

Page 1	Flat Series Calculation of external available Pressure																																										
	Size: 2													200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800																
Air flow volume [m³/h]																																											
1. Step	1. Criterion flow velocity (Ref. 20°C)													Do not design units in conditions acc. to white areas!																													
	Supply Unit with air conditioning elements:																																										
	Flow velocity related to Cross section of filter (long) [m/s]																											0,30	0,60	0,90	1,19	1,49	1,79	2,10	2,39	2,69	2,99	3,28					
	Flow velocity related to Finned surface of heater [m/s]																											0,53	1,07	1,60	2,14	2,67	3,21	3,74	4,27	4,81							
Flow velocity related to Finned surface of cooler [m/s]													0,53	1,07	1,60	2,14	2,67	3,21	3,74																								
Extract Unit without air conditioning elements:													0,30	0,60	0,90	1,23	1,54	1,84	2,15	2,45	2,76	3,07	3,38	3,69	3,99	4,30																	
2. Step	2. Pressure Calculation													Available statical pressure [Pa] at rated voltage without consideration of pressure regain!																													
	Ventilator Unit													VF 221	580	585	585	580	565	545	515	470	415	340	250	145																	
														VF 222	765	760	760	755	745	730	705	670	620	555	475	370	250	100															
														VF 223	790	800	805	805	805	800	785	765	730	690	630	560	475	375															
														The following air conditioning elements reduce pressure available!																													
														Pressure loss [Pa] at above stated air volume																													
	Pocket filter F5													Calculated resistance	103	106	109	113	116	120	125	129	134	138	143																		
	Short filter (195 mm pocket)													Clean resistance	6	12	18	25	33	41	49	58	67	77	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													Calculated resistance	101	102	104	107	110	114	119	124	130	136																			
Long filter (600 mm pocket)													Clean resistance	2	4	8	14	20	28	37	48	59	72																				
													Recommended final resistance: 200 - 300 Pa																														
Pocket filter F7													Calculated resistance	105	110	116	123	130	137	145	154	162	172																				
Long filter (600 mm pocket)													Clean resistance	10	21	33	46	60	74	90	107	125	144																				
													Recommended final resistance: 200 - 300 Pa																														
Pocket filter F9													Calculated resistance	156	163	171	179	187	196	206	216	227	238																				
Long filter (600 mm pocket)													Clean resistance	13	27	42	58	75	93	112	132	153	176																				
													Recommended final resistance: 300 - 400 Pa																														
Air Heater LW													LW 1	2	7	14	22	32	43	55	69	83																					
Medium: PWW (pump circulated hot water)													LW 2	3	11	21	34	50	68	87	109	133																					
													LW 3	5	16	32	52	75	102	132	166	202																					
Subtotal													External statical pressure [Pa] available																														

Page 2	Flat Series Calculation of external available Pressure															
	Size: 2															
Air Flow Volume	[m ³ /h]	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	
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	7	21	40	65	94	127	164							
	Medium: chilled water KKW	LK 4	8	26	52	84	122	166	214							
		LK 6	10	33	65	106	154	210	272							
	Air Cooler LKR	LKR 2	5	15	29	48	70	95	124	156	190					
	Direct Evaporating	LKR 4	6	18	37	60	87	119	155	194	238					
	Medium: R407C, 5°C	LKR 6	6	20	40	65	95	129	168	211	258					
	Water Eliminator		2	6	11	19	28	38	50							
	Damper		1	2	3	5	7	9	12	14	17	20	22	25	29	32
			Pressure losses to be taken into consideration only with damper on inlet side.													
	Air Mixer LM, CLM		1	2	3	5	7	9	12	14	17	20	22	25	29	32
		Pressure losses to be taken into consideration only with air mixer on inlet side.														
	Unit length															
Attenuator SD	750 mm	0,1	0,2	0,4	0,7	1,1	1,5	2,1	2,7	3,5	4,3	5,2	6,2	7,2	8,4	
	1500 mm	0,1	0,2	0,4	0,8	1,2	1,8	2,4	3,1	4,0	4,9	5,9	7,0	8,2	9,6	
	1750 mm	0,1	0,2	0,5	0,9	1,4	2,0	2,7	3,5	4,4	5,5	6,6	7,9	9,3	10,7	
	2250 mm	0,1	0,2	0,5	1,0	1,5	2,2	3,0	3,9	4,9	6,1	7,3	8,7	10,2	11,9	
Plate heat Exchange APD		on request														
resistance calculated at 22°C/30% r. H.																
Coarse Filter GF	clean resistance	7	24	47	77	112	152	198								
		Regularly cleaning required!														
Activated Carbon Filter			34	67	107	158										
Calculated resistance same than clean resistance																
Electric Air Heater LE	LE 5	7	17	27	38	49	61	73	85	98	110					
Operating voltage 400V/50Hz	LE 10	9	20	32	45	58	72	86	100	115	129					
	LE 15	11	24	38	52	67	83	99	115	132	149					
Total	External statical pressure [Pa] available															

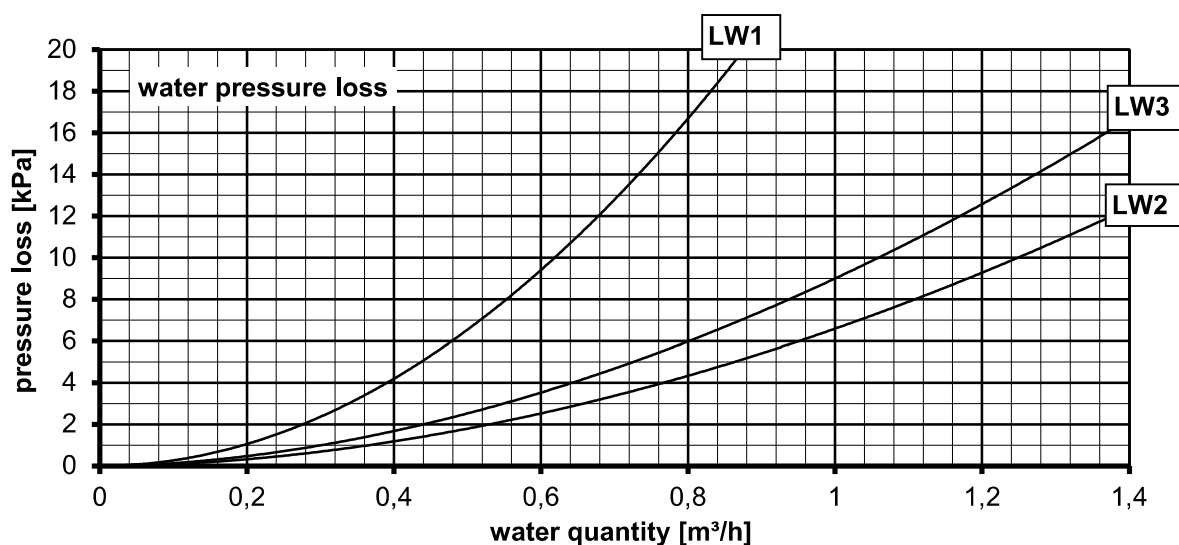
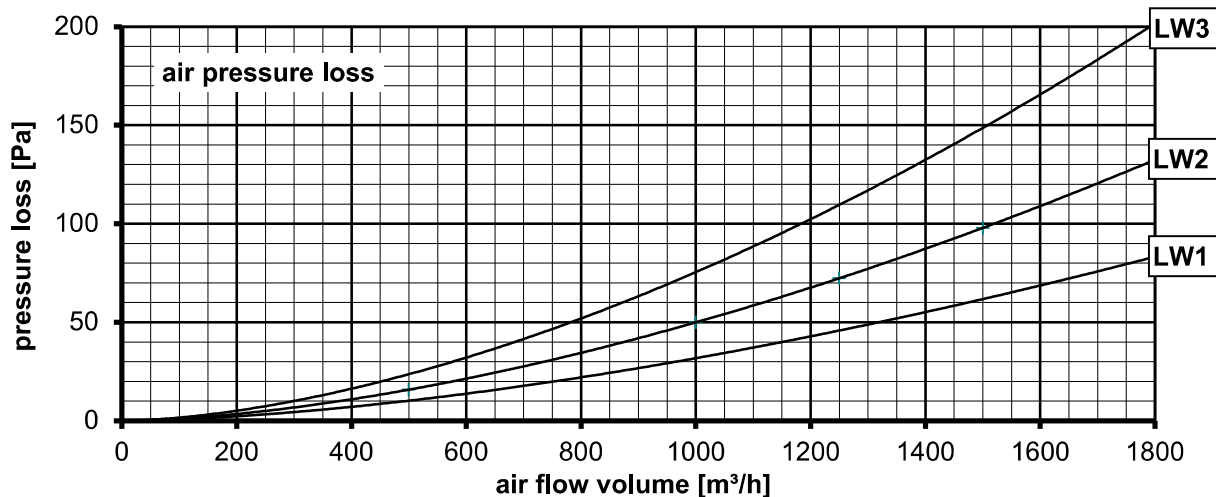
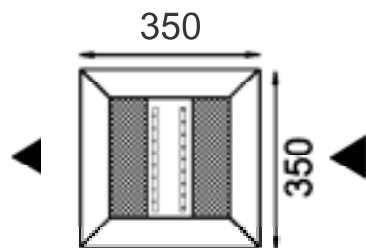
Flat Series

