Swirl diffusers

Type FD

recommended room heights from 2.60 . . . 4.00 m

TROX® TECHNIK

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Contents · Description

FD-Q Construction

FD-R Construction

The diffuser face of the type FD consists of fixed, radially arranged air control blades. The supply air design has specially arranged internal air guidance elements which are not required on the extract version.

Due to the rotary swirling motion of the air discharge, induction of room air occurs very quickly, resulting in rapid decay of supply air velocity and temperature differential. Air change rates of 30 per hour can be achieved with supply air temperature differentials of +10K to –10K.

To stabilise horizontal discharge, all sizes must be mounted flush with a ceiling.

The minimum mounting height between floor and diffuser face is 2.60 m.

Flow Visualisation

Construction

Type FD swirl diffusers are available in 5 sizes.

Depending on the architectural requirements, the face plate can be circular or square. The fixed air control blades on the diffuser face are arranged radially.

The diffuser face can be attached or removed via a centre fix screw into the plenum box. The screw head is covered with a decorative cap. The plenum box can be supplied with either top or side entry spigots and on request, with spigot lip seals and volume control damper.

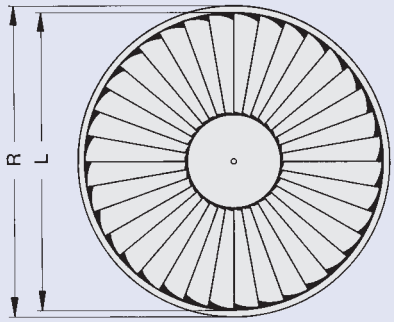
If a circular diffuser face is ordered, the plenum box with side entry spigot has a 35 mm extension piece fitted to the plenum.

For simple adjustment of the volume flow, on request the plenum box can be provided with a test connection for measurement of a reference pressure and a volume control damper operated by sheathed cables. The characteristic curve of pressure reading versus volume flow rate for each size of plenum box is supplied.

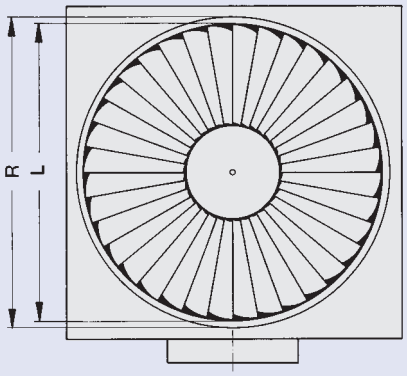
Note: If a larger size side entry plenum is fitted to a diffuser face, this should be considered in relation to performance (lower noise levels and pressure drop).

Size	B	D	L	Q	R	H_2	□K	Ø P	AK code, diffuser face [1]	
									Square	Circular
300	280	158	250	298	300	250	290	278	AK001	AK013
400	364	198	350	398	400	295	372	362	AK002	AK014
500	462	198	450	498	500	295	476	460	AK003	AK015
600	559	248	538	598	600	345	567	557	AK004	AK016
625	559	248	538	623	623	345	567	557	AK004	AK016

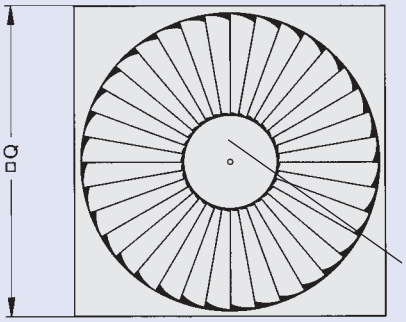
1) Valid only for FD-...-H!



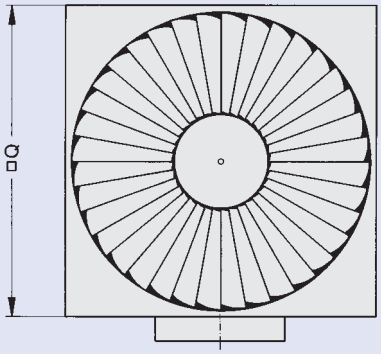
FD-R-...-V



FD-R-...-H

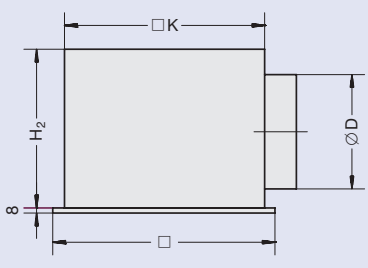


FD-Q-...-V



FD-Q-...-H

Plenum Boxes



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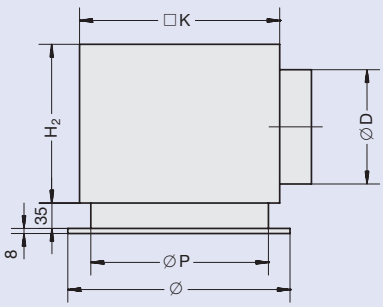
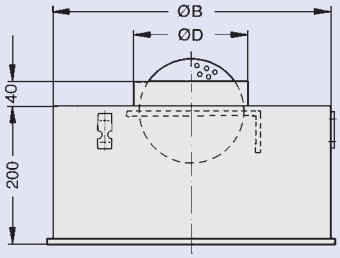


FD-R-...-H



FD-...-V

Materials · Installation · Assembly

Materials

The diffuser face is made of galvanised sheet steel. The surface is pre-treated and powder coated white (RAL 9010)

The plenum boxes are galvanised sheet steel, the lip seal of rubber.

Installation

All sizes are suitable for flush mounting into a ceiling.

If the diffuser is installed below a closed ceiling (i. e. freely suspended) a stable discharge can be achieved if a peripheral collar > 50 mm is provided – available on request.

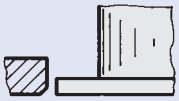
Assembly

The plenum box is suspended by wires or slotted strips using the drilled holes in the plenum return edge or hanging brackets, when provided. For the side entry plenum box, a self adhesive seal, supplied loose, must be fitted by the client. The diffuser face is fitted to the plenum box by means of centre fix screw locating in cross channel in the plenum box.

