Technical Bulletin
BT15D006GB-09

ELFOEnergy Magnum - Heat pump

Air-water heat pump for outdoor installation

WSAN-XEM 50.4 - 120.4 RANGE

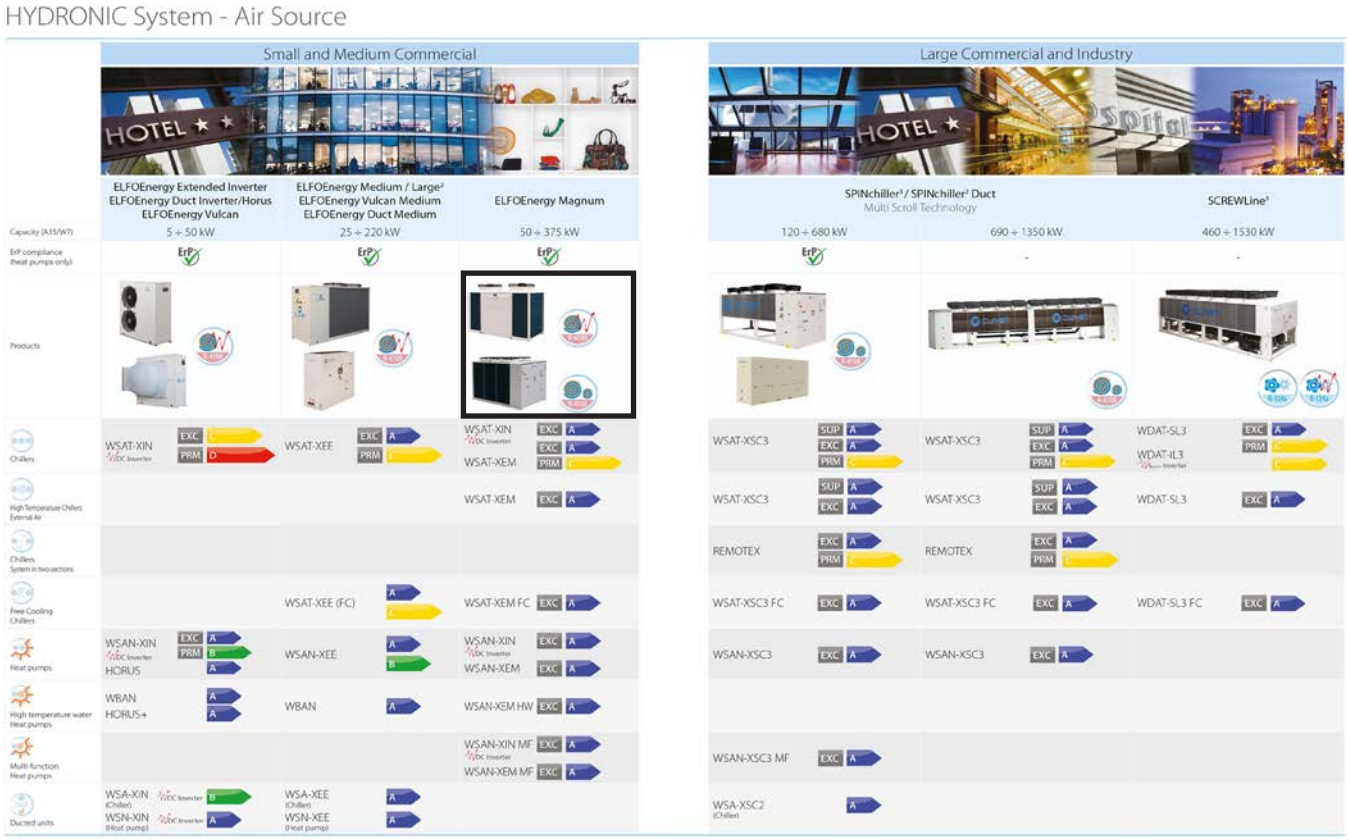
Nominal heating capacity **(A7/W45)** from 155 kW to 378 kW
Nominal cooling capacity **(A35/W7)** from 139 kW to 321 kW

- **R-410A MODULAR SCROLL TECHNOLOGY**
- **TWO INDEPENDENT REFRIGERATION CIRCUITS**
- **EUROVENT CLASS A IN HEATING**
- **PARTIAL RECOVERY OF THE CONDENSING HEAT (OPTIONAL)**
- **AXITOP FAN (optional for size 70.4 - 120.4)**
  Silent operation and reduced fan consumptions
- **ECOBREEZE FANS (optional for size 70.4 - 120.4)**
  For a further increase in efficiency
- **VARYFLOW + (optional)**
  Variable water flow-rate with inverter pumps

Clivet is taking part in the EUROVENT certification programme up to 1.500 kW. The products concerned appear in the certified products list of the EUROVENT www.eurovent-certification.com site.

Clivet hydronic system

Designed to provide high energy efficiency and sustainability of the investment, the wide range of Clivet liquid chillers and heat pumps for high efficiency air conditioning of Residential and Commercial spaces and for Industrial applications it is available with air or water source.



Specialization

Every intended use has specific requirements which determine the overall efficiency. For this, the Clivet hydronic system always offers the best solution in every project.

- Modular range with over 8000 kW of overall capacity
- Capacity control with Screw and modular Scroll technology
- Multifunction versions
- Outdoor or indoor (ductable type) installation

Centrality of the Air Renewal

From the Air Renewal depends the comfort in the spaces. Since it often represents the main building energetic load, it also determines the running costs of the entire system.

ZEPHIR3
Packaged Primary Air supply system with thermodynamic energy recovery

- Simplifies the system, reduces the heating and cooling generators
- Purifies the air with the standard electronic filters
- Increases the energy efficiency and it also allows a savings of 40% on the running costs
- From –40°C to +50°C of outdoor air temperature

Terminal and AHU complete system

The hydronic terminal units are very diffused for their versatility and reliability. The Clivet range includes many versions that simplify the application in differents type of installation and building.

ELFOSpace
High energy efficiency hydronic terminal units

AQX

Air-conditioning unit

- Cased and uncased terminal units, from 1 to 90 kW
- Horizontal and vertical installation
- Energy-saving DC fans
- Modular air conditioning units up to 160.000 m³/h
- EUROVENT certification

ELFOEnergy Magnum: modular scroll technology for every application

MAGNUM HEAT PUMP WSAN-XEM:

- Air cooled heat pump
- EXCELLENCE high efficiency version

MAGNUM COOL ONLY WSAT-XEM:

- Air cooled water chiller
- EXCELLENCE high efficiency version
- PREMIUM compact version
- Total/partial recovery of the condensing heat

MAGNUM MULTIFUNCTION WSAN-XEM MF:

- Air cooled heat/cool heat pump with simultaneous operating
- EXCELLENCE high efficiency version
- 4-pipe system
- 2-pipe system and total condensing heat recovery

MAGNUM HEAT PUMP HIGH TEMPERATURE WSAN-XEM HW:

- Air cooled heat pump
- EXCELLENCE high efficiency version
- Production of hot water up to 65°C
- Extended operating range

Cost or reliability?

The dilemma of modern system engineering applications

Air-conditioning systems in trade centres influence both the starting investment and monthly management costs, for the whole of their working lives. This theme is even more relevant in residential applications with centralised systems. Furthermore, maximum working flexibility requirements should be added to that, in serving different users while avoiding wasting energy and thus, money. Finally, there are several industrial applications which require hot or chilled water as service fluid, process fluid or vector fluid for operator comfort and for conserving goods and enabling cycles to function correctly. Furthermore, in all these cases, the working reliability of the system is decisive.



High efficiency hydronic systems

The high efficiency hydronic systems are extremely versatile, reliable and widespread

Despite their apparently low costs, split, multi-split and VRF direct expansion systems have a lot of limits in these applications. For example, they require a separate system for primary air treatment. The pipes that contain the refrigerant cross the served rooms and therefore they are subject to restrictions and use limitations. They cannot operate in the FREE-COOLING mode, the high efficiency and convenient mode that allows energy savings.

The hydronic systems are certainly more complete and versatile. They make it possible to adopt various types of terminals in the served environment, from fan coil units exposed or integrated in the furnishings, up to radiant or induction systems. They are also irreplaceable in the service and process industrial applications.

The main component performances, like air-cooled liquid chillers and hydronic heat pumps, are checked and certificated by appropriate certification programs, as Eurovent.

Clivet technological evolution

Clivet chillers reduce consumption and are compact and reliable

With over twenty years of technological evolution, Clivet liquid chillers and heat pumps represent the state of the art in air-conditioning of residential, trade and industrial environments.

Their success is based on high energy efficiency, compactness and management maintenance simplicity, with wide versatility in the choice of the most suitable model for the specific use.

ELFOEnergy Magnum

Provides all Clivet technological developments for their medium capacity hydronic systems

High efficiency Scroll compressors, high performance heat exchangers, electronic control fans, fully automatic operation: these are only some of the technologies available with ELFOEnergy Magnum, in a range of models that are ideal for medium and high capacity air conditioning systems in commercial, residential and industrial buildings.

The best combination between the initial investment and the costs throughout the entire life cycle of the system.

- the EXCELLENCE version stands out for its extremely high energy efficiency under both part and full load conditions. (A- class Eurovent certification)

ELFOEnergy Magnum can also be supplied in many configurations equipped with the main components installed built-in.

Maximum efficiency is necessary with a part load

The system is required to generate maximum capacity only for a short amount of time.

Therefore, it is essential to have the maximum efficiency under part-load conditions.

This is the only way to actually reduce overall yearly consumptions.

Magnum technology enhances part-load efficiency

Magnum uses high efficiency Scroll compressors.

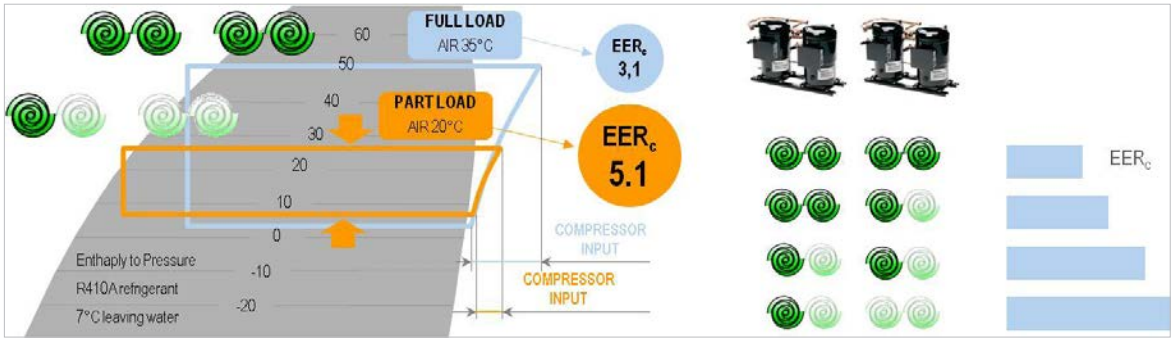
The advantages are:

- compressors manufactured in large ranges on an industrial scale with strict quality control inspections and maximum manufacturing reliability thanks to the high production volumes.
- every refrigeration circuit uses two or three Scroll compressors, depending on the different sizes of the unit. When two compressors are used, their sizes are different in order to obtain more control steps. This way, only the necessary energy is supplied.

Doubled efficiency

The heat exchange surface is sized for full capacity operation. Under part load condition, some compressors are automatically deactivated. Under this condition, in fact, the compressors in operation make use of a much larger surface.

This entails a reduced condensation temperature and an increased evaporation temperature. This way, the compressor capacity consumption is reduced with respect to the yield thereby increasing the overall efficiency of the unit.



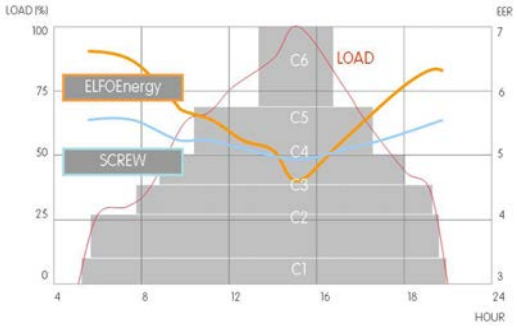
EERc = Energy effieciency referred to compressors

Superior flexibility and reliability

Efficient precision

Sequential activation of ELFOEnergy Magnum compressors allow:

- adapting to the load required for use, thereby ensuring added comfort
- reducing the number of compressor start-ups, i.e., the main cause of wear
- increasing the unit's useful life
- reducing repair times and costs, thanks to the modular components, their reduced dimensions and reduced cost compared to semi-hermetic compressors.



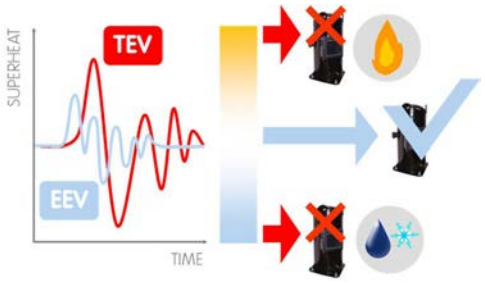
THE NUMBER OF START-UPS DECREASES THEREFORE THE LIFE CYCLE INCREASES

Control of the refrigerant flow

The load variability involves the continuous variation of the refrigerant volume moved by compressors.

The electronic expansion valve (EEV), standard on Clivet units, adapts rapidly and precisely to the actual load required for usage, allowing stable and reliable control in comparison with mechanical thermostatic valves (TEV). **This results also in a further increase in efficiency and longer compressor life.**

The overheating control allows preventing phenomena that are hazardous to the compressors, such as overtemperature and return fluids, thereby increasing even more efficiency and durability.



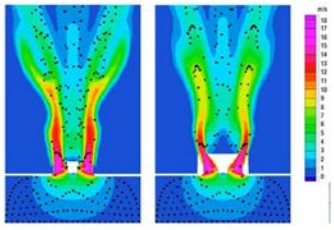
Efficient and silent ventilation technology (optional)

Available only for size 70.4 ÷120.4.

It is possible to further increase the seasonal efficiency with the innovative air handling system on the external exchangers.

The new AxiTop diffuser creates an ideal air distribution: it aerodynamically decelerates the flow and transforms a big part of its kinetic energy in static pressure. All AXITOP components are aerodinamically optimized enhancing significantly the efficiency and reducing the impeller speed and consequently the noise. Obtaining:

- down to –3 dB of silence
- reduction of 3% of the absorbed energy



ECOBREEZE fans, electronically controlled (optional)

Available only for size 70.4 ÷120.4.

With ECOBREEZE, the electric motor with an external rotor is driven by the continuous magnetic switching of the stator, deriving from the integrated electronic control.

