


HYGIENIC AHU UNITS

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Vice Chairman



HYGIENIC AIR HANDLING UNITS

Hygienic Air Handling Units series which are produced in Turkey comply with DIN 1946-4:2008 standards.

| DEUTSCHE NORM | | December 2008 |
|---|--|---|
| | DIN 1946-4 |  |
| ICS 91.040.10; 91.140.30 | Supersedes DIN 1946-4:1999-03 and DIN 4799:1990-06 | |
| Ventilation and air conditioning – Part 4: VAC systems in buildings and rooms used in the health care sector | | |
| Raumluftechnik – Teil 4: Raumluftechnische Anlagen in Gebäuden und Räumen des Gesundheitswesens | | |



DIN 1946-4

VENTILATION AND AIR CONDITIONING

PART 4: VAC SYSTEMS IN BUILDINGS AND ROOMS USED IN THE HEALTH CARE SECTOR

DIN 1946-4:2008-12

1 Scope



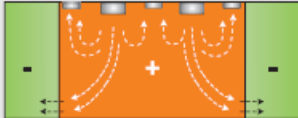
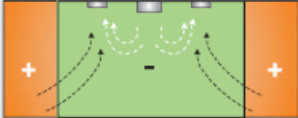

This standard applies to the planning, construction and qualification of ventilation and air conditioning (VAC) systems in buildings and rooms used in the health sector, particularly those used for medical examinations, treatments and operations on humans, including any rooms directly connected to such rooms via doors, corridors/hallways, etc. in:

- hospitals;
- day clinics;
- treatment rooms in doctor's offices/surgeries;
- operating rooms in outpatient facilities;
- dialysis centres;
- internal and external medical device sterilization facilities.

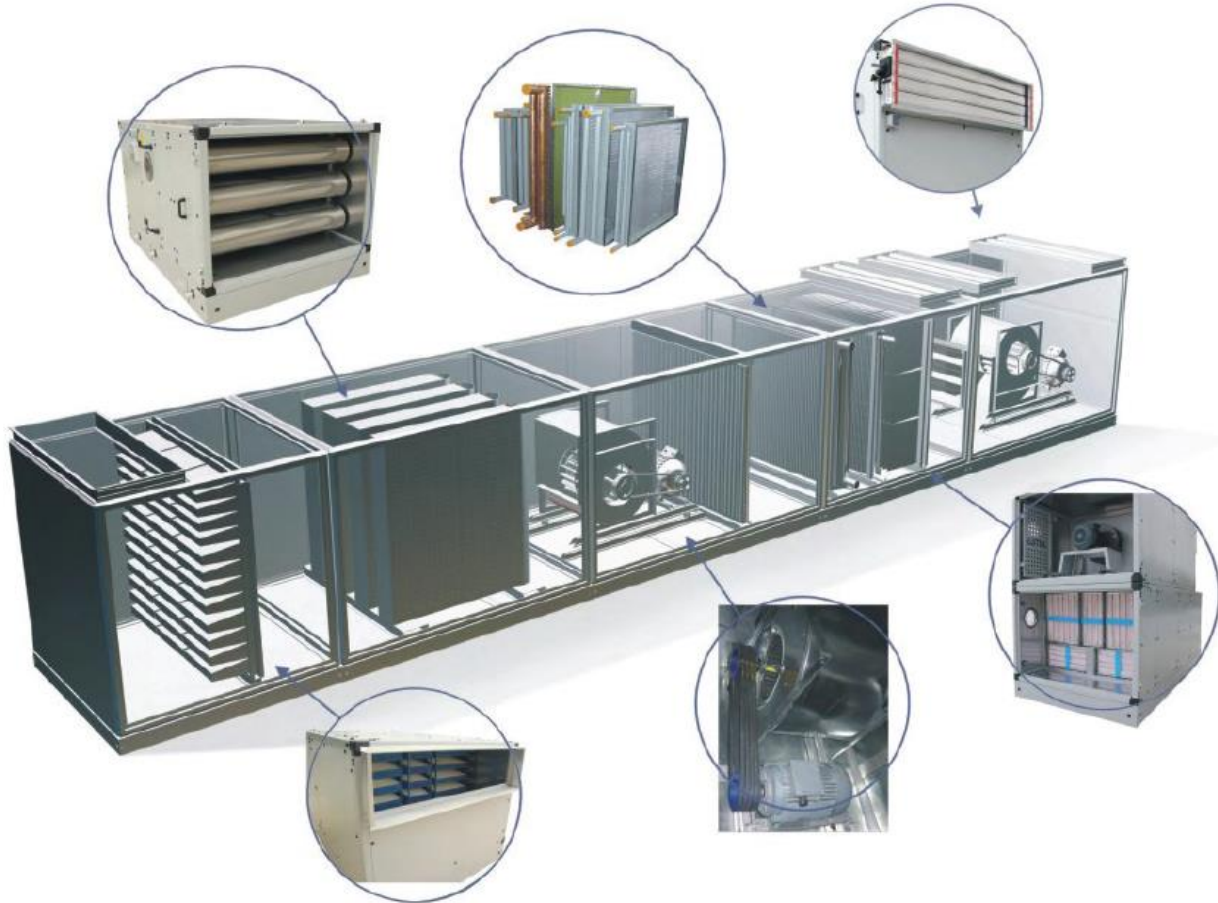
This standard applies to the operation of VAC systems only when they have been designed, built and accepted on the basis of this standard.



