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

IT COOLING

CHILLERS

i-FR2-Z

G01
G04
G05

AIR SOURCE CHILLERS WITH INVERTER SCREW COMPRESSORS, FROM 563 TO 2443 kW

R134a

HFO 1234ze

R513A

TOTAL INVERTER TECHNOLOGY

rcitcooling.com

i-FR2-Z

G01
G04
G05

FULL INVERTER TECHNOLOGY FOR A CONCENTRATION OF EFFICIENCY

Air source chiller with inverter screw compressors for outdoor installation from 563 to 2443 kW.

i-FR2-Z is the new generation of MEHITS air source chillers with inverter driven screw compressors.

The new series is available with 3 refrigerant alternatives: R134a, R513A, and R1234ze. i-FR2-Z has been designed to perfectly match your installation's needs thanks to an extensive list of versions and options.

Thanks to its reduced footprint , i-FR2-Z is a concentration of efficiency, ideal also for equipment upgrades or replacements, making your Data Centre more energy efficient and sustainable.

EXTENDED RANGE

i-FR2-G01_G05-Z

E: 764 - 2176 kW

R134a R513A

i-FR2-G04-Z

K: 627 - 2443 kW
E: 563 - 2255 kW

HFO 1234ze

2 EFFICIENCY LEVELS FOR THE MOST CHALLENGING NEEDS

K

Compact design featuring EC fans as standard for every size, ensuring very high seasonal efficiency.

EER up to **4,24**

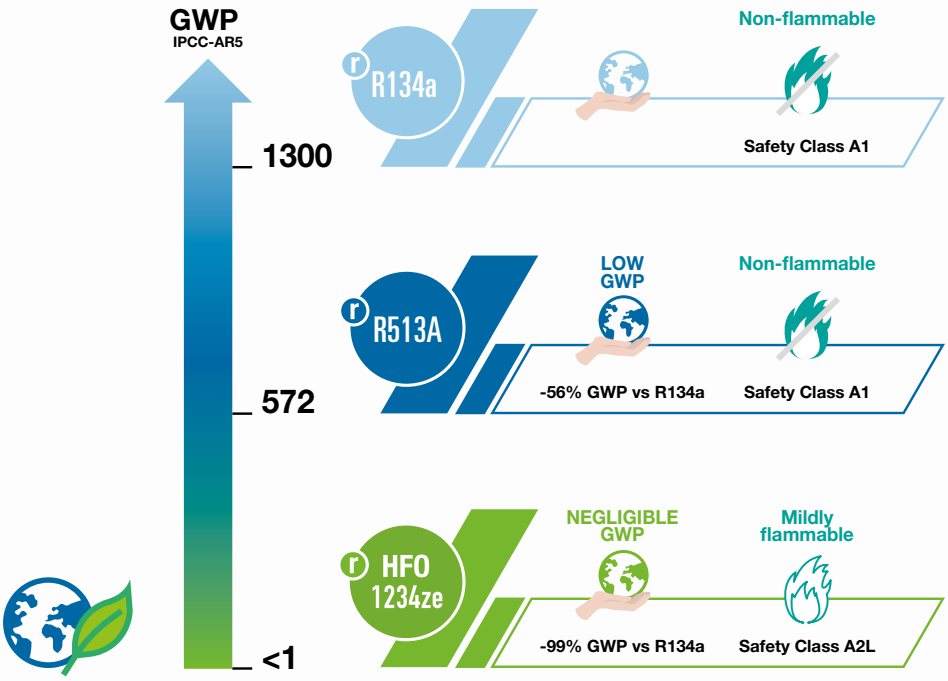
E

Best efficiency unit, both at full load and partial load, with EC fans and enhanced heat exchange surfaces.

EER up to **4,28**

4 SOUND CONFIGURATIONS TO MATCH THE MOST SOUND-SENSITIVE ENVIRONMENTS

Standard unit	Baseline
Compressors acoustical enclosure	**-2** dB(A)
Unit with Noise Reducer (NR) kit	**-5** dB(A)
Super Low noise version	**-9** dB(A)



