

Page 1	Standard Series Size: 4														Calculation of external available Pressure													
	Air flow volume [m³/h]		4000	6000	8000	10000	11000	12000	13000	14000	15000	16000	17000	19000	21000	23000												
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]		0,79	1,19	1,59	1,98	2,18	2,38	2,58	2,77	2,97	3,17	3,37	3,76														
	Flow velocity related to Finned surface of heater [m/s]		0,85	1,27	1,70	2,12	2,33	2,54	2,76	2,97	3,18	3,39	3,60	4,03	4,45													
	Flow velocity related to Finned surface of cooler [m/s]		0,89	1,33	1,78	2,22	2,44	2,67	2,89	3,11	3,33	3,56	3,78															
Extract Unit without air conditioning elements:																												
Flow velocity related to Inner cross section of unit [m/s]		0,69	1,04	1,38	1,73	1,90	2,07	2,25	2,42	2,59	2,76	2,94	3,28	3,63	3,97													
2. Step	2. Pressure Calculation		Available statical pressure [Pa] at rated voltage without consideration of pressure regain!																									
	Ventilator Unit		VN 406	1130	1080	978	773	617	416	165																		
			VN 407	1100	1017	937,5	838	773,6	695,5	600,9	486,9	350,5	189															
			VN 409	1379	1342	1302	1250	1216	1177	1129	1073	1007	930	841	622	342												
			VN 410	769	665	531	374	288	200	109																		
			VN 411	1029	998	939	854	803	747	687	623	555	484	411	259	102												
			VN 412	1312	1290	1254	1204	1174	1141	1105	1066	1025	981	935	837	732	621											
			VN 413	1468	1449	1419	1377	1351	1323	1292	1258	1221	1182	1139	1045	940	823											
			<i>The following air conditioning elements reduce pressure available!</i>																									
			Pressure loss [Pa] at above stated air volume																									
Pocket filter F5		Calculated resistance	108	113	117	122	125	128	130	133	136	139	142	148														
Short filter (195 mm pocket)		Clean resistance	16	25	35	45	50	55	61	66	72	78	84	96														
		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	103	106	110	115	118	121	125	128	132	136	141															
Long filter (600 mm pocket)		Clean resistance	6	12	20	30	36	42	49	56	64	72	81															
		Recommended final resistance: 200 - 300 Pa																										
Pocket filter F7		Calculated resistance	113	121	129	139	144	149	154	160	165	171																
Long filter (600 mm pocket)		Clean resistance	26	42	59	77	87	98	108	119	131	143																
		Recommended final resistance: 200 - 300 Pa																										
Pocket filter F9		Calculated resistance	168	178	189	200	206	213	219	226	232																	
Long filter (600 mm pocket)		Clean resistance	35	56	77	100	113	125	138	151	165																	
		Recommended final resistance: 300 - 400 Pa																										
Air Heater LW		LW 1	4	7	12	17	20	24	27	31	34	38	42	51	60													
Medium: PWW (pump circulated hot water)		LW 2	7	13	21	31	36	42	48	54	61	68	76	91	108													
		LW 3	11	22	35	51	60	70	80	90	101	113	125	150	178													
Subtotal																												
External statical pressure [Pa] available																												

Page 2	Standard Series															
	Calculation of external available Pressure															
	Size: 4															
	Air Flow Volume	[m ³ /h]	4000	6000	8000	10000	11000	12000	13000	14000	15000	16000	17000	19000	21000	23000

2. Step	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 and LKV		LK 2	16	31	49	71	84	97	110	125	140	156	172			
	Medium. chilled water KKW		LK 4	20	39	64	93	109	126	145	164	184	205	227			
			LK 6	24	47	77	113	134	155	178	202	227	253	281			
	Water Eliminator			3	6	10	15	18	22	25	29	33	37	41			
	Damper		<u>class type A</u>	1	2	3	4	5	6	6	7	8	9	10	12	14	16
			<u>class type B</u>	3	6	11	15	18	21	24	27	30	34	37	45	53	62
				Pressure losses to be taken into consideration only with damper on inlet side.													
	Luftmischermodule		<u>class type A</u>	1	2	3	4	5	6	6	7	8	9	10	12	14	16
	LJ, LM, CLM		<u>class type B</u>	3	6	11	15	18	21	24	27	30	34	37	45	53	62
			Pressure losses to be taken into consideration only with air mixer on inlet side.														
Attenuator SD		Unit length															
		850 mm	1	2	4	6	8	9	11	12	14	16	18	23	28	33	
		1350 mm	1	3	5	8	10	11	13	15	18	20	23	29	35	42	
		1750 mm	2	3	6	10	12	14	16	19	22	25	28	35	42	51	
		2250 mm	2	4	7	11	14	16	19	22	25	29	32	41	50	59	
Plate heat Exchange APD			on request														
		with integrated Bypass resistance calculated at 22°C/30% r. H.															
Coarse Filter GF		clean resistance	29	57	93	136	160	189									
			Regularly cleaning required!														
Activated Carbon Filter			31	60	97	140											
		Calculated resistance same than clean resistance															
Electric Air Heater LE		LE 48	12	19	27	35	39	43	48	52	57	61	66	75			
Operating voltage 400V/50Hz		LE 95	14	23	32	42	47	52	58	63	69	74	80	91			
		LE 143	16	25	36	47	53	58	64	70	76	83	89	102			
Total																	
		External statical pressure [Pa] available															

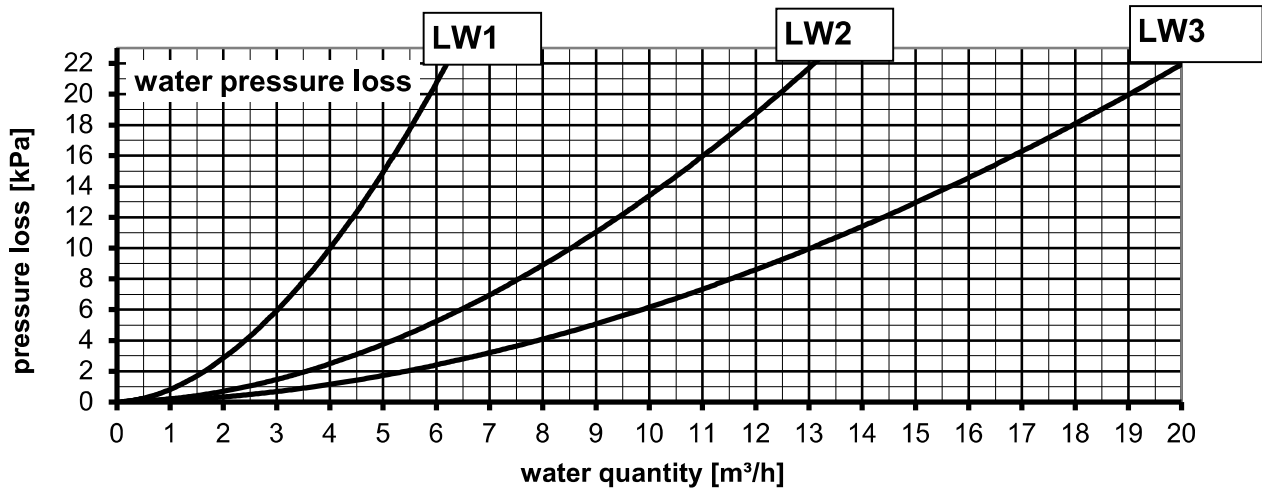
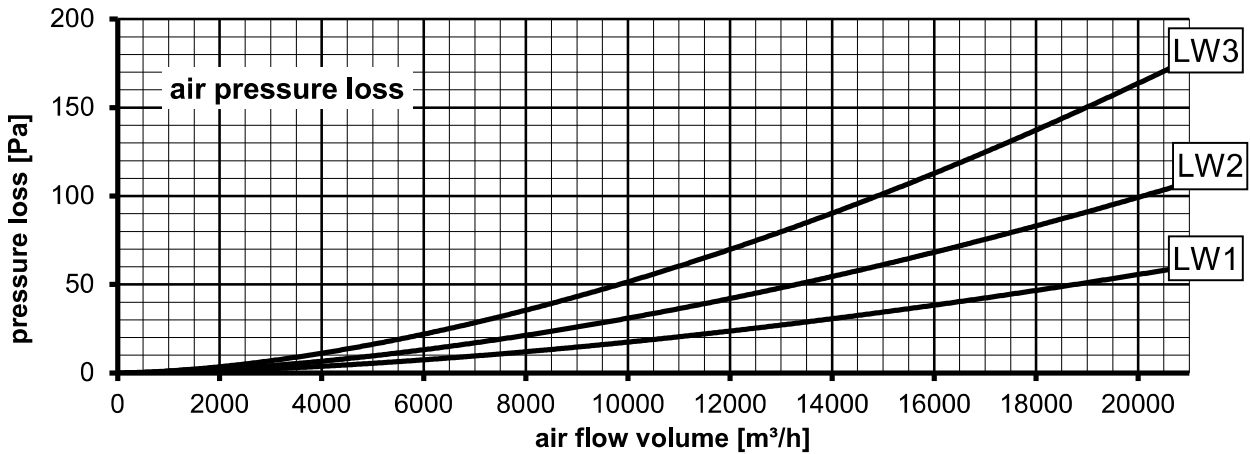
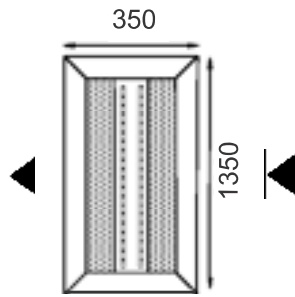
Standard Series

