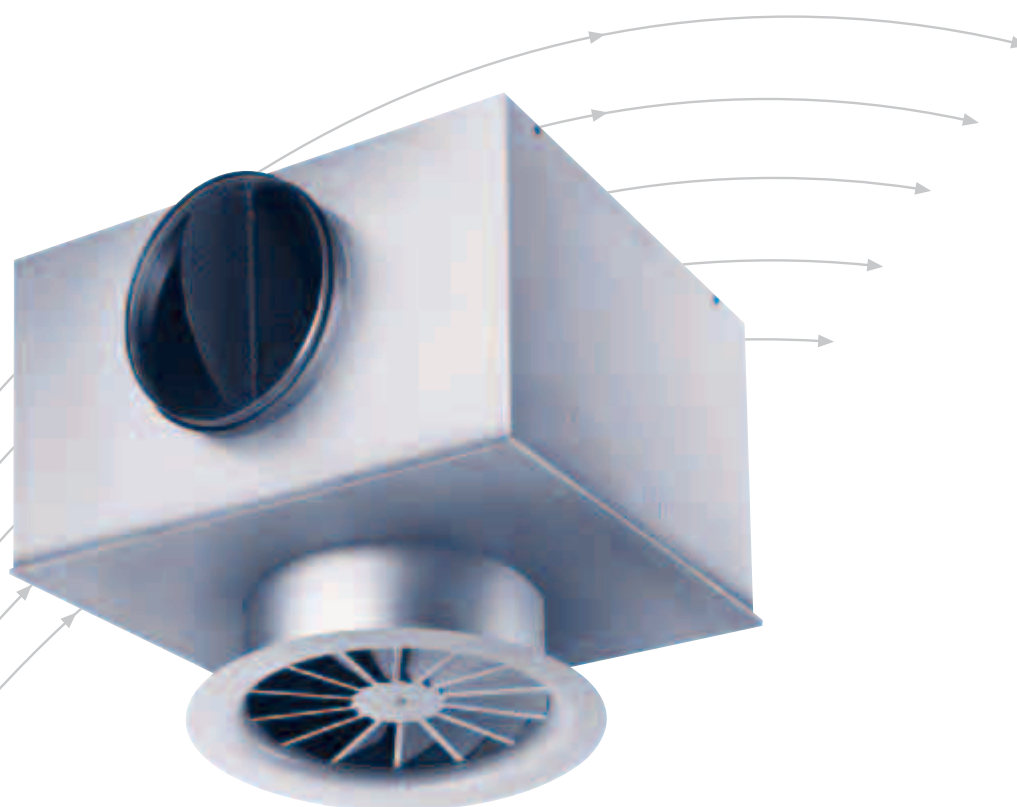


Swirl Diffusers

Type RFD

recommended for use in rooms with ceiling heights of approx. 2.60 . . . 4.00 m



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Construction RFD-Q



Construction RFD-R



The application of TROX swirl diffusers has been extended from the comfort conditioning field and has found a significant number of industrial applications. Therefore, to complete the range of FD swirl diffusers which have been so successful, the RFD range has been extended to include smaller diameters.

The construction of the diffuser results in a swirling rotational type of discharge of supply air ensuring a high level of induction and rapid reduction in temperature differential. The noise levels are low.

Swirl diffusers can be used in either constant or variable air volume systems with excellent performance characteristics when air flow reduces from 100 % to 25 %.

Swirl diffusers type RFD can be installed in many situations: in continuous ceilings, suspended without a ceiling, above open grid ceilings and in ceiling panels (max. 20 mm thick) using fixing clamps. On request, the face shape of the diffuser plate can be changed to meet specific architectural requirements.



Flow discharge characteristics

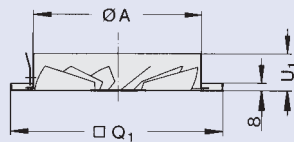
Construction · Dimensions

Dependant on requirements of maximum volumetric flow, noise level and installation situation, swirl diffusers are available with or without discharge nozzles. Depending on architectural demands the face can be circular or square. Duct connection details for the type RFD swirl diffuser are shown below.

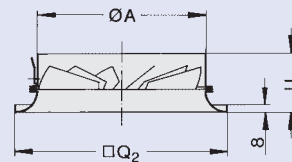
For types RFD-...-UO or RFD-...-UD, the top entry plenum box supplied includes the internal subframe. In this configuration the diffuser face is held in position by a central fixing bolt which has a decorative cap.