Room Classes

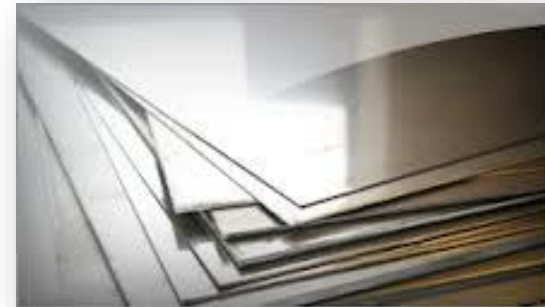
| Room classes and air routing systems ¹⁾ | | |
|---|--|--|
| Room class Ia | Room class Ib | Room class II |
| Rooms subject to very strict hygiene requirements | Rooms subject to increased hygiene requirements | Rooms subject to general hygiene requirements |
|  |   |   |
| Dynamic screening of the protected area | Static pressurisation | Overflow / air-mixing principle |
| <ul style="list-style-type: none"> • Surgery rooms for Trauma surgery or Orthopaedics. • 3-stage filtration (F5/F9/H13) | <ul style="list-style-type: none"> • Surgery rooms for laser operations and diagnostic surgeries. • 3-stage filtration (F5/F9/H13) | <ul style="list-style-type: none"> • Anaesthetic recovery rooms. • Observation and pre operative rooms. • 2-stage filtration (F5/F9) |

Typical AHU



Casing-1

- Interior parts of the air handling unit shall be suitable for cleaning. Non-smooth surfaces are not allowed.
- Within an air handling unit, all metal parts shall be corrosion-resistant.
 - *304 quality (AISI/ASTM/UNS) (EN 1.4301) stainless steel is used for bottom panel,*
 - *powder coated galvanized sheet metal is used for side and top panels.*
- All plastic parts located at supply air side should be selected as non-microbial and smooth surfaces according to ISO 846 (Evaluation of the action of microorganisms)



INTERNATIONAL
STANDARD

ISO
846

Second edition
1997-06-15

**Plastics — Evaluation of the action
of microorganisms**

Plastiques — Évaluation de l'action des micro-organismes

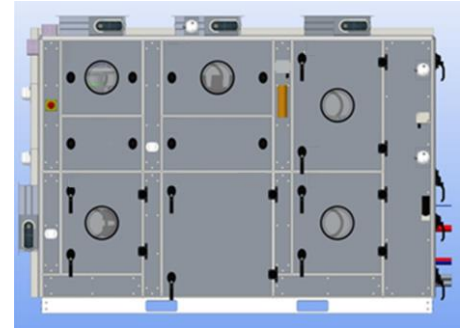


Reference number
ISO 846:1997(E)

Casing-2



- Casing materials which are in contact with the air flow shall be resistant to disinfectants.
- Twin wall observation glasses shall be supplied for fan, filter and humidifier sections with at least 150 mm diameter. Inner parts of the observation glass shall be smooth.
- Humidifier, filter and fan sections shall be accompanied with light fixtures. In order to prevent contamination within the air handling unit, electrical installations shall be located at topside. Light fixtures also shall not contain any non-smooth surface.
- For cleaning purposes, all air handling unit components shall be accessible.