Size: 2, Module depth 750 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:

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

\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]

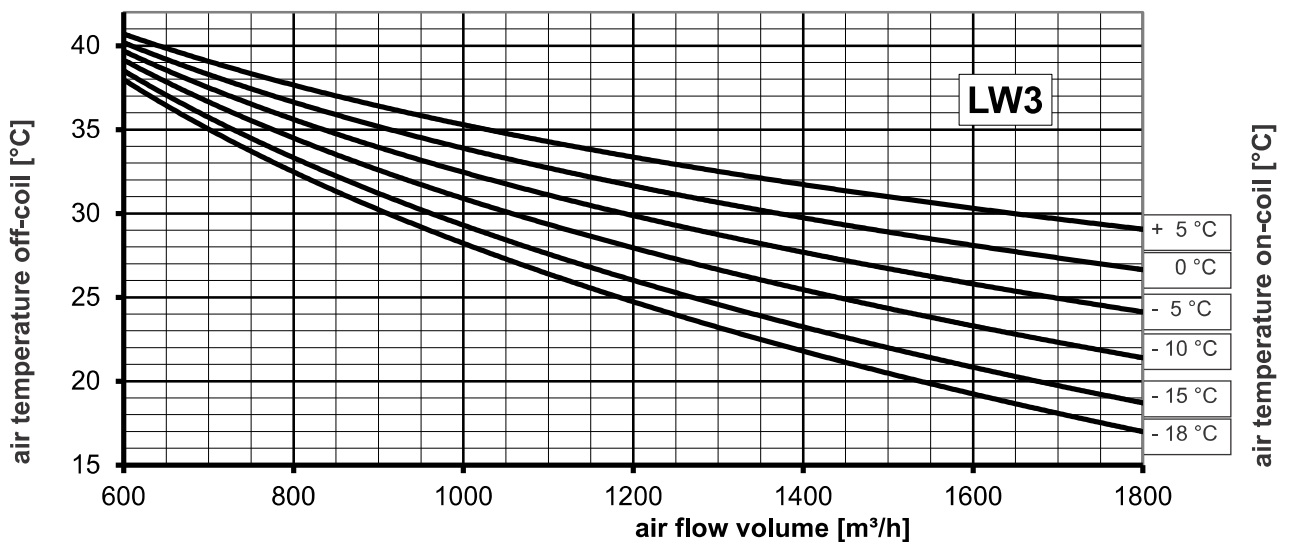
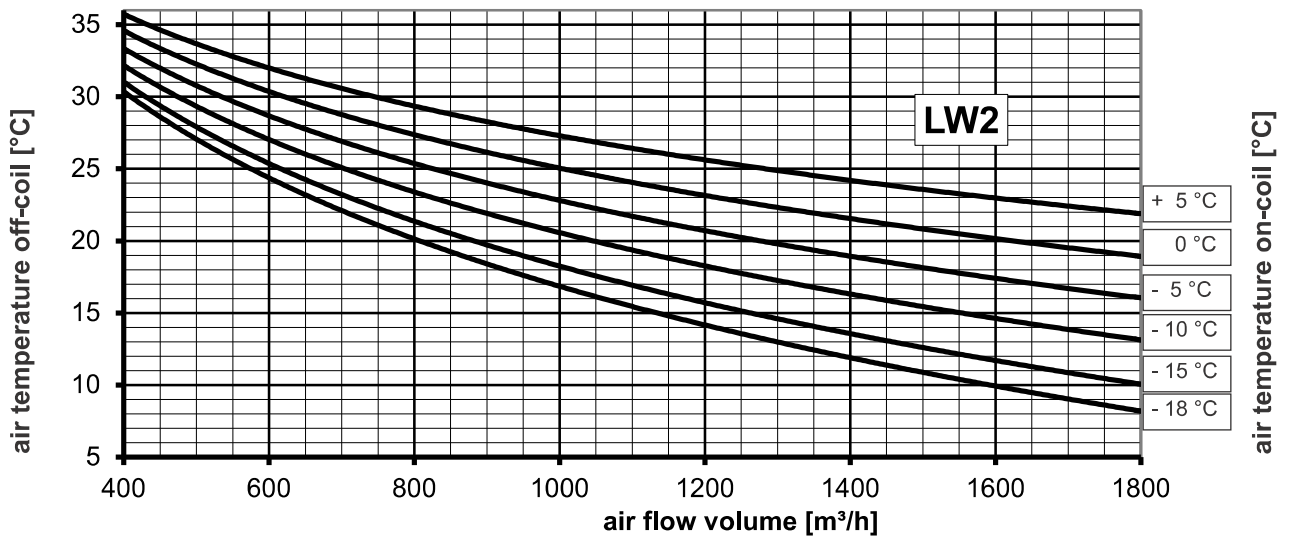
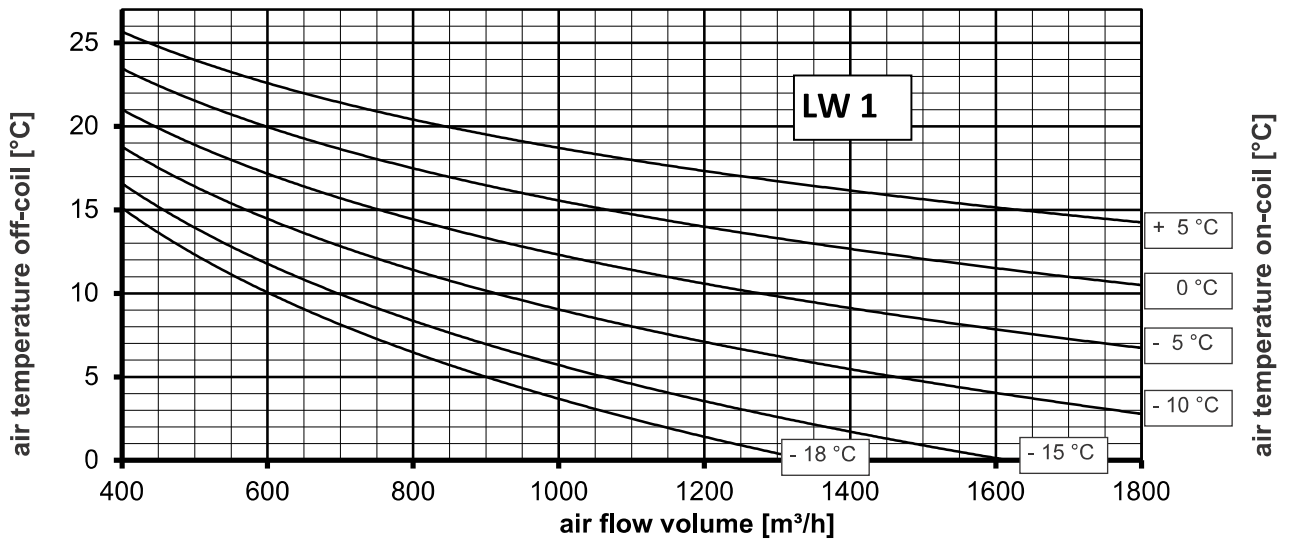
ρ_L = specific weight of air = 1,2 [kg/m³]

