

Page 1	Flat Series Calculation of external available Pressure															
	Size: 3															
Air flow volume [m³/h]		500	800	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3400	3800	
1. Step	1. Criterion flow velocity (Ref. 20°C)		<i>Do not design units in conditions acc. to white areas!</i>													
	Supply Unit with air conditioning elements:															
	Flow velocity related to Cross section of filter (long)	[m/s]	0,54	0,87	1,30	1,52	1,74	1,95	2,17	2,39	2,60	2,82	3,04	3,26		
	Flow velocity related to Finned surface of heater	[m/s]	0,90	1,44	2,16	2,53	2,89	3,25	3,61	3,97	4,33	4,69				
	Flow velocity related to Finned surface of cooler	[m/s]	0,90	1,44	2,16	2,53	2,89	3,25	3,61							
Extract Unit without air conditioning elements:																
Flow velocity related to Inner cross section of unit	[m/s]	0,56	0,90	1,35	1,58	1,81	2,03	2,26	2,48	2,71	2,94	3,16	3,39	3,84	4,29	
2. Step	2. Pressure Calculation		Available statical pressure [Pa] at rated voltage without consideration of pressure regain!													
	Ventilator Unit	VF 308	759	766	749	726	691	643	580	501	403	286	148			
		VF 310	774	771	756	741	720	693	659	617	566	505	434	352	150	
		VF 311	758	753	737	724	707	685	656	622	580	531	474	407	244	
		VF 312	913	911	903	895	885	871	854	832	806	775	739	698	595	466
	<i>The following air conditioning elements reduce pressure available!</i>															
			Pressure loss [Pa] at above stated air volume													
	Pocket filter F5 Short filter (195 mm pocket)	Calculated resistance	104	108	112	115	118	121	124	128	131	135	139	144		
		Clean resistance	8	15	24	30	35	42	48	55	62	70	78	87		
	Recommended final resistance: 200 - 300 Pa To ensure long filter life time please dimension the unit with consideration of „Calculated resistance“															
Pocket filter F5 Long filter (600 mm pocket)	Calculated resistance	150	150	150	150	150	150	150	150	150	150	100				
	Clean resistance	3	7	14	18	23	28	34	41	47	55	63				
Recommended final resistance: 200 - 300 Pa																
Pocket filter F7 Long filter (600 mm pocket)	Calculated resistance	100	100	100	100	100	100	100	100	100	100					
	Clean resistance	17	29	46	55	64	74	85	95	107	118					
Recommended final resistance: 200 - 300 Pa																
Pocket filter F9 Long filter (600 mm pocket)	Calculated resistance	160	167	178	184	190	197	204	211	219						
	Clean resistance	20	34	56	68	80	94	108	122	138						
Recommended final resistance: 300 - 400 Pa																
Air Heater LW Medium: PWW (pump circulated hot water)	LW 1	5	10	20	26	32	39	46	54	62	71					
	LW 2	7	16	32	41	52	63	75	88	102	117					
	LW 3	12	27	53	69	86	104	124	146	169	193					
Subtotal External statical pressure [Pa] available																

Page 2	Flat Series		Calculation of external available Pressure															
	Size: 3		Air Flow Volume [m³/h]	500	800	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3400	3800	
2. Pressure calculation <i>The following air conditioning elements reduce pressure available!</i>																		
Subtotal of page before			of external available statical pressure [Pa]															
			Pressure loss [Pa] at above stated air volume															
2. Step Calculation of external available statical air pressure by deduction of internal pressure losses Deduct the respective pressure losses of needed elements from available stat. pressure of fan!	Air Cooler LK		LK 2	16	34	66	86	107	129	154								
	Medium: chilled water KKW		LK 4	20	43	85	110	138	168	200								
			LK 6	25	56	110	142	178	216	258								
	Air Cooler LKR		LKR 2	11	25	49	64	80	98	117	138	160	183					
	Direct Evaporating		LKR 4	14	31	61	80	100	122	146	172	199	228					
	Medium: R407C, 5°C		LKR 6	22	48	95	124	155	190	227	267	309	355					
	Water Eliminator			6	13	27	36	45	55	66								
	Damper			2	4	6	8	10	11	13	15	17	19	22	24	29	34	
				Pressure losses to be taken into consideration only with damper on inlet side.														
	Air Mixer LM, CLM			2	4	6	8	10	11	13	15	17	19	22	24	29	34	
				Pressure losses to be taken into consideration only with air mixer on inlet side.														
			Unit length															
	Attenuator SD		1000 mm	0,1	0,4	0,8	1,1	1,4	1,8	2,2	2,7	3,2	3,8	4,4	5,0	6,5	8,1	
			1500 mm	0,2	0,4	0,9	1,2	1,6	2,1	2,5	3,1	3,7	4,3	5,0	5,7	7,4	9,2	
			1750 mm	0,2	0,5	1,0	1,4	1,8	2,3	2,9	3,5	4,1	4,8	5,6	6,4	8,3	10,3	
		2250 mm	0,2	0,5	1,1	1,5	2,0	2,6	3,2	3,8	4,58	5,3	6,2	7,1	9,1	11,4		
Plate heat Exchange APD			on request															
resistance calculated at 22°C/30% r. H.																		
Coarse Filter GF		clean resistance	20	45	89	116	145	177										
			Regularly cleaning required!															
Activated Carbon Filter			31	67	130	167												
Calculated resistance same than clean resistance																		
Electric Air Heater LE		LE 8	15	26	42	50	59	67	76	86	95	104	114	124				
Operating voltage 400V/50Hz		LE 17	18	31	50	59	69	79	90	100	111	121	132	143				
		LE 25	22	37	58	69	80	92	103	115	127	139	151	163				
Total			External statical pressure [Pa] available															

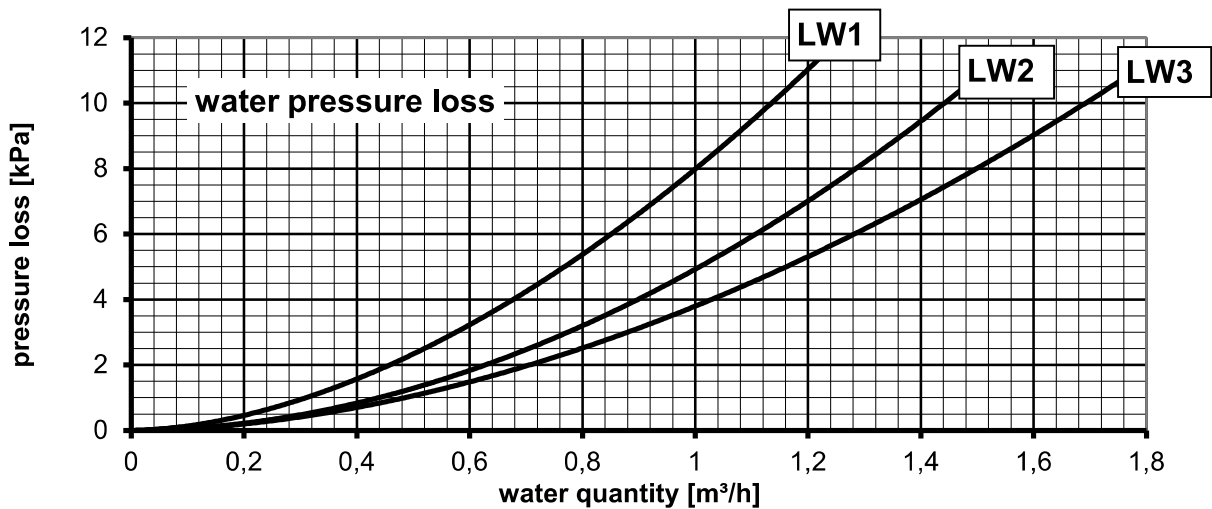
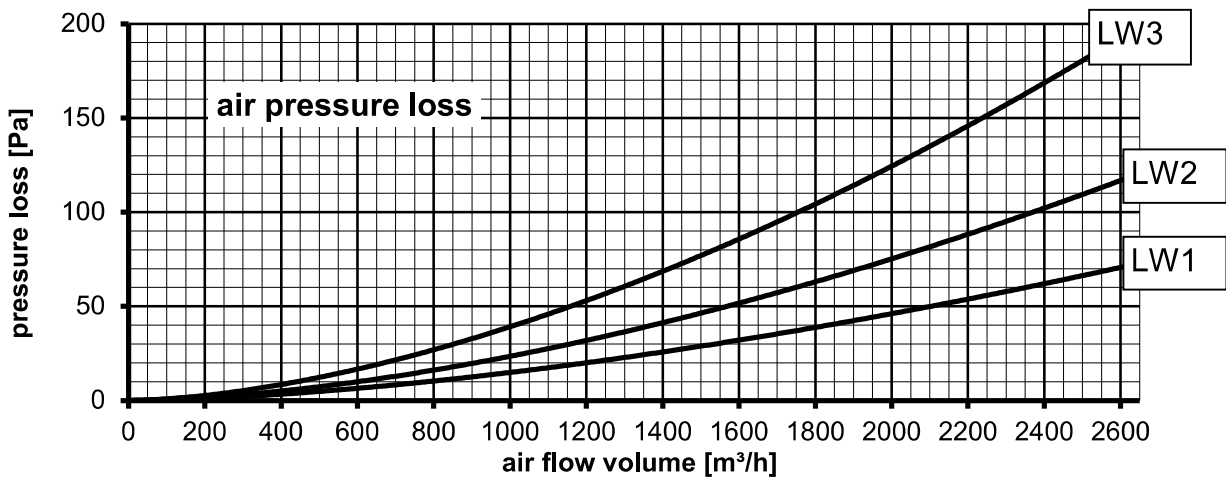
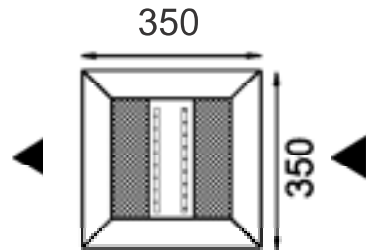
Flat Series

