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

COMFORT

CHILLERS

# TECS2 HFO

## AIR AND WATER COOLED CHILLERS WITH MAGNETIC LEVITATION COMPRESSORS AND HFO 1234ze REFRIGERANT, FROM 339 TO 1364 kW

GREEN EFFICIENCY

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CLIMAVENETA®

**“The ultimate objective of this Convention is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.**
**Such a level should be achieved with a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.”**

United Nations
Framework Convention on Climate Change
UNFCCC, 1992

# THE CALL FOR CLIMATE ACTION

Tackling stratospheric ozone depletion and the greenhouse effect have led to drastic regulatory changes in the HVAC&R industry. Starting from the United Nations Framework Convention on Climate Change UNFCCC, the Member States are progressively setting more challenging targets in order to:

### Reduce greenhouse gas emissions (GHG)

Reduction in greenhouse gases and -40% of $CO_2$ emissions by 2030

### Tackle climate change

Keeping global warming within 2 °C compared to pre-industrial era (1850)

### Promote sustainable development

Increasing use of renewables and efficiency targets for energy related products

## This has posed new challenges for the HVAC industry:

### Against Global Warming

**Refrigerant greenhouse and global warming potential are measured by two parameters:**

- **ODP** Ozone Depletion Potential
- **GWP** Global Warming Potential

While in the past the main focus was on reducing ODP values down to 0, new regulations now encourage Member States to work harder on GWP.

### Challenging efficiency targets

Countries are becoming more and more aware that environmental targets must be regulated by laws and programs in terms of energy efficiency targets related both to products:

- **ERP** Ecodesign 2009/125/EC
- **MEPS**

and to buildings:

- **LEED**
- **BEAM**
- **Green Mark**
- **Green Star**
- **BREEAM**

# RESPONDING TO CLIMATE CHANGE WITH

## TECS2 HFO

New generation chillers with magnetic levitation technologyand HFO refrigerant embracing an innovative forward-looking concept of sustainability:

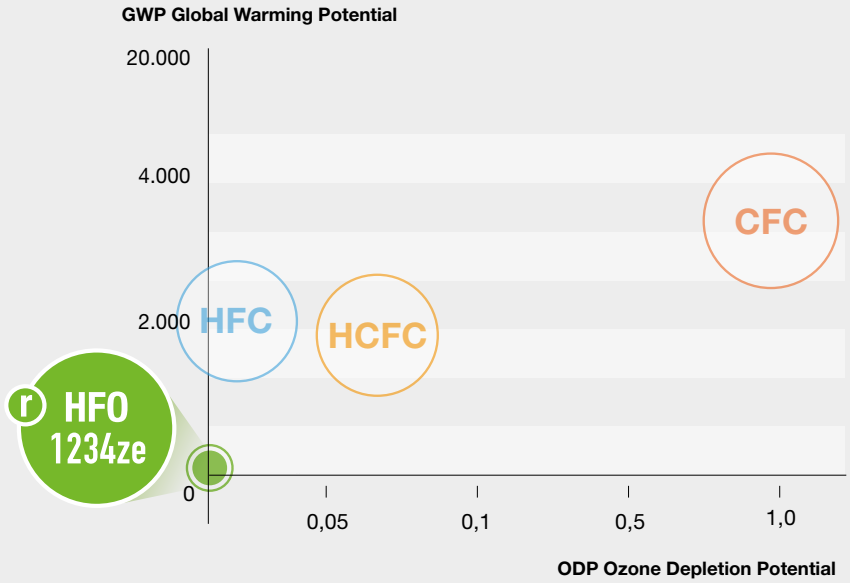
**GREEN**

## The eco-friendly alternative to HFCs

**HFO, the new generation low GWP refrigerant**

The 4th generation refrigerant HFOs result in being the perfect solution to keep ODP=0 and GWP levels near zero.