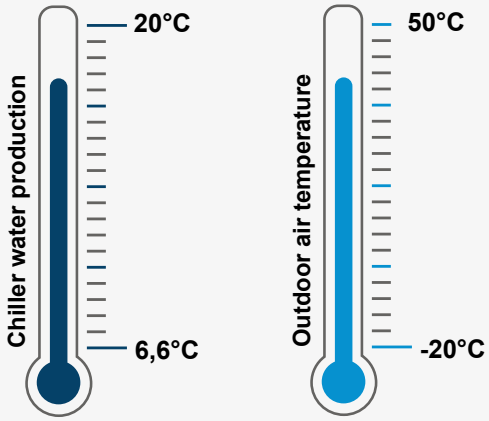
THE IMPORTANCE OF HEAT RECOVERY

Every time there are simultaneous heating and cooling loads, heat recovery provides effective opportunities for energy savings. Chilled water can be provided while recovering heat that would normally be rejected to the environment. With the heat recovery solutions, i-FR2-Z produces hot water up to 68°C that can be used for space heating, domestic hot water, or any other need.

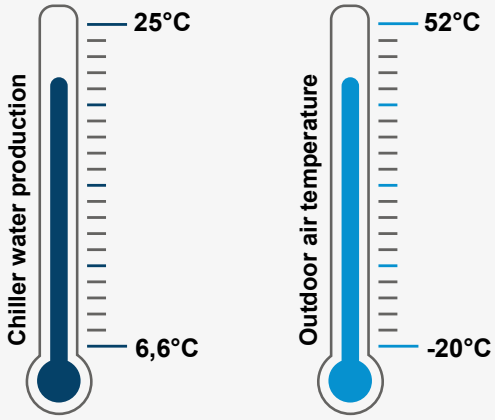
R **TOTAL HEAT RECOVERY**

A devoted refrigerant water heat exchanger recovers the entire thermal load. Available for G04 units.

i-FR2-G01_G05-Z



i-FR2-G04-Z



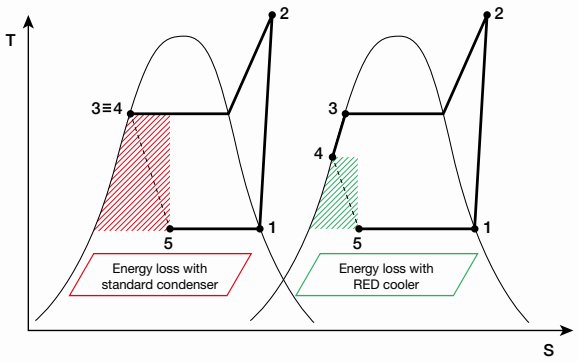
i-FR2-Z can operate with outdoor temperature down to -20°C and up to 52°C (50° for G01 and G05 units) and chilled water temperature from 6,6°C up to 25°C (20°C for G01 and G05 units).

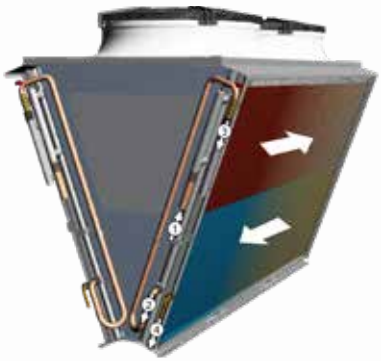
TECHNOLOGICAL CHOICES

WHAT'S NEW

R.E.D. Cooler
Reduced **E**xergy **D**epletion

The new i-FR2-Z comes with the in-house developed **Red Cooler**, a patented technological solution that improves the efficiency of the unit and reduces the exergy loss of the expansion phase.





1) Condensing coil inlet
2) Condensing coil outlet
3) RED Cooler subcooling coil inlet
4) RED Cooler subcooling coil outlet

The refrigerant is subcooled in a dedicated coil, the **subcooler**, where the refrigerant liquid is cooled down to a temperature very close to the external air, exploiting the sub-cooling energy to the fullest.

RED Cooler increases the cooling capacity of the chiller, the amount of work required by the compressor being equal.

A careful design of the RED Cooler heat rejection section maximizes the unit's efficiency and reduces the footprint of the unit.

Full inverter driven compressors

for a stepless capacity control

2 or 3 independent refrigerant circuits

for simpler maintenance and a more efficient operation

Factory-installed pumps (with VPF options)

and pre-plumbed hydraulic for the minimum installation time and cost (optional).

Shell and tube evaporator

ΔT: up to **15K**

Dry expansion, single pass shell and tube evaporator, fully developed and manufactured by Mitsubishi Electric Hydronics & IT Cooling Systems.

- Internally grooved copper tubes for enhanced heat exchange
- Low pressure drops
- Fully protected against ice formation

FULL INVERTER CHILLER

ABSENCE OF IN-RUSH CURRENTS

No electrical and mechanical stress

The unit never exceeds the nominal current, not even when starting up.