Size	A	C	D	Q ₁	Q ₂	R ₁	R ₂	U ₁	U ₂	U ₃	U ₄	U ₅	U ₆
125	123	120	98	198	198	158	200	50	75	128	153	154	192
160	158	155	123	198	248	197	250	53	78	133	158	159	196
200	198	195	158	248	248	241	300	53	78	136	161	162	197
250	248	245	198	298	298	295	350	50	75	141	166	167	202
315	313	310	248	398	398	364	450	53	88	148	183	174	219
400	398	395	313	498	498	450	580	53	88	158	193	184	229

RFD-Q-K

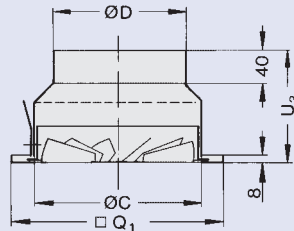


RFD-Q-D-K



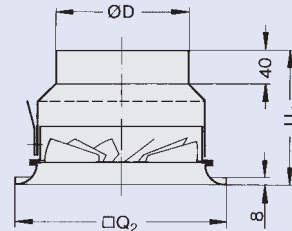
RFD-Q-US

Size 125 and 160 without perforated plate

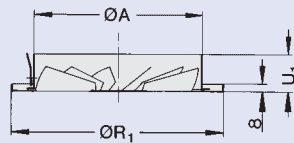


RFD-Q-D-US

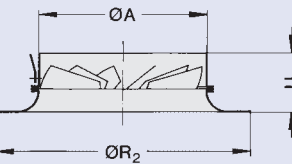
Size 125 and 160 without perforated plate



RFD-R-K

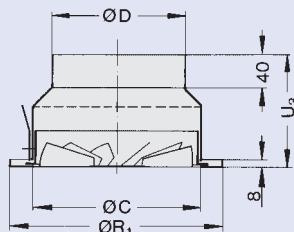


RFD-R-D-K



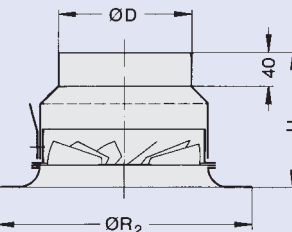
RFD-R-US

Size 125 and 160 without perforated plate



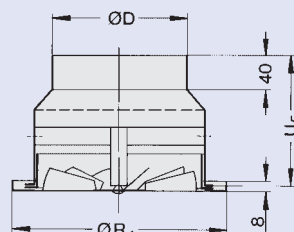
RFD-R-D-US

Size 125 and 160 without perforated plate



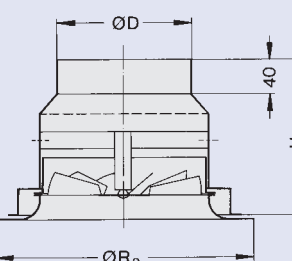
RFD-R-UO

Size 125 and 160 without perforated plate



RFD-R-D-UD

Size 125 and 160 without perforated plate



Construction · Dimensions

The face section of the diffuser or side entry plenum box is demountable, held in position by a central fixing bolt. The screw head is covered by a decorative cap.

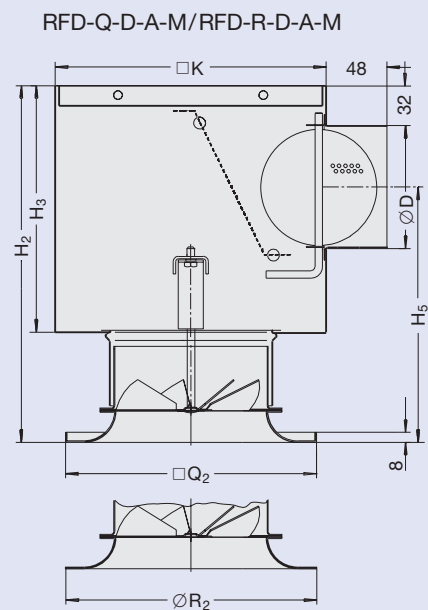
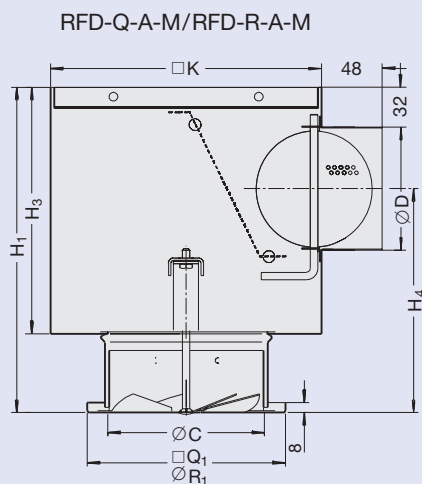
The plenum box can be supplied with a volume control damper or lip seal.

For type RFD-...-D-N (which is only available with discharge nozzle), the plenum box and diffuser face form an integral unit.

