

Page 1	Standard Series		Calculation of external available Pressure												
	Size: 2		800	1200	1600	2000	2400	2800	3200	3600	4000	4600	5200	5800	6400
	Air flow volume	[m³/h]													
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]	0,59	0,90	1,19	1,49	1,79	2,10	2,39	2,69	3,00	3,40			
	Flow velocity related to <b>Finned surface of heater</b>	[m/s]	0,72	1,08	1,43	1,79	2,15	2,51	2,87	3,23	3,56	4,12			
	Flow velocity related to <b>Finned surface of cooler</b>	[m/s]	0,79	1,19	1,59	1,98	2,38	2,78	3,17	3,57	3,97				
<b>Extract Unit without air conditioning elements:</b>															
Flow velocity related to <b>Inner cross section of unit</b>	[m/s]	0,49	0,74	0,99	1,24	1,49	1,73	2,00	2,23	2,48	2,85	3,22	3,59	3,96	
2. Step	<b>2. Pressure Calculation</b>		<b>Available statical pressure [Pa] at rated voltage</b> without consideration of pressure regain!												
	Ventilator Unit	VN 201	540	525	550	485	455	430	390	350	290	190	60		
		VN 202	590	575	565	560	550	530	505	475	425	325	185		
		VN 203	745	735	725	710	700	680	660	630	595	530	445	305	185
	<i>The following air conditioning elements reduce pressure available!</i>														
			<b>Pressure loss [Pa] at above statet air volume</b>												
	Pocket filter F5 Short filter (195 mm pocket)	Calculated resistance	106	109	113	117	121	125	130	134	139	146			
		Clean resistance	11	18	26	34	42	51	60	69	78	92			
	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	103	106	107	110	114	119	124	130	136	147			
Clean resistance		5	9	14	20	28	37	48	59	72	94				
Recommended final resistance: 200 - 300 Pa															
Pocket filter F7 Long filter (600 mm pocket)	Calculated resistance	111	116	123	130	137	143	153	162	172					
	Clean resistance	21	32	45	59	74	89	106	124	143					
Recommended final resistance: 200 - 300 Pa															
Taschenfilter F9 Long filter (600 mm pocket)	Calculated resistance	165	172	180	189	198	207	217	228						
	Clean resistance	30	43	69	77	96	115	135	157						
Recommended final resistance: 300 - 400 Pa															
Air Heater LW Medium: PWW (pump circulated hot water)	LW 1	2	5	8	12	16	21	27	33	39	50				
	LW 2	5	10	16	23	31	40	51	62	74	93				
	LW 3	9	17	27	40	53	69	86	105	125	157				
<b>Subtotal</b> External statical pressure [Pa] available															

Page 2	Standard Series Calculation of external available Pressure														
	Size: 2														
Air Flow Volume	[m <sup>3</sup> /h]	800	1200	1600	2000	2400	2800	3200	3600	4000	4600	5200	5800	6400	
<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>Air Cooler LK and LKV</b>		LK 2	12	23	38	55	75	97	121	148					
Medium. chilled water KKW		LK 4	17	33	54	78	106	137	172	209					
		LK 6	21	41	67	97	132	172	215	262					
<b>Pressure losses of direct evaporating coolers (LKR) are on request available</b>															
<b>Water Eliminator</b>			3	5	9	13	18	24	30	38	46				
horizontal air flow (LK)															
<b>Damper</b>		<u>class type A</u>	1	1	2	2	3	4	5	6	7	9	11	13	16
		<u>class type B</u>	2	4	6	9	12	16	20	24	29	36	44	53	63
Pressure losses to be taken into consideration only with damper on inlet side.															
<b>Air Mixer LJ, LM, CLM</b>		<u>class type A</u>	1	1	2	2	3	4	5	6	7	9	11	13	16
		<u>class type B</u>	2	4	6	9	12	16	20	24	29	36	44	53	63
Pressure losses to be taken into consideration only with air mixer on inlet side.															
<b>Attenuator SD</b>		Unit length													
		850 mm	1	1	2	3	4	5	7	9	11	14	18	23	28
		1350 mm	1	1	2	3	5	6	8	11	13	18	22	28	34
		1750 mm	1	1	3	4	6	8	10	13	16	21	27	33	40
		2250 mm	1	2	3	5	7	9	12	15	18	24	31	38	46
<b>Plate heat Exchange APD</b>															
with integrated Bypass															
resistance calculated at 22°C/30% r. H.															
<b>Coarse Filter GF</b>		clean resistance	16	33	53	78	106	137	172						
Regularly cleaning required!															
<b>Activated Carbon Filter AKCF</b>			22	42	67	97	130								
Calculated resistance same than clean resistance															
<b>Electric Air Heater LE</b>		LE 15	8	13	19	25	31	37	43	49	57	67	78		
Operating voltage 400V/50Hz		LE 30	10	16	23	30	37	45	52	60	69	81	94		
		LE 45	11	18	25	33	41	50	58	67	77	91	105		
<b>Total</b> External statical pressure [Pa] available															

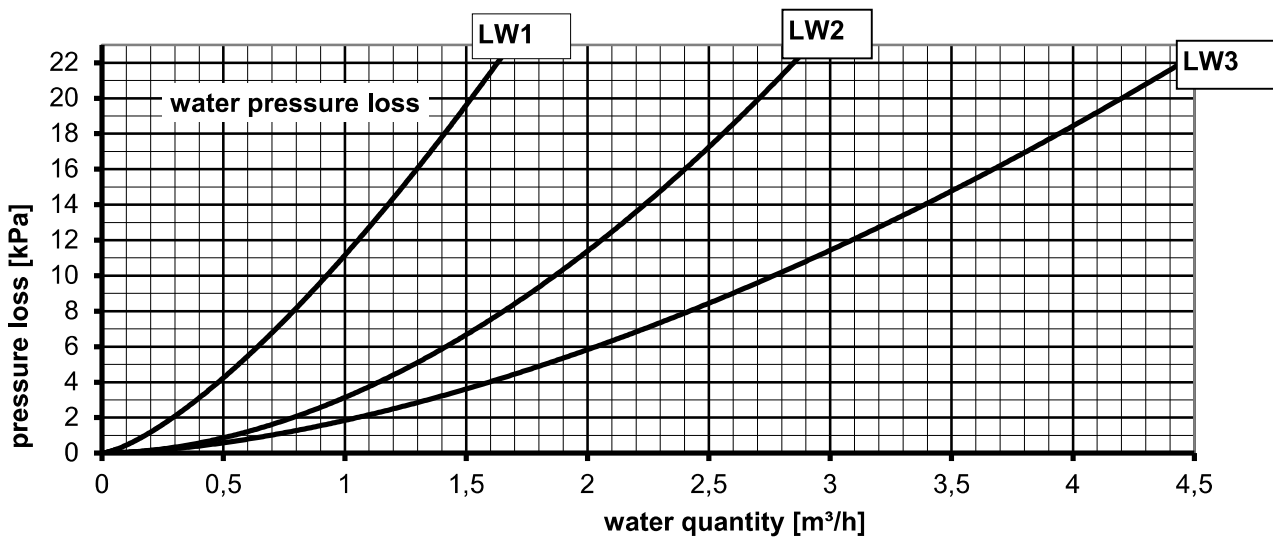
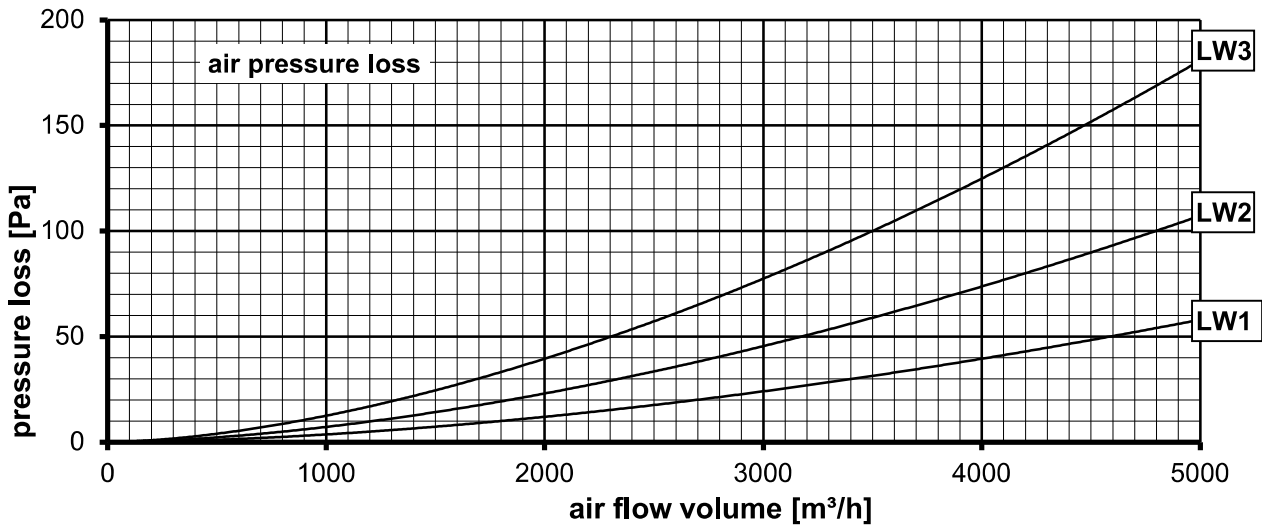
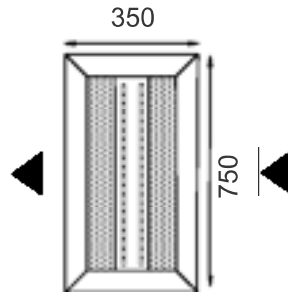
**Standard Series**

