

Page 1	Flat Series Size: 1													Calculation of external available Pressure												
	Air flow volume [m ³ /h]													200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
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]													0,40	0,50	0,70	0,90	1,10	1,30	1,40	1,60	1,80	2,00	2,20	2,30	2,50
	Flow velocity related to Finned surface of heater [m/s]													0,70	1,00	1,30	1,70	2,00	2,30	2,70	3,00	3,30	3,70	4,00	4,30	4,70
	Flow velocity related to Finned surface of cooler [m/s]													0,70	1,00	1,40	1,70	2,00	2,40	2,70	3,10	3,40	3,80	4,10	4,50	4,80
1. Step	Extract Unit without air conditioning elements:																									
	Flow velocity related to Inner cross section of unit [m/s]													0,40	0,50	0,70	0,90	1,10	1,30	1,40	1,60	1,80	2,00	2,20	2,30	2,50
2. Step	2. Pressure Calculation													Available statical pressure [Pa] at rated voltage without consideration of pressure regain!												
	Ventilator Unit																									
	VF 101													354	347	339	329	316	300	279	254	223	185	139	85	22
	VF 102													460	455	450	440	430	420	403	385	365	340	315	285	250
	<i>The following air conditioning elements reduce pressure available!</i>																									
														Pressure loss [Pa] at above stated air volume												
	Pocket filter F5													103	105	107	109	111	113	116	118	120	123	125		
	Short filter (195 mm pocket)													7	10	14	18	22	27	31	36	41	46	51		
														Recommended final resistance: 200 - 300 Pa To ensure long filter life time please dimension the unit with consideration of „Calculated resistance“												
	Pocket filter F5													not to be used in size 1												
Long filter (600 mm pocket)																										
Pocket filter F7													106	109	113	117	120	124	129	133	138	142	147			
Short filter (195 mm pocket)													12	19	26	33	41	49	57	66	75	85	94			
													only to be used together with activated carbon filter													
Pocket filter F9													not to be used in size 1													
Long filter (600 mm pocket)																										
Air Heater LW													3	7	10	15	20	25	33	40	47	55	64	73	82	
Medium: PWW (pump circulated hot water)													6	12	18	27	36	46	58	70	84	98	113	129	146	
LW 3													7	14	23	34	46	60	75	91	109	127	147	169	191	
Subtotal																										
External statical pressure [Pa] available																										

Page 2	Flat Series Calculation of external available Pressure													
	Size: 1													
Air Flow Volume	[m³/h]	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400
2. Pressure calculation <i>The following air conditioning elements reduce pressure available!</i>														
Subtotal of page before of external available statical pressure [Pa]														
Air Cooler LK		Pressure loss [Pa] at above stated air volume												
	LK 2	7	14	24	34	47	61	76	92	110	130	150	172	195
Medium: chilled water KKW	LK 4	10	19	31	45	62	80	100	122	146	172	199	228	
	LK 6	12	24	39	57	77	100	125	152	182	214			
Air Cooler LKR		8	17	27	39	54	70	88	107	128	151	175	200	227
	LKR 2													
	LKR 4	9	18	29	43	58	76	95	116	139	163	189	217	
Medium: R407C, 5°C	LKR 6	13	26	42	61	84	109	137	167	200	235			
Water Eliminator		6	9	12	16	20	24	29	34	39	44	50	56	62
Damper		10	10	10	10	10	10	12	14	16	18	21	24	
Pressure losses to be taken into consideration only with damper on inlet side.														
Air Mixer LM, CLM		10	10	10	10	10	10	12	14	16	18	21	24	
Pressure losses to be taken into consideration only with air mixer on inlet side.														
Attenuator KSD		Unit length												
	500 mm	0,1	0,1	0,2	0,4	0,5	0,7	1	1,2	1,5	1,8	2,2	2,5	2,9
	1000 mm	0,1	0,2	0,3	0,4	0,6	0,8	1,1	1,4	1,7	2,1	2,5	2,9	3,3
	1500 mm	0,1	0,2	0,3	0,5	0,7	0,9	1,2	1,5	1,9	2,3	2,8	3,2	3,7
Plate heat Exchange APD		on request												
resistance calculated at 22°C/30% r. H.														
Coarse Filter GF		9	19	30	44	60	78	98	120	143	168	195	223	253
		clean resistance												
Regularly cleaning required!														
Activated Carbon Filter		15	28	46	66	89	114	142						
Calculated resistance same than clean resistance														
Electric Air Heater LE		1	1	1	2	3	4	5	7	9	10	12	14	17
	LE 4,9													
Operating voltage 400V/50Hz	LE 9,8	1	1	2	3	5	7	10	13	16	20	24	29	35
	LE 14,8	1	3	6	9	12	17	22	28	35	42	50	58	68
Total														
External statical pressure [Pa] available														

Calculation of external available statical air pressure by deduction of internal pressure losses
 Deduct the respective pressure losses of needed elements from available static pressure of fan!

2. Step

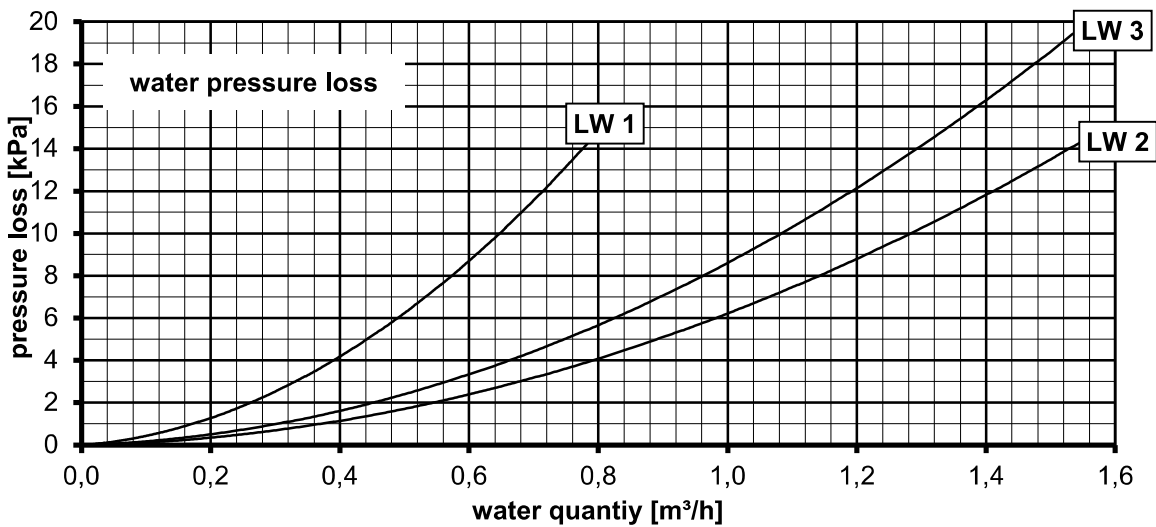
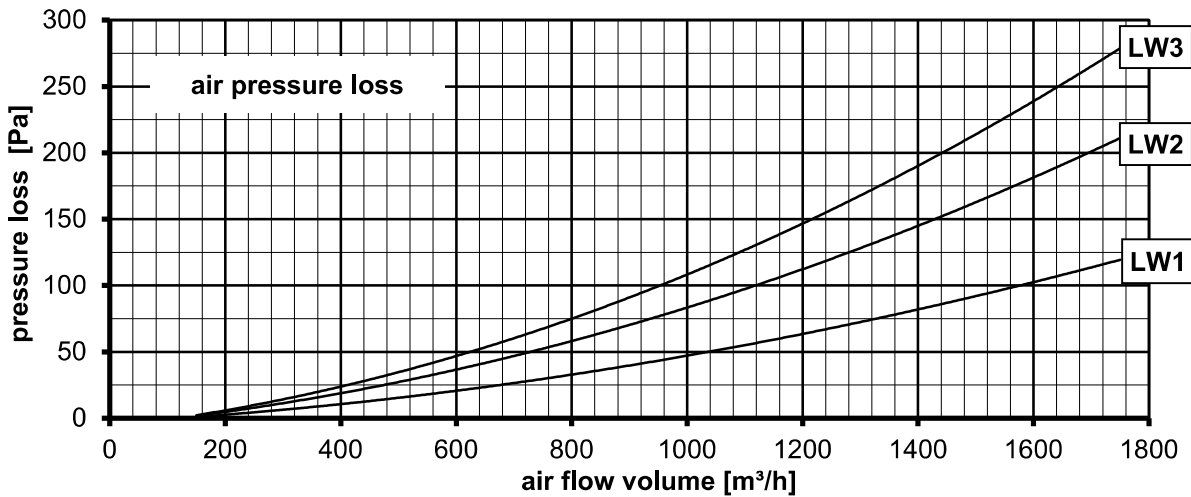
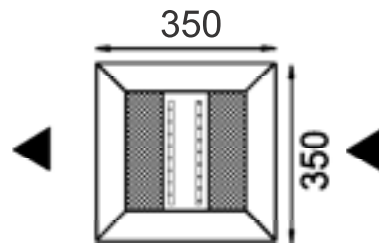
Flat Series