Size: 3, Module depth 1000 mm

The unit sides marked by arrow are open!

Air Heater Unit LW

for medium pump circulated water PWW



The formula for calculation of heating performance [kW] of air heater is dependant on air flow volume and the air temperature difference (between air on-coil and air off-coil, to be taken out of following diagrams) is as follows:

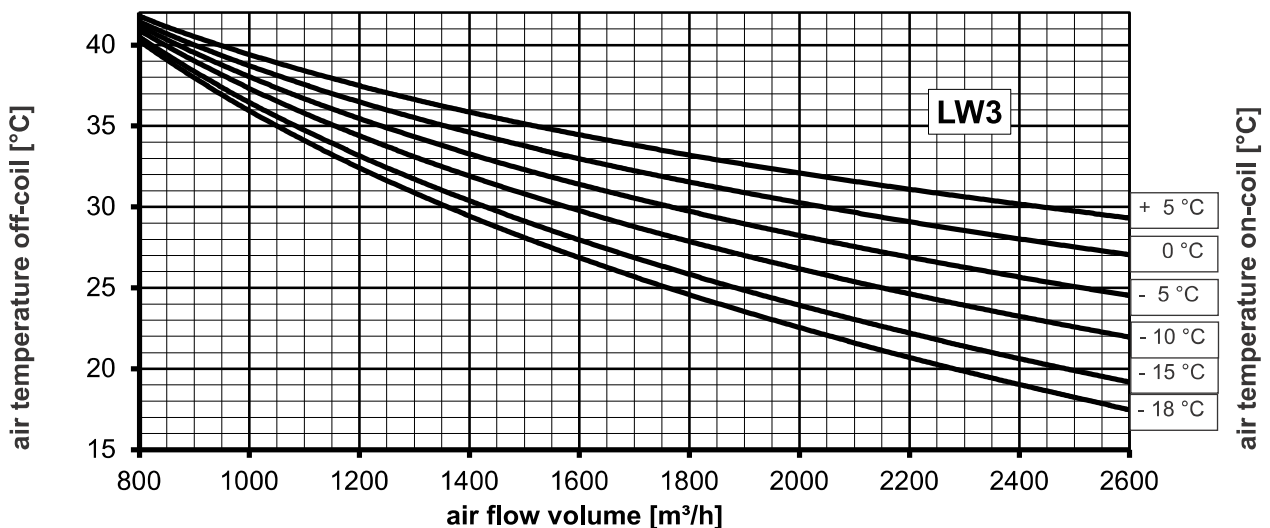
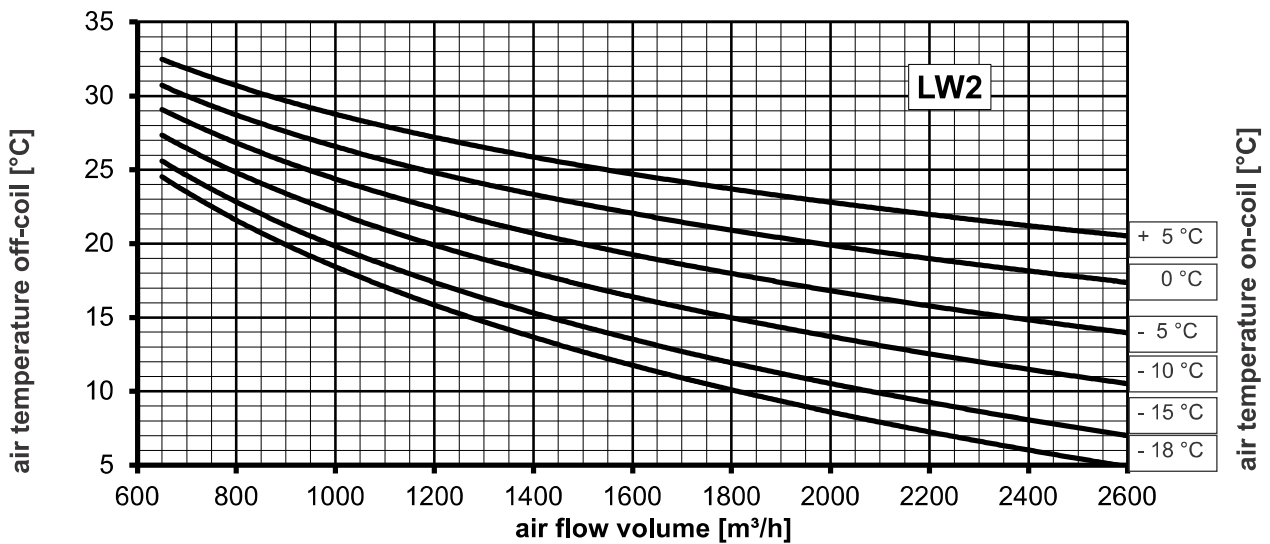
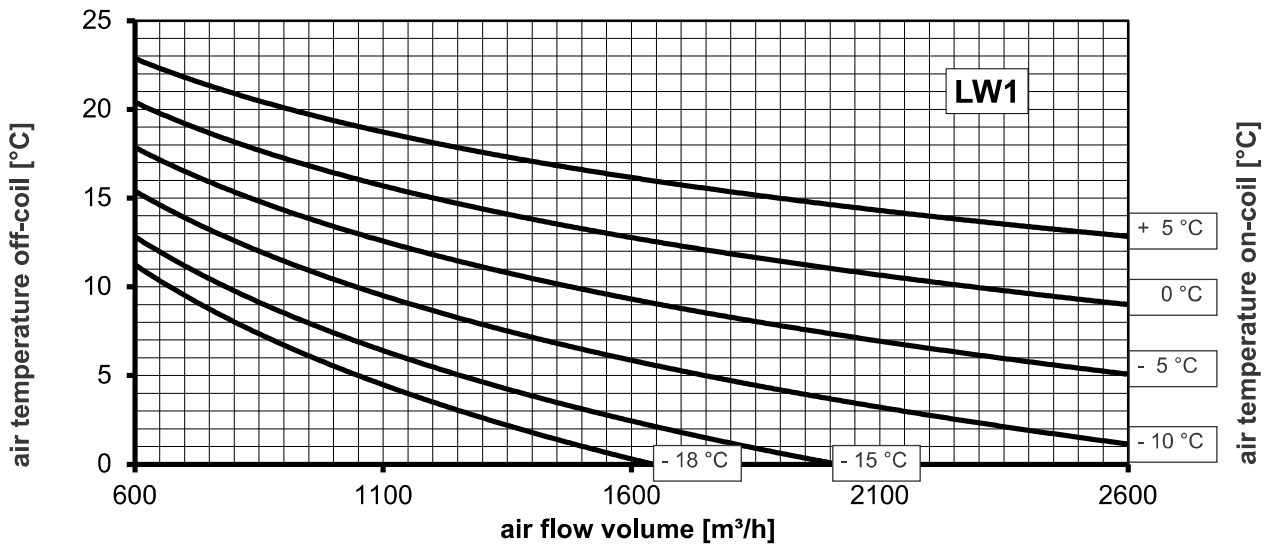
$$\dot{Q}_h [\text{kW}] = \dot{V}_L / 3600 \times (t_{LA} - t_{LE}) \times \rho_L \times c_{pL}$$