The advantages are:

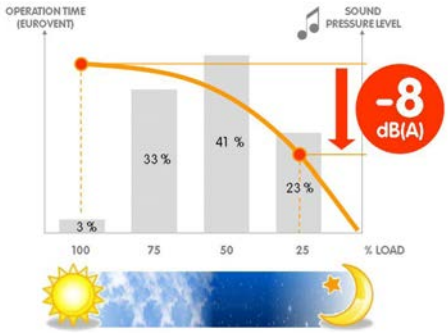
- **70% increase in efficiency** thanks to the brushless technology and the special electricity supply;
- **increase in the working life,** thanks to the elimination of the brush wear;
- **reduction in the electrical consumption by the system,** thanks to a drastic reduction of the inrush current for the fans obtained using the integrated 'Soft starter' function.

Fans at variable speed for minimal noise emission

All units are supplied with a **condensation electronic control**. It automatically reduces the fan speed as the heat load drops.

Since the fans are the unit's main noise source, the benefits are evident especially during the night hours, when the load is reduced but sensitivity to noise is enhanced.

All this translates into a **sound pressure reduced down to 8 dB(A)** compared to full load operation in 90% of operating time of the unit.



Water flow-rate continuous modulation (optional)

The energy used for the vector pumping is fundamental on the seasonal efficiency.

The VARYFLOW + modulating pumping unit made up of two pumps in parallel controlled by inverter, allows a precise water flow-rate modulation reducing notably the consumptions and at the same time it guarantees its functionality also in case of temporary unavailability of one of the two pumps, guaranteeing about the 80% of the nominal flow-rate.

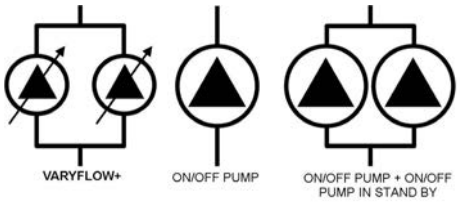
The water flow-rate is modulated by keeping the supply/return water temperature differential constant.

If the installation water temperature is in critical conditions, **VARYFLOW+** allows to extend the ELFOEnergy Magnum operating ranges guaranteeing the operating.

In case of particular installation needs, the hydronic assemblies are also available:

- **ON/OFF pump:** the traditional solution with high available pressure.
- **ON/OFF pump + ON/OFF pump in stand-by:** the solution that favours reliability. The built-in control balances the operating hours of the two pump and in case of any failure it signals the damage and automatically activates the stand-by pump.

VARYFLOW+



Built-in inertial accumulation available (optional)

In most Magnum systems it can be installed without inertial accumulation on the system. In fact, the unit quickly adapts to the load due to modular compressors, electronic thermostatic valve and low water content plate heat exchangers. However, in the event of hydraulic distribution networks with reduced dimensions, it is important to provide the system with a hydraulic flywheel. In such cases, inertial accumulation is available built-in, equipped with insulating coating and all the necessary safety devices. This allows eliminating installation times and costs and freeing space inside the building.

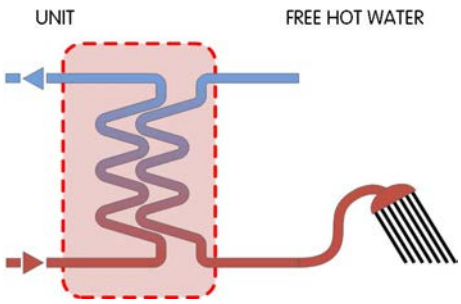
Produces hot water freely

Condensation heat partial recovery:

- it recovers about the 20% of the available heat (desuperheater)

It allows the free DHW production for:

- hot water coil supply for reheat
- domestic hot water production (with intermediate exchanger)
- other processes or operations



Advanced control

The control system combines in a single solution the operating efficiency and the user-friendliness.

Continuously monitoring all of the unit operating parameters, it ensures the maintenance of an optimal energy efficiency.

The control includes many safety functions and a complete alarm management.

It also includes advanced functions, such as daily and weekly programming and automatic maximum power consumption limitation (demand limit).

It allows the management of several units in cascade up to 1 master and 6 slave (Ecoshare)

The interface terminal is equipped with a backlit graphic display and a multifunction access keyboard. The multilevel menu is protected by different passwords according to the type of user.

Smart management of defrosts

The automatic defrost cycles on the remaining external exchanger surface are managed in **ALTERNATED mode for each refrigeration circuit**, guaranteeing the 50% of the delivered capacity. The built-in electronic control analyzes not only the external conditions but also the evaporating pressure variations in the exchanger.

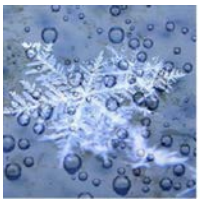
Coils protected against the formation of ice

The particular technology of the heat pump developed by Clivet guarantees its continued and reliable operation.

The ICE PROTECTION SYSTEM device prevents icing on the base of the external exchanger during winter operation, thanks to a special subcooling circuit. This prevents damages caused by freezing.

Even for low water temperature

The unit is also perfectly adapted for use in process cooling where the low temperature version (Brine) together with the addition of glycol to the thermo-vector liquid produces chilled water down to –8 °C.



Remote system management

Magnum is standard equipped with:

- potential-free contact for remote on/off control
- potential-free contacts for remote display of the compressor status
- setting from user interface: Off / local On / serial On
- potential-free contact to remote any possible alarm

The various communication protocols allow the unit to exchange information with the main supervision systems by means of serial connections.

Controlled power supply

Proper power supply ensures optimal unit operation and protects its many electrical components.

The phase monitor, standard supplied.

- controls the presence and the exact sequence of the phases
- checks any voltage anomalies (-10%)
- automatically restarts the unit as soon as the proper power supply is restored.

Modularity

In the event of particularly large buildings requiring high capacities, it is advisable to use several units.

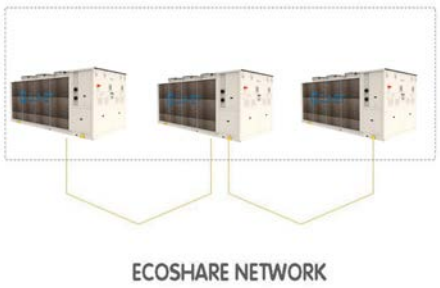
The Magnum units are designed to be connected in parallel in modular logic, thereby granting the following advantages:

Increased flexibility, enhanced by the control that can adapt to the load

Increased reliability, since the malfunction of one unit does not compromise the capacity supply of the other units.

Increased efficiency, since energy is produced where and when required, according to the served area.

The microprocessor control combined with ECOSHARE allows controlling up to 7 units in local network (1 Master unit and 6 Slave).

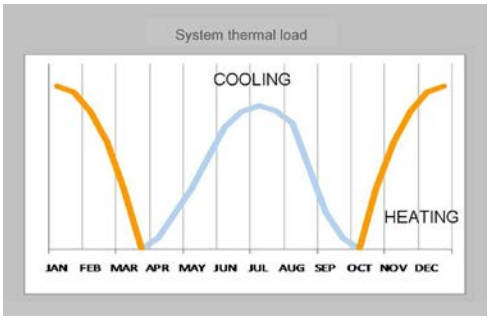


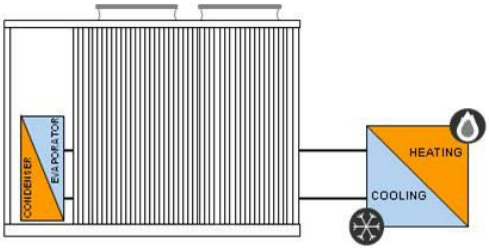
ELFOEnergy Magnum

System solutions:

Standard unit

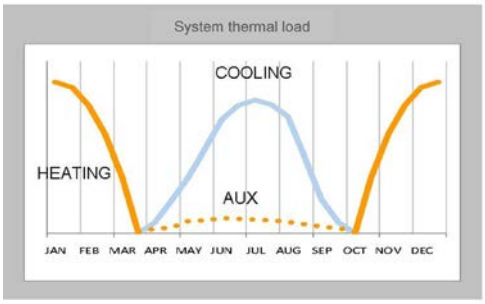
- **Production of chilled or hot water**

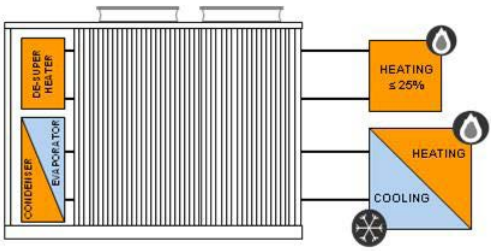




Unit with Partial energy recovery option

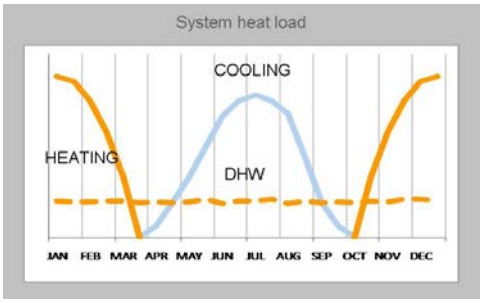
- **Production of chilled or hot water**
- **Free production of hot water from partial energy recovery**

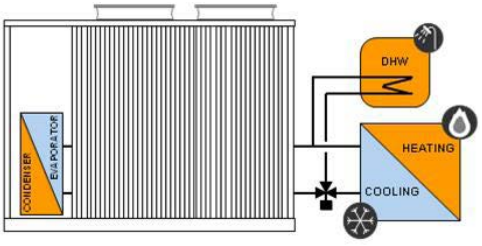




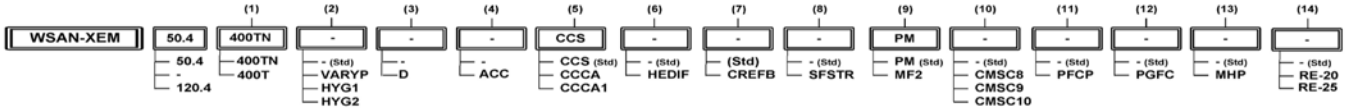
Unit with accessory User side DHW switching valve (supplied separately)

- **Production of chilled or hot water**
- **Priority hot water production with User side DHW switching valve**





Unit configuration



(1) Voltage
Supply voltage 400/3/50+N (only for size 50.4 ÷ 65.4)
Supply voltage 400/3/50 (only for size 70.4 ÷ 120.4)

(2) User side hydronic unit
Refer to the diagrams of the hydronic assembly reported

(3)Partial recovery device
(-) Not required (standard)
D - Partial energy recovery

(4) Storage tank
(-) Not required (standard)
ACC - Storage tank

(5) Condensing coil
CCS - Standard condenser coil (standard)
CCCA - Copper / aluminium condenser coil with acrylic lining
CCCA1 - Condenser coil with Energy Guard DCC Aluminum

(6) Diffuser for fans
(-) Not required (standard)
HEDIF - Diffuser for high efficiency axial fan (only for size 70.4 ÷ 120.4)

(7) Type of fans
(-) Not required (standard)
CREFB - Device for consumption reduction of the the external section ECOBREEZE fans (only for size 70.4 ÷ 120.4)

(8) Soft starter
(-) Not required (standard)
SFSTR - Disposal for inrush current reduction

(9) Phase monitor
PM - Phase monitor (standard)
MF2 - Multi-function phase monitor

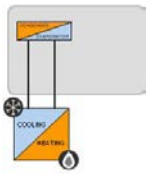
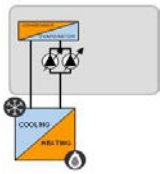
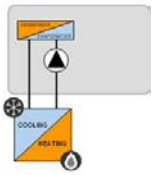
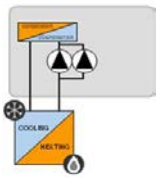
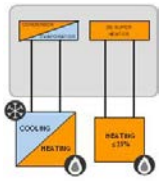
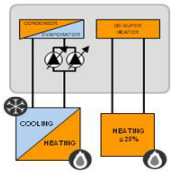
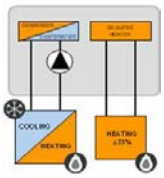
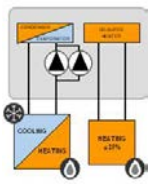
(10) Serial communication module
(-) Not required (standard)
CMSC8 - Serial communication module to BACnet supervisor
CMSC9 - Serial communication module to Modbus supervisor
CMSC10 - Serial communication module to LonWorks supervisor

(11) Power capacitors
(-) Not required (standard)
PFCP - Power factor correction capacitors (cosfi>0.9)

(12) Protection grill
(-) Not required (standard)
PGFC – Finned coil protection grill

(13) High and low pressure gauges
(-) Not required (standard)
MHP - High and low pressure gauges

(14)Electrical panel anti-freeze protection
(-) Not required (standard)
RE-20 - Electric panel antifreeze protection for minimum ambient temperature up to -20 ° C
RE-25 - Electric panel antifreeze protection for minimum ambient temperature up to -25 ° C

Functionalities	Diagram hydronic assemblies			
2 PIPE SYSTEM Hot or chilled water production for installation	**1.1** Standard unit (Std)	**1.2** Unit with VARYFLOW+ (VARYP)	**1.3** Unit with one ON/OFF pump (HYG1)	**1.4** Unit with two ON/OFF pumps (HYG2)
				
2 PIPE SYSTEM + PARTIAL RECOVERY Hot or chilled water production for installation - Free production of hot water from partial recovery	**2.1** Unit with partial recovery (D)	**2.2** Unit with partial recovery and WARYFLOW+ (D + WARYP)	**2.3** Unit with partial recovery and one ON/OFF pump (D + HYG1)	**2.4** Unit with partial recovery and two ON/OFF pumps (D + HYG2)
				

Accessories separately supplied

• **RCTX** - Remote control	• **BACX** - BACnet serial communication module • **CMMBX** - Serial communication module to supervisor (MODBUS) • **CMSLWX** - LonWorks serial communication module	• **PGFCX** - Finned coil protection grill • **IFWX** - Steel mesh strainer on the water side • **VACSUX** - User side DHW switching valve	• **AVIBX** - Anti-vibration mount support • **MHPX** - High and low pressure gauges