No additional equipment needed

Such as star/delta commuters or soft starters

CONTINOUS CAPACITY CONTROL

The smart design always has the ideal capacity and extreme modularity control in every load condition thanks to the independent refrigerant circuits and the full inverter technology.

REDUCED SOUND POWER LEVELS

LOWER SPEED, LOWER NOISE

i-FR2-Z range ensures extremely low noise operations compared to fixed speed units. The unit working in partial load conditions is far more silent than a fixed speed compressor unit.

EC fans

for the highest efficiency

Electrical panel

with power circuit components and W3000+ control. Numbered wiring and Fast Restart per standard.

Full Aluminum microchannel coils with RED COOLER patented solution

to increase the efficiency of the unit. Cu/Al coils and anti corrosion treatments available as option.

MAIN OPTIONS

FACTORY MOUNTED PUMPS

Low or high head dual pumps, fixed or variable speed

Hydronic modules and flow controls

i-FR2-Z units come equipped **as standard** with **terminal and modulating signal (0-10V)** to control the activation and speed of one external variable speed pump, with the internally developed **VPF.E** control logic, which **adjusts the pump speed** on the basis of the **plant's thermal load**, in order to **maintain the defined plant-side ΔT** (primary circuit).

Terminals for external pump control

The unit controls the activation and speed of 1 or 2 external pumps.

Terminals + Modulating signal

1 pump: Standard

2 pumps: Optional

These arrangements allow to control the activation / deactivation of fixed speed pumps too!

Factory-mounted pump group

As an option, i-FR2-Z can be provided with 2 pumps (duty/standby) with 2-pole motor, fixed or variable speed, to provide low or high head (available head approx 100 or 200 kPa).

Other possible variable primary flow control logics:

VPF control logic

The VPF control series (Variable Primary Flow) doesn't only **adjust the pump speed 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 on the plant side
For single unit or multi-unit systems with only the primary circuit.

VPF.D: constant ΔT on the plant side
For single unit or multi-unit systems with primary and secondary circuits separated by a hydraulic decoupler.

VPF
VARIABLE PRIMARY FLOW

PUMPS MANAGEMENT CONTROL FUNCTION

WITH HYDRAULIC DECOUPLER PROBE

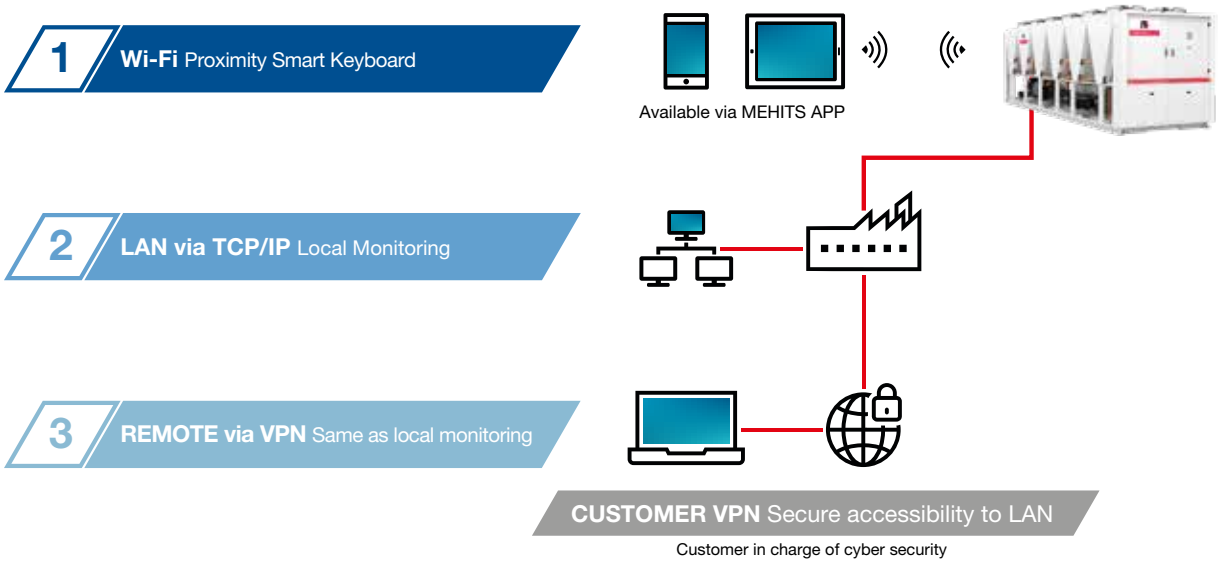
Pumps activation is regulated in accordance with the water temperature measured by the storage probe (in the systems with the primary and secondary circuits separated by an hydraulic decoupler). The function reduces the pump operating hours and related energy consumption.