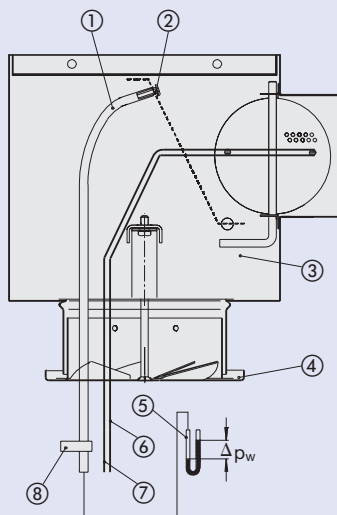
For simple adjustment of the volume flow, on request the plenum box can be provided with a test connection for measurement of reference pressures and a volume control damper, operated by sheathed cables. The characteristic curve of pressure reading versus volume flow rate for each size of plenum box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

Size	∅ C	∅ D	H ₁	H ₂	H ₃	H ₄	H ₅	H ₆	f	g	K	K ₁	K ₂	Q ₁	Q ₂	R ₁	R ₂	AK Code ¹⁾
125	123.5	98	259	284	195	178	204	152	26	159	216	264	283	198	198	158	200	AK 028
160	158.5	123	284	309	220	190	216	177	26	155	266	293	335	198	248	197	250	AK 029
200	198.5	158	314	339	250	202	228	212	26	195	290	373	392	248	248	241	300	AK 030
250	248.5	198	359	384	295	227	253	262	31	195	476	416	435	298	298	295	350	AK 031
315	313.5	248	409	444	345	252	289	312	31	230	567	476	496	398	398	364	450	AK 032
400	398.5	313	474	509	410	285	321	377	31	305	615	652	728	498	498	450	580	AK 033

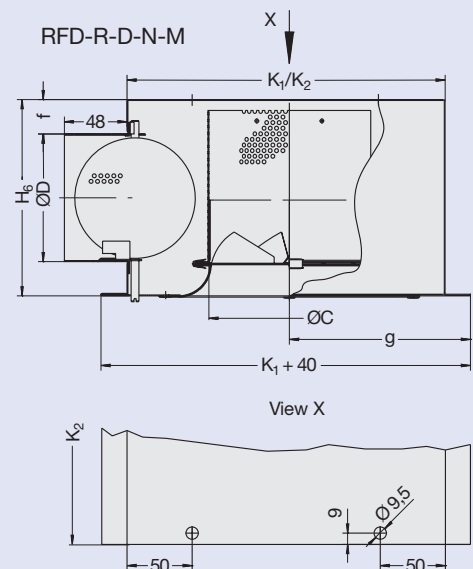
1) Not valid for RFD-R-D-N



Measurement of Reference Pressures



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



Installation · Fixing · Materials

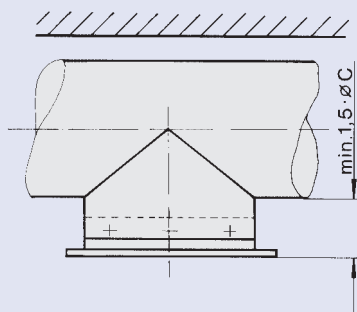
Installation · Fixing

Because of their excellent performance, type RFD swirl diffusers can be installed flush with a continuous ceiling or freely suspended (with discharge nozzle). Installation is also possible on stub ducts or suspended above a grid ceiling. For the suspended versions of the top or side entry plenums neck, transition piece and plenum box are fitted with suspension holes resp. suspension lugs. For ceiling panels up to 20 mm thickness, clamp fixing is possible without additional support from the slab ceiling itself. Ensure that the ceiling panels are stable.

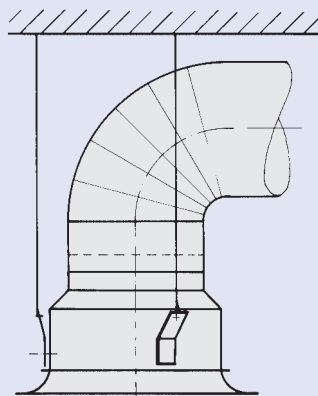
Materials

The diffuser face and side entry plenum boxes are made of rolled galvanised sheet steel. The discharge nozzle ring is made of sheet steel and the top entry spigot is made of aluminium. The surfaces of the face plate and discharge nozzle are pre-treated and powder-coated white (RAL 9010).

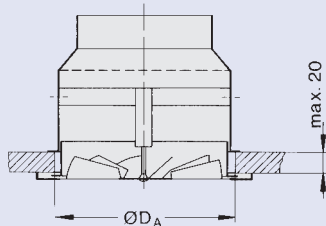
Construction	Cutout in ceiling $\varnothing D_A$ Sizes					
	125	160	200	250	315	400
RFD-Q with nozzle	170	205	233	283	380	480
RFD-Q without nozzle	140	175	215	265	330	415
RFD-R with nozzle	170	205	245	295	380	480
RFD-R without nozzle	140	175	215	265	330	415
RFD-R-UD with nozzle	165	200	240	290	375	460
RFD-R-UO without nozzle	125	160	200	250	315	400