General technical data

Size			50.4	55.4	60.4	65.4	70.4	80.4	90.4	100.4	110.4	120.4
Cooling												
Cooling capacity	1	kW	139	149	160	170	184	209	236	275	297	324
Compressor power input	1	kW	43,3	48,2	52,8	58,2	60,4	69,4	85,2	86,7	98,3	114
Total power input	2	kW	48,2	53,1	57,7	63,1	66,8	75,8	91,6	96,4	108	124
EER	1		2,89	2,81	2,78	2,70	2,76	2,76	2,58	2,85	2,75	2,62
Water flow-rate	1	l/s	6,66	7,12	7,66	8,13	8,81	10,0	11,3	13,1	14,2	15,5
User side exchanger pressure drops	1	kPa	17,1	19,4	22,3	20,8	13,8	17,4	21,7	22,1	17,2	20,2
Cooling capacity (EN14511:2013)	3	kW	139	148	160	170	184	208	235	273	296	321
Total power input (EN14511:2013)	3	kW	48,7	53,6	58,4	63,7	67,6	77,0	92,7	98,1	110	126
EER (EN 14511:2013)	3		2,85	2,76	2,73	2,66	2,72	2,70	2,54	2,79	2,69	2,55
SEER	9		3,99	4,00	4,04	4,07	3,94	4,08	4,08	3,93	3,91	3,85
Heating												
Heating capacity	4	kW	154	166	181	193	209	238	273	312	338	374
Compressor power input	4	kW	42,3	46,5	50,7	54,3	57,8	66,6	77,4	85,7	93,5	106
Total power input	2	kW	47,2	51,4	55,6	59,2	64,2	73,0	83,6	95,4	103	115
COP	4		3,26	3,23	3,26	3,26	3,26	3,26	3,27	3,27	3,28	3,24
Water flow-rate	4	l/s	7,36	7,93	8,65	9,22	9,99	11,4	13,0	14,9	16,1	17,9
User side exchanger pressure drop	4	kPa	20,6	23,9	28,4	26,1	17,3	22,2	28,3	28,2	21,8	26,8
Heating capacity (EN14511:2013)	5	kW	155	167	183	194	210	239	274	313	340	378
Total power input (EN14511:2013)	5	kW	47,9	52,3	56,5	60,1	65,3	74,3	85,1	97,5	106	118
COP (EN 14511:2013)	5		3,24	3,20	3,24	3,23	3,22	3,22	3,22	3,21	3,21	3,20
SCOP - AVERAGE Climate - W35	9		3,70	3,66	3,72	3,72	3,64	3,64	3,76	3,25	3,70	3,80
Compressor												
Type of compressors			SCROLL									
Refrigerant			R-410A									
No. of compressors		No	4	4	4	4	4	4	4	4	4	4
Std Capacity control steps		No	6	5	4	5	6	6	6	6	6	4
Oil charge (C1)		l	7,00	7,00	7,00	7,00	8,00	10,0	10,0	11,0	13,0	13,0
Oil charge (C2)		l	7,00	7,00	7,00	8,00	8,00	10,0	10,0	11,0	13,0	13,0
Tot. refrigerant charge (C1)		kg	20,0	26,0	24,0	28,0	29,0	34,0	43,0	46,0	48,0	52,0
Tot. refrigerant charge (C2)		kg	20,0	26,0	24,0	28,0	29,0	34,0	43,0	46,0	48,0	52,0
Refrigeration circuits		No	2	2	2	2	2	2	2	2	2	2
Internal exchanger												
Type of internal exchanger	6		PHE									
No. of internal exchangers		No	1	1	1	1	1	1	1	1	1	1
Water content		l	20,0	20,0	20,0	22,0	30,0	30,0	30,0	36,0	46,0	46,0
External Section Fans												
Type of fans	7		AX									
Number of fans		No	8	8	8	8	4	4	4	6	6	6
Standard airflow		l/s	20300	20300	20000	20000	25000	24200	24200	35000	35000	35000
Installed unit power		kW	0,60	0,60	0,60	0,60	1,90	1,90	1,90	1,90	1,90	1,90
Connections												
Water fittings			3"	3"	3"	3"	3"	3"	3"	4"	4"	4"
Water circuit												
Max water side pressure		KPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Safety valve calibration		kPa	600	600	600	600	600	600	600	600	600	600
Min. installation water contents	8	l	864	841	1240	1227	1245	1233	1176	1618	2005	2505
Power supply												
Standard power supply		V	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50

The Product is compliant with the Erp (Energy Related Products) European Directive. It includes the Commission delegated Regulation (EU) No 811/2013 (rate heat output ≤70 kW at specified reference conditions) and the Commission delegated Regulation (EU) No 813/2013 (rated heat output ≤400 kW at specified reference conditions).
'Contains fluorinated greenhouse gases'(GWP 2087,5)

1. Data referred to the following conditions: Internal exchanger water temperature = 12/7°C Entering external exchanger air temperature = 35°C
2. The Total Power Input value does not take into account the part related to the pumps and required to overcome the pressure drops for the circulation of the solution inside the exchangers
3. Data compliant to Standard EN 14511:2013 referred to the following conditions: - Internal exchanger water temperature = 12/7°C - Entering external exchanger air temperature = 35°C
4. Data referred to the following conditions: Internal exchanger water temperature = 40/45°C. Entering external exchanger air temperature= 7°C D.B./6°C W.B
5. Data compliant to Standard EN 14511:2013 referred to the following conditions: - Internal exchanger water temperature = 40/45°C - Entering external exchanger air temperature =7°C. D.B. / 6°C W.B.
6. PHE = plate exchanger
7. AX = axial fan
8. The minimum system water content calculated value does not consider the internal exchanger water content. With outdoor air low temperature applications or low medium requested loads, the minimum installation water volume is obtained doubling the indicated value
9. Data calculated according to the EN 14825:2016 Regulation

Electrical data

Supply voltage 400/3/50+N

Size			50.4	55.4	60.4	65.4
F.L.A. - Full load current at max admissible conditions						
F.L.A. - Compressor 1		A	19,7	19,7	30,5	30,5
F.L.A. - Compressor 2		A	30,5	30,5	30,5	30,5
F.L.A. - Compressor 3		A	19,7	30,5	30,5	30,5
F.L.A. - Compressor 4		A	30,5	30,5	30,5	36,5
F.L.A. - Single External Fan		A	2,60	2,60	2,60	2,60
F.L.A. - Total		A	111	122	133	151
L.R.A. - Locked rotor amperes						
L.R.A. - Compressor 1		A	118	118	174	174
L.R.A. - Compressor 2		A	174	174	174	174
L.R.A. - Compressor 3		A	118	174	174	174
L.R.A. - Compressor 4		A	174	174	174	225
L.R.A. - Single External Fan		A	14,0	14,0	14,0	14,0
F.L.I. - Full load power input at max admissible conditions						
F.L.I. - Compressor 1		kW	11,9	11,9	17,0	17,0
F.L.I. - Compressor 2		kW	17,0	17,0	17,0	17,0
F.L.I. - Compressor 3		kW	11,9	17,0	17,0	17,0
F.L.I. - Compressor 4		kW	17,0	17,0	17,0	22,6
F.L.I. - Single External Fan		kW	0,60	0,60	0,60	0,60
F.L.I. - Total		kW	60,4	65,6	70,7	76,3
M.I.C. Maximum inrush current						
M.I.C. - Value		A	254	265	276	327
M.I.C. with soft start accessory		A	192	203	214	230

Electrical data refer to standard units; according to the installed accessories, the data can suffer some variations.
Power supply: 400/3/50 Hz. Voltage variation: max. +/-10% Voltage unbalance between phases: max 2 %
For non standard voltage please contact Clivet technical office
The units are compliant with the provisions of European standards CEI EN 60204 and CEI EN 60335.

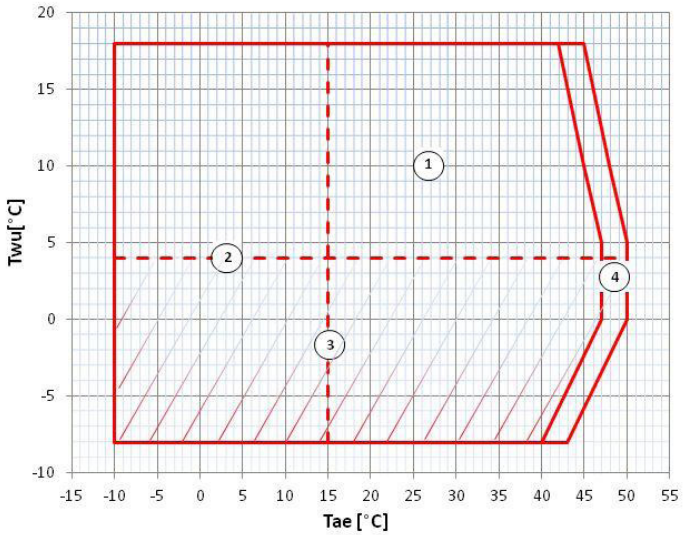
Supply voltage 400/3/50

Size			70.4	80.4	90.4	100.4	110.4	120.4
F.L.A. - Full load current at max admissible conditions								
F.L.A. - Compressor 1		A	30,5	30,5	30,5	36,5	44,9	59,3
F.L.A. - Compressor 2		A	36,5	44,9	59,3	59,3	59,3	59,3
F.L.A. - Compressor 3		A	30,5	30,5	30,5	36,5	44,9	59,3
F.L.A. - Compressor 4		A	36,5	44,9	59,3	59,3	59,3	59,3
F.L.A. - Single External Fan		A	4,10	4,10	4,10	4,10	4,10	4,10
F.L.A. - Total		A	151	168	196	217	234	262
L.R.A. - Locked rotor amperes								
L.R.A. - Compressor 1		A	174	174	174	225	272	310
L.R.A. - Compressor 2		A	225	272	310	310	310	310
L.R.A. - Compressor 3		A	174	174	174	225	272	310
L.R.A. - Compressor 4		A	225	272	310	310	310	310
L.R.A. - Single External Fan		A	14,0	14,0	14,0	14,0	14,0	14,0
F.L.I. - Full load power input at max admissible conditions								
F.L.I. - Compressor 1		kW	17,0	17,0	17,0	22,6	27,6	36,1
F.L.I. - Compressor 2		kW	22,6	27,6	36,1	36,1	36,1	36,1
F.L.I. - Compressor 3		kW	17,0	17,0	17,0	22,6	27,6	36,1
F.L.I. - Compressor 4		kW	22,6	27,6	36,1	36,1	36,1	36,1
F.L.I. - Single External Fan		kW	1,90	1,90	1,90	1,90	1,90	1,90
F.L.I. - Total		kW	86,9	96,9	114	129	139	156
M.I.C. Maximum inrush current								
M.I.C. - Value		A	339	394	447	467	484	512
M.I.C. with soft start accessory		A	242	262	309	329	346	375

Electrical data refer to standard units; according to the installed accessories, the data can suffer some variations.
Power supply: 400/3/50 Hz. Voltage variation: max. +/-10% Voltage unbalance between phases: max 2 %
For non standard voltage please contact Clivet technical office
The units are compliant with the provisions of European standards CEI EN 60204 and CEI EN 60335.

Operating Range

Cooling

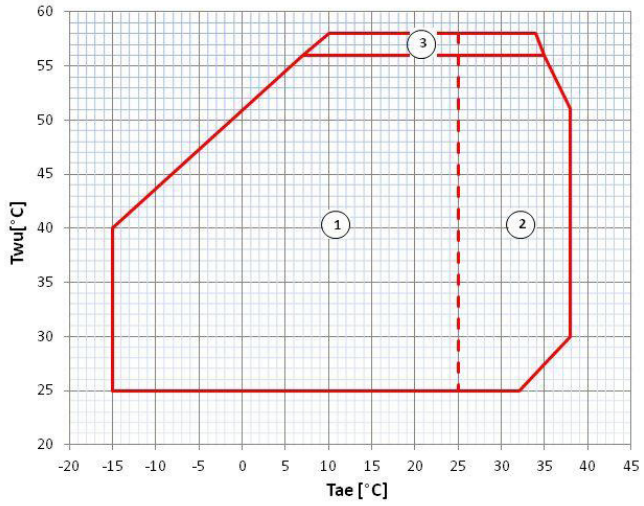


Twu [°C] = Internal exchanger outlet water temperature
Tae [°C] = External exchanger inlet air temperature

1. Standard unit operating range at full load
2. Standard unit operating range with air flow automatic modulation
3. Operating range where the use of ethylene glycol is mandatory in relation to the temperature of the water at the outlet of the user side exchanger
4. Unit operating range with automatic staging of the compressor capacity

Operating Range

Heating



Twu [°C] = Internal exchanger outlet water temperature
Tae [°C] = External exchanger inlet air temperature

1. Standard unit operating range at full load
2. Standard unit operating range with air flow automatic modulation
3. Unit operating range with automatic staging of the compressor capacity

Unit equipment with low outdoor temperatures

Minimum outdoor air temperature	Operating unit		Unit in stand-by *** (fed unit)	Unit in storage (unit not fed)
	Freddo*	Caldo**		
+11°C	√ standard unit	√ standard unit	√ standard unit	√ standard unit Unit without water or conteining water with an appropriate quantity of glycol. At the unit start-up the water temperature or water with glycol must be inside the operating range indicated in the "Operating range" graph. To know the water freezing temperature at the glycol percetage changing refer to the specific 'Correction factor for antifreeze solutions' table.
+2°C				
-5°C				
-7°C				
-10°C				
Tra –10°C e –18°C	NOT POSSIBLE	√ glycol in an appropriate percentage (1)	√ glycol in an appropriate percentage (1)	

Data referred to the following conditions:
* Production of chilled water:
internal exchanger water = 12/7°C
** Production of hot water:
internal exchanger water = 30/35 °C
*** consider the unit powered electrically, with active control on pumping units. It is recommended to set a set-point value lower than standard (eco mode)

1. Operating range where the water pumping unit must be powered and always active, or with a periodical activation of the outdoor temperature operating pump to guarantee the correct unit operation

At the unit start-up the water temperature or water with glycol must be inside the operating range indicated in the "Operating range" graph.
To know the water freezing temperature at the glycol percetage changing refer to the specific 'Correction factor for antifreeze solutions' table.

Air conditions which are at rest are defined as the absence of air flowing towards the unit. Weak winds can induce air to flow through the exchanger and air-levels which can cause a reduction in the operating range. In the presence of predominant winds it is necessary to use suitable windbreak barriers.

Sound levels

Standard unit

Size	Sound power level (dB)								Sound Power Level	Sound Pressure Level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
50.4	88	95	84	84	83	81	68	61	**88**	**69**
55.4	88	95	84	84	83	81	68	61	**88**	**69**
60.4	88	95	84	84	83	81	68	61	**88**	**69**
65.4	88	95	84	84	83	81	68	61	**88**	**69**
70.4	91	88	88	85	83	82	67	60	**88**	**68**
80.4	91	88	88	85	83	82	67	60	**88**	**68**
90.4	91	88	88	85	83	82	67	60	**88**	**68**
100.4	93	90	90	88	88	85	71	62	**92**	**72**
110.4	93	90	90	88	88	85	71	62	**92**	**72**
120.4	93	90	90	88	88	85	71	62	**92**	**72**

Sound levels refer to units with full load under nominal test conditions.
The sound pressure level refers to a distance of 1 meter from the outer surface of the unit operating in open field.
Measures are according to UNI EN ISO 9614-2 regulations, with respect to the EUROVENT 8/1 certification, which provides for a tolerance of 3 dB(A) on the sound power level, which is the only acoustic data to be considered binding.

