

Centrifugal Chiller

WCH-i 250-550 SERIES

Water Cooled Liquid Chillers for indoor installation



Size	250	300	350	400	450	500	550
Cooling capacity kW	879	1055	1231	1406	1582	1758	1934

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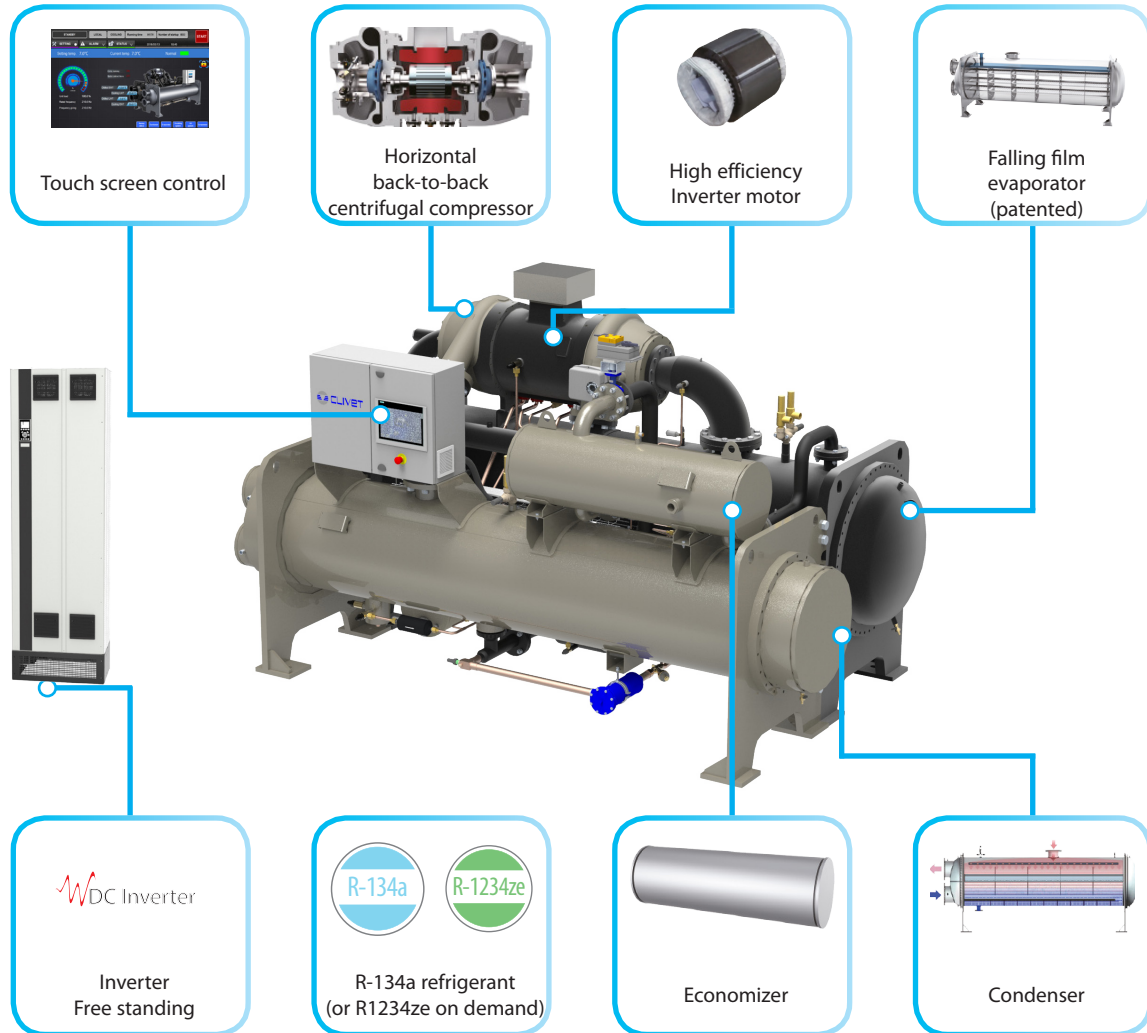
Clivet is taking part in the EUROVENT certification programme up to 1.500 kW. The products concerned appear in the certified products list of the EUROVENT www.eurovent-certification.com site.

Features and benefits

Technology

Liquid chillers with WCH-i centrifugal compressors are high efficiency units for large-sized applications in the commercial and industrial sector. Designed for indoor installation, they ensure the highest energy efficiency over the entire operating cycle.

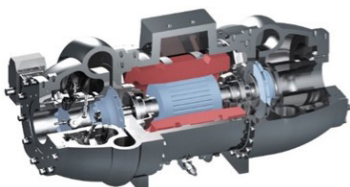
WCH-i Inverter centrifugal chillers are available from 880 up to 1934 kW with refrigerant R-134a. HFO-1234ze refrigerant is available on demand.



Horizontal back-to-back centrifugal compressor

7 patented technologies adopted:

- Horizontally back-to-back self-balanced impeller
- Keyless joint system thanks to a profile connection between impeller and shaft
- Inlet guide vane regulating mechanism with rolling element
- Integration design of thrust plate and rotation axis
- Wire leading device and motor equipped with wire leading
- A centrifugal chiller inlet guide vane correcting algorithm
- Gas-inlet regulation mechanism and centrifugal compressor with this mechanism



Inverter free standing

The use of inverter technology allows to adapt the rotation speed of the compressor to the real demand of the plant:

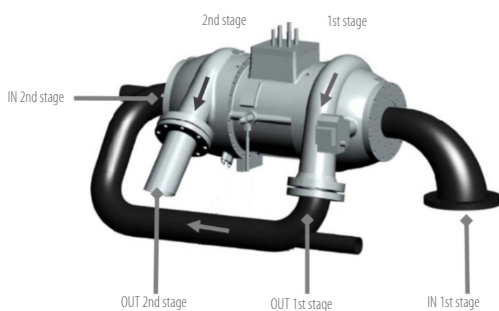
- Capacity control from 100% to 15%
- SEER up to 9,06
- Zero in-rush current
- Management of compressor working conditions



Features and benefits

Double compression stage

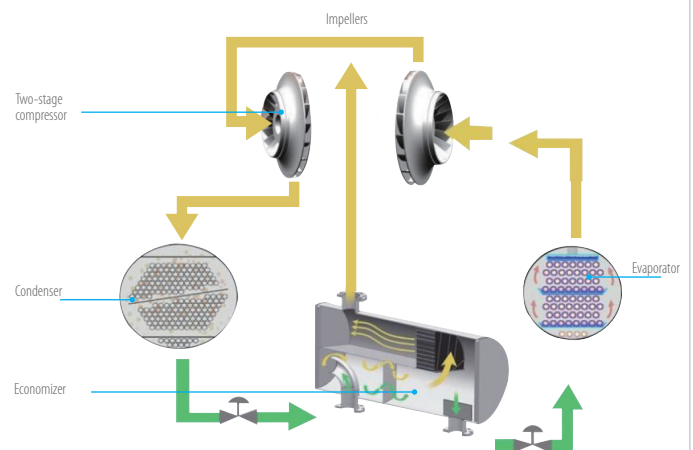
- The technology of two-stage compression with economizer fully demonstrates the advantage of aerodynamic design and brings higher efficiency to the system.
- Unique pipeline crossover, with large backflow radius to reduce flow losses and noise.



Economizer

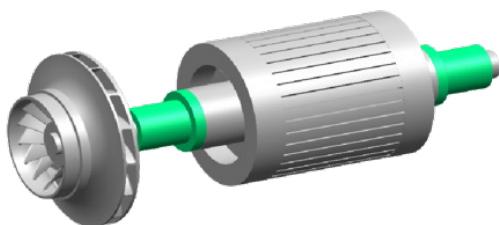
The economizer, supplied as standard, improves the efficiency of the compression and expansion process:

- 6% higher efficiency than single-stage compression.
- The compression ratio is equally divided between the two impellers, reducing the speed of rotation by 40% and increasing reliability.
- Unique three-stage separation economizer, reliable and effective.



Direct drive motor coupling

- 2 bearings instead of 4 = More compact structure and smaller size
- No gear losses
- Lower noise level

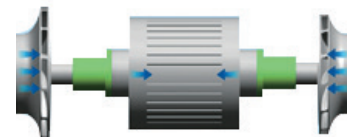


Accoppiamento Diretto albero motore

Horizontally back-to-back compression technology

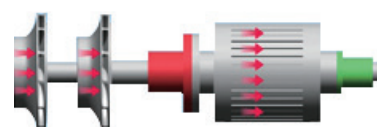
Clivet horizontally back-to-back impeller

- Clivet developed the patented horizontally back-to-back compression technology.
- Balance the thrust forces for longer life span and improved efficiency by less seal leakage and no gear loss.



