

LENNOX

APPLICATION GUIDE



PROVIDING **GLOBAL SYSTEM** SOLUTIONS

**AIR HANDLING
UNIT
SENATOR 25**

English/04-2004



APPLICATION GUIDE

Réf : SENATOR25_AGU-0404-E

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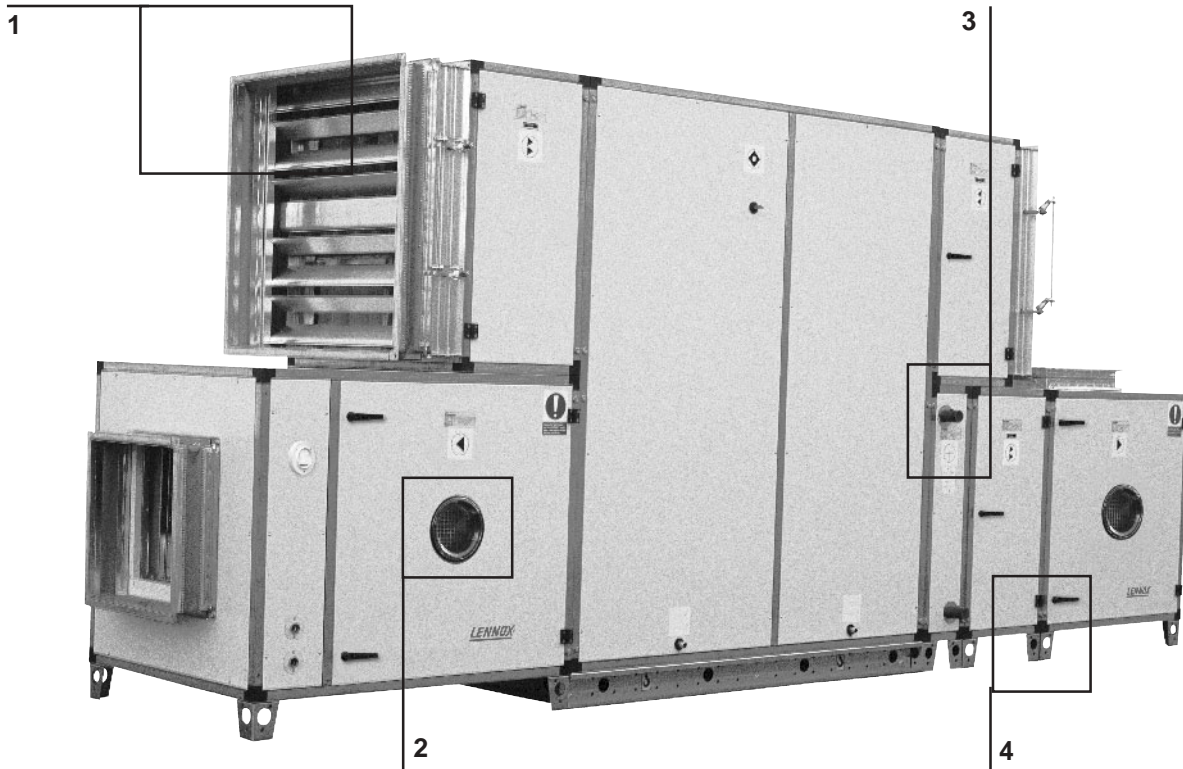
Our company's products comply with European standards.

The manufacturing of SENATOR 25 Air Handling Units answer to ISO9001 control quality system.

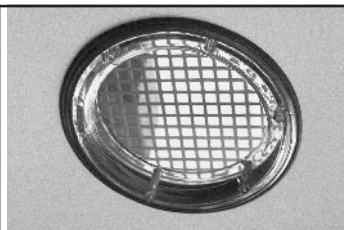
LENNOX have been providing environmental solutions since 1895, our range of SENATOR 25 Air Handling Units continue to meet the standards that have made LENNOX a household name. Flexible design solutions to meet your needs and uncompromising attention to detail. Engineered to last, simple to maintain and quality that comes as standard.

Information on local contacts at www.lennox europe.com All the technical and technological information contained in this manual, including any drawing and technical descriptions provided by us, remain the property of LENNOX and must not be utilised (except in the operation of this product), reproduced, issued to or made available to third parties without the prior written agreement of LENNOX.

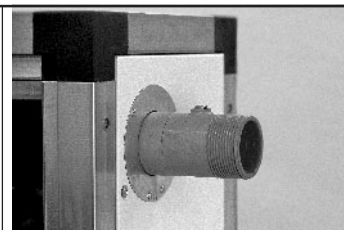




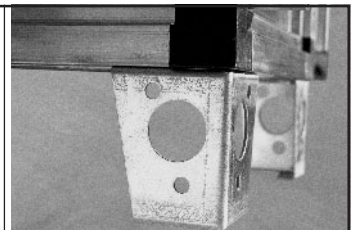
1 - Profile vanes of regulating damper



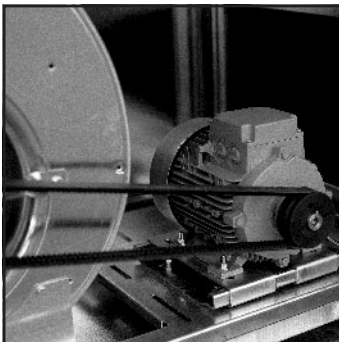
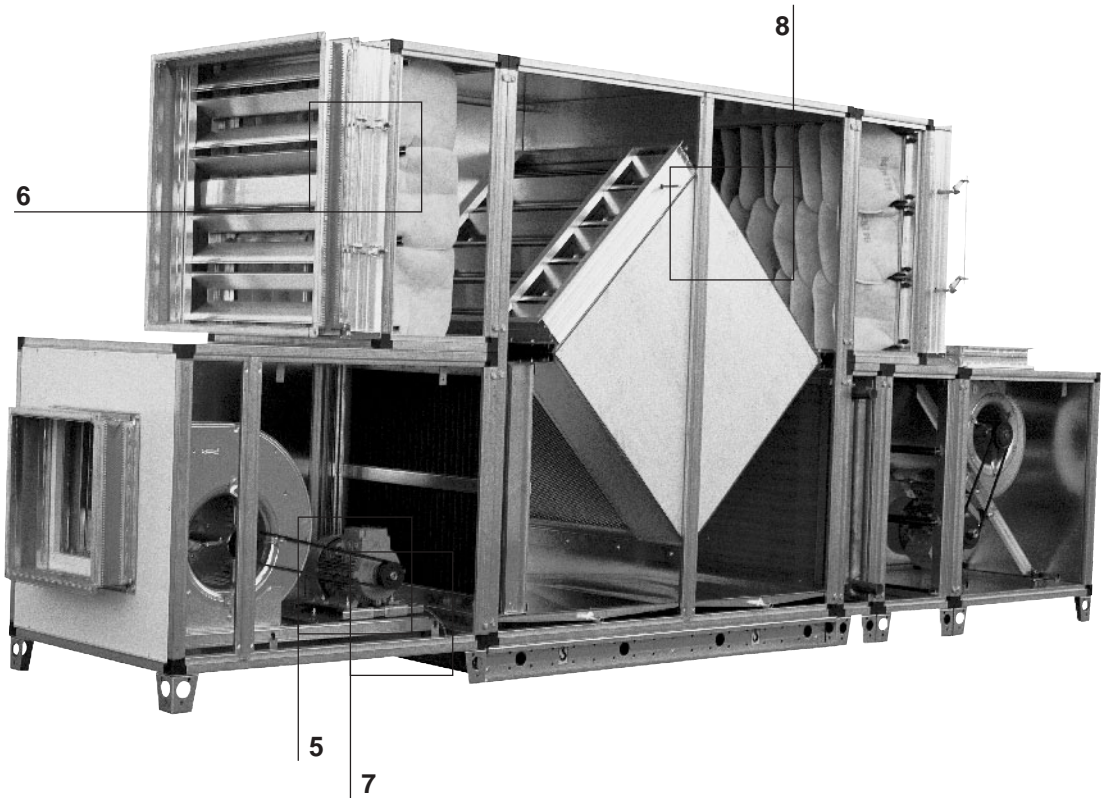
2 - Plastic double sight glass for servicing



3 - Heater coil branch with air relief valve



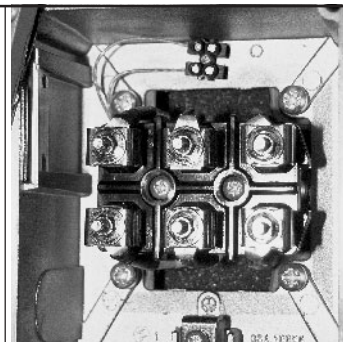
4 - Legs



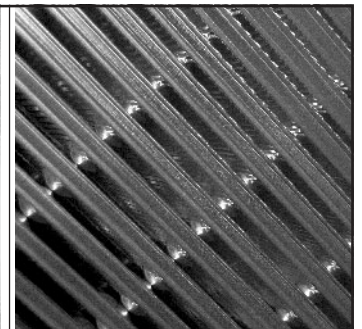
5 - Reliable belt gear tensioning



6 - Dampers prepared for actuator installation

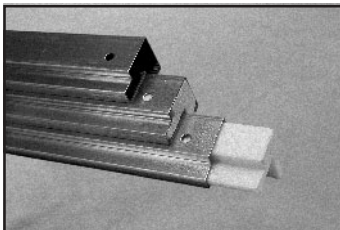


7 - Motors terminal plate with terminals of thermo-contacts

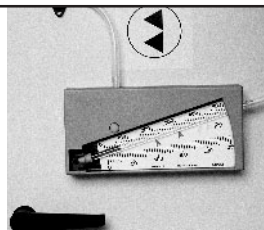


8 - Aluminium vanes of desk regenerator

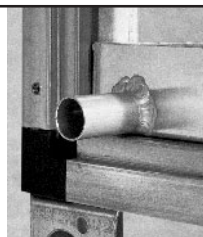
13



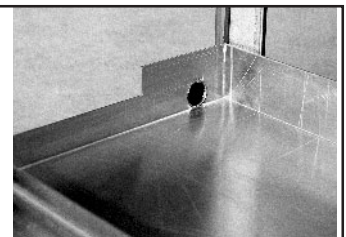
9 - Frame profiles with thermal insulation



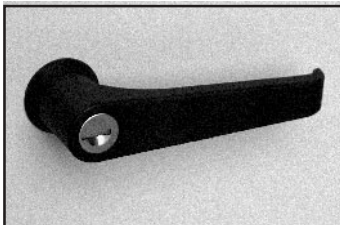
10 - Visual control of filter clogging



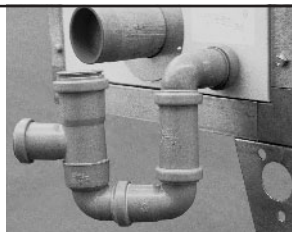
11 - Condensate drain with adequate diameter



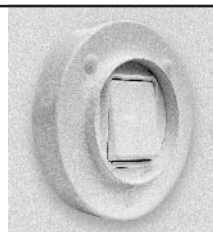
12 - Aluminium or stainless drain pan



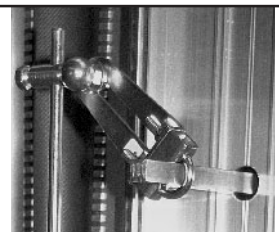
13 - Lockable door lock



14 - Siphon

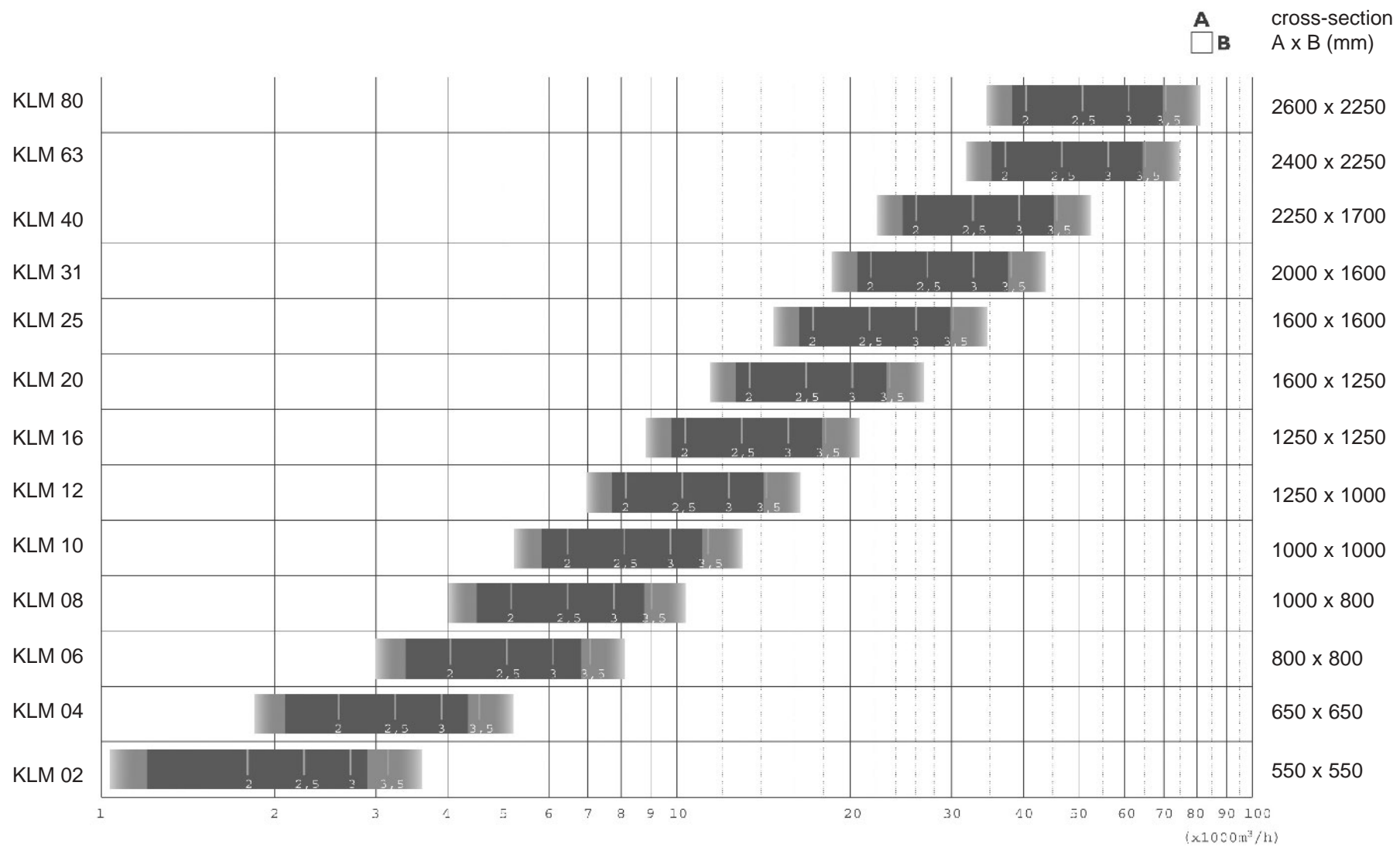


15 - Inner light



16 - Regulating damper shaft interconnection

5



SENATOR 25 units serve as multifunctional air treatment for a variety of air-conditioning applications, with a wide range of outputs. They include ventilation, filtration, heating, cooling, humidification and recuperation, mostly in several versions. These functions are contained in separate chambers, which allow individual arrangement of the air conditioning unit exactly to the designer's requirement. The units may be used for both indoor and outdoor installations, they are suitable for facilities with hygienic operation as well as for explosive hazardous areas. The units are designed for the air flow rates from 1,000 m³/h to 80,000 m³/h, and this range is covered by 13 sizes.



Guarantee of quality

The high quality of **LENNOX** products is documented by certificates granted to our air conditioning units. **LENNOX** manufacturing plant was awarded a certificate EN ISO 9001 in 1998, assuring a high level of quality within the organisation.

As regards to safety of equipment, our products were awarded a certificate No. C5-03820 complying with the CE product safety directive. Certificates of Compliance are issued on the basis of this certificate. For use in buildings the certificate is supplemented with a Certificate of Building Compliance STO 03820.

As a recommendation for the use of our equipment in facilities with hygienic operation, the State Medical Institute in Prague issued a *Hygienic Assessment of the Air-Conditioning Unit*.

Performance testing

The manufacturing plant has its own test facility with expert staff and state-of-the-art measuring instruments for air-conditioning equipment testing. Tested in the test facility are all prototypes of new chambers as well as design innovations of the existing chambers. Thanks to the parameters measured, the air-conditioning units are further optimized. Air output, rate of flow, temperature, noise and vibrations measurements may be performed using mobile instruments on equipment that has already been put into service. The measurement results are documented in test records.

Structure and jacket

The unit's frame consists of hollow galvanized steel sections joined in the corners with plastic corner squares. The unit is constructed from 25 mm thick sandwich panels with a supporting profile along the perimeter. The inner and outer panel skin is made of galvanized steel sheet 0.6 mm thick. Outer skins of the outdoor units have a white paint coat RAL 9002 colour. The units may be coated with optional spray paint colours on request. The panels are filled with polyurethane foam manufactured in an environmentally friendly way without the use of freons. Thanks to the polyurethane foam the panels are extremely rigid and have very good heat-insulating properties comparable with panels filled with mineral wool 50 mm thick. Units insulated with

mineral wool and sheets 0.8 mm thick are supplied on request.

Panels are joined with the frame by bolts. Connecting surfaces are separated and sealed with rubber sealing.

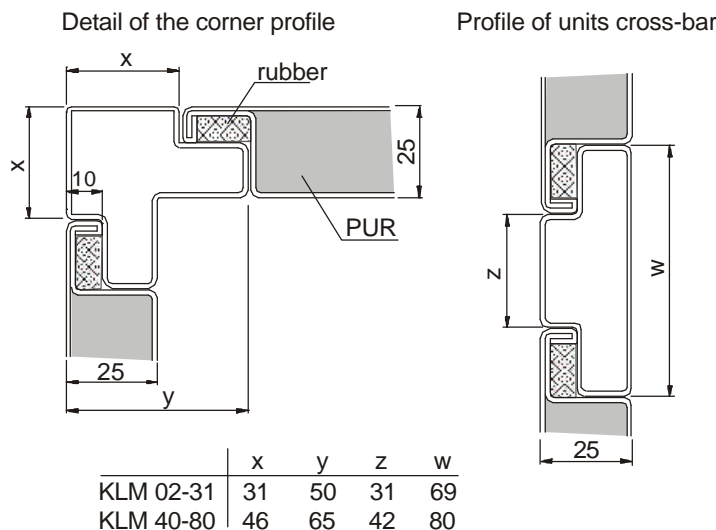
parameters of panel:*

panel skin material	Zn 275 g/m ²
specific weight of insulation	50 kg/m ³
thermal resistance R	1.14 m ² .kW
heat passage coefficient k	0.88 W / m ² .K
attenuation (to DIN 52210)	32 dB
fire resistance (to DIN 4102)	B2 (B1)
deflection (EN 1886)	2A

jacket tightness (to EN 1886):

tightness with filtration G3-G4	3A
tightness with filtration F5-F7	A
tightness with filtration F8-F9 (bonded)	B
thermal insulation factor :	
without frame profile insulation	TB3
with frame profile insulation	TB2

* values for standard polyurethane foam insulation



Chamber access

Access to the internal parts are provided on the service side of the unit.

