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

Technical Bulletin
FRCS3-W-G05-Z 0551 - 4752_201810_EN HFC R513A
ELCA_Engine ver.4.1.0.0

COOLING

FRCS3-W-G05-Z 0551 - 4752

Water cooled chiller

R513A
SCREW
FLOODED
EUROVENT CERTIFIED PERFORMANCE www.eurovent-certification.com
VPF VARIABLE PRIMARY FLOW

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

- HIGH EFFICIENCY
- MAXIMUM COMPACTNESS
- ELECTRONIC EXPANSION VALVE SUPPLIED STANDARD

CERTIFICATIONS

Product certifications

Voluntary product certifications

Check ongoing validity of certificate:
www.eurovent-certification.com
or
www.certiflash.com

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

INDEX **FRCS3-W-G05-Z 0551 - 4752**

The units highlighted in this publication contain R513A [GWP_{100} 631] fluorinated greenhouse gases.

Functions

COOLING — Cooling

Refrigerant

R513A — R513A

Compressors

SCREW — Screw compressor

Exchangers

FLOODED — Flooded evaporator

Other features right position

ENERGY CLASS — Energy Class A

Other features

EUROVENT CERTIFIED PERFORMANCE www.eurovent-certification.com — Eurovent

VPF VARIABLE PRIMARY FLOW — VPF

1.1 PRODUCT FEATURES

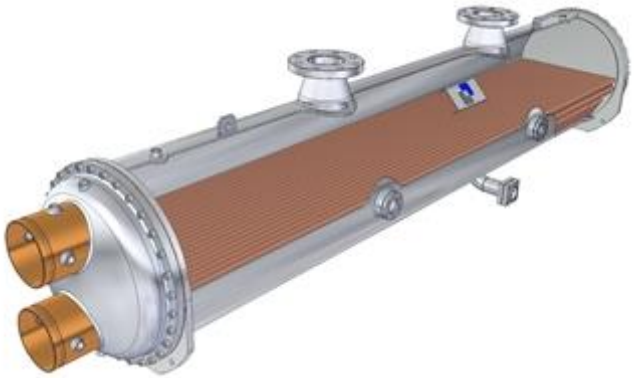
1.2 Maximum efficiency at every load condition
High efficiency units, both at part and at full load. The flooded evaporator, dedicated compressors, specifically designed condenser and a special management for the lubricant separation and recovery, lead units to very competitive efficiency levels, with EER 5.8, ESEER 7.4, IPLV 7.7

1.3 Maximum flexibility and adaptability
Maximum flexibility and adaptability to the needs of the plant thanks to:
- continuous modulation of the cooling capacity, guaranteed by sophisticated regulation logics
- precision and quickness in the control, in order to guarantee stable water temperature
- management of the variable flow using the VPF or VPF.D signal
- pressure drops reduction, thanks to particular layout for the flooded evaporator
- compact and essential design, achieved by the construction layout, without base, frame structure and panels. The components are directly fixed on one another, through fixing brackets
- movimentation and on site placement easiness, even in case of small spaces, added to immediate and complete accessibility during maintenance operations

1.4 Optimized compressors
These units are equipped with screw compressors designed in order to work with low compression ratios, allowing to reach efficiency values higher than the ones possible for units with standard screw compressors, both at part and at full load, thanks to a targeted study of the volume ratio and the extension of the application limits.

1.5 Innovative design of the heat exchangers
The exclusive design of the flooded evaporator and of the shell and tube condenser, both designed and manufactured by MEHITS, maximizes the cooling power of the unit and optimizes the compressors' operation thanks to the high heat exchange coefficients.
In the evaporator the presence of the refrigerant in the shell side and of the water inside the tubes allows to:
- minimize the pressure drops
- gain a perfect temperature uniformity as well as the complete evaporation of the refrigerant
- cancel any necessity to have heat surfaces dedicated to desuperheating
- facilitate cleaning operations

The flooding of the tubes in the evaporator is controlled by an electronic expansion valve managed but proprietary control logics.



1.6 Lubricant recovery
An innovative lubricant oil recovery system from the exchangers, combined with the traditional built-in oil separator, allows the compressors to work always with the correct and appropriate lubification and at the same time enables the exchange surfaces of the heat exchanger to stay clean, ensuring reliability to the entire system.

GREEN CERTIFICATION RELEVANT

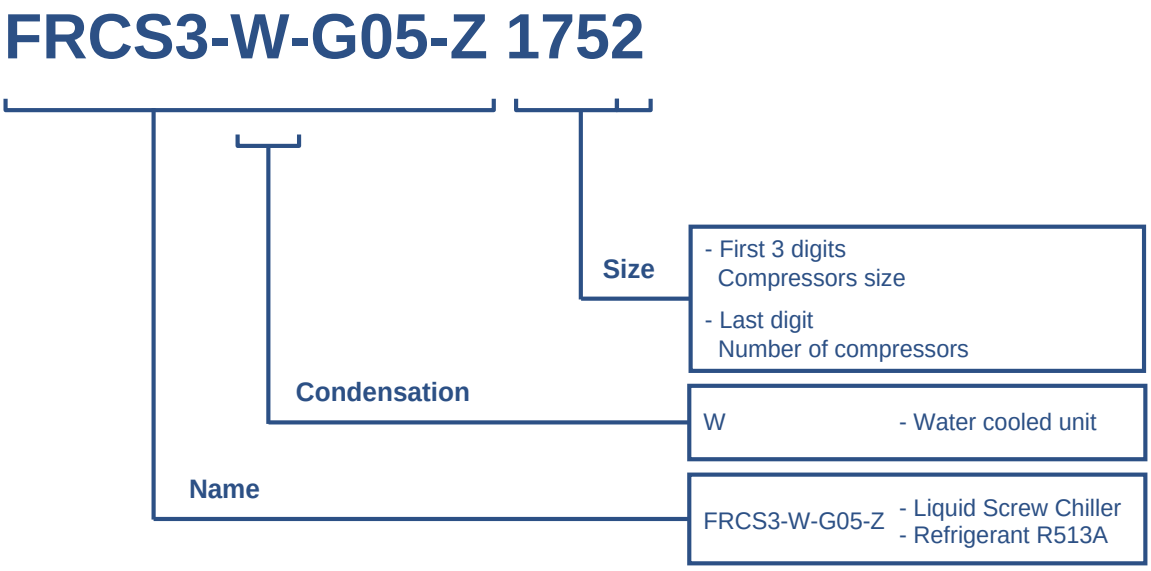
Mitsubishi Electric Hydronics & IT Cooling Systems S.p.A., as a major player in the world HVAC market and a leading manufacturer of energy efficient, sustainable HVAC solutions, recognizes and supports the diffusion of green certification systems, as an effective way to deliver high performance buildings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


FRCS3-W-G05-Z 1752
Size
- First 3 digits
Compressors size
- Last digit
Number of compressors
Condensation
W
- Water cooled unit
Name
FRCS3-W-G05-Z
- Liquid Screw Chiller
- Refrigerant R513A

High efficiency unit for indoor installation for chilled water production. Semihermetic screw compressors optimized to operate with low compression ratio and R513A; shell and tubes condenser, flooded evaporator and electronic expansion valve. High efficiency unit thanks to the innovative optimized compressors and the high performing heat exchangers.

2.3 HIGH EFFICIENCY
Very high efficiency at full and partial load, at the highest market levels, thanks to the adopted technological solutions. These units ensure low operating costs and therefore a quick payback time.

2.4 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.

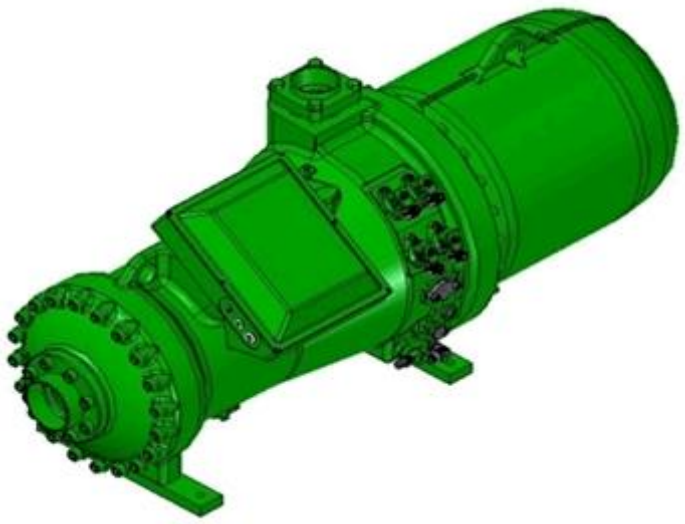
2.5 ELECTRONIC EXPANSION VALVE SUPPLIED STANDARD
The use of the electronic expansion valve generates considerable benefits, especially in cases of variability of the source temperature. The electronic expansion valve guarantees speed in reaching machine stability and an extension of the operating limits.

3.2 High efficiency water cooled chiller
Indoor unit for the production of chilled water featuring semihermetic screw compressors optimized to operate with low compression ratio and R513A, electronic expansion valve, shell and tube condenser and shell and tube flooded evaporator.
The unit results extremely compact, thanks to the peculiar construction layout, without base , frame and panels. At the same time high efficiency is guaranteed by the innovative optimized compressors and high performing heat exchangers, enhancing the EER values up to 5,8 at Eurovent standard conditions.

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

3.4 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
- high and low pressure transducers
- check valve on the compressor delivery line
- liquid line shut-off device (function performed by electronic expansion valve with ultracap)
- drier filter with replaceable cartridge
- refrigerant line sight glass with humidity indicator
- safety switching device for limiting the pressure

3.5 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. Each compressor is provided with two entrances for the oil recovery from the exchangers. 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. 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.



3.6 Plant side heat exchanger
Shell and tube heat exchanger, fully designed and manufactured by MEHITS, working as flooded type evaporator, with water flowing inside the pipes and refrigerant flowing in the shell side. 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 and externally grooved in order to improve the heat exchange. Integrated system to avoid liquid entrainment and to protect the compressor against the risk of liquid suction. A differential pressure switch is fitted in order to control the water flow while the unit is working, avoiding the risk of ice generation. An electric heater, operating when antifreezing mode is active, is present on the shell. The pipes' flooding is controlled by an electronic expansion valve, managed by proprietary logics to guarantee the proper refrigerant flow and the complete flooding of pipes in all conditions of compressors' load. The heat exchanger complies with PED standards, concerning the operating pressures.

3.7 Source side heat exchanger
Shell and tube heat exchanger, fully designed and manufactured by MEHITS, working as condenser, with water flowing inside and refrigerant flowing outsider the pipes. The steel shell is insulated with a foamed polyethylene closed-cell mat. The copper pipes are internally and externally grooved to improve heat exchange. Heads can be removed to inspect the pipes. The heat exchanger complies with PED standards, concerning the operating pressures.

