

FR-FC-Z FR-FC-G05-Z

**AIR COOLED CHILLERS
WITH SCREW COMPRESSORS
AND FREE-COOLING
TECHNOLOGY
332 to 1450 kW**

R513A



FR-FC-Z

FR-FC-G05-Z

HARNESSING THE FULL POTENTIAL OF OUTDOOR AIR



Air cooled chiller with screw compressors and free-cooling technology. From 332kW to 1450kW

FR-FC-Z is the complete range of free-cooling chillers with screw compressors dedicated to the data processing infrastructure.

Combining Mitsubishi Electric Hydronics & IT Cooling experience in developing high efficiency free-cooling solutions, FR-FC-Z features new generation screw compressors with innovative lubrication system and large surface heat exchangers for maximizing the free-cooling potential.

PROCESS APPLICATIONS

- ✓ Food industry
- ✓ Chemical and Pharmaceutical
- ✓ Printing industry
- ✓ Plastics
- ✓ Winery

TOP-LEVEL PERFORMANCE



Thanks to devoted technological solutions and accurate design, each FR-FC-Z configuration brings high full load performance and brilliant part load efficiency together, thus helping individuals and businesses reduce the energy consumption of their HVAC systems and cut running costs.

NEW G05 VERSION WITH R513A REFRIGERANT

R513A

It is now available the new low GWP FR-FC-G05-Z version: the screw compressor chiller with free-cooling technology and R513A low GWP refrigerant that has been specifically selected to comply with the most restricted eco-friendly standards.

WIDEST USE OF FREE-COOLING



Thanks to special heat exchangers featuring large surface and advanced logics for the free-cooling management, the liquid is cooled by outdoor air, thus lowering the load of the compressors till zero. This occurs already at positive outdoor temperatures.

UTMOST RELIABILITY



In IT cooling infrastructure working for more than 8000 hours/year, even a small increase in the product efficiency can lead to a significant saving on the overall energy bill.

Devoted functions such as the unit fast restart and the double power supply are key in maximizing the unit's uptime even in case of emergency circumstances.

ACOUSTIC VERSIONS

T+

Standard version
with positive free-cooling temperature 100%

T+ NR

Standard version with Noise reducer
with positive free-cooling temperature 100%

SL-T+

Low noise version
with positive free-cooling temperature 100%

CONFIGURATIONS

STD

Standard free-cooling

NG

Function for free-cooling without glycol

FR-FC-G05-Z



COMBINING EFFICIENCY WITH ALL-ROUND SUSTAINABILITY

FR-FC-G05-Z is the result of Mitsubishi Electric Hydronics & IT Cooling Systems' extensive approach to sustainability.

Increasing concerns about the global warming impact of chillers and heat pumps is driving new regulatory policies to push towards even more efficient units with the lowest carbon footprint.

Today, an all-round approach is the only way to effectively reduce the Total Equivalent Warming Impact (TEWI).

Fully committed to support the creation of a greener tomorrow, Mitsubishi Electric Hydronics & IT Cooling Systems designed FR-FC-G05-Z, a complete chiller range with reduced environmental impact, optimized for R513A refrigerant.

Combining brilliant annual efficiency with the use of a low GWP refrigerant, FR-FC-G05-Z tackles both the indirect (due to primary energy consumption) and the direct global warming, thus resulting in the perfect choice for any new, forward-looking cooling system.



LOW GWP

-56% GWP vs R134a



Non-flammable

Safety Class A1

REFRIGERANT BENCHMARK

SCROLL			SCREW		
Refrigerant	GWP*	Flammability**	Refrigerant	GWP*	Flammability**
R410A	2088	NON flammable	R134a	1430	NON flammable
R32	675	MILDLY flammable	R513A	631	NON flammable
R454B	466	MILDLY flammable	1234ze	7	MILDLY flammable
R452B	698	MILDLY flammable	1234yf	4	MILDLY flammable

*IPCC AR4

**ASHRAE 34 - ISO 817

New regulations like the EU F-gas and the Kigali Amendment to the Montreal Protocol, are driving the industry towards new eco-friendly refrigerants, with reduced greenhouse effect.

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

The new refrigerant R513A, chosen for FR-FC-G05-Z, is a brilliant exception: it offers a -56% GWP reduction compared to R134a's while ensuring complete non-toxicity and non-flammability (Class A1 of ASHRAE 34, ISO 817).

FREE-COOLING

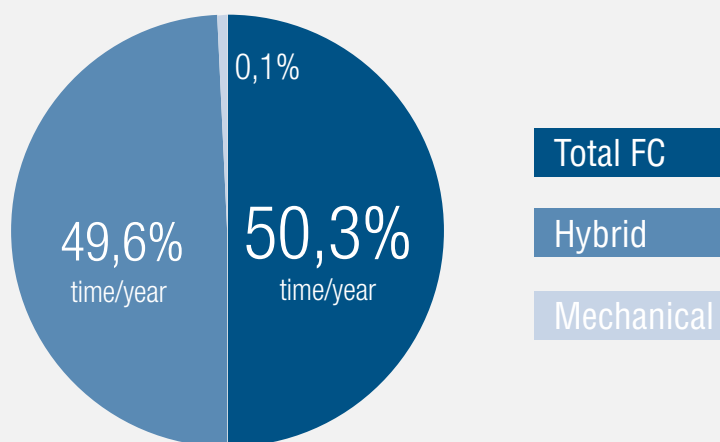
NATURAL EFFICIENCY TO COOL YOUR HVAC SYSTEM

In IT infrastructures working 24/7 cooling costs can be easily cut by taking advantage of outside low air temperatures to cool your data center activities.