**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]

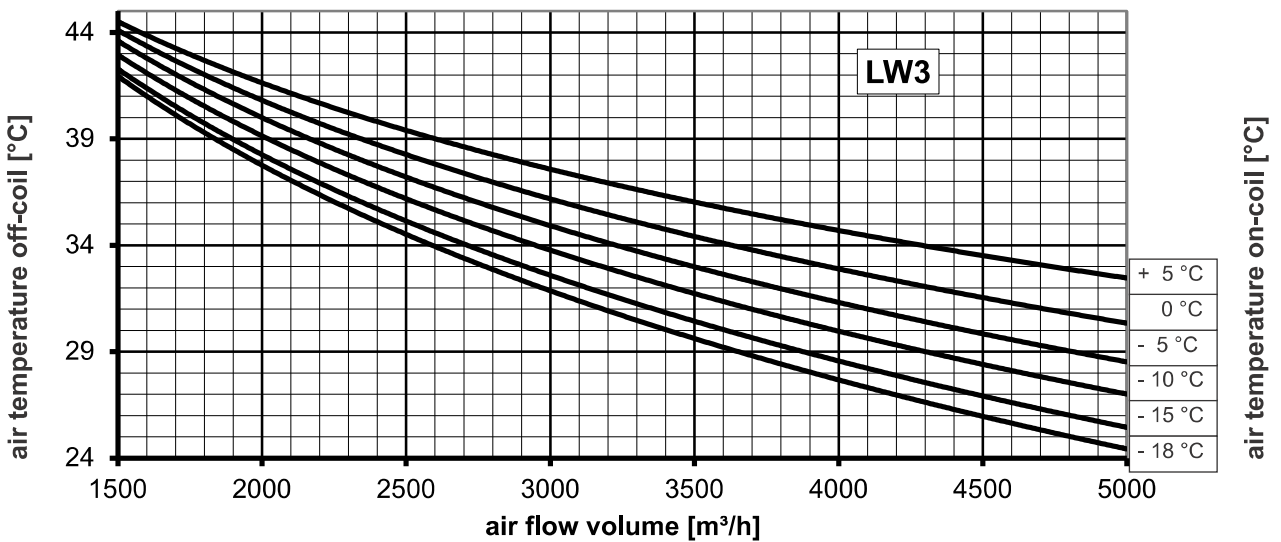
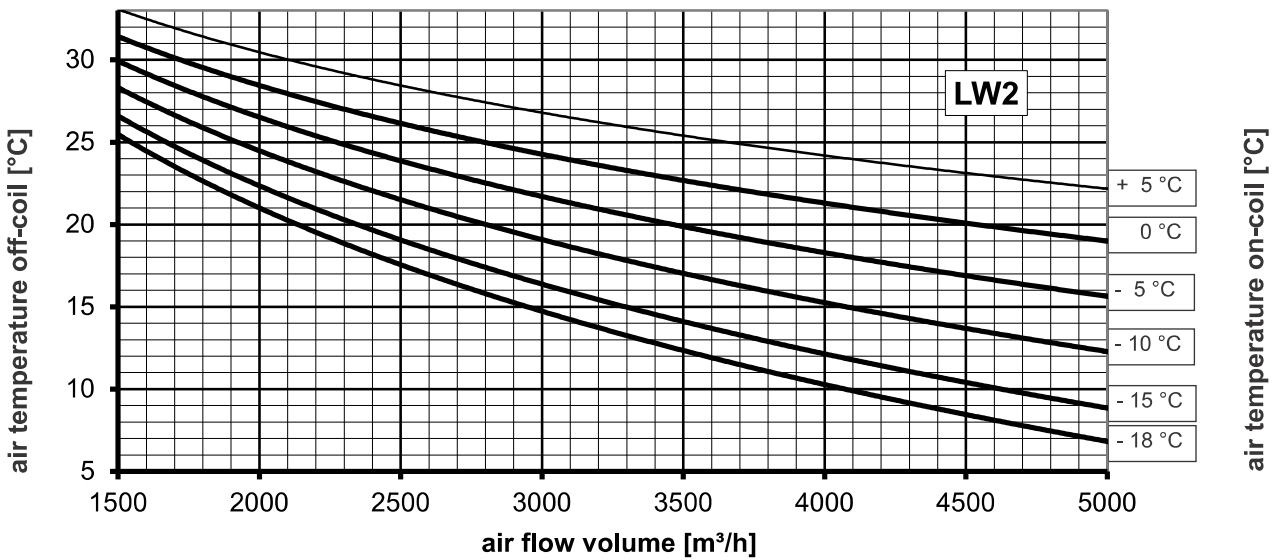
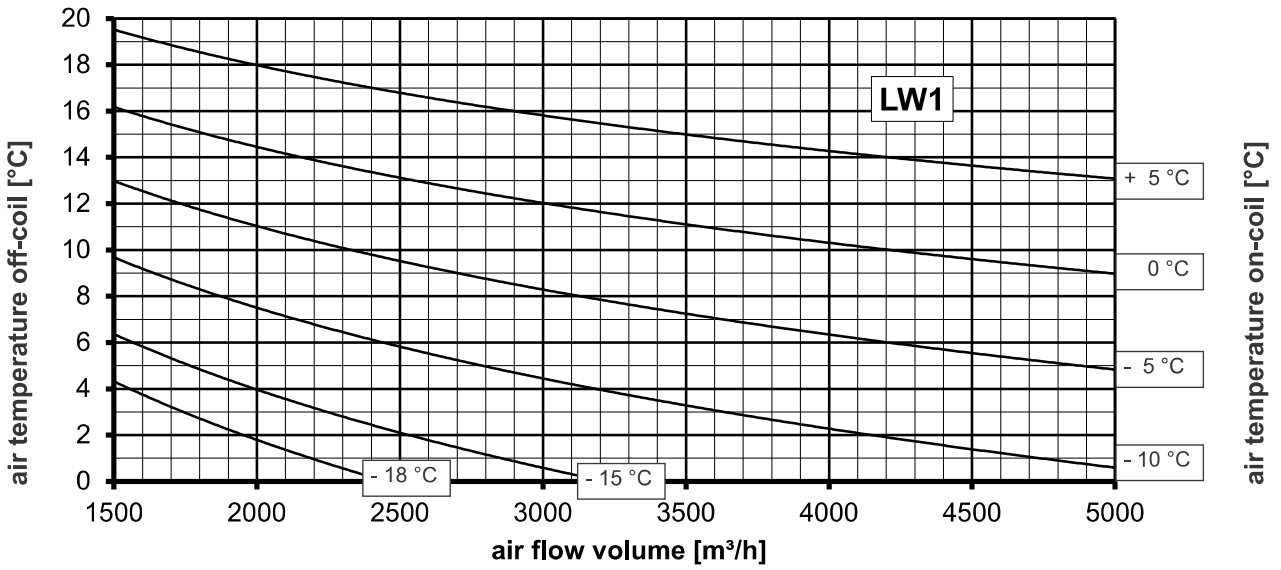
$\rho_L$  = specific weight of air = 1,2 [kg/m³]