3.8 Electrical and control panel
Electrical and control panel built to EN60204-1 and EC204-1 standards, complete with:
- electronic controller
- control circuit transformer
- general door lock isolator
- power circuit with electric bus bar distribution system
- fuses and contactors 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 and minimum/maximum voltage control
- compressors' start up with part winding (sizes 0551-0701) or start/delta (remaining sizes)
- cables' entrance from the top

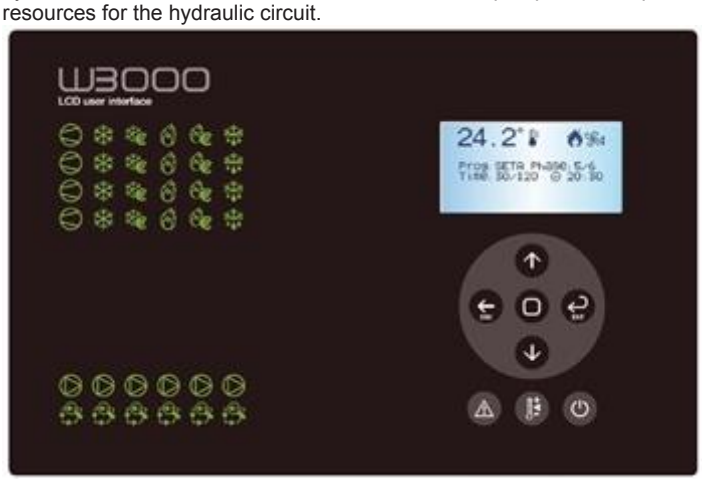
3.9 Certification and applicable directives
The unit complies with the following directives and relative amendments:
- EUROVENT Certification program
- CE Declaration of conformity certificate for the European Union
- SAFETY QUALITY LICENCE Product quality certificate for Popular Republic of China
- Machine directive 2006/42/EC
- PED directive 2014/68/EU
- Low Voltage directive 2006/95/EC
- ElectroMagnetic compatibility directive 2004/108/EC
- ISO 14001 Company´s Environmental Management System certification
- ISO 9001 Company´s Quality Management System certification

3.10 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.

3.11 Electronic control W3000 TE
The brand new W3000TE controller offers advanced functions and algorithms. The large format keyboard and the wide LCD display favour an easy and safe access to the machine setup and a complete view of unit's staus. 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, as well as of the

fans and of the water pumps (if present). An optional extra is the touch screen interface: 7.0” WVGA colour display with adjustable LED backlight and front USB port. The touch screen technology allows intuitive navigation between the various screens, safe access to the data with a three-level password protection as well as the graphic display of the performance of some monitored measurements.
The diagnostics comprises a complete alarm management system, with “black box” (via PC) and alarm log functions (via display or also PC) for a better analysis of the unit performance.
For the systems made of several units, the adjustment of the resources is performed by optional proprietary devices.
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-over-IP, Echelon LonWorks, Bacnet MS/TP protocols.
Compatibility with the remote keyboard managing up to 8 units.
The presence of the programmable timer allows the creation of an operating profile containing up to 4 typical days and 10 time bands.
The control is characterized by the continuous modulation of the unit capacity, based on PID algorithms and referring to the water delivery temperature.
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.



3.11 Touch screen
Touch screen interface

3.12 Versions
/CA - Class A of efficiency
Unit in ´Class A´ of efficiency as per Eurovent.

4.1 OPTIONS

OPTIONS	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
1020 **REGULATIONS**			
1015 HEAT EXCHANGERS NSW CERTIFIED	Heat exchangers with SafeWork NSW certificate		ALL
1960 **PRESSURE RELIEF VALVES**			
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
380 **NUMBERED WIRING**			
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 maintainance interventions to the electrical board connections.	ALL
3300 **COMPRESSOR REPHASING**			
3301 COMPR.POWER FACTOR CORR.	Capacitors on the compressors' power inlet line.	The unit's average cos(phi) increases.	ALL
3410 **AUTOMATIC CIRCUIT BREAKERS**			
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
3600 **ON/OFF COMPRESSOR SIGNAL**			
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
4180 **REMOTE CONNECTION ARRANGEMENT**			
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
6160 **AUXILIARY INPUT**			
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
6170 **DEMAND LIMIT**			
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

OPTIONS

OPTIONS	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
6190 **TYPE OF VISUAL DISPLAY**			
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
1510 **SOFT-STARTER**			
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
3350 **WATER FLOW REGULATION :**			
3351 WITH VPF SYSTEM (SIG. 0-10V)	Pre-arrangement for the control of the inverter driven pumps for the plant's primary circuit (see dedicated section). This option includes: differential pressure transducer on the evaporator, additional control devices to read the signals (4-20 mA) coming from the differential pressure transducers on the evaporator and on the plant and to manage the pumps and the by-pass valve (0-10V signals). [Plant differential pressure transducers, pumps and by-pass valve to be supplied by others].	Energy consumption associated with fluid circulation drops significantly, very often over 50%. Beyond the energy saving and the consequent lower operating costs, this new approach enables simplification in the plant's design that ensures substantial savings in initial investment costs. The integration of variable flow pumps on board, permits significant savings in overall dimensions, circuit components and in the system's commissioning.	ALL
3352 WITH VPF.D SYSTEM (SIG. 0-10V)	Pre-arrangement for the control of the inverter driven pumps for the plant's primary circuit in installation with hydraulic decoupler (see dedicated section). This option includes: temperature sensors to be installed on the plant, additional control devices to read the signals (4-20 mA) coming from the plant temperature sensors and to manage the pump speed (0-10V signal). [Pumps to be supplied by others].	Energy consumption associated with fluid circulation drops significantly, very often over 50%. Beyond the energy saving and the consequent lower operating costs, this new approach enables simplification in the plant's design that ensures substantial savings in initial investment costs. The integration of variable flow pumps on board, permits significant savings in overall dimensions, circuit components and in the system's commissioning.	ALL
3360 **PUMPS COMAND RELAYS**			
3361 1 RELAY EVAPORATOR PUMP	Relay for the pump(s) on/off.	It controls the operation of 1 evaporator external pump with a devoted on/off signal.	ALL
3362 2 RELAYS EVAPORATOR PUMPS	Relay for the pump(s) on/off.	It controls the operation of 2 evaporator external pumps with 2 devoted on/off signals. The second pump operates in stand-by to the first. The relative operating hours of the two pumps are balanced.	ALL
3363 1 EVAP. + 1 COND. RELAY PUMPS	Relay for the pump(s) on/off.	It controls the operation of 2 evaporator external pumps with 2 devoted on/off signals. The second pump operates in stand-by to the first. The relative operating hours of the two pumps are balanced.	ALL
3364 2 EVAP. + 2 COND. RELAY PUMPS	Relay for the pump(s) on/off.	It controls the operation of 2 evaporator external pumps with 2 devoted on/off signals. The second pump operates in stand-by to the first. The relative operating hours of the two pumps are balanced.	ALL
5920 **MANAGEMENT & CONTROL SYSTEMS**			
5921 NETWORK ANALYZER FOR DEMETRA	This option includes all following devices on-board the unit panel: - network analyzer operating on ModBUS protocol over RS-485 (without certification MID) - current transformers.	This accesory allows to acquire the electrical data and the power absorbed by the unit and send them via RS-485 bus to an external device for energy metering (DEMETRA - see dedicated manual).	ALL

OPTIONS

OPTIONS	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
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_{φ}), 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_{φ}), 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
1950 **HIGH TEMPERATURE DEVICE**			
1953 KIT HWT	Kit for increased condenser leaving water temperature up to 60°C. To ensure control of the condenser leaving water temperature, this option must be fitted for /H function. NOTE: the adoption of "kit HWT" modifies the unit's performance in all the operating range; refer to the selection software to have the correct technical data.	The accessory is required for applications with high condensing temperature (heat pump, high level heat reclaim or dry cooler applications).	ALL
1240 **CONDENSING PRESSURE CTRL DEV**			
1241 PRESSOSTATIC WATER VALVE	Pressostatic valve with grey cast iron body.	It's used for regulating the flow of water as a function of the condensing pressure, maintaining it constant during operation. When the refrigeration plant is stopped, the cooling water flow is shut off automatically. The valve is selected and tested by Mehits during the unit's test. Recommended for applications with low temperature water, for example groundwater, where it's request the condensation pressure's control and it's possible to work with variable flow on the rejection circuit (Separately supplied, not mounted).	ALL

OPTIONS

OPTIONS	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
1246 WITH MODULATING SIGNAL 0-10V	0-10 V signal on terminal board for the condensation control.	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
1380 **3 WAY MODULATING VALVE**			
1381 3 WAY VALVE MOD. A	3 way modulating valve, steel made, with diverting function (see dedicated section).	It's recommended for applications with geothermal probes, in which the water flow is required to be constant.	ALL
1382 3 WAY VALVE MOD. B	3 way modulating valve, steel made, with diverting function (see dedicated section).	It's recommended for applications with geothermal probes, in which the water flow is required to be constant.	ALL
1383 3 WAY VALVE MOD. C	3 way modulating valve, steel made, with diverting function (see dedicated section).	It's recommended for applications with geothermal probes, in which the water flow is required to be constant.	ALL
1384 3 WAY VALVE MOD. D	3 way modulating valve, steel made, with diverting function (see dedicated section).	It's recommended for applications with geothermal probes, in which the water flow is required to be constant.	ALL
1385 3 WAY VALVE MOD. E	3 way modulating valve, steel made, with diverting function (see dedicated section).	It's recommended for applications with geothermal probes, in which the water flow is required to be constant.	ALL
1386 3 WAY VALVE MOD. F	3 way modulating valve, steel made, with diverting function (see dedicated section).	It's recommended for applications with geothermal probes, in which the water flow is required to be constant.	ALL
1387 3 WAY VALVE MOD. G	3 way modulating valve, steel made, with diverting function (see dedicated section).	It's recommended for applications with geothermal probes, in which the water flow is required to be constant.	ALL
1410 **2 WAY MODULATIMG VALVE**			
1411 2 WAY VALVE MOD. A	Two way servo-motorized valve with steel body (see dedicated section).	It's recommended in case of inverter pumps and water flow modulation.	ALL
1412 2 WAY VALVE MOD. B	Two way servo-motorized valve with steel body (see dedicated section).	It's recommended in case of inverter pumps and water flow modulation.	ALL
1413 2 WAY VALVE MOD. C	Two way servo-motorized valve with steel body (see dedicated section).	It's recommended in case of inverter pumps and water flow modulation.	ALL
1414 2 WAY VALVE MOD. D	Two way servo-motorized valve with steel body (see dedicated section).	It's recommended in case of inverter pumps and water flow modulation.	ALL
1415 2 WAY VALVE MOD. E	Two way servo-motorized valve with steel body (see dedicated section).	It's recommended in case of inverter pumps and water flow modulation.	ALL
1416 2 WAY VALVE MOD. F	Two way servo-motorized valve with steel body (see dedicated section).	It's recommended in case of inverter pumps and water flow modulation.	ALL
1417 2 WAY VALVE MOD. G	Two way servo-motorized valve with steel body (see dedicated section).	It's recommended in case of inverter pumps and water flow modulation.	ALL
1418 2 WAY VALVE MOD. H	Two way servo-motorized valve with steel body (see dedicated section).	It's recommended in case of inverter pumps and water flow modulation.	ALL
1800 **EVAPORATOR WATER FLOW SWITCH**			
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

OPTIONS

OPTIONS	DESCRIPTIONS	BENEFITS	AVAILABLE FOR MODELS
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
2630 **INSULATION ON EXCHANGERS**			
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
2340 **UNIT ENCLOSURE**			
2316 COMPRESSORS SOUNDPROOFING	Compressors soundproofing covering	Reduction of 6 dB(A) on the total sound power	ALL
9960 **PACKING**			
9966 NYLON PACKING	Unit covered with nylon		ALL
9979 CONTAINER PACKING	Unit provided with container slides and covered with nylon		ALL

OPTIONS

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 branche, 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.

