

GENERAL SPECIFICATION

HVAC

GS EP HVA 206

Air Conditioning Unit(s) (ACU) and Associated Air Cooled Condenser(s) (ACC)

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1. Scope

The purpose of this document is to define the minimum requirements for the design, the construction and the operability of *air conditioning unit(s) (ACU)* and associated *air cooled condenser(s) (ACC)*. The choice / use of an *air conditioning unit (ACU)* and associated *air cooled condenser (ACC)* shall be submitted to COMPANY HVAC SPECIALIST approval.

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

When other words require a definition only to be used in the present document, then the definition is given in a dedicated paragraph of the present document and the defined word when used, is marked in small and *italic* letters.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

Reference	Title
ADC	Air Diffusion Institute (All documents in accordance with equipment or part of HVAC installation designed)
AFI	American Filtering Institute (All documents in accordance with equipment or part of HVAC installation designed)
AGA	American Gas Association (All documents in accordance with equipment or part of HVAC installation designed)
AICVF Codes	Association des Ingénieurs de Chauffage, Ventilation Français (All codes in accordance with equipment or part of HVAC installation designed)
AMCA	Air Moving and Conditioning Institute (All documents in accordance with equipment or part of HVAC installation designed)
ARI	Air Conditioning and Refrigeration Institute (All documents in accordance with equipment or part of HVAC installation designed)
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers (All documents in accordance with equipment or part of HVAC installation designed)
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

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Reference	Title
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
Directive 2006/95 dated 12 December 2006	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
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
EUROVENT	Certification (All documents concerning that subject)
IEC 60947-4-1	Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters
IEC 60034 (All parts)	Rotating electrical machines - All parts
IEC 60079 (Parts 0; 14)	Explosive atmospheres - Parts 0; 14
IEC 60079-14	Explosive atmospheres - Part 14: Electrical installations design, selection and erection
IEC 61310-1	Safety of machinery - Indication, marking and actuation - Part 1: Requirements for visual, acoustic and tactile
NF EN 10169 (Parts 1; 2; 3)	Continuously organic coated (coil coated) steel flat products – Parts 1; 2; 3
NF EN 1216	Heat exchangers - Forced circulation air-cooling and air-heating coils - Test procedures for establishing the performance
NF EN 12735 (Parts 1;2)	Copper and copper alloys - Seamless, round copper tubes for air conditioning and refrigeration – Parts 1; 2
NF EN 13463 (Parts 1; 3; 5)	Non-electrical equipment for potentially explosive atmospheres - Part 1; 3; 5
NF EN 14986	Design of fans working in potentially explosive atmospheres
NF EN 1886	Ventilation for buildings - Air handling units - Mechanical performance

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Reference	Title
NF EN 308	Heat exchangers - Test procedures for establishing performance of air to air and flue gases heat recovery devices
NF EN 378 (Parts 1; 2; 3; 4)	Refrigerating systems and heat pumps - Safety and environmental requirements – Parts 1; 2; 3; 4
NF EN 779	Particulate air filters for general ventilation - Determination of the filtration performance
NF EN ISO 11546-1 (Parts 1; 2)	Acoustics - Determination of sound insulation performances of enclosures - Parts 1; 2
NF EN ISO 14001	Environmental management systems - Requirements with guidance for use
NF EN ISO 1940-1	Mechanical vibration - Balance quality requirements for rotors in a constant (rigid) state - Part 1: specification and verification of balance tolerances
NF EN ISO 3741	Acoustics - Determination of sound power levels of noise sources using sound pressure - Precision methods for reverberation rooms
NF EN ISO 3744	Acoustics. Determination of sound power levels of noise sources using sound pressure. Engineering method in an essentially free field over a reflecting plane
NF EN ISO 3746	Acoustics - Determination of sound power levels of noise sources using sound pressure - Survey methods using an enveloping measurement surface over reflecting plane
NF EN ISO 4628-3	Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 3: assessment of degree of rusting
NF EN ISO 9614 (Parts 1; 2; 3)	Acoustics. Determination of sound power levels of noise sources using sound intensity - Parts 1; 2; 3
VDI 6022 Part 1	Ventilation and indoor-air quality – Hygiene requirements for ventilation and air-conditioning systems and units (VDI Ventilation Code of Practice)
VDI 6022 Part 1.1 :	Ventilation and indoor-air quality – Hygiene requirements for ventilation and air-conditioning systems and units – Checking of ventilation and air-conditioning systems (VDI Ventilation Code of Practice)

Note: NF EN 378 shall be only read and applicable according to the **GS EP HVA 301**.

