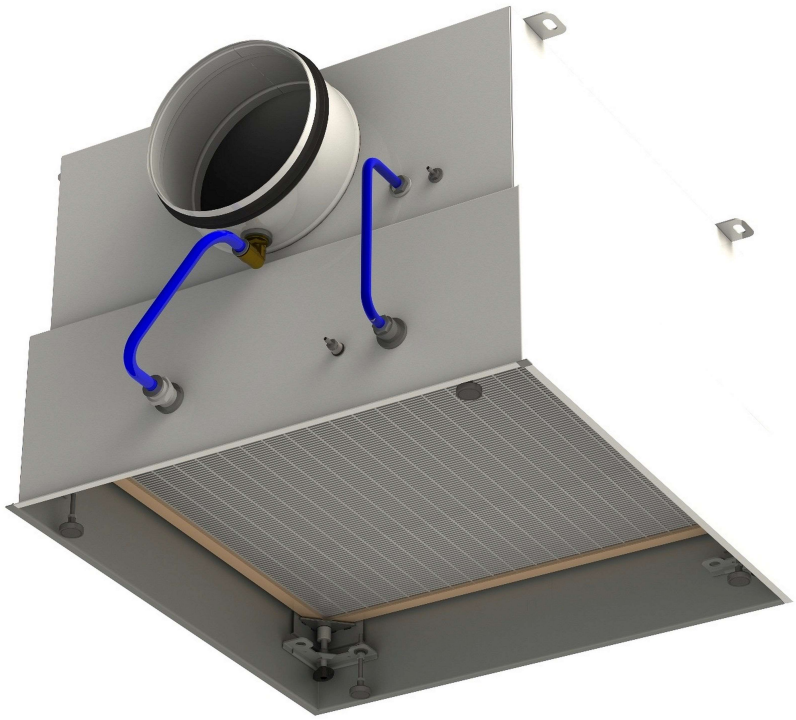
Particle filter box

FKF



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Particle filter box FKF

Contents

Particle filter box FKF

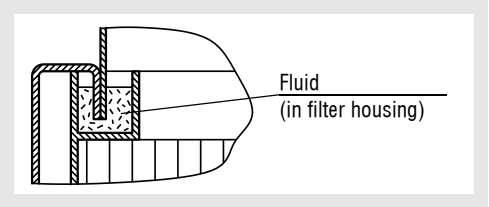
Description

The particle filter box type FKF with fluid seal at the filter cell has been developed especially for use in cleanrooms required by the pharmaceutical, electronic, precision mechanical and optical industries in hospitals and laboratories. The integrated particle filter (to DIN EN 1822) removes particles, radioactive dust, mist, bacteria, viruses, etc., from the supply or return air. This ensures that the incoming and outgoing air flows are extremely clean and germ-free.
The fluid is located at the filter cell and pressed into a sealing device especially developed for this purpose in the filter box when the filter cell is installed. Owing to the properties of the fluid, the filter cell can be mounted and dismounted several times without having to change the fluid.
The filter box type FKF-... consists of electrolytically galvanised sheet steel painted to RAL 9010 (white) with a round connection spigot for hose connection while the type FKF-Q-... has a rectangular pipe with connection flange. A filter pressure device in the filter box ensures a safe seal. As a standard feature, a differential pressure and aerosol monitoring device is integrated into the particle filter box.
Optionally, the particle filter boxes FKF-H-... are additionally equipped with a shut-off damper sealing air-tight. This shut-off damper can be adjusted manually from below after the air diffuser is removed. The type FKF is actuated by an electric actuator OPEN/CLOSED 24 V or by a spring return actuator.
Leakage at closed shut-off damper according to DIN EN 1751, class 4, at a duct pressure of up to 1000 Pa.

Attention!
We would like to point out that we supply the filter boxes with integrated spacers for fitting the filter clamps and the diffuser assembly pole brace. This makes it possible to fit the air diffuser without additional expense, even when the filter has not yet been inserted into the filter box.

The assembly of the air diffusers is effected via magnetic fastening. This allows the air diffusers to be easily taken off for filter replacement and decontamination without requiring tools. The following ceiling air diffusers in supply and return air models are suitable to be fitted to the particle filter box type FKF: FDQJ, FPIL. Magnetic fastening is generally not possible for FPIL and for air diffusers made of aluminium and stainless steel. These air diffusers are mounted via central fastening (-VM).
If required, the suitable particle filters can be included in the delivery.

Sealing on the particle filter



The filter boxes in stainless steel design 1.4301 are delivered together with the air diffuser FDQJ made of stainless steel. FPIL is not available in connection with particle filter boxes made of stainless steel.

Particle filter box FKF

Construction

Filter box

- electrolytically galvanised sheet steel (-SB)
  - painted inside and outside, RAL colour 9010 (white) (- 9010)
  - painted inside and outside, colour can be freely selected (- xxxx)
- Stainless steel V2A (-V2-0000, at an extra charge)

Shut-off damper

- Galvanised sheet steel (only available for -SB)
- Stainless steel V2A, 1.4301 (only available for -V2)

Differential pressure device/aerosol monitoring device (-D1)

- with measuring spigot inside the box, for hose connection with an outer diameter of 10 mm

Model

FKF-H-...-M000-... - with horizontal, round connection spigot, without shut-off damper

FKF-H-...-M001-... - with horizontal, round connection spigot and manually adjustable shut-off damper. Leakage at closed damper blade according to DIN EN 1751, class 4, at a duct pressure of up to 1000 Pa.

FKF-H-...-Exxx-... - with horizontal, round connection spigot and electrically (OPEN/CLOSED actuator) adjustable shut-off damper with/without spring return. Leakage at closed damper blade according to DIN EN 1751, class 4, at a duct pressure of up to 1000 Pa.

FKF-V-...-M000-... - with vertical, round connection spigot, without shut-off damper

FKF-V-...-M001-... - with vertical, round connection spigot and manually adjustable shut-off damper. Leakage at closed damper blade according to DIN EN 1751, class 4, at a duct pressure of up to 1000 Pa.

FKF-Q-... - with horizontal, rectangular spigot, with connection flange

FKF-...-Z-... - supply air

FKF-...-A-... - return air

Filter boxes for air diffusers:
(must be ordered separately)

FKF-...-41-... - for ceiling swirl diffuser FDQJ-...

FKF-...-42-... - for ceiling impulse diffuser FPIL-...

For description of diffusers, see pages 13+14.

Accessories

Differential pressure device / aerosol monitoring device

- With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm (-D2).
- With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm and aerosol feeding device in the spigot of the box inside (-D3).
- With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with aerosol feeding device in the spigot of the box inside (-D4).
- With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with aerosol feeding device in the spigot on the outside (-D5).
- With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm and aerosol connection from the box inside to the on-site connection (-D6).

Differential pressure transducer (-U1)

- only available in connection with differential pressure / aerosol monitoring devices (-D2, -D3 and -D6).
- supplied loose or optionally mounted to box outside

Rubber lip seal (-GD1)

- Special rubber (not for FKF-Q)

Particle filter (FIL-...)

- Filter frame H=102 mm
  - UXA (-3), made of aluminium.
    With double-sided handle protection (-G1).
- Fluid seal on filter housing.
- Filter classes HEPA H13 (-H13, $\geq$99.95%) or HEPA H14 (-H14, $\geq$99.995%).
- Filter checked by means of oil thread test (-O, standard) or scan test (-S, at an extra charge) according to DIN EN 1822.
- Temperature-resistant up to 80°C. Filter wrapped in film

Antibacterial coating

- without coating (-AB0, standard)
- with coating (-AB1, at an extra charge)

Fastening

Magnetic fastening (-MB)

- only available for NW 400-650
- only available as sheet steel model (-SB)
- only available for ceiling diffuser FDQJ-...-SB (standard).
- not available for ceiling diffuser FPIL.

Concealed mounting (-VM)

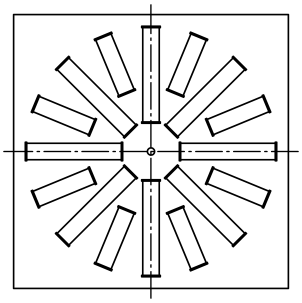
- pole brace fastening
- Standard for ceiling diffuser FDQJ-...-AL/-V2, FDQJ-...-SB at an extra charge.
- Standard for ceiling diffuser FPIL.

