



Exploration & Production

GENERAL SPECIFICATION

HVAC

GS HVA 202

Air Handling Unit (AHU)

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00	02/03	First issue
Rev.	Date	Notes

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1. Scope

The purpose of this document is to define the minimum requirements for design and construction of air handling units (AHU). This specification is not applicable for spaces requiring asepsis.

The words and expressions in capital characters are defined inside the general specification **GS HVA 801**.

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.

Equipment and installations must be in accordance with (in order of precedence):

1. The country local regulations where equipment and/or installations shall be operated
2. Total General Specifications as listed in **GS HVA 000**
3. The International Standards
4. The French Regulation (when Country local regulation does not exist).

Notes:

- In case of discrepancy between documents the more stringent requirements shall apply.
- The HVAC VENDOR or CONTRACTOR may propose proven improvements to the reference documents but shall 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 data if any must be used and applied by VENDOR, SUPPLIER, MANUFACTURER and CONTRACTOR.

Standards

Reference	Title
AISI 316L	Composition of steel
AISI 304L	Composition of steel
BS 4718:1971	Methods of test for silencers for air distribution systems
DIN ISO 1940-1	Mechanical vibration; balance quality requirements of rigid rotors
EN ISO 7235	Acoustics - Measurement procedures for ducted silencers
EN 305	Échangeurs thermiques - Définitions de la performance des échangeurs thermiques et procédure générale d'essai pour la détermination de la performance de tous les échangeurs thermiques

Reference	Title
EN 779	Filtres à air de ventilation générale pour l'élimination des particules – Exigences, essais, marquage.
EN 1216	Échangeurs thermiques - Batteries à ailettes à circulation forcée - Procédures d'essai pour la détermination des performances
EN 1751	Ventilation des bâtiments - Bouches d'air - Essais aérodynamiques des registres et clapets
EN 10169-1	Produits plats en acier revêtus en continu de matières organiques (pré-laques) - Partie 1 : Généralités (définitions, matériaux, tolérances, méthodes d'essai)
EN 1886 rev. 2002 (E)	Ventilation des bâtiments - Caissons de traitement d'air - Performance mécanique
EN 13053	Ventilation des bâtiments - Caissons de traitement d'air - Classification et performance des caissons, composants et sections
IEC 60034	Rotating electrical machines
IEC 60079	Electrical apparatus for explosive gas atmosphere
IEC 61310-1	Safety of machinery - Indication, marking and actuation Requirements for visual, auditory and tactile signals
ISO 3741	Acoustique - Détermination des niveaux de puissance acoustique émis par les sources de bruit à partir de la pression acoustique - Méthodes de laboratoire en salles réverbérantes
ISO 3744	Détermination des niveaux de puissance acoustique émis par les sources de bruit à partir de la pression acoustique - Méthode d'expertise dans des conditions approchant celles du champ libre sur plan réfléchissant.
ISO 3746	Acoustique. Détermination des niveaux de puissance acoustique émis par les sources de bruit à partir de la pression acoustique. Méthode de contrôle employant une surface de mesure enveloppante au-dessus d'un plan réfléchissant
ISO 4628 part 3	Paints and varnish – Evaluation of degradation of paint coatings.
ISO 9001 : 2000	Systèmes de management de la qualité
ISO 14001	Environmental Certification
ISO 1940-1973 G2.5	Fan impeller balance accuracy
ISO 9614-1	Acoustique - Détermination par intensimétrie des niveaux de puissance acoustique émis par les sources de bruit - Partie 1 : Mesurages par points
ISO 9614-2	Acoustique - Détermination par intensimétrie des niveaux de puissance acoustique émis par les sources de bruit - Partie 2 : Mesurages par balayage.

Reference	Title
ISO 11546-1	Détermination de l'isolement acoustique des encoffrements - Partie 1 : Mesurages dans des conditions de laboratoire (aux fins de déclaration)
ISO 11546-2	Détermination de l'isolement acoustique des encoffrements - Partie 2 : Mesurages sur site (aux fins d'acceptation et de vérification)
NF C26-220	Méthodes d'essai des matières isolantes - Méthode pour déterminer les indices de résistance et de tenue au cheminement des matériaux isolants solides dans des conditions humides
UTE C63-100	Appareils mécaniques de connexion - Guide pratique pour l'exécution des appareils et de leurs enveloppes en vue de leur fonctionnement dans un environnement déterminé
VDI 6022	Hygienic standards for ventilation and air conditioning systems

Professional Documents

Reference	Title
ADC	Air Diffusion Institute (All documents)
AFI	American Filtering Institute (All documents)
AGA	American Gas Association (All documents)
AICVF Codes	Association des Ingénieurs de Chauffage - Ventilation Français (All codes)
AMCA	Air Moving and Conditioning Association (All documents)
ARI 410	Air Conditioning and Refrigeration Institute
ASHRAE 52-76	American Society of Heating, Refrigeration and Air Conditioning Engineers
EUROVENT	Certification (All documents concerning that subject)
EUROVENT	Sound attenuator (All documents concerning that subject)
SMACNA	Sheet Metal and Air Conditioning CONTRACTORS National Association (All documents concerning duct construction)

Regulations

Reference	Title
Not applicable	

Codes

Statutory by law or recognised professional body approved by COMPANY.

Reference	Title
CODETI	Code Français de Construction des tuyauteries industrielles (All documents concerning pipe construction)
ASTM B209-02	Standard specification for aluminium and aluminium-alloy sheet and plate
ASTM E34	Test method for Chemical analysis of aluminium and aluminium base alloys
ASTM E53-98	Standard test method for determination of copper in unalloyed copper by gravimetry

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS HVA 000	List of HVAC Specifications
GS HVA 100	Basis of design
GS HVA 801	Terminology, definitions, abbreviations
GS COR 350	External protection of offshore and related structures and equipment by painting

3. Construction

In the present specification, Stainless Steel [AISI 316L](#) shall be understood as a Stainless Steel with C < 0.003% / Mo > 2.5% (Z7CND 18-12-03).

For the whole unit and components, screws and nuts will be made of stainless steel (nuts in Z6CND 17-11 and screws in Z6CN18-09), equipped with nylon washers. An alternative can be the use of screws protected by Impreglon Delta-MKS.

3.1 Casing

Construction shall be designed to assure the supply of a product in accordance with [EN 1886 rev. 2002 \(E\)](#) (Ventilation des bâtiments - Caissons de traitement d'air - Performance mécanique) standard. The minimum requirements of this standard are supplemented by the present specification.

The following design classes are selected for the design of the AHU casing:

- Casing strength: casing class: CEN 1A for airflow upto 25,000 m³/hr & CEN 2A above 25,000 m³/hr.

- Casing air leakage classes of AHU (400 Pa negative test pressure): leakage class CEN B (filter class EN 779: F8 to F9)
- Units operating under both negative and positive pressure: casing air leakage classes of AHU (700 Pa positive test pressure): leakage class: CEN B
- Classification of thermal transmittance U of the casing panel of the air handling unit: T2 (MANUFACTURER certification to be provided)
- Classification of thermal bridging factor of the casing: (MANUFACTURER certification to be provided).
 1. TB3 for indoor installation.
 2. TB2 for outdoor installation.

Installer shall provide adequate ventilation around the AHU installation area. Installer shall also provide additional internal insulation at AHU frames & corners after cooling coil section for outdoor installation.

The air handling unit casing shall be built with double face panels. Support parts and casing structure shall be integrated in panels thickness.

Panels shall be made of sheet metal (minimum thickness: 07/10 mm). A mineral wool cushion shall be used to realise thermal and sound insulation (M0 fire classification in accordance with French regulation or equivalent in accordance with International Standards). The sound attenuation of the casing shall be at least 40 dB.

Sheet metal type shall be in accordance with the using conditions indicated in **GS HVA 100**:

"Installation type"	Air handling unit outside panel casing	Air handling unit inside panel casing	Complementary protection against corrosion
Indoor	Stainless steel AISI 316L	Stainless steel AISI 316L	-
Outdoor	Stainless steel AISI 316L	Stainless steel AISI 316L	According with GS COR 350 OR PSN 530

Complementary protections against corrosion shall be done after cutting and boring of steel sheet metal & on outer surface of AHU panel for outdoor installation.

Panels shall be fixed with **AISI 316L** stainless steel screws, with interposition for fixation on painted sheet metal of a nylon washer between screw top and panel. An alternative can be using of screws protected by Impregon Delta-MKS.

