Technical Bulletin

BT15D015GB-07

ELFOEnergy Magnum - High temperature

Air-water heat pump at high temperature for outdoor installation

WSAN-XEM HW 35.4 - 60.4 RANGE

Nominal heating capacity **(A7/W45)** from 107 kW to 183 kW
Nominal cooling capacity **(A35/W7)** from 85 kW to 149 kW

- **R-410A MODULAR SCROLL TECHNOLOGY**
- **TWO INDEPENDENT REFRIGERATION CIRCUITS**
- **EUROVENT CLASS A IN HEATING**
- **PRODUCTION OF HOT WATER UP TO 65°C**
- **PARTIAL RECOVERY OF THE CONDENSING HEAT (OPTIONAL)**
- **ECOBREEZE FANS (OPTIONAL)**
  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.

HYDRONIC System - Air 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 HIGH TEMPERATURE WSAN-XEM HW:

- Reversible-cycle heat pump
- Production of hot water up to 65°C
- Extended operating range

MAGNUM HEAT PUMP WSAN-XEM:

- Reversible-cycle heat pump

MAGNUM COOL ONLY WSAT-XEM:

- Water chiller
- Hot water production by partial energy recovery option

MAGNUM MULTIFUNCTION WSAN-XEM MF:

- Reversible-cycle heat pump
- Chilled and hot water produced at the same time

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 High temperature

Provides all Clivet technological developments for their medium capacity hydronic systems

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

EXCELLENCE version:

- The EXCELLENCE version stands out for its extremely high energy efficiency under both part and full load conditions. (A- class Eurovent certification)
- High efficiency heat pump, perfect in the operation at high water temperature (up to +65°C) and low outdoor air temperature (down to -20°C).

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.

Maximum efficiency is necessary with a part load

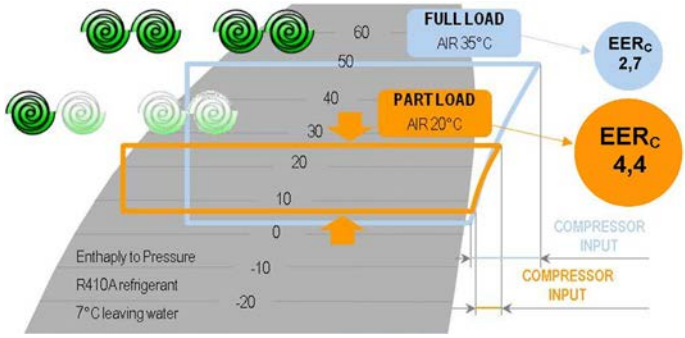
Magnum uses high efficiency Scroll compressors. The advantages are:

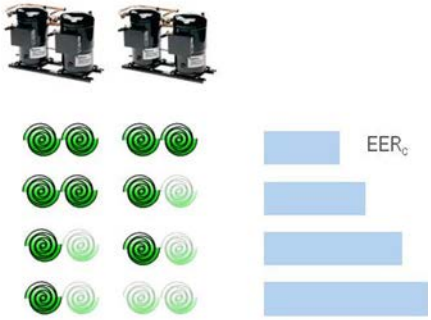
- Compressors manufactured in large numbers on an industrial scale, with strict quality checks and highest reliability thanks to the high scale mass production volumes.
- every refrigeration circuit uses two or three Scroll compressors, depending on the different sizes of the unit. When two compressors 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.





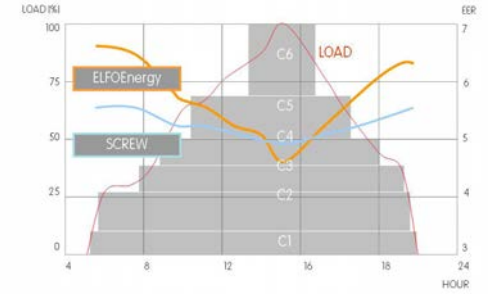
EERc = Energy effieciency referred to compressors

Superior flexibility and reliability

Efficient precision

Sequential activation of ELFOEnergy Magnum compressors allow:

- accurately following the load heating/cooling, supplying better comfort;
- reducing the number of compressor start-ups which is the main cause for wear and tear
- increasing the life cycle of the unit
- reducing time and costs for any repairs, thanks to the modularity of components, their reduced dimensions and the lower cost compared to semi-hermetic compressors.



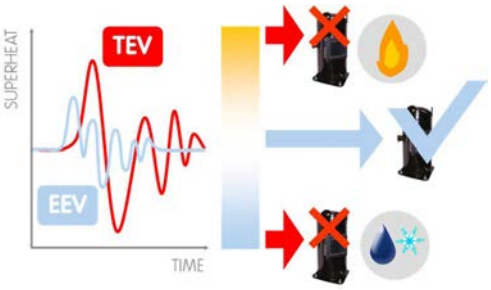
THE NUMBER OF START-UPS DECREASES THEREFORE THE LIFE CYCLE INCREASES

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.



ECOBREEZE fans, electronically controlled (optional)

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.

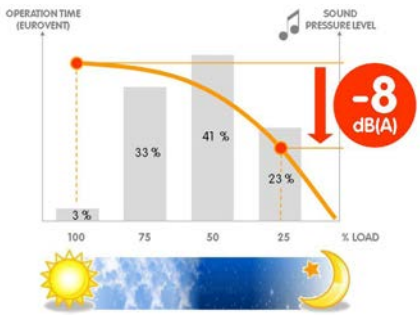
The advantages are:

- **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 reduction of **sound pressure 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.

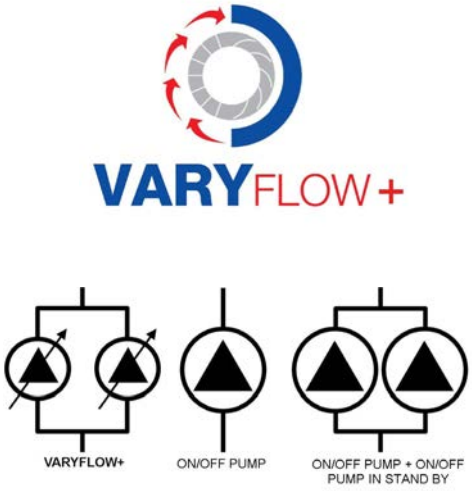
The VARYFLOW + modulating pumping unit made up of two pumps in parallel controlled by inverter, allows a precise water flow-rate modulation reducing notably the consumptions and at the same time it guarantees its functionality also in case of temporary unavailability of one of the two pumps, guaranteeing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



Built-in inertial accumulation available

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.

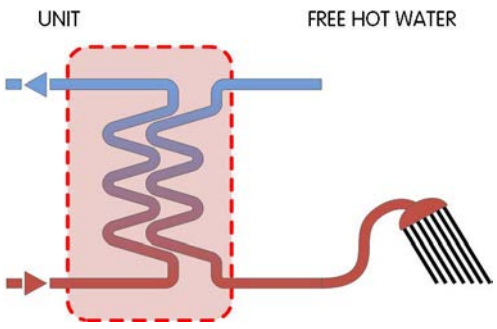
Produces hot water freely

Condensation heat recovery:

- partial: 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).

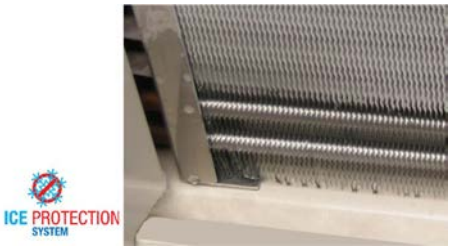
It allows the management of several units in cascade up to 1 master and 6 slave (Ecoshare)

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.

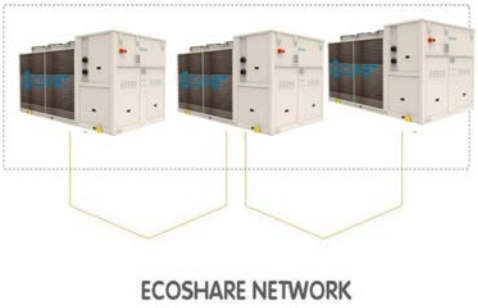
The Magnum units are designed to be connected in parallel in modular logic, thereby granting the following advantages:

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).