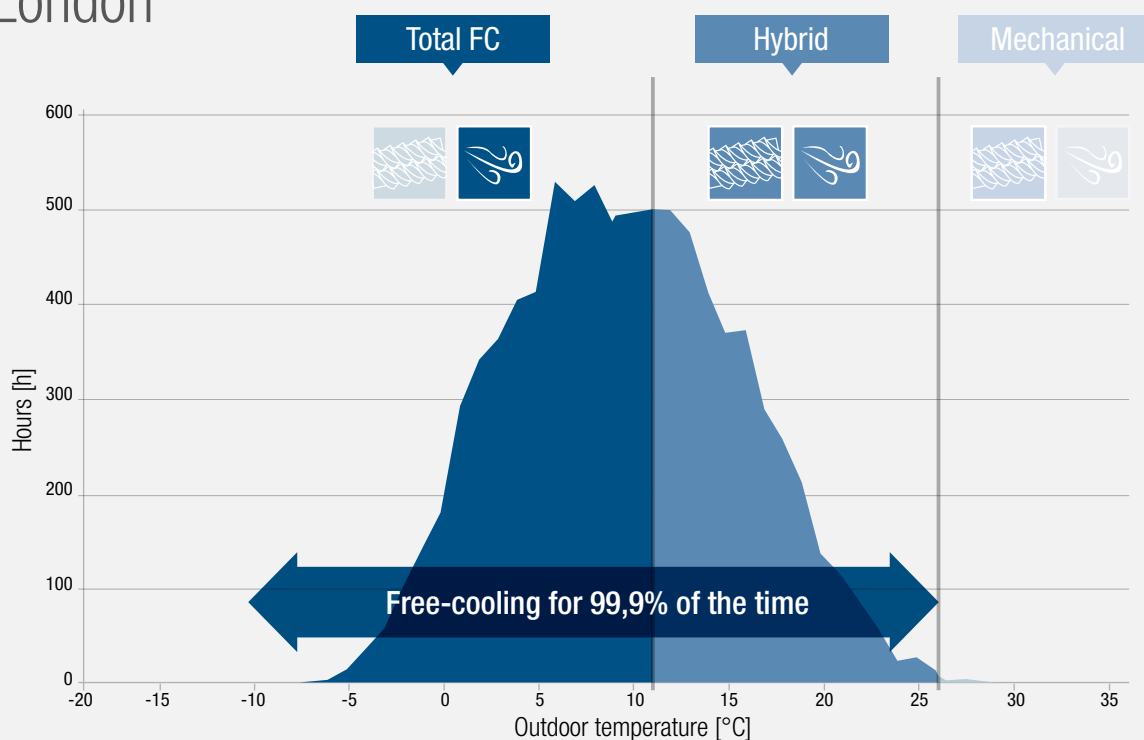
Wherever cooling demand is constant all year round, this technology can save so much in electrical costs that it can be defined as “free cooling.”

In a cooling system located in London, working with favorable levels of water temperature (such as 27-20°C), **the outdoor air alone can satisfy the cooling demand 50,3% of the time.** 49,6% of the time, the outdoor air cooling capacity allows the chiller's compressors to run at part load, with a significant increase in efficiency. For only 0,1% of the time, the unit works as an ordinary chiller.

This means that, for most of the time, there is a large saving opportunity where outdoor air can be employed to directly or indirectly cool your activities.



London



Graphics above show the cumulative hours per year of a unit working 24/7 in either Mechanical, Hybrid or Total free-cooling. Operating water temperature (in/out) 22°C/20°C.

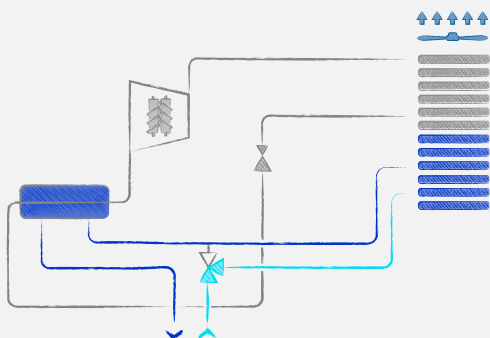
How RC masters free-cooling

RC's free-cooling chillers work in three different modes: Total free-cooling, Hybrid cooling, Mechanical cooling, according to outdoor air conditions and operating water temperature.

As the outdoor air temperature drops 1 degree below the returning water temperature, a valve system redirects the water to the special coils and the benefits of the free-cooling begin.



Total Free Cooling



Maximum Energy Saving

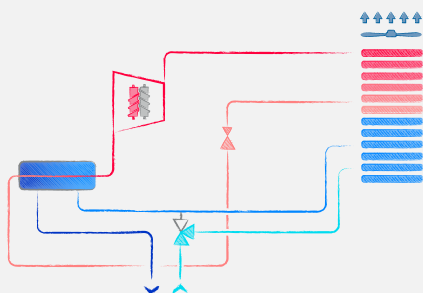
Total Free-cooling temperature up to 2°C*

*at water 15°C/10°C ; Air 30°C, Ethylene glycol 30%

- ▶ The outdoor air temperature is low enough to satisfy the entire cooling demand.
- ▶ Total cooling capacity is provided by the outdoor air in the free-cooling coils while the compressors are off.



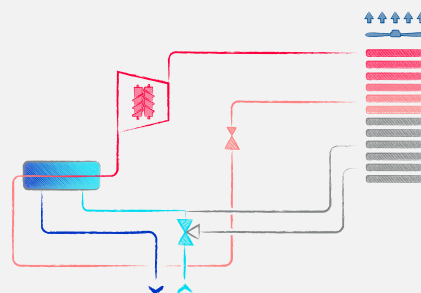
Hybrid Cooling



- ▶ The outdoor air temperature is lower than the returning water temperature but not cold enough to achieve total free-cooling.
- ▶ Part of the cooling capacity is provided by the outdoor air while the rest is provided by the compressors.



Mechanical Cooling

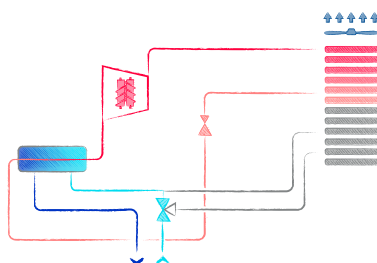


- ▶ The outdoor air temperature is equal to or higher than the returning water temperature.
- ▶ Total cooling capacity is provided by the compressors, in the evaporator.