Casing-3

- Antibacterial Mastic or equivalent material shall be used against dust accumulation at panel and profile connections.
- Structure of screw parts for assembly shall be protective against contamination. Screw threads might be covered with plastic caps to protect against dust contamination.
- According to EN 1886* standard, casing shall comply with the following class requirements,



| | |
|----------------------------|-----------|
| Mechanical Strength | D2 |
| Casing Air Leakage Rate | L2 |
| Filter Bypass Leakage Rate | F9 |
| Thermal Transmittance | T3 |
| Thermal Bridging | TB3 |

*** EN 1886**

Ventilation for buildings. Air handling units. Mechanical performance

Drain Pans

- Drain pans shall be made of 304 type stainless steel or equivalent material.
- Drain pans shall be provided for;
 - Fresh air inlet
 - Cooling Coil
 - Humidifier/Dehumidifier
 - Heat Recovery Unit (Both for supply and extract inlets)
- Diameter of drainage pipes shall be minimum 40 mm and connected to siphon in order to prevent back flow.
- Drain pan shall be tested with negative pressure to ensure that 5 lt/m² of water can be drained within 10 minutes.



Dampers



- Dampers shall be provided for inlet and outlet parts of the air handling unit.
- Dampers air leakage class shall meet at least the criteria for leakage class 2, for stricter tightness requirements class 4 according to DIN EN 1751*.
- The current damper position (open/closed) shall be visible from the outside of the damper.
- Dampers for weatherproof units shall be located inside the AHU. For units which are intended for indoor installation, the outdoor air dampers shall either be located inside or outside.



* DIN EN 1751

Ventilation for buildings - Air terminal devices - Aerodynamic testing of damper and valves

Filters



- Filters shall comply with EN 779*.
- For first and second stage filtration, at least F5 (F7 is recommended) and F9 filter types shall be provided respectively.
- First stage filter shall be provided for air inlets. Second stage filtering shall be at last section of an air handling unit.
- Filter frame assembly shall be rigid to avoid any damage or bypass leakage.
- The air filters shall be removable from dirty air side to minimize particle contamination on the clean side.



* EN 779

Particulate air filters for general ventilation. Determination of the filtration performance

Filters

- Filter location shall not be provided before a cooling coil or a humidifier.
- Differential pressure switches for monitoring filters shall be installed on the exterior panels of an air handling unit.
- Mean value of clean and final filter pressure drop is suitable for the pressure drop evaluation.



$$\frac{\Delta p_{Start} + \Delta p_{End}}{2}$$

Filters

- On each filter system the following information shall be provided on a nameplate :
 - nominal air flow rate of the air handling unit;
 - number of air filters installed in the filtration stage;
 - filter type (number of pockets, where appropriate), filter class, dimensions;
 - final pressure difference of the air filters in relation to the nominal air flow rate of the system.
- Filter frames shall be corrosion-resistant.
- Access doors for filters shall be wide enough for dismantling.
- The filter area shall be $\geq 10 \text{ m}^2$ per m^2 of the cross-sectional area of the unit.



Heating Coil

- Heating coil materials shall be corrosion-resistant.
- Fin spacing shall be at least 2.0 mm. for easy cleaning.

| | |
|--------------|---|
| Fin Material | Aluminum (or Coated aluminum) |
| Tubes | Copper |
| Headers | Copper (optional) or galvanized steel |
| Frame | Corrosion-resistant material (Stainless steel or Galvanized Steel) |



Cooling Coil



- Cooling coil materials shall be corrosion-resistant.
- All drainage shall be in the same direction.
- Fin spacing shall be at least 2.5 mm. (for easy cleaning)
- Cooling coil shall be installed before the second stage filtration.
- Number of fin rows shall not exceed 10 and fin depth shall be 300 mm max.



