Air Handling Units
TI-50.

AHU Casing Characteristics, Design Details For Outdoor Installation
And Increased Hygiene Requirements.

robatherm
the air handling company

Characteristics of the robatherm casing construction

robatherm's AHUs provide a product quality by far outperforming the minimum quality requirements in all versions. The robatherm series are available in special design versions for outdoor installation and for increased hygiene requirements.

In principle, the guideline values for casing design are based on the following criteria:

[1] The AHU Guideline 01 "General Requirements for Air Handling Units" of the German AHU Manufacturers' Association summarizes the state of the art, addressing the relevant standards and guidelines.

[2] The certificated test body uses a standardized model casing – the „model box" – for each line for determining the casing characteristics according to DIN EN 1886.
(M) stands for „model box".
(R) stands for „real unit". Specification / measurement is based on in-house investigations using real AHUs.

[3] Averaged values of commercially available AHUs whose manufacturers are members of the German AHU Manufacturers' Association.

Thermal transmittance

Thermal transmittance is a measure for an AHU's heat loss per square meter and kelvin. Thermal transmittance coefficients are determined for the overall casing construction.

Minimum requirements for the thermal insulation of AHU casings include:[1]

Class T5 according to DIN EN 1886 for AHUs without thermodynamic air conditioning,
Class T4 with up to 1.99 W/(m²K) for AHUs with air heating or further functions, and
Class T3 for weatherproof AHUs with air heating or further functions.
Class T3 for AHUs with increased hygiene requirements.

Using noncombustible mineral wool and market standard insulation thicknesses, Class T2 is the best thermal transmittance class achievable.

robatherm line	Thermal transmittance class	Value added compared to T4
TI-50	T2[2]	+ 58,5 %

Thermal bridging

One of the crucial criteria for assessing casing quality is the thermal bridging factor kb. It allows to provide statements on the risk of condensation forming on the AHU.

At least Class TB3 (i.e. thermal bridging coefficient >0,45) is required for indoor units where the internal temperature in outdoor air intake chambers and downstream components is below -7 °C, or TB4 between -7 °C and +5°C.

Class TB3 is the minimum for cooling sections and downstream casing components at an internal air temperature below 7°C. Between 7°C and 13°C, Class TB4 is required.

Weatherproof units with air heating and further functions need to be TB3 as well.[1]

The theoretical maximum value is k_b=1.0. The thermal bridging class TB1, where $k_b \geq 0.75$, offers highest possible protection from condensation on the AHU's casing.

robatherm line	Thermal bridging class	Value added compared to TB3
TI-50	TB1[2]	+ 75,5 %

Soundproofing

Sound emissions from AHUs to the outside must be limited. Permissible limits for outdoor units depend on the building area and its environment. Reflections from surrounding objects may cause violations of accepted limits. In such cases, excellent sound insulation is particularly important. The casing itself already provides a high sound dampening effect.

The AHU casing itself already provides a high level of sound insulation, evaluated as the "insertion loss factor" D_p - not to be confused with the "weighted sound insulation factor" R_w. This refers only to one component (e.g. panel). It is determined according to DIN 52210, Part 3, and is unsuitable for assessing the overall enclosure insulation.

Particularly in the relevant low frequency range, the measure of sound reduction in casings of robatherm is up to 36 % above market average.[3]

robatherm line	Insertion loss (D_p) in the respective octave band [dB]						
Frequency [Hz]	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
TI-50	13,6	21,8	30,6	32,2	35,7	38,7	43,8

Airtightness

Loosing conditioned air through casing or duct leaks is energy lost.

Therefore, AHUs are required to meet at least casing leakage class L3(R) with a maximum 1.90 l/(sm²) at 700 Pa test pressure and 1.32 l/(sm²) at 400 Pa negative pressure.[1]
Class L2(R) is stipulated for units subject to increased hygiene requirements.[1]

At present, Class L1(M) is the best achievable airtightness class.[2]

robatherm line	Class	Test pressure [Pa]	Value added compared to L3
TI-50	L1(M)[2]	-400 / +700	+ 98 %

Filter bypass leakage

The higher the filter class in use the more serious are any leaks at the filter mounting frame, as leaking unfiltered air will mix with filtered air.

DIN EN 1886 allows maximum leakages of 6 % of the nominal volume flow with G1 filters, and up to 0.5 % with F9 filters.
Filter bypass leakage class F9 (≤ 0.5 % of nominal volume flow) is stipulated for units subject to increased hygiene requirements.[1]

F9 is the highest tightness class with the lowest filter bypass leakage.

robatherm line	Class	Test pressure [Pa]	Value added compared to nominal requirement
TI-50	F9	-400 / +400	+ 80 %

Casing strength

Pressure variations as e.g. in the case of closing fire dampers involve the risk of permanent deformations on the AHU. The deflection per meter of the casing's cover plates is the criterion for its strength. The minimum requirement is a mechanical stability of Class D2 (M), with a maximum deflection of 10 mm/m.[1]

The measurement procedure to DIN EN 1886 yields the measured value, confirming that even a test pressure of ± 2,500 Pa does not entail any permanent deformation on the model box.

robatherm line	Class	Test pressure [Pa]	Value added compared to D2
TI-50	D1(M)[2]	-1000 / +1000	+ 67 % / + 76 %

Design of the robatherm AHU casing

Dismountable construction with thermal break between outer- and inner shell, two-shell panels insulated with mineral wool of reaction to fire class A1 (noncombustible), density ≥ 35 kg/m^3, thermal conductivity ≤ 0.04 W/mK.