A panel arrangement shall allow to limit thermal bridges and shall be preferred to a frame arrangement (which must be in stainless steel **AISI 316L**). Joints between panels, which are not subject to a regular dismantling, shall be blocked up with silicone.

Therefore, the pressure rating of the casing, withstanding a negative pressure or an overpressure (based on maximum Head of the fan(s)) shall not induce any permanent deformation.

When negative pressure or overpressure duty of the casing shall be superior to value shown in chapter "sizing characteristics", maximum authorised leakage flow, shown in this chapter shall be corrected with the following formula:

$$f_m = f_e \times \left[\frac{\text{overpressure}^*}{700} \right]^{0,65}$$

*: overpressure or negative pressure

f_m : maximum actual leakage flow allowable for overpressure (or negative pressure) in l/s/m²

f_e : maximum leakage flow allowable for overpressure (or negative pressure) nominal (sizing characteristics) in l/s/m²

Some panels shall need to be dismantled to allow access to any component of the unit. The removal of these panels shall not alter the rigidity of the assembly. Each panel must be dismantled independently of other panels.

Air tightness between panels will be assured by resistant joints put on fixed parts, and by another joint put on mobile parts. Contact surfaces shall be free from any roughness.

AHU corner shall be made of composite material in single piece with no sharp edges. For larger units, height more than 2mtr, AHU corner piece should be die cast aluminium painted (70 micron primer+70 micron epoxy powder paint).

Casing will be delivered with longitudinal steel supports feet. This structure must be in stainless steel **AISI 316L**, and protected against corrosion in accordance with **GS COR 350** specification.

Casing will be delivered with a stainless steel **AISI 316L** I-beam bottom frame. The I-beam will be 20 cm height **minimum** in order to allow the drainage of condensates.

Insulation of the casing and accessories shall be realised with non-flammable material (M0), 50mm thick, heat transfer coefficient not more than 0.7W/m² °C. The term "Accessories" defines all the components of the casing (i.e. angles profiles, doors, etc.).

Minimum Insulation density

	Panel	Frame
Outdoor installation	140 Kg/m ³	140 Kg/m ³
Indoor installation	50 Kg/m ³	140 Kg/m ³

External framework in pentapost construction, closed-profile members bolted to solid corner pieces using two bolts on each stem (refer fig). Welded frame is not acceptable.



Frame & corner piece fixing arrangement

Every maintenance area inside the casing (e.g. fan, filters sections) shall be equipped with a stainless steel flooring withstanding a load of 400 kg.

The maximum surface temperature, on external part of casing must be less than 50°C and must be 5°C above the dew point of the outside conditions.

Factor of thermal bridge k_b shall be higher than the value shown in chapter "sizing characteristics", with:

$$k_b = \frac{t_{\min}}{t_{\text{air}}}$$

$$t_{\min} = t_i - t_{\max}$$

$$t_{\text{air}} = t_i - t_a \text{ (nearby } 20^\circ\text{C)}$$

$$t_i = \text{average temperature of air inside the unit (}^\circ\text{C)}$$

$$t_a = \text{average temperature of air outside (}^\circ\text{C)}$$

$$t_{\max} = \text{maximum temperature of external area (}^\circ\text{C)}$$

For air handling unit part located between fresh air intake up to downstream filters (filters located upstream a heating coil), the floor must be sloping and equipped with drain. The drain must be extended by pipe to the maintenance side of the air handling unit (in order to connect it to siphon - out air handling unit MANUFACTURER's scope -). Drain and piping shall be made of stainless steel [AISI 316L](#).

All components which require to be removed for replacement or maintenance (except filters), shall be installed on sliding drawers made of stainless steel [AISI 316L](#).

The unit construction shall allow dismantling of any coil (by sliding) by both sides of the unit, whatever the position of coil junctions to hydraulic circuit.

Access doors shall be easy to open and shut. They will be delivered with handles integrated in the door thickness. Handles shall be equipped with adjustable bolts, to assure a perfect air tightness. Doors shall be installed and could be dismantled without any tools. Bolts shall take support on plastic washers or in stainless steel, fixed on the casing columns, to avoid any damage of the paint or of protection against corrosion. Inspection door hinge should be manufactured from aluminium alloy coated with black epoxy (refer fig). Inspection doors shall be provided with special gasket for complete air tightness. For unit height more than 1.5mtr, 3 handles shall be provided in each door.



Mechanically fixed replaceable door seal



Door handle & locking arrangement

Each door shall be equipped with the following blocking system:

- When the part of the air handling unit on which the door is located is at negative pressure (relative to outside of casing), the door shall be maintained in open position by blocking system. The closure of the door shall need a manual operation on the blocking system.
- When the part of the air handling unit on which the door is located is at positive pressure (relative to outside of casing), the door shall be blocked in its opening way. This opening shall be limited to opening angle of 25°, by the blocking system. The complete opening of the door shall need a manual operation on the blocking system.

The doors dedicated to maintenance of filters under positive pressure (relative to outside of casing) must have an external open way.

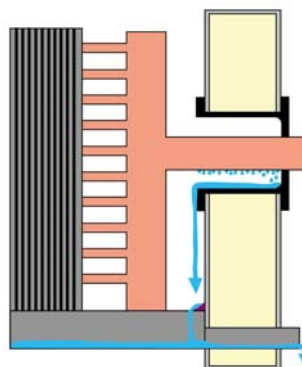
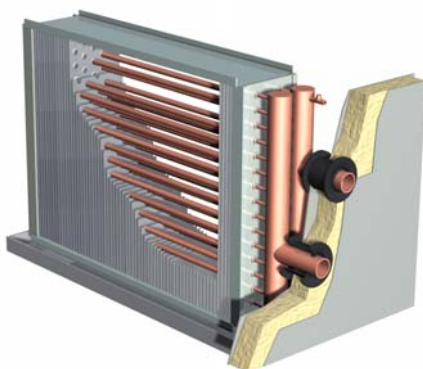
The sound absorption through the panels shall be according to EN 1886 (acoustic insulation). The sound reduction through the panels required shall confirm to the values below:

Noise reduction through casing shall be atleast:

Frequency (Hz)	125	250	500	1000	2000	4000	8000
Insertion Loss (dB)	12	22	29	28	26	27	29

All AHUs shall be provided with AISI 316L connecting flanges at inlet and outlet for duct connections at site. The AHU panels on such inlet & outlet (with duct connections) shall be provided with additional stiffener or thicker casing material than rest of the AHU panel.

Panels crossed by pipes of heating and cooling coils shall be sealed (see picture).



Purpose made pipe seals for low air leakage and vapour seal for panel.

Dismantling of coils must be possible from both sides of the air handling unit, by removal of panels located in line with coil. Position of flanges must allow the sliding of coils, for dismantling, without disconnection of the flanges from headers.

U trap for draining: The minimum height between the bottom drain connection and the finished floor level to be applied as a “thumb rule” is:

- LP systems: 250 to 300 mm
- HP system: 500 to 700 mm

A calculation shall be supplied to validate the height.



Water trap picture shown is for LP system only, up to 850 Pa suction pressure in coil section. For HP system, contractor to fabricate suitable water trap at site depending on suction pressure in cooling coil (to supply calculation) & increase base frame height accordingly (to supply calculation).

Water Trap

Insulation, out of MANUFACTURER's scope must be realised by CONTRACTOR. The three part panel shall be dismantled before insulation.

Assembly must be realised as follow:

- Piping insulation
- Installation of the mechanical protection
- Flange threading
- Installation of three parts panel
- Seal installation between flange and panel
- Flange fastening
- Installation of peripheral seal between insulation mechanical protection and flange.

All cable penetrations in the casing shall be equipped with a polyamide or **chrome plated brass** cable gland. One separated cable gland shall be supplied per purpose such as:

- Electrical motor power supply, heater, temperature sensor, starter, etc.
- Fire and gas detectors
- Safety switches (near fan motor, interlocking cable for the position switch which control the second door on fan access, etc.)
- Shut-off dampers (motor, heater, etc.)
- Anti-freeze thermostat
- Control devices, etc.

A cable tray shall be supplied in the casing to support the cable between the penetration and the connecting point on the equipment. They must be made of stainless steel **AISI 316L**.