cp = specific heat capacity of air = 1,0 [kJ/kg K]

Flat Series
Size: 2

Air Heater Unit LW
for medium pump circulated water

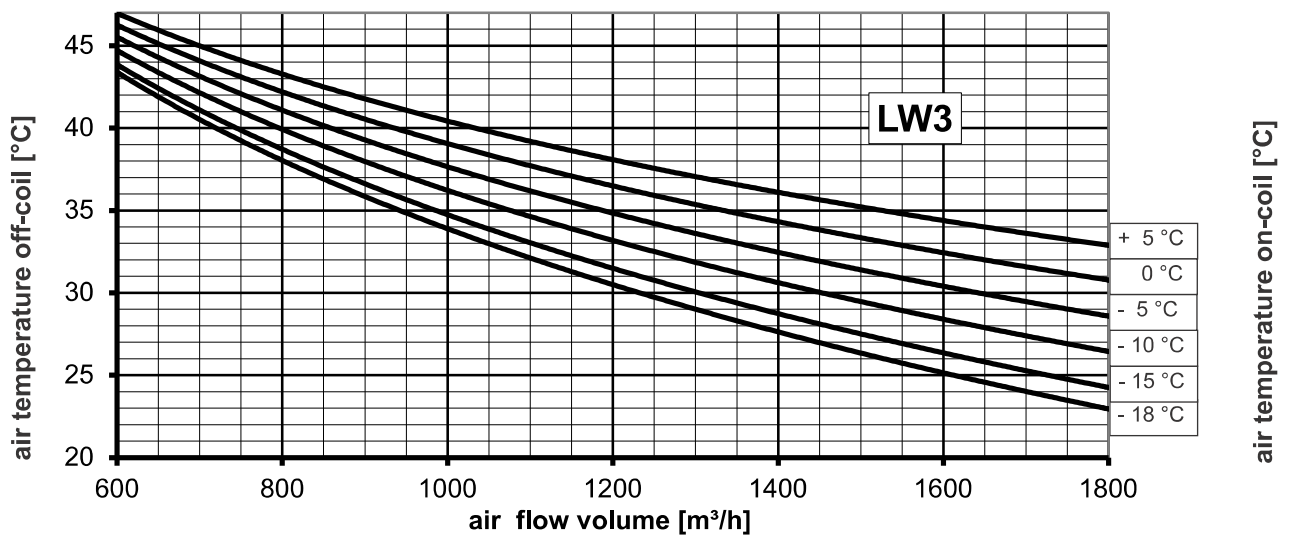
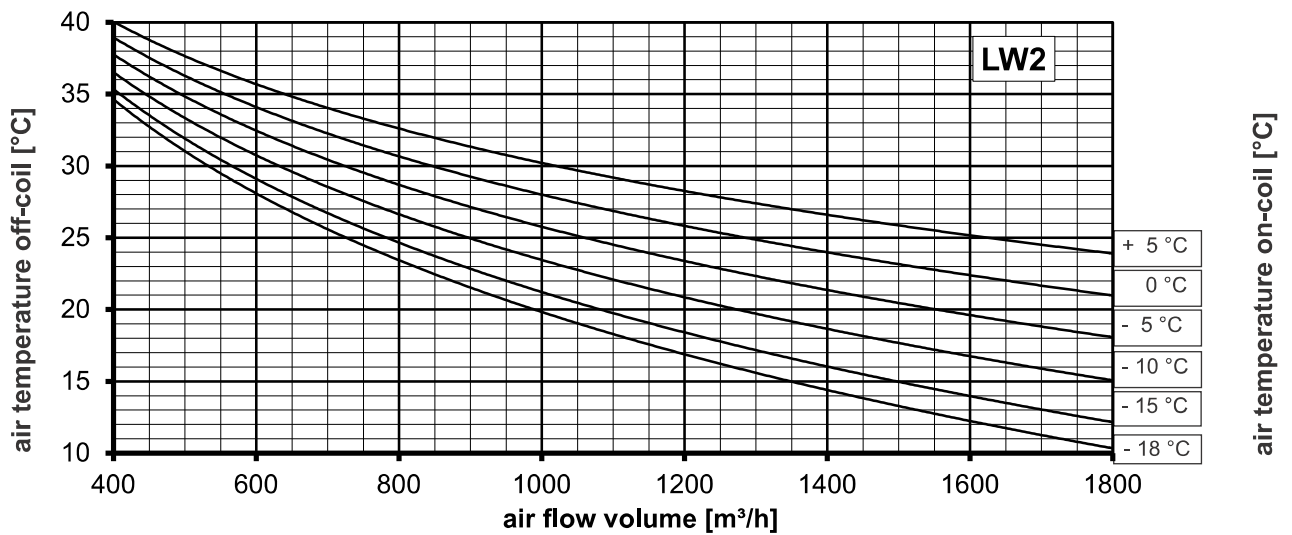
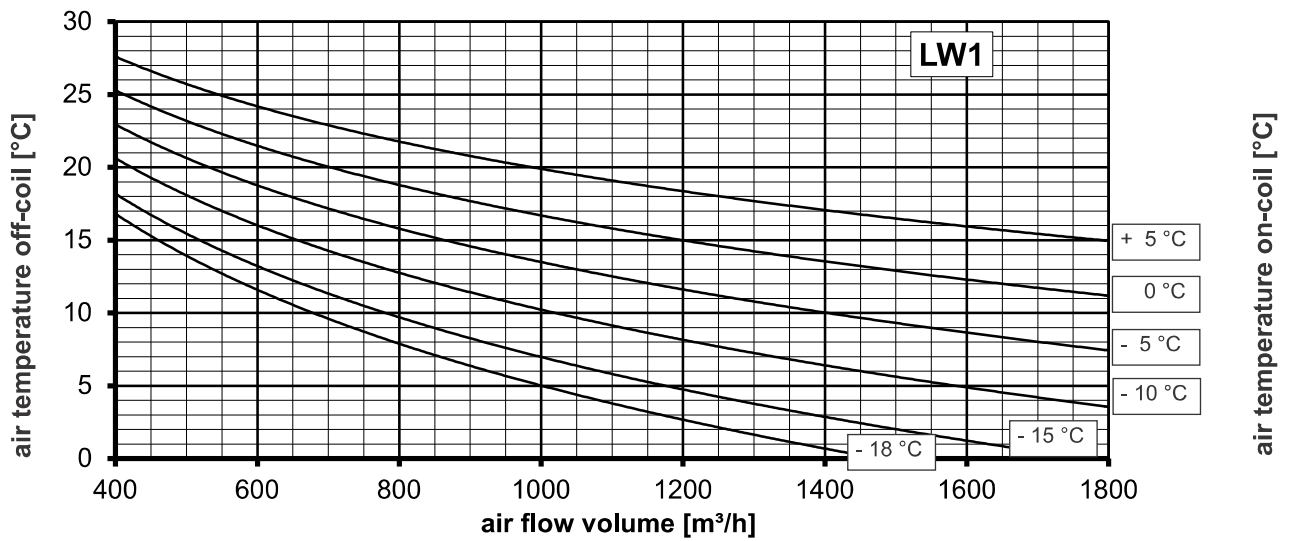
Heating performance for water temperature on-/off-coil 55/45°C



