



Exploration & Production

GENERAL SPECIFICATION

HVAC

GS EP HVA 231

Chilled Water Unit(s) (Water Cooled - Screw compressors)

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Owner: DEV/TEC

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1. Scope

The purpose of this specification is to define the requirement for design and construction of chilled water unit(s) equipped with screw compressors and water cooled condenser(s). This specification is only applicable to chilled water units having a nominal refrigerating capacity between 200 to 1400 kW in nominal operating conditions.

The words and expressions in CAPITAL characters and *italic* are defined in the general specification **GS EP HVA 801**.

When other words require a restrictive definition only applicable for that document, the definition is given in a paragraph of that document. Moreover defined word is written in small and *italic* letters.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Documents order of precedence is defined in **GS EP HVA 100**.

Notes:

- In case of discrepancy between documents the more stringent requirements must apply.
- The *HVAC VENDOR* or *CONTRACTOR* may propose proven improvements to the reference documents but must obtain written approval of the *COMPANY* prior to implementation.
- An International Standard is a good "engineering practice" which shall be recognised and taken into consideration by *VENDOR*, *SUPPLIER*, *MANUFACTURER* and/or *CONTRACTOR*. If required, the translation of the standards must be included into *HVAC* scope.
- The latest revision of Standards, codes, regulations and the published errata if any must be used and applied by *VENDOR*, *SUPPLIER*, *MANUFACTURER* and *CONTRACTOR*.

Standards

Reference	Title
ASTM B 633	Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM F 1941M	Standard Specification for Electrodeposited Coatings on Threaded Fasteners [Metric]
EN 378 (Parts 1; 2; 3; 4)	Refrigerating systems and heat pumps - Safety and environmental requirements - (Parts 1; 2; 3; 4)
EN 1044	Brazing - Filler metals
EN 10204	Metallic products - Types of inspection documents
EN 12735 (Parts 1; 2)	Copper and copper alloys - Seamless, round copper tubes for air conditioning and refrigeration - (Parts 1; 2)



Reference	Title
EN 14511 (Parts 1; 2; 3; 4)	Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling - (Parts 1; 2; 3; 4)
EN 25817	Arc-Welded Joints in Steel - Guidance on Quality Levels for Imperfections
EN 50102	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)-
IEC 60529	Degrees of protection provided by enclosures

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
Directive 94/9/EC, referred to a ATEX 100a / 95	Directive of the European parliament and the council on the approximation of the laws of the member states concerning equipment and protective systems intended for use in potentially explosives atmospheres
Directive 97/23/EC dated 29 May 1997	Directive 97/23/EC of the European Parliament and of the Council of 29 May 1997 on the approximation of the laws of the Member States concerning pressure equipment
Directive 98/37/EC dated 27 June 1988	Directive 98/37/EC of the European Parliament and of the Council of 22 June 1998 on the approximation of the laws of the Member States relating to machinery
Directive 1999/92/EC, referred to a ATEX 118 / 137	Directive of the European parliament and the council on minimum requirements for improving the safety and health protection of workers potentially at risk from explosives atmospheres
Directive 2004/108/EC dated 15 December 2004	Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EECText with EEA relevance
Directive 2006/42/EC dated 17 May 2006	Directive 2006/42/EC of the European parliament and of the council on machinery, and amending Directive 95/16/EC



Reference	Title
Directive 2006/95 dated 12 December 2006 Certifying Body rules (when equipment is Marine classified)	Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
	HVAC basis of design Project specification (this document has only to be taken into account in detailed engineering phase)

Total General Specifications

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP ELE 011	Electrical requirements for packaged units
GS EP ELE 031	Design of earthing and bonding systems
GS EP ELE 079	Electrical apparatus for potentially explosive gas atmospheres ¹
GS EP ELE 111	Induction motor ²
GS EP ELE 162	Low Voltage electrical cables
GS EP HVA 000	List of HVAC specifications
GS EP HVA 010	Selection of Stainless Steel Grade for HVAC Equipment
GS EP HVA 100	HVAC Basis of design

¹ This specification is only applicable when unit is located in potentially explosive atmosphere or where it is required to design it for explosive atmosphere.

² This specification is only applicable for open compressors and air cooled condenser fans



Reference	Title
GS EP HVA 801	Terminology, Definitions, Abbreviations
GS EP INS 110	Instrumentation for package units

3. Definitions

Floor: defines the surface on which the unit is installed. This surface can be a metallic structure, a metallic or concrete floor.

Geographic Criterion: refer to [GS EP HVA 010](#) General Specification.

Nominal refrigerating capacity: corresponds to the refrigerating capacity of unit operating under *Project nominal conditions*, taken into account the tolerances of measurement. The *nominal refrigerating capacity* considered for acceptance of equipment must be measured during *FAT* and will include the tolerances of instruments used during this *FAT* (see also [GS EP HVA 100](#) for definition of tolerances).

Project nominal conditions: correspond to the operating conditions defined within this specification and/or within the Project specification. In case of discrepancies between documents, the more restrictive conditions must be taken into account.

4. Construction

When stainless steel is required in the following of this specification, the grade must be defined in accordance with the location of unit and "Choice of metallurgy for HVAC equipment" Total General Specification. The *Geographic Criterion* (GC) is defined within the "Basis of design" specification (this document has to be required by the Bidder). If the *Geographic criterion* is not indicated within the above document, the GC value indicated in the "Choice of metallurgy for HVAC equipment" ([GS EP HVA 010](#)) Total General Specification must be taken into account.

Materials for rivets, bolts and nuts used on the chilled water unit shall be as following:

- Rivets: stainless steel AISI 316L
- Screws: stainless steel AISI 316L
- Nuts: stainless steel AISI 304L.

When *Geographic Criterion* (GC) is "1", if rivets, screws and nuts molybdenum rate is lower or equal to 2.5% and carbon rate upper than 0.03%, Tectil coating must be applied on their surface.

Aluminium is forbidden.

4.1 Base plate

The chilled water unit must be assembled on a metallic base plate. The base plate is composed of profiles assembled together by bolting (including washers). The base plate must be designed to support the components of the unit without complementary structure. Assembly bolting must be stainless steel if GC = 1 and diameter less than 12 mm. For bigger bolting, zinc plated and bi-chromated (Zn12/C/Fe) according to standard [ASTM F 1941M](#) or [ASTM B 633](#) and painted

according with **GS EP COR 350**. The base plate must be designed to guarantee the structure integrity (finite element calculation and shake table test must be used for the design).

The base plate must be hot galvanised steel and must be protected against corrosion as per protection against corrosion specifications (GS specifications). The protection against corrosion must be applied after cutting, boring and removing the burrs from each frame section.

Anti-vibration supports must be placed on site, between the base plate of unit and the *floor*. The design of frame shall take into account the anti-vibration support location. The rigidity of base plate must be sufficient to install the unit on the anti-vibration supports. The selection, location and furniture of anti-vibration supports are included in the scope of the *MANUFACTURER*.

When chilled water unit is installed on a floating unit (*FPSO, FPU, ...*), the base plate of the unit has to be designed taking into account the heel and trim angles and acceleration values defined for the Project.