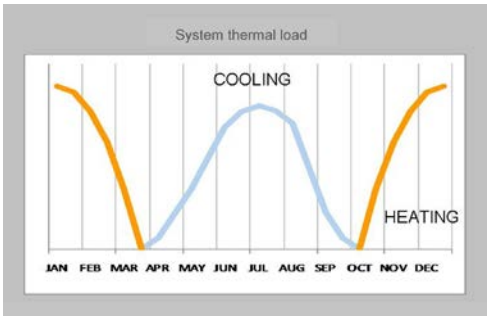


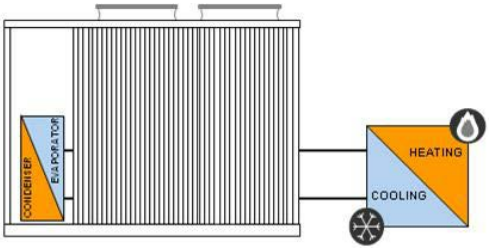
ELFOEnergy Magnum High temperature

System solutions:

Standard unit

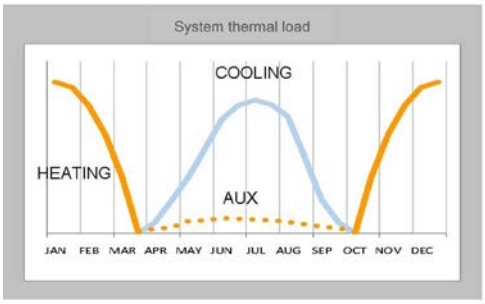
- **Production of chilled or hot water**

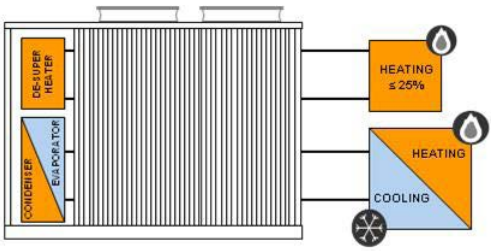




Unit with Partial energy recovery option

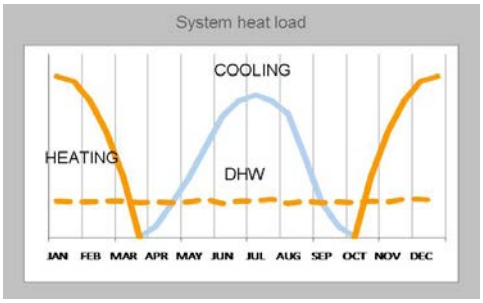
- **Production of chilled or hot water**
- **Free production of hot water from partial energy recovery**

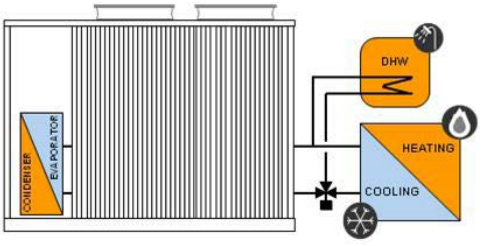




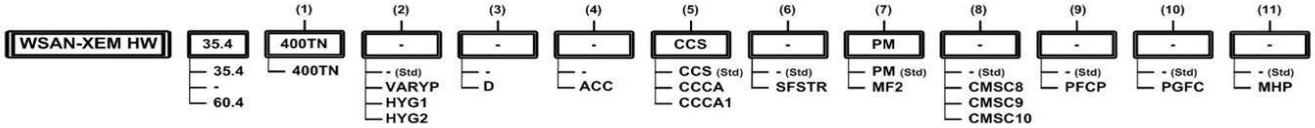
Unit with accessory User side DHW switching valve (supplied separately)

- **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

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

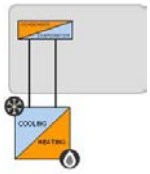
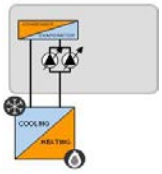
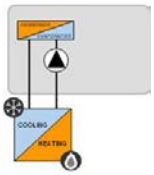
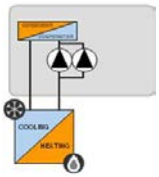
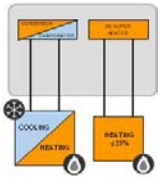
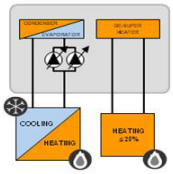
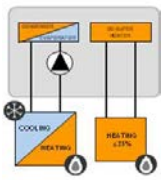
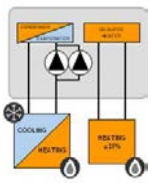
(7) Phase monitor
PM - Phase monitor (standard)
MF2 - Multi-function phase monitor

(8) 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

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

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

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

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 VARYFLOW+ (D+VARYP)	**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			35.4	40.4	45.4	50.4	55.4	60.4
Cooling (A35/W7)								
Cooling capacity	1	kW	86,1	98,7	110	118	132	150
Compressor power input	1	kW	28,5	32,4	34,4	38,3	44,4	48,7
Total power input	2	kW	31,1	35,0	37,0	41,3	48,0	54,2
EER	1		2,77	2,82	2,98	2,87	2,74	2,77
Water flow-rate	1	l/s	4,1	4,7	5,3	5,7	6,3	7,2
User side exchanger pressure drops	1	kPa	27,0	28,0	27,0	24,0	25,0	31,0
Cooling capacity (EN14511:2013)	3	kW	85,8	98,3	110	118	131	150
Total power input (EN14511:2013)	3	kW	31,5	35,4	37,5	41,7	48,4	54,8
EER (EN 14511:2013)	3		2,73	2,78	2,93	2,83	2,71	2,73
SEER	8		2,93	3,35	3,50	3,31	3,28	3,09
Heating (A7/W45)								
Heating capacity	4	kW	109	122	133	143	164	184
Compressor power input	4	kW	28,7	31,6	34,7	38,0	43,9	48,1
Total power input	2	kW	31,3	34,2	37,3	41,0	47,5	53,6
COP	4		3,47	3,57	3,57	3,49	3,46	3,43
Water flow-rate	4	l/s	5,2	5,8	6,4	6,8	7,8	8,8
User side exchanger pressure drops	4	kPa	41,0	42,0	38,0	35,0	37,0	46,0
Heating capacity (EN14511:2013)	5	kW	109	123	134	144	165	185
Total power input (EN14511:2013)	5	kW	31,8	34,9	37,9	41,6	48,2	54,5
COP (EN 14511:2013)	5		3,43	3,52	3,53	3,45	3,42	3,39
SCOP - AVERAGE Climate - W35	8		3,52	3,95	3,90	3,88	3,54	3,64
SCOP - AVERAGE Climate - W55	8		3,03	3,19	3,15	3,22	3,12	3,04
Compressor								
Type of compressors			SCROLL					
Refrigerant			R-410A					
No. of compressors		No	4	4	4	4	4	4
Std Capacity control steps		No	4	4	6	4	4	4
Oil charge (C1)		l	3,5	6,5	6,5	6,5	6,5	6,5
Oil charge (C2)		l	3,5	6,5	6,5	6,5	6,5	6,5
Tot. refrigerant charge (C1)		kg	20,0	22,0	22,0	23,0	28,0	30,0
Tot. refrigerant charge (C2)		kg	20,0	22,0	23,0	23,0	28,0	30,0
Refrigeration circuits		No	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
Water content		l	6,8	7,7	8,9	10,1	11,4	11,4
External Section Fans								
Type of fans	7		AX					
Number of fans		No	6	6	6	6	8	8
Standard airflow		l/s	16000	15567	15567	15567	20733	20733
Installed unit power		kW	0,60	0,60	0,60	0,60	0,60	0,60
Connections								
Water fittings			3″	3″	3″	3″	3″	3″
Water circuit								
Max water side pressure		Kpa	1000	1000	1000	1000	1000	100
Safety valve calibration		kPa	600	600	600	600	600	600
Min. installation water contents		l	350	390	360	450	530	590
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+N	400/3/50+N

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. Data calculated according to the EN 14825:2016 Regulation

Electrical data

Supply voltage 400/3/50+N

Size			35.4	40.4	45.4	50.4	55.4	60.4
F.L.A. - Full load current at max admissible conditions								
F.L.A. - Compressor 1		A	18,4	21,2	21,2	25,6	31,9	33,2
F.L.A. - Compressor 2		A	18,4	21,2	21,2	25,6	31,9	33,2
F.L.A. - Compressor 3		A	18,4	21,2	25,6	25,6	31,9	33,2
F.L.A. - Compressor 4		A	18,4	21,2	25,6	25,6	31,9	33,2
F.L.A. - Single External Fan		A	2,60	2,60	2,60	2,60	2,60	2,60
F.L.A. - Total		A	82,0	93,2	102	111	139	144
L.R.A. - Locked rotor amperes								
L.R.A. - Compressor 1		A	128	118	118	140	174	174
L.R.A. - Compressor 2		A	128	118	118	140	174	174
L.R.A. - Compressor 3		A	128	118	140	140	174	174
L.R.A. - Compressor 4		A	128	118	140	140	174	174
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	11,0	12,9	12,9	15,4	18,1	19,1
F.L.I. - Compressor 2		kW	11,0	12,9	12,9	15,4	18,1	19,1
F.L.I. - Compressor 3		kW	11,0	12,9	15,4	15,4	18,1	19,1
F.L.I. - Compressor 4		kW	11,0	12,9	15,4	15,4	18,1	19,1
F.L.I. - Single External Fan		kW	0,60	0,60	0,60	0,60	0,60	0,60
F.L.I. - Total		kW	46,1	53,7	58,7	63,7	75,1	79,1
M.I.C. Maximum inrush current								
M.I.C. - Value		A	191	190	216	225	280	284
M.I.C. with soft start accessory		A	162	170	75,9	183	225	110

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.