Size: 1, Module depth 650 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]

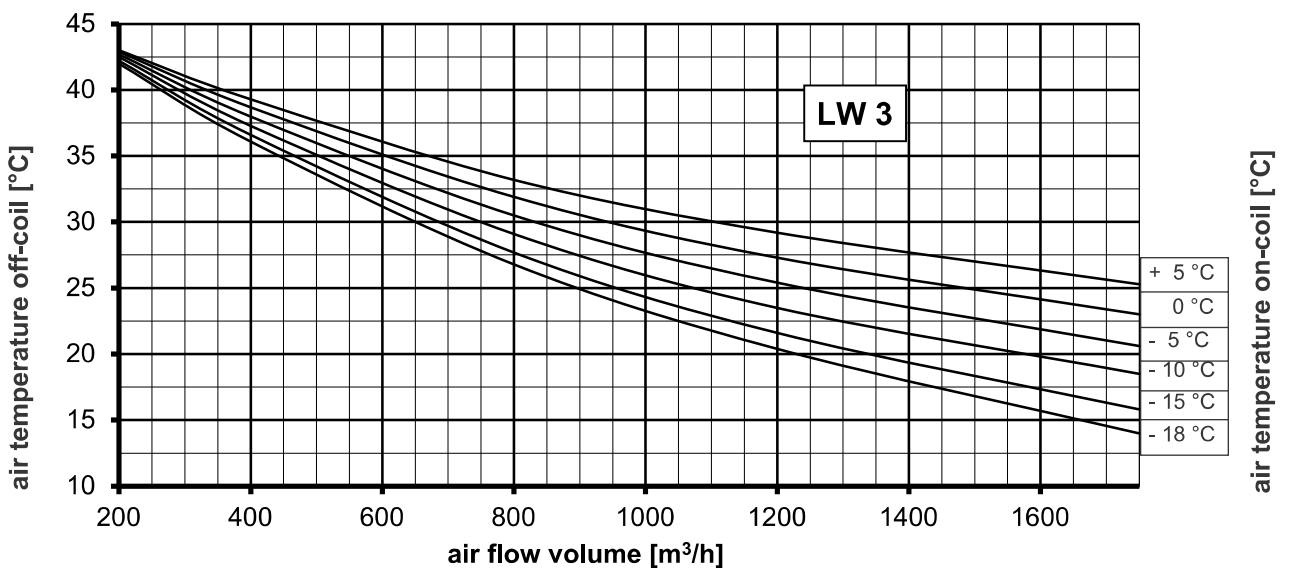
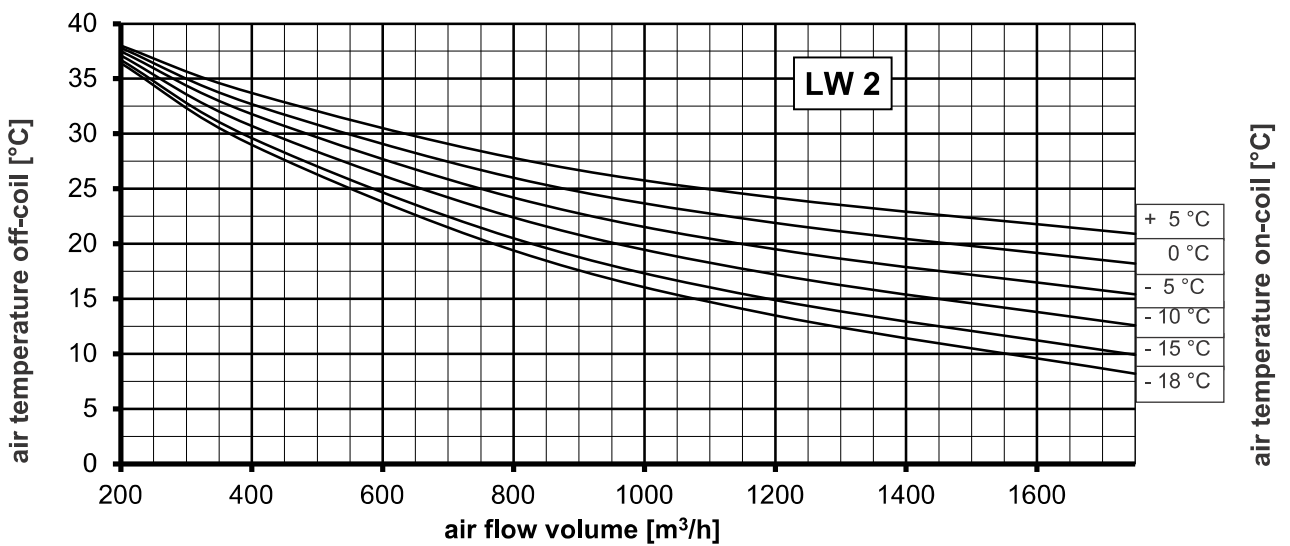
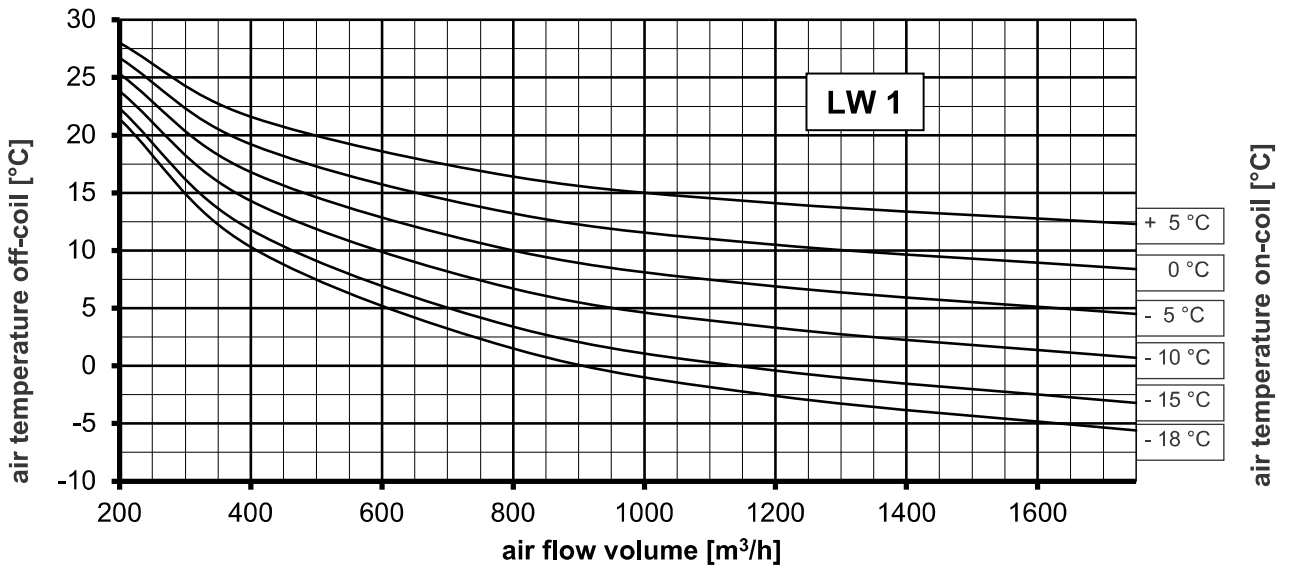
ρ_L = specific weight of air = 1,2 [kg/m³]

c_{pL} = specific heat capacity of air = 1,0 [kJ/kg K]