Disinfectant-resistant materials and certified material resistance to disinfection using hydrogen peroxide vapor. Seals do not absorb moisture and are not metabolizable by microorganisms.

Outer shell

Made of hot dip galvanized sheet steel 1.0mm thick, standard version with additional powder coating (≥ 60µm).
Color similar to RAL 7035 ("light gray")

Option
- Powder coating of the outer shell in special color on request

Inner shell

Made of hot dip galvanized sheet steel 1.0mm thick.

Options
- With additional powder coating of the interior shell in the color shade similar to RAL 7035 (light grey), with antimicrobial powder coating in the color shade similar to RAL 9010 (pure white), stainless steel 1.4301 or stainless steel 1.4571.
- Third shell, without or with additional 30mm insulation

Modular design

Modular design for easy installation on site; using bolted connections.
Crane lug attached to the equipment roof.

Inspection doors

Inspection doors come with thermal bridging class TB1. Circumferential hollow profile gasket seals are multi hollow profile type. The gasket seals are fixed to the door in a form locking manner and completely removable. The seal's corners are miter milled and properly welded in order to avoid any pads and to achieve constant contact pressure and the best possible air-tightness.

Option
- Isolating sight glass, thermal bridging class TB1 (as per VDI 3803-1)

Casing bottom

In the basic version made of galvanized sheet steel. No inaccessible corners or recesses, very easy to be cleaned and maintained.

Options
- With additional powder coating in the color shade similar to RAL 7035 (light grey), with antimicrobial powder coating in the color shade similar to RAL 9010 (pure white), stainless steel 1.4301 or stainless steel 1.4571
- Base of the device includes thermal decoupling (thermal bridge class TB1)
- Third shell, in line with frame for increased hygiene requirements, without or with additional 30mm insulation
- Floor grating
- Checker plate floor

Bottom trays

At robatherm, bottom trays are made of stainless steel 1.4301 in a laser-welded model with a tray height of 80 mm or 120 mm, allside-incline with a rounded out run-off edging and a run-off at the deepest point for optimal draining and cleanability; including thermal decoupling (thermal bridge class TB1).
The gas- and liquid tight pans are laser welded in an inert gas atmosphere. They come with a perfectly slender weld seam, its surface is both appealing and hygienically even and plain. As opposed to a conventionally welded drain pans, laser welded pans are distortion free due to extremely low thermal load and a fractional heat effected zone.
Bottom trays are insulated at least 30mm underneath.

Options
- With additional surface protection by epoxy powder coating in the color shade similar to RAL 7043 (traffic grey)
- Made of stainless steel 1.4571

Base frame

Base frame made of allround U-profiles under all sections of the casing modules. Standard version: 100 mm high. Material: 3mm of hot-dipped galvanized steel with additional powder-coating (in the outer shell's color shade) for excellent corrosion protection.

Options
- U-profile base frame 200, 306 or 406 mm in height
- Thermal decoupled frame – Thermal bridging class TB1
- Eaves flashing on the base frame made of hot dip galvanized sheet steel with additional powder coating in the colour of the outer shell.
- Drive with external linkage

Design details – AHU casings for outdoor installation

Packaged rooftop units are included in VOB Part C / DIN 18379 and shall be considered as part of the building services installation. They are manufactured following the rules of mechanical engineering and thus not to be seen as a part of the building.
As stipulated in DIN EN 13053 and VDI 3803, the casing bottom must not replace the building's roof! robatherm AHU casings designed for outdoor installation have the following additional features:

Weatherproofing

With UV-resistant roofing film, roof overhang and drip nozzle in a light-grey color.

Outdoor air intake + exhaust air blow out

Options

- Protection hood or weather louver made of hot dip galvanized sheet steel with additional powder coating in same color as outer shell (as specified in DIN EN 13053)
- Outdoor air intake chamber with bottom tray (design see Bottom trays) and inspection doors (as specified in DIN EN 13053)

Inspection doors

Option

- All inspection doors from 459 mm width upwards come with a fixing device to prevent unintentional closing (as specified in VDI 3803-1)

Design details – AHU casings subject to increased hygiene requirements

A number of additional details must be taken into account since AHUs are subject to increased hygiene requirements. AHUs from robatherm already meet a large part of the hygiene requirements. Most of these are covered by the standard version of robatherm AHUs – see above. Examples of design details for increased hygiene requirements, going beyond the robatherm standard, include:

Inner shell

Options

- Side panels and all components of which the surfaces lie in the airflow, are made of hot-dipped galvanized sheet steel with additional powder-coating (as required in accordance with DIN 1946-4) in a color shade similar to RAL 7035 ("light grey") or antimicrobial powder-coating similar to RAL 9010 ("pure white")
- Made of stainless steel 1.4301
- Made of stainless steel 1.4571

AHU connection

Options

- Smooth, sound-insulated AHU connection of hot dip galvanized sheet steel with additional, allround powder coating in same color as the unit's outer shell. Designed as U-profile frame with intermediate insulation profile (closed cell), including equipotential bonding (as specified in DIN 1946-4)
- Sound-insulated AHU connection of stainless steel 1.4301

robatherm
John-F.-Kennedy-Str. 1
89343 Jettingen-Scheppach

Tel. +49 8222 999-0
info@robatherm.com
www.robatherm.com

robatherm
the air handling company