HFO 1234ze is a gas blend characterised by extremely low GWP whilst maintaining high efficiency values. Thanks to its compatibility with standard construction materials and operating performance similar to R134a, the new HFO 1234ze is the perfect alternative to HFC refrigerants.




**Negligible GWP**

HFO 1234ze GWP $_{100\ year}$ < 1
R134a GWP $_{100\ year}$ = 1300
(GWP values according to IPCC rev. 5th)

**Rapid molecule disintegration in the atmosphere**

HFO 1234ze = 2 weeks
R134a = 14 years

**Approved by international standards (ASHRAE 34, ISO 817)**

HFO 1234ze classification = A2L (non toxic, mildly flammable), safety group 2 for PED (same as R134a)

**Compatible with common construction materials**

No special components
No extra cost

**In-line with F-Gas regulation objectives**

No future retrofit required


All the advantages of an eco-friendly refrigerant combined with high performing magnetic levitation technology, together with the renowned quality of Climaveneta brand solutions. This is TECS2 HFO's key feature for a long-term sustainable solution that satisfies even the strictest environmental requirements.

# EFFICIENCY

## The ultimate technology for unbeatable performance

**High performance magnetic levitation technology**

TECS2 HFO is the latest technology of chillers with magnetic levitation compressor optimised for HFO 1234ze refrigerant.

The new chiller optimised for HFO is even more performing than its predecessor working with R134a, displaying an increased efficiency value of 3% if considering the same cooling capacity.

**Reliability and extended life cycle**

Reliability is key in units meant to be forerunners. Thanks to a decade of experience in magnetic levitation compressor units and thousands units installed all over the world, Climaveneta brand represents the best proof of total reliability, significant cost savings and longer life cycle (HFO doesn't need any future retrofit due to refrigerant legislation compliance).

**Higher efficiency than similar chillers with R134a**

| | |
|---|---|
| TECS2 HFO EER 3,5 | +3,3% |
| TECS2 EER 3,4 | |
| TECS2-W HFO EER 5,2 | +4% |
| TECS2-W EER 5,0 | |

**Less annual energy consumption than similar chillers with R134a**

| | |
|---|---|
| TECS2 HFO ESEER 5,6 | +3,7% |
| TECS2 ESEER 5,4 | |
| TECS2-W HFO ESEER 8,2 | +3,8% |
| TECS2-W ESEER 7,9 | |

Average values of the series, according to EN14511:2011

# TECHNOLOGICAL CHOICES

R HFO1234ze

## MAGNETIC LEVITATION COMPRESSOR SPECIFICALLY DESIGNED FOR HFO

TECS2 HFO is the result of a smart combination between the centrifugal compressor with magnetic levitation technology and the HFO 1234ze refrigerant. It is well known that the efficiency levels achieved by the magnetic levitation compressors are far superior to those with traditional volumetric compressors.

Besides the reduction of weight and dimensions with respect to traditional compressors, this is a solution that permits the compressor to operate without any oil at all, allowing a significant improvement in the heat exchange performance. Vibrations are virtually eliminated together with possible jolts due to inrush current in the start up phase: the unit's wear is minimised.

The new HFO magnetic levitation compressor is 3% more efficient than similar technology working with R134a.

## NEW GENERATION EC FANS

EC electronic commutation fans are characterised by high efficiency motor and, according to Regulations 327/2011, their Efficiency Grade is far superior to any other AC fan.

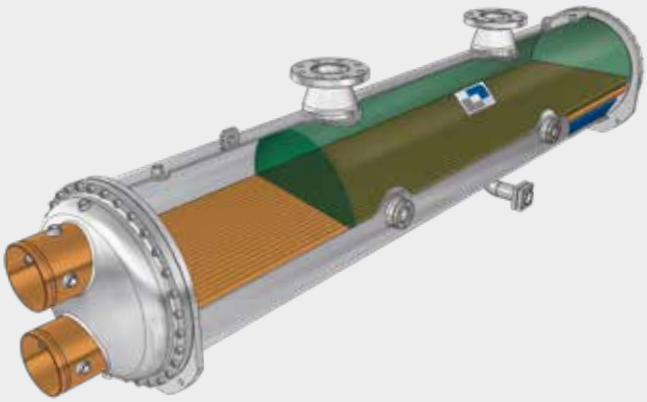
Their extraordinary efficiency, together with really low inrush current, improves chiller performance, especially at partial loads, and contributes to the overall reliability of the unit and thus to relevant running cost savings.