The base plate must be designed by the *MANUFACTURER* to allow a handling by crane. Specification for handling has to be issued by the *MANUFACTURER*. Handling accessories painted in red and fitted to the base plate, must help the loading and unloading of the unit. These accessories must be removable.

For handling and positioning, the Manufacturer must provide the instruction manual. Pictograms indicating the slings positions on the base plate handling points must be fixed by sticky tape or painted on each side of the chilled water unit. If slings must be moved apart from the unit by mean of a lifting beam, the lifting beam must be supplied with the unit. All details relative to the handling means must be mentioned in the handling instruction manual. Centre of gravity must be indicated and sized on drawings.

The design of the base plate must allow the removal of components from unit without to remove any part of the base plate.

4.2 Refrigerating circuits

Each unit must be equipped with a minimum of two independent refrigerating circuits. It means that the refrigerant from one circuit cannot be in contact with the refrigerant of the second circuit.

The refrigerating capacities must be equal for the different circuits. A maximum difference of 10% (relative to the nominal refrigerating capacity of the unit), between the circuits is acceptable.

Each refrigerating circuit must be equipped with the following components:

- One or several refrigerating compressors
- One or several oil / refrigerant separators
- One or several water cooled condensers
- One or several de-hydrators
- One refrigerant sight glass
- One refrigerant supply valve
- One evaporator
- The refrigerant piping
- One or several oil pumps

- The lubrication piping
- One refrigerant receiver
- The instruments for temperature, pressure, measurement and indication
- The safety pressure cut-outs
- The safety valves
- The temperature sensors
- The pressure sensors
- Refrigerant and oil required to operate on full operating range.

4.2.1 Piping

Piping must be in accordance with the above referenced standards ([EN 12735](#), [EN 12735-1](#), [EN 12735-2](#), ...).

Brazing must be high percentage of silver, without cadmium, L-Ag34Sn according DIN 8513 with following characteristics:

- Fusion range: 630 to 730°C
- Composition: Ag: 34%, Cu: 36%, Zn: 27%, Sn: 3%
- R: 42 daN/mm²
- A: 25%
- d: 9.

Brazing must be made under nitrogen purging gas.

Suction refrigerant piping can be stainless steel ("Choice of metallurgy for HVAC equipment" has not to be applied for this piping).

For discharge piping, copper must be used.

Varnish shall be applied on pipes after the satisfying tightness pressure test of the whole unit, for unit operating in MA environment (refer to "HVAC basis of design" Project specification).

Transmission of vibration to the chilled water unit frame must be limited to 95% by improving of piping design and adequate piping support. Piping support must be selected in accordance with the ambient conditions and must be resistant to ultraviolet.

Economiser line must be equipped with a muffler.

4.2.2 Refrigerating compressors

The refrigerating compressors shall be hermetic accessible type. The compression of refrigerant shall be ensured bi-screws technology. The refrigerating capacity shall be obtained by a drawer allowing a linear capacity (slide valve) from 30 to 100% of nominal compressor capacity. The displacement of drawer must be hydraulically (oil) motorized. The design of compressors shall include an economiser operating to improve the performance of the chilled water unit.

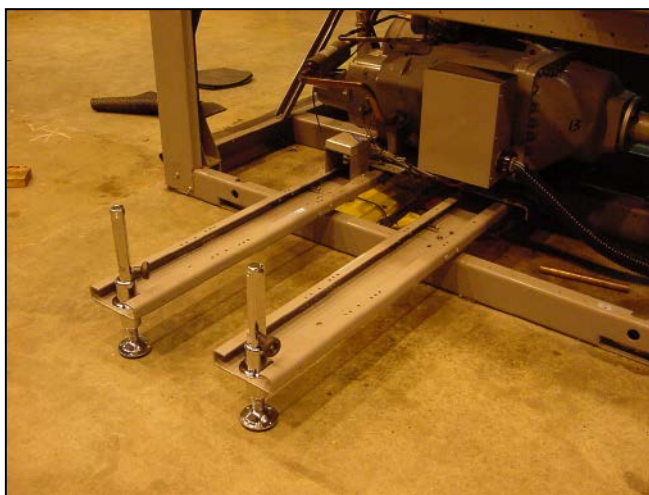
Each compressor shall be equipped with a suction filter (120 µ). Bearings must be designed for a minimum of 65,000 operating hours.

The electrical motor included within the compressor crankcase shall be cooled by sucked gas.

The bearings of compressors shall be lubricated by pressurized oil in order to guarantee a correct operating whatever the refrigerating capacity delivered by compressors.

The compressor must operate without oil pump. The lubrication must be obtained by the differential pressure between oil / refrigerant separator and compressor. It means that oil pressure fault has to be delayed when compressor starts.

When the chilled water unit design does not allow to install a handling beam above refrigerating compressor (compressor removal from unit), the chilled water unit shall be provided with the handling system allowing the removal of compressors from the unit, without to remove any other parts of the unit. Each compressor must be equipped with hook(s).



Example of compressor handling system

Silencer shall be installed on economiser return line to reduce the pulse effect on unit.

In case sound attenuator housing on compressor is provided, the sound attenuator housing shall be designed to be easily removed without damage.

Each refrigerating compressor shall be equipped with suction and discharge isolating ball valves allowing the removal of compressor without loss of refrigerant from discharge and suction lines.

4.2.3 Economiser function

Each compressor must be designed to operate with an economiser system to increase the refrigerating efficiency of unit. Each economiser must be composed of:

- A brazed plate heat exchanger, with connection to the "liquid" inlet and outlet lines, to the expanded refrigerant and to the compressor intermediate port
- An electronic refrigerant expansion device
- A liquid service valve, installed on "liquid" line
- A refrigerant filter, including a dryer function, installed on the "liquid" line.

The minimum efficiency of economiser, relative to the unit without economiser, must be an increase of 4% on COP Energy Efficiency Ratio (as per Eurovent definition) and 6% on the refrigerating capacity.

4.2.4 Refrigerant / oil separator - lubrication

The refrigerant / oil separation must be achieved by a specific device, located out of compressor crankcase or must be included within condenser shell. The separator shall include a silencer to reduce the pulse effects issued from compressor(s).

Oil separation shall be achieved by gravity and coalescing mesh.

The separator must be equipped with a heater. Heating element must be removable without to drain the separator.

The minimum oil level in separator must be monitored by an oil level switch wired for "fail safe" operation.

The oil piping supplying the compressor must be equipped with a service valve (oil outlet of separator), an oil filter (maximum mesh size: 12 µm), an oil control solenoid valve and a service check valve.

Oil temperature must be maintained at a minimum temperature for correct lubrication. The oil heater must only operate when a refrigerating circuit is not running and according outdoor air temperature.

4.2.5 Water cooled condenser

Condenser must be shell and tubes type.