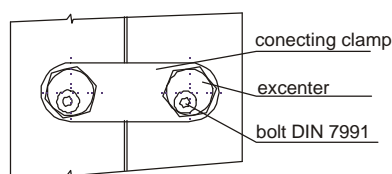
Parts, where frequent access is demanded, are equipped with doors. Doors are hung on plastic hinges and are fitted with reliable closures, which ensures a good seal of the chamber. Double glaze sight glass and internal light with switch are available as an option. Doors are used on fan, filtration, humidification and free parts of the units.

Chambers, removable panels are fitted where no frequent access is demanded, for example installing of actuators and cleaning. Panels are joined in the structure with plastic clamps. Removable panels are used on mixing, electrical heater, rotate recovery exchanger, steam humidifier and free parts of units.

Fixed panels are used on chambers where the access is necessary for repairing or changing of its functionality. Fixed panels are joined by bolts. These panels are used on heaters or coolers parts, attenuating parts and plate exchangers.

Jointing of chambers

As a standard, the units are supplied as separate chambers to be assembled by the customer as soon as they are arranged at the site of installation. The chambers are jointed with couplings with cams screwed in the chamber frame. Between the chambers is a self-adhesive seal. Alternatively, the chambers can be connected inside the unit with bolts and thread nuts. All assembly material is always included in the air-conditioning unit supplied. Pre-assembled units fixed to the common frame are supplied on request. The length of these transport sections is limited by the maximum frame length of 3000 mm and weight.



Chamber base

The chambers are supplied with demountable galvanized steel legs 120 mm high or on a galvanized steel supporting frame 120 mm high. The frame is equipped with handling holes 50 mm diameter and holes 11 mm diameter for the unit anchoring to the base. As a standard, all outdoor chambers are supplied on a frame. Standard indoor chambers are supplied on legs except for some chambers mounted on a frame due to a high weight.

The following chambers are always frame-mounted:

- Fan chamber KLM 40-80
- Damping chamber KLM 63-80
- Plate recuperator KLM 02-80, vertical arrangement
- Plate recuperator KLM 10-80, horizontal arrangement
- Rotary regenerator KLM 25-80
- Gas heater

Spray washer units with a tank under the unit are supplied with a frame 350 mm or 400 mm high depending on the unit size. The frame may be equipped with adjustable legs 220 mm or special customized frames are supplied on request.

Handling area around the unit

Units located in a machinery room must have enough space around for maintenance and service purposes. Clearance on rear of the unit for comfort jointing of chambers should be approximately 600 mm (in case of outside cams) and 200 mm (in case of inside jointing). Free space in front of service side of chambers is a must.

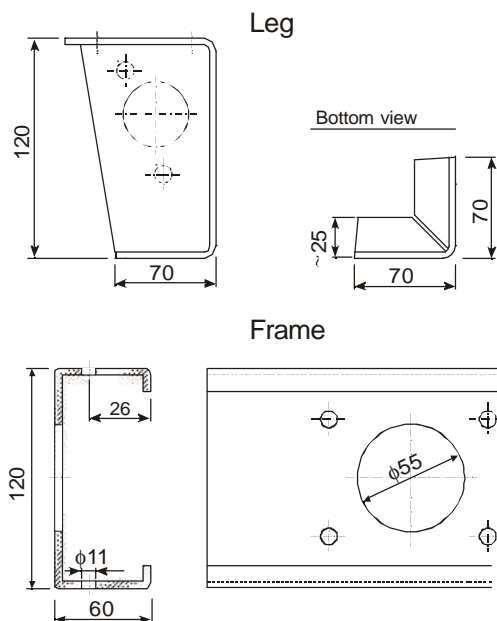
Minimal space for base maintenance:

filter chamber	700 mm
filter chamber (fine pocket filter)	800 mm
fan chamber	700 mm
others chambers	600 mm

Demanded space for repairing or changing of unit:

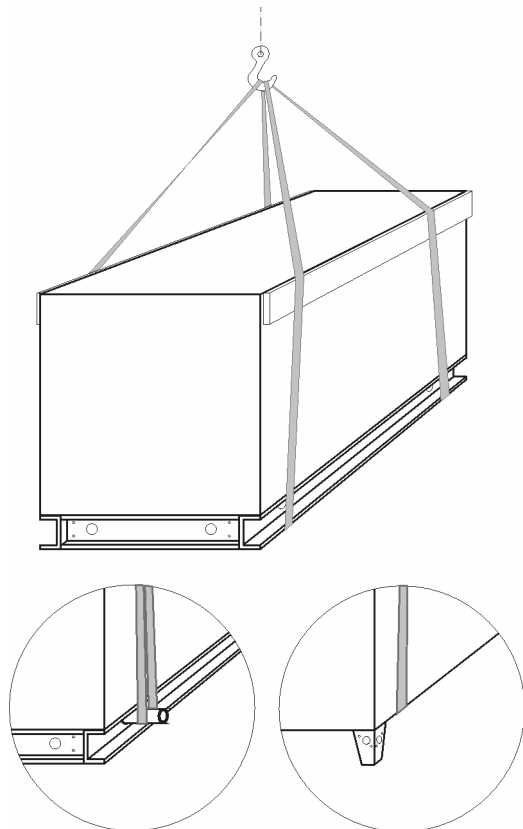
fan chamber	unit width + 200 mm
water and steam heater	unit width + 200 mm
gas heater	unit width + 200 mm
water and DX cooler	unit width + 200 mm
plate recovery exchanger	unit width + 200 mm
water humidification (air washer)	unit width + 200 mm
others chambers	approximately 1000 mm

When the unit is planted on frame upon roof level, its necessary to use foot platform around the unit with adequate width or removable handrail.

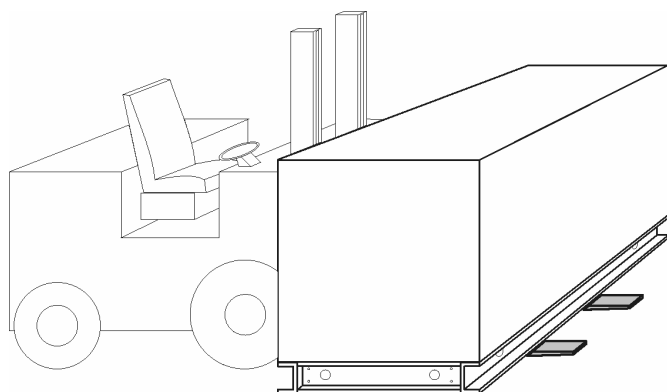


Transport and manipulation

Chambers, during manipulation, has to be lift by “slings”, drawn under the bottom of unit. In case of larger pieces, “slings” should be used with spreader bars on the top, to prevent unit deformation.



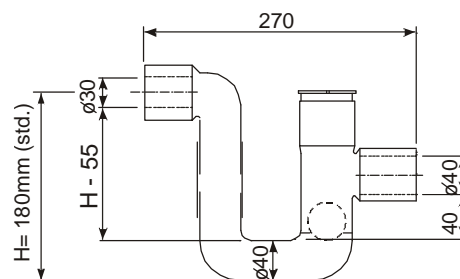
The chamber should be supported on the whole width during the forklift manipulating, as damage to the bottom can occur.



Condensate outlet

Condensation forms in some chambers while the air-conditioning unit is in operation. This is a case of a water cooler chamber, direct evaporator cooler chamber, plate recuperator chamber and a humidification chamber. These chambers are furnished with an aluminium or stainless steel condensate pan with a neck. To ensure proper condensation outlet from the pan and to avoid malodour suction from the waste pipe the outlet branch should be equipped with a syphon. The standard supply includes a syphon with a ball. Hose syphon traps with a non-return valve are supplied on request. No more than one waste pipe may be connected to one syphon. The syphon and waste pipe in outdoor units should be protected against freezing with an electric heating cable.

Scheme of syphon with a ball:



Syphon in the vacuum part of the unit:

The syphon height has to correspond with the chamber vacuum.

Syphon in standard is 180 mm high, which corresponds to vacuum 850 Pa. In case of higher vacuum than 850 Pa is necessary to extend syphon extension arm (see charts bellow). Note, that extended syphon overlaps the bottom level of chamber (with frame or legs 120mm high). This fact is necessary to consider during installation.

chamber vacuum (Pa)	height H (mm)
850 Pa (standard)	180 mm
1050 Pa	200 mm
1250 Pa (maximum)	220 mm

$$\text{height H (mm)} = \text{vacuum } \Delta p \text{ (Pa)} / 10 + 95 \text{ (mm)}$$

Syphon in the overpressure part of the unit:

The syphon works without problems with overpressures up to 400 Pa. For higher overpressures, the downstream waste pipe (ø 40mm) should be lengthened to create the required U-column height (1 cm = 100 Pa).

AIR HANDLING UNITS – MARKING

KLM.. SI	standard type
KLM.. SO	standard outdoor type
KLM.. HI	Clean interior type
KLM.. HO	Clean interior outdoor type
KLMZ..	explosion proof type

OUTDOOR UNITS – KLM.. O

The SENATOR 25 with mark O (e.g. KLM 04 SO) air-conditioning units are suitable for outdoor installation. All dimensions and technical parameters of the outdoor units are identical to the standard KLM units. All chambers have a white finish and are equipped with insulated profiles and a plastic roof for better thermal insulation of chambers. The roof section is delivered unfolded for customer installation.

The standard supply includes

- White varnished outer panels, RAL 9002
- Internal insulation of frame profiles
- Plastic roof with insulating fabric and plastic drip moulds
- Supporting frame 120 mm under all unit chambers
- Gas heater burner and fitting covers

Optional accessories

- Inlet and discharge rain guards
- Water-free hose siphon

Designer's recommendations

- Humidification (steam, evaporative, water) chambers are not recommended for outdoor use due to the risk of freezing
- Water heaters should be equipped with heating water piping to avoid freezing. The heater branches may discharge into the adjacent free chamber and from there through the chamber bottom right through the roof into the building.
- We recommend using an internal overall flap on the fresh air inlet along the rain guard (low speed in the inlet reduces the risk of raindrops entraining by the air intake)
- We recommend inlet/outlet side-by-side arranging in recuperation or air mixing units due to a lower overall height and a better weight distribution
- It is necessary to ensure safe condensate offtake from the siphon of chambers where condensate forms even in winter

SANITARY UNITS – KLM.. H.

The SENATOR 25 KLMH sanitary air-conditioning units are suitable for clean areas. All dimensions and technical parameters of the outdoor units are identical to the standard KLM units.

The standard supply includes

- Inner caulking of all air-conditioning unit chamber joints
- Silencer (anti-squeak) links are plastic foil coated and may be cleaned with disinfectants

Optional accessories

- Inner chamber panel walls are varnished
- Internal paint coat

Designer's recommendations

- Rotary regenerator, evaporative humidification and gas heating are not suitable for sanitary units
- Medium-pressure fans are recommended for easier cleaning
- Since the droplet separator cleaning is problematic we recommend not using the separator in the cooler chamber. In such case, the air flow rate across the cooler must not exceed 2.5 m/s.
- We recommend placing a sufficiently long empty chamber before and behind the exchanger for easier exchanger cleaning
- Unit must be equipped with the filtration degree 2, EU7 to EU9 located always in the end of the air-conditioning unit

EXPLOSION-PROOF UNITS – KLMZ..

The SENATOR 25 KLMZ air-conditioning units are suitable for explosive hazard areas. All dimensions and technical parameters of the outdoor units are identical to the standard KLM units. Explosion-proof air-conditioning units comply with the applicable standards. Every unit must receive its own certificate.

The use of some chambers is limited – see the applicable standards.

FAN CHAMBER

General information

Fan chambers serve for air transportation. They use low-pressure or medium-pressure double inlet centrifugal fans in three variants of the fan case direction: sidelong, upward and downward.

The fans are driven by three-phase induction motors 400 V / 50 Hz through a cogged V-belt gears. As a standard, the motors are equipped with thermocontacts.

Optional are two-speed motors or motors using other voltages. The fan impeller is statically and dynamically balanced, the motor with the fan is mounted on rubber vibration dampers. The motor is seated on a straining plate with a straining screw; motors with axial heights over 200 mm are seated on two thrusting mechanisms. Bushing outlets for supply cables are on the operator side. The fan bearings are enclosed, filled with grease and guarantee 20,000 operating hours of unattended operation.

The standard supply includes

- SIEMENS electric motor protected with thermocontacts
- Taper-lock belt pulley for easy mounting and demounting
- Door with a handle
- Two levels of belt transmission protection: inspection door and an easily demountable V-belt guard

Optional accessories

- Double-case sight hole
- Chamber lighting with a switch outside the unit
- Lockable door catch
- Epoxide-coated fan for aggressive environment
- Pressure sensors (liquid pressure gauge or differential pressure switch)
- Variable belt pulley for additional exact air output adjustment

- Motor circuit breaker (not mounted)
- Set of replacement bearings
- Frequency converter
- Motor protection with thermistors
- External motor cooling

Designer's recommendations

- Single-speed and two-speed motor wiring diagrams are to be found at the end of the catalogue
- Motors with outputs up to 3 kW start and run in the Y connection – direct start
- We recommend starting the motors with outputs 4 kW and higher with Y-Δ switching (start - Y, running - Δ)
- We recommend using the SOFT START for starting the motors with outputs over 30 kW
- Motors with axial heights over 200 mm are not mounted in the chamber and are transported separately
- Between the fan chamber discharge and other following chambers in the unit (filtration stage 2, silencer, gas heater) there must be a empty chamber for the fan diffuser at least 250 mm long.
- We recommend using a medium-pressure fan for sanitary units due to its easier cleaning, and placing the second filtration level behind the fan chamber

Short fan chamber – special construction

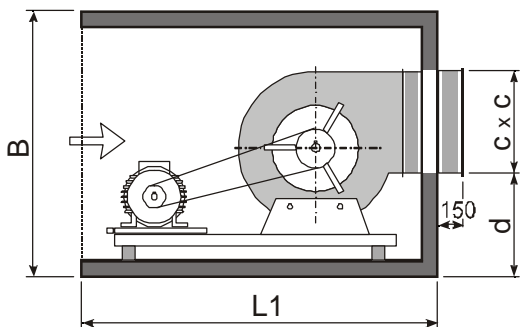
Due to space-saving construction of this chamber, there is move difficult access of the terminal board of electromotor as well as lower vibration damping from fan body to the unit frame (fan discharge is connecting to the chamber through the rubber sealing only).

KLM size	length L (mm)	width A (mm)	height B (mm)	fan size	max. size of motor	connecting dimension			short fan chamber**	
						c x c	d (mm)	e (mm)	L3 (mm)	f (mm)
02	800	550	550	160 180	90	250	145	140	550	130
04	850	650	650	200 225	100	315	155	80	650	135
06	1000	800	800	250 280	112	400	160	250	800	160
08	1000	1000	800	280	112	400	160	250	-	-
10	1100 (1250)*	1000	1000	315 355	132	500	150 250	130	1000	200
12	1100 (1250)*	1250	1000	355	132	500	250	130	-	-
16	1650	1250	1250	400 450	160	630	260	260	1250	260
20	1650	1600	1250	450	160	630	260	260	-	-
25	1800	1600	1600	500 560	160	800	530	320	-	-
31	1800	2000	1600	560	160	800	450	350	-	-
40	2200	2250	1700	630 710	200 225	1000	600	390	-	-
63	2700	2400	2250	800 900	250 280	1250	680	490	-	-
80	2900	2600	2250	900 1000	250 280	1400	750	550	-	-

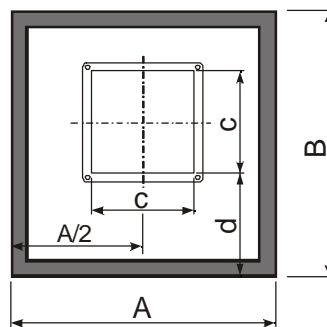
* Fan chamber length with fan discharge upwards and downwards for sizes KLM 10 and KLM 12 is 1250mm

** There is difficult access to terminal board and lower vibration damping from fan body to the unit frame by short fan chamber

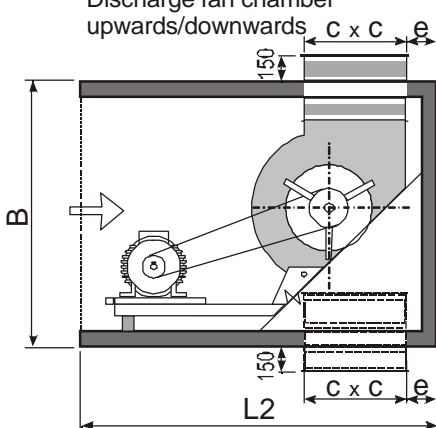
Discharge fan chamber



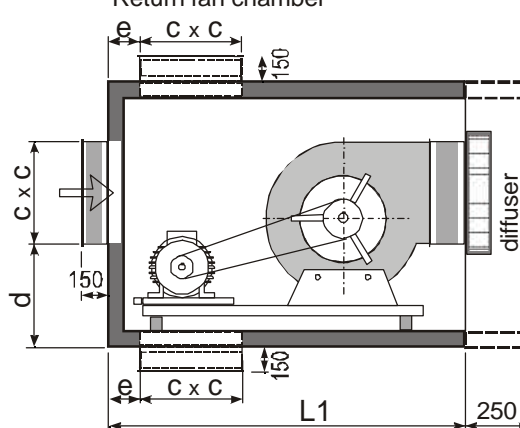
View



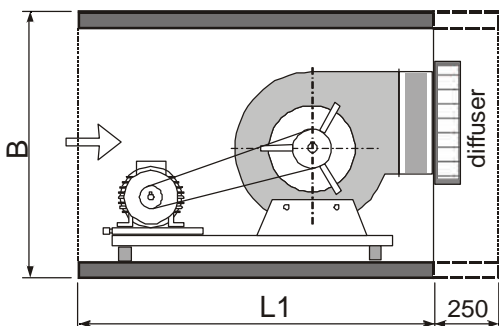
Discharge fan chamber upwards/downwards



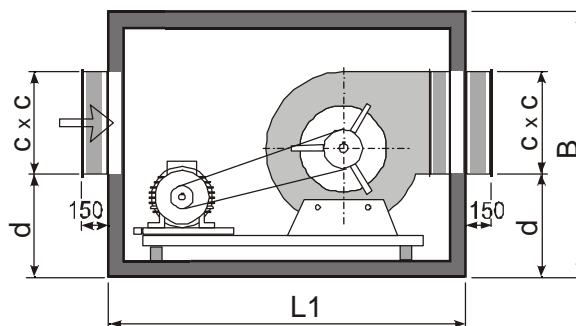
Return fan chamber



Through fan chamber



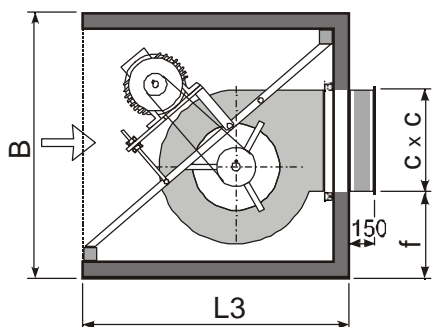
Single fan chamber



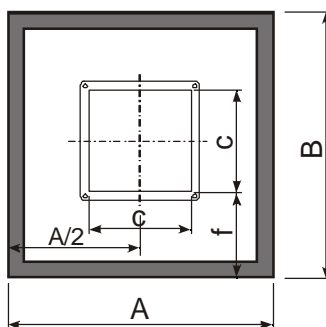
Note:

- there is possibility down/up for return or discharge
- the combination entry and exit at same time up and the combination entry and exit at the same time down it is impossible

Short fan chamber



View



DAMPER CHAMBER

General information

The damper chamber serves for the air current control, inlet and exhaust air blending and unit closing using regulating dampers. The regulating dampers consist of an aluminium frame and aluminium fins with rubber seals on the bearing surface. The plastic gears are hidden inside an aluminium side profile that protects them from fouling from the transported air. The regulating damper is provided with a square iron 12 x 12 mm for actuator or lockable hand lever mounting. The chamber may be equipped with one or two regulating dampers in different combinations of damper positions in the chamber: lateral, upper, bottom or side. The damper chamber is equipped with a flexible connection for the air piping connection.