5.1 GENERAL TECHNICAL DATA FRCS3-W-G05-Z

[SI System]

FRCS3-W-G05-Z			0551	0701	0851	0951	1101	1301	1401	1651	1901	2101
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
PERFORMANCE												
COOLING ONLY (GROSS VALUE)												
Cooling capacity	(1)	**kW**	**188,2**	**250,0**	**306,0**	**337,6**	**383,5**	**459,9**	**524,0**	**591,8**	**681,6**	**741,3**
Total power input	(1)	kW	36,40	47,78	58,45	63,77	72,73	85,99	96,90	108,2	127,0	138,7
EER	(1)	kW/kW	5,170	5,230	5,231	5,292	5,275	5,348	5,408	5,470	5,367	5,345
ESEER	(1)	kW/kW	6,910	7,150	6,560	6,830	6,800	6,730	7,250	6,960	7,020	6,920
COOLING ONLY (EN14511 VALUE)												
Cooling capacity	(1)(2)	**kW**	**187,4**	**248,9**	**304,7**	**336,1**	**381,9**	**458,2**	**522,3**	**589,5**	**679,4**	**738,9**
EER	(1)(2)	kW/kW	4,890	4,950	4,960	5,010	5,000	5,090	5,190	5,200	5,120	5,130
ESEER	(1)(2)	kW/kW	6,180	6,370	5,950	6,150	6,140	6,140	6,670	6,310	6,390	6,400
Cooling energy class			B	B	B	B	B	A	A	A	A	A
EXCHANGERS												
HEAT EXCHANGER USER SIDE IN REFRIGERATION												
Water flow	(1)	l/s	9,001	11,95	14,63	16,15	18,34	21,99	25,06	28,30	32,59	35,45
Pressure drop	(1)	kPa	42,0	48,7	49,1	52,4	52,8	47,5	39,9	50,9	42,0	42,7
HEAT EXCHANGER SOURCE SIDE IN REFRIGERATION												
Water flow	(1)	l/s	10,70	14,19	17,36	19,13	21,74	26,02	29,60	33,37	38,54	41,94
Pressure drop	(1)	kPa	57,4	57,9	56,7	59,3	58,1	55,2	44,8	55,8	60,4	45,8
REFRIGERANT CIRCUIT												
Compressors nr.		N°	1	1	1	1	1	1	1	1	1	1
Number of capacity steps		N°	0	0	0	0	0	0	0	0	0	0
No. Circuits		N°	1	1	1	1	1	1	1	1	1	1
Regulation			STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS
Min. capacity step		%	50	50	50	50	50	50	50	50	50	50
Refrigerant			R513A	R513A	R513A	R513A	R513A	R513A	R513A	R513A	R513A	R513A
Refrigerant charge		kg	83,0	95,0	105	104	95,0	110	121	124	134	162
Oil charge		kg	15,0	15,0	22,0	19,0	19,0	35,0	35,0	35,0	35,0	38,0
Rc (ASHRAE)	(3)	kg/kW	0,45	0,38	0,35	0,31	0,25	0,24	0,23	0,21	0,20	0,22
NOISE LEVEL												
Sound Pressure	(4)	dB(A)	77	77	80	80	80	80	80	80	80	82
Sound power level in cooling	(5)(6)	dB(A)	95	95	98	98	98	98	98	98	98	100
SIZE AND WEIGHT												
A	(7)	mm	2920	2920	2920	2920	2920	2900	2900	2900	2930	2980
B	(7)	mm	1180	1180	1180	1180	1180	1180	1180	1180	1180	1190
H	(7)	mm	1870	1870	1870	1870	1870	1960	1970	1960	2050	2100
Operating weight	(7)	kg	1740	1790	2170	2200	2260	2940	3020	3150	3270	3570

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 Rated in accordance with AHRI Standard 550/590 (2011 with addendum 1).
4 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.
5 Sound power on the basis of measurements made in compliance with ISO 9614.
6 Sound power level in cooling, indoors.
7 Unit in standard configuration/execution, without optional accessories.
- Not available
Certified data in EUROVENT

GENERAL TECHNICAL DATA FRCS3-W-G05-Z

[SI System]

FRCS3-W-G05-Z			2501	2602	3002	3152	3502	3652	4002	4102	4502	4602
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
PERFORMANCE												
COOLING ONLY (GROSS VALUE)												
Cooling capacity	(1)	**kW**	**837,0**	**915,9**	**1062**	**1140**	**1218**	**1303**	**1382**	**1450**	**1522**	**1614**
Total power input	(1)	kW	155,6	171,0	194,8	204,3	222,9	234,1	251,9	263,1	279,3	295,9
EER	(1)	kW/kW	5,379	5,356	5,452	5,580	5,464	5,566	5,486	5,511	5,449	5,455
ESEER	(1)	kW/kW	6,800	7,060	7,330	7,530	7,150	7,400	7,130	7,200	7,190	7,230
COOLING ONLY (EN14511 VALUE)												
Cooling capacity	(1)(2)	**kW**	**834,3**	**913,2**	**1058**	**1137**	**1214**	**1299**	**1377**	**1445**	**1517**	**1609**
EER	(1)(2)	kW/kW	5,160	5,160	5,210	5,400	5,220	5,380	5,250	5,290	5,210	5,240
ESEER	(1)(2)	kW/kW	6,280	6,400	6,480	6,870	6,330	6,740	6,350	6,450	6,410	6,500
Cooling energy class			A	A	A	A	A	A	A	A	A	A
EXCHANGERS												
HEAT EXCHANGER USER SIDE IN REFRIGERATION												
Water flow	(1)	l/s	40,03	43,80	50,79	54,53	58,23	62,33	66,11	69,33	72,76	77,20
Pressure drop	(1)	kPa	42,8	40,0	51,5	37,4	51,4	39,8	50,4	46,7	51,5	42,5
HEAT EXCHANGER SOURCE SIDE IN REFRIGERATION												
Water flow	(1)	l/s	47,31	51,80	59,91	64,10	68,67	73,30	77,91	81,66	85,84	91,05
Pressure drop	(1)	kPa	48,1	44,5	54,4	32,0	56,8	34,1	53,5	50,1	55,4	53,7
REFRIGERANT CIRCUIT												
Compressors nr.		N°	1	2	2	2	2	2	2	2	2	2
Number of capacity steps		N°	0	0	0	0	0	0	0	0	0	0
No. Circuits		N°	1	2	2	2	2	2	2	2	2	2
Regulation			STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS	STEPSLESS
Min. capacity step		%	50	25	25	25	25	25	25	25	25	25
Refrigerant			R513A	R513A	R513A	R513A	R513A	R513A	R513A	R513A	R513A	R513A
Refrigerant charge		kg	201	231	274	297	297	308	308	317	327	376
Oil charge		kg	38,0	70,0	70,0	70,0	70,0	70,0	70,0	73,0	76,0	76,0
Rc (ASHRAE)	(3)	kg/kW	0,24	0,25	0,26	0,26	0,25	0,24	0,23	0,22	0,22	0,24
NOISE LEVEL												
Sound Pressure	(4)	dB(A)	82	81	81	81	81	81	81	82	82	82
Sound power level in cooling	(5)(6)	dB(A)	100	100	100	100	100	100	100	101	102	102
SIZE AND WEIGHT												
A	(7)	mm	2990	4430	4430	4440	4470	4470	4470	4565	4650	5270
B	(7)	mm	1280	1270	1270	1270	1270	1320	1270	1320	1320	1320
H	(7)	mm	2200	2210	2210	2280	2250	2330	2280	2380	2380	2380
Operating weight	(7)	kg	3960	6200	6430	7080	7160	7560	7280	7850	7940	8420

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 Rated in accordance with AHRI Standard 550/590 (2011 with addendum 1).
4 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.
5 Sound power on the basis of measurements made in compliance with ISO 9614.
6 Sound power level in cooling, indoors.
7 Unit in standard configuration/execution, without optional accessories.
- Not available
Certified data in EUROVENT

GENERAL TECHNICAL DATA FRCS3-W-G05-Z

[SI System]

FRCS3-W-G05-Z			4752
Power supply		V/ph/Hz	400/3/50
PERFORMANCE			
COOLING ONLY (GROSS VALUE)			
Cooling capacity	(1)	**kW**	**1693**
Total power input	(1)	kW	304,3
EER	(1)	kW/kW	5,564
ESEER	(1)	kW/kW	7,500
COOLING ONLY (EN14511 VALUE)			
Cooling capacity	(1)(2)	**kW**	**1688**
EER	(1)(2)	kW/kW	5,320
ESEER	(1)(2)	kW/kW	6,660
Cooling energy class			A
EXCHANGERS			
HEAT EXCHANGER USER SIDE IN REFRIGERATION			
Water flow	(1)	l/s	80,94
Pressure drop	(1)	kPa	46,7
HEAT EXCHANGER SOURCE SIDE IN REFRIGERATION			
Water flow	(1)	l/s	95,19
Pressure drop	(1)	kPa	58,7
REFRIGERANT CIRCUIT			
Compressors nr.		N°	2
Number of capacity steps		N°	0
No. Circuits		N°	2
Regulation			STEPSLESS
Min. capacity step		%	25
Refrigerant			R513A
Refrigerant charge		kg	376
Oil charge		kg	76,0
Rc (ASHRAE)	(3)	kg/kW	0,22
NOISE LEVEL			
Sound Pressure	(4)	dB(A)	82
Sound power level in cooling	(5)(6)	dB(A)	102
SIZE AND WEIGHT			
A	(7)	mm	5270
B	(7)	mm	1320
H	(7)	mm	2380
Operating weight	(7)	kg	8950