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

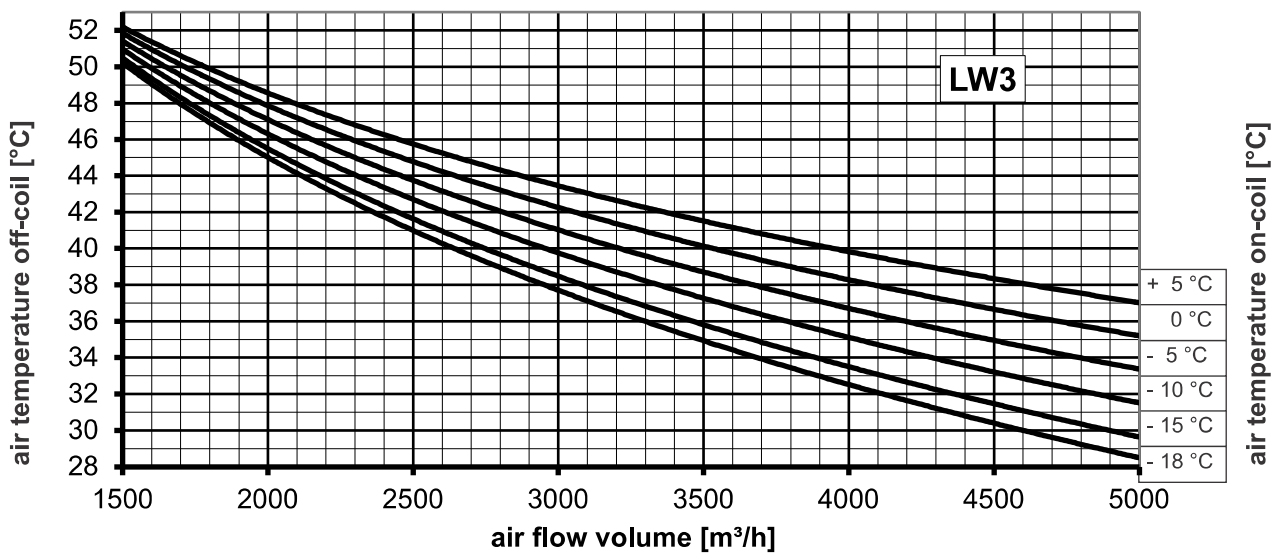
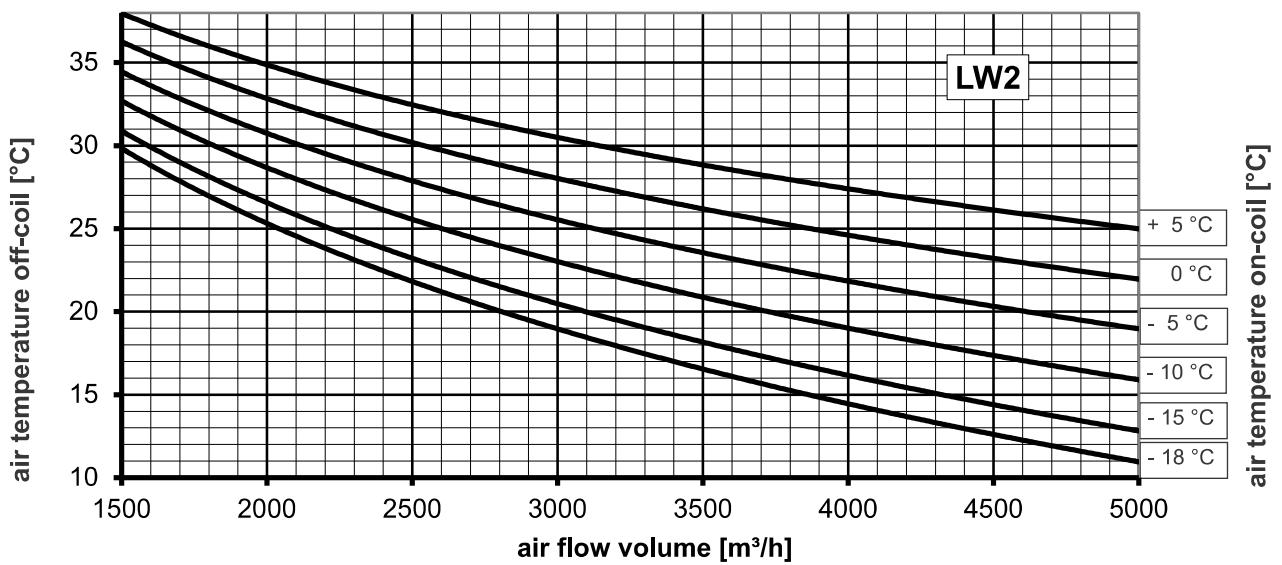
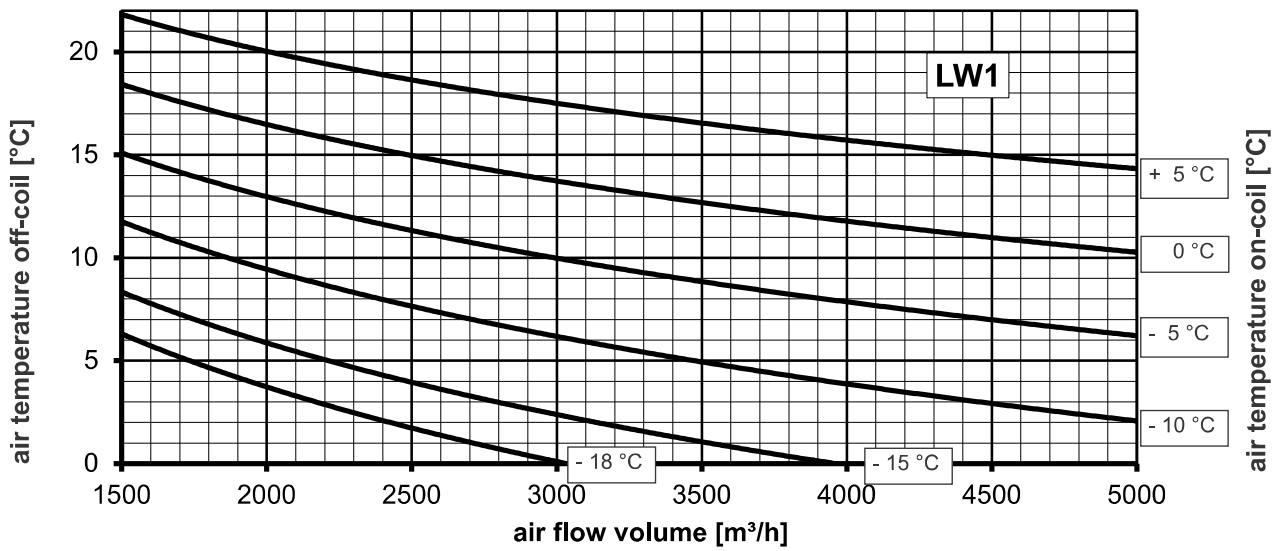
**Standard Series**  
**Size: 2**