Data referred to the following conditions:
- internal exchanger water = 12/7 °C
- ambient temperature = 35 °C

Unit with HEDIF - "Diffuser for high efficiency axial fan" option

Size	Sound Power Level	Sound Pressure Level
	dB(A)	dB(A)
70.4	86	66
80.4	86	66
90.4	86	66
100.4	90	70
110.4	90	70
120.4	90	70

Sound levels refer to units with full load under nominal test conditions.
The sound pressure level refers to a distance of 1 meter from the outer surface of the unit operating in open field.
Measures are according to UNI EN ISO 9614-2 regulations, with respect to the EUROVENT 8/1 certification, which provides for a tolerance of 3 dB(A) on the sound power level, which is the only acoustic data to be considered binding.

Data referred to the following conditions:
- internal exchanger water = 12/7 °C
- ambient temperature = 35 °C

Correction factors for glycol use

% ethylene glycol by weight			5%	10%	15%	20%	25%	30%	35%	40%
Freezing temperature		°C	-2,0	-3,9	-6,5	-8,9	-11,8	-15,6	-19,0	-23,4
Safety temperature		°C	3	1	-1	-4	-6	-10	-14	-19
Cooling Capacity Factor			0,995	0,990	0,985	0,981	0,977	0,974	0,971	0,968
Compressor power input Factor			0,997	0,993	0,990	0,988	0,986	0.984	0,982	0,981
Internal exchanger glycol solution flow factor			1,003	1,010	1,020	1,033	1,050	1,072	1,095	1,124
Pressure drop Factor			1,029	1,060	1,090	1,118	1,149	1,182	1,211	1,243

The correction factors shown refer to water and glycol ethylene mixes used to prevent the formation of frost on the exchangers in the water circuit during inactivity in winter.

Fouling Correction Factors

	Internal exchanger	
m^2 °C/W	**F1**	**FK1**
0,44 x 10^(-4)	1,0	1,0
0,88 x 10^(-4)	0,97	0,99
1,76 x 10^(-4)	0,94	0,98

F1 = Cooling capacity correction factors
FK1 = Compressor power input correction factor

Overload and control device calibrations

		open	closed	Value
High pressure switch	[kPa]	4050	3300	-
Low pressure alarm (gas side)	[kPa]	450	600	-
Antifreeze protection	[°C]	4,0	6,0	-
High pressure safety valve (gas side)	[kPa]	-	-	4500
Low pressure safety valve (gas side)	[kPa]	-	-	3000
Max no. of compressor starts per hour (gas side)	[n°]	-	-	10
Differential pressure switch (water side)	[kPa]	3	5	-
Max. pressure without hydronic assembly (water side)	[kPa]	-	-	1000
Max. pressure with hydronic assembly (water side)	[kPa]	-	-	600
Safety valve calibration (water side) (1)	[kPa]	-	-	600

(1) Available only with hydronic assembly option

Integrated heating capacities

Air temperature external exchanger inlet °C (B.S. / B.U)	-10/-10,5	-5/-5,4	0/0,6	5/3,9	Others
Heating capacity multiplication coefficient	0,90	0,89	0,88	0,91	1

To obtain the integrated heating capacities (the real heating capacity considering the defrost cycles too), multiply the kWt value in the heating performance tables by the following coefficient.

Standard unit technical specifications

Compressor

First circuit: Hermetic scroll compressors in tandem, equipped with a motor protection device for overheating, overcurrents and excessive temperatures of the supply gas. They are installed on anti-vibration mounts and equipped with oil charge. An oil heater, which starts automatically, keeps the oil from being diluted by the refrigerant when the compressor stops.

Second circuit: Hermetic scroll compressor in tandem equipped with a motor protection device for overheating, overcurrents and excessive temperatures of the supply gas. They are installed on anti-vibration mounts and equipped with oil charge. An oil heater, which starts automatically, keeps the oil from being diluted by the refrigerant when the compressor stops.

Structure

Supporting structure realised with steel frame with zinc-magnesium superficial traitment painted with polyester powder RAL 9001, that ensures excellent mechanical features and high long-term resilience against corrosion.

Panelling

External pre-painted zinc-magnesium panelling that ensures superior resistance to corrosion for outdoor installation and eliminates the need for periodical painting. The panels can be easily removed to fully access internal components and are lined with sound-proof material on the inside to contain the unit's sound levels.

Internal exchanger

direct expansion heat exchanger, braze-welded AISI 316 stainless steel plates with large exchange surface and complete with external heat and anti-condensate insulation.

The exchanger is complete with:

- differential pressure switch, water side
- antifreeze heater to protect the water side exchanger, preventing the formation of frost if the water temperature falls below a set value.

External exchanger

direct expansion finned exchanger, made from copper pipes in staggered rows and mechanically expanded to the fin collars. The fins are made from aluminium with a corrugated surface and adequately distanced to ensure the maximum heat exchange efficiency.

Fan

Helical fans with shaped aluminium blades coupled directly to a three phase electric motor with thermal protection incorporated in version IP 54. Housed in aerodynamically shaped nozzles to increase efficiency and minimise noise levels. They are fitted with protective safety guard grilles and supplied with variable speed electronic control (phase cutting).

Refrigeration circuit

Double refrigeration circuit complete, for each circuit, with:

- replaceable anti-acid solid cartridge dehydrator filter
- high pressure safety pressure switch
- high pressure transducer
- low pressure transducer
- liquid receiver
- liquid separator
- refrigerant temperature probe
- double electronic thermostatic expansion valve
- inversion valve of the 4-way cycle
- non-return valve
- high pressure safety valve
- low pressure safety valve
- cutoff valve on compressor supply
- cutoff valve on liquid line

Electrical panel

The capacity section includes:

- main door lock isolator switch
- isolating transformer for auxiliary circuit power supply
- on-off "C1" and "C2" scroll compressor protection magnetothermic
- inverter scroll compressor protection fuses (size from 50.4 to 65.4)
- fan overload circuit breakers (size from 70.4 to 120.4)
- on-off "C1" and "C2" scroll compressor control contactor

The control section includes:

- interface terminal with graphic display
- display of the set values, the error codes and the parameter index
- keys for ON/OFF control, cool and heat operating modes, alarm reset
- proportional-integral water temperature control
- daily, weekly programmer of temperature set-point and unit on/off
- Set point compensation in function of the outdoor air temperature
- set-point compensation with signal 0-10 V
- unit switching on management by local or remote (serial)
- antifreeze protection water side
- compressor overload protection and timer
- prealarm function for water antifreeze and high refrigerant gas pressure
- self-diagnosis system with immediate display of the fault code
- automatic rotation control for compressor starts
- compressor operating hour display
- remote ON/OFF control
- relay for remote cumulative fault signal
- inlet for demand limit (power input limitation according to a 0÷10V external signal)
- digital input for double set-point enabling
- potential-free contacts for compressor status
- phase monitor
- ECOSHARE function for the automatic management of a group of units
- 0÷10V signal output and potential-free contact for auxiliary heater
- enabling of DHW preparation in relation to remote consent
- numeration of electrical panel cables

Electronic control

Description of step start-up control

The electronic control allows to manage the unit depending on the requested load.

The compressor power steps are activated to maximise efficiency.

Main controls

Leaving water temperature control with PID algorithm: it keeps the leaving mean temperature to a set value.

- Auto-adaptive switching on differential: guarantees the compressors minimum operating time in systems with low water content.
- Condensation control based on pressure
- Pre-alarms at automatic reset: in case of alarm it is allowed a certain number of restarts before the definitive lock.
- Compressor operating hour calculation
- Compressor start calculation
- Control and continuous management of the compressor operating conditions to guarantee the unit operating also in extreme conditions
- Water temperature check (when used) to avoid the pipe freezing
- "Anti-snow" function: in case of heavy snowfalls, it avoid the deposit of snow on fans
- Alarm log
- Autostart after voltage drop
- Local or remote control

Unit status display

By the user interface is possible to display:

- unit operating status
- leaving/entering water temperature
- outdoor air temperature
- refrigeration circuit pressure and temperatures (circuit 1 and 2)
- signalling of alarms and anomalies in progress.

Probe, transducer and parameter display

A user interface dedicated section allows the maintenance or technical assistance personnel to control the unit operating stata.

This section is accessible only by specialized personnel.

Management of more units in cascade (ECOSHARE)

It allows the management of several units hydraulically connected up to 1 master and 6 slave maximum.

Units must be of the same type: all reversible heat pumps, or all air-cooled liquid chiller.

Sizes can be different.

The communication among the units is via a BUS serial cable allowing:

- supply water set-point setting of the slave units
- setting of logics that increase the system energy efficiency
- unit operating hours balancing
- unit management in case of damage (only on slave unit)
- hydronic assembly switch-off management of units not used

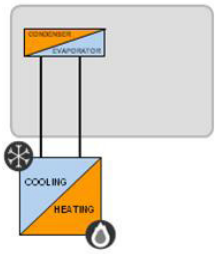
RCTX - Remote control

The remote control allows the full control of all unit functions from remote position.

It can be easily installed on the wall and has the same aspect and functions of the user interface on the unit.

Hydronic assembly configuration 1.1

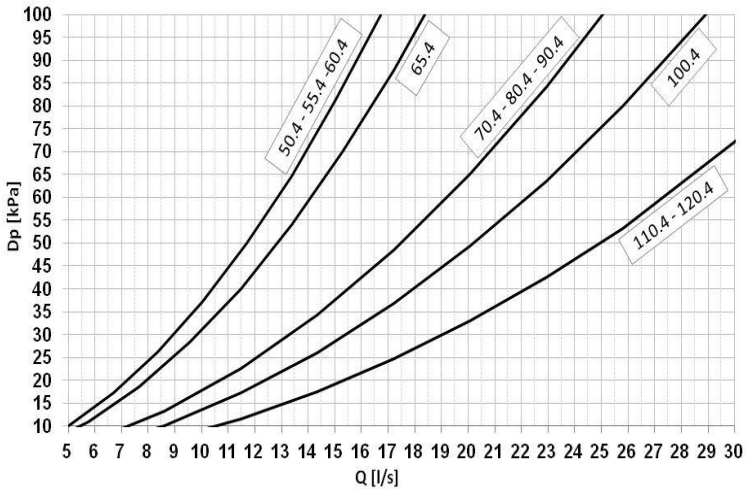
Standard unit



Configuration without hydronic assembly, equipped with components as described on the water diagram key.

All water fittings are Victaulic type. It is possible to control an external pump by an on/off or 0-10V signal.

Internal exchanger pressure drop curves



The pressure drops on the water side are calculated by considering an average water temperature at 7°C.

Q = Water flow rate[l/s]
DP = Pressure drops [kPa]

The water flow rate must be calculated with the following formula

Q [l/s] = kWf / (4,186 x DT)

kWf = Cooling capacity in kW
DT = Temperature difference between entering / leaving water

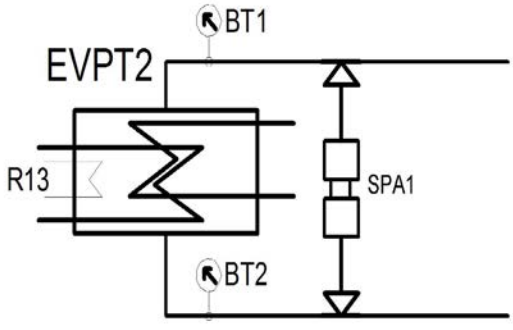
To the internal exchanger pressure drops must be added the pressure drops of the steel mesh mechanical filter that must be placed on the water input line. It is a device compulsory for the correct unit operation, and it is available as Clivet option (IFWX).

Admissible water flow rates

Min. (Qmin) and max. (Qmax) water flow-rates admissibles for the correct unit operation.

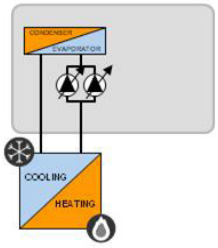
Size		50.4	55.4	60.4	65.4	70.4	80.4	90.4	100.4	110.4	120.4
Qmin	[l/s]	5,0	5,0	5,0	5,5	7,4	7,4	7,4	8,6	10,7	10,7
Qmax	[l/s]	16,7	16,7	16,7	18,4	25,1	25,1	25,1	29,0	35,8	35,8

Water diagram



EVPT2 = Plate evaporator 2 circuits
R13 = Evaporator group heater
BT1 = Probes of entering water temperature
BT2 = Probes of leaving water temperature
SPA1 = Differential pressure switch water

Hydronic assembly configuration 1.2
Unit WITH VARYFLOW + (VARYP)

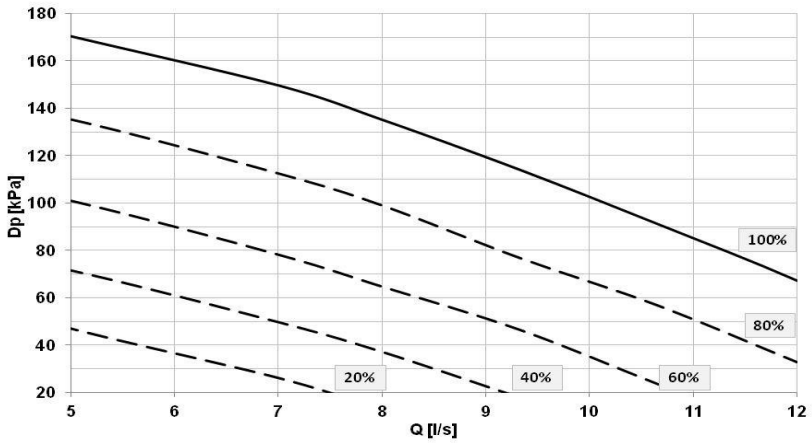


Configuration with 2 centrifugal electric pumps arranged in parallel and controlled by inverter, with housing and impeller made with AISI 304 stainless steel, and components as described on the water diagram key. All water fittings are Victaulic type.

The electric pumps are equipped with three-phase electric motor with IP55-protection and complete with thermoformed insulated casing. The control, modulates the water flow-rate keeping constant the delta T.

If the water temperature is in critical conditions, it allows to extend the unit operating ranges guaranteeing its operating, automatically reducing the water flow-rate. In the event of one of the two pumps is temporarily unavailable, it guarantees about the 80% of the nominal flow-rate.