The dampers are manufactured in the following variants:

Inner damper – lateral, upper and bottom position

The flap is fixed on the panel inside the chamber. The operating rod goes out through the unit jacket.

Outer flap – side position

The damper is fixed on the side panel from the chamber outside. The control device is on the damper profile.

Overall outer damper – lateral and side position

The damper is fixed right on the chamber frame and covers almost the whole of the unit's useful cross-section. The control device is on the damper side profile.

Overall inner damper – lateral position

The damper is located inside the chamber 250 mm long. It covers almost the whole of the unit's useful cross-section and is recommended especially for outdoor units. The operating rod goes out from the chamber.

Inner damper – side position – long chamber

The damper is fixed from the inside on the chamber side panel. It covers almost the whole of the unit's useful cross-section and is suitable especially for outdoor units or for blending between the parallel supply and exhaust air-conditioning unit branches. The control device is on the damper profile inside the chamber. Combination with the upper/bottom inner damper is not possible.

The standard supply includes

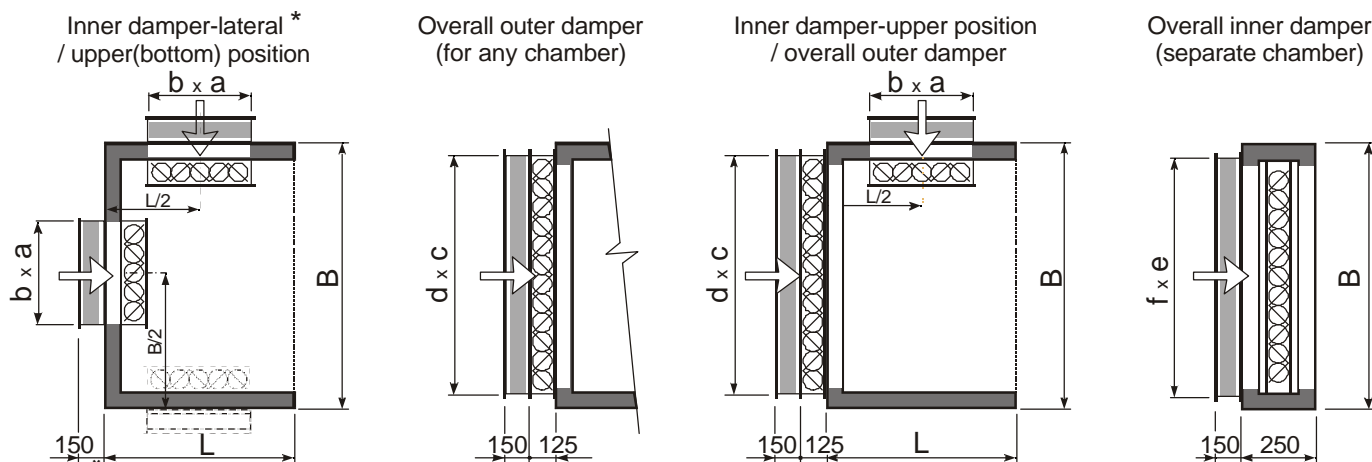
- One or two regulating gates
- Demountable panel on the operator side with threaded nuts
- Anti-squeak packing flexible connection (flexible cups)

Optional accessories

- Double-case viewing port
- Chamber lighting with a switch outside the unit
- Draw rod and joints for interconnection of parallel shafts of two stand-alone dampers (delivered separately).

Designer's recommendations

- Maximum recommended flap surface temperature is 40 °C
- We recommend using overall dampers for outdoor units due to a lower air flow rate
- Do not drill holes into the lateral damper profile (risk of gear damaging)



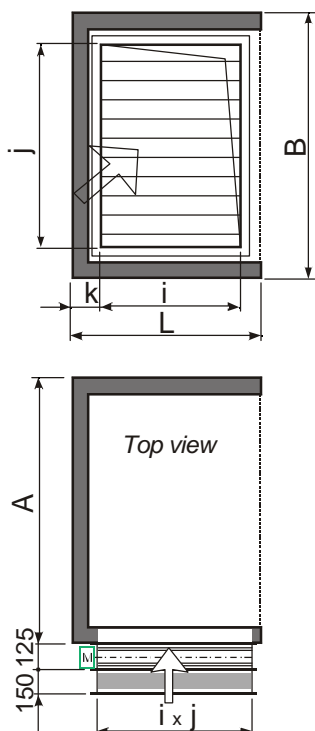
KLM size	length L (mm)	width A (mm)	height B (mm)	lateral, upper, bottom damper flexible connection size			overall outer damper flexible connection size			overall inner damper flexible connection size		
				a (mm)	b (mm)	servo (Nm)	c (mm)	d (mm)	servo (Nm)	e (mm)	f (mm)	servo (Nm)
02	400	550	550	361	200	4	496	400	4	490	490	4
04	400	650	650	456	200	4	596	500	4	590	590	4
06	400	800	800	636	200	4	746	700	8	740	740	8
08	600	1000	800	800	400	4	940	700	8	940	740	8
10	500	1000	1000	806	300	4	946	900	18	940	940	8
12	800	1250	1000	1000	600	8	1190	900	18	1190	940	8
16	600	1250	1250	1006	400	8	1196	1100	18	1190	1190	18
20	800	1600	1250	1400	600	8	1540	1100	18	1540	1190	18
25	600	1600	1600	1406	400	8	1546	1500	18	1540	1540	18
31	1000	2000	1600	1800	700	18	1940	1500	18	1940	1540	18
40	700	2250	1700	2006	500	18	2196	1500	30	2180	1630	30
63	900	2400	2250	2126	700	18	-	-	-	2330	2180	2x 18
80	1100	2600	2250	2256	900	18	-	-	-	2530	2180	2x 18

Note:

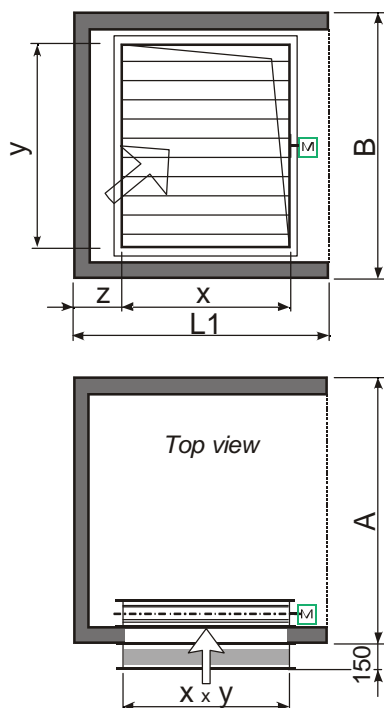
- it is possible to combine dampers in any order, except where collision can occur.

* Inner damper lateral could be installed as outer damper lateral (damper length 125 mm + flexible connection 150 mm)

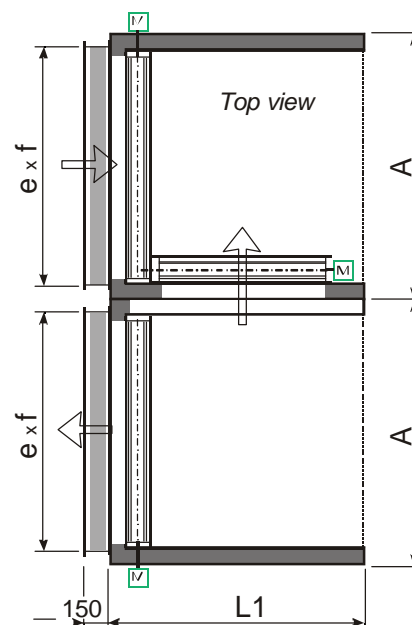
Overall outside damper side position



Inside damper-side position -long chamber **



... mixing block as a combination of two damper chambers



Note:
- it is possible to install overall inner damper inside the long chamber

KLM size	length L (mm)	length L1 (mm)	width A (mm)	height B (mm)	outer side damper flexible connection size				inner side damper – long chamber flexible connection size			
					i (mm)	j (mm)	k (mm)	servo (Nm)	x (mm)	y (mm)	z (mm)	servo (Nm)
02	400	500	550	550	346	400	27	4	200	320	95	4
04	400	800	650	650	346	500	27	4	420	400	150	4
06	400	800	800	800	346	700	27	4	450	600	150	4
08	600	1000	1000	800	540	700	30	4	650	600	150	4
10	500	900	1000	1000	446	900	27	4	550	800	150	8
12	800	1200	1250	1000	740	900	30	8	850	800	150	8
16	600	1000	1250	1250	546	1100	27	8	650	900	150	8
20	800	1200	1600	1250	740	1100	30	8	850	900	150	8
25	600	1000	1600	1600	546	1500	27	8	650	1300	150	18
31	1000	1400	2000	1600	940	1500	30	18	1050	1300	150	18
40	700	1200	2250	1700	646	1500	27	8	830	1500	145	18
63	900	1400	2400	2250	846	2100	27	18	1050	1900	145	18
80	1100	1600	2600	2250	1046	2100	27	30	1250	1900	145	30

** Inner damper – lateral (long chamber) is not combinable with damper in upper, bottom position and with overall outer damper.

FILTER CHAMBER

General information

The chamber serves for air filtration. The offer includes metal filters – grease separators with an aluminium drip pan, panel filters 96 mm long, filtration class G4 to F5 and pocket filters, filtration class G3, G4, F5 to F9

The filters comply with EN 779 / ASHRAE / EUROVENT

The standard supply includes

- Sealed frame for filter fixing
- Inspection door with a handle for pocket filters
- Removable panel for metal and panel filters
- Aluminium drip pan for grease separators

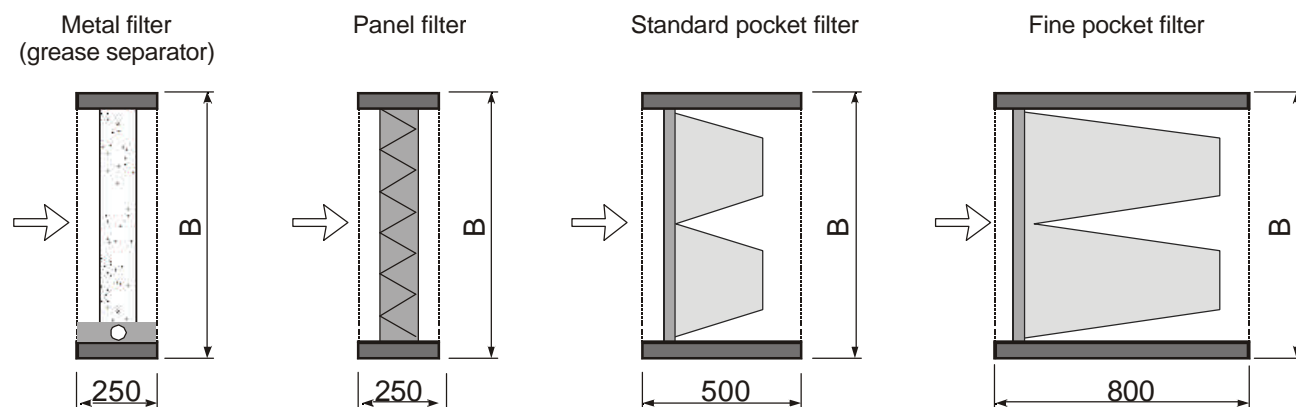
Optional accessories

- Double-case viewing port for pocket filters
- Lockable door catch for pocket filters
- Pressure sensor (manometer) for filter clogging control

- Liquid pressure gauge for visual check of filter clogging
- Stainless drip pan for grease separators

Designer's recommendations

- Place the filtration stage 2 preferably behind the fan chamber; between the fan chamber exhaust and the filter chamber there must be a empty chamber for a diffuser
- Air in sanitary units must go through all filtration stages; the second filtration stage must be in the end of the unit
- Maximum recommended end pressure loss:
 - Metal filters – max. 130 Pa
 - Panel filters – max. 200 Pa
 - Pocket filters – max. 300 Pa
- Pan with outlet branch at metal grease separator chambers serves only for filter and chamber inside



filter type	filtration class EN 779								chamber length (mm)	filter length l (mm)	pressure loss on clogged filter
	G2	G3	G4	F5	F6	F7	F8	F9			
standard metal filter with pan, grease filter	☑								250	25	130 Pa
standard paper panel filter			☑	☑					250	96	200 Pa
standard pocket filter		☑	☑	☑					500	360	300 Pa
fine pocket filter				☑					800	500	300 Pa
fine pocket filter					☑	☑	☑	☑	800	625	300 Pa

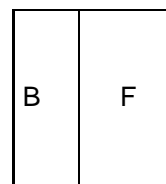
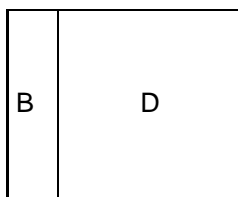
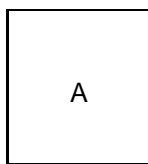
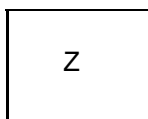
Table of filtration efficiency

group	standard dust filters							
	EU1		EU2		EU3		EU4	
DIN 24185, 24184	EU1		EU2		EU3		EU4	
EUROVENT 4/5	EU1		EU2		EU3		EU4	
EN 779	G1		G2		G3		G4	
median separability A (%)	60		70		80		90	

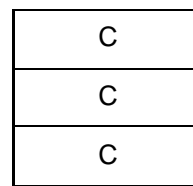
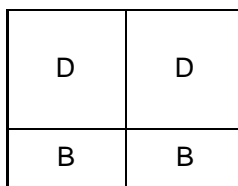
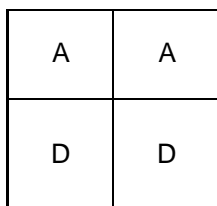
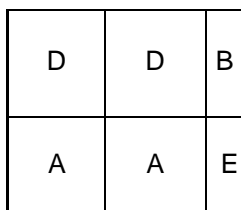
group	fine dust filters								
	EU5		EU6		EU7		EU8		EU9
DIN 24185, 24184	EU5		EU6		EU7		EU8		EU9
EUROVENT 4/5	EU5		EU6		EU7		EU8		EU9
EN 779	F5		F6		F7		F8		F9
median efficiency E (%)	40	50	60	70	80	90	96		

Filter sizes and layout in the filter chamber

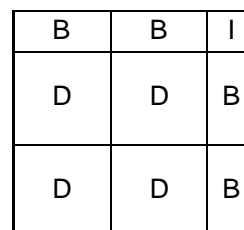
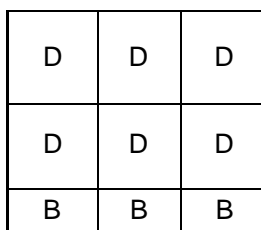
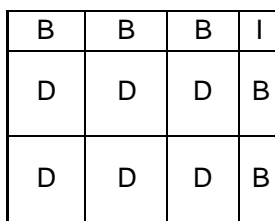
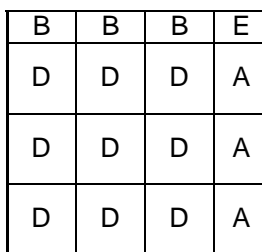
KLM 02 KLM 04 KLM 06 KLM 08



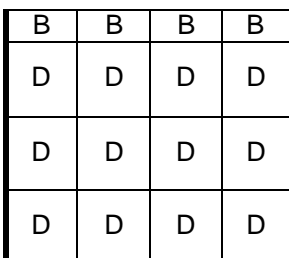
KLM 10 KLM 12 KLM 16 KLM 20



KLM 25 KLM 31 KLM 40 KLM 63



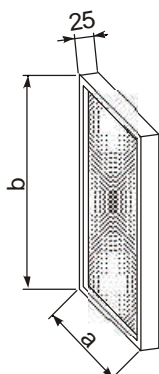
KLM 80



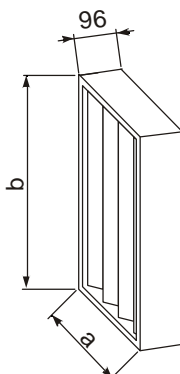
Sizes of filters used

- a x b
- A 490 x 592
- B 287 x 592
- C 897 x 287
- D 592 x 592
- E 490 x 287
- F 402 x 592
- I 287 x 287
- Z 490 x 402

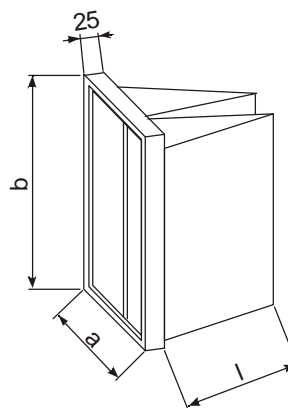
Standard pre-filter metal



Standard panel filter



Pocket filter standard / fine



FILTER CHAMBER WITH ACTIVE CARBON FILTER

General information

The chamber serves for gas, odour and other contaminant absorption from the air. The cartridge contains granular **active carbon SC 40** for capturing toluene, xylene, benzene, benzene, chloroform, perchlorethylene, styrene, acetates, kerosine, turpentine, malodours (from smokehouses and meat processing plants, waste water treatment plants, hospitals), tobacco smoke and dangerous substances from glueing, soldering and welding.

Special impregnated **active carbon** is used to capture substances that granular **active carbon** absorbs only a little if at all:

KS – KR1 to capture ammonia from gases and the air

KS – KC10 to capture acid vapours from gases and the air (partially SO₂)

KS – J42 to capture sulphates from the air

KS – HS10 to capture formaldehyde from the air

KS – SQ21 to capture mercury vapours from the air and gases

KS – CCA to capture phosphates from the air

KS – RKJ 1 to capture radioactive methyl iodide

KS – ZS10 to capture amines from gases and the air

The **active carbon** cartridges are attached in the filter chamber with bayonet locks in the metal frame.

The carbon cartridges must be exchanged after some time of operation when their weight as against the clean cartridges exceeds the recommended limit specified in the table.

The clean 625 mm cartridge weighs 4.49 kg, the cartridge contains 2.73 kg of active carbon.

It is possible to reactivate the granular **active carbon SC40** at the manufacturer and use it again. If the SC40 carbon cartridge contains PCB, toxic and radioactive substances, it must be exchanged for a new one. It is not possible to reactivate the impregnated **active carbon**, the cartridge must always be exchanged for a new one.