Particle filter box FKF

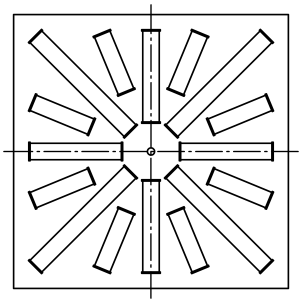
Ceiling diffuser selection

Ceiling swirl diffuser FDQJ

FDQJ-Q-SR

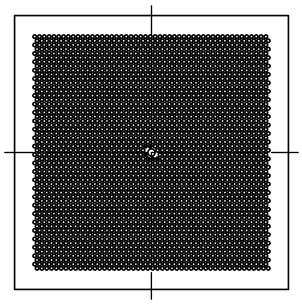


FDQJ-Q-SQ

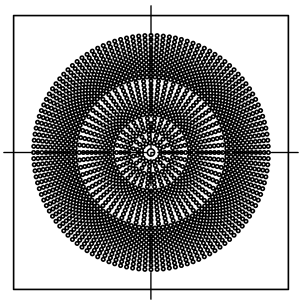


Ceiling impulse diffuser FPIL

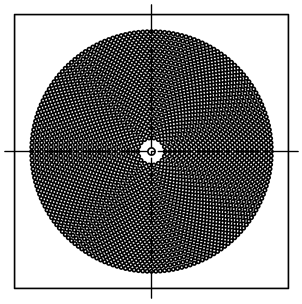
FPIL-QV



FPIL-QS



FPIL-QK

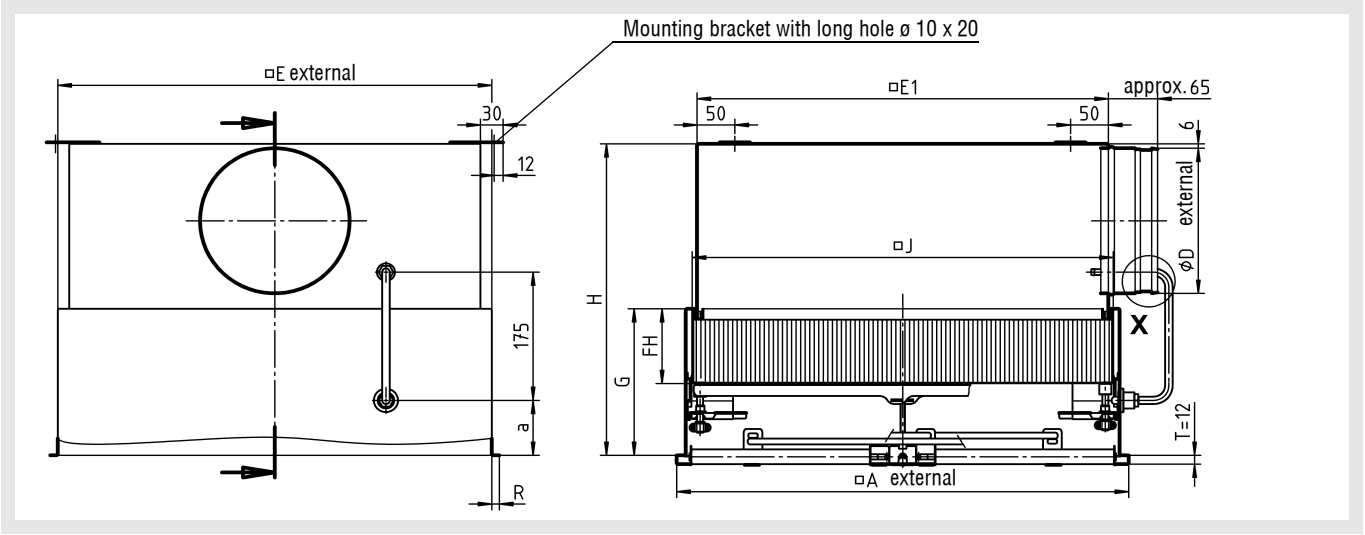


Particle filter box FKF

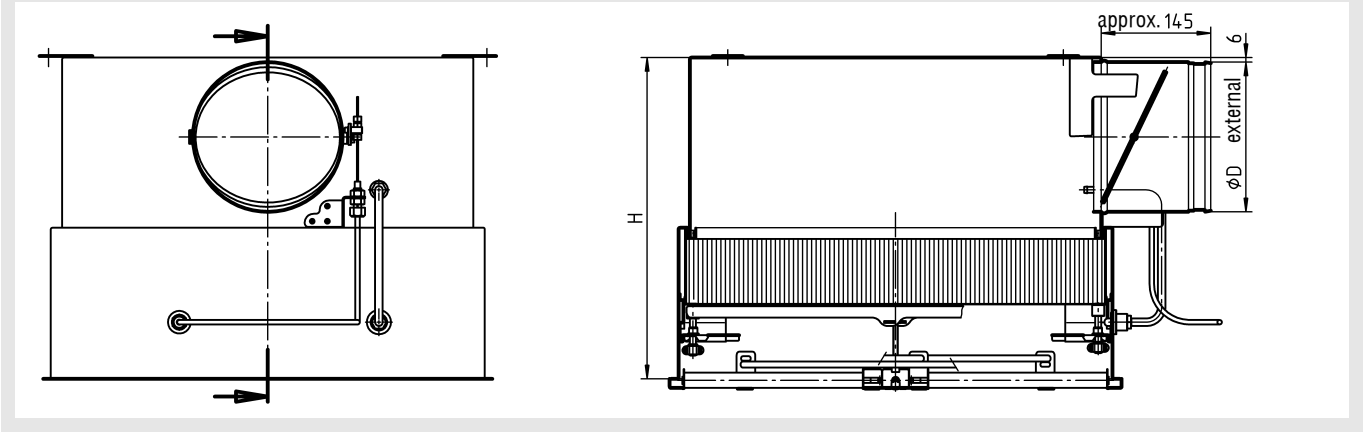
Models and dimensions

Dimensions

FKF-H-...-M000-D1-...



FKF-H-...-M001-D1-...



Available sizes

NW	Filter dimensions		□ A	øD	□ E	□ E1	R	FDQJ-Z / FDQJ-A (Supply air / return air)			FPIL-A (return air)			FPIL-Z (supply air)		
	□ J	FH						H	G	a	H	G	a	H	G	a
400	357	102	398	148	374	344	10	375	200	75	375	200	75	415	240	115
500	457	102	498	158	474	444	10	385	200	75	385	200	75	425	240	115
600	557	102	598	198	574	544	10	425	200	75	425	200	75	465	240	115
625	575	102	623	198	592	562	12	425	200	75	425	200	75	465	240	115
650	610	102	648	248	627	597	10	475	200	75	475	200	75	515	240	115
800	762	102	798	248	779	749	9	475	200	75	-	-	-	-	-	-

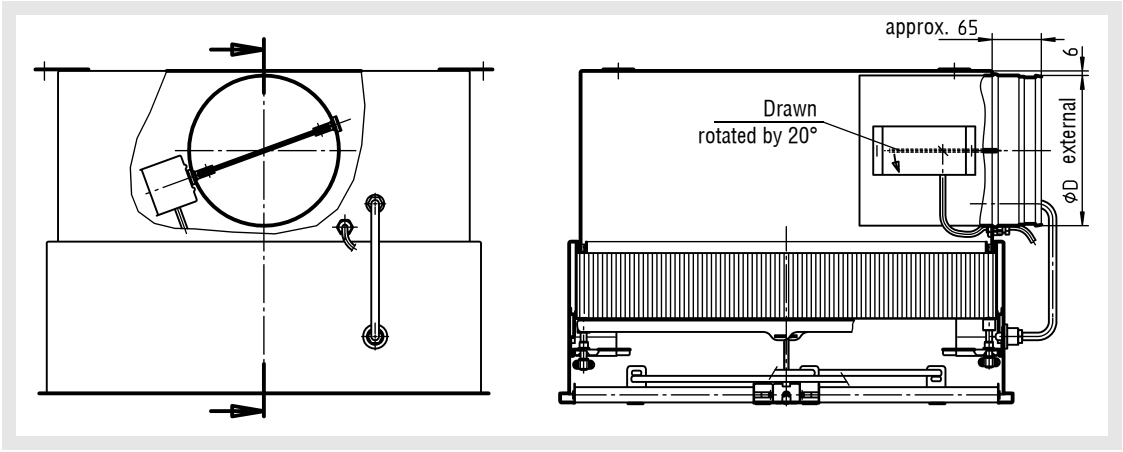
Air diffusers for NW 650 consist of a 650x650 mm faceplate having a drill pattern of size 600.

For seal leakage monitoring system/differential pressure device/aerosol monitoring device, see page 10.