Additional polyamide or chrome plated brass cable gland cable glands shall be provided for commissioning and maintenance to allow insertion of control equipment. Their minimum diameter will be 22.2 mm and they will be supplied with screwed caps (see pictures below). They will be located at:

- Fresh air casing inlet

- Return air casing inlet
- Humidifier outlet
- Outlet of each coil

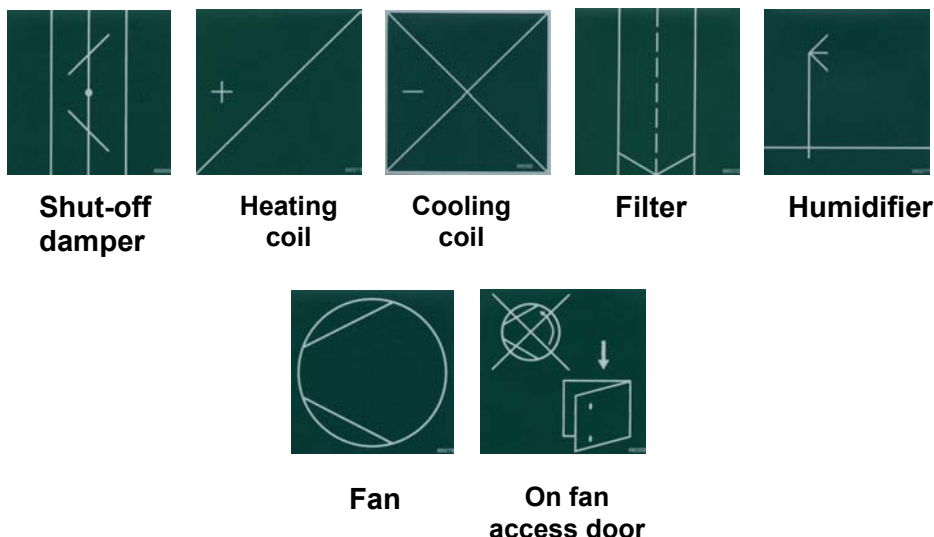
These orifices will be supplied with screwed caps.

Panels of air handling unit shall be protected by a plastic film, which will be removed during commissioning.

In order to design the face velocity through the components, the minimum actual free area of the components shall be considered instead of the casing section (reduction of air handling unit section is prohibited).

3.2 Tagging of air handling units components

Pictograms hereunder defined shall be indicated on concerned parts of air handling unit



Components of air handling unit must be tagged in accordance with Project specification.

3.3 General consideration about Air Handling Units

All elements of the unit shall be free of salient or trenchant parts (sheet metal cutting, sharp angles, etc.).

Components described hereafter must be installed, in accordance with P&ID, D&ID calculation note results, approved by COMPANY.

3.4 Shut-off damper

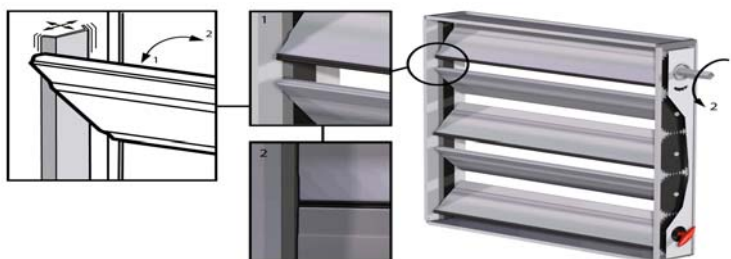
Each shut off damper shall be equipped with blades (in opposition) composed of double sheet metal (material in accordance with table of chapter "Casing - Air handling unit inside panel "). Blades should be equipped with ethylene-propylene joints. They should be operated by Stainless steel [AISI 316L](#) solid drive shafts, with square end. Bearings should be made of nylon and crankshaft of stainless steel, with opposite moving. An indicator of shut-off damper position shall be engraved on end of the damper operating shaft. A interface flanging plate shall allow to install a motorization.

According to the air handling unit configuration, one shut-off damper (provided by MANUFACTURER) must be supplied and installed on each air inlet. In accordance with CONTRACTOR, it shall be supplied and installed one shut-off damper (provided by MANUFACTURER) at fan discharge (when the fan cannot be located on duct).

Return air shut-off damper and blown air shut-off damper must be installed outside of the casing.

Fresh air shut-off damper must be located outside of casing, except when fresh air temperature is less than -10°C (winter temperature defined in **GS HVA 100** specification). In this case, fresh air shut-off damper must be located inside of casing.

When fresh air temperature is less than -10°C , driving crankcase and bearings crankcase must be equipped with heaters in order to maintain a positive temperature, whatever the fresh air intake temperature is. Safety thermostats with automatic reset, must be installed inside crankcases in order to avoid over-heating inside them.



Opposed blade damper

The balancing dampers shall be located inside the air handling units.

In order to ease the air balancing of the AHU (Fresh air Vs Return air), two perforated grilles shall be installed on the fresh air stream (one fixed, one sliding). These two Stainless steel **AISI 316L** grilles shall be supplied with a fixation device to stop the sliding grille in the adequate position.

Dampers shall be in accordance with **CEN 4 (T5)**. Damper shall be provided with blade position indicator. Damper linkages located outside the casing shall be provided with protection plate to hide the linkage.

3.5 Air filters

Filtration shall be assured by one or several filters. The filters efficiency shall be equal or superior to the one defined in chapter "Sizing characteristics". Filters, when clean, shall be, at least, classified M2 (according to French regulation).

The frame receiving the filter(s) must be Stainless steel **AISI 316L**.

Easy access to filters shall be provided for maintenance and replacement. Dismantling of filters shall be done on dirty side (i.e. in upstream side of filters). Filters shall never be handled in downstream side relative to the vertical level of filter fixation.

The air tightness between filters and filter holders shall be improved by a joint fixed on the holder, combined with a device allowing a solid contact between the two elements (e.g. picture). Filters freely installed into slides are prohibited.

Indicator of pressure loss, (one per filtration stage), shall be installed on the casing in order to monitor the filter clogging. The manometer shall be Magnehelic Mark. Piping for pressure measurement on each filtration stage must be "Instrument quality", stainless steel [AISI 316L](#).



Variation of clogging-up of filters shall not lead to variation of flow above 6% from of the nominal flow of the air handling unit.

Pressure loss of each filtration stage, at maximum above allowed clogging-up, shall be indicated on a engraved Dilophane label, located under each manometer. Pressure tapings shall be integrated into the frame to allow a manometer or filter monitor to be fitted.

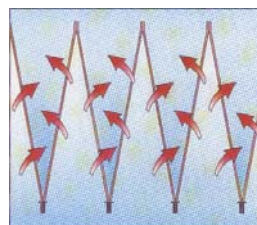
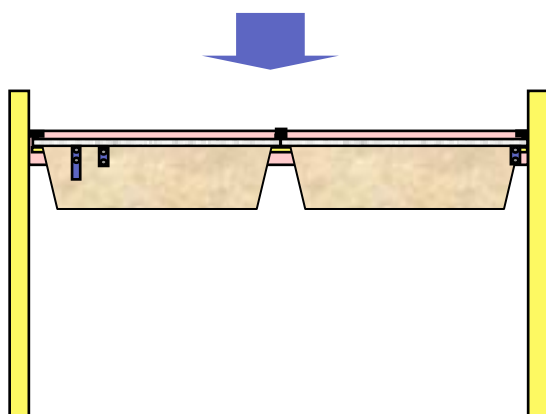
Filter materials shall be flame-retardant, incombustible, and non-odorous. Filter efficiency & class should be in accordance with European standard EN779.

The air by-pass around filters will be limited to the value indicated in chapter "sizing characteristics", according to level type of filtration installed.

The filters shall be composed of two stages:

- Prefilters : 50 mm long (EU-3, as per EN779)
- Bag filters : 630 mm long 'F9' efficiency (EU-9, as per EN779)

0,2% leakage rate



For each filtration stage, MANUFACTURER must provide perforated grille(s) in stainless steel [AISI 316L](#). Pressure loss of this grille must be identical to filter(s) pressure loss taken into account for design (see § "Sizing characteristics") with nominal air flow rate. The grille(s) shall be placed instead of filters during pre-commissioning and commissioning. Air tightness between grille(s) and filter(s) frame must be realised.

A chart "Pressure loss- Versus - Air flow rate" must be supplied by the MANUFACTURER, in order to read the air flow rate when the grille(s) is (are) installed.

Use of filter material which can produce illness shall not be used like asbestos etc., (a certificate shall be issued to certify above requirement).