Sound levels

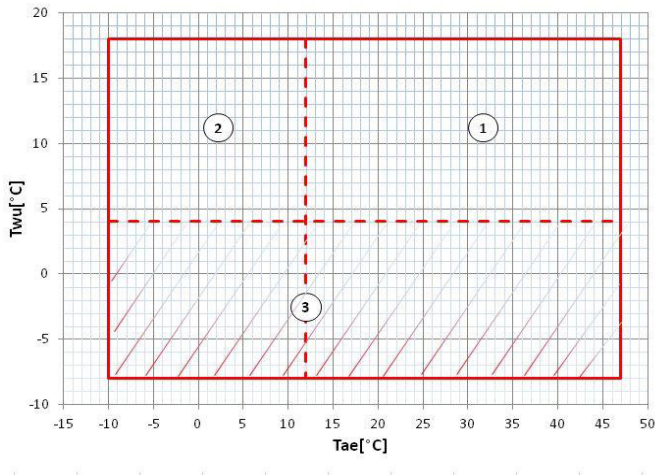
Size	Sound power level (dB)								Sound power level	Sound pressure level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
35.4	51	69	78	82	80	81	74	66	86	67
40.4	51	69	78	82	80	81	74	66	86	67
45.4	51	69	78	82	80	80	74	66	86	67
50.4	53	71	79	83	81	79	74	67	86	67
55.4	54	73	81	85	82	82	77	69	88	69
60.4	54	73	81	85	83	82	77	69	88	69

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.
Noise levels are determined using the tensiometric method (UNI EN ISO 9614-2)
Data referred to the following conditions:
internal exchanger water = 12/7°C
ambient temperature = 35 °C

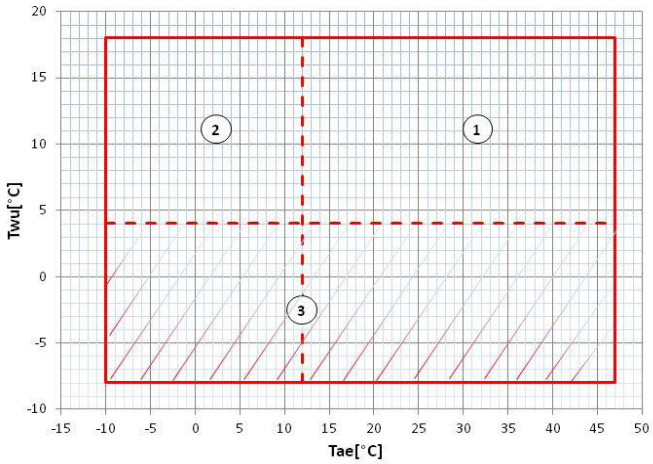
Operating Range

Cooling

Size 35.4



Size 40.4 ÷ 60.4



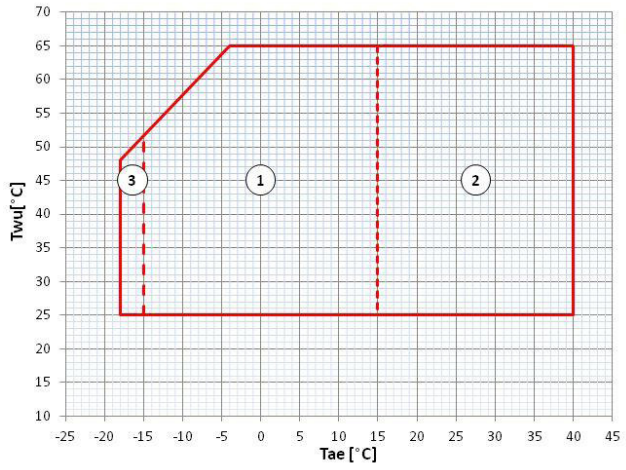
Twu [°C] = Internal exchanger outlet water temperature
Tae [°C] = External exchanger inlet air temperature

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

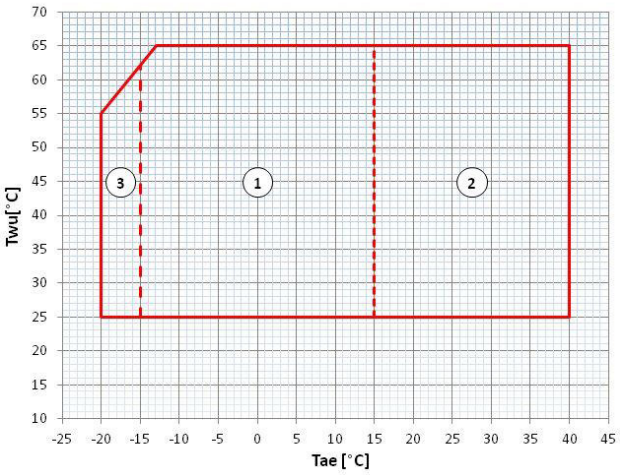
Operating Range

Heating

Size 35.4



Size 40.4 ÷ 60.4



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. Standard unit operating range at full load, not compatible with Clivet integrated pumping device (HYG1 - HYG2 - VARYP)

N.B: The domestic hot water production (that is with leaving water temperature = 65°C) is reached with a temperature differential of 7°C. The max water temperature allowed on return is 58°C.

Unit equipment with low outdoor temperatures

Minimum outdoor air temperature	Operating unit		Unit in stand-by *** (fed unit)	Unit in storage (unit not fed)
	Cool*	Heat**		
+11°C	√ standard unit	√ standard unit	√ standard unit	√ standard unit
+2°C				
-5°C				
-7°C				
-10°C				
Between –10°C and –15°C	NOT POSSIBLE	√ glycol in an appropriate percentage (1)	√ glycol in an appropriate percentage (1)	NOT POSSIBLE
Between –15°C and –20°C****	NOT POSSIBLE	√ glycol in an appropriate percentage (1) X not compatible with Clivet integrated pumping device	√ glycol in an appropriate percentage (1) X not compatible with Clivet integrated pumping device	NOT POSSIBLE

Data referred to the following conditions:

* chilled water production:
internal exchanger water = 12/7°C

** hot water production:
internal exchanger water = 50/55 °C (for size 35.4, internal exchanger water = 40/45°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)

**** for size 35.4 minimum outdoor air temperature is between -15°C and -18°C

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 on varying the glycol percentage refer to the specific 'Correction factors for glycol use' 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.

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)	No	-	-	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 with orbiting spiral with steam injection, 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. The compressors are supplied with a thermal and acoustic insulation jacket. An oil heater, which starts automatically, keeps the oil from being diluted by the refrigerant when the compressor stops. The compressors are connected in TANDEM on a single refrigeration circuit and have a biphasic oil equalisation.

Second circuit: Hermetic Scroll compressors with orbiting spiral with steam injection, 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. The compressors are supplied with a thermal and acoustic insulation jacket. An oil heater, which starts automatically, keeps the oil from being diluted by the refrigerant when the compressor stops. The compressors are connected in TANDEM on a single refrigeration circuit and have a biphasic oil equalisation.

