

HYGIENIC AIR-HANDLING UNITS Series KU-H



Quality without a risk



Cleanroom air conditioning has always been one of the most demanding applications

Viewing an ever-increasing environmental pollution the quality of air that we breathe is of vital importance. Hygienic air-handling units are designed for essential features and sensitive installations of high-demanding cleanroom air conditioning applications like hospitals, operating rooms, laboratories, pharmacy and electronic facilities, etc. Standards, regulations and guidelines govern the air-handling units calculation, design, manufacture, installation and maintenance.

DESIGN CRITERIA

When developing, designing and manufacturing air-handling units in hygienic design, the major objectives were :

- to apply only those materials that do not pose any threat to human health and do not facilitate the growth of harmful micro organisms
- internal surfaces of the units must be made of wear-resistant materials and easily accessible for cleaning and disinfection purposes;
- all parts for air movement should allow easy inspection, cleaning and disinfection.

Air-handling unit in hygienic design has following differences from standard design:



CASING AND COMPONENTS

- Internal surface and walls are smooth and without open adsorption grooves
- Inside panel surface made of plastic coated galvanized steel sheet, stainless steel sheet or sea-water resistant aluminium sheet (AlMg)
- Seal and gap filling materials are non-porous and not moisture absorbing
- All parts and components of the unit, such as fans, motors, filters, coils (together with droplet separator and drain pan), etc. are resistant to commonly used cleaning and disinfecting agents
- For units height up to 1,3 m, components could be pulled out for cleaning and disinfection purposes. For higher units, both sides of components are accessible from service side through dismantlable front panel or service door.



AIR INLETS AND OUTLETS

- All units are equipped with airtight dampers according to DIN 1946 Part 4
- Inlets sections are equipped with drainage system



FILTERS

- Bag filters are mounted at the 1st stage of filtration, i.e. the suction side for fresh air class G4 or F5 at least, and at the 2nd stage of filtration, i.e. the unit outlet - not less than air class F7. At each stage, the air humidity should be kept below 80% r.H.
- In less demanding spaces, where return air is used, it is still necessary to maintain the maximum permissible pollutant concentration. It should be noted that filter class G3 and G4 are intended for the protection of coils and heat recovery devices rather than reduction of the dust load in a space. If the ambient air pollution is to be reduced, then filter class F7 or higher are to be installed.
- Differential pressure gauges installed on each filter section
- The section of units higher than 1,3 m is fitted with lighting and an 150 mm inspection glass



AIR HUMIDIFIERS

- Air humidifiers contain an inclined base pan for water drainage for prevention of a potential microbiological growth, depositions and corrosion. Water can be completely drained when the unit is not operating. According to water hardness grade and air pollution, it is recommended to use a water-softening device or rather a device for germ elimination from water like for e.g. UV lamps
- Drip tubes, condensate pans and water tanks are made of stainless steel
- Drip tubes and condensate pans, water tanks, droplet separators and air deflectors are easily accessible for cleaning and disinfection purposes
- Spray humidifiers (class A,B or C), evaporative humidifiers (class D) or steam humidifiers (class E) could be installed
- Steam humidifiers are dimensioned and designed to prevent water condensation
- The section of units higher than 1,3 m is fitted with lighting and an 150 mm inspection glass





↔ HEAT EXCHANGERS

- ▶ Droplet separators, drip tubes and condensate pans are easily accessible for cleaning and disinfection purposes
- ▶ Heat exchanger surfaces are smooth and free from sharp edges. The fin spacing is minimum 2 mm for heaters and minimum 2.5 mm for coolers. In case of larger air-handling units heat exchangers consist of 2 parts interconnected by a heat exchange coil.
- ▶ Differential pressure gauges installed on each heat exchanger section
- ▶ Base pans below cooling coils are inclined and allow a free drainage of all condensed water, can be easily cleaned and disinfected and are made of stainless steel
- ▶ Due to a very high relative humidity coolers are normally not installed upstream filters or a sound attenuator sections. Otherwise, re-heater should be installed in between.
- ▶ Considering the pressures present, the siphon of the cooler base pan equipped with a return flow protection is dimensioned to enable the undisturbed water drainage