The NO GLYCOL function

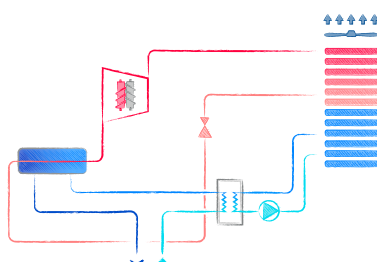
STD configuration

3 way valve



NG configuration

Plate heat exchanger + pump



The strength point of RC Free-cooling units is their capability to manage the most diverse building requirements and external temperature conditions.

For specific installations operating with very low temperature outdoor air, the entire primary hydraulic circuit needs to be glycolated. Sometimes this is not possible or simply it is not desired. This is why RC has provided the No Glycol option: a compact and unique solution that avoids the customer any complication related to the plant's circuit.

TECHNOLOGICAL CHOICES

Innovative Booster Technology

Fully developed by Mitsubishi Electric Hydraulics and IT Cooling Systems, the innovative Booster function allows the unit to achieve higher performances when working with high condensation temperatures.

Electronic Expansion Valve



The electronic valve is adopted to grant the ideal operation of the evaporator in all conditions.

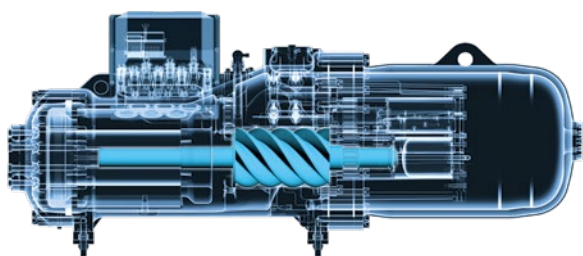
In the air cooled unit the control is made with a precise measurement of the subcooling in the condenser coil.

The fast processing of the acquired data allow a quick, fluctuation-free regulation, and therefore a highly accurate adjustment to the swings of load and ambient conditions.



Dedicated screw compressors for maximizing the free-cooling potential

Dual rotor screw compressors with innovative booster function designed to achieve high efficiencies when working on the mechanical mode.



Innovative internal geometry

Thanks to its specific design, aimed at optimizing the internal volumes for partial load operation, the FR-FC-Z screw compressors deliver excellent performance in all the different operating conditions.

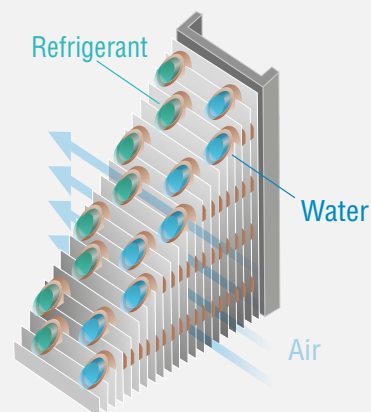
Enhanced lubrication system

A special oil management valve calibrates the oil circulation and delivers a remarkable increase of the compressor efficiency at partial loads, thus working on the hybrid mode.

Variable speed fans

High performing axial fans equipped with autotransformer for speed adjustment.

- ▶ Precise air-flow management, reduced power consumption and lower sound levels at part load
- ▶ Totally independent ventilation system for each refrigerant circuit
- ▶ EC fans available with proprietary algorithm for energy savings and very low ambient operation (Opt.)



Cu/Al free-cooling coils

Free-cooling efficacy is strictly related to the effectiveness of the air/water direct heat exchange. Nevertheless, an efficient air/refrigerant coil is necessary for proper condensation.

A special coil, made of both refrigerant and water tubes, achieves both goals. This particular configuration, instead of two separate finned coils, also prevents fin spacing misalignment and dust and dirt accumulation. Hence low pressure drops and high heat exchange efficiency will last.

Shell and tube evaporator

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

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

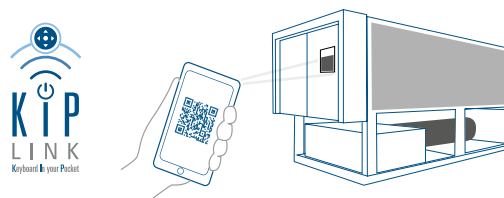
W3000TE CONTROL AND USER-FRIENDLY INTERFACE

The logic behind FR-FC-Z is the W3000TE control software.



Characterized by advanced functions and algorithms, **W3000TE features proprietary settings** that ensure faster adaptive responses to different dynamics, in all operating conditions:

- ✓ Efficient and reliable operation in all conditions
- ✓ Connectivity with the most commonly used BMS protocols (Opt.)
- ✓ Demand limit option (available for double circuit units).



Easier on-site operation

Real-time graphs and trends

Data logger function

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).

FR-FC-G05-Z

FOR MISSION CRITICAL APPLICATIONS

Highest standards of reliability and reduced running costs, without any compromise.

In IT cooling applications, telecommunication infrastructures and many manufacturing and chemical industrial processes, downtime costs are a crucial aspect. In all these applications, an interruption in the cooling supply may seriously compromise the technical equipment operation, causing unexpected shutdowns.

RC's approach to cooling dependability goes beyond the unit's accurate and sturdy design. It also involves several devices and functions that maximize unit's uptime in case of emergency circumstances such as power supply outage.

FAST RESTART

Sometimes few seconds can determine the shutdown of the entire facility.

After a power failure, the cooling must be ensured as soon as possible. Fast Restart is the special function that ensures:



Immediate cooling start-up

Compressor start-up within 26" after power is restored.

Accelerated cooling ramp-up

1000 kW are delivered within 6' 30" after a voltage dip.

Variable primary flow management

To leverage load variation

SMART PUMP MANAGEMENT

Free-cooling units lead to high energy savings but, because of their very nature, they always involve a water flow management issue: when the free-cooling is activated, the pressure drops suddenly increase due to the additional path throughout the free-cooling coils. This causes a significant change in the pump working conditions.

With the 2PS (2 Pump Speeds) function (opt), the unit adjusts the pump speed according to the free-cooling chiller operating mode, keeping the water flow steady without any energy waste nor hydraulic plant complication.