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 in steel sheet 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. Located in aerodynamically shaped nozzles to increase efficiency and minimise noise levels. They are fitted with protective safety guard grilles and supply with variable speed electronic control (phase cutting)

Refrigeration circuit

Double refrigeration circuit complete, for each circuit, with:

- replaceable anti-acid solid cartridge dehydrator filter
- double 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
- 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
- input for 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:

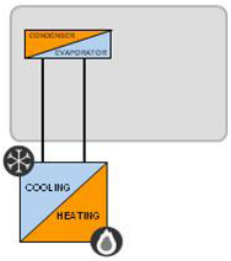
- supply water set-point setting of the slave units
- setting of logics that increase the system energy efficiency
- unit operating hours balancing
- unit management in case of damage (only on slave unit)
- hydronic assembly switch-off management of units not used

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

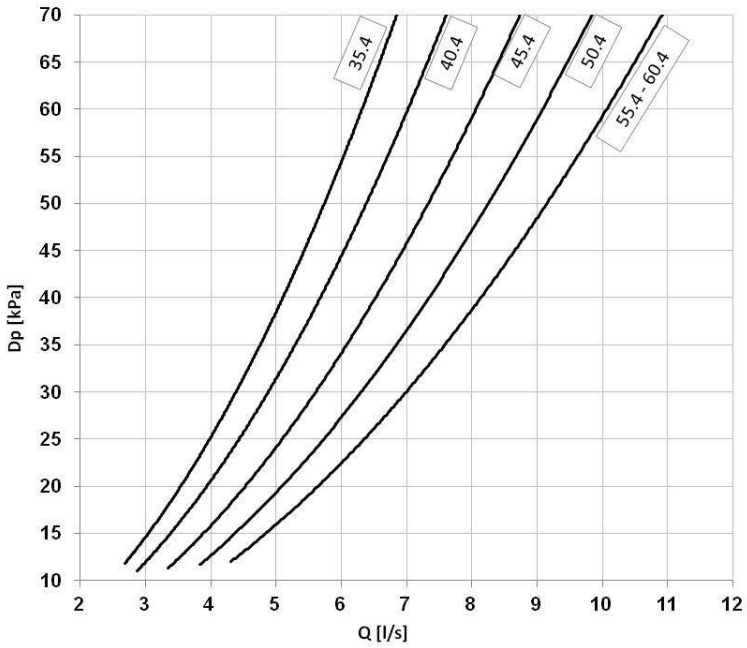


Standard unit

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

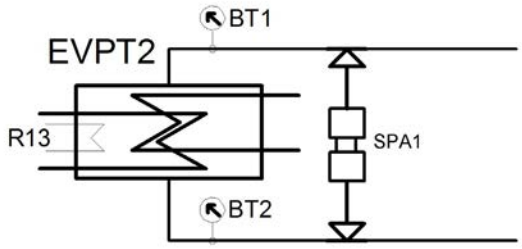
To the internal exchanger pressure drops must be added the pressure drops of the steel mesh mechanical filter that must be placed on the water input line. It is a device compulsory for the correct unit operation, and it is available as Clivet option (IFWX).

Admissible water flow rates

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

Grandezze		35.4	40.4	45.4	50.4	55.4	60.4
Qmin	[l/s]	2,7	2,9	3,3	3,8	4,3	4,3
Qmax	[l/s]	8,3	9,2	10,5	12,0	13,0	13,0

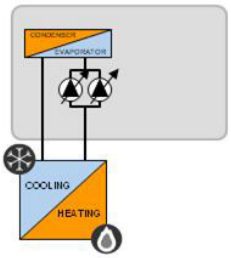
Water diagram



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)



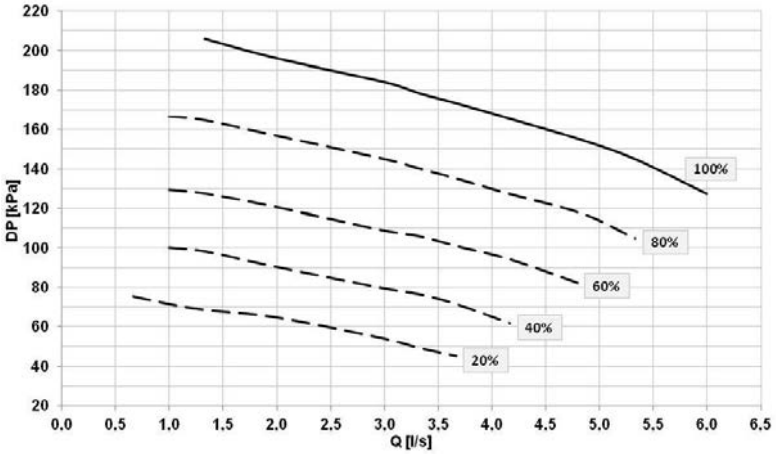
Configuration with 2 centrifugal electric pumps arranged in parallel and controlled by inverter, with housing and impeller made with AISI 304 stainless steel, and components as described on the water diagram key. All water fittings are Victaulic type.

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 35.4)

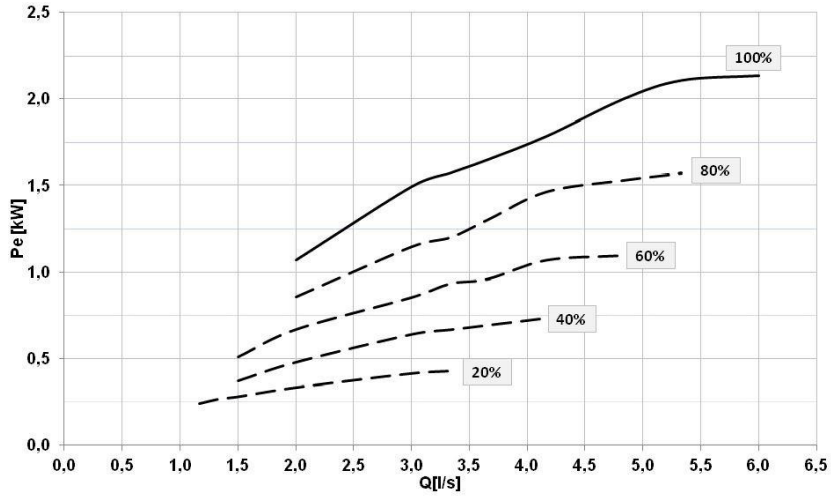


Q = Water flow rate [l/s]
DP = Pressure head [kPa]

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

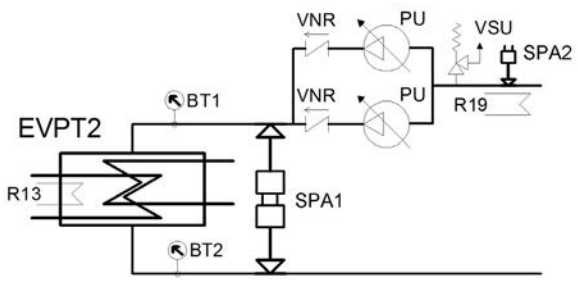
- User side exchanger pressure drops
- IFVX accessory –Steel mesh filter on the water side (where applicable)

Absorption curves VARYFLOW+ (Size 35.4)



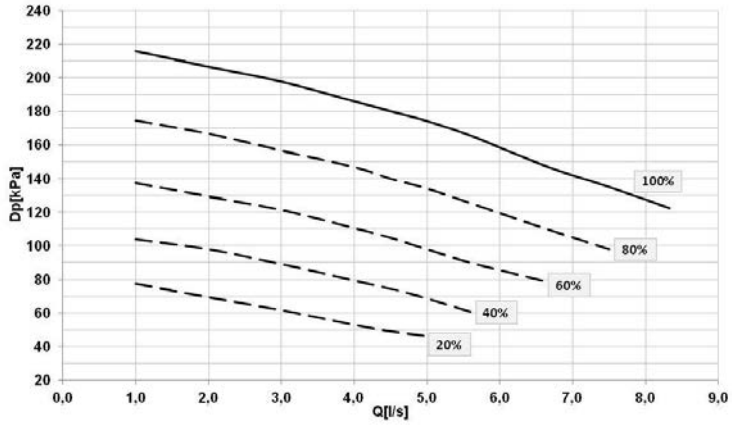
Q = Water flow rate [l/s]
Pe = Electric power consumption [kW]

Water diagram



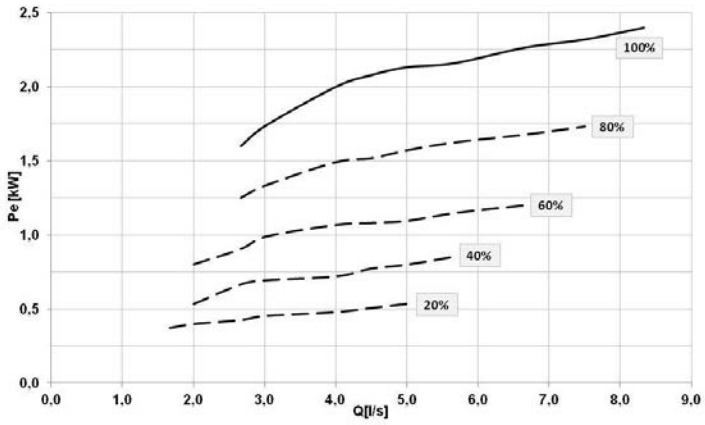
EVPT2 = Plate evaporator 2 circuits
R13 = Evaporator group heater
BT1 = Probes of entering water temperature
BT2 = Probes of leaving water temperature
VNR = Non return valves
SPA1 = Differential pressure switch water
PU = Hydronic assembly VARYFLOW +
VSU = Water safety valve
R19 = Hydronic assembly heaters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