Traditional serial impeller

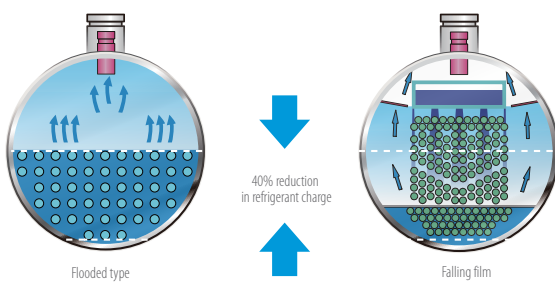
- The traditional two-stage centrifugal impellers are arranged in serial to the same direction, and the axial forces on the two impellers are from the same direction and overlapped.
- More stress on thrust bearing, cause mechanical damage, and require higher reliability of bearing.



Features and benefits

Falling film evaporator

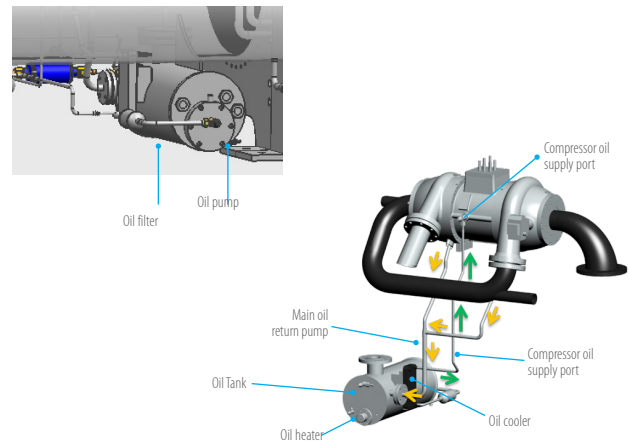
- The Falling Film evaporator is distinguished by the patented refrigerant distributor, which injects from above a spray refrigerant. The surface of the heat exchange tubes, in which water circulates, is completely covered by a film of refrigerant, greatly increasing the efficiency of the heat exchange and reducing the refrigerating charge up to 40% compared to a flooded evaporator.
- The high heat exchange efficiency and the low superheat allow an evaporation temperature very close to the supply water temperature, increasing the overall efficiency of the unit.



Oil circulation system

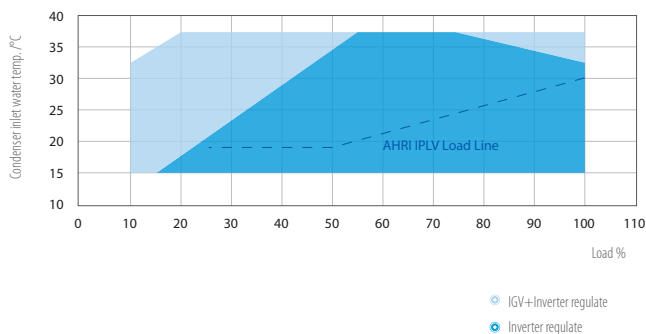
It guarantees the optimal lubrication of the bearing and prevents oil circulation through the refrigerant circuit. This leads to:

- Higher exchange efficiency at evaporator and condenser
- Improved compressor reliability



Wider operation map

Capacity load from 100% to 15% and condenser leaving water temperature up to 40°C are able to satisfy the requirement of multiple operating conditions.



Compliant with LOT21 (TIER2) requirements

The cutting-edge technologies patented by Clivet comply with the ErP Regulation and also exceed 40% the minimum requirements of the European Directive 2281:2016.

The seasonal efficiency values achieved, SEER up to 9,06, make the WCH-i inverter centrifugal chillers already compliant with the increased efficiency levels required in 2021.



Perfect for LEED

Falling-film technology reduces refrigerant charge by up to 40%, which enables you to qualify for maximum Leadership in Energy and Environmental Design (LEED) points for Enhanced Refrigerant Management. And with the chiller's high efficiency, you can also earn additional points for credits from Optimized Energy Performance (EAc1).



Unit technical characteristics

Compressor

Double stage semi-hermetic compressor with double propeller. The compressor motor is activated directly by the inverter at a speed between 13000-18000 rev / min. The rotor is made of a transmission shaft in highly resistant heat treated steel alloy. The compressor is equipped with completely coated highly resistant aluminium alloy propellers. The two closed type opposing propellers are designed to balance the axial thrust, they are dynamically balanced and tested at high speed for regular operation without vibrations. At the entrance of the first impeller is the IGV (inlet guide vane), a system of variable inclination paddles that modifies the flow upon changing the rotation speed and increases efficiency with partial unit load. IGV movement is controlled by an electrical actuator that follows the cooling load on the evaporator. The compressor motor is cooled by the circulating refrigerant, the incorporated sensors supply active thermal protection to the motor. Thanks to the refrigerant cooling, it avoids heat transmission to the mechanical part of the compressor, reducing mechanical stress and vibrations. The compressor is capable of modulating capacity from 100% to 15% in order to maintain the temperature of the water exiting the usage side constant

Inverter

Air-cooled inverter for indoor installation and 400V three-phase power supply, supplied separately and to be installed by the customer.

The inverter is equipped with:

- cooling system with forced ventilation
- user interface on board
- protection fuses
- terminal block for connection of input and output power cables
- terminal block for connecting communication cables to the unit
- over-current and over-voltage protection
- phase sequence control
- entry for emergency stop (connected to the emergency button on the unit)

Lubrication system

The lubrication system is made of the following: an oil accumulation external to the compressor, a volumetric oil pump, an oil cooling exchanger with brazed plates collected to an oil circulation line.

The following components are also included: High efficiency oil filters; Protection in case of low oil pressure; Oil heater (with incorporated thermostat); Oil level indicator; Oil pressure control with pressure gauges and thermometer, pressure transducer and temperature probe.

Evaporator

Falling film exchanger. The exchanger is made of a carbon steel sleeve. The tubes, still anchored to the tubular plate with a mechanical tube expansion, are copper, highly efficient, internally and externally striped in order to optimise thermal exchange. It is also complete with differential pressure switch protecting the water side and coating of closed cell heat insulating material, which keeps condensation from forming and heat exchange with the outside. Removable heads to allow cleaning and maintenance of the exchanger. Maximum operating pressure of the water side of the exchanger: 10 bar. Quick coupling hydraulic connection with grooved joint.

Condenser

Highly efficient shell and tube exchanger. The exchanger is made of a carbon steel sleeve. The tubes, still anchored to the tubular plate with a mechanical tube expansion, are copper, highly efficient, internally and externally striped in order to optimise thermal exchange. It is also complete with differential pressure switch protecting the water side. Removable heads to allow cleaning and maintenance of the exchanger. Maximum operating pressure of the water side of the exchanger: 10 bar. Quick coupling hydraulic connection with grooved joint.

Refrigerant circuit

Refrigerant circuit made of steel and copper, welded, brazed and factory

assembled, complete with:

- metal mesh filter complete with connection for quick refrigerant charge;
- high and low pressure transducer ;
- Refrigerant temperature probe;
- electronic expansion valve;
- high pressure side safety valve (double safety valve with exchange shut-off valve);
- low pressure side safety valve (double safety valve with exchange shut-off valve);
- liquid line cutoff valve ;
- intake piping thermally insulated using highly flexible closed cell elastomer insulating material ;
- economiser with butterfly valve flow adjustment ;
- auxiliary lines for cooling the motor and oil recovery ;

The refrigerant circuit is pressure tested to check for leaks and supplied complete with the refrigerant gas charge

Electrical panel

Entirely manufactured and wired in conformity to the EN 60204 standard and equipped with microprocessor control (PLC).

A touch screen graphical display is included through which it is possible to monitor all operational data and set parameters for machine adjustment.

The capacity section includes:

- terminals main power (400V/3Ph/50Hz);
- trasformatore di isolamento per l'alimentazione del circuito ausiliario (230V/24V);

The control section includes:

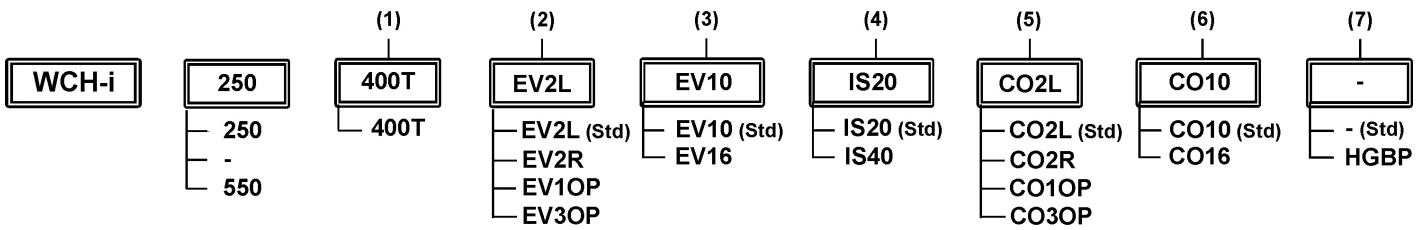
- display of water inlet/outlet temperatures on the use side and source side;
- display of refrigerant pressures and corresponding saturation temperatures in the refrigerant circuit;
- display of oil pressure in the lubrication system ;
- display of set values, malfunction codes and parameter index
- proportional-full-derivative adjustment of water temperature
- unit switching on management by local or remote;
- ON/OFF controls and alarms reset;
- daily, weekly program for unit start-up or shut-off
- water side anti-freeze protection;
- compressor protection and timer;
- self-diagnosis system immediately displaying the malfunction code;
- current display of the motor, operational hours, number of compressor start-ups;
- remote ON/OFF control ;
- relay for remoting of cumulative alarm signal ;
- display of refrigerant flow adjustment (IGV) valve position;
- customer terminal block ;
- terminal block for connection to the remote inverter;
- serial communication module for supervisor Modbus;
- Clivet eye.