- \dot{Q}_h = heating performance [kW]
- \dot{V}_L = air flow volume [m³/h]
- t_{LA} = air temperature off-coil [°C]
- t_{LE} = air temperature on-coil [°C]
- ρ_L = specific weight of air = 1,2 [kg/m³]
- c_{pL} = specific heat capacity of air = 1,0 [kJ/kg K]

Flat Series
Size: 3

Air Heater Unit LW
 for medium pump circulated water

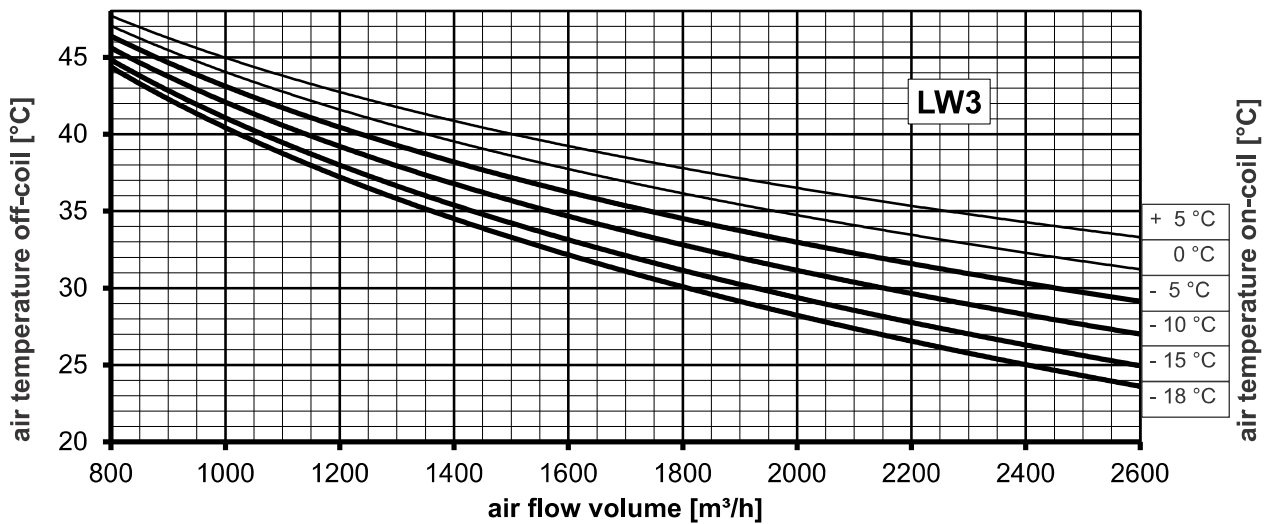
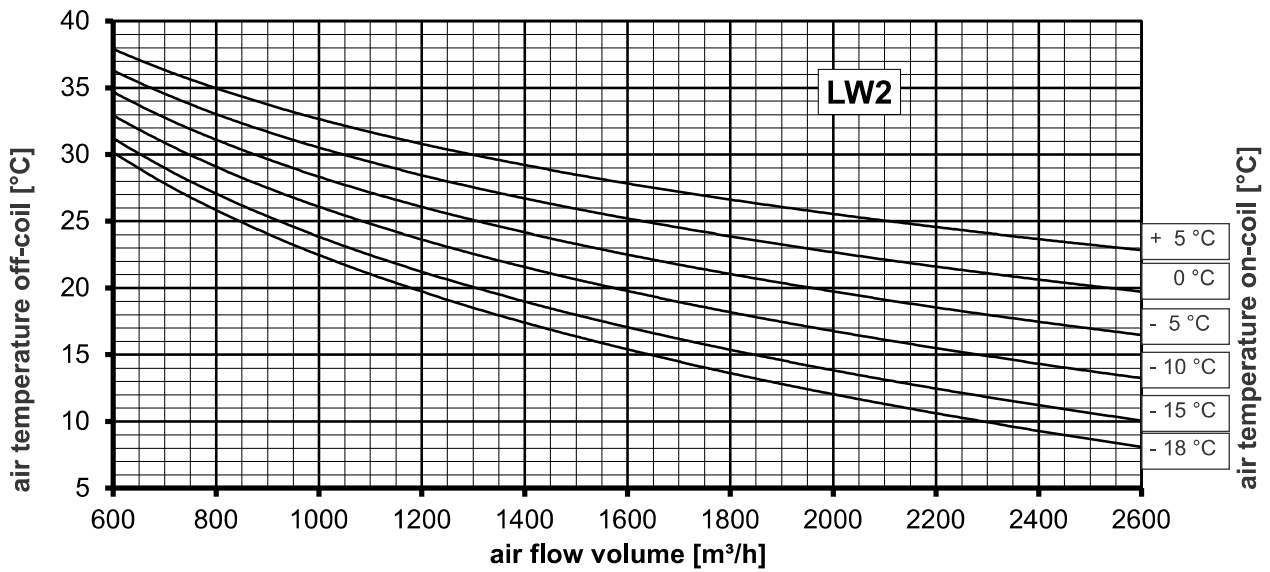
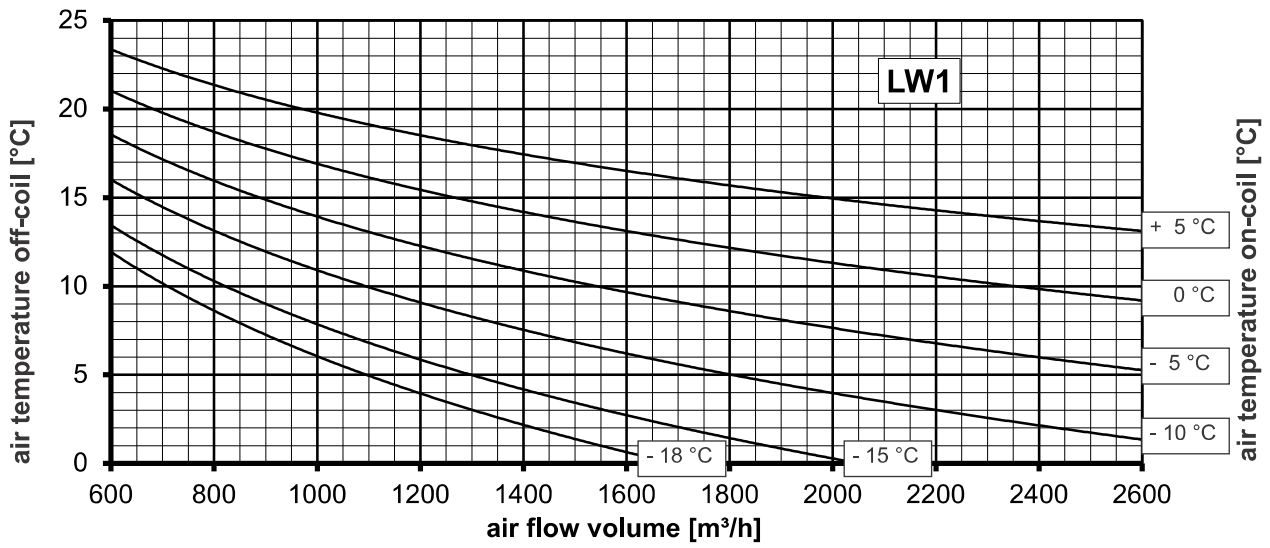
Heating performance for water temperature on-/off-coil 55/45°C