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 Rated in accordance with AHRI Standard 550/590 (2011 with addendum 1).
4 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.
5 Sound power on the basis of measurements made in compliance with ISO 9614.
6 Sound power level in cooling, indoors.
7 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

FRCS3-W-G05-Z			0551	0701	0851	0951	1101	1301	1401	1651	1901	2101	2501
Prated,c	(1)	kW	187,4	248,9	304,7	336,1	381,9	458,2	522,3	589,5	679,4	738,9	834,3
SEPR	(1)(2)		7,74	7,82	7,46	7,50	7,48	7,50	7,52	7,51	7,51	7,70	7,65

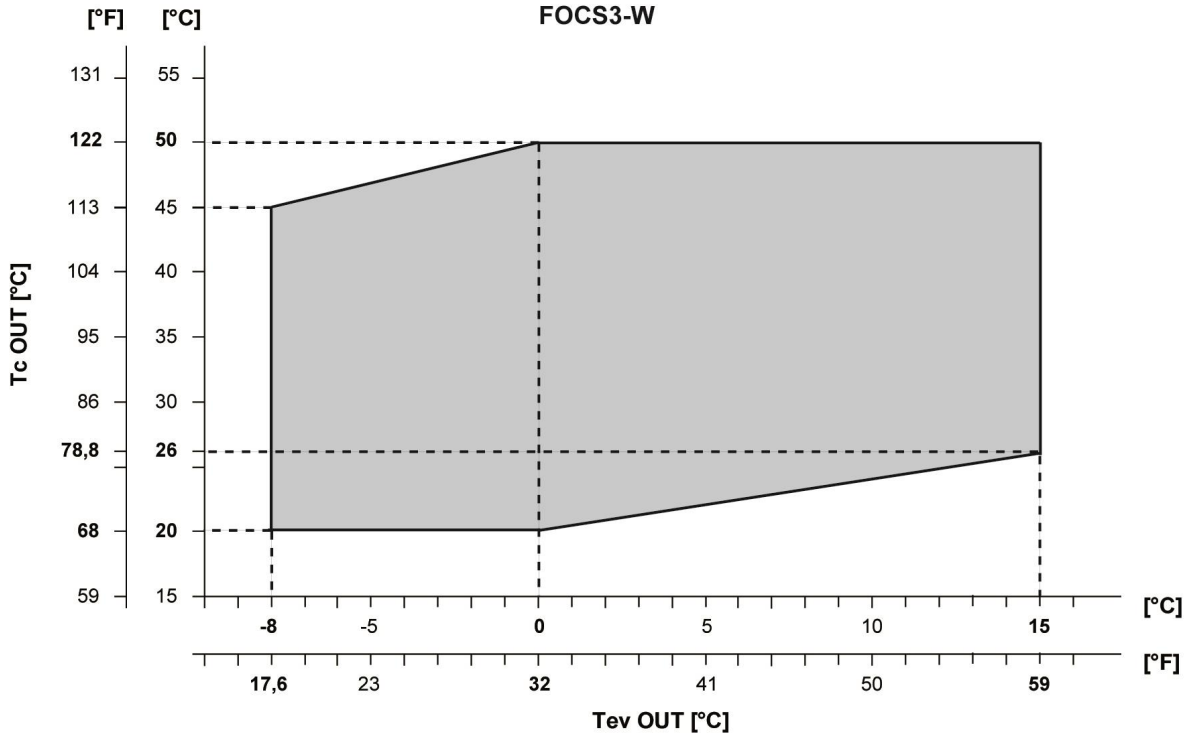
FRCS3-W-G05-Z			2602	3002	3152	3502	3652	4002	4102	4502	4602	4752	
Prated,c	(1)	kW	913,2	1058	1137	1214	1299	1377	1445	1517	1609	1688	
SEPR	(1)(2)		7,62	7,50	7,71	7,50	7,68	7,50	7,59	8,00	8,00	8,00	

Notes:

(1) Seasonal energy efficiency of high temperature process cooling [REGULATION (EU) N. 2016/2281]
(2) Seasonal space heating energy index
The units highlighted in this publication contain R513A [GWP100 631] fluorinated greenhouse gases.

Certified data in EUROVENT

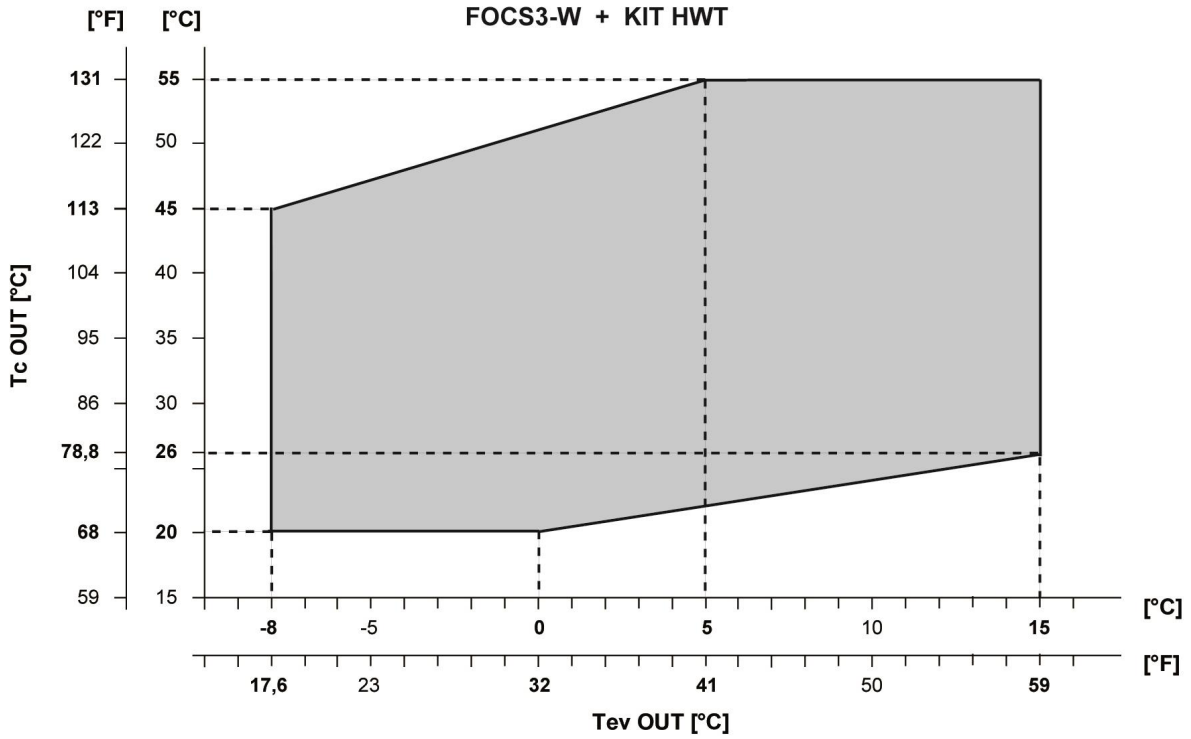
6.1 OPERATING LIMITS



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.

SIZE
FRCS3-W-G05-Z /0551
FRCS3-W-G05-Z /0701
FRCS3-W-G05-Z /0851
FRCS3-W-G05-Z /0951
FRCS3-W-G05-Z /1101
FRCS3-W-G05-Z /1301
FRCS3-W-G05-Z /1401
FRCS3-W-G05-Z /1651
FRCS3-W-G05-Z /1901
FRCS3-W-G05-Z /2101
FRCS3-W-G05-Z /2501
FRCS3-W-G05-Z /2602
FRCS3-W-G05-Z /3002
FRCS3-W-G05-Z /3152
FRCS3-W-G05-Z /3502
FRCS3-W-G05-Z /3652
FRCS3-W-G05-Z /4002
FRCS3-W-G05-Z /4102
FRCS3-W-G05-Z /4502
FRCS3-W-G05-Z /4602
FRCS3-W-G05-Z /4752

6.2 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.

6.3 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 (m² °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	$1{,}80 \times 10^{-5}$	1,000	1,000	0,0	1,000	1,000	0,0	1,000
VARIOUS	$4{,}40 \times 10^{-5}$	1,000	1,000	0,0	0,990	1,030	1,0	0,990
VARIOUS	$8{,}80 \times 10^{-5}$	0,960	0,990	0,7	0,980	1,040	1,5	0,980
VARIOUS	$13{,}20 \times 10^{-5}$	0,944	0,985	1,0	0,964	1,050	2,3	0,964
VARIOUS	$17{,}20 \times 10^{-5}$	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

7.1 HYDRAULIC DATA

[SI System]

Water flow and pressure drop

Water flow in the plant (side) exchanger is given by:
Q=P/(4,186 x Dt)
Q: water flow (l/s)
Dt: difference between inlet and outlet water temp. (°C)
P: heat exchanger capacity (kW)

Pressure drop is given by:
Dp= K x (3,6 x Q)^2/1000
Q: water flow (l/s)
Dp: pressure drop (kPa)
K: unit size ratio

SIZE	Power supply V/ph/Hz	HEAT EXCHANGER USER SIDE					HEAT EXCHANGER SOURCE 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
FRCS3-W-G05-Z /0551	400/3/50	40,0	4,722	13,89	25,0	940	38,7	4,167	13,06	30,0
FRCS3-W-G05-Z /0701	400/3/50	26,3	5,833	17,22	32,0	1250	22,2	5,556	17,50	40,0
FRCS3-W-G05-Z /0851	400/3/50	17,7	6,944	21,11	40,0	1530	14,5	6,944	21,94	40,0
FRCS3-W-G05-Z /0951	400/3/50	15,5	7,500	22,78	40,0	1690	12,5	7,500	23,61	50,0
FRCS3-W-G05-Z /1101	400/3/50	12,1	8,611	25,83	50,0	1920	9,49	8,611	27,50	60,0
FRCS3-W-G05-Z /1301	400/3/50	7,57	11,94	34,44	67,0	2300	6,29	11,39	35,56	73,0
FRCS3-W-G05-Z /1401	400/3/50	4,90	13,89	39,44	80,0	2620	3,95	13,06	41,11	80,0
FRCS3-W-G05-Z /1651	400/3/50	4,90	15,56	44,17	90,0	2960	3,87	14,72	46,11	90,0
FRCS3-W-G05-Z /1901	400/3/50	3,05	17,50	50,00	100	3410	3,14	14,72	46,11	90,0
FRCS3-W-G05-Z /2101	400/3/50	2,62	18,89	53,89	110	3710	2,01	18,33	57,78	120
FRCS3-W-G05-Z /2501	400/3/50	2,06	21,39	60,83	120	4190	1,66	20,28	63,61	130
FRCS3-W-G05-Z /2602	400/3/50	1,61	23,33	66,94	190	3210	1,28	22,78	71,11	210
FRCS3-W-G05-Z /3002	400/3/50	1,54	26,39	75,83	220	3720	1,17	25,83	81,11	240
FRCS3-W-G05-Z /3152	400/3/50	0,97	30,28	86,39	250	3990	0,60	33,33	104,4	300
FRCS3-W-G05-Z /3502	400/3/50	1,17	30,28	86,39	250	4260	0,93	29,44	91,94	270
FRCS3-W-G05-Z /3652	400/3/50	0,79	33,33	95,83	280	4560	0,49	36,94	115,3	240
FRCS3-W-G05-Z /4002	400/3/50	0,89	33,33	95,83	280	4840	0,68	33,33	104,4	300
FRCS3-W-G05-Z /4102	400/3/50	0,75	36,94	105,8	300	5150	0,58	36,94	115,3	340
FRCS3-W-G05-Z /4502	400/3/50	0,75	36,94	105,8	300	5330	0,58	36,94	115,3	340
FRCS3-W-G05-Z /4602	400/3/50	0,55	40,28	115,3	330	5650	0,50	40,00	125,3	450
FRCS3-W-G05-Z /4752	400/3/50	0,55	40,28	115,3	330	5930	0,50	40,00	125,3	450