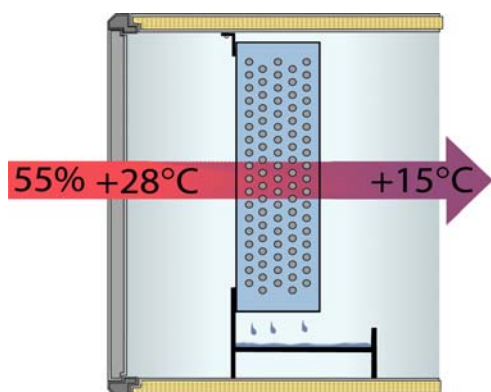
3.6 Cooling coil

The materials of the cooling coil shall be selected taking into account the environment and the operating situation, defined in document **GS HVA 100**:

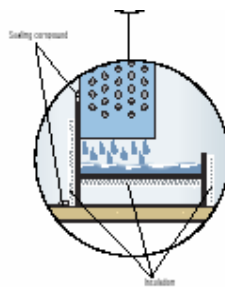
"Coil type"	Tubes	Fins	Coil frame	Protection against corrosion
Chilled water	Copper	Copper	Stainless steel 316L	Hérésite Sakaphen
DX coil	Copper	Copper	Stainless steel 316L	Hérésite Sakaphen

Cooling coil should be in-house production of AHU manufacturer. The internal diameter of pipes crossing in the coil frame shall be 0.5 mm larger than the coil pipes diameter. Coil tube thickness should not be less than 0.4mm, return bend 0.5mm & fin thickness should not be less than 0.12mm.

All joints shall be silver brazed. Headers of cooling coil shall be outside the airstream enclosed in an double skin insulated box and shall provide maximum face area. Sealing around cooling coil should be provided to avoid hot air bypass (on the hot air side), refer figure.



Air temperature mentioned in this picture is for illustration only.



Cooling coil sealed to prevent leakage

Drain pans shall be in stainless steel AISI 316L minimum 1mm thickness, insulated and should have at least 4 threaded drain outlet, one in each corner & cross connection. The drain pan should be designed to take care of rolling effect. The condensate drain pipe connection through the unit casing shall be insulated from the factory with 12 mm thick closed cell elastomeric foam rubber insulation and sealed with plastic grommet. All connections shall be insulated with closed cell rubber and shall be sealed with a rubber gasket where they pass through the casing.

Space between two fins should not be less than 2.5 mm after protective coating.

Cooling coils should be fitted with withdrawable profiled droplet eliminator made from hard plastic of offshore quality. The slides must be made of **AISI 316L**. Material should be mineral reinforced polypropylene with 2.5% well dispersed carbon black (density 1500-2000 kg/m³). The material should not burn at less than 160Deg C, combustion gases of eliminator material should

not be hazardous and should not produce more than carbon oxides (CO, CO₂) and water. Eliminator efficiency should be 100% at 4 m/sec air velocity.

Maximum air velocity across the coil shall be calculated taking into account the free section at the level of the coil rows, (thickness of finned tubes and their protection will be considered).

Finned tubes will be crimped with tube expansion. The slotted tubes or with interior finned tubes are prohibited. Headers will be made in copper. They must be equipped with manual venting devices, located inside the casing. A leak test will be realised in a pool, (immersion during 2 hours) with air pressure of 21 bars. Working pressure of coils shall be 16 bar. A proof certificate will be issued at the end of the test.



Unit with height more than 1.5 mtr should have horizontally split coil. Double height coils shall have intermediate condensate collector tray to reduce carry over. Drains shall be brought to the drain receiver incorporated in the floor of the unit.

After test, a global protection of the coil shall be applied, with Sakaphen anti-corrosion painting system (application by hot bath).

Variation of air velocity across finned tube section, with regard to average air velocity on this section, shall be less than 20%.

Sizing of cooling coil shall take into account heat gains due to air compression during its way through the fan and heat gains due to the motor.

The outlet pipe of the drain receiver shall be screwed to allow coupling of a screwed sleeve, and then connected to waste waters circuit. In case of air handling unit installed on board of ships, vessels, FPU, FPSO, it must be foreseen one outlet of drain receiver starboard and port side of air handling unit.

Connection of the coil to hydraulic circuit shall be realised with screwed devices or flanges (see chapter "Sizing characteristics"). In this last case, the nozzle connections on the coils headers shall be realised with a gap allowing the coil and flanges sliding on both sides.

3.7 Heating coil

The materials of the heating coil shall be selected taking into account the environment and the operating situation, defined in document **GS HVA 100**.

Electric Heating Coil

Electric heating coils elements shall be of low surface temperature type (not more than 90 Deg C). The heater will be finned body fitted with stainless steel (AISI 321) tubular heating element. The heating spiral (composition of 80%nickel, 20%chromium) should be protected in a stainless steel casing filled with magnesium oxide to give lower watt/sq cm and therefore longer life.

Minimum distance between tubes 25mm. The air heater should be fitted with two independent overheating thermostat, one for manual reset & one for automatic reset. The heater shall be asbestos free. The maximum air temperature downstream of air heater must not exceed 40 Deg C. The power supply to the heater must be interlocked across an airflow meter to ensure that air heater will be switched off should the airflow be lower than permissible value. Heater, upto 4 KW shall be controllable in steps. Heater more than 4KW shall be controllable by Thyristor.

Water Heating Coil

For maximum fluid temperature of 95°C:

Copper tube & copper fins. Coils shall be provided with copper headers. Suitable for 82-71 Deg C water temperature. The coil shall be fitted with connections for vents and drain and they shall be brought to outside of the casing. Should be suitable for maximum working pressure 16bar.

Tubes	Fins	Coil frame	Protection against corrosion
Copper	Copper	Stainless steel 316L	Hérésite Sakaphen

Steam Heating Coil

For fluid temperature between 95 and 200°C:

"Type"	Tubes	Fins	Coil frame	Protection against corrosion
Unit height less than 1.5 mtr.	Copper	Copper	Stainless steel 316L	Hérésite Sakaphen
Unit height more than 1.5 mtr.	Carbon steel	Aluminium	Stainless steel 316L	Hérésite Sakaphen

Coils shall be provided with copper headers. Larger unit of height more than 1500 mm should have painted steel header.

	Height lower than 1500mm	Height more than 1500mm
Max working pressure	10 bar	16 bar
Max temperature	185 Deg C	225 Deg C

Fluid heating coil should be in-house production of AHU manufacturer. The internal diameter of pipes crossing in the coil frame shall be 0.5 mm larger than the coil pipes diameter. Coil tube thickness should not be less than 0.4mm, return bend 0.5mm & fin thickness should not be less than 0.12mm.

Maximum air velocity across the coil shall be calculated taking into account the free section at the level of the coil rows, (thickness of finned tubes and their protection will be considered).

Finned tubes will be crimped with tube expansion. The slotted tubes or with interior finned tubes are prohibited. Headers will be made off steel or in copper. They must be equipped with manual venting devices, located inside the casing. A leak test will be realised in a pool, (immersion

during 2 hours) with air pressure of 16 bars. A proof certificate will be issued at the end of the test.

Sizing of heating coil shall not take into account heat gains due to air compression during its way on the fan and heat gains due to the motor.

When temperature of fluid used for heating is above 90°C (or when a electrical heater is used), an anti-radiation screen must be installed upstream and downstream the heating coil. In addition, dilatation must be taken into account (operating phase and stand-by phase). In all cases, the maximum headers height shall be 1.2 m.

Particular arrangement when a heating section is associated with cooling coils:

- A drain receiver common to all coils is prohibited, a drain receiver shall be dedicated to each cooling coil
- The minimum distance between the heating element and the upstream droplet separator shall be 300 mm.

3.8 Heating section

When a heating section is part of the AHU design (electrical heater or heating coil), a dedicated damper, closed in normal operation, located above the heating element shall open and then allow the dissipation of the heat in case of unexpected electrical shortage or lack of ventilation.

3.9 Sensor frame section

Downstream the first hot water coil installed in the air handling unit, a sensor frame shall be installed on slides.

This frame shall receive the capillary of antifreeze thermostat equipped with manual reset. Thermostat shall be fixed on a plate part of the frame.

The bent support of the capillary shall be metallic and shall respect the minimum bending radius of the capillary.



The antifreeze thermostat shall be part of supplied equipment and shall be delivered with cable to allow connection to a junction box outside the air handling unit. The junction box with minimal classification IP55, shall have a cable gland which allows a connection of cable type U 1000 RO2V 3 x 2.5 mm². This cable gland shall be located on lower part of the junction box.