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:

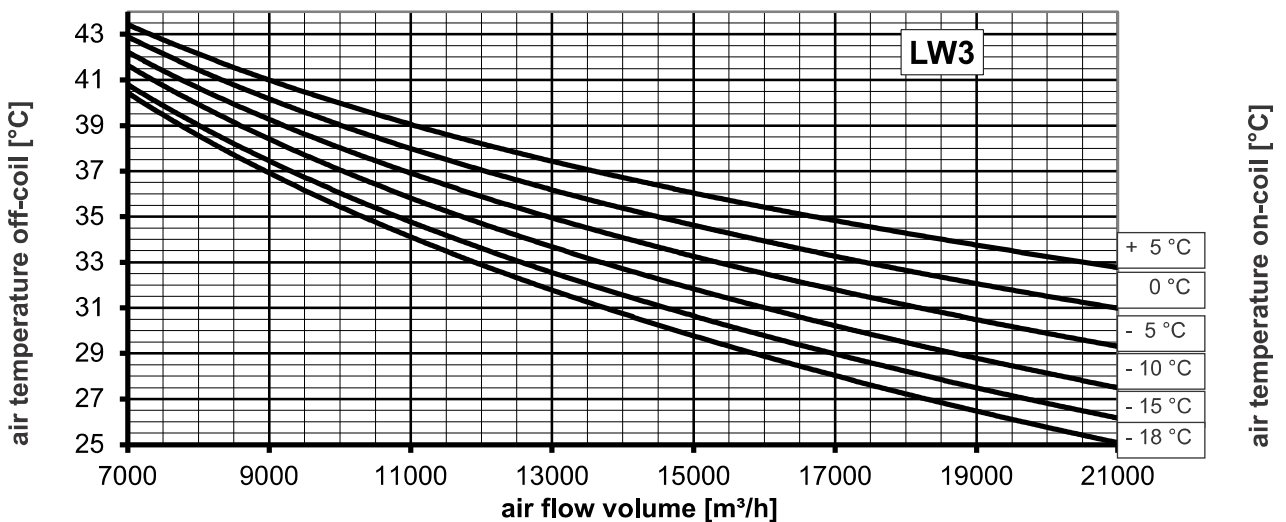
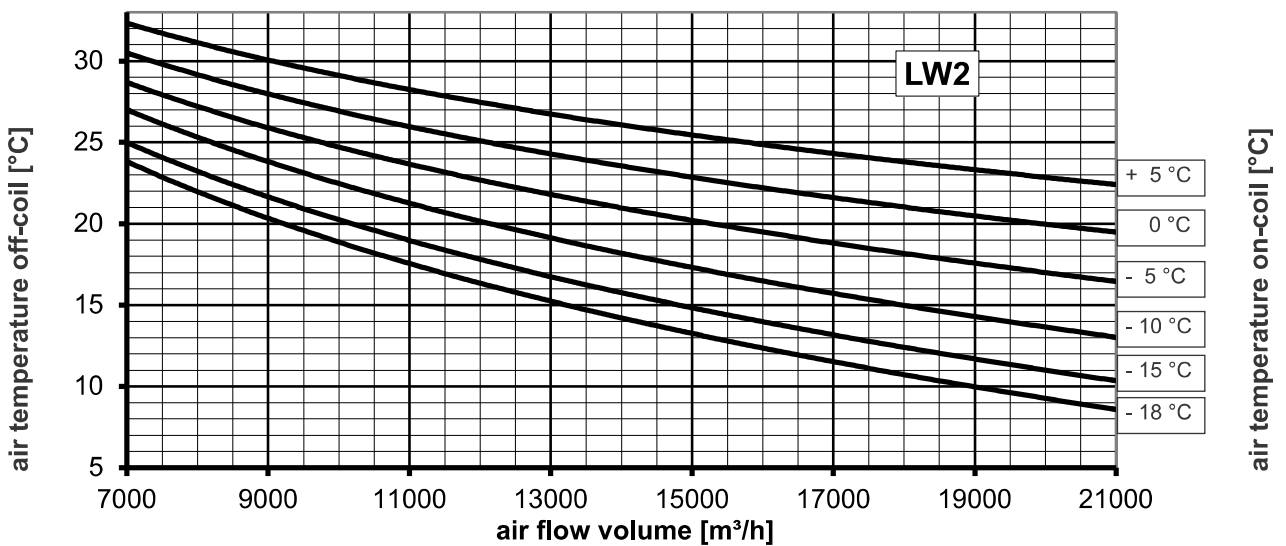
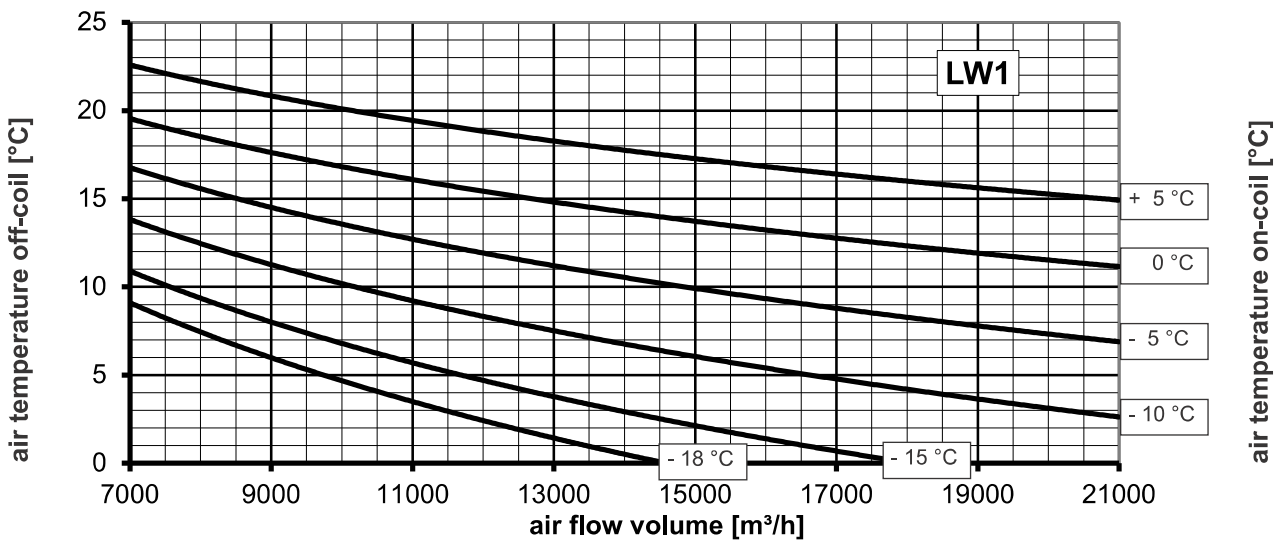
$$\dot{Q}_h [\text{kW}] = \dot{V}_L / 3600 \times (t_{LA} - t_{LE}) \times \rho_L \times cp_L$$