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

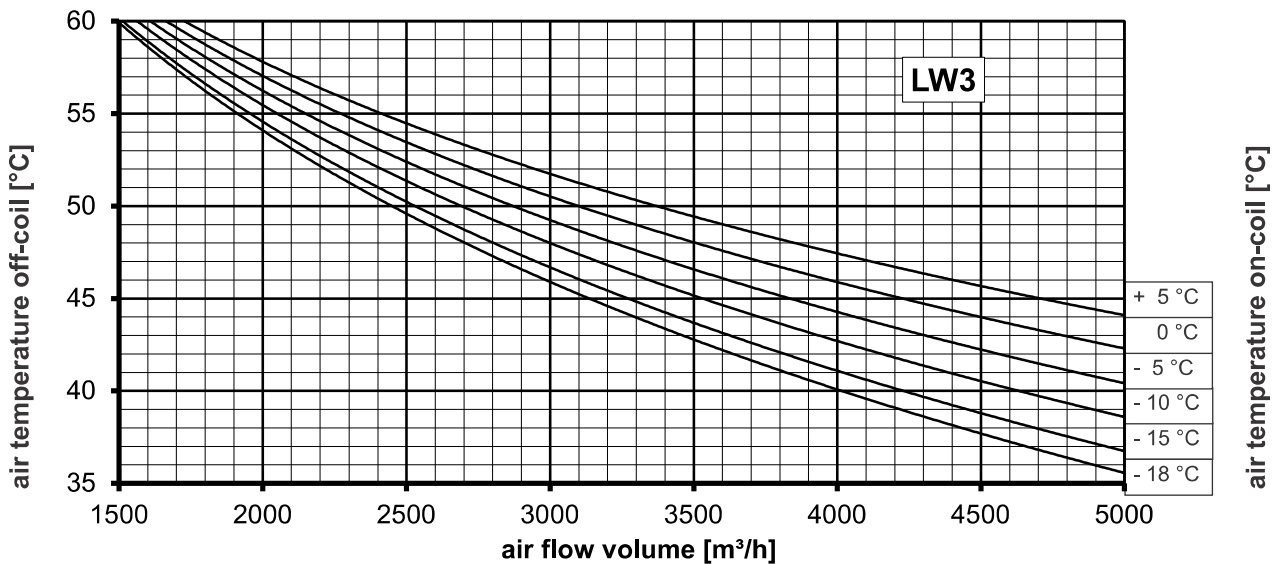
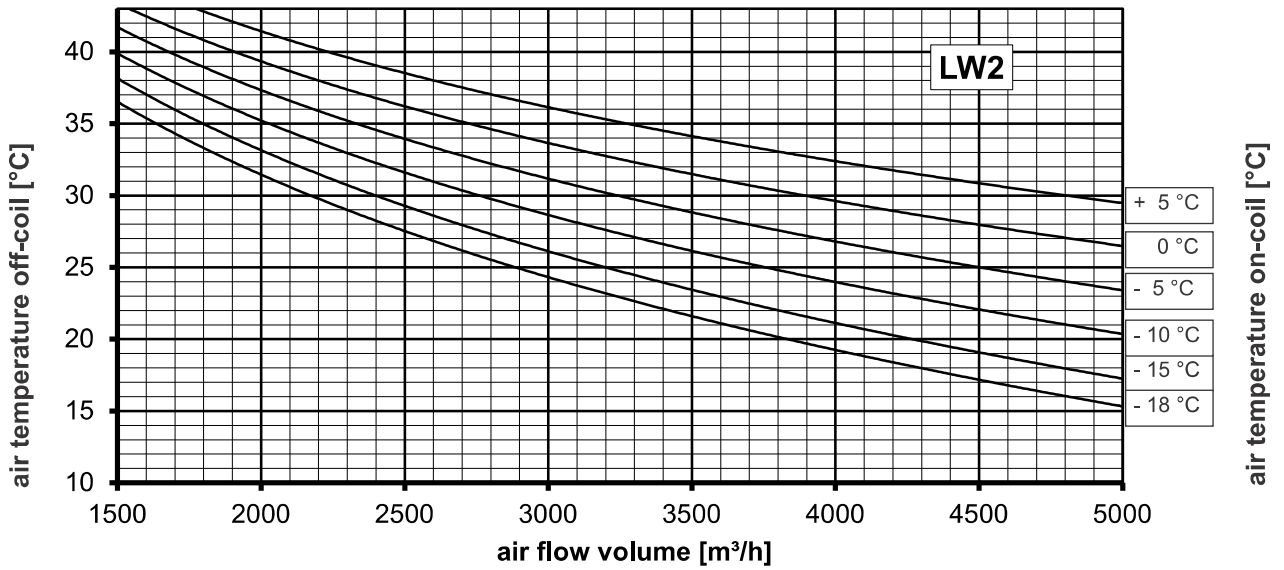
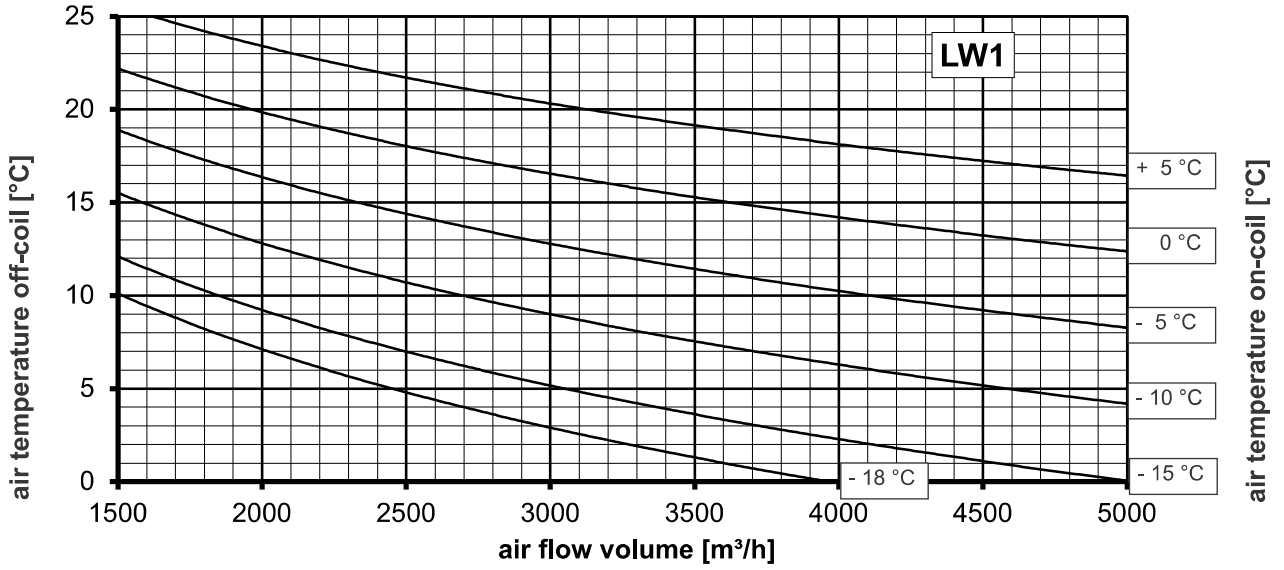
Heating performance for water temperature on-/off-coil 55/45°C