The standard supply includes

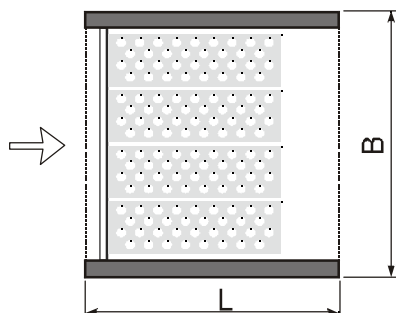
- Sealed frame for cartridge fixing
- **Active carbon** cartridges 625 mm long
- Inspection door

Optional accessories

- Double-case sight window
- Lockable door catch

Designer's recommendations

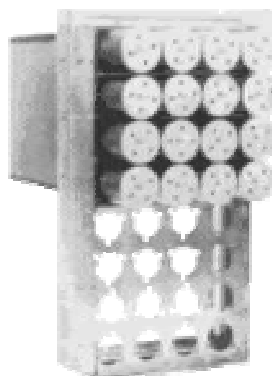
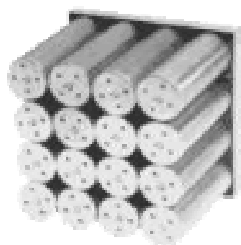
- Filtration class of at least F7 must always be before the carbon filter chamber
- Maximum operating temperature is 45°C
- Most efficient way of saturation checking is weighing the filter cartridges. When the maximum adsorption capacity is reached (specified below for the impregnated **active carbon** types) the **active carbon** cartridge should be exchanged
- This filtration system is certified and approved by the Czech Environmental Inspection Authority as a recommended method for gas contaminant capturing



KLM size	length L (mm)	width A (mm)	height B (mm)	number of cartridges	active carbon charge SC40 (kg)	max. recommended air output (m ³ /h)
02	800	550	550	8	21.8	2180
04	800	650	650	12	32.8	3270
06	800	800	800	20	54.6	5460
08	800	1000	800	24	65.5	6550
10	800	1000	1000	30	82	8190
12	800	1250	1000	40	109	10920
16	800	1250	1250	48	131	13100
20	800	1600	1250	60	164	16380
25	800	1600	1600	78	213	21290
31	800	2000	1600	104	284	28390
40	800	2250	1700	118	322	32210
63	800	2400	2250	172	470	46950
80	800	2600	2250	174	475	47500

cartridge charge	contaminant capturing efficiency	adsorption capacity (allowed gain in weight)
KS – SC40 for adsorption of organic hydrocarbons and odours from air	on average 60 – 75 %	25 %
special impregnated active carbons		
KS – KR1 to capture ammonia from gases and air	80 – 90 %	20 %
KS – KC10 to capture acid vapours from gases and air (partially SO ₂)	60 – 90 %	10 %
KS – J42 to capture sulphates from air	85 – 90 %	> 95 %
KS – HS10 to capture formaldehyde from air	80 – 90 %	20 %
KS – SQ21 to capture mercury vapours from air and gases	95 – 98 %	20 %
KS – CCA to capture phosphates from air	90 – 95 %	5 %
KS – RKJ 1 to capture radioactive methyl iodide	99 %	12 %
KS – ZS10 to capture amines from air and gases	75 – 80 %	10 %

Saturation of **active** carbon filters is measured by checking the gain in weight of the cartridge charge against the clean filter. The maximum allowed gain in weight percentages are specified in the column "Adsorption capacity" of the table.



WATER HEATER

General information

The chamber serves for air heating water. Heating medium is hot water. The exchangers used have aluminium fins and copper tubes. Available for each unit size is a series of exchangers with one to four rows, optimised fin spacing and number of water tracks.

The maximum heating medium temperature is 110 °C and the maximum working pressure is 2 MPa. All exchangers are tested with inner pressure of 3 MPa (dry air).

The exchangers are supplied with sockets covered with plastic end caps.

The standard supply includes

- Exchanger with copper tubes and aluminium fins
- Steel inlet and outlet branches with outside thread
- Manual venting screw in the upper part of the exchanger
- Fixed side panel

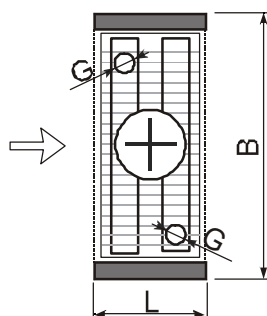
Optional accessories

- Copper fins (Cu/Cu)
- Al/Cu exchanger with a protective polymer coat (anti-salt protection)

- Branch outlets in adjacent empty chamber – the heater chamber will be 100 to 150 mm longer
- Anti-freeze sensor with a capillary tube
- Threaded flange and welded-on counter-flange (not mounted)

Designer's recommendations

- Exchanger should be counter-current connected
- All heater parameters must be computed using the LENNOX software
- Exchanger pressure loss at the water side is about 1-10 kPa
- Exchanger must be protected from freezing
- Exchanger can be moved out when the side panel is removed
- If the heater is located before the fan, the exhaust temperature behind the heater must not exceed 40 °C due to the electric motor heat resistance
- Supply water pipes in outdoor units must be protected from freezing by insulation and a trace heating cable. Heater branches may discharge into the adjacent empty chamber and go through the bottom of the unit and through the roof into the building.



KLM size	length L (mm)	width A (mm)	height B (mm)	connecting dimension – male thread G (")						
				type A 1 row	type B 1 row	type C 1 row	type D 2 rows	type E 2 rows	type F 3 rows	type M 1 row
02	250	550	550	1/2	1/2	1/2	1/2	1/2	1/2	1/2
04	250	650	650	1/2	1/2	1/2	3/4	3/4	3/4	1/2
06	250	800	800	3/4	3/4	3/4	1	1	1	1/2
08	250	1000	800	3/4	3/4	3/4	1 1/4	1 1/4	1 1/4	1/2
10	250	1000	1000	1	1	1	1 1/4	1 1/4	1 1/4	3/4
12	250	1250	1000	1	1	1	1 1/4	1 1/4	1 1/4	3/4
16	250	1250	1250	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1
20	250	1600	1250	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1
25	250	1600	1600	1 1/4	1 1/4	1 1/4	1 1/2	2	2	1 1/4
31	250	2000	1600	1 1/4	1 1/4	1 1/4	1 1/2	2 1/2	2 1/2	1 1/4
40	400	2250	1700	1 1/4	1 1/4	1 1/2	1 1/2	2 1/2	2 1/2	1 1/4
63	400	2400	2250	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	1 1/2
80	400	2600	2250	2 1/2	2 1/2	2 1/2	2 1/2	3	3	1 1/2

Note:

- except mentioned exchangers, exchangers for water cooler chambers also can be used. Lengths of the chambers will be identical with the lengths of water cooler chambers without separator.
- if the heater branches discharge into the adjacent chamber, the heater chamber will be 400 mm or 500 mm long.

STEAM HEATER

General information

The chamber serves for air heating. The active medium is saturated steam at pressure up to 1,7 MPa (absolute) and temperatures up to 200°C

The exchangers used have galvanized steel fins and tubes. Available for each unit size is a one row and two rows exchanger.

The exchanger branches are ready for welding. The supply and condensate pipes are not equipped with any flanges or threads.

Heaters for sizes KLM 02 to 10 have one exchanger only.

Heaters for sizes KLM 12 to 25 consist of two separate exchangers with two pairs of separate discharge pipes that end on the service side (side-by-side – span of 70 mm).

Heaters for sizes KLM 31 to 80 consist of several exchangers allowing for one supply and one condensate pipe.

The standard supply includes

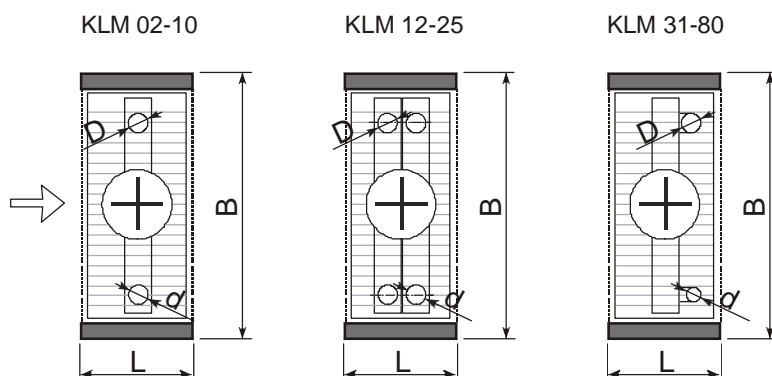
- Exchanger with galvanized steel tubes and fins
- Fixed side panel

Optional accessories

- Branch outlets in adjacent empty chamber – the heater chamber will be 100 to 150 mm longer

Designer's recommendations

- Use of superheated steam should be consulted with the manufacturer
- Regarding the exchanger protection against freezing, we recommend sensing the air temperature behind the heater with a capillary thermostat (min. 5°C) and sensing the condensate piping water temperature (min. 10°C)
- Supply pipes in outdoor units must be protected against freezing. For example by insulation and trace heating cable.



KLM size	length L (mm)	width A (mm)	height B (mm)	connecting dimensions for medium – outer pipe size	
				supply branch x pipe thickness D (mm)	condensate branch x pipe thickness d (mm)
02	250	550	550	38 x 2,6	38 x 2,6
04	250	650	650	38 x 2,6	38 x 2,6
06	250	800	800	38 x 2,6	38 x 2,6
08	250	1000	800	38 x 2,6	38 x 2,6
10	250	1000	1000	38 x 2,6	38 x 2,6
12	250	1250	1000	2 branches - 38 x 2.6	2 branches - 38 x 2.6
16	250	1250	1250	2 branches - 38 x 2.6	2 branches - 38 x 2.6
20	250	1600	1250	2 branches - 38 x 2.6	2 branches - 38 x 2.6
25	250	1600	1600	2 branches - 38 x 2.6	2 branches - 38 x 2.6
31	400	2000	1600	76 x 3,5	48 x 3,2
40	400	2250	1700	90 x 4	48 x 3,2
63	400	2400	2250	90 x 4	48 x 3,2
80	400	2600	2250	115 x 4,5	48 x 3,2

GAS HEATER

General information

The chamber serves for air heating. The source of heat is gas-fired (natural gas, propane) or liquid fuel-fired (light fuel oil, heating oil) Weishaupt burner, usually with a stepless output regulation. The working pressure of gas supplied to the burner must be between 1.7 and 50 kPa. The air is heated in the flue exchanger and the flue gas is fully separated from the recycled air. The burner-air heat transmission efficiency is 91-93 %. The heaters are offered in three design variants:

- By-pass less variant – for fresh air heating ($\Delta t=30-40\text{ }^{\circ}\text{C}$) without special demand for supply air temperature accuracy
 - Low-output by-pass variant – for pre-heated air heating for blending or recuperation ($\Delta t=10-20\text{ }^{\circ}\text{C}$) with more accurate supply air temperature control
 - High-output by-pass variant – for fresh air heating ($\Delta t=30-40\text{ }^{\circ}\text{C}$) with more accurate supply air temperature control
- The inlet by-pass flap lets an adequate air portion through the exchanger; the remaining portion goes through the free duct. Thus flue gas condensation and exchanger overheating is avoided while keeping the optimum efficiency.

As a standard, burners in the gas heating chambers are located on the air-conditioning unit operating side and the flue gas and condensate outlets are on the opposite (rear) side.

The standard supply includes:

- Weishaupt burner with two-step or modulation heating output control
- Fittings – gas regulating series
- Following heating exchanger finish:
 - * high-output chambers: step one – steel, step two stainless steel + creep-resistant rear face.
 - * low-output chambers: steel exchanger
- Louver fins inside the chamber – non-coupled without actuators (for by-pass variant only)
- Condensate exhaust
- Stainless steel pan under the flue gas exhaust
- Two triple safety thermostats, one behind and one before the exchanger for stack chimney effect suppression
- Burner and thermostat guards for outdoor units
- Fixed side panel

Optional accessories

- Flue gas and condensate exhaust on the operator or upper side
- Gas pressure regulator from medium to low pressure
- By-pass flap actuators
- Other optional customized designs including higher exchanger heating power

The delivery does not include:

- Flue gas duct
- Electric controls
- By-pass controlling actuators

Designer's recommendations

- We recommend placing the chamber in the end of the unit behind the fan chamber

- Between the fan and gas heating chambers there must be a empty (diffuser) chamber. Recommended length is approximately 2/3 of the unit chamber width

- Requirements for wiring: burner output control, two safety thermostats, bypass actuators

- Unit must be equipped with a flue gas stack chimney

- Ensure condensate delivery from the exchanger and the stack chimney

Regulation

The bypass-less heater output is controlled either in two steps, i.e. ON step 1 – ON step 2, or using stepless regulation between the step 1 and 2. The regulation uses a three-point control.

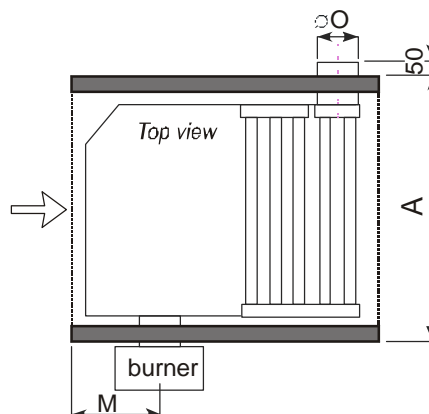
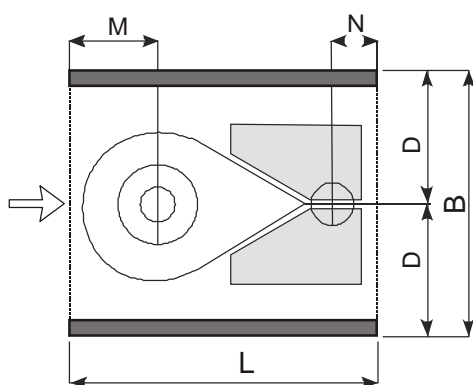
The bypass variant may be regulated in two ways:

1/ The burner is controlled in accordance to the required temperature. The burner control is separate, dependent on the flue gas temperature in the stack chimney to prevent chamber overheating and condensation. The flue gas output temperature should be around $160\text{ }^{\circ}\text{C}$

2/ The dampers are controlled in accordance to the required temperature. The burner is controlled by a two-step flue gas thermostat and the burner keeps the flue gas temperature at the required level to prevent flue gas condensation.

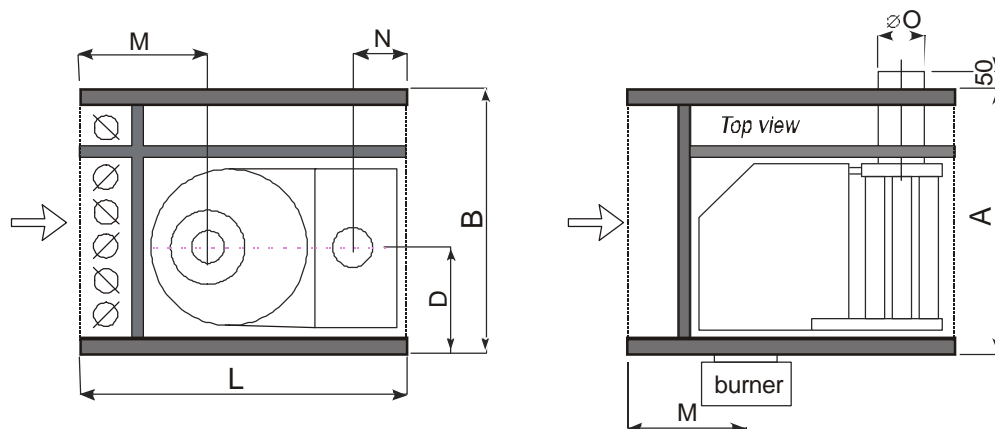
The controls must ensure the fan runs when the burner is switched off (at least 3 minutes) and the burner should have a lock-out switch in case of low air flow.

CHAMBER WITHOUT BY-PASS



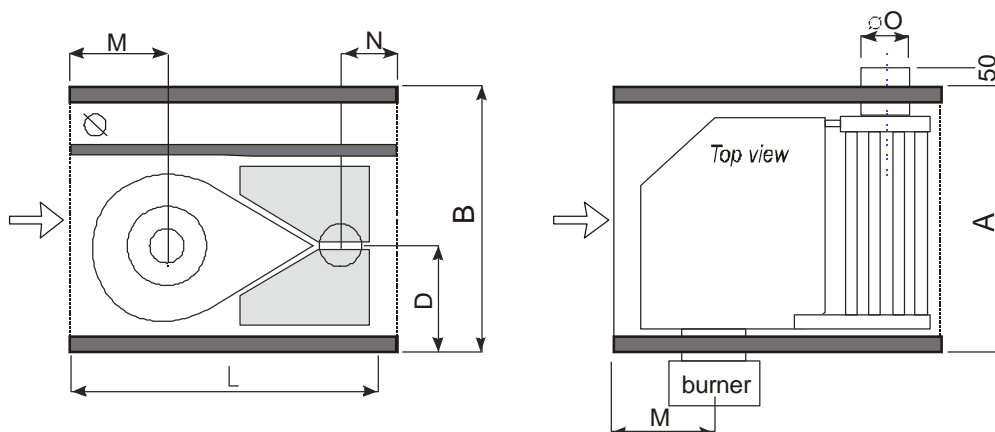
KLM size	dimensions			dimensions				output kW	
	length L (mm)	width A (mm)	height B (mm)	heater position D (mm)	burner position M (mm)	stack chimney position N (mm)	stack chimney diameter O (mm)	min. kW	max. kW
02	1000	650	550	275	315	185	150	15	40
04	1000	650	650	325	315	185	150	15	40
06	1320	800	800	400	385	195	180	25	60
08	1320	1000	800	400	385	195	180	50	90
10	1520	1000	1000	500	455	325	180	60	100
12	1520	1250	1000	500	455	325	180	80	130
16	1550	1250	1250	625	460	350	180	80	180
20	1550	1600	1250	625	460	350	180	130	250
25	1910	1600	1600	800	620	390	250	130	330
31	1910	2000	1600	800	620	390	250	280	450
40	2250	2250	1700	850	750	442	250	280	650
63	2490	2400	2250	1125	795	491	400	480	800
80	2490	2600	2250	1125	795	491	400	480	1000

CHAMBER WITH BY-PASS, LOW POWER



KLM size	dimensions			dimensions					output kW	
	length L (mm)	width A (mm)	height B (mm)	heater position D (mm)	burner position M (mm)	stack chimney position N (mm)	stack chimney diameter O (mm)	actuator moment (Nm)	min. kW	max. kW
10	1520	1000	1000	335	455	625	180	2 x 8Nm	20	60
12	1370	1250	1000	330	650	280	180	2 x 8Nm	40	80
16	1370	1250	1250	330	650	280	180	2 x 8Nm	40	80
20	1600	1600	1250	390	750	320	200	2 x 8Nm	70	135
25	1600	1600	1600	390	750	320	200	2 x 8Nm	70	135
31	1975	2000	1600	595	875	340	300	2 x 8Nm	150	280
40	1975	2250	1700	595	875	340	300	2 x 8Nm	160	280
63	2150	2400	2250	680	878	370	300	2 x 8Nm	250	480
80	2150	2600	2250	680	878	370	300	3 x 8Nm	250	480

CHAMBER WITH BY-PASS, HIGH POWER



KLM size	length L (mm)	width A (mm)	height B (mm)	dimensions					output kW	
				heater position D (mm)	burner position M (mm)	stack chimney position N (mm)	stack chimney diameter O (mm)	actuator moment (Nm)	min. kW	max. kW
10	1520	1000	1000	445	455	325	180	1 x 8Nm	60	100
12	1520	1250	1000	445	455	325	180	1 x 8Nm	80	130
16	1550	1250	1250	565	460	350	180	1 x 8Nm	80	180
20	1550	1600	1250	565	460	350	180	1 x 8Nm	130	250
25	1910	1600	1600	620	620	390	250	1 x 8Nm	130	330
31	1910	2000	1600	620	620	390	250	1 x 8Nm	280	450
40	2250	2250	1700	625	750	442	250	1 x 8Nm	280	650
63	2490	2400	2250	865	795	491	400	2 x 8Nm	480	800
80	2490	2600	2250	865	795	491	400	2 x 8Nm	480	1000

Weishaupt burner output parameters:

Weishaupt burner	min. gas pressure before burner (kPa)	fitting connection size	burner output (kW)	max. chamber heating output (kW)
WG5 N/1-A, LN	2 kPa	½"	12-50 kW	45 kW
WG10N/1-C, LN	1.2 kPa	¾"	25-110 kW	100 kW
WG20N/1-C, LN	1.5 kPa	¾", 1"	60-200 kW	180 kW
WG30N/1-C, ZM-LN	1.6 kPa	½", ¾", 1", 6/4"	65-350 kW	315 kW
WG40N/1-A, ZM-LN	1.7 kPa	¾", 1", 6/4", 2"	80-550 kW	495 kW
G3/1-E, ZD	1.7 kPa	¾", 1", 6/4", 2"	200-590 kW	530 kW
G3/1-E, ZD-LN	1.7 kPa	¾", 1", 6/4", 2", DN65	250-515 kW	460 kW
G5/1-D, ZD	1.7 kPa	1", 6/4", 2", DN 65	300-880 kW	790 kW
G5/1-D, ZD-LN	1.7 kPa	1" - DN100	300-850 kW	765 kW
G7/1-D, ZD	1.7 kPa	1" - DN100	500-1650 kW	1480 kW
G7/1-D, ZD-LN	2.6 kPa	1" - DN100	500-1500 kW	1350 kW

ELECTRIC HEATER

General information

The chamber serves for air heating by means of electric heating rods. The heating rods are joined into several sections within the chamber. The heating output is controlled by switching over the sections or by a continuous thyristor output control.