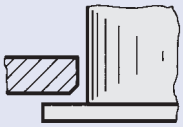
Measurement of Reference Pressures

For simple adjustment of the volume flow, on request the plenum box can be provided with a test connection for measurement of a reference pressure and a volume control damper operated by sheathed cables. The characteristic curve of pressure reading versus volume flow rate for each size of plenum box is supplied.

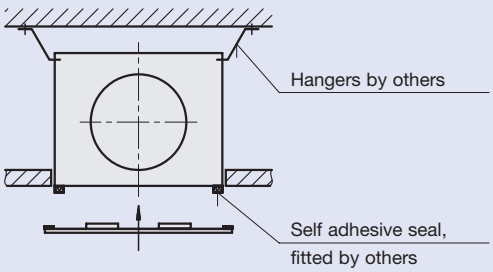
Installation flush to ceiling

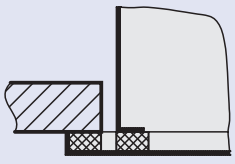


Installation with cut out in ceiling



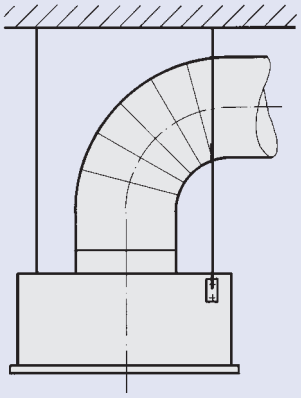
Surface mounting on ceiling



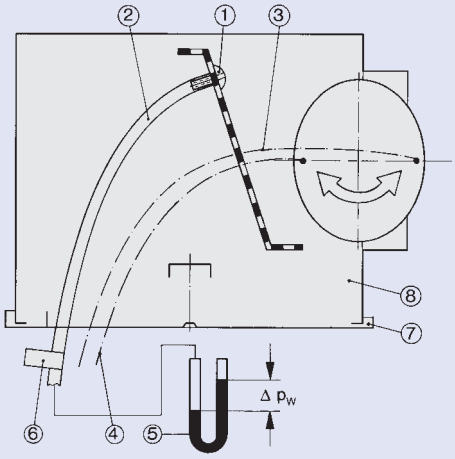


Fixing of diffuser face
using centre screw

Freely suspended

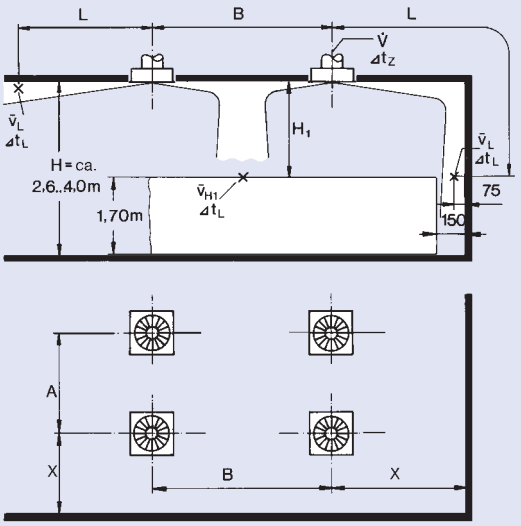


Installation
using hangers



① Test nipple
② Plastic tube
③ White sheathed cable damper open
④ Green sheathed cable damper closed
⑤ Inclined manometer
⑥ Code
⑦ Diffuser face
⑧ Plenum box

Nomenclature



$\dot{V}$ in l/s: Volume flow per diffuser
$\dot{V}$ in m³/h: Volume flow per diffuser
A, B in m: Spacing between two diffusers
X in m: Distance between diffuser centre and wall
H_1 in m: Distance between ceiling and occupied zone
$\bar{v}_{H1}$ in m/s: Time average air velocity between two diffusers at distance from ceiling H_1
L in m: (Horizontal + vertical) distance ($X + H_1$) discharge to the wall
$\bar{v}_L$ in m/s: Time average air velocity at the wall
Δt_Z in K: Temperature difference between supply air and room air
Δt_L in K: Difference between core and room air temperature at distance $L = A/2 + H_1$ or $L = B/2 + H_1$ or $L = X + H_1$
A_{eff} in m²: Effective outlet area
Δp_t in Pa: Total pressure drop (supply air)
L_{WA} in dB(A): A-weighted sound power level
L_{WNC} : NC rating of sound power level
L_{WNR} : $L_{WNR} = L_{WNC} + 2$
L_{pA}, L_{pNC} : A-weighting and NC rating respectively of room sound pressure level $L_{pA} \approx L_{WA} - 8$ dB, $L_{pNC} \approx L_{WNC} - 8$ dB
α in °: Damper angle

Quick Selection (Supply air)

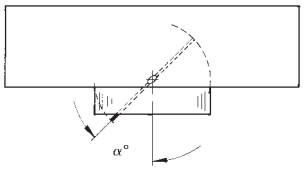
Size	$\dot{V}_{max}$ l/s	$\dot{V}_{max}$ m³/h	$\dot{V}_{min}$ l/s	$\dot{V}_{min}$ m³/h	$L_{WA\ max}$ dB(A)	$L_{W\ NC\ max}$ NC	$L_{WA\ min}$ dB(A)	$L_{W\ NC\ min}$ NC	A_{eff} m²
300	55	200	40	145	40	34	31	25	0.00884
400	110	400	50	180	40	34	25	< 20	0.0180
500	145	520	60	215	40	34	< 20	< 20	0.0251
600 625	165	600	80	290	40	34	< 20	< 20	0.0295

Octave band spectrum on request!