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



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



**Standard Series**

**Size: 2, Module depth 750 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 glycol

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

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

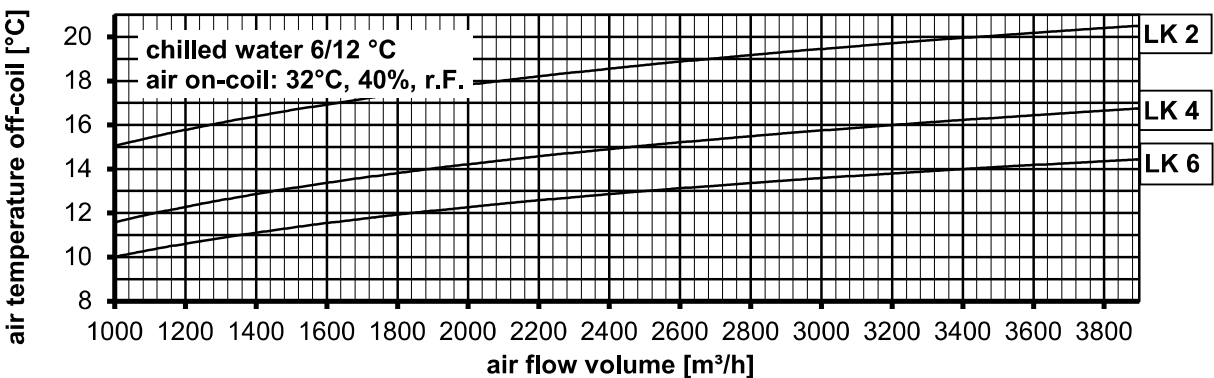
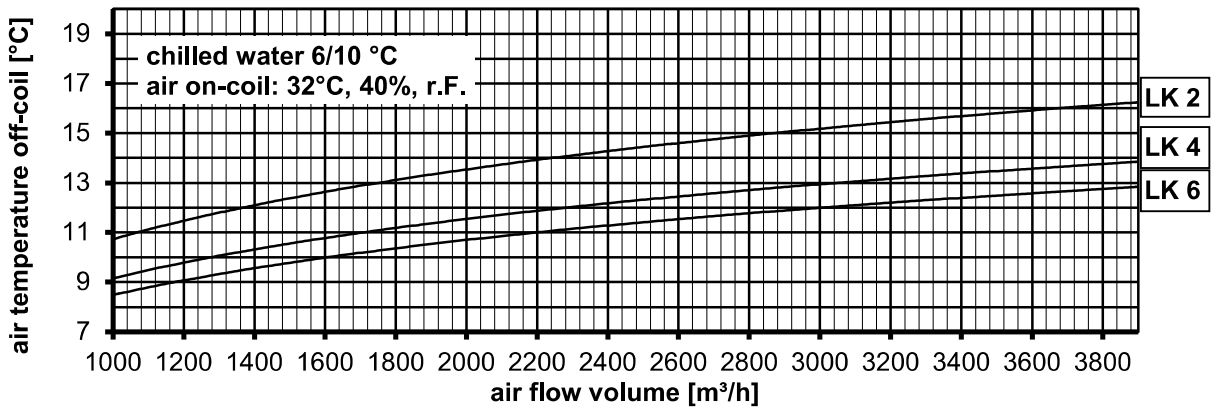
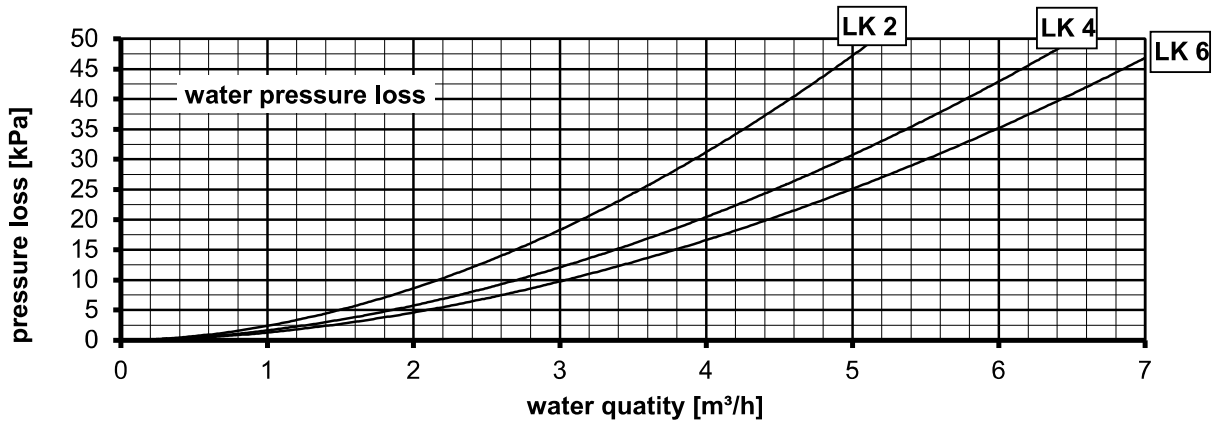
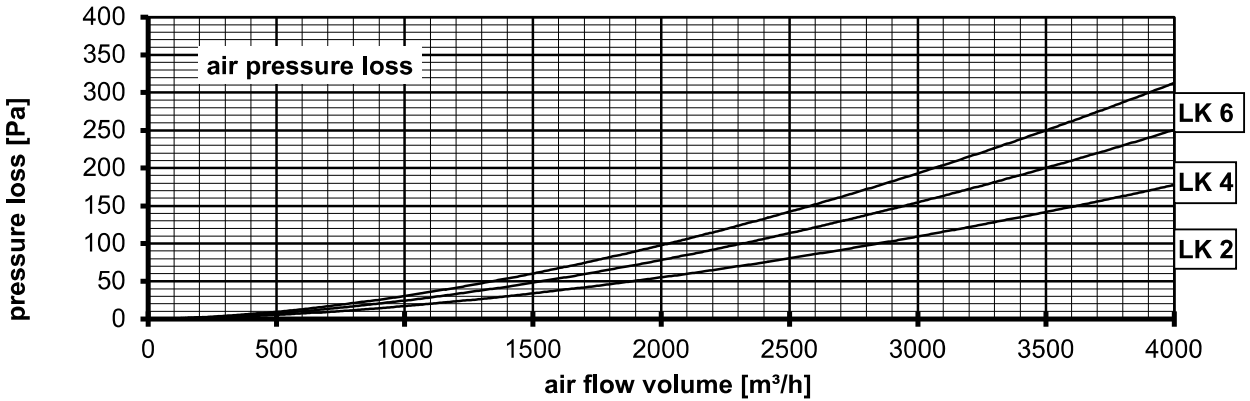
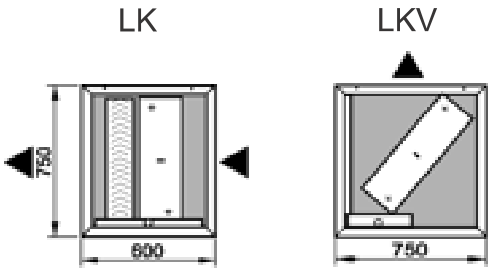
$\dot{Q}_h$  = cooling performance [KW]

$\dot{V}_w$  = 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]



