Page 1

Standard Series Size: 3

Calculation of external available Pressure

Air flow volume	[m³/h]	1500	3000	4000	5000	5500	6000	6500	7000	7500	8000	9000	10000	11000	12000

1. Step

1. Criterion flow velocity (Ref. 20°C)

Do not design units in conditions acc. to white areas!

Supply Unit with air conditioning elements:

Flow velocity related to ***Cross section of filter (long)***	[m/s]	0,53	1,06	1,42	1,77	1,95	2,13	2,30	2,48	2,66	2,83	3,19	3,54		
Flow velocity related to ***Finned surface of heater***	[m/s]	0,66	1,32	1,76	2,20	2,43	2,65	2,87	3,09	3,53	3,97	4,41			
Flow velocity related to ***Finned surface of cooler***	[m/s]	0,68	1,37	1,82	2,28	2,50	2,73	2,96	3,19	3,64					

Extract Unit without air conditioning elements:

Flow velocity related to ***Inner cross section of unit***	[m/s]	0,49	0,99	1,32	1,65	1,81	1,98	2,14	2,31	2,47	2,64	2,97	3,30	3,63	3,96

2. Step

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. Pressure Calculation

Available statical pressure [Pa] at rated voltage
without consideration of pressure regain!

Ventilator Unit	VN 308	840	725	640	545	490	430	360	285	200	105				
	VN 309	1150	1010	915	810	750	690	625	550	475	390				
	VN 310	1210	1170	1130	1080	1055	1025	990	955	910	865	760	635	490	315
	VN 311	1310	1220	1160	1110	1085	1060	1035	1010	980	955	865	830	750	660

The following air conditioning elements reduce pressure available!

Pressure loss [Pa] at above statet air volume

Pocket filter F5	Calculated resistance	104	110	114	119	122	124	127	130	133	136	143	151		
Short filter (195 mm pocket)	Clean resistance	9	20	28	38	43	48	54	60	66	73	87	101		

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	102	105	108	112	114	117	120	122	126	129	136			
Long filter (600 mm pocket)	Clean resistance	3	10	16	24	29	34	39	45	51	58	72			

Recommended final resistance: 200 - 300 Pa

Pocket filter F7	Calculated resistance	108	118	126	134	138	142	147	151	156	161				
Long filter (600 mm pocket)	Clean resistance	17	37	51	67	76	84	93	103	112	122				

Recommended final resistance: 200 - 300 Pa

Pocket filter F9	Calculated resistance	162	174	184	194	199	204	210	216	221					
Long filter (600 mm pocket)	Clean resistance	23	49	68	88	98	109	120	131	143					

Recommended final resistance: 300 - 400 Pa

Air Heater LW	LW 1	2	18	13	18	22	25	29	32	36	40	49	59		
Medium: PWW (pump circulated hot water)	LW 2	4	14	22	33	38	44	51	58	65	72	88	105		
	LW 3	8	24	39	56	65	76	86	98	110	122	148	177		

Subtotal
External statical pressure [Pa] available

Page 2

Standard Series
Size: 3

Calculation of external available Pressure

Air Flow Volume	[m³/h]	1500	3000	4000	5000	5500	6000	6500	7000	7500	8000	9000	10000	11000	12000

2. Pressure calculation *The following air conditioning elements reduce pressure available!*

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	10	32	52	75	87	101	115	130	146	163				
Medium. chilled water KKW	LK 4	13	41	67	98	115	133	152	172	193	215				
	LK 6	15	50	82	119	140	163	186	211	238	265				
Air Cooler LKR	LKR 2	9	29	48	70	83	96	110	124	140	156	191	228		
Direct Evaporator	LKR 4	10	32	52	76	90	104	119	135	152	170	208	248		
Medium R407C, 5°C	LKR 6	15	49	81	118	139	161	184	209	235	262	320	383		
Water Eliminator		2	7	11	17	20	23	27	31	35					
horizontal air flow (LK)															
Damper	class type A		2	3	4	5	5	6	7	7	8	10	12	14	16
	class type B		5	8	11	13	15	18	20	23	25	31	36	43	49
		Pressure losses to be taken into consideration only with damper on inlet side.													
Air Mixer LJ, LM, CLM	class type A		2	3	4	5	5	6	7	7	8	10	12	14	16
	class type B		5	8	11	13	15	18	20	23	25	31	36	43	49
		Pressure losses to be taken into consideration only with air mixer on inlet side.													
	Unit length														
Attennuator SD	850 mm	1	1	2	3	4	5	6	7	8	9	11	14	16	19
	1350 mm	1	1	3	4	5	6	7	8	9	10	13	16	19	23
	1750 mm	1	2	3	5	5	7	8	9	10	12	15	18	22	26
	2250 mm	1	2	3	5	6	7	9	10	11	13	17	20	25	29
Plate heat Exchange APD		on request													
with integrated Bypass resistance calculated at 22°C/30% r. H.															
Coarse Filter GF	clean resistance	16	53	86	125	147	170	195							
		Regularly cleaning required!													
Activated Carbon Filter		22	67	107	155										
Calculated resistance same than clean resistance															
Electric Air Heater LE	LE 25	8	18	26	34	38	42	46	50	55	59	68	77	87	96
Operating voltage 400V/50Hz	LE 50	9	22	31	41	45	50	56	61	66	71	82	93	105	116
	LE 75	11	24	35	45	51	56	62	68	74	80	92	104	117	130

Total
External statical pressure [Pa] available

2. Step

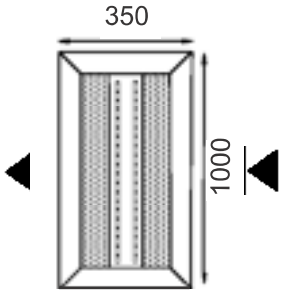
Calculation of external available statical air pressure by deduction of internal pressure losses

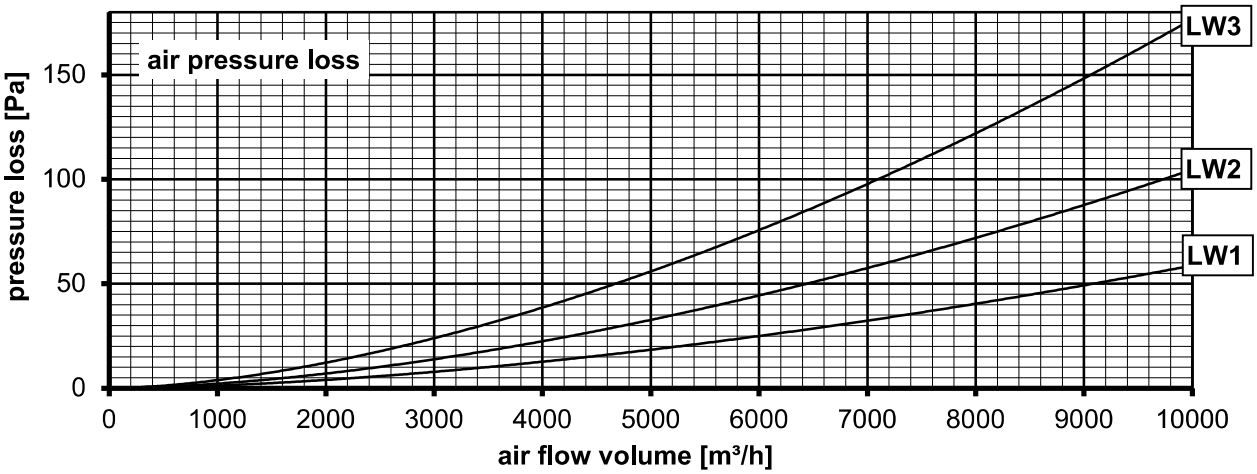
Deduct the respective pressure losses of needed elements from available stat. pressure of fan!