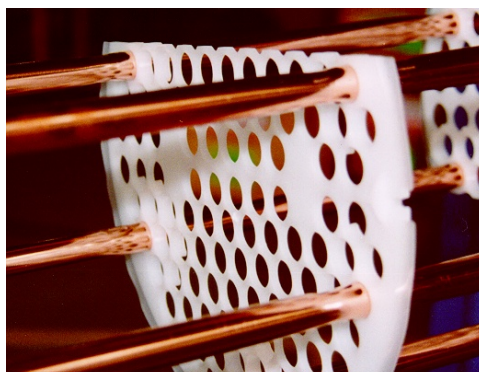
It must be designed and be tested as per PED 97/23/CE for usual applications. In case of installation of chilled water unit(s) on *FSO*, *FPSO*, *FPU*, *FSU*, and generally speaking on a floating unit (refer to the "HVAC basis of design" Project specification), the condenser must be designed and be tested as per Marine BV rules or Notifying Body selected by *COMPANY*.

Condenser must include a sub-cooler (flash type) to increase refrigerating capacity of unit.

Grooved or knurled tubes are only agreed with a fooling factor over-design. Tubes must be supported inside shell by baffles to avoid pulse effects on tubing (stress). Baffles must be made of material which does not produce any corrosion. An air vent will be installed on top of each condenser water box. A drain plug must be provided, on each water box, to allow the complete draining of condenser. Condenser shell must be equipped with connection for a three-ways valve associated with safety valves.

Chilled water Victaulic type connections (inlet and outlet) must be provided at the extremity of the shell. Each chilled water unit must be provided with tie-in piping with flanges and counter-flanges.

Water boxes must be treated against corrosion as per **GS EP COR 350**.





4.2.5.1 Fresh water cooled condenser

Condenser tubes must be made of copper. Condenser water boxes must be casted or welded construction type.

4.2.5.2 Sea water cooled condenser

Construction of water boxes must be welded construction with minimum welding flaw in accordance with [EN 25817](#) Class C.

Condenser must be sea water cooled. Therefore, precaution regarding the corrosion has to be taken by the *MANUFACTURER* to avoid the damages on condensers. Condenser tubes must be made of Copper-Nickel Alloy 90/10.

Internal surfaces of condenser, in contact with sea water, except tubes, must be protected against corrosion by 3 layers of Devcon (brushable, high performance ceramic-filled epoxy for sealing, protecting and repairing surfaces subject to erosion). Before applying the first Devcon layer, surfaces must be cleaned with Devcon Cleaner Blend 300 to remove all oil, grease, and dirt. Different layers of Devcon colours must be alternatively applied: first layer: blue, second layer: red, third layer: blue.

Anodes must be provided and installed within the two sea water boxes of each condenser. Anodes must be designed for a life-time of 12 months with a non protected surface of 5% of condenser surface exposed to sea water.

4.2.6 Dehydrator

The refrigerating pipe "liquid phase" shall be equipped with a dehydrator filter with removable cartridge. The crankcase of filter shall be welded on piping. Dehydration capacity must be: 1.5 time capacity defined by standard ARI 710-64.

Dehydrator crankcase shall be equipped with a male connection "Schraeder" plug and cap. Isolating valves must be installed upstream and downstream the dehydrator to reduce the volume of refrigerant to remove from unit during of cartridge replacement.

The dehydrator cartridges shall be an usual products of the market (specific design of cartridge is prohibited).

4.2.7 Sight glass

A sight glass shall be installed on "liquid" refrigerant pipe upstream the refrigerant expansion valve. The device must be welded on piping. The sight glass shall be equipped with a hygroscopic indicator.

4.2.8 Refrigerant expansion valve

The expansion valve must be controlled by the PLC of chilled water unit. When the unit is stopped, the refrigerant expansion valve must be maintained in closed position. The expansion valve actuator must be step-by-step type.

4.2.9 Evaporator

Two types of evaporators are agreed by *COMPANY*.

4.2.9.1 Flooded type

Evaporator must be flooded type (water in tubes and refrigerant in shell). The shell and tubes evaporator shall include two independent refrigerating circuits. Refrigerating circuits must be separated by a welded partition in shell. In case of chilled water units equipped with more than 2 refrigerating circuits, the independent evaporators must be installed in serial (water side). Each evaporator must be equipped with 1 or 2 circuits depending on the number of refrigerating circuits on the unit.

Evaporator suction connection must be located to avoid liquid suction, particularly on floating units, submitted to pitch.

Tubes of evaporator must be of micro-grooves type on water side.

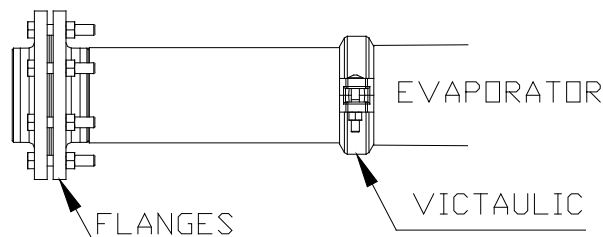
4.2.9.2 Direct expansion type

Evaporator must be constituted of shell and tubes. Each refrigerating circuit must be equipped with an evaporator, with its independent shell. micro-grooves inside tubes and helicoidal design on external tubes face must be used to improve the thermal exchange efficiency.

4.2.9.3 Common specification for evaporator

The evaporator must be designed and be tested as per PED 97/23/CE for usual applications. In case of Installation (refer to the "HVAC basis of design" Project specification - this document has only to be taken into account in detailed engineering phase) of chilled water unit(s) on *FSO*, *FPSO*, *FPU*, *FSU*, and generally speaking on a floating unit, the evaporator must be designed and be tested as per Marine BV rules or Notifying Body chosen by *COMPANY*.

Chilled water Victaulic type connections (inlet and outlet) must be provided at the extremity of shell. Each chilled water unit must be provided with tie-in piping with flanges and counter-flanges.



The shell and water boxes must be equipped with drain plugs and venting plugs. The drain and venting plugs must be placed outside of insulation to allow an access without insulation removal.

The shell and water boxes must be insulated with Armstrong or equivalent foam, to avoid condensation on evaporator surface. The evaporator insulation must be glued onto the evaporator to prevent any condensation. The fire resistance of the insulation must be non flammable classified and without toxic gas release in case of fire exposure. Fire resistance test, issued from European Notifying Body must be provided to *COMPANY*. The evaporator insulation must be covered by a stainless steel cladding.

A minimum water flow rate through the evaporator must be monitored by the control cabinet of the chilled water unit. In case of insufficient water flow, the whole unit must be immediately stopped and major fault must be released by the chilled water unit control panel.

In order to ensure a safe operation of the unit, a free voltage contact from external water flow controller must be connected to terminals of chilled water unit control panel. The chilled water unit start-up / operating must be interlocked to the external water flow rate controller (unit must be stopped in case of insufficient water flow rate through the evaporator).

An evaporator and chilled water piping freezing-up protection must be provided, for unit which can operate with ambient conditions equal or lower than 8°C.