Pressure head VARYFLOW+ (Size 40.4 - 50.4)



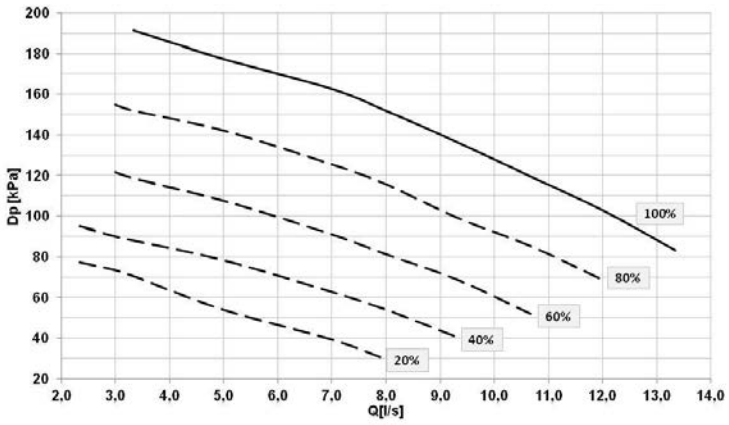
Q = Water flow rate [l/s]
DP = Pressure head [kPa]

Absorption curves VARYFLOW+ (Size 40.4 - 50.4)



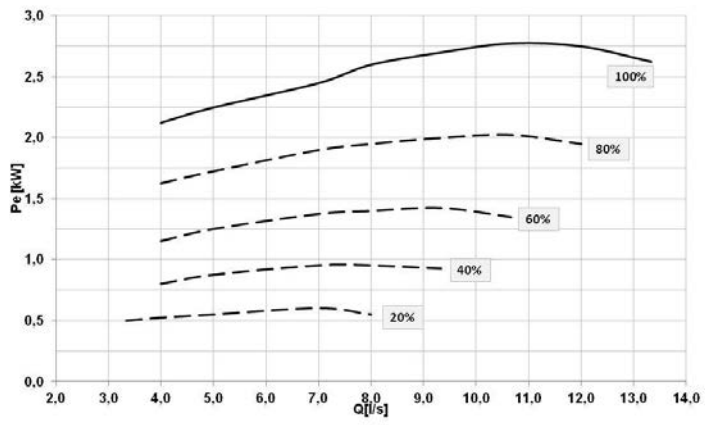
Q = Water flow rate [l/s]
Pe = Electric power consumption [kW]

Pressure head VARYFLOW+ (Size 55.4 - 60.4)



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

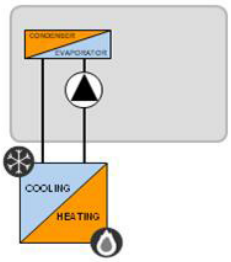
Absorption curves VARYFLOW+ (Size 55.4 - 60.4)



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

Hydronic assembly configuration 1.3

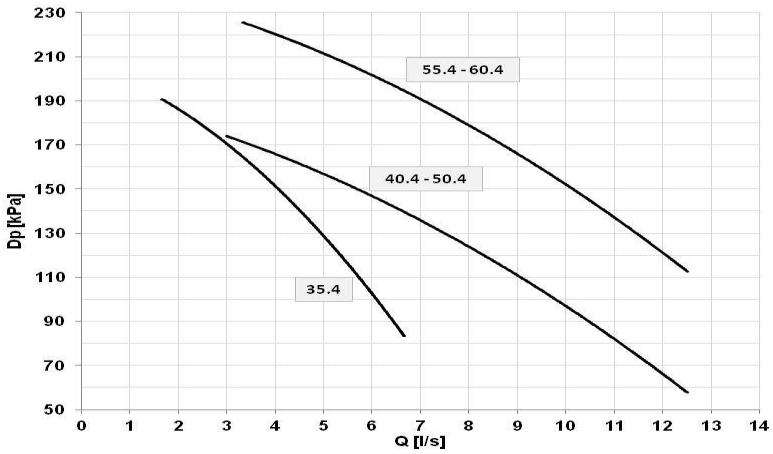
Unit with one ON/OFF pump (HYG1)



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 35.4 - 60.4)

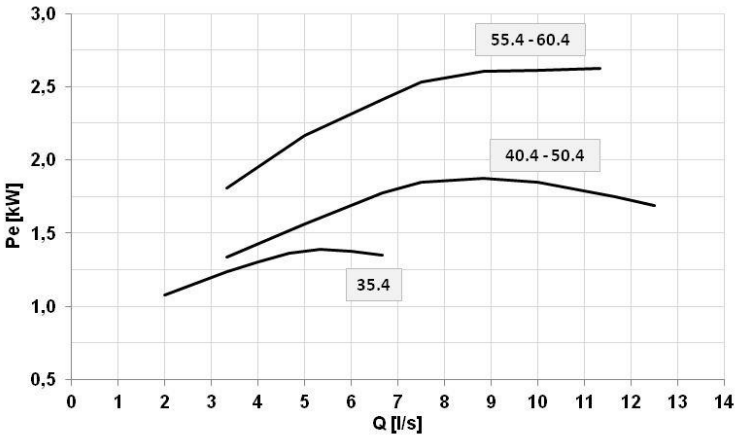


Q = Water flow rate [l/s]
DP = Pressure head [kPa]

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

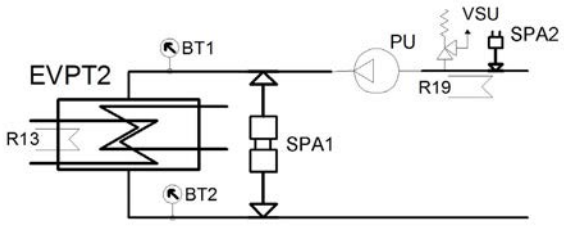
- User side exchanger pressure drops
- IFVX accessory –Steel mesh filter on the water side (where applicable)

ON/OFF pump absorption curves (Size 35.4 - 60.4)



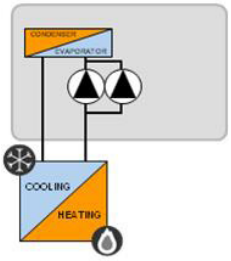
Q = Water flow rate [l/s]
Pe = Electric power consumption [kW]

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)

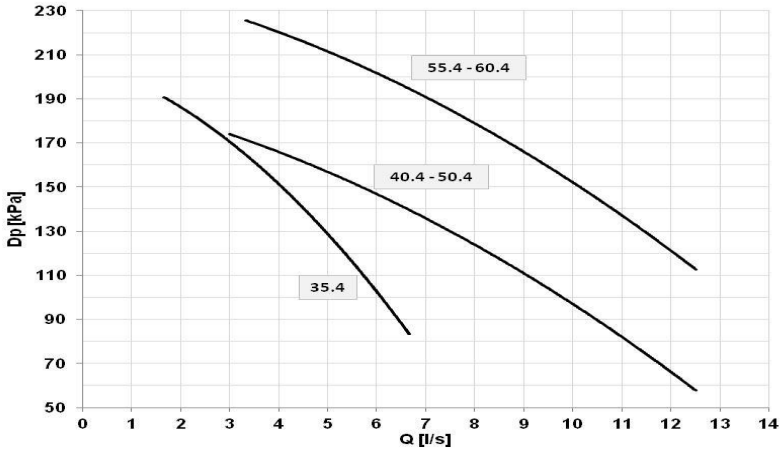
Configuration with 2 centrifugal electric pumps, 1 stand-by, with housing and impeller made with AISI 304 stainless steel, and components as described on the water diagram key.

