate to the thermal load, the pump speed is kept constant.
- If  $\Delta P > \Delta P_{max}$   
The plant water flow exceeds what is necessary to properly cover the thermal load, the pump speed is reduced to save pump energy.
- If  $\Delta P < \Delta P_{min}$   
The plant water flow is too low to ensure the proper feed to the hydronic terminals, the pump speed is increased.

With the VPF system, the water flow can be reduced to 50% of the unit nominal water flow, with regards to the selection conditions, provided that the minimum water flow required by the unit's heat exchanger is respected (the control of the heat exchanger's minimum water flow is described below).

The pump speed regulation is performed with little progressive adjustments while continuously monitoring the values of both the delta P on the plant side and the water temperature on the heat exchanger. The absence of abrupt water flow changes prevents fluctuation due to possible conflicts with the unit's thermoregulation function (compressor regulation).

#### Control of the unit's minimum water flow

Under no circumstances can the primary circuit water flow be reduced below the minimum water flow required by the unit's heat exchanger. The monitoring of the unit's water flow is performed through a factory installed differential pressure transducer on the unit's heat exchanger. If the differential pressure on the plant side requests a user's water flow lower than the unit's minimum water flow, the VPF system commands the gradual opening of the hydraulic by-pass valve (safety function). This ensures that the minimum water flow required by the unit's heat exchanger is always provided. As soon as the hydronic terminals request an increase of the water flow ( $\Delta P < \Delta P_{min}$ ), the VPF closes the by-pass valve.

#### Multi-unit systems

The VPF control logic is also the same for multi-unit systems. The plant side differential pressure transducer reading and the by-pass valve opening are managed by the multi-unit control system (Manager3000 or ClimaPRO). Each unit autonomously adjusts its pump speed on the basis of the information provided by the multi-unit control system. When the plant load requests the activation of a stand-by unit, the multi-unit control system calculates the starting speed of its pump in order to avoid excessive water flow variation of the running units.

## VPF - Devices and installation

Device	Accessory name		
	VPF (plant DP trans excl)	VPF (plant DP trans incl)	VPF MULTI-UNIT SYSTEM
Differential pressure transducer on the unit's heat exchanger and related controller expansion board	Factory installed	Factory installed	Factory installed
Controller expansion board to read the plant side differential pressure transducer (4-20mA signal) and manage the hydraulic by-pass valve opening (0-10V signal)	Factory installed	Factory installed	Factory installed on the multi-unit control system <sup>(2)</sup>
Plant side differential pressure transducer	Not included (the supply is the customer's responsibility) <sup>(1)</sup>	Factory supplied, installation is the client's responsibility <sup>(1)(2)</sup>	Factory supplied with the multi-unit control system, installation is the client's responsibility <sup>(1)(3)</sup>
Plant side hydraulic by-pass valve	Not included (the supply is the customer's responsibility) <sup>(4)</sup>	Not included (the supply is the customer's responsibility) <sup>(4)</sup>	Not included (the supply is the customer's responsibility) <sup>(4)</sup>

- (1) It is recommended to install the differential pressure transducer on the most hydraulically critical hydronic terminal, to ensure it has a proper water flow in any load condition.
- (2) Technical features of the differential pressure transducer supplied:  
 Model: Huba Control 692.9 120071C1  
 Pressure range: 0 ... + 1 bar  
 Output: 4-20mA  
 Electrical connection: DIN EN 175301-803-A (IP 65)  
 Pressure connection adapters: male threaded G 1/8"
- (3) It is the customer's responsibility to configure the multi-unit control system (Manager3000 or ClimaPRO) with option VPF.
- (4) See attached table for information on the hydraulic by-pass design.

The following table provides the indications for a correct hydraulic by-pass design.

Heat exchanger minimum flow (m <sup>3</sup> /h) <sup>(1)</sup>	Minimum by-pass diameter	Minimum by-pass valve diameter	Suggested valve model	Kvs	Suggested actuator model
From 19 to 30	DN50 (2")	DN50 (2")	VVG41.50	40	SKB60
Up to 37	DN65 (2" ½)	DN65 (2" ½)	VVF31.65	49	SKB60
Up to 60	DN80 (3")	DN80 (3")	VVF31.80	78	SKB60
Up to 95	DN100 (4")	DN100 (4")	VVF31.90	124	SKC60
Up to 150	DN125 (5")	DN125 (5")	VVF31.91	200	SKC60
Up to 230	DN150 (6")	DN150 (6")	VVF31.92	300	SKC60

- (1) In case of a multi-unit system, the unit with the highest minimum water flow should be the reference.