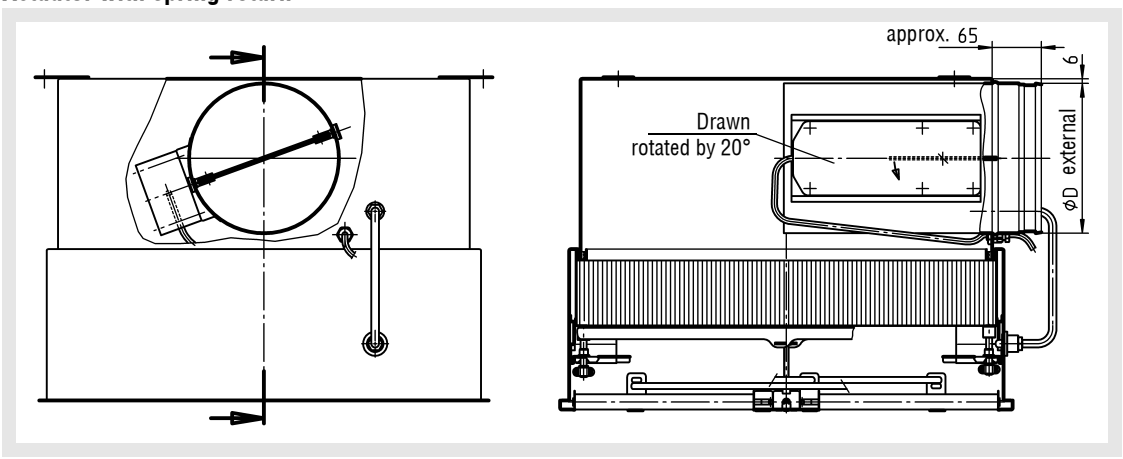
Particle filter box FKF

FKF-H-…-Exxx-D1-…

Actuator without spring return



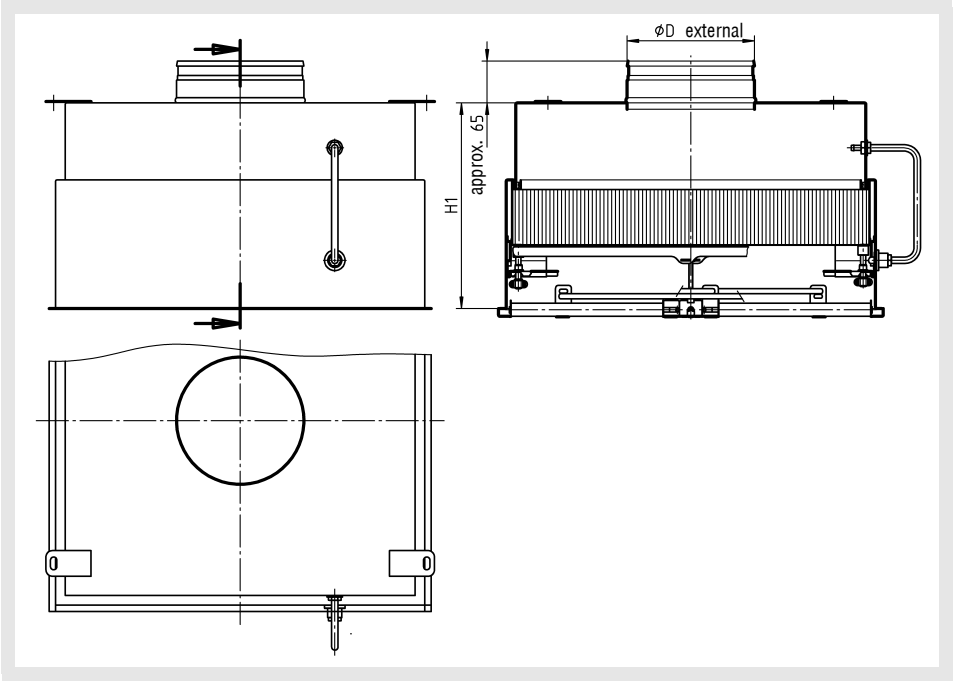
Actuator with spring return



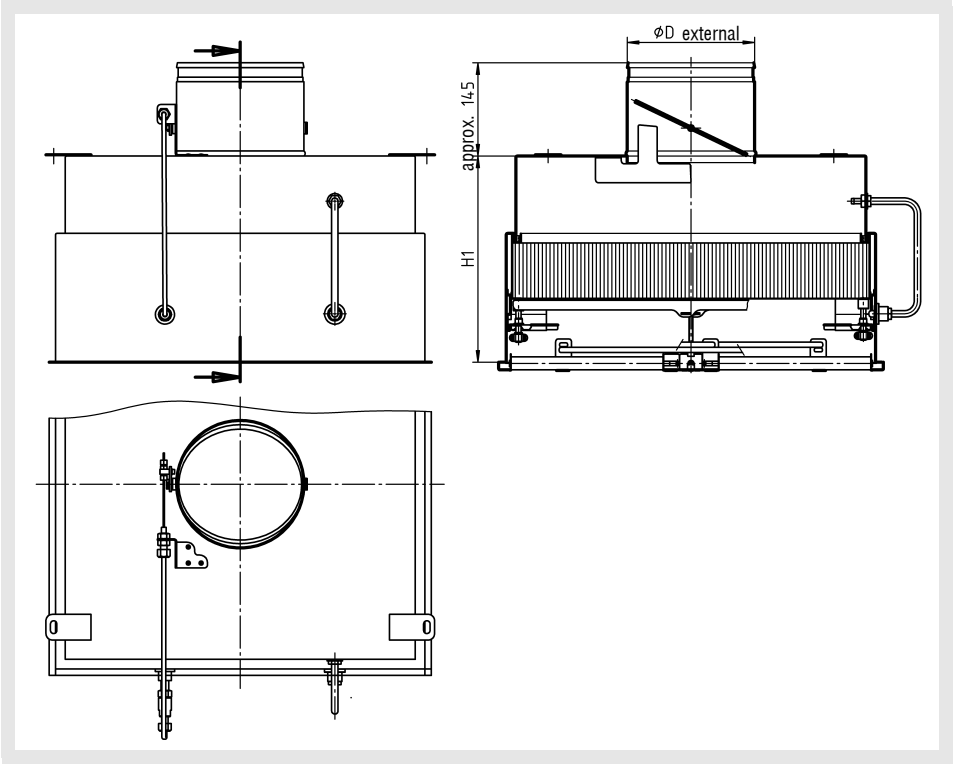
Attention!
With the FKF-V model, the actuator cannot be mounted to the shut-off damper!

Particle filter box FKF

FKF-V-...-M000-D1-...



FKF-V-...-M001-D1-...

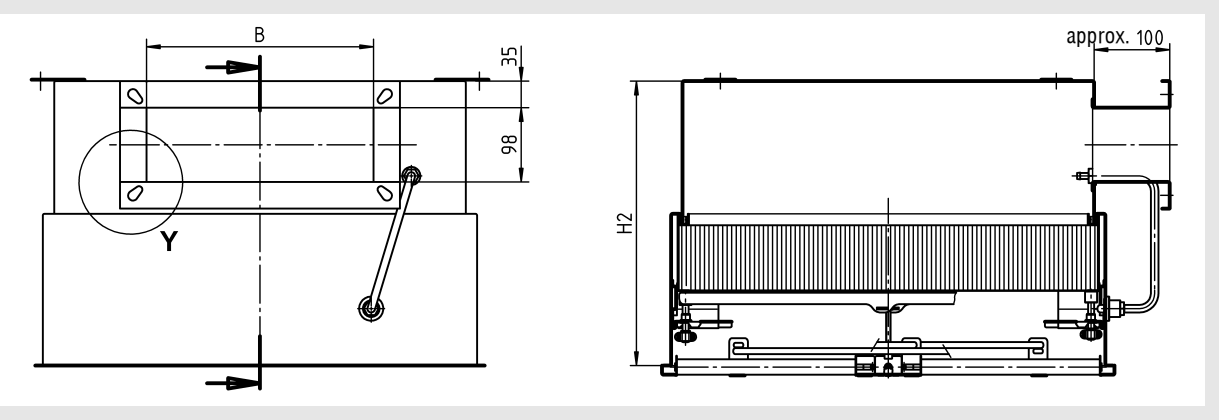


Available sizes

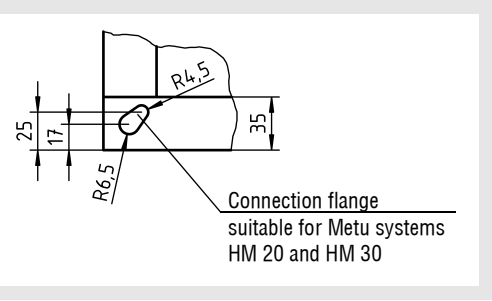
NW	H1		
	FDQJ-Z / FDQJ-A (Supply air / return air)	**FPIL-A** (return air)	**FPIL-Z** (supply air)
400-650	320	320	360
800	320	-	-

Particle filter box FKF

FKF-Q-...-D1-...



Detail Y



Available sizes

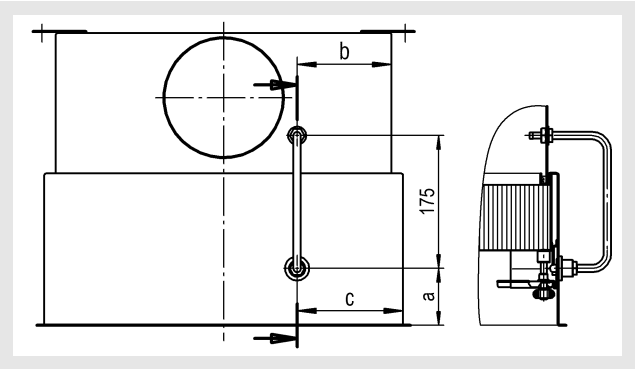
NW	B	H2		
		FDQJ-Z / FDQJ-A (Supply air / return air)	**FPIL-A** (return air)	**FPIL-Z** (supply air)
400	200	375	375	415
500	250			
600	300			
625	300			
650	300			
800	500		-	-

Particle filter box FKF

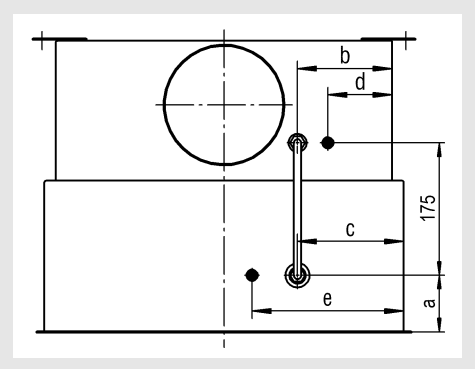
Differential pressure device / aerosol monitoring device

applies to models -H and -V

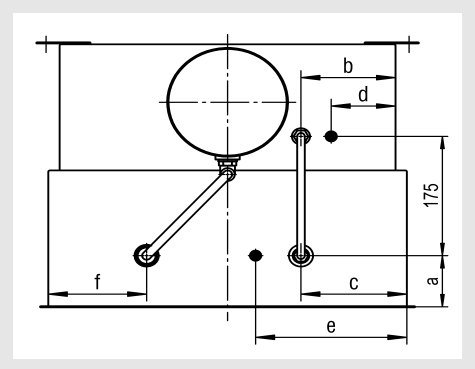
FKF-...-D1 (standard)
With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm.



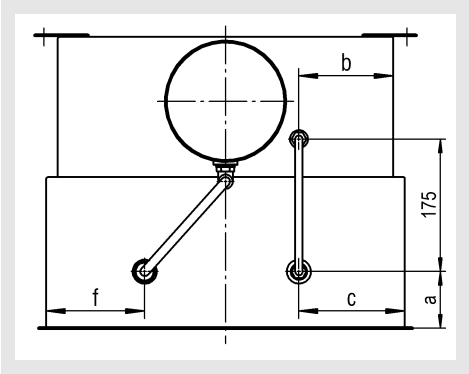
FKF-...-D2 (at an extra charge)
With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm.



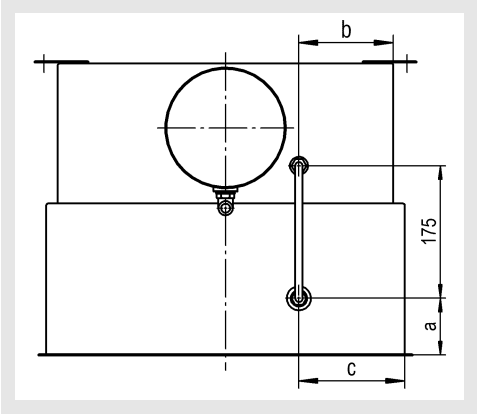
FKF-...-D3 (at an extra charge)
With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm and aerosol feeding device in the spigot of the box inside.



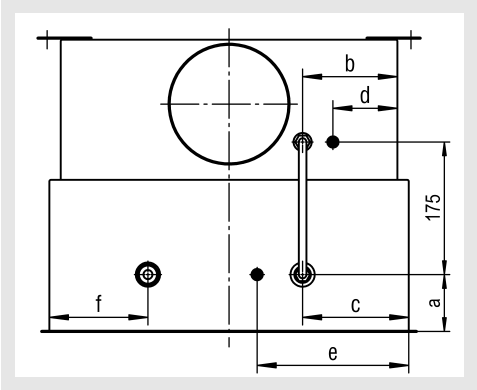
FKF-...-D4 (at an extra charge)
With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with aerosol feeding device in the spigot of the box inside.



FKF-...-D5 (at an extra charge)
With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with aerosol feeding device in the spigot on the outside.



FKF-...-D6 (at an extra charge)
With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm and aerosol connection from the box inside to the on-site connection.



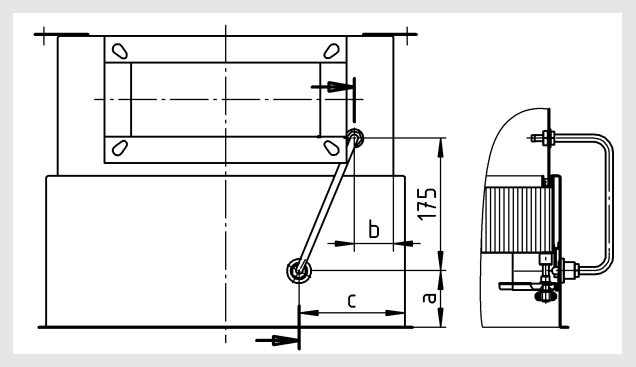
The table of available sizes can be found on page 12.