Flat Series
Size: 1

Air Heater Unit LW
for medium pump circulated water

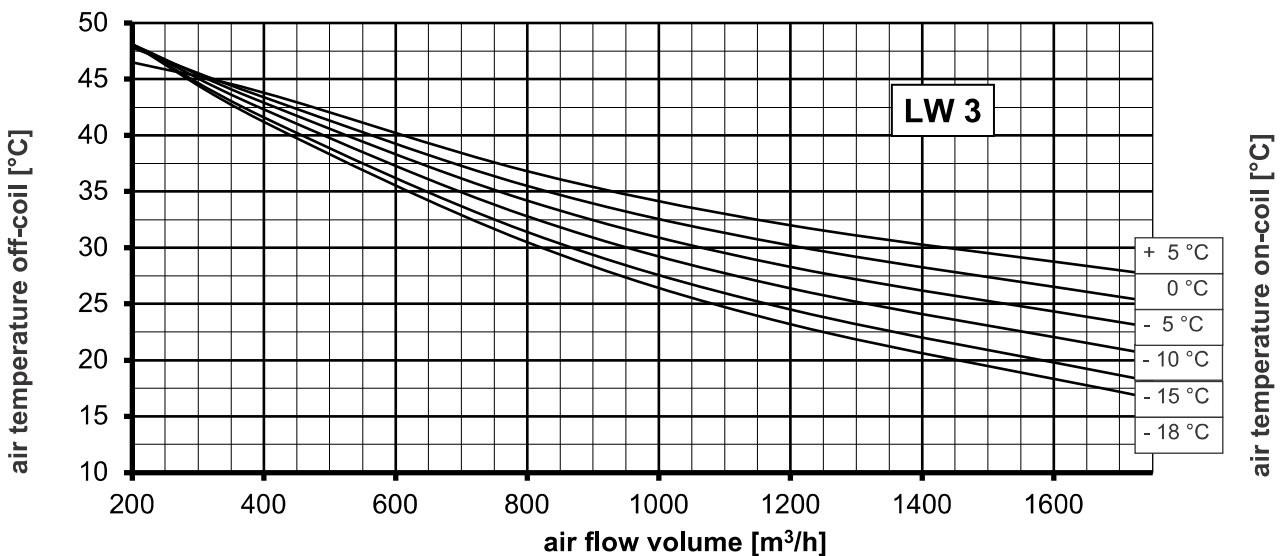
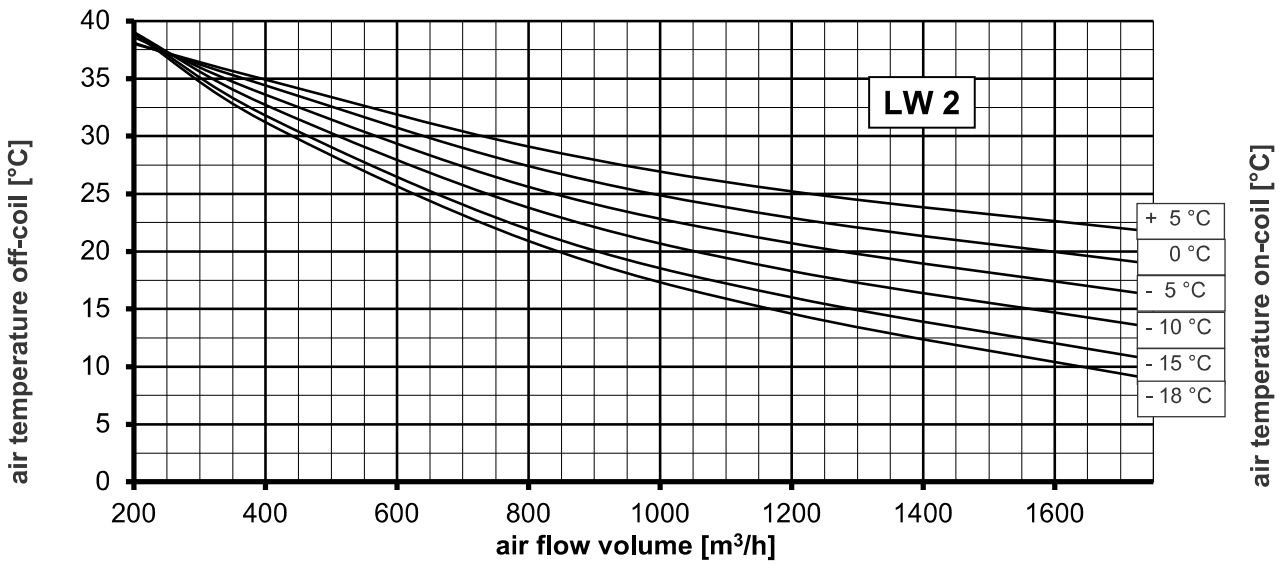
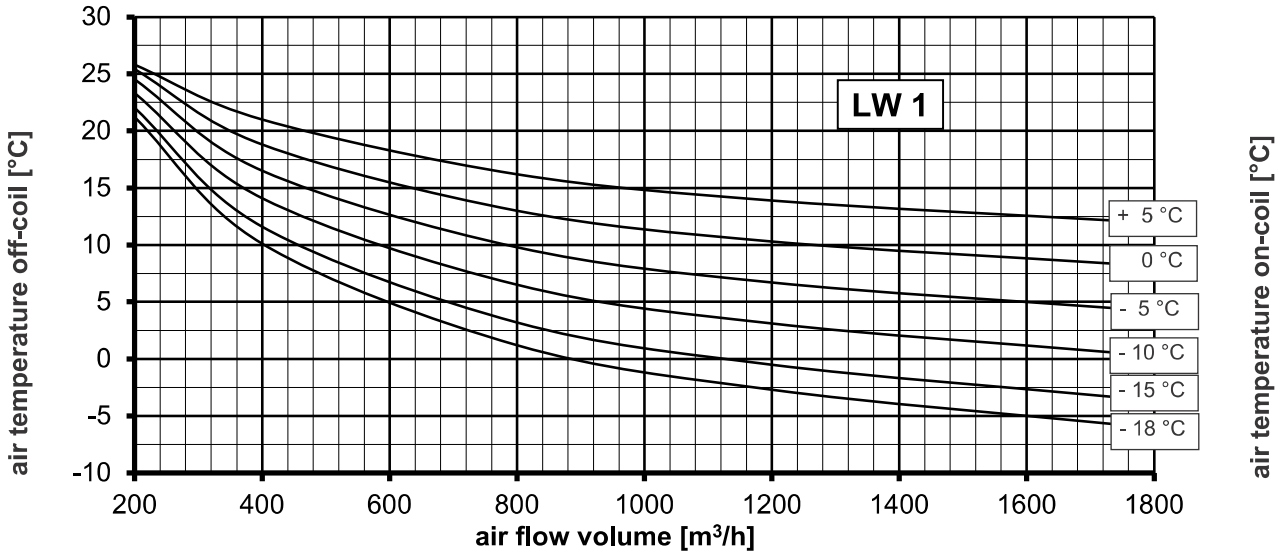
Heating performance for water temperature on-/off-coil 55/45°C