- \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]

Standard Series
Size: 4

Air Heater Unit LW
 for medium pump circulated water

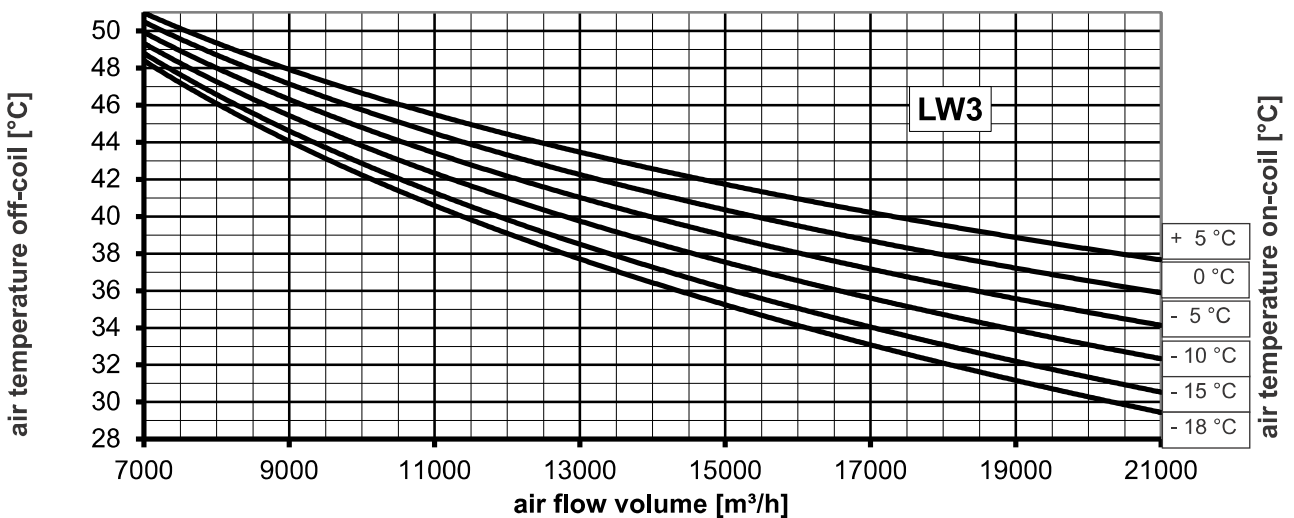
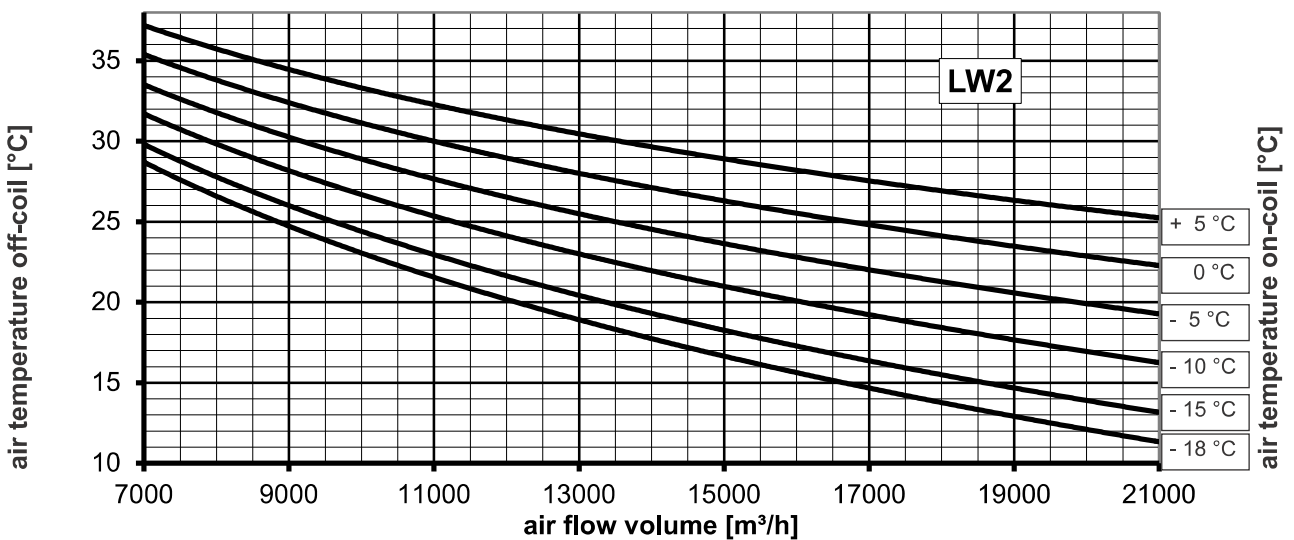
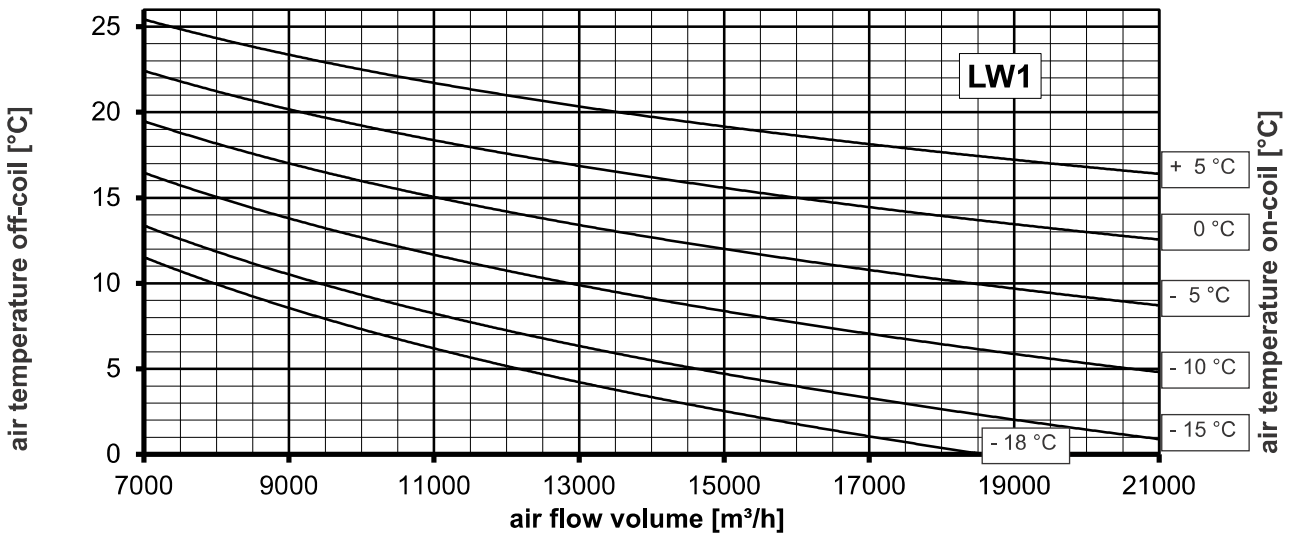
Heating performance for water temperature on-/off-coil 55/45°C