All electrical cables are coloured and numbered in conformity with the electrical diagram

Testing

Unit subject to factory functional testing at the end of the production line and seal testing under pressure of refrigerant circuit piping (with nitrogen and hydrogen), before shipment. After testing, the content of humidity present is checked in order to ensure the respect of limits set by the manufacturer for various components.

Unit configuration



(1) Supply voltage

400T - Supply voltage 400/3/50 (standard)

(2) Evaporator

EV2L - Two-pass evaporator and left connections (standard)

EV2R - Two-pass evaporator and right connections

EV10P - One-pass evaporator and opposing connections

EV30P - Three-pass evaporator and opposing connections

(3) Evaporator water pressure

EV10 - Evaporator water pressure 10 bar (standard)

EV16 - Evaporator water pressure 16 bar

(4) Evaporator insulation

IS20 - IS20 - 20 mm thickness insulation for evaporator (standard)

IS40 - 40 mm thickness insulation for evaporator

(5) Condenser

CO2L - Two pass condenser and left connections (standard)

CO2R - Two pass condenser and right connections

CO10P - One pass condenser and opposing connections

CO30P - Three pass condenser and opposing connections

(6) Condenser water pressure

CO10 - Condenser water pressure 10 bar (standard)

CO16 - Condenser water pressure 16 bar

(7) Hot gas by pass

(-) not required (standard)

HGBP - Hot gas by pass

Built-in options

Accessory		Description
EV2R	Two-pass evaporator and right-hand fittings	Falling film exchanger. Complete with differential pressure switch protecting the water side and coating of closed cell with a thickness of 20mm. Removable heads to allow cleaning and maintenance of the exchanger. Maximum operating pressure of the water side of the exchanger: 10 bar. Quick coupling hydraulic connection with grooved joint with exits to the right of the control panel.
EV10P	One-pass evaporator and opposing connections	Falling film exchanger. In case the project evaporator flow is higher than the nominal standard unit flow (i.e. delta T between input and output < 4K), you must use a single pass evaporator on the water side. In this configuration the input connection of the water will be in the standard location (left hovering in front of the control panel) while the output will be on the other side.
EV30P	Three-pass evaporator and opposing connections	Falling film exchanger. In case the project evaporator flow is below than the nominal standard unit flow (>7K delta T between input and output), you must use a three pass evaporator on the water side. In this configuration the input connection of the water will be in the standard location (left hovering in front of the control panel) while the output will be on the other side.
CO2R	Two pass condenser and right-hand fittings	Highly efficient shell and tube exchanger. Complete with differential pressure switch protecting the water side. Removable heads to allow cleaning and maintenance of the exchanger. Maximum operating pressure of the water side of the exchanger: 10 bar. Quick coupling hydraulic connection with grooved joint, with exits to the right of the control panel.
CO10P	One pass condenser and opposing connections	Highly efficient shell and tube exchanger. In case the project condenser flow is higher than the nominal standard unit flow (<4K delta T between input and output), you must use a single pass condenser on the water side. In this configuration the input connection of the water will be in the standard location (left hovering in front of the control panel) while the output will be on the other side.
CO30P	Three pass condenser and opposing connections	Highly efficient shell and tube exchanger. In case the project condenser flow is below than the nominal standard unit flow (>7K delta T between input and output), you must use a three steps condenser on the water side. In this configuration the input connection of the water will be in the standard location (left hovering in front of the control panel) while the output will be on the other side.
HGBP	Hot gas by pass	The unit is supplied with a motorised ball valve installed on board. The valve is positioned on the refrigerant side between condenser and evaporator, and its function is to bypass part of the refrigerant, in case a partialisation of the capacity, below the one allowed by the standard unit, is requested. It also provides additional protection against surges, in case the temperature of the condensation water is beyond the operating limits !! Surge is a situation of operating instability, it happens when there is high pressure ratio and low speed. Refrigerant flow through impeller is interrupted and comes back to the suction.

Built-in options

Accessory		Description
EV16	Evaporator water pressure 16 bar	Falling film evaporator sized for a maximum operating pressure water side of 16 bar.
IS40	Isolation for evaporator with thickness 40 mm	Increased evaporator insulation with thickness of 40 mm. Ideal solution in case of water production at low temperatures (< 5°C) or for conditions of high air temperature and high humidity.
CO16	Condenser water pressure 16 bar	Shell and tube condenser sized for a maximum operating pressure water side of 16 bar.
CSIC	Shielded cables for connection between inverter and compressor length 4.5 meters	If the inverter is installed near the unit, Clivet can supply a cable kit for the connection between inverter and compressor. The cables are shielded, 4.5 meters long and already equipped with terminals to allow connection of the compressor to the inverter. They are sized for the specific application, considering the characteristics of the inverter and the electric motor of the compressor and for an ambient temperature below 45°C. The cables are sent already connected to the terminals in the electrical termination box of the compressor. The connection to the inverter must be made on site after its placement, by the Customer.

Options separately supplied (installation by customer)

Accessory		Description
AMRX	Rubber antivibration mounts	<p>Mat in thermoplastic elastomer composed of 4 inner layers. Hardness 45 ShA, thickness 37.5 mm.</p> <p>Thermoplastic Elastomer is ideal for temperature range -45° C to 110° C</p> <p>It has a high resistance to aging, pollutants, hydrocarbons, saline mists, UV rays and detergents and is composed of recyclable material.</p> <p>High degree of thermal and electrical insulation.</p>
AMMX	Anti-vibration mount support	<p>The spring antivibration mounts must be fixed to the heat exchanger support plates are used to dampen the vibrations produced by the unit by reducing the noise transmitted to the structures. They consist of:</p> <p>n° 7 springs in harmonic steel UNI EN 10270-1 SH with surface protected by cathaphoretic treatment.</p> <p>n° 2 "plate" containment bodies made of 5 mm thick galvanized steel plates, coated with thermoplastic with high mechanical resistance, injection molded. The contact surfaces of the plates have deformable non-slip reliefs, which allow the anti-vibration mount to stand for friction. The springs are fixed with a special adhesive in the relative seats provided on the plates.</p> <p>N° 1 galvanized steel screw jack to record the level of suspended machine in various points of support.</p>
AMMSX	Anti-seismic spring antivibration mounts	<p>The anti-seismic spring antivibration mounts be secured to the support plates of the exchangers. The containment structure is designed to ensure high resistance to multi-directional forces acting on the surface of the suspended unit in case of earthquakes. They consist of:</p> <p>n° 4 springs in harmonic steel UNI EN 10270-1 SH with surface protected by cathaphoretic treatment</p> <p>n° 8 nylon discs that block the spring to the structure and prevent metal contact</p> <p>n° 2 rubber side seals to prevent metallic contact between base and cover insulation and ensure continuity even in the presence of axial thrusts</p> <p>n° 2 TCEI M16 side safety screws, to lock the cover to the base guides and prevent the spring from coming out</p> <p>n° 1 screw and nut M24 1 to record the fee of the suspended machine</p> <p>n° 1 intermediate plate to evenly distribute the load on the springs</p> <p>n° 1 base and 1 cover made of sandblasted Fe420 steel, protected by cathaphoretic treatment and epoxy powder coated</p> <p>n° 1 neoprene pad applied to the base, which features deformable slip, allowing the vibration station by friction</p>
2VBYX	ON/OFF motorized by-pass valve	<p>The by-pass valve is supplied separately and must be installed between the water inlet and outlet on the condenser side. If the source water temperature falls below the operating limits (<19° C in input) it is possible to use the by-pass valve to reduce the effective water flow to the condenser by raising the pressure of condensation and keeping the unit running.</p>
QSGX	Panel with main switch: supplied separately	<p>Since the inverter chiller unit consists of two separate power supplies (on-board electrical panel and inverter), it is necessary to provide a main switch to allow the interruption of the power supply to the whole system.</p> <p>Clivet can provide an electrical panel with main switch specially designed according to the power consumption of the unit.</p> <p>This panel is supplied separately and must be installed on site by the Customer.</p>
CCSQX	Connection cables from Panel with main switch (QSGX) to the inverter and Panel Unit	<p>If the QSGX option is selected (Panel with main switch), Clivet can supply a cable kit for connecting the main switch to the inverter and to the unit electrical panel.</p> <p>The cables are specially designed according to the absorption characteristics of the electrical panel and the inverters are equipped with terminals and are of sufficient length to allow the positioning of main switch at the side of the inverter.</p> <p>The connection cables kit also includes a steel support for positioning the main switch..</p>