4.2.10 Safety pressure switch

Each refrigerating compressor must be equipped with two high pressure cut-outs connected in parallel to the compressor discharge. Isolating valve between the compressor discharge and the pressure cut-out is forbidden. Pressure cut-out connection has to be made on compressor crankcase or on discharge valve of compressor. In this last case, it must be impossible to isolate this connection, whatever the position of the compressor valve (3-ways valve). Schraeder connection is forbidden between compressor and pressure cut-out.

High pressure cut-outs must be equipped with a manual resets. Automatic reset is not accepted.

Each pressure cut-out must be installed on a support fixed on the base plate of the chilled water unit.

In order to avoid setting point modification (setting point and differential), safety plug must be placed on the setting device.

4.2.11 Safety valves

Each refrigerating circuit must be equipped with refrigerant safety valves. These valves must be located on compressor discharge piping (two safety valves) and on evaporator shell. Each group of two valves must be installed on a three-ways valve (common way connected to the piping to secure) to allow the isolating of one safety valve at once.



Each part of circuit, automatically isolated (during operation and/or during non operating of compressors, must be equipped with a group of two safety valves as indicated above.

4.2.12 Refrigerant charge

The required refrigerant charge must be provided with the unit to allow a correct operating according to the nominal design conditions.

Refrigerant must be R134a, without additive like leak tracers or other.

The refrigerant must be charged in the refrigerating circuit after a vacuum procedure as described hereafter:

- 1st vacuum phase to 10 kPa (absolute pressure)
- Charge with refrigerant up to 150 kPa
- Maintain this pressure during a minimum of 30 minutes
- Refrigerant recovery
- 2nd vacuum phase to 1 kPa (absolute pressure)
- Charge with refrigerant up to 150 kPa
- Maintain this pressure during a minimum of 30 minutes
- Refrigerant recovery
- 3rd vacuum phase to 1 kPa (absolute pressure)
- Final refrigerant charge.

The refrigerant quantity must be limited to the following values:

Refrigerating capacity of the unit (kW) (nominal operating conditions)	Maximum refrigerant quantity in unit (kg)	Maximum refrigerant quantity per refrigerating circuit (kg)
<= 400	120	60
> 400 and <= 500	140	72
> 500 and <= 600	150	80
> 600 and <= 800	215	125
> 800 and <= 1000	310	165
> 1000	370	190

4.2.13 Oil charge

The required oil charge must be provided with the unit to allow a correct operating according to the nominal design conditions.

The oil characteristics must be in accordance with the mechanical and refrigerating system constraints.

4.3 Electrical cabinet(s)

The unit must be provided with electrical cabinet(s) including the following functions:

- Field power supply cable connection (terminals or direct connection to disconnection switch)
- Protection against short circuits
- Compressors motor starters and protections

- Condensers fans starter and protections
- Transformers and control relays.

The control circuits must be supplied 24AC issued from transformer included within the electrical cabinet(s).

Disconnecting switches must be provided for each electrical equipment of each refrigerating circuit to allow an isolation of a circuit while the other(s) circuit(s) is (are) operating.

The power supply for the control board, must be provided from the unit main circuit power supply.

Compressors must be protected against winding overheating, voltage dips, phase reversal, phase loss.

Starting current of compressors must be limited to 1.8 Must Trip Amps (MTA). The compressors star / delta coupling must be optimised by electronic controllers to minimize the stress of power supply and to reduce the mechanical and electrical constraints on compressors.

4.4 Control cabinet

Each chilled water unit must be provided with a control cabinet installed on the chilled water unit skid.

HMI must be done via a touch screen placed in front of the control cabinet. The VDU must offer the following facilities:

- Local ON/OFF
- Access to operating schedule
- Chilled water outlet temperature setting. Two setting points must be settable. The selection of the valid setting point must be accessible by opening / closure of contact. This contact must be accessible on terminals in control cabinet
- Demand limit set point. The selection of the valid setting point must be accessible by opening / closure of contact. This contact must be accessible on terminals in control cabinet
- Leaving water temperature or entering water temperature control configurable
- Monitoring of temperatures (entering chilled water temperature, leaving chilled water temperature, water temperature entering to condenser, water temperature leaving condenser, compressors suction pressures, compressors discharge pressures)
- Running hours for maintenance (condenser fans, compressors)
- Refrigerating capacity delivered by each refrigerating circuit
- Recording of the unit operating status (suction pressure, discharge pressure, temperatures, current, ...) for the last five minutes of operation, to allow a diagnostic in case of chilled water unit failure
- Data stored for the five most important events
- System alarm messages and alarm history,



The logic of automation must include:

- The Soft starter with current limitation
- Starting time limited to 1second
- Soft starter with internal by-pass contactor allowing a start-up and stop sequence electronically managed.

Available information on HMI must be accessible via a dedicated port, for remote information transfer.

Communication between the chilled water unit *PLC* and the *HVAC* control cabinet (out of *MANUFACTURER*' scope) must be available by Ethernet link (IP address and protocol). Following information must be provided:

- View Display, Forced / Auto of all status point data
- Allows times / set points schedule adjustments
- Allows chilled water unit reset, demand limitation
- Alarm notification
- Time synchronization.

Remote access via free voltage contacts must be available on terminals for:

- Unit ON / OFF
- Chilled water temperature setting point
- Time synchronization.

Unit must be provided with the following free voltage contacts:

- ON / OFF contact for pump A supplying the evaporator
- ON / OFF contact for pump B supplying the evaporator
- ON / OFF contact indicating that unit is ready to start
- ON / OFF contact for refrigerating capacity reducing
- ON / OFF contact for chilled water temperature setting point selection
- ON / OFF contact for interlocking with process, in order to stop the unit.

The unit must be equipped with an absorbed current limiter. If setting point is reached by unit, the control must automatically reduce the refrigerating capacity of unit to maintain the absorbed current to below the setting point.

Two selectable modes must be available for refrigerating capacity adjustment:

- Balancing between the refrigerating circuits
- Capacity increasing from 0 to 100% on a circuit before starting the next refrigerating circuit.

Unit must be provided with a modem and interface in order to allow a distant connection to *MANUFACTURER* Services. The chilled water unit operating parameters and operating data must be available for *MANUFACTURER* via this link.

In order to maintain a minimum water temperature at condenser inlet (defined by design of the unit), a 0-10 V signal must be issued from control to manage an external valve (valve is out *MANUFACTURER* scope).

5. Equipment certified in accordance with Atex Directives

When **ATEX Directives** are applicable to a chilled water unit, requirements indicated in **GS EP HVA 100** must be taken into account by the *MANUFACTURER* and by *HVAC CONTRACTOR*. A certificate must be delivered, for each chilled water unit, by chilled water unit *MANUFACTURER* taking into account the operating conditions and environment of chilled water unit.

The certificate must be issued for equipment leaving the factory. Whatever the reason of chilled water unit dismantling, (transportation, handling, installation, reparation ...), the re-assembly of the unit must be realized by the chilled water unit *MANUFACTURER*. It is *HVAC CONTRACTOR*'s responsibility to purchase the re-assembly of unit to the chilled water unit *MANUFACTURER*. It is *HVAC CONTRACTOR*'s responsibility to indicate to *MANUFACTURER* that chilled water unit must be dismantled.