Acoustic Data FD-…-V

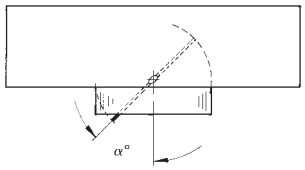
Supply Air

Correction to diagram 1: Volume control damper setting



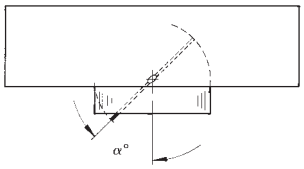
Damper angle α	0°	45°	90°
Δp_t	x 1.0	x 1.2	x 2.5
L_{WA}	–	–	+ 2
L_{WNC}	–	–	+ 2

Correction to diagram 3: Volume control damper setting



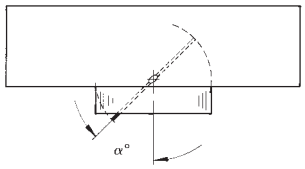
Damper angle α	0°	45°	90°
Δp_t	x 1.0	x 1.5	x 4.0
L_{WA}	–	+ 3	+ 7
L_{WNC}	–	+ 3	+ 7

Correction to diagram 2: Volume control damper setting



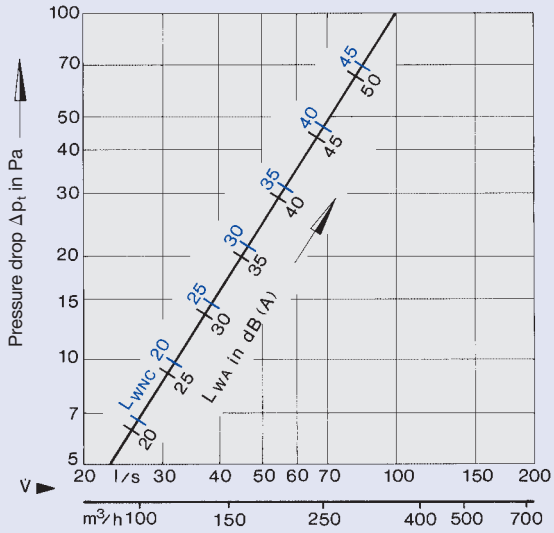
Damper angle α	0°	45°	90°
Δp_t	x 1.0	x 1.1	x 2.1
L_{WA}	–	+ 1	+ 2
L_{WNC}	–	+ 1	+ 2

Correction to diagram 4: Volume control damper setting

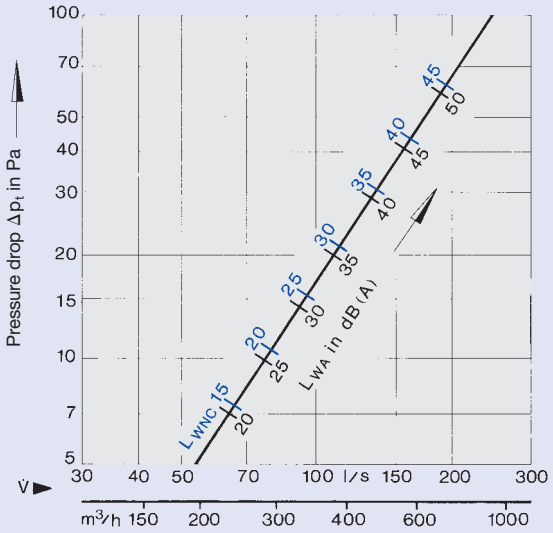


Damper angle α	0°	45°	90°
Δp_t	x 1.0	x 1.1	x 2.2
L_{WA}	–	+ 1	+ 4
L_{WNC}	–	+ 1	+ 4

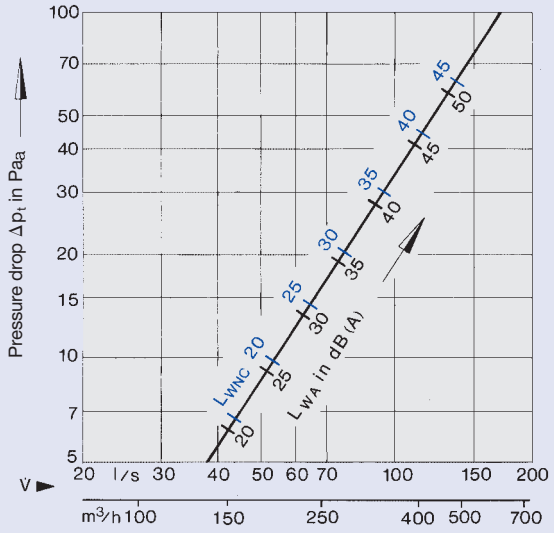
1 Sound power level and pressure drop
Size 300



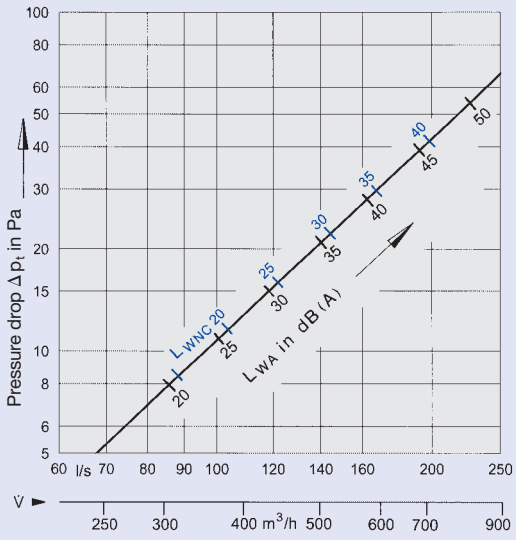
3 Sound power level and pressure drop
Size 500



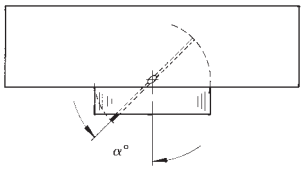
2 Sound power level and pressure drop
Size 400



4 Sound power level and pressure drop
Size 600 and 625

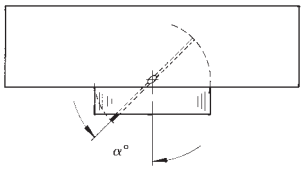


Correction to diagram 5: Volume control damper setting



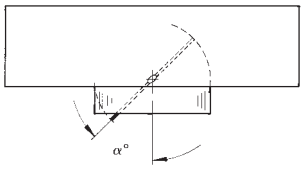
Damper angle α	0°	45°	90°
Δp_t	x 1.0	x 1.1	x 2.3
L_{WA}	–	+ 0	+ 2
L_{WNC}	–	+ 0	+ 2

Correction to diagram 7: Volume control damper setting



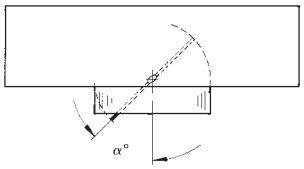
Damper angle α	0°	45°	90°
Δp_t	x 1.0	x 1.4	x 4.3
L_{WA}	–	+ 1	+ 8
L_{WNC}	–	+ 1	+ 8