Particle filter box FKF

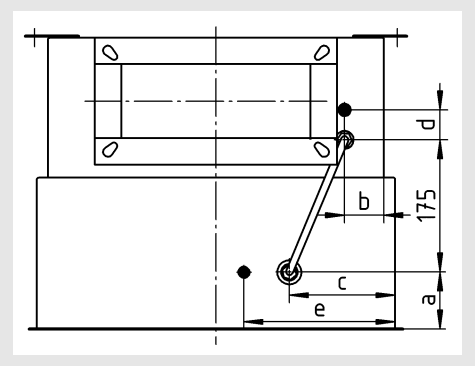
Differential pressure device / aerosol monitoring device

applies to model -Q

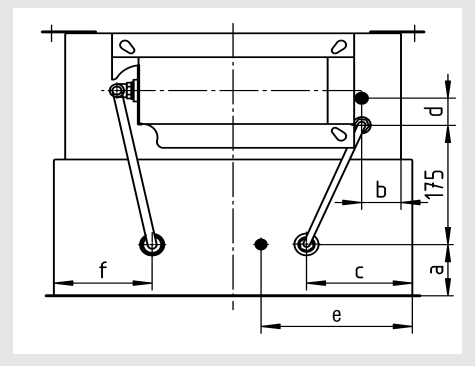
FKF-...-D1 (standard)
With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm.



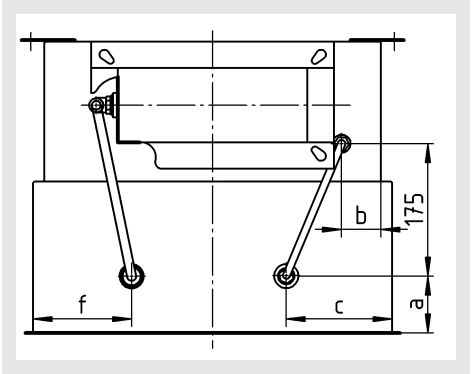
FKF-...-D2 (at an extra charge)
With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm.



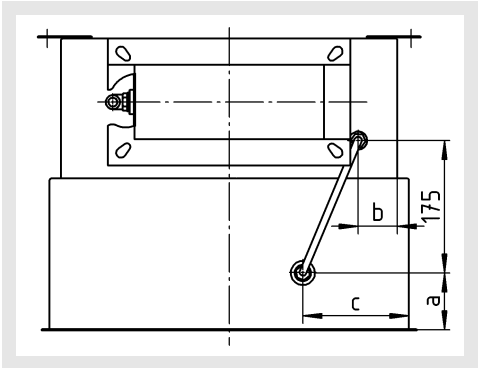
FKF-...-D3 (at an extra charge)
With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm and aerosol feeding device in the spigot of the box inside.



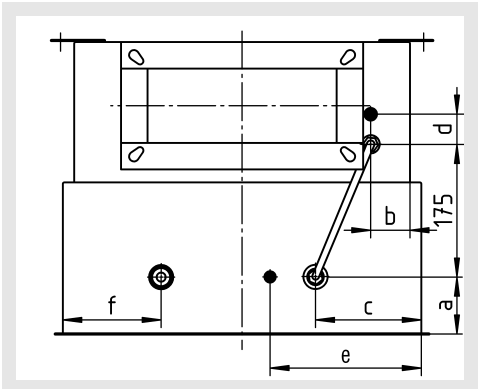
FKF-...-D4 (at an extra charge)
With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with aerosol feeding device in the spigot of the box inside.



FKF-...-D5 (at an extra charge)
With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with aerosol feeding device in the spigot on the outside.



FKF-...-D6 (at an extra charge)
With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm and aerosol connection from the box inside to the on-site connection.



Particle filter box FKF

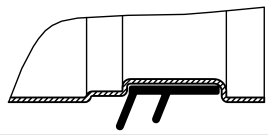
Available sizes of the differential pressure devices / aerosol monitoring devices

NW	a		
	FDQJ-Z / FDQJ-A (Supply air / return air)	**FPIL-A** (return air)	**FPIL-Z** (supply air)
400-650	75	75	115
800	75	-	-

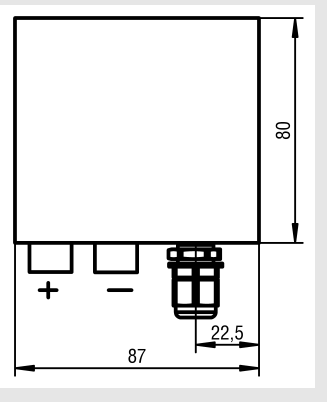
NW	b	c	d	e	f
400	32	90	40	150	80
500	52	140		200	130
600	72				180
625	71				189
650	69				206
800	55	144		204	282

Accessories - dimensions
(at an extra charge)

Rubber lip seal (-GD1)
Detail X
Not for model FKF-Q-...!



Differential pressure transducer (-U1)
Only available in connection with differential pressure / aerosol monitoring devices (-D2, -D3 and -D6). Supplied loose or optionally mounted to box outside.



- Output: 0 - 20 mA
- 24 V AC/DC
- 1 relays

Particle filter box FKF

Ceiling diffusers

The diffusers FDQJ and FPIL are models especially designed for filter boxes. Theses diffusers can only be used with the corresponding filter boxes. Their ventilation characteristics are identical to those of the standard air diffusers DQJ-.... and PIL-....

Ceiling swirl diffuser FDQJ (-41)

Construction

Faceplate
- Sheet steel (-SB)
  - painted to the RAL colour 9010 (white) (-9010)
  - painted to a different RAL colour (-xxxx)
- Stainless steel V2A (1.4301, -V2-0000)
  (only possible with concealed mounting)
- Natural colour anodised aluminium (-AL-ELOX)
  (only possible with concealed mounting)

Blades
- made of plastic
  - similar to RAL colour 9005 (black) (-L9005)
  - similar to RAL colour 9006 (grey) (-L9006)
  - similar to RAL colour 9010 (white) (-L9010)
- Painted aluminium, RAL colour can be freely selected (-Axxxx)
  (subsequent adjustment of blades not possible)

Blade fixing
- Painted sheet steel (with -SB/-AL model)
- Stainless steel V2A, 1.4301 (with -V2 model)

Blade holder
- Aluminium ducts / plastic for -V2

Pole brace fastening (only with concealed mounting)
- Plastic / stainless steel for -V2

Pole brace holder (only with concealed mounting)
- Galvanised sheet steel / stainless steel for -V2

concealed mounting pole brace (only with concealed mounting)
- Aluminium / stainless steel for -V2

Antibacterial coating
- without coating (-AB0, standard)
- with coating (-AB1)

Model

FDQJ-Q-...	-	Square faceplate
...-SR-...	-	with circular blade pattern
...-SQ-...	-	with square blade pattern
...-Z-...-PS-...	-	for supply air, with continuous blades
...-A-...-P0-...	-	for return air, without blades
Nominal size	-	NW 400 to 800
Drill pattern:		
...-000	-	not reduced (standard)
...-310 to 600	-	reduced drill pattern

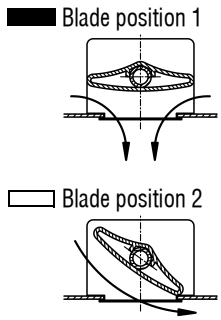
Fastening

Magnetic fastening (-MB), with safety cable
- Standard for sheet steel model (-SB), available for NW 400-650. Not possible for aluminium (-AL) and stainless steel (-V2) models.
- only possible for installation below the ceiling

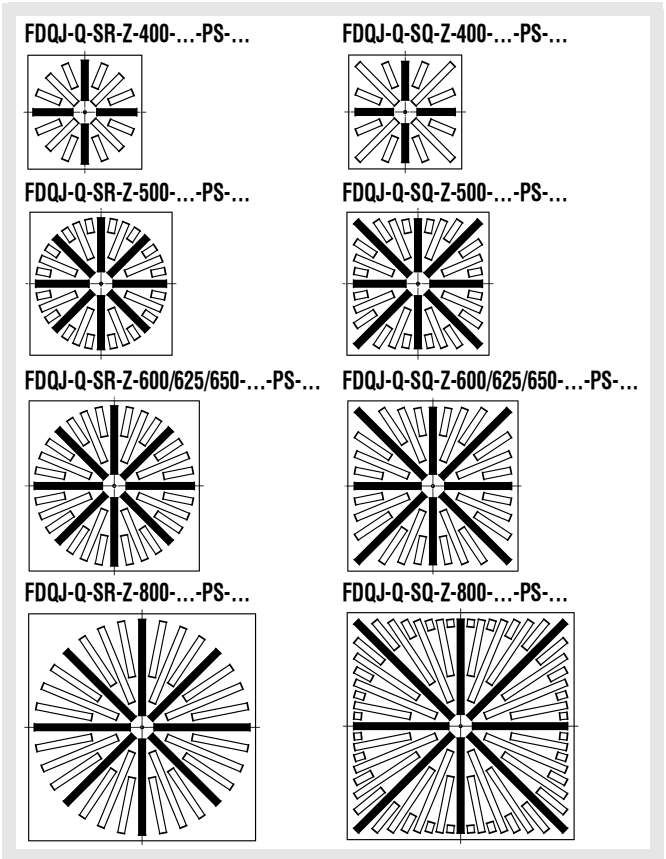
Concealed mounting (-VM)
- Pole brace fastening, by means of a M6 cylinder screw (according to DIN EN ISO 4762) at the particle filter box
- Standard for aluminium (-AL) and stainless steel (-V2) model, available in NW 400-650, for sheet steel (-SB) model available in NW 400-800.

Air throw pattern

"A" :all blades in blade position 2.
"B" :blades in blade positions 1+2, preset by manufacturer.
"C" :without blades (standard for return air)
"V" :all blades in blade position 1 (heating mode only)



Air throw pattern "B":



Particle filter box FKF

Ceiling impulse diffuser FPIL (-42)

Construction

Faceplate

- perforated sheet steel (-SB)
  - painted to the RAL colour 9010 (white) (-9010)
  - painted to a different RAL colour (-xxxx)
- natural colour anodised perforated aluminium (-AL-ELOX)
  - only available for PIL-...-QV-... model

baffle plate

- Sheet steel painted to RAL 9005 (black), only for supply air model

Funnel

- Sheet steel painted to RAL 9005 (black), only for supply air model

- Antibacterial coating
  - without coating (-AB0, standard)
  - with coating (-AB1)

Model

FPIL-N-...	-	for standard air volumes, supply air and return air
FPIL-G-...	-	for large air volumes, only for supply air
...-QV-...	-	square faceplate, drill pattern V (offset perforations) (standard)
...-QS-...	-	square faceplate, drill pattern S (star-shaped perforations, not available for aluminium model)
...-QK-...		square faceplate, drill pattern K (circular perforations, not available for aluminium model)
...-Z-...	-	for supply air:
...-A-...	-	for return air (not available for FPIL-G)
Nominal size	-	NW 400 to 650
Drill pattern:		
...-000	-	not reduced (standard)
...-310 to 500	-	reduced drill pattern

Fastening

Concealed mounting (-VM)

- Pole brace fastening, by means of a M6 cylinder screw (according to DIN EN ISO 4762) at the particle filter box

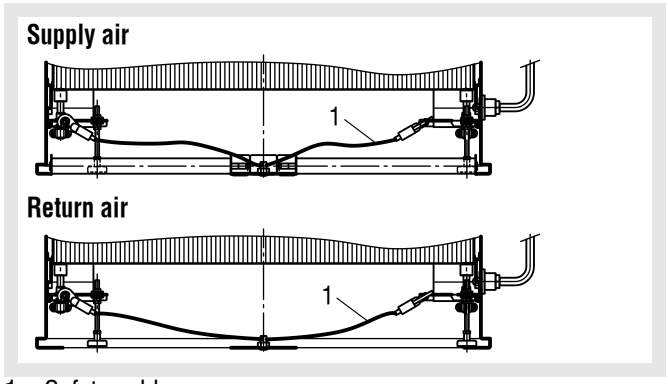
Particle filter box FKF

Fastening methods

Magnetic fastening (-MB)

With safety cable, only available for NW 400-650, only available for FDQJ-...-SB, only possible for installation below the ceiling.

