MITSUBISHI ELECTRIC
Changes for the Better

for a greener tomorrow eco Changes

COMFORT CHILLERS

R513A

FX-W-G05

Water-cooled screw chillers
124 - 399kW

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

CLIMAVENETA®

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FX-W-G05

Screw Compressor
Water-cooled Chiller

R513A

- Green refrigerant
- Product overview
- Technological insight
- ErP regulatory framework
- Operating limits
- Controls and user interface
- Thermal recovery configurations
- Further options

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FX-W-G05 - Low GWP refrigerant

All-round approach to sustainability

All-round sustainability

Today, an extended approach is the only way to effectively reduce the **Total Equivalent Warming Impact** (TEWI).

Delivering **brilliant annual efficiency** is fundamental, but is not enough.

New regulations like the *EU F-gas* and the *Kigali Amendment to the Montreal Protocol* are driving the industry towards new **low GWP refrigerants.**

FX-W-G05 - Low GWP refrigerant

Possible alternatives

Flammability

Unfortunately, the majority of low GWP refrigerants raises a critical issue: **flammability**.

SCROLL

Refrigerant	GWP*	Flammability**
R410A	2088	NON flammable
R32	675	MILDLY flammable
R454B	466	MILDLY flammable
R452B	698	MILDLY flammable

SCREW

Refrigerant	GWP*	Flammability**
R134a	1430	NON flammable
R513A	631	NON flammable
1234ze	7	MILDLY flammable
1234yf	4	MILDLY flammable

* IPCC AR4 ** ASHRAE 34; ISO 817

FX-W-G05 - Low GWP refrigerant

Possible alternatives

FX-W-G05

The **new refrigerant R513A**, chosen for FX-W-G05, is a brilliant exception.

SCROLL

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FX-W-G05 - Low GWP refrigerant

R513A characteristics

FX-W-G05

The **new refrigerant R513A**, chosen for FX-W-G05, is a brilliant exception.

LOW GWP

-56% GWP vs R134a

Non-flammable

Safety Class A1

r R513A

FX-W-G05 - Low GWP refrigerant

R513A characteristics

R513A

New generation refrigerant: **reduced** greenhouse effect, **nom-flammable**.

- **Low GWP**

  R513A $GWP_{100\ year}$ = 631

  R134a $GWP_{100\ year}$ = 1430

  * GWP values according to IPCC AR4

- **Non flammable**

  ASHRAE 34, ISO 817

  Safety Class A1

  (non toxic, non flammable)

  PED (UNI EN 10204)

  Fluid Group 2

  (non dangerous)

Favorable physical properties

- Same cooling capacity delivered as R134a
- Same operating pressures as R134a

Compliant with eco-regulation objectives

- No future retrofit required
- Reduced price volatility vs high GWP refrigerants

In line with standard building codes

- No special equipment
- No need for flammable risk assessment
- No extra costs

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Product overview: The range

R HFC R513A | COOLING | SCREW | T SHELL&T. | VPF

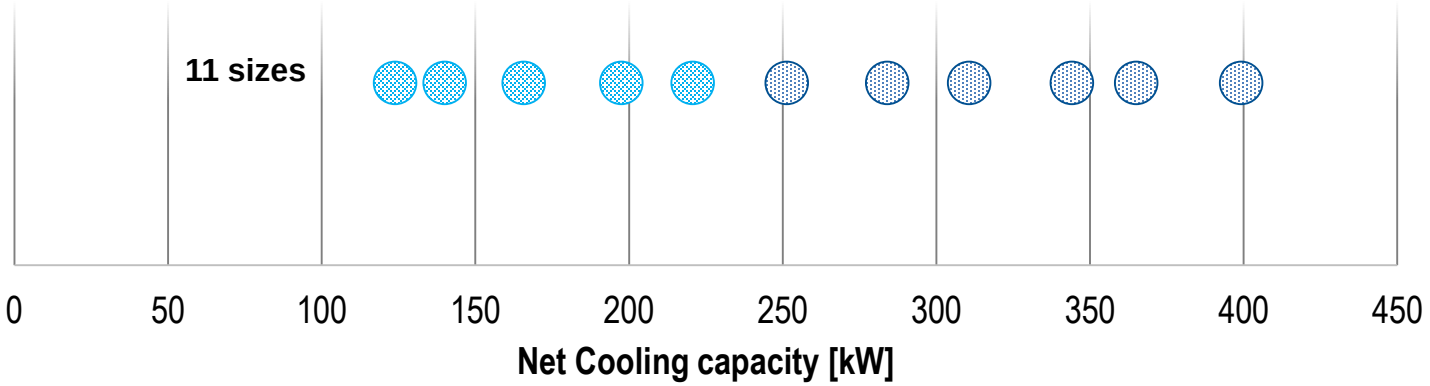
COMFORT

FX-W-G05

Water-cooled screw chillers
124 - 399kW

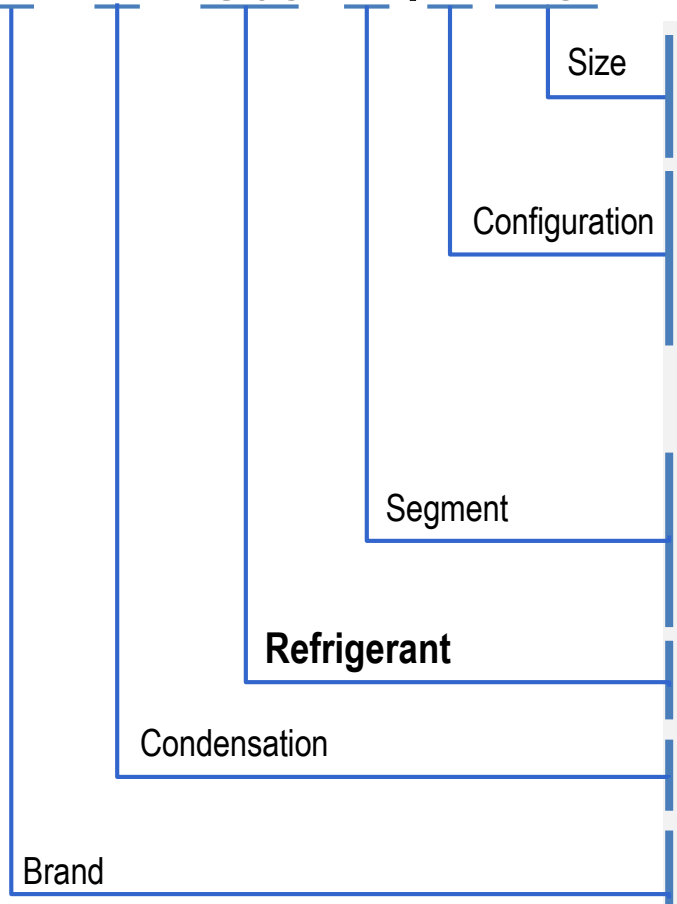
1 comp. range

2 comp. range



Product overview: Nomenclature

FX – W – G05 – / R 1752



Size	First 3 digits Last digit	- Compressors size - Number of compressors
Configuration	<> D R	- Standard - Partial heat recovery - Total heat recovery
Segment	<> Y Z	- Comfort - Process - IT cooling
Refrigerant	G05	- R513A
Condensation	W	- Water
Brand	X R	- Climaveneta - RC group