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 35.4 - 60.4)

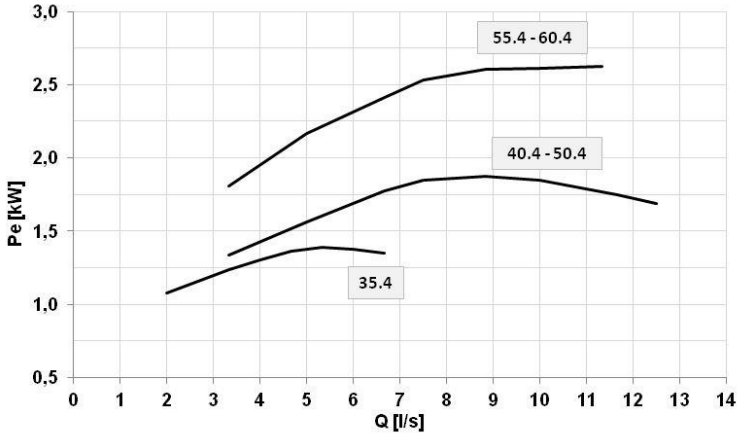


Q = Water flow rate [l/s]
DP = Pressure head [kPa]

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

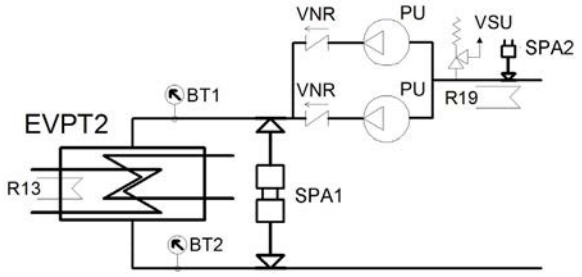
- User side exchanger pressure drops
- IFVX accessory –Steel mesh filter on the water side (where applicable)

ON/OFF pump absorption curves (Size 35.4 - 60.4)



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 2 ON/OFF pumps
VSU = Water safety valve
R19 = Hydronic assembly heaters
SPA2 = Installation load pressure switch

Configurations - Partial energy recovery (D)

Configuration with one recovery side brazed stainless steel (316 AISI) plate exchanger, and components per the legend of the enclosed plumbing circuit diagram. All water fittings are Victaulic type Ø 1 1/2".

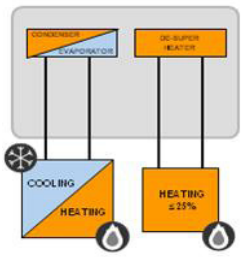
A configuration which enables the production of hot water free-of-charge while operating in the cooling mode, thanks to the partial recovery of condensation heat that would otherwise be rejected to the external heat source. It is possible to recovery about 20% of the unit rejected heating capacity equal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

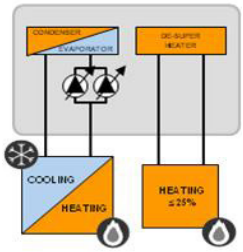
If cold water production is not requested, the unit can not produce hot water. The heating capacity request is made by the digital contact enabling, that activates the pump recovery side (outside the unit)

The partial energy recovery option (D) can be matched to the hydronic assemblies user side indicated in the previous pages according to the diagrams below.

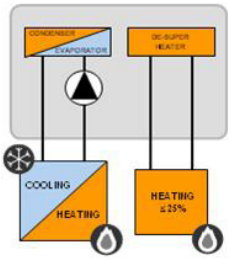
D



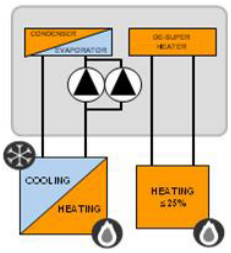
D+VARYP



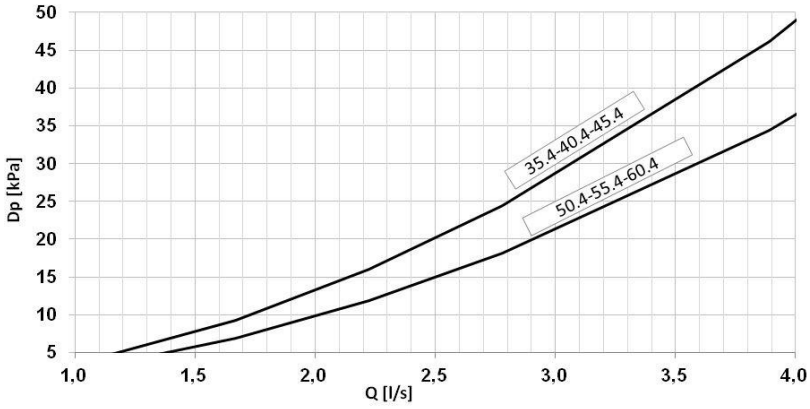
D+HYG1



D+HYG2



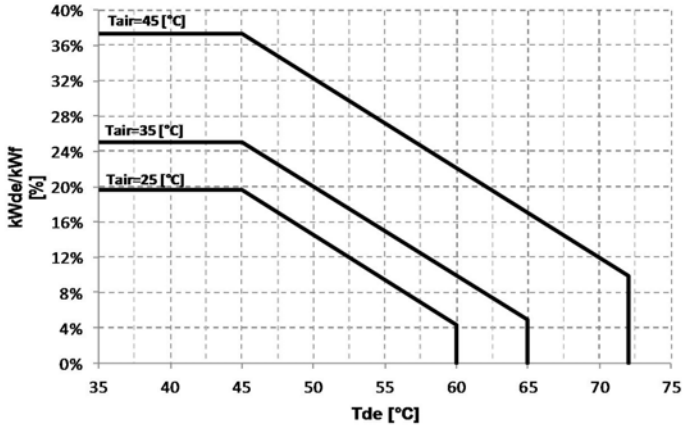
Partial energy recovery pressure drop curves



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

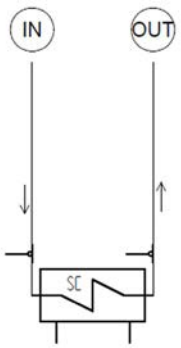
Q = Water flow rate [l/s]
DP = Pressure drops [kPa]

Partial recovery heating capacity



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

Water diagram



IN = Recovery side inlet
OUT = Recovery side outlet
SC = Plate heat exchangers

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 size 35.4 ÷ 60.4 the storage tank capacity is 300L.

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.

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.

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 the internal components of the unit, which are powered by an abnormal voltage, 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.

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.

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.

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 guages

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.

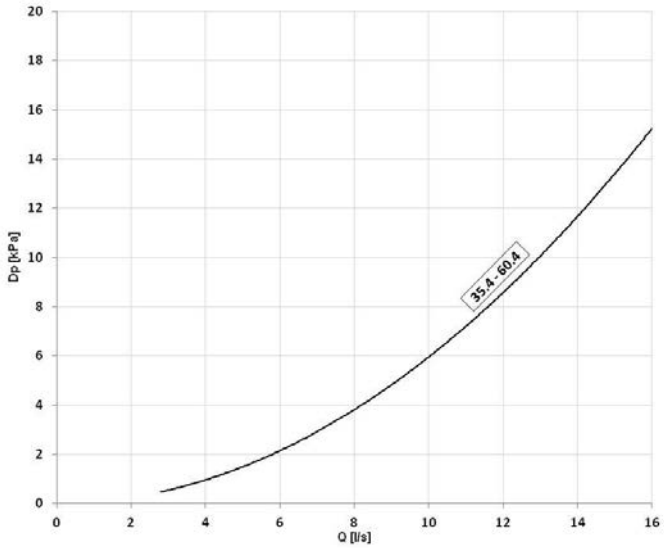
IFWX - Steel mesh strainer on the water side

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]

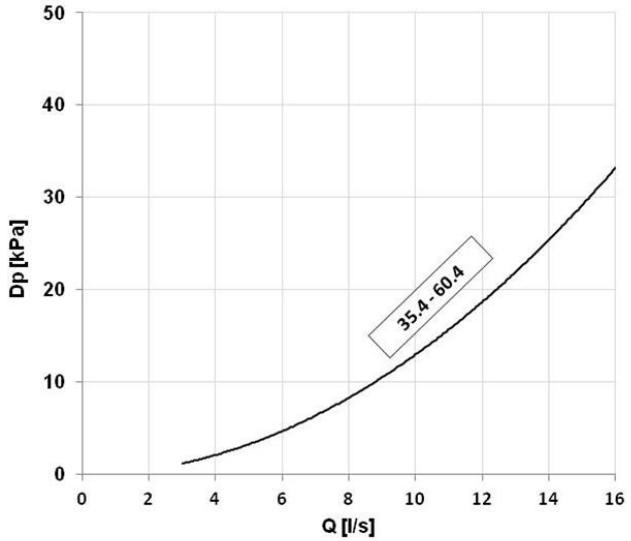
AVIBX - Anti-vibration mount support

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 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 35.4 to 60.4 the DHW switching valve is 3".
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]