**VPF.D SYSTEM (delta T control)**

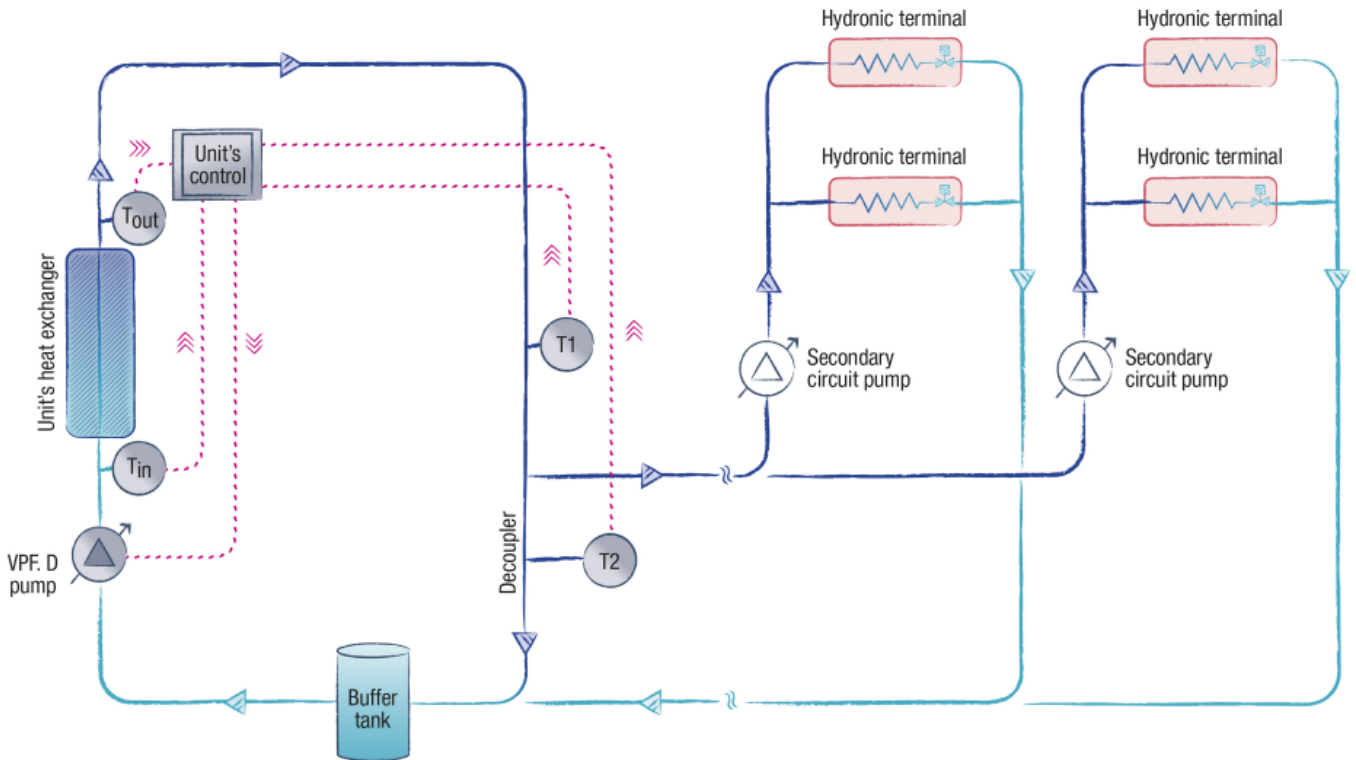
For plants with primary and secondary circuits separated by a hydraulic decoupler.