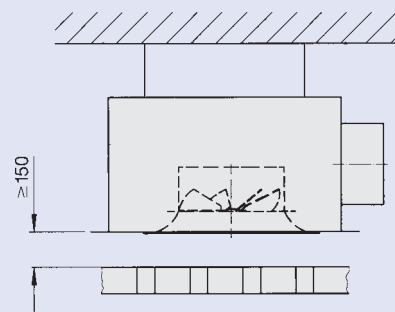
Mounting on a duct



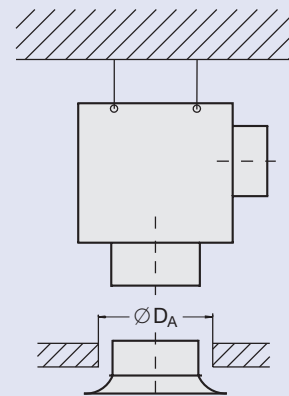
Mounting with hangers



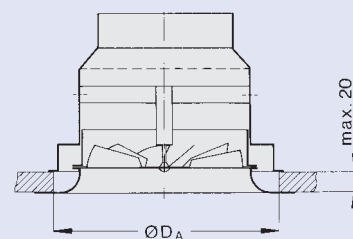
Mounting of front face with central fixing bolt (clamp fixing) Type ...UO



Arrangement above open grid (raster) ceilings



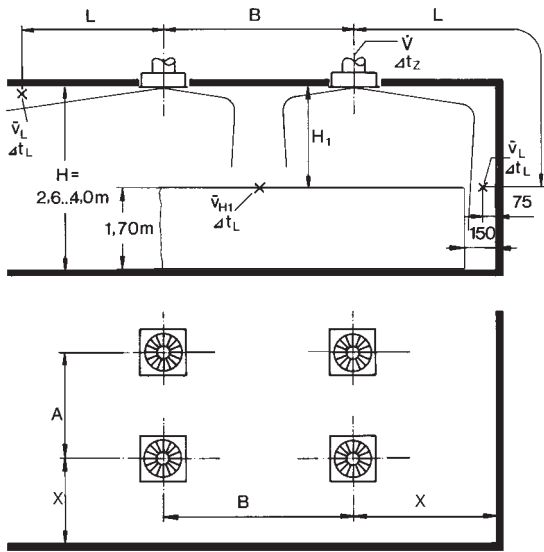
Mounting of front face with central fixing bolt



Mounting of front face with central fixing bolt (clamp fixing) Type ...UO

Nomenclature · Quick Selection · Spectral Data

Nomenclature



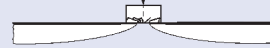
\dot{V}	in l/s:	Supply air volume flow per diffuser
\dot{V}	in m ³ /h:	Supply air volume flow per diffuser
A, B	in m:	Spacing between two diffusers
X	in m:	Spacing between diffuser centre and wall
H ₁	in m:	Distance between ceiling and occupied zone
\bar{v}_{H_1}	in m/s:	Time average air velocity between two diffusers, at distance from ceiling H ₁
L	in m:	Distance horizontal + vertical (X+H ₁) discharge to the wall
\bar{v}_L	in m/s:	Time average air velocity at wall
Δt_z	in K:	Temperature difference between supply air and room air
Δt_L	in K:	Differential between core and room temperature at distance L = A/2 + H ₁ or L = B/2 + H ₁ or L = X + H ₁
A _{eff}	in m ² :	Effective jet velocity
Δp_t	in Pa:	Total pressure drop (supply air)
L _{WA}	in dB(A):	A-weighted sound power level
L _{W NC}	:	NC rating of sound power level
L _{W NR}	:	L _{W NR} = L _{W NC} + 2
L _{pA} , L _{pNC}	:	A-weighting and NC rating respectively of room sound pressure level L _{pA} ≈ L _{WA} - 8 dB L _{pNC} ≈ L _{W NC} - 8 dB
ΔL	in dB/Okt.:	Relative sound power level with respect to L _{WA}
L _W	in dB/Okt.:	Octave band sound power level of regenerated noise L _W = L _{WA} + ΔL

Quick Selection

Continuous ceiling installation with discharge nozzle

Freely suspended with discharge nozzle

Continuous ceiling installation without discharge nozzle



Size	\dot{V}_{max}		\dot{V}_{min}		L _{WA max} dB(A)	L _{WNC max} NC	L _{WA min} dB(A)	L _{WNC min} NC	A _{eff} m ²
	l/s	m ³ /h	l/s	m ³ /h					
125	35	126	10	36	39	34	< 20	< 25	0.0034
160	50	180	13	47	38	33	< 20	< 25	0.0060
200	70	252	17	61	38	34	< 20	< 25	0.0092
250	110	396	30	108	38	33	< 20	< 25	0.0150
315	200	720	50	180	46	41	< 20	< 25	0.0265
400	270	972	70	252	46	40	< 20	< 25	0.0355

Size	\dot{V}_{max}		\dot{V}_{min}		L _{WA max} dB(A)	L _{WNC max} NC	L _{WA min} dB(A)	L _{WNC min} NC	A _{eff} m ²
	l/s	m ³ /h	l/s	m ³ /h					
125	20	72	7	25	39	34	< 20	< 25	0.0026
160	35	126	8	29	45	39	< 20	< 25	0.0037
200	50	180	13	47	37	32	< 20	< 25	0.0066
250	80	288	20	72	38	33	< 20	< 25	0.0110
315	150	540	35	126	45	40	< 20	< 25	0.0205
400	210	756	50	180	46	41	< 20	< 25	0.0280