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FX-W-G05

Screw Compressor
Water-cooled Chiller

R513A

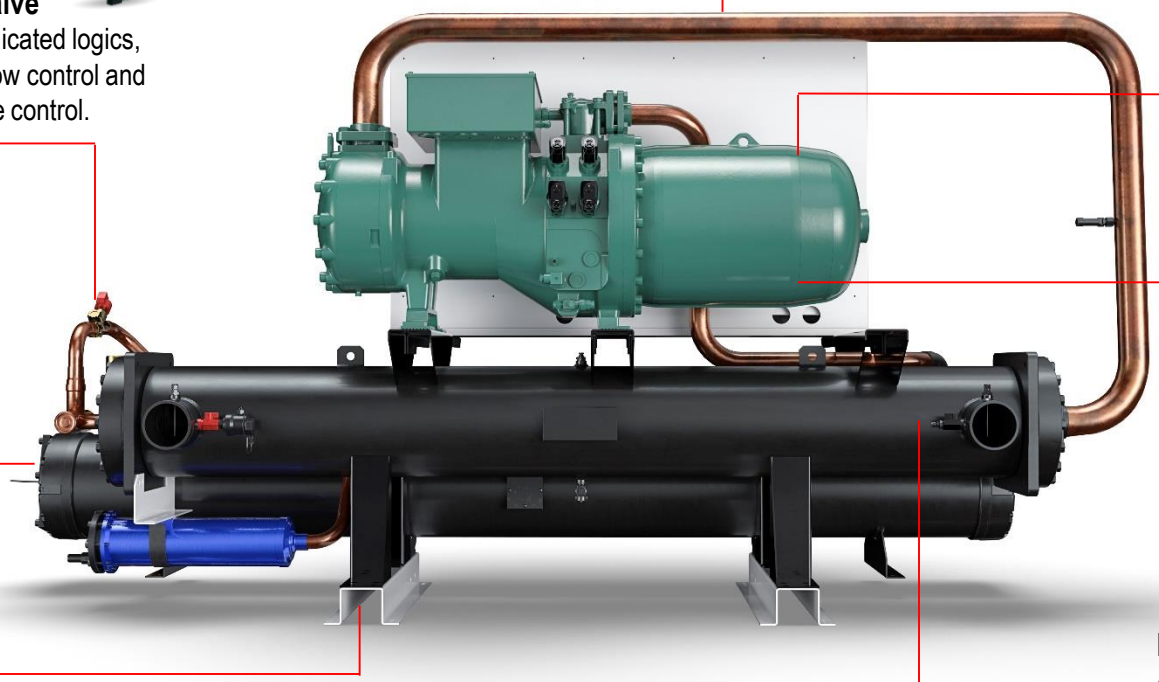
Technological insight

Dual circuit units
from 250kW cooling capacity for increased reliability and easier maintenance operations

Electronic expansion valve
managed by proprietary dedicated logics, to guarantee an excellent flow control and a highly precise temperature control.

Compact screw compressors
optimized for low pressure ratio applications

Compressors enclosure (opt.)
in peraluman panels with 30mm polyester acoustic insulation (-5 dB(A)).



S&T condenser
2 (std) or 4 (opt.) passes condenser gives flexibility for various types of cooling water sources

Dry expansion S&T evaporator fully developed by MEHITS

Frame in polyester-painted galvanized steel

- Very easy maintenance operation thanks to the rationalized positioning of components
- Easy transport, lifting and handling
- Compact structure (width<950mm for single circuit units)

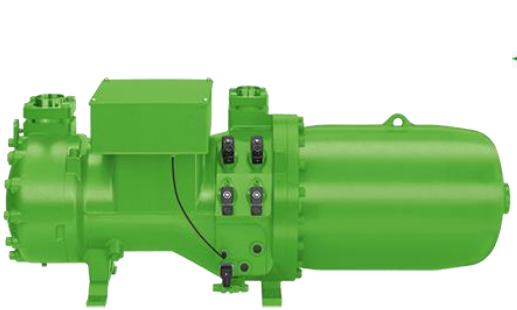
MITSUBISHI ELECTRIC
Changes for the Better

Mitsubishi Electric
Hydronics & IT Cooling Systems S.p.A.

Technological insight

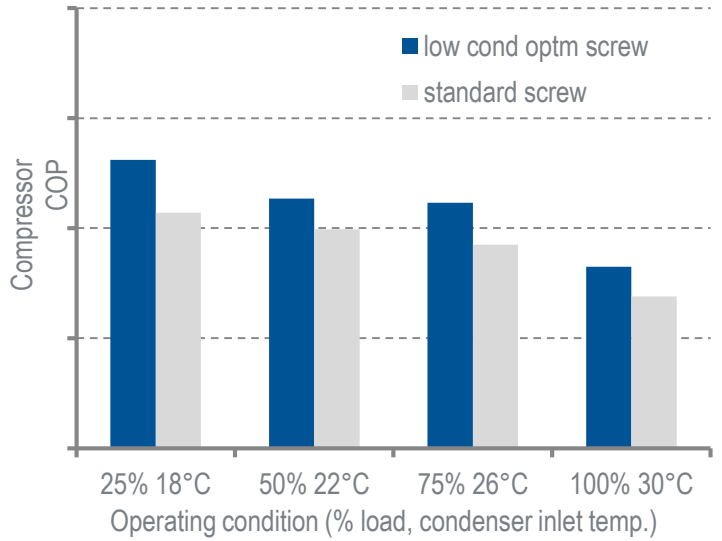
The compressor

Dual rotor **CSW** screw compressors



- **25% minimum capacity step** (opt. for two circuit units).
- **Extreme durability**

  The carbon steel bearings are granted for a **lifetime of 150.000 hours**.



Technological insight

The condenser

Shell and tube condenser

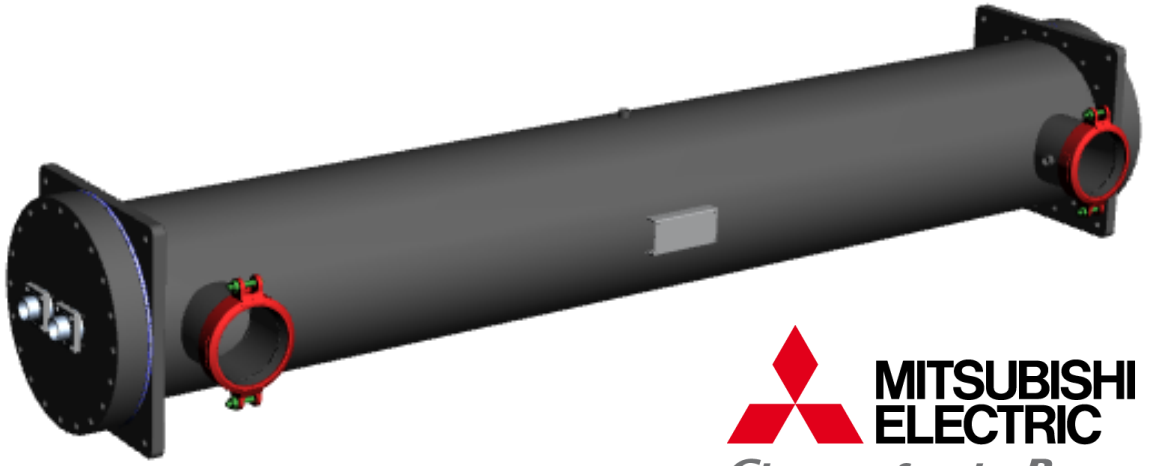
- **- 2-pass condenser (std):** optimized for water ΔT=5°C (typically cooling tower).
  - 4-pass condenser (opt.): optimized with water ΔT>10°C of water (typically open loop sources: groundwater or waterworks).

- **- Cu/Ni 90/10 tubes condenser (opt.) for seawater:** to provide protection against corrosion and guarantee a reliable operation and optimal condensation

Technological insight

The evaporator

Dry expansion, **single pass shell and tube evaporator**, with grooved copper tubes for **enhanced heat transfer**.



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Changes for the Better

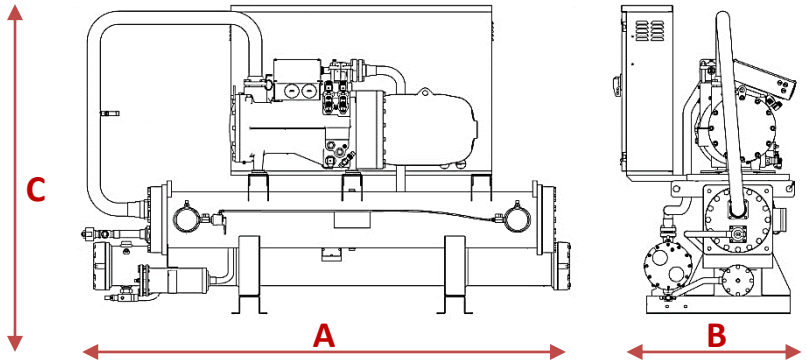
Mitsubishi Electric
Hydronics & IT Cooling Systems S.p.A.