The junction box shall be located on a fixed panel of the air handling unit.

Wiring of antifreeze thermostat shall be "fail safe". Thirty centimetres upstream the antifreeze thermostat (on cable way), a complete plug (male and female, 2 Poles + Earth) shall be installed in order to allow removing of the whole sensor frame section or checking.

3.10 Fan

The fan design shall take into account a filters pressure loss due to a clogging-up of 50%. Fan shall be preferably inhouse production of AHU manufacturer.

The fan operating point shall be selected on the steeper section of the fan curve approaching a straight vertical line from minimum to maximum static pressures, in order to minimise variation in delivered air volume, due to change in external wind pressure.

The fan shall be backward centrifugal type, simple or double air intake. Driving will be done by blocks and belts. The fan and motorization shall be installed on a same fixed structure (AISI 316L), isolated from the casing by steel anti-vibration devices (calculation of anti-vibration devices shall be provided).

Heavy duty impeller should be continuously welded to the back-plate and shroud. Every individual fan shall be run before delivery to check bearing condition and vibration.

When a support is installed between the fan motor and the anti-vibration devices (i.e. in order to heighten the fan), bracing must equip the support in order to resist to the torque produced by equipment.

Discharge of fan shall be linked to the casing with a flexible sleeve (M0 according French regulation or equivalent in accordance with International Standards).

The driving shaft of the fan shall supported with ball-bearing life-lubricated or equipped with lubricators. All bearings should be rated for continuous operation and L10 40,000 hours of operation, with 90% probability at maximum fan speed. The probable mean useful life is thus 200,000 hours or more at maximum fan speed and appreciably longer at lower speed.

Driving of fan shall be realised with a minimum of two belts.

The motor shall be installed on a support type (installation of motor on a support fixed on the fan volute is prohibited). An adjustment by central screw shall permit to adjust belts tension without modifying the blocks alignment. A locking screw will stop the adjustment device once in position.

All AHU fans shall be provided with airflow meter (Q-nozzle) with overall accuracy of $\pm 7\%$. Q-nozzle shall be connected to the digital display mounted outside the casing. Q-nozzle shall be compatible for connection to control system.



Air flow measurement with q-nozzle sensor

Bulkhead light wired to switch outside casing, drainage, anti- spark protection (brass inlet cone) shall be provided in fan section.

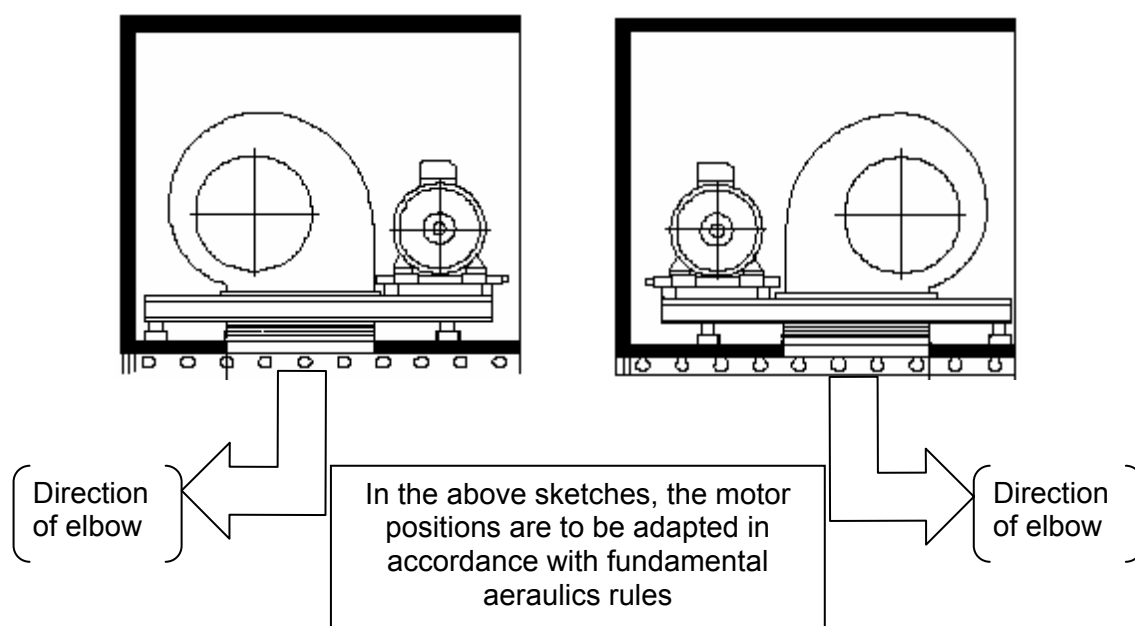
Fans shall be fitted with a proximity speed sensor head & impulse pad permanently attached to fan casing & blade respectively for remote monitoring of rotational speed. Junction box to be

delivered separately to be mounted on external face of AHU at site and wired. The sensor shall provide 1 pulse per revolution.

Equipotential connection between frame fan and casing shall be realised with tinned copper braid, as shown on the picture.



The MANUFACTURER shall take into account the direction of the duct at discharge of the fan. The mounting arrangement of the fan shall depend on the elbow orientation downstream the discharge of the fan, as shown hereafter:



If the fan is located upstream one or several air handling equipment in the plant, the fan shall be positioned far enough to allow a balanced air flow distribution.

When the fan will be located upstream one or several equipment installed inside the air handling unit, it must be installed a perforated grille in order to spread out the blown air flow rate on the section located downstream the fan (see picture).



In addition to the fan access door, it must be installed a second door located inside the air handling unit casing (safety door). This door must be done with a metal frame with wire netting (maximum mesh 30 x 30 mm). This door will open from inside to outside. The door shall be fixed and removed without any tools.

The door construction must be in accordance with the following table :

"Installation type"	Door outside panel casing	Door inside panel casing	Complementary protection against corrosion
Indoor	Stainless steel AISI 316L	Stainless steel AISI 316L	-
Outdoor	Stainless steel AISI 316L	Stainless steel AISI 316L	According with GS COR 350 OR PSN 530

A belt guard protection (epoxy painted) shall be provided. An access panel shall allow to measure rotation speed of the fan, without removing this protection.



A limit switch (with bipolar contact NO and NC type Schneider Ref. XCK-P 121 or equivalent) must be installed inside the air handling unit to monitor the opening of second door.

An impulse push-button (type Schneider Ref. XB4 - BA 21 or equivalent) must be installed inside the air handling unit.

The position limit switch will trip the fan motor when the second door is opened. However, it will be possible to run temporarily and manually the fan by action on the push button located inside the casing.

An emergency switch to trip all phases of the fan power supply will be installed close to the fan motor. It will be equipped with an auxiliary contact (voltage free) to remote the switch status.

All push button and switch will be wired by the CONTRACTOR.

Fan materials:

For maximum pressure of the fan less or equal to 3000 Pa, **and for both indoor & outdoor installation**, the following materials shall be used:

Fan casing must be 250 micron epoxy painted & impeller 100 micron epoxy painted. A five years warranty is required for the anti-corrosion painting (with a degree of rusting Ri2 according to [ISO 4628](#) part 3).

The fan shaft shall be made of Carbon Steel and protected against corrosion with a varnish.

All metal parts shall be protected against corrosion by same corrosion protection than the fan itself (included screw and nuts).

Beyond a maximum pressure of the fan of 3000 Pa the construction will be industrial and customised for the specific requirement and application.

Fan made of Stainless steel (prohibited in case of chloride (i.e. salt + water):

When using stainless steel fans (incase manufacturer can not match base material specification of fan above) the following specific cares must be implemented:

- Design
 1. The design operating point of the fan shall be 30% less than the maximum head of the fan
 2. In case of important system effects, precautions must be taken for the duct support to avoid transmission of vibrations to the fan (stresses induced to the fan)
 3. Climatic environment study, regarding atmospheric pollutants and process will be carried out by the COMPANY
 4. Use of a fan made of stainless steel will be clearly notified to COMPANY.

Fan upstream of coils:

Whenever fan is located upstream of coils, the fan shall be of "plug fan" type equipped with a frequency variator. The variator shall be classified IP54 minimum and located inside a ventilated box (the variator shall be separately provided by installer in control panel).

3.11 Humidifier

Evaporative humidifier

- The drain tray of humidifier should be made of stainless steel (AISI 316L).
- Drain tray should be designed for effective flushing and quick drying of tray when the humidifier is not in operation.
- The humidifier should be supplied with humidifier fills made of aluminium.