**The ability to continuously modulate the rotational speed and perfectly adapt to the plant requirements, provides great advantages in terms of:**

- Minimised sound levels and energy consumption at any load condition
- Large running cost savings
- Premium efficiency, especially when all year round operation is required

**Efficiency, reliability, silent operation. But also great care to the environmental effects of its components. All of these premises have led to the creation of TECS2-HFO: the most advanced and eco-compatible solution available on the market.**

## ADVANCED CONTROLLER



The new controller features proprietary settings which ensure fast adaptive responses to different dynamics. The interface is intuitive and user-friendly thanks to the adoption of LED icons for a full and immediate status display of the various circuits.

**As an option, a touch screen interface is available with:**

- 7” color display
- USB port, for quick and easy application updates and download of all registered variables in graphic form

## INNOVATIVE DESIGN OF THE HEAT EXCHANGERS

The flooded evaporator, fully designed and built internally, together with the shell and tube condenser (in water source units), features an exclusive design aimed at maximising the cooling capacity and optimising the operation of the compressors.

The shell and tube condenser is designed to ensure reduced pressure drops on the water side and to decrease the pumping costs as much as possible. In the evaporator the complete flooding of the tubes is also guaranteed during partial load conditions by an electronic expansion valve, managed by proprietary control logics.

**On the evaporator the presence of the refrigerant fluid in the shell side and water in the tube side allows:**

- Minimisation of pressure drops
- Perfect unified temperature as well as complete refrigerant evaporation
- No surface for the over-heating
- Easy cleaning operations

## STANDARD INTERFACE


## OPTIONAL TOUCH SCREEN INTERFACE

# TECS2 HFO 0351-1053

## HIGH EFFICIENCY AIR COOLED CHILLER FOR OUTDOOR INSTALLATION FROM 339 kW TO 1017 kW

Units for outdoor installation, characterised by an extremely compact layout and 4th generation refrigerant HFO 1234ze. TECS2 HFO units easily adapt to different thermal load conditions thanks to the precise thermoregulation together with the use of inverter technology.