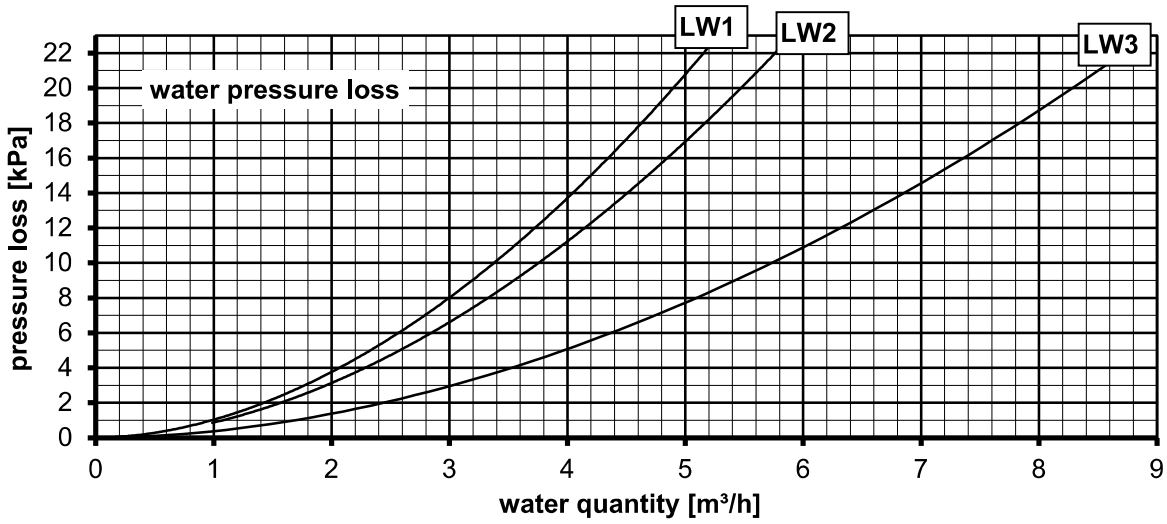
Standard Series
Size: 3 , Module depth 1000 mm

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:

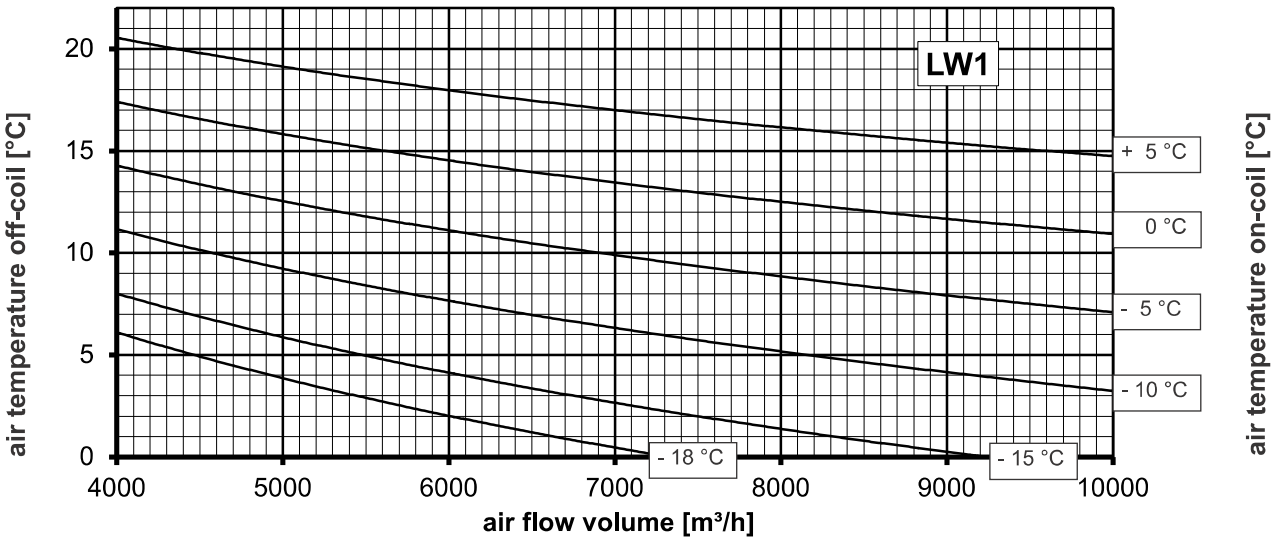
$$\dot{Q}_h[kW] = \dot{V}_L/3600 \times (t_{LA} - t_{LE}) \times \rho_L \times cp_L$$

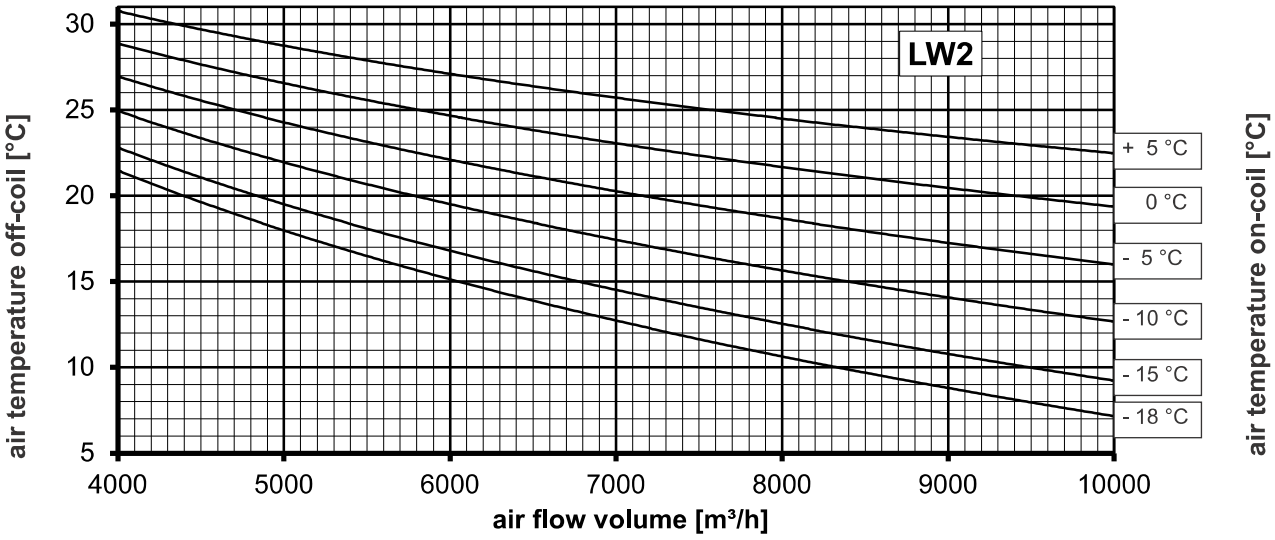
$\dot{Q}_h$ = heating performance [kW]
$\dot{V}_L$ = air flow volume [m³/h]
t_{LA} = air temperature off-coil [°C]
t_{LE} = air temperature on-coil [°C]
ρ_L = specific weight of air = 1,2 [kg/m³]
cp = specific heat capacity of air = 1,0 kJ/kg K