Relative Spectra ΔL for damper angle 0°

Type	Effective jet velocity v _{eff} m/s	Octave band centre frequency Hz							
		63	125	250	500	1000	2000	4000	8000
RFD-...-D-K	4	7	3	5	-1	-10	-20	-27	-33
	5	6	2	4	0	-8	-17	-24	-31
	7	2	0	2	0	-7	-13	-19	-27
RFD-...-D-U	4	-2	-3	-1	-1	-6	-9	-14	-24
	5	8	3	4	0	-10	-20	-24	-33
	7	6	2	3	0	-8	-17	-21	-31
RFD-...-D-A	4	2	-1	1	0	-6	-12	-18	-28
	5	-3	-4	-2	-2	-5	-9	-15	-26
	7	12	6	4	-4	-6	-16	-27	-33
RFD-...-K	4	10	6	4	-4	-5	-14	-24	-31
	5	6	5	2	-4	-4	-12	-20	-28
	7	1	4	0	-4	-4	-9	-16	-26
RFD-...-U	2	18	9	5	-6	-16	-33	-44	-48
	3	13	7	5	-3	-12	-25	-36	-40
	5	5	3	4	-1	-8	-18	-26	-32
RFD-...-A	2	-1	0	2	-1	-6	-14	-21	-28
	4	14	3	5	-1	-15	-28	-41	-47
	3	10	2	5	0	-11	-22	-33	-40
RFD-...-U	5	3	0	3	0	-8	-16	-25	-33
	7	-2	-2	1	0	-6	-12	-19	-29
	2	17	11	5	-6	-17	-33	-34	-39
RFD-...-A	3	13	9	5	-4	-11	-25	-28	-34
	5	6	6	4	-3	-6	-17	-22	-30
	7	1	3	2	-4	-4	-13	-20	-29

Acoustic Data

Example

Data given:

Type RFD-R-D-US/125

Volume flow per diffuser

$$\dot{V} = 24 \text{ l/s}$$

Required: Octave band sound power level of regenerated noise L_w

Diagram 1:

Sound power level and pressure drop

$L_{WA} = 30 \text{ dB(A)}$

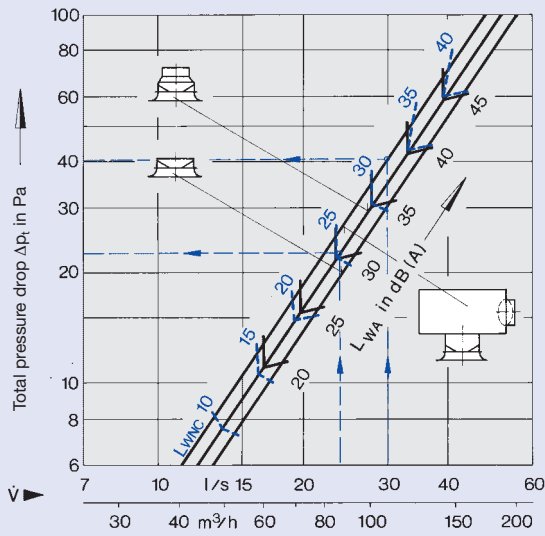
$\Delta p_t = 22 \text{ Pa}$

Effective jet velocity v_{eff} :

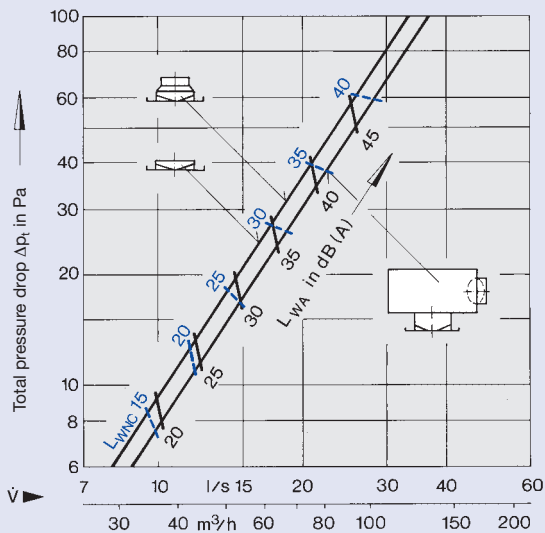
$$v_{\text{eff}} = \frac{\dot{V}}{A_{\text{eff}} \cdot 1000} = \frac{24}{0.0034 \cdot 1000} = 7.1 \text{ m/s}$$

Octave band centre frequency in Hz	63	125	250	500	1000	2000	4000	8000
L_{WA} in dB(A)	30	30	30	30	30	30	30	30
ΔL in dB	+ 2	- 1	+ 1	+ 0	- 6	- 12	- 18	- 28
L_w in dB	32	29	31	30	24	18	12	2