Ceiling swirl diffuser FDQJ-...-MB
(NW 400 to 650)



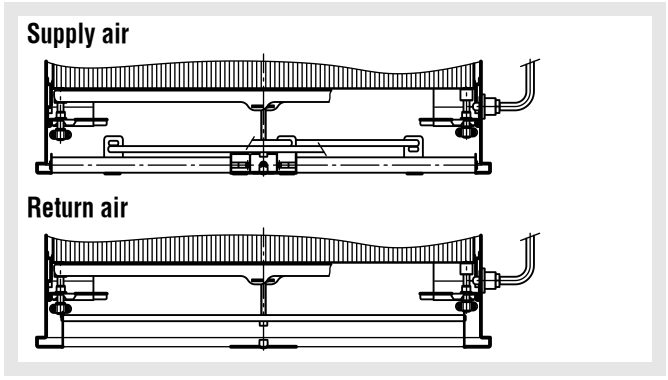
1 = Safety cable

Concealed mounting (-VM)

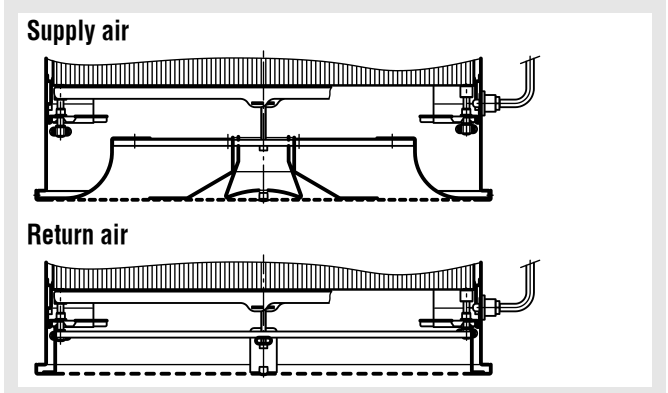
In concealed mounting, the diffuser is fixed to the particle filter box by means of a pole brace and an M6 cylinder head screw (according to DIN EN ISO 4762).

Attention: The max. torque of the fastening screw is 0.4 Nm

Ceiling swirl diffuser FDQJ-...-VM
(NW 400 to 800)



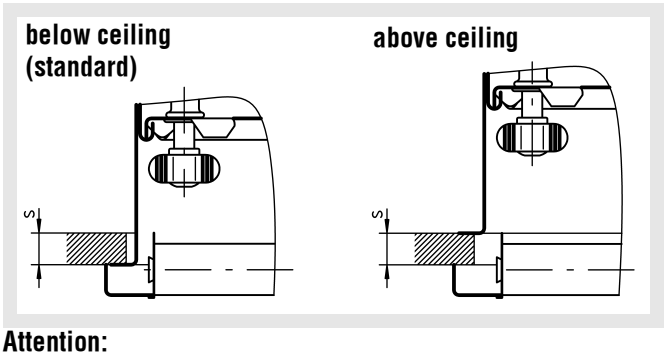
Ceiling impulse diffuser FPIL-...-VM
(NW 400 to 650)



Installation and maintenance

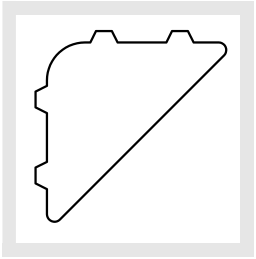
Attention:
Please note that the O-rings (seals) of the bulkhead stuffing box may dry out over the months. Once the O-rings have dried out, the hoses can only be inserted, applying higher force. A common method of reoiling these bulkhead stuffing boxes is to impregnate a cloth with a universal oil, for example from Ballistol, and wipe it across the hose, before inserting it. This small amount is sufficient to make the bulkhead stuffing boxes running smoothly again.

Installation situation

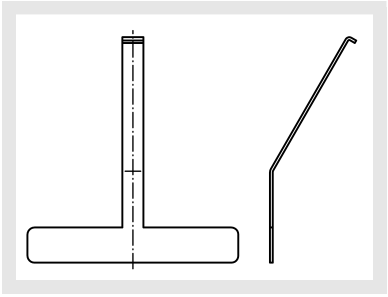


Attention:
In case of installation above the ceiling, you have to specify the thickness of the ceiling "s".

Shipping brace



Mounting lever
For filter replacement.



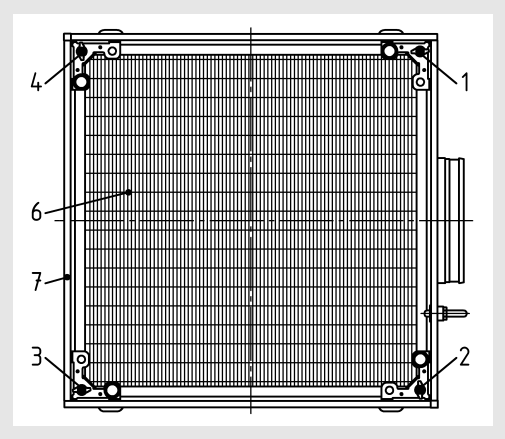
Attention! Before the particle filter unit can be inserted, the shipping brace clamped by means of the filter clamps must be removed!

Particle filter box FKF

Installation (filter installation Instructions)

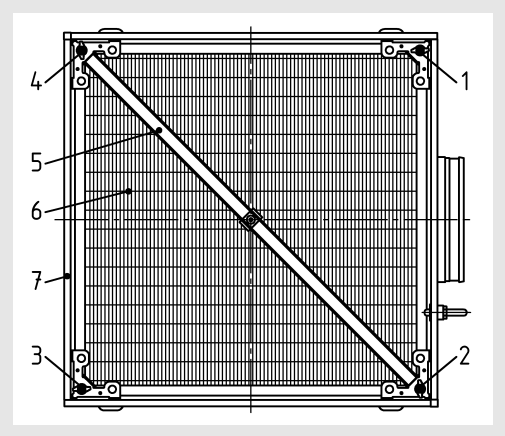
Diffusers with magnetic fastening (-MB)

NW 400-650 (NW 800 not available)



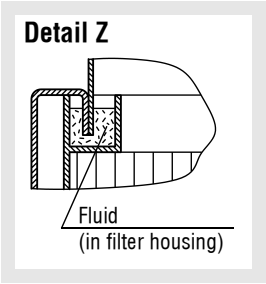
Diffusers with pole brace fastening (-VM)

NW 400-800



With built-in spacers for fixing the filter clamps.

Installation description



Loosen filter clamp (pos. 4) and remove it along with shipping brace. Press the particle filter unit (pos. 6) with the fluid seal (see detail Z) pointing upwards into the filter housing (pos. 7). Take care that the filter material is not irreparably damaged.
The filter unit can be easily locked using two diagonal filter clamps (pos. 1 and 3). Next, the VM pole brace (pos. 5) is inserted and fastened using the other two filter clamps (pos. 2 and 4) Care must be taken that the filter clamps are at first tightened only slightly cross-wise (e.g. in the sequence filter clamps 1, 3, 2, 4). After tightening the filter clamps slightly, they can be tightened properly, again cross-wise and evenly until the filter unit has a tight fit. Care must be taken that the filter clamps are tightened to 2 Nm maximum. A buffer prevents the immersing sword from severing the fluid.

Dismounting

In case of concealed mounting (-VM), unscrew the air diffuser (in case of magnetic fastening (-MB), insert your hands into the air diffusor slots and remove the unit). Loosen the filter clamps and take off the VM pole brace. The particle filter cell can easily be taken off downwards with an assembly lever. The assembly lever is led sideways from the filter upwards and then hooked on the filter top edge. Gently pulling on the assembly lever removes the filter from the box.

Attention!

The particle filter cell may fall out of the filter housing when the filter clamps are removed!

Maintenance

In addition to keeping machines and equipment clean, the maintenance of the filters is especially important. A constant control of the filters is as essential as changing them when the maximum allowed particle absorption has been reached. The inspection must take place at short enough intervals to allow faults that have occurred or become apparent to be eliminated in time. The necessary intervals are set depending on the local conditions. The measured variable for the particle intake of the filter is the pressure difference. Because of this a differential pressure measure device is attached at every filter step to monitor the operating condition.
The filter is changed upon reaching the final resistance, which is set in advance when designing the ventilator capacity of the ventilation system. The final resistance is normally twice the starting resistance.