Pressure head VARYFLOW + (Size 50.4 - 65.4)

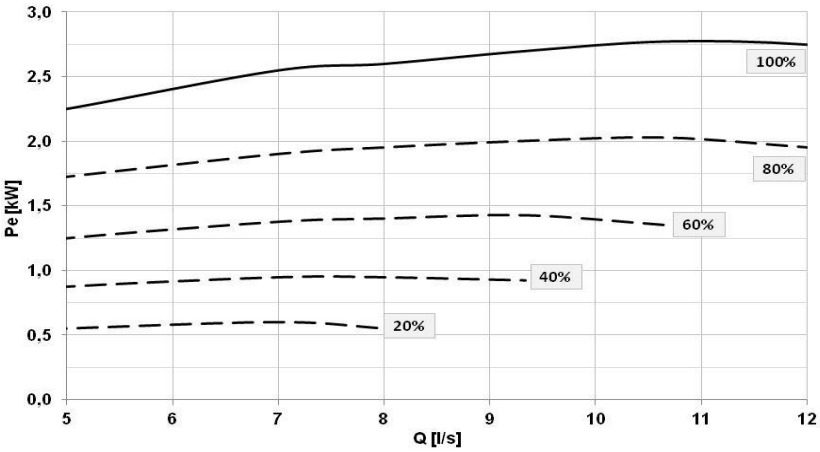


Q = Water flow rate [l/s]
DP = Pressure head [kPa]

Caution: to obtain the available pressure values, you need to subtract the following from the head values represented in these diagrams:

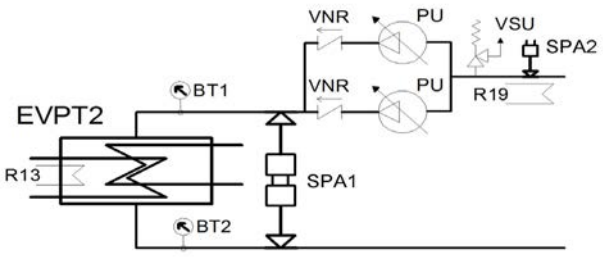
- User side exchanger pressure drops
- IFVX accessory –Steel mesh filter on the water side (where applicable)

Absorption curves VARYFLOW+ (Size. 50.4 - 65.4)



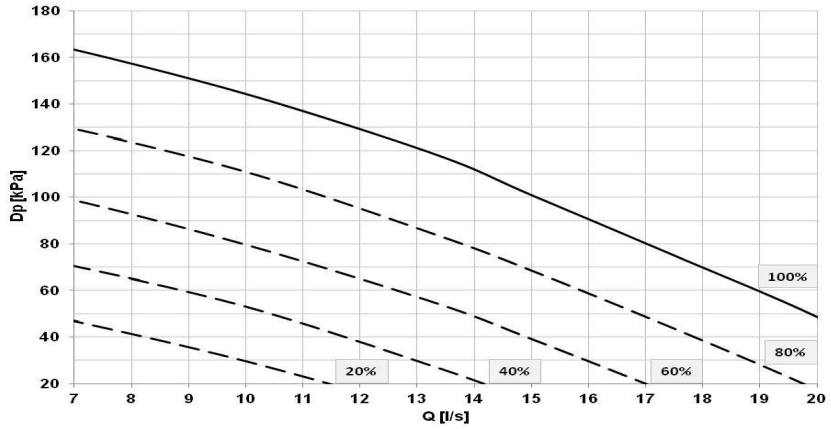
Q = Water flow rate[l/s]
Pe = Electric power consumption [kW]

Water diagram



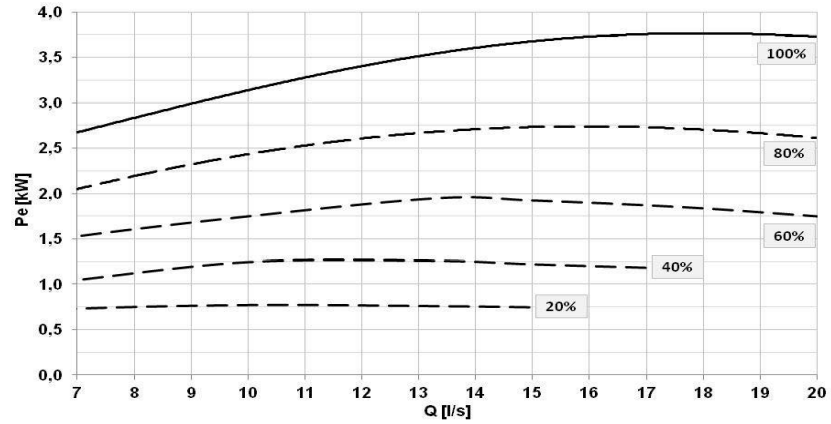
EVPT2 = Plate evaporator 2 circuits
R13 = Evaporator group heater
BT1 = Probes of entering water temperature
BT2 = Probes of leaving water temperature
VNR = Non return valves
SPA1 = Differential pressure switch water
PU = Hydronic assembly VARYFLOW +
VSU = Water safety valve
R19 = Hydronic assembly heaters
SPA2 = Installation load pressure switch

Pressure head VARYFLOW + (Size. 70.4 - 90.4)



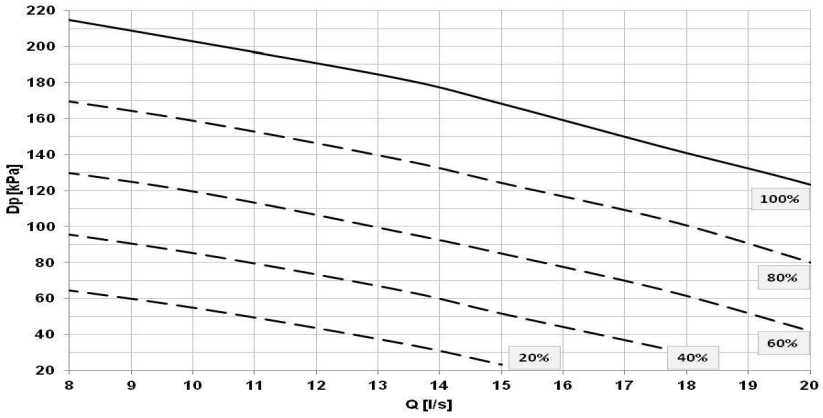
Q = Water flow rate [l/s]
DP = Pressure head [kPa]

Absorption curves VARYFLOW + (Size 70.4 - 90.4)



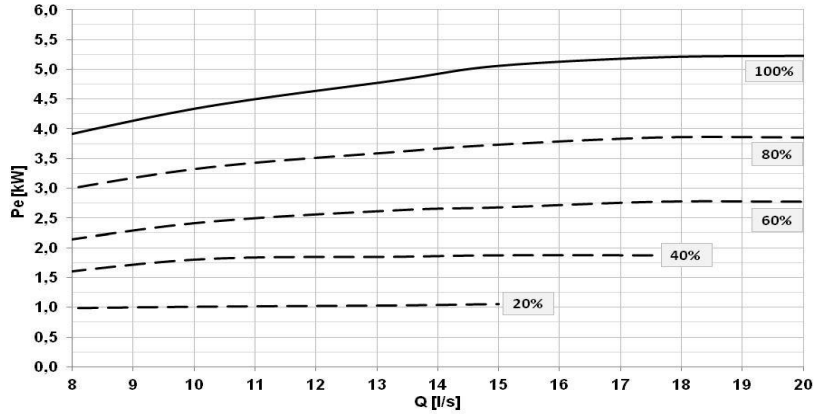
Q = Water flow rate [l/s]
Pe = Electric power consumption [kW]

Pressure head VARYFLOW + (Size 100.4 - 120.4)



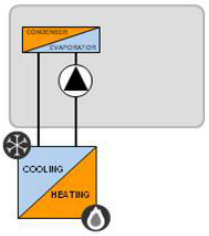
Q = Water flow rate [l/s]
DP = Pressure head [kPa]

Absorption curves VARYFLOW + (Size 100.4 - 120.4)



Q = Water flow rate [l/s]
Pe = Electric power consumption [kW]

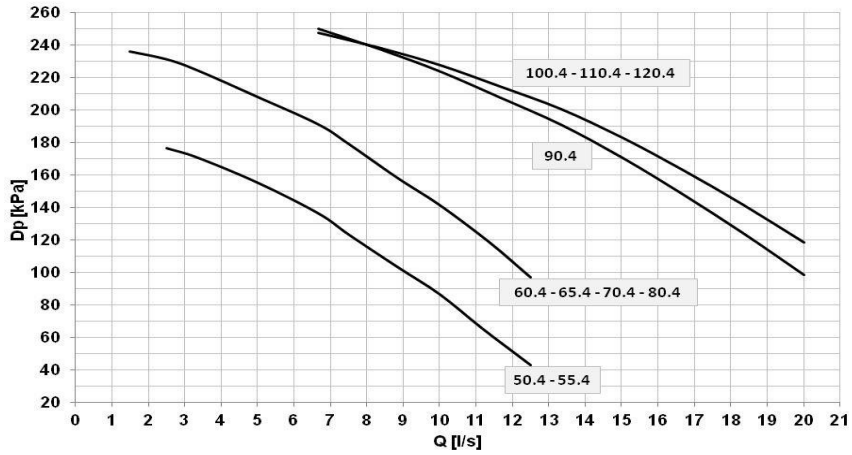
Hydronic assembly configuration 1.3
Unit with one ON/OFF pump (HYG1)



Configuration with 1 centrifugal electric pump, with housing and impeller made with AISI 304 stainless steel, and components as described on the water diagram key. All water fittings are Victaulic type.

The electric pump is equipped with three-phase electric motor with IP55-protection and complete with thermoformed insulated casing.

ON/OFF pump pressure head (Size 50.4 - 120.4)

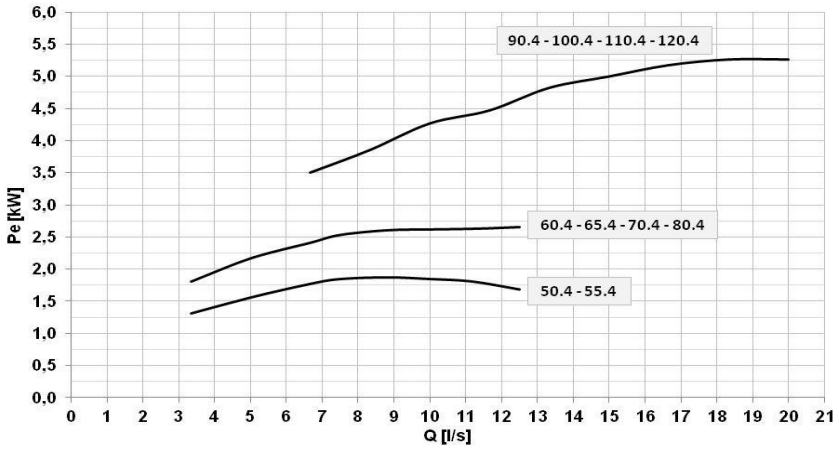


Q = Water flow rate [l/s]
DP = Pressure head [kPa]

Caution: to obtain the available pressure values, you need to subtract the following from the head values represented in these diagrams:

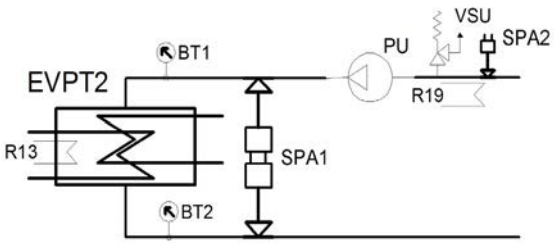
- User side exchanger pressure drops
- IFWX accessory –Steel mesh filter on the water side (where applicable)

ON/OFF pump absorption curves (Size 50.4 - 120.4)



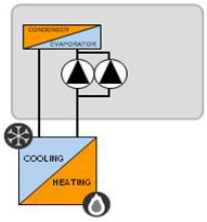
Q = Water flow rate [l/s]
Pe = Electric power consumption [kW]

Water diagram



EVPT2 = Plate evaporator 2 circuits
R13 = Evaporator group heater
BT1 = Probes of entering water temperature
BT2 = Probes of leaving water temperature
SPA1 = Differential pressure switch water
PU = Hydronic assembly 1 ON/OFF pump
VSU = Water safety valve
R19 = Hydronic assembly heaters
SPA2 = Installation load pressure switch

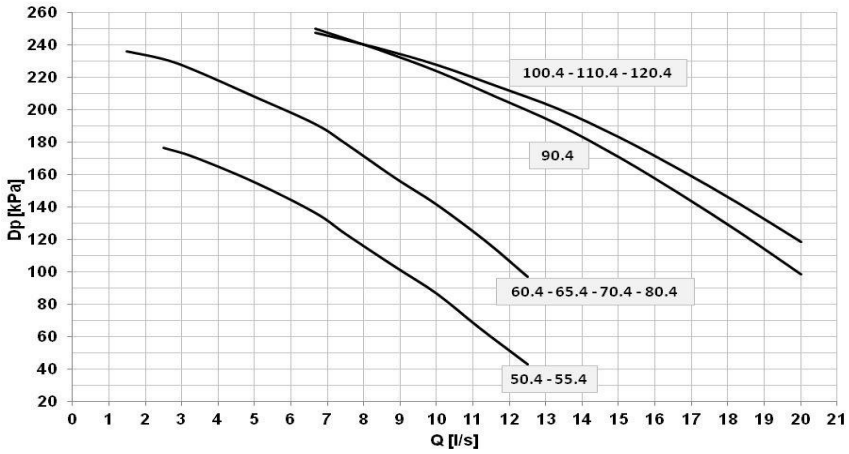
Hydronic assembly configuration 1.4
Unit with two ON/OFF pumps (HYG2)



Configuration with 2 centrifugal electric pumps, 1 stand-by, with housing and impeller made with AISI 304 stainless steel, and components as described on the water diagram key. All water fittings are Victaulic type. The electric pumps are equipped with three-phase electric motor with IP55-protection and complete with thermoformed insulated casing.

The control balances the operating hours and in case of failure it is signaled and the stand-by pump is automatically activated.