Flat Series
Size: 2

Air Heater Unit LW
 for medium pump circulated water

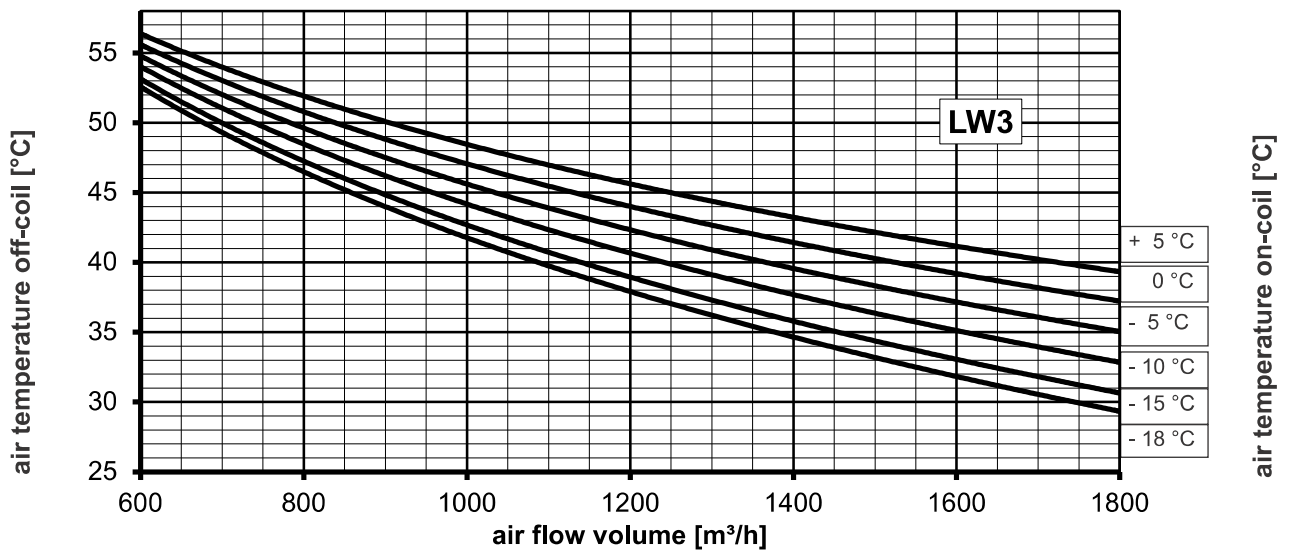
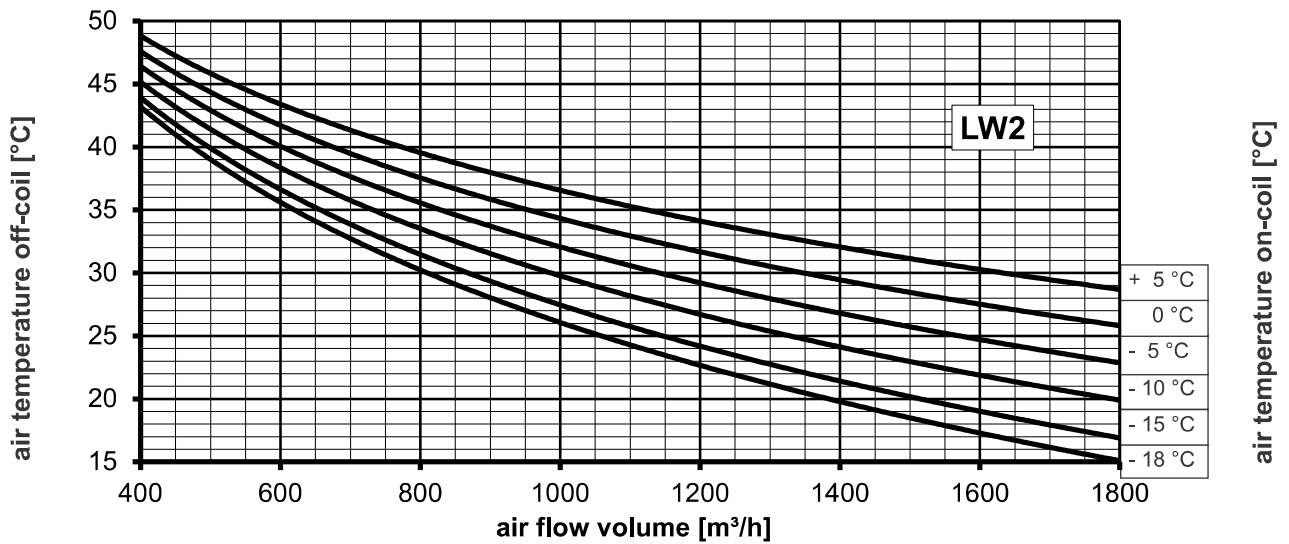
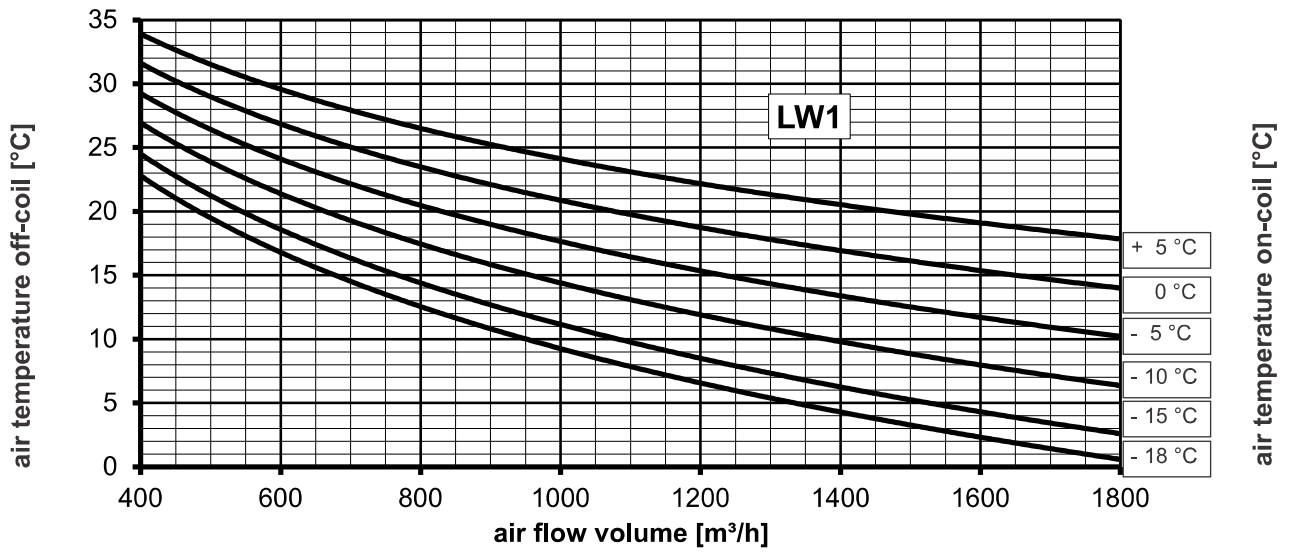
Heating performance for water temperature on-/off-coil 70/50°C