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 >=10°C), “K” coefficient as to be multiplied for 8,5 (Knew = K x 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

8.1 ELECTRICAL DATA FRCS3-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	1x50.9	1x84.4	1x267	50,90	84	267
0701	400/3/50	1	1x66.3	1x109	1x350	66,30	109	350
0851	400/3/50	1	1x80.9	1x130	1x246	80,90	130	246
0951	400/3/50	1	1x89	1x147	1x300	89,00	147	300
1101	400/3/50	1	1x101	1x168	1x360	101,0	168	360
1301	400/3/50	1	1x122	1x197	1x318	122,0	197	318
1401	400/3/50	1	1x138	1x223	1x436	138,0	223	436
1651	400/3/50	1	1x155	1x247	1x465	155,0	247	465
1901	400/3/50	1	1x175	1x286	1x586	175,0	286	586
2101	400/3/50	1	1x196	1x318	1x650	196,0	318	650
2501	400/3/50	1	1x216	1x351	1x805	216,0	351	805
2602	400/3/50	2	2X122	2x197	2x318	244,0	394	444
3002	400/3/50	2	2X138	2x223	2x436	276,0	446	579
3152	400/3/50	2	1x138+1x155	1x223+1x247	1x436+1x465	293,0	470	608
3502	400/3/50	2	2X155	2x247	2x465	310,0	494	612
3652	400/3/50	2	1x155+1x175	1x247+1x286	1x465+1x586	330,0	533	733
4002	400/3/50	2	2X175	2x286	2x586	350,0	572	761
4102	400/3/50	2	1x175+1x196	1x286+1x318	1x586+1x650	371,0	604	825
4502	400/3/50	2	2X196	2x318	2x650	392,0	636	860
4602	400/3/50	2	1x196+1x216	1x318+1x351	1x650+1x805	412,0	669	1015
4752	400/3/50	2	2X216	2x351	2x805	432,0	702	1025

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

ELECTRICAL DATA

Maximum cables/bars section connected to main switch and short time current

SIZE	MAXIMUM CABLE SECTION CONNECTED TO MAIN SWITCH ∅ [mm²]	MAXIMUM BAR SECTION CONNECTED TO MAIN SWITCH □ [mm²]	ICW (0.25 s) short time current rms [kA]
0551	120	20 x 5	10
0701			
0851			15
0951			
1101			
1301			
1401	2 x 150	2 x 25 x 5	25
1651			
1901			
2101			
2501			
2602	2 x 185	2 x 32 x 6	
3002			
3152			27
3502			
3652			
4002	min 2 x 185 max 2 x 300	min 2 x 40 x 5 max 2 x 63 x 5	
4102			
4502			
4602	min 2 x 240 max 2x 400	min 2 x 50 x 5 max 2 x 63 x 5	50
4752			

9.1 FULL LOAD SOUND LEVEL FRCS3-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	73	76	91	90	92	87	81	71	**95**
0701	73	76	91	90	92	87	81	71	**95**
0851	82	79	90	94	97	85	73	67	**98**
0951	82	79	90	94	97	85	73	67	**98**
1101	82	79	90	94	97	85	73	67	**98**
1301	82	79	90	94	97	85	74	68	**98**
1401	82	79	90	94	97	85	74	68	**98**
1651	82	79	90	94	97	85	74	68	**98**
1901	82	79	90	94	97	85	74	68	**98**
2101	84	81	91	96	99	87	76	70	**100**
2501	84	81	91	96	99	87	76	70	**100**
2602	84	81	91	96	99	87	76	70	**100**
3002	84	81	91	96	99	87	76	70	**100**
3152	84	81	91	96	99	87	76	70	**100**
3502	84	81	91	96	99	87	76	70	**100**
3652	84	81	91	96	99	87	76	70	**100**
4002	84	81	91	96	99	87	76	70	**100**
4102	84	82	93	97	100	88	77	71	**101**
4502	85	83	94	98	101	90	78	71	**102**
4602	85	83	94	98	101	90	78	71	**102**
4752	85	83	94	98	101	90	78	71	**102**

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	55	58	73	72	74	69	63	53	**77**
0701	55	58	73	72	74	69	63	53	**77**
0851	64	61	72	76	79	67	55	49	**80**
0951	64	61	72	76	79	67	55	49	**80**
1101	64	61	72	76	79	67	55	49	**80**
1301	64	61	72	76	79	67	56	50	**80**
1401	64	61	72	76	79	67	56	50	**80**
1651	64	61	72	76	79	67	56	50	**80**
1901	64	61	72	76	79	67	56	50	**80**
2101	66	63	73	78	81	69	58	52	**82**
2501	66	63	73	78	81	69	58	52	**82**
2602	65	62	72	77	80	68	57	51	**81**
3002	65	62	72	77	80	68	57	51	**81**
3152	65	62	72	77	80	68	57	51	**81**
3502	65	62	72	77	80	68	57	51	**81**
3652	65	62	72	77	80	68	57	51	**81**

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.

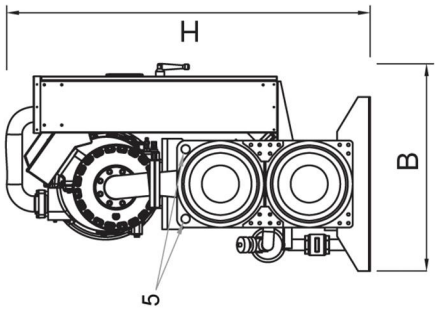
FULL LOAD SOUND LEVEL FRCS3-W-G05-Z

SOUND PRESSURE LEVEL									
SIZE	Octave band [Hz]								Total sound level dB(A)
	63	125	250	500	1000	2000	4000	8000	
	Sound pressure level dB								
4002	65	62	72	77	80	68	57	51	**81**
4102	65	63	74	78	81	69	58	52	**82**
4502	65	63	74	78	81	70	58	51	**82**
4602	65	63	74	78	81	70	58	51	**82**
4752	65	63	74	78	81	70	58	51	**82**

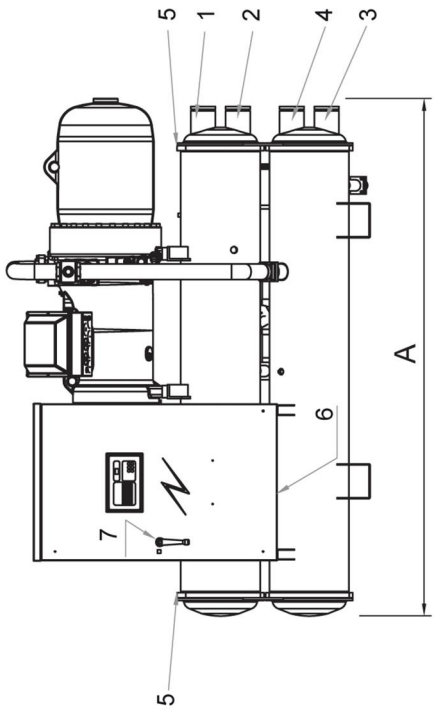
Working conditions

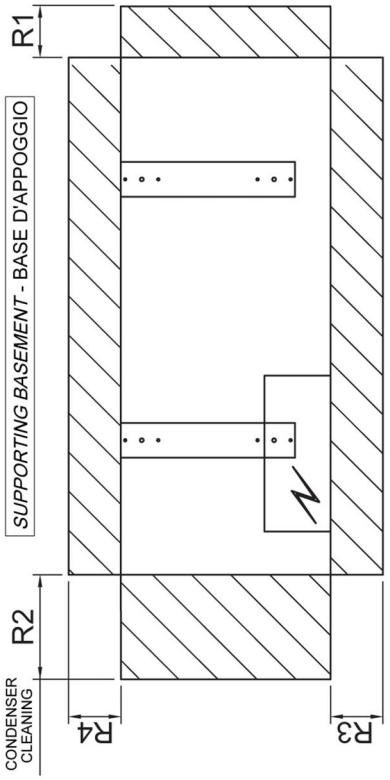
Plant (side) cooling exchanger water (in/out) 12,00°C/7,00°C; Source (side) heat exchanger water (in/out) 30,00°C/35,00°C.

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 Power inlet
Ingresso linea elettrica
7 Main isolator
Sezionatore generale





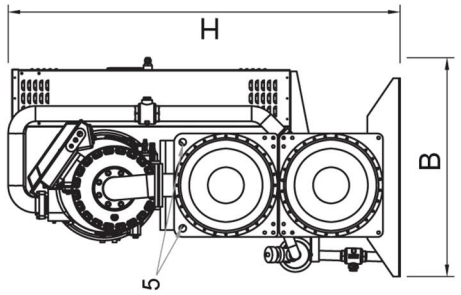
REMARKS:For installation purposes, please refer to the documentation sent after the purchase-contract. This technical data should be considered as indicative. Mitsubishi Electric Hydronics & IT Cooling Systems S.p.A. may modify them at any moment. Data valid for standard units without any additional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

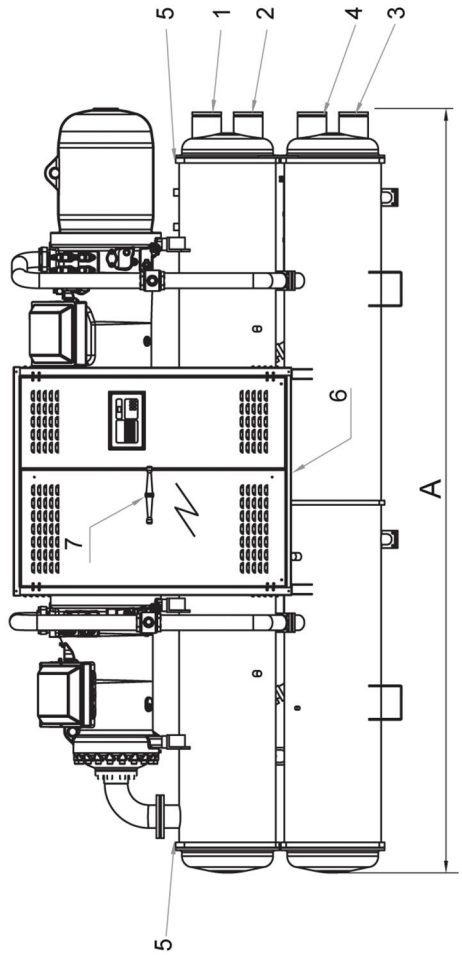
DIMENSIONAL DRAWINGS

FRCS3-W-G05-Z 0551 - 4752

[SI System]

SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE		HEAT EXCHANGER SOURCE SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT		IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø	TYPE	Ø
FRCS3-W-G05-Z /0551	2920	1180	1870	1740	1000	2500	900	500	H	3"	H	3"
FRCS3-W-G05-Z /0701	2920	1180	1870	1790	1000	2500	900	500	H	3"	H	3"
FRCS3-W-G05-Z /0851	2920	1180	1870	2170	1000	2500	900	500	H	3"	H	3"
FRCS3-W-G05-Z /0951	2920	1180	1870	2200	1000	2500	900	500	H	3"	H	3"
FRCS3-W-G05-Z /1101	2920	1180	1870	2260	1000	2500	900	500	H	3"	H	3"
FRCS3-W-G05-Z /1301	2900	1180	1960	2940	1000	2500	900	500	H	4"	H	4"
FRCS3-W-G05-Z /1401	2900	1180	1970	3020	1000	2500	900	500	H	4"	H	4"
FRCS3-W-G05-Z /1651	2900	1180	1960	3150	1000	2500	900	500	H	4"	H	4"
FRCS3-W-G05-Z /1901	2930	1180	2050	3270	1000	2500	900	500	H	5"	H	4"
FRCS3-W-G05-Z /2101	2980	1190	2100	3570	1000	2500	900	500	H	5"	H	5"
FRCS3-W-G05-Z /2501	2990	1280	2200	3960	1000	2500	900	500	H	6"	H	6"





1 Evaporator water inlet
Entrata acqua evaporatore
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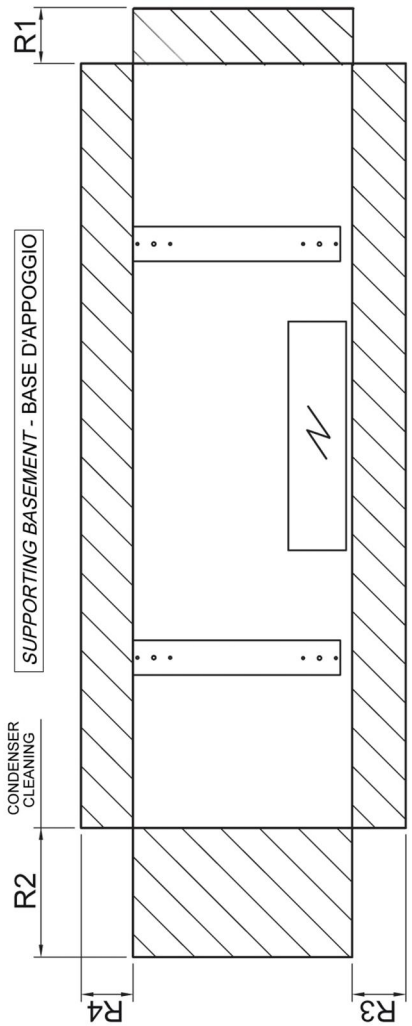
Uscita acqua evaporatore
3 Condenser water inlet
Entrata acqua condensatore
4 Condenser water outlet
Uscita acqua condensatore
5 Lifting points
Punti di sollevamento
6 Power inlet
Ingresso linea elettrica
7 Main isolator
Sezionatore generale



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

DIMENSIONAL DRAWINGS FRCS3-W-G05-Z 0551 - 4752

[SI System]

SIZE	DIMENSIONS AND WEIGHTS				CLEARANCE				HEAT EXCHANGER USER SIDE		HEAT EXCHANGER SOURCE SIDE	
	A	B	H	WEIGHT	R1	R2	R3	R4	IN/OUT		IN/OUT	
	[mm]	[mm]	[mm]	[kg]	[mm]	[mm]	[mm]	[mm]	TYPE	Ø	TYPE	Ø
FRCS3-W-G05-Z /2602	4430	1270	2210	6200	1000	4000	900	500	H	6"	H	6"
FRCS3-W-G05-Z /3002	4430	1270	2210	6430	1000	4000	900	500	H	6"	H	6"
FRCS3-W-G05-Z /3152	4440	1270	2280	7080	1000	4000	900	500	H	6"	H	6"
FRCS3-W-G05-Z /3502	4470	1270	2250	7160	1000	4000	900	500	H	6"	H	6"
FRCS3-W-G05-Z /3652	4470	1320	2330	7560	1000	4000	900	500	H	6"	H	8"
FRCS3-W-G05-Z /4002	4470	1270	2280	7280	1000	4000	900	500	H	6"	H	6"
FRCS3-W-G05-Z /4102	4565	1320	2380	7850	1000	4000	900	500	H	8"	H	8"
FRCS3-W-G05-Z /4502	4650	1320	2380	7940	1000	4000	900	500	H	8"	H	8"
FRCS3-W-G05-Z /4602	5270	1320	2380	8420	1000	4000	900	500	H	8"	H	8"
FRCS3-W-G05-Z /4752	5270	1320	2380	8950	1000	4000	900	500	H	8"	H	8"

DIMENSIONAL DRAWINGS

LEGEND OF PIPE CONNECTIONS

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

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.

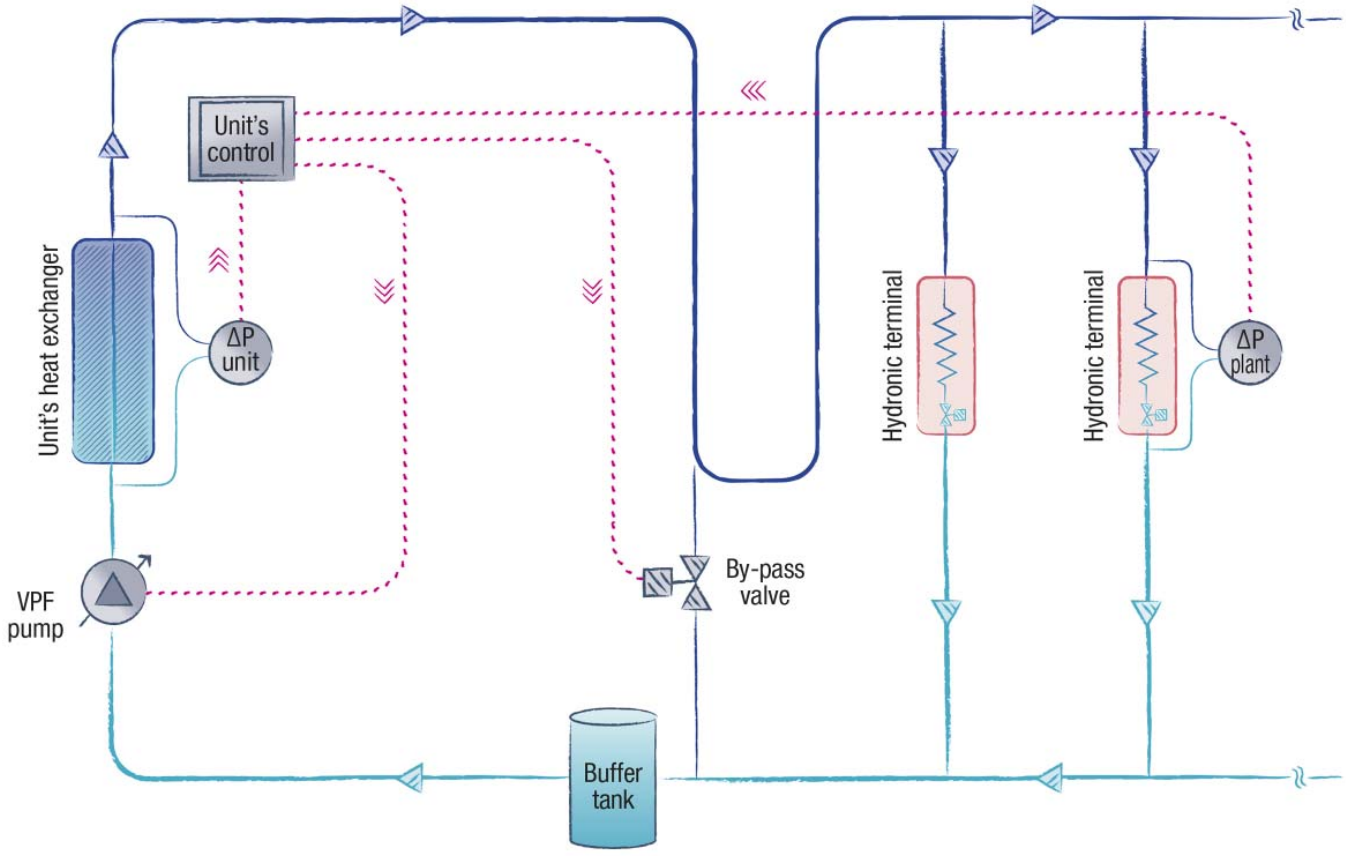
VPF SYSTEM (delta P control)
For plants with only a primary circuit