Standard Series
Size: 4

Air Heater Unit LW
 for medium pump circulated water

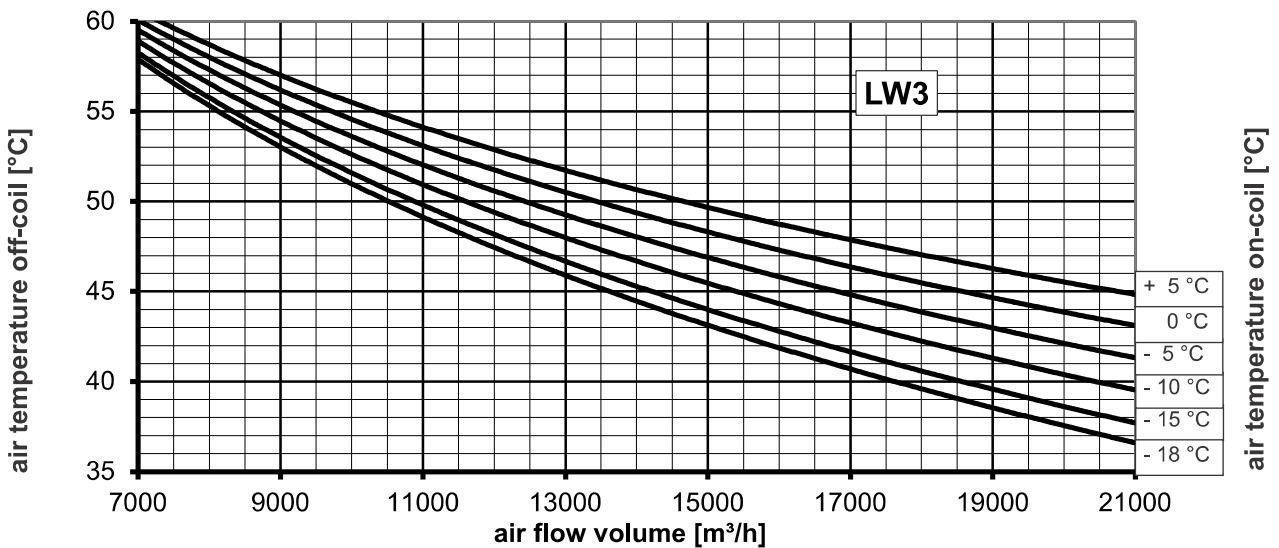
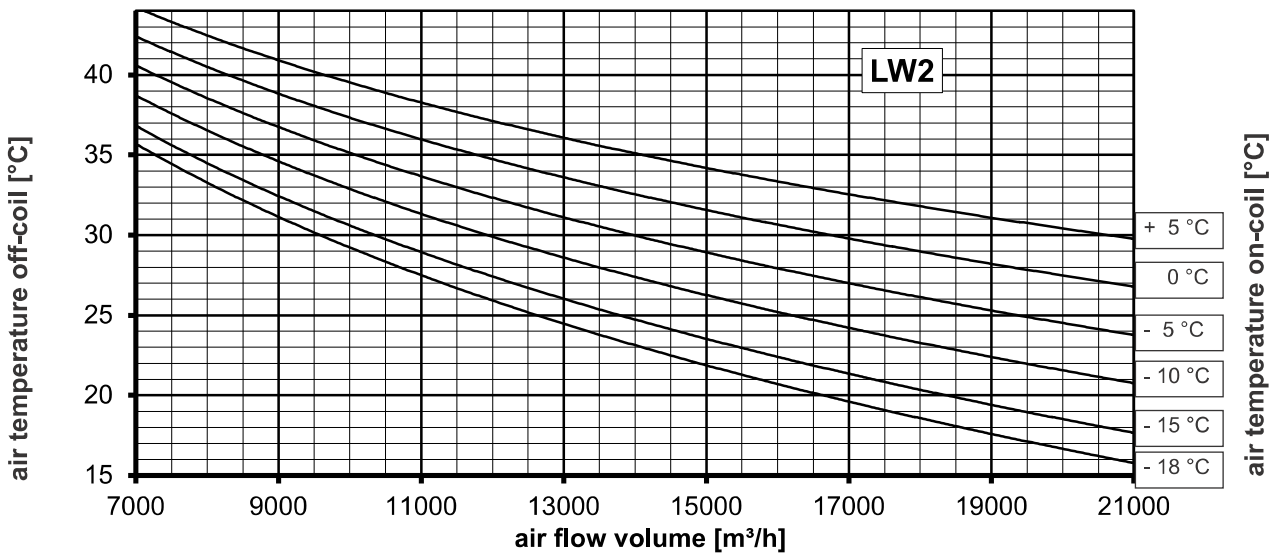
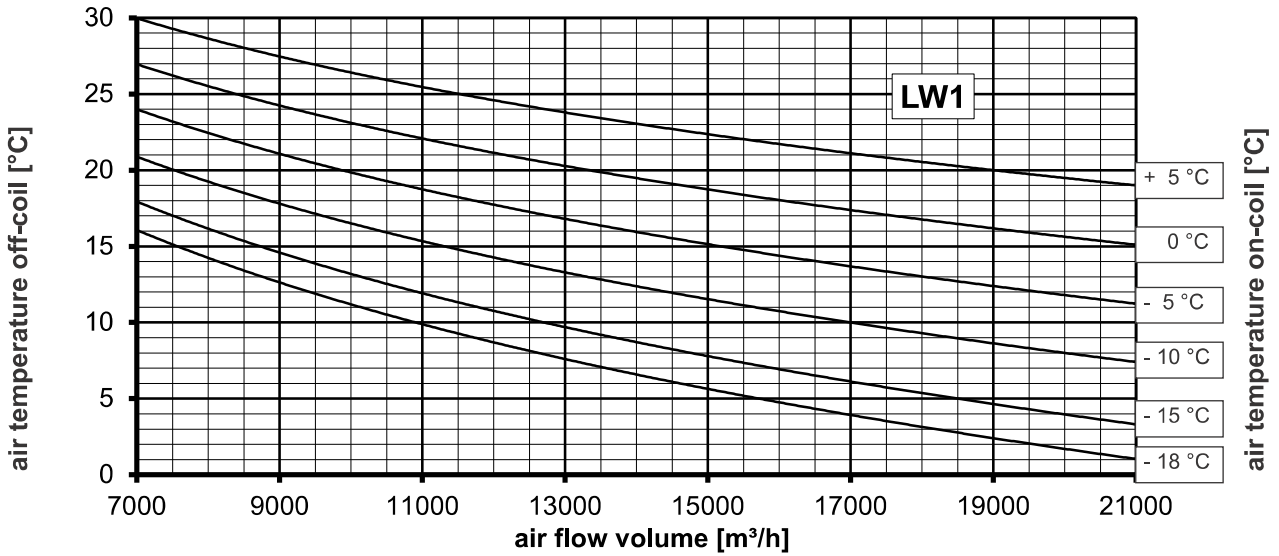
Heating performance for water temperature on-/off-coil 70/50°C



Standard Series
Size: 4

Air Heater Unit LW
 for medium pump circulated water

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



Standard Series

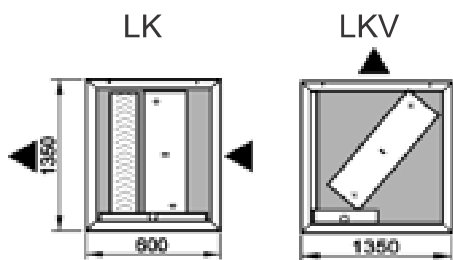
Size: 4, Module depth 1350 mm

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:

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

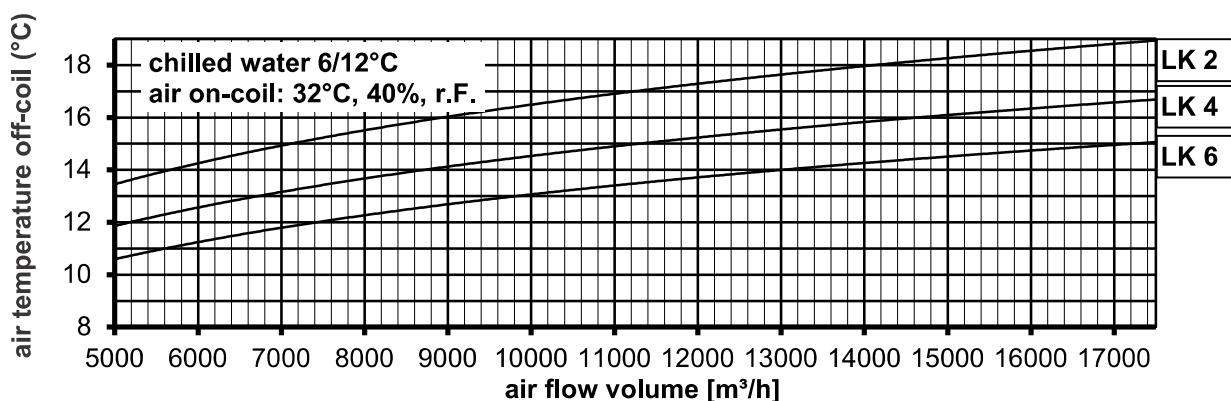
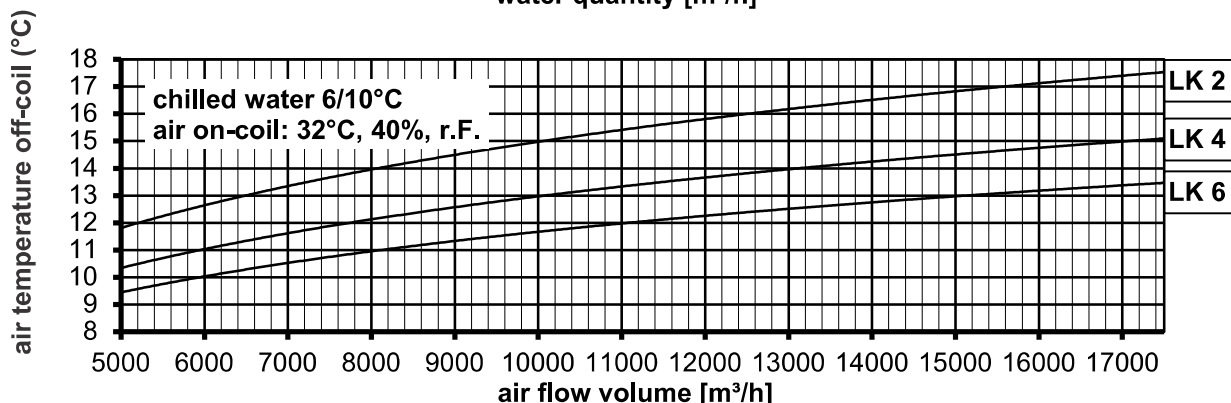
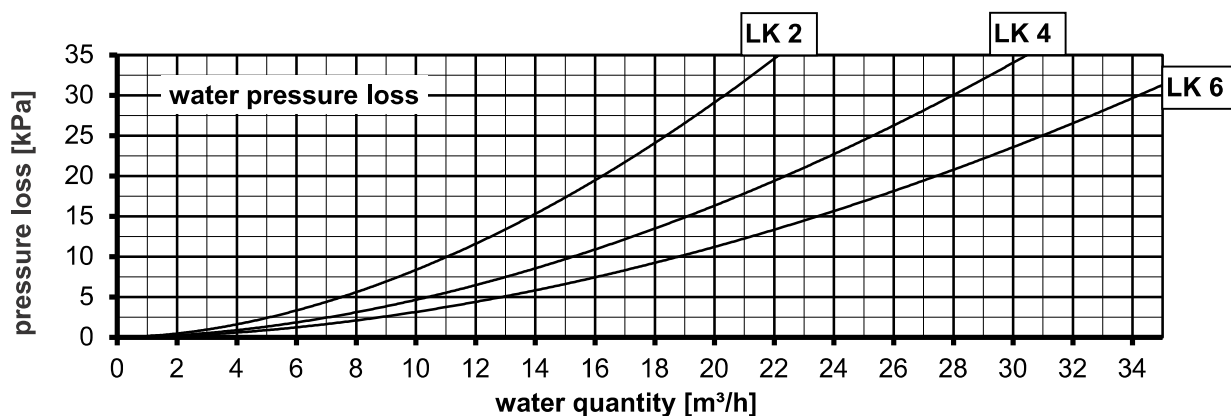
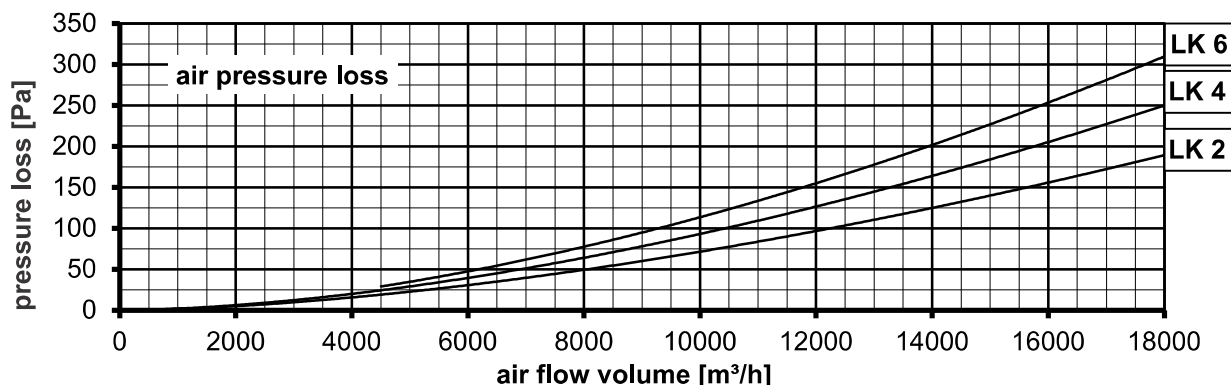
\dot{Q}_h = cooling performance [KW]

\dot{V}_w = quantity of water [m³/h]

Δt_w = water temperature difference [Kelvin] (4K at 6/10°C or 6K at 6/12°C)

ρ_w = specific weight of water = 1000 [kg/m³]

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



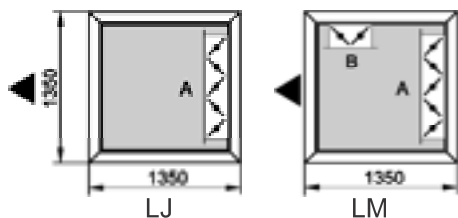
Standard Series

Size: 4, Module depth 1350 mm

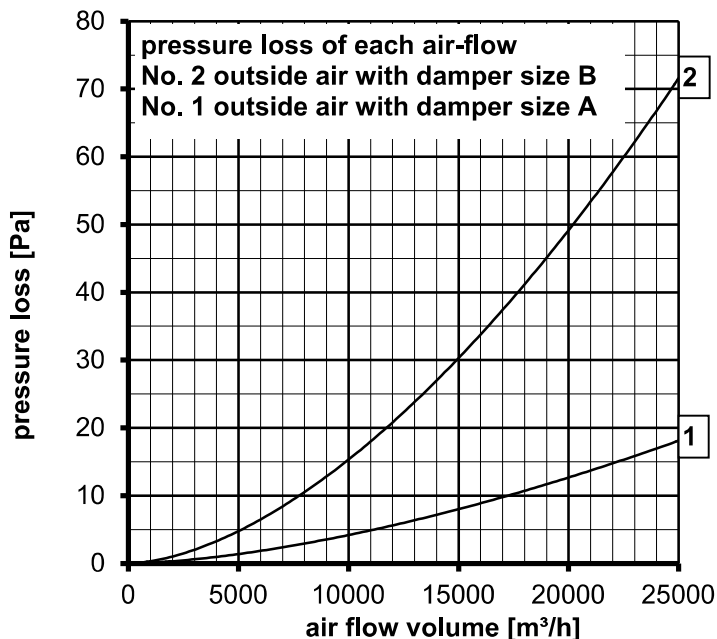
The unit sides marked by arrow are open!