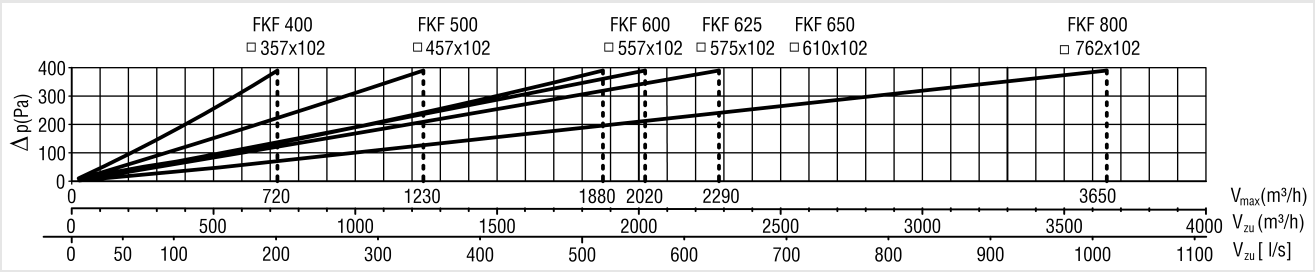
Particle filter box FKF

Technical data

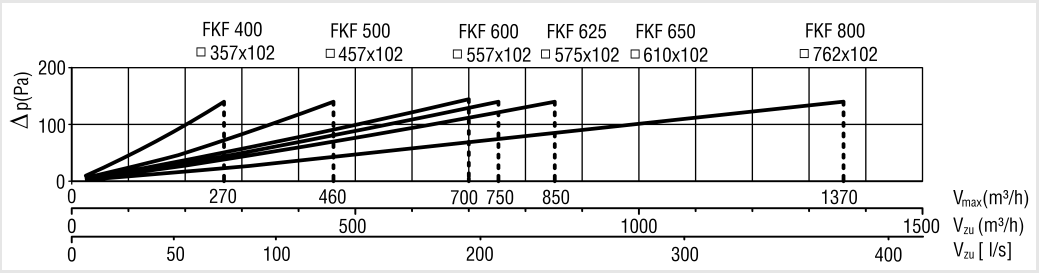
Pressure loss UXA filter

NW	Width x Height x Depth [mm]	V_{nenn} / pressure difference [m³/h / Pa]	
		FIL-FKF…-H13-…	FIL-FKF…-H14-…
400	357 x 357 x 102	190 / 85	190 / 85
500	457 x 457 x 102	325 / 85	325 / 85
600	557 x 557 x 102	500 / 85	500 / 85
625	575 x 575 x 102	530 / 85	530 / 85
650	610 x 610 x 102	600 / 85	600 / 85
800	762 x 762 x 102	960 / 85	960 / 85

FIL-FKF-…-H13-…



FIL-FKF-…-H14-…



An H13 filter unit cannot be used as H14 filter!
If the particle filters are designed according to filter class H14, make sure that the air volume at the faceplates is checked. Thus, it may happen that the air volume is too low for the selected faceplate, resulting in an uncontrolled jet drop. In this case, we recommend using a faceplate with a smaller perforation, for example a 600 faceplate with a 500 perforation.

Filter class according to DIN EN 1822

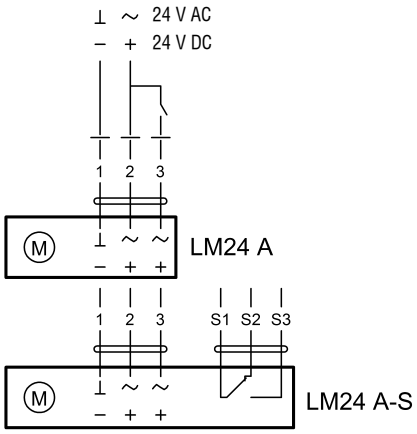
- Allowed final pressure: max. 500 Pa
- Filtration efficiency in MPPS: H13 = $\geq$ 99,95 %
  H14 = $\geq$ 99,995 %

Particle filter box FKF

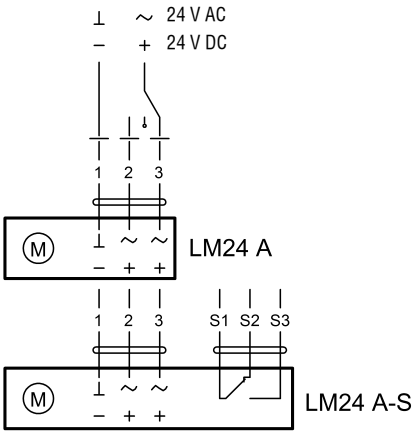
Circuit diagram

Connection diagram LM24A (-E001)/LM24A-S (-E030)

OPEN/CLOSED control



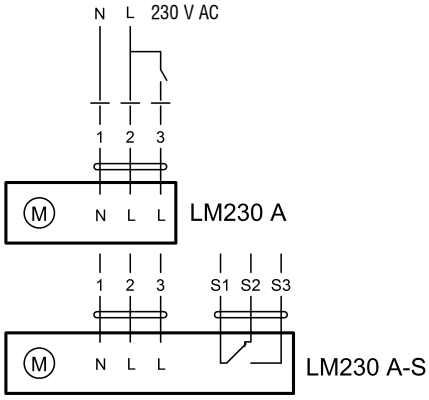
3-point control



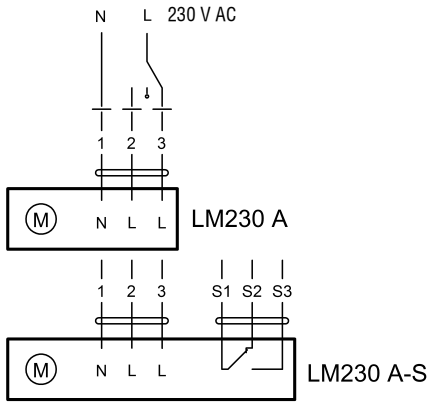
Attention!
- Connection via safety transformer.
- Parallel connection of further drives is possible. Observe specifications.

Connection diagram LM230A (-E002) / LM230A-S (-E031)

OPEN/CLOSED control

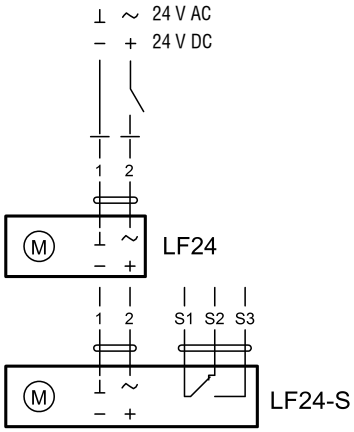


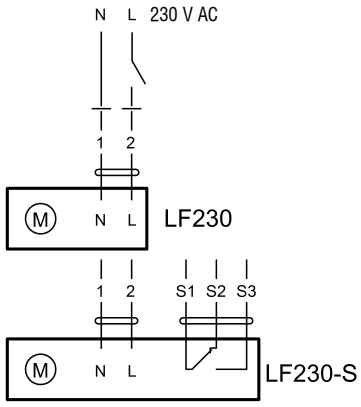
3-point control



Attention!
- Mains voltage connected!
- Parallel connection of further drives is possible. Observe specifications.

Connection diagram LF24 (-E021)/LF24-S (-E037) / LF230 (-E020) / LF230-S (-E036)





Attention!
- Connection via safety transformer.
- Parallel connection of further drives is possible. Observe specifications.

Particle filter box FKF

Technical data of actuators

LM24A (-E001) / LM24A-S (-E030) (make Belimo)

Rated voltage:	AC/DC 24 V, 50/60 Hz
Functional range:	AC19.2...28.8 V / DC19.2...28.8 V
Power consumption:	- Operation: 1 W - Idle position: 0.2 W
Dimensioning:	1.5 VA
Torque:	min. 5 Nm
Running time:	150 s
Sound power level:	35 dB (A)
Protection class:	III Safety extra low voltage / II protective insulation
Degree of protection:	IP54 in all mounting positions
EMC:	CE according to 2004/108/EC

LM230A (-E002) / LM230A-S (-E031) (make Belimo)

Rated voltage:	AC 230 V, 50/60 Hz
Functional range:	AC 85...264 V
Power consumption:	- Operation: 1.5 W - Idle position: 0.5 W
Dimensioning:	3.5 VA
Torque:	min. 5 Nm
Running time:	150 s
Sound power level:	35 dB (A)
Protection class:	II protective insulation
Degree of protection:	IP54 in all mounting positions
EMC:	CE according to 2004/108/EC
Low voltage directive:	CE according to 2006/95/EC

LF24 (-E021) / LF24-S (-E037) (make Belimo)

Rated voltage:	AC/DC 24 V, 50/60 Hz
Functional range:	AC 19.2...28.8 V / DC 21.6...28.8 V
Power consumption:	- running: 5 W - holding: 2.5 W
Dimensioning:	7 VA
Torque:	-Motor: min. 4 Nm -Spring return: min. 4 Nm
Running time:	-Motor: 40...75 s (0...4 Nm) -Spring return: 20 s (60 s at -30°C)
Sound power level:	-Motor: 50 dB (A) -Spring return: 62 dB (A)
Protection class:	III Safety extra low voltage
Degree of protection:	IP54
EMC:	CE according to 2004/108/EC
Low voltage directive:	CE according to 2006/95/EC

LF230 (-E020) / LF230-S (-E036) (make Belimo)

Rated voltage:	AC 230 V, 50/60 Hz
Functional range:	AC 198...264 V
Power consumption:	- running: 5 W - holding: 3 W
Dimensioning:	7 VA
Torque:	-Motor: min. 4 Nm -Spring return: min. 4 Nm
Running time:	-Motor: 40...75 s (0...4 Nm) -Spring return: 20 s (-20...50°C)
Sound power level:	-Motor: 50 dB (A) -Spring return: 62 dB (A)
Protection class:	II protective insulation
Degree of protection:	IP54
EMC:	CE according to 2004/108/EC
Low voltage directive:	CE according to 2006/95/EC

Auxiliary switch for LM24A-S / LM230A-S / LF24-S / LF230-S

- 1 EPU, 1 mA...3 (0.5) A, AC 250 V adjustable 0...100%

Legend

V_{ZU}	(m^3/h) [l/s]	=	Supply air volume
V_{Nenn}	(m^3/h)	=	Nominal volumetric flow
Δp	(Pa)	=	Pressure difference
H13	(-)	=	Filter class H13
H14	(-)	=	Filter class H14

Particle filter box FKF

Order code FKF

01	02	03	04	05	06
Type	Connection	Air diffuser	Type of air	Nominal size	Mounting
Example					
FKF	-H	-41	-Z	-500	-MB

07	08	09	10	11	12
Material	Paint	Antibacterial coating	Shut-off damper	Differential pressure/ Aerosol monitoring device	Differential pressure transducer
-SB	-9010	-AB0	-M000	-D1	-U0

13	14	15	16
Tight seal test	Rubber lip seal	Box dimensions	Spigot diameter
-P0	-GD1	-KHS	-SDS

Sample
FKF-H-41-Z-500-MB-SB-9010-AB0-M000-D1-U0-P0-GD1-KHS-SDS

Particle filter box type FKF | horizontal with round spigot | for ceiling swirl diffuser FDQJ | supply air | NW500 | magnetic fastening | sheet steel | painted to RAL9010 | without antibacterial coating | without shut-off damper | with differential pressure / aerosol monitoring device inside | without differential pressure transducer | without tight seal test | with rubber lip seal | height of plenum box standard | spigot diameter standard

Order details

01 - Type

FKF = Particle filter box type FKF (with fluid seal)

02 - Connection

H = horizontal with round spigot (standard)
Q = horizontal with rectangular spigot and connection flange
V = vertical with round spigot

03 - Air diffuser (must be ordered separately)

41 = Ceiling swirl diffuser FDQJ-...
42 = Ceiling impulse diffuser FPIL-...