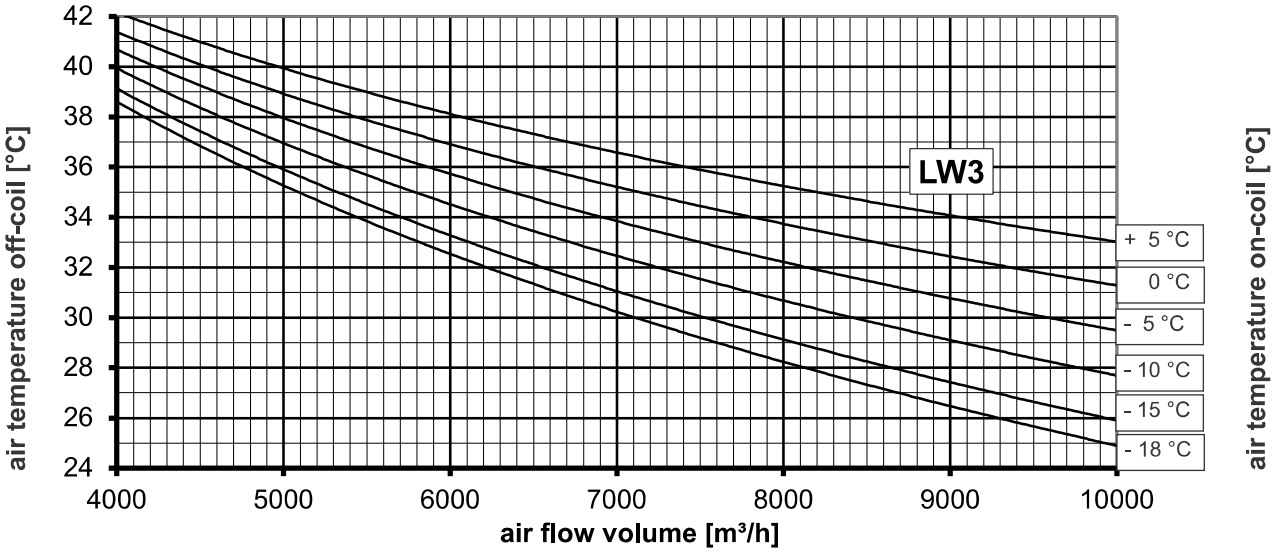
Standard Series
Size: 3

Air Heater Unit LW
for medium pump circulated water

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



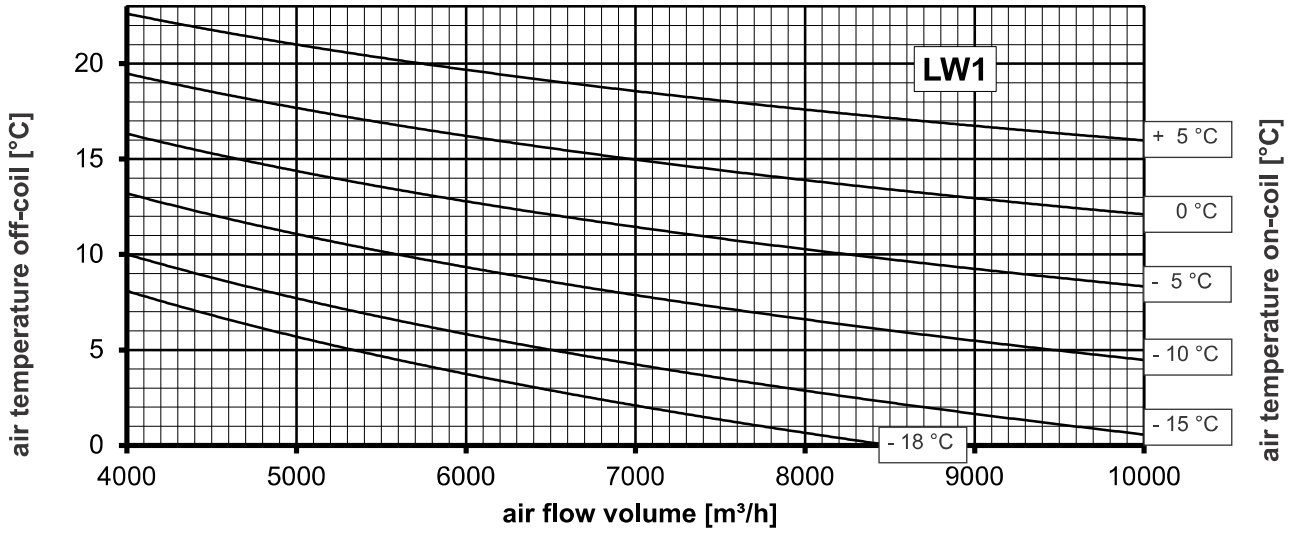


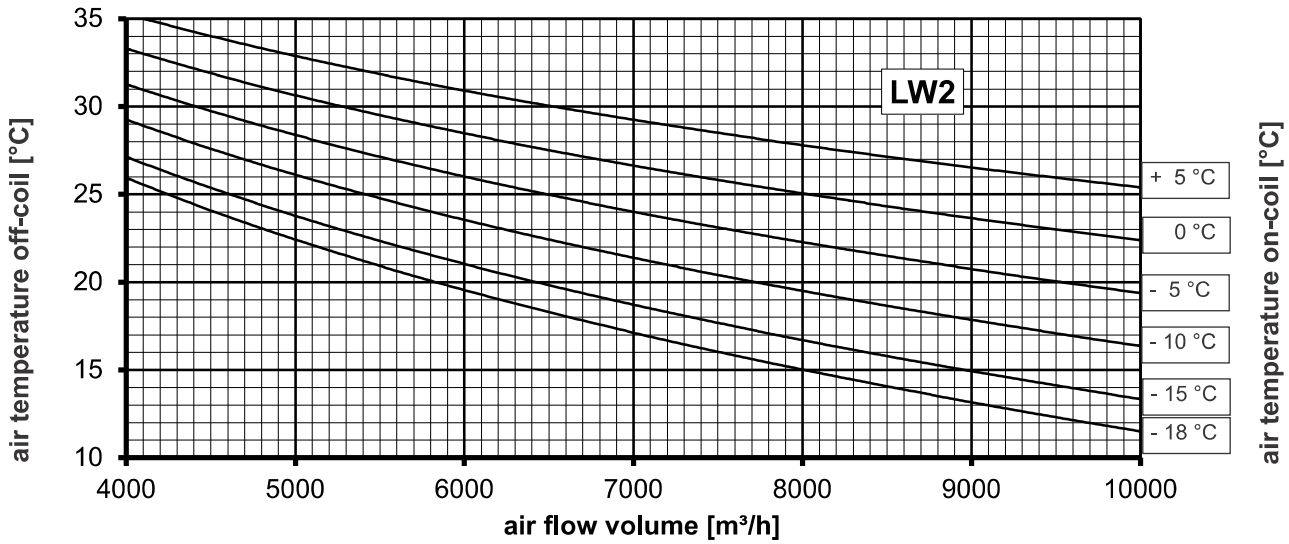


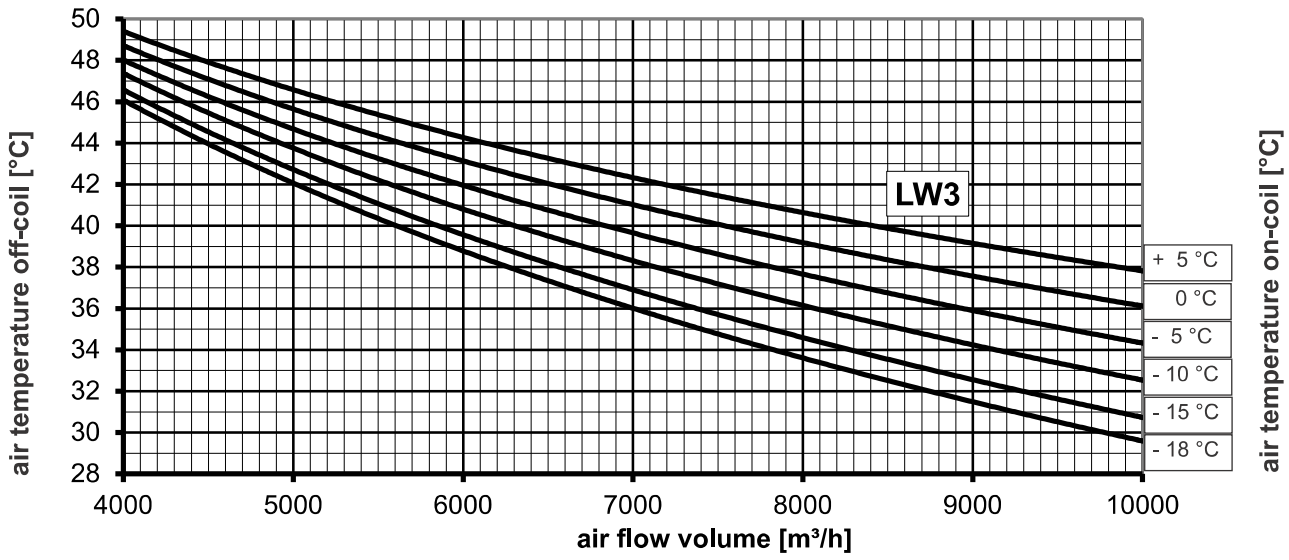
Standard Series
Size: 3

Air Heater Unit LW
for medium pump circulated water

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