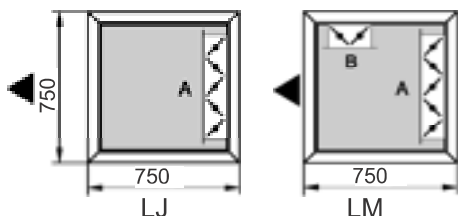
### Standard Series

Size: 2, Module depth 750 mm

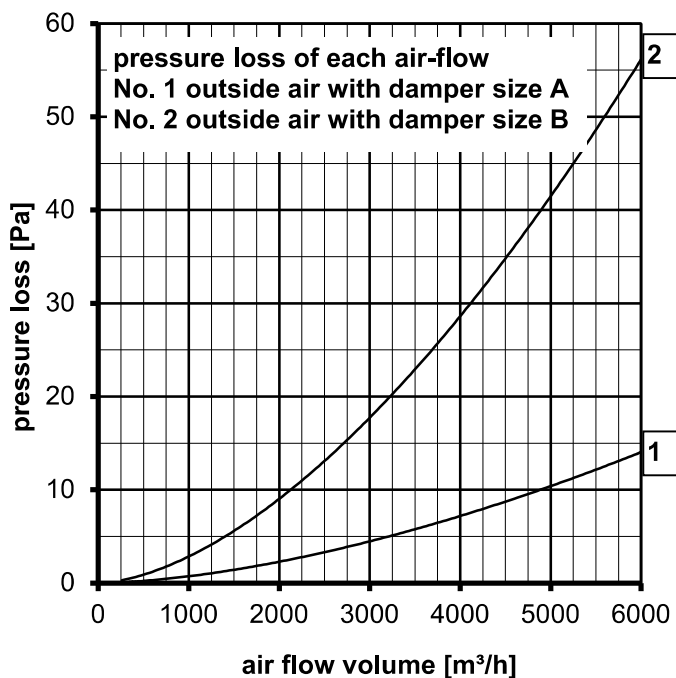
The unit sides marked by arrow are open!

### Air Mixer Unit LJ and LM

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

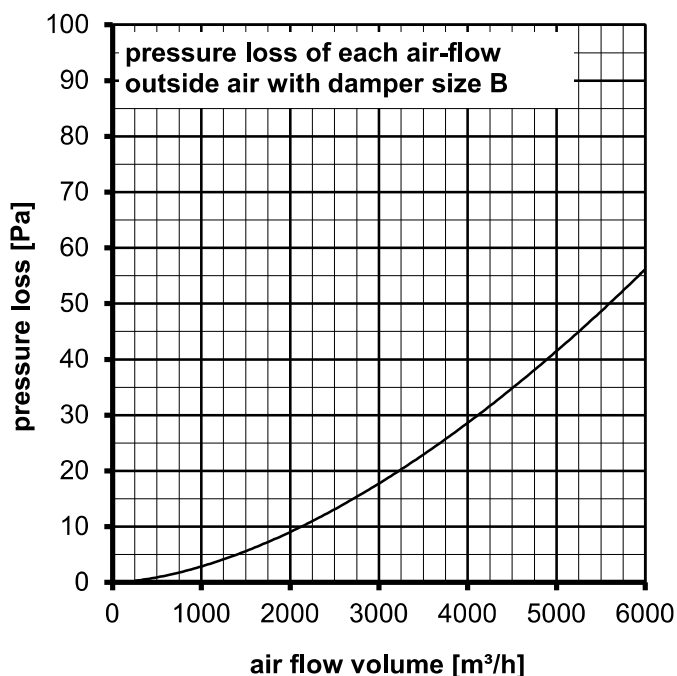
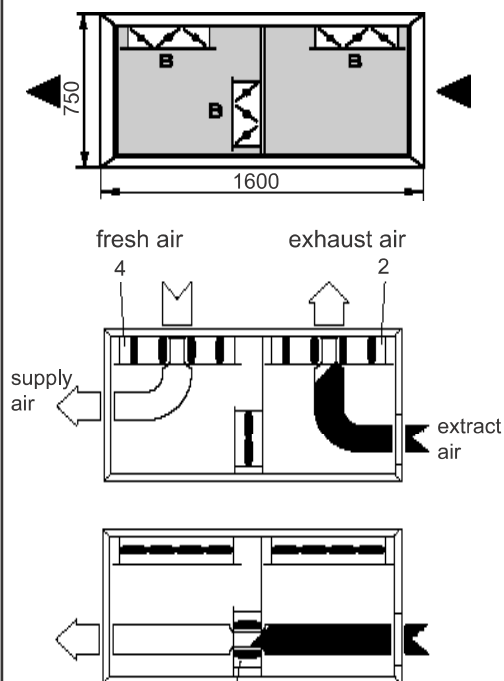


Damper size A: 662x662 mm inner size  
 Damper size B: 662x410 mm inner size



### Air Mixer Unit CLM

for AHU with supply and extract air arranged in row



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

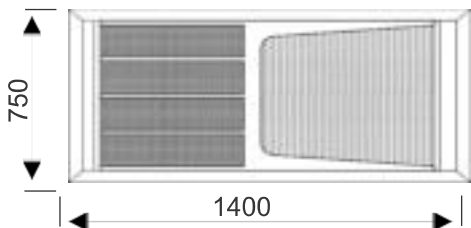
Pressure loss of Air Mixing Units is calculated on base „free air“. That means, for connected duct of same cross section no additional dynamical intake losses have to be considered.

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: 2, Module depth 750 mm**

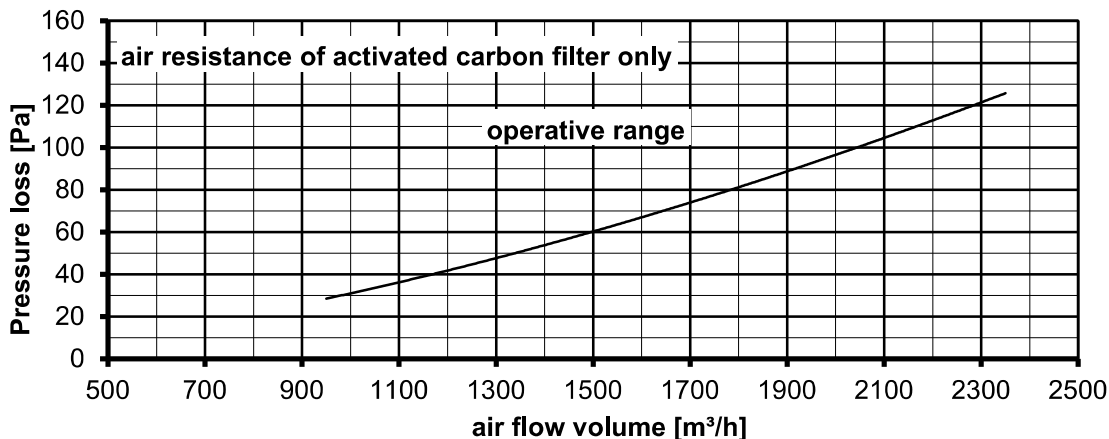
**Combinated Activated Carbon Filter Unit AKCF**  
 for elimination of dust and undesirable odours



equipped with:

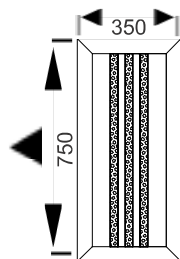
1. Activated carbon filter with 16 filter cartridges (bayonet fixing),
  2. Pocket filter, quality class F7 (EU7), length 600mm
- Total air resistance of combinated filter unit is a sum of pressure drops of the filter steps 1 and 2.

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).



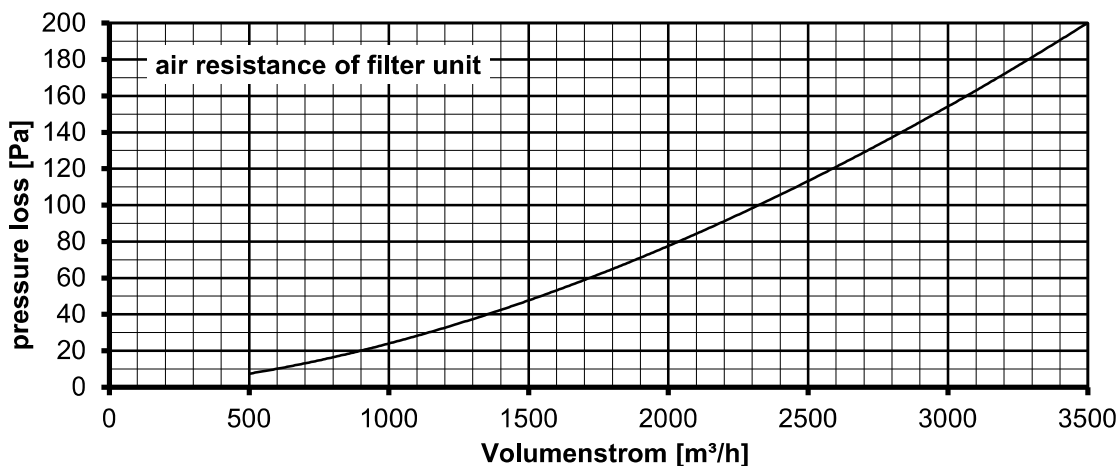
The unit sides marked by arrow are open!