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Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

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
GS EP ELE 111	Induction motors
GS EP ELE 137	Distribution boards
GS EP HVA 010	Selection of Stainless Steel Grade for HVAC Equipment
GS EP HVA 100	HVAC Basis of Design
GS EP HVA 202	Air Handling Unit(s) (AHU)
GS EP HVA 205	FAN UNIT(s)
GS EP HVA 220	Shut-off Dampers
GS EP HVA 290	Shut-off Damper Electrical Actuator(s)
GS EP HVA 301	HVAC Plant Room(s)
GS EP HVA 462	HVAC equipment numbering rules
GS EP HVA 801	Terminology, Definitions, Abbreviations
GS EP INS 102	Instrumentation identification
GS EP INS 107	Design and installation of instrumentation links

3. Definitions

Air conditioning unit (ACU): vertical *AIR HANDLING UNIT* which can include electrical cabinet(s) (*HVAC MCC* and / or *HVAC CC*), and built in accordance with the present specification.

Note: **GS EP HVA 202** is not applicable for construction of *ACU*.

Air cooled condenser (ACC): outdoor casing which contains condenser coil(s), *FAN UNIT(s)*, instruments, electrical devices.

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4. Limit of Use

The *ACUs* can be used under the following conditions:

- The total cooling capacity (sensible and latent capacity) does not exceed 50 kW
- The *OUTDOOR* air quantity of *HVAC* system does not exceed 25% of the *SUPPLY* air of *HVAC* system
- *ACUs* are only accepted for technical rooms, temporary refuge
- The number of rooms served by an *ACU* is limited to three rooms
- The total number of *ACUs* installed for a building shall not exceed four (4) units.

ACUs cannot be installed outside a safe area.

5. System Design

The system is used in order to filter, to cool, to heat, to humidify and to dehumidify air of room(s) and *OUTDOOR AIR* when required.

In case of *ACU* is equipped with a chilled water cooling coil, the requirements for *ACC* shall not apply.

In case of *ACU* is equipped with a direct expansion coil, an *ACC* shall be associated to the *ACU*. Both units shall be provided by the same *VENDOR*.

The *ACU* and the *ACC* shall be connected together by means of piping network, instruments and electrical cables.

The design of the *ACU* shall take into account the ducting arrangement / air distribution (raised floor,..) defined by the *HVAC ENGINEERING*.

For information, a minimum free space of 300 mm high shall be provided (main *CONTRACTOR*) to allow a correct air distribution through the raised floor.

The units shall be designed according to the life time required by the project.

6. Air Conditioning Unit (ACU)

6.1 Construction

The construction shall be of a self-supporting type enabling lift handling. Two procedures for handling are accepted:

- Single-point lift from pad eyes installed at top of unit
- Handling from bottom of the unit, with spreader bars (3.2 certified spreader bars shall be provided by the *ACU MANUFACTURER*).

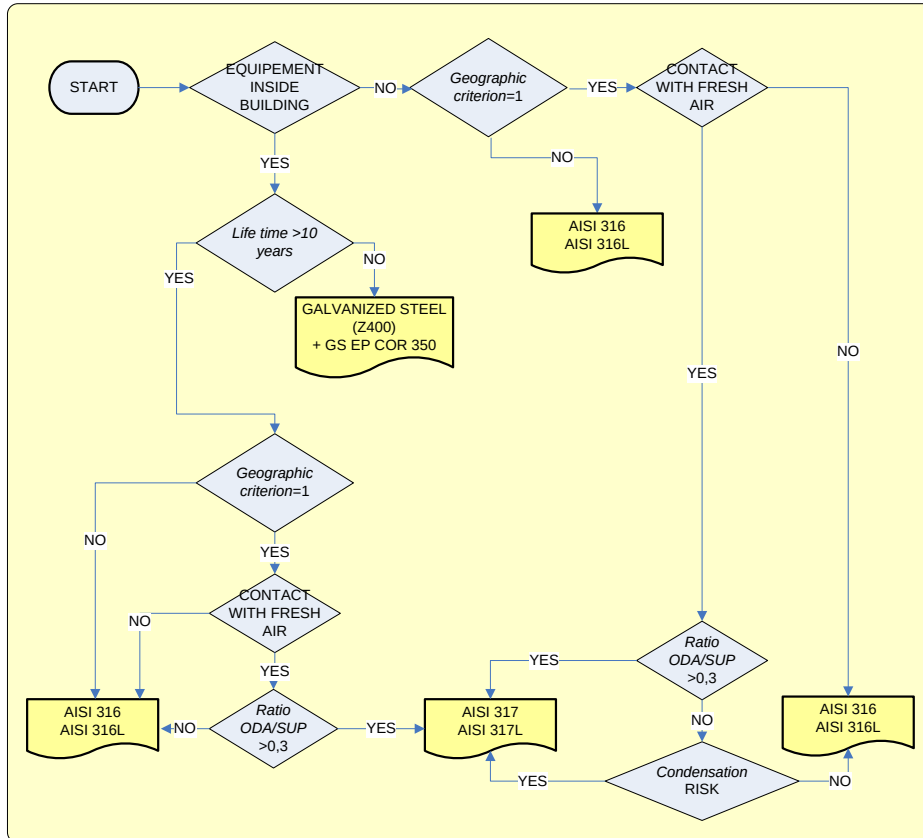
The *ACU* casing material shall be compliant with the following figure:

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6.1.1 Casing

Strength of casing structure shall be sufficient to enable the removal of any access panel without any deformation.