Air Mixer Unit LJ and LM

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

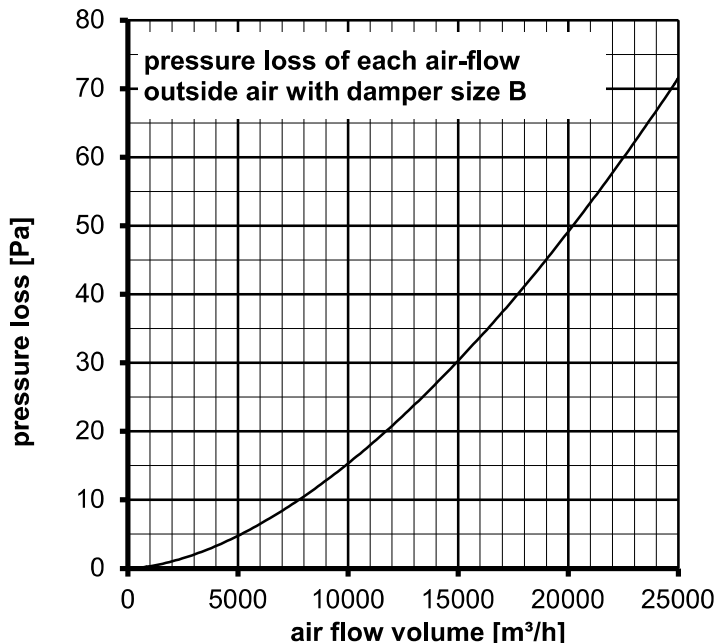
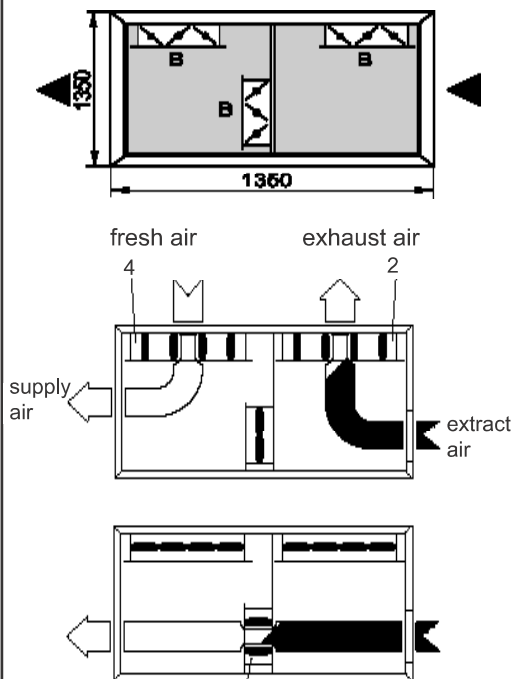


Damper size A: 1262x1262 mm (inner size)
 Damper size B: 1262x762 mm (inner size)



Air Mixer Unit CLM

for AHU with supply and extract air arranged in row



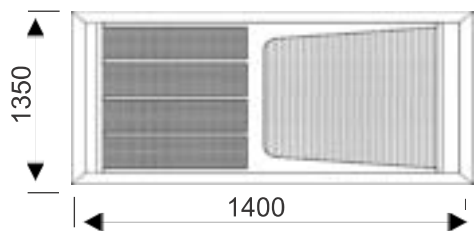
Note for units type LJ, LM and CLM:

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.

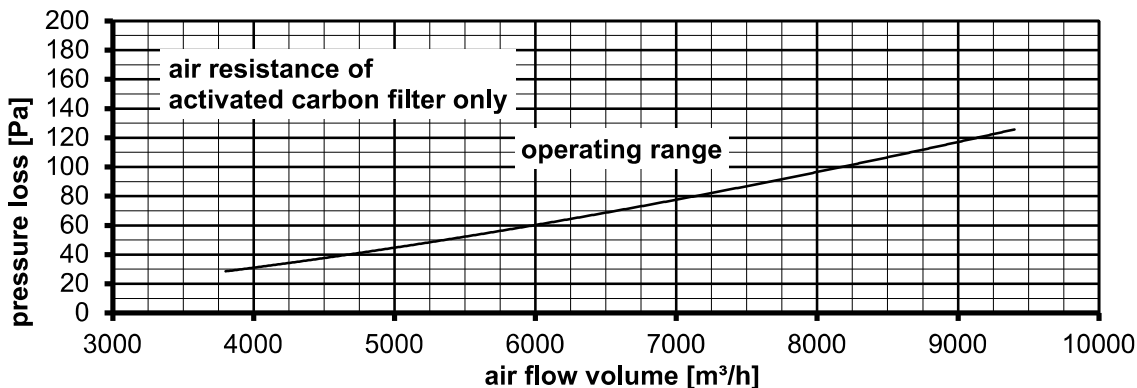
Standard Series
Size: 4, Module depth 1350 mm

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



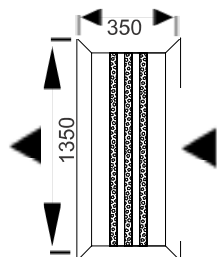
equipped with:

1. Activated carbon filter with 64 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).



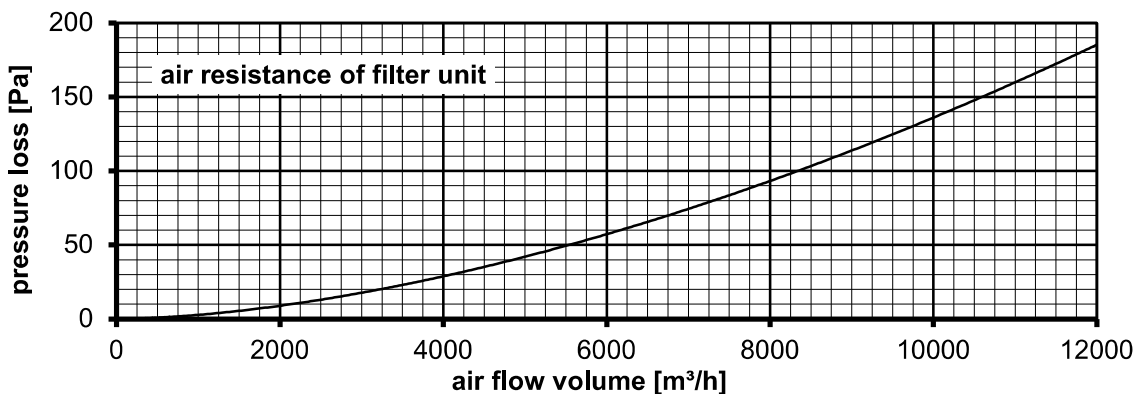
The unit sides marked by arrow are open!

Coarse Filter Unit GF

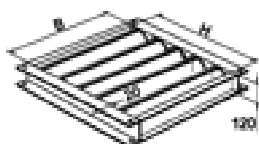


equipped with:

- 3 Filter steps:
- 2 Metal mat work filter and
- 1 Fibre mat filter G3 (EU3) with an exchange frame with drain tray (regularly cleaning required)



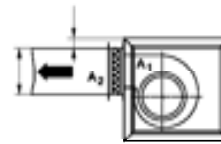
Dampers and Flexible Connections



Damper type „A“: for total cross section of unit
 1262 mm width (B) x 1262 mm height (H)
 Damper type „B“ (1262 mm width (B) x 762 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“: 1262 mm width (B) x 1262 mm height (H) for total cross section of unit.
 type „B“: 1262 mm width (B) x 762 mm height (H) for mounting on fan unit's discharge and on air mixer units with damper size „B“



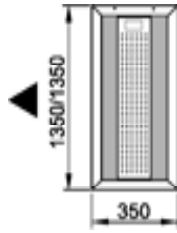
Standard Series

Size: 4, Module depth 1350 mm

The unit sides marked by arrow are open!