⊞ FANS

- ▶ Fans are corrosion-protected. Fans with casing always contain a filter. For an easy cleaning the fans have backward curved blades and a condensate drainage on the bottom of the fan casing.
- ▶ Fan casing for nominal diameters exceeding 400 mm contains an inspection opening. For hygienic reasons, fans without casings are preferred.
- ▶ Differential pressure gauges installed on each fan section
- ▶ The section of units higher than 1,3 m is fitted with lighting and an 150 mm inspection glass
- ▶ Fans and motors are mounted on sliding frame which may be easily pulled out for cleaning and disinfection purposes



↻ HEAT RECOVERY DEVICES

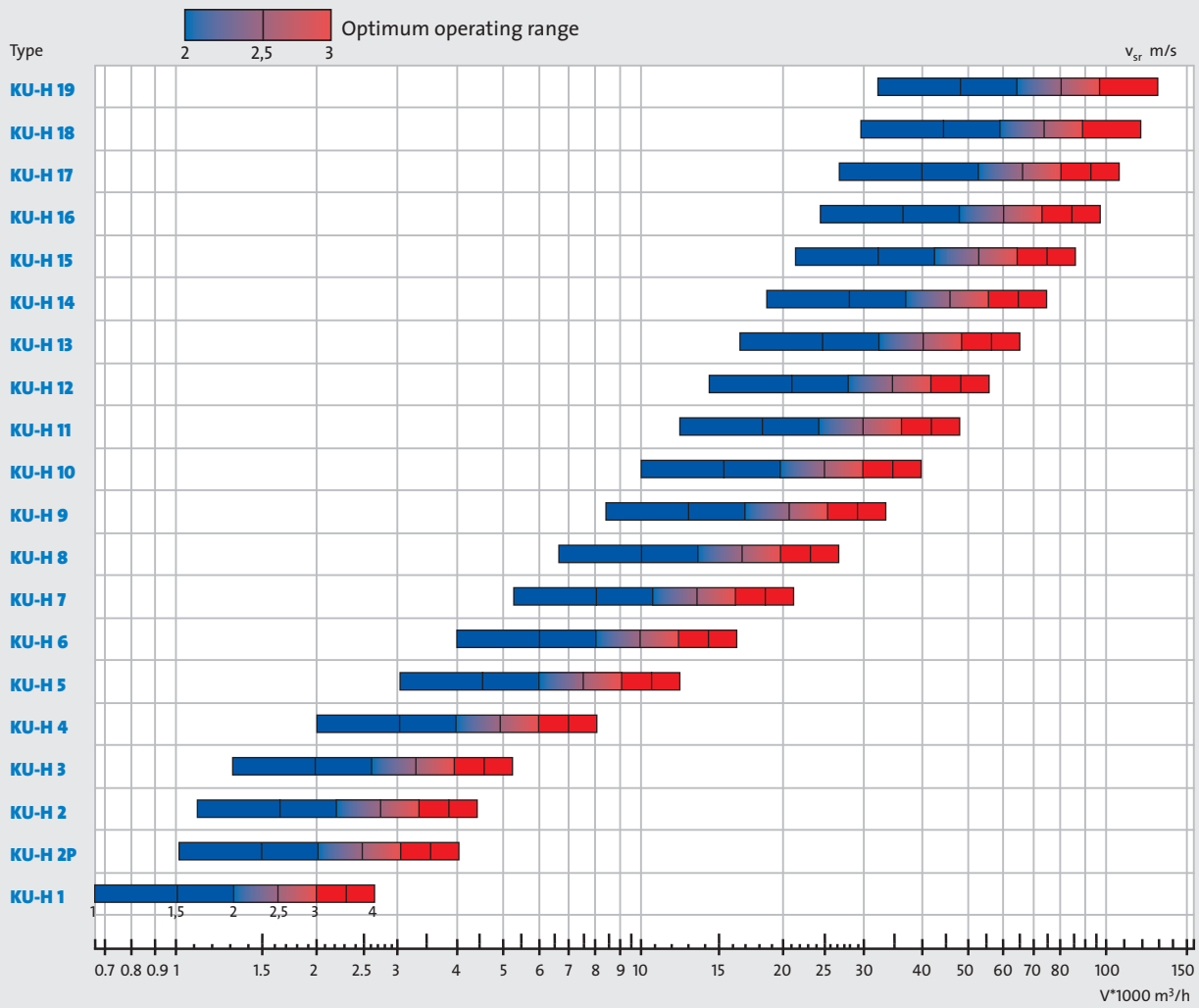
- ▶ Heat recovery devices are used for exploitation of the exhaust air energy mainly in cases when fresh and return airflows do not mix like in e.g. plate-type recuperators
- ▶ Droplet separators, drip tubes and pans may be pulled out for cleaning and disinfection purposes
- ▶ Rotating regenerators may only be applied if, due to hygienic conditions, the return air may be used