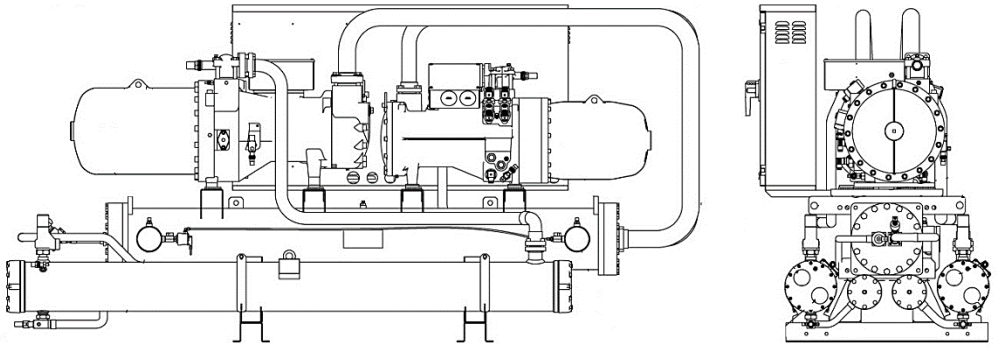
- Perfect **counter-current** heat transfer
- **Low pressure drops** water-side
- Fully **protected against ice** formation

Technological insight

COMPACT DESIGN FOR THE HIGHEST FLEXIBILITY

More flexibility during the installation phase, both in case of new plants and existing ones.





		551	651	751	851	951
A	mm	2400	2600	2700	3000	3000
B	mm	920	920	950	960	960
H	mm	1500	1500	1500	1500	1500
Operating weight	kg	1050	1110	1280	1450	1460
Refrigerant charge	kg	24	34	32	59	57

1 comp. range

1102	1302	1402	1502	1602	1752
3000	3100	3100	3200	3200	3200
1100	1100	1100	1100	1200	1200
1500	1500	1500	1600	1600	1600
1710	1820	1990	2280	2430	2590
47	68	66	63	91	116

2 comp. range

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FX-W-G05

Screw Compressor
Water-cooled Chiller

R513A

Efficiency in comfort applications

Directive 2009/125/EC (Ecodesign)

SEER Seasonal Energy Efficiency Ratio

					Jan 2018	July 2018	Jan 2021
Source	**Unit Type**		**PDesign**	**Water temp.**	**Seasonal Efficiency**	**Seasonal Efficiency**	**Seasonal Efficiency**
WATER	Cooling Only Reversible	SEER	<400kW		5,10 (ηs≥196%)		5,20 (ηs≥200%)
		SEER	400kW<PD≤1500kW		5,88 (ηs≥227%)		6,50 (ηs≥252%)
		SEER	>1500kW		6,33 (ηs≥245%)		7,00 (ηs≥272%)