Installation of a dismantled chilled water unit must be supervised by the chilled water unit *MANUFACTURER*. It is *MANUFACTURER*'s responsibility to inform *COMPANY* when the above installation requirement is not respected.

6. Energy efficiency ratio

Energy efficiency has become one of the most important issues for HVAC industry. Implementation of Kyoto Protocol is a high priority for the *COMPANY* and strong measures should be applied to achieve its targets. Within this framework, *COMPANY* has decided that additive criteria regarding the energy consumption must be taken into account for chilled water unit selection.

In addition to the other technical criteria mentioned in this specification, the chilled water unit provided must be in accordance with the Energy Efficiency Ratio hereafter. The Energy Efficiency Ratio must be calculated for chilled water unit at full load and for chilled water unit at part load. The performance measurement must be in accordance with the following conditions:

- Leaving chilled water temperature from evaporator: 6.7°C
- Water flow rate through the evaporator must be equal to the nominal water flow rate defined for the Project
- Water flow rate through the condenser must be equal to the nominal water flow rate defined for the Project.

The water temperature entrance on condenser must be in accordance with the following table:

ETC_{Max} = Maximum water entering temperature on condenser (nominal Project conditions) - Refer to "General design data" paragraph.

ETC_{Min} = Minimum water entering temperature on condenser (nominal Project conditions) - Refer to "General design data" paragraph.

$$\Delta T = ETC_{Max} - ETC_{Min}$$

Load ratio (% of nominal condition of Project)	ΔT
100	Maximum water entering temperature on condenser (nominal Project conditions) - Refer to "General design data" paragraph
75	$ETC_{MIN} + 0,75 \cdot (ETC_{Max} - ETC_{Min})$
50	$ETC_{MIN} + 0,50 \cdot (ETC_{Max} - ETC_{Min})$
25	$ETC_{MIN} + 0,25 \cdot (ETC_{Max} - ETC_{Min})$

An Energy Efficiency Ratio (EER_N) must be calculated:

$$EER_N = \frac{P_{FN}}{P_{AN}}$$

Where EER_N = Energy Efficiency Ration for operating conditions "N"

P_{FN} = Refrigerating capacity of unit (kW) measured for operating conditions "N"

P_{AN} = Absorbed power by unit (kW), measured for operating conditions "N"

A Seasonal Energy Efficiency Ratio ($SEER$) must be calculated as follow:

$$SEER = A \cdot EER_A + B \cdot EER_B + C \cdot EER_C + D \cdot EER_D$$

Coefficients A, B, C, D depend on local meteorological data. They are indicated, for each Project, in *HVAC* basis of design.

If meteorological data are not available to define the coefficients A, B, C, D , the following values must be taken into account:

A	B	C	D
0,03	0,33	0,43	0,23

The minimum acceptable Seasonal Energy Efficiency Ratio ($SEER$) is indicated in *HVAC* basis of design - Project specification.

7. General design data

The following design data shall be taken into account for chilled water unit engineering and construction:

Criteria	Design value
Maximum ambient temperature around chilled water unit:	Refer to "HVAC basis of design" Project specification
Minimum ambient temperature around chilled water unit:	Refer to "HVAC basis of design" Project specification
Power supply voltage (nominal Project conditions):	Refer to "HVAC basis of design" Project specification
Power voltage supply tolerance:	Refer to "HVAC basis of design" Project specification
Power supply frequency:	Refer to "HVAC basis of design" Project specification
Earthing system:	Refer to "HVAC basis of design" Project specification
Location of chilled water unit:	Refer to Project documents
Starting mode:	Direct if absorbed power during start-up period is ≤ 35 kW Star-delta if absorbed power during start-up period is > 35 kW
Refrigerating capacity of unit (measured during FAT) for nominal Project conditions:	Refer to Project documents
Minimum evaporating temperature:	2.5°C
Chilled water entering temperature (nominal Project conditions):	11°C (unless other indication of "HVAC basis of design" Project specification)
Chilled water leaving temperature (nominal Project conditions):	6°C (unless other indication of "HVAC basis of design" Project specification)
Glycol percentage:	Refer to "HVAC basis of design" Project specification
Fouling factor on evaporator:	0.044 m ² .K./kW
Fouling factor on condenser with smooth tubes:	0.044 m ² .K./kW
Fouling factor on condenser with grooved or knurled tubes	0.066 m ² .K./kW
Fouling factor on sea water condenser	0.088 m ² .K./kW
Minimum water temperature at condenser inlet:	Refer to "HVAC basis of design" Project specification

Criteria	Design value
Maximum water temperature at condenser inlet:	Refer to "HVAC basis of design" Project specification
Number of independent refrigerating circuits per unit:	2
Refrigerant used:	R134a
Fan motor minimum efficiency:	80%
Minimum Seasonal Energy Efficiency Ratio (SEER):	Refer to "HVAC basis of design" Project specification.
Electromagnetic compatibility:	61000-6-4; A class
Evaporator minimum design pressure (water side):	10 bar (unless other indication in Project specifications)
Condenser minimum design pressure (water side):	10 bar (unless other indication in Project specifications)
Type of protection according to IEC 60529 and EN 50102	IP54 - IK07

8. Equipment tagging

The following components must be equipped with stainless steel tagging plates, mechanically fixed onto them:

- Chilled water unit (main name plate)
- Compressors
- Condenser(s)
- Evaporator(s).

The tag numbers must be provided by the main *CONTRACTOR* (if the *MANUFACTURER* is subcontractor from main *CONTRACTOR*) or by *COMPANY* if the purchase order issued from her.

Information on name plates must be engraved.

The main name plate must indicate the following data:

- Manufacturer's name
- Purchase order number
- Refrigerating capacity in Project nominal conditions (kW)
- Refrigerant designation
- Refrigerant charge per refrigerating circuit (kg)
- Chilled water inlet temperature (°C)



- Chilled water outlet temperature (°C)
- Minimum water entering temperature in condenser (°C)
- Maximum water entering temperature in condenser (°C)
- Nominal absorbed power (as per Project nominal conditions) (kW)
- Nominal absorbed power per circuit (in case of several main power supplies) (kW)
- Maximum starting current (as per Project nominal conditions) (A).

9. Additional documents to provide

9.1 Submission of documents

The documents are submitted for Approval, Comment or Information. The following table lists the category of each document. Definitions of the submission class of documents are indicated below:

- Category A: document required for approval; **VENDOR** must not proceed on until receipt of the Purchaser's approval or first working day after the end of the review cycle, first coming.
- Category B: document required for comment; **VENDOR** must be allowed to proceed-on before the end of the review cycle, but shall take into account at no cost/schedule impact any Purchaser's comment(s) issued within the review cycle.
- Category C: document required for information.