Correction to diagram 6: Volume control damper setting



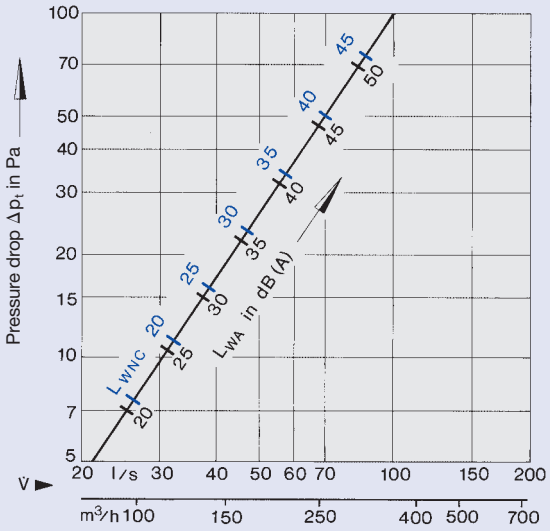
Damper angle α	0°	45°	90°
Δp_t	x 1.0	x 1.3	x 2.7
L_{WA}	–	+ 1	+ 3
L_{WNC}	–	+ 1	+ 3

Correction to diagram 8: Volume control damper setting

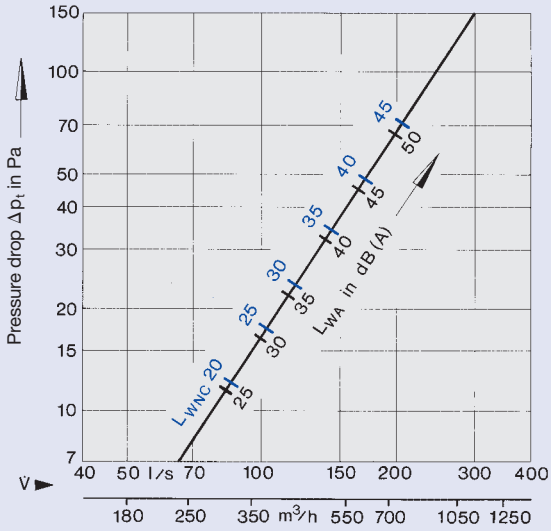


Damper angle α	0°	45°	90°
Δp_t	x 1.0	x 1.4	x 3.5
L_{WA}	–	+ 1	+ 4
L_{WNC}	–	+ 1	+ 4

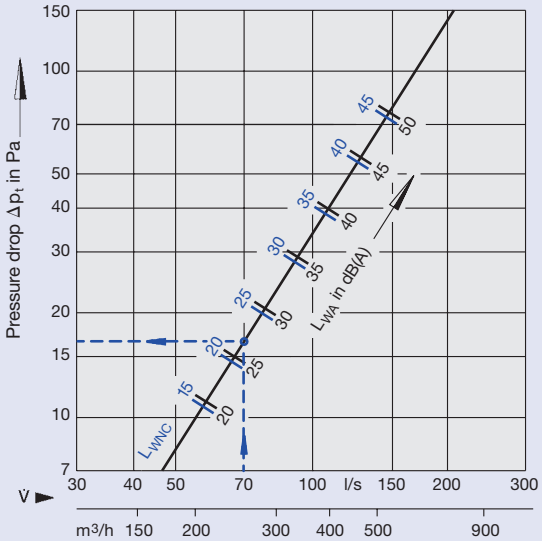
5 Sound power level and pressure drop
Size 300



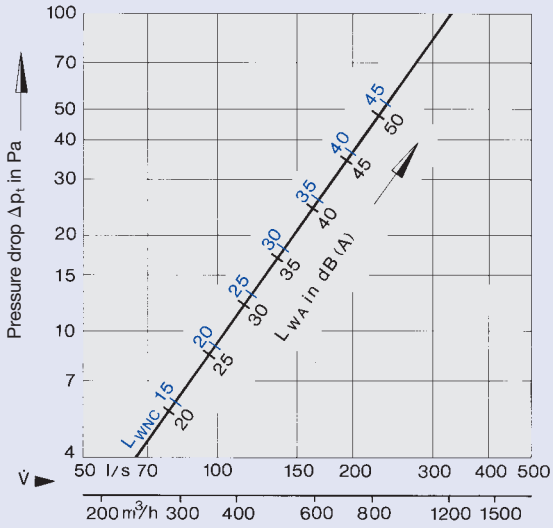
7 Sound power level and pressure drop
Size 500