General technical data

Performance

Size			250	300	350	400	450	500	550
Cooling									
Cooling capacity	(1)	kW	879	1055	1231	1407	1582	1758	1934
Compressor power input	(1)	kW	149	173	202	222	245	274	307
Total power input	(2)	kW	151	175	204	223	246	275	308
EER	(1)	-	5,84	6,04	6,04	6,30	6,43	6,39	6,28
Water flow-rate user side/cold	(1)	l/s	42,0	50,4	58,8	67,2	75,6	84,0	92,4
User side pressure drop/cold	(1)	kPa	53	52	53	53	52	45	52
Water flow-rate source side/hot	(1)	l/s	49,1	58,7	68,5	77,8	87,3	97,1	107
Source side pressure drop/hot	(1)	kPa	51	51	52	52	50	51	47
Cooling capacity (EN14511:2013)	(3)	kW	876	1051	1227	1402	1577	1752	1927
Total power input (EN 14511:2013)	(3)	kW	157	183	213	234	257	288	322
EER (EN 14511:2013)	(3)	-	5,56	5,75	5,76	6,00	6,13	6,09	5,99
SEER	(4)	-	7,66	7,99	8,36	8,82	8,97	9,01	9,06
SEPR	(5)	-	8,73	8,74	9,18	10,8	10,7	9,83	9,70
Cooling capacity (AHRI 550/590)	(6)	kW	879	1055	1231	1407	1582	1758	1934
Total power input (AHRI 550/590)	(6)	kW	152	176	206	224	247	277	310
COP _R	(6)	-	5,79	6,00	5,98	6,27	6,40	6,36	6,24
IPLV	(6)	-	8,50	9,01	9,32	10,5	10,6	10,59	10,69

The Product is compliant with the Erp (Energy Related Products) European Directive. It includes the Commission delegated Regulation (EU) No 2016/2281, also known as Ecodesign LOT21

Data referred to the following conditions:

1. Evaporator water temperature = 12/7 °C. Condenser water temperature = 30/35 °C. Evaporator fouling factor = $0.44 \times 10^{(-4)} \text{ m}^2 \text{ K/W}$
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 calculated in conformity to the EN 14511:2013 Standard and referring to the following conditions: Evaporator water temperature = 12/7 °C. Condenser water temperature = 30/35 °C
4. Data calculated in compliance with Standard EN 14825:2016
5. Data calculated in compliance with Standard EU 2016/2281
6. Data compliant to Standard AHRI 550/590 referred to the following conditions: Evaporator water temperature = 12,22 °C/ 6,7 °C. Water flow-rate 0,043 l/s per kW. Condenser water temperature 29,44 °C/34,61 °C. Evaporator fouling factor = $0.18 \times 10^{(-4)} \text{ m}^2 \text{ K/W}$

Electrical data

Supply voltage 400/3/50+N

Size			250	300	350	400	450	500	550
F.L.A. Full load current at max admissible conditions									
F.L.A. - Total		[A]	291	339	398	462	508	563	630
F.L.I. Full load power input at max admissible conditions									
F.L.I. - Total		[A]	177,9	207,3	243,3	282,5	310,6	344,2	385,2
M.I.C. Maximum inrush current									
M.I.C. - Value		[A]	291	339	398	462	508	563	630

Maximum Phase Unbalance: 2%.

Power supply: 400/3/50 Hz +/-10%

Electrical data refer to standard units; according to the installed accessories, the data can suffer light variations.

General technical data

Construction

Size		250	300	350	400	450	500	550	
Compressor									
Compressor type	(1)								CFGi
Refrigerant									R-134a
N° compressor		Nr							1
Nominal capacity		HP	268	268	322	375	422	422	469
Std capacity steps	(2)		15%-100%	15%-100%	15%-100%	15%-100%	15%-100%	15%-100%	15%-100%
Oil charge		l	40	40	40	40	40	40	40
Refrigerant charge		kg	210	225	225	310	330	360	370
Refrigerant circuits		Nr							1
Internal exchanger / Evaporator									
Type of exchanger	(3)								FF
N° of exchanger		Nr							1
Water content		l	240	270	300	370	400	450	450
Minimum system water content		l	5100	6100	7100	8100	9100	10100	11100
External exchanger/ Condenser									
Type of exchanger	(4)								S&T
N° exchangers		Nr							1
Water content		l	275	360	399	362	323	349	349
Connections									
Evaporator water connections		-	8"	8"	8"	10"	10"	10"	10"
Condenser water connections		-	8"	8"	8"	10"	10"	10"	10"
Power supply									
Standard power supply		V	400/3/50	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 2016/2281, also known as Ecodesign LOT21

1. CFGi = Centrifugal compressor regulated by inverter
2. Modulation refers to the conditions: Evaporator water temperature = 12/7°C, condenser water temperature = 30/35°C, with option HGBP.
3. FF = falling film exchanger
4. S&T = shell and tube exchanger

Sound levels

Size	Sound power level								Sound pressure level dB(A)	Sound power level dB(A)
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000		
250	78	81	82	82	83	91	97	84	80	99
300	79	79	83	84	85	93	96	85	80	99
350	80	87	85	87	88	92	97	84	80	99
400	78	81	82	81	83	91	97	84	80	99
450	79	78	82	84	84	92	96	84	80	99
500	80	87	85	87	88	92	97	84	80	100
550	81	87	85	88	89	92	97	85	81	100

Sound levels refer to full load units, in test nominal conditions. The sound pressure level refers to 1 m. from the standard unit outer surface operating in open field. Measurements are carried out according to the UNI EN ISO 9614-2 standard, in compliance with the EUROVENT 8/1 certification. Data referred to the following conditions: Evaporator water temperature= 12/7°C; Condenser water temperature = 30/35°C.

General technical data

Admissible water flow rates

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

Size			250	300	350	400	450	500	550
Condenser	Qmin	[l/s]	24,4	29,2	32,8	38,6	43,6	48,6	55,6
	Qmax	[l/s]	73,1	87,8	98,3	116,1	130,8	145,6	166,7
Evaporator	Qmin	[l/s]	21,0	25,2	29,4	33,6	37,8	42,0	46,2
	Qmax	[l/s]	54,6	65,5	76,4	87,4	98,3	109,2	109,2

Fouling Correction Factors

Size	External exchanger (condenser)		Internal exchanger (evaporator)	
m ² C / W	F1	FK1	F2	FK2
0.44 x 10 (-4)	1,0	1,0	1,0	1,0
0.88 x 10 (-4)	0,97	0,99	0,97	1,08
1.76 x 10 (-4)	0,94	0,98	0,92	1,05

F1 = Cooling power correction factor

FK1 = Compressor power input correction factor

F2 = Cooling power correction factor

FK2 = Compressor power input correction factor

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
Evaporator cooling Capacity Factor	-	0,995	0,990	0,985	0,981	0,977	0,974	0,971	0,968
Internal exchanger compressor power input Factor	-	0,997	0,993	0,990	0,988	0,986	0,984	0,982	0,981
Evaporator glycol solution flow factor	-	1,023	1,068	1,025	1,044	1,065	1,088	1,525	1,140
Evaporator pressure drop Factor	-	1,017	1,060	1,132	1,212	1,304	1,409	1,552	1,706
Condenser cooling Capacity Factor	-	0,999	0,997	0,995	0,992	0,989	0,986	0,983	0,979
Condenser compressor power input Factor	-	1,003	1,006	1,009	1,012	1,016	1,021	1,026	1,031
Condenser glycol solution flow factor	-	1,007	1,016	1,027	1,043	1,060	1,081	1,101	1,124
Condenser pressure drop Factor	-	1,026	1,064	1,110	1,177	1,251	1,336	1,432	1,540

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

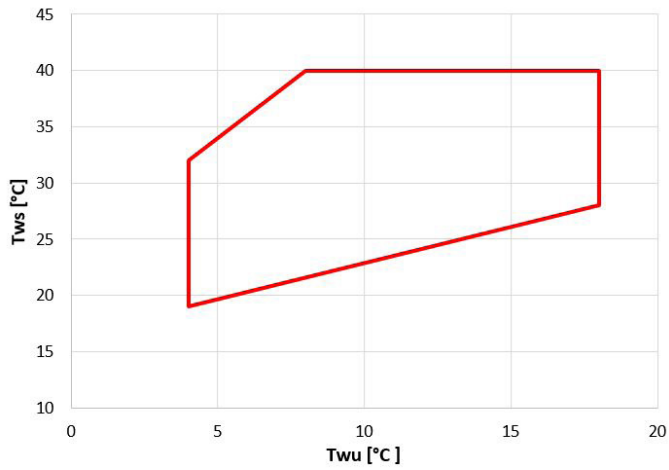
Overload and control device calibrations

		Intervention	Reset	Value
Higt pressure alarm (gas side)	[kPa]	944	-	-
Low pressure alarm (gas side)	[kPa]	226	-	-
Antifreeze protection	[°C]	-	-	3
High pressure safety valve (gas side)	[kPa]	-	-	1280
Low pressure safety valve (gas side)	[kPa]	-	-	1280
Max no. of compressor starts per hour	[n°]	-	-	4
Differential pressure switch (water side)	[kPa]	13	18	-
Max pressure (water side)	[kPa]	-	-	1000