**Coarse Filter Unit GF**

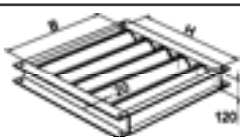


equipped with:

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



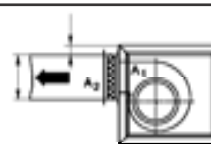
**Dampers and Flexible Connections**



Damper type „A“: for total cross section of unit 662 mm width (B) x 662 mm height (H)  
 Damper type „B“ (662 mm width (B) x 410 mm height (H) for fan unit's discharge opening (smaller); fitting for flexible connection B



Flexible Connection: to be used for outlet- and inlet side type „A“: 662 mm width (B) x 662 mm height (H) for total cross section of unit.  
 type „B“: 662 mm width (B) x 410 mm height (H) for mounting on fan unit's discharge and on air mixer units with damper size „B“



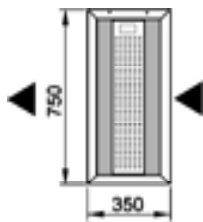
**Standard Series**

**Size: 2, Module depth 750 mm**

The unit sides marked by arrow are open!

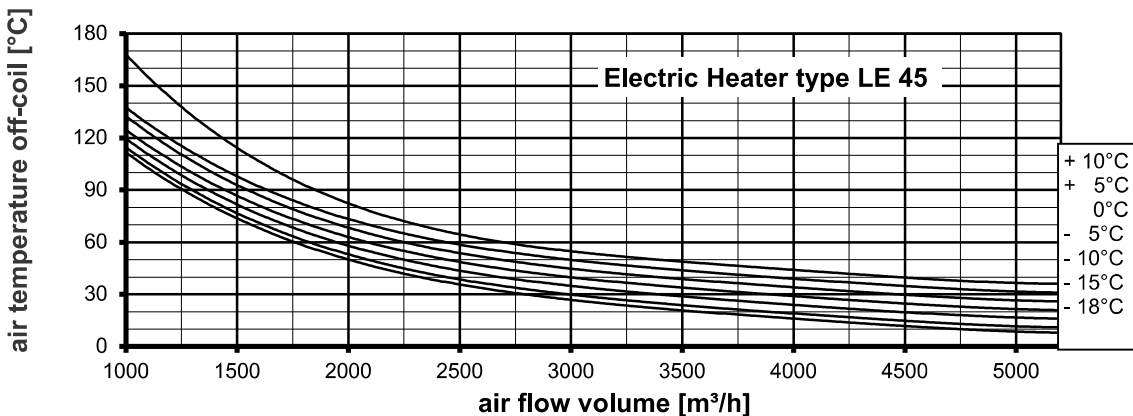
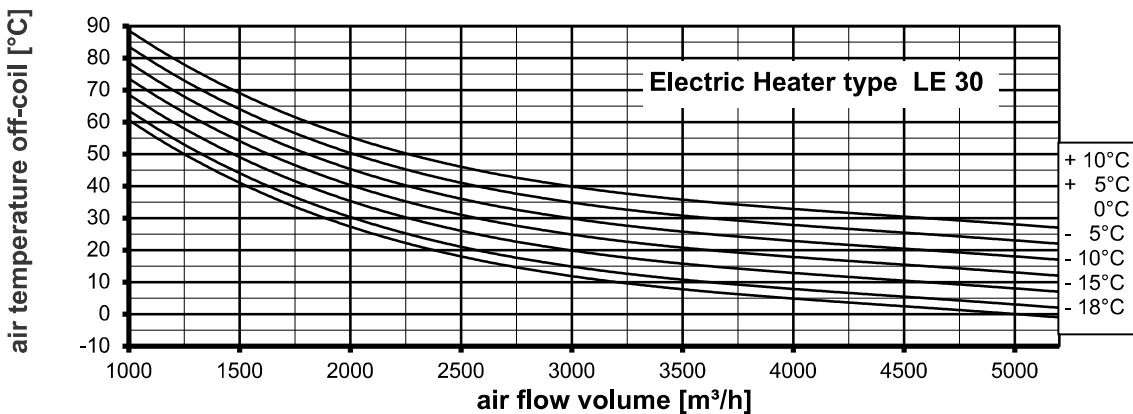
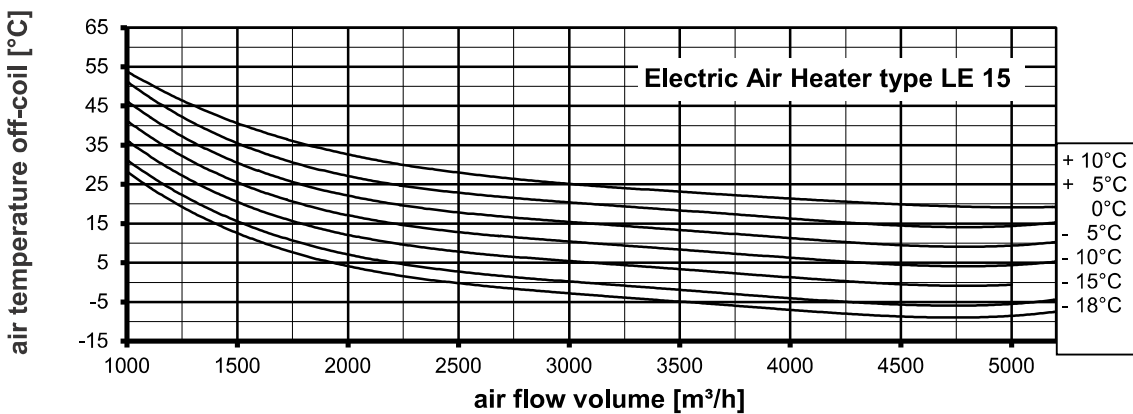
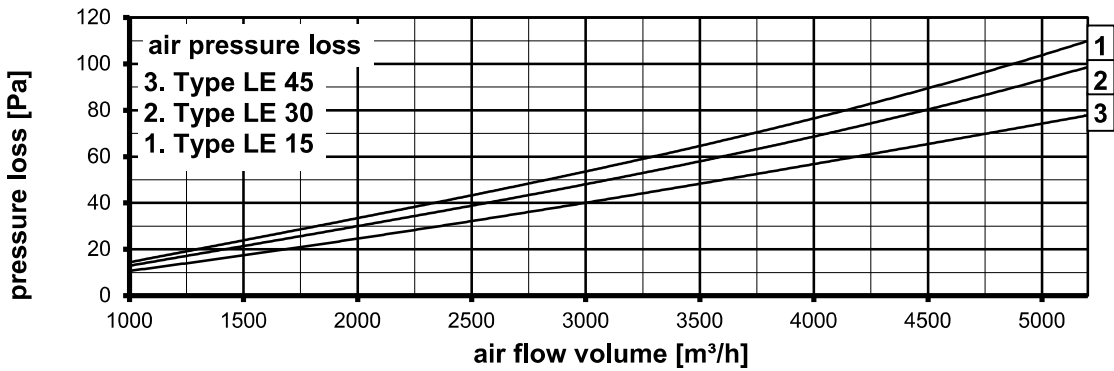
**Electric Air Heater Unit LE**

for 400V/50Hz operating voltage



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

- Type LE 15 (kW), 18 elements, current max. 21,7 A, 4 switching levels
- Type LE 30 (kW), 36 elements, current max. 43,3 A, 4 switching levels
- Type LE 45 (kW), 54 elements, current max. 64,9 A, 4 switching levels