Heating Performance

Size	Tae (°C) D.B/W.B.	Leaving internal exchanger water temperature (°C)													
		35		40		45		50		55		60		65*	
		kWt	kWe	kWt	kWe	kWt	kWe	kWt	kWe	kWt	kWe	kWt	kWe	kWt	kWe
35.4	-15 / -15.4	65,2	20,9	66,7	23,2	67,7	25,7	68,1	28,8	-	-	-	-	-	-
	-7 / -8	78,7	21,8	80,1	24,2	80,9	26,9	81,6	30,1	82,3	33,3	86,2	37,3	-	-
	-5 / -5.4	82,9	22,0	84,2	24,4	85,1	27,2	85,7	30,5	86,4	33,7	90,4	37,7	-	-
	0 / -1	92,1	22,5	93,2	25,0	94,2	27,8	94,7	31,2	95,2	34,6	99,6	38,6	102	41,8
	7 / 6	107	23,2	108	25,7	108	28,7	109	32,2	109	35,7	115	39,9	117	43,2
	15 / 12	126	23,8	126	26,4	126	29,4	125	33,0	125	36,6	132	41,0	135	44,3
40.4	-15 / -15.4	73,9	24,5	75,0	27,5	75,8	30,9	76,7	35,5	77,7	40,1	81,2	46,2	-	-
	-7 / -8	89,2	24,9	90,2	27,9	91,0	31,3	91,9	35,9	92,8	40,5	97,9	46,6	99,9	50,3
	-5 / -5.4	94,1	24,9	95,3	28,0	95,8	31,4	96,5	36,0	97,3	40,6	103	46,7	105	50,4
	0 / -1	104	25,0	106	28,1	106	31,6	107	36,2	107	40,8	113	46,9	115	50,7
	7 / 6	121	24,9	122	28,1	122	31,6	122	36,4	123	41,1	130	47,1	132	50,9
	15 / 12	141	24,4	141	27,7	140	31,5	140	36,3	141	41,2	149	47,2	152	51,0
45.4	-15 / -15.4	80,3	26,7	81,6	30,0	82,6	33,2	84,7	38,1	86,8	43,0	90,0	48,5	-	-
	-7 / -8	96,8	27,0	98,2	30,5	99,3	34,3	100	39,0	101	43,8	106	49,6	108	53,6
	-5 / -5.4	102	27,0	103	30,5	105	34,4	105	39,2	106	44,1	111	50,2	113	54,2
	0 / -1	113	27,0	115	30,6	115	34,6	116	39,6	117	44,6	123	50,9	125	55,0
	7 / 6	131	26,8	132	30,5	133	34,7	133	39,8	134	45,0	141	51,4	144	55,6
	15 / 12	153	26,5	153	30,1	153	34,4	153	39,7	153	45,0	162	51,7	165	55,9
50.4	-15 / -15.4	86,7	29,1	88,4	32,6	89,4	36,3	90,2	40,7	90,9	45,2	94,2	51,0	-	-
	-7 / -8	104	29,6	106	33,4	107	37,6	109	42,6	110	47,7	115	54,0	117	58,4
	-5 / -5.4	110	29,6	111	33,4	113	37,7	114	42,9	115	48,1	121	54,5	123	58,9
	0 / -1	121	29,5	123	33,5	124	38,0	126	43,5	127	48,9	134	55,7	137	60,2
	7 / 6	140	29,4	142	33,3	143	38,0	144	43,7	145	49,4	154	56,5	157	61,1
	15 / 12	163	29,3	164	33,1	164	37,8	164	43,7	165	49,6	175	56,9	178	61,5
55.4	-15 / -15.4	99,0	33,7	101	37,6	102	41,9	104	47,8	106	53,7	111	61,4	-	-
	-7 / -8	119	34,1	121	38,0	122	42,4	124	48,3	125	54,3	133	62,3	134	62,3
	-5 / -5.4	126	34,2	128	38,2	129	42,6	130	48,6	131	54,7	140	62,6	141	62,7
	0 / -1	140	34,6	141	38,6	142	43,1	143	49,3	144	55,4	154	63,5	156	63,6
	7 / 6	162	34,9	164	39,1	164	43,9	165	50,4	166	56,9	176	64,9	178	64,9
	15 / 12	189	34,9	190	39,4	189	44,6	190	51,5	191	58,3	204	66,7	206	66,8
60.4	-15 / -15.4	111	37,2	113	41,5	114	46,4	114	52,3	115	58,2	123	67,7	-	-
	-7 / -8	135	37,7	136	42,0	137	46,9	138	53,4	139	59,9	147	68,6	150	74,1
	-5 / -5.4	142	37,9	143	42,1	144	47,1	145	53,6	146	60,1	155	68,8	158	74,4
	0 / -1	158	38,2	159	42,5	159	47,4	160	54,0	161	60,7	170	69,3	174	75,0
	7 / 6	184	38,8	184	43,1	184	48,1	185	54,8	185	61,6	197	70,2	200	75,9
	15 / 12	216	39,6	215	43,8	213	49,0	213	55,8	213	62,6	228	71,4	232	77,2

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
* Performances in function of the entering/leaving water temperature differential = 7°C

Cooling Performance

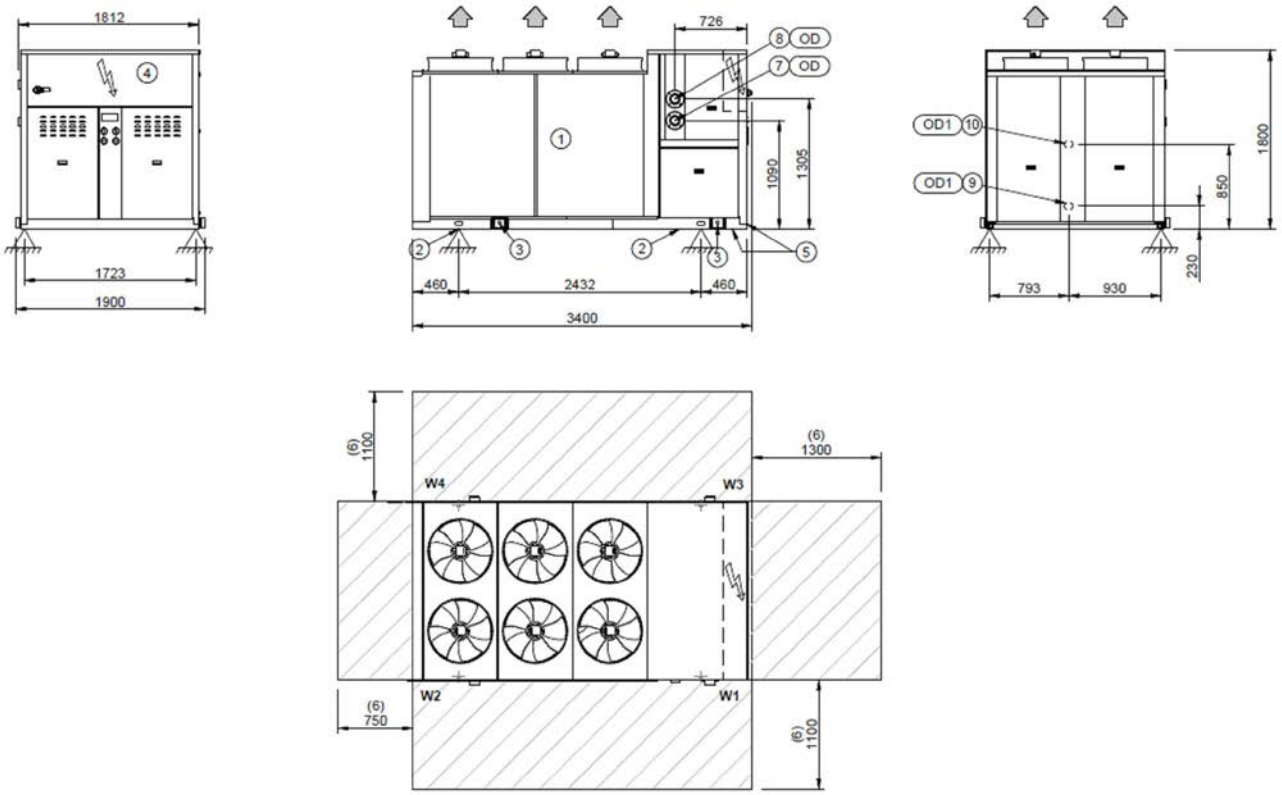
Size	To(°C)	Entering external exchanger air temperature (C°)											
		25		30		35		40		43		46	
		kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe	kWf	kWe
35.4	5	85,6	22,9	83,3	25,5	81,1	28,4	78,8	31,6	77,1	34,1	75,3	36,7
	7	90,3	23,3	88,1	25,9	86,1	28,5	83,3	32,5	81,4	34,9	79,6	37,3
	10	98,3	23,8	95,9	26,4	93,5	29,3	90,5	32,9	88,3	35,6	86,1	38,2
	12	104	24,0	101	26,7	98,5	29,9	95,3	33,2	92,9	36,0	90,5	38,8
	15	110	24,8	108	27,5	105	30,8	101	34,2	98,6	37,4	95,8	40,5
	18	118	25,3	115	28,4	112	31,4	108	35,3	106	38,1	103	40,8
40.4	5	99,7	24,8	96,7	28,3	93,2	32,1	89,6	36,6	86,5	40,5	83,4	44,5
	7	105	25,0	102	28,5	98,7	32,4	94,6	37,3	91,4	41,5	88,1	45,6
	10	113	25,4	109	28,8	106	33,0	101	38,0	98,2	41,9	95,0	45,9
	12	118	25,6	114	29,0	110	33,4	106	38,5	103	42,3	99,7	46,0
	15	126	25,7	122	29,5	118	33,7	114	39,0	109	43,9	104	48,9
	18	135	25,7	131	29,4	126	34,4	121	39,6	117	44,1	112	48,5
45.4	5	111	26,3	107	30,4	104	34,6	101	39,4	97,6	43,7	94,4	48,0
	7	117	26,3	114	30,4	110	34,4	106	39,9	103	43,9	100	47,9
	10	126	26,8	123	30,6	119	34,8	115	40,3	111	44,7	108	49,0
	12	132	27,0	129	30,7	125	35,0	121	40,5	117	45,2	113	49,8
	15	141	27,0	138	30,9	133	35,7	129	40,8	124	45,8	120	50,7
	18	150	27,3	146	31,1	142	35,8	137	41,5	132	46,5	127	51,4
50.4	5	118	29,6	115	33,8	112	38,5	109	44,0	105	48,8	102	53,6
	7	125	29,7	122	34,1	118	38,3	115	44,4	111	48,9	108	53,5
	10	135	30,1	132	34,3	128	39,0	123	45,2	120	49,9	116	54,7
	12	142	30,4	138	34,4	134	39,4	129	45,7	126	50,6	122	55,5
	15	151	31,2	147	35,2	143	39,9	138	46,4	132	52,8	127	59,1
	18	160	31,8	156	36,2	152	41,0	147	47,0	141	52,9	136	58,8
55.4	5	131	33,8	128	38,4	125	43,3	121	49,0	118	54,1	114	59,1
	7	138	34,3	135	38,8	132	44,4	127	50,4	124	55,8	120	61,3
	10	148	34,6	145	39,3	141	44,8	136	51,3	133	56,4	129	61,6
	12	155	34,7	152	39,6	147	45,1	142	51,9	139	56,9	135	61,8
	15	165	35,4	161	40,4	157	46,4	152	52,7	147	58,7	142	64,8
	18	177	35,7	172	41,4	168	47,0	162	54,5	157	60,6	152	66,6
60.4	5	150	37,9	146	42,4	141	48,0	137	54,1	134	59,0	130	64,0
	7	159	38,6	155	43,0	150	48,7	145	54,8	141	60,5	137	66,1
	10	170	39,1	165	43,8	161	49,5	156	55,7	151	61,5	147	67,3
	12	177	39,5	172	44,4	168	50,0	162	56,3	158	62,2	153	68,1
	15	189	40,5	184	45,2	179	50,9	173	57,9	169	63,6	164	69,2
	18	202	41,8	197	46,5	192	52,6	186	59,0	180	66,4	173	73,8