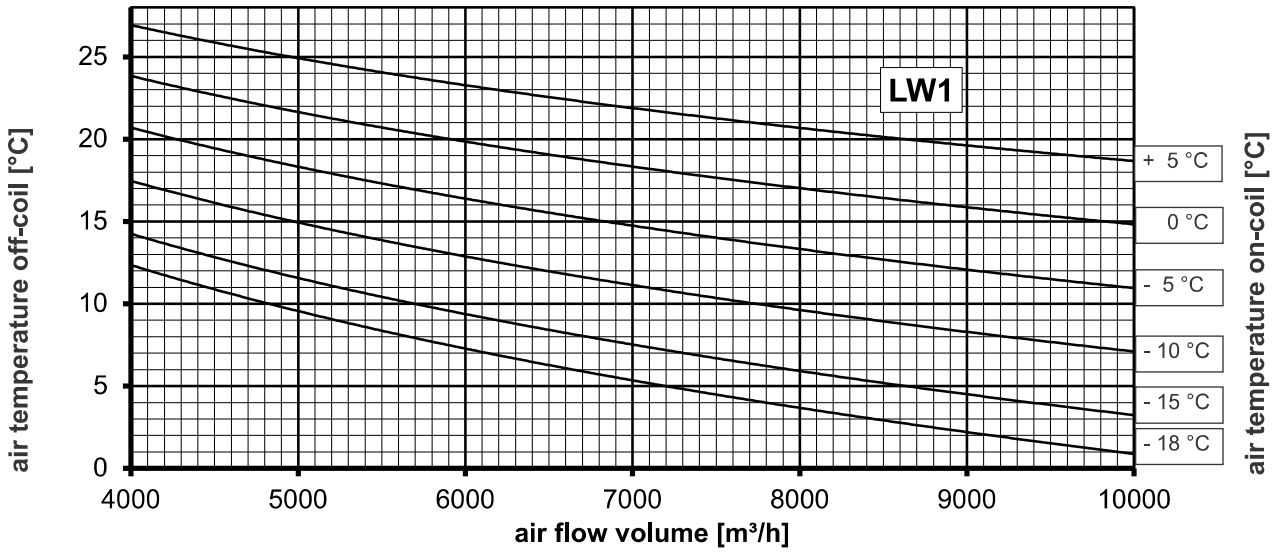


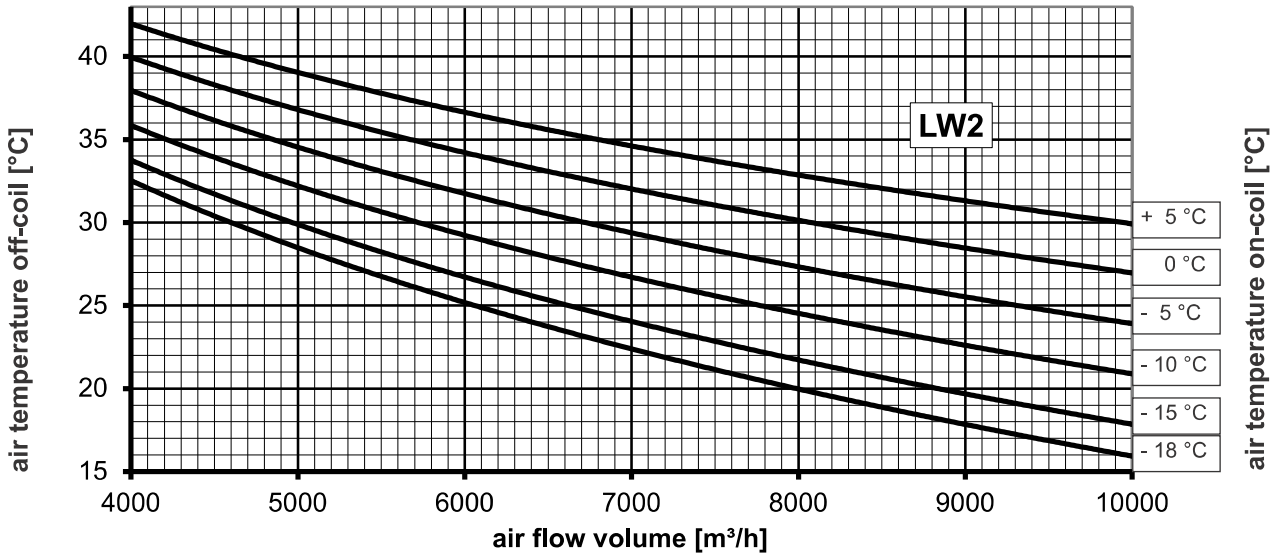


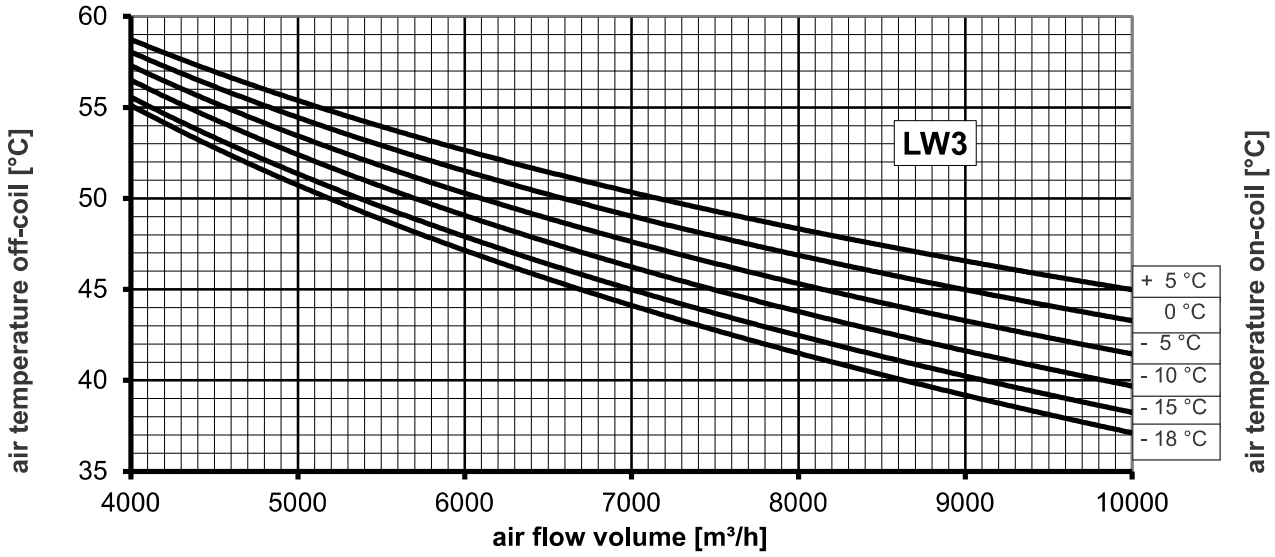
Standard Series
Size: 3

Air Heater Unit LW
for medium pump circulated water

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

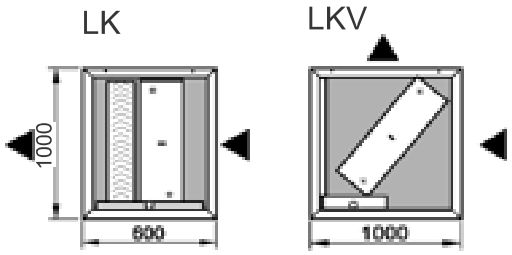






Standard Series
Size: 3, Module depth 1000 mm
The unit sides marked by arrow are open!