Flat Series
Size: 3

Air Heater Unit LW
for medium pump circulated water

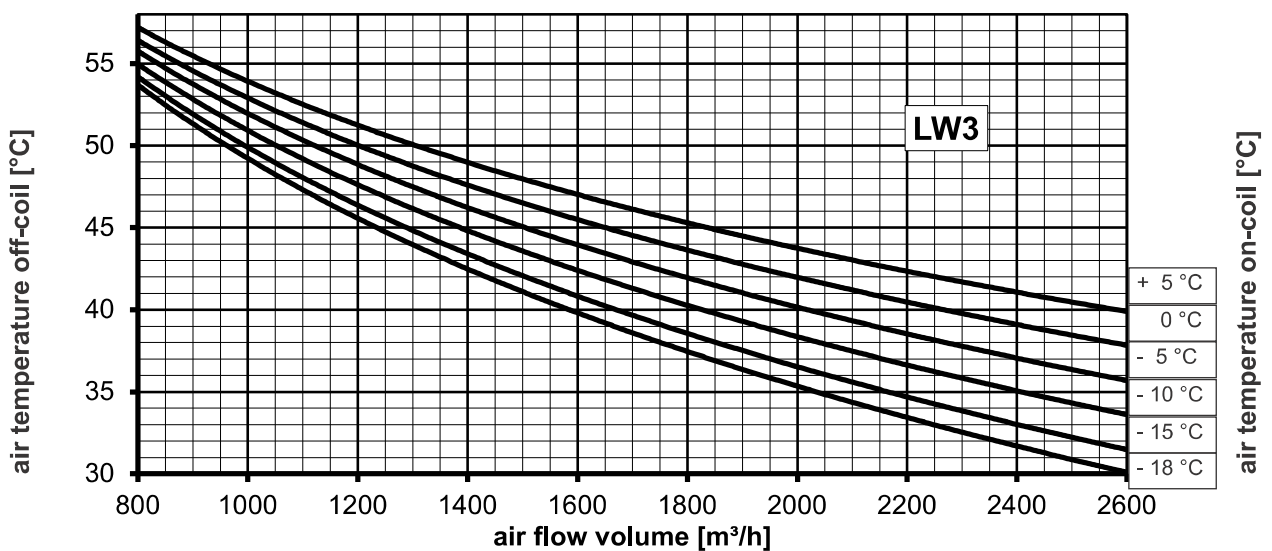
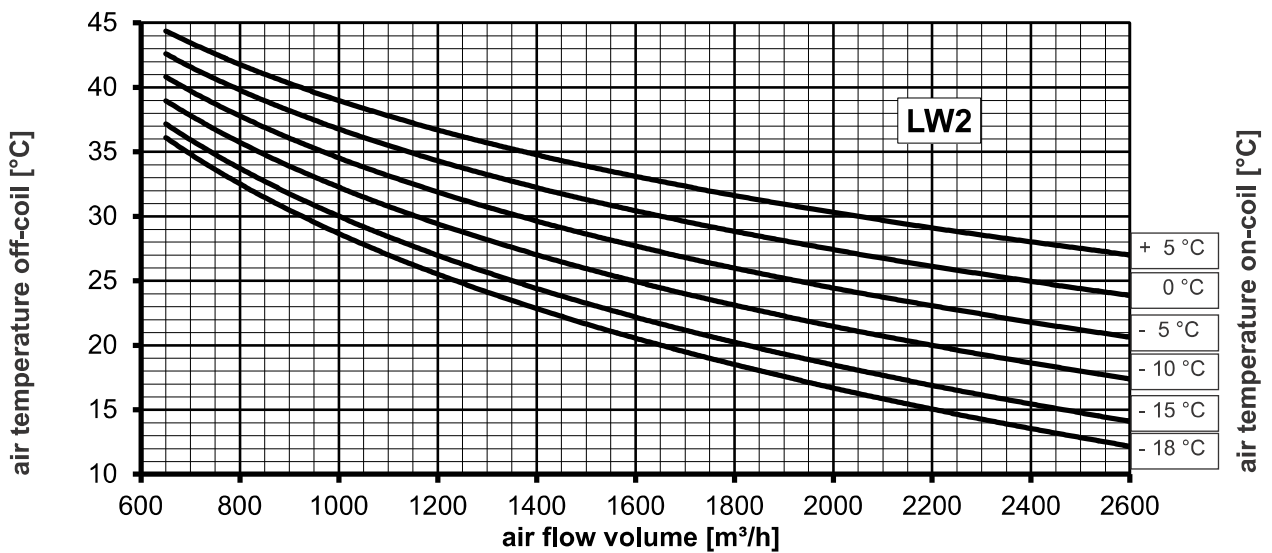
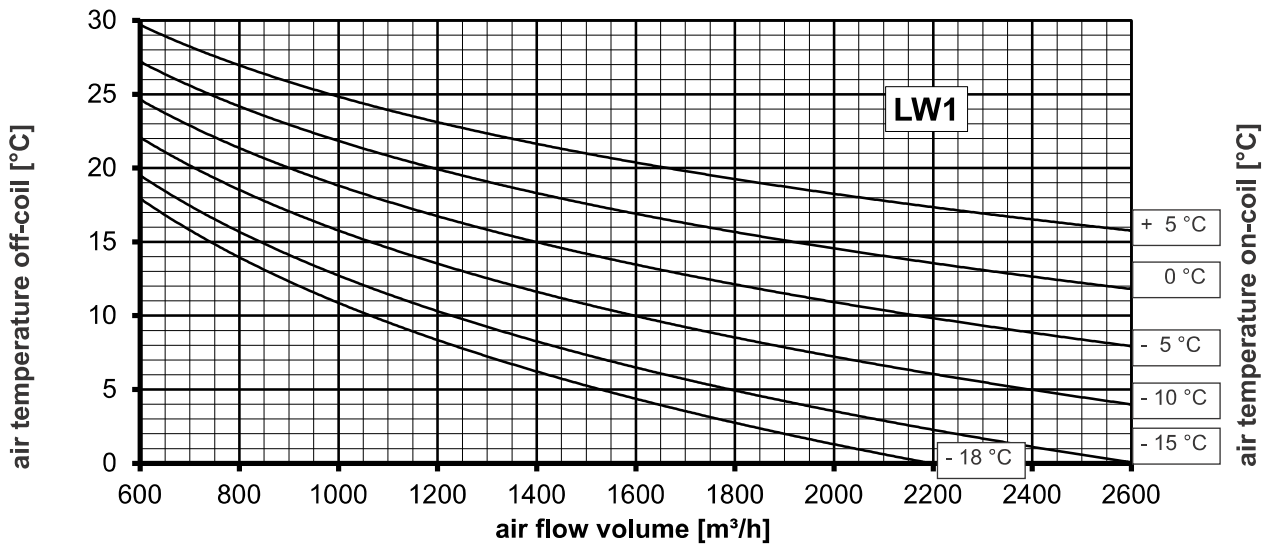
Heating performance for water temperature on-/off-coil 70/50°C



Flat Series
Size: 3

Air Heater Unit LW
 for medium pump circulated water

Heating performance for water temperature on-/off-coil 80/60°C



Flat Series

Size: 3, Module depth 1000 mm

The unit sides marked by arrow are open!

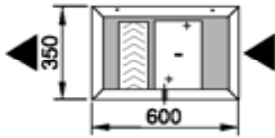
Air Cooler Units LK

for cooling medium chilled water KKW

Water temperature on-/off-coil 6/10 or 6/12, without glykol

The required amount of water can be calculated with the formula:

$$\dot{V}_w[\text{m}^3/\text{h}] = (\dot{Q}_h \times 3600) / (\Delta t_w \times c_w \times \rho_w)$$