FX-W-G05

EER*: 4,68

SEER*: 5,50

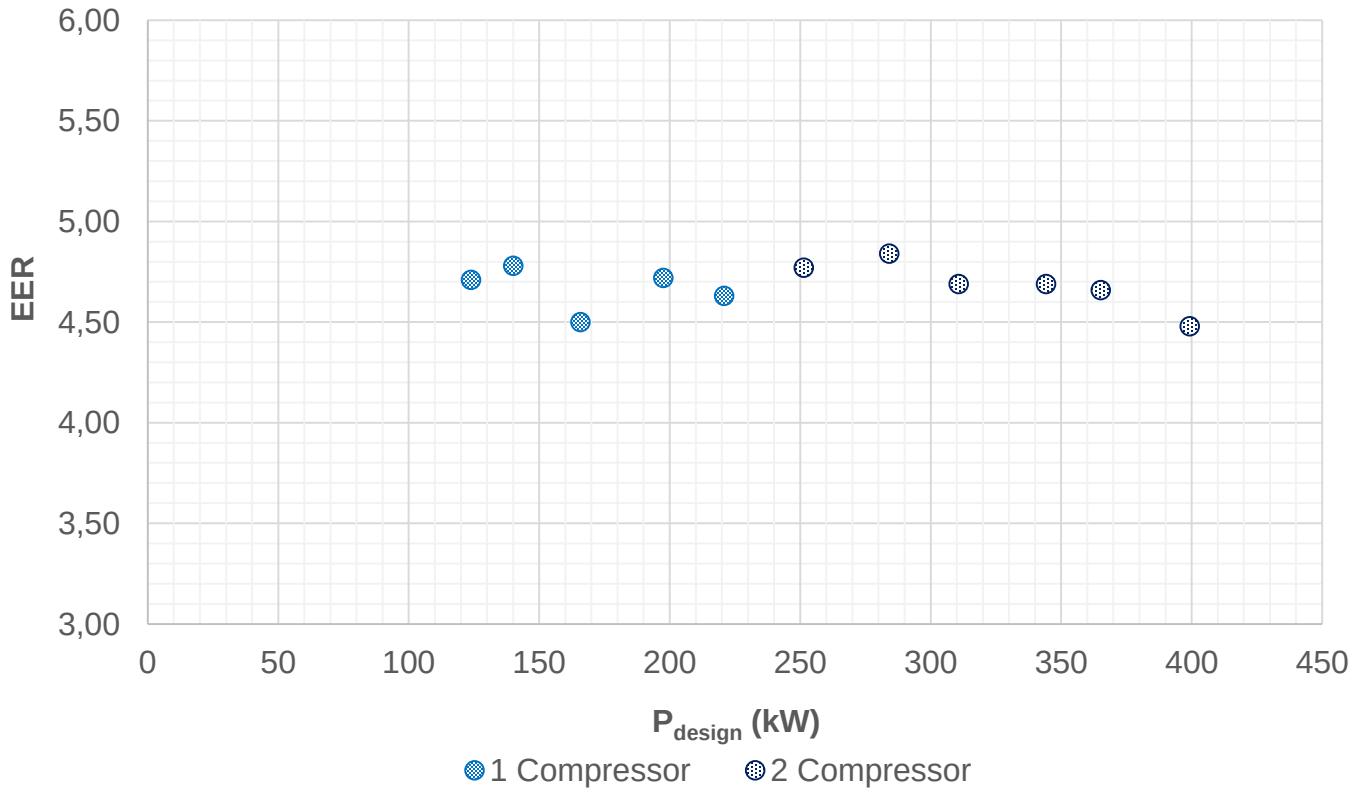
ErP COMPLIANT 2021

Average values

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

Efficiency: EER

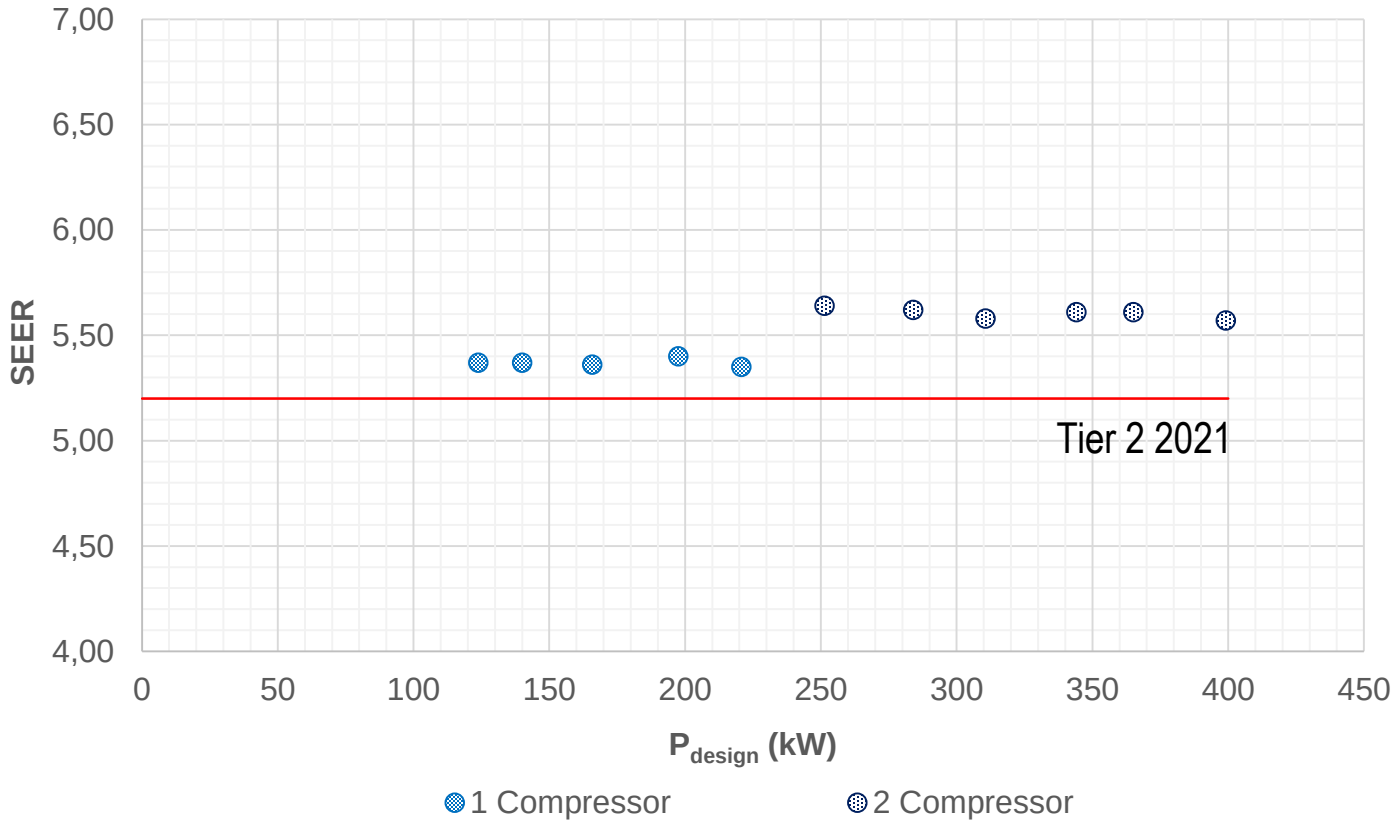
COMFORT FX-W-G05



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

Efficiency: SEER

COMFORT FX-W-G05



Plant (side) cooling exchanger water (in/out) 12°C/7°C

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Screw Compressor
Water-cooled Chiller

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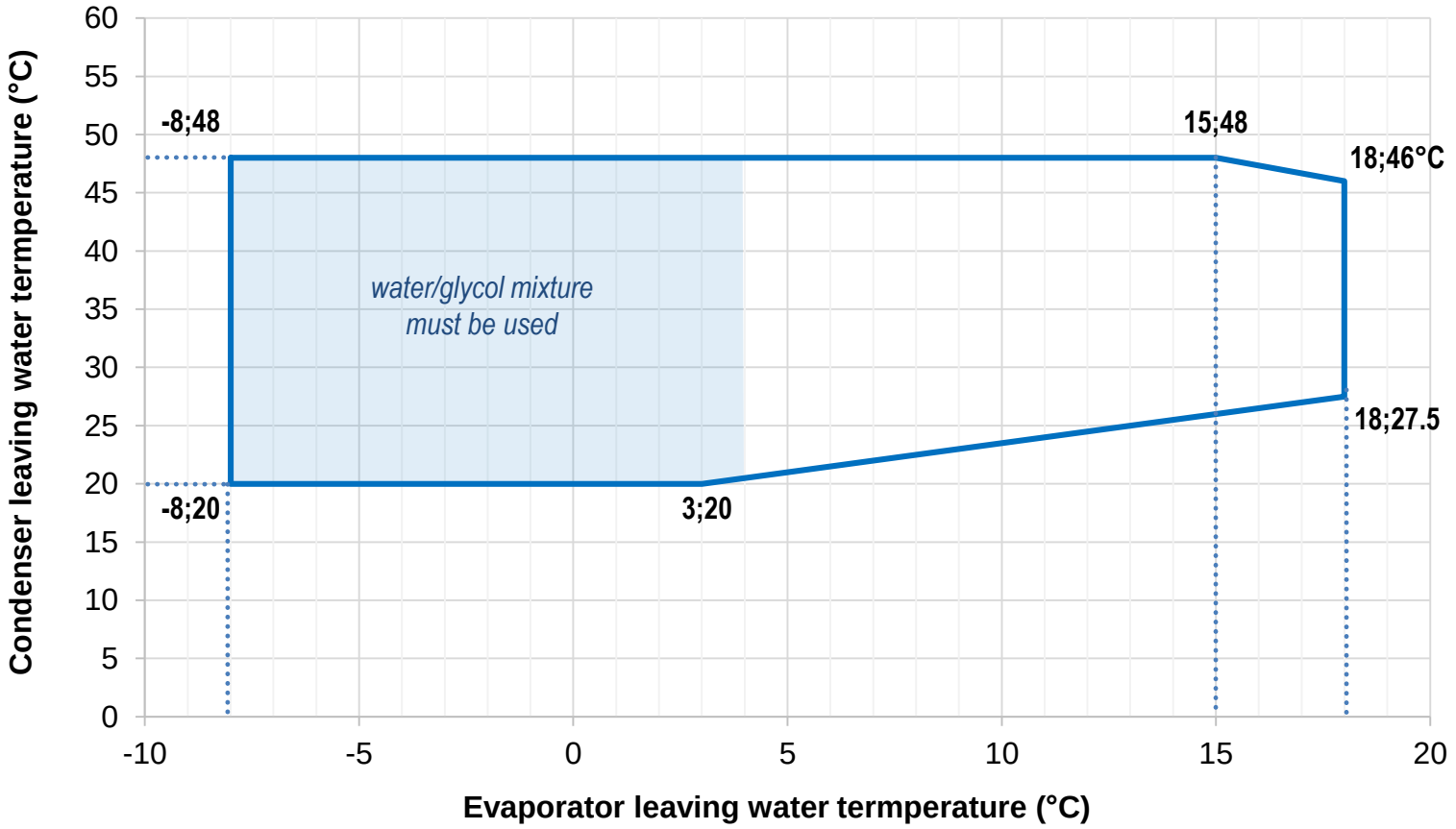
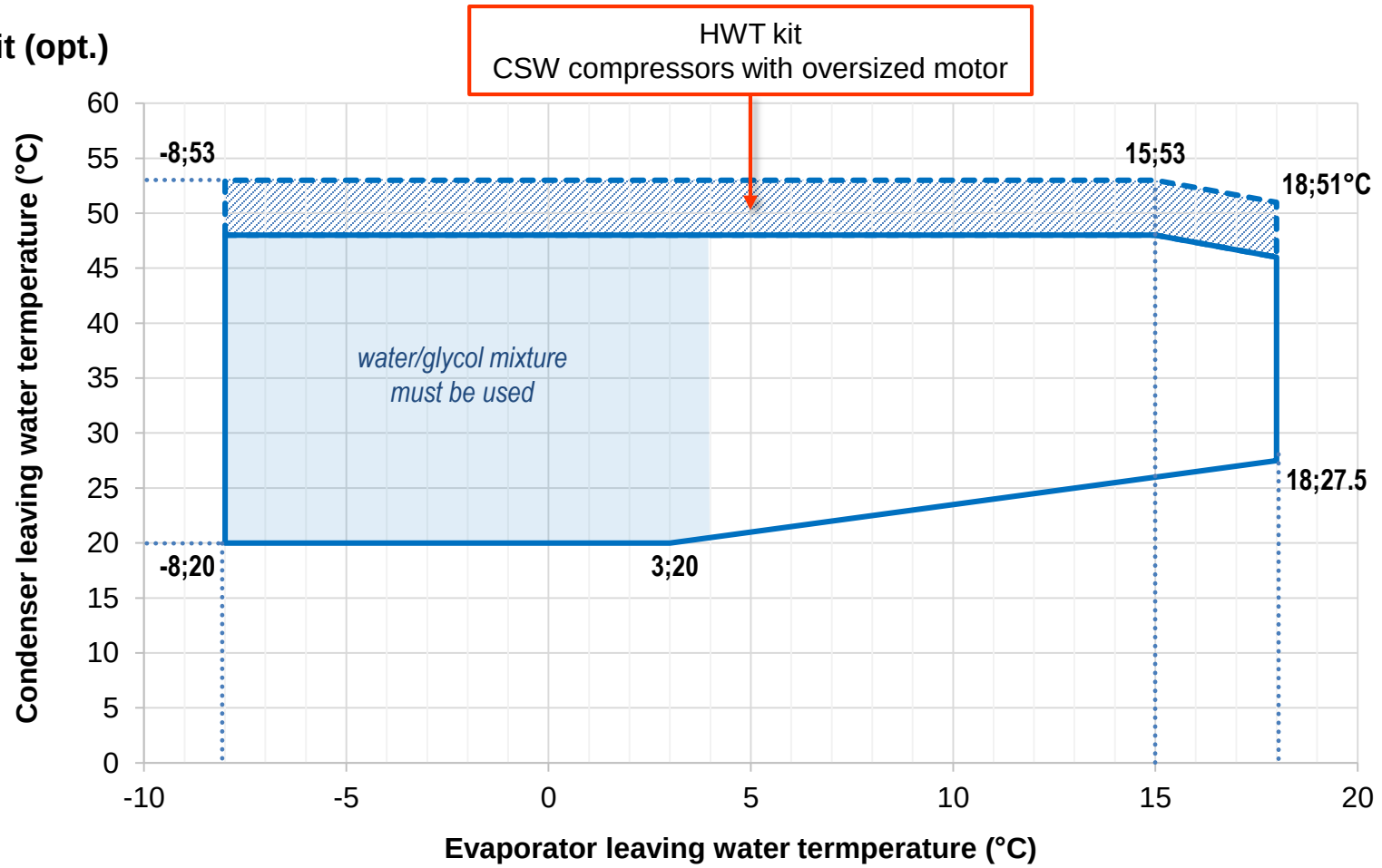
Operating limits