### Standard Series

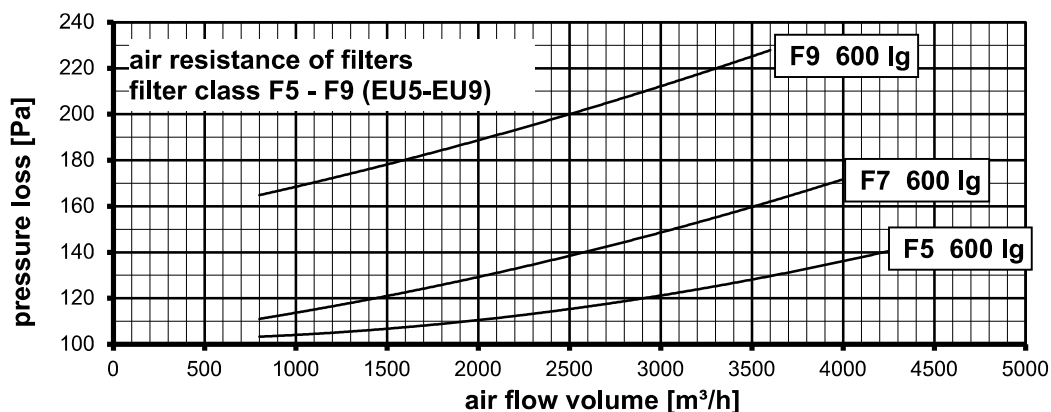
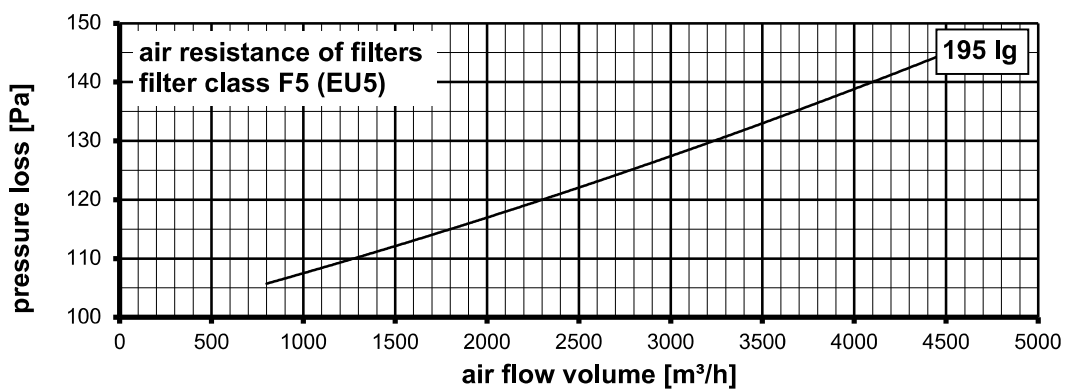
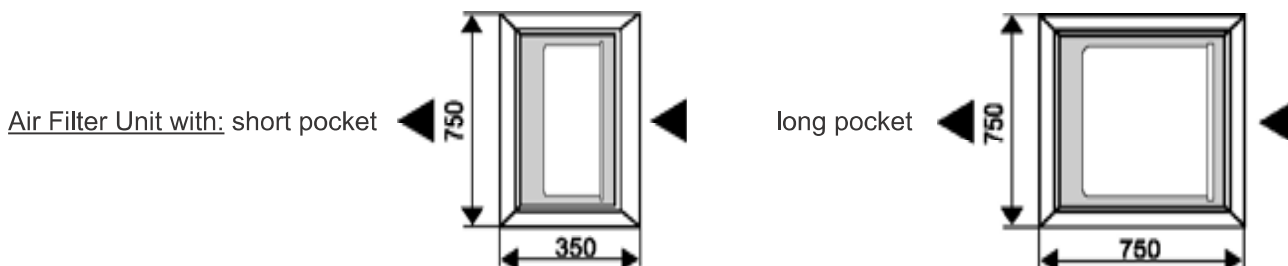
Size: 2, Module depth 750 mm

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:



**Standard Series**  
**Size: 2**

**Sound data for Ventilator Unit VN 201 - VN 203**

**VN 201 Fan: D 770/E 65**

*sound pressure level $L_p$ in dB (A)							
voltage [V]	80	100	125	150	170	190	230
<b>inlet</b>	41	47	53	58	61	63	66
<b>discharge</b>	45	51	57	62	65	67	71

\* 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>	50	46	42	45	44	42	42	38	49		<b>80</b>	51	47	48	49	49	45	43	40	53	
<b>100</b>	55	51	48	51	50	47	48	44	55		<b>100</b>	55	53	53	55	55	51	49	46	59	
<b>125</b>	60	57	53	57	56	54	54	50	61		<b>125</b>	60	59	59	61	61	57	56	52	65	
<b>150</b>	63	62	58	61	60	59	59	55	66		<b>150</b>	64	63	64	66	66	62	60	57	70	
<b>170</b>	65	64	60	64	63	61	61	58	69		<b>170</b>	66	66	66	69	69	65	63	59	73	
<b>190</b>	67	66	63	66	65	64	64	60	71		<b>190</b>	68	68	69	71	71	68	66	62	75	
<b>230</b>	70	70	66	70	69	67	67	63	74		<b>230</b>	71	72	72	75	75	71	69	65	79	

**VN 202 Fan: D 770/E 80**

*sound pressure level $L_p$ in dB (A)							
voltage [V]	80	100	125	150	170	190	230
<b>inlet</b>	40	49	57	63	65	66	69
<b>discharge</b>	44	53	61	67	69	70	74

\* 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	C 45-11200		voltage [Volt]	63	125	250	500	1000	2000	4000	8000	total 45-11200	
<b>80</b>	50	45	41	44	43	41	41	37	48		<b>80</b>	50	47	47	48	48	44	43	39	52	
<b>100</b>	57	54	50	53	52	50	50	46	57		<b>100</b>	57	55	55	57	57	53	52	48	61	
<b>125</b>	62	61	57	60	59	58	58	54	65		<b>125</b>	63	62	63	65	65	61	59	55	69	
<b>150</b>	67	66	62	66	65	63	63	59	71		<b>150</b>	68	68	68	71	71	67	65	61	75	
<b>170</b>	69	68	64	68	67	66	66	62	73		<b>170</b>	69	70	70	73	73	70	68	64	77	
<b>190</b>	69	69	65	69	68	67	67	63	74		<b>190</b>	70	71	71	74	74	71	69	65	78	
<b>230</b>	72	72	68	72	71	70	70	66	77		<b>230</b>	73	74	74	77	77	74	72	68	82	

**VN 203 Fan: D 770/D 1**

*sound pressure level $L_p$ in dB (A)					
voltage [V]	120	180	230	280	400
<b>inlet</b>	48	54	62	65	72
<b>discharge</b>	52	58	66	70	76

\* 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>120</b>	55	52	48	51	50	48	48	45	56		<b>120</b>	56	54	54	56	56	52	50	46	60	
<b>180</b>	60	58	54	57	56	54	54	50	62		<b>180</b>	61	59	59	62	62	58	56	52	66	
<b>230</b>	66	65	61	65	64	62	62	58	70		<b>230</b>	67	67	67	70	70	66	64	60	74	
<b>280</b>	69	68	65	68	67	66	66	62	73		<b>280</b>	70	70	70	73	73	70	68	64	77	
<b>400</b>	74	74	71	75	74	73	72	68	80		<b>400</b>	75	77	77	80	80	77	74	70	84	