Flat Series
Size: 1

Air Heater Unit LW
 for medium pump circulated water

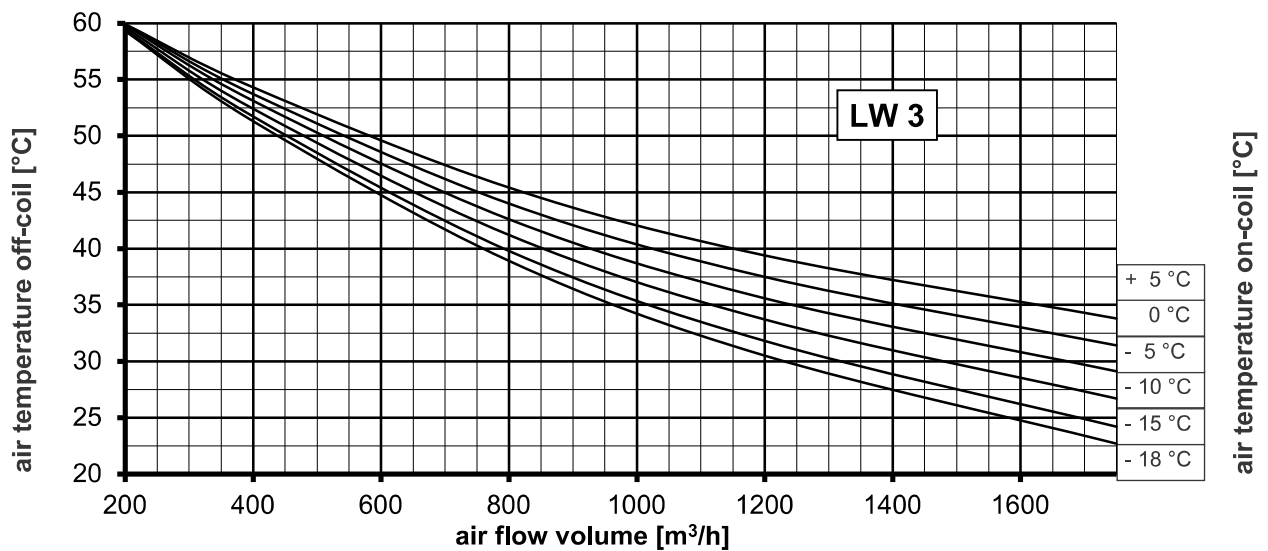
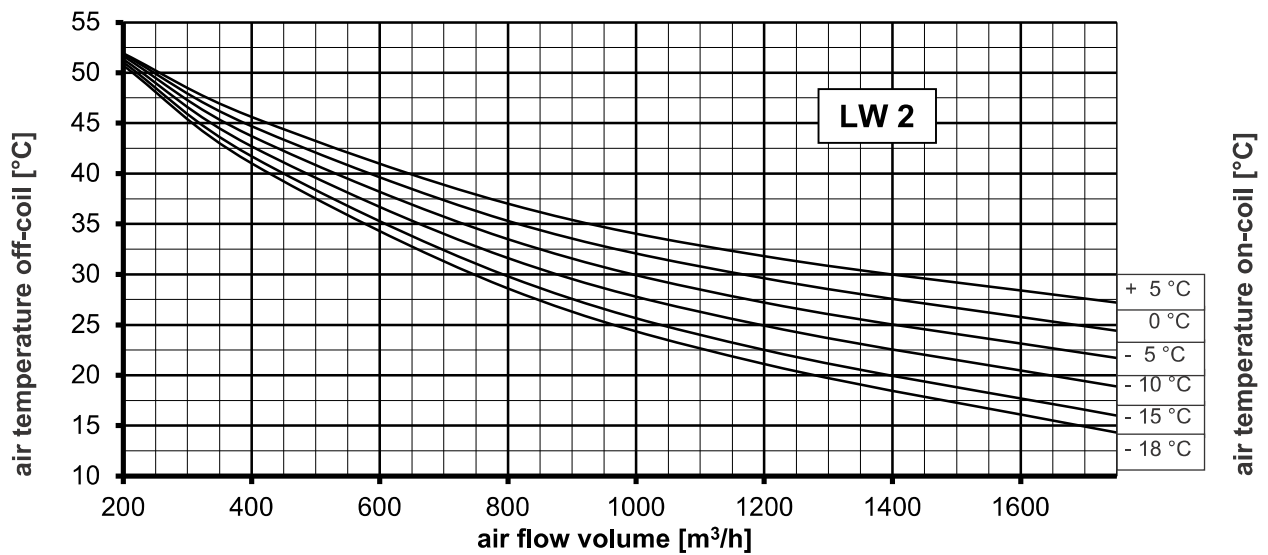
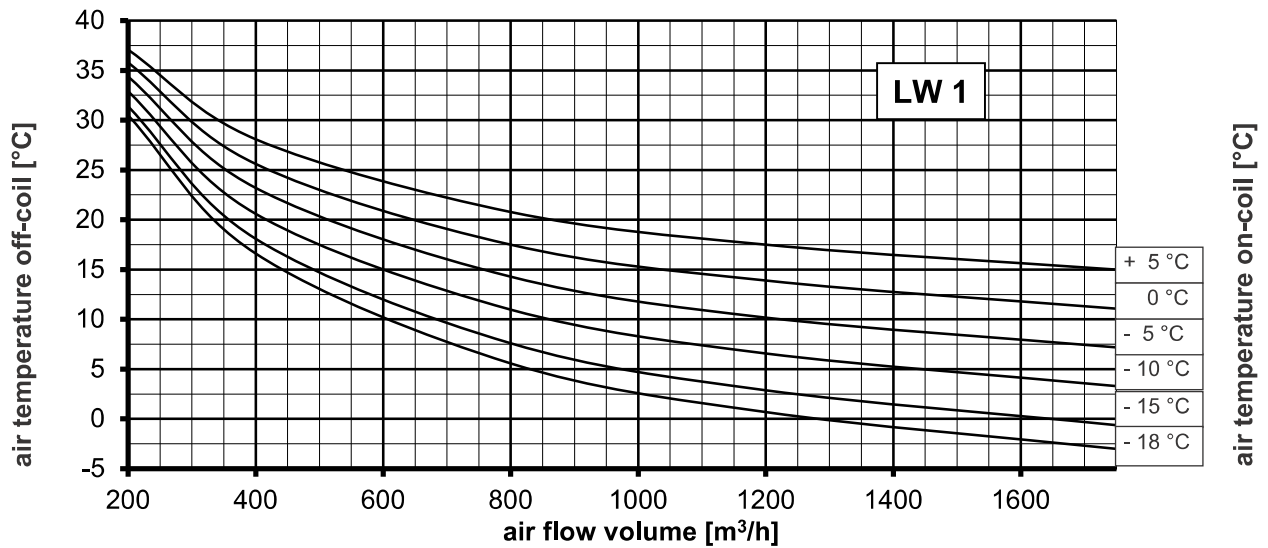
Heating performance for water temperature on-/off-coil 70/50°C