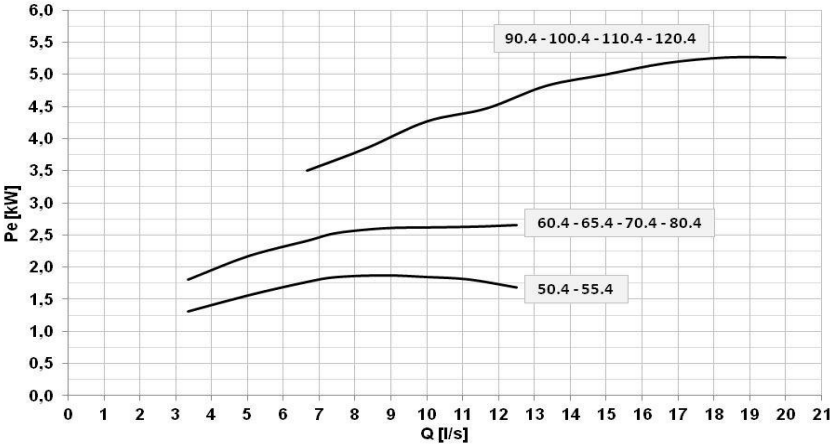
ON/OFF pump pressure head (Size 50.4 - 120.4)



Q = Water flow rate [l/s]
DP = Pressure head [kPa]

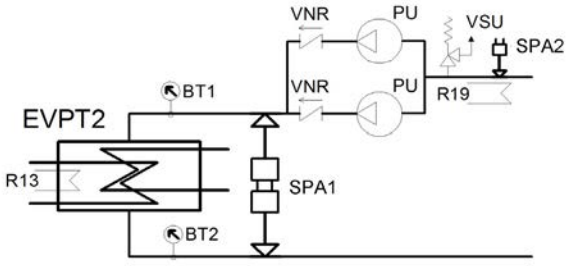
Caution: to obtain the available pressure values, you need to subtract the following from the head values represented in these diagrams:
- User side exchanger pressure drops
- IFWX accessory –Steel mesh filter on the water side (where applicable)

ON/OFF pump absorption curves (Size 50.4 - 120.4)



Q = Water flow rate [l/s]
Pe = Electric power consumption [kW]

Water diagram



EVPT2 = Plate evaporator 2 circuits
R13 = Evaporator group heater
BT1 = Probes of entering water temperature
BT2 = Probes of leaving water temperature
SPA1 = Differential pressure switch water
PU = Hydronic assembly 2 ON/OFF pumps
VSU = Water safety valve
R19 = Hydronic assembly heaters
SPA2 = Installation load pressure switch

D - Partial energy recovery

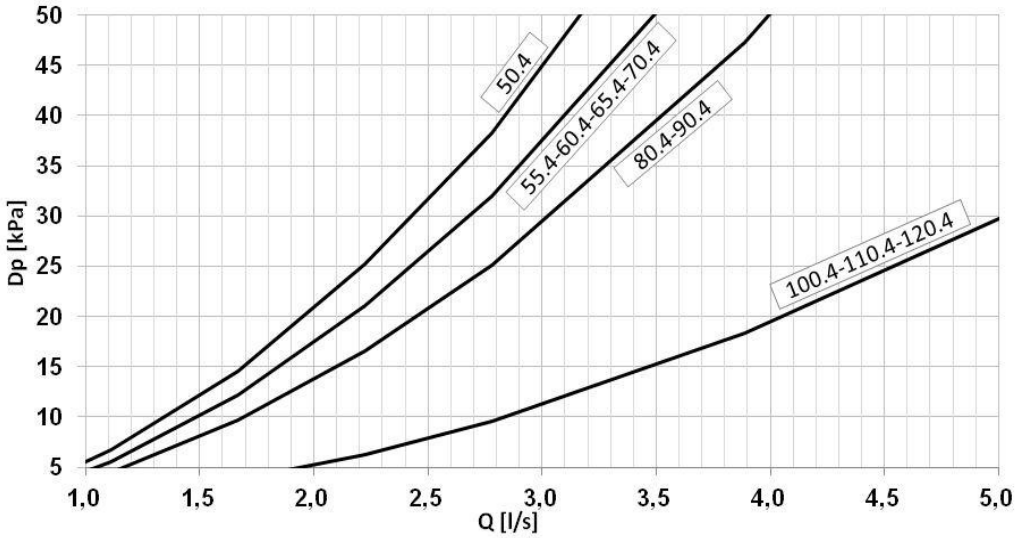
Configuration with recovery side brazed stainless steel (316 AISI) plate exchangers, and components per the legend of the enclosed plumbing circuit diagram. All water fittings are Victaulic type.

A configuration which enables the production of hot water free-of-charge while operating in the cooling mode, thanks to the partial recovery of condensation heat that would otherwise be rejected to the external heat source. It is possible to recovery about 20% of the unit rejected heating capacity equal to the sum of the cooling capacity and the compressor power input.

The partial recovery device is considered to be operating when it is powered by the water flow which is to be heated. This condition improves the unit performance, since it reduces the condensation temperature: in nominal conditions the cooling capacity increases indicatively by 3.2% and the power input of the compressors is reduced by 3.6%.

Hot water availability is always subordinate to the production of chilled water. The heating capacity request is made by the digital contact enabling, that activates the pump recovery side (outside the unit).

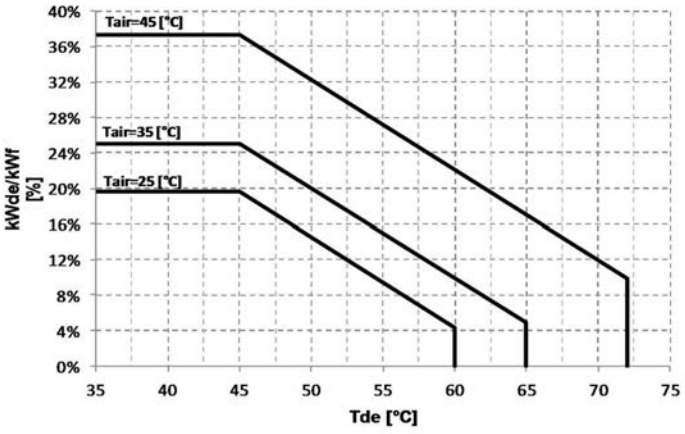
Partial energy recovery pressure drop curves



The pressure drops on the water side are calculated by considering an average water temperature at 7°C.

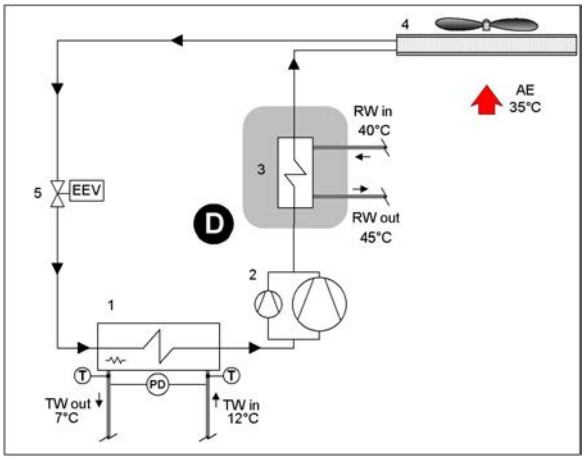
Q = Water flow-rate [l/s]
DP = Pressure drops [kPa]

Partial recovery heating capacity



kWde/kWf = Heat recovered/Cooling capacity [%]
Tde = Heat recovering device outlet water temperature [°C]

Diagram



D - Partial recovery device

1 - Internal exchanger
2 - Compressors
3 - Recovery exchanger
4 - External exchanger
5 - Electronic expansion valve

TW out chilled water outlet
TW out Uscita acqua refrigerata

RW in - Ingresso acqua recupero
RW out - Uscita acqua recupero

T - Sonda di temperatura
PD - Pressostato differenziale
AE Aria esterna

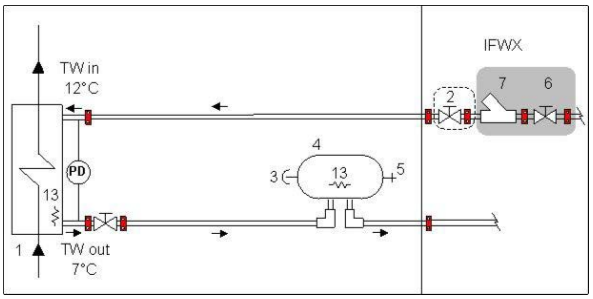
Built-in configuration options

ACC - Storage tank

Option supplied built-in the unit. Steel storage tank complete with double layer covering with closed-cell insulation, stainless steel anti-freeze immersion resistance, bleed valve, draw off cock, cast-iron shut-off butterfly valve with quick connections and activation lever with a mechanical calibration lock at the evaporator output, quick connections with insulated casing.

For sizes 50.4 ÷ 65.4 the storage tank capacity is 300L.

For sizes 70.4 ÷ 120.4 the storage tank capacity is 500L.



1- Internal exchanger
2- Cutoff valve
3- Purge valve
4- Storage tank with antifreeze electric heater
5- Discharge stop valve
6- Cutoff valve
7- Steel mesh strainer on the water side
13- Antifreeze heater
TW in Chilled water inlet
TW out Chilled water outlet
IFWX = Steel mesh strainer on the water side
T - Temperature probe
PD - Differential pressure switch

CCCA - Copper/aluminium condenser coil with acrylic lining

Coils with copper pipes and aluminium fins with acrylic lacquering. Can be used in settings with moderately aggressive saline concentrations and other chemical agents.

Attention!

- cooling capacity variation -2.7%
- variation in compressor power input +4.2%
- operating range reduction -2.1°C

CCCA1 - Condenser coil with Energy Guard DCC Aluminum

A treatment which offers an optimal thermal exchange and guarantees and protects the finned coil exchangers from corrosion over time. Can be used in settings with very aggressive saline concentrations and other chemical agents in the air thus maintaining the performance of the coils over time.

HEDIF - Diffuser for high efficiency axial fan

The new AxiTop diffuser creates an ideal air distribution: it aerodynamically decelerates the flow and transforms a big part of its kinetic energy in static pressure.

Obtaining:

- down to –3 dB of silence
- reduction of 3% of the absorbed energy

Since the fans are the unit's main noise source, the benefits are evident especially during the night hours, when the load is reduced but sensitivity to noise is enhanced.

Available only for size 70.4 ÷120.4.

CREFB - Device for consumption reduction of the external section ECOBREEZE fans

Axial fans with sickle profile blades terminating with "Winglets", directly coupled to the electronic controlled motor (IP54), driven by the magnetic switching of the stator. The brushless technology and the special supply increase both the life expectancy and the efficiency. As a result the electric consumption is reduced up to 50%. Fans are housed in aerodynamically shaped structures to increase efficiency and reduce noise level. The assembly is protected by accident prevention guards.

Available only for size 70.4 ÷120.4.

SFSTR - Disposal for inrush current reduction

Electronic device that automatically and gradually starts the compressors, thereby reducing the current peak generated in star-triangle start-ups and therefore reduces the mechanical stress on the motor and the electrodynamic stress on the power cables and on the mains.

For sizes 50.4 ÷ 65.4 the disposal for inrush current reduction is for supply voltage 400/3/50 + N.

For sizes 70.4 ÷ 120.4 the disposal for inrush current reduction is for supply voltage 400/3/50.

MF2 - Multi-function phase monitor

The multifunction phase monitor controls all phases and their sequence, checks for voltage anomalies (+/–10%), and automatically restores operation of the unit as soon as the power supply returns to normal.

This control allows to:

- protect components inside the unit, as if they are powered by an anomalous voltage they may operate incorrectly or break;
- quickly identify, among the alarms of the unit's components, the real cause of the malfunction due to the sudden change in voltage.

CMSC8 - Serial communication module to BACnet supervisor

This enables the serial connection of the supervision system, using Modbus as the communication protocol. It enables access to the complete list of operational variables, commands and alarms. Using this accessory every unit can dialogue with the main supervision systems.

The device is installed and wired built-in the unit.

The configuration and management activities for the BACnet networks are the responsibility of the client.

The total length of each serial line do not exceed 1000 meters and the line must be connected in bus typology (in/out)

CMSC9 - Serial communication module to Modbus supervisor

This enables the serial connection of the supervision system, using Modbus as the communication protocol. It enables access to the complete list of operational variables, commands and alarms. Using this accessory every unit can dialogue with the main supervision systems.

The device is installed and wired built-in the unit.

The total length of each serial line do not exceed 1000 meters and the line must be connected in bus typology (in/out)

CMSC10 - Serial communication module to LonWorks supervisor

This enables the serial connection of the supervision system which uses the LonWorks communication protocol. It enables access to a list of operating variables, commands and alarms which comply with the Echelon® standard.

The device is installed and wired built-in the unit.

The configuration and management activities for the LonWorks networks are the responsibility of the client.

LonWorks technology uses the LonTalk® protocol for communicating between the network nodes. Contact the service supplier for further information.

PFCP - Power-factor correction capacitors (cosfi > 0,9)

The component is necessary to lower the phase difference between current and voltage in the electromagnetic components of the unit (e.g. asynchronous motors). The component allows to put the cosfi power factor to values on average higher than 0.9, reducing the network reactive power. This often leads to an economic benefit which the energy provider grants to the final user.

PGFC – Finned coil protection grill

This accessory is used to protect the external coil from the accidental contact with external things or people.

Ideal for installation in places where persons can pass from, such as car parks, terraces, etc.

MHP - High and low pressure gauges

Despite the unit already enabling a series of digital displays on the operating pressure of the refrigeration circuit, this option enables analogical measuring of refrigerant pressures at compressor intake and supply thus easing the checking of these parameters for the technicians who are managing the unit. The two liquid pressure gauges and related pressure sensors are attached built-in in easily accessible positions.

RE-20 / RE-25 - Electrical panel anti-freeze protection

It includes self-regulating electric heaters with thermost which are able to protect the electrical panel against condensation and frost guaranteeing its correctly functions down to -25°C. This accessory operates even when the unit is switched off provided that the power supply is maintained active and the unit continues to be electrically connected.

Device installed and wired built-in the unit.

This accessory operates even when the unit is switched off provided that the power supply is maintained active and the unit continues to be connected.

This accessory does not lead to substantial variations in the electrical data for the unit which has been declared in the Electrical Data section.

Accessories separately supplied

RCTX - Remote control

This option allows to have full control over all the unit functions from a remote position.

It can be easily installed on the wall and has the same aspect and functions of the user interface on the unit.

All device functions can be repeated with a normal portable PC connected to the unit with an Ethernet cable and equipped with an internet navigation browser.

The device should be installed on the wall using suitable plugs, electrically hooked up and connected to the unit (installation and wiring are the responsibility of the Customer). Max. remote distance 350 m without auxiliary supply.

Data and power supply serial connection cable n.1 twisted and shielded pair. Diameter of the individual conductor 0.8 mm.

BACX - BACnet serial communication module

Allows the serial connection to supervision systems by using BACnet-IP as a communication protocol. It allows the access to the entire list of operating variables, controls and alarms. With this accessory every unit can communicate with the main supervision systems.

The configuration and management activities for the BACnet networks are the responsibility of the client.

The total length of each serial line do not exceed 1000 meters and the line must be connected in bus typology (in/out)

CMMBX - Serial communication module to supervisor (Modbus)

This enables the serial connection of the supervision system, using Modbus as the communication protocol. It enables access to the complete list of operational variables, commands and alarms. Using this accessory every unit can dialogue with the main supervision systems.

The total length of each serial line do not exceed 1000 meters and the line must be connected in bus typology (in/out)

CMSLWX - LonWorks serial communication module

This enables the serial connection of the supervision system which uses the LonWorks communication protocol. It enables access to a list of operating variables, commands and alarms which comply with the Echelon® standard.

The configuration and management activities for the LonWorks networks are the responsibility of the client.