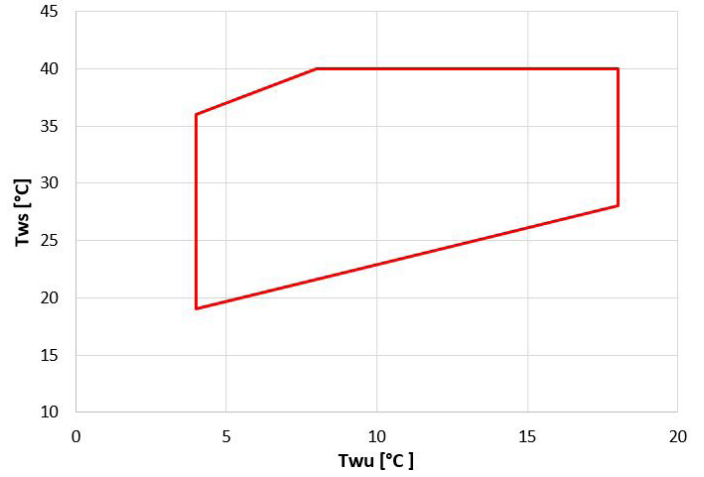
General technical data

Operating range

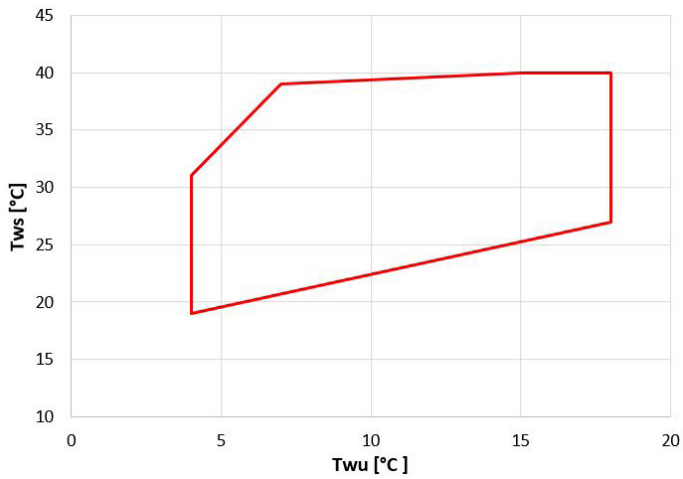
Size 250 - 300



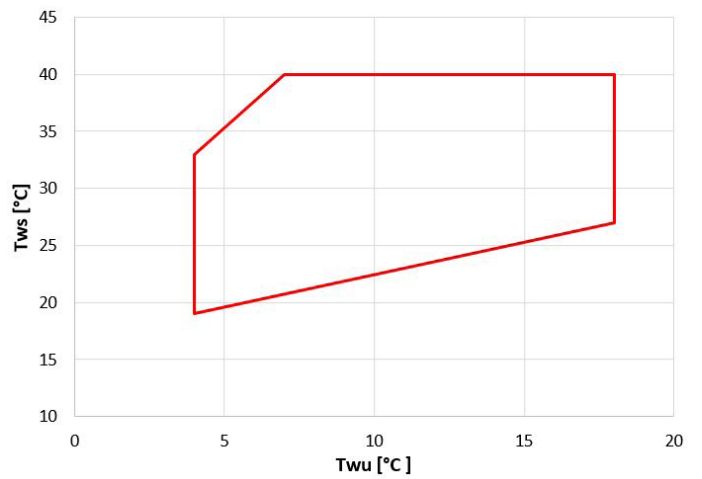
Size 350



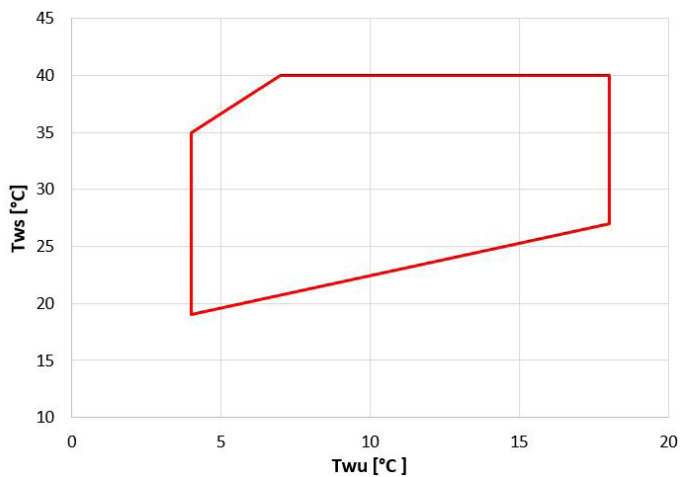
Size 400



Size 400 - 500



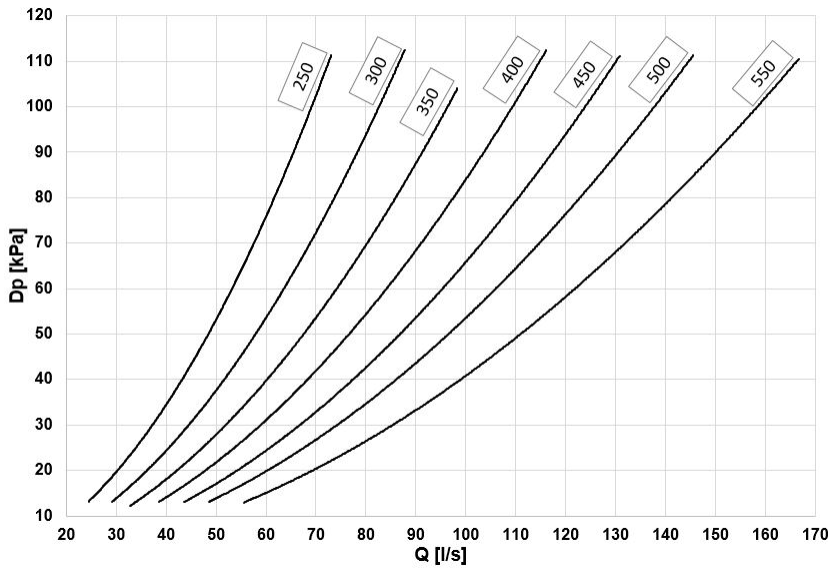
Size 550



*Twu [°C] = Evaporator leaving water temperature
Tws [°C] = Condenser leaving water temperature*

General technical data

Condenser pressure drops



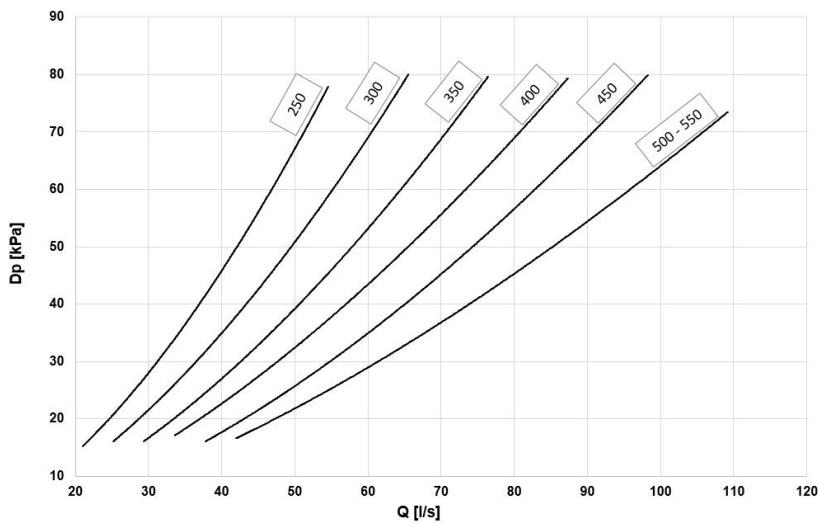
Pressure drops on the water side are calculated considering an average water temperature of 30°C.
 Q = water flow-rate (l/s)
 DP = pressure drop [kPa]

The water flow rate must be calculated with the following formula

$$Q [l/s] = kWf / (4,186 \times DT)$$

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

Evaporator pressure drops



Pressure drops on the water side are calculated considering an average water temperature of 30°C.
 Q = water flow-rate (l/s)
 DP = pressure drop [kPa]

The water flow rate must be calculated with the following formula

$$Q [l/s] = kWf / (4,186 \times DT)$$

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 strainer that must be placed on the water input line. It is a device compulsory for the correct unit operation.

!! If the mechanical strainer is selected and installed by the Customer, it is forbidden the use of filters with the mesh pitch higher than 1,6 mm, because they can cause a bad unit operation and also its serious damaging.

