

Energy efficient air handling units

As one of the first manufacturers, robatherm has air handling units (AHU) with energy efficiency class A or B (according to RLT Directive 01) in its sales programme since May 2008 and since January 2008 according to European certification body EUROVENT directive. Moreover robatherm offers air handling units with energy efficiency class A+ since January 1st 2009.

Up until then there had been no reliable indicator for energy efficiency of air handling units as there has been for example in the form of labels on refrigerators, washing machines and other electrical appliances in daily use for many years.

Previous criteria were unsuitable

Even specific fan capacity, i.e. SFP value (Specific Fan Power) according to DIN EN 13779, only allows a rough estimate of the overall installation including the AHU to be made, but not the AHU itself; the SFP value is determined by the external pressure loss which is neither influenced by the equipment manufacturer nor is it dependent on the quality of the equipment.

Specific fan capacity according to DIN EN 13779

Class	P_{SFP} [W/(m ³ /s)] with $P_{SFP} = P_M / q_V = \Delta p_{stat} / \eta_{ges}$
SFP 1	< 500
SFP 2	500 bis 750
SFP 3	750 bis 1,250
SFP 4	1,250 bis 2,000
SFP 5	2,000 bis 3,000
SFP 6	3,000 bis 4,500
SFP 7	> 4,500

P_{SFP} additions [W/ (m³/s)] for components

Each further filter stage above 1st filter stage	+ 300
Absolute filter stage HEPA H10 to H13	+ 1,000
Active charcoal filter (gas filter)	+ 300
Heat recovery of Class H1 or H2	+ 300
Cooler with pressure loss air side $\Delta p > 200$ Pa	+ 300

Recommendation according to DIN EN 13779

ETA-System simple (without heat recovery)	SFP 2
ETA -System complex (with heat recovery)	SFP 3
SUP-System simple (with air heating)	SFP 3
SUP -System complex (with further functions)	SFP 4

Quality criteria for central air handling units

That is why directives have been developed by the manufacturers association and by EUROVENT to establish the energy efficiency of air handling units. The following features that stand out are:

- Low internal pressure loss by limiting the air velocity in the air handling unit (V Classes according to DIN EN 13053).

Class	Velocity in clear housing class section [m/s]
V1	$v \leq 1.5$
V2	$1.5 < v \leq 2.0$
V3	$2.0 < v \leq 2.5$
V4	$2.5 < v \leq 3.0$
V5	no requirements

- Low electrical energy requirement for the fan motors by limiting the effective electric power input ($I_{\text{input max}}$ according to a formula and/or the function of the air volume flow and the static pressure increase).

$$P_{\text{Input max}} = [(\Delta p_{\text{stat}}/450)]^{0.925} \times [q_v + 0.08]^{0.95} \text{ in [kW]}; \Delta p_{\text{stat}} \text{ in [Pa]}; q_v \text{ in [m}^3\text{/s]}$$

- High quality heat recovery by setting minimum heat recovery figures at the same time as limiting the air side pressure losses (H Classes according to DIN EN 13053).

Class	Heat recovery figure [%]	Pressure loss [Pa]
H1	Values x 1.15	Values x 0.75
H2	Values x 1.10	Values x 0.90
H3	Values from Table "Minimum heat recovery figures..."	
H4	Values x 0.90	Values x 1.10
H5	No requirement	No requirement

Minimum heat recovery figures Φ_{min} and maximum pressure loss P_{max}







	Air volume flow q_v [m ³ /s]				
	$q_v \leq 1.39$	$1.39 < q_v \leq 2.78$	$2.78 < q_v \leq 6.94$	$6.94 < q_v \leq 13.89$	$q_v > 13.89$
Φ_{min} [-]	0.43	0.45	0.5	0.58	0.63
Δp_{max} [Pa]	200	225	250	275	300

These figures are based on 4,000 to 6,000 operating hours a year.

Saving potential with good amortisation

As a result there is an average of 10% to 20% lower annual energy requirement for air handling units with Class A in comparison to currently conventional equipment available on the market (comparable to Class B). With Class A+ there are energy savings between 20% and 30% in comparison to Class B available. And that is for a period of amortisation that is frequently less than two years.

When planning air handling units, efficient equipment should be selected, particularly with regard to ecological operation and increasing energy costs. The new energy efficiency classes give a simple, transparent, reliable and precise basis for this.

Class	Equipment type	V	H	Max. electrical motor capacity [kW]
	Equipment without thermodynamic air handling	V4	-	$0.90 \times P_{\text{Input max}}$
	Equipment with air heating	V3	-	$0.90 \times P_{\text{Input max}}$
	Equipment with further functions	V2	H1	$0.90 \times P_{\text{Input max}}$
 	Equipment without thermodynamic air handling	V4	-	$0.95 \times P_{\text{Input max}}$
	Equipment with air heating	V3	-	$0.95 \times P_{\text{Input max}}$
	Equipment with further functions	V2 ¹	H2	$0.95 \times P_{\text{Input max}}$
 	Equipment without thermodynamic air handling	V5	-	$1.00 \times P_{\text{Input max}}$
	Equipment with air heating	V4	-	$1.00 \times P_{\text{Input max}}$
	Equipment with further functions	V3 ²	H3	$1.00 \times P_{\text{Input max}}$
	All equipment types	No requirements		

¹ According to EUROVENT ($qV \leq 3 \text{ m}^3/\text{s}$): V3

² According to EUROVENT ($qV \leq 3 \text{ m}^3/\text{s}$): V4

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