LonWorks technology uses the LonTalk® protocol for communicating between the network nodes. Contact the service supplier for further information.

PGFCX - Finned coil protection grill

This accessory is used to protect the external coil from the accidental contact with external things or people.

Ideal for installation in places where persons can pass from, such as car parks, terraces, etc.

This option is not suitable for application in sulphuric environments

MHPX - High and low pressure gauges

Despite the unit already enabling a series of digital displays on the operating pressure of the refrigeration circuit, this option enables analogical measuring of refrigerant pressures at compressor intake and supply thus easing the checking of these parameters for the technicians who are managing the unit. The two liquid pressure gauges and related pressure sensors are attached built-in in easily accessible positions.

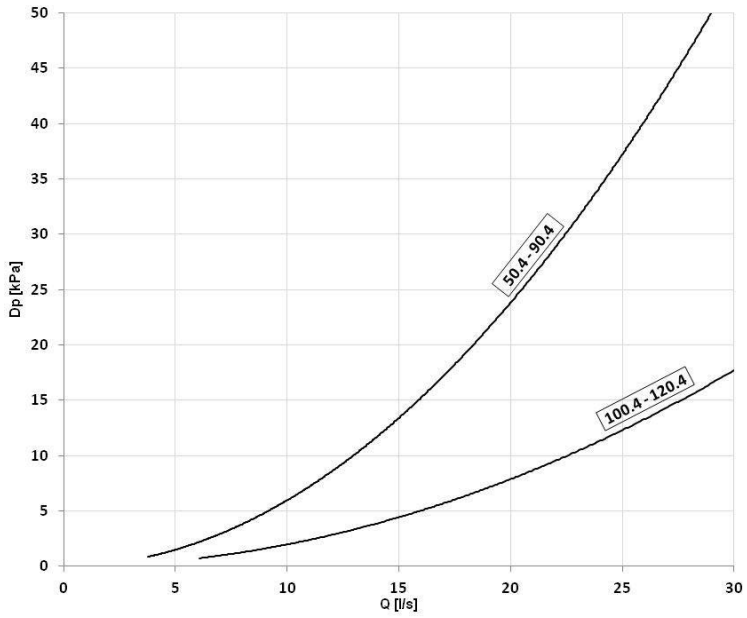
IFWX - Steel mesh strainer on the water side

The device prevents any impurity in the hydraulic circuit from soiling the exchanger. The stainless steel mesh mechanical filter must be placed on the water inlet line. It needs to be easy to remove for periodical maintenance and cleaning operations.

Moreover, it consists of:

- cast-iron shut-off butterfly valve with quick coupling and throttle drive and mechanical calibration stop
- quick couplings with an insulated casing

Steel mesh strainer pressure drops



Q = Water flow rate (l/s)
DP = Water side pressure drops (kPa)

AVIBX - Anti-vibration mount support

The spring antivibration mounts are attached in special housing on the support frame and serve to smooth the vibrations produced by the unit thus reducing the noise transmitted to the support structure.

VACSUX - User side DHW switching valve

The domestic hot water switching valve on the utility side is also supplied as a separate accessory. The DHW switching valve user side is supplied as accessory separated from the unit. The unit controller closes a digital output to control the DHW switching valve from the installation to the storage tank up to the DHW set point reaching

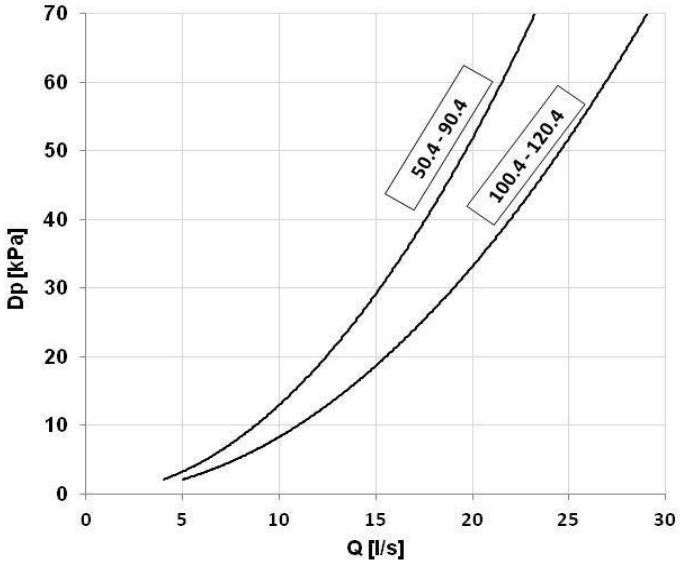
For sizes from 50.4 to 90.4 the DHW switching valve is 3".

For sizes from 100.4 to 120.4 the DHW switching valve is 4".

The DHW switching valve has a IP 40 protection degree.

It is therefore compulsory that client provides a protection for the external liquid valve

DHW switching valve pressure drops



Q = Water flow rate (l/s)
DP = Water side pressure drops (kPa)

Performance in Heating

Size 50.4 - 90.4

Size	Tae (°C) D.B./W.B.	Leaving internal exchanger water temperature (°C)									
		25		35		40		45		55	
		kWt	kWe	kWt	kWe	kWt	kWe	kWt	kWe	kWt	kWe
50.4	-15 / -15.4	90,0	26,1	89,0	32,7	88,8	36,8	-	-	-	-
	-10 / -10.5	104	26,5	102	33,0	102	37,0	-	-	-	-
	-7 / -8	111	26,7	110	33,2	109	37,1	108	41,6	-	-
	0 / -0.6	137	27,2	134	33,7	133	37,5	131	41,9	-	-
	7 / 6	163	27,5	160	34,3	157	38,0	154	42,3	146	53,2
	15 / 13	197	27,6	192	34,8	190	38,7	185	42,9	173	53,6
55.4	-15 / -15.4	95,7	28,7	94,9	35,6	96,2	40,2	-	-	-	-
	-10 / -10.5	110	29,2	109	36,0	110	40,3	-	-	-	-
	-7 / -8	117	29,5	118	36,2	118	40,5	117	45,3	-	-
	0 / -0.6	144	30,2	144	36,9	143	41,1	142	45,8	-	-
	7 / 6	172	30,6	171	37,8	169	41,9	166	46,5	157	58,0
	15 / 13	207	30,7	206	38,6	203	42,8	200	47,4	186	58,7
60.4	-15 / -15.4	104	31,3	105	38,6	105	43,5	-	-	-	-
	-10 / -10.5	120	32,0	120	39,1	121	42,8	-	-	-	-
	-7 / -8	128	32,4	128	39,4	129	43,9	128	49,1	-	-
	0 / -0.6	157	33,3	157	40,5	156	44,8	154	49,7	-	-
	7 / 6	188	33,8	186	41,5	185	45,9	181	50,7	171	63,1
	15 / 13	228	33,7	225	42,5	223	47,2	218	52,0	203	64,2
65.4	-15 / -15.4	110	33,3	110	39,8	111	46,5	-	-	-	-
	-10 / -10.5	126	33,9	126	41,7	127	46,7	-	-	-	-
	-7 / -8	135	34,2	135	42,0	135	46,9	135	52,8	-	-
	0 / -0.6	166	35,1	165	42,9	165	47,7	163	53,4	-	-
	7 / 6	198	35,6	196	44,0	195	48,7	193	54,3	180	67,0
	15 / 13	240	35,8	238	45,0	235	49,9	230	55,5	214	68,0
70.4	-15 / -15.4	121	35,1	120	44,7	120	49,7	-	-	-	-
	-10 / -10.5	139	35,7	138	45,2	138	50,1	-	-	-	-
	-7 / -8	149	36,0	147	45,5	147	50,2	146	56,1	-	-
	0 / -0.6	185	37,0	181	46,3	179	51,1	177	56,8	-	-
	7 / 6	220	37,6	215	47,5	213	52,1	209	57,8	199	72,5
	15 / 13	268	38,2	261	48,7	257	53,4	253	58,2	236	73,6
80.4	-15 / -15.4	140	41,4	140	51,3	139	57,2	-	-	-	-
	-10 / -10.5	160	42,2	160	51,9	160	57,7	-	-	-	-
	-7 / -8	171	42,6	171	52,3	170	58,0	168	64,6	-	-
	0 / -0.6	209	43,7	208	53,5	206	59,1	203	65,5	-	-
	7 / 6	251	44,5	248	54,6	244	60,2	238	66,6	226	82,6
	15 / 13	304	45,3	297	55,8	292	61,6	284	67,9	269	83,9
90.4	-15 / -15.4	158	48,2	161	60,8	162	68,3	-	-	-	-
	-10 / -10.5	182	48,9	182	61,1	183	68,3	-	-	-	-
	-7 / -8	194	49,3	194	61,2	194	68,2	194	76,1	-	-
	0 / -0.6	237	50,6	236	62,3	234	68,9	233	76,5	-	-
	7 / 6	284	51,8	281	63,5	276	69,9	273	77,4	261	97,0
	15 / 13	347	53,1	335	65,0	333	71,6	325	79,0	309	98,5

kWt = Internal exchanger heating capacity (kW)
kWe = Compressor power input (kW)
Tae [°C] = Entering external exchanger air temperature
Performances in function of the entering/leaving water temperature differential = 5°C

Performance in Heating

Size 100.4 - 120.4

Size	Tae (°C) D.B./W.B.	Leaving internal exchanger water temperature (°C)									
		25		35		40		45		55	
		kWt	kWe	kWt	kWe	kWt	kWe	kWt	kWe	kWt	kWe
100.4	-15 / -15.4	179	53,1	180	66,1	182	74,2	-	-	-	-
	-10 / -10.5	206	53,8	206	66,5	207	74,4	-	-	-	-
	-7 / -8	221	54,2	221	66,8	220	74,6	221	83,5	-	-
	0 / -0.6	272	55,6	269	68,0	267	75,4	264	84,2	-	-
	7 / 6	327	57,2	321	69,4	317	76,9	312	85,7	299	108
	15 / 13	398	59,4	390	71,5	380	78,9	373	87,9	353	110
110.4	-15 / -15.4	195	58,0	197	72,1	199	80,6	-	-	-	-
	-10 / -10.5	224	59,1	225	73,3	226	81,3	-	-	-	-
	-7 / -8	239	59,7	240	73,4	241	81,8	239	90,5	-	-
	0 / -0.6	295	61,7	292	75,3	291	83,1	286	91,8	-	-
	7 / 6	353	63,6	347	77,0	344	84,9	338	93,5	320	116
	15 / 13	429	66,1	416	79,3	410	87,3	403	95,6	377	118
120.4	-15 / -15.4	220	65,5	223	82,4	223	92,5	-	-	-	-
	-10 / -10.5	248	66,6	252	82,9	253	92,8	-	-	-	-
	-7 / -8	263	67,2	267	83,2	268	92,7	268	103	-	-
	0 / -0.6	323	69,3	325	85,1	323	93,8	320	104	-	-
	7 / 6	388	71,7	385	87,0	381	95,7	374	106	359	132
	15 / 13	471	74,6	465	89,8	456	98,3	444	108	421	134

kWt = Internal exchanger heating capacity (kW)
kWe = Compressor power input (kW)
Tae [°C] = Entering external exchanger air temperature
Performances in function of the entering/leaving water temperature differential = 5°C

Cooling Performance

Size 50.4 - 100.4

Size	To (°C)	Entering external exchanger air temperature (C°)											
		20		25		30		35		40		45	
		kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe
50.4	5	157	31,8	150	35,2	142	38,9	132	42,6	119	47,7	109	53,5
	7	166	32,3	158	35,9	150	39,5	139	43,3	126	48,3	116	54,2
	10	181	33,1	172	36,6	163	40,3	151	44,4	137	49,5	128	55,1
	12	191	33,7	183	37,3	172	41,1	159	45,1	145	49,9	-	-
	15	208	34,7	198	38,4	186	42,4	172	46,6	158	51,4	-	-
	18	223	35,8	213	39,5	200	43,5	185	47,6	170	52,7	-	-
55.4	5	167	36,0	160	39,7	152	43,5	142	47,4	128	52,9	117	59,4
	7	176	36,7	169	40,6	160	44,4	149	48,2	135	53,9	125	60,1
	10	191	37,7	183	41,7	173	45,5	161	49,6	146	55,3	136	61,8
	12	202	38,4	193	42,5	182	46,4	170	50,4	155	55,9	-	-
	15	218	39,7	209	43,8	196	48,0	183	52,2	168	57,7	-	-
	18	234	41,1	225	45,2	211	49,3	197	53,6	183	59,5	-	-
60.4	5	182	39,5	175	43,4	164	47,6	152	52,2	139	57,3	127	64,7
	7	192	40,1	184	44,3	173	48,4	160	52,8	147	58,2	136	65,4
	10	209	41,4	200	45,7	187	49,8	173	54,8	159	60,0	150	67,1
	12	220	42,1	211	46,6	197	50,9	183	55,3	167	61,0	-	-
	15	238	43,5	227	48,1	212	52,6	196	57,2	181	63,4	-	-
	18	257	44,6	244	49,2	228	53,8	211	59,2	197	65,3	-	-
65.4	5	195	43,1	186	47,5	175	52,1	162	57,1	147	63,1	138	71,2
	7	206	44,0	197	48,3	185	53,0	170	58,2	155	64,5	148	72,4
	10	224	45,4	214	49,9	200	54,8	184	59,9	169	66,4	162	74,9
	12	236	46,7	225	51,0	210	55,9	193	61,3	178	68,2	-	-
	15	255	48,3	243	52,7	226	57,8	209	63,3	195	70,5	-	-
	18	275	49,7	260	54,4	242	59,7	224	65,6	216	73,4	-	-
70.4	5	208	45,2	200	49,4	189	54,3	176	59,5	159	66,4	148	74,5
	7	219	46,1	210	50,3	198	55,5	184	60,4	167	67,0	156	75,9
	10	232	47,4	225	51,7	211	56,9	197	61,7	180	68,8	164	77,7
	12	249	48,4	239	52,9	225	58,2	209	63,5	191	70,9	-	-
	15	271	50,5	260	55,0	244	60,2	226	65,8	209	73,3	-	-
	18	290	51,9	277	56,5	262	61,7	243	67,3	226	75,0	-	-
80.4	5	235	52,0	226	57,4	215	62,6	199	68,7	182	75,9	168	83,7
	7	249	53,3	239	58,4	226	63,4	209	69,4	190	76,9	177	85,3
	10	267	54,5	257	59,7	242	65,4	225	71,2	206	78,4	194	86,6
	12	282	56,2	272	61,0	255	66,6	238	72,3	218	80,2	-	-
	15	308	57,8	293	62,9	277	68,7	258	74,7	237	82,9	-	-
	18	328	59,5	316	64,9	294	70,9	273	77,2	256	84,8	-	-
90.4	5	270	64,3	259	70,0	241	76,8	223	84,1	205	93,0	188	103
	7	287	65,8	272	71,9	255	77,9	236	85,2	216	94,4	203	106
	10	305	68,0	291	73,9	271	80,8	250	88,0	233	97,1	218	110
	12	321	69,5	305	75,6	286	82,0	265	89,7	247	98,7	-	-
	15	349	71,9	331	78,2	309	84,9	287	93,4	273	104	-	-
	18	373	75,2	352	80,9	330	87,8	308	96,0	287	111	-	-
100.4	5	311	65,6	297	71,6	281	78,1	263	85,5	239	95,2	218	107
	7	325	66,8	310	73,0	292	80,0	275	86,7	248	96,5	229	108
	10	344	67,9	326	74,6	310	80,6	290	88,4	265	97,9	246	110
	12	364	70,0	349	76,3	331	82,7	309	90,8	281	102	-	-
	15	399	72,1	380	78,7	359	85,6	333	93,5	307	104	-	-
	18	423	75,2	404	81,4	380	87,8	352	96,6	328	106	-	-

kWf = Internal exchanger cooling capacity (kW)
kWe = Compressor power input (kW)
To (°C) = Leaving internal exchanger water temperature (°C)
Performances in function of the entering/leaving water temperature differential = 5°C