General technical data

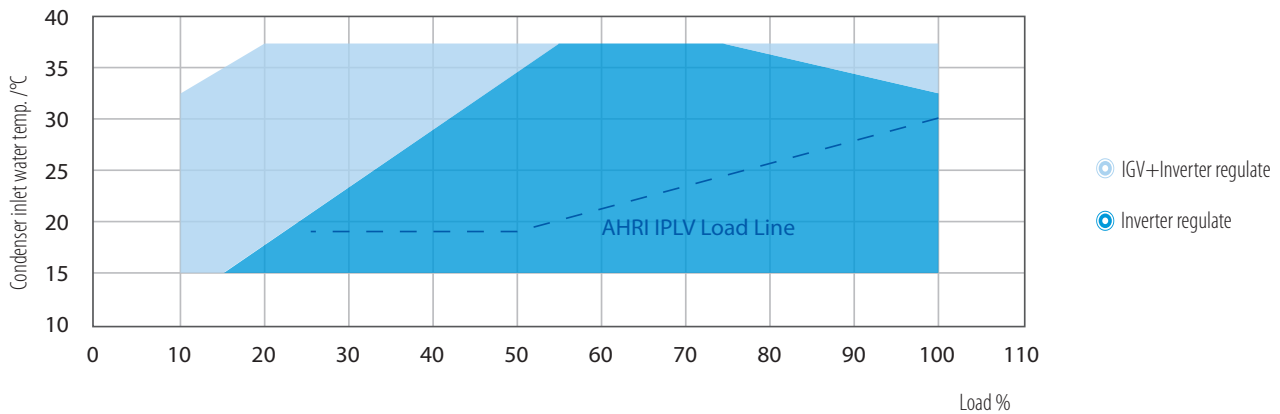
Adjusting the capacity and operating range

Capacity control is done by combining two adjustments

- (1) inverter frequency
- (2) IGV opening / closing (Inlet Guide Vane) a variable angle blading system at the compressor inlet

Generally the adjustment is made by means of an inverter by varying the rotational speed of the compressor. When it is no longer possible to reduce capacity, reducing the frequency of the inverter, the unit starts to change the position of the IGV reduces the flow of refrigerant in the suction.

When you switch the compressor the IGV is partially closed and the frequency of the inverter is at minimum to reduce inrush current. The compressor start ramp is to open the IGV and further increasing compressor rotation speed.



Inverter

The inverter is equipped with an air cooling system, observe the spaces of respect indicated in the dimensional pages.

For the correct operation of the inverter, it is necessary to guarantee an air temperature inside the technical room below +43 °C.

The maximum heat rejection by the inverter is 2% of the maximum power input at full load.

Hydraulic connections

For the correct operation of the unit it is necessary to provide the installation of the following components (both on the user side and source side):

- Water filter: must be installed immediately at the entrance of the unit, in an easily accessible position for cleaning.
- Flow switch: must be provided in order to guarantee the unit stop in case of lack of water circulation.

Consult the installation and owner's manual for installation specifications.

Electrical connections

Since the inverter chiller unit consists of two separate power supplies (on-board electrical panel and inverter), it is necessary to provide a main switch to allow the interruption of the power supply to the whole system.

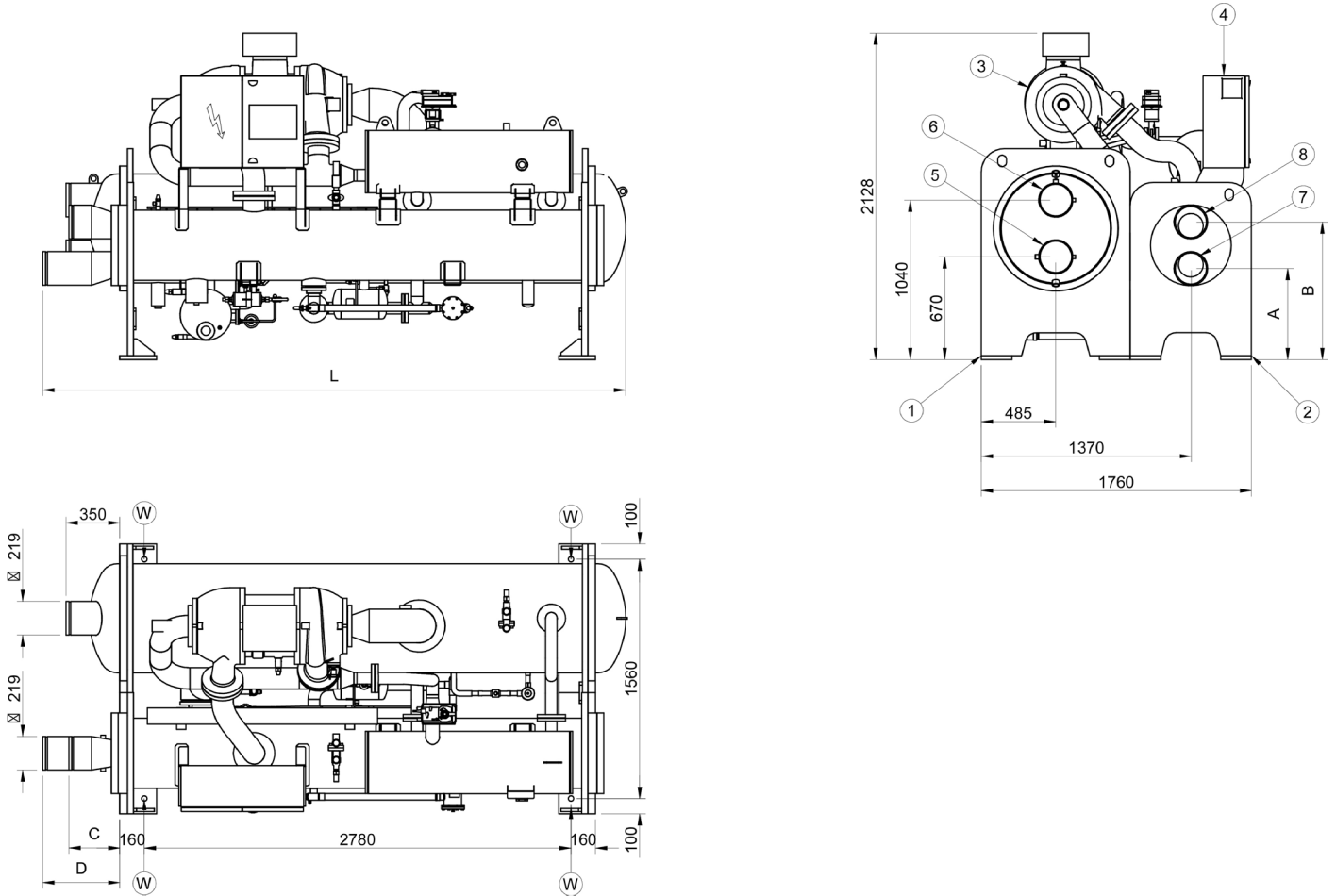
Clivet can provide an electrical panel with main switch specially designed according to the power consumption of the unit (option QSGX).

This panel is supplied separately and must be installed on site by the Customer.

Dimensional unit

Size 250 - 300 - 350

DAACL0001_250_300_350_REV01
Data/Date 12/09/2018



1. Evaporator
2. Condenser
3. Compressor
4. Electrical panel
5. Water inlet user side
6. Water outlet user side
7. Water inlet source side
8. Water outle source side
9. Unit fixing holes $\varnothing 35$

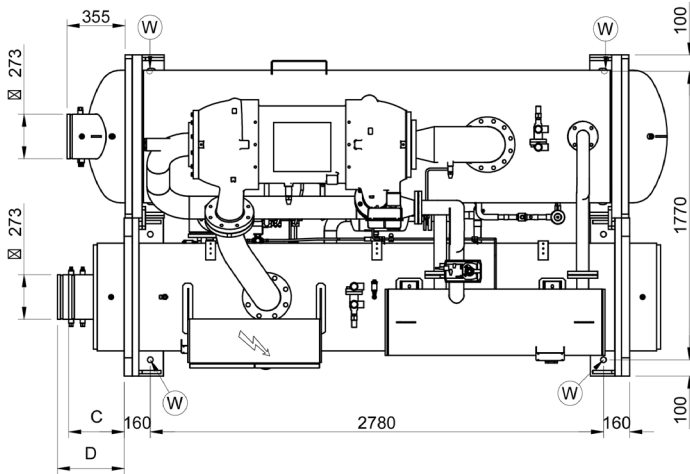
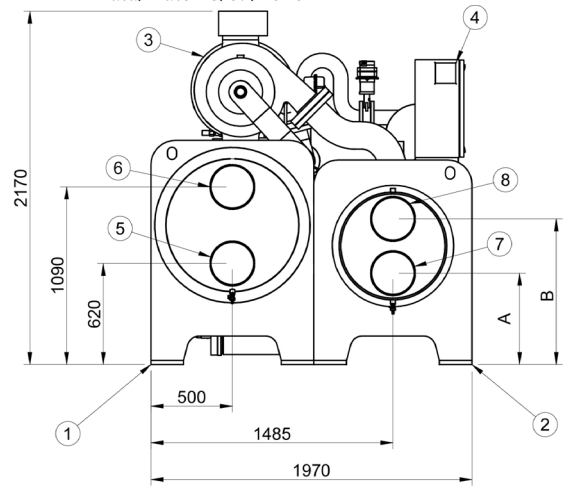
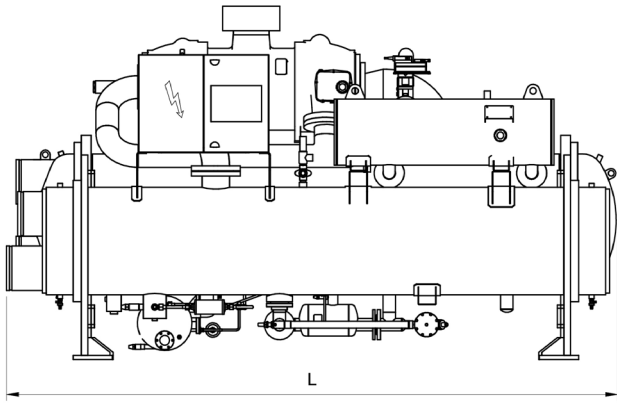
Size		250	300	350
Lenght	mm	3820	3870	3870
Operation weight	kg	5780	5852	6020
Shipping weight	kg	5250	5220	5320