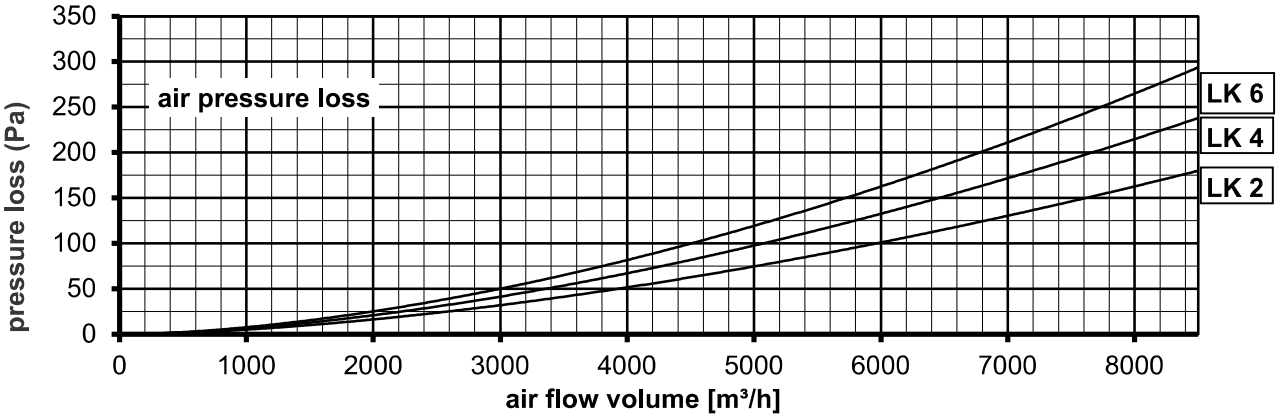
Air Cooler Units LK and LKV
for cooling medium chilled water KKW
Water temperature on-/off-coil 6/10 or 6/12, without glycol

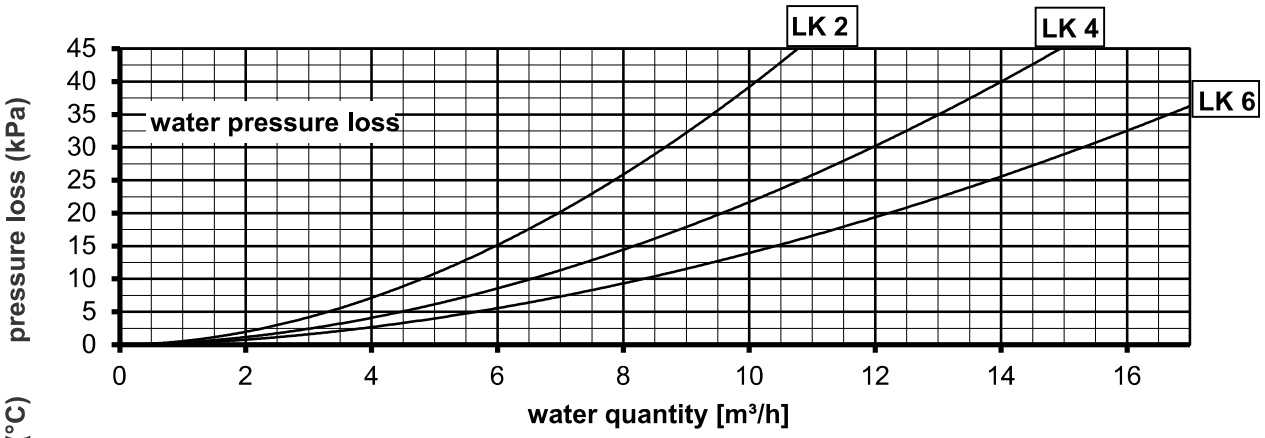


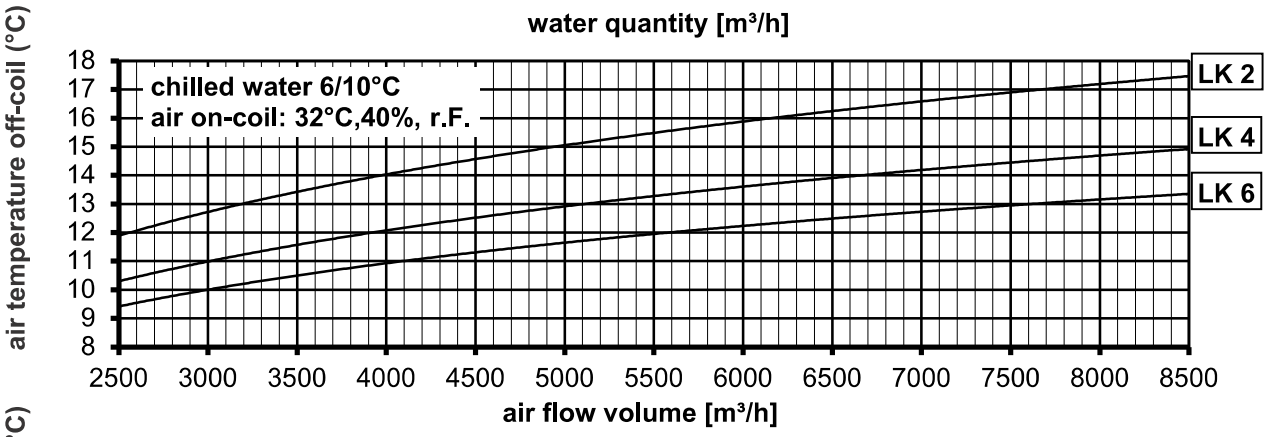
The required amount of water can be calculated with the formula:

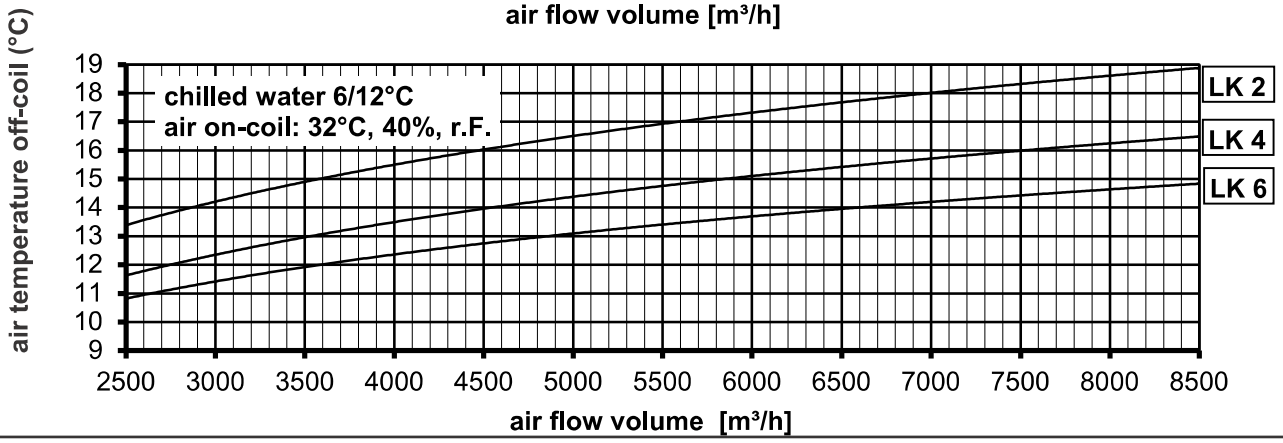
$$\dot{V}_W[m^3/h] = (\dot{Q}_h \times 3600)/(\Delta t_W \times c_W \times \rho_W)$$