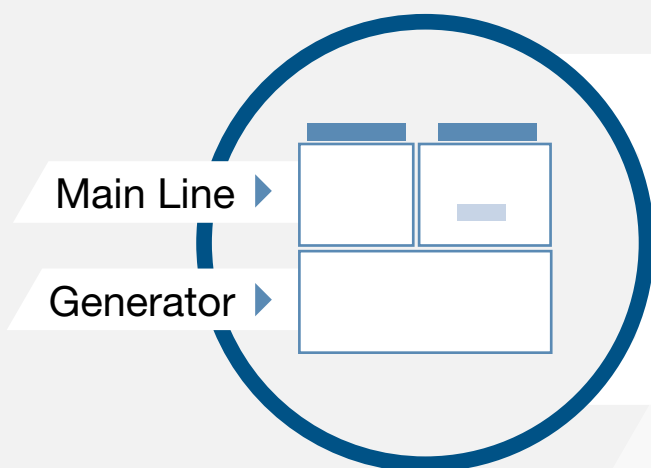
2 Pump Speed adjustment
Perfect for free-cooling units

The awareness of the most demanding application requirements and the commitment to improve their energy efficiency has led to the development of devoted solutions.

DOUBLE POWER SUPPLY

Redundancy increases uptime.

With the aim of enhancing cooling dependability, FR-FC-G05-Z extends this concept also to the electrical supply.



With the double power supply configuration, the unit is equipped with an ATS (Automatic Transfer Switch) and can be connected to two separate power lines (usually the mains and the auxiliary generator line). In case of a main line power outage, the ATS automatically switches over to the other line, granting uninterrupted power supply to the unit.

The double power supply makes FR-FC-Z suitable for TIER III and TIER IV* design topologies, the highest standards of reliability.

*Widely accepted within the uninterruptible industry, the Uptime Institute's TIER Performance Standards and Classifications are an objective basis for comparing the capabilities of a particular design topology against others or to compare groups of sites.

POWER FACTOR

The accurate design of electrical and electronic components and the use of specific solutions, such as power factor correction capacitors (opt), increase unit's Power Factor.



Power Factor Corrector



FR-FC-G05-Z 1502 - 6002

Air cooled chiller with screw compressors
and free-cooling technology.
From 332 to 1450 kW

FR-FC-G05-Z/T+

1502 1702 1902 2002 2202 2602 2702 3002 3202 3402 3602 3902 4202 4502 4802 5402 6002

Power supply

V/ph/Hz

400/3/50

PERFORMANCE

MECHANICAL COOLING (GROSS VALUE)

Cooling capacity	(1)	kW	335,5	372,5	432,5	480,9	530,3	619,0	665,3	695,1	753,2	826,3	881,4	944,2	1013	1093	1189	1325	1412
Total power input	(1)	kW	92,40	106,4	119,0	138,1	146,1	178,9	191,7	206,9	218,9	232,3	254,9	276,1	288,4	317,9	330,2	385,8	432,3
EER	(1)	kW/kW	3.631	3.501	3.634	3.482	3.630	3.460	3.471	3.360	3.441	3.557	3.458	3.420	3.512	3.438	3.601	3.434	3.266

MECHANICAL COOLING (EN14511 VALUE)

Cooling capacity	(2)(3)	kW	333,5	369,9	429,7	477,6	527,6	615,3	661,9	691,3	749,5	821,6	876,4	937,8	1006	1086	1181	1317	1402
EER	(2)(3)	kW/kW	3.530	3.390	3.530	3.380	3.540	3.370	3.390	3.280	3.370	3.470	3.370	3.320	3.400	3.350	3.490	3.340	3.170
SEPR	(4)(5)		5,79	5,52	5,97	5,69	5,96	5,83	5,81	5,76	5,83	5,84	5,75	5,59	5,64	5,59	5,75	5,72	5,53

TOTAL FREE-COOLING (GROSS VALUE)

Total free-cooling temp.	(6)	°C	1,2	1,4	1,4	1,4	1,5	1,8	1,8	1,4	1,8	1,2	1,6	1,1	1,1	1,3	1,2	1,3	1,3
Cooling capacity	(6)	kW	335,5	372,5	432,5	480,9	530,3	619,0	665,3	695,1	753,2	826,3	881,4	944,2	1013	1093	1189	1325	1412
EER	(6)	kW/kW	27,96	23,28	27,03	24,05	26,51	25,79	27,72	28,96	26,90	25,82	27,54	29,51	31,66	27,33	24,77	27,60	29,42

MECHANICAL COOLING (GROSS VALUE)

16°C/10°C

Cooling capacity	(7)	kW	335,5	372,5	432,5	480,9	530,3	619,0	665,3	695,1	753,2	826,3	881,4	944,2	1013	1093	1189	1325	1412
Total power input	(7)	kW	92,40	106,4	119,0	138,1	146,1	178,9	191,7	206,9	218,9	232,3	254,9	276,1	288,4	317,9	330,2	385,8	432,3
EER	(7)	kW/kW	3.631	3.501	3.634	3.482	3.630	3.460	3.471	3.360	3.441	3.557	3.458	3.420	3.512	3.438	3.601	3.434	3.266

23°C/15°C

Cooling capacity	(8)	kW	385,3	428,3	498,4	553,0	612,5	710,2	763,8	796,3	864,3	948,2	1009	1079	1158	1252	1365	1518	1618
Total power input	(8)	kW	98,60	113,5	126,8	147,1	155,7	191,1	205,0	221,8	234,1	246,2	270,1	294,1	307,6	338,6	349,3	411,0	461,5
EER	(8)	kW/kW	3.908	3.774	3.931	3.759	3.934	3.716	3.726	3.590	3.692	3.851	3.736	3.669	3.765	3.698	3.908	3.693	3.506