Flat Series
Size: 1

Air Heater Unit LW
 for medium pump circulated water

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



Flat Series

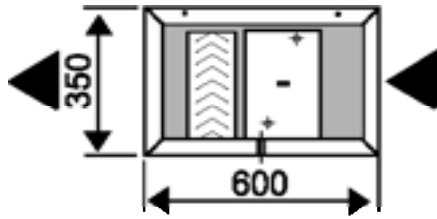
Size: 1, Module depth 650 mm

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:

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

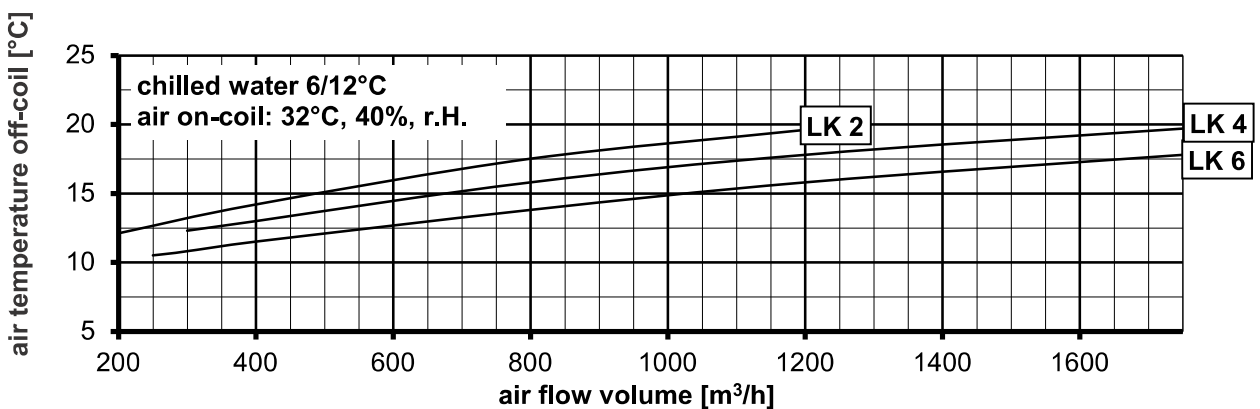
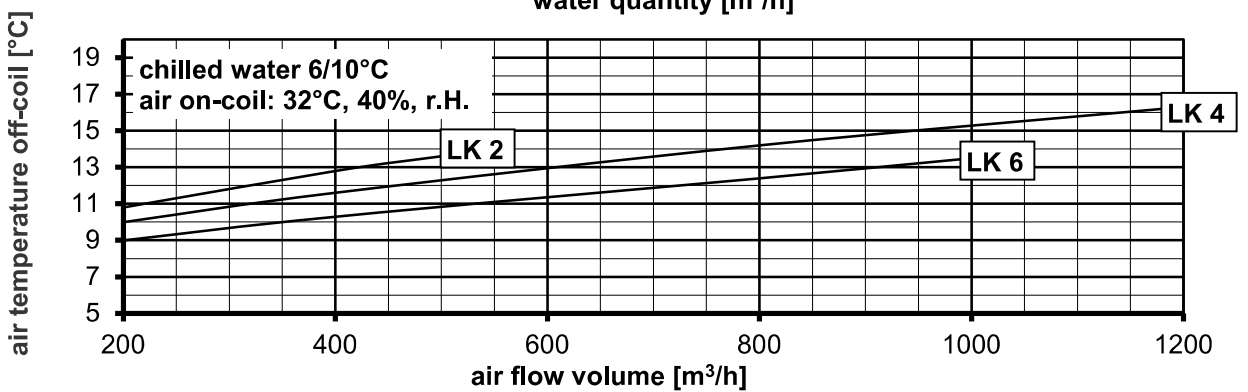
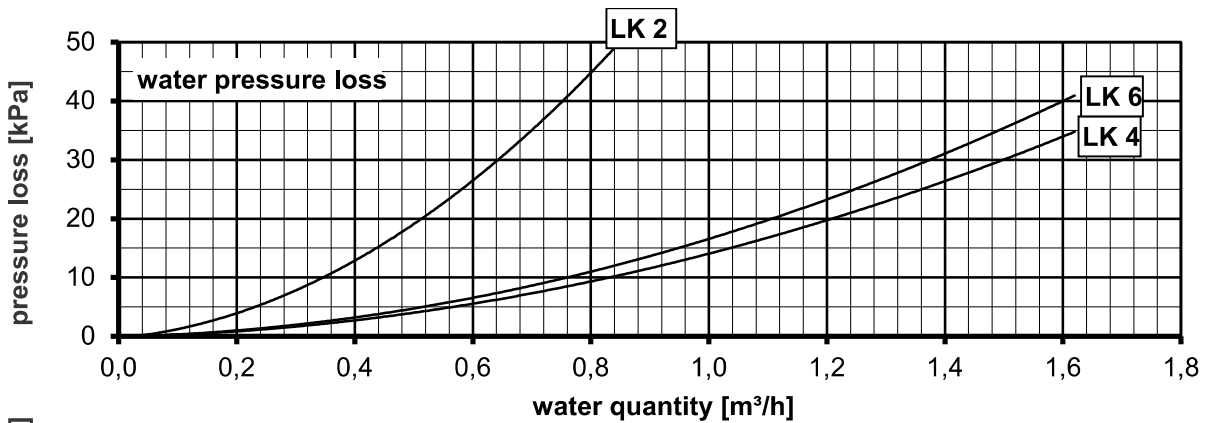
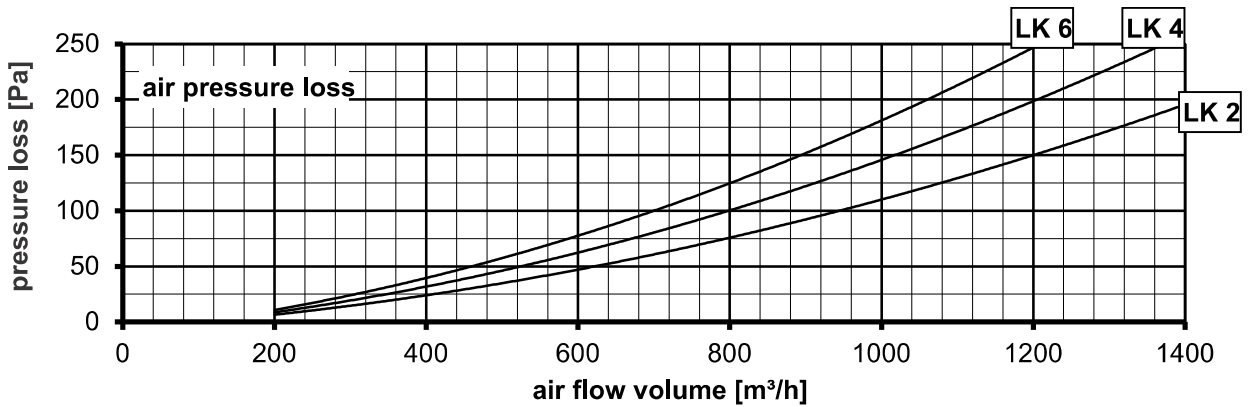
\dot{Q}_h = cooling performance [KW]