Standard



Operating limits

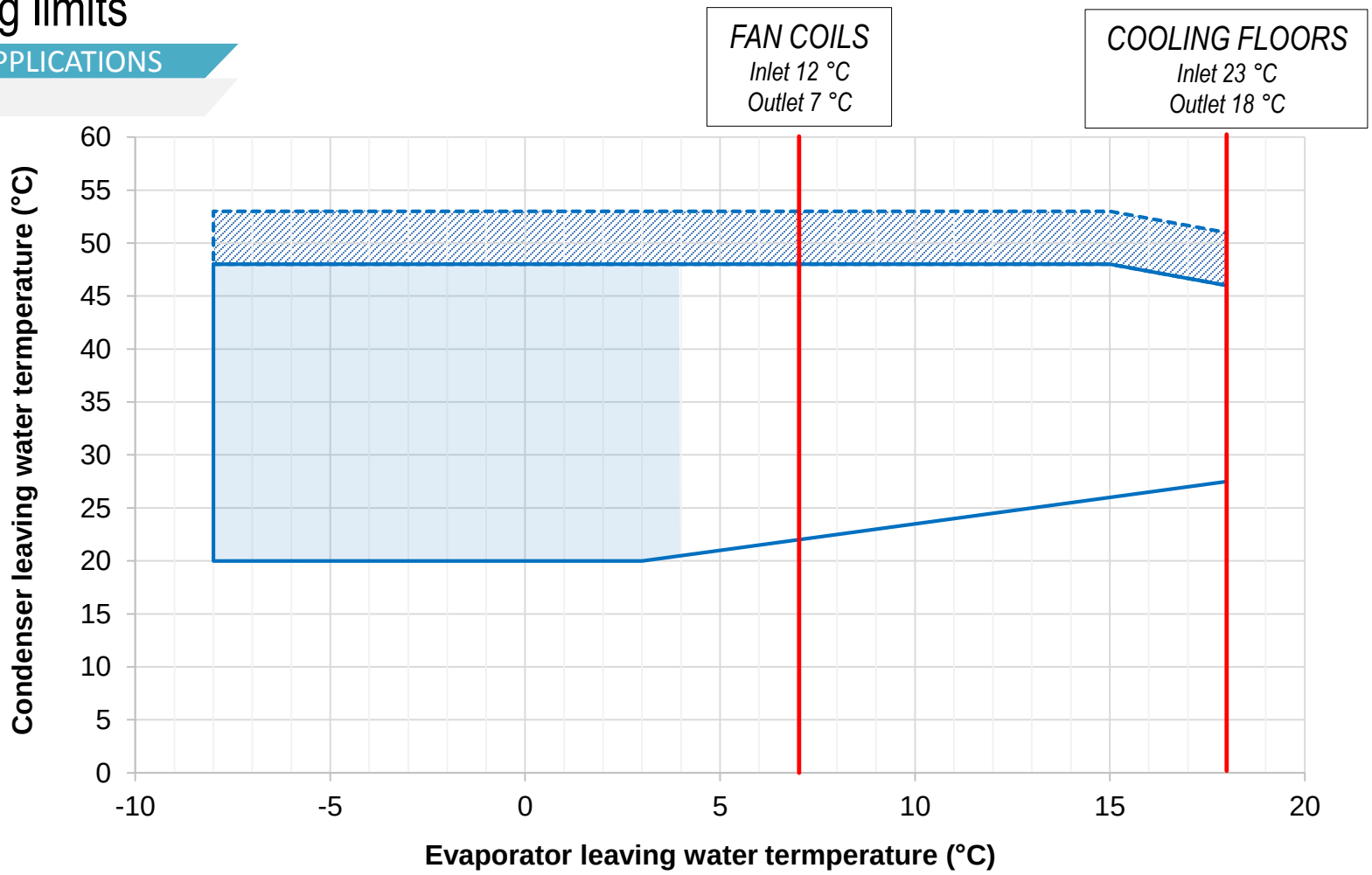
HWT kit (opt.)



Operating limits

COMFORT APPLICATIONS

FX-W-G05



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FX-W-G05

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R513A

Controls and user interface

Control software

W3000TE: reliable and efficient operation

The logic behind FX-W-G05 is the W3000TE control software.

Characterized by advanced functions and self-adapting algorithms, **W3000TE features proprietary settings** ensure faster adaptive responses to different dynamics, in all operating conditions.

Proprietary logics

All the functions and algorithms are developed in-house.

Thermoregulation

Based on dynamic dead band with a DIP modulating adjustment.

Monitoring

Easy and complete visualization of the operation status.
User-friendly navigation tree.

Security

3 levels of password: user, service, manufacturer.

Connectivity

- BMS: Modbus, LonWorks, BACnet MS/TP, BACnet-over-IP
- Mitsubishi M-Net proprietary communication protocol
- Proprietary devices: ClimaPRO, Manager3000

Diagnostics

Alarm acknowledgement, event records, data download, black box function.

Controls and user interface

Controls

Large keyboard (Standard)

7” touch screen (Option)

Wide LCD display and led icons to immediately show the operating status of the circuit(s)

- 7” WVGA color display and a front USB port
- easy-to-access data
- effective graphical representation of the main figures.

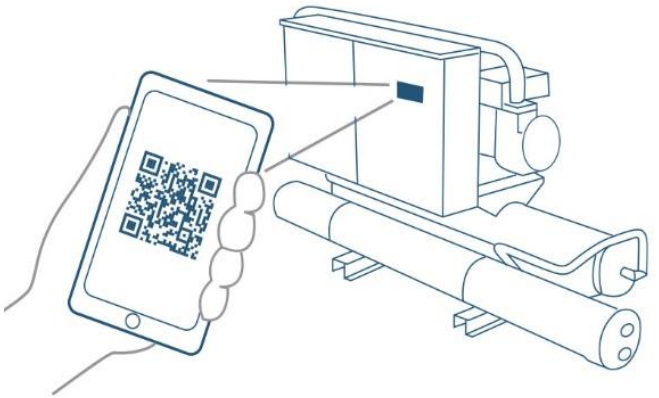
Controls and user interface

User interface (option)

KIPlink: the Keyboard is In your Pocket
As an option, the direct control over the unit comes through the innovative **KIPlink interface**.