1 Sound power level and pressure drop Size 125 Construction with discharge nozzle



2 Sound power level and pressure drop Size 125 Construction without discharge nozzle



Correction to Diagram 1: Damper angle

Blade angle	0°	45°	90°
Δp_t	x 1	x 1.2	x 2
L_{WA}	-	-	-
L_{WNC}	-	-	-

Correction to Diagram 2: Damper angle

Blade angle	0°	45°	90°
Δp_t	x 1	x 1.1	x 1.6
L_{WA}	-	-	-
L_{WNC}	-	-	-

Acoustic Data

Correction to Diagram 3: Damper angle

Blade angle	0°	45°	90°
Δp_t	x 1	x 1.2	x 2.4
L_{WA}	-	+ 1	+ 3
L_{WNC}	-	+ 1	+ 3

Correction to Diagram 5: Damper angle

Blade angle	0°	45°	90°
Δp_t	x 1	x 1.2	x 2.1
L_{WA}	-	+ 1	+ 4
L_{WNC}	-	+ 1	+ 4

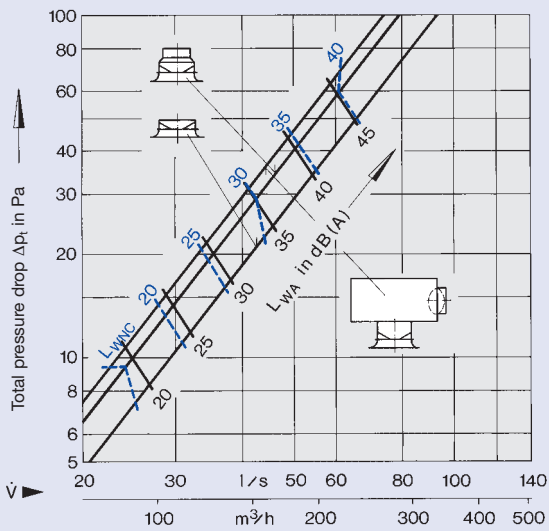
Correction to Diagram 4: Damper angle

Blade angle	0°	45°	90°
Δp_t	x 1	x 1.1	x 1.6
L_{WA}	+ 3	+ 3	+ 4
L_{WNC}	+ 3	+ 3	+ 4

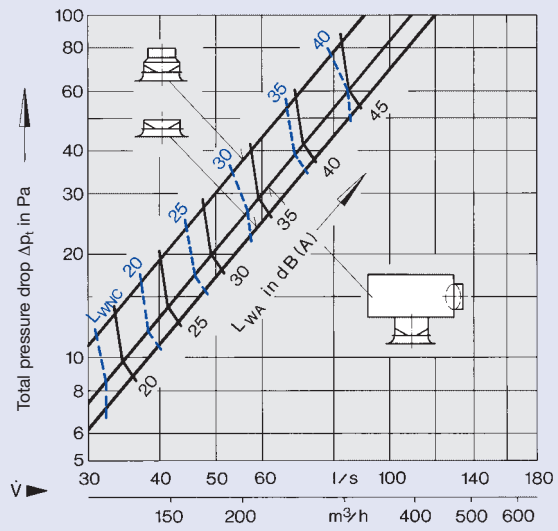
Correction to Diagram 6: Damper angle

Blade angle	0°	45°	90°
Δp_t	x 1	x 1.2	x 1.7
L_{WA}	+ 3	+ 4	+ 5
L_{WNC}	+ 3	+ 4	+ 5

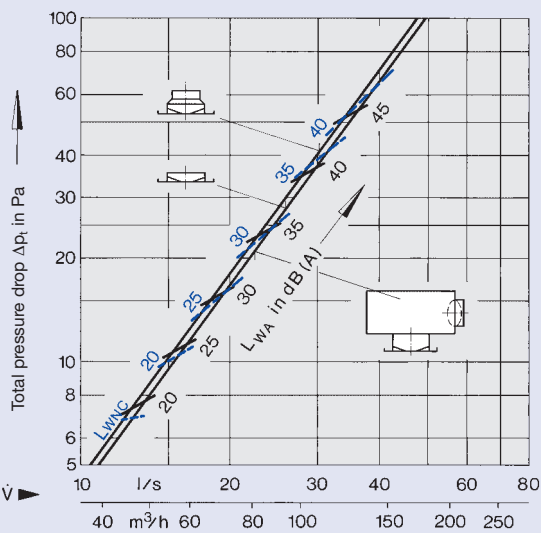
3 Sound power level and pressure drop Size 160 Construction with discharge nozzle



