

Page 1	Flat Series Size: 4		Calculation of external available Pressure													
	Air flow volume	[m³/h]	700	1000	1400	1800	2200	2400	2600	2800	3000	3400	3800	4200	4600	5000
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 <i>Cross section of filter (long)</i>	[m/s]	0,57	0,82	1,14	1,47	1,80	1,96	2,13	2,29	2,45	2,78	3,11	3,43		
	Flow velocity related to <i>Finned surface of heater</i>	[m/s]	0,87	1,24	1,74	2,23	2,73	2,98	3,22	3,47	3,72	4,22	4,71			
	Flow velocity related to <i>Finned surface of cooler</i>	[m/s]	0,87	1,24	1,74	2,23	2,73	2,98	3,22	3,47	3,72					
Extract Unit without air conditioning elements:																
Flow velocity related to <i>Inner cross section of unit</i>	[m/s]	0,57	0,82	1,14	1,47	1,80	1,96	2,13	2,29	2,45	2,78	3,11	3,43	3,76	4,09	
2. Step	2. Pressure Calculation		Available statical pressure [Pa] at rated voltage without consideration of pressure regain!													
	Ventilator Unit	VF 407	776	767	742	700	637	597	546	489	424	266				
		VF 408	772	767	748	713	654	614	567	512	447	288				
		VF 409	912	909	898	877	841	817	789	755	716	619	495			
		VF 410	714	714	714	711	703	697	690	682	672	648	615	575	525	465
		<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	105	108	111	115	118	120	122	125	127	131	136	141		
		Clean resistance	10	15	22	29	37	41	45	49	53	62	72	82		
	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	100	100	100	100	100	100	100	100	100	100	100	100			
	Clean resistance	4	6	11	17	24	28	33	37	42	53	66				
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	100				
	Clean resistance	18	27	39	53	67	74	82	90	99	116					
Recommended final resistance: 200 - 300 Pa																
Pocket filter F9 Long filter (600 mm pocket)	Calculated resistance	162	168	176	185	194	198	203	208	213						
	Clean resistance	25	36	52	69	87	97	106	116	126						
Recommended final resistance: 300 - 400 Pa																
Air Heater LW Medium: PWW (pump circulated hot water)	LW 1	5	8	14	21	30	34	39	44	49	61	73				
	LW 2	7	13	22	34	47	54	62	70	79	97	117				
	LW 3	14	25	43	65	91	105	119	135	151	185	222				
Subtotal External statical pressure [Pa] available																

Page 2	Flat Series Calculation of external available Pressure														
	Size: 4														
Air Flow Volume	[m ³ /h]	700	1000	1400	1800	2200	2400	2600	2800	3000	3400	3800	4200	4600	5000
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													
Air Cooler LK Medium: chilled water KKW	LK 2	15	27	47	70	99	115	131	147						
	LK 4	19	35	61	95	131	151	173	196						
	LK 6	23	42	75	115	161	186	213	242						
Air Cooler LKR Direct Evaporating Medium: R407C, 5°C	LKR 2	11	20	35	53	75	87	100	113	127	157	190			
	LKR 4	14	26	46	71	100	116	133	150	169	209	253			
	LKR 6	20	38	67	102	143	166	191	216	243	301	363			
Water Eliminator		7	12	22	35	49	58	66	75	85					
Damper		2	3	5	6	9	10	11	12	14	16	19	22	25	29
		Pressure losses to be taken into consideration only with damper on inlet side.													
Air Mixer LM, CLM		2	3	5	6	9	10	11	12	14	16	19	22	25	29
		Pressure losses to be taken into consideration only with air mixer on inlet side.													
Attenuator SD	Unit length														
	1000 mm	0,1	0,3	0,6	0,9	1,4	1,7	2,0	2,3	2,6	3,3	4,2	5,1	6,1	7,2
	1500 mm	0,2	0,3	0,6	1,1	1,6	1,9	2,2	2,6	3,0	3,8	4,8	5,8	7,0	8,2
	1750 mm	0,2	0,4	0,7	1,2	1,85	2,1	2,5	2,9	3,3	4,3	5,3	6,5	7,8	9,3
2250 mm	0,2	0,4	0,8	1,3	2,0	2,4	2,8	3,2	3,7	4,7	5,9	7,2	8,7	10,2	
Plate heat Exchange APD		on request													
resistance calculated at 22°C/30% r. H.															
Coarse Filter GF	clean resistance	21	38	67	102	144	167	191							
		Regularly cleaning required!													
Activated Carbon Filter		28	50	86	130										
Calculated resistance same than clean resistance															
Electric Air Heater LE Operating voltage 400V/50Hz	LE 10	15	23	34	46	58	65	71	78	84	98	111	126		
	LE 20	18	28	41	54	69	76	83	91	98	114	130	145		
	LE 31	22	33	48	64	80	88	96	105	113	130	148	166		
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 stat. pressure of fan!

2. Step

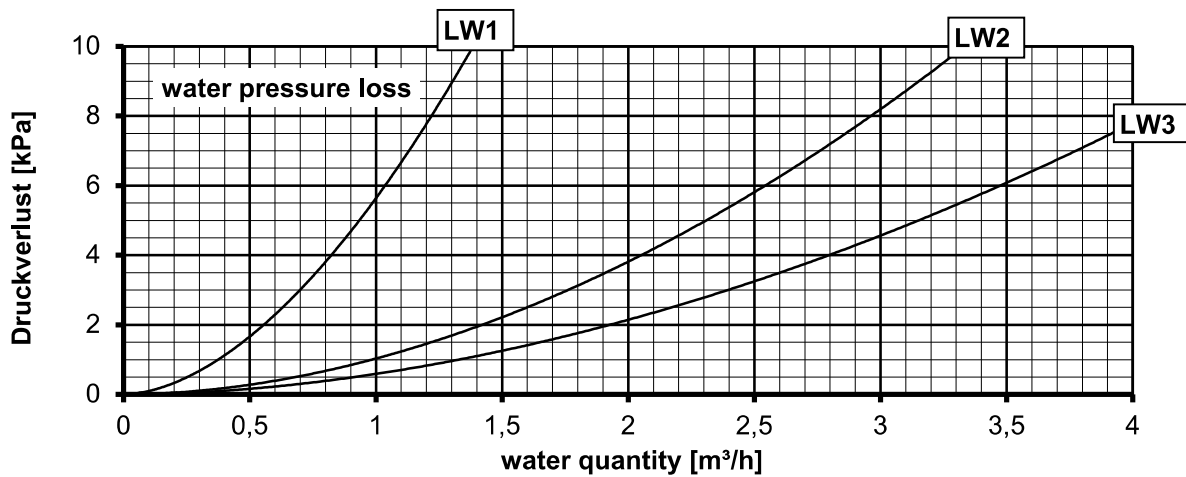
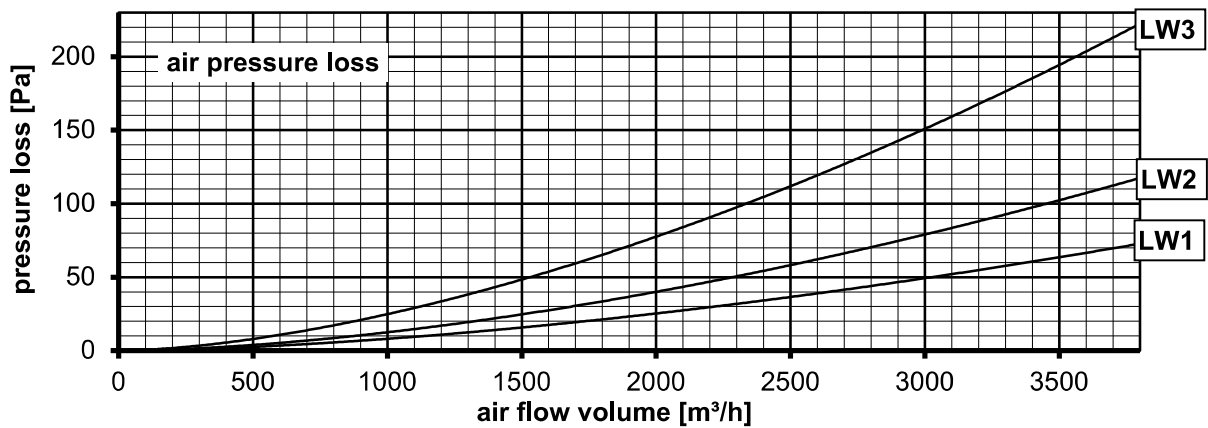
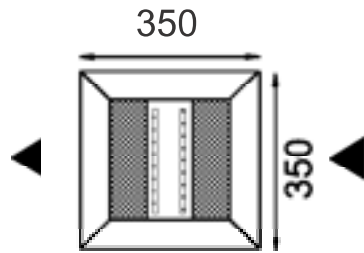
Flat Series