GREEN EFFICIENCY

EUROVENT CERTIFIED PERFORMANCE www.eurovent-certification.com

VSPEED VARIABLE SPEED DRIVE

VPF VARIABLE PRIMARY FLOW

A ENERGY CLASS | COOLING | FL FLOODED

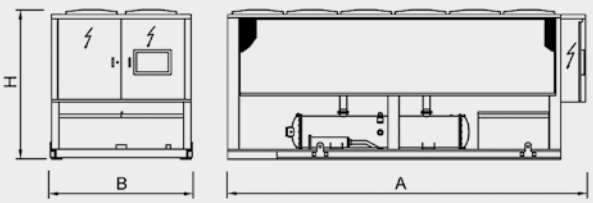
R HFO1234ze | CENTRIFUGAL | HEATING

| TECS2 HFO / SL-CA-E | | | 0351 | 0702 | 1053 |
|---|---|---|---|---|---|
| Power supply | | V/ph/Hz | 400/3/50 | 400/3/50 | 400/3/50 |
| **PERFORMANCE** | | | | | |
| **COOLING ONLY (GROSS VALUE)** | | | | | |
| Cooling capacity | (1) | kW | 339 | 679 | 1017 |
| Total power input | (1) | kW | 96,3 | 192 | 282 |
| EER | (1) | kW/kW | 3,52 | 3,53 | 3,60 |
| ESEER | (1) | kW/kW | 5,56 | 5,96 | 6,00 |
| **COOLING ONLY (EN14511 VALUE)** | | | | | |
| Cooling capacity | (1)(2) | kW | 338 | 677 | 1014 |
| EER | (1)(2) | kW/kW | 3,48 | 3,50 | 3,55 |
| ESEER | (1)(2) | kW/kW | 5,36 | 5,75 | 5,64 |
| Cooling energy class | | | A | A | A |
| **ENERGY EFFICIENCY** | | | | | |
| **SEASONAL EFFICIENCY IN COOLING (Reg. EU 2016/2281)** | | | | | |
| **Ambient refrigeration** | | | | | |
| Prated,c | (7) | kW | 338 | 677 | 1014 |
| SEER | (7)(8) | | 5,65 | 5,99 | 5,89 |
| Performance ηs | (7)(9) | % | 223 | 237 | 233 |
| **EXCHANGERS** | | | | | |
| **HEAT EXCHANGER USER SIDE IN REFRIGERATION** | | | | | |
| Water flow | (1) | l/s | 16,22 | 32,45 | 48,66 |
| Pressure drop | (1) | kPa | 27,4 | 23,1 | 45,7 |
| **REFRIGERANT CIRCUIT** | | | | | |
| Compressors nr. | | N° | 1 | 2 | 3 |
| No. Circuits | | N° | 1 | 1 | 2 |
| Refrigerant charge | | kg | 150 | 475 | 550 |
| **NOISE LEVEL** | | | | | |
| Sound Pressure | (3) | dB(A) | 58 | 59 | 60 |
| Sound power level in cooling | (4)(5) | dB(A) | 90 | 92 | 93 |
| **SIZE AND WEIGHT** | | | | | |
| A | (6) | mm | 4000 | 7900 | 9700 |
| B | (6) | mm | 2260 | 2260 | 2260 |
| H | (6) | mm | 2430 | 2430 | 2430 |
| Operating weight | (6) | kg | 3130 | 6450 | 7610 |

**Notes:**
1 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Source (side) heat exchanger air (in) 35°C.
2 Values in compliance with EN14511-3:2013.
3 Average sound pressure level at 10m distance, unit in a free eld on a reective surface; non-binding value calculated from the sound power level.
4 Sound power on the basis of measurements made in compliance with ISO 9614.
5 Sound power level in cooling, outdoors.
6 Unit in standard conguration/execution, without optional accessories.
7 Seasonal energy efciency of the cooling environment in AVERAGE climatic conditions [REGULATION (EU) N. 2016/2281]
8 Seasonal space heating energy index
9 Seasonal energy efciency of the space cooling
**The units highlighted in this publication contain HFC HFO-1234ze [GWP_100 7] fluorinated greenhouse gases.**
**Certified data in EUROVENT**

## Accessories:

- VPF (Variable Primary Flow) kit: \variable flow pumps with on board regulation
- Electromagnetic compatibility (EMC) - EN6100-6-3 for residential environments
- Compressors' power factor correction 0.95
- Remote control keyboard (distance up to 200m or up to 500m, available with standard or touch screen keyboard)
- Hydronic group
- Set-up for remote connectivity with ModBus/Echelon protocol cards



# TECS2-W HFO 0351-1414

## HIGH EFFICIENCY WATER COOLED CHILLER FOR INDOOR INSTALLATION FROM 340 kW TO 1364 kW

Units for indoor installation, characterised by a minimum footprint and 4th generation refrigerant HFO 1234ze. Conceived to be extremely flexible and reliable units, TECS2-W HFO are also available with the /H function (heat pump reversible on hydraulic side).