Flat Series
Size: 2

Air Heater Unit LW
 for medium pump circulated water

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



Flat Series

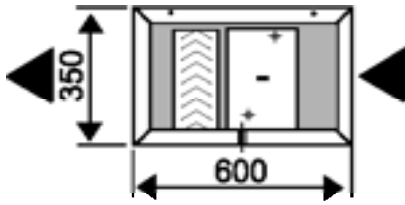
Size: 2, Module depth 750 mm

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:

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

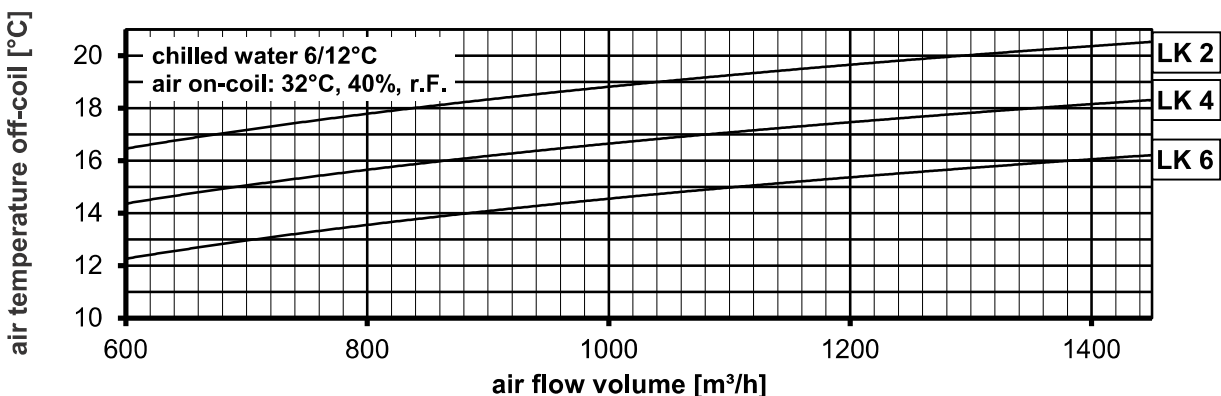
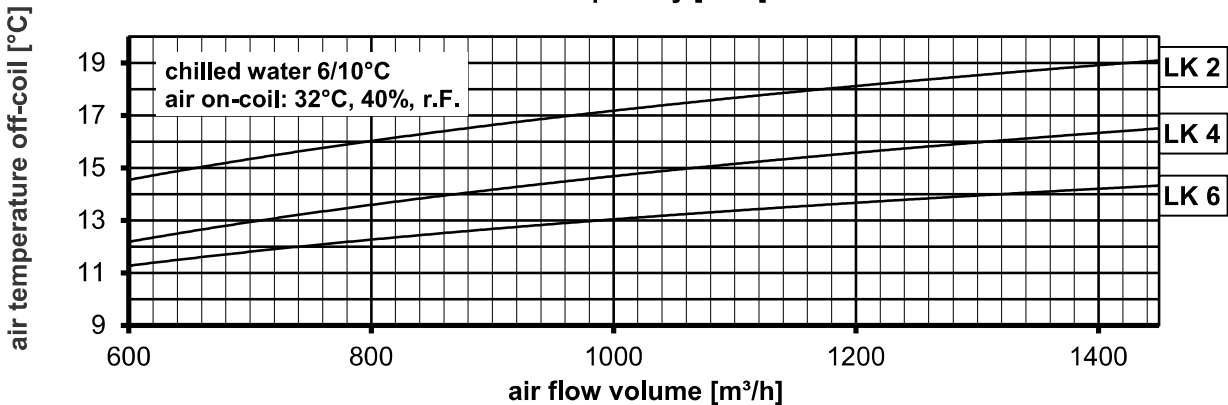
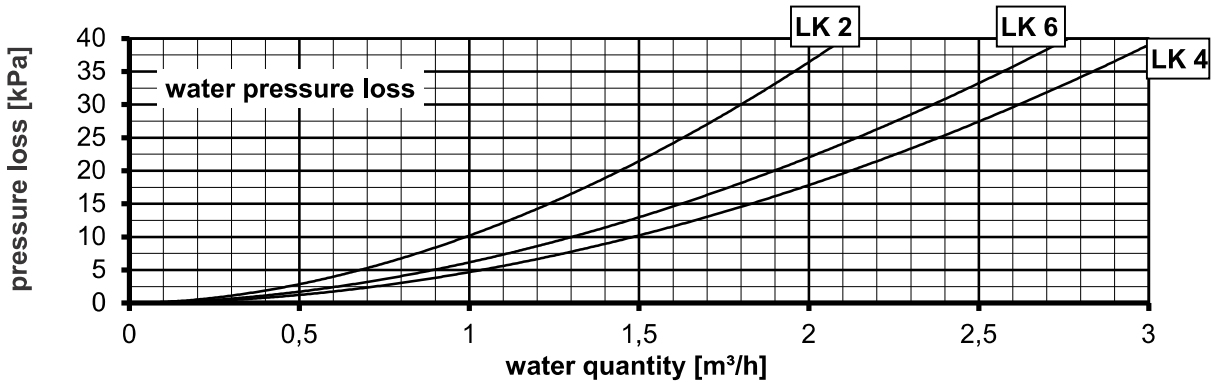
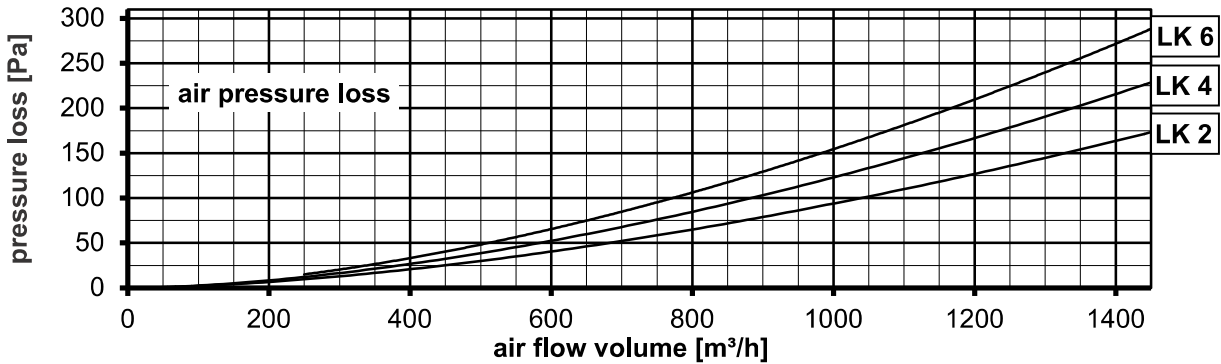
\dot{Q}_h = cooling performance [KW]