))) SOUND ATTENUATORS

- ▶ For prevention of possible sound attenuator shutters pollution with dirt, they are normally preceded by a filter. The air humidity should be kept below 80% r.H.
- ▶ For prevention of possible pollution during the transport, sound attenuators are packed separately before dispatchment
- ▶ Installation of sound attenuators downstream of the air humidifiers or coolers should be avoided. Otherwise, re-heater should be installed in between.
- ▶ The shutter material is wear-resistant, easy for cleaning and disinfection
- ▶ Sound attenuators shutters are normally accessible on both sides or can be rather dismounted to facilitate cleaning and disinfection

Selection of unit size



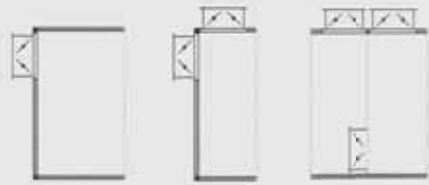
Unit dimensions

Type	Number of filter inserts ¹⁾			b mm	h mm	Insulation thickness: 30 mm		Insulation thickness: 50 mm	
	1/1	1/2	1/4			B mm	H mm	B mm	H mm
KU-H 1		1		680	380	800	500	840	540
KU-H 2P			1	980	380	1100	500	1140	540
KU-H 2	0,83*			680	580	800	700	840	740
KU-H 3	1			680	680	800	800	840	840
KU-H 4	1	1		980	680	1100	800	1140	840
KU-H 5	1	2	1	980	980	1100	1100	1140	1140
KU-H 6	2	2		1280	980	1400	1100	1440	1140
KU-H 7	4			1280	1280	1400	1400	1440	1440
KU-H 8	4	2		1580	1280	1700	1400	1740	1440
KU-H 9	4	4	1	1580	1580	1700	1700	1740	1740
KU-H 10	6	3		1880	1580	2000	1700	2040	1740
KU-H 11	9			1880	1880	2000	2000	2040	2040
KU-H 12	9	3		2180	1880	-	-	2340	2040
KU-H 13	9	6	1	2180	2180	-	-	2340	2340
KU-H 14	12	4		2480	2180	-	-	2640	2340
KU-H 15	16			2480	2480	-	-	2640	2640
KU-H 16	16	4		2780	2480	-	-	2940	2640
KU-H 17	20			3080	2480	-	-	3240	2640
KU-H 18	20	4		3380	2480	-	-	3540	2640
KU-H 19	24			3680	2480	-	-	3840	2640

¹⁾ Size of filter inserts : 1/1=595x595 mm (24"x24"), 1/2=290x595 mm (12"x24"), 1/4=290x290 mm (12"x12")

* Special dimensions of filter insert: 490x595 mm (20"x24")