Casing shall be built in three separate sections: the air handling section, the refrigeration section (in case of direct expansion ACU) and the power & control section. The power & control section shall be physically segregated from the air handling section and from refrigeration section.

The whole ACU casing, including the internal partitions, shall be thermally and acoustically insulated and with double face panels. Panels metallurgy shall be identical to the metallurgy of the casing.

The panel thickness shall be defined in order to fulfill the [NF EN 1886](#) strength requirements. Nevertheless thickness shall not be less than 15/10 mm for panels equipped with duct connections (inlet and outlet) and 08/10 mm for other panels.

A mineral wool cushion shall be used to realize thermal and sound insulation with a density of 45 kg/m³ as minimum. The mineral wool shall be non-combustible. Frame and doors shall also be insulated in order to reach the expected thermal performances defined in section "Air handling section – Casing".

The surface temperature of the casing (structure, panels, doors) shall be less than 50°C and shall be 5°C above the dew point of the ambient conditions.

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6.1.2 Removable Panels and Access Doors

The casing shall be equipped with removable panels and access doors. Access doors shall be provided for regularly maintenance (filter access, power & control section, belt tension...). Removable panels shall be used for curative maintenance (compressor replacement, exchanger replacement, heater, *FAN* replacement...).

Access doors shall be equipped with hinges, two kickstands and quarter turn handles (heavy duty corrosion resistant). Power & control section shall be key lockable.

Removable panels shall be fixed with screw or quarter turn devices. Removable panels shall be equipped with handles to facilitate panel removal.

For assembly of panels made of dissimilar material, it shall be used a Teflon washer between screws head and panel. An alternative can be the use of screws protected by Impreglon Delta-MKS.

Air tightness of panels shall be provided by resistant gasket secured on the frame and running on the entire perimeter.

For access doors:

- A gasket shall mechanically fixed on the door, without additional fixing system. The installation and the removal of the gasket shall be feasible without tools
- The removable gasket, placed on the periphery of the door, shall be compressed by door closure
- The compression of the gasket shall not exceed 20% of the initial thickness, after 24 hours, between 20°C and 25°C.

The external faces of panels and doors of the *ACU* shall be protected by a plastic film, which will be removed during *COMMISSIONING*.

The removal of panel or the opening of the door, dedicated to the *FAN UNIT*s section of *ACU*, shall automatically stop the operation of *FAN UNIT*(s).

6.1 Battery Limit

The external battery limit of the *ACU* shall be:

- The inlet and outlet *SHUT-OFF DAMPERS* duct connection
- The screw connection of the condensate drain pipe; the battery limit shall be located outside the *ACU* casing
- The Multi-Cable Transit (MCT or similar) for interfacing (piping and cables) with the *ACC*, the main power supply, and any plant instrument or control system.

6.2 Air Handling Section

The air handling section and the refrigerating compartment shall be equipped with *REFRIGERANT* leak detector (detection level of 5 gram / year), in case the unit is equipped with a refrigerating circuit (use of *REFRIGERANT*).

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6.2.1 General

The air handling section is mainly composed of the following equipment:

- Inlet actuated *SHUT-OFF DAMPER*
- Pre-filters
- Filters
- *FAN UNIT*
- Outlet actuated *SHUT-OFF DAMPER*.

According to the air treatment process, the one or several of the following components shall be provided:

- Heat exchanger (direct expansion coil, heating and cooling coil)
- Droplet eliminator
- Drain pan
- Electrical heater
- Steam humidifier.

6.2.2 Casing

The air handling section shall conform to the enforcing of the following requirement:

- Casing strength: D2, as per [NF EN 1886](#)
- Casing air leakage: L2, as per [NF EN 1886](#) (measurement on *real unit (R)*)
- Filter bypass leakage: according to filter class as defined in [NF EN 779](#)
- Thermal transmittance U of the casing: T2 as per [NF EN 1886](#)
- Thermal bridging factor of the casing: TB3 for indoor installation, TB2 for outdoor installation as per [NF EN 1886](#).

The design pressure of the casing (negative or positive pressure (based on maximum head of the *FAN(s)*)) shall not induce any permanent deformation.

6.2.3 Filtration

The filtration shall be composed of two stages and be at least of the following performance level according to [NF EN 779](#):

- Pre-filters: G4
- Filters: F7.

Each filtration stage shall be composed of one or several filters.

All filters shall be of disposable type and of standard size and brand (refer to *HVAC VENDORS* list). Customized filters dimensions are not accepted.