9.2 Documents to provide

The following documents must be provided by the **VENDOR**. These documents are a part of **FINAL DOCUMENTATION** that **HVAC CONTRACTOR** must provide to **COMPANY**:

Item	Document Title	Categ.	With Bid
MANAGEMENT			
MGT01	VENDOR Document Schedule - VDS	A	Mandatory
MGT02	Organisation Brief	B	Mandatory
MGT04	Planning showing Engineering, Procurement, Fabrication, Testing, Delivery	B	Mandatory
QUALITY			
QAC01	Project Quality Plan	B	
QAC02	Quality Manual	B	Mandatory
QAC03	QC Inspection Plan	A	
QAC04	QC Procedures	A	
HEALTH, SAFETY, ENVIRONMENT			
HSE02	Material Safety and product Data sheets	B	



Item	Document Title	Categ.	With Bid
INTERFACE			
INT03	Equipment Data Sheets (Refer to <i>COMPANY</i> General Specifications)	B	Mandatory
INT07	Functional description	B	Mandatory
INT12	Interface Block diagrams	B	
INT13	Junction box termination drawings	B	
INT15	P&ID's	A	
INT16	Utility Consumption List	B	Mandatory
INT17	Power supply requirements	A	Mandatory
INT19	Earthing details	B	
INT20	Weight / Centre of gravity drawings & data's	B	
INT21	External Static and Dynamic Forces & Moments	B	
INT22	Anchor bolt details drawings (including size, type, locations relative to the equipment centre-lines in three planes)	B	
ENGINEERING			
ENG02	Detailed Overall Description	C	
ENG03*	Mechanical Detailed Specifications (one per component)	B	
ENG04*	Detailed design/fabrication drawings	B	
ENG06*	Assembly drawings	B	
ENG07*	Design calculation notes	B	
ENG09*	Piping Detailed Specifications (one per component)	B	
ENG10*	Piping routing	B	
ENG11*	Valves & Instruments location drawings (including Provisions for operational and maintenance access)	B	
ENG12*	Electrical Detailed Specifications (one per component)	B	
ENG13*	Electrical cables routing (including junction boxes)	B	
ENG14*	Electrical equipment location drawings (including provisions for operational and maintenance access)	B	
ENG16	Electrical wiring diagrams	B	
ENG17*	Instrument & Control Detailed Specifications (one per component)	B	



Item	Document Title	Categ.	With Bid
ENG18*	Instrument cables routing (including cable trays & junction boxes)	B	
ENG19*	Instrument equipment location drawings including provisions for operational and maintenance access)	B	
ENG21*	Wiring Loops diagrams	B	
ENG24	Power distribution & consumption	B	
ENG27	Insulation mounting drawings	B	
PROCUREMENT			
PRO01	Procurement procedure (covering Purchase, Expediting, QC)	A	Mandatory
PRO02	List of sub-suppliers (table giving: part of equipment, tag no, sub-supplier reference)	A	Mandatory
PRO03*	Unpriced copy of sub-orders	C	
MANUFACTURING			
MAN01*	Weighting procedure	B	
MAN02	Surface preparation and painting procedures	B	
MAN04*	Welding procedure specification (including repair procedures)	B	
MAN05*	Welder qualification procedure	B	
TESTING			
TES01	Pneumatic Testing Procedure (Tightness test)	B	
TES02	Performances & Functional Test Procedure	B	Mandatory
RECORDS, REPORTS & CERTIFICATES			
RRC01	Material Inspection Certificate (EN 10204 , DIN 50049)	C	
RRC02	Testing Authority Approval Certificate	C	
RRC03	Hazardous Area Certificates (when ATEX classified unit)	C	
RRC07*	Welding procedure qualification record	B	
RRC08*	Welder qualification records	B	
RRC10	Detailed <i>NDT</i> reports	B	
RRC12*	Dimensional Control Reports	B	
RRC16	Pressure Test Reports/Certificates	B	
RRC17	Functional Test Report/certificates	B	



Item	Document Title	Categ.	With Bid
RRC22*	Cable continuity and resistance test reports	B	
RRC26*	Surface preparation & Coating reports	B	
RRC27*	Certified Weight certificates	B	
INSTALLATION			
INS01	Weight	B	
INS02	Sub-assembly Documentation	C	
INS03	Sub-assembly Drawings	C	
INS04	Erection/Installation & Tie-in Documentation	B	
INS05	Erection/Installation & Tie-in Drawings	B	
INS06	Lifting Procedure (Onshore/Offshore)	B	
INS07	Name Plate Documents	C	
INS08	Handling, Transportation & Storage Instructions	C	
INS09	Unpacking & Inspection Instructions	C	
INS10	Packing List	C	
OPERATION & MAINTENANCE			
OPM01	Operating Instructions	C	
OPM02	Maintenance Instructions	C	
OPM03	Commissioning & Start-up Manual	C	
OPM04	List of Spare Parts Commissioning & Start-up	C	Mandatory
OPM05	List of Spare Parts 2 Years Operation	C	Mandatory
OPM06	List of Special Tools	C	Mandatory
OPM07	Lube Oil Schedule	C	

* This item is only applicable to *MANUFACTURER* which is not in the Company's HVAC *VENDORS* List.

9.3 Number of documents

The hereafter indicated values are minimum. In case of more important quantity of copies required by the Contract, the values indicated hereafter must be increased as per requirement.

For Review:

- Drawings: 3 hard-copy + 1 electronic
- Documents: 3 hard-copy + 1 electronic
- *VENDOR's* Book: 2 sets + 1 electronic.



Final Submission (Certified Finals)

- Drawings: 6 hard-copy + 2 electronic (CD-Rom)
- Documents: 12 hard-copy + 2 electronic (CD-Rom)
- Data Books: 3 Original + 3 copies + 2 electronic (CD-Rom).

9.4 Format of documents

9.4.1 Electronic copy

An electronic copy of all project specific documents must be submitted in Native File Format. (.doc, .xls & .dwg preferred). Standard documentation may be .pdf or .tif format. Data must be provided on CD.

9.4.2 Hard Copy

All documents must be full size based on 'A' series sizes, A0 size is not acceptable.

All documents shall be checked before submission, unchecked documents may be returned un-reviewed.

All documents submitted must be clearly marked with the Purchase Order No., Item No, *VENDOR* Job No., Equipment/Tag No. (if applicable), *VENDOR* Document No., Purchasers Document No.

All documents and technical data must be in the English language with dimensions and units in accordance with ISO.

A3 and A4 documents must be submitted with a project document front sheet, which will carry the Purchaser's review status on return to the *VENDOR*.

All document prints larger than A4 must be folded to A4 size with identification data visible at the bottom right.

Note I: The documents to provide represent an important part of the *VENDOR*'s supply. If one or several documents were not delivered, the Buyer would be able to suspend his payment.

Note II: The documents provided by the *VENDOR*, correspondence between the *VENDOR* and the Buyer or between the *VENDOR* and *ENGINEERING* must be typed. Hand-written correspondence will be rejected.