\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



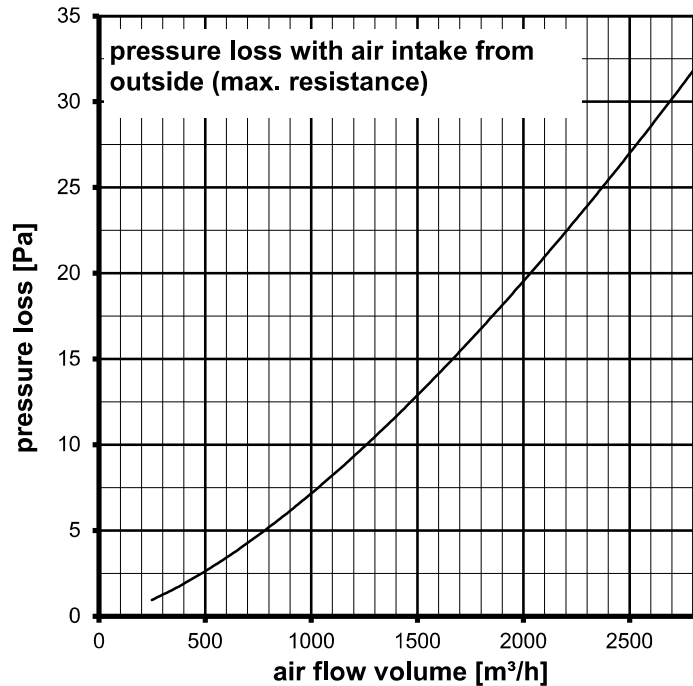
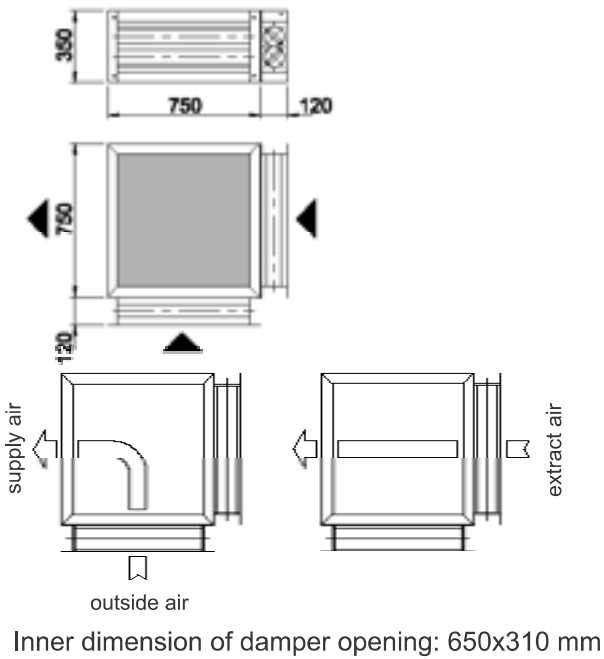
Flat Series

Size: 2, Module depth 750 mm

The unit sides marked by arrow are open!

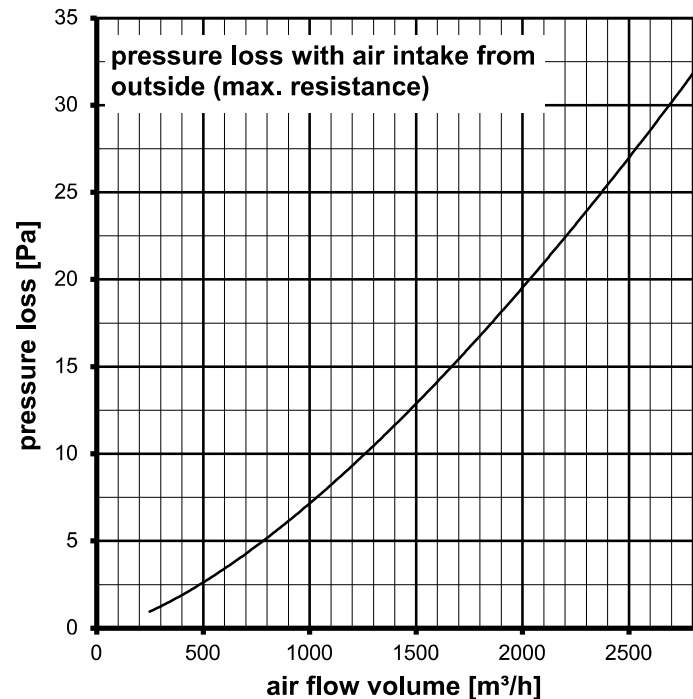
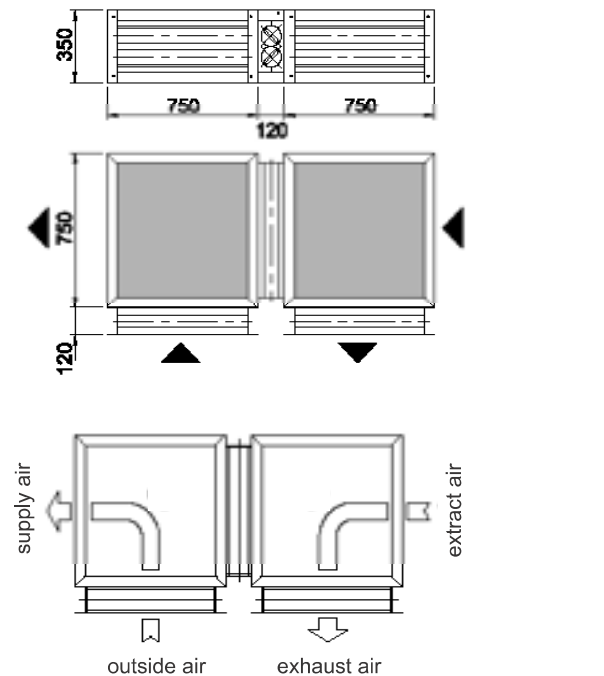
Air Mixer Unit LM

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



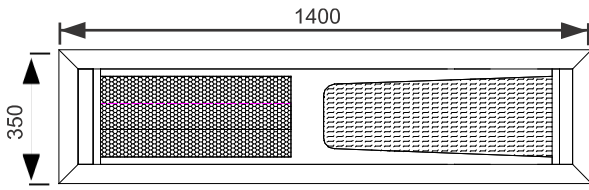
Note for units type LM and CLM:

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.

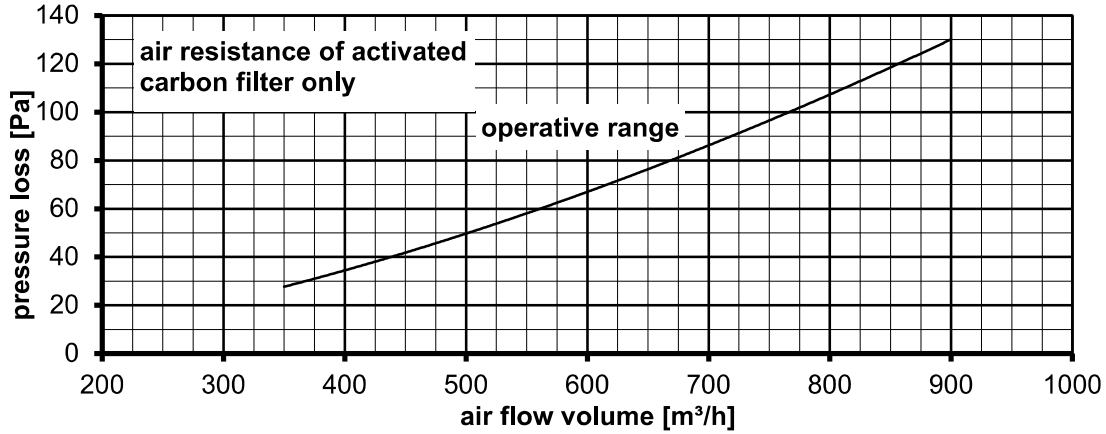
In case of pressure side connection with a ventilator unit the resulting pressure regain is bigger than the pressure loss. Therefore, no statical pressure loss needs to be considered.