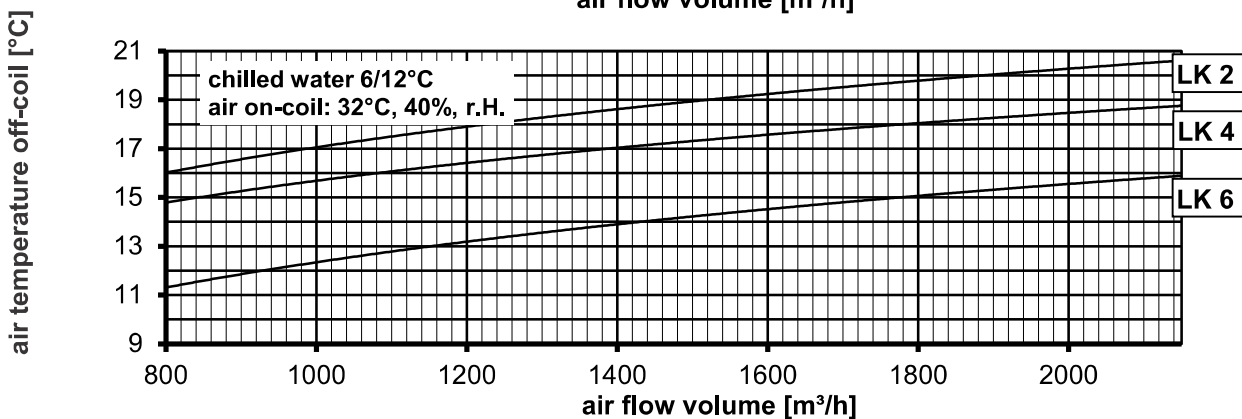
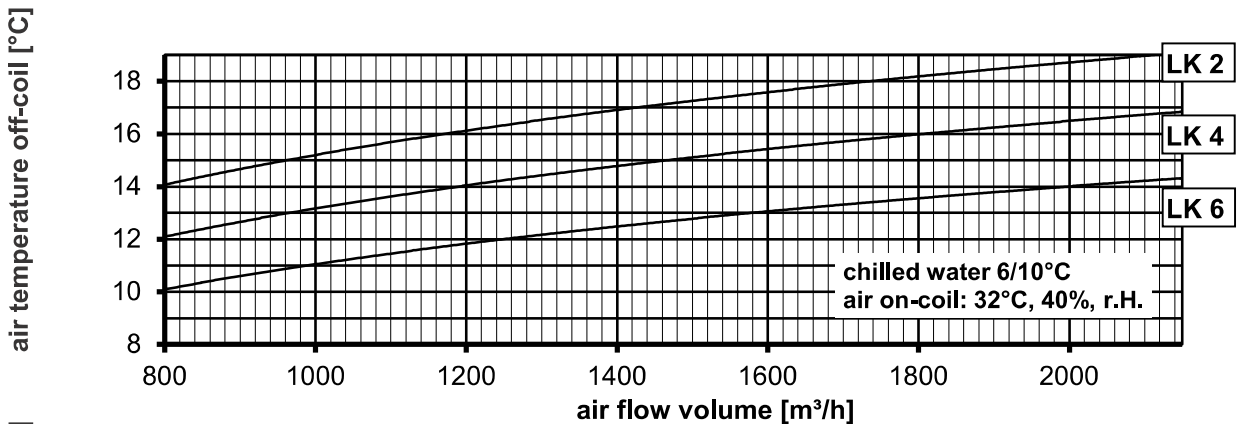
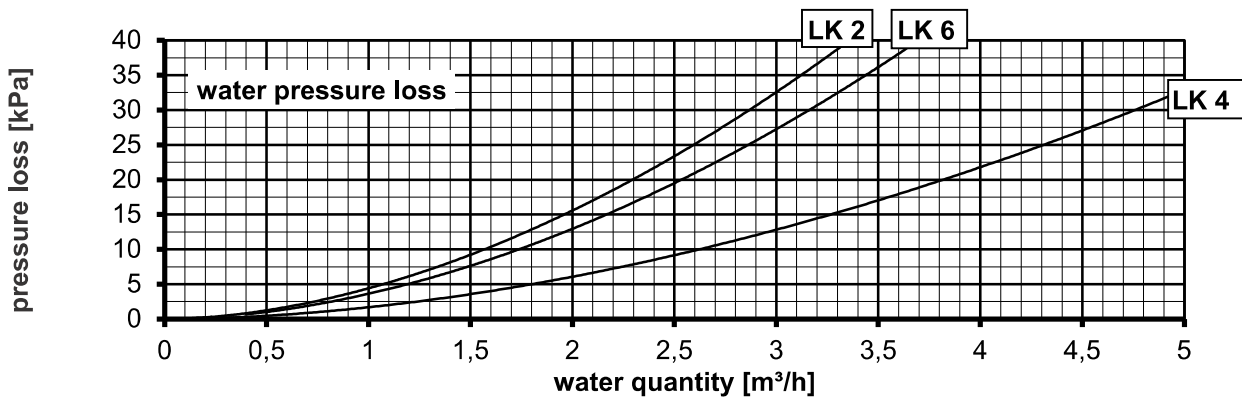
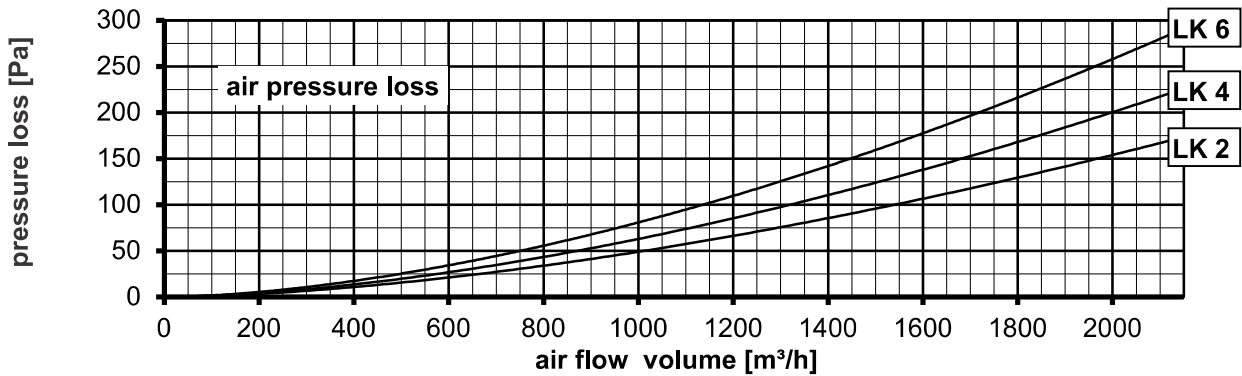
\dot{Q}_h = cooling performance [KW]

\dot{V}_w = quantity of water [m³/h]

Δt_w = water temperature difference [Kelvin] (4K at 6/10 or 6K at 6/12)

ρ_w = specific weight of water = 1000 [kg/m³]

c_w = specific heat capacity of water = 4,19 kJ/kg K



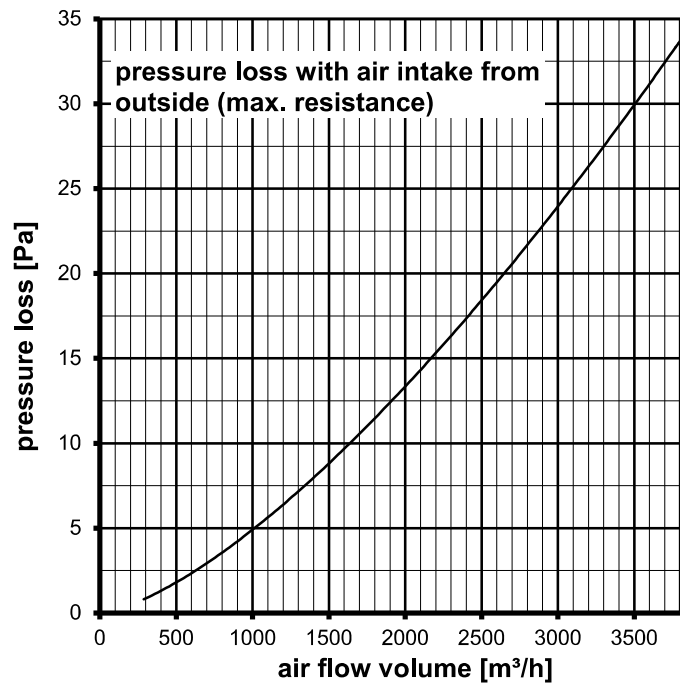
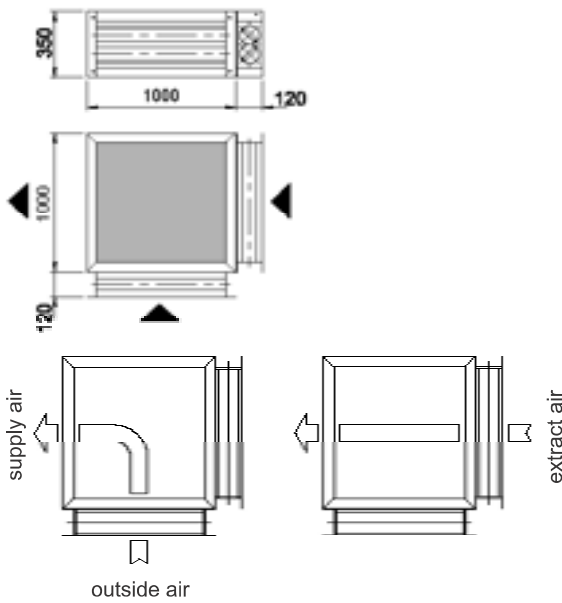
Flat Series

Size: 3, Module depth 1000 mm

The unit sides marked by arrow are open!