10. Equipment inspection

COMPANY can require an equipment inspection according to the following table:

Level 0	[]	No inspection required
Level 1	[X ³]	- Kick-off meeting with Manufacturer and COMPANY HVAC specialist (from Exploration & Production division, Technology department). - Final inspection prior to shipment and FAT with Manufacturer and COMPANY HVAC specialist (from Exploration & Production division, Technology department).
Level 2	[X ⁴]	- Kick-off meeting with Manufacturer and COMPANY HVAC specialist (from Exploration & Production division, Technology department). - In-progress surveillance, meetings, all witness and hold points. - Final inspection prior to shipment and FAT with Manufacturer and COMPANY HVAC specialist (from Exploration & Production division, Technology department). - Cost for COMPANY, regarding this equipment inspection level is at CONTRACTOR charge.
Level 3	[]	- Kick-off meeting with Manufacturer and COMPANY HVAC specialist (from Exploration & Production division, Technology department). - Continuous monitoring by resident inspector. - Final inspection prior to shipment and FAT with Manufacturer and COMPANY HVAC specialist (from Exploration & Production division, Technology department).

11. Factory Acceptance Tests

The target of factory acceptance tests is to check that equipment supplied is in accordance with the requirements defined within the present specification and requisition documents.

The factory acceptance tests (FAT) must be carried out by the chilled water unit MANUFACTURER, according to following standard and rule:

- EN 14511
- Measurement procedures and instrumentation must be certified by an independent Certifying Body.

Performance (refrigerating capacity, absorbed power, water flow rates, pressure losses within exchangers) measurement must be carried out by MANUFACTURER in a certified Laboratory. Performance must be measured at:

- At minimum water entering temperature on condenser (as per Project specifications)

³: Applicable to MANUFACTURER which is in the COMPANY's HVAC VENDORS List

⁴: Applicable to MANUFACTURER which is not in the COMPANY's HVAC VENDORS List



- At maximum water entering temperature on condenser (as per Project specifications)
- At lowest refrigerating capacity.

Tests must be realised in the *MANUFACTURER* premises at their own expenditure and have to include all expenses required to allow to the *COMPANY*, to the *HVAC CONTRACTOR* and to the *HVAC ENGINEERING* to attend to the factory acceptance tests.

The *COMPANY* can carry out the performance and design data listed in "General design data" paragraph and in accordance with the present specification.

12. Data sheet

A filled-up data sheet must be provided by the chilled water unit *MANUFACTURER*. The data sheet form, provided with *COMPANY* General Specifications must be used by the *MANUFACTURER*.

13. Minimum information for quotation

For chilled water units provided for installation on FPSO, FPU, ... or for offshore platforms submitted to inspection by a Certifying Body (Bureau Veritas, DNV, ...) the following data must be transmitted to the *MANUFACTURER* for quotation (mandatory):

Note: *COMPANY* requires to *MANUFACTURER* only answer to request for quotation when the following data are indicated by the *CONTRACTOR*.

- Name of owner (TOTAL or affiliate)
- Construction yard
- Location of chilled water unit
- Organism for marine certification:
 - American Bureau of shipping
 - Bureau Veritas Marine
 - Germanischer Lloyds
 - Rina
 - Det Norsk Veritas
 - Lloyds Register of Shipping
 - Other.

14. Spare parts list

A spare part list for start-up and two years maintenance must be provided by the *MANUFACTURER*.

Except when otherwise stated in General Specifications or in Project documents, the spare parts list must be filled on a form in accordance with the present model (refer to next page).

By its acceptance of purchase order, the equipment *MANUFACTURER* contracts to provide exhaustive spare parts lists including the designation and reference of each component, as mentioned in catalogue of the originator *MANUFACTURER* of this component.



Equipment spare parts list can be required by *COMPANY's HVAC SPECIALIST* as soon as equipment is provided by the *MANUFACTURER*. In this case the *COMPANY's HVAC SPECIALIST* requirement prevails on other specification, delay or request mentioned in the other Projects documents.

[illegible]



15. Other references

Following documents are applicable:

- Standards: [EN 378 \(Parts 1; 2; 3; 4\)](#), [EN 1044](#)
- Regulations: [Directive 94/9/EC](#), referred to a ATEX 100a / 95, [Directive 97/23/EC](#) dated 29 May 1997, [Directive 98/37/EC](#) dated 27 June 1988, [Directive 1999/92/EC](#), referred to a ATEX 118 / 137, [Directive 2004/108/EC](#) dated 15 December 2004, [Directive 2006/42/EC](#) dated 17 May 2006, [Directive 2006/95](#) dated 12 December 2006, Certifying Body rules (when equipment is Marine classified)
- Total General Specifications: [GS EP ELE 011](#), [GS EP ELE 031](#), [GS EP ELE 079](#), [GS EP ELE 111](#), [GS EP ELE 162](#), [GS EP HVA 000](#), [GS EP INS 110](#).



Appendix 1 Chilled water unit (water cooled) – Data Sheet



Exploration & Production

GENERAL SPECIFICATION

HVAC

DS EP HVA 230

Chilled Water Unit (Water cooled) - Data Sheet

01	10/08	General updating
00	10/06	First issue
Revision	Date	Notes



Exploration & Production

HVAC

CHILLED WATER UNIT - WATER COOLED - DATA SHEET

Data sheet presentation

This data sheet is composed of following sheets:

- Water cooled chilled water unit ("Main" sheet)
This sheet sums up the main data concerning the unit.
- Refrigerating compressor ("Compressor" sheet)
This sheet sums up the compressor data. In case of several compressors, one data sheet per refrigerating compressor has to be provided.
- Evaporator ("Evaporator" sheet)
This sheet sums up the evaporator data. In case of several evaporators, one data sheet per evaporator has to be provided.
- Condenser ("Condenser" sheet)
This sheet sums up the condenser data. In case of several condensers, (heat recovery,...)one data sheet per condenser has to be provided.
- Motor ("Electrical motor" sheet)
This sheet sums up the motor data. In case of several motor compressors, one data sheet per motor has to be provided.

Sheets use method:

Only fields to fill in by the *CONTRACTOR* are accessible.
For major part of these fields, contextual help is accessible when roll-over with the mouse.
The contextual help includes a definition of field to avoid misunderstanding.
The "Cover" and "presentation" sheets shall not be attached to the data sheet submitted *COMPANY* for approval.
An "Highlighting" button allows to identity the fields to modify or to fill in for each sheet.
Before printing a sheet, press "Without highlighting" button.

Data sheets approval:

The data sheets have to be fully filled in by *CONTRACTOR*.
The fully informed data sheets (all sheets) have to be approved by the *COMPANY*'s Specialist before purchasing the equipment.

Within *HVAC* documents, expression in capital characters and *ITALIC* are defined within the "Terminology, definitions and abbreviations" specification.