$\dot{Q}_h$ = cooling performance [KW]
$\dot{V}_W$ = quantity of water [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





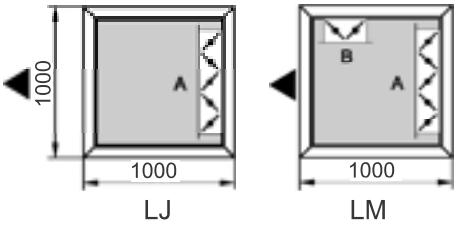




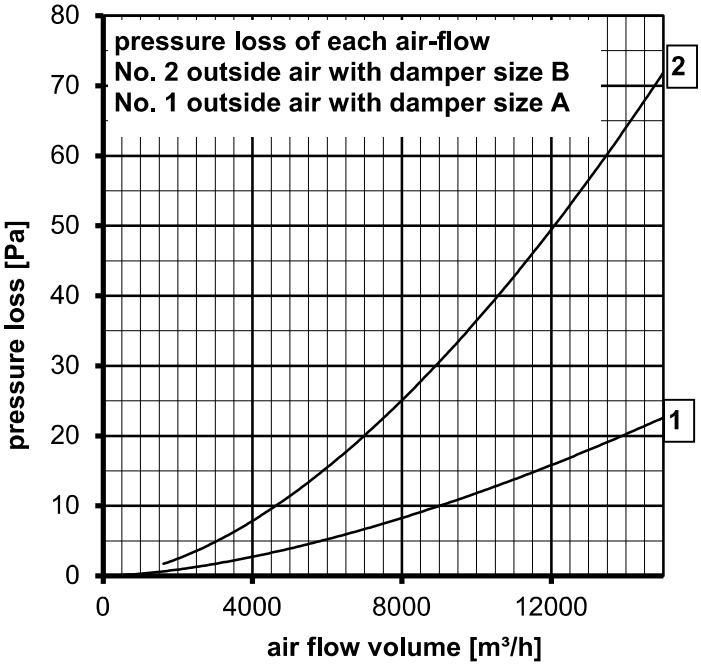
Standard Series
Size: 3, Module depth 1000 mm
The unit sides marked by arrow are open!

Air Mixer Unit LJ and LM

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

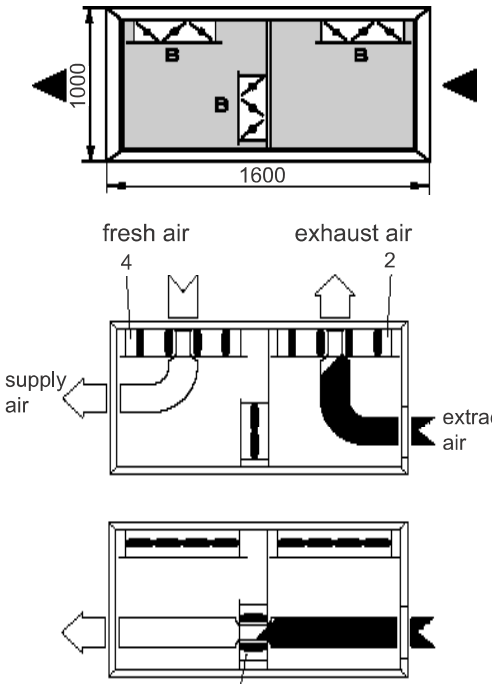


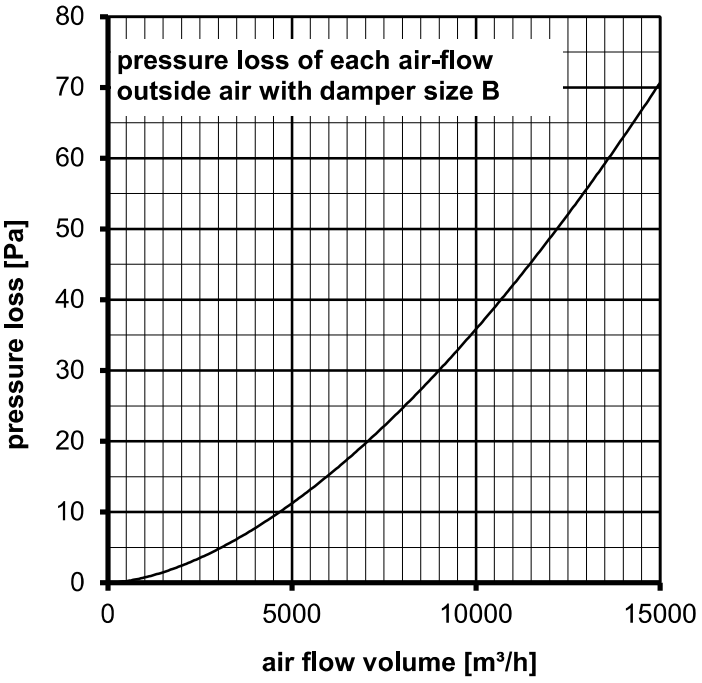
Damper size A: 912x912 mm (inner size)
Damper size B: 912x662 mm (inner size)



Air Mixer Unit CLM

for AHU with supply and extract air arranged in row



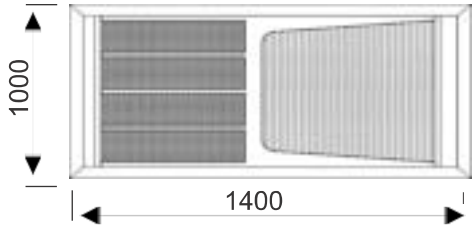


Note for units type LJ, LM and CLM:
Pressure loss of Air Mixing Units is calculated on base „free air“. That means, for connected duct of same cross section no additional dynamical intake losses have to be considered.

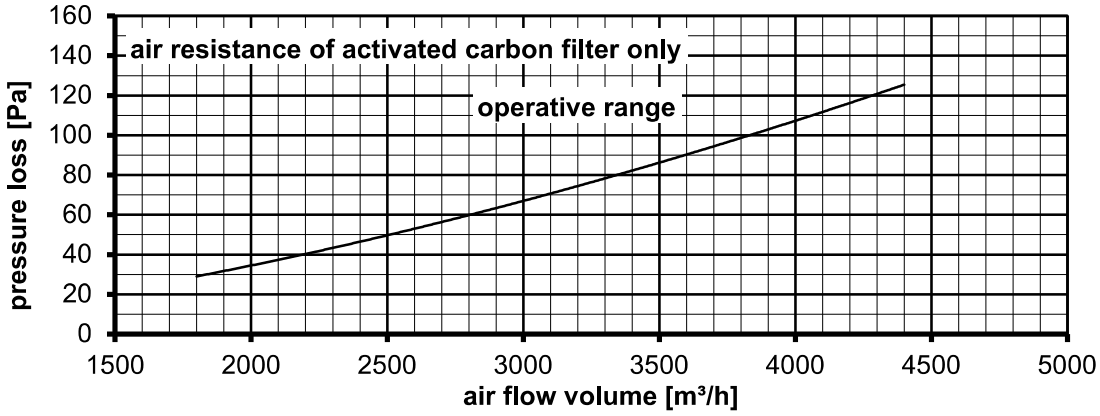
In case of pressure side connection with a ventilator unit the resulting pressure regain is bigger than the pressure loss. Therefore, no statical pressure loss needs to be considered.

Standard Series
Size: 3, Module depth 1000 mm

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

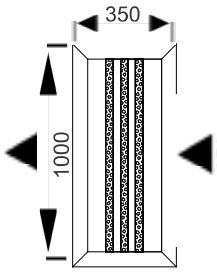


equipped with:
1. Activated carbon filter with 30 filter cartridges (bayonet fixing),
2. Pocket filter, quality class F7 (EU7), length 600mm
Total air resistance of combinated filter unit is a sum of pressure drops of the filter steps 1 and 2.
Therefore, the pressure loss of filter EU7 has to be added separately to below values for activated carbon filter (to be found in diagram for the respective filter module).