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

Dimensional unit

Size 400 - 450 - 500 - 550

DAACL0002_400_450_500_550_REV01
Data/Date 26/07/2018



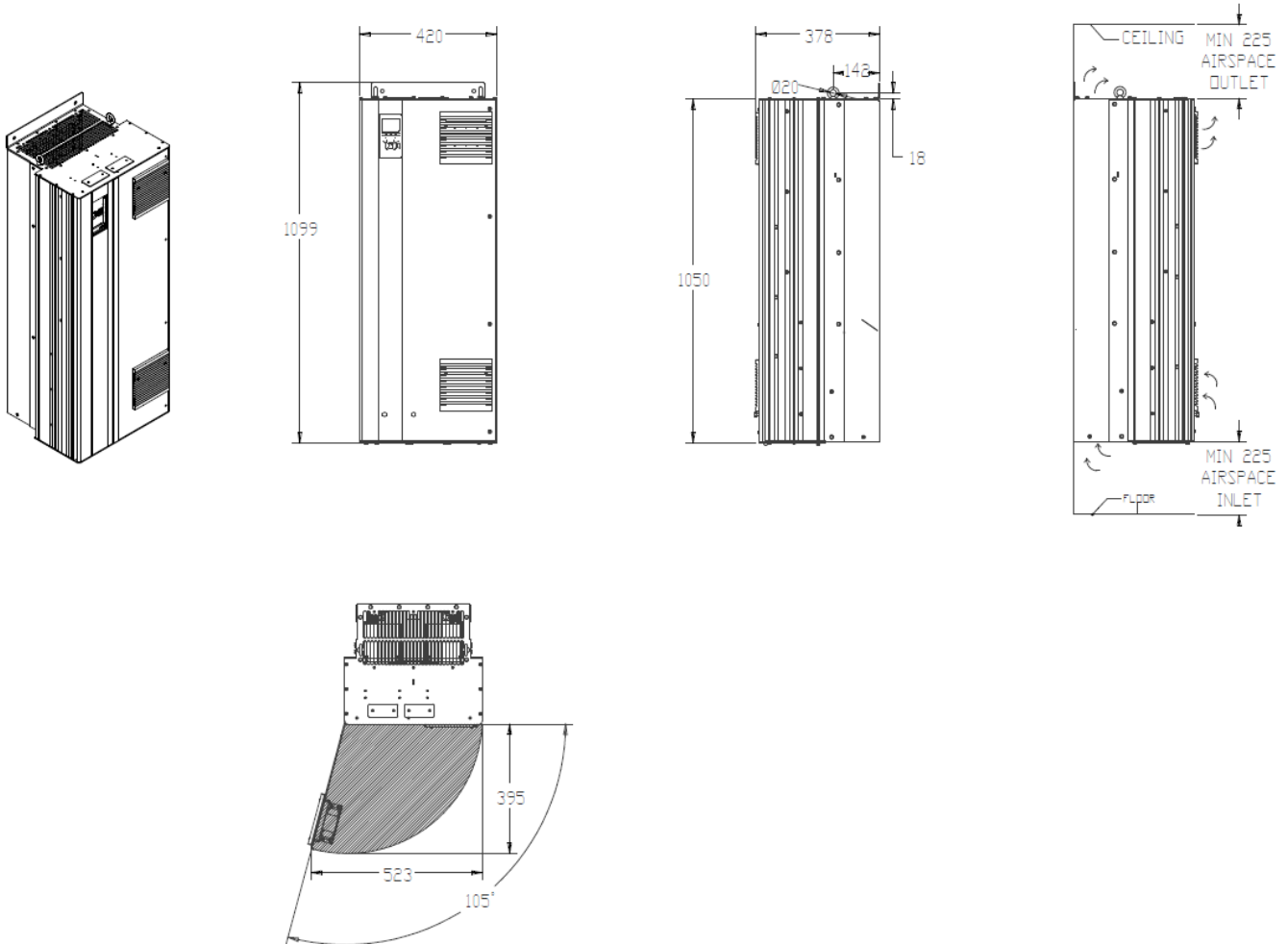
1. Evaporator
2. Condenser
3. Compressor
4. Electrical panel
5. Water inlet user side
6. Water outlet user side
7. Water inlet source side
8. Water outlet source side
9. Unit fixing holes $\varnothing 35$

Size			400	450	500	550
Lenght		mm	3770	3810	3810	3770
Operating weight		kg	7264	7688	7940	8364
Shipping weight		kg	6530	6960	7140	7490

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

Dimensional inverter

Size 250 - 300 - 350



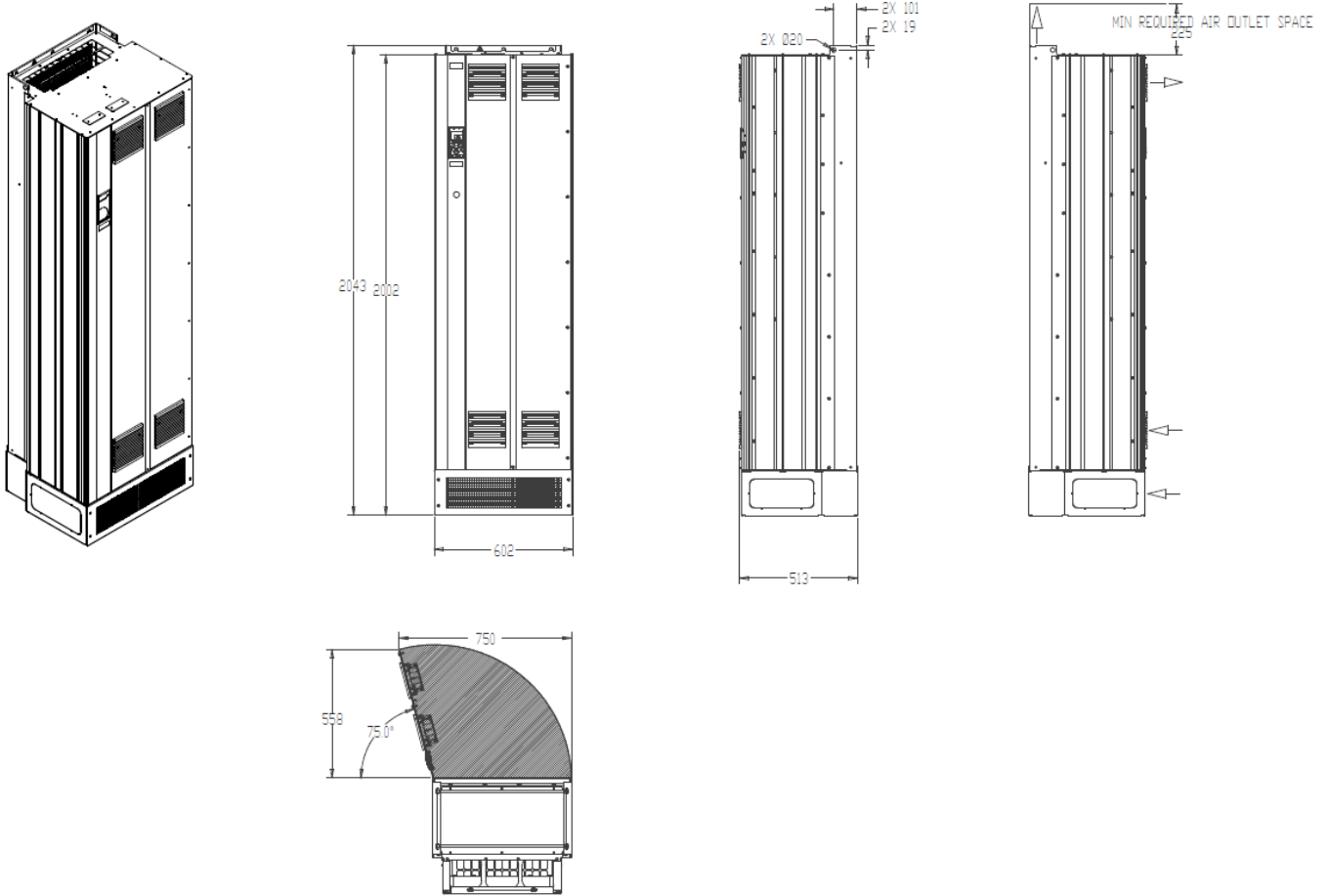
Size		250	300	350
Lenght	mm	420	420	420
Depth	mm	378	378	378
Height	mm	1100	1100	1100
Operating weight	kg	125	125	125

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

!! For inverter installation (sizes 250-300-350), it is also necessary to respect the lower clearance (Min 225 mm airspace inlet). The inverter can be installed on the wall or directly on the unit by means of a special bracket on the condenser.