GREEN EFFICIENCY

EUROVENT CERTIFIED PERFORMANCE www.eurovent-certification.com

VSPEED VARIABLE SPEED DRIVE

VPF VARIABLE PRIMARY FLOW

A ENERGY CLASS | COOLING | FL FLOODED

R HFO1234ze | CENTRIFUGAL | HEATING

| TECS2-W HFO / HC | | | 0351 | 0712 | 1053 | 1414 |
|---|---|---|---|---|---|---|
| Power supply | | V/ph/Hz | 400/3/50 | 400/3/50 | 400/3/50 | 400/3/50 |
| **PERFORMANCE** | | | | | | |
| **COOLING ONLY (GROSS VALUE)** | | | | | | |
| Cooling capacity | (1) | kW | 340 | 676 | 1015 | 1364 |
| Total power input | (1) | kW | 63,0 | 127 | 190 | 251 |
| EER | (1) | kW/kW | 5,39 | 5,34 | 5,35 | 5,43 |
| ESEER | (1) | kW/kW | 9,01 | 9,40 | 9,32 | 9,51 |
| **COOLING ONLY (EN14511 VALUE)** | | | | | | |
| Cooling capacity | (1)(2) | kW | 339 | 674 | 1013 | 1361 |
| EER | (1)(2) | kW/kW | 5,18 | 5,17 | 5,19 | 5,29 |
| ESEER | (1)(2) | kW/kW | 7,83 | 8,12 | 8,22 | 8,50 |
| Cooling energy class | | | A | A | A | A |
| **ENERGY EFFICIENCY** | | | | | | |
| **SEASONAL EFFICIENCY IN COOLING (Reg. EU 2016/2281)** | | | | | | |
| **Ambient refrigeration** | | | | | | |
| Prated,c | (7) | kW | 339 | 674 | 1013 | 1361 |
| SEER | (7)(8) | | 8,20 | 8,22 | 8,36 | 8,76 |
| Performance ηs | (7)(9) | % | 320 | 321 | 326 | 342 |
| **EXCHANGERS** | | | | | | |
| **HEAT EXCHANGER USER SIDE IN REFRIGERATION** | | | | | | |
| Water flow | (1) | l/s | 16,24 | 32,33 | 48,54 | 65,22 |
| Pressure drop | (1) | kPa | 32,9 | 29,0 | 31,1 | 33,1 |
| **HEAT EXCHANGER SOURCE SIDE IN REFRIGERATION** | | | | | | |
| Water flow | (1) | l/s | 19,19 | 38,25 | 57,42 | 76,97 |
| Pressure drop | (1) | kPa | 40,8 | 39,6 | 32,0 | 23,0 |
| **REFRIGERANT CIRCUIT** | | | | | | |
| Compressors nr. | | N° | 1 | 2 | 3 | 4 |
| No. Circuits | | N° | 1 | 1 | 1 | 1 |
| Refrigerant charge | | kg | 95,0 | 230 | 360 | 390 |
| **NOISE LEVEL** | | | | | | |
| Sound Pressure | (3) | dB(A) | 74 | 76 | 77 | 78 |
| Sound power level in cooling | (4)(5) | dB(A) | 92 | 94 | 96 | 97 |
| **SIZE AND WEIGHT** | | | | | | |
| A | (6) | mm | 2990 | 3490 | 4990 | 5450 |
| B | (6) | mm | 950 | 1300 | 1300 | 1300 |
| H | (6) | mm | 1900 | 1800 | 1800 | 1990 |
| Operating weight | (6) | kg | 1570 | 3010 | 4380 | 5240 |

**Notes:**
1 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Source (side) heat exchanger air (in) 35°C.
2 Values in compliance with EN14511-3:2013.
3 Average sound pressure level at 10m distance, unit in a free eld on a reective surface; non-binding value calculated from the sound power level.
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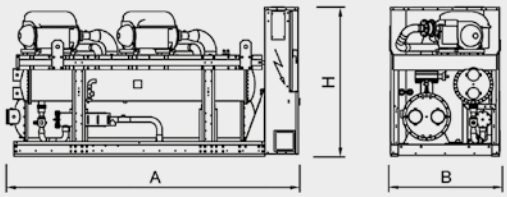
**The units highlighted in this publication contain HFC HFO-1234ze [GWP_100 7] fluorinated greenhouse gases.**
**Certified data in EUROVENT**