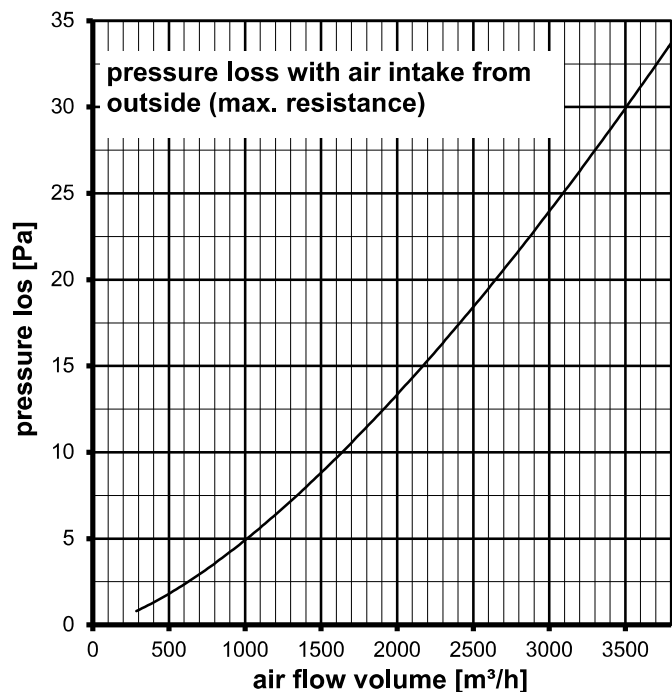
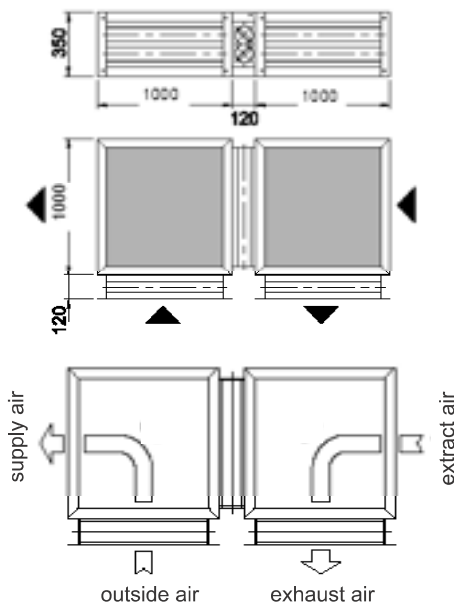
Air Mixer Unit LM

for AHU with supply and extract air arranged on top of each other



Air Mixer Unit CLM

for AHU with supply and extract air arranged in row



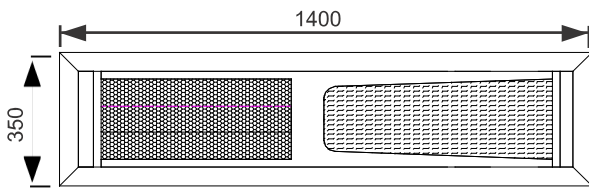
Note for units type LM and CLM:

Pressure loss of Air Mixing Units is calculated on base „free air“. That means, for connected duct of same cross section no additional dynamical intake losses have to be considered.

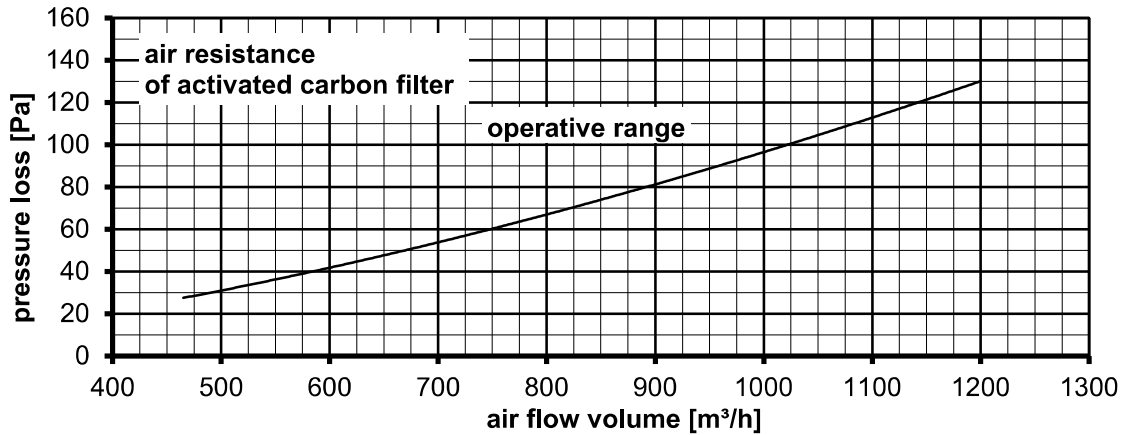
In case of pressure side connection with a ventilator unit the resulting pressure regain is bigger than the pressure loss. Therefore, no statical pressure loss needs to be considered.

Flat Series
Size: 3, Module depth 1000 mm

Combinated Activated Carbon Filter Unit AKCF
 for elimination of dust and undesirable odours

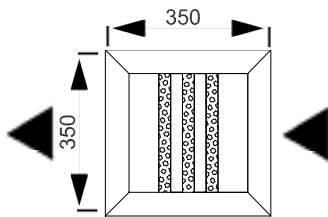


equipped with:
 1. Activated carbon filter with 8 filter cartridges (bayonet fixing)
 2. Pocket filter, quality class F7 (EU7), length 600mm
 Total air resistance of combinated filter unit is a sum of pressure drops of the filter steps 1 and 2.
 Therefore, the pressure loss of filter EU7 has to be added separately to below values for activated carbon filter (to be found in diagram for the respective filter module).

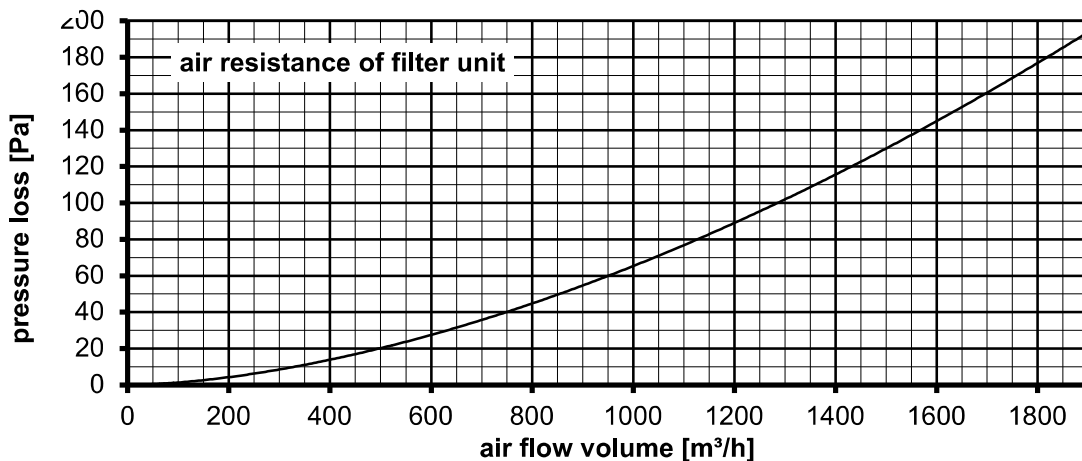


The unit sides marked by arrow are open!