04 - Type of air

Z = supply air
A = return air

05 - Nominal size

400 = NW 400
500 = NW 500
600 = NW 600
625 = NW 625
650 = NW 650
800 = NW 800 (only possible for FDQJ-...-VM)

06 - Mounting

MB = magnetic fastening (only available for NW 400-650, only available as -SB model, only available for ceiling swirl diffuser FDQJ-...-SB (standard), not available for diffuser FPIL.)
VM = concealed mounting (standard for FDQJ-...-AL/-V2, FDQJ-...-SB at an extra charge, standard for FPIL.)

07 - Material

SB = electrolytically galvanised sheet steel (standard)
V2 = Stainless steel V2A, 1.4301

08 - Paint

0000 = without paint (standard for -V2, not possible for -SB)
9010 = painted inside and outside, RAL colour white (only available for -SB model, standard for -SB)
xxxx = painted inside and outside, RAL colour can be freely selected (only available for -SB model)

09 - Antibacterial coating

AB0 = Without antibacterial coating (standard)
AB1 = with antibacterial coating

Particle filter box FKF

10 - Shut-off damper

M000= without shut-off damper (standard)

M001= with manually adjustable shut-off damper with cable (only available for FKF-H / -V)

E001 = with electrically adjustable shut-off damper, 24 V, 3-point

E030 = with electrically adjustable shut-off damper, 24 V, 3-point, with one limit switch

E002 = with electrically adjustable shut-off damper, 230 V, 3-point

E031 = with electrically adjustable shut-off damper, 230 V, 3-point, with one limit switch.

E021 = with electrically adjustable shut-off damper, 24 V, 3-point, spring return actuator.

E037 = with electrically adjustable shut-off damper, 24 V, 3-point, spring return actuator, with one limit switch.

E020 = with electrically adjustable shut-off damper, 230 V, 3-point, spring return actuator.

E036 = with electrically adjustable shut-off damper, 230 V, 3-point, spring return actuator, with one limit switch.

Exxx model only available for FKF-H.

11 - Differential pressure / aerosol monitoring device

D1= Differential pressure/aerosol test device with measuring spigot inside the box, for hose connection with an outer diameter of 10 mm (standard).

D2= Differential pressure/aerosol monitoring device with measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm.

D3= Differential pressure/aerosol monitoring device with measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm and aerosol feeding device in the spigot of the box inside.

D4= Differential pressure/aerosol monitoring device with measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with aerosol feeding device in the spigot of the box inside.

D5= Differential pressure/aerosol monitoring device with measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with aerosol feeding device in the spigot on the outside (only connection at the spigot).

D6= With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm and aerosol connection from the box inside to the on-site connection.

12 - Differential pressure transducer

U0 = without differential pressure transducer (standard)

U1 = with differential pressure transducer (only available in connection with differential pressure / aerosol monitoring devices (-D2, -D3 and -D6))

13 - Tight seal test

P0 = without tight seal test (standard)

14 - Rubber lip seal

GD0 = without rubber lip seal at the connection spigot (standard)

GD1 = with rubber lip seal at the connection spigot (only available for FKF-H / -V)

15 - Box dimensions

KHS = Height of plenum box standard

xxx = Height of box in mm (minimum height = spigot diameter + 222 mm, for FPIL-...-Z-... spigot diameter + 262 mm)

16 - Spigot diameter

SDS = spigot diameter (standard)

xxx = spigot diameter in mm (for spigot diameter > than standard only possible with higher plenum box, maximum height of box = 580mm)

Particle filter box FKF

Order code FDQJ

01	02	03	04	05	06	07
Type	Model	Blade pattern	Air throw	Nominal size	Material	Paint
Example						
FDQJ	-Q	-SR	-Z	-500	-SB	-9010

08	09	10	11	12	13
Drill pattern reduced	Blades	Blade colour	Air throw pattern	Mounting	Antibacterial coating
-000	-PS	L9005	-B	-MB	-AB0

Sample
FDQJ-Q-SR-Z-500-SB-9010-000-PS-L9005-B-MB-AB0

Ceiling swirl diffuser for filter box type FDQJ I square faceplate I circular blade pattern I supply air I NW500 I sheet steel I painted to RAL9010 I drill pattern not reduced I continuous blades I blades made of plastic similar to RAL9005 (black) I air throw pattern B I with magnetic fastening I without antibacterial coating

Order details

01 - Type

FDQJ = Ceiling swirl diffuser for filter box type FDQJ

02 - Model

Q = Square faceplate

03 - Blade pattern

SR = circular blade pattern
SQ = square blade pattern

04 - Air throw

Z = supply air
A = Return air (without blades)

05 - Nominal size

400 = NW 400
500 = NW 500
600 = NW 600
625 = NW 625
650 = NW 650
800 = NW 800

06 - Material

SB = Painted sheet steel
V2 = Stainless steel V2A (1.4301, only available with VM)
AL = Aluminium (only available with VM)

07 - Paint

0000 = without paint (standard for -V2, not possible for -SB)
9010 = RAL colour white (standard for -SB, only available for -SB)
xxxx = RAL colour can be freely selected (only available for -SB)
ELOX = natural colour anodised (only available for -AL)

08 - Drill pattern reduced

000 = Drill pattern not reduced (standard)
310 = reduced drill pattern 310 - (NW> 310)
400 = reduced drill pattern 400 - (NW> 400)
500 = reduced drill pattern 500 - (NW> 500)
600 = reduced drill pattern 600 - (NW> 600)

09 - Blades

PS = Continuous blades (only for supply air)
P0 = without blades (only for return air)

10 - Blade colour

L9005 = Blades made of plastic similar to RAL 9005 (black)
L9006 = Blades made of plastic similar to RAL9006 (grey)
L9010 = Blades made of plastic similar to RAL9010 (white)
Axxxx = Painted aluminium blades, RAL colour can be freely selected (subsequent adjustment of blades not possible)
00000 = without blades (standard for return air)

11 - Air throw pattern

A = all blades in blade position 2
B = blades in blade positions 1+2, set ex works
C = without blades (standard for return air)
V = all blades in blade position 1 (heating mode only)

12 - Mounting

MB = Magnetic fastening, with safety cable, only available as sheet steel model, only available for NW 400-650, only possible for installation below the ceiling.
VM = Concealed mounting (standard for aluminium and stainless steel model, available in NW 400-650, for sheet steel model available in NW 400-800)

13 - Antibacterial coating

AB0 = Without antibacterial coating (standard)
AB1 = with antibacterial coating

Particle filter box FKF

Order code FPIL

01	02	03	04	05
Type	Air volume	Model	Air throw	Nominal size
Example				
FPIL	-N	-QV	-Z	-500

06	07	08	09	10
Material	Paint	Drill pattern reduced	Mounting	Antibacterial coating
-SB	-9010	-000	-VM	-AB0

Sample
FPIL-N-QV-Z-500-SB-9010-000-VM-AB0

Ceiling impulse diffuser for filter box type FPIL I for normal air volume I square faceplate, drill pattern V (standard) I supply air I NW500 I sheet steel I painted to RAL9010 I drill pattern not reduced I with concealed mounting I without antibacterial coating

Order details

01 - Type

FPIL = Ceiling impulse diffuser for filter box type FPIL

02 - Air volume

N = for normal air volume (supply air and return air)
G = for large air volume (only for supply air)

03 - Model

QV = Square faceplate, drill pattern V (standard)
QS = Square faceplate, drill pattern S (not available for -AL)
QK = Square faceplate, drill pattern K (not available for -AL)

04 - Air throw

Z = supply air
A = Return air (not available for FPIL-G, without funnel)

05 - Nominal size

400 = NW 400
500 = NW 500
600 = NW 600
625 = NW 625
650 = NW 650

06 - Material

SB = perforated sheet steel (standard)
AL = perforated aluminium (only available for FPIL-...-QV-...)

07 - Paint

9010 = RAL colour white (standard)
xxxx = RAL colour can be freely selected
ELOX = natural colour anodised (only available for -AL)

08 - Drill pattern reduced

000 = Drill pattern not reduced (standard)
310 = reduced drill pattern 310 (NW> 310)
400 = reduced drill pattern 400 (NW> 400)
500 = reduced drill pattern 500 (NW> 500)

09 - Mounting

VM = Concealed mounting (standard)

10 - Antibacterial coating

AB0 = Without antibacterial coating (standard)
AB1 = with antibacterial coating

Particle filter box FKF

Order code filter for FKF

01	02	03	04	05	06	07
Type	Filter size	Filter frame	Filter class	Filter seal	Handle cover	Filter test
Example						
FIL	-FKF600	-3	-H13	-G	-G1	-O

Sample
FIL-FKF600-3-H13-G-G1-O

Particle filter for filter box | Size 557x557x102 für FKF600 | UXA with aluminium frame | Filter class H13 | fluid seal | with handle cover | checked oil thread test

Order details
01 - Type

FIL = Particle filter for filter box

02 - Filter size

FKF400 = Size 357x357x102 -
Filter for filter box FKF 400

FKF500 = Size 457x457x102 -
Filter for filter box FKF 500

FKF600 = Size 557x557x102 -
Filter for filter box FKF 600

FKF625 = Size 575x575x102 -
Filter for filter box FKF 625

FKF650 = Size 610x610x102 -
Filter for filter box FKF 650

FKF800 = Size 762x762x102 -
Filter for filter box FKF 800

03 - Filter frame

3 = UXA with aluminium frame

04 - Filter class

H13 = filter class H13 (HEPA)

H14 = filter class H14 (HEPA)

05 - Filter seal

G = Fluid seal

06 - Handle cover

G1 = with double-sided handle cover (standard for UXA)

07 - Filter test

O = checked oil thread test (standard), according to DIN EN 1822

S = checked scan test, according to DIN EN 1822

Particle filter box FKF

Specification texts

Particle filter box with safely sealing pressure device and sealing device for installation of filter cells with fluid frame. With horizontal, round connection spigot. With integrated differential pressure/aerosol test device with measuring spigot inside the box, for hose connection with an outer diameter of 10 mm (-D1).
Without shut-off damper and without seal leakage test.
Product: SCHAKO **type FKF-H-…-M000-D1-…-P0-…**

- with horizontal, round connection spigot and manually adjustable sealing shut-off damper. Leakage at closed damper blade according to DIN EN 1751, class 4, at a duct pressure of up to 1000 Pa. Without seal leakage test.
  With integrated differential pressure/aerosol test device with measuring spigot inside the box, for hose connection with an outer diameter of 10 mm (-D1). Without seal leakage test.
  Product: SCHAKO **type FKF-H-…-M001-D1-…-P0-…**