\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



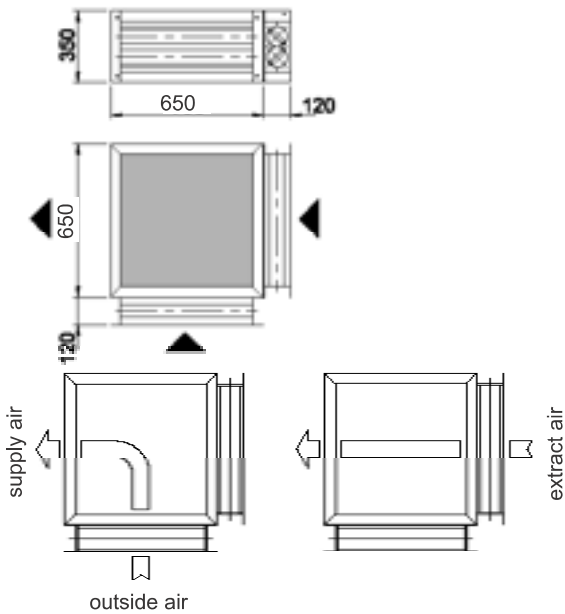
Flat Series

Size: 1, Module depth 650 mm

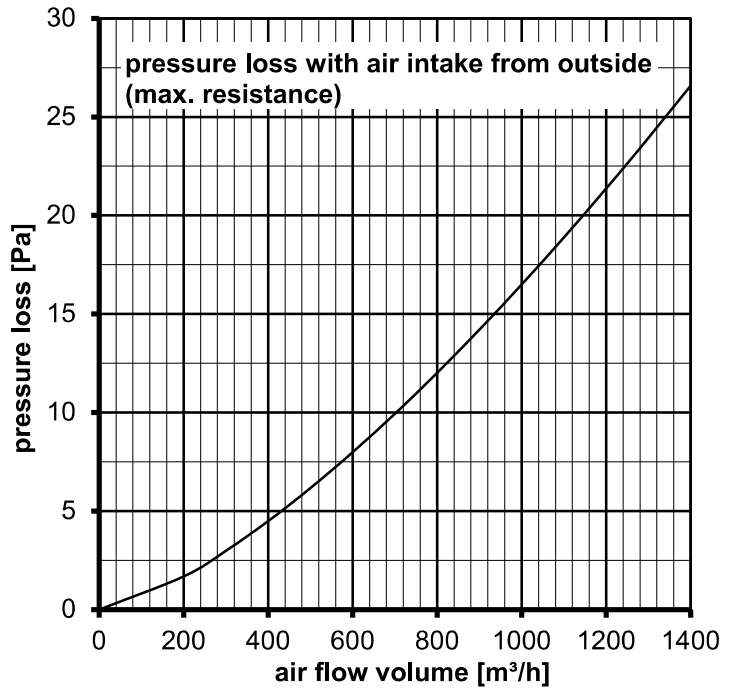
The unit sides marked by arrow are open!

Air Mixer Unit LM

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

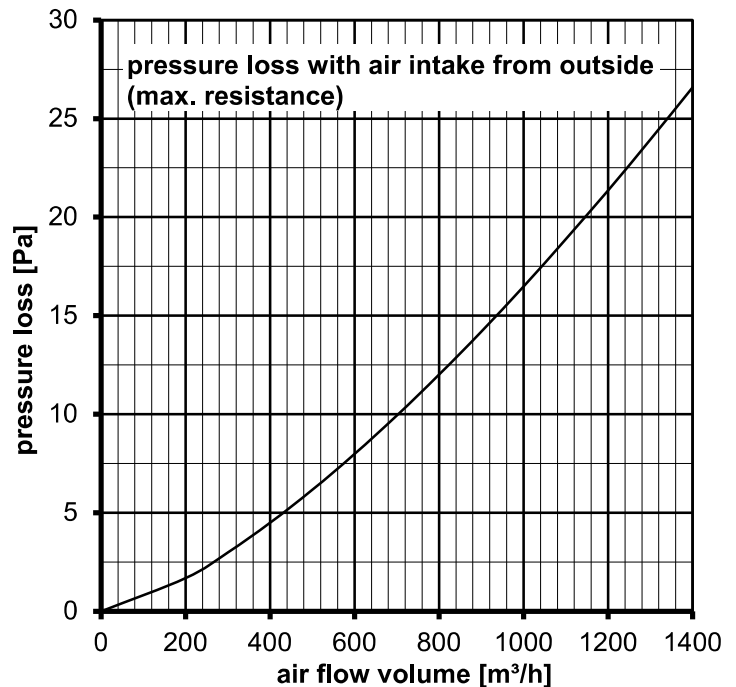
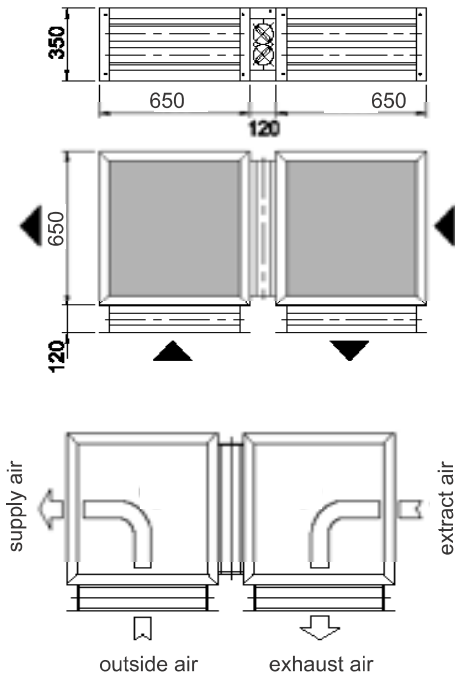


Inner dimension of damper opening: 500x250 mm



Air Mixer Unit CLM

for AHU with supply and extract air arranged in row



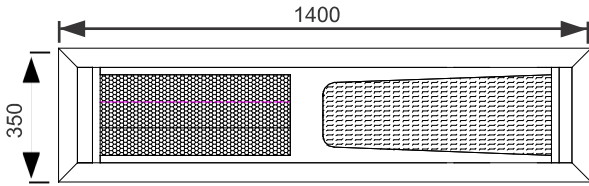
Note for units type LM and CLM:

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.

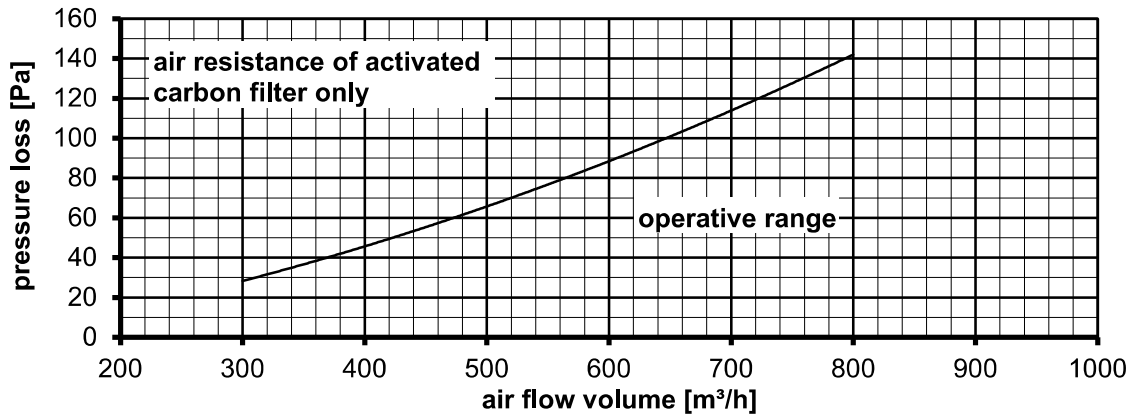
Flat Series
Size: 1, Module depth 650 mm

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



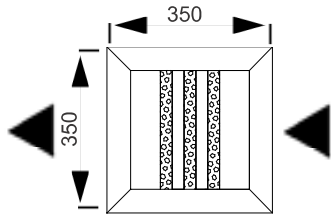
equipped with:

1. Activated carbon filter with 5 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).



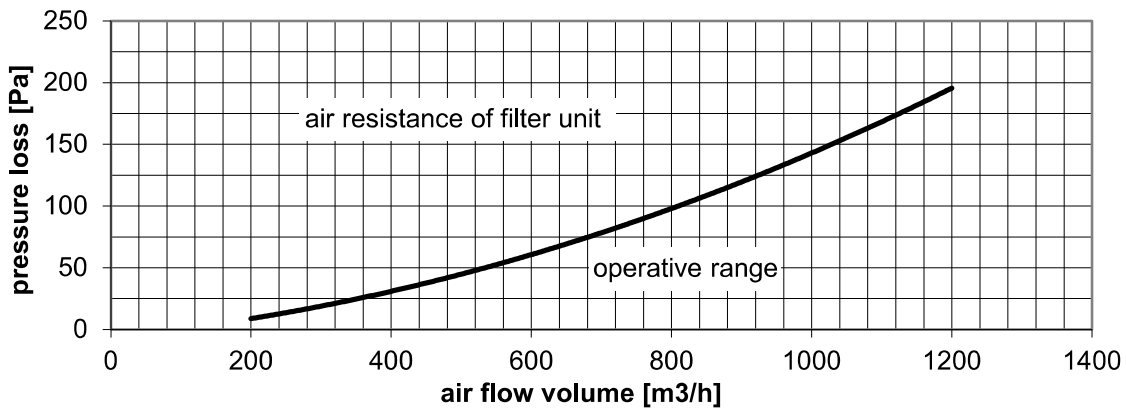
The unit sides marked by arrow are open!

Coarse Filter Unit GF

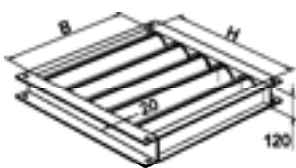


equipped with:

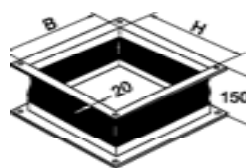
- 3 Filter steps:
- 2 Metal mat work filter and
- 1 Fibre mat filter with an exchange frame (regularly cleaning required)



Dampers and Flexible Connections



Damper type „A“: for total cross section unit 550 mm width (B) x 310 mm height (H)



Flexible Connection: to be used for outlet- and inlet side type „A“: 550 mm width (B) x 310 mm height (H) for total cross section of unit.

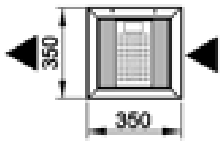
Flat Series

Size: 1, Module depth 650 mm

Electric Air Heater Unit LE

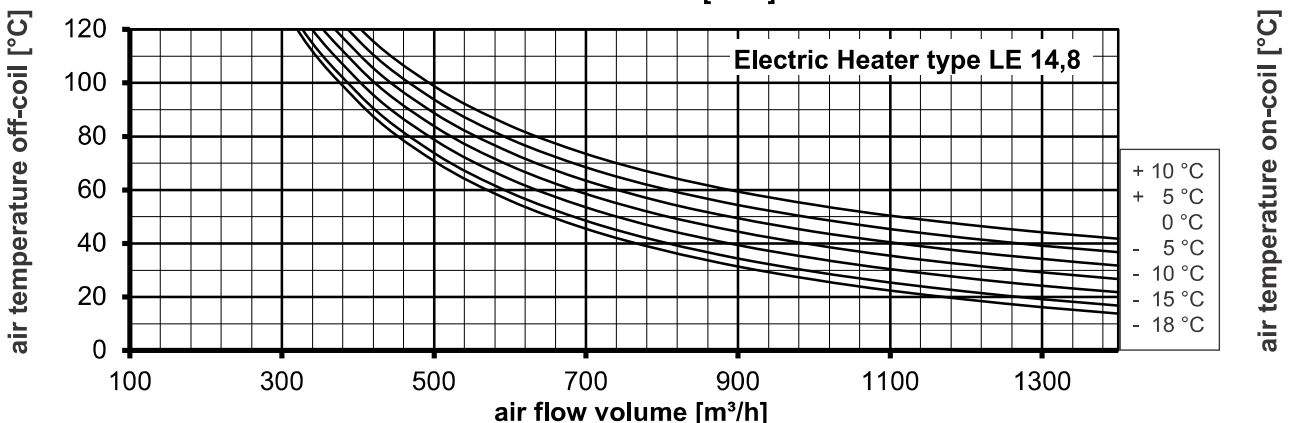
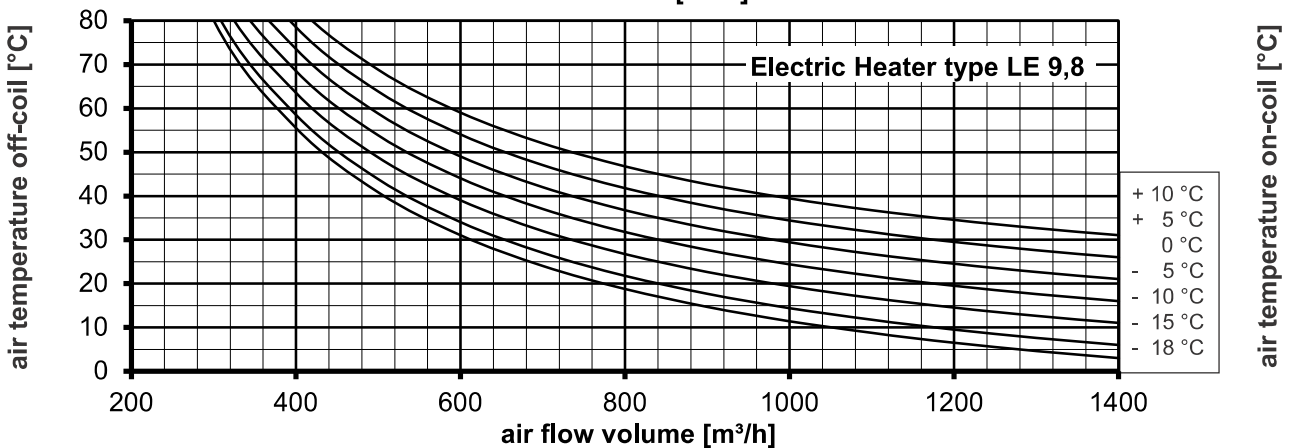
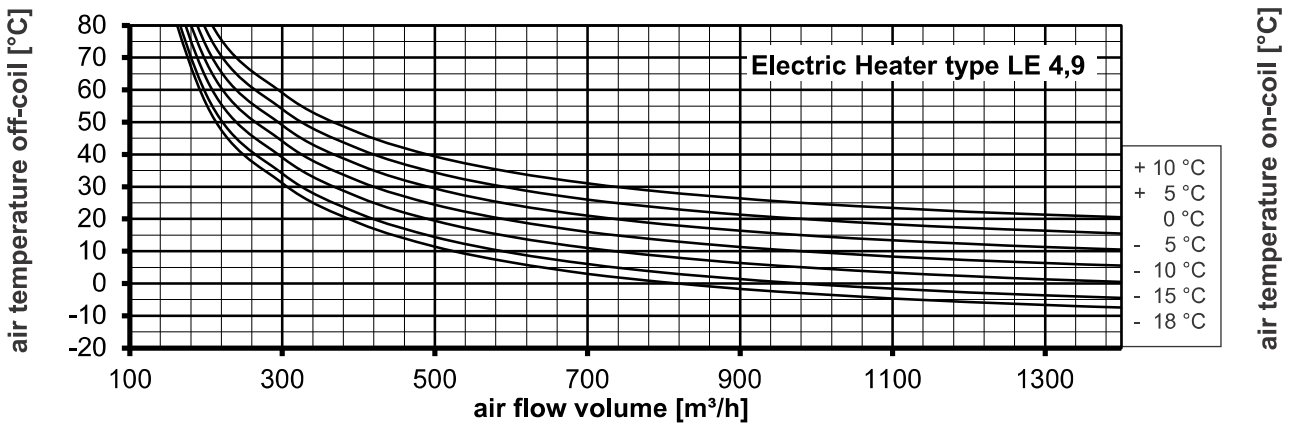
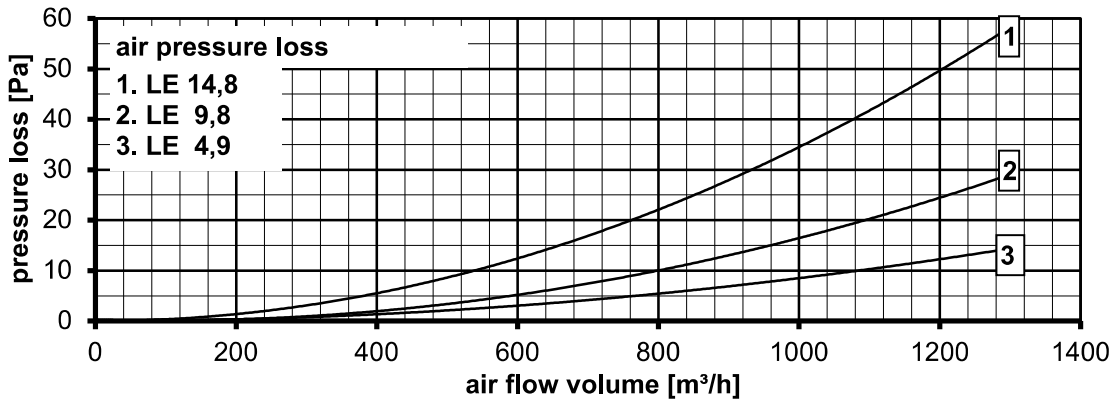
for 400V/50Hz operating voltage