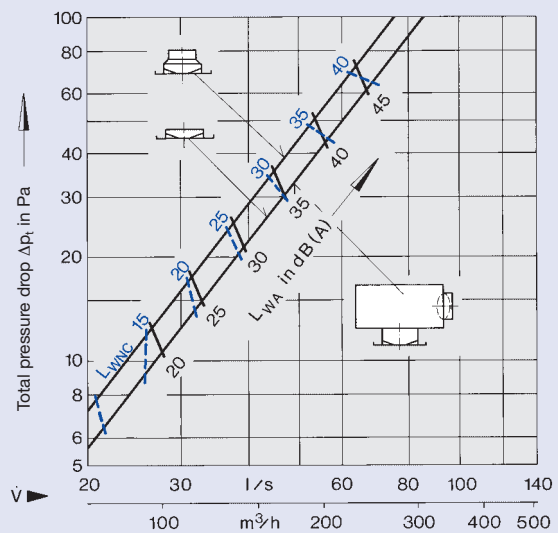
5 Sound power level and pressure drop Size 200 Construction with discharge nozzle



4 Sound power level and pressure drop Size 160 Construction without discharge nozzle



6 Sound power level and pressure drop Size 200 Construction without discharge nozzle



Correction to Diagram 7: Damper angle

Blade angle	0°	45°	90°
Δp_t	x 1	x 1.2	x 2.1
L_{WA}	-	-	+ 1
L_{WNC}	-	-	+ 1

Correction to Diagram 9: Damper angle

Blade angle	0°	45°	90°
Δp_t	x 1	x 1.2	x 2
L_{WA}	-	-	+ 1
L_{WNC}	-	-	+ 1

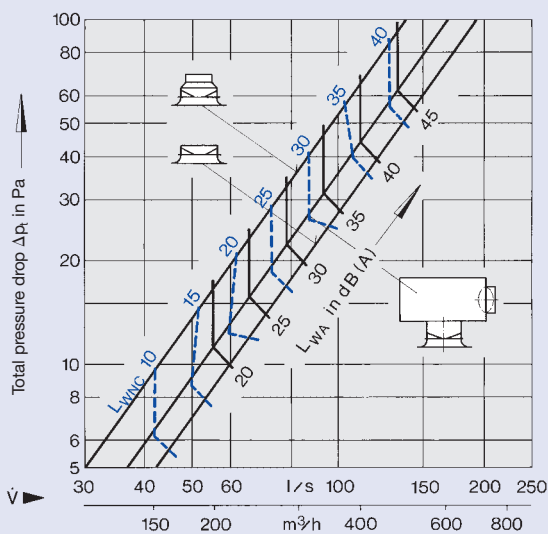
Correction to Diagram 8: Damper angle

Blade angle	0°	45°	90°
Δp_t	x 1	x 1.2	x 1.8
L_{WA}	-	-	+ 1
L_{WNC}	-	-	+ 1

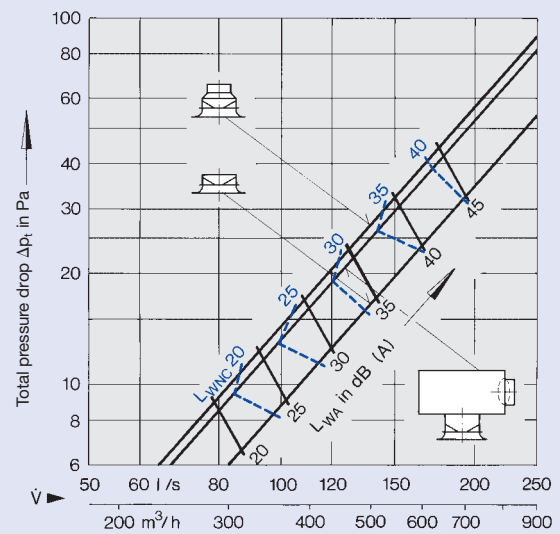
Correction to Diagram 10: Damper angle

Blade angle	0°	45°	90°
Δp_t	x 1	x 1.1	x 1.6
L_{WA}	-	-	+ 1
L_{WNC}	-	-	+ 1

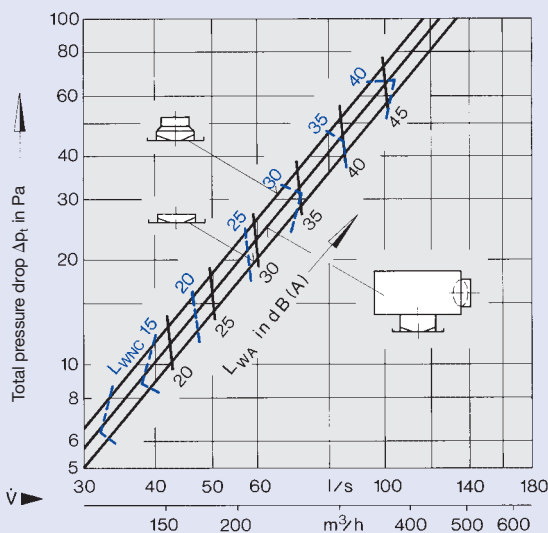
7 Sound power level and pressure drop Size 250 Construction with discharge nozzle