6 Sound power level and pressure drop
Size 400

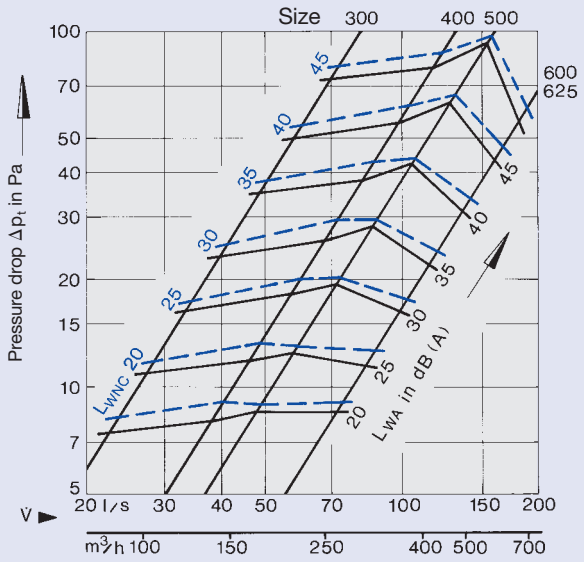


8 Sound power level and pressure drop
Size 600 and 625

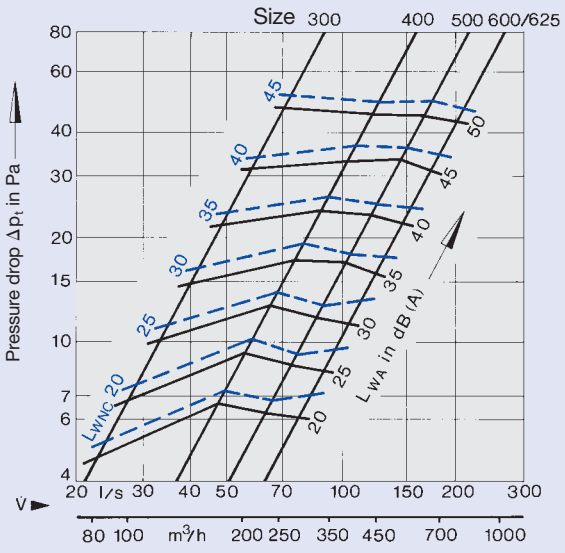


Correction to diagram 9 and 10: Volume control damper setting				
Size	**Damper angle**	**0°**	**45°**	**90°**
300	Δp_t	x 1.0	x 1.1	x 2.0
	L_{WA}	–	–	+ 3.0
	L_{WNC}	–	–	+ 3.0
400	Δp_t	x 1.0	x 1.0	x 1.9
	L_{WA}	–	–	+ 4.0
	L_{WNC}	–	–	+ 4.0
500	Δp_t	x 1.0	x 1.1	x 2.5
	L_{WA}	–	–	+ 7.0
	L_{WNC}	–	–	+ 7.0
600/625	Δp_t	x 1.0	x 1.1	x 2.2
	L_{WA}	–	+ 1.0	+ 4.0
	L_{WNC}	–	+ 1.0	+ 4.0

9 Sound power level and pressure drop FD-...-V

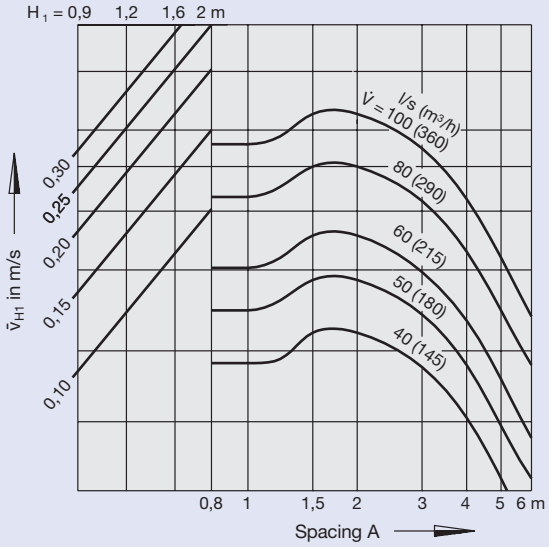


10 Sound power level and pressure drop FD-...-H

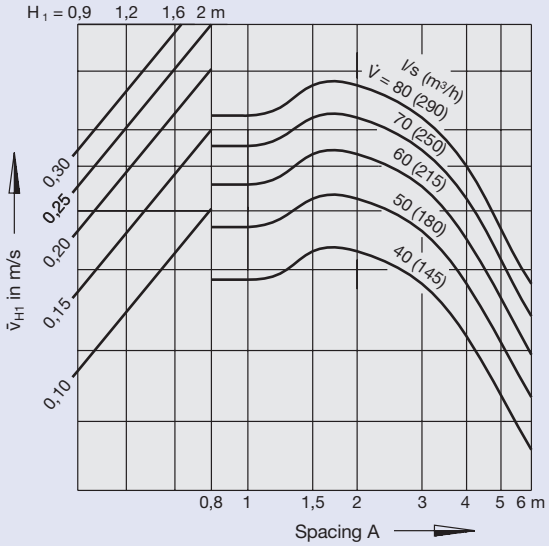


Correction!
For an installation below the ceiling line, the values $\bar{v}_{H1}$, $\bar{v}_L$ and $\Delta t_L / \Delta t_Z$ must be multiplied by a factor of 0.71!

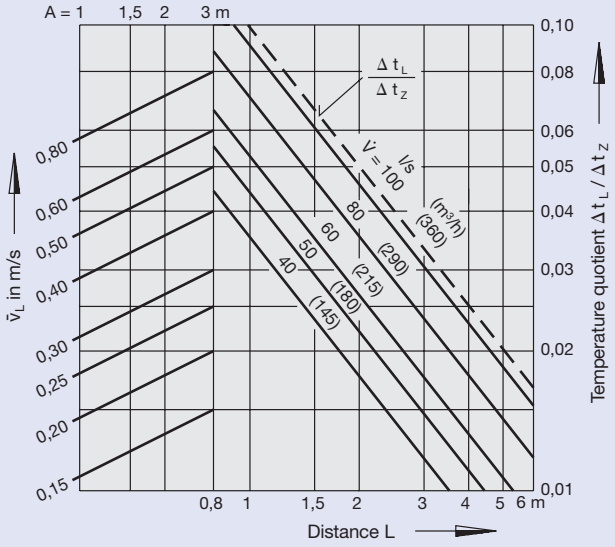
11 Diffuser arrangement: single or more than one row if B ≧ 4.00 m



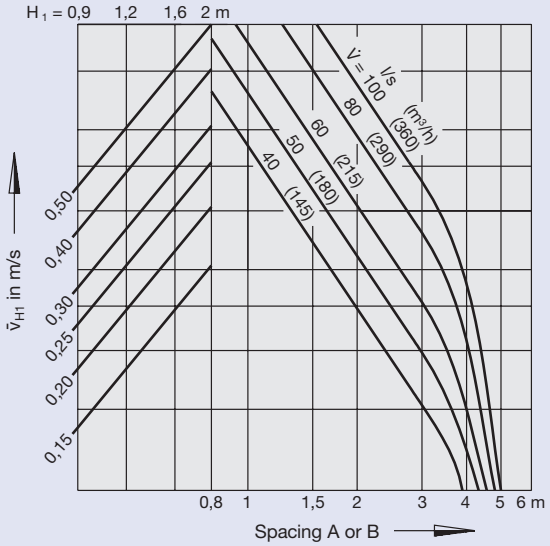
12 Diffuser arrangement: more than one row if B = 3.00 m



13 Temperature Quotient



14 Square Array of Diffusers



Aerodynamic Data FD 400

Example

Data given:

2 off type FD-Q-H-Z/400	
Volume flow per diffuser	$\dot{V} = 70$ l/s
Supply air temperature difference	$\Delta t_Z = -8$ K
Spacing between two diffusers	A = 1.20 m
Distance between diffuser centre and wall	X = 1.50 m
Distance between ceiling and occupied zone	$H_1 = 1.20$ m

Diagram 6: Sound power level and pressure drop
L_{WA} = 26 dB(A) (L_{WNC} = 21 NC)
Δp_t = 16 Pa

Diagram 15: Diffuser arrangement: single or more than one row

$\bar{v}_{H1}$ = 0.10 m/s

Diagram 17: Temperature Quotient

$L = A/2 + H_1 = 0.6 + 1.20 = 1.80$ m

$\Delta t_L / \Delta t_Z = 0.08$

$\Delta t_L = -8 \cdot 0.08 = -0.64$ K between two diffusers

$L = X + H_1 = 1.50 + 1.20 = 2.70$ m

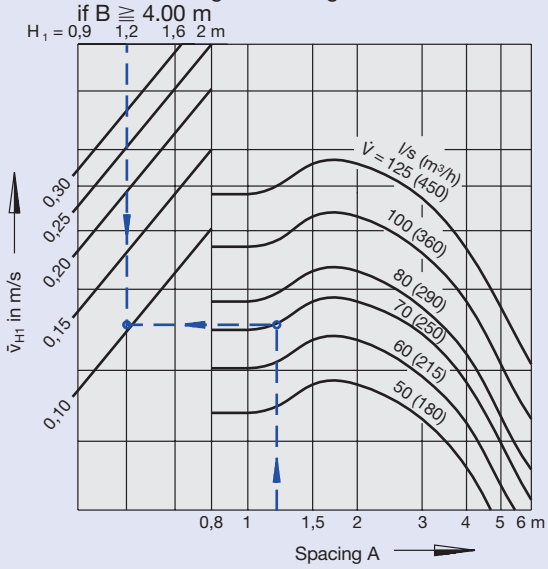
$\Delta t_L / \Delta t_Z = 0.053$

$\Delta t_L = -8 \cdot 0.053 = -0.4$ K at the wall

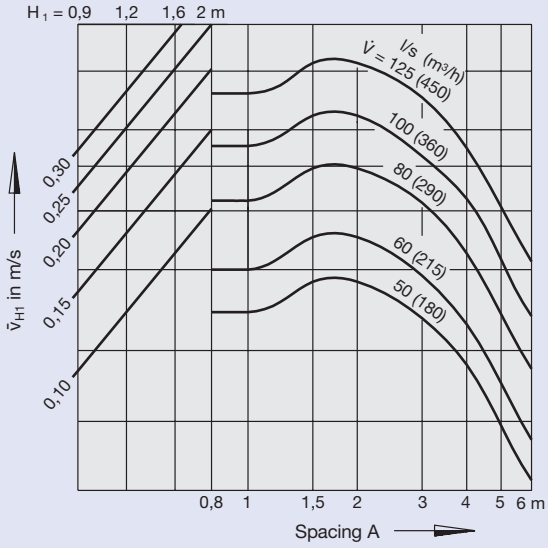
$\bar{v}_L \approx 0.22$ m/s

Correction!
For an installation below the ceiling line, the values $\bar{v}_{H1}$, $\bar{v}_L$ and $\Delta t_L / \Delta t_Z$ must be multiplied by a factor of 0.71!

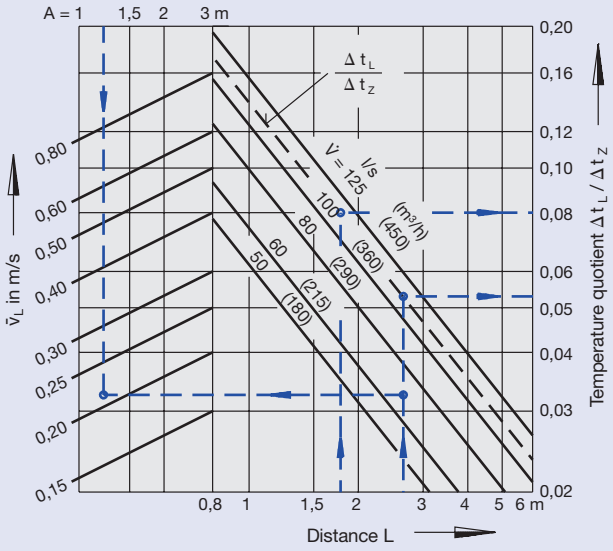
15 Diffuser arrangement: single or more than one row if B ≧ 4.00 m



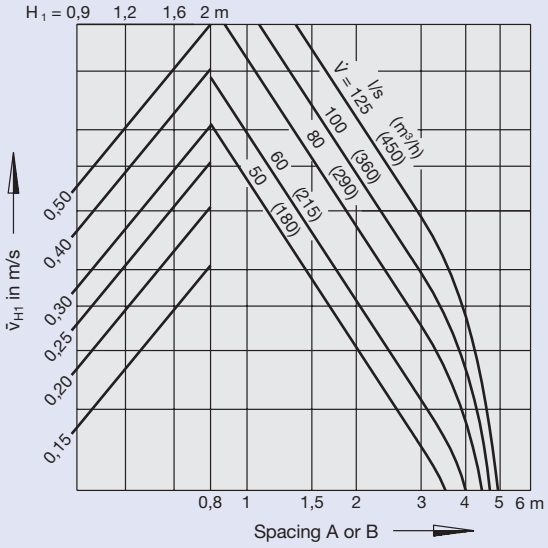
16 Diffuser arrangement: more than one row if B = 3.00 m