Flat Series
Size: 2, Module depth 750 mm

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

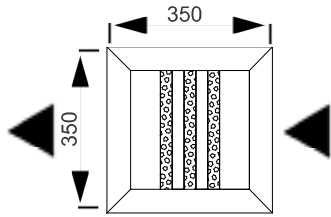


equipped with:
 1. Activated carbon filter with 6 filter cartridges (bayonet fixing)
 2. Pocket filter, quality class F7 (EU7), length 600mm
 Total air resistance of combinated filter unit is a sum of pressure drops of the filter steps 1 and 2.
 Therefore, the pressure loss of filter EU7 has to be added separately to below values for activated carbon filter (to be found in diagram for the respective filter module).

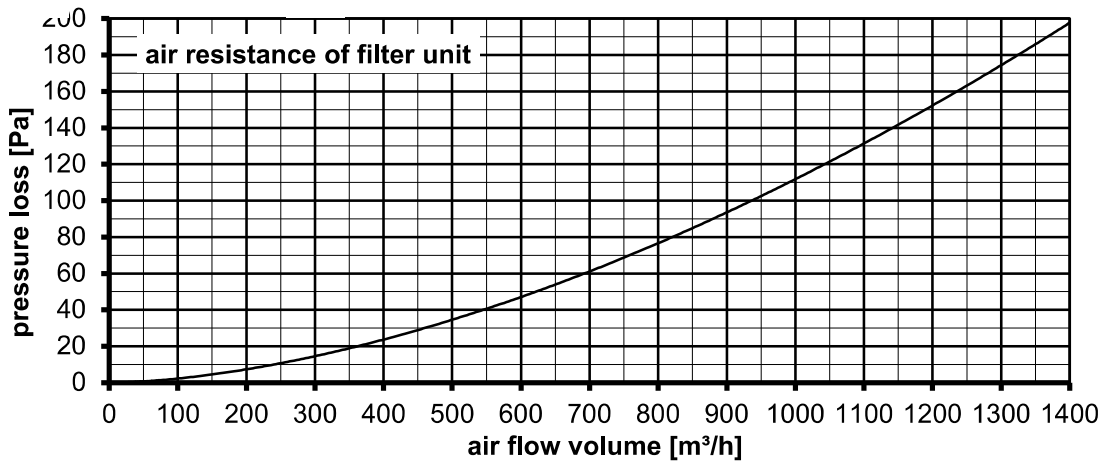


The unit sides marked by arrow are open!

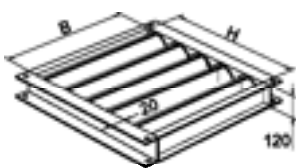
Coarse Filter Unit GF



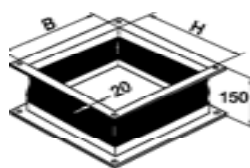
equipped with:
 3 Filter steps:
 2 Metal mat work filter and
 1 Fibre mat filter with an exchange frame
 (regularly cleaning required)



Dampers and Flexible Connections



Damper type „A“: for total cross section unit 650 mm width (B) x 310 mm height (H)



Flexible Connection: to be used for outlet- and inlet side type „A“: 650 mm width (B) x 310 mm height (H) for total cross section of unit.

Flat Series

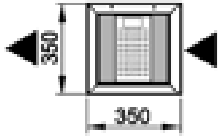
Size: 2, Module depth 750 mm

The unit sides marked by arrow are open!

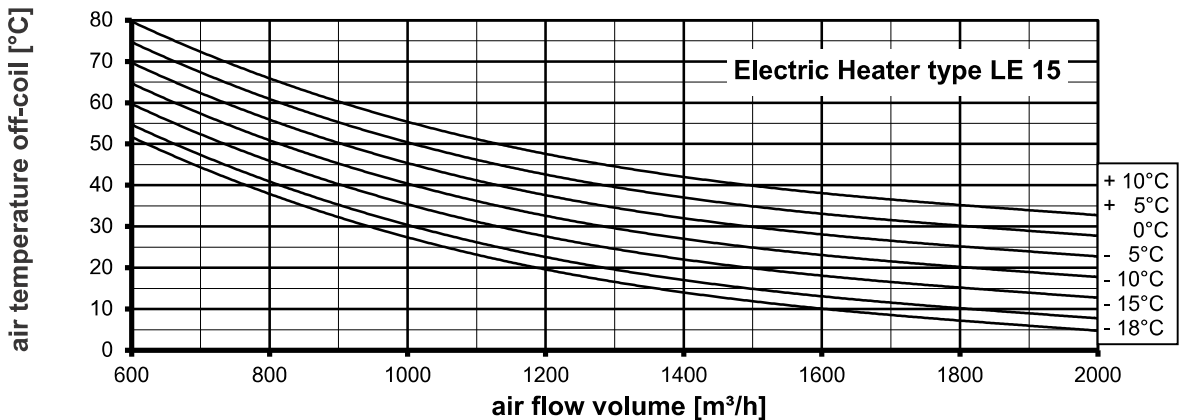
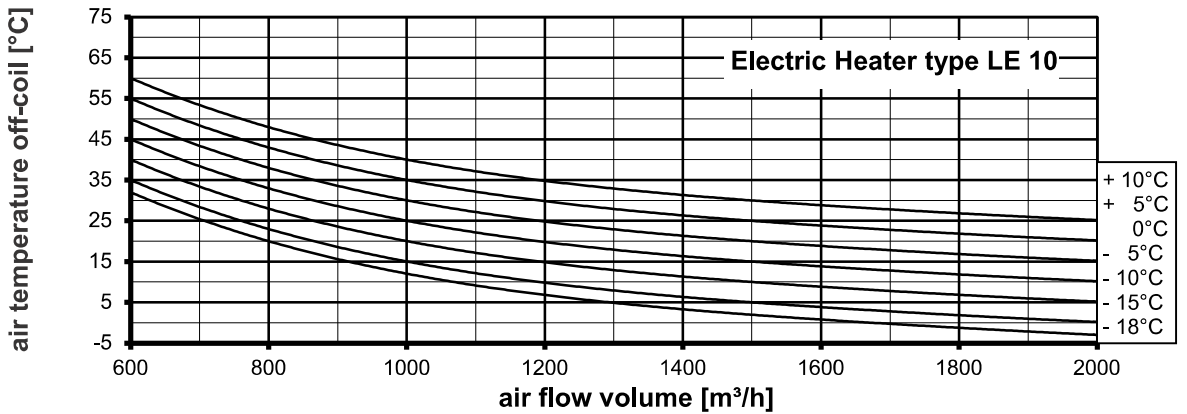
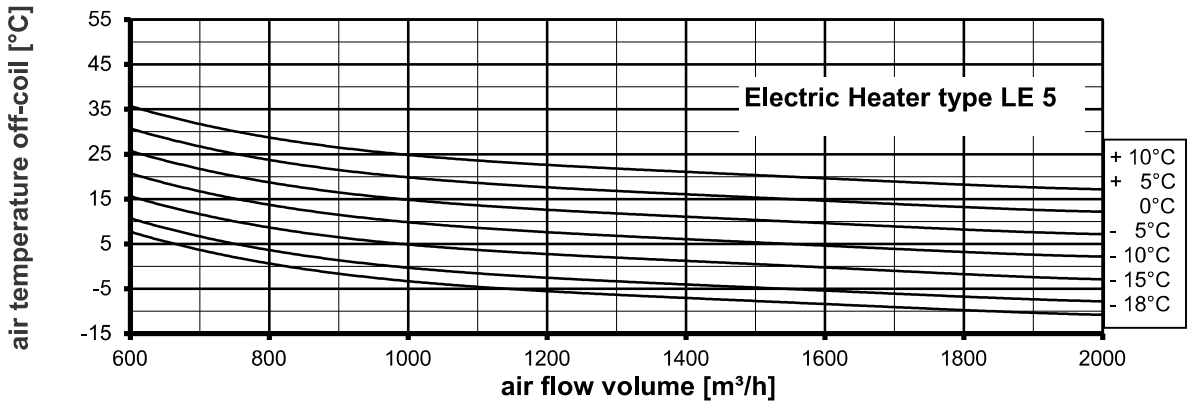
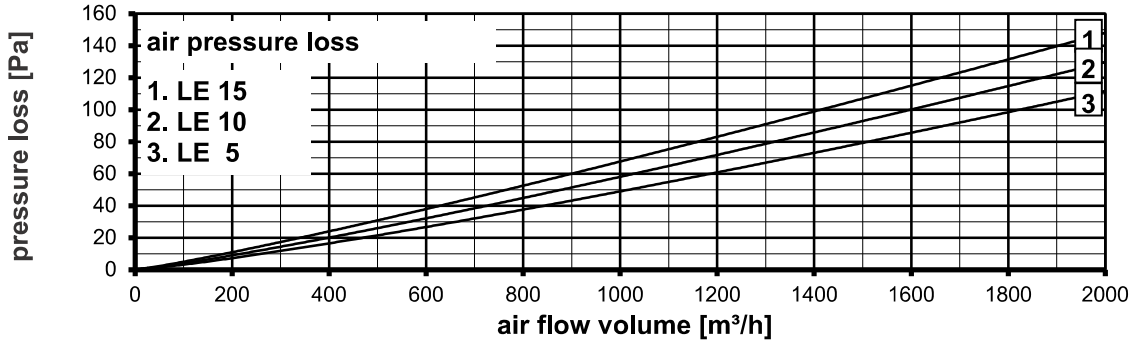
Electric Air Heater Unit LE