VPF - Plant and unit requirements

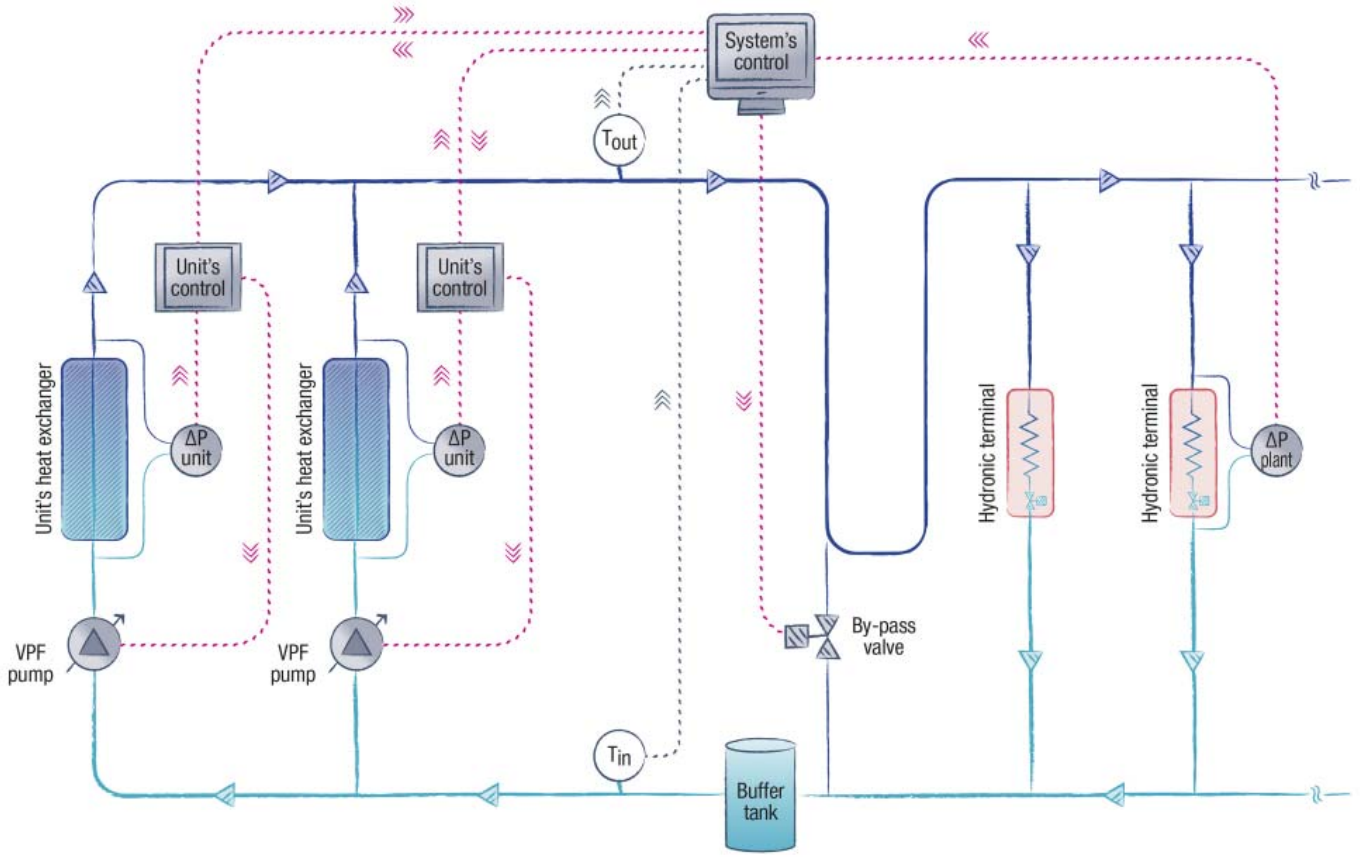
The VPF logic provides the variable flow control for the plant's primary circuit.

- 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 (ΔP) and adjusts the pump speed in order to keep it within a defined range (ΔPmin ↔ ΔPmax).

- If ΔPmin ≤ ΔP ≤ ΔPmax
  The plant water flow is appropriate to the thermal load, the pump speed is kept constant.

- If ΔP > ΔPmax
  The plant water flow exceeds what is necessary to properly cover the thermal load, the pump speed is reduced to save pump energy.

- If ΔP < ΔPmin
  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 users' 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 (ΔP < ΔPmin), 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 (2)
Plant side differential pressure transducer	Not included (the supply is the customer's responsibility) (1)	Factory supplied, installation is the client's responsibility (1)(2)	Factory supplied with the multi-unit control system, installation is the client's responsibility (1)(3)
Plant side hydraulic by-pass valve	Not included (the supply is the customer's responsibility) (4)	Not included (the supply is the customer's responsibility) (4)	Not included (the supply is the customer's responsibility) (4)

(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^3/h) (1)	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.

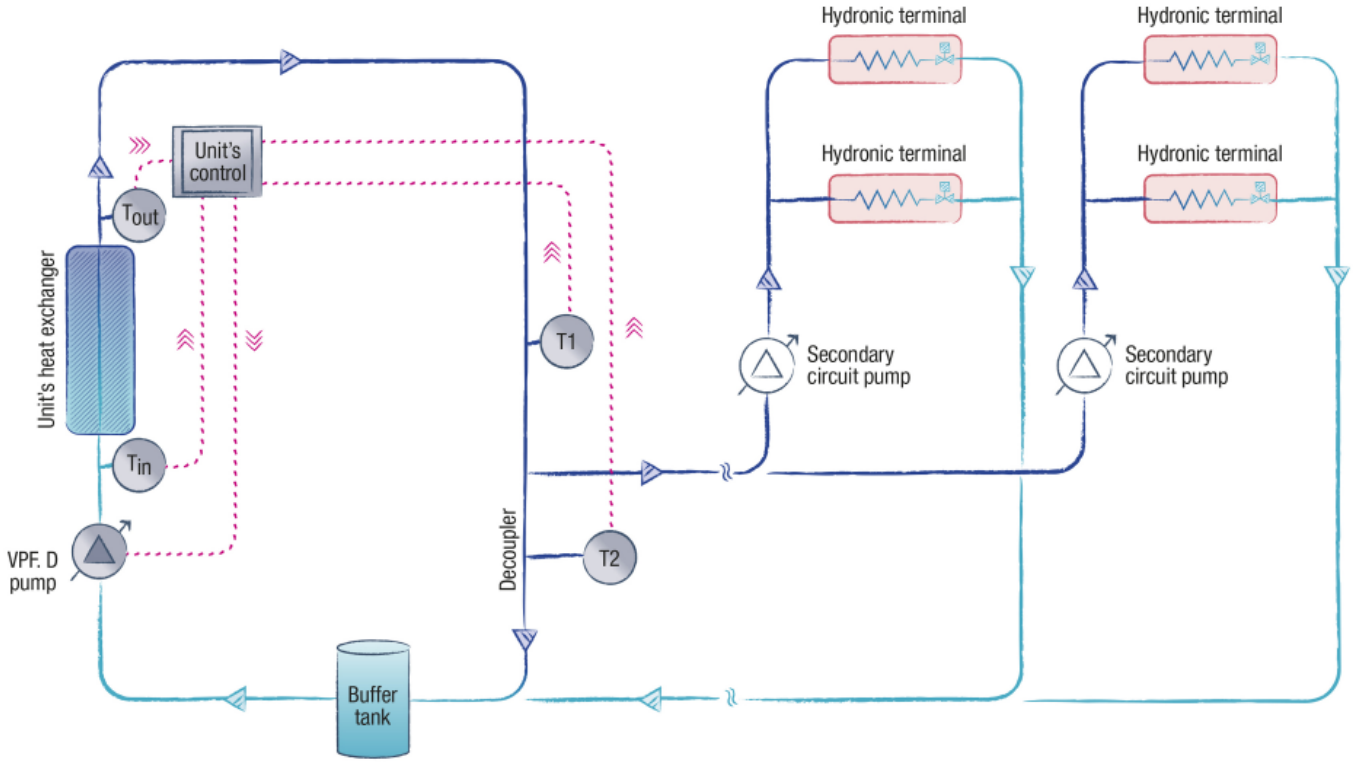
VPF.D SYSTEM (delta T control)
For plants with primary and secondary circuits separated by a hydraulic decoupler.

VPF.D - Plant and unit requirements

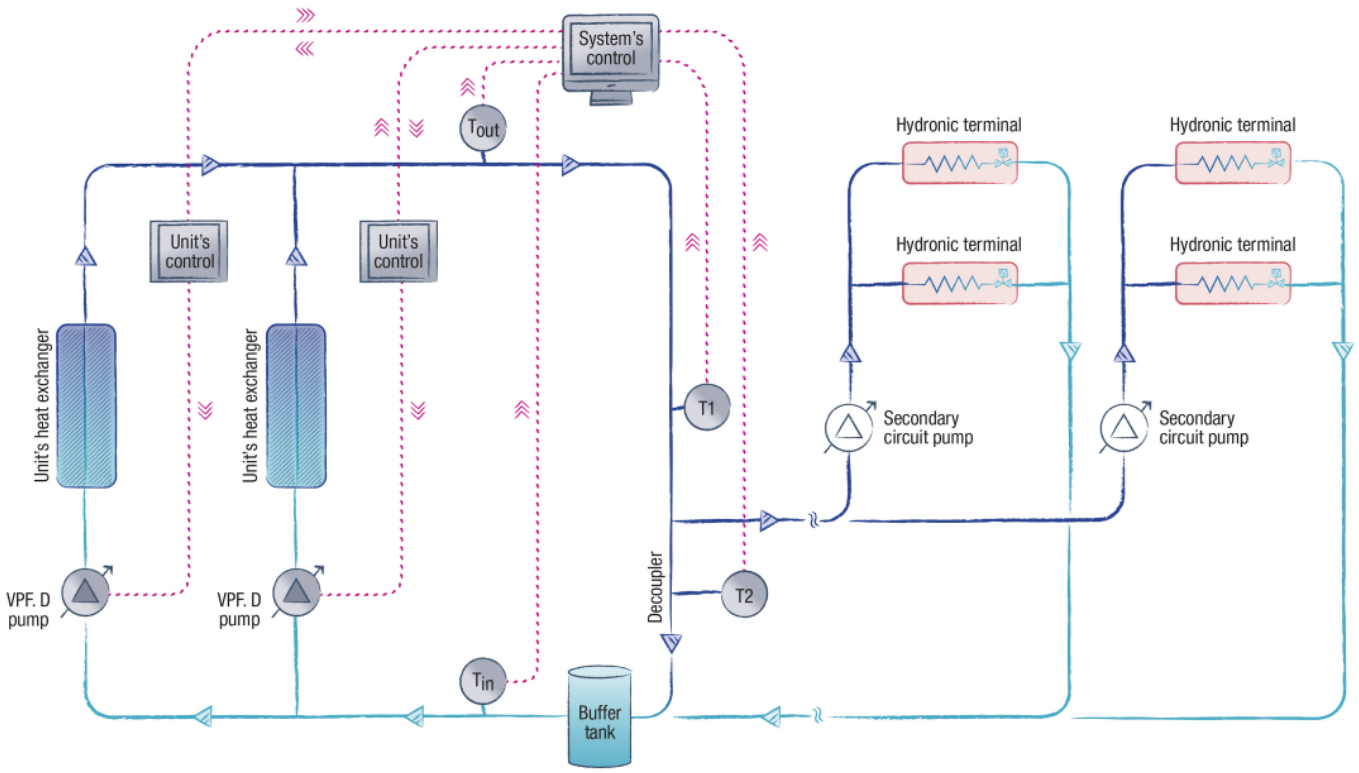
The VPF.D logic provides the variable flow control for the plant's primary circuit.

- 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 (ΔT) (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 (ΔTmin ↔ ΔTmax). The secondary circuit water flow is completely independent and is to be managed by the client.

- If ΔTmin ≤ ΔT ≤ ΔTmax
  The plant water flow is appropriate to the thermal load, the pump speed is kept constant.