Each section consists of one or more triplets of heating rods (output 500-3000 W) star interconnected. Power supply for the heater sections along with the safety and emergency thermostat terminals are terminated in the terminal box inside the chamber. Each section is separately connected to the 3x400 V/ 50Hz wiring. The safety and emergency thermostat is connected as a break-type contact. Cable bushing through the unit casing is near the terminal box.

The standard supply includes

- Stainless steel heating coils with stainless winding
- Two safety bimetal thermostats to prevent overheating setup to 50 °C (connected in series)

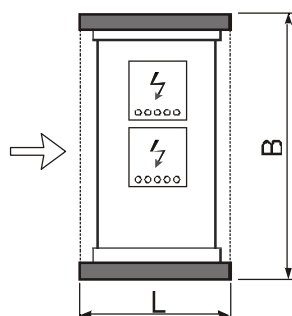
- Two emergency capillary thermostats setup to 50 °C with manual reset (connected in series)
- Removable side panel with bushings

Options

- possibility to make up heating power in sections to accordance to customers demand

Designer's recommendations

- Minimum air flow through the heater is 1 m/s
- Controls must ensure heater operation blocking in the cases of zero air flow through the unit and the fan after-run when the electric heater is switched off (at least 3 minutes)
- It is recommended to locate the heater in the end of the unit due to the fan electric motor heat resistance (40 °C max.)
- If the electric heater is in the middle of the unit we recommend placing empty chambers before and behind the heater
- Electric heaters for KLM 31-80 sizes are designed individually
- Electric heating is subject to revisions according to the relevant national safety standards.



KLM size	length L (mm)	width A (mm)	height B (mm)	heating output (kW)	number of output		arrangement of sections
					steps		
02	400	550	550	12	2		2x6kW
				18	3		3x6kW
				24	4		4x6kW
04	400	650	650	12	2		2x6kW
				18	3		3x6kW
				24	4		4x6kW
				36	4		4x9kW
06	400	800	800	18	3		3x6kW
				36	4		4x9kW
				48	4		2x9kW/2x15kW
				60	4		4x15kW
08	400	1000	800	54	5		1x6kW/4x12kW
				60	5		5x12kW
				81	5		1x9kW/4x18kW
10	400	1000	1000	63	7		7x9kW
				72	4		8x9kW
				96	4		8x12kW
12	400	1250	1000	72	4		4x18kW
				96	4		8x12kW
				132	4		2x12kW/6x18kW
16	400	1250	1250	72	4		8x9kW
				108	3		6x18kW
				144	4		8x18kW
20	400	1600	1250	126	4		2x9kW/6x18kW
				162	3		6x27kW
				216	4		8x27kW
25	400	1600	1600	108	3		6x18kW
				162	4		2x18kW/6x21kW
				180	4		2x9kW/6x27kW
				216	4		8x27kW

WATER COOLER

General information

The chamber serves for air cooling using cold water or antifreeze mixture. The exchangers are equipped with aluminium fins and copper tubes. Available for each unit size is a series of exchangers with two to eight rows of tubes and an optimised spacing of fins and number of water tracks. There are no limitations as to the temperature medium but it is necessary to avoid freezing. The maximum working pressure of the medium is 2 MPa. All exchangers are tested with the inner pressure of 3 MPa (dry air).

The chamber is equipped with an aluminium condensate pan with an outlet for siphon connection of Ø30 mm – external diameter.

The exchangers are supplied with branches covered with plastic end caps.

The standard supply includes

- Exchanger with copper tubes and aluminium fins
- Manual venting screw in the exchanger upper part
- Plastic droplet separator
- Aluminium condensate drain pan
- Siphon
- Fixed side panel

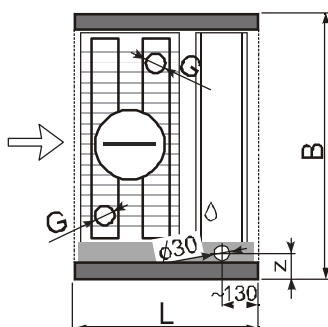
Optional accessories

- Stainless steel condensate drain pan
- Variant without droplet separator

- Copper fins (Cu/Cu)
- Al/Cu exchanger with a protective polymer coat (anti-salt protection)
- Pan heating
- Branch outlets in adjacent empty chamber – the cooler chamber will be 100 mm
- Threaded flange and welded-on counter-flange (not mounted)

Designer's recommendations

- Exchanger should be counter-current connected
- All cooler parameters must be computed using the LENNOX software
- Exchanger pressure loss at the water side is about 1-20 kPa
- Condensate drain must be connected to the siphon
- Inlet and outlet steel branches are equipped with a male thread
- Sanitary units should use a chamber without eliminator (problematic cleaning) and the unit should be sized so as to keep the air flow below 2.5 m/s over the cooler working surface
- If the side panel is removed, the exchanger with eliminator may be moved out
- If anti-freeze cooling medium is used, this should be compatible with copper (Friterm,)



KLM size	length with eliminator L (mm)	length without eliminator L (mm)	width A (mm)	height B (mm)	branch height z (mm)	connecting dimension – male thread G (")							
						type O	type P	type R	type S	type T	type U	type V	type W
02	400	300	550	550	65	7/8	7/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8
04	400	300	650	650	65	7/8	7/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8
06	400	300	800	800	65	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8
08	400	300	1000	800	65	1 3/8	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	1 5/8
10	400	300	1000	1000	65	1 3/8	1 3/8	1 3/8	1 3/8	1 5/8	1 5/8	2 1/8	2 1/8
12	400 (500)*	300 (400)*	1250	1000	65	1 3/8	1 3/8	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8
16	400 (500)*	300 (400)*	1250	1250	65	1 5/8	1 5/8	1 5/8	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8
20	400 (500)*	300 (400)*	1600	1250	65	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	2 5/8	2 5/8	2 5/8
25	400 (500)*	300 (400)*	1600	1600	65	2 1/8	2 1/8	2 1/8	2 1/8	2 5/8	3 1/8	3 1/8	3 1/8
31	400 (500)*	300 (400)*	2000	1600	65	2 1/8	2 1/8	2 1/8	3 1/8	3 1/8	3 1/8	3 1/8	3 1/8
40	500	400	2250	1700	80	2 1/8	2 5/8	2 5/8	2 5/8	3 1/8	3 1/8	4 1/8	4 1/8
63	500	400	2400	2250	80	2 1/8	2 1/8	2 1/8	3 1/8	3 1/8	3 1/8	3 1/8	4 1/8
80	500	400	2600	2250	80	2 1/8	2 1/8	2 1/8	3 1/8	3 1/8	3 1/8	3 1/8	4 1/8

Note:

- chamber with type W exchanger (highest output) is longer by 100 mm (KLM 12 - KLM 31)
- if branches discharge into the adjacent chamber, the cooler chamber will be 100 mm longer

DIRECT EVAPORATOR COOLER

General information

The chamber serves for air cooling using direct expansion evaporation. It is always connected in a separate refrigerant circuit with a condensing unit. Offered are single-circuit or double-circuit exchangers for refrigerants R407C, R134a, R404a, R22, R410A, R502 and R22 (outside EEC).

The exchangers are equipped with aluminium fins and copper tubes. The maximum working pressure of the medium is 250 kPa. All exchangers are tested with the inner pressure of 3 MPa (dry air).

The chamber is equipped with an aluminium condensate pan with an outlet for siphon connection of $\varnothing 30$ mm – external dia.

The exchangers are supplied with branches covered with plastic end caps.

The standard supply includes

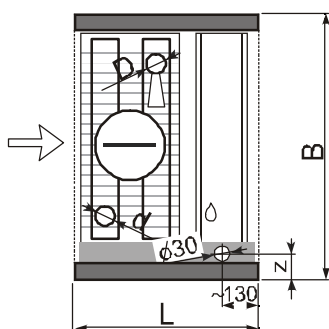
- Exchanger with copper tubes and aluminium fins
- Plastic droplet separator
- Aluminium condensate drain pan
- Siphon
- Fixed side panel

Optional accessories

- Stainless steel condensate drain pan
- Variant without droplet separator
- Copper fins
- Al/Cu exchanger with a protective polymer coat (anti-salt protection)

Designer's recommendations

- All cooler parameters must be computed using the LENNOX software
- Double-circuit coolers are recommended for cooling outputs over 40kW
- Condensate drain must be connected to the siphon
- Inlet and outlet branches are made of copper ready for soldering
- Interconnection between the direct evaporator and the condensing unit must contain: expansion valve, closing solenoid valve, filter-dehydrator, sight glass and a connecting Cu piping with steam-tight insulation
- Sanitary units should use a chamber without eliminator (problematic cleaning) and the unit should be sized so as to keep the air flow below 2.5 m/s over the cooler working surface
- If the side panel is removed, the exchanger with eliminator may be moved out



KLM size	length with eliminator L (mm)	length without eliminator L (mm)	width A (mm)	height B (mm)	branch height z (mm)
02	500	400	550	550	55
04	500	400	650	650	55
06	500	400	800	800	55
08	500	400	1000	800	55
10	500	400	1000	1000	55
12	500 /600*	400 /500*	1250	1000	65
16	500 /600*	400 /500*	1250	1250	65
20	500 /600*	400 /500*	1600	1250	65
25	500 /600*	400 /500*	1600	1600	65
31	500 /600*	400 /500*	2000	1600	65
40	500 /600*	400 /500*	2250	1700	80
63	500 /600*	400 /500*	2400	2250	80
80	500 /600*	400 /500*	2600	2250	80

all direct evaporator cooler parameters has to be consulted with Customer service department of **LENNOX**

* Length of the direct evaporator cooler chamber for sizes KLM12- KLM80 depends on the evaporator cooling output.

ATTENUATING CHAMBER

General information

The chamber serves for attenuation of noise produced by the air-conditioning unit in service. The chamber contains galvanized sheet plates filled with a noise-absorbing material. The surface of the plates is covered by a cloth preventing sound insulation particles from springing off. Perforated sheet attenuators are suitable for attenuating lower frequency noise.

The standard supply includes

- Plates 200 mm wide with holders (width 100 mm for KLM 02), plates are 695 mm, 995 mm, 1395 mm or 1895 mm long
- Fixed side panel

Optional accessories

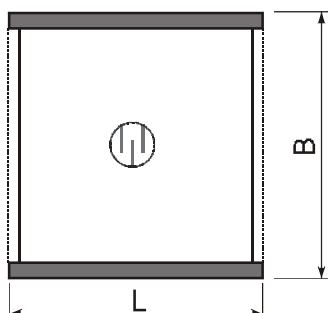
- In clean interior (sanitary) units the plates are coated with plastic foil which can be disinfected
- Perforated sheet attenuators for attenuation of low-frequency noise

Designer's recommendations

- Attenuating chamber length depends on the required noise attenuation
- Between the fan chamber discharge and the attenuating chamber there must be a empty chamber for the diffuser

Noise attenuator parameters – attenuating material covered with a cloth or a plastic foil (sanitary variant)

KLM size	width A (mm)	height B (mm)	length L (mm)	noise attenuation D (dB) in octave bands (Hz)								number of plates
				63	125	250	500	1k	2k	4k	8k	
02	550	550	800	1	6	12	20	36	37	24	18	3
			1 100	1	5	14	23	43	43	29	21	3
			1 500	2	7	18	33	50	50	37	25	3
			2 000	3	9	23	37	50	50	43	31	3
04	650	650	800	2	5	12	24	32	33	21	13	2
			1 100	2	7	15	29	40	41	26	15	2
			1 500	3	10	22	34	49	50	34	19	2
			2 000	4	13	28	41	50	50	40	28	2
06	800	800	800	5	8	16	28	43	41	26	22	3
			1 100	5	9	19	31	46	44	29	24	3
			1 500	6	11	23	37	50	50	36	24	3
			2 000	3	11	28	41	50	50	50	31	3
08	1000	800	800	2	5	12	22	30	29	18	12	3
			1 100	2	7	14	27	37	36	22	13	3
			1 500	3	10	20	34	47	46	29	16	3
			2 000	2	14	26	41	50	50	34	19	3
10	1000	1000	800	2	5	12	22	30	29	18	12	3
			1 100	2	7	14	27	37	36	22	13	3
			1 500	3	10	20	34	47	46	29	16	3
			2 000	2	14	26	41	50	50	34	19	3
12	1250	1000	800	2	5	12	24	32	33	21	13	4
			1 100	2	7	15	29	40	41	26	15	4
			1 500	3	10	22	34	49	50	34	19	4
			2 000	4	13	26	41	50	50	40	28	4
16	1250	1250	800	2	5	12	24	32	33	21	13	4
			1 100	2	7	15	29	40	41	26	15	4
			1 500	3	10	22	34	49	50	34	19	4
			2 000	4	13	26	41	50	50	40	28	4
20	1600	1250	800	2	5	12	23	31	30	19	12	5
			1 100	2	7	15	28	38	38	23	13	5
			1 500	3	10	21	34	48	48	31	17	5
			2 000	4	12	27	41	50	50	37	25	5
25	1600	1600	800	2	5	12	23	31	30	19	12	5
			1 100	2	7	15	28	38	38	23	13	5
			1 500	3	10	21	34	48	48	31	17	5
			2 000	4	12	27	41	50	50	37	25	5
31	2000	1600	800	2	5	12	23	30	30	18	12	7
			1 100	2	7	15	28	37	37	22	13	7
			1 500	3	10	20	34	47	47	30	17	7
			2 000	4	12	26	41	50	50	35	18	7
40	2250	1700	800	2	5	12	23	30	30	18	12	7
			1 100	2	7	15	28	37	37	22	13	7
			1 500	3	10	20	34	47	47	30	17	7
			2 000	4	12	26	41	50	50	35	18	7
63	2400	2250	800	2	6	13	25	33	33	21	14	8
			1 100	3	7	16	29	41	41	26	15	8
			1 500	3	11	22	35	50	50	34	20	8
			2 000	5	13	28	42	50	50	40	28	8
80	2600	2250	800	2	5	12	22	29	29	18	11	8
			1 100	2	7	14	27	36	36	21	13	8
			1 500	3	10	20	33	47	46	29	16	8
			2 000	4	12	26	41	50	50	34	19	8



Noise attenuator parameters – perforated sheet plates for attenuation of low-frequency noise

KLM size	width A (mm)	height B (mm)	length L (mm)	noise attenuation D (dB) in octave bands (Hz)								number of plates
				63	125	250	500	1k	2k	4k	8k	
02	550	550	800	2	10	17	14	23	20	14	15	3
			1 100	2	9	19	17	30	26	19	18	3
			1 500	3	11	23	27	44	40	27	22	3
			2 000	4	13	28	31	46	42	33	28	3
04	650	650	800	3	9	17	18	19	16	11	10	2
			1 100	3	11	20	23	27	24	16	12	2
			1 500	4	14	27	28	36	33	24	16	2
			2 000	5	17	33	35	44	40	30	25	2
06	800	800	800	6	12	21	22	30	24	16	19	3
			1 100	6	13	24	25	33	27	19	21	3
			1 500	7	15	28	31	43	39	26	21	3
			2 000	4	15	33	35	50	46	40	28	3
08	1000	800	800	3	9	17	16	17	12	8	9	3
			1 100	3	11	19	21	24	19	12	10	3
			1 500	4	14	25	28	34	29	19	13	3
			2 000	3	18	31	35	47	42	24	16	3
10	1000	1000	800	3	9	17	16	17	12	8	9	3
			1 100	3	11	19	21	24	19	12	10	3
			1 500	4	14	25	28	34	29	19	13	3
			2 000	3	18	31	35	47	42	24	16	3
12	1250	1000	800	3	9	17	18	19	16	11	10	4
			1 100	3	11	20	23	27	24	16	12	4
			1 500	4	14	27	28	36	33	24	16	4
			2 000	5	17	31	35	44	40	30	25	4
16	1250	1250	800	3	9	17	18	19	16	11	10	4
			1 100	3	11	20	23	27	24	16	12	4
			1 500	4	14	27	28	36	33	24	16	4
			2 000	5	17	31	35	44	40	30	25	4
20	1600	1250	800	3	9	17	17	18	13	9	9	5
			1 100	3	11	20	22	25	21	13	10	5
			1 500	4	14	26	28	35	31	21	14	5
			2 000	5	16	32	35	44	40	27	22	5
25	1600	1600	800	3	9	17	17	18	13	9	9	5
			1 100	3	11	20	22	25	21	13	10	5
			1 500	4	14	26	28	35	31	21	14	5
			2 000	5	16	32	35	44	40	27	22	5
31	2000	1600	800	3	9	17	17	17	13	8	9	7
			1 100	3	11	20	22	24	20	12	10	7
			1 500	4	14	25	28	34	30	20	14	7
			2 000	5	16	31	35	46	41	25	15	7
40	2250	1700	800	3	9	17	17	17	13	8	9	7
			1 100	3	11	20	22	24	20	12	10	7
			1 500	4	14	25	28	34	30	20	14	7
			2 000	5	16	31	35	46	41	25	15	7
63	2400	2250	800	3	10	18	19	20	16	11	11	8
			1 100	4	11	21	23	28	24	16	12	8
			1 500	4	15	27	29	37	33	24	17	8
			2 000	6	17	33	36	44	40	30	25	8
80	2600	2250	800	3	9	17	16	16	12	8	8	8
			1 100	3	11	19	21	23	19	11	10	8
			1 500	4	14	25	27	34	29	19	13	8
			2 000	5	16	31	35	47	42	24	16	8

ROTARY REGENERATOR - ZZT

General information

The chamber serves for heat (humidity) recovery from the discharged air. Through the inlet and exhaust air flow rotates a rotor with an aluminium heat transfer surface, thus transferring heat from the exhaust to the inlet air. The heat recovery efficiency is normally about 70-75 %. A scavenging chamber (wedge) in the part plane reduces exhaust air infiltration into the inlet air.

The hygroscopic coat of the heat transfer surface helps transfer humidity at the same time. The humidity transfer efficiency is about 60-65 %.