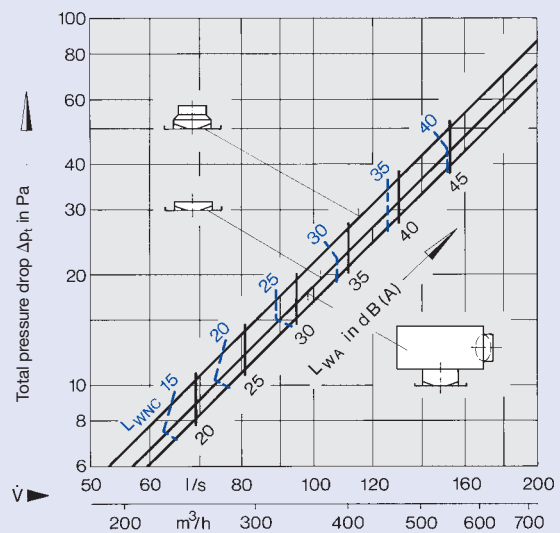
9 Sound power level and pressure drop Size 315 Construction with discharge nozzle



8 Sound power level and pressure drop Size 250 Construction without discharge nozzle



10 Sound power level and pressure drop Size 315 Construction without discharge nozzle



Acoustic Data

Example

Data given:

Volume flow per diffuser $\dot{V} = 30 \text{ l/s}$
 Supply air temperature differential $\Delta t_z = -8 \text{ K}$
 Sound pressure level in room $L_A = 40 \text{ dB(A)}$
 Room height $H = 3.0 \text{ m}$
 Required: spacing dimensions $A \times B = 3.20 \text{ m} \times 3.20 \text{ m}$
 Distance to side wall $X = 1.60$
 Flush installation in ceiling with discharge nozzle. Due to restricted ceiling void, plenum box with side entry spigot is required.

Diagram 11: Sound power level and pressure drop
 RFD-R-D-A/125
 $L_{WA} = 37 \text{ dB(A)}$
 $\Delta p_t = 40 \text{ Pa}$
 To arrive at room sound pressure level, corrections are required for the number of diffusers and room absorption.

Diagram 13: Diffuser arrangement if $B = 2.80 \text{ m}$
 $A = 3.20 \text{ m}$
 $H_1 = H - 1.70 \text{ m} = 1.30 \text{ m}$
 At $\dot{V} = 30 \text{ l/s}$, $\bar{v}_{H1} = 0.20 \text{ m/s}$

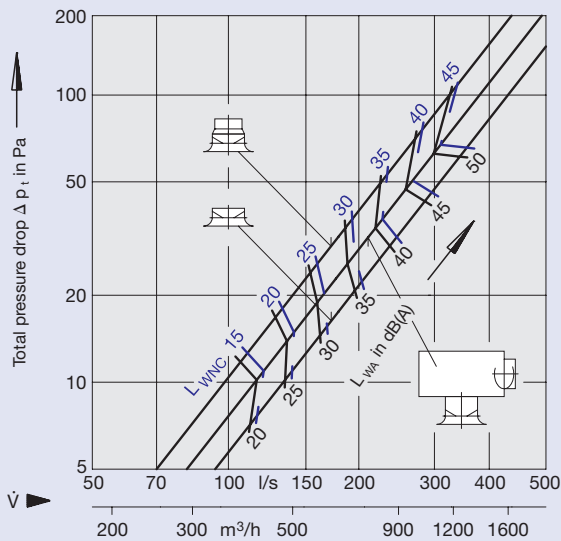
Diagram 14: Diffuser arrangement: single or more than one row if $B \geq 4.00 \text{ m}$

$\bar{v}_{H1} = 0.14 \text{ m/s}$
 Diagram 13 applies for $B = 2.80 \text{ m}$
 and diagram 14 for $B \geq 4.00 \text{ m}$
 As B is given 3.20 m , interpolation is required between the values from the above graphs

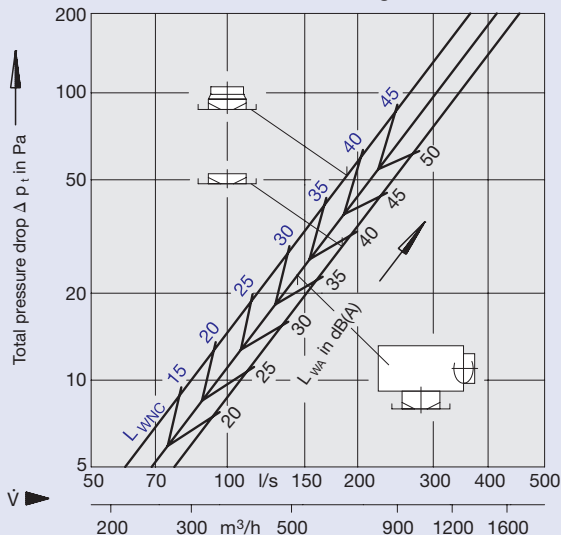
$\bar{v}_{H1} = 0.20 \text{ m/s}$ and
 $\bar{v}_{H1} = 0.14 \text{