17 Temperature Quotient

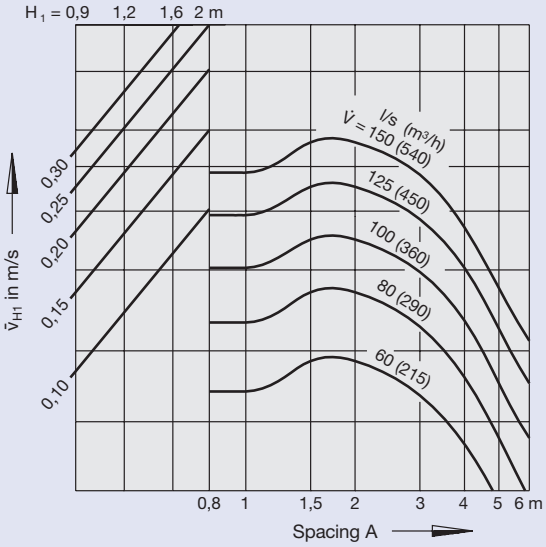


18 Square Array of Diffusers

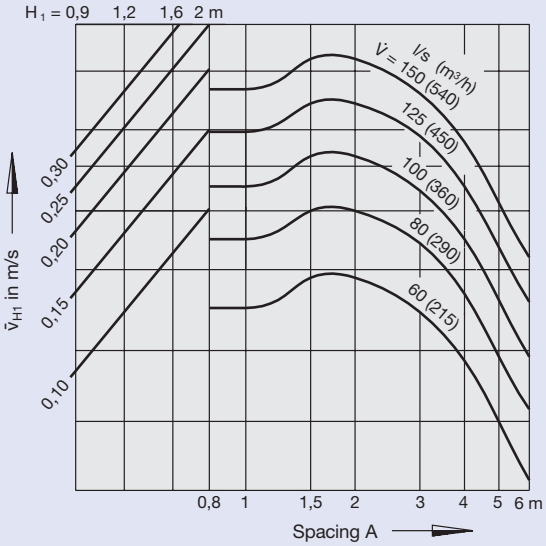


Correction!
For an installation below the ceiling line, the values $\bar{v}_{H1}$, $\bar{v}_L$ and $\Delta t_L / \Delta t_Z$ must be multiplied by a factor of 0.71!

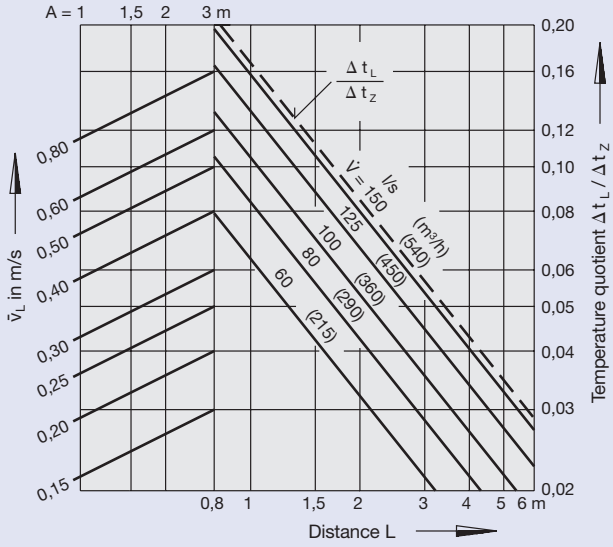
19 Diffuser arrangement: single or more than one row if B ≧ 4.00 m



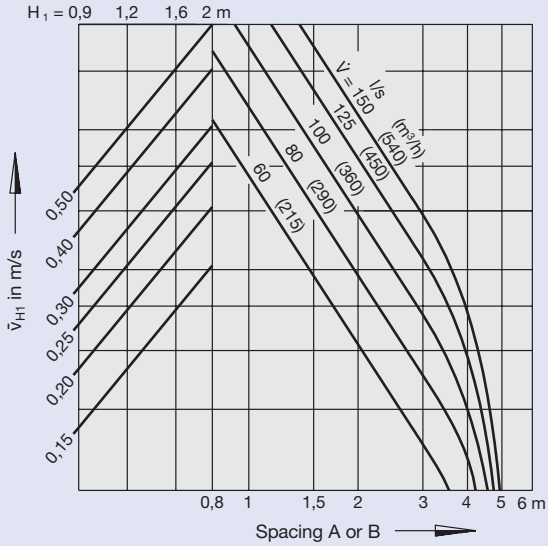
20 Diffuser arrangement: more than one row if B = 3.00 m



21 Temperature Quotient



22 Square Array of Diffusers



Aerodynamic Data FD 600 and FD 625

Example

Data given:

4 off type FD-Q-Z-H/600

Volume flow per diffuser	$\dot{V}$ = 100 l/s
Spacing between two diffusers	A = B = 2.00 m
Distance between ceiling and occupied zone	H_1 = 1.60 m

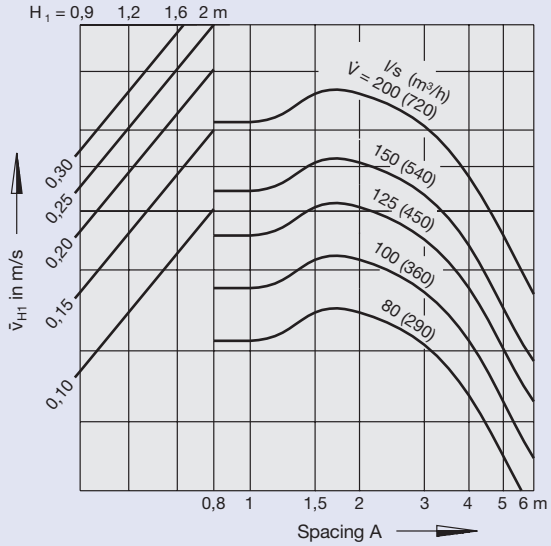
Required: air velocity in occupied zone

Diagram 26: Square array of diffusers

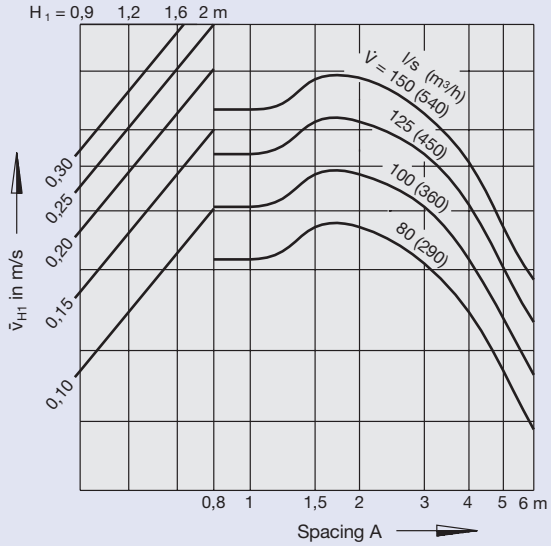
$\bar{v}_{H1}$ = 0.22 m/s

Correction!
For an installation below the ceiling line, the values $\bar{v}_{H1}$, $\bar{v}_L$ and $\Delta t_L / \Delta t_Z$ must be multiplied by a factor of 0.71!