## Accessories:

- Electromagnetic compatibility (EMC) - EN6100-6-3 for residential environments
- /H version (heat pump reversible on hydraulic side)
- VPF or VPF.D signal
- Condensing pressure control devices
- Integral acoustic enclosure



# “ BY FAR THE BEST PROOF IS EXPERIENCE ”

**Sir Francis Bacon**
British philosopher
(1561 - 1626)

## RTS RADIO TELEVISION SUISSE

2016-2017 Geneva (Switzerland)

**Application:**
Telecommunications, Offices

**Plant type:**
Hydronic System

**Cooling capacity:**
674 kW

**Machines installed:**
1x TECS2-W HFO/HC 0712

**Project**
RTS (Radio Television Suisse) is the company that handles production and broadcasting of radio and television programming in French for Switzerland. Its headquarters are in Geneva, behind the Hans Wilsdorf Bridge.

**Challenge**
In recording studios air conditioning system plays a key role, in fact rooms are sound proof to avoid as much as possible noises while machineries as mixers, cameras and lights cause very high internal heating loads.

**Solution**
For the air conditioning of the several rooms, a TECS2-W HFO water cooled chiller with magnetic levitation compressors was installed. This unit was chosen because of its efficiency also at partial loads and because indoor installation makes its noise emissions low. In addition the use of HFO green refrigerant, in compliance with latest European regulations to tackle climate change was considered a ideal choice to avoid anticipated retrofit of the plant.

Resulting from decades of experience in managing the magnetic levitation technology, the success of TECS2 HFO solutions have been already tested in several renowed projects. Because experience is not only a matter of prestige but also the best proof to provide its customers with the highets quality levels and no-compromise reliability for all kinds of applications.

**Genève Plage**
2015 - Cologny (Switzerland)

**Application:**
Gyms/Swimming pools

**Plant type:** Hydronic system
**Cooling capacity:** 680 kW
**Heating capacity:** 341 kW
**Installed machines:**
2x TECS2-W HFO/HC/H/S 0351

**Métropole**
2015 - 2016
Lausanne (Switzerland)

**Application:**
Hotels and Resorts

**Plant type:** Hydronic System
**Cooling capacity:** 1016 kW
**Installed machines:**
2x TECS2-W HFO

**Datwyler Sealing Solutions**
2016-2018 Schattdorf (Switzerland)

**Application:**
Office Building

**Plant type:** Hydronic system
**Cooling capacity:** 1360 kW
**Installed machines:**
2x TECS2 HFO/SL-CA-E 702

**Geschäftshaus Lindbergh Allee**
2014 - Opfikon (Switzerland)

**Application:**
Office Building

**Plant type:** Hydronic System
**Cooling capacity:** 1015 kW
**Installed machines:**
1x TECS2-W HFO

**Singapore Sports Hub**
2014 - Singapore

**Application:** Sport facilities
**Plant type:** Hydronic system
**Constructor:** BYME Singapore

**Cooling capacity:** 1360 kW
**Designer:** ARUP
**Installed machines:**
8x TECS2-W/LC,
8x FOCS2-W/D/CA-E,
7x FOCS2-W/CA-E,
4x ACU


**Principal Place**
**THE UN SQUARE MILE**
2014 - Singapore

**Application:** Mixed-use buildings

**Plant type:** Hydronic system

**Cooling capacity:** 9243 kW
**Heating capacity:** 478 kW
**Installed machines:**
6x TECS2-W/LC,
1x FOCS2-W/R/CA-E

TECS-HFO_ENG_12-2017

CLIMAVENETA®

for a greener tomorrow

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

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