- If ΔT < ΔTmax
  The plant water flow exceeds what is necessary to properly cover the thermal load, the pump speed is reduced to save pump energy.

- If ΔT > ΔTmin
  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 (1)	Factory supplied with the multi-unit control system (probes supplied without wells), installation is the client's responsibility (1)(2)

(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^3/h) (1)	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.

Pressostatic valve

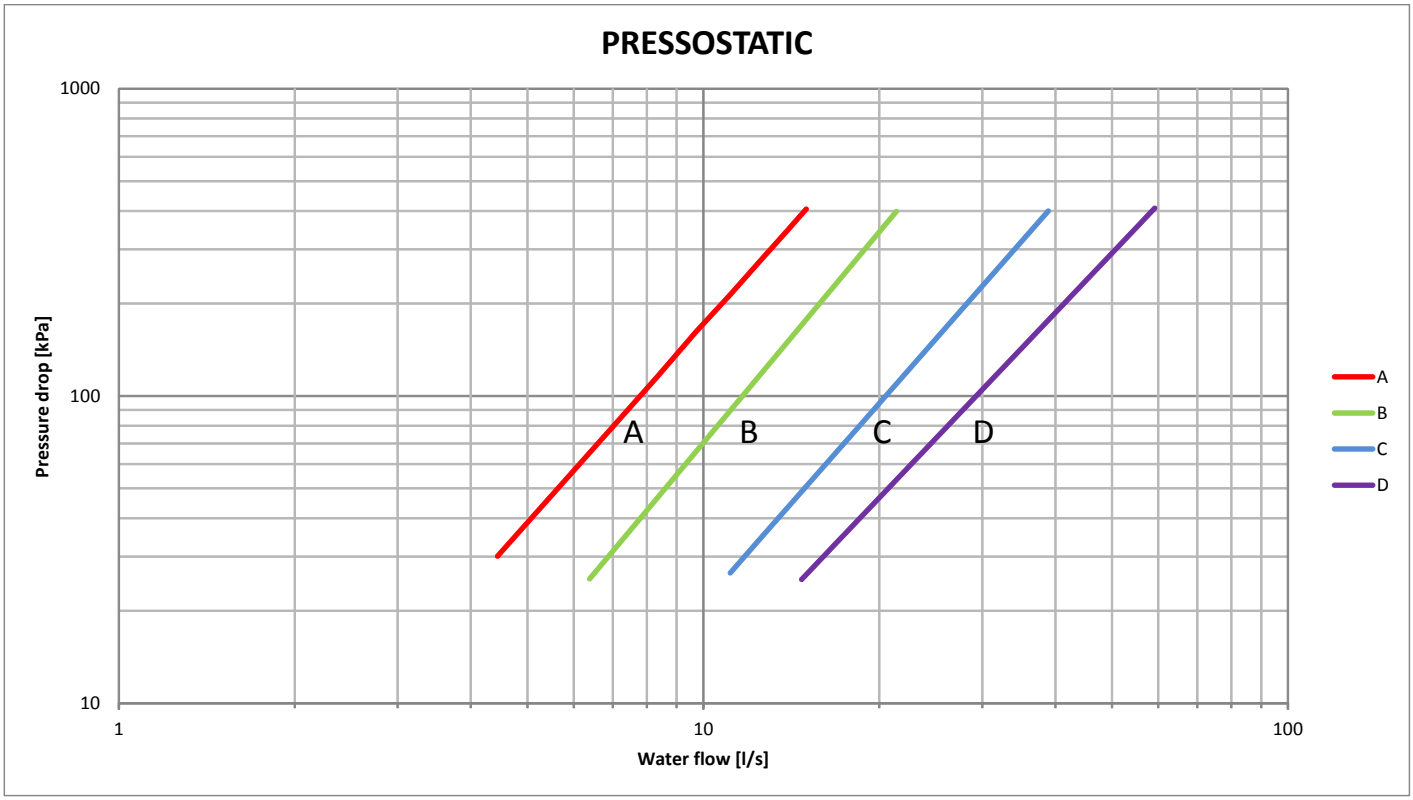
Pressostatic valve with steel body.

It provides a modulating control of the water flow as a function of the condensing pressure, keeping it constant during the operation time.

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

It's recommended for applications with low temperature water, in which the condensation pressure control is required and it's possible to work with variable water flow on the source side.

In the chart below:
Line (A): curve of the pressostatic valve for units size **0551, 0701, 0851**
Line (B): curve of the pressostatic valve for units size **0951, 1101, 1301**
Line (C): curve of the pressostatic valve for units size **1401, 1651, 1901, 2101**
Line (D): curve of the pressostatic valve for units size **2501**.



2Way valve

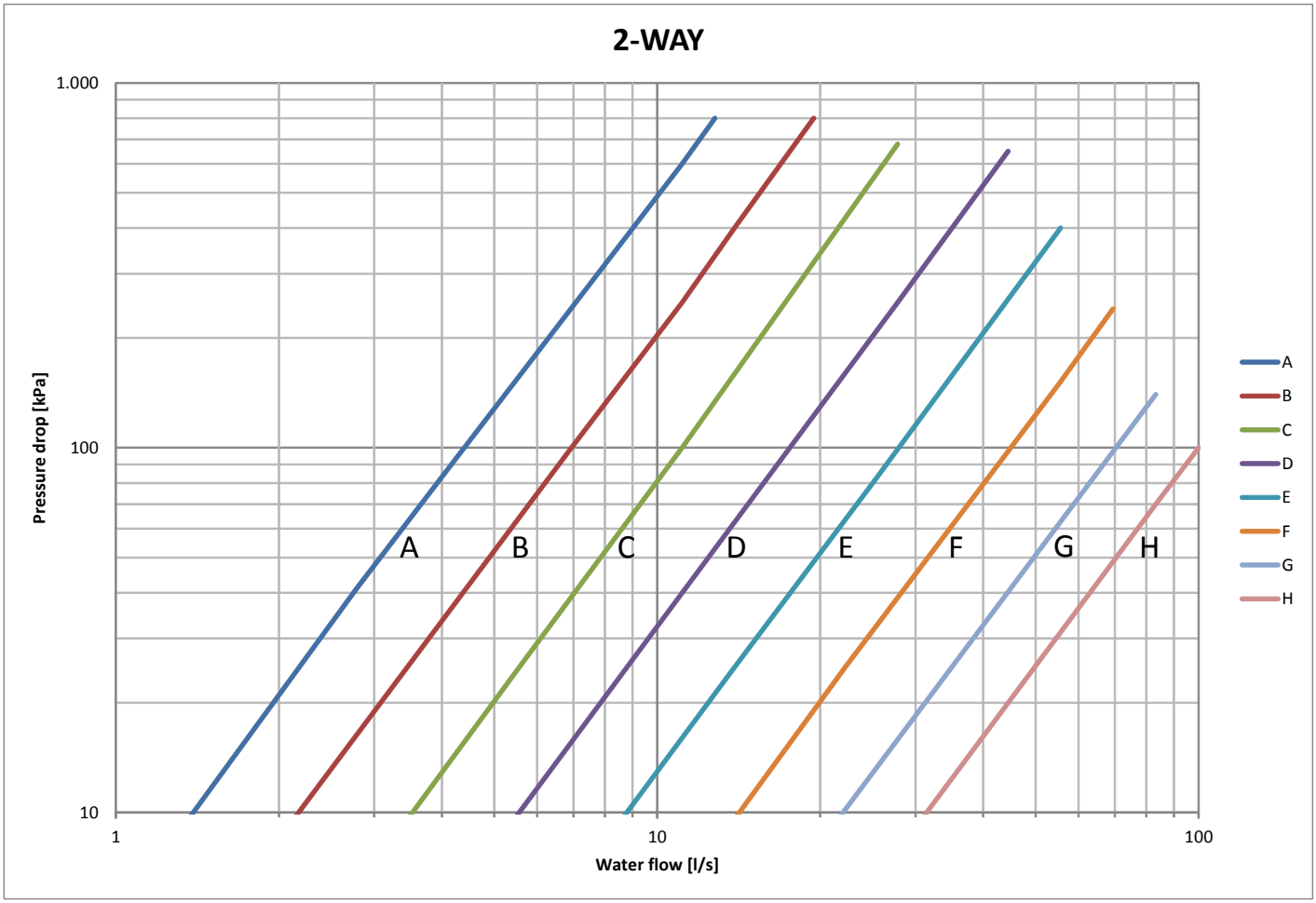
Two way servo-motorized valve with steel body.

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

It's recommended in case of inverter pumps and water flow modulation.

2-way valve type	kvs [l/s]	DN	Dp max [kPa]	Qmin [l/s]	Qmax [l/s]	Actuator type
A	4,4	32	300	2,8	4,4	0-10 V
B	6,9	40	300	4,4	6,9	0-10 V
C	11,1	50	300	6,9	11,1	0-10 V
D	17,5	65	300	11,1	17,5	0-10 V
E	27,8	80	300	17,5	27,8	0-10 V
F	44,4	100	300	27,8	44,4	0-10 V
G	63,9	125	300	40,3	63,9	0-10 V
H	100,0	150	300	63,9	100,0	0-10 V

In the chart below:
Line (A): curve of the 2-way valve for units size **0551**
Line (B): curve of the 2-way valve for units size **0551-0701**
Line (C): curve of the 2-way valve for units size **0551-1101**
Line (D): curve of the 2-way valve for units size **0551-1901**
Line (E): curve of the 2-way valve for units size **0851-3002**
Line (F): curve of the 2-way valve for units size **1301-4752**
Line (G): curve of the 2-way valve for units size **1651-4752**
Line (H): curve of the 2-way valve for units size **2602-4752**.



3Way valve

3 way modulating valve, steel made, with diverting function.

The valve is selected for a Delta T of 5°C (12/7 °C e 30/35°C) and supplied as a pare item (not factory mounted- maximum length for the connection cable 30m).

It's recommended for applications with geothermal probes, in which the water flow is required to be constant.

3-way valve type	kvs [l/s]	DN	Qmin [l/s]	Qmax [l/s]	Actuator type
A	6,9	40	3,3	5,0	0-10 V
B	11,1	50	5,0	7,8	0-10 V
C	17,5	65	7,8	12,5	0-10 V
D	27,8	80	12,5	20,0	0-10 V
E	44,4	100	20,0	31,1	0-10 V
F	69,4	125	31,1	50,0	0-10 V
G	111,1	150	50,0	79,2	0-10 V

In the chart below:
Line (A): curve of the 3-way valve for units size **0551**
Line (B): curve of the 3-way valve for units size **0551-0951**
Line (C): curve of the 3-way valve for units size **0551-1301**
Line (D): curve of the 3-way valve for units size **0551-2101**
Line (E): curve of the 3-way valve for units size **0851-3002, 3502**
Line (F): curve of the 3-way valve for units size **1301-4752**
Line (G): curve of the 3-way valve for units size **2101-4752**

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