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 drawings

Size 35.4 - 40.4 - 45.4 - 50.4

DAAL 535.4_50.4 _0 REV00
Data/Date 31/07/2015



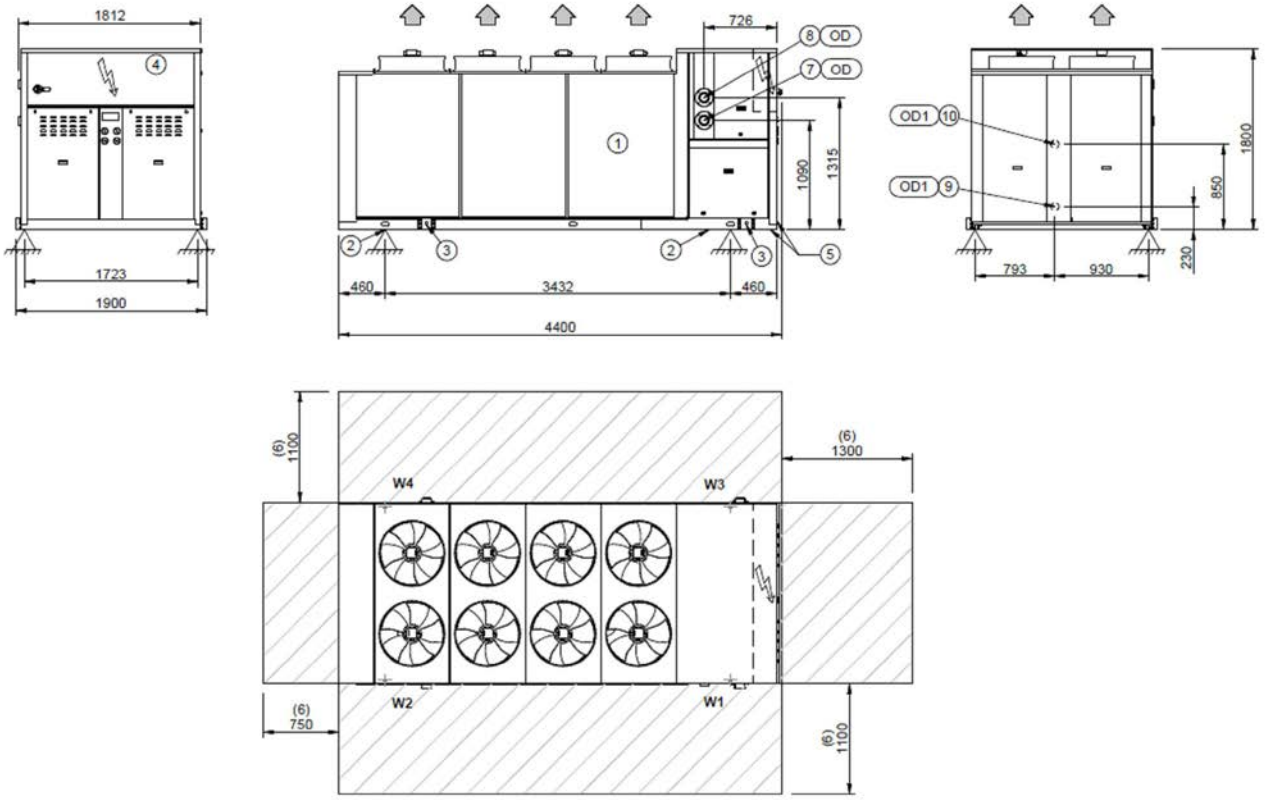
1) External exchanger
2) Unit fixing holes Ø 25
3) Lifting brackets (Removable)
4) Electrical panel
5) Power input
6) Clearance access recommended
7) Water inlet user side of no pumps unit / Water inlet user side of unit with pumps (optional) Ø 3"
8) Water outlet user side of no pumps unit / Water outlet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

Size		35.4	40.4	45.4	50.4
Length	mm	3400	3400	3400	3400
Height	mm	1800	1800	1800	1800
Depth	mm	1812	1812	1812	1812
W1 Support point	kg	472	521	529	531
W2 Support point	kg	167	184	187	187
W3 Support point	kg	500	552	561	563
W4 Support point	kg	177	195	198	199
Operation weight	kg	1285	1418	1441	1444
Shipping weight	kg	1315	1451	1475	1479

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

Size 55.4 - 60.4

DAAL 555.4_60.4 _0 REV00
Data/Date 31/07/2015



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 inlet user side of unit with pumps (optional) Ø 3"
8) Water outlet user side of no pumps unit / Water outlet user side of unit with pumps (optional) Ø 3"
9) Recovery side exchanger water inlet (optional) Ø 1 1/2"
10) Recovery side exchanger water outlet (optional) Ø 1 1/2"

Size		55.4	60.4
Length	mm	4400	4400
Height	mm	1800	1800
Depth	mm	1812	1812
W1 Support point	kg	593	595
W2 Support point	kg	228	229
W3 Support point	kg	686	687
W4 Support point	kg	264	264
Operation weight	kg	1735	1739
Shipping weight	kg	1772	1776

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

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