Electric Air Heater Unit LE

for 400V/50Hz operating voltage

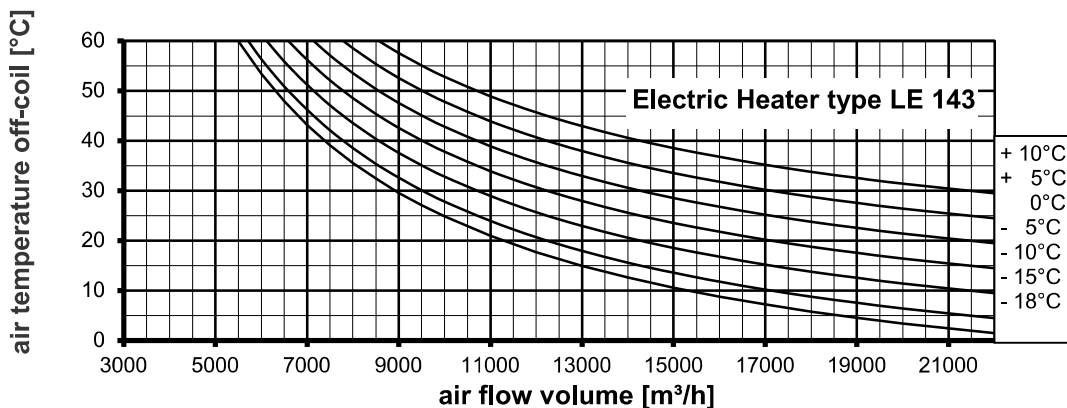
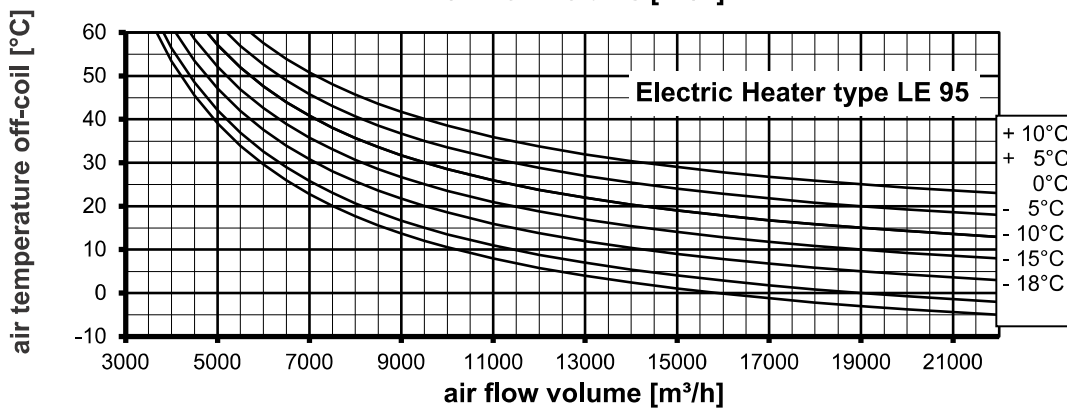
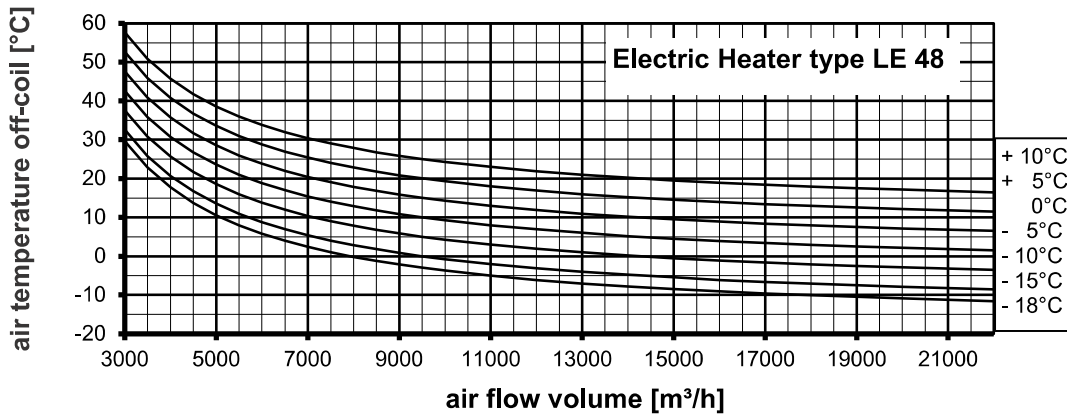
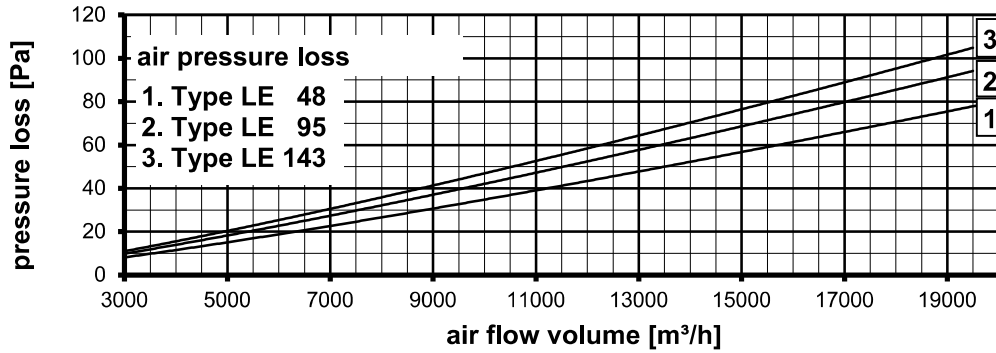