EXCHANGERS

HEAT EXCHANGER USER SIDE IN REFRIGERATION

Water flow	(3)	l/s	17,77	19,73	22,92	25,48	28,10	32,80	35,24	36,82	39,90	43,78	46,70	50,03	53,65	57,91	62,98	70,20	74,78
Pressure drop	(2)(3)	kPa	68,7	84,7	78,3	86,3	63,2	77,5	65,2	71,1	62,4	75,1	77,0	95,0	98,1	83,3	98,5	89,7	102

REFRIGERANT CIRCUIT

Compressors nr.	N°	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
No. Circuits	N°	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Refrigerant charge	kg	94,0	113	138	140	166	179	184	189	207	237	265	267	288	313	343	357	406	

NOISE LEVEL

Sound Pressure	(9)	dB(A)	67	68	68	68	69	70	69	69	69	69	70	70	70	72	73	73	73
Sound power level in cooling(10)(11)	dB(A)	99	100	100	100	101	102	102	102	102	102	102	103	103	103	105	106	106	106

SIZE AND WEIGHT

A	(12)	mm	4000	4000	4900	4900	5800	5800	6400	6400	7000	7900	7900	7900	10000	10000	11800	11800	13000
B	(12)	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260
H	(12)	mm	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Operating weight	(12)	kg	4880	4990	5520	5700	7000	7410	8270	8310	8750	9600	10470	10570	12680	13180	13710	14930	15810

Notes:

1 Plant (side) cooling exchanger water (in/out) 15°C/10°C;
Source (side) heat exchanger air (in) 30°C; Ethylene glycol 30%.

2 Values in compliance with EN14511

3 Plant (side) cooling exchanger water (in/out) 15°C/10°C;
Source (side) heat exchanger air (in) 30°C; Ethylene glycol 30%

4 Seasonal energy efficiency ratio

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

6 Plant (side) cooling exchanger water (in/out) 15°C/10°C; Ethylene glycol 30%.

7 Plant (side) cooling exchanger water (in/out) 16°C/10°C;
Source (side) heat exchanger air (in) 35°C; Ethylene glycol 30%

8 Plant (side) cooling exchanger water (in/out) 23°C/15°C;

Source (side) heat exchanger air (in) 35°C; Ethylene glycol 30%

9 Average sound pressure level at 10m distance, unit in a free field on a reflective surface;
non-binding value calculated from the sound power level.

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

11 Sound power level in cooling, outdoors.

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

The units highlighted in this publication contain
R513A [GWP₁₀₀ 631] fluorinated greenhouse gases.


FR-FC-G05-Z/SL-T+ 1502 1702 1902 2002 2202 2602 2702 3002 3202 3402 3602 3902 4202 4502 4802 5402

Power supply V/ph/Hz 400/3/50

PERFORMANCE
MECHANICAL COOLING (GROSS VALUE)

Cooling capacity	(1)	kW	331,7	372,1	426,4	476,0	521,6	625,0	656,2	712,0	745,0	787,2	878,0	938,3	983,7	1097	1139	1288
Total power input	(1)	kW	93,40	102,8	120,4	135,4	148,2	173,5	193,7	200,5	219,1	241,8	254,6	277,2	296,4	312,8	341,0	393,1
EER	(1)	kW/kW	3.551	3.620	3.542	3.516	3.520	3.602	3.388	3.551	3.400	3.256	3.449	3.385	3.319	3.507	3.340	3.277

MECHANICAL COOLING (EN14511 VALUE)

Cooling capacity	(2)(3)	kW	329,8	369,5	423,7	472,8	519,0	621,2	652,9	707,9	741,4	783,1	873,4	932,4	977,2	1090	1132	1280
EER	(2)(3)	kW/kW	3.460	3.510	3.440	3.410	3.440	3.500	3.310	3.460	3.330	3.180	3.370	3.290	3.230	3.410	3.250	3.190
SEPR	(4)(5)		5,85	5,71	6,08	6,12	6,07	6,08	6,00	6,07	6,10	5,90	5,96	5,80	5,64	5,99	5,90	5,91

TOTAL FREE-COOLING (GROSS VALUE)

Total free-cooling temp.	(6)	°C	0,6	0,7	0,6	0,6	0,7	0,5	0,9	0,7	0,9	0,6	0,9	0,5	0,1	0,8	0,5	0,0
Cooling capacity	(6)	kW	331,7	372,1	426,4	476,0	521,6	625,0	656,2	712,0	745,0	787,2	878,0	938,3	983,7	1097	1139	1288
EER	(6)	kW/kW	34,55	38,76	35,53	39,67	36,22	37,20	39,06	37,08	38,80	41,00	36,58	39,10	40,99	38,09	39,55	44,72

MECHANICAL COOLING (GROSS VALUE)
16°C/10°C

Cooling capacity	(7)	kW	331,7	372,1	426,4	476,0	521,6	625,0	656,2	712,0	745,0	787,2	878,0	938,3	983,7	1097	1139	1288
Total power input	(7)	kW	93,40	102,8	120,4	135,4	148,2	173,5	193,7	200,5	219,1	241,8	254,6	277,2	296,4	312,8	341,0	393,1
EER	(7)	kW/kW	3.551	3.620	3.542	3.516	3.520	3.602	3.388	3.551	3.400	3.256	3.449	3.385	3.319	3.507	3.340	3.277

23°C/15°C

Cooling capacity	(8)	kW	379,8	427,0	489,4	545,6	600,6	716,4	750,8	816,3	852,3	896,7	1002	1069	1116	1253	1299	1469
Total power input	(8)	kW	100,1	110,3	129,0	145,2	159,3	186,1	208,6	215,1	235,9	260,0	271,5	297,0	317,9	334,6	365,8	423,1
EER	(8)	kW/kW	3.794	3.871	3.794	3.758	3.770	3.850	3.599	3.795	3.613	3.449	3.691	3.599	3.511	3.745	3.551	3.472

EXCHANGERS
HEAT EXCHANGER USER SIDE IN REFRIGERATION

Water flow	(3)	l/s	17,57	19,71	22,59	25,22	27,64	33,11	34,77	37,72	39,47	41,70	46,51	49,71	52,12	58,09	60,32	68,25
Pressure drop	(2)(3)	kPa	67,2	84,5	76,1	84,6	61,2	79,0	63,4	74,6	61,0	68,2	69,8	86,2	92,6	83,8	90,4	84,8