The rotor shaft lies in the frame on ball or tapered roller bearing. The rotor is driven by a worm-gear motor via rubber belting with a tension spring. The rotor inside the chamber is sealed with a brush welt in the part plane. As a standard, rotary regenerators (with rotor diameters up to 3 m) are supplied as an integral unit. On request they are supplied in parts assembled at the site. The rotor is usually divided into 4-8 circle sectors and the frame into 2-4 parts. The unit is assembled by the manufacturer to safeguard the guarantee of the unit.

The chambers for unit sizes up to KLM 40 are available in vertical arrangement and in horizontal arrangement for sizes up to KLM 63. The rotary regenerator chamber always overlaps the unit's outline. In vertical arrangement it overlaps both unit sides and in horizontal arrangement it overlaps upwards along with the transition chambers.

Speed control

The heat recovery efficiency depends on the rotor speed. Available are two variants of speed control:

- Constant speed. The rotor runs at a constant speed given by the transmission used. This is an optimum speed for the maximum efficiency in winter. This control type is supplied as a standard.
- Control with speed frequency converter. The rotor speed is controlled in the range of 2-12 rpm using a frequency converter. The control frequency is determined by a parent control system and is transmitted through a voltage signal 0-10 V or a current signal 0-20 mA.
- On request we supply systems with autonomous speed control. The rotor speed is controlled in the range of 2-12 rpm using a frequency converter with an automatic control regulator. Through heat-sensing elements, the regulator

controls optimum rotor speed. The regulator is equipped with a control panel.

The standard supply includes

- Rotary exchanger (aluminium fins)
- Electric motor drive 3x400 V with a gearbox and a rubber belting (direct wiring to the motor)
- Removable side panel near the driving unit
- Horizontal arrangement versions include two transition chambers for air distribution onto the whole of the regenerator working surface
- Transition chambers with removable side panels

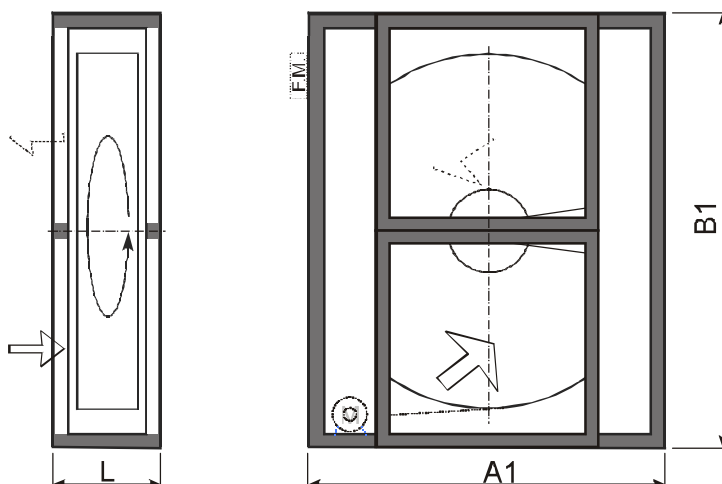
Optional accessories

- Frequency converter for rotor speed control
- Autonomous rotor speed control
- Hygroscopic rotor coat for humidity transfer
- Supply in parts (divided rotor and housing)
- Condensate pan with a siphon for use in damp areas (swimming pools etc.)

Designer's recommendations

- Inlet and exhaust air should circulate in counterflow. Reduced heat transfer efficiency and a higher infiltration occur in concurrent flow arrangements
- Empty chambers facilitating rotor cleaning must be on both regenerator sides (at least 500 mm long; alternative: filter chamber)
- In vertical arrangement, neighbouring chambers are connected with the rotary regenerator from inside using bolts and thread nuts in the regenerator frame. Chambers being joined together must allow access inside for assembly (empty, filtration, fan, damper chamber...)
- Sizes KLM16 and higher are available with the divided rotary exchanger. On-site assembly is provided by the manufacturer.
- Rotary exchangers are not suitable for sanitary units due to bypassing infiltration.
- Indoor units have the frequency converter and/or regulator located on the side of the unit.
- Frequency converters (and/or regulators) for outdoor units are supplied separately and have to be installed in spaces with operating temperatures between 0 to 40 °C and relative humidity max. 90 %.

ROTARY REGENERATOR, VERTICAL ARRANGEMENT

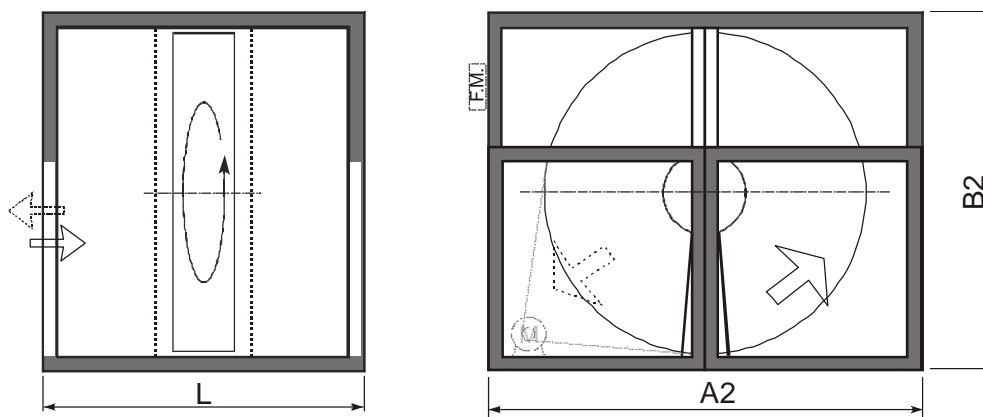


Note:

- for examples of rotary regenerator arrangement see Chapter *Sample Patterns*

KLM size	chamber length L (mm)	width A (mm)	height B (mm)	width A1 (mm)	height B1 (mm)	rotor diameter (mm)	motor (W)	frequency converter (if requested)
02	420	550	550	980	1100	820	90	FIA-L18
04	420	650	650	1180	1300	1020	90	FIA-L18
06	420	800	800	1460	1600	1320	180	FIA-L18
08	420	1000	800	1460	1600	1320	180	FIA-L18
10	420	1000	1000	1810	2000	1670	180	FIA-L18
12	420	1250	1000	1810	2000	1670	180	FIA-L18
16	420	1250	1250	2160	2500	2020	180	FIA-L18
20	420	1600	1250	2360	2500	2220	370	FIA-L37
25	515	1600	1600	2560	3200	2420	370	FIA-L37
31	555	2000	1600	2900	3200	2720	370	FIA-L37
40	555	2250	1700	3100	3500	2920	370	FIA-L37
63	NOT AVAILABLE							
80	NOT AVAILABLE							

ROTARY REGENERATOR, HORIZONTAL ARRANGEMENT



Note:
- for examples of rotary regenerator arrangement see Chapter *Sample Patterns*

KLM size	chamber length L(mm)	width A (mm)	height B (mm)	width A1 (mm)	height B1 (mm)	rotor diameter (mm)	motor (W)	frequency converter (if requested)
02	1420	550	550	1100	980	820	90	FIA-L18
04	1420	650	650	1300	1180	1020	90	FIA-L18
06	1420	800	800	1600	1460	1320	180	FIA-L18
08	1420	1000	800	2000	1460	1320	180	FIA-L18
10	1420	1000	1000	2000	1810	1670	180	FIA-L18
12	1420	1250	1000	2500	1810	1670	180	FIA-L18
16	1420	1250	1250	2500	2160	2020	180	FIA-L18
20	1420	1600	1250	3200	2360	2220	370	FIA-L37
25	1515	1600	1600	3200	2560	2420	370	FIA-L37
31	1555	2000	1600	4000	2900	2720	370	FIA-L37
40	1555	2250	1700	4500	3100	2920	370	FIA-L37
63	1555	2400	2250	4800	3600	3420	750	FIA-L75
80	NOT AVAILABLE							

Note:
- rotary exchangers for sizes KLM 63 are standardly supplied split.

PLATE RECUPERATOR - ZZT

General information

The plate recuperator chamber serves for heat recovery from the exhaust, while inlet and outlet air streams are fully separated. Own cube of the plate recuperator consists of a system of aluminium plates (fins) interconnected so as to permit alternating passage of the inlet and exhaust air between the plates. The exhaust air transfers heat to the aluminium plates, which subsequently heat the fresh inlet air. The heat recovery efficiency depends on temperature and humidity of both types of air and usually ranges from 50 to 55%. The cube inside the plate recuperator is seated and sealed with a silicon-free sealant. At the inlet side the chamber is furnished with a fresh air bypass as a protection against frozen condensed water build-up on the recuperator. The bypass is provided with a damper with an outlet for an actuator. The chamber is equipped with a droplet separator at the outlet side and a condensate pan at both recuperator sides.

The chamber is available for vertically or horizontally arranged units.

The standard supply includes

- Aluminium recuperator cube
- Aluminium condensate pans
- Plastic droplet separator
- Siphon and caps for unused outlets
- By-pass on the air inlet side
- All panels are fixed

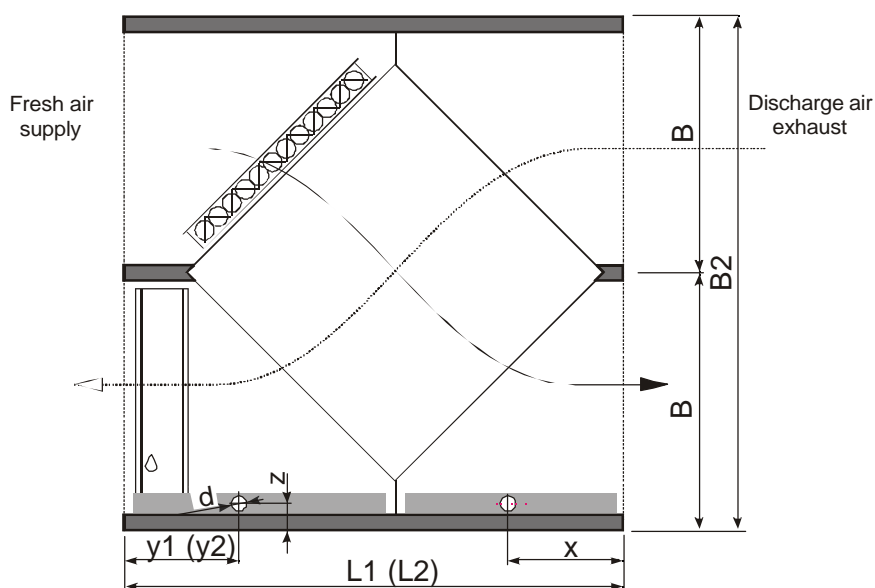
Optional accessories

- By-pass damper actuator
- Without droplet separator (for vertical arrangement only)
- Double-case sight hole on the bypass side
- Chamber lighting with a switch outside the unit (not available for sizes KLM 02 and KLM 04)
- Epoxid coat the cube for aggressive atmosphere

Designer's recommendations

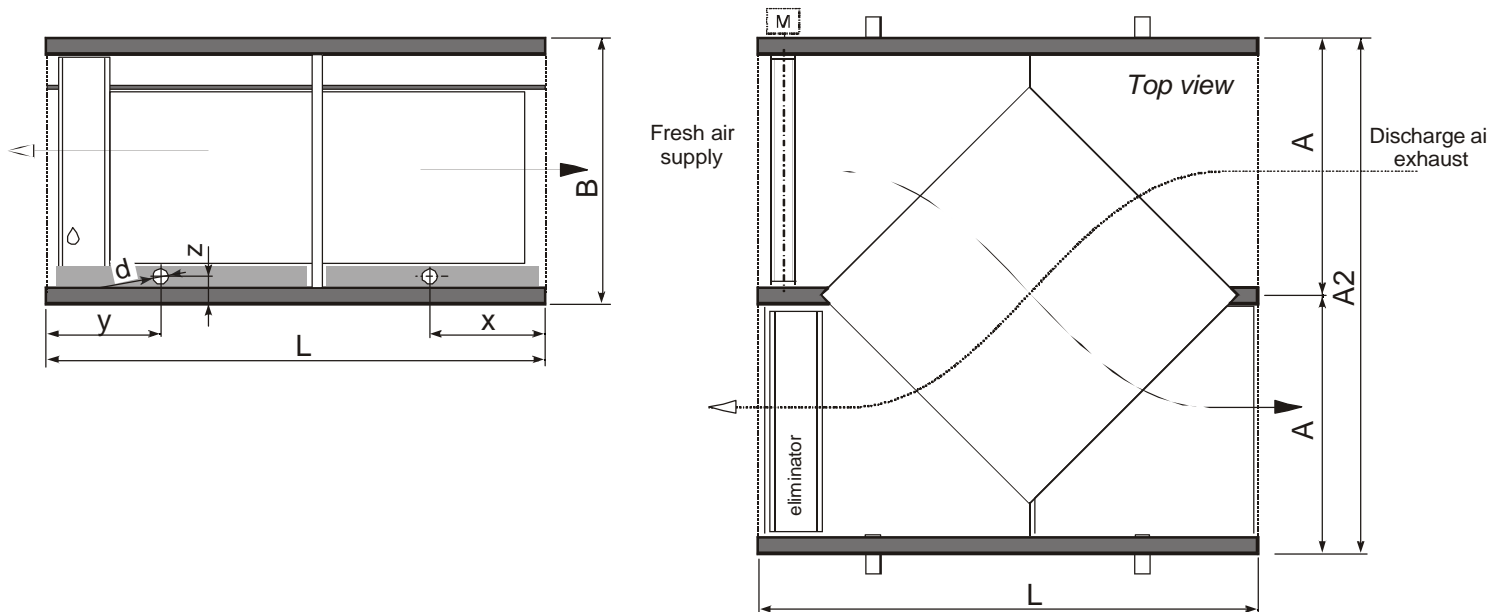
- Plate exchanger is suitable for sanitary units.
- Condensate discharge must be equipped with a siphon

PLATE RECUPERATOR, VERTICAL ARRANGEMENT



KLM size	length of chamber with separator L1 (mm)	length of chamber without separator L2 (mm)	width A (mm)	height B (mm)	height B2 (mm)	condensate drain					servo by-pass (Nm)
						x (mm)	with separ. y1 (mm)	without separ. y2 (mm)	z (mm)	d (mm)	
02	1250	1100	550	550	1100	282	357	282	66	20	8
04	1250	1100	650	650	1300	282	357	282	66	20	8
06	1500	1400	800	800	1600	357	407	357	70	20	8
08	1800	1650	1000	800	1600	419	494	419	70	20	8
10	1800	1650	1000	1000	2000	419	494	419	70	20	15
12	2100	1950	1250	1000	2000	494	569	494	70	20	15
16	2100	1950	1250	1250	2500	494	569	494	70	20	15
20	2550	2400	1600	1250	2500	606	681	606	75	30	15
25	2100	1950	1600	1600	3200	494	569	494	75	30	18
31	2550	2400	2000	1600	3200	606	681	606	75	30	18
40	NOT AVAILABLE										
63	NOT AVAILABLE										
80	NOT AVAILABLE										

PLATE RECUPERATOR, HORIZONTAL ARRANGEMENT



KLM size	length of chamber with separator L (mm)	width A (mm)	height B (mm)	width A2 (mm)	condensate drain				servo by-pass (Nm)
					x (mm)	y (mm)	z (mm)	d (mm)	
02	1250	550	550	1100	287	362	70	20	8
04	1250	650	650	1300	287	362	70	20	8
06	1450	800	800	1600	337	412	70	20	8
08	2150	1000	800	2000	512	587	70	20	8
10	1850	1000	1000	2000	437	512	70	20	15
12	2150	1250	1000	2500	512	587	70	20	15
16	2150	1250	1250	2500	512	587	70	20	15
20	2550	1600	1250	3200	537	687	75	30	15
25	2150	1600	1600	3200	512	587	75	30	15
31	3250	2000	1600	4000	787	862	75	30	18
40	2700	2250	1700	4500	687	687	90	30	30
63	NOT AVAILABLE								
80	NOT AVAILABLE								

GLYCOL RECOVERY SYSTEM

General description

Glycol circuit for heat recovery consist of two coils (cooler and heater), which are components of circuit with pump circulated heat-transfer medium. Advantages of this configuration is: 100 % separation of fresh air and exhaust units separately. Coils dimensioning is selected by LENNOX software. Connecting pipelines and pump not included.

The standard supply includes

Chamber in exhaust part of the unit:

- Coil with aluminium fins and copper tubes
- Aluminium condensate drain pan, drop separator including
- Siphon

Chamber in intake part of the unit:

- Coil with aluminium fins and copper tubes
- Inlet and outlet steel nozzles with male thread
- Manual air relief valve in upper part of coil

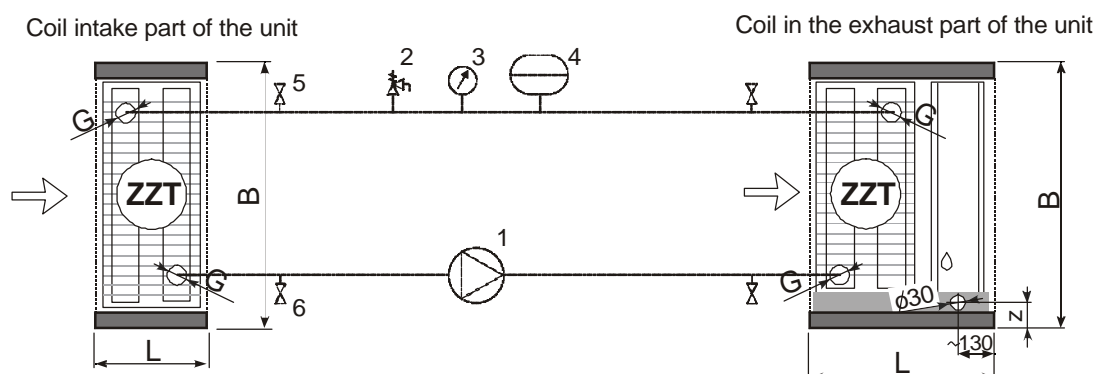
- All panels fixed

Optional accessories

- Copper coil fins
- Coils Al / Cu with polymeric coating (protection against salts)
- Antifreeze protection sensor with capillary
- Threaded flange and anti-flange (for welding) delivered loose
- All panels fixed

Designer's recommendations

- Glycol circuit is suitable for units in sanitary arrangement as well as units in outdoor arrangement
- Condansate drain has to be fitted with siphon
- The heat transfer medium recommended to be used water-ethylenglycol mixture or another antifreeze liquid compatible with copper
- Power controlling by switching circulating pump ON/OFF, or by including of 3 – way valve on the heater coil side



Connecting circuit description:

- 1 – pump
- 2 – safety valve
- 3 – pressure gauge
- 4 – expansion vessel
- 5 – air relief valves
- 6 – bleeding valves

Note:

- connecting pipelines and pump not included

size KLM	intake coil length L (mm)	exhaust coil length L1 (mm)	width A (mm)	height B (mm)	branch height z (mm)
02	250-300*	400	550	550	65
04	250-300*	400	650	650	65
06	250-300*	400	800	800	65
08	250-300*	400	1000	800	65
10	250-300*	400	1000	1000	65
12	250-300*	400	1250	1000	65
16	250-300*	400	1250	1250	65
20	250-300*	400	1600	1250	65
25	250-300*	400	1600	1600	65
31	250-300*	400	2000	1600	65
40	400	500	2250	1700	80
63	400	500	2400	2250	80
80	400	500	2600	2250	80

all glycol circuit parameters has to be consulted with Customer service department of **LENNOX**

* chamber length depends on demanded exchanger power

AIR HUMIDIFICATION- AIR WASHER BÄHR

General information

The air humidification chamber, also called air washer, serves for conditioned air humidification and adiabatic cooling by sprayed water. Water is drawn by a pump and driven through distributing pipes into the jets that create water mist in the unit.