Fin Material

Aluminum (or coated aluminum)

Tubes

Copper

Headers

Copper (optional) or galvanized steel

Frame

Corrosion-resistant material (Stainless steel or Galvanized Steel)

Droplet and Mist Eliminators

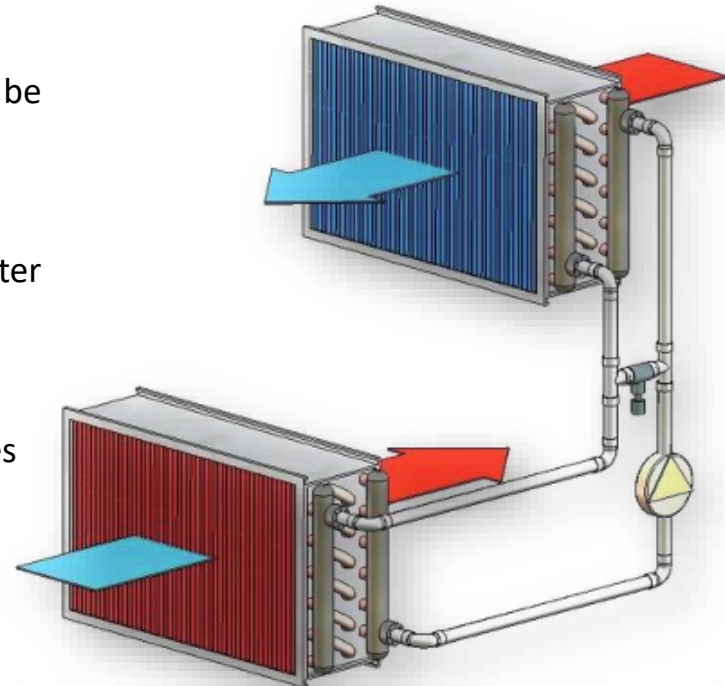


- The Position of the mist eliminator is behind the air Cooling coil and prevents the system against rot.
- In order to prevent water flow where air velocity is above 2.5 m/s, droplet eliminators shall be installed. Fire-resistant material (at least 120°C) shall be provided for droplet eliminators.
- For cleaning, mist eliminators can be removed easily and completely dismantled.



Heat Recovery

- All requirements for cooling and heating coil applications shall also be valid for heat recovery units.
- Run around coil type recovery systems shall be preferred to prevent contamination.
- Heat recovery systems shall be provided after the first stage filtration.
- Condensation pans shall be supplied both sides of a heat recovery systems. (Inlet and outlet)



Fans

- Plug fans with EC motor should be preferred. Centrifugal fans with a drainage opening and an observation glass can also be selected for hygienic applications.
- Fans shall be located between the first and last filter sections.
- Empty section shall be provided before the fans where humidifier is supplied in order to avoid humid air suction.
- The following information shall be permanently labelled to every fan sections:
 - type/year of construction/model;
 - nominal flow rate;
 - total pressure increase;
 - nominal and maximum rotational speed;
 - nominal motor power;
 - rotational direction of the fan impeller (e.g. Label attached to impeller or casing).



Humidifiers



- Humidifiers shall be provided before the second stage filtration.
- Steam type humidifiers are extremely hygienic due to sterile steam.
- Relative humidity at outlet air of humidifiers shall not exceed 90%.
- Absorbtion distance shall be complied with humidifier manufacturers technical documentations.



Attenuators (Silencers)



- Silencers are designed to minimize the transmission of sound generated by fan and air flow to ductwork.
- Casing material shall be 304 stainless steel.
- The acoustical material is glass wool or rock wool.
- Silencers shall be provided between the first and second grade filtration.
- Silencers shall not be provided before a humidifier or a cooling coil for dehumidification.



THANK YOU FOR YOUR ATTENTION