- For cleaning purpose, all component should be side withdrawable.
- Maximum air temperature upstream of humidifier : 70 Deg C.
- Maximum air temperature downstream of the humidifier : 40 Deg C.
- The humidifier should be supplied with droplet eliminator with fins made of PP hard plastic.
- The humidifier should be equipped with self flushing function that empties the humidifier drain tray every 24 hour to minimise risk of bacterial & algae growth.
- The water consumption should consists of the water evaporated and a certain amount of water bleed-off. This bleed off flow is necessary to reduce concentration of salts in the circulated water. If the concentration of salt is too high, salts may be deposited to the humidifier fill, which will have a detrimental effect on the performance and useful life of the humidifier. Hence, continuous bleed off & make up of fresh water is necessary.
- 90% humidity efficiency should be achieved with dew point control.
- Running time per cycle should not be less than 10 minutes.
- The pump for circulating water should have IP44 protection & IP 54 for the cubicle.
- The pH value of water should not be lower than 5 & should not be higher than 8.5. Water of normal drinking quality should be used.

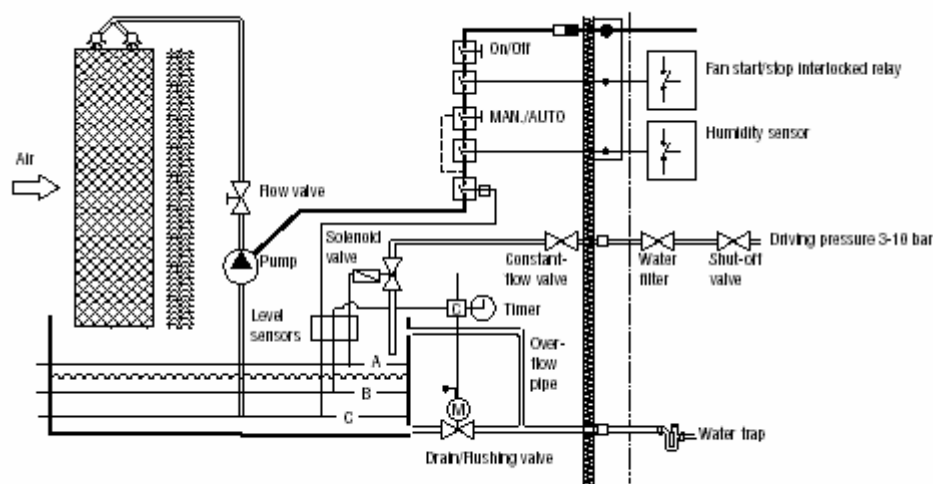


Fig. 1. Humidifier for circulated water

Steam humidifier

The steam humidifier shall consist of an empty section, equipped with sloping drain tray made of stainless steel AISI 316L & a U profiled section secured at the top for suspending steam lances. An empty section with inspection door shall be installed downstream of the humidifier.

3.12 Equipment safety

Equipment shall be studied and designed taking into account constraints due to ambience in which the air handling unit will be installed.

Whatever the air flow rate, a fire detector shall be installed downstream the filters.

On filters access door, a engraved plate (8 mm of height white characters with red background) must be mechanically fixed. It shall be mentioned: **"Fire Risk - Flammables Dirty Filters"**.

In case of fire detection inside the air handling unit, a stop order must be transmitted from Fire & Gas system to HVAC control cabinet. In this case, the air handling unit must be stopped and shut-off dampers (fresh air, return air and discharge) must be closed.

3.13 Tropicalisation

Electrical equipment integrated in the air handling unit shall withstand to their environment i.e.:

- Their position in the air handling unit
- Psychrometric conditions surrounding the electrical equipment.

Depending on environment, treatments shall have to satisfy to the following requirements:

- [UTE C 63-100](#) for the following limit conditions:

Temperature (°C)	20	30	40
Relative humidity (%)	80	60	45

- Standard [NF C 26-220](#) (Méthodes d'essai des matières isolantes - Méthode pour déterminer les indices de résistance et de tenue au cheminement des matériaux isolants solides dans des conditions humides (complétée par le rectificatif 1, septembre 1980), beyond operating conditions here above.

3.14 Air Handling Unit roof protection

When installed outdoor, AHU shall be protected by a roof against environmental conditions (rain, direct solar radiation, etc.).

The roof shall be provided separately by installer made of the same material than external panel of the casing.

The roof shall be larger than the AHU outside dimensions of 20 cm.

3.15 Low temperature application

- For low ambient temperature application (upto -50 DegC), fluid in heating coil shall be oil. Test pressure for coil should be 22 bar.
- Surface temperature of heating section panel should not be more than 60Deg C. Special insulation (if required) to be used.
- AHUs should be installed in conditioned plant room.
- Fan bearing & grease used should be able to withstand & function at -50Deg C (for cold start).
- A special electric heater should be used before fresh air damper for frost control.

- Filter should be installed after fan section.

4. Sizing characteristics

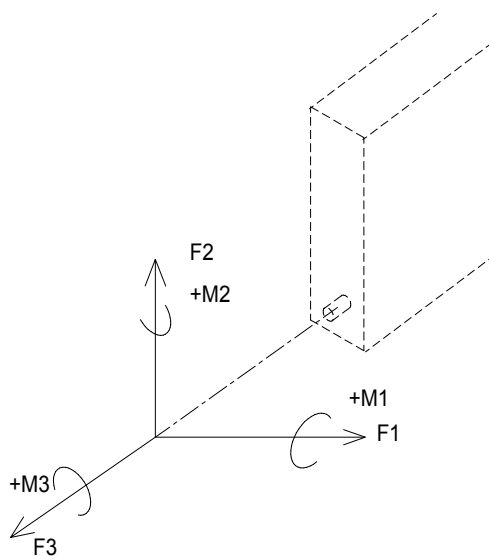
See also **GS HVA 100** for specific data.

4.1 Strength and acceptable moments on the piping (flanges or threaded tubes)

The MANUFACTURER of the present equipment shall indicate the strength values and acceptable moments on the headers (flanges or screwed tubes) of the coils equipping its air handling unit.

Strength values and acceptable moments can apply at the same time in all directions and with both signs (positive and negative), on each pipe (inlet and outlet).

System of tag used:



If these values cannot be shown by the MANUFACTURER, it shall be considered the values defined by **CODETI**, for pumps with horizontal shaft.

4.2 General characteristics

Maximum flexion of the casing cover	See "Casing" section
Positive pressure defining tightness test	Pressure generated by the discharge fan
Negative pressure defining tightness test	Pressure generated by the suction fan
Leakage flow acceptable under overpressure of 400 Pa	See "Casing" section
Leakage flow acceptable under depression of 400 Pa	See "Casing" section
Maximum part of derived flow around filters (according to EN 1886 rev. 2002 (E) classification) under 400 Pa test pressure	
G1 to G4	10% of nominal flow to filter

F5	6% of nominal flow to filter
F6	4% of nominal flow to filter
F7	2% of nominal flow to filter
F8	1% of nominal flow to filter
F9	0.5% of nominal flow to filter
Maximum heat transmission factor of the air handling unit	See "Casing" section
Heat bridge factor	See "Casing" section
Zinc mass due to galvanisation (when this corrosion protection is accepted)	400 g zinc/m ²
Minimum zinc thickness (when this corrosion protection is accepted)	50 µm
Minimum painting thickness (when requested)	200 µm colour RAL 9002
Structure insulation (except floor)	See "Casing" section
Minimum thickness insulation	50 mm once crushed
Minimum panels sheet metal thickness	07/10 mm
Maximum shut-off dampers leakage air flow rate (tightness required for overpressure relative to outside conditions)	20 m ³ /h/m ² under 100 Pa
Minimum pressure accepted by the shut-off dampers	2000 Pa for 1 m of shut-off damper length
Filters sizes	According European standards
Pre-filters efficiency	G3 according to EN 779
Pockets filters efficiency	F9 according to EN 779
Maximum front velocity on filters	2.5 m/s
Maximum pressure loss of dirty filters	200 Pa
Fins fouling factor	0.002 m ² .K/W
Maximum by-pass factor on coils	5 %
Maximum quantity of row per coil	8
Velocity in cooling coils tubes	1 to 1.75 m/s
Minimum fins spacing (including anti-corrosion protection)	2.1 mm for heating coils 2.5 mm for cooling coils