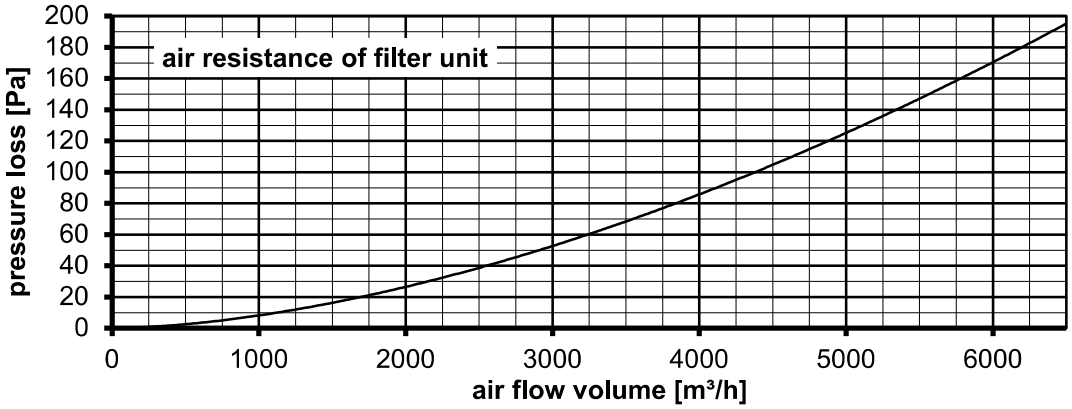


The unit sides marked by arrow are open!

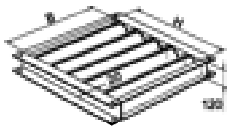
Coarse Filter Unit GF



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

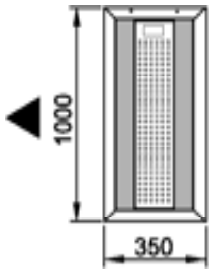


Damper type „A“: for total cross section of unit 912 mm width (B) x 912 mm height (H)
Damper type „B“ (912 mm width (B) x 662 mm height (H) for fan unit´s discharge opening (smaller); fitting for flexible connection B

Flexible Connection: to be used for outlet- and inlet side
type „A“: 912 mm width (B) x 912 mm height (H) for total cross section of unit.
type „B“: 912 mm width (B) x 662 mm height (H) for mounting on fan unit´s discharge and on air mixer units with damper size „B“

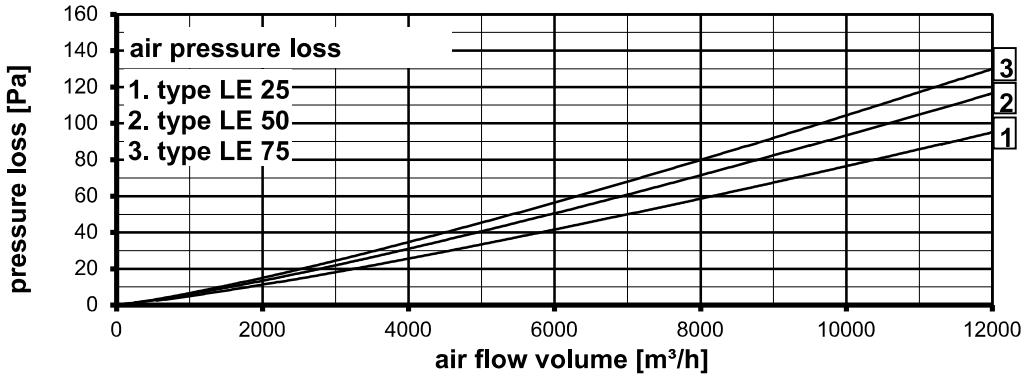
Standard Series
Size: 3, Module depth 1000 mm
The unit sides marked by arrow are open!

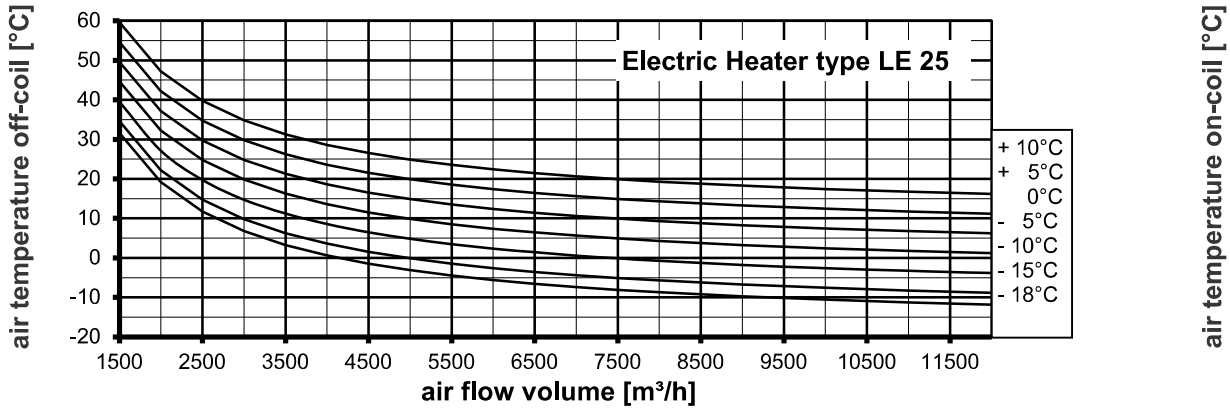
Electric Air Heater Unit LE
for 400V/50Hz operating voltage

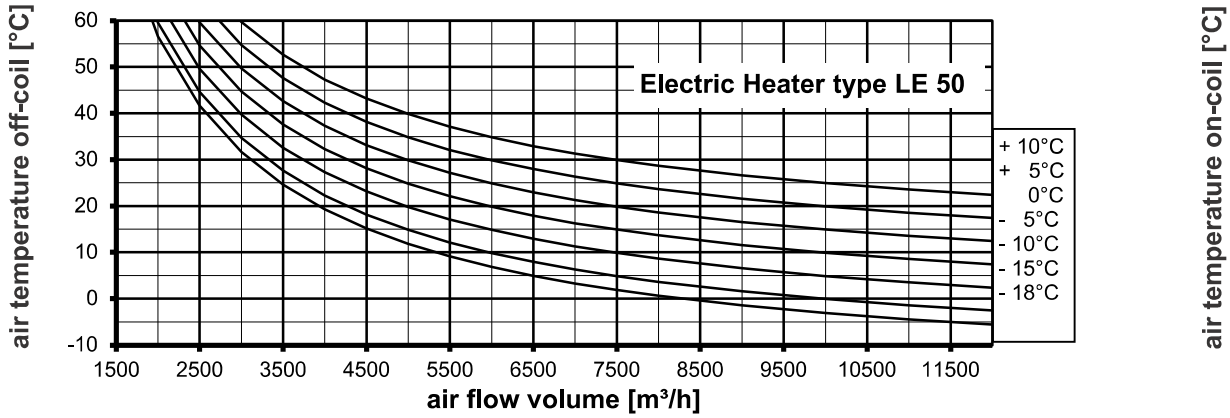


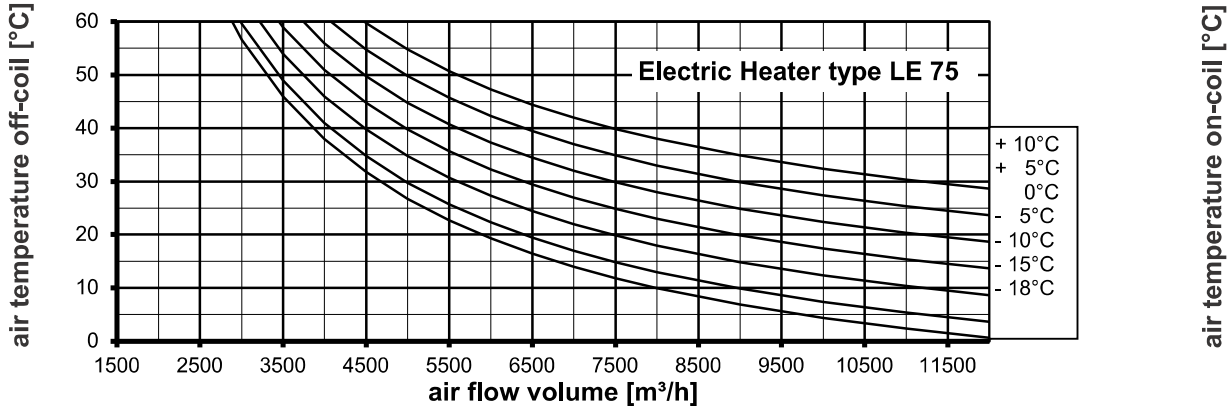
Heating performance, pressure loss and air temperature on-/off-coil