REFRIGERANT CIRCUIT

Compressors nr.	N°	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
No. Circuits	N°	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Refrigerant charge	kg	110	120	131	150	159	179	196	206	214	239	251	267	279	314	327	369	

NOISE LEVEL

Sound Pressure	(9)	dB(A)	57	57	57	58	59	58	58	59	59	59	59	59	59	61	61	62
Sound power level in cooling (10)(11)		dB(A)	89	89	89	90	91	91	91	92	92	92	92	92	92	94	94	95

SIZE AND WEIGHT

A	(12)	mm	4000	4900	4900	5800	5800	7000	7000	7900	7900	7900	10000	10000	10000	11800	11800	13000
B	(12)	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260
H	(12)	mm	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Operating weight	(12)	kg	5380	5950	6040	6600	7500	8250	9070	9550	10040	10590	13020	13060	13560	14970	15060	16360

Notes:

- 1 Plant (side) cooling exchanger water (in/out) 15°C/10°C;
Source (side) heat exchanger air (in) 30°C; Ethylene glycol 30%.
- 2 Values in compliance with EN14511
- 3 Plant (side) cooling exchanger water (in/out) 15°C/10°C;
Source (side) heat exchanger air (in) 30°C; Ethylene glycol 30%
- 4 Seasonal energy efficiency ratio
- 5 Seasonal energy efficiency of high temperature process cooling [REGULATION (EU) N. 2016/2281]
- 6 Plant (side) cooling exchanger water (in/out) 15°C/10°C; Ethylene glycol 30%.
- 7 Plant (side) cooling exchanger water (in/out) 16°C/10°C;
Source (side) heat exchanger air (in) 35°C; Ethylene glycol 30%

- 8 Plant (side) cooling exchanger water (in/out) 23°C/15°C;
Source (side) heat exchanger air (in) 35°C; Ethylene glycol 30%
- 9 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
- 10 Sound power on the basis of measurements made in compliance with ISO 9614.
- 11 Sound power level in cooling, outdoors.
- 12 Unit in standard configuration/execution, without optional accessories.

The units highlighted in this publication contain
R513A [GWP₁₀₀ 631] fluorinated greenhouse gases.



FR-FC-Z 1502 - 6002

Air cooled chiller with screw compressors
and free-cooling technology.
From 332 to 1450 kW

FR-FC-Z/T+ 1502 1702 1902 2002 2202 2602 2702 3002 3202 3402 3602 3902 4202 4502 4802 5402 6002

Power supply V/ph/Hz 400/3/50

PERFORMANCE

MECHANICAL COOLING (GROSS VALUE)

Cooling capacity	kW	335,5	372,5	432,5	480,9	530,3	619,0	665,3	695,1	753,2	826,3	881,4	944,2	1013	1093	1189	1325	1412
Total power input	kW	88,90	102,6	114,6	133,0	140,7	172,3	184,6	199,1	210,8	223,7	245,3	265,6	277,4	306,0	318,1	371,3	415,9
EER	kW/kW	3.774	3.631	3.774	3.616	3.769	3.593	3.604	3.491	3.573	3.694	3.593	3.555	3.652	3.572	3.738	3.569	3.395

MECHANICAL COOLING (EN14511 VALUE)

Cooling capacity	kW	333,5	369,9	429,7	477,6	527,6	615,3	661,9	691,3	749,5	821,6	876,4	937,8	1006	1086	1181	1317	1402
EER	kW/kW	3.670	3.520	3.660	3.500	3.680	3.500	3.520	3.410	3.490	3.600	3.500	3.450	3.540	3.480	3.620	3.470	3.290
SEPR		5,95	5,68	6,15	5,84	6,12	5,99	5,98	5,93	6,00	6,00	5,91	5,75	5,80	5,75	5,92	5,89	5,69

TOTAL FREE-COOLING (GROSS VALUE)

Total free-cooling temp.	°C	1,2	1,4	1,4	1,4	1,5	1,8	1,8	1,4	1,8	1,2	1,6	1,1	1,1	1,3	1,2	1,3	1,3
Cooling capacity	kW	335,5	372,5	432,5	480,9	530,3	619,0	665,3	695,1	753,2	826,3	881,4	944,2	1013	1093	1189	1325	1412
EER	kW/kW	27,96	23,28	27,03	24,05	26,51	25,79	27,72	28,96	26,90	25,82	27,54	29,51	31,66	27,33	24,77	27,60	29,42

MECHANICAL COOLING (GROSS VALUE)

16°C/10°C

Cooling capacity	kW	335,5	372,5	432,5	480,9	530,3	619,0	665,3	695,1	753,2	826,3	881,4	944,2	1013	1093	1189	1325	1412
Total power input	kW	88,90	102,6	114,6	133,0	140,7	172,3	184,6	199,1	210,8	223,7	245,3	265,6	277,4	306,0	318,1	371,3	415,9
EER	kW/kW	3.774	3.631	3.774	3.616	3.769	3.593	3.604	3.491	3.573	3.694	3.593	3.555	3.652	3.572	3.738	3.569	3.395

23°C/15°C

Cooling capacity	kW	385,3	428,3	498,4	553,0	612,5	710,2	763,8	796,3	864,3	948,2	1009	1079	1158	1252	1365	1518	1618
Total power input	kW	94,90	109,3	122,1	141,6	149,9	184,0	197,3	213,3	225,2	237,0	259,9	282,9	295,8	325,8	336,4	395,4	443,9
EER	kW/kW	4.060	3.919	4.082	3.905	4.086	3.860	3.871	3.733	3.838	4.001	3.882	3.814	3.915	3.843	4.058	3.839	3.645