Based on Wi-Fi technology, KIPlink gets rid of the standard keyboard and allows one to operate on the unit directly from a mobile device (smartphone, tablet, notebook).

KIP LINK
Keyboard In your Pocket



A new approach to the Human Machine Interface

Wi-Fi technology
(no internet connection needed)

Hardware
Industrial characteristics, tolerates temperatures from -20 to +65°C

Exclusive product
Mitsubishi Electric Hydronics & IT Cooling Systems S.p.A.

Software compatibility
IOS 8.0 and up
Android 5.0 and up
Chrome Web browser on Windows PC

Controls and user interface

User interface (option)

KIP LINK
Keyboard In your Pocket

Easier on-site operation

- **Monitor** each component **while moving** around the unit for maintenance.
- View and change all parameters with **easy-to-understand screenshots** and dedicated tooltips.
- Get devoted “help” message for alarm reset and trouble shooting.

Real-time graphs and trends

- Monitor the **actual status** of the compressors, heat exchangers, cooling circuits and pumps.
- View the real-time graphs of the key **operating variable trends**.

Data logger function

- View history of events and use the **filter for a simple search**.
- Enhance diagnostics with data and graphs of **10 minutes before and after** each alarm.
- **Download** all the data for detailed analysis.

Controls and user interface

Multi-unit system control (option)

ClimaPRO: turn your plant room into a value generating asset

The ultimate **plant room optimization** solution.

According to the units' actual efficiency curves, ClimaPRO **continuously optimizes** plant working conditions by promptly adjusting **equipment staging** and sequencing, managing operating **set-points** and controlling **water flows** throughout the entire system.

ClimaPRO can be interfaced with any BMS or perform all functions on its own.

clima PRO
PERFORMANCE RELIABILITY OPTIMISATION

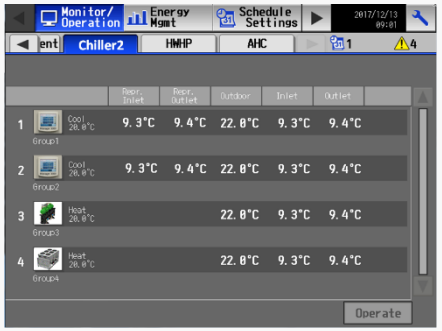
M-Net connection

Multi-unit system control (option)

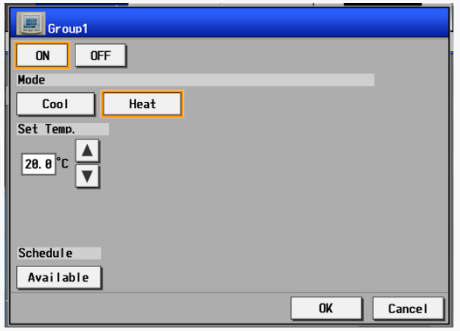
M-Net connection module – Opt. 4187

Connect FX-W-G05 to Mitsubishi system controllers

- View the units and their working status
- Alarm display
- Control and set the operation of each group of units: on/off function, cooling/heating switch, set point setting
- Set an operating schedule for each group of unit
- Web app
- Languages: English, Italian, French, German, Spanish , Russian, Chinese, Portuguese, Turkish



Plant units screen



Operation screen

Schedule settings

M-Net connection

Multi-unit system control (option)

M-Net connection module – Opt. 4187

Connect FX-W-G05 to Mitsubishi system controllers

Compatible with Mitsubishi:

- **AE-200E** (Ver. 7.68 or later)
- **AE-50** (Ver. 7.68 or later)
- **EW-50** (Ver. 7.68 or later)

M-Net W3000 interface kit (opt. 4187) comes **installed inside the electrical panel** of the unit (or inside Manager 3000's board)

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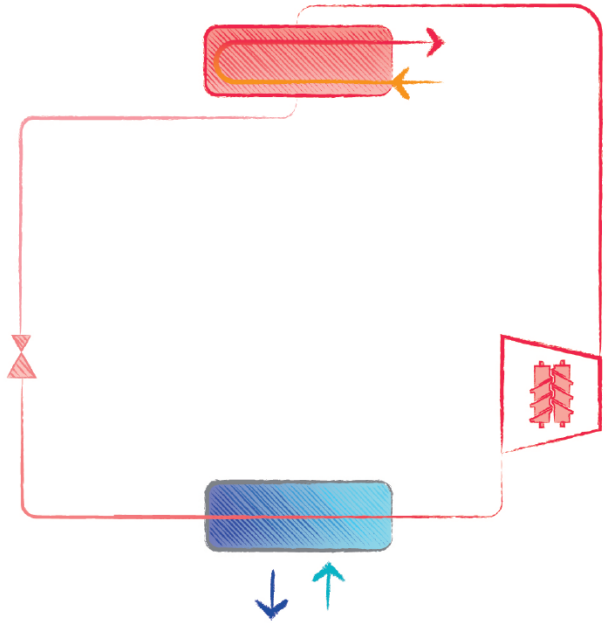
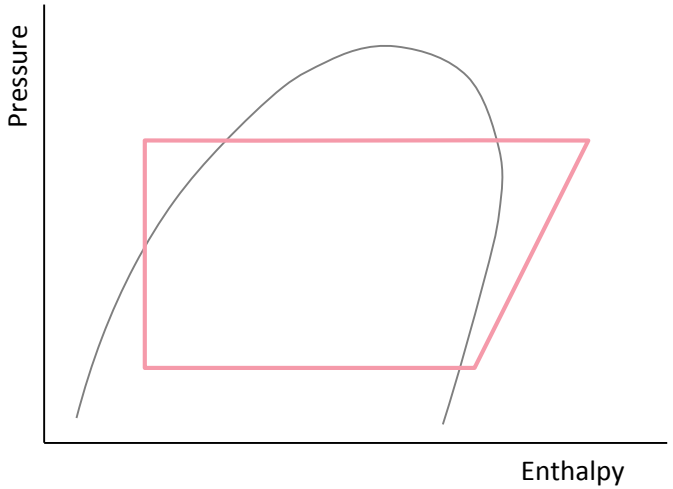
Heat recovery configurations

Standard

Standard



No heat recovery

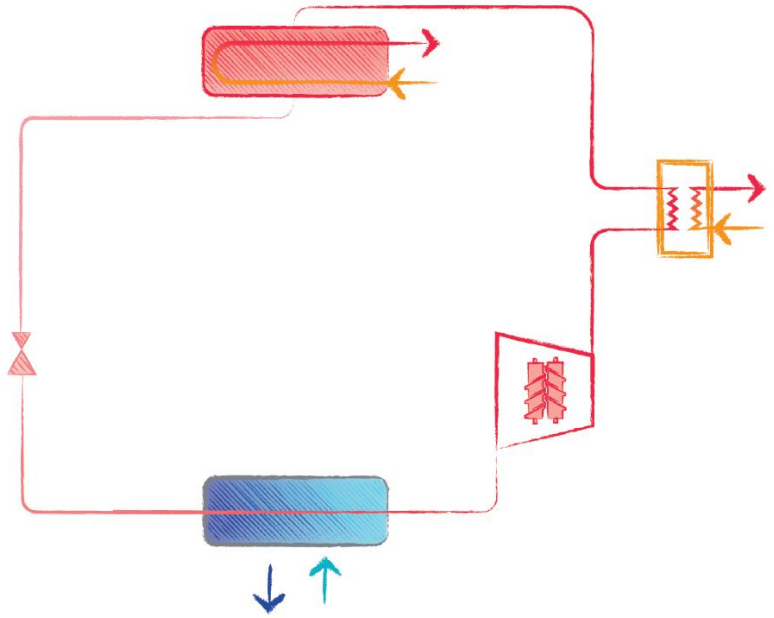


Standard refrigerant circuits.