The unit sides marked by arrow are open!



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

- Type LE 4,9 (kW), 6 elements, current max. 7,1 A, 2 switching levels
- Type LE 9,8 (kW), 12 elements, current max. 14,2 A, 3 switching levels
- Type LE 14,8 (kW), 18 elements, current max. 21,3 A, 3 switching levels



Flat Series

Size: 1, Module depth 650 mm

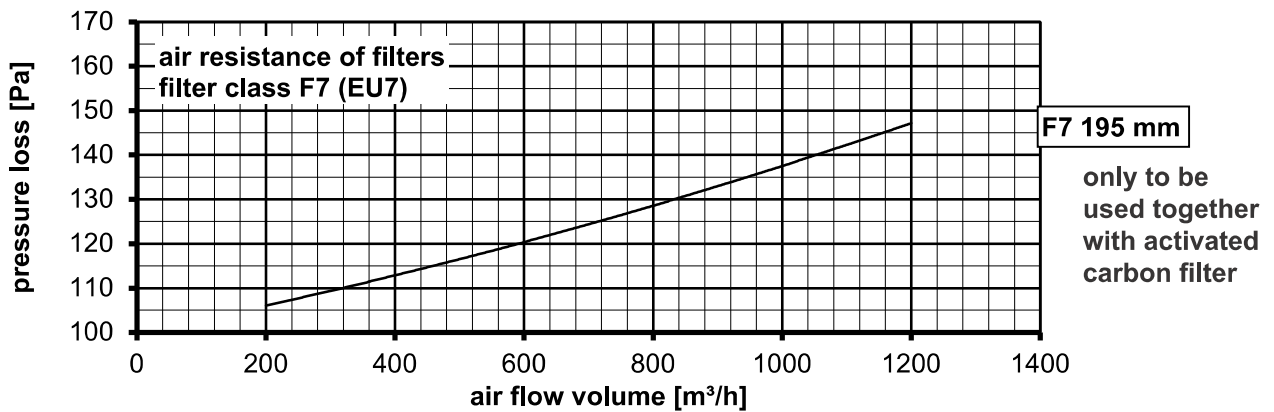
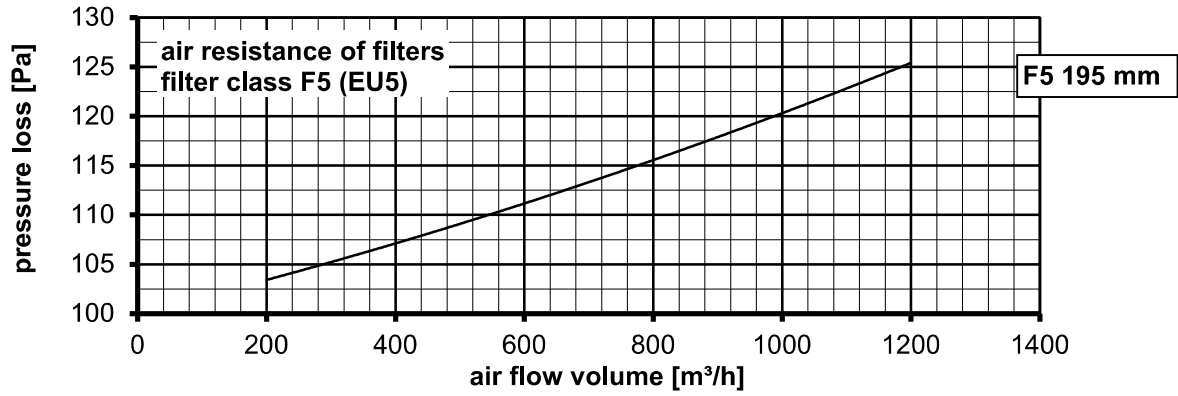
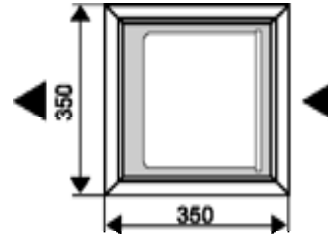
The unit sides marked by arrow are open!

Air Filter Unit KFS

with short pocket (195mm)

Technical data and resistance:

Air Filter Unit with: short pocket



Flat Series
Size: 1

Sound data for Ventilator Unit VF 101 - VF 102

VF 101 Fan: CFE 640/E 15

*sound pressure level L_p in dB (A)							
voltage [V]	80	100	125	150	170	190	230
inlet	31	40	47	52	55	58	62
discharge	30	39	47	52	55	58	61

* 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	42	25	43	38	32	27	22	16	39		80	33	29	33	38	32	26	24	16	38	
100	50	37	50	46	42	38	33	27	48		100	42	39	42	47	42	36	35	27	47	
125	56	47	56	53	50	47	43	37	55		125	50	48	50	54	50	45	43	37	55	
150	60	53	59	57	55	52	48	43	60		150	54	53	55	58	55	50	48	42	60	
170	62	57	62	60	59	55	52	47	63		170	58	57	58	61	59	54	52	46	63	
190	64	60	64	62	62	58	55	50	66		190	60	60	61	63	61	57	55	49	65	
230	67	65	66	65	66	62	59	54	70		230	64	64	64	65	65	61	59	53	69	

VF 102 Fan: CFE 740/E 25

*sound pressure level L_p in dB (A)							
voltage [V]	80	100	125	150	170	190	230
inlet	30	39	47	54	58	61	66
discharge	29	39	46	54	58	61	65

* 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	42	24	42	37	31	27	21	15	38		80	32	28	32	38	32	25	24	15	38	
100	50	36	50	46	41	37	33	27	47		100	42	39	42	46	42	36	34	27	47	
125	56	46	55	52	50	46	42	36	55		125	49	47	50	53	50	44	43	36	54	
150	61	55	61	59	58	54	51	45	62		150	56	55	57	59	57	52	51	44	61	
170	65	60	64	62	62	58	55	50	66		170	60	60	61	63	62	57	55	49	66	
190	67	64	66	65	65	62	59	54	69		190	63	64	64	66	65	60	59	53	69	
230	70	69	69	68	70	66	64	59	74		230	67	68	68	69	69	65	63	58	73	