Maximum air velocity on fins:	
• For heating coil	3 m/s
• For cooling coil	2.5 m/s
• For electrical heaters	4 m/s
Droplet separator efficiency	100% at 4m/s
Characteristics of ambient air in unit	
Dry temperature	According to calculation notes
Relative humidity	According to calculation notes
Overdesign	See GS HVA 100
Water inlet temperature at heating coil	According to calculation notes
Water outlet temperature at heating coil	According to calculation notes
Water inlet temperature at cooling coil	According to calculation notes
Water outlet temperature at cooling coil	According to calculation notes
Glycol percentage in hot water	According to calculation notes
Glycol percentage in chilled water	According to calculation notes
Maximum water pressure loss in coils	3000 Pa
Connections on heating and cooling coils:	
• If $DN \leq 50$	Threaded
• If $DN > 50$	Flanges PN 16
Coils operating pressure	10 bars
Coils design pressure	16 bars
Fan vibration isolating	> 90%
Minimum fan efficiency	> 80%
Maximum bearings temperature	85°C
Minimum quantity of belts	2
Maximum fan rotation speed	2500 t/min
Supply voltage of electrical motor	400 V 3 phases
Frequency of supply voltage	50 Hz
General protection index	IP55 - IK07
Cable gland sizes:	
• Lighting equipment supply	12.5 mm
• Fire detection	9.3 mm
Position of cable gland for cables	+ 200 mm above bottom of unit

Position of cable gland for measurement equipment	Half height of the casing
Position of manometric plugs	Half height of the casing and maximum 1700 mm from soil taking into account a frame of 200 mm under the lowest part of the unit
Painting colour (when requested)	RAL 9002
Pipe insulation thickness	50 mm (minimum)
Equipment tagging	On stainless steel plate mechanically fixed
Cable gland size	According to motor size
Classification area	See GS HVA 100
Blown air temperature (at air handling unit discharge)	According to calculation notes
Maximum pressure loss of coils, on water side	According to calculation notes
Nominal air flow rate to blow, in blowing conditions	According to calculation notes
Available pressure at inlet of the unit	According to calculation notes
Available pressure at outlet of the unit	According to calculation notes (system effect on fan not included)
Sound power level at air handling unit inlet	< 77dBA
Sound power level at air handling unit outlet	< 90 dBA
Access: • Doors • Coils connections • Condensates • Cable glands	See drawings See drawings See drawings See drawings
Ambient characteristics	See GS HVA 100

5. Equipment tagging

The following equipment will have a engraved Stainless steel label, mechanically fixed:

- Air handling unit
- Filter
- Cooling coil
- Fan
- Fan motor
- Fresh air shut-off damper

- Return air shut-off damper
- Blown air shut-off damper
- Fresh air shut-off damper motor
- Return air shut-off damper motor
- Blown air shut-off damper motor
- Differential manometer on filter
- Fire detection

The characters to be used for tagging are defined in Project specification.

6. Presentation of calculation results

Detailed calculation notes concerning sizing of the following equipment will be given by the MANUFACTURER:

- Cooling and Heating coils
- Quantity of row(s)
- Quantity of tubes(s)
- Finned area
- Water pressure loss
- Air velocity in fins
- Selection of fan
- Pressure loss on each air handling unit component
- Available pressure
- Fan discharge area
- Fan discharge area at fan volute
- Heat gain due to the fan
- System effects.

Calculation notes about above topics will be provided with full details, without any reserve. Algorithms and formulas will be provided.

Above information will only be provided to COMPANY and not be disclosed outside.

Calculation notes are considered as an integral part of the air handling unit supply.

“Proprietary information” cannot be claimed in order not to supply any of the requested documents.

7. Factory acceptance tests

Tests will be carry out by MANUFACTURER according to listed Standards.

- Test shall be carried out on AHU selected by company at the R & D/ test center of AHU factory.
- The test will be conducted to verify presented data for airflow, fan pressure, radiated noise level and noise in duct & casing leakage rate/class. Airflow test will be done at room temperature & suitable extrapolation shall be made for design air temperature.
- Tests standards should be in accordance with prEN13053 in pressure chamber.
- Leakage test should be carried out to demonstrate that the casing meets CEN B leakage class. The test should be carried out as per EN 1886 standard at a pressure of +700 Pa and – 400 Pa
- Tolerances : +/- 5% including instrument tolerance for airflow & pressure.
- Mandatory instrument : Betz manometer for pressure, AMCA nozzles & Betz manometer for airflow, frequency analyser & sound intensity meter for noise level, Tachometer for fan speed.
- Calibration certificates should be issued during and after the test so that they are relevant and up to date.
- Witness test results should be printed out at the time of each test and copies should be provided at that time for verification.

Tests shall be realised in the MANUFACTURER premises at their own expense. They shall be carried out at least eight days before shipping material on site.

COMPANY or COMPANY Engineering can carry out controls to verify the performance and design data listed in chapter “sizing characteristics” and accordance with the present technical specification.

8. Documents to be supplied

Requirement disclosed in this paragraph shall not prevail over Project specific requirements.

Documents will consist in:

Due date	Document
With tender	Conformity certificates in accordance with EN 1886 rev. 2002 (E)
At receipt of order	The MANUFACTURER must transmit to COMPANY or Engineering a copy of the order signed on each page, and possible deviation inquiries which need to be submitted and approved by COMPANY or COMPANY Engineering prior signing the order. Note: If the MANUFACTURER do not return to COMPANY or COMPANY Engineering the documents listed here above, MANUFACTURER undertake to supply equipment in contractual operating conditions and conform to the contract specifications.
2	Air handling unit drawings (including accesses for maintenance and operation)
2	Detailed calculation notes (thermal, hydraulic, aerodynamic, acoustic, center of gravity, stress and moments on piping, vibration analysis, etc.)
2	Technical data sheets
3	Installation and support drawings
4	Certificates (Tightness, painting, fire tests, electrical for hazardous area, etc.)
6	Maintenance book
5	Factory Acceptance Tests report
1	Weight and centre of gravity

Due dates:

- 10 days after purchase of order
- 21 days before erection
- 8 days before erection
- 8 days after end of erection
- 3 days after FAT
- 8 days before FAT

A fortnight will be given to COMPANY or to Engineering, to control and comment documents. These comments shall be taken into account by the MANUFACTURER. They are a contractual element.

All documents shall be provided in at least 4 paper copies and at least 1 electronic copy on CD ROM (Autocad 2000 for drawings and PDF for texts).

Notes:

The transmitted documents shall be specific to the supplied equipment. General documents are not acceptable.

Documents are an integral part of the supply. In case of delay in the issue of documents, the same liquidated damages than for late delivery of equipment may apply.

The transmitted documents between the MANUFACTURER or CONTRACTOR and the COMPANY or Engineering shall be typed. The hand written documents will be refused.

“Proprietary information” cannot be claimed in order not to supply any of the requested documents.

9. Information to be provided with proposal

- A drawing with equipment sizes, weights, gravity center of each component and the global gravity center
- Characteristics of each component of the air handling units. The attached data sheets shall be used to describe the proposed air handling unit composition and shall be copied as often as necessary if components of a same type are used several times (e.g.: when several heating coils are used).

10. Appendix

10.1 Data sheet

- Air Handling Unit
- Air Filters
- Fan
- Electrical Motor Low Voltage

Remark :

International System of Units (SI) must be used in order to fill up that data sheet.