Size: 4, Module depth 1350 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:

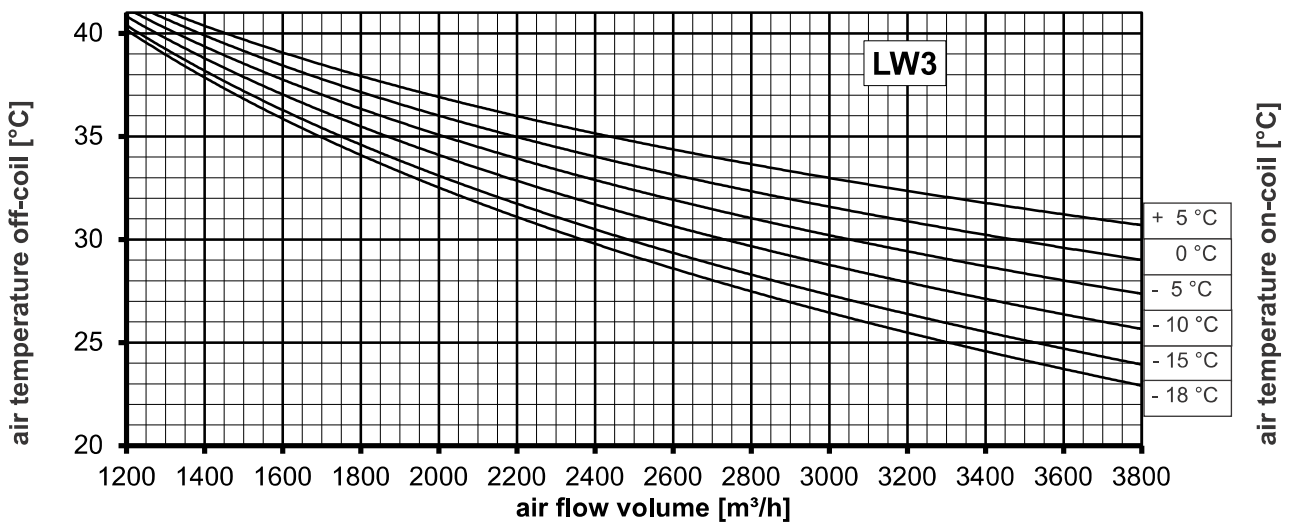
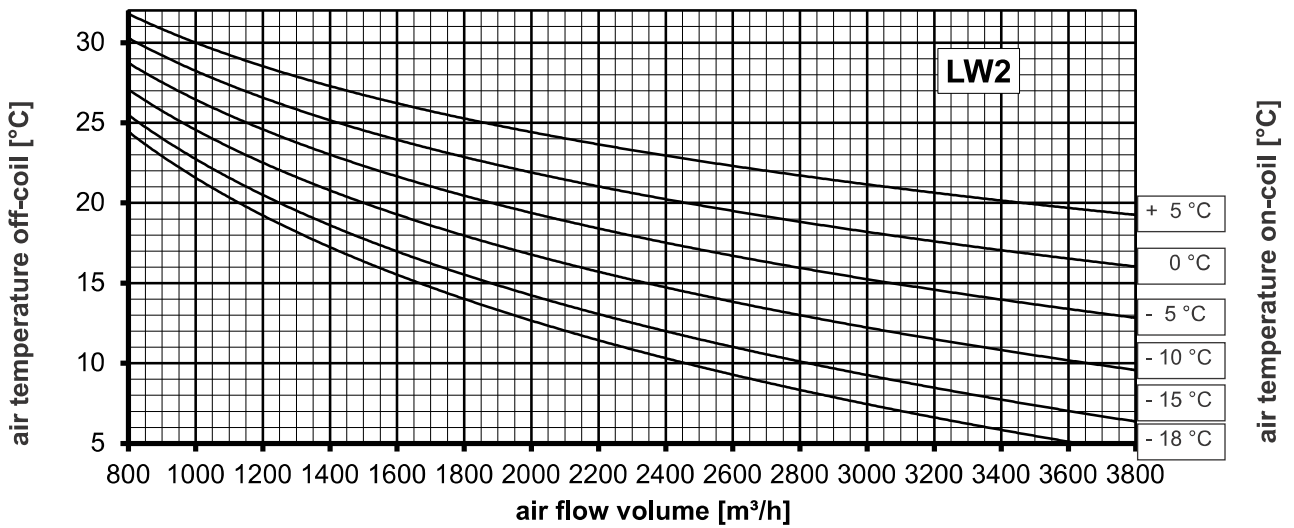
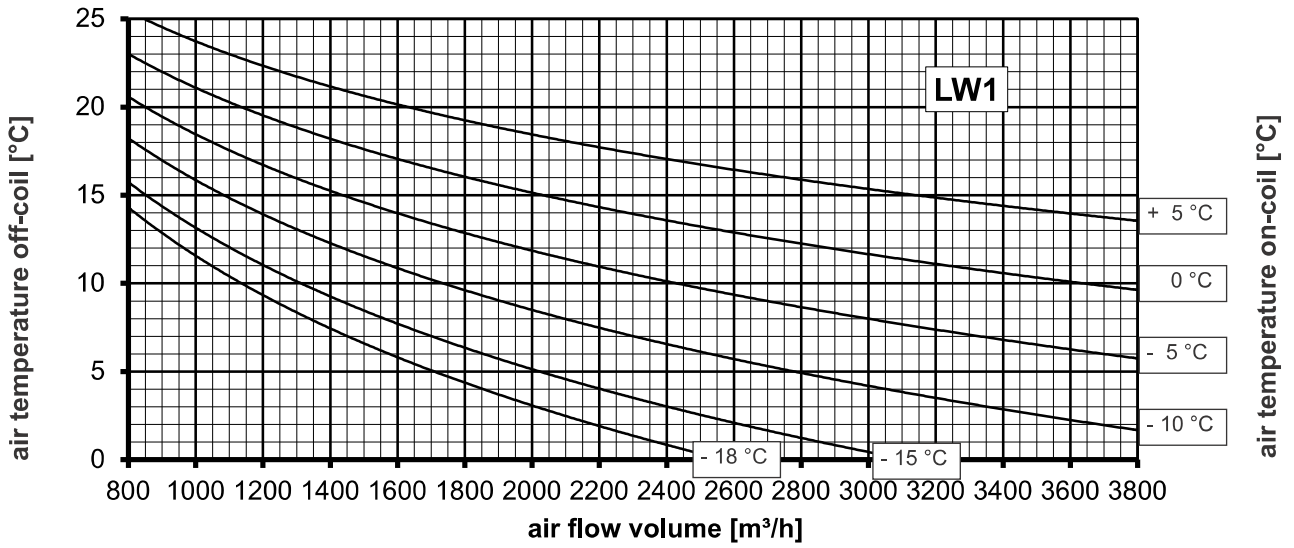
$$\dot{Q}_h [\text{kW}] = \dot{V}_L / 3600 \times (t_{LA} - t_{LE}) \times \rho_L \times c_{pL}$$

- \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: 4

Air Heater Unit LW
 for medium pump circulated water

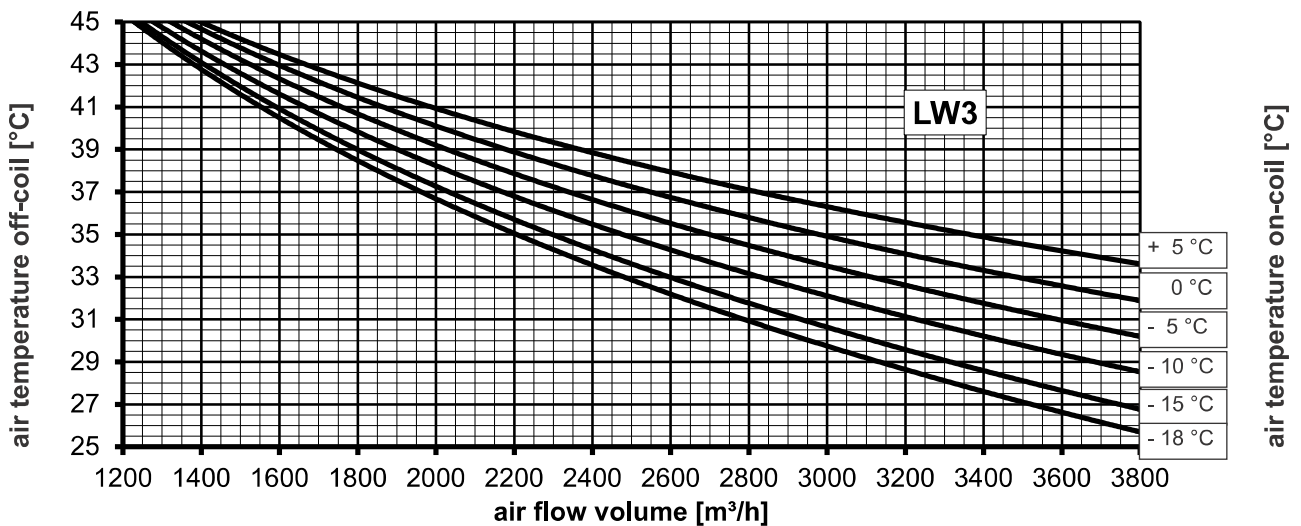
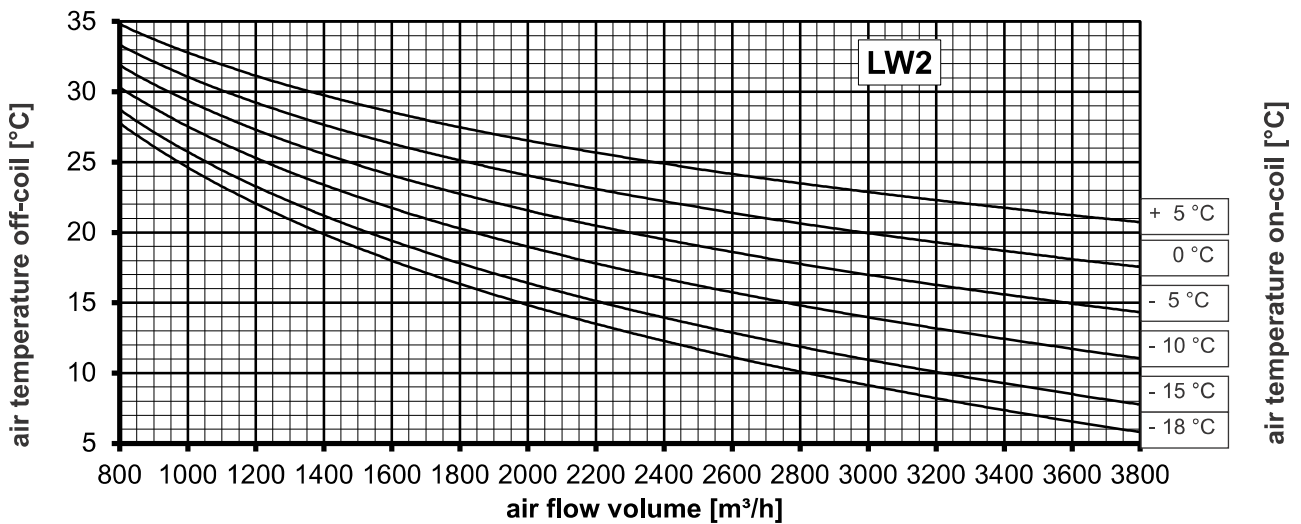
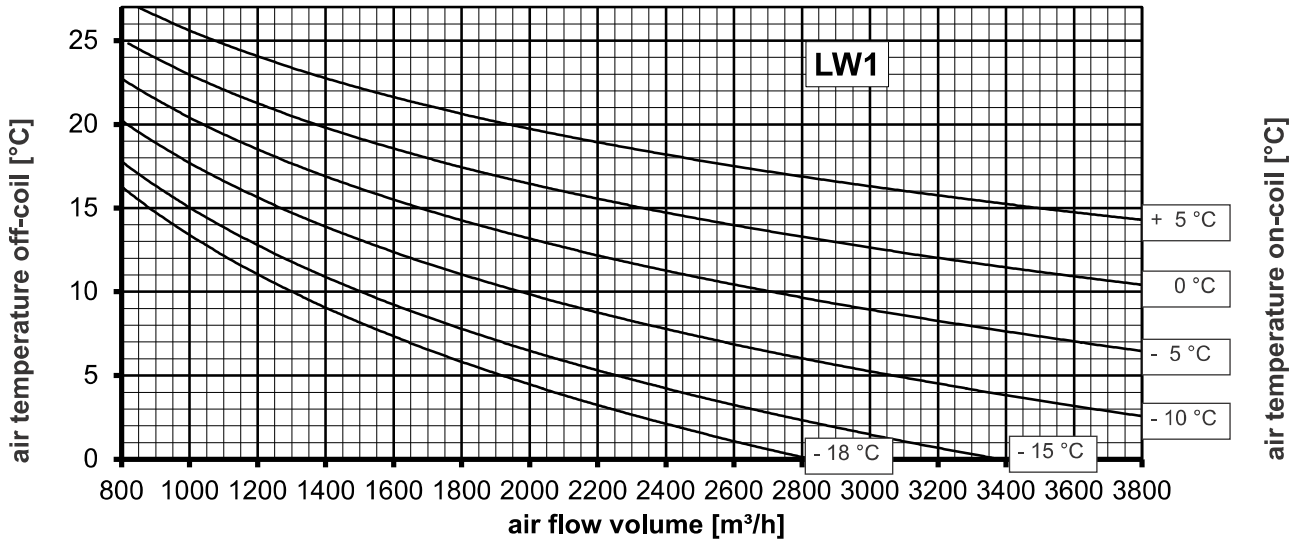
Heating performance for water temperature on-/off-coil 55/45°C



Flat Series
Size: 4

Air Heater Unit LW
 for medium pump circulated water

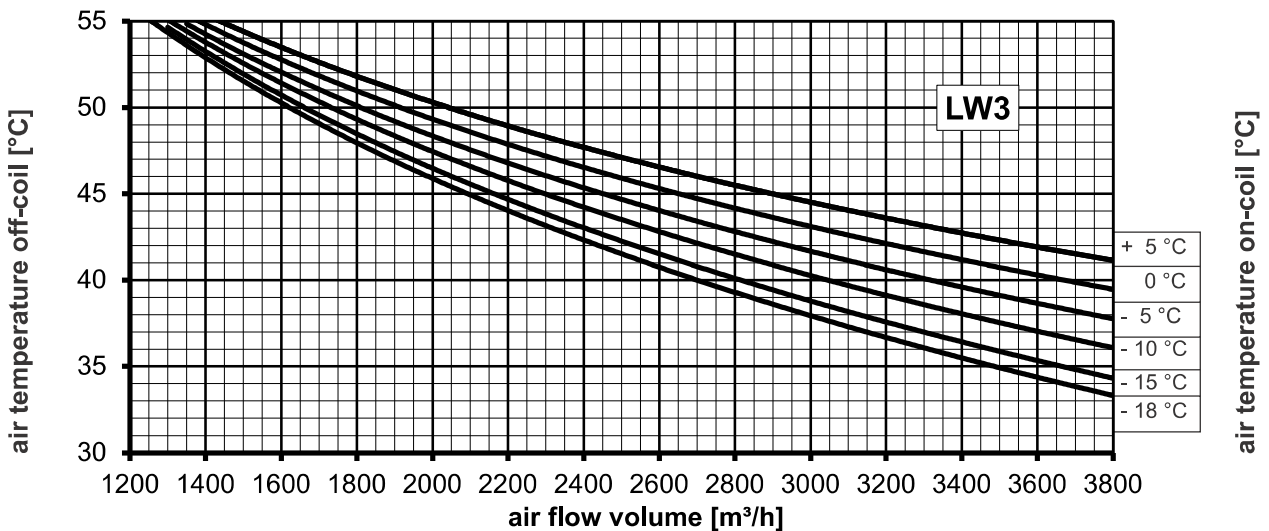
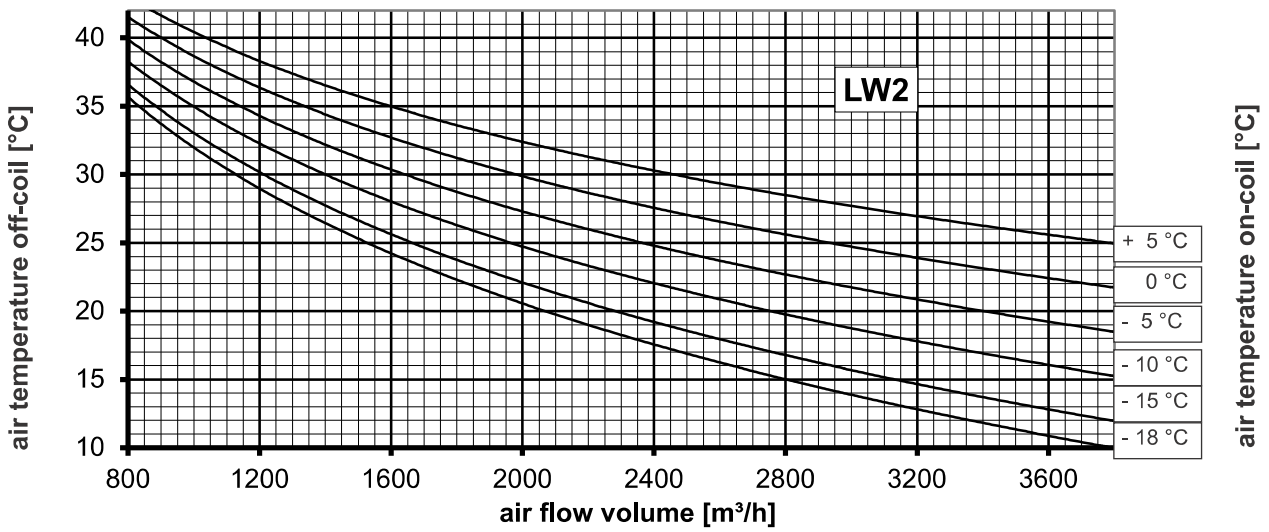
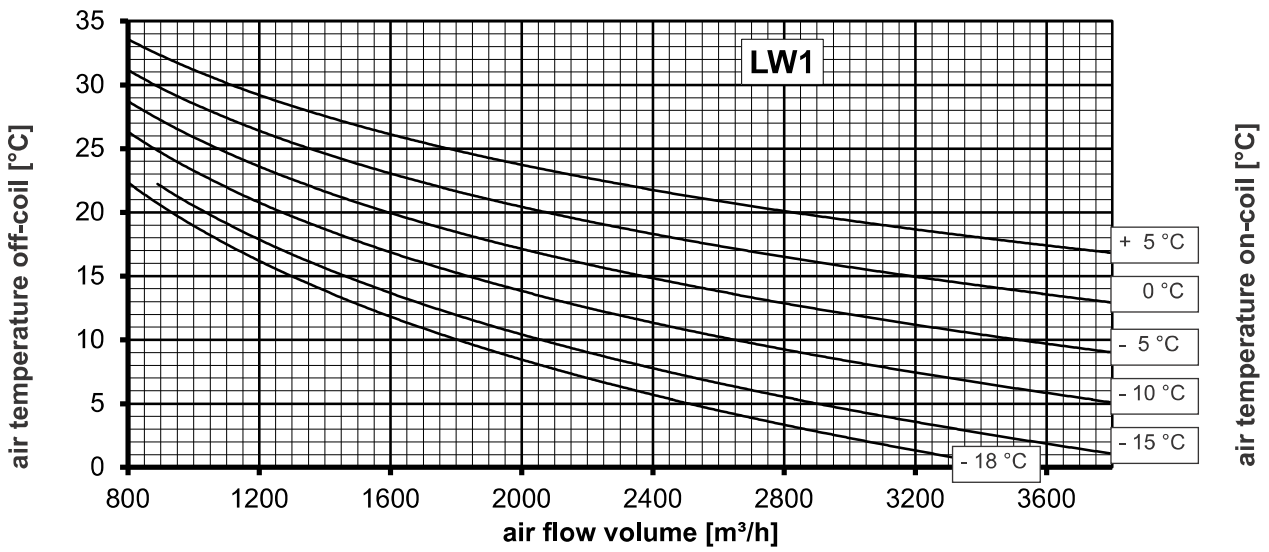
Heating performance for water temperature on-/off-coil 70/50°C



Flat Series
Size: 4

Air Heater Unit LW
 for medium pump circulated water

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



Flat Series

Size: 4, Module depth 1350 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:

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

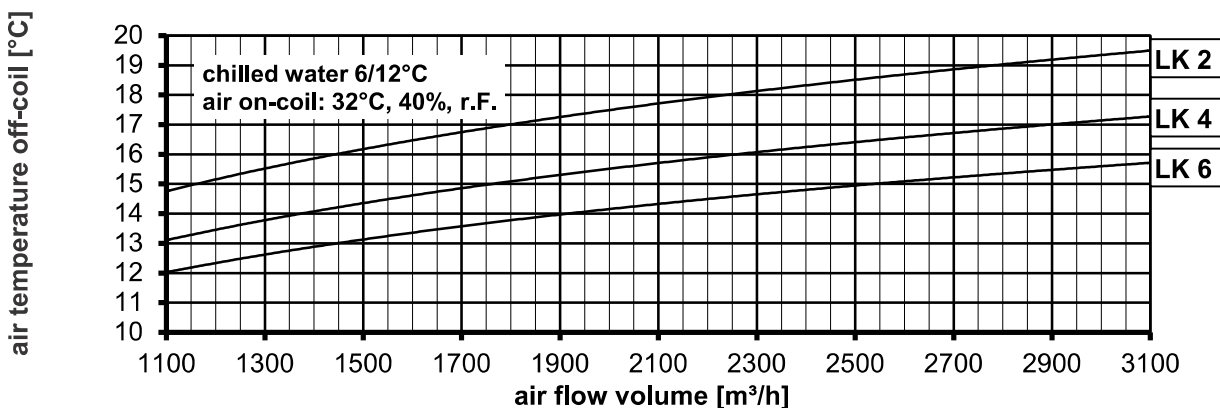
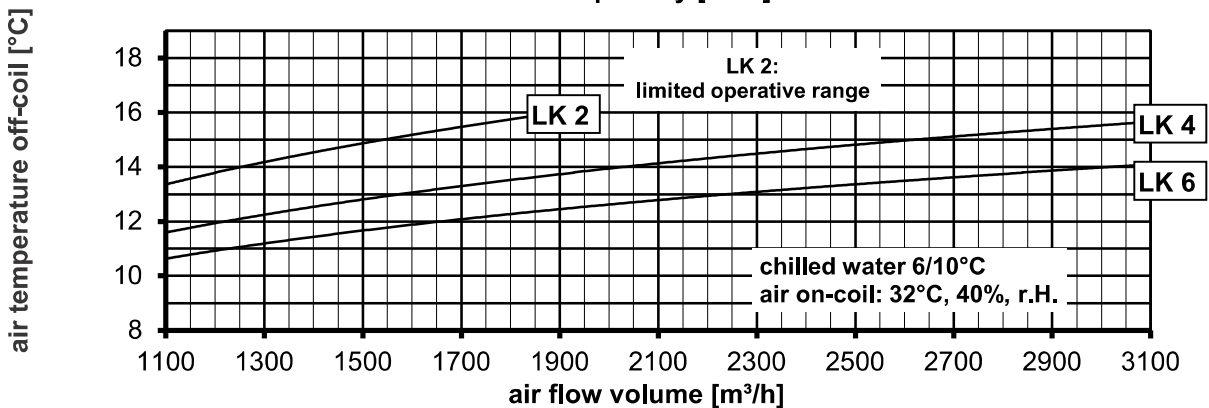
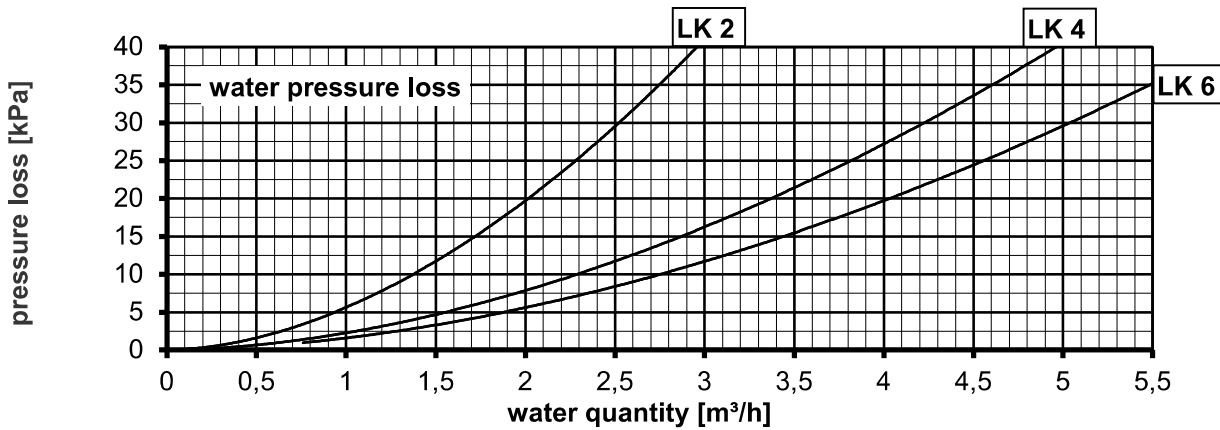
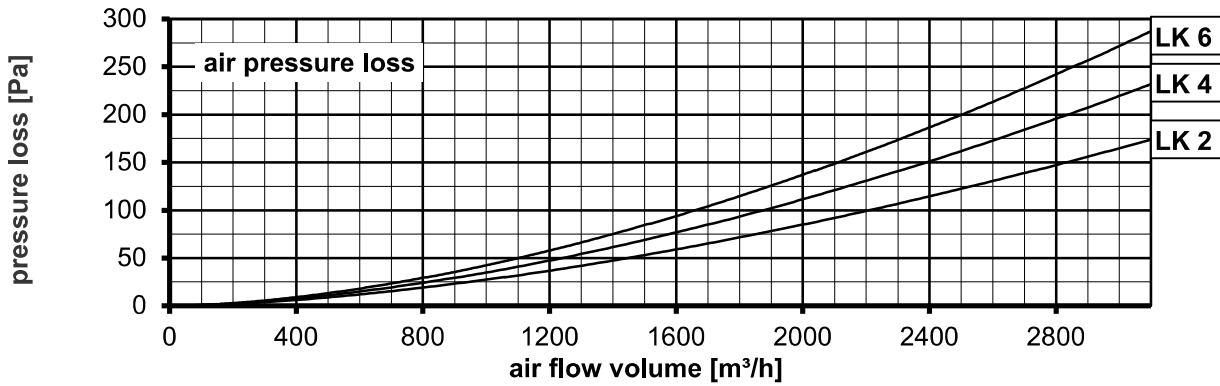
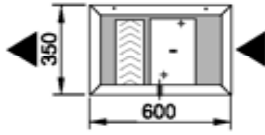
\dot{Q}_h = cooling performance [KW]

\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



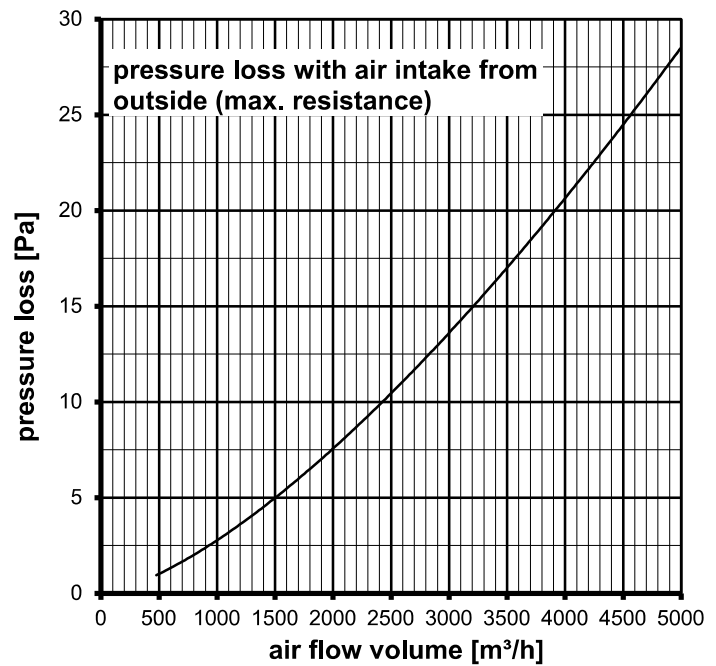
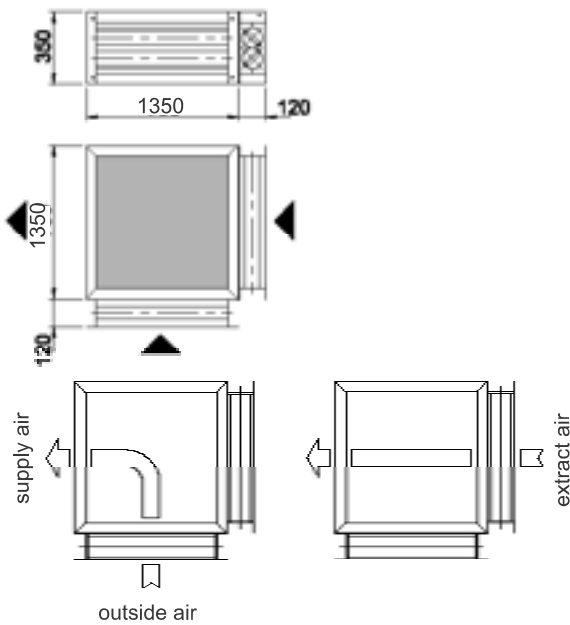
Flat Series

Size: 4, Module depth 1350 mm

The unit sides marked by arrow are open!

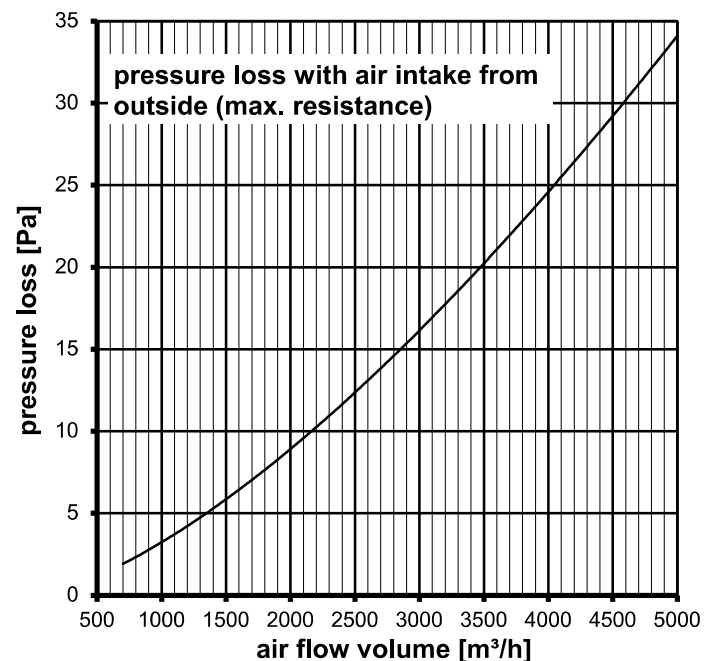
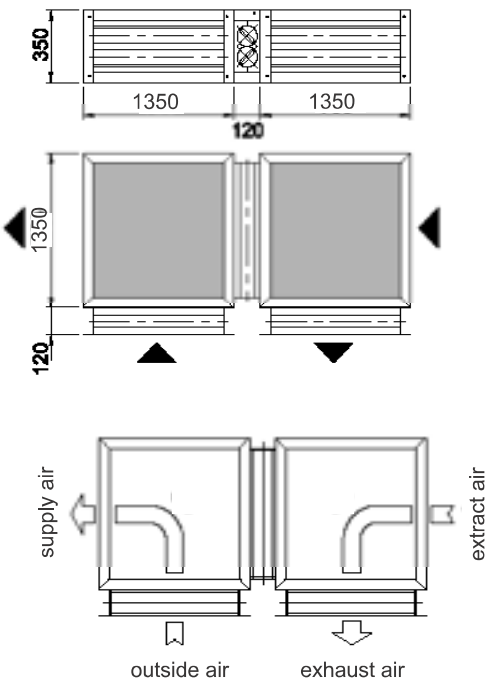
Air Mixer Unit LM

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



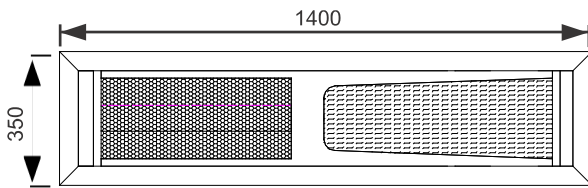
Note for units type LM and CLM:

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: 4, Module depth 1350 mm

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

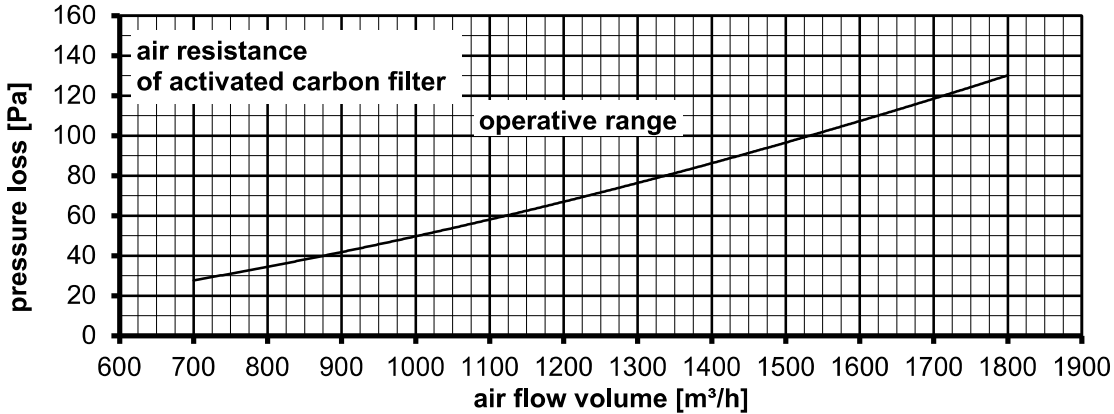


equipped with:

1. Activated carbon filter with 12 filter cartridges (bayonet fixing)
2. Pocket filter, quality class F7 (EU7), length 600mm

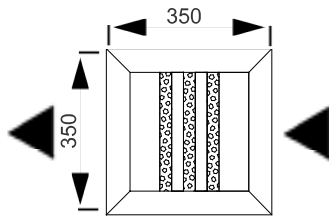
Total air resistance of combined filter unit is a sum of pressure drops of the filter steps 1 and 2.

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).



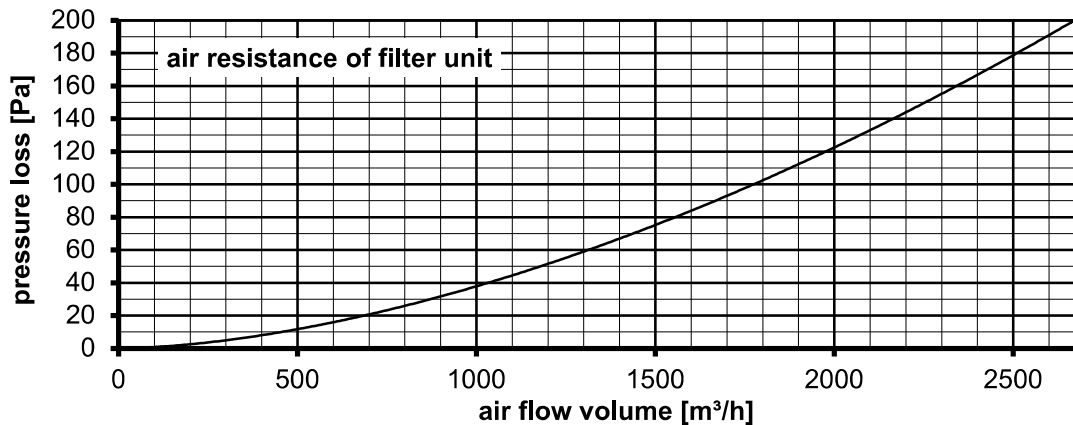
The unit sides marked by arrow are open!

Coarse Filter Unit GF



equipped with:

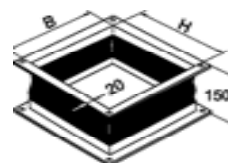
- 3 Filter steps:
- 2 Metal mat work filter and
- 1 Fibre mat filter with an exchange frame (regularly cleaning required)



Dampers and Flexible Connections



Damper type „A“: for total cross section unit 1250 mm width (B) x 310 mm height (H)



Flexible Connection: to be used for outlet- and inlet side type „A“: 1250 mm width (B) x 310 mm height (H) for total cross section of unit.

Flat Series

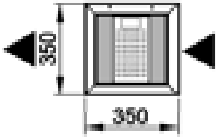
Size: 4, Module depth 1350 mm

The unit sides marked by arrow are open!

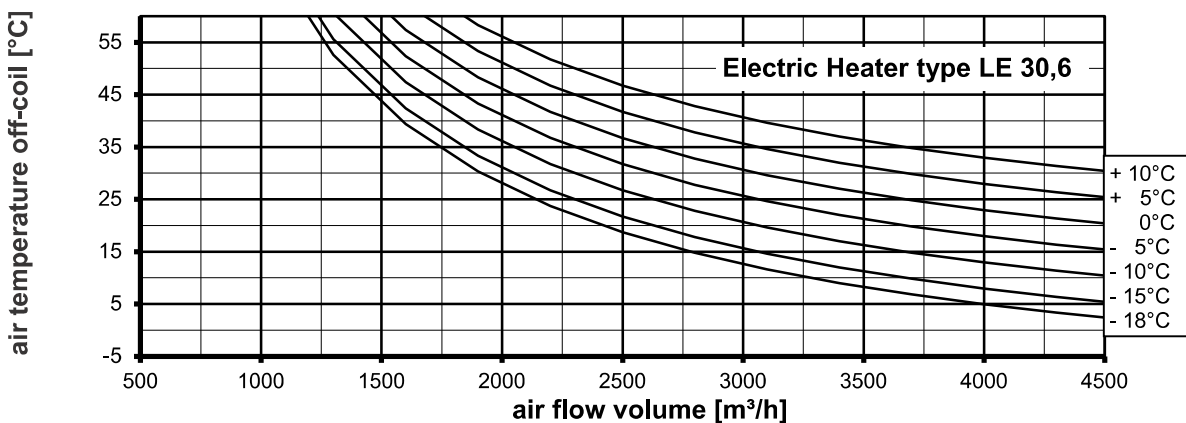
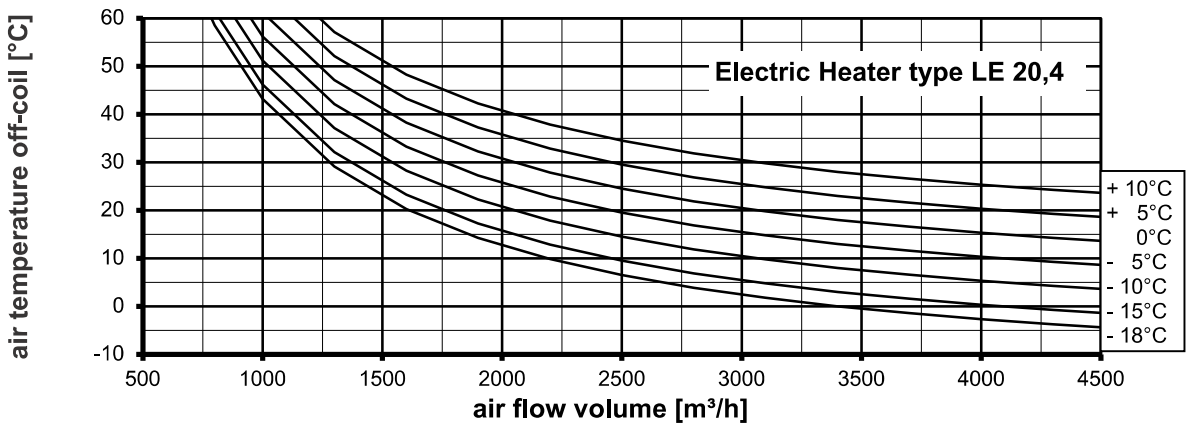
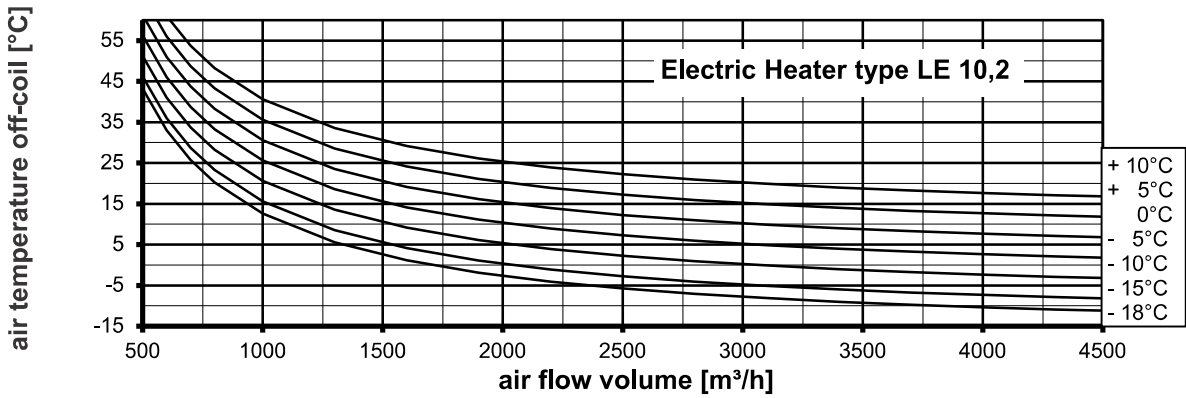
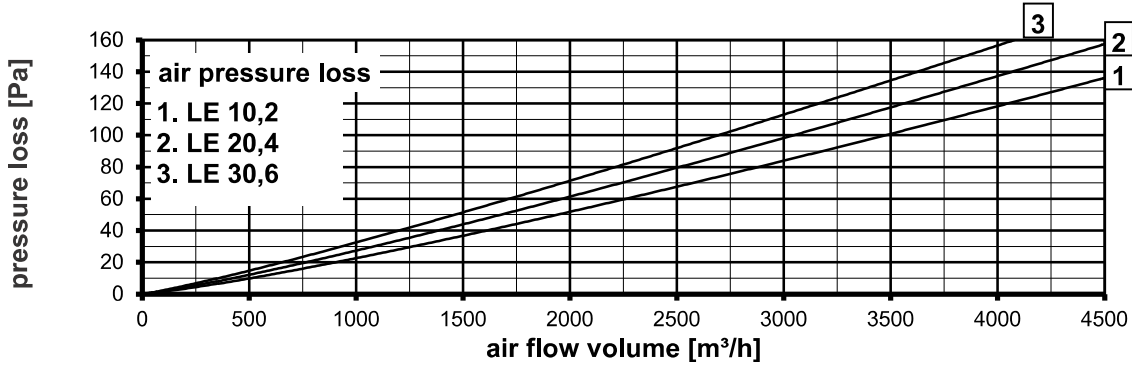
Elektrolufterhitzermodul LE

for 400V/50Hz operating voltage

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



Typ LE 10,2 (kW), 6 elements, current max. 14,7 A, 2 switching levels
 Typ LE 20,4 (kW), 12 elements, current max. 29,4 A, 3 switching levels
 Typ LE 30,6 (kW), 18 elements, current max. 44,2 A, 3 switching levels



Flat Series

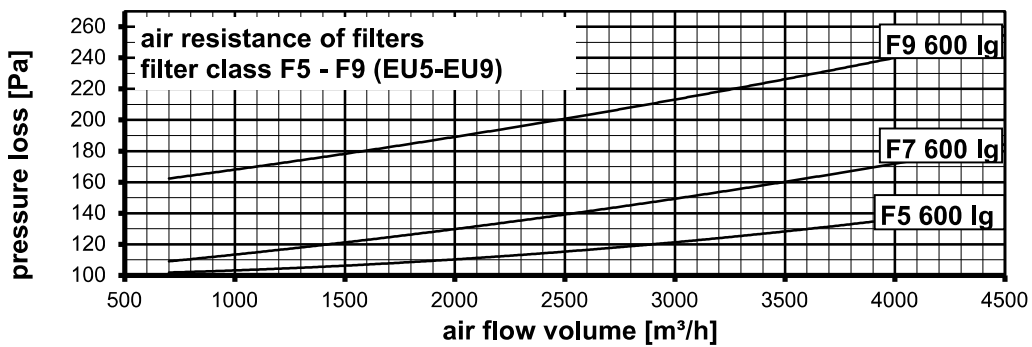
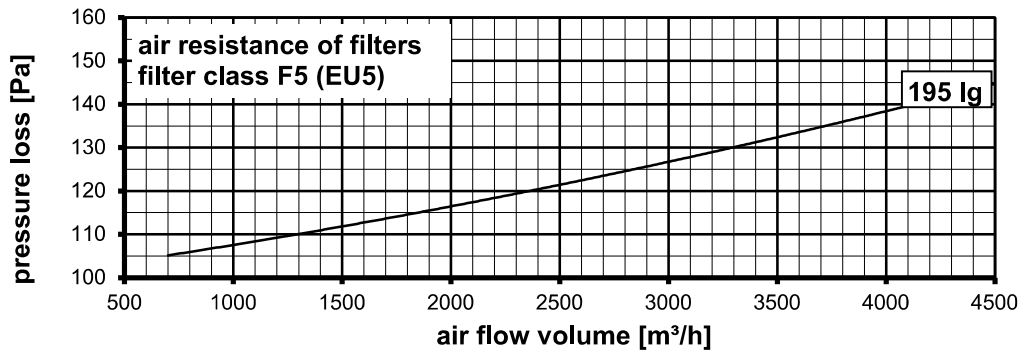
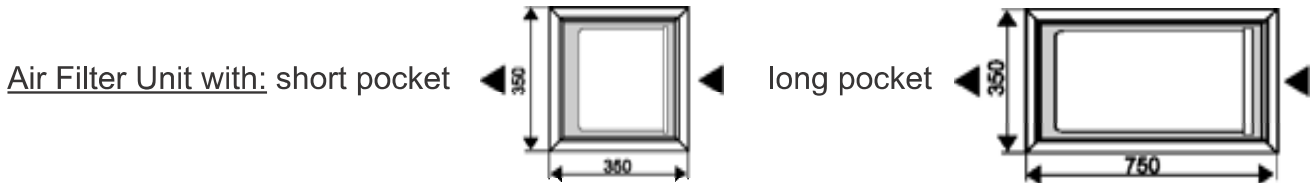
Size: 4, Module depth 1350 mm

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: 4

Sound data for Ventilator Unit VF 407 - VF 410

VF 407 Fan: CFE 931/E 80										*sound pressure level L_p in dB (A)									
										voltage [V]	80	100	125	150	170	190	230	inlet	
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
VF 408 Fan: CFE 930/D 1										*sound pressure level L_p in dB (A)									
										voltage [V]	120	180	230	280	400	inlet		discharge	
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 409 Fan: CFE 9-070/D 2										*sound pressure level L_p in dB (A)									
										voltage [V]	120	180	230	280	400	inlet		discharge	
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
VF 410 Fan: CFE 9-070/D2.5 sound data: only fan!										*sound pressure level L_p in dB (A)									
										voltage [V]	120	180	230	280	400	inlet		discharge	
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	62	58	62	60	60	56	54	49	65	120	58	59	60	61	60	56	53	49	65
180	72	72	71	71	71	69	58	61	76	180	70	71	71	73	73	67	58	62	77
230	75	78	75	75	77	74	72	68	81	230	74	75	74	76	77	73	71	67	81
280	80	84	78	78	82	78	77	72	85	280	78	81	80	80	81	77	75	71	84
400	81	87	79	80	83	81	82	77	88	400	81	83	81	82	83	81	78	75	87