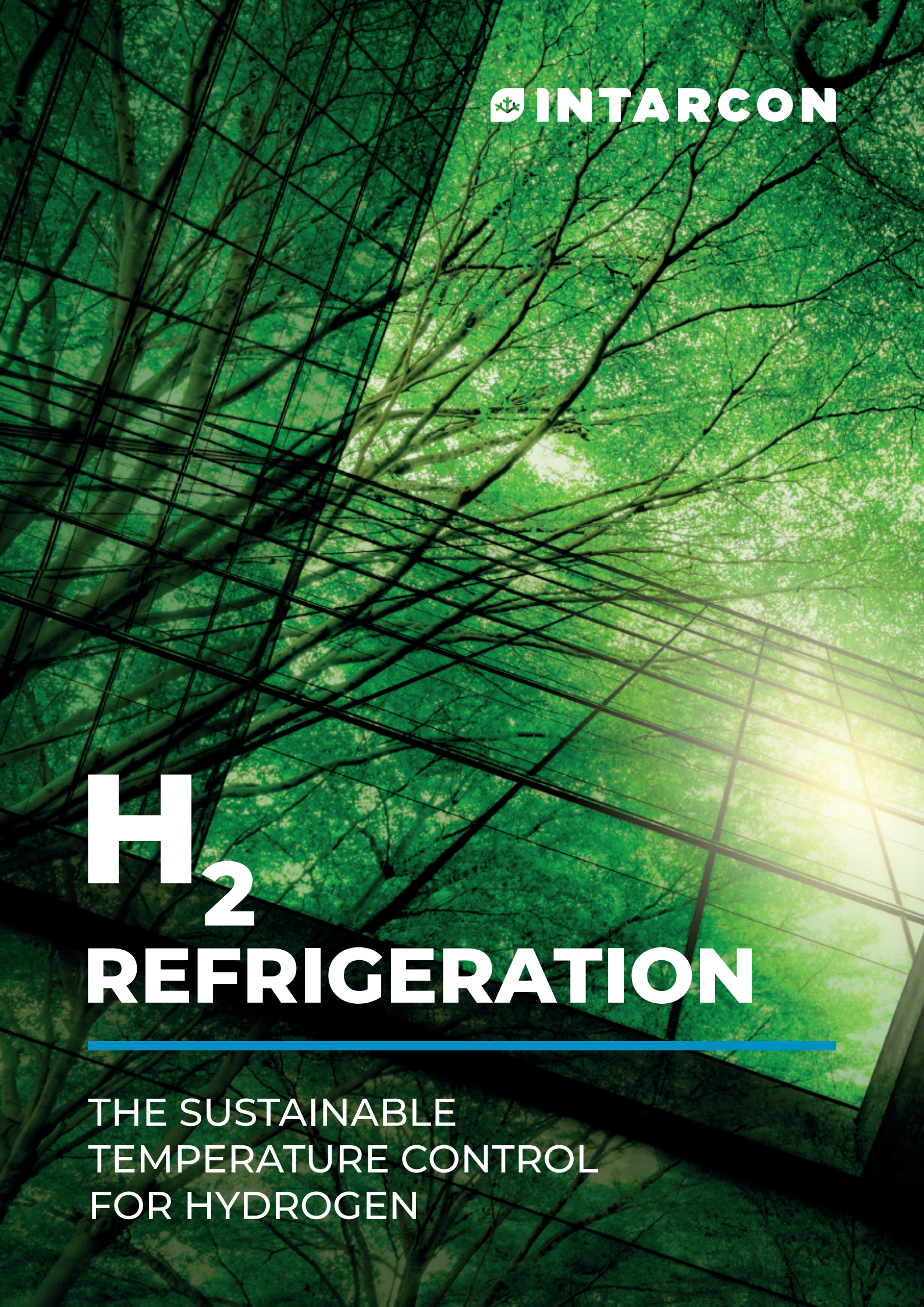


H_2 REFRIGERATION

THE SUSTAINABLE
TEMPERATURE CONTROL
FOR HYDROGEN

INTARCON

HYDROGEN REFRIGERATION

Sustainable temperature control for hydrogen

HYDROGEN PRODUCTION

Cooling electrolyzers is essential to maintain efficiency and safety in **hydrogen production**. It uses thermal control systems to dissipate the heat generated during electrolysis, optimizing performance and prolonging the useful life of the equipment. Advanced strategies include liquid cooling and intelligent temperature management.

HYDROGEN PURIFICATION

After the **electrolysis** process, the hydrogen stream contains traces of water that must be eliminated to meet the standards specified in ISO14687 for use in fuel cells, in whose applications purity levels of up to 99.999 % are required.
This purification is achieved through a Pressure Swing Absorption process (PSA). Prior to this process, a significant amount of moisture can be extracted by cooling the hydrogen, avoiding negative temperatures to prevent formation of ice.

COMPRESSOR COOLING

Refrigeration in hydrogen compressors is essential to manage the heat generated during compression, maintaining operational efficiency and safety. Specialized cooling systems, such as chiller plants with negative temperature secondary fluids, help control temperature, reducing risk and **extending equipment life**. This approach ensures a constant and safe supply of compressed hydrogen.

In the hydrogen value chain, INTARCON provides solutions for the cooling of electrolyzers, cooling and heating of technical rooms, cooling of hydrogen compressors and refrigeration equipment specifically designed for the supply of hydrogen in vehicles.
Among INTARCON strategic lines is the use of natural refrigerants and the commitment to technological solutions that optimize processes as a whole.

HYDROGEN DISPENSERS

When refueling the vehicle, the pressure in the tank increases, also causing an increase in temperature. This heating can cause thermal degradation of the tank, which is why regulations such as ISO 19880 and SAE J2601 limit the maximum temperature.

To avoid reaching these temperatures, there are two options:

- Slow fueling: heat caused by pressure increase dissipates through the tank structure. This is only possible for heavy vehicles (H35) and requires very long filling times.
- Hydrogen pre-cooling: It is chosen to cool the hydrogen in the temperature range between -10 °C and -40 °C, depending on the application, with the aim of guaranteeing safe and fast refueling.

Electrolyzers play a fundamental role in the production of green hydrogen. These devices use electricity, usually from renewable sources such as solar or wind energy, to dissociate the water molecule (H_2O) into hydrogen (H_2) and oxygen (O_2) through a process known as electrolysis.

The resulting hydrogen is a clean and sustainable source of energy, since it does not produce carbon emissions, either in its production or in its subsequent use, either in fuel cells to generate electricity or as a chemical input. Electrolyzers enable large-scale green hydrogen generation, contributing to the transition to a low-carbon economy and playing a crucial role in the decarbonization of sectors such as mobility and industry.

Despite the high efficiencies of PEM and Alkaline electrolyzers, a portion of the energy is converted into heat, which requires the incorporation of a cooling system that dissipates that heat and keeps the electrolyzer working within its optimal temperature range.

CHILLER FOR HYDROGEN PROCESSES

ELECTROLYZER REFRIGERATION

COMPRESSOR COOLING

T10 AND T20 DISPENSED

- R-290 or R-717
- Reliability and efficiency
- < 800 kW
- -30 to 20 °C
- Plug & Play
- Easy installation
- Monitoring and control

INTARCON chiller, thanks to the use of natural refrigerants such as R-290 and R-717, are a solution for the future since they comply with the F-Gas and Reach regulations.

Water or glycol chillers in construction intarCUBE or intarWatt **for industrial refrigeration applications.** They have **a reduced charge of R-290**, and use Full INVERTER compressors that provide precise control over the glycol supply temperature, in the face of variable thermal demand.

This system sequentially and simultaneously controls the capacity of the compressors, varying the motor speed from 30 to 70Hz, and avoiding continuous starts and stops, with significant energy savings.

- Reduced charge of R-290.
- Semi-hermetic R-290 compressors with capacity control and unloaded start, with ATEX class crankcase resistance, with Inverter drive in each compressor (Full INVERTER).
- Cooling circuit made of annealed copper tube with soldered connections, filter drier, ATEX high and low pressure switches, pressure transducers and temperature probes, and ducted safety valve by cooling circuit with common discharge.
- Hydraulic circuit made of copper pipe with threaded connections, fill / drain valve, air vent, flow switch, thermometers and inlet / outlet pressure gauges.

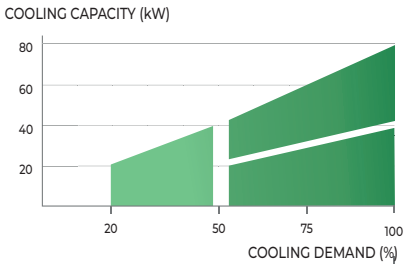
For its part, **industrial chillers with low ammonia charge technology** developed by INTARCON, for positive and negative temperature applications condensed by air.

These chillers, thanks to their size, allow the use of ammonia as a refrigerant to have high performance and also be very efficient. Ammolite brings together the latest ammonia technology to achieve a reduction in the refrigerant charge and consequently an improvement in its performance and efficiency.

Full INVERTER

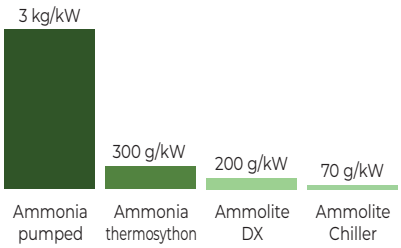
The Full INVERTER system provides precise control over the glycol supply temperature, in the face of a variable refrigeration demand.

This system controls sequentially and simultaneously the capacity of the compressors, varying the motor speed from 30 to 70Hz, and avoiding starts and stops, with significant energy savings.



Low ammonia charge

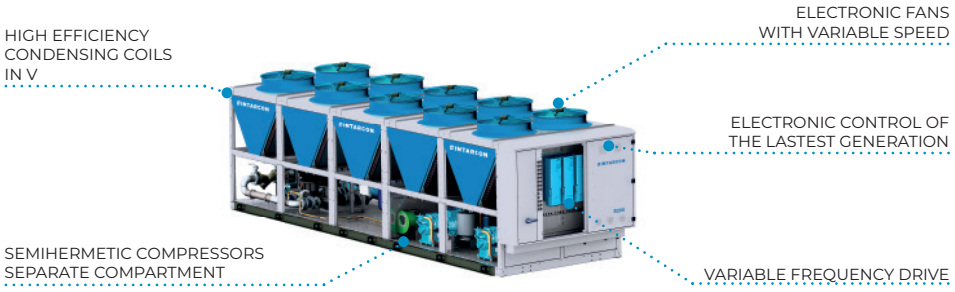
Ammonia is a natural refrigerant with zero greenhouse effect. Thanks to the critical charge design and low charge components, we have achieved the lowest specific refrigerant charge of only 70 g per kW refrigerant.



400V 3N 50Hz | Positive temperature | High temperature | Semihermetic compressor Full INVERTER | R-290

Refrigerant	Compressor	Series / Model	Compressor CV	Compressor Model	Cooling capacity (kW) [1] I/O 35 % propylene glycol temperature -2/-8 °C [1]	Cooling capacity (kW) [1] I/O water temperature 12/7 °C	Input power (kW)	Ecodesign SEPR [2]	Max. input current. (A)	Condenser Fan Ø (mm)	Condenser Air flow (m³/h)	Water flow (m³/h)	Hydraulic connection	Weight (kg)	SPL dB(A) [3]
R-290	1x Semihermetic	MWT-FD-1 0121 AWT-FD-1 0121	12i	S12-42AXH Full Inverter	24	37	13.2 13.7	3.2 5.6	26	1x Ø 800	17 000	3.7 6.3	2"	790	48
		MWT-FD-1 0151 AWT-FD-1 0151	15i	S15-52AXH Full Inverter	29	44	15.6 16.7	3.4 5.8	33	1x Ø 800	17 000	4.5 7.5	2"	800	49
		MWT-FD-1 0201 AWT-FD-1 0201	20i	S20-56AXH Full Inverter	32	48	17.6 19.1	3.4 5.9	41	1x Ø 800	17 000	4.9 8.2	2"	805	50
		MWT-FD-1 0251 AWT-FD-1 0251	25i	V25-71AXH Full Inverter	37	56	21.3 23.5	3.5 5.9	42	1x Ø 800	17 000	5.7 9.6	2 1/2"	860	50
	2x Semihermetics	MWT-FD-2 0242 AWT-FD-2 0242	24i	2x S12-42AXH Full Inverter	48	73	26.6 27.6	3.2 5.6	52	2x Ø 800	34 000	7.4 12.5	2 1/2"	1 130	51
		MWT-FD-2 0302 AWT-FD-2 0302	30i	2x S15-52AXH Full Inverter	58	87	31.3 33.6	3.4 5.8	67	2x Ø 800	34 000	8.8 14.9	3"	1 140	52
		MWT-FD-2 0402 AWT-FD-2 0402	40i	2x S20-56AXH Full Inverter	62	96	35.6 38.3	3.4 5.9	81	2x Ø 800	34 000	9.5 16.4	3"	1 150	53
		MWT-FD-2 0502 AWT-FD-2 0502	50i	2x V25-71AXH Full Inverter	74	112	42.7 47.1	3.5 5.9	83	2x Ø 800	34 000	11.3 19.2	3"	1 260	53
		MWW-FD-1 0502 AWW-FD-1 0502	50i	2x V25-71AXH Full Inverter	77	115	41.2 45.5	3.8 6.4	82	2x Ø 800	46 000	11.8 19.7	DN80	1 525	51
		MWW-FD-1 0702 AWW-FD-1 0702	70i	2x V35-103AXH Full Inverter	109	156	56.7 64.2	4.1 6.4	102	2x Ø 800	44 000	16.7 26.7	DN80	1 540	53
		MWW-FD-2 0802 AWW-FD-2 0802	80i	2x Z40-126AXH Full Inverter	141	213	70.5 75.4	3.9 6.8	138	4x Ø 800	92 000	21.6 36.5	DN100	2 780	56
		MWW-FD-2 1002 AWW-FD-2 1002	100i	2x Z50-168AXH Full Inverter	180	267	92.8 103.0	4.0 6.6	165	4x Ø 800	88 000	27.6 45.7	DN100	2 785	58
		MWW-FD-2 1502 AWW-FD-2 1502	150i	2x W75-228AXH Full Inverter	227	340	125.9 141.3	4.0 6.2	231	4x Ø 800	88 000	34.9 58.4	DN125	2 953	61
	3x Sh.	MWW-FD-3 1203 AWW-FD-3 1203	120i	3x Z40-126AXH Full Inverter	212	320	106.0 113.0	3.9 6.4	207	6x Ø 800	138 000	32.5 54.7	DN125	4 160	58
		MWW-FD-3 1503 AWW-FD-3 1503	150i	3x Z50-168AXH Full Inverter	270	401	139.0 155.0	4.0 6.8	248	6x Ø 800	132 000	41.3 68.5	DN125	4 170	60
		MWW-FD-3 2253 AWW-FD-3 2253	225i	3x W75-228AXH Full Inverter	342	513	189.3 212.4	4.0 6.2	347	6x Ø 800	132 000	52.6 88.0	DN125	4 421	63
	4x Sh.	MWW-FD-4 2004 AWW-FD-4 2004	200i	4x Z50-168AXH Full Inverter	360	534	186.0 206.0	4.0 6.8	330	8x Ø 800	176 000	55.1 91.4	DN125	5 550	61
		MWW-FD-4 3004 AWW-FD-4 3004	300i	4x W75-228AXH Full Inverter	455	684	251.8 283.2	4.0 6.2	463	8x Ø 800	176 000	69.8 117.3	DN150	5 889	64
	5x	MWW-FD-5 3755 AWW-FD-5 3755	375i	5x W75-228AXH Full Inverter	568	855	314.8 354.0	4.0 6.2	579	10x Ø 800	220 000	87.3 146.6	DN150	7 357	65

intarWatt Full INVERTER chiller



[1] Nominal performance high temperature: 35 °C ambient temperature with water inlet / outlet at 12/7 °C, and with glycol inlet/outlet at -2/-8 °C, with a propylene glycol concentration of 35 %.

[2] Seasonal performance factor (SEPR) according to Commission Regulation (EU) 2015/1095 and (EU) 2016/2281.

[3] Sound pressure level of the condenser referred to dB(A) sound pressure level, measured in the open field at 10 m distance.

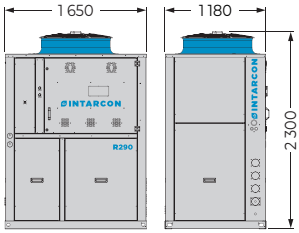
Options

- Modular pump sets (intarCUBE) or integrable (intarWatt).
- Heat recovery.

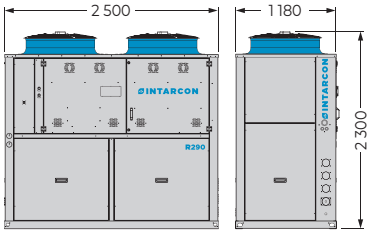
WW Dimensions (mm)	A
1 series	1 947
2 series	3 422
3 series	4 899
4 series	6 848
5 series	8 329

Dimensions

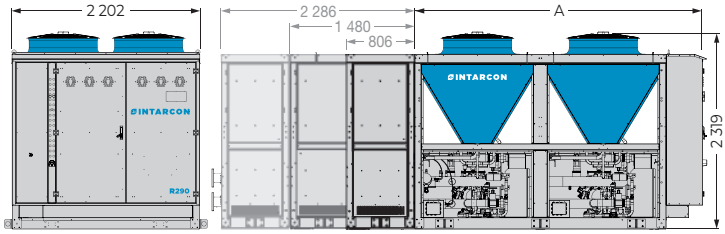
WT-1 series



WT-2 series



WW series



Dimensions in mm.

Pump sers (+)

HYDROGEN COOLING SYSTEM

T20, T30 AND T40 DISPENSER

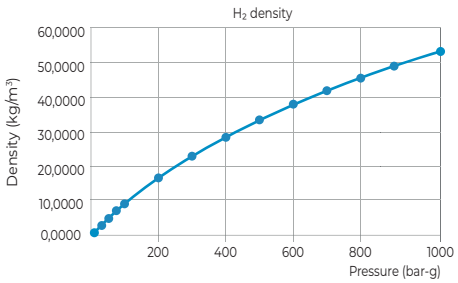
- R-744
- Reliability and efficiency
- < 250 kW
- -40 to -20 °C
- Plug & Play
- Easy installation
- Monitoring and control

Transcritical CO_2 condensing units with built-in gas cooler for cooling hydrogen dispensers.

- Compliance with F-Gas and Reach regulations.
- Free of secondary fluids and HFC refrigerants.
- Flooded exchanger, allowing immediate cooling of the hydrogen.
- Hydrogen supply at constant temperature.
- Designed to meet the most demanding requirements of SAE J2601 (T20, T30 and T40).
- Technical advice on installation and commissioning.
- Redundancy and back-up in critical elements.

Hydrogen storage

By storing hydrogen at high pressure, its energy density per unit volume is increased. This means that more energy can be stored in a smaller space, which is crucial for applications where space is limited, such as in hydrogen vehicles. The more hydrogen that can be stored in a vehicle's tank, the greater its range, making hydrogen vehicles more practical and competitive.

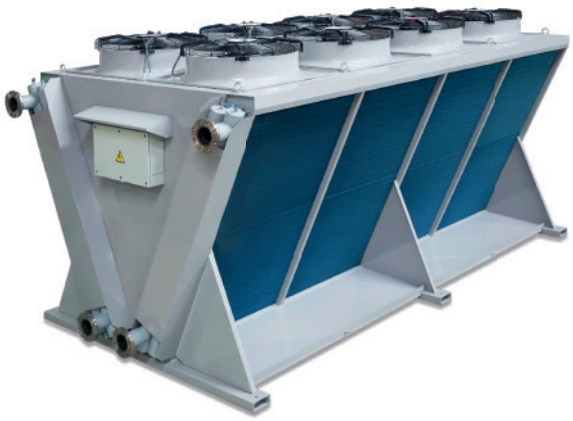


ADDED VALUE

DRY COOLER

Equipment to directly dissipate process heat into the outside environment. Modular and industrial solution.

- From 5 kW to 1.2 MW, in dry coolers with vertical, horizontal and “V” format configurations.
- Electronic fans for precise temperature control.
- Anti-corrosion treatments and different fin pitch configurations for aggressive or dirty environments.
- Direct integration with chilling plants for automatic management of free-cooling modes.



PUMP SETS

Pump sets for pumping water or glycol in a closed circuit, assembled in a body and structure made of galvanized steel sheet with polyester paint for outdoor installation.

Flow rate up to 90 m^3/h.

Modular construction that can be easily integrated with reduced floor occupancy.

Adaptive settings:

- Primary hydraulic group.
- Primary hydraulic group + tank.
- Primary hydraulic group + tank + secondary. Reserve pumps. Electronic control for pump management and system security.

IoT - CONNECTED SERVICES

Remote control, monitoring and auditing service for refrigeration equipment and installations with IoT technology.

- Remote access to your installation from any device with an Internet connection.
- Proactive monitoring, remote support service to resolve any incident.
- Intelligent optimization, greater reliability, energy efficiency, productivity and implementation of intelligent operation adapted to each need.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