Heat recovery configurations

Partial heat recovery: /D

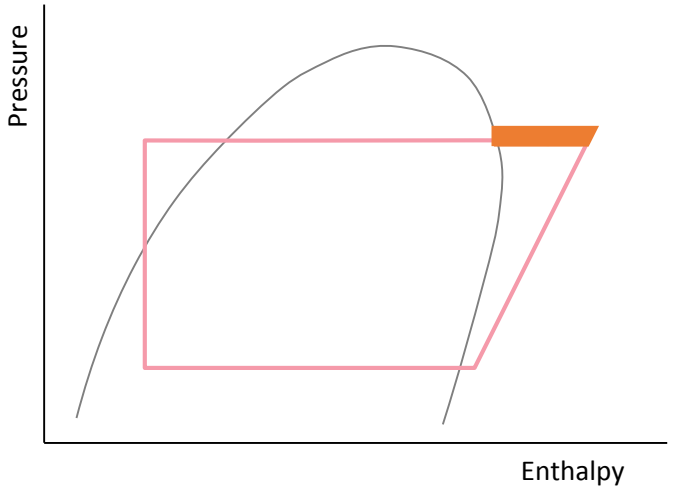
Partial heat recovery



Each refrigerant circuit is fitted with a **desuperheater** in series with the condenser.

Approximately
20%
of the chiller's capacity (*)

Up to
60°C
of leaving water temperature (*)



(*) The heat recovery and its amount depend on the unit's operating conditions.

Heat recovery configurations

Partial heat recovery: /D

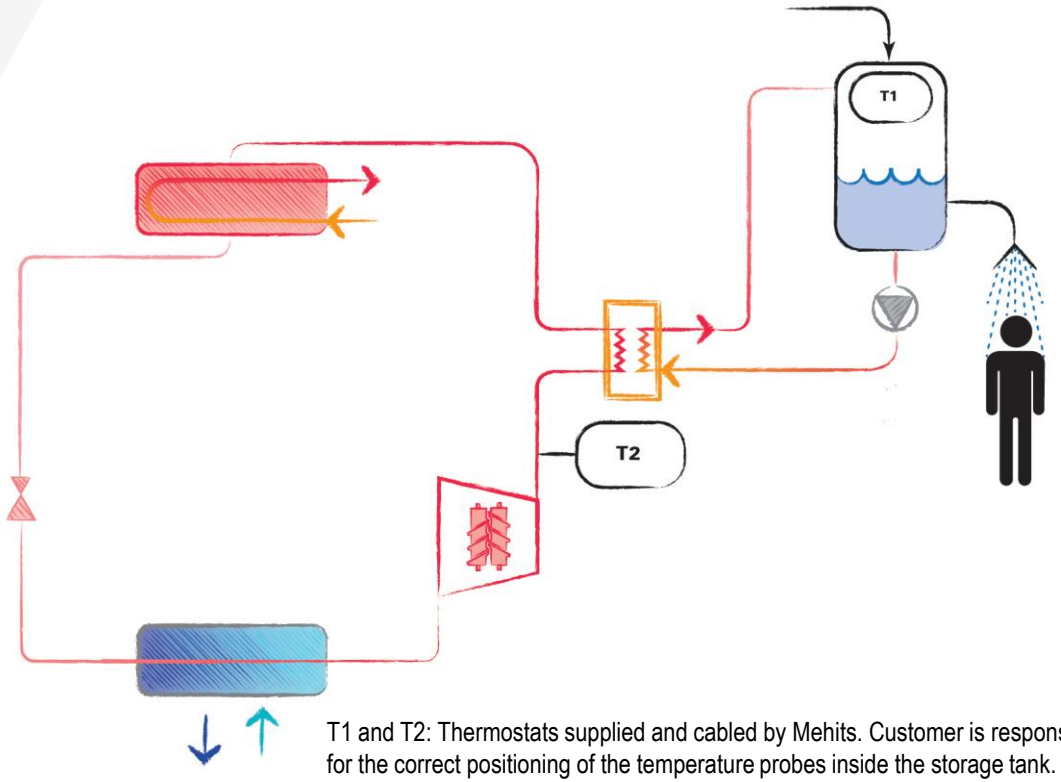
The desuperheater can recover the heat only when the temperature of the hot water circuit is lower than the **compressor discharge temperature**.

Option 3371 D - RELAY 1 PUMP (ON/OFF) **interrupts the water flow** to the desuperheater when the conditions for an actual heat recovery are not met.

Minimizes the auxiliary pumps on the de-superheat circuit consumption.

They are **activated only when** real capability of heat reclaim is detected:

- **compressors on**
- hot storage **tank's temperature lower** than its set-point and than compressors' outlet gas temperature.

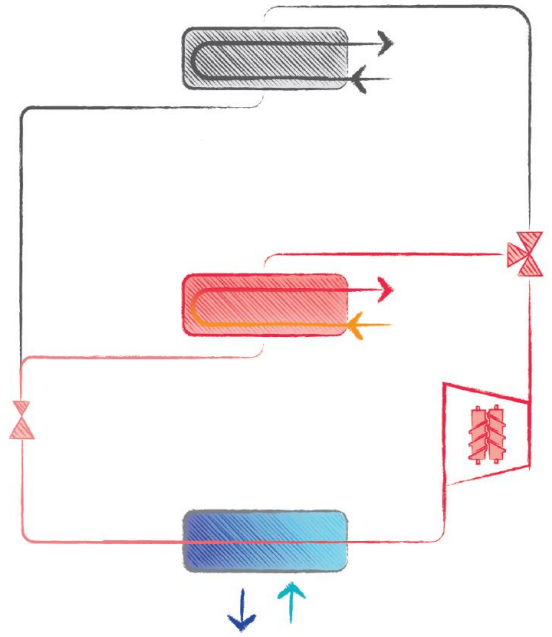


T1 and T2: Thermostats supplied and cabled by Mehits. Customer is responsible for the correct positioning of the temperature probes inside the storage tank.

Heat recovery configurations

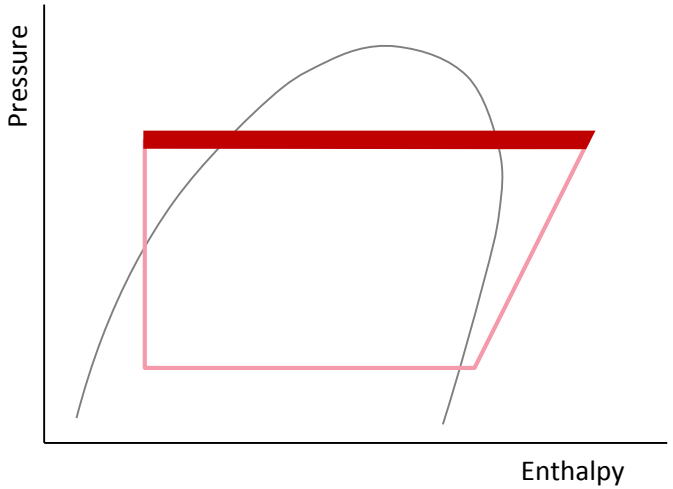
Total heat recovery: /R

Total heat recovery



Always
100%
of the chiller's capacity

Up to
48°C
of leaving water temperature



Each refrigerant circuit is fitted with a **total heat recovery exchanger,** in parallel with the condenser.

Heat recovery configurations

Applications

The recovered heat can be sustainably **redirected to different facilities** instead of rejecting it to the environment:

- Restaurants, hotels, resorts, hospitals, residential buildings: hot water can be used for the **kitchen, laundry and bathrooms.**

- Schools and sports facilities conditioning: **showers, washrooms and swimming pool heating.**

- Feed the **AHU post-heating coil** to compensate the amount of heat lost during dehumidification.

- **Pre-heat** service fluids or incoming raw materials before further processing.