Exploration & Production

General Specification

Date: 10/04

GS HVA 202

Rev: 02

Equipment:		Air Handling Unit			
Location:					
Tag:					
MANUFACTURER:					
MANUFACTURER reference:					
Order number:					
Rev:	Date:	By:	Checked:	Description:	
Air Handling Unit					
1	Blown air flow rate (m ³ /h):			Total heating capacity:	
2	Available pressure (Pa):		11	- Heating coil 1 (kW):	
3	Blowing temperature (°C):		12	- Heating coil 2 (kW):	
4	Fresh air flow rate (m ³ /h):		13	Humidifier capacity (kg/h)	
5	Fresh air temperature (°C):		14	Voltage supply (V):	
6	Fresh air humidity (%):		15	Voltage limits (V):	
7	Return air temperature (°C):		16	Absorb. power on fan motor (kW):	
8	Return air humidity (%):		17	Installed power on fan motor (kW):	
	Total cooling capacity:		18	Weight (kg):	
9	- Cooling coil 1 (kW):		19	External sizes (L x W x h) (mm):	
10	- Cooling coil 2 (kW):		20		
21	Service space required (please define the equipment sides):				
	Side 1:		Size 1 (mm):		
	Side 2:		Size 2 (mm):		
	Side 3:		Size 3 (mm):		
	Side 4:		Size 4 (mm):		
	Side 5:		Size 5 (mm):		
	Side 6:		Size 6 (mm):		
22	Sound power level (dBA):				
	Frequency (Hz)	Suction		Discharge	
	63				
	125				
	250				
	500				
	1000				
	2000				
	4000				
	8000				



Exploration & Production

General Specification

Date: 10/04

GS HVA 202

Rev: 02

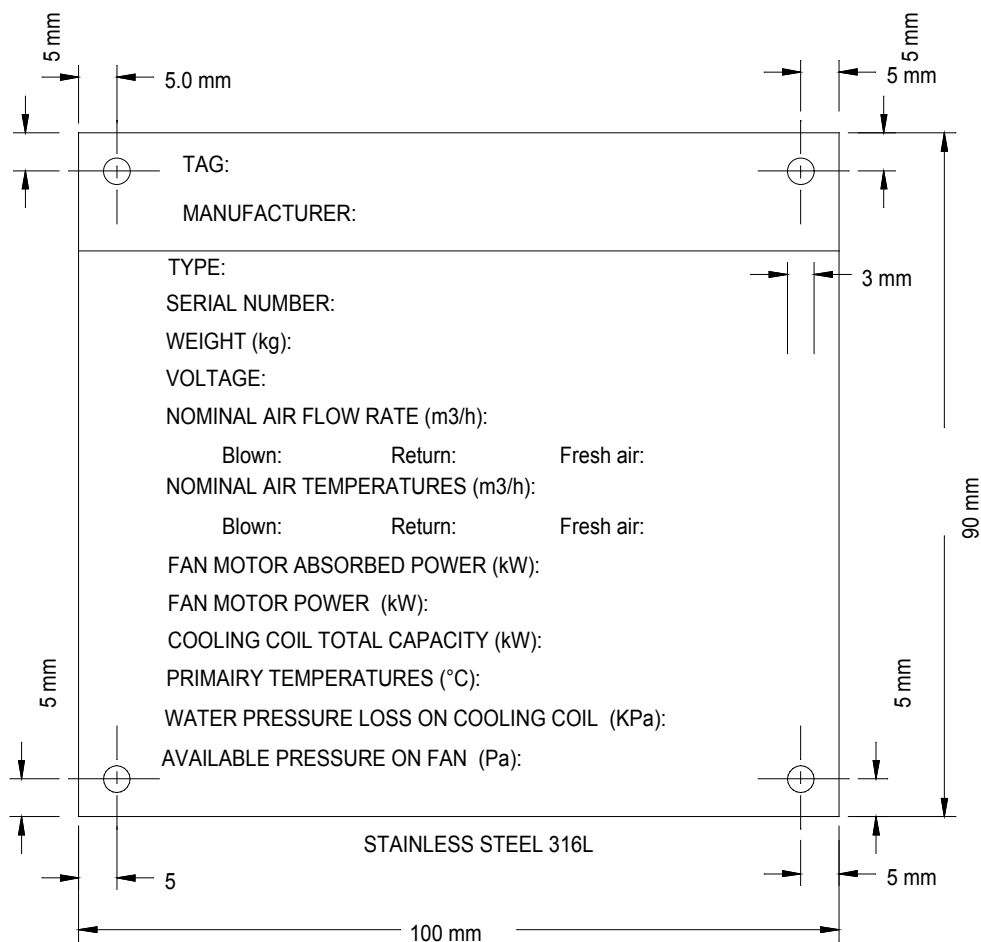
Equipment:		Air Filter		
Location:				
Tag:				
MANUFACTURER:				
MANUFACTURER reference:				
Order number:				
Rev:	Date:	By:	Checked:	Description:
Air filter				
	Pre-Filter:			
1	Filtration surface (m ²):			
2	Filter dimensions (mm):			
3	Quantity of filter(s):			
4	Pressure loss of clean filter (Pa):			
5	Pressure loss of dirty filter (Pa):			
6	Fire classification (French regulation):			
7	Efficiency of filtration (%):			
8	Maximum allowable temperature (°C):			
9	Maximum allowable relative humidity (%):			
	Filter or High efficiency Filter:			
10	Filtration surface (m ²):			
11	Filter dimensions (mm):			
12	Quantity of filter(s):			
13	Pressure loss of clean filter (Pa):			
14	Pressure loss of dirty filter (Pa):			
15	Fire classification (French regulation):			
16	Efficiency of filtration (%):			
17	Maximum allowable temperature (°C):			
18	Maximum allowable relative humidity (%):			
	Charcoal filter:			
19	Filtration surface (m ²):			
20	Filter dimensions (mm):			
21	Mass of charcoal (Kg)			
22	Quantity of filter(s):			
23	Pressure loss (Pa):			
24	Efficiency of filtration (%):			
25	Maximum allowable temperature (°C):			
26	Maximum allowable relative humidity (%):			
27	Maximum allowable temperature/humidity couple (°C/%)			

Equipment:		Fan		
Location:				
Tag:				
MANUFACTURER:				
MANUFACTURER reference:				
Order number:				
Rev:	Date:	By:	Checked:	Description:
Fan				
1	Type:			
2	Installation:			
3	Air flow rate (m ³ /s):			
4	Air inlet temperature (°C):			
5	Air outlet temperature (°C):			
6	Inlet relative humidity (%):			
7	Inlet pressure (Pa):			
8	Total pressure of fan (Pa):			
9	Static pressure of fan (Pa):			
10	Absorbed power on motor (kW):			
11	Fan rotation speed (rpm):			
12	Motor rotation speed (rpm):			
13	Maximum velocity of turbine (rpm):			
14	Fan efficiency (%):			
15	Number of air inlet (1 or 2):			
16	Discharge fan surface (m ²):			
17	Discharge volute surface (m ²):			
18	Type (forward/backward):			
19	Number of belt(s):			
	Material			
20	- Turbine:			
21	- Envelope:			
22	- Frame:			
23	- Screws/bolts:			
24	Sound power level (dBA):			
	Frequency (Hz)	Suction	Discharge	
	63			
	125			
	250			
	500			
	1000			
	2000			
	4000			
	8000			

Equipment:		Low voltage electrical motor			
Location:					
Tag:					
MANUFACTURER:					
MANUFACTURER reference:					
Order number:					
Rev:	Date:	By:	Checked:	Description:	
Electrical motor					
1	Type:		18	Type of protection according to IEC 60079:	
2	Mounting arrangement:		19	Area classification:	
3	Driven machine:		20	Certificate number of approval:	
4	Rated power (kW):		21	Certificate of approval by notified body:	
5	Motor voltage (V):		22	Maximum operating time with locked rotor (for Exe or Exn) (s):	
6	Frequency (Hz):		23	Temperature rise class (°C):	
7	Number of phases:		24	Insulation class:	
8	Rated current (IR) (A):		25	Maximum ambient temperature (°C):	
9	Starting current (IS) (A):		26	Duty type:	
10	Efficiency (1/2 - 3/4 - 4/4):		27	Operating factor:	
11	Rated speed (rpm):		28	Space heater power (W):	
12	Rated torque (N.m):		29	Space heater voltage (V):	
13	Starting torque (N.m):		30	Cable gland quantity and type:	
14	Moment of inertia (kg/m²):		31	Earthing (frame/terminal box):	
15	Bearing type (DE/NDE):		32	External dimensions (H x W x D) (mm):	
16	Index of protection IP:		33	Quantity of grease (cm³):	
17	Index of protection IK:		34	Tightening torque on terminal Blocks (N.m):	
	Material				
37	Frame:		50	DE bearing:	
38	Rotor:		51	DE seal:	
39	Wound stator:		52	DE shield:	
40	Fan:		53	DE shield fixing screws:	
41	Fan cover:		54	NDE bearing:	
42	Fan fixing pin:		55	NDE seal:	
43	Fan cover screw:		56	NDE shield:	
44	Key:		57	NDE thrust bearing seal:	
45	Cover washer:		58	NDE shield fixing screws:	
46	Bolting:		59	Rubber plug:	
47	Pre-loading washer:		60	Flameproof screening:	
48	Lock washer:		61	Rating plate:	
49	Terminal box casing:		62	Painting system:	

10.2 Tagging plate

- Drawing of the tagging plate for each air handling unit, to be fixed on the casing:



- Tagging plate concerning clogging of filters:

