

Page 1	Standard Series Calculation of external available Pressure														
	Size: 1														
Air flow volume [m³/h]		400	600	800	1000	1200	1400	1600	1800	2000	2400	2800	3200	3600	
1. Step	<b>1. Criterion flow velocity (Ref. 20°C)</b>		<i>Do not design units in conditions acc. to white areas!</i>												
	<b>Supply Unit with air conditioning elements:</b>														
	Flow velocity related to <b>Cross section of filter (long)</b>	[m/s]	0,41	0,62	0,82	1,03	1,23	1,44	1,64	1,85	2,05	2,47	2,88	3,29	3,7
	Flow velocity related to <b>Finned surface of heater</b>	[m/s]	0,70	1,10	1,40	1,80	2,10	2,50	2,80	3,20	3,50	4,20	4,90		
	Flow velocity related to <b>Finned surface of cooler</b>	[m/s]	0,80	1,20	1,50	1,90	2,30	2,70	3,10	3,50	3,90	4,70			
<b>Extract Unit without air conditioning elements:</b>															
Flow velocity related to <b>Inner cross section of unit</b>	[m/s]	0,41	0,62	0,82	1,03	1,23	1,44	1,64	1,85	2,05	2,47	2,88	3,29	3,70	
2. Step	<b>2. Pressure Calculation</b>		<b>Available statical pressure [Pa] at rated voltage</b> without consideration of pressure regain!												
	Ventilator Unit	VN 101	357	345	332	319	303	286	266	242	213	140	40		
		VN 102	413	401	388	373	357	340	319	296	269	204	119	12	
		VN 103	486	483	278	470	459	444	425	402	374	302	208	88	
		VN 104	480	482	482	478	472	463	450	433	411	355	278	178	53
	<i>The following air conditioning elements reduce pressure available!</i>														
			<b>Pressure loss [Pa] at above stated air volume</b>												
	Pocket filter F5 Short filter (195 mm pocket)	Calculated resistance	104	106	109	111	114	116	119	122	126	132	140		
		Clean resistance	8	13	17	22	27	33	39	45	51	65	79		
	Recommended final resistance: 200 - 300 Pa <b>To ensure long filter life time please dimension the unit with consideration of „Calculated resistance“</b>														
Pocket filter F5 Long filter (600 mm pocket)	Calculated resistance	not to be used in size 1													
	Clean resistance	not to be used in size 1													
Pocket filter F7 Long filter (600 mm pocket)	Calculated resistance	108	112	117	122	127	133	139	145	151	165	180			
	Clean resistance	16	25	34	44	55	66	77	90	102	130	159			
only to be used together with activated carbon filter															
Pocket filter F9 Long filter (600 mm pocket)	Calculated resistance	not to be used in size 1													
	Clean resistance	not to be used in size 1													
Air Heater LW Medium: PWW (pump circulated hot water)	LW 1	4	7	11	16	22	29	35	43	51	69	89			
	LW 2	6	12	20	29	39	50	63	76	90	122	157			
	LW 3	8	16	25	7	50	65	81	98	118	160	207			
<b>Subtotal</b> External statical pressure [Pa] available															

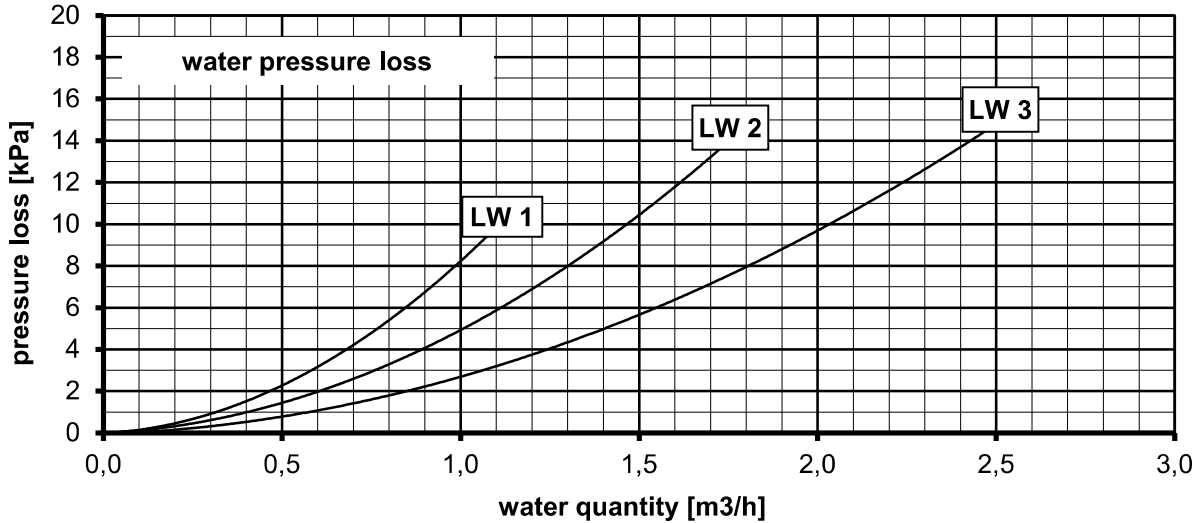
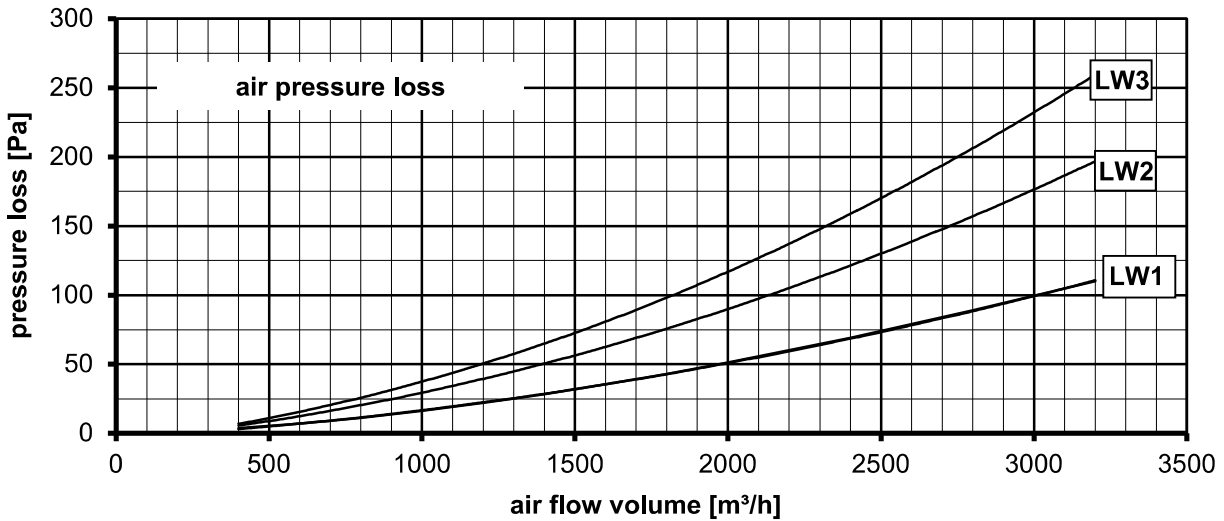
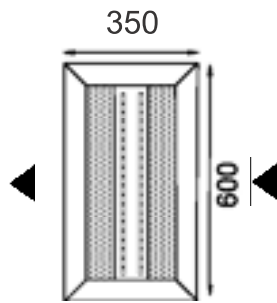
<b>Page 2</b>	<b>Standard Series</b>		<b>Calculation of external available Pressure</b>											
	<b>Size: 1</b>		<b>400</b>	<b>600</b>	<b>800</b>	<b>1000</b>	<b>1200</b>	<b>1400</b>	<b>1600</b>	<b>1800</b>	<b>2000</b>	<b>2400</b>	<b>2800</b>	<b>3200</b>
	<b>Air Flow Volume</b>	[m <sup>3</sup> /h]												

<b>2. Step</b>	<b>2. Pressure calculation</b> <i>The following air conditioning elements reduce pressure available!</i>														
	<b>Subtotal of page before</b> of external available statical pressure [Pa]														
			<b>Pressure loss [Pa] at above stated air volume</b>												
	<b>Air Cooler LK and LKV</b>	LK 2	9	18	29	43	58	75	94	115	137	186			
	Medium: chilled water KKW	LK 4	12	24	39	56	77	99	124	152	181	246			
		LK 6	15	30	48	70	95	123	155	189	225				
	<b>Air Cooler LKR</b>	LKR 2	11	23	37	54	74	96	120	147	176	240			
	<b>Direct Evaporating</b>	LKR 4	12	25	40	59	81	105	131	161	192	262			
	Medium: R407C, 5°C	LKR 6	19	38	62	91	124	161	203	247	296	404			
	<b>Water Eliminator</b>		3	6	10	15	21	28	36	45	55	78			
horizontal air flow (LK)															
<b>Damper</b>	<u>class type A</u>	1	1	2	2	3	4	5	6	7	9	11	14	17	
		Pressure losses to be taken into consideration only with damper on inlet side.													
<b>Air Mixer</b>	<u>class type A</u>	1	1	2	2	3	4	5	6	7	9	11	14	17	
<b>LJ, LM, CLM</b>		Pressure losses to be taken into consideration only with air mixer on inlet side.													
<b>Plate heat Exchange APD</b>		on request													
with integrated Bypass resistance calculated at 22°C/30% r. H.															
<b>Coarse Filter GF</b>	clean resistance	18	36	60	88	121	158	199	245	294					
		Regularly cleaning required!													
<b>Activated Carbon Filter AKCF</b>		13	25	41	60	82	107	134	163						
Calculated resistance same than clean resistance															
<b>Electric Air Heater LE</b>	LE 6,6	2	4	6	8	10	13	17	21	25	34	44	56	70	
Operating voltage 400V/50Hz	LE 13,1	4	7	10	14	18	23	28	34	40	54	70	88	107	
	LE 19,7	3	7	11	16	22	28	36	43	52	70	92	116	143	
<b>Total</b>															
External statical pressure [Pa] available															

**Standard Series**  
**Size: 1, Module depth 600 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:

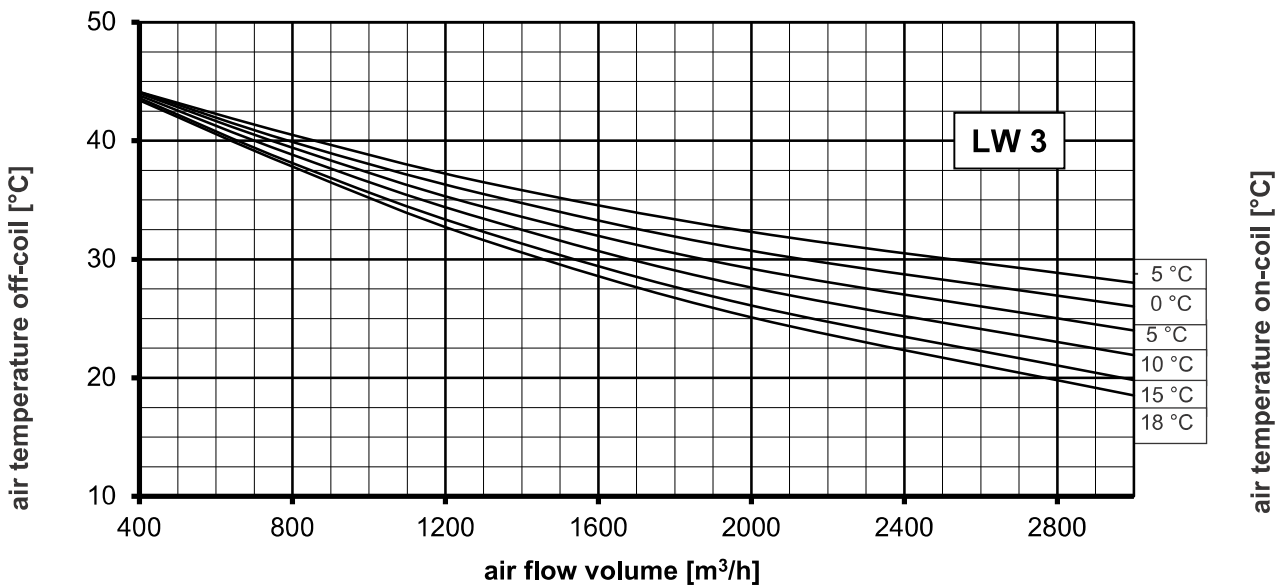
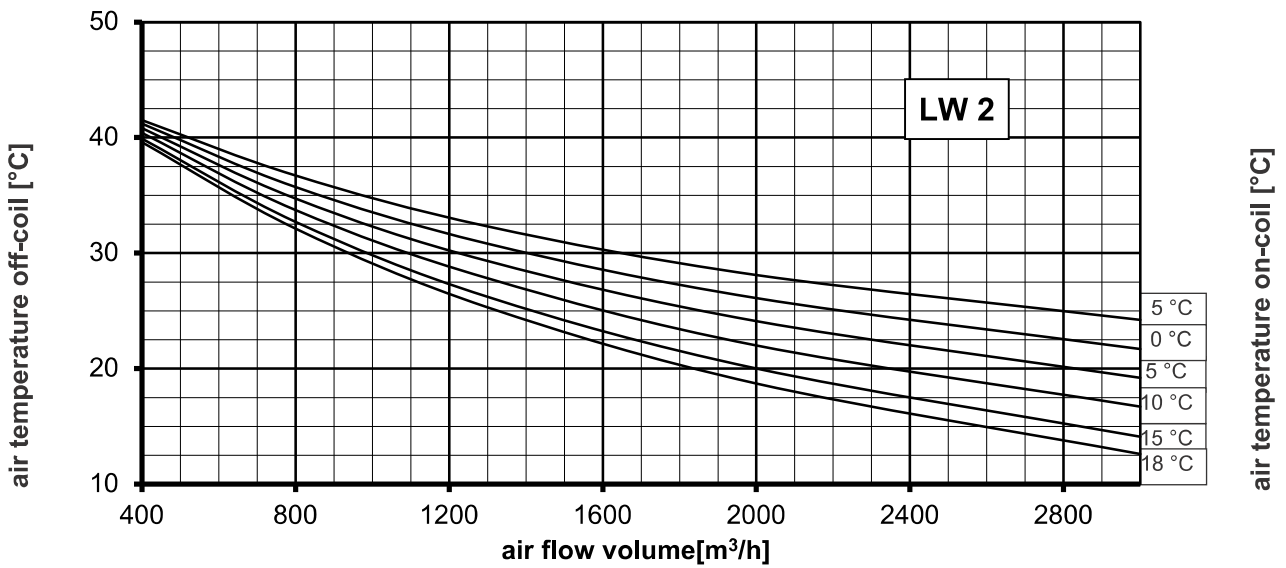
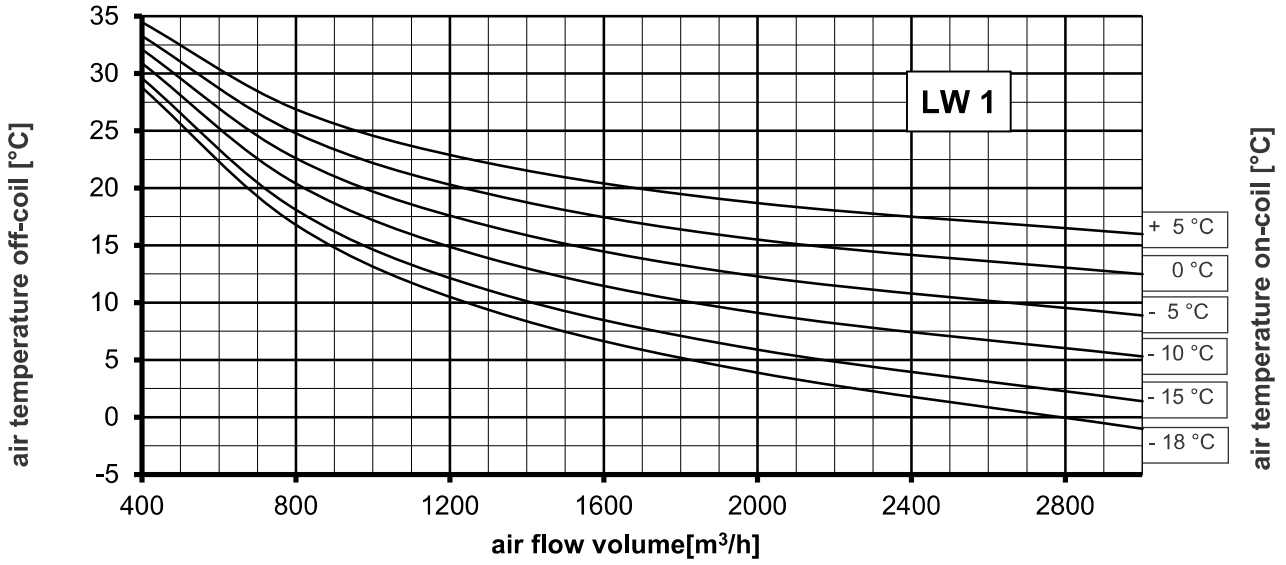
$$\dot{Q}_h [\text{kW}] = \dot{V}_L / 3600 \times (t_{LA} - t_{LE}) \times \rho_L \times c_{pL}$$

- $\dot{Q}_h$  = 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]
- $\rho_L$  = specific weight of air = 1,2 [kg/m³]
- $c_{pL}$  = specific heat capacity of air = 1,0 [kJ/kg K]

**Standard Series**  
**Size: 1**

**Air Heater Unit LW**  
 for medium pump circulated water

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



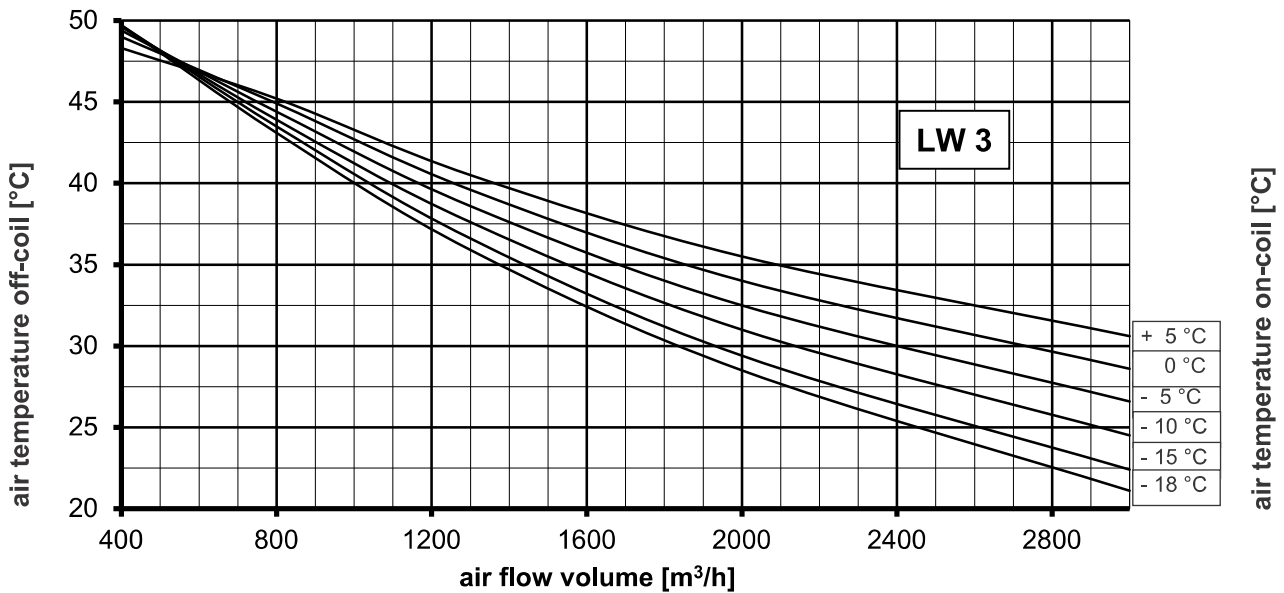
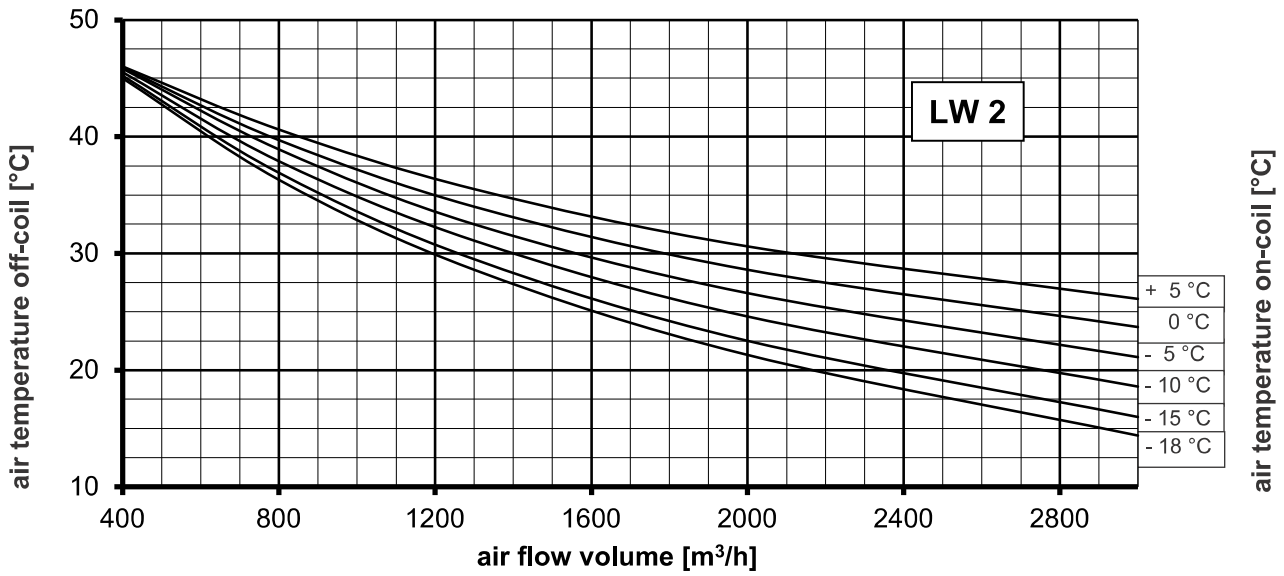
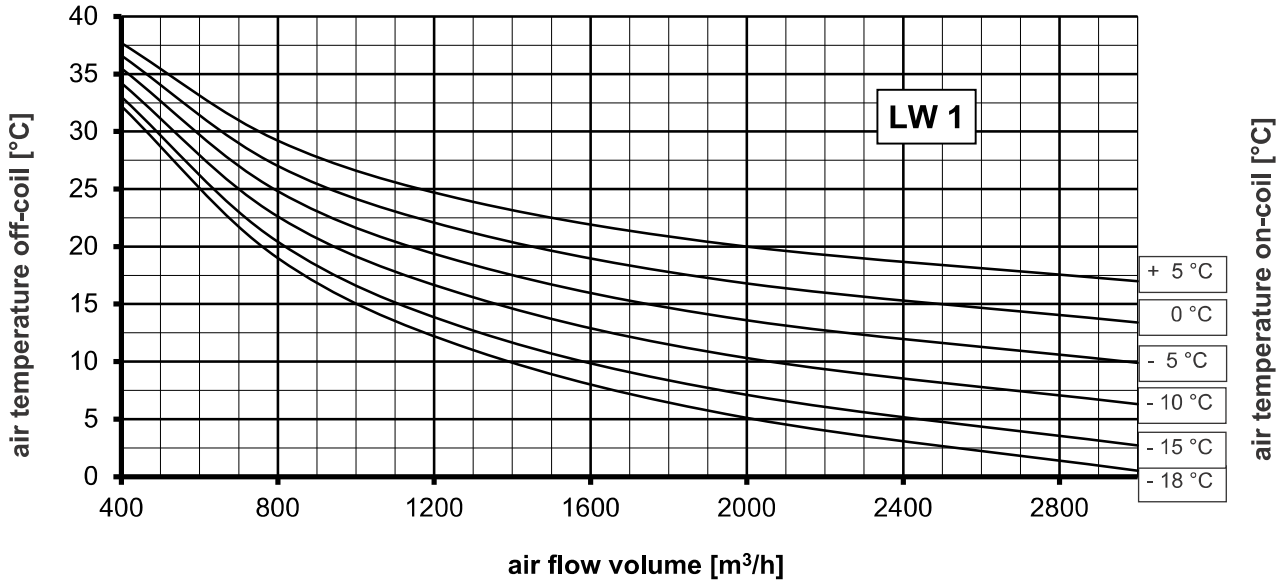
**Standard Series**

**Size: 1**

**Air Heater Unit LW**

for medium pump circulated water

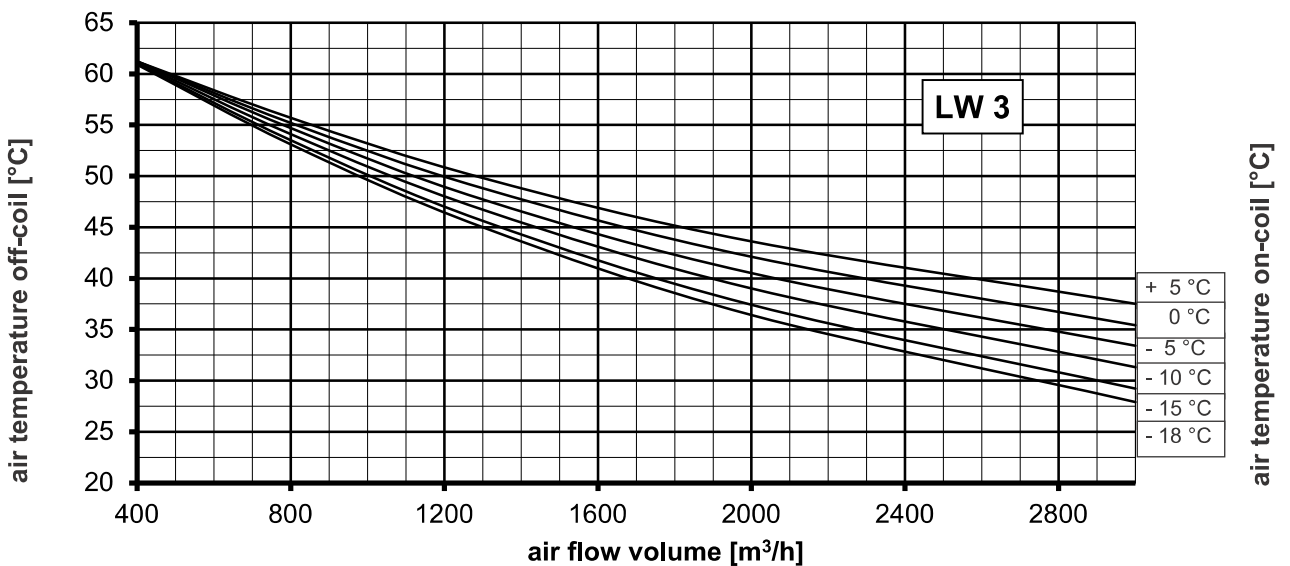
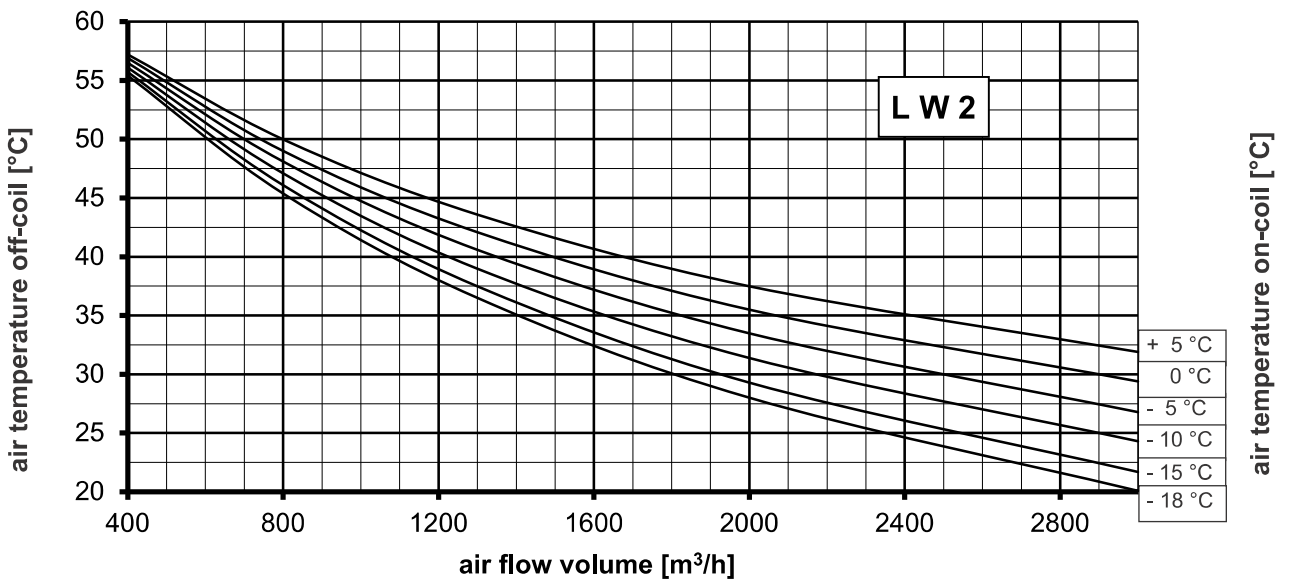
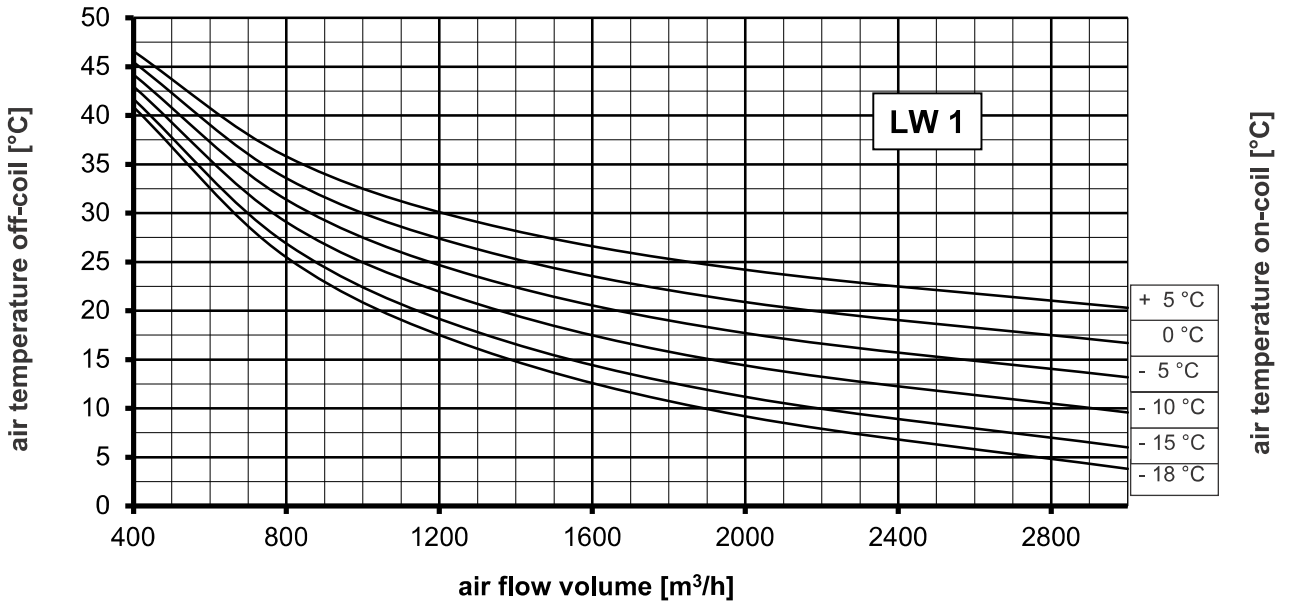
Heating performance for water temperature on-/off-coil 70/50°C



**Standard Series**  
**Size: 1**

**Air Heater Unit LW**  
 for medium pump circulated water

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



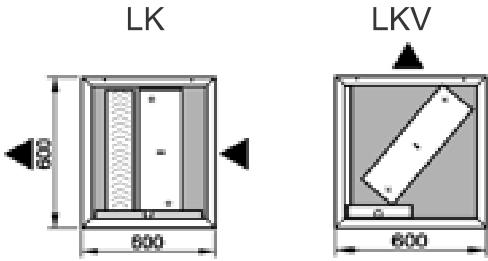
**Standard Series**  
**Size: 1, Module depth 600 mm**

The unit sides marked by arrow are open!

**Air Cooler Units LK and LKV**

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:

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

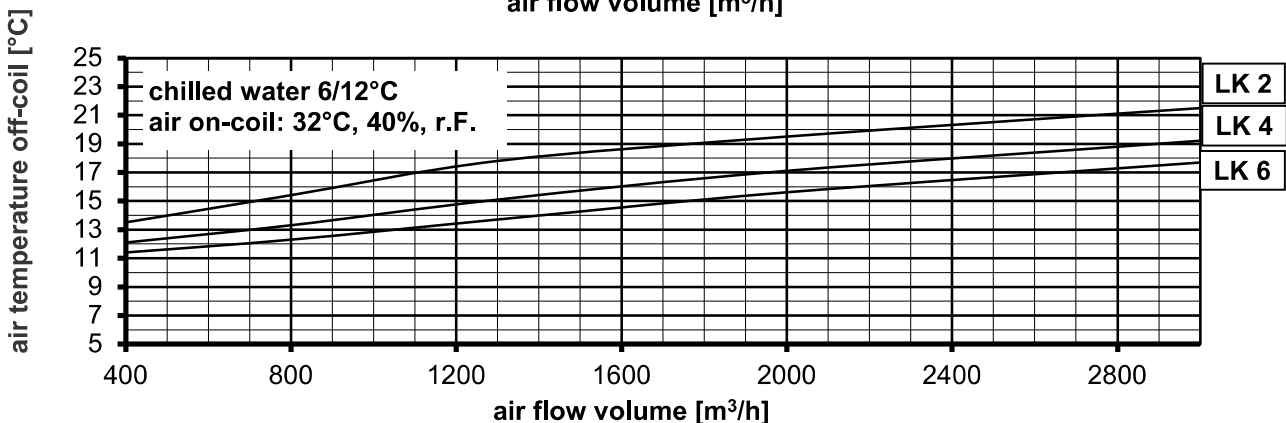
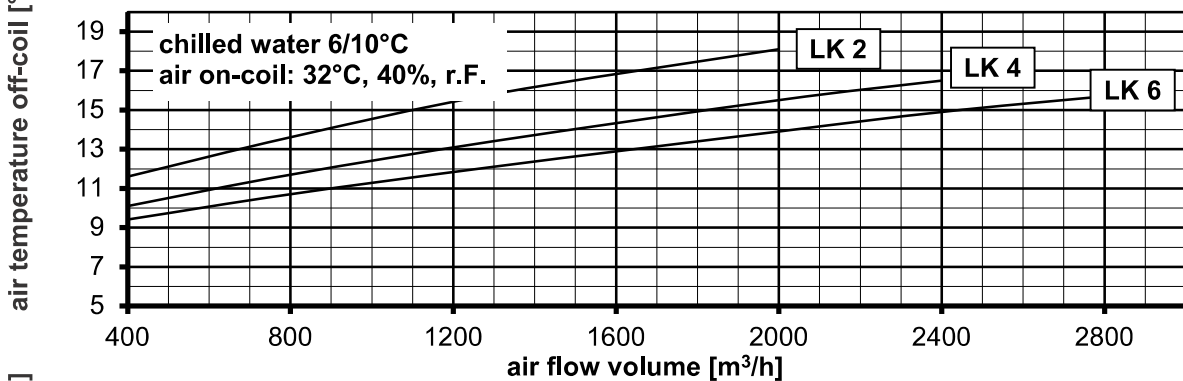
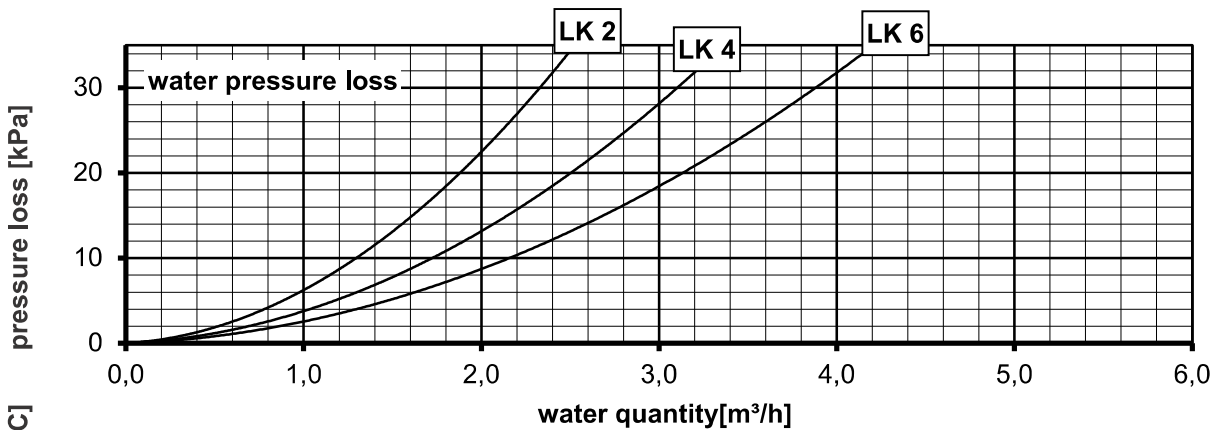
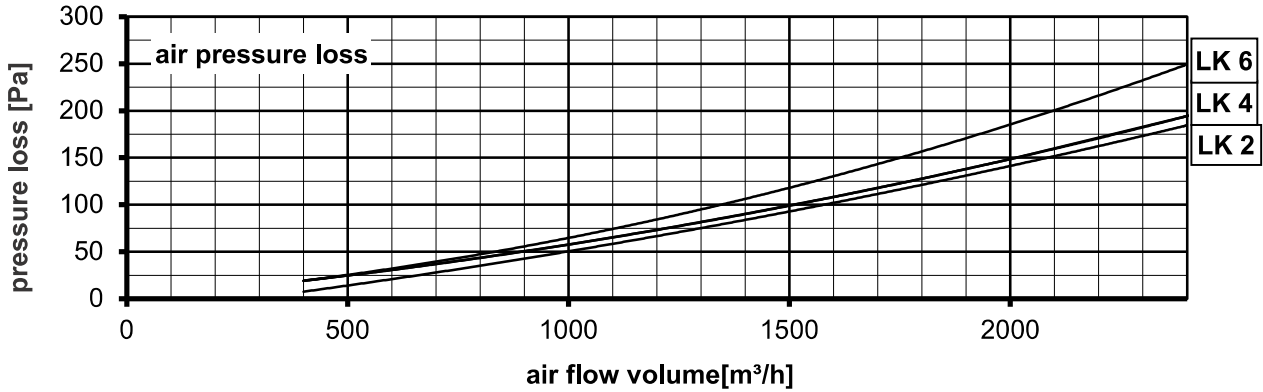
$\dot{Q}_h$  = cooling performance [KW]

$\dot{V}_w$  = quantity of water [m<sup>3</sup>/h]

$\Delta t_w$  = water temperature difference [Kelvin] (4K at 6/10°C or 6K at 6/12°C)

$\rho_w$  = specific weight of water = 1000 [kg/m<sup>3</sup>]

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



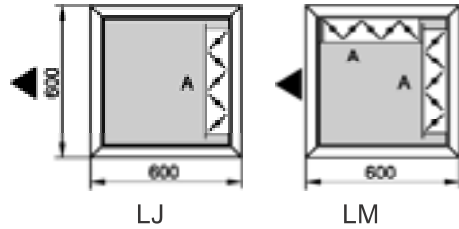
**Standard Series**

**Size: 1, Module depth 600 mm**

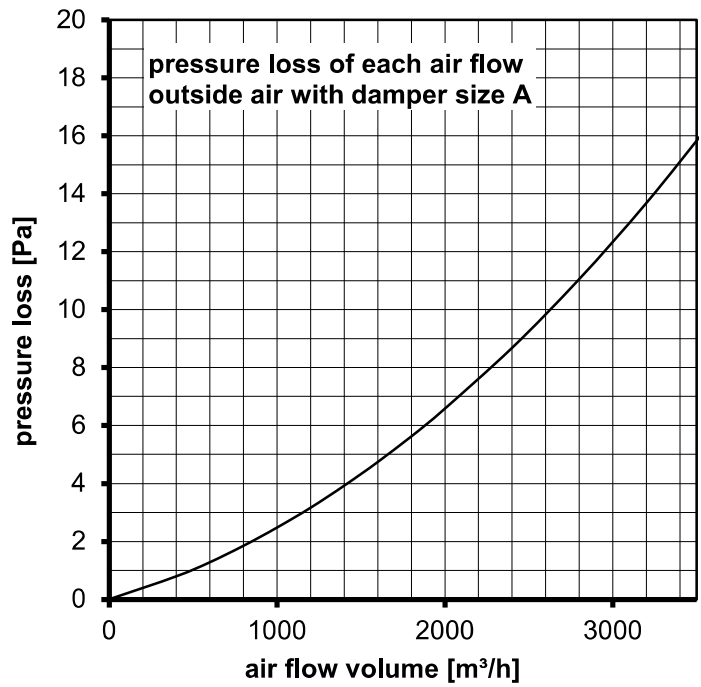
The unit sides marked by arrow are open!

**Air Mixer Unit LJ and LM**

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

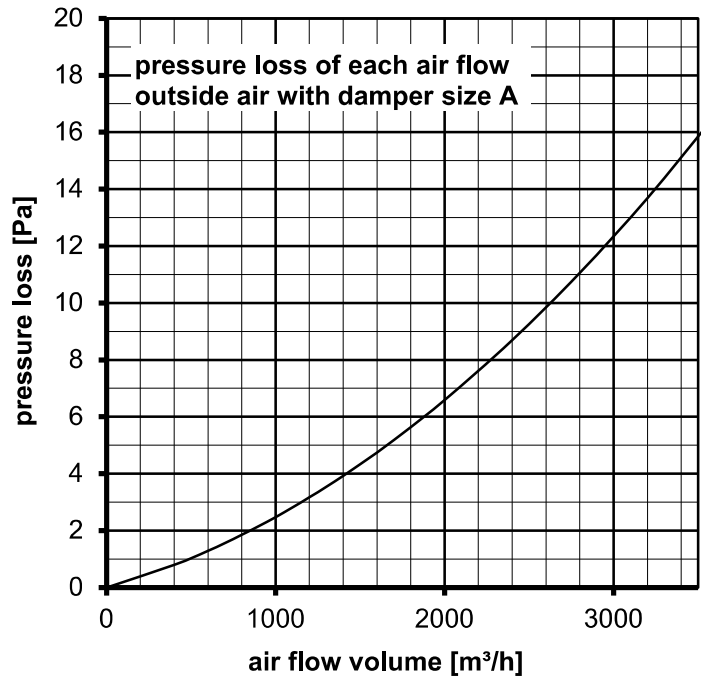
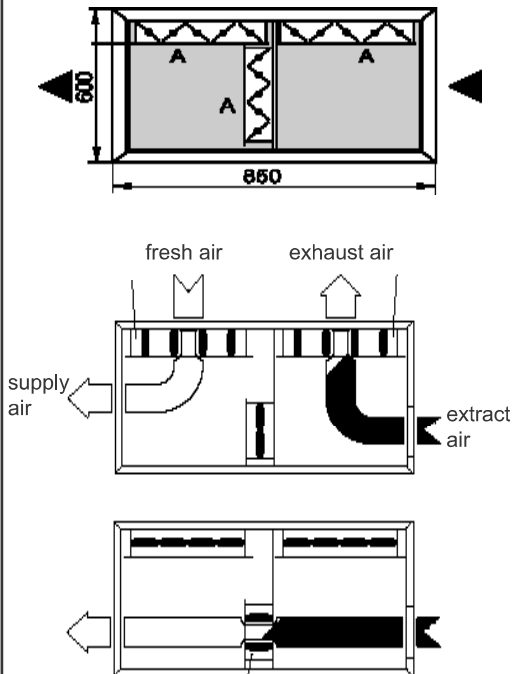


Damper size A: 512 x 512 mm inner size



**Air Mixer Unit CLM**

for AHU with supply and extract air arranged in row



**Note for units type LJ, LM and CLM:**

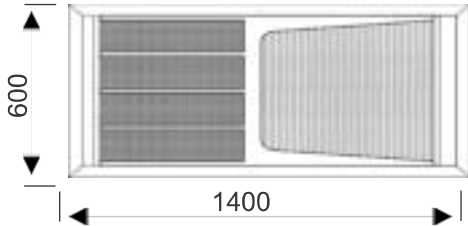
Pressure loss of Air Mixing Units is calculated on base „free air“. That means, for connected duct of same cross section no additional dynamical intake losses have to be considered.

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.



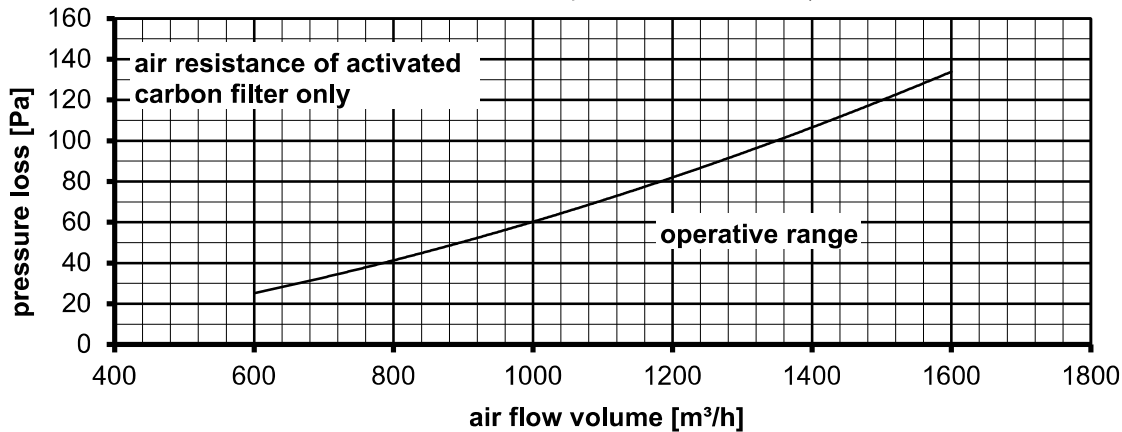
**Standard Series**  
**Size: 1, Module depth 600 mm**

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



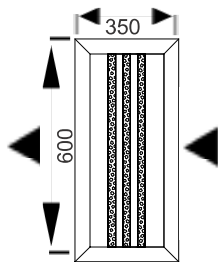
equipped with:

1. Activated carbon filter with 9 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).



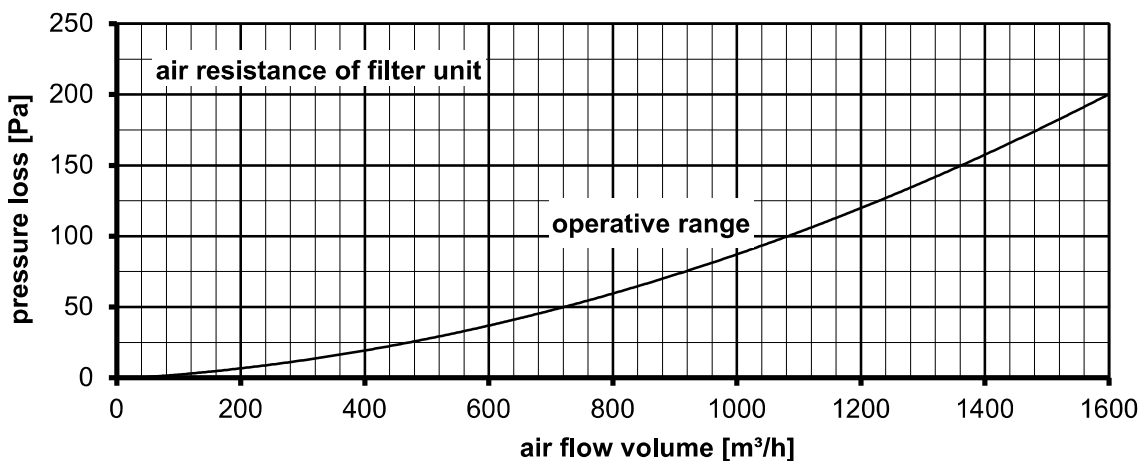
The unit sides marked by arrow are open!

**Coarse Filter Unit GF**

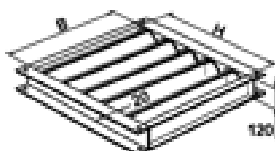


equipped with:

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



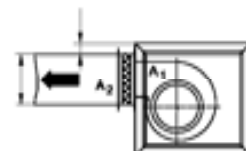
**Dampers and Flexible Connections**



Damper type „A“: for total cross section unit 512 mm width (B) x 512 mm height (H)



Flexible Connection: to be used for outlet- and inlet side type „A“: 512 mm width (B) x 512 mm height (H) for total cross section of unit.



**Standard Series**

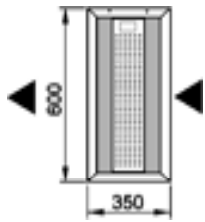
**Size: 1, Module depth 600 mm**

The unit sides marked by arrow are open!

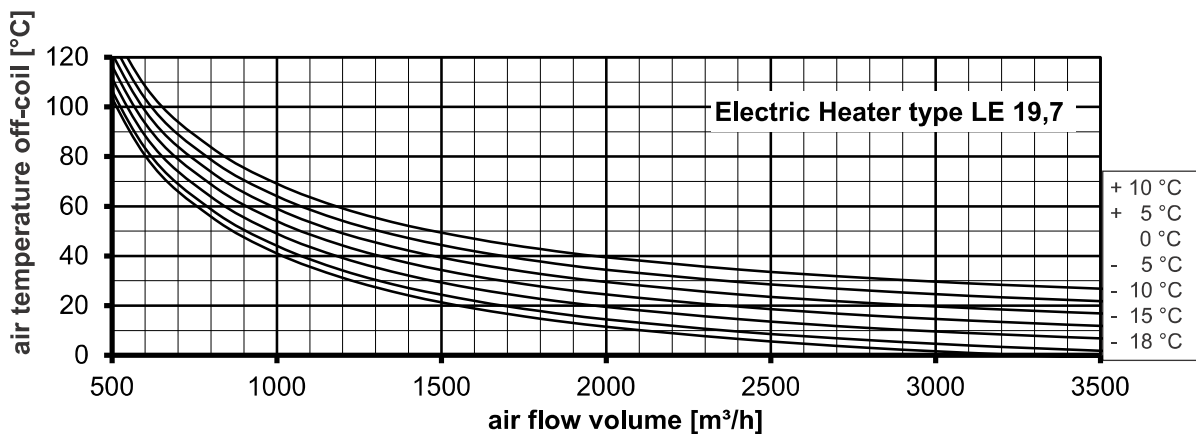
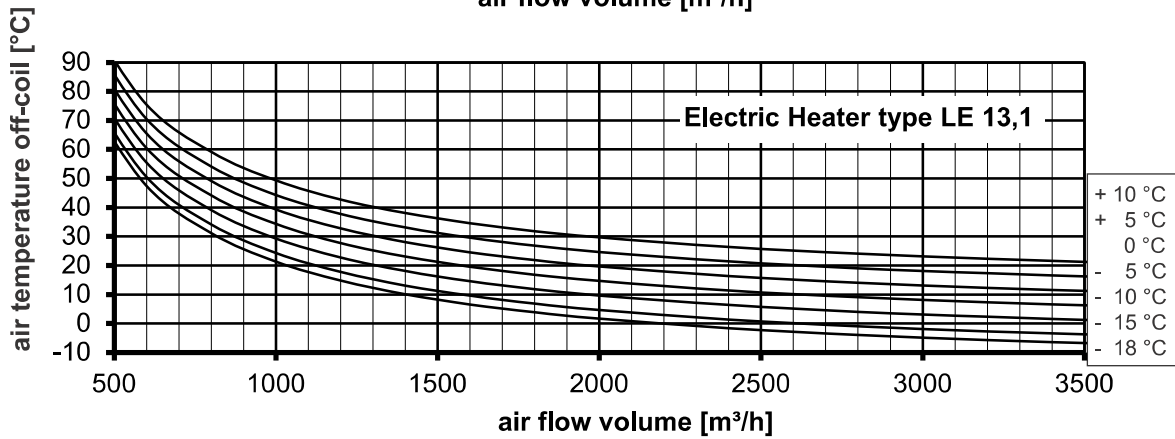
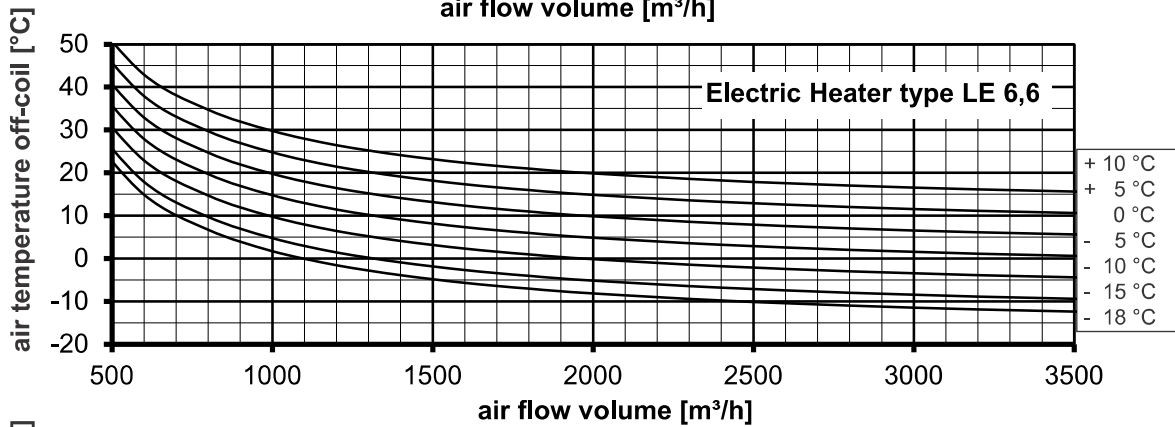
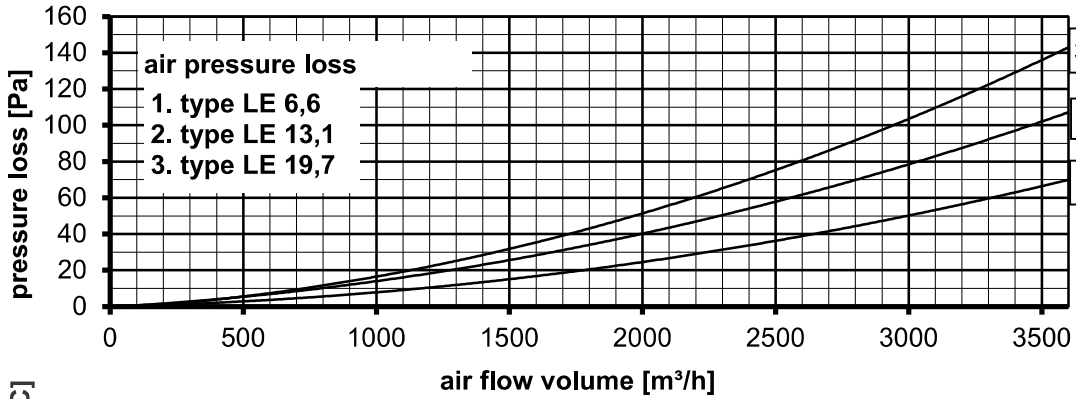
**Electric Air Heater Unit LE**

for 400V/50Hz operating voltage

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



Type LE 6,6 (kW), 8 elements, current max. 9,5 A, 3 switching levels  
 Type LE 13,1 (kW), 16 elements, current max. 19,0 A, 3 switching levels  
 Type LE 19,7 (kW), 24 elements, current max. 28,4 A, 3 switching levels



air temperature on-coil [°C]

air temperature on-coil [°C]

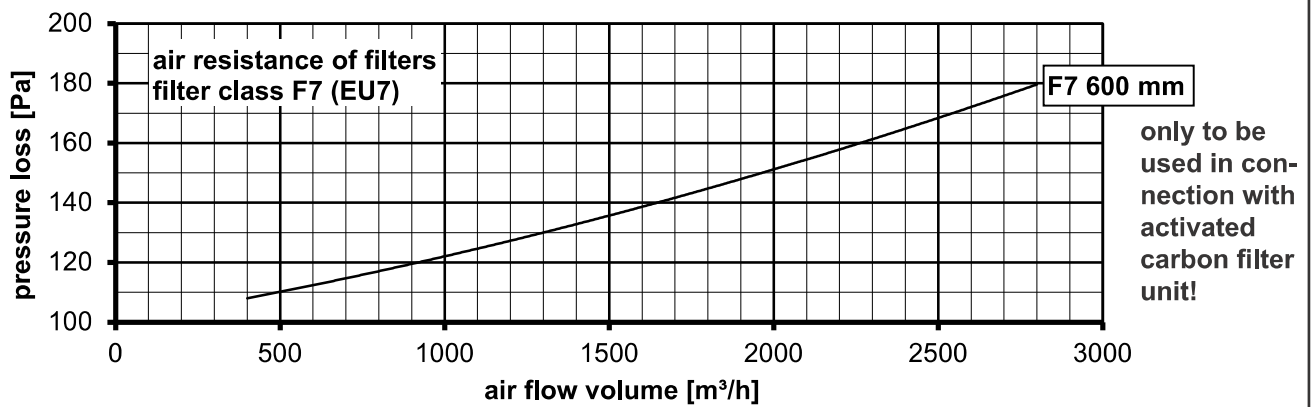
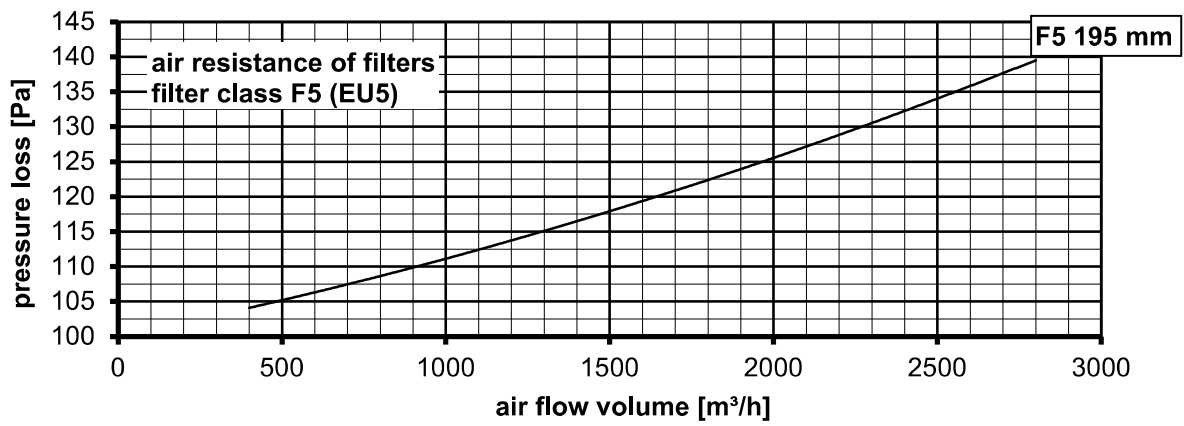
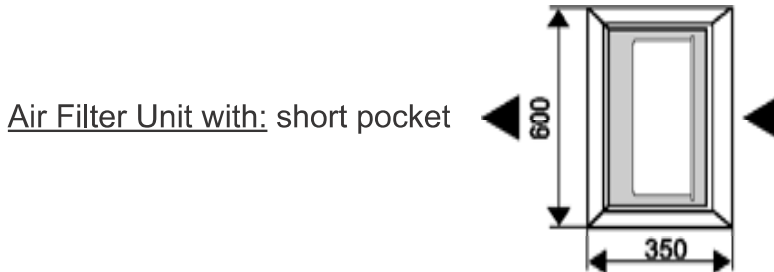
air temperature on-coil [°C]

**Standard Series**  
**Size: 1, Module depth 600 mm**

**Air Filter Unit KFS**  
with short pocket (195mm)

The unit sides marked by arrow are open!

Technical data and resistance:



**Standard Series**  
**Size: 1**

**Sound data for Ventilator Unit VN 101 - VN 103**

**VN 101 Fan: D 540/E 25**

*sound pressure level $L_p$ in dB (A)							
voltage [V]	80	100	125	150	170	190	230
<b>inlet</b>	40	46	53	58	61	63	66
<b>discharge</b>	41	48	54	60	63	65	68

\* related to room absorption of 8 db (25m<sup>2</sup> 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		
<b>80</b>	46	41	41	46	43	38	37	32	48	<b>80</b>	47	43	43	48	44	40	38	33	49		
<b>100</b>	51	47	48	52	49	45	43	39	54	<b>100</b>	52	49	49	54	51	46	45	40	56		
<b>125</b>	56	54	54	59	56	52	50	46	61	<b>125</b>	58	56	56	60	58	54	52	47	62		
<b>150</b>	60	59	59	63	61	58	56	51	66	<b>150</b>	62	61	61	65	63	59	57	53	67		
<b>170</b>	63	62	62	66	65	61	59	54	69	<b>170</b>	64	64	64	68	66	63	61	56	71		
<b>190</b>	64	64	64	68	67	63	61	56	71	<b>190</b>	66	66	66	70	69	65	63	58	73		
<b>230</b>	67	67	67	71	70	66	64	59	74	<b>230</b>	69	69	69	73	72	68	66	61	76		

**VN 102 Fan: D 640/E 35**

*sound pressure level $L_p$ in dB (A)							
voltage [V]	80	100	125	150	170	190	230
<b>inlet</b>	40	48	56	61	64	66	68
<b>discharge</b>	42	49	57	63	66	68	70

\* related to room absorption of 8 db (25m<sup>2</sup> 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		
<b>80</b>	46	42	42	47	43	39	37	33	48	<b>80</b>	48	43	43	48	45	40	39	34	50		
<b>100</b>	52	49	49	54	51	47	45	40	56	<b>100</b>	54	50	51	55	52	48	47	42	57		
<b>125</b>	58	57	57	61	59	55	53	49	63	<b>125</b>	60	58	59	63	61	57	55	50	65		
<b>150</b>	63	62	62	66	65	61	59	54	69	<b>150</b>	64	64	64	68	66	63	61	56	71		
<b>170</b>	65	65	65	69	68	64	62	57	72	<b>170</b>	67	67	67	71	70	66	64	59	74		
<b>190</b>	67	67	67	71	70	67	65	60	74	<b>190</b>	69	69	69	73	72	68	66	62	76		
<b>230</b>	69	69	69	73	72	69	67	62	76	<b>230</b>	70	71	71	75	74	71	69	64	78		

**VN 103 Fan: DS 6-740/E 35**

*sound pressure level $L_p$ in dB (A)							
voltage [V]	80	100	125	150	170	190	230
<b>inlet</b>	40	46	53	57	60	62	65
<b>discharge</b>	44	51	57	62	65	67	70

\* related to room absorption of 8 db (25m<sup>2</sup> 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		
<b>80</b>	45	41	41	46	43	39	37	32	48	<b>80</b>	50	46	46	51	47	43	42	37	52		
<b>100</b>	51	48	48	53	50	46	44	39	54	<b>100</b>	55	52	53	57	54	50	49	44	59		
<b>125</b>	55	54	54	58	56	52	50	45	61	<b>125</b>	60	58	59	63	61	57	55	50	65		
<b>150</b>	59	58	59	63	61	57	55	51	65	<b>150</b>	64	63	63	67	66	62	60	55	70		
<b>170</b>	61	61	61	65	64	60	58	53	68	<b>170</b>	66	66	66	70	69	65	63	58	73		
<b>190</b>	63	63	63	67	66	62	60	55	70	<b>190</b>	68	68	68	72	71	67	65	60	75		
<b>230</b>	65	66	66	69	69	65	63	58	73	<b>230</b>	70	71	71	74	74	70	68	63	78		

**Standard Series**  
**Size: 1**

**Sound data for Ventilator Unit VN 104**

**VN 104 Fan: DS 6-740/E 65**

*sound pressure level $L_p$ in dB (A)							
voltage [V]	80	100	125	150	170	190	230
<b>inlet</b>	39	45	51	56	58	61	64
<b>discharge</b>	43	50	55	60	63	66	69

\* related to room absorption of 8 db (25m<sup>2</sup> 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	
<b>80</b>	44	40	40	45	42	37	36	31	47		<b>80</b>	49	44	45	50	46	42	40	35	51	
<b>100</b>	49	46	47	51	48	44	43	38	53		<b>100</b>	54	51	51	56	53	49	47	42	58	
<b>125</b>	54	52	52	57	54	50	49	44	59		<b>125</b>	59	57	57	61	59	55	53	48	63	
<b>150</b>	58	57	57	61	59	55	53	49	64		<b>150</b>	62	61	62	66	64	60	58	53	68	
<b>170</b>	60	59	60	63	62	58	56	51	66		<b>170</b>	65	64	64	68	67	63	61	56	71	
<b>190</b>	62	62	62	66	64	61	59	54	69		<b>190</b>	67	66	67	70	69	66	64	59	74	
<b>230</b>	65	65	65	69	68	65	62	58	72		<b>230</b>	70	70	70	74	73	70	67	62	77	