Dimensional inverter

Size 400 - 450 - 500 - 550



Size			400	450	500	550
Lenght		mm	120	420	602	602
Depth		mm	378	378	514	514
Height		mm	1100	1100	2043	2043
Operating weight		kg	125	125	300	300

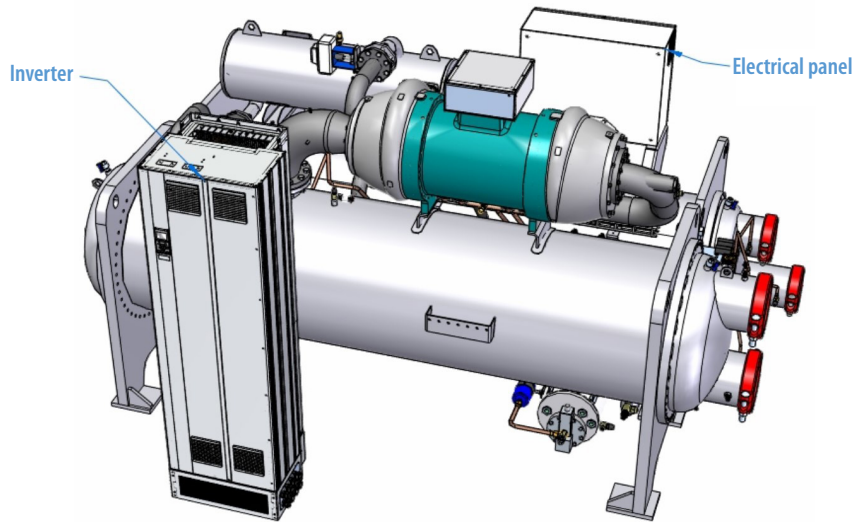
The presence of optional accessories may result in a substantial variation of the weights shown in the table

Installation

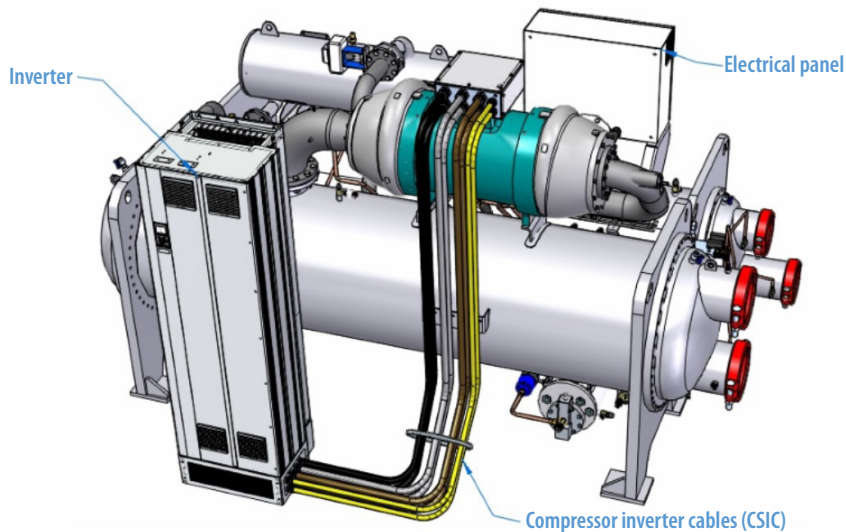
The WCH-i centrifugal chillers are supplied complete with the refrigerant gas charge and are composed of the unit and inverter supplied separately. The inverter must be positioned at a maximum distance of 10 meters from the unit (cable length).

Consult the installation and owner's manual for sizing the connection cables.

Clivet recommends positioning the inverter as shown in the following figure.



Clivet can supply a cable kit for the connection between inverter and compressor. The cables are shielded, 4.5 meters long (CSIC option). The cables are sent already connected to the terminals in the electrical termination box of the compressor. The connection to the inverter must be made on site after its placement, by the Customer.

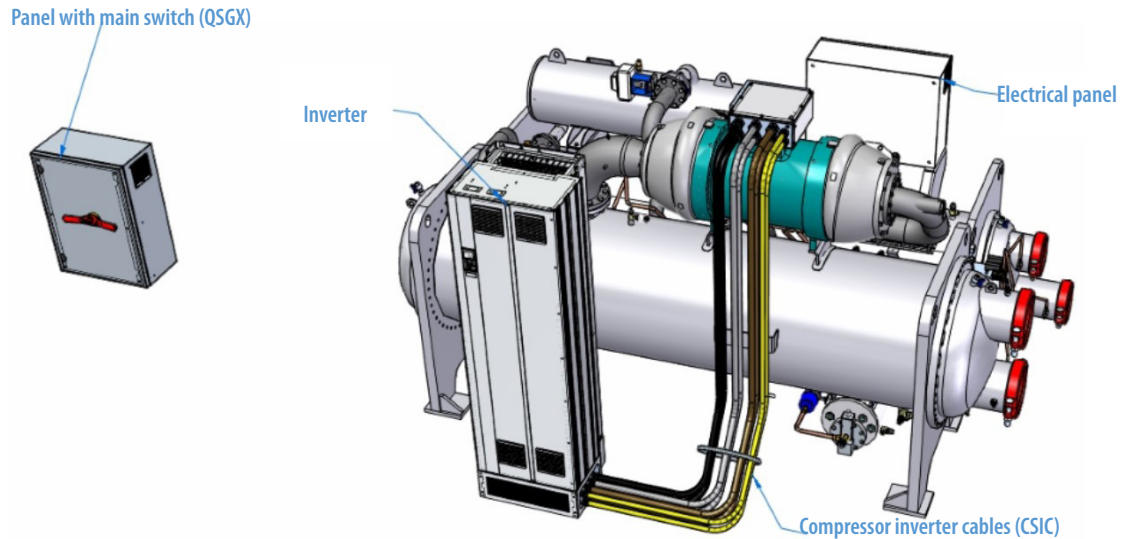


Installation

Since the inverter chiller unit consists of two separate power supplies (on-board electrical panel and inverter), it is necessary to provide a main switch to allow the interruption of the power supply to the whole system.

Clivet can provide an electrical panel with main switch specially designed according to the power consumption of the unit.

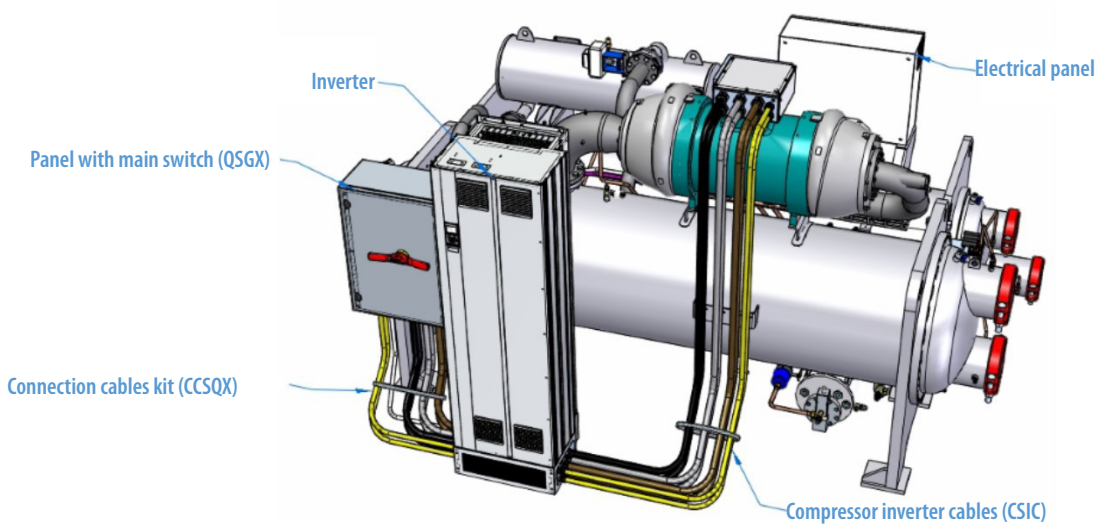
This panel is supplied separately and must be installed on site by the Customer.



If QSGX option is selected (Panel with main switch), Clivet can supply a cable kit for connecting the main switch to the inverter and to the unit electrical panel (option CCSQX).

The cables are specially designed according to the absorption characteristics of the electrical panel and the inverters, are equipped with terminals and are of sufficient length to allow the positioning of main switch at the side of the inverter as shown in the following figure.

The connection cables kit also includes a steel support for positioning the main switch..



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