for 400V/50Hz operating voltage

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



Type LE 5 (kW), 6 elements, current max. 7,2 A, 2 switching levels
 Type LE 10 (kW), 12 elements, current max. 14,4 A, 3 switching levels
 Type LE 15 (kW), 18 elements, current max. 21,7 A, 3 switching levels



Flat Series

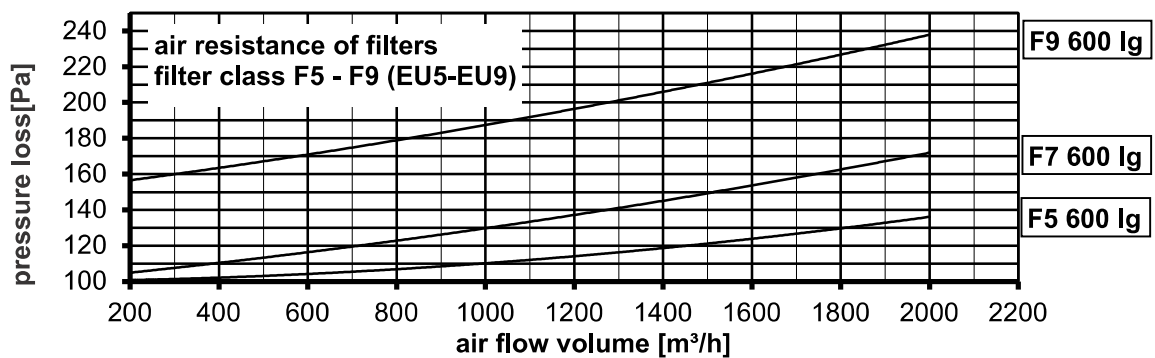
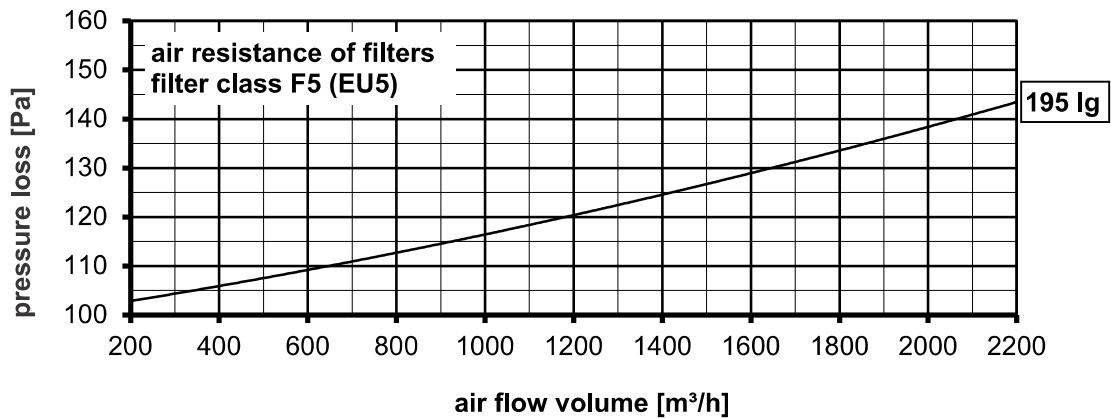
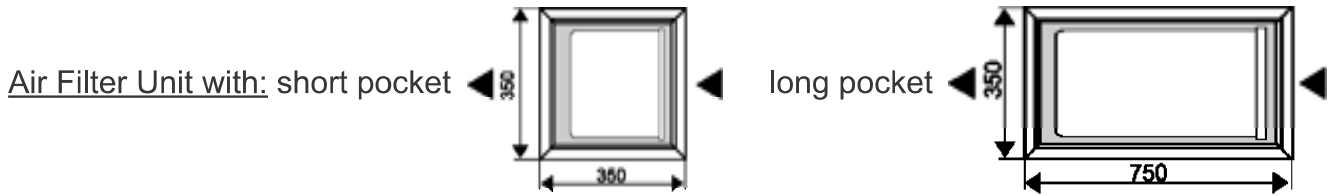
Size: 2, Module depth 750 mm

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: 2

Sound data for Ventilator Unit VF 221 - VF 223

VF 221 Fan: CFE 840/E 35

*sound pressure level L_p in dB (A)							
voltage [V]	80	100	125	150	170	190	230
inlet	30	38	46	52	56	60	64
discharge	34	44	52	58	61	65	69

* 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	46	31	41	33	32	30	27	23	38	80	49	33	44	41	35	28	30	25	42
100	52	40	47	41	40	38	36	31	46	100	47	43	48	52	48	42	40	33	52
125	58	49	53	49	48	46	45	40	54	125	55	51	55	58	56	50	49	42	60
150	62	57	57	55	54	53	52	47	60	150	60	58	61	63	62	57	55	49	66
170	65	61	60	59	58	57	56	52	64	170	64	62	64	67	65	61	59	53	69
190	68	65	62	63	62	60	60	56	68	190	67	66	68	69	69	64	63	57	73
230	71	71	65	67	66	65	65	61	72	230	71	70	72	73	73	69	67	62	77

VF 222 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 223 Fan: CFE 8-940/E 80

*sound pressure level L_p in dB (A)							
voltage [V]	80	100	125	150	170	190	230
inlet	28	39	51	59	63	67	70
discharge	35	46	57	64	68	71	74

* 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	28	40	31	30	28	25	20	36	80	38	32	38	43	38	32	30	22	43
100	53	42	48	43	42	40	38	33	47	100	49	45	49	53	49	44	42	35	54
125	62	55	56	54	53	52	51	46	59	125	59	57	60	62	61	56	54	48	65
150	67	64	62	62	61	60	59	55	67	150	67	65	67	69	68	64	62	57	72
170	71	70	65	67	66	64	64	60	71	170	71	69	71	72	72	68	66	61	76
190	73	73	67	70	69	67	67	63	75	190	73	73	74	75	75	71	69	65	79
230	75	77	69	73	72	71	71	67	78	230	76	76	77	78	79	75	73	68	82