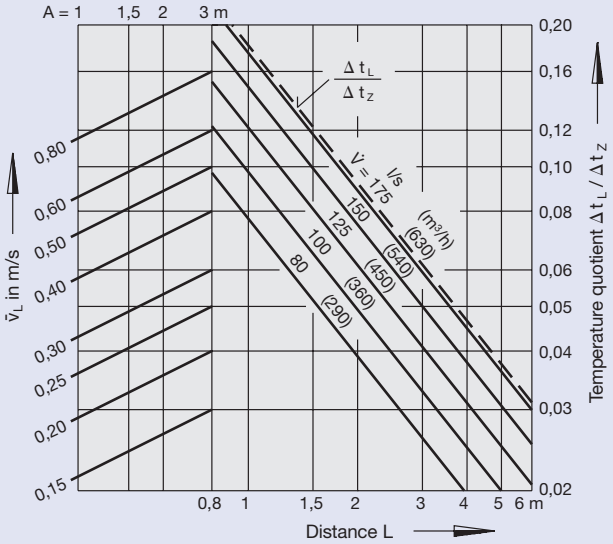
23 Diffuser arrangement: single or more than one row if B ≧ 4.00 m



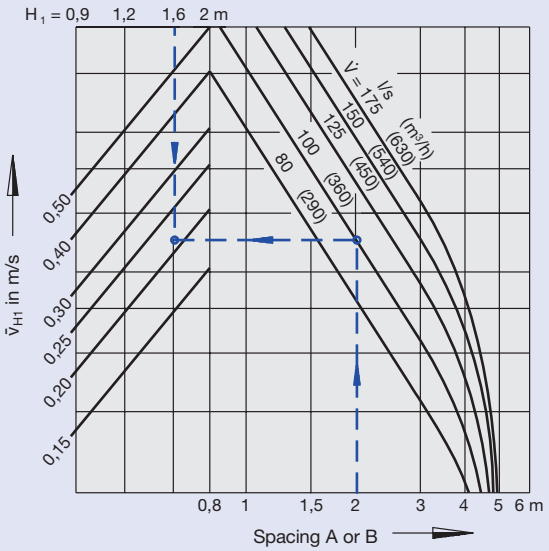
24 Diffuser arrangement: more than one row if B = 3.00 m



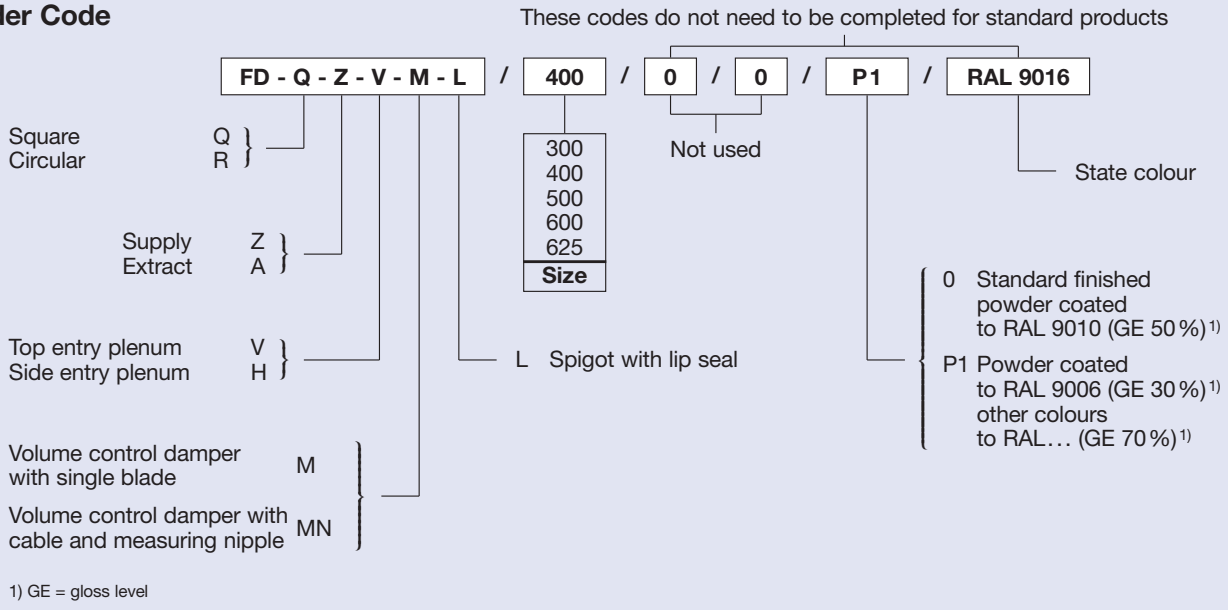
25 Temperature Quotient



26 Square Array of Diffusers



Order Code



1) GE = gloss level

Specification Text

Fixed swirl diffusers in square and circular construction for swirling, horizontal air discharge with high induction, for air change rates up to 30 per hour, comprising the diffuser face with radially arranged air control blades, top or side entry spigot, on request with spigot lip seal and/or volume control damper. On request, to measure the reference pressure, the spigot is fitted with a cable-adjusted volume control damper and measuring nipple.
The plenum with circular side entry spigot can be fitted to various TROX diffusers; however, variation in performance must be taken into account.

Materials:
Diffuser face is in galvanised sheet steel. The surfaces are pre-treated and powder coated white (RAL 9010). The plenum box is also of galvanised sheet steel, the lip seal of black rubber.

Order Example

Make: TROX
Type: FD - Q - Z - V - M / 400 / P1 / RAL 9016