- **Comfort workplaces** and other areas located close to the industrial facilities.

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FX-W-G05

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R513A

Flow controls

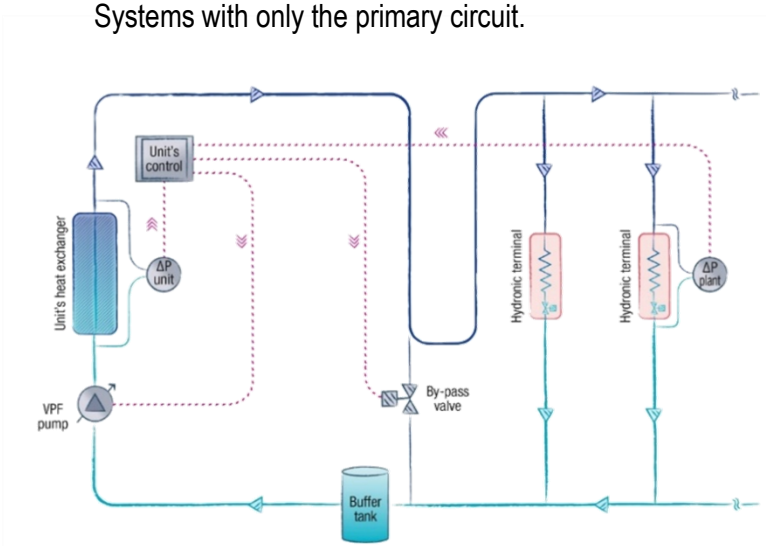
Primary flow controls

VPF Variable Primary Flow

The VPF control series (Variable Primary Flow) doesn't only **adjust the pump speeds** on the basis of the **plant's thermal load**, but also **dynamically optimizes the unit's thermoregulation** for variable flow operation, thus ensuring both the highest pump energy savings and chiller stable operation.

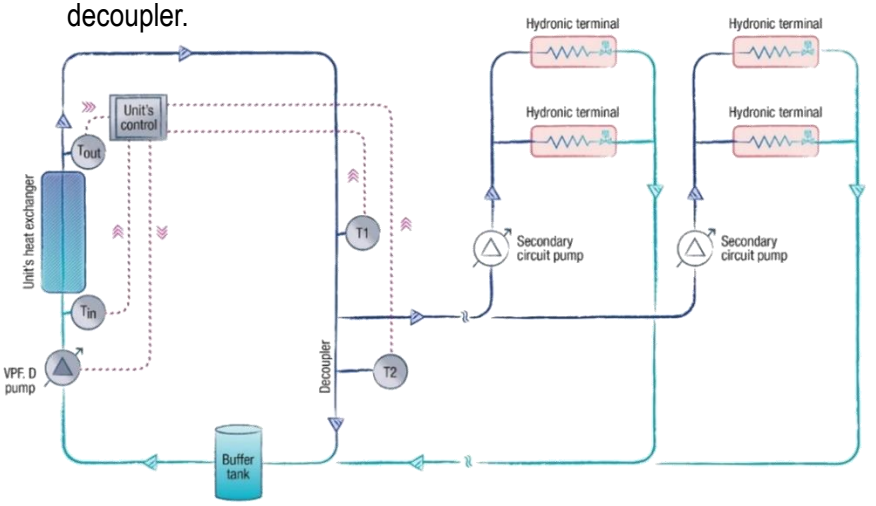
VPF: constant ΔP

Systems with only the primary circuit.



VPF.D: constant ΔT

Systems with primary and secondary circuits separated by a hydraulic decoupler.



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.

Further options

Electrical

Soft-starter (Opt. 1511):
Manages the inrush current enabling lower motor windings' mechanical wear and avoidance of mains voltage fluctuations during starting.
Compressor re-phasing (Opt. 3301):
The capacitors on the compressors' line increase the unit's power factor.
Automatic circuit breakers (Opt. 3412):
Protection from possible current peaks, over-current switches are provided in place of the standard fuses.
Power socket 230V MAX 500VA (Opt. 1571):
230V power socket installed in the electrical board, CEE 7/3 type (Schuko).

Energy Meter

Energy meter for BMS (Opt. 5924):
Acquires the electrical data and the power absorbed by the unit and sends them to the BMS for energy metering (Modbus RS485).

Auxiliary inputs

Auxiliary signal 4-20mA (Opt. 6161):
Change the operating set-point according to a current applied to the analog input,
Remote signal double sp (Opt. 6162):
Change the operating set-point according to a remote switch.

Further options

Refrigerant Circuit

Compressor suction valve (Opt. 1901):
Installed on each compressor suction line, simplify maintenance activity (discharge valves are present as per standard).

Leak Detector

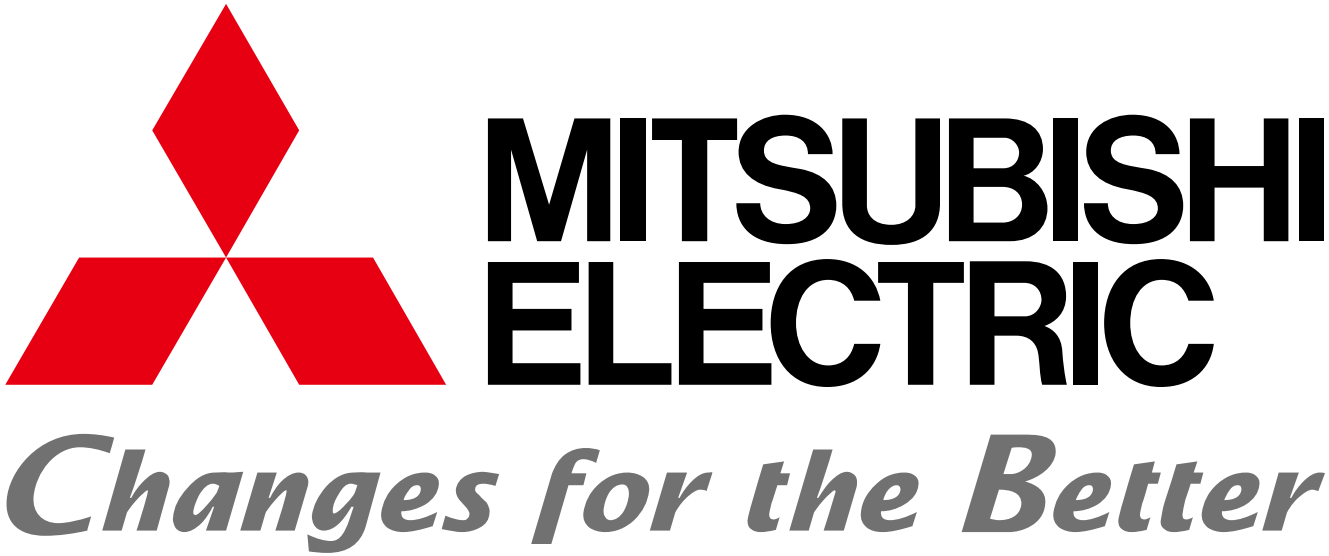
Leak detector (Opt. 3431):
Factory installed device, placed within the compressor enclosure. In case of a gas leak detection it raises an alarm.
Leak detector + migration system (Opt. 3432):
Factory installed device. In case of a gas leak detection stores the remaining refrigerant in the exchanger and stops the units.

Hydraulic

Water flow switch (Opt. 1801):
Designed to protect the unit where the water flow across the evaporator is not sufficient and falls outside of the operating parameters.
Water connections:
Evaporator flanges and counter-flanges (Opt. 2903); Condenser flanges (Opt. 2981), condenser flexible joint (Opt. 2982).
Condenser water flow control (Opt. 4900):
2-way servo-motorized modulating valve (4901-4911); 0-10V signal (1 per circuit) on terminal board for the condensation control of the single circuit (Opt. 491B).

Mechanical

Rubber type anti-vibration mountings (Opt. 2101)
Reduce vibrations, keeping noise transmission to the minimum.
Compressor acoustical enclosure (Opt. 2301)
The accessory leads to a noise reduction of 5 dB(A) (sound power level).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