EXCHANGERS

HEAT EXCHANGER USER SIDE IN REFRIGERATION

Water flow	l/s	17,77	19,73	22,92	25,48	28,10	32,80	35,24	36,82	39,90	43,78	46,70	50,03	53,65	57,91	62,98	70,20	74,78
Pressure drop	kPa	68,7	84,7	78,3	86,3	63,2	77,5	65,2	71,1	62,4	75,1	77,0	95,0	98,1	83,3	98,5	89,7	102

REFRIGERANT CIRCUIT

Compressors nr.	N°	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
No. Circuits	N°	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Refrigerant charge	kg	82,0	98,0	120	122	144	156	160	164	180	206	230	232	250	272	298	310	353

NOISE LEVEL

Sound Pressure	dB(A)	67	68	68	68	69	70	69	69	69	69	70	70	70	72	73	73	73
Sound power level in cooling	dB(A)	99	100	100	100	101	102	102	102	102	102	103	103	103	105	106	106	106

SIZE AND WEIGHT

A	mm	4000	4000	4900	4900	5800	5800	6400	6400	7000	7900	7900	7900	10000	10000	11800	11800	13000
B	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260
H	mm	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Operating weight	kg	4880	4990	5520	5700	7000	7410	8270	8310	8750	9600	10470	10570	12680	13180	13710	14930	15810

Notes:

1 Plant (side) cooling exchanger water (in/out) 15°C/10°C;
Source (side) heat exchanger air (in) 30°C; Ethylene glycol 30%.

2 Values in compliance with EN14511

3 Plant (side) cooling exchanger water (in/out) 15°C/10°C;
Source (side) heat exchanger air(in) 30°C; Ethylene glycol 30%

4 Seasonal energy efficiency ratio

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

6 Plant (side) cooling exchanger water (in/out) 15°C/10°C; Ethylene glycol 30%.

7 Plant (side) cooling exchanger water (in/out) 16°C/10°C;
Source (side) heat exchanger air (in) 35°C; Ethylene glycol 30%

8 Plant (side) cooling exchanger water (in/out) 23°C/15°C;

Source (side) heat exchanger air (in) 35°C; Ethylene glycol 30%

9 Average sound pressure level at 10m distance, unit in a free field on a reflective surface;
non-binding value calculated from the sound power level.

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

11 Sound power level in cooling, outdoors.

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

The units highlighted in this publication contain
HFC R134a [GWP₁₀₀ 1430] fluorinated greenhouse gases.



R134a

FR-FC-G05-Z/SL-T+ 1502 1702 1902 2002 2202 2602 2702 3002 3202 3402 3602 3902 4202 4502 4802 5402

Power supply V/ph/Hz 400/3/50

PERFORMANCE**MECHANICAL COOLING (GROSS VALUE)**

Cooling capacity	(1)	kW	331,7	372,1	426,4	476,0	521,6	625,0	656,2	712,0	745,0	787,2	878,0	938,3	983,7	1097	1139	1288
Total power input	(1)	kW	89,80	98,81	115,7	130,1	142,4	166,7	186,1	192,6	210,5	232,2	244,6	266,3	284,6	300,6	327,5	377,5
EER	(1)	kW/kW	3.694	3.766	3.685	3.659	3.663	3.749	3.526	3.697	3.539	3.390	3.590	3.523	3.456	3.649	3.478	3.412

MECHANICAL COOLING (EN14511 VALUE)

Cooling capacity	(2)(3)	kW	329,8	369,5	423,7	472,8	519,0	621,2	652,9	707,9	741,4	783,1	873,4	932,4	977,2	1090	1132	1280
EER	(2)(3)	kW/kW	3.590	3.640	3.580	3.550	3.580	3.640	3.450	3.600	3.460	3.310	3.500	3.430	3.360	3.550	3.380	3.320
SEPR	(4)(5)		6,02	5,88	6,26	6,30	6,24	6,26	6,18	6,24	6,28	6,07	6,13	5,97	5,80	6,16	6,07	6,08

TOTAL FREE-COOLING (GROSS VALUE)

Total free-cooling temp.	(6)	°C	0,6	0,7	0,6	0,6	0,7	0,5	0,9	0,7	0,9	0,6	0,9	0,5	0,1	0,8	0,5	0,0
Cooling capacity	(6)	kW	331,7	372,1	426,4	476,0	521,6	625,0	656,2	712,0	745,0	787,2	878,0	938,3	983,7	1097	1139	1288
EER	(6)	kW/kW	34,55	38,76	35,53	39,67	36,22	37,20	39,06	37,08	38,80	41,00	36,58	39,10	40,99	38,09	39,55	44,72

MECHANICAL COOLING (GROSS VALUE)**16°C/10°C**

Cooling capacity	(7)	kW	331,7	372,1	426,4	476,0	521,6	625,0	656,2	712,0	745,0	787,2	878,0	938,3	983,7	1097	1139	1288
Total power input	(7)	kW	89,80	98,81	115,7	130,1	142,4	166,7	186,1	192,6	210,5	232,2	244,6	266,3	284,6	300,6	327,5	377,5
EER	(7)	kW/kW	3.694	3.766	3.685	3.659	3.663	3.749	3.526	3.697	3.539	3.390	3.590	3.523	3.456	3.649	3.478	3.412

23°C/15°C

Cooling capacity	(8)	kW	379,8	427,0	489,4	545,6	600,6	716,4	750,8	816,3	852,3	896,7	1002	1069	1116	1253	1299	1469
Total power input	(8)	kW	96,20	106,0	123,9	139,4	153,0	178,8	200,3	206,6	226,6	249,6	260,8	285,2	305,2	321,4	351,2	406,2
EER	(8)	kW/kW	3.948	4.028	3.950	3.914	3.925	4.007	3.748	3.951	3.761	3.593	3.842	3.748	3.657	3.899	3.699	3.616

EXCHANGERS**HEAT EXCHANGER USER SIDE IN REFRIGERATION**

Water flow	(3)	l/s	17,57	19,71	22,59	25,22	27,64	33,11	34,77	37,72	39,47	41,70	46,51	49,71	52,12	58,09	60,32	68,25
Pressure drop	(2)(3)	kPa	67,2	84,5	76,1	84,6	61,2	79,0	63,4	74,6	61,0	68,2	69,8	86,2	92,6	83,8	90,4	84,8