KIPlink: LOCAL AND REMOTE MONITORING FUNCTIONS

An exclusive product of Mitsubishi Electric Hydronics & IT Cooling Systems. Monitor and control the unit from a LAN device (PC, laptop, mobile phone) with a simple web browser.

MAIN FEATURES

- Easier on-site operation
- Real-time graphs and trends
- Data logger function



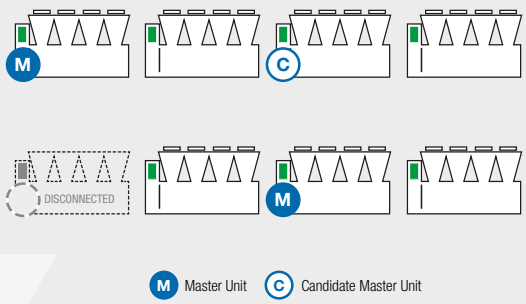
SMART LAN FUNCTIONS

i-FR2-Z features embedded LAN logics for an easy connection between a group of chillers.

- **Up to 8 chillers connected to the same group.**
- **Load sharing and Sequencing.**
- **Selectable unit start-up sequence.**
- **Stand by unit management with automatic unit rotation.**
- **Dynamic master with succession priority.**

  One master unit is elected to coordinate the group and if it becomes disconnected the candidate unit takes full control.
- **Resource priority management.**

MASTER SUCCESSION PRIORITY



User interfaces available as an option

- Touch screen

- Large keyboard

REFRIGERANT LEAK DETECTION SOLUTIONS

Several leak detection solutions are available as an option

- **Internal refrigerant leak detector**

  Proprietary control logic that is able to detect a refrigerant leak,without needing external devices, by reading and interpreting of internal cycle parameters.
- **Leak detector**

  In case of a gas leak detection, it raises an alarm.
- **Leak detection with compressor off**

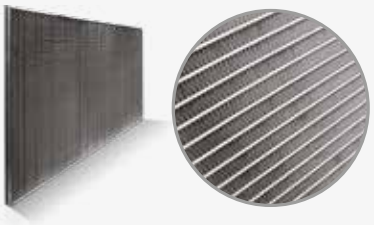
  In case of a gas leak detection, it raises an alarm and stops the units.
- **Leak detection + pump-down**

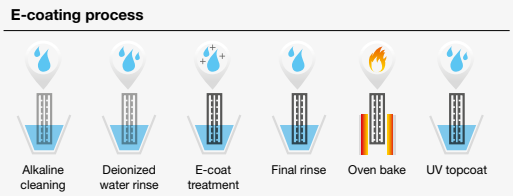
  In case the device detects a leakage, the unit stops and stores the remaining refrigerant inside the evaporator, waiting for the intervention of a technician.

ANTI CORROSION COIL TREATEMENTS

MICROCHANNEL COILS

Al - Regular (std)



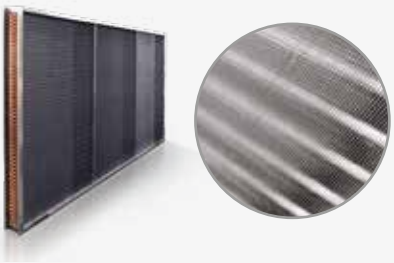


Al - E-coating

- UV rays excellent

TUBE & FIN COILS

Cu/Al - Regular



Cu/Al - Pre-painted fins

- Fins treated with protective polyester resin paint.
- 1000 h of salt spray protection as per ASTM B117.
- Excellent resistance to UV rays.

Cu/Al - Fin Guard Silver SB

- Polyurethane paint with metallic emulsion.
- 3000 h of salt spray protection as per ASTM B117.
- Excellent resistance to UV rays.

FURTHER OPTIONS

OPERATING MAP

Antifreeze piping, pumps: Electrical heaters on pipes and pumps to protect the unit against ice formation on its hydraulic components.

Double insulation on exchanger (+pipes+pumps): Thermal insulation on heat exchangers, pumps and pipes to reduce heat losses and prevent from condensate problems.

Oversized EC fans: To provide an available static pressure at the air discharge of the fans up to 150Pa.