The air comes into the chamber from air baffles, then it goes through the water mist where it dampens and adiabatically cools and at the end of the chamber it goes through a droplet separator that prevents the unabsorbed air from entering the next chambers of the unit.

The chamber may be entered through water-tight door with an inspection hole. The chamber is made of fibreglass-reinforced plastic. The pan is situated under the chamber so other chambers within the unit should be adjusted accordingly.

The standard supply includes

- Bähr air washer
- Water-tight chamber lighting with a switch outside the unit
- Water-tight door with a sight hole
- Plastic droplet separators at the chamber inlet and outlet
- Distribution jets with a pump

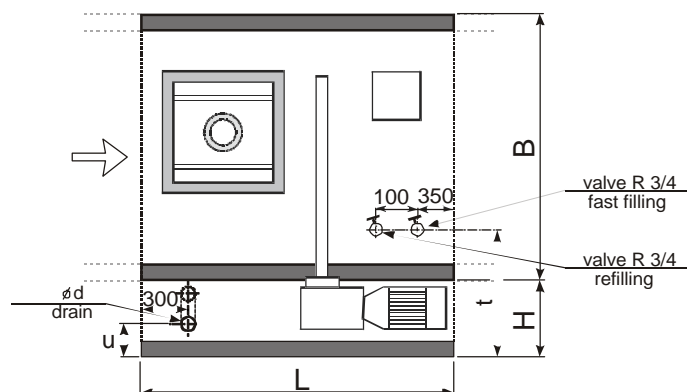
- Sensor preventing the pump dry running
- Automatic valve supplying water into the storage tank

Optional accessories

- Pan heating
- UV-lamp for liquidation of germs
- Pump control by frequency converter or bypass

Designer's recommendations

- Water has to meet the prescribed parameters, see the Operating Instructions. Conductivity 1000 $\mu\text{S}/\text{cm}$ max. (at humidification over 95 %, 800 $\mu\text{S}/\text{cm}$ max.), carbonate hardness 3.5 mol/m³ max.
- Water connection contains: fast filling, refilling and draining including overflow discharge
- Electric connection includes: pump, lighting, dry run sensor
- Air humidification chamber is maintenance-intensive, see the Operating Instructions. It necessitates weekly cleaning (drain the water fill and disinfect the chamber).
- Air-conditioning unit with a spray washer necessitates an elevated frame under the remaining unit chambers 350 (400) mm high



KLM size	chamber length L (mm)	width A (mm)	height B (mm)	pan height H(mm)	pump		dimensions			jet discharge (l/s)
					pump type	power input (kW)	t (mm)	φd (mm)	u (mm)	
02	1500	550	550	350	Lowara CA 70/33	0,75	450	50	70	0,617
04	1500	650	650	350	Lowara CA 70/33	0,75	450	50	70	0,863
06	1500	800	800	350	Lowara CA 120/33	1,1	450	50	70	1,438
08	1500	1000	800	350	Lowara CA 120/35	1,5	450	50	70	1,793
10	1500	1000	1000	350	Lowara CA 200/33	1,85	450	50	70	2,324
12	1500	1250	1000	350	Lowara SHS 32-160/22	2,2	450	50	70	2,661
16	1500	1250	1250	350	Lowara SHS 32-160/22	2,2	450	50	70	3,873
20	1500	1600	1250	400	Lowara SHS 32-200/30	3	500	63	80	4,022
25	1500	1600	1600	400	Lowara SHS 40-160/40	4	500	63	80	6,418
31	1500	2000	1600	400	Lowara SHS 40-160/40	4	500	63	80	6,812
40	1500	2250	1700	400	Lowara SHS 40-200/55	5,5	500	63	80	9,560
63	1500	2400	2250	400	Lowara SHS 50-160/75	7,5	500	63	80	14,163
80	1500	2600	2250	400	Lowara SHS 50-160/75	11	500	63	80	15,491

Note:

- when air handling unit with air washer is used the rest of units chambers should be provided with higher frame of 350 or 400 mm - see chart - pan height H

AIR HUMIDIFICATION – MUNTERS EVAPORATIVE HUMIDIFIER

General information

The Munters air humidification chamber serves for conditioned air and adiabatic cooling. Using this method of humidification, moisture gets into the air solely by evaporation (not by spraying). The humidifier works without a circulating pump with a direct water flow.

The basis is GLASdek humidifier cassettes of glass-fibre-based material that enables optimum moisture evaporating into the air flow. The drain pan with two drains and the supporting frame are constructed from stainless steel plate. The chamber is provided with a droplet separator. The plastic distributing hoses are equipped with quick-release coupling. The water supply is equipped with a male thread DN 1½", the discharge PVC pipe is DN32.

The standard supply includes

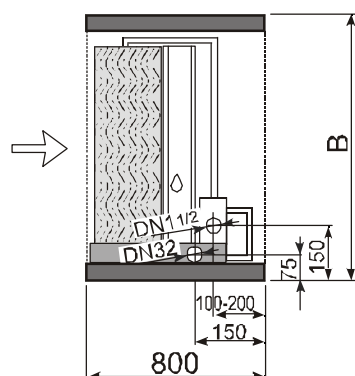
- Humidifier cassettes of nonflammable GLASdek
- Solenoid valve, compensating valves
- Droplet separator
- Stainless steel drain pan
- Siphon
- Door with handle

Optional accessories

- Multi-level humidification output control (2 solenoid valves)
- Closing valve
- Lockable door catch

Designer's recommendations

- Drinking water Ph7 or softer is suitable for humidification
- Humidifier material is suitable for air temperatures up to 60 °C, the plastic parts behind the humidifier up to 40°C.
- Solenoid valve wiring must be done by a person owning a licence for wiring work
- Equipment must be operated in accordance with the Instructions for Use and Maintenance



Note:

- evaporative humidifier not available for size KLM 02

STEAM HUMIDIFICATION

General information

The chamber serves for air humidification from steam produced by an electric steam generator. When the unit is assembled at the site, steam distribution tubes are built into the chamber and through hoses connected with the steam generator located near the unit. The steam generator and the distribution tubes are not part of the chamber supply. The steam generator parameters must be specified always according to the need of humidity.

The chamber is accessible through a water-tight door with a double-case inspection hole. The chamber is equipped with an aluminium condensate pan with an outlet for siphon connection of \varnothing 20 mm – external dia.

The standard supply includes

- Aluminium condensate pan
- Siphon
- Removable inspection panel

Optional accessories

- Double-case inspection hole
- Chamber lighting with a switch outside the unit
- Electric steam generator and distribution tubes + hoses
- Stainless steel condensate pan

Designer's recommendations

- Steam humidification is suitable for sanitary units
- Condensate outlet from the chamber must be connected to the siphon

- Chamber is not equipped with droplet separator (water droplet entrainment does not occur in steam humidification)

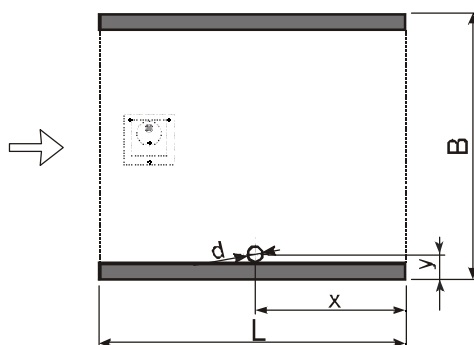
Designer's recommendations for steam generator

- Conductivity of water supplied to the steam generator must be 400-1200 μ S/cm and hardness 15-40 °fH. Water with conductivity of 150-450 μ S/cm necessitates special electrodes

- Interconnecting hoses should not be longer than 4 m
- Steam generator must be equipped with water supply and condensate discharge

- Condensate drain from the distribution tube must be equipped with a siphon and ended in the discharge pipe (or steam generator)

- Complete supply contains: steam generator with a stepless control or an on/off switch, distribution tube, steam hose, condensate hose and a humidity sensor for the piping or a humidistat



KLM size	length L (mm)	width A (mm)	height B (mm)	condensate outlet			
				max. length of distribution tube (mm)	diameter ϕ d	distance x (mm)	distance y (mm)
2	1500	550	550	525	25	750	64
4	1500	650	650	625	25	750	64
6	1500	800	800	775	25	750	64
8	1500	1000	800	975	25	750	64
10	1500	1000	1000	975	25	750	64
12	1500	1250	1000	1225	25	750	64
16	1500	1250	1250	1225	25	750	64
20	1500	1600	1250	1575	25	750	64
25	1500	1600	1600	1575	25	750	64
31	1500	2000	1600	1975	25	750	64
40	1500	2250	1700	2225	25	750	78
63	NOT AVAILABLE						
80	NOT AVAILABLE						

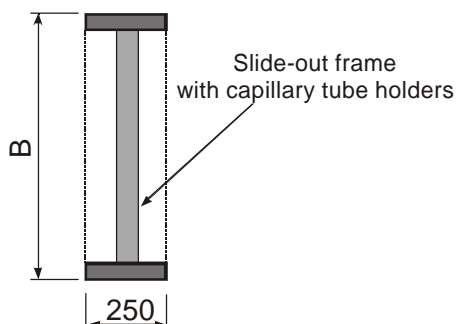
ANTI-FREEZE PROTECTION

General information

The chamber serves for embedding a capillary tube of the anti-freeze protection of the water or steam heaters. The chamber is 250 mm long, equipped with a rail and slide-out frame with capillary tube holders.

The standard supply includes

- Slide out frame with capillary tube holders



Optional accessories

- Anti-freeze protection sensor with a capillary tube

Designer's recommendations

- Always place the chamber right behind the heater chamber.
- In outdoor units we recommend placing the anti-freeze protection sensor inside the chamber

EMPTY CHAMBER CROSS-FLOW

General information

The chamber serves for various purposes such as:

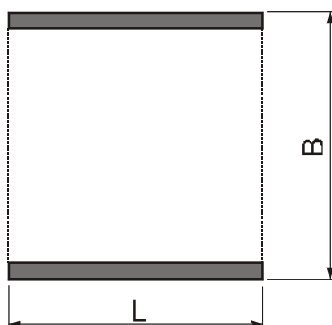
- Better access to other functional parts of the unit
- Air current diffusion behind the fan chamber
- Alignment of the bottom unit part length in vertical arrangements
- For exchanger branch outlets inside the air-conditioning unit
- For switchboard or steam generator building-in
- For special filter with fixtures building-in

Casing variants - panels

- Removable panel
- Fixed panel
- Door with handles (not available for lengths 250 mm – 400 mm)

Optional accessories

- Double-case sight hole (not available for chambers 250 and 300 mm long)
- Chamber lighting with a switch outside the unit (not available for chambers 250 and 300 mm long, for sizes KLM 02 and KLM 04 and chambers 400 mm long)
- Pressure sensor (manostat) or a liquid pressure gauge
- Aluminium or stainless steel condensate pan (for selected chambers only)



optional accessories	empty chambers use length for size of KLM (mm)											
	250	300	400	500	600	700	800	900	1000	1100	1500	2000
removable panel	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		
door with handle				☑	☑	☑	☑	☑	☑	☑		
fixed panel	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
inspection hole			☑	☑	☑	☑	☑	☑	☑	☑		
lightning			☑*	☑	☑	☑	☑	☑	☑	☑		

Note:

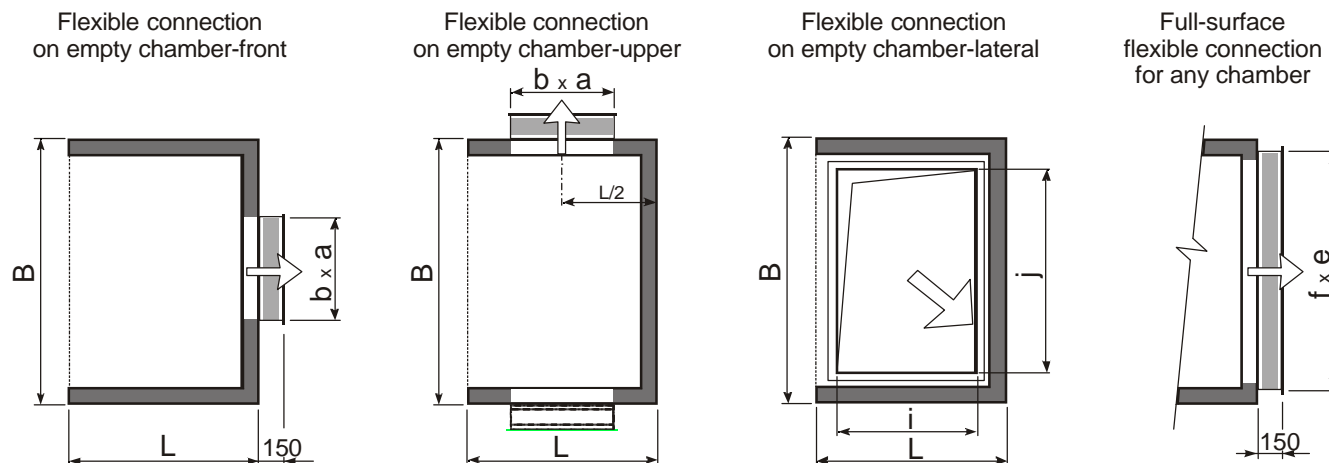
- lightning is not available for sizes KLM 02 and KLM 04 and for chambers shorter than 400 mm

END EMPTY CHAMBER, FULL – SURFACE FLEXIBLE CONNECTION

General description

The end empty chamber is designed for connection onto air distributing pipes, when the regulating damper is not in use. It is empty section with opening on the panel, provided with flexible connection.

Full-surface flexile connection is a special type of connection onto air distributing pipes. Its dimensions are identical with unit cross-section and is fixed to chamber frame. This attenuating element could be installed on all chambers of air-handling unit.



size KLM	length L (mm)	width A (mm)	height B (mm)	flexible connection front, upper, bottom		flexible connection lateral		full-surface flexible connection	
				a (mm)	b (mm)	i (mm)	j (mm)	e (mm)	f (mm)
02	400	550	550	361	200	200	361	490	490
04	400	650	650	456	200	200	456	590	590
06	400	800	800	636	200	200	636	740	740
08	600	1000	800	800	400	406	626	940	740
10	500	1000	1000	806	300	300	806	940	940
12	800	1250	1000	1000	600	606	826	1190	940
16	600	1250	1250	1006	400	400	1006	1190	1190
20	800	1600	1250	1400	600	606	926	1540	1190
25	600	1600	1600	1406	400	400	1406	1540	1540
31	1000	2000	1600	1800	700	806	1326	1940	1540
40	700	2250	1700	2006	500	-	-	2180	1630
63	900	2400	2250	2126	700	-	-	2330	2180
80	1100	2600	2250	2256	900	-	-	2530	2180

Note:

- flexible connection is always situated in the centre of panel
- possibility to combine two flexible connections in any order

DUCTLINE CONNECTION – FLEXIBLE CONNECTION

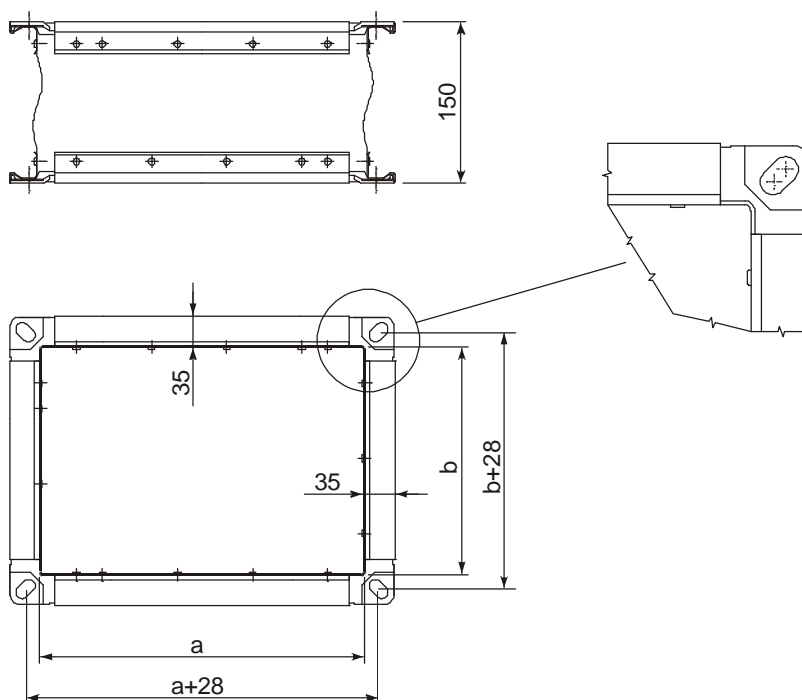
General description

Air-distribution ducting is connected onto the unit through attenuating adapter. It can be fixed from the outer side of chamber panel or outer damper (damper chamber, empty chamber, fan chamber). Full – area attenuating element is connecting to the frame and can be used for any chamber. Attenuating adapter prevent vibration transfer from unit to ductwork and balancing inaccuracies of co-axial symmetry in duct connection. Its made of airtight textile sleeve with

flanges. Flanges are connected together with earth-wire. Attenuating adapter is 150mm long in maximum extending and 100mm long in maximum pressing. When pressed or extended extremely, damage can occur.