- with horizontal, round connection spigot and electrically (OPEN/CLOSED actuator) adjustable sealing shut-off damper (with and without spring return).
  Leakage at closed damper blade according to DIN EN 1751, class 4, at a duct pressure of up to 1000 Pa.
  With integrated differential pressure/aerosol test device with measuring spigot inside the box, for hose connection with an outer diameter of 10 mm (-D1). Without seal leakage test.
  Product: SCHAKO **type FKF-H-…-Exxx-D1-…-P0-…**

- with vertical, round connection spigot With integrated differential pressure/aerosol test device with measuring spigot inside the box, for hose connection with an outer diameter of 10 mm (-D1). Without shut-off damper and without seal leakage test.
  Product: SCHAKO t**ype FKF-V-…-M000-D1-…-P0-…**

- with vertical, round connection spigot and manually adjustable sealing shut-off damper. Leakage at closed damper blade according to DIN EN 1751, class 4, at a duct pressure of up to 1000 Pa.
  With integrated differential pressure/aerosol test device with measuring spigot inside the box, for hose connection with an outer diameter of 10 mm (-D1). Without seal leakage test.
  Product: SCHAKO **type FKF-V-…-M001-D1-…-P0-…**

- with horizontal, rectangular connection spigot, with connection flange. With integrated differential pressure/aerosol test device with measuring spigot inside the box, for hose connection with an outer diameter of 10 mm (-D1). Without shut-off damper and without seal leakage test.
  Product: SCHAKO **type FKF-Q-…-M000-D1-…-P0-…**

Type of air:
- Supply air (-Z)
- Return air (-A)

Material:
- Filter box made of electrolytically galvanised sheet steel (-SB) (standard)
  - painted inside and outside, RAL colour white (-9010) (standard)
  - painted inside and outside, RAL colour can be freely selected (-xxxx)
- Filter box made of stainless steel V2A (-V2-0000)

Antibacterial coating:
- Without antibacterial coating (-AB0, standard)
- with antibacterial coating (-AB1)

Mounting:
- with magnetic fastening (-MB) (only available for NW 400-650, only available as -SB model, only available for ceiling swirl diffuser FDQJ-...-SB [standard], not available for diffuser FPIL.)
- concealed mounting (-VM) (standard for FDQJ-...-AL/-V2, FDQJ-...-SB at an extra charge, standard for FPIL).

Box dimensions:
- Standard height of box (-KHS)
- Height of box ..... mm (-xxx, always with 3 digits) (minimum height = spigot diameter + 222 mm, for FPIL-...-Z-... spigot diameter + 262 mm)

Spigot diameter:
- Standard spigot diameter (-SDS)
- Spigot diameter ..... mm (-xxx, always with 3 digits) (for spigot diameter > than standard only possible with higher plenum box, maximum height of box = 580 mm)

Diffusers (for supply air and return air)**:**
- Ceiling swirl diffuser FDQJ-... (-41)
- Ceiling impulse diffuser FPIL-... (-42)

Particle filter box FKF

Accessories (at an extra charge):

- Differential pressure / aerosol monitoring device
  - With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm (-D2).
  - With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm and aerosol feeding device in the spigot of the box inside (-D3).
  - With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with aerosol feeding device in the spigot of the box inside (-D4).
  - With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with aerosol feeding device in the spigot on the outside (-D5).
  - With measuring spigot inside the box, for hose connection with an outer diameter of 10 mm. Additionally with 2 measuring spigots on the box outside, for a hose with an inner diameter of 4 mm and aerosol connection from the box inside to the on-site connection (-D6).

- Differential pressure transducer (-U1)
  - only available in connection with differential pressure / aerosol monitoring devices (-D2, -D3 and -D6).
  - supplied loose or optionally mounted to box outside

- Rubber lip seal (-GD1),
  - made of special rubber (only available for FKF-H / -V)

- Particle filter (FIL-...)
  - Filter frame H=102 mm
    - UXA (-3), filter frame made of aluminium. With double-sided handle protection (-G1).
  - With fluid seal in filter housing.
  - Filter classes:
    - HEPA H13 (-H13, ≥99,95%)
    - HEPA H14 (-H14, ≥99,995%)
  - Filter checked by means of oil thread test (-O, standard) or scan test (-S, at an extra charge) according to DIN EN 1822.
  - Temperature-resistant up to 80°C. Filter wrapped in film

- Mounting lever for replacing the filter, made of sheet steel painted to RAL 9010 (white)

Specification texts diffusers

(for supply air and return air)

Ceiling swirl diffuser FDQJ (-41)

Ceiling swirl diffuser type DQJ-..., particularly suitable for installation in comfort rooms with high number of air changes, for clean rooms (in connection with particle filter boxes) and for VAV systems with variable volumetric flows (between 40-100%). Cooling and heating modes are possible.
With square faceplate, with radial blade pattern. For supply air, with central pivoting, aerodynamic radially arranged continuous air deflection blades in support blade profile sections made of plastic in a colour similar to RAL 9005 (-L9005, black, standard), similar to RAL 9006 (-L9006, grey), similar to RAL 9010 (-L9010, white) or made of aluminium painted to a RAL colour which can be freely selected (-Axxxx, subsequent adjustment of blades not possible). Each blade is adjustable from the diffuser faceplate without using any special device, without dismounting the diffuser. Free cross-section, resistance and sound power level remain constant in all blade positions.
TÜV inspected according to VDI 6022 Sheets 1+2 as well as DIN 1946 Sheet 2.
Product: SCHAKO **type FDQJ-Q-SR-Z-...-PS-...**

- With square faceplate, square blade pattern. For supply air, with central pivoting, aerodynamic radially arranged continuous air deflection blades in support blade profile sections made of plastic in a colour similar to RAL 9005 (-L9005, black, standard), similar to RAL 9006 (-L9006, grey), similar to RAL 9010 (-L9010, white) or made of aluminium painted to a RAL colour which can be freely selected (-Axxxx, subsequent adjustment of blades not possible).
  TÜV inspected according to VDI 6022 Sheets 1+2 as well as DIN 1946 Sheet 2.
  Product: SCHAKO **type FDQJ-Q-SQ-Z-...-PS-...**

- With square faceplate, with radial blade pattern. For return air, without air deflection blades.
  TÜV inspected according to VDI 6022 Sheets 1+2 as well as DIN 1946 Sheet 2.
  Product: SCHAKO **type FDQJ-Q-SR-A-...-P0-...**

- With square faceplate, square blade pattern. For return air, without air deflection blades.
  TÜV inspected according to VDI 6022 Sheets 1+2 as well as DIN 1946 Sheet 2.
  Product: SCHAKO **type FDQJ-Q-SQ-A-...-P0-...**

Nominal sizes: NW 400 to 800

Drill pattern:

- not reduced (-000, standard)
- reduced drill pattern:
  - drill pattern 310 (-310, NW >310)
  - drill pattern 400 (-400, NW >400)
  - drill pattern 500 (-500, NW >500)
  - drill pattern 600 (-500, NW >600)

Particle filter box FKF

- Faceplate made of:
  - Sheet steel (-SB)
    - painted to the RAL colour 9010 (white) (-9010)
    - painted to a different RAL colour (-xxxx)
  - Stainless steel V2A (-V2-0000) (only possible with concealed mounting)
  - Natural colour anodised aluminium (-AL-ELOX) (only possible with concealed mounting)

- Antibacterial coating:
  - Without antibacterial coating (-AB0, standard)
  - with antibacterial coating (-AB1)

- Air throw pattern:
  - for supply air model:
    - "A" (-A), all blades in position 2
    - "B" (-B), blades in positions 1+2, preset ex works
    - "V" (-V), all blades in position 1 (heating mode only)
  - for return air model:
    - "C" (-C), without blades

- Mounting:
  - Magnetic fastening (-MB), with safety cable.
    - Standard for sheet steel model (-SB), available for NW 400-650. Not possible for aluminium (-AL) and stainless steel (-V2) models. Only possible for installation below the ceiling.
  - Concealed mounting (-VM)
    - Standard for aluminium (-AL) and stainless steel (-V2) model, available in NW 400-650, for sheet steel (-SB) model available in NW 400-800.
    - Pole brace fastening, by means of a M6 cylinder screw (according to DIN EN ISO 4762) to the particle filter box.

Ceiling impulse diffuser FPIL (-42)
Square ceiling impulse diffuser FPIL-... for **normal** air volumes, for installation in supply and exhaust air systems in clean rooms, operating theatres and comfort rooms up to a height of 4 m.
Consisting of an easy-to-clean perforated square faceplate, **drill pattern V** (offset perforations). For **supply air** with a baffle plate and a sheet steel air guide funnel painted to RAL 9005 (black). It is fastened using concealed mounting (-VM) by means of a central fastening screw. TÜV inspected according to VDI 6022 Sheets 1+2, as well as DIN 1946 Sheet 2.
Product: SCHAKO **type FPIL-N-QV-Z-...**

- **Supply air**, for **large** air volumes.
  Product: SCHAKO **type FPIL-G-QV-Z-...**
- **Return air** (without baffle plate and without air guide funnel), for **normal** air volumes.
  Product: SCHAKO **type FPIL-N-QV-A-...**

- **Supply air**, for **normal** air volumes, **drill pattern S** (star-shaped perforations, not possible in aluminium).
  Product: SCHAKO **type FPIL-N-QS-Z-...**
  - **Supply air**, for **large** air volumes.
    Product: SCHAKO **type FPIL-G-QS-Z-...**
  - **Return air** (without baffle plate and without air guide funnel), for **normal** air volumes.
    Product: SCHAKO **type FPIL-N-QS-A-...**

- **Supply air**, for **normal** air volumes, **drill pattern K** (circular perforations, not possible in aluminium).
  Product: SCHAKO **type FPIL-N-QK-Z-...**
  - **Supply air**, for **large** air volumes.
    Product: SCHAKO **type FPIL-G-QK-Z-...**
  - **Return air** (without baffle plate and without air guide funnel), for **normal** air volumes.
    Product: SCHAKO **type FPIL-N-QK-A-...**

Nominal sizes: NW 400 to 650

Drill pattern:
- not reduced (-000, standard)
- reduced drill pattern:
  - drill pattern 310 (-310, NW >310)
  - drill pattern 400 (-400, NW >400)
  - drill pattern 500 (-500, NW >500)

- Faceplate made of:
  - perforated sheet steel (-SB)
    - painted to the RAL colour 9010 (white) (-9010)
    - painted to a different RAL colour (-xxxx)
  - natural colour anodised perforated aluminium (-AL-ELOX) (only available for PIL-...-QV-... model)

- Antibacterial coating:
  - Without antibacterial coating (-AB0, standard)
  - with antibacterial coating (-AB1)