Functional sections



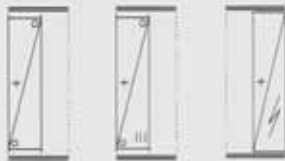
A - Inlet-/Discharge- and Mixing box

Air handling unit with or without damper, for regulation of pressure or air volume flow, with flexible canvas or inlet/outlet hood



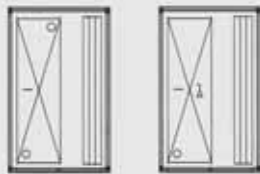
F - Filter section

Air handling unit with standardised filter sizes according to DIN 24185. Filter classes according to EN 779 : G1-G2, G3-G4, F5-F9 and H10-H14. Execution : panel, bag, compact, HEPA or activated carbon filter.



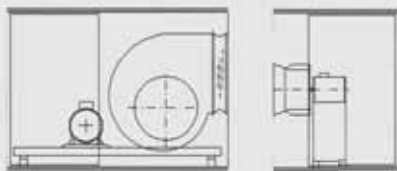
H - Heating section

Heat exchanger for hot water, glycol, steam or refrigerant. Made of Cu/Al or galvanized steel. Coil connections internally or straight to outside. Electric heater with automatic control elements and safety devices.



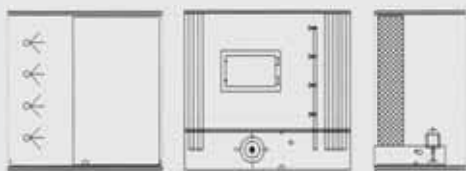
K - Cooling section

Heat exchanger for chilled water, glycol or as refrigerant DX-coil. Made of Cu/Al, Cu/Cu or Cu/Cu tinned coil or galvanized steel. Bottom integrated drain pan made of stainless steel 304L. Droplet eliminator made of PVC profiles in stainless steel 304L frame. Coil connections internally or straight to outside.



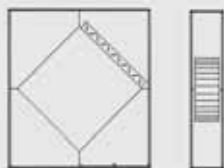
VR/VF - Fan unit

With built-in high efficiency radial fans, double inlet design (VR) for V-belt drive with motor, protection class IP55. Open impeller type (VF) with plug-in motor, mounted on common base frame with anti vibration isolators.



HUM - Humidifier section

- Steam humidifier as self-producing electric type or network dry steam
- Honeycomb humidifier for contact humidifying, with circulating and fresh water, water tank and pump
- Spray humidifier with nozzles, water tank and pump



ER - Heat recovery section

for saving of waste energy :

- PWT plate type recuperator with Al fins and cross flow design, sensible heat transfer
- RWT rotary wheel regenerator for saving of latent and sensible heat energy
- KV twin-coil system with 2 heat exchangers, installed in supply/ exhaust air flow



S - Sound attenuator

with built-in high efficiency acoustic splitters. Splitter casing of galvanized steel and acoustic filling according to DIN 4102, class A2 (non combustible) covered by abrasion resistant tissue (up to 20 m/s)



DIN 1946-4



VDI 6022



EN 13053

STANDARDS AND GUIDELINES

Hygienic air-handling units are designed and manufactured in conformity with the following standards and guidelines:

- ▶ EN 1886 - Ventilation for buildings - Air handling units - Mechanical performance
- ▶ EN 13053 - Ventilation for buildings - Air handling units - Ratings and performance for units, components and sections
- ▶ VDI 3803 - Air-conditioning systems - Structural and technical principles
- ▶ VDI 6022 Part 1 - Hygienic standards for ventilation and air-conditioning systems - Offices and assembly rooms
- ▶ VDI 6022 Part 3 - Hygienic standards for ventilation and air-conditioning systems in production facilities and business enterprises
- ▶ DIN 1946 Part 2 - Ventilation and air conditioning; technical health requirements (VDI ventilation rules)
- ▶ DIN 1946 Part 4 - Ventilation and air conditioning - Part 4: Ventilation in hospitals (VDI Ventilation rules)



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