 TOTAL Exploration & Production	COMPANY PROJECT NAME DATA SHEET CHILLED WATER UNIT - WATER COOLED						
	Doc. number:				Contractor document N°:		
	Equipment location:						
Tag No:				Model:			
System No:				Serial No:			
Sub-system No:							
Supplier:							
Manufacturer:							

Subject	Rev.	Stat.	Date	By:	Checked by:	Approved by:

Technical data

Refrigerating capacity*: kW

Condenser water inlet temperature*: °C

Water temp. range in condenser: to °C

Evaporator water entering temperature*: °C

Evaporator water leaving temperature*: °C

Refrigerant:

Number of refrigerating circuit:

Refrigerating system:
 Expansion: ☐ Flooded: ☐

Circuit 1	Circuit 2

Refrigerant charge: kg

Number of compressors:

Reducing capacity steps nbr:

Absorbed power*: kW

Absorbed current*: A

Starting current: A

Maximum absorbed current: A

Short circuit current: A

Minimum refrigerating capacity: %

Nominal voltage: V

Voltage range: to V

Frequency: Hz

When pump(s) included within package:

Available pressure for piping: kPa

Heat rejection: kW

Heat recovery water condenser: Yes ☐ No ☐

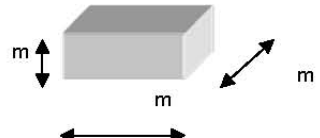
Evaporating temperature: °C

Condensing temperature: °C

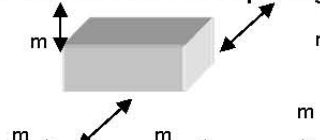
Refrigerant recovery system: Yes ☐ No ☐

Unit mass Dry: kg Operating: kg

Main sizes :



Space for maintenance and operating:



Noise data:

Sound power levels SWL in dB (ref. 10⁻¹²W)

Octave band centre frequency (Hz)

	63	125	250	500	1000	2000	4000	8000
Maximum value:								

* : nominal conditions of Project.



Exploration & Production

General Specification

Date: 01/2012

GS EP HVA 231

Rev: 02

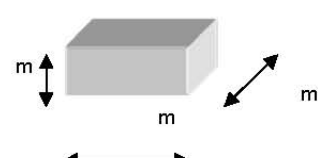
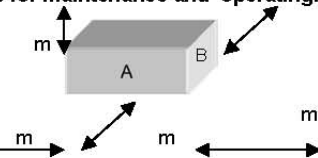
Appendix 1

 TOTAL Exploration & Production	COMPANY PROJECT NAME DATA SHEET CHILLED WATER UNIT - WATER COOLED		Project Logo
1	Unit composition		
2	Description:	Tag number:	Refer to data sheet:
3	Water cooled condenser		
4	Evaporator		
5	Refrigerating compressor		
6			
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8			
9	Motor		
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Appendix 1

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 TOTAL Exploration & Production	COMPANY PROJECT NAME CHILLED WATER UNIT - WATER COOLED - DATA SHEET EVAPORATOR					
Doc. number: _____ Contractor document N°: _____						
Equipment location: _____ Tag No: _____ Model: _____ System No: _____ Serial No: _____ Sub-system No: _____ Supplier: _____ Manufacturer: _____						
Subject	Rev.	Stat.	Date	By:	Checked by:	Approved by:

Technical data: Refrigerating capacity* : kW Refrigerant used : Medium entering temperature : °C Medium leaving temperature : °C Medium flow rate : m³/h Medium specific heat capacity: kJ/kg.K Medium specific weight: kg/m³ Requested cooling medium filtration: µm Evaporator type: ☐ Direct expansion: ☐ Flooded: ☐ Medium velocity inside tubes (flooded): m/s Tightness test pressure: bar(g) Operating pressure (medium side): bar(g) Design pressure (medium side): bar(g) Glycol percentage: %mass Exchange area : m² Drain plug: Yes ☐ No ☐ Fouling factor : m².K/kW Evaporating temperature : °C Pressure loss on water side: kPa Medium content : l Unit mass Dry: kg Operating: kg Construction : Piping connection sizes : Medium inlet : mm Medium outlet : mm Refrigerant inlet : in Refrigerant outlet : in Drain : mm When shell and tubes type : Tube thickness: mm Number of circuits: 87 When plates type : Number of plates: 89 Plates thickness : mm Medium connections: Piping schedule : 94 Victaulic : ☐ To weld: ☐ Thread: ☐ Removable headers: Yes ☐ No ☐ Safety valve quantity: 2 98 Sacrificial anode : Yes ☐ No ☐ 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104	Material: Shell / frame: Exchange tube / plates: Tubes sheets : Headers: Baffles : Gaskets : Protection against corrosion on headers Type: Thickness: µm Main sizes :  Space for maintenance and operating:  Water connections: Side A: ☐ Side B: ☐ Opposite to side A: ☐ Opposite to side B: ☐
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* : nominal conditions of Project.

	COMPANY PROJECT NAME CHILLED WATER UNIT - WATER COOLED - DATA SHEET CONDENSER	
	Doc. number:	Contractor document N°:

Equipment location: Tag No: System No: Sub-system No: Supplier: Manufacturer:		Model: Serial No:	
---	--	----------------------	--

Subject	Rev.	Stat.	Date	By:	Checked by:	Approved by:

1 Technical data

2 Rejection capacity*: kW

3 Refrigerant used:

4 Medium:

5 Hypochlorite content: ppm

6 Dissolved oxygen: mg/l

7 Medium entering temperature: °C

8 Max. medium leaving temperature: °C

9 Medium flow rate*: m³/h

10 Medium specific heat capacity: kJ/kg.K

11 Medium specific weight: kg/m³

12 Requested cooling medium filtration: µm

13 Medium velocity inside tubes: m/s

14 Tightness test pressure: bar

15 Operating pressure (medium side): bar

16 Design pressure (medium side): bar

17 Glycol percentage: %mass

18 Exchange area: m²

19 Drain plug: Yes ☐ No ☐

20 Fouling factor: m².K/kW

21 Condensing temperature: °C

22 Pressure loss on water side: kPa

23 Medium content: l

24 Unit mass Dry: kg

25 Operating: kg

27 Construction:

28 Piping connection sizes:

29 Medium inlet: mm

30 Medium outlet: mm

31 Refrigerant inlet: in

32 Refrigerant outlet: in

33 Drain: mm

34 When shell and tubes type:

35 Tube thickness: mm

36 Number of circuit:

37 When plates type:

38 Number of plates: mm

39 Plates thickness: mm

44 Medium connections:

45 Piping schedule:

46 Victaulic: ☐

47 Thread: ☐

48 Removable headers: Yes ☐ No ☐

49 Safety valve quantity: 2

50 Sacrificial anode: Yes ☐ No ☐

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52 *: nominal conditions of Project.

52 Material:

53 Shell / frame:

54 Exchange tube / plates:

55 Tubes sheets:

56 Headers:

57 Baffles:

58 Gaskets:

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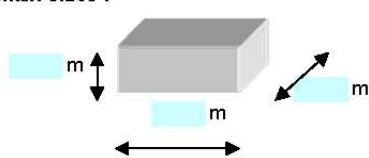
60 Protection against corrosion on headers

61 Type:

62 Thickness: µm

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64 Main sizes:



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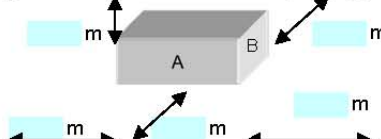
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72 Space for maintenance and operating:



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78 Water connections:

79 Side A: ☐ Side B: ☐

80 Opposite to side A: ☐ Opposite to side B: ☐

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