**VPF.D - Plant and unit requirements**

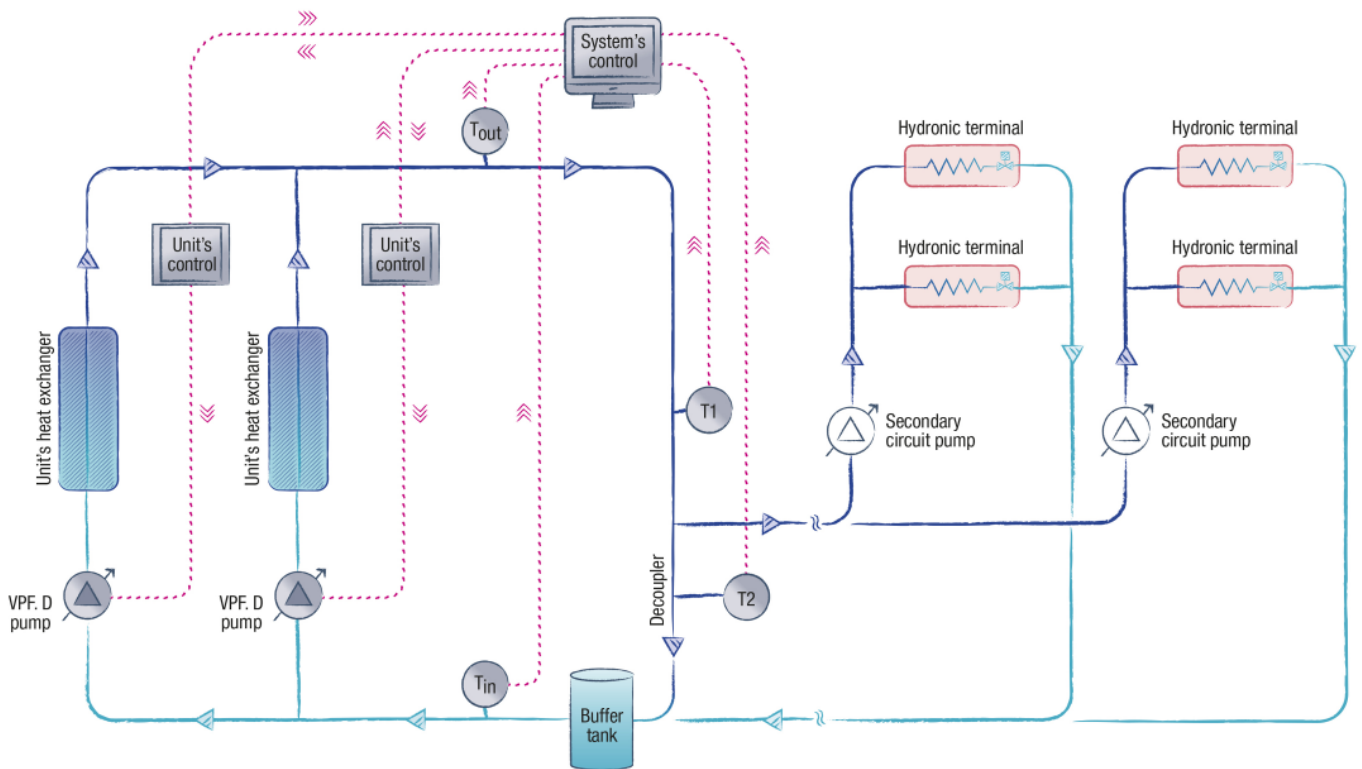
The VPF.D logic provides the variable flow control for the plant's primary circuit.

- Type of plant: primary and secondary circuits separated by a hydraulic decoupler
- Hydronic module: modulating regulation devices (0-10V signal) or variable speed pumps
- Unit thermoregulation: control of the leaving water temperature
- Monitored parameter: delta T on primary circuit

Plant diagram for single unit system



Plant diagram for multi-unit system



## VPF.D - Operating logic

### Water flow regulation

The VPF.D system monitors the temperature difference of the primary circuit ( $\Delta T$ ) (that corresponds to the temperature difference of the unit's heat exchanger in the case of a single unit system), and adjusts the primary circuit's pump speed in order to keep it within a defined range ( $\Delta T_{min} \leftrightarrow \Delta T_{max}$ ). The secondary circuit water flow is completely independent and is to be managed by the client.

- If  $\Delta T_{min} \leq \Delta T \leq \Delta T_{max}$   
The plant water flow is appropriate to the thermal load, the pump speed is kept constant.
- If  $\Delta T < \Delta T_{min}$   
The plant water flow exceeds what is necessary to properly cover the thermal load, the pump speed is reduced to save pump energy.
- If  $\Delta T > \Delta T_{max}$   
The plant water flow is too low to ensure the proper feed to the users, the pump speed is increased.