Type LE25 (kW), 19 elements, current max. 35,7 A, 4 switching levels
Type LE50 (kW), 38 elements, current max. 71,4 A, 4 switching levels
Type LE75 (kW), 57 elements, current max. 74,6 A, 4 switching levels







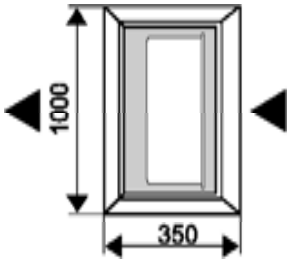


Standard Series
Size: 3, Module depth 1000 mm
The unit sides marked by arrow are open!

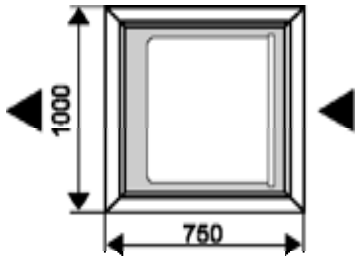
Air Filter Unit KFS
with short pocket (195mm) and
long pocket filters (600mm)

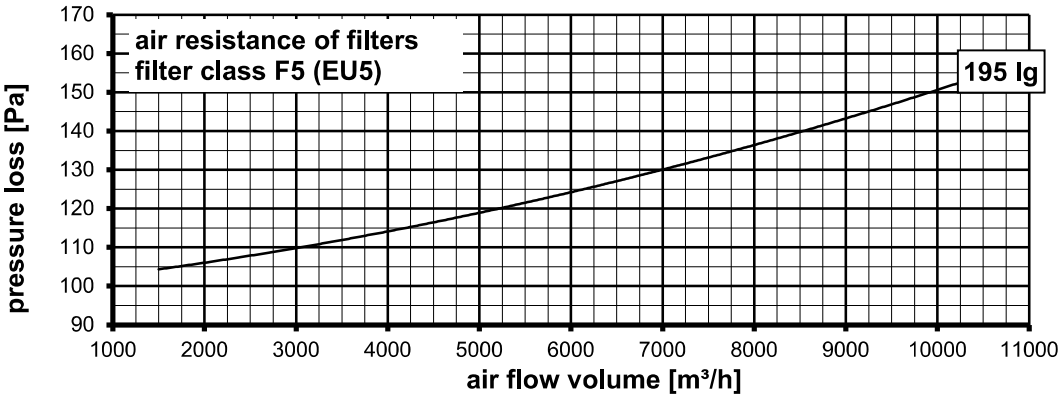
Technical data and resistance:

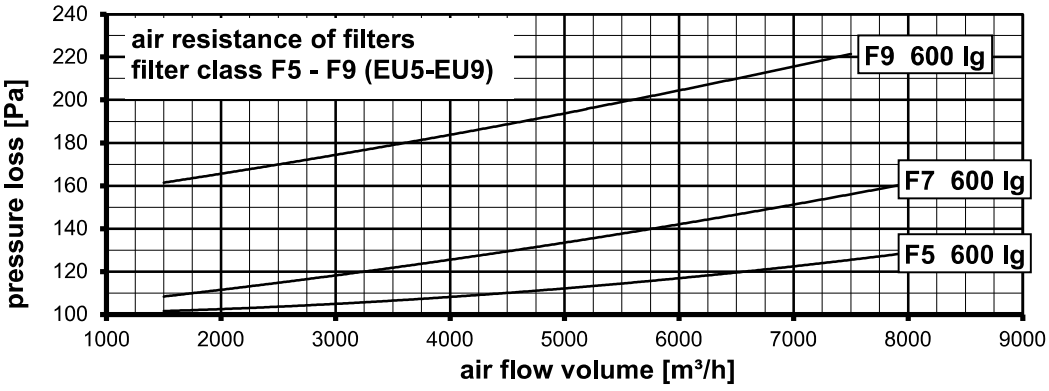
Air Filter Unit with: short pocket



long pocket







Standard Series
Size: 3

Sound data for Ventilator Unit VN 308 - VN 310

VN 308 Fan: D 970/D 2

*sound pressure level L_p in dB (A)					
voltage [V]	120	180	230	280	400
inlet	52	57	62	66	71
discharge	54	60	65	68	73

* related to room absorption of 8 db (25m² Sabine), at free air! measured in distance of 3 m

inlet side: sound power level in Lw [dB] at mid frequency in (Hz) (at free air!)									L_{WA} [dB(A)]	**discharge side: sound power level in Lw [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	58	55	52	55	54	52	52	48	59	**120**	57	55	56	58	58	54	52	48	62
180	63	61	57	61	60	58	58	54	65	**180**	62	61	61	64	64	60	58	54	68
230	67	66	62	66	65	63	63	59	70	**230**	66	66	66	69	69	65	63	59	73
280	69	69	65	69	68	67	67	63	74	**280**	68	69	69	72	72	69	67	63	76
400	73	74	70	74	73	72	72	67	79	**400**	72	74	74	77	77	74	72	67	81

VN 309 Fan: DS 9-070/D 2.5

*sound pressure level L_p in dB (A)					
voltage [V]	80	100	125	150	170
inlet	52	62	66	69	74
discharge	55	64	68	71	76

* related to room absorption of 8 db (25m² Sabine), at free air! measured in distance of 3 m

inlet side: sound power level in Lw [dB] at mid frequency in (Hz) (at free air!)									L_{WA} [dB(A)]	**discharge side: sound power level in Lw [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	56	52	56	55	53	53	49	60	**120**	58	56	56	59	59	55	53	49	63
180	66	65	61	65	64	62	62	58	70	**180**	65	65	635	68	68	64	62	58	72
230	69	69	65	69	68	67	67	63	74	**230**	68	69	69	72	72	69	67	63	76
280	72	72	68	72	71	70	70	66	77	**280**	71	72	72	75	75	72	70	66	79
400	75	76	73	77	76	75	74	70	82	**400**	74	76	77	80	80	77	74	70	84

VN 310 Fan: DS 9-070/D 5

*sound pressure level L_p in dB (A)					
voltage [V]	80	100	125	150	170
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 Lw [dB] at mid frequency in (Hz) (at free air!)									L_{WA} [dB(A)]	**discharge side: sound power level in Lw [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

Standard Series
Size: 3

Sound data for Ventilator Unit VN 311

VN 311 Fan: DS 9-001/D 5

*sound pressure level L_p in dB (A)					
voltage [V]	120	180	230	280	400
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 Lw [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
120	62	60	56	59	58	57	57	53	64
180	70	70	66	70	69	68	67	63	75
230	74	74	71	75	74	73	72	68	80
280	76	77	74	78	77	76	75	71	83
400	78	80	77	81	80	79	79	75	86

discharge side: sound power level in Lw [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
120	61	60	60	62	62	59	57	53	66
180	69	70	70	73	73	70	67	63	77
230	73	74	75	78	78	75	72	68	82
280	75	77	78	81	81	78	75	71	85
400	77	80	81	84	84	81	79	75	88