Coarse Filter Unit GF



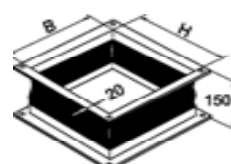
equipped with:
 3 Filter steps:
 2 Metal mat work filter and
 1 Fibre mat filter with an exchange frame
 (regularly cleaning required)



Dampers and Flexible Connections



Damper type „A“: for total cross section unit 900 mm width (B) x 310 mm height (H)



Flexible Connection: to be used for outlet- and inlet side type „A“: 900 mm width (B) x 310 mm height (H) for total cross section of unit.

Flat Series

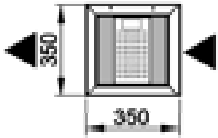
Size: 3, Module depth 1000 mm

The unit sides marked by arrow are open!

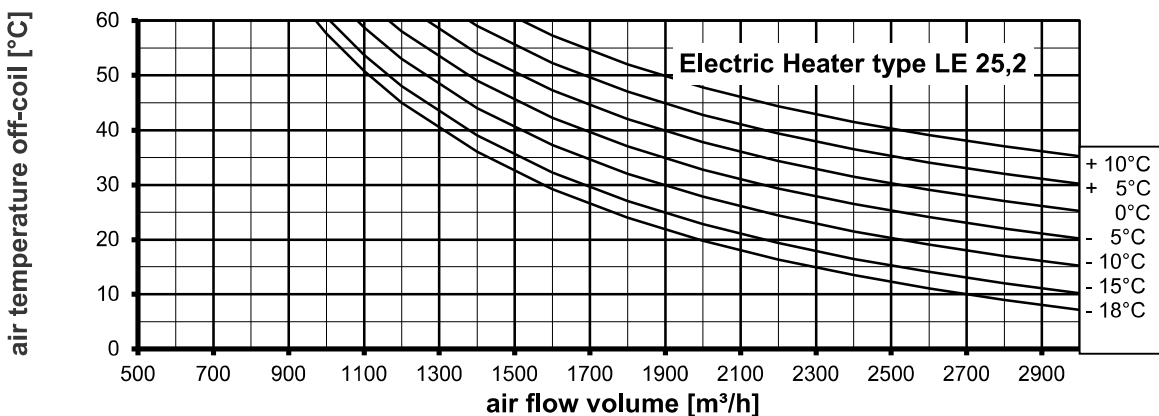
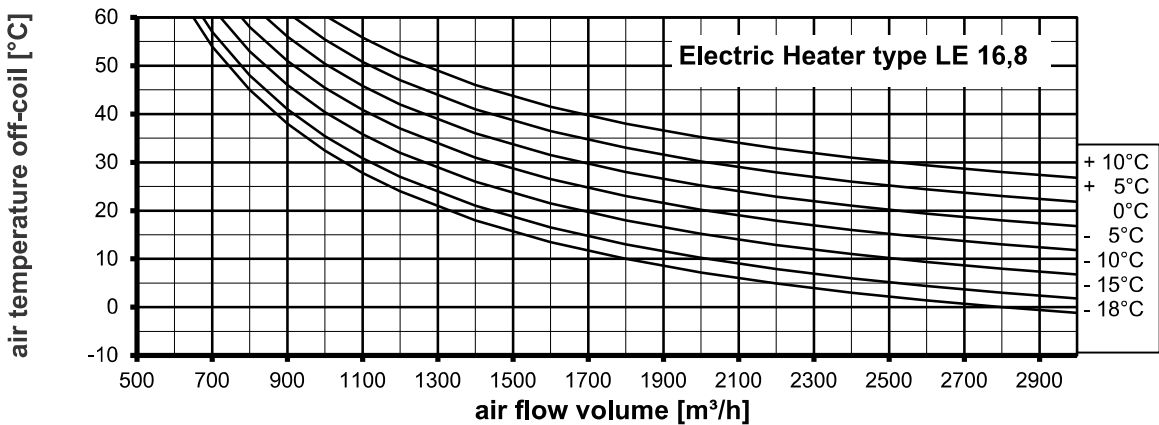
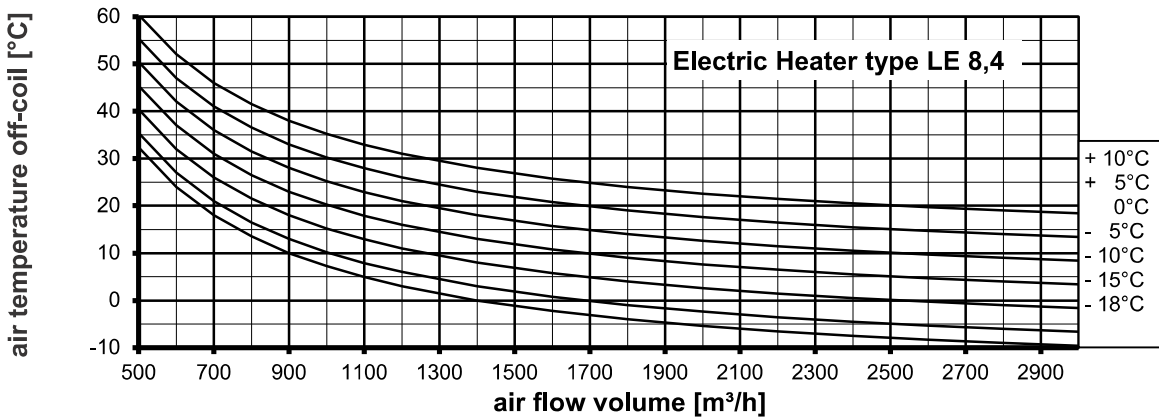
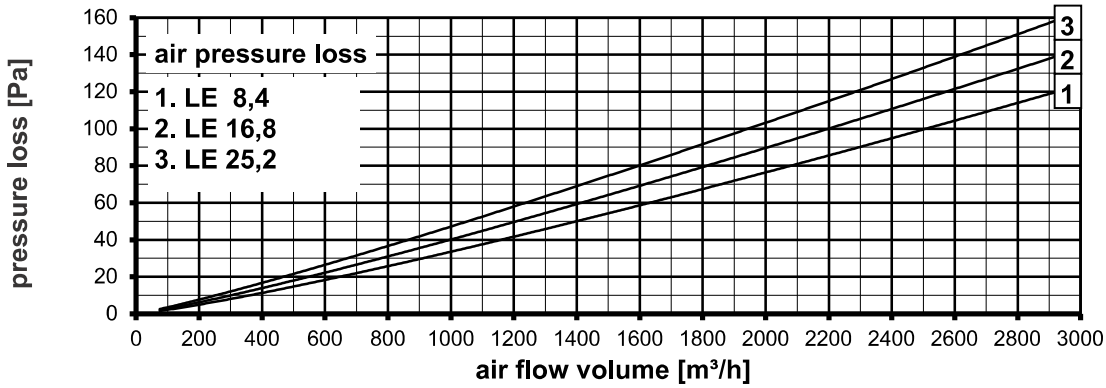
Electric Air Heater Unit LE

for 400V/50Hz operating voltage

Heating performance, pressure loss and air temperature on-/off-coil



Typ LE 8,4 (kW), 6 elements, current max. 12,1 A, 2 switching levels
 Typ LE 16,8 (kW), 12 elements, current max. 24,2 A, 3 switching levels
 Typ LE 25,2 (kW), 18 elements, current max. 36,4 A, 3 switching levels