Heating performance, pressure loss and air temperature on-/off-coil

Type LE 48 (kW), 28 elements, current max. 68,7 A, 4 switching levels

Type LE 95 (kW), 56 elements, current max. 137,4 A, 4 switching levels

Type LE 143 (kW), 84 elements, current max. 206,0 A, 4 switching levels



Standard Series

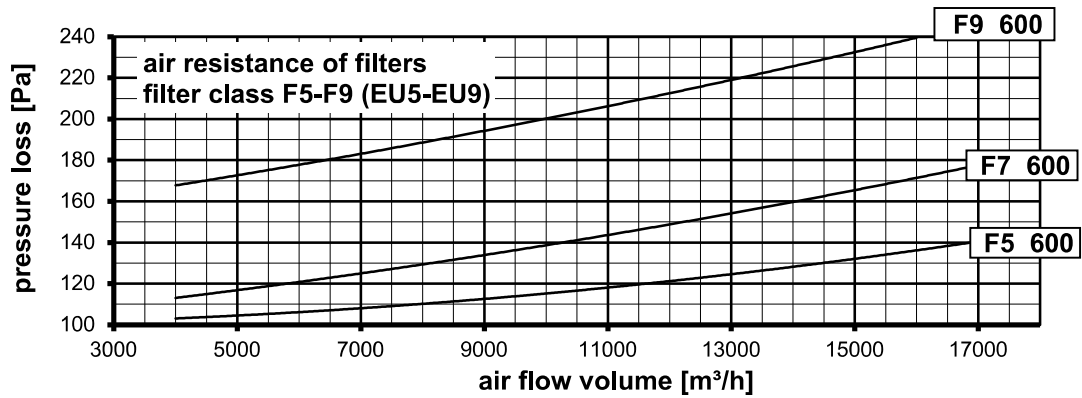
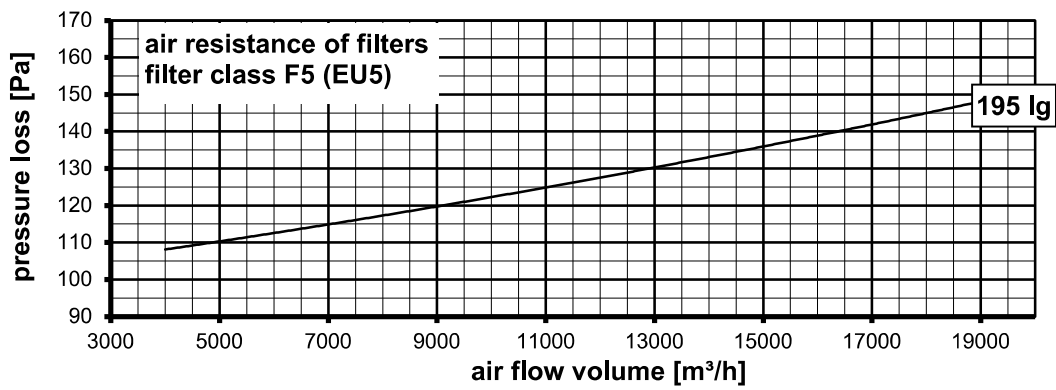
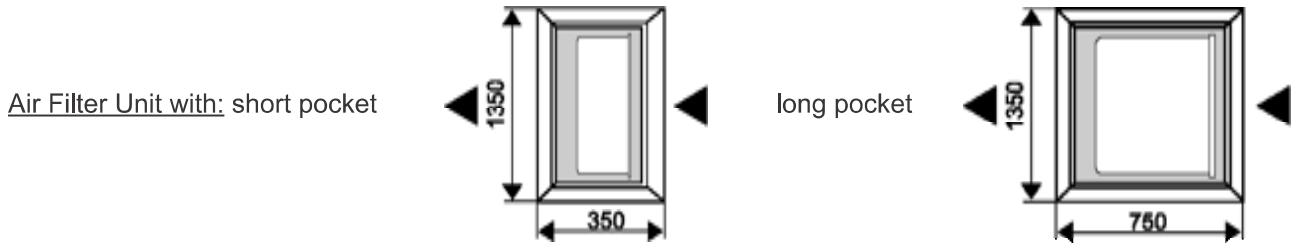
Size: 4, Module depth 1350 mm

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:



Standard Series
Size: 4

Sound data for Ventilator Unit VN 406 - VN 407

VN 406 Fan: DS 9-070/D 5

*sound pressure level L_p in dB (A)					
voltage [V]	120	180	230	280	400
inlet	57	67	72	75	78
discharge	59	69	74	77	80

* 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		
120	62	60	57	60	59	57	57	53	65	120	61	60	61	63	63	59	57	53	67		
180	70	70	66	70	69	68	67	63	75	180	69	70	70	73	73	70	67	63	77		
230	74	74	71	75	74	73	72	68	80	230	73	74	75	78	78	75	72	68	82		
280	76	77	74	78	77	76	75	71	83	280	75	77	78	81	81	78	75	71	85		
400	78	80	76	81	80	79	78	74	86	400	77	80	80	84	84	81	78	74	88		

VN 407 Fan: DS 9-001/D 5

*sound pressure level L_p in dB (A)					
voltage [V]	80	100	125	150	170
inlet	56	67	72	75	78
discharge	58	69	74	77	80

* 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		
120	62	60	56	59	58	57	57	53	64	120	61	60	60	62	62	59	57	53	66		
180	70	70	66	70	69	68	67	63	75	180	69	70	70	73	73	70	67	63	77		
230	74	74	71	75	74	73	72	68	80	230	73	74	75	78	78	75	72	68	82		
280	76	77	74	78	77	76	75	71	83	280	75	77	78	81	81	78	75	71	85		
400	78	80	77	81	80	79	79	75	86	400	77	80	81	84	84	81	79	75	88		

Standard Series
Size: 4

Sound data for Ventilator Unit VN 409 - VN 411

VN 409 Fan: DS 0-101/TD 10

*sound pressure level L_p in dB (A)					
voltage [V]	120	180	230	280	400
inlet	62	71	75	78	81
discharge	65	73	78	81	84

* 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		
120	67	66	62	66	65	63	63	59	70	120	66	66	66	69	69	65	63	59	73		
180	73	74	70	74	73	72	72	68	79	180	72	74	74	77	77	74	72	68	81		
230	77	78	74	79	78	77	76	72	83	230	76	78	78	82	82	79	76	72	86		
280	79	81	77	81	80	79	79	75	86	280	78	81	81	84	84	81	79	75	89		
400	81	84	80	84	83	83	82	78	89	400	80	84	84	87	87	85	82	78	92		

VN 410 Fan: HD 500/D 2.5

*sound pressure level L_p in dB (A)					
voltage [V]	80	100	125	150	170
inlet	43	59	68	73	80
discharge	47	63	72	77	85

* 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		
120	55	50	57	35	34	40	38	46	51	120	55	51	63	40	40	43	40	47	55		
180	68	68	74	59	58	58	56	56	67	180	68	69	78	62	62	61	56	57	71		
230	75	77	81	69	68	67	64	61	76	230	75	77	86	73	73	70	65	62	80		
280	79	82	85	76	75	72	70	65	81	280	79	83	90	80	80	75	71	65	85		
400	85	88	91	84	83	80	77	69	88	400	84	89	96	88	88	83	78	70	93		

VN 411 Fan: HD 560/D 5

*sound pressure level L_p in dB (A)					
voltage [V]	80	100	125	150	170
inlet	43	61	71	77	83
discharge	47	65	75	81	87

* 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		
120	55	50	57	35	34	39	38	45	51	120	55	51	63	39	39	43	40	47	55		
180	69	70	75	60	59	59	57	57	69	180	69	70	80	64	64	62	58	58	73		
230	78	80	84	73	72	70	68	63	79	230	77	81	89	77	77	73	69	64	83		
280	82	85	88	80	79	77	74	67	85	280	82	86	93	84	84	80	75	68	89		
400	87	91	93	87	86	83	79	70	91	400	87	92	98	91	91	86	81	71	95		

Standard Series
Size: 4

Sound data for Ventilator Unit VN 412 - VN 413

VN 412 **Fan: HD 630/D 5**
Sound data: only fan!

sound pressure level L_p in dB (A)					
voltage [V]	120	180	230	280	400
inlet *	70	80	87	91	93
discharge **	54	63	71	76	77

* sound pressure level A - measured in distance of 4m from the inlet, (room absorption 8 dB)
** sound pressure level A - at free air measured in distance of 4m from the discharge, (absorption 20 dB)

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	77	73	80	77	73	63	56	54	84	120	79	72	73	73	69	66	57	59	82		
180	90	83	90	87	81	73	74	62	95	180	84	82	84	82	77	68	72	61	90		
230	93	91	97	92	92	79	84	78	100	230	89	89	91	89	88	75	80	74	96		
280	96	93	100	95	96	84	87	85	104	280	90	96	98	92	93	80	83	83	102		
400	96	95	101	96	99	86	88	89	105	400	93	96	98	93	94	83	84	87	103		

VN 413 **Fan: HD 630/TD 10**

*sound pressure level L_p in dB (A)					
voltage [V]	120	180	230	280	400
inlet	55	73	81	88	90
discharge	60	78	86	91	95

* 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		
120	64	63	69	52	51	53	51	53	63	120	65	65	75	57	57	56	53	55	68		
180	79	81	85	76	75	72	69	64	81	180	80	83	91	81	81	76	71	66	86		
230	85	88	91	85	84	80	77	69	89	230	86	90	97	90	90	84	79	71	94		
280	88	92	95	90	89	85	82	71	94	280	89	95	101	95	95	89	84	73	99		
400	91	96	98	94	93	89	86	74	98	400	92	98	104	99	99	94	88	76	103		