To prevent the returning water of the secondary circuit from recirculating through the decoupler and mixing with the delivery water, which would cause serious plant regulation problems, the VPF.D provides a safety function based on the temperatures, which are detected by two probes on the plant side: T1 on the unit delivery line and T2 on the hydraulic decoupler. If during the water flow regulation of the circuits, the flow direction in the decoupler reverses (detected temperatures  $T1 < T2$ ), the system forces a quick increase of the primary water flow until the correct direction of the flow in the decoupler is restored (detected temperatures  $T1 = T2$ ).

With the VPF.D system, the water flow can be reduced to 50% of the unit nominal water flow, with regards to the selection conditions, provided that the minimum water flow required by the unit's heat exchanger is respected (the control of the heat exchanger's minimum water flow is described below).

The pump speed regulation is performed with little progressive adjustments while continuously monitoring the values of both the temperature difference on the primary circuit and the temperatures of the probes T1 and T2. The absence of abrupt water flow changes prevents fluctuation due to possible conflicts with the unit's thermoregulation function (compressor regulation).

### Control of the unit's minimum water flow

Under no circumstances can the primary circuit water flow be reduced below the minimum water flow required by the unit's heat exchanger. The unit's minimum water flow is ensured by setting the minimum pump speed (service menu parameter).

### Multi-unit systems

The VPF.D control logic is also the same for multi-unit systems. The reading of the temperature difference on the primary circuit and the reading of the temperature probes T1 and T2 is managed by the multi-unit control system (Manager3000 or ClimaPRO). Each unit autonomously adjusts its pump speed on the basis of the information provided by the multi-unit control system. When the plant load requests the activation of a stand-by unit, the multi-unit control system calculates the starting speed of its pump in order to avoid excessive water flow variation of the running units.



## VPF.D - Devices and installation

Device	Accessory name	
	VPF.D	VPF.D MULTI-UNIT SYSTEM
2 plant side NTC temperature sensors and related controller expansion board	Factory supplied (probes supplied without wells), installation is the client's responsibility <sup>(1)</sup>	Factory supplied with the multi-unit control system (probes supplied without wells), installation is the client's responsibility <sup>(1)(2)</sup>

(1) It is recommended to install the temperature probes as shown in the enclosed plant diagrams (T1 on the unit delivery line, T2 on the hydraulic decoupler)

(2) It is the customer's responsibility to configure the multi-unit control system (Manager3000 or ClimaPRO) with option VPF.D.

The following table provides the indications for a correct hydraulic decoupler design.

Heat exchanger minimum flow (m <sup>3</sup> /h) <sup>(1)</sup>	Minimum hydraulic decoupler diameter
From 25 to 40	DN65 (2" ½)
Up to 60	DN80 (3")
Up to 100	DN100 (4")
Up to 150	DN125 (5")
Up to 225	DN150 (6")
Up to 375	DN200 (8")

(2) In case of a multi-unit system, the unit with the highest minimum water flow should be the reference.

## CONDENSATION CONTROL DEVICES

### Way valve

Two-way servo-motorized valve with steel body.

The valve is selected for a Delta T of 10°C (12/7 °C e 15/25°C), factory mounted and tested by MEHITS during the end of line test of the unit.

2-way vie	kvs	DN	Dp max	Qmin	Qmax	Actuator
Type	[m³/h]		[kPa]	[m³/h]	[m³/h]	Type
<b>A</b>	10	25	300	6.5	10	0-10 V
<b>B</b>	16	32	300	10	16	0-10 V
<b>C</b>	25	40	300	16	25	0-10 V
<b>D</b>	40	50	300	25	40	0-10 V
<b>E</b>	50	65	300	32	50	0-10 V
<b>F</b>	63	65	300	40	63	0-10 V
<b>G</b>	80	80	300	51	80	0-10 V
<b>H</b>	100	80	300	63	100	0-10 V

In the chart below:

**Line (A):** curve of the 2-way valve for units **size 0551, 0651, 0751, 1102, 1302, 1402, 1502**

**Line (B):** curve of the 2-way valve for units **size 0551-1752**

**Line (C):** curve of the 2-way valve for units **size 0551-1752**

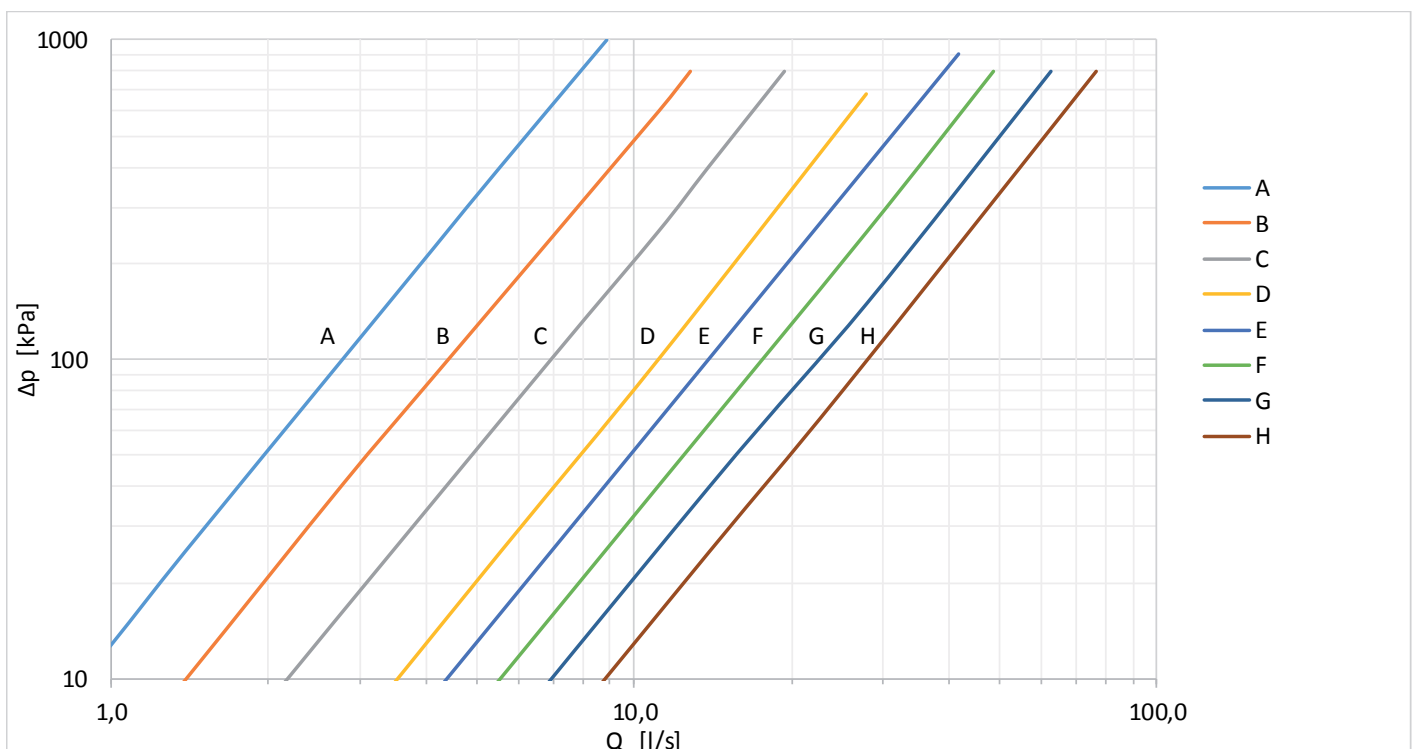
**Line (D):** curve of the 2-way valve for units **size 0551-1752**

**Line (E):** curve of the 2-way valve for units **size 0551-1752**

**Line (F):** curve of the 2-way valve for units **size 0551-1752**

**Line (G):** curve of the 2-way valve for units **size 0851, 0951, 1602, 1752**

**Line (H):** curve of the 2-way valve for units **size 0851, 0951, 1752**





for a greener tomorrow

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.



## **MITSUBISHI ELECTRIC HYDRONICS & IT COOLING SYSTEMS S.p.A.**

Head Office: Via Roma 5 • 27010 Valle Salimbene (PV) • Italy  
Ph. (+39) (0) 382 433 811 • Fax (+39) (0) 382 587148

[www.rcitcooling.com](http://www.rcitcooling.com)  
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