Cooling Performance

Size 110.4 - 120.4

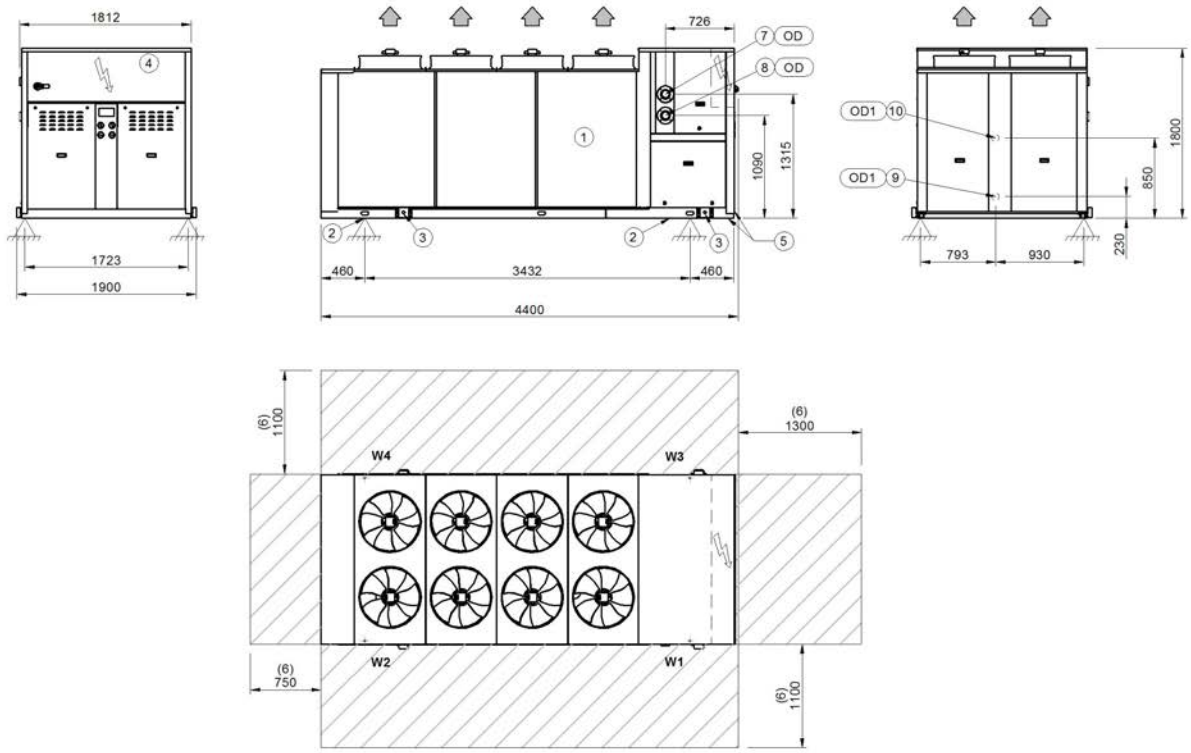
Size	To (°C)	Entering external exchanger air temperature (C°)											
		20		25		30		35		40		45	
		kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe
110.4	5	342	74,8	328	81,0	309	88,3	287	96,7	261	108	242	120
	7	357	75,6	340	82,6	321	89,8	297	98,3	272	109	253	121
	10	376	77,0	361	83,6	338	91,8	315	99,8	289	111	272	123
	12	400	79,5	383	85,8	358	93,9	334	102	307	114	-	-
	15	437	82,1	415	89,2	388	97,1	362	105	336	116	-	-
	18	464	85,1	441	91,8	415	99,4	381	109	359	121	-	-
120.4	5	375	86,2	357	94,6	338	102	313	112	286	125	271	141
	7	389	88,0	373	95,2	350	104	324	114	295	128	278	141
	10	411	89,6	390	97,5	368	106	343	116	315	128	298	143
	12	435	92,2	414	99,9	386	110	362	119	335	132	-	-
	15	470	96,4	450	104	419	114	391	124	369	137	-	-
	18	502	99,1	475	108	447	117	417	127	395	142	-	-

kWf = Internal exchanger cooling capacity (kW)
kWe = Compressor power input (kW)
To (°C) = Leaving internal exchanger water temperature (°C)
Performances in function of the entering/leaving water temperature differential = 5°C

Dimensional

Size 50.4 - 55.4 - 60.4 - 65.4

DAAL 150.4_65.4 EXC_0 REV02
Data/Date 23/07/2015



1) External exchanger
2) Unit fixing holes Ø 25
3) Lifting brackets (Removable)
4) Electrical panel
5) Power input
6) Clearance access recommended
7) Water inlet user side of no pumps unit / Water outlet user side of unit with pumps (optional)
8) Water inlet user side of unit with pumps (optional) / Water outlet user side of no pumps unit
9) Water inlet recovery side (Optional)
10) Water outlet recovery side (Optional)

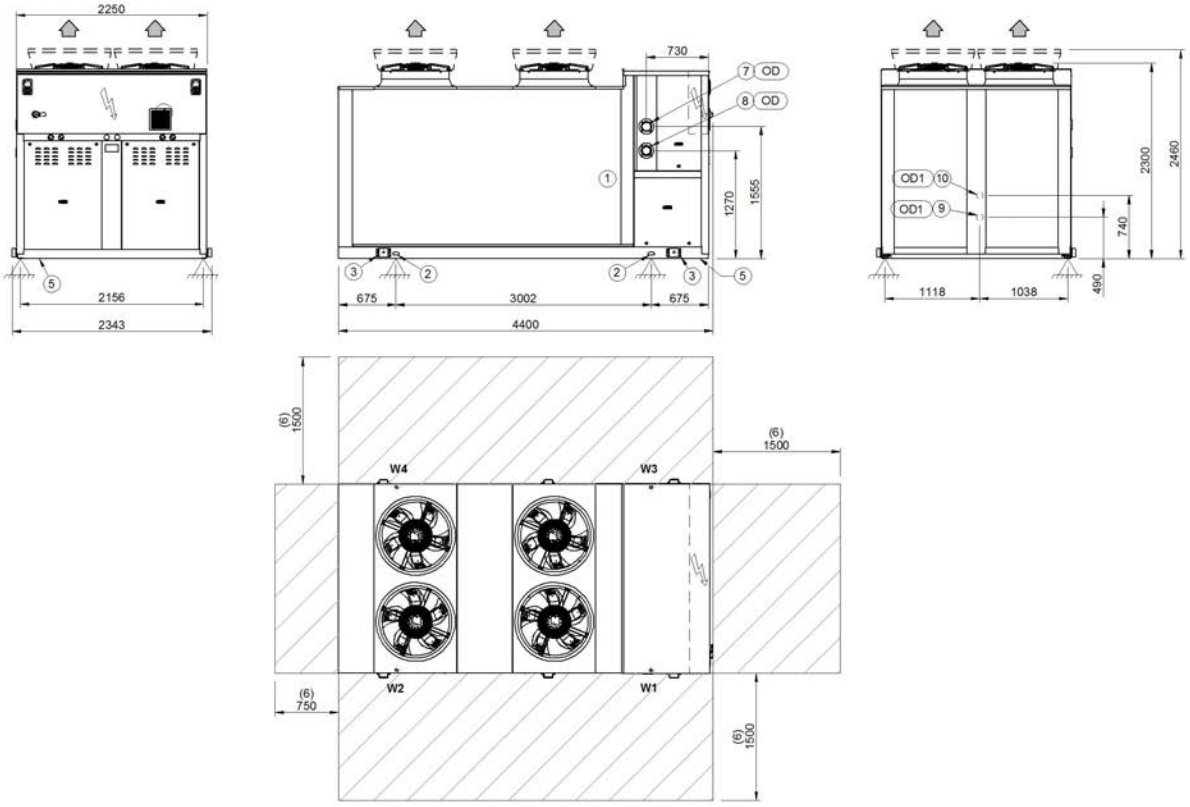
Size		50.4	55.4	60.4	65.4
Length	mm	4400	4400	4400	4400
Height	mm	1800	1800	1800	1800
Depth	mm	1812	1812	1812	1812
W1 supporting point	kg	483	484	505	550
W2 Supporting point	kg	308	307	327	344
W3 Supporting point	kg	487	495	510	572
W4 Supporting point	kg	313	317	331	366
Operating weight	kg	1590	1604	1673	1831
Shipping weight	kg	1550	1565	1635	1790

The presence of optional accessories may result in a substantial variation of the weights shown in the table.

Dimensional

DAAL 170.4_90.4 EXC_0 REV01
Data/Date 22/07/2015

Size 70.4 - 80.4 - 90.4



1) External exchanger
2) Unit fixing holes Ø 25
3) Lifting brackets (Removable)
4) Electrical panel
5) Power input
6) Clearance access recommended
7) Water inlet user side of no pumps unit / Water outlet user side of unit with pumps (optional)
8) Water outlet user side of no pumps unit / Water inlet user side of unit with pumps (optional)
9) Water inlet recovery side (Optional)
10) Water outlet recovery side (Optional)

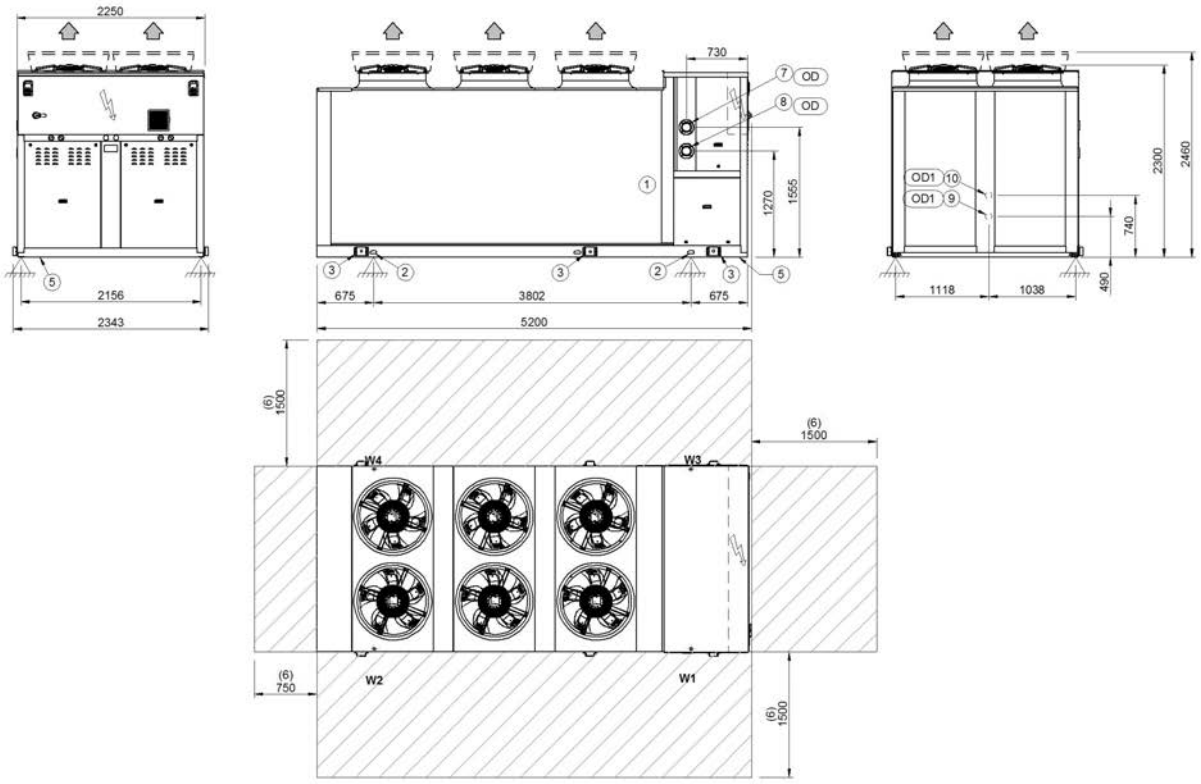
Size		70.4	80.4	90.4
Length	mm	4400	4400	4400
Height standard unit	mm	2300	2300	2300
Height with AXITOP	mm	2460	2460	2460
Depth	mm	2250	2250	2250
W1 supporting point	kg	740	774	817
W2 Supporting point	kg	440	463	485
W3 Supporting point	kg	770	807	856
W4 Supporting point	kg	469	496	523
Operating weight	kg	2420	2540	2681
Shipping weight	kg	2375	2495	2630

The presence of optional accessories may result in a substantial variation of the weights shown in the table.

Dimensional

DAAL 1100.4_120.4 EXC_0 REV01
Data/Date 22/07/2015

Size 100.4 - 110.4 - 120.4



1) External exchanger
2) Unit fixing holes Ø 25
3) Lifting brackets (Removable)
4) Electrical panel
5) Power input
6) Clearance access recommended
7) Water inlet user side of no pumps unit / Water outlet user side of unit with pumps (optional)
8) Water outlet user side of no pumps unit / Water inlet user side of unit with pumps (optional)
9) Water inlet recovery side (Optional)
10) Water outlet recovery side (Optional)

Size		100.4	110.4	120.4
Length	mm	5200	5200	5200
Height standard unit	mm	2300	2300	2300
Height with AXITOP	mm	2460	2460	2460
Depth	mm	2250	2250	2250
W1 supporting point	kg	960	991	1033
W2 Supporting point	kg	568	577	608
W3 Supporting point	kg	989	1020	1061
W4 Supporting point	kg	597	606	636
Operating weight	kg	3114	3194	3338
Shipping weight	kg	3050	3120	3262

The presence of optional accessories may result in a substantial variation of the weights shown in the table.

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