Flat Series

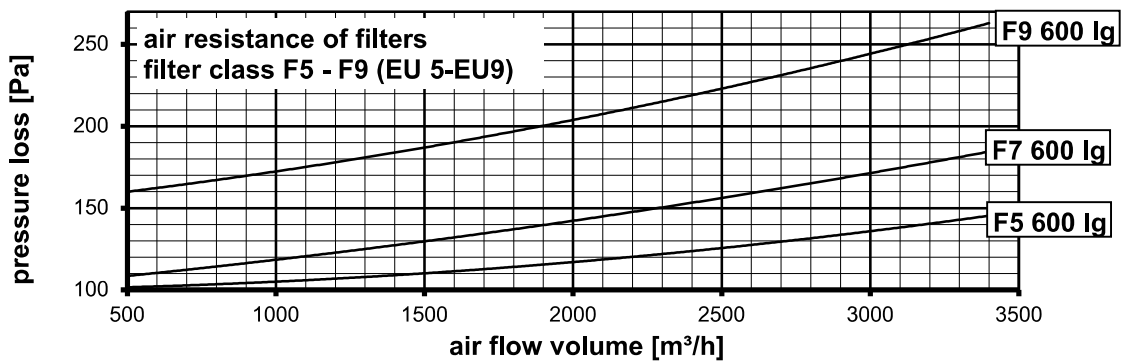
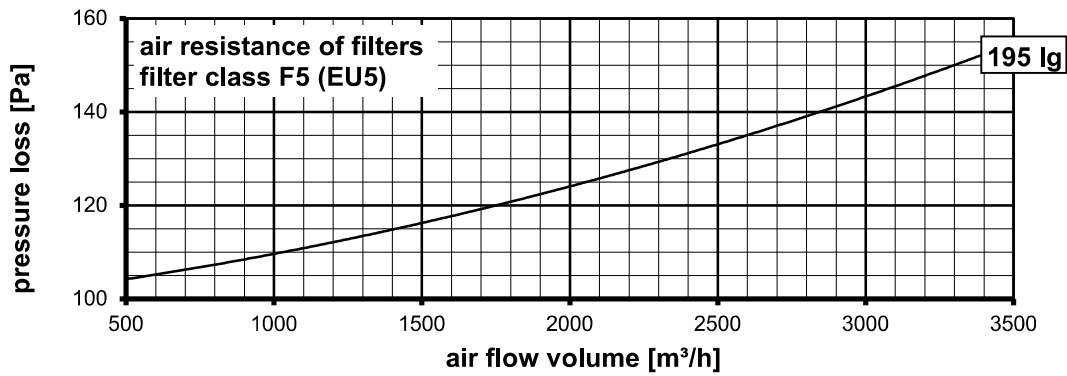
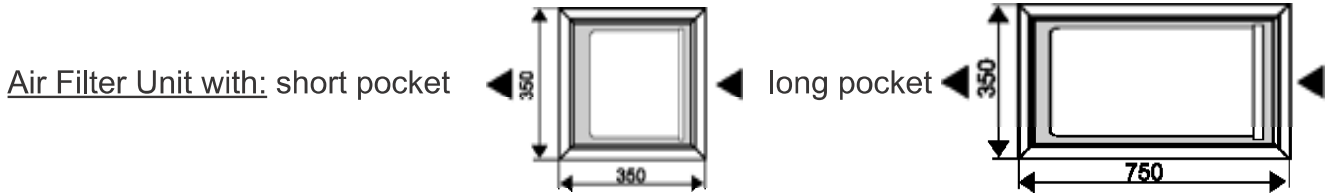
Size: 3, Module depth 1000 mm

The unit sides marked by arrow are open!

Air Filter Unit KFS

with short pocket (195mm) and long pocket filters (600mm)

Technical data and resistance:



Flat Series
Size: 3

Sound data for Ventilator Unit VF 308 - VF 310

VF 308 Fan: CFE 8-940/E 65

*sound pressure level L_p in dB (A)							
voltage [V]	80	100	125	150	170	190	230
inlet	31	38	46	53	57	60	65
discharge	38	45	53	58	62	66	70

* related to room absorption of 8 db (25m² Sabine), at free air!
measured in distance of 3 m

inlet side: sound power level in L_w [dB] at mid frequency in (Hz) (at free air!)										L_{WA} [dB(A)]	discharge side: sound power level in L_w [dB] at mid frequency in (Hz) (at free air!)										L_{WA} [dB(A)]
voltage [Volt]	63	125	250	500	1000	2000	4000	8000	total 45-11200		voltage [Volt]	63	125	250	500	1000	2000	4000	8000	total 45-11200	
80	47	32	42	34	33	31	29	24	39		80	41	36	42	46	41	35	34	26	46	
100	53	41	47	42	41	39	37	32	46		100	48	44	48	52	48	43	41	34	53	
125	58	50	53	50	49	47	46	41	54		125	55	52	56	59	56	51	49	43	61	
150	63	57	57	56	55	53	52	48	61		150	61	59	61	64	62	57	56	50	66	
170	66	62	60	60	59	58	57	53	65		170	65	63	65	67	66	62	60	54	70	
190	68	66	63	64	63	61	61	56	68		190	68	66	68	70	70	65	63	58	74	
230	72	72	66	69	68	66	66	62	73		230	72	72	73	74	74	70	68	64	78	

VF 310 Fan: CFE 930/E 80

*sound pressure level L_p in dB (A)							
voltage [V]	80	100	125	150	170	190	230
inlet	29	40	51	60	64	68	71
discharge	36	46	57	65	69	72	76

* related to room absorption of 8 db (25m² Sabine), at free air!
measured in distance of 3 m

inlet side: sound power level in L_w [dB] at mid frequency in (Hz) (at free air!)										L_{WA} [dB(A)]	discharge side: sound power level in L_w [dB] at mid frequency in (Hz) (at free air!)										L_{WA} [dB(A)]
voltage [Volt]	63	125	250	500	1000	2000	4000	8000	total 45-11200		voltage [Volt]	63	125	250	500	1000	2000	4000	8000	total 45-11200	
80	45	29	40	32	31	29	26	21	37		80	39	33	39	44	39	33	31	23	44	
100	54	42	48	43	42	40	38	34	48		100	49	45	50	53	50	44	43	36	54	
125	62	56	56	55	54	52	51	47	59		125	60	57	60	63	61	56	54	48	65	
150	68	65	62	63	62	61	60	56	68		150	67	66	68	70	69	65	63	57	73	
170	71	71	65	68	67	65	65	61	72		170	71	70	72	73	73	69	67	62	77	
190	74	74	67	71	70	68	68	64	76		190	74	74	75	76	76	72	70	66	80	
230	76	78	70	74	73	72	72	68	79		230	77	77	78	79	80	76	74	70	84	

Flat Series
Size: 3

Sound data for Ventilator Unit VF 311 - VF 312

VF 311 Fan: CFE 930/D 1

*sound pressure level L_p in dB (A)					
voltage [V]	120	180	230	280	400
inlet	47	59	65	68	73
discharge	53	64	69	73	77

* related to room absorption of 8 db (25m² Sabine), at free air!
measured in distance of 3 m

inlet side: sound power level in L_w [dB] at mid frequency in (Hz) (at free air!)										L_{WA} [dB(A)]	discharge side: sound power level in L_w [dB] at mid frequency in (Hz) (at free air!)										L_{WA} [dB(A)]
voltage [Volt]	63	125	250	500	1000	2000	4000	8000	total 45-11200		voltage [Volt]	63	125	250	500	1000	2000	4000	8000	total 45-11200	
120	59	51	53	50	49	48	46	42	55		120	56	53	56	59	57	52	50	44	61	
180	67	64	61	62	61	60	59	55	67		180	66	65	67	69	68	64	62	56	72	
230	71	71	65	68	67	65	65	61	73		230	72	71	72	73	73	69	67	63	77	
280	74	75	68	71	70	69	69	65	76		280	75	74	75	76	77	73	71	67	81	
400	77	80	71	75	74	73	74	70	81		400	78	79	79	80	81	77	75	71	85	

VF 312 Fan: CFE 9-070/D 2

*sound pressure level L_p in dB (A)					
voltage [V]	120	180	230	280	400
inlet	44	57	63	68	75
discharge	50	62	68	73	79

* related to room absorption of 8 db (25m² Sabine), at free air!
measured in distance of 3 m

inlet side: sound power level in L_w [dB] at mid frequency in (Hz) (at free air!)										L_{WA} [dB(A)]	discharge side: sound power level in L_w [dB] at mid frequency in (Hz) (at free air!)										L_{WA} [dB(A)]
voltage [Volt]	63	125	250	500	1000	2000	4000	8000	total 45-11200		voltage [Volt]	63	125	250	500	1000	2000	4000	8000	total 45-11200	
120	56	47	51	47	46	44	43	38	52		120	53	49	53	57	54	48	47	40	58	
180	66	62	60	60	59	57	57	52	65		180	65	63	65	67	66	61	60	54	70	
230	70	69	65	66	65	64	64	60	71		230	70	69	71	72	72	68	66	61	76	
280	74	75	68	71	70	69	69	65	76		280	75	74	75	76	77	73	71	66	81	
400	78	82	72	77	76	75	76	72	83		400	80	81	81	81	83	79	77	73	87	