REFRIGERANT CIRCUIT

Compressors nr.	N°	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
No. Circuits	N°	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Refrigerant charge	kg	96,0	104	114	130	138	156	170	179	186	208	218	232	243	273	284	321	

NOISE LEVEL

Sound Pressure	(9)	dB(A)	57	57	57	58	59	58	58	59	59	59	59	59	59	61	61	62
Sound power level in cooling (10)(11)		dB(A)	89	89	89	90	91	91	91	92	92	92	92	92	92	94	94	95

SIZE AND WEIGHT

A	(12)	mm	4000	4900	4900	5800	5800	7000	7000	7900	7900	7900	10000	10000	10000	11800	11800	13000
B	(12)	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260
H	(12)	mm	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500
Operating weight	(12)	kg	5380	5950	6040	6600	7500	8250	9070	9550	10040	10590	13020	13060	13560	14970	15060	16360

Notes:

- 1 Plant (side) cooling exchanger water (in/out) 15°C/10°C;
Source (side) heat exchanger air (in) 30°C; Ethylene glycol 30%.
- 2 Values in compliance with EN14511
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- 5 Seasonal energy efficiency of high temperature process cooling [REGULATION (EU) N. 2016/2281]
- 6 Plant (side) cooling exchanger water (in/out) 15°C/10°C; Ethylene glycol 30%.
- 7 Plant (side) cooling exchanger water (in/out) 16°C/10°C;
Source (side) heat exchanger air (in) 35°C; Ethylene glycol 30%

- 8 Plant (side) cooling exchanger water (in/out) 23°C/15°C;
Source (side) heat exchanger air (in) 35°C; Ethylene glycol 30%
- 9 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
- 10 Sound power on the basis of measurements made in compliance with ISO 9614.
- 11 Sound power level in cooling, outdoors.
- 12 Unit in standard configuration/execution, without optional accessories.

The units highlighted in this publication contain
HFC R134a [GWP₁₀₀ 1430] fluorinated greenhouse gases.

“BY FAR THE BEST PROOF IS EXPERIENCE”

Sir Francis Bacon
British Philosopher
(1561 - 1626)



Schipol Airport Data Center

2017 Amsterdam - Netherlands

Data Center

Plant type: Hydronic System - HPAC System

Cooling capacity: 7869 kW

Installed machines: 40x close control chilled water units, 6x air cooled free-cooling chillers



Project

The datacenter at Schipol Airport was acquired in April 2016, with the intent to bring it up to date and to enlarge the available floor space. From 1,000 square meters of space, they increased the total area to more than 4,500 square meters.

Challenge

The data center operator additionally wanted to revise and re-install the entire cooling system with the aim of achieving a low PUE (Power Usage Effectiveness) for both existing and new customers, thus significantly reducing energy costs in terms of cooling. At the same time, they wanted to increase the power density per square meter to between 1.6 and 1.8 kW for greater efficiency.

Solution

For this reason, the IT Cooling system is based on RC free-cooling chillers with screw compressors and 40 water chilled close control units. The indoor air conditioners were supplied with the air intake from the top and air delivery from the bottom of the unit.

MORE THAN 2000 PROJECTS ALL OVER THE WORLD.

Every project is characterized by different usage conditions and system specifications for many different latitudes. All these projects share high energy efficiency, maximum integration, and total reliability due to the unique experience of RC branded solutions.

CDC CANBERRA DATA CENTER4 FYSHWICK 2

2018 Canberra - Australia

Application: Data Center

Plant type: Hydronic System

Cooling capacity: 1139 kW

Installed machines: 1x FR-FC screw compressor chiller with free-cooling technology, 2x 4-pipe heat pumps



VODAFONE BUCCINASCO

2015 Buccinasco - Italy

Application: Data Center

Plant type: Hydronic System

Installed machines: 4x oil-free compressor chillers, 1 x screw compressor chiller with free-cooling technology, 2x ClimaPRO Optimisation and Control Systems, 29x close control air conditioners



OS-IX DATA CENTER

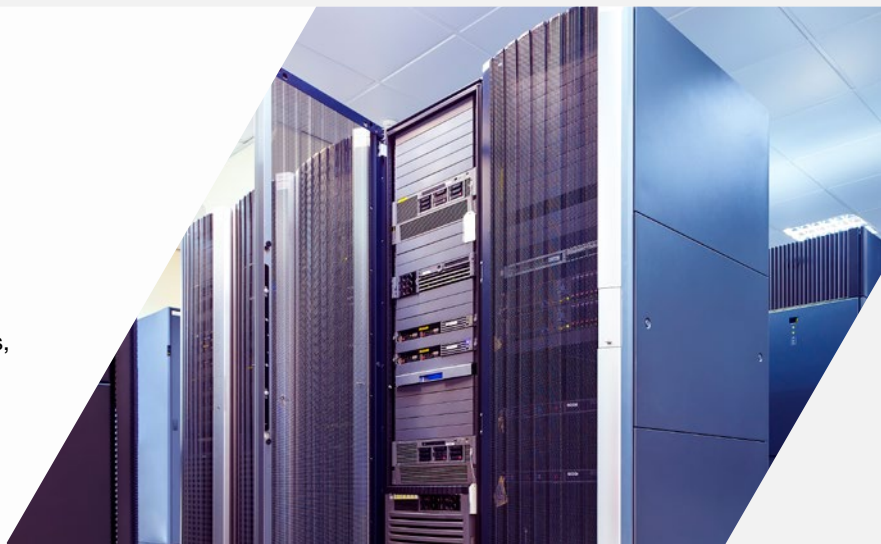
2018 Oslo - Norway

Application: Data Center

Plant type: HPAC System

Cooling capacity: 3300 kW

Installed machines: 5x oil-free compressor chillers, 9x close control air conditioners with X Type coil, 12x chilled water close control air conditioners





for a greener tomorrow

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



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

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www.melcohit.com