AUXILIARY INPUTS

4-20 mA: Enables remote set-point adjustments (analog input).

Double set-point: Enables the remote switch between 2 set-points (digital input).

DEMAND LIMIT SOLUTIONS

Demand Limit: Limits the unit's power absorption for safety reasons or in temporary situations (digital imput).

External capacity cap: Limits the unit's cooling capacity to a specific % value, by acting on active resources and their operating frequencies. The unit can exceed this limit in specific conditions.

CONTROL FUNCTIONS

U.L.C. User Limit Control: Controls a mixing valve (not included) to ensure a safe start-up and operation of the unit even in critical conditions.

Remote probe: Controls the unit's and pump's activation on the base of the water temperature of the buffer tank or hydraulic decoupler.

Smart current limit: Controls the maximum current and power absorption of the unit under a determined value.

Night mode: The noise of the unit is reduced limiting maximum compressor frequency and fan speed.

ENERGY METER

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

Energy meter for W3000+: The electrical data acquired is available directely on the unit's control.

CONNECTIVITY

Serial card interface module to allow integration with BMS protocols: Modbus / BACnet MS / TP / BACnet over IP / Konnex / Modbus TCP/IP/ SNMP.

Multi Manager options to allow easy connection between a group of chillers.

LIGHT ON ELECTRICAL BOARD+ POWER SOCKET

230V power socket in the electrical board, CEE 7/3 type (Schuko). The maximum power available is 500VA.

Electrical board equipped with lights.

HYDRAULIC

Evaporator flow switch: Flow switch with AISI 316L stainless steel basket and IP65 protection suitable for installation in industrial plant pipes.

Electronic water flow switch: Flow switch with electronic detection of the flow in the pipes.

Evaporator hydraulic connections on opposite side.

MECHANICAL

Rubber or spring type antivibration mountings (supplied loose): Reduce vibrations, keeping noise transmission to a minimum.

EQUIPMENT FOR MISSION CRITICAL APPLICATIONS

FAST RESTART

Ensures a **faster return to the necessary cooling** levels in the shortest time possible, while maintaining the **reliability** of the chiller.

Ensure fast cooling start-up

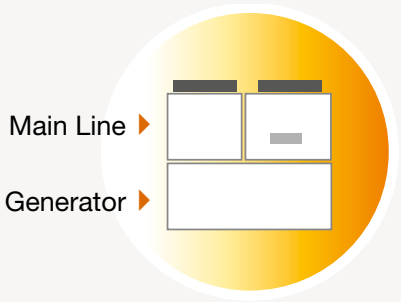
Have the unit running at full load in a shorter time

Fast restart - UPS excluded (Standard)
This option requires an external 230V AC UPS, not supplied with the unit, to keep the on-board controller functional and ensure fast restart after a power outage.

Fast restart - UPS included
This option includes an electric device capable of keeping the controller power supply uninterrupted during a power failure. The capacity of this device is selected on the basis of the needs of a specific project.

DOUBLE POWER SUPPLY

i-FR2-Z can be connected to two separate power lines to enhance the system’s dependability.



In case of a main line power outage, the ATS* automatically switches over to the backup line, granting uninterrupted power supply to the unit.
The double power supply makes i-FR2-Z suitable for Uptime Institute’s TIER III and TIER IV** design topologies, the highest standards of reliability.

* ATS: Automatic Transfer Switch
** The Tier Classification System provides the data center industry with a consistent method to compare typically unique facilities based on expected site infrastructure performance, or uptime.

Double power supply (ATS)
The ATS, installed within the electrical board, automatically senses if one of the sources has lost or gained power. The switching is completely automatic (line priority and frequency of checking are selectable).

ADVANCED METERING

You can’t manage what you don’t measure.

PUE (Power usage effectiveness) is the ratio that determines how energy efficient data centers.

Thermal energy meter
Acquires water temperature and flow ratio delivered by the unit and compute the cooling capacity produced. Together with energy meter you can instaneously evaluate the EER.

Energy meter
Acquires the electrical data and the power absorbed by the unit and sends them to the supervisor for energy metering.

MORE THAN 1000 PROJECTS ALL OVER THE WORLD

Bologna
Tecnopolo Bologna

Period: 2018-2019
Mixed-Use Development, Offices, Residential buildings, Data Center

Bologna
Bonfiglioli Riduttori

Period: 2018-2019
Industial Process, Office Buildings, Data Center

Luxembourg
KAD Building - European

Period: 2016-2018
Institutions, Data Center

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