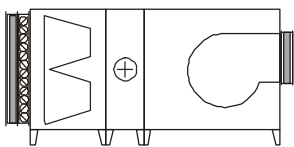
Designing recommendations

- Ducting has to be independently suspended and must not weight the flexible connection in any direction

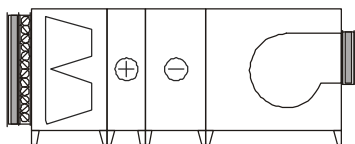


SAMPLE PATTERNS

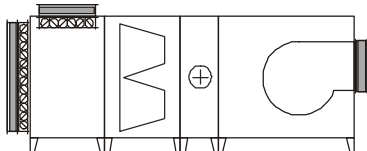
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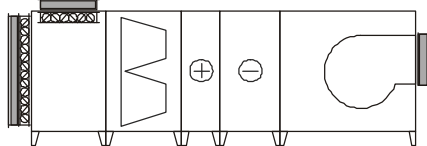
configuration number 2



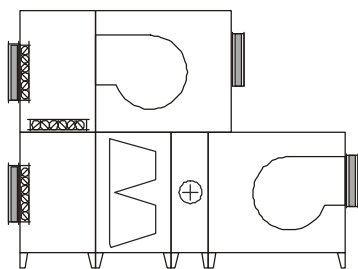
configuration number 3



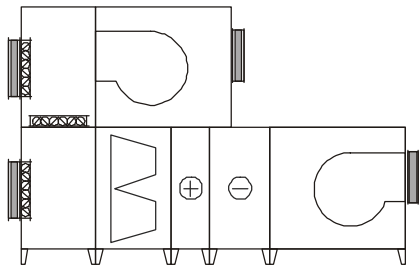
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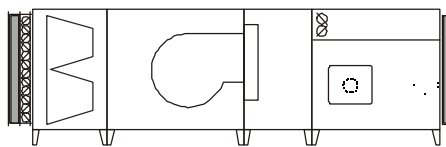
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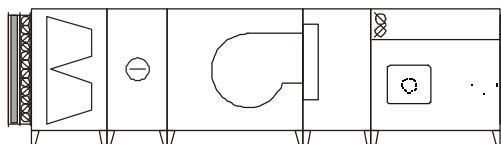
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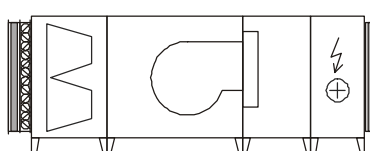
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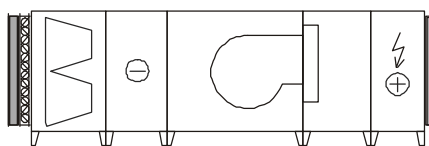
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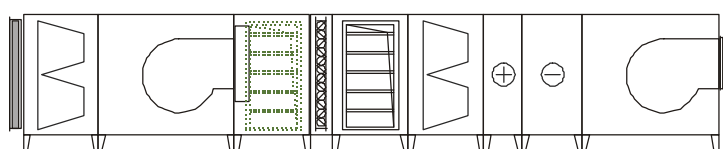
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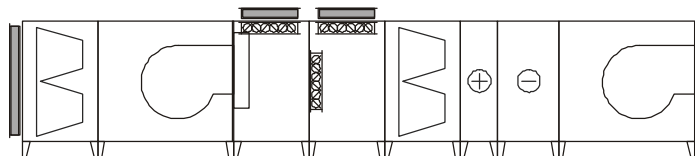
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configuration number 11

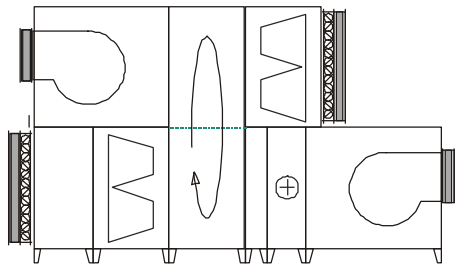


configuration number 12

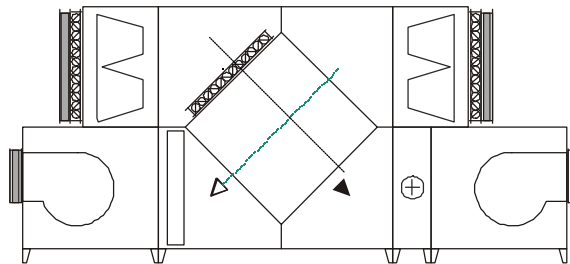


SAMPLE PATTERNS

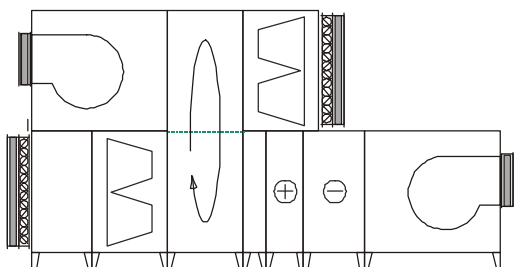
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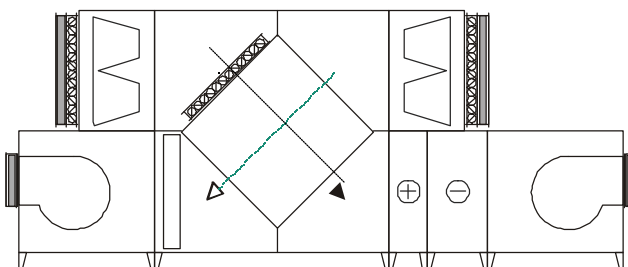
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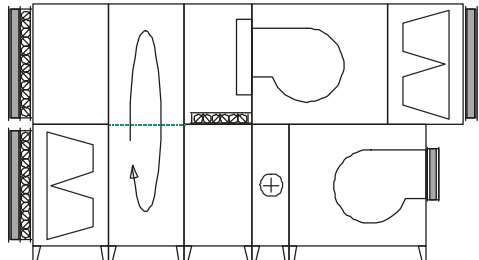
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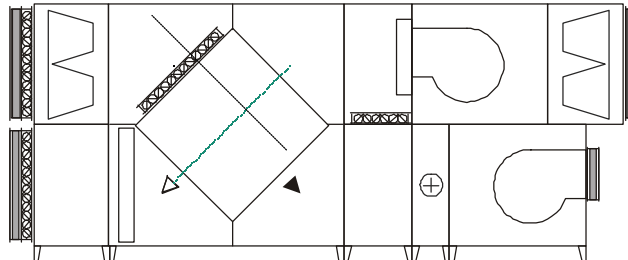
configuration number 18



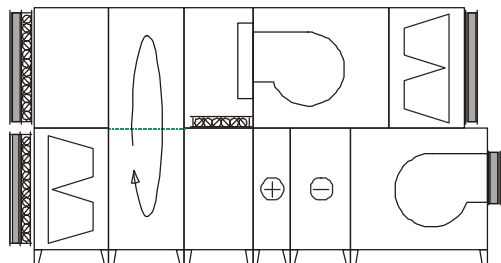
configuration number 15



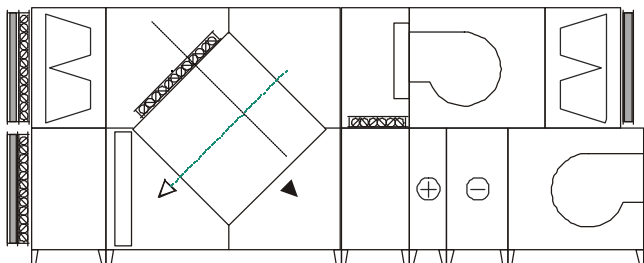
configuration number 19



configuration number 16

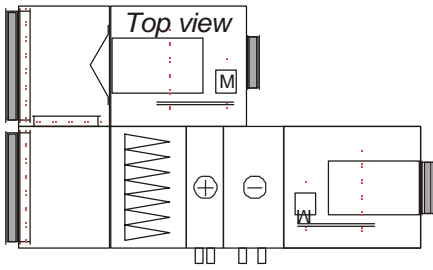


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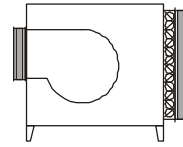


SAMPLE PATTERNS

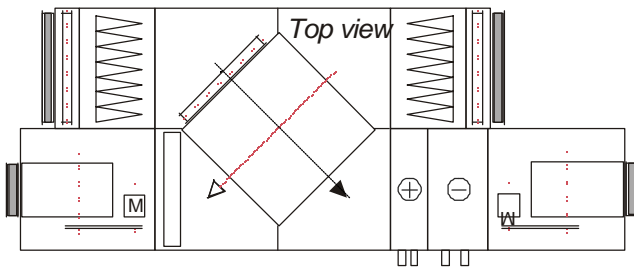
configuration number 21



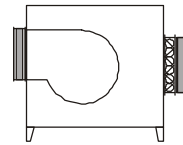
configuration number 24



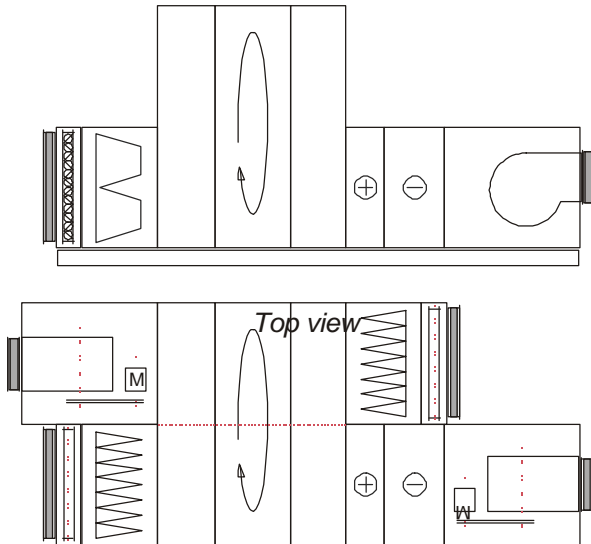
configuration number 22



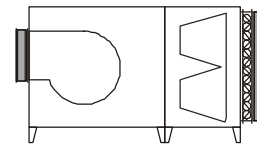
configuration number 25



configuration number 23



configuration number 26



UNITS CHAMBERS WEIGHTS

SIZE KLM / weight (kg)		02	04	06	08	10	12	16	20	25	31	40	63	80	
damper	with 1 damper	32	35	47	60	57	91	79	107	99	145	187	256	285	
	with 2 dampers	38	41	55	71	64	109	93	129	117	165	210	280	322	
	full -area outer	10	11	15	16	19	25	32	35	41	51	58	-	-	
	full-are inner (250mm chamber)	26	29	37	40	39	53	64	74	83	95	131	167	174	
	with outer damper – lateral	31	35	45	58	55	81	81	103	101	145	180	245	269	
	with inner damper – long	33	49	72	79	80	107	110	135	134	220	221	291	341	
filtration	short pocket filter	29	32	54	48	52	57	63	67	89	98	139	167	175	
	long pocket filter	41	42	71	68	73	78	83	93	116	135	182	215	230	
	cartridge filter	22	27	33	37	44	48	53	56	72	86	124	151	157	
	metal filter	23	28	40	40	45	53	56	64	76	90	130	158	163	
	carbon filter (SC 40)	74	96	154	175	209	254	296	368	466	592	737	1026	1042	
heater	water, 1-row	25	30	37	38	41	50	57	65	74	92	166	224	220	
	water, 2-row	27	32	41	44	52	63	75	88	102	129	203	254	274	
	water, 3-row	28	34	45	50	57	65	79	97	125	184	226	288	311	
	water, 4-row	29	35	46	54	61	76	88	105	140	172	252	325	250	
	steam, 1-row	36	46	61	69	78	106	116	154	184	238	323	387	414	
	steam, 2-row	40	54	75	88	103	138	152	205	246	334	425	537	581	
		electric – minimum	42	45	59	86	86	122	126	202	179	-	-	-	-
		electric – maximum	46	50	71	108	102	159	126	234	212	-	-	-	-
		gas without by-pass	125	150	255	290	310	390	560	720	950	1250	1800	2700	3150
		gas (by-pass) low	-	-	-	-	330	360	380	470	500	850	1050	1600	1660
		gas (by-pass) high	-	-	-	-	310	390	580	740	980	1290	1850	2800	3250
		+ gas burner - min.	14	14	14	14	14	14	14	19	19	26	26	37	37
	+ gas burner – max.	14	14	19	19	26	26	26	37	45	45	65	65	90	
cooler	water, 3-row	39	46	62	68	79	91	108	129	171	235	299	399	382	
+eliminator	water, 4-row	41	50	66	75	87	102	122	162	195	235	353	450	437	
	water, 6-row	44	55	75	87	103	136	161	190	246	286	398	545	539	
	water, 8-row	51	66	86	102	122	154	183	210	265	343	450	623	623	
	DX cooler – minimum	37	51	69	69	70	83	95	115	130	152	242	238	260	
	DX cooler – maximum	-	55	84	99	102	162	188	233	197	173	269	270	330	
fan	minimum* (no motor)	64	66	101	108	144	157	200	271	344	426	626	991	1044	
	maximum** (no motor)	66	66	105	106	149	156	237	274	370	420	716	1028	1142	
	+ light motor	8	9	12	12	16	16	22	22	24	24	31	42	49	
	+ heaviest motor	13	24	27	54	54	54	102	102	102	102	280	510	510	
heat recovery	plate, one on another with eliminator	147	162	240	354	379	531	586	773	767	1219	-	-	-	
	plate, one on another without eliminator	134	142	219	339	355	497	563	735	695	1126	-	-	-	
	plate, side by side	233	257	383	607	565	641	789	1099	1029	1610	1934	-	-	
	rotating, one on another	145	190	265	260	375	366	585	570	971	1077	1560	-	-	
	rotating, side by side	145	190	265	260	375	366	585	570	971	1088	1560	-	-	
empty	250 mm	17	20	24	25	26	28	34	37	40	43	76	87	91	
	500 mm	24	26	37	37	38	40	47	50	55	93	96	112	116	
	800 mm	36	36	53	56	58	60	63	72	81	93	129	147	157	

UNITS CHAMBERS WEIGHTS

SIZE KLM / weight (kg)		02	04	06	08	10	12	16	20	25	31	40	63	80
antifreeze protection		22	30	31	34	36	43	46	56	61	62	96	107	113
humidification	steam (no tube)	50	52	69	72	73	90	98	128	140	161	185	-	-
	air-washer without water	230	247	260	286	310	345	395	456	521	594	678	836	884
	air-washer with water	410	424	485	570	600	720	766	1050	1109	1400	1521	1738	1864
	charging Munters	-	62	83	92	99	108	116	136	156	183	236	281	300
attenuating	800 mm	56	59	92	95	103	120	132	161	187	248	295	422	439
	1100 mm	57	77	107	109	118	146	168	204	239	305	361	541	555
	1500 mm	86	93	137	140	151	190	221	276	325	421	464	692	724
	2000 mm	121	129	179	182	197	244	280	332	397	489	555	853	929
rain hood	big	11	17	20	24	29	35	38	57	80	96	116	147	164
	small	4	6	9	9	11	11	14	14	19	19	29	38	42
roof	1 m of configuration length	4	4	4	5	5	6	6	7	7	9	9	9	10
frame	1 m of configuration length	23	24	25	29	29	34	34	41	41	48	54	55	58

* Low pressure fan with small impeller diameter

** Medium pressure fan with big impeller diameter

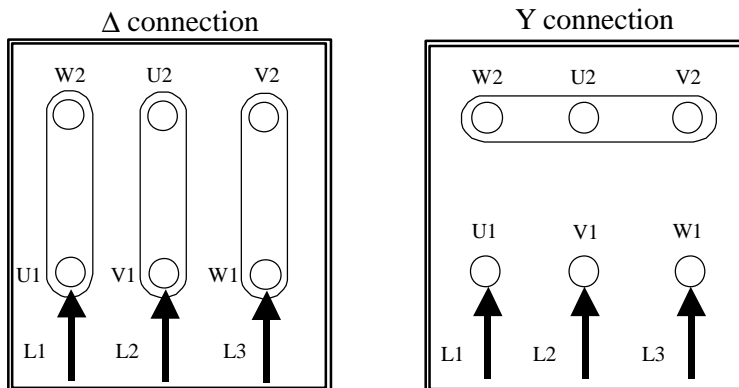
Note:

- short filter chamber including EU4 filters
- panel filter chamber including EU4 filters
- long filter chamber including EU7 filters
- damper chambers attenuating elements including
- fan chambers with flexible connection or diffuser
- gas burners fittings included (gas controlling devices)

ELECTRIC MOTOR CONNECTION

1LA7 SIEMENS three-phase single-speed motors

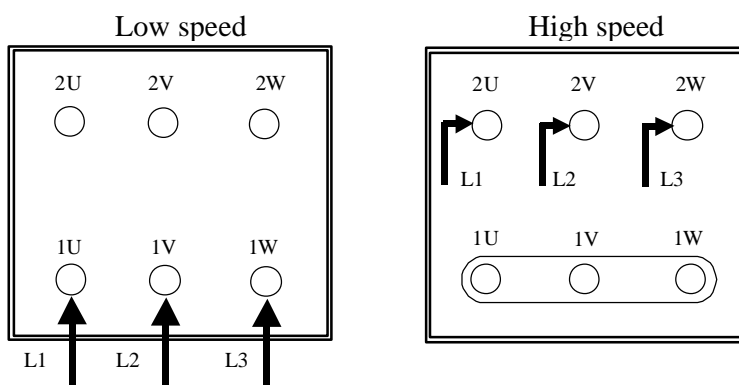
Basic connection of single-speed motors



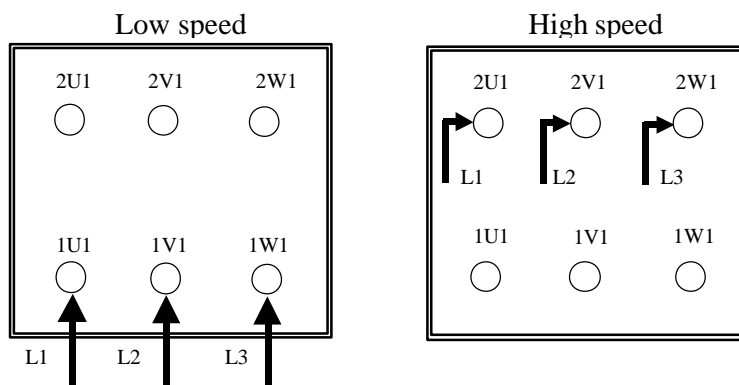
Note: In electric motors with thermal protection, connect thermal protection contacts located on electric motor terminal box

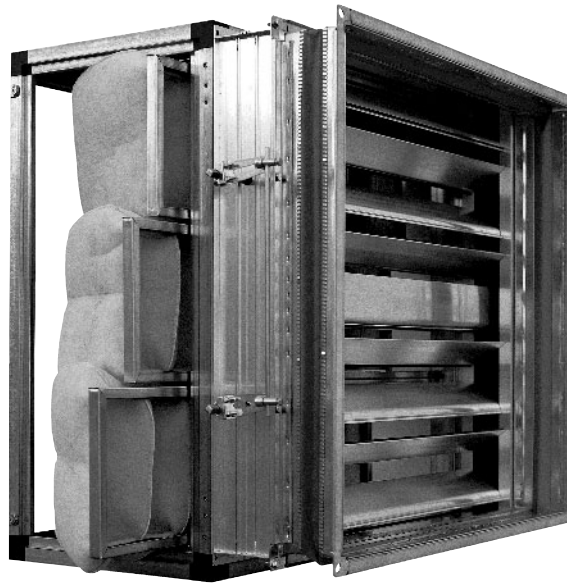
1LA7 SIEMENS three-phase two-speed motors

Dahlander connection 4/2 (21); 8/4 (23)

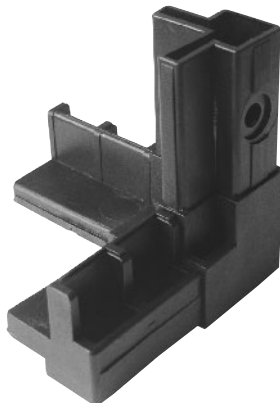


Connection for two separate windings 4/6 (25)





Pocket filters with standard dimensions



Units frame joining corner



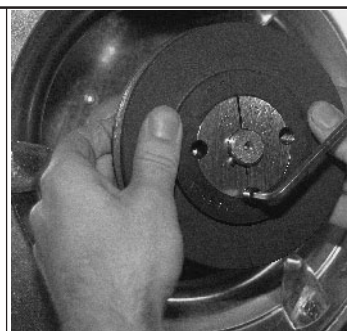
Sandwich panels with polyurethane foam



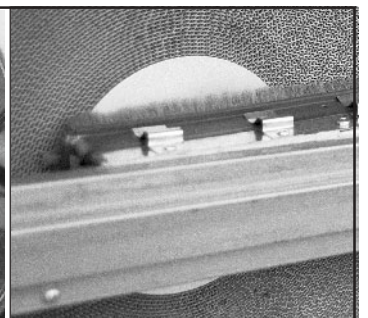
Jets in air washer chamber



Drain pan system in air washer chamber



Easy exchangeable pulleys



Sealing brushes of rotate regenerator



National theatre



River city



Prague Castle



Sazka - Multifunctional Arena - Prague



Ruzyne Airport - Prague

- Cultural centres
- Public Administration buildings
- Administrations buildings
- Banks and Insurance companies
- Shopping centres
- Car Industry
- Cinemas
- Sport centres
- Airport – transport
- Industry
- Television
- Hospitals – health buildings
- Printer offices
- Hotels
- Foundry industry, Power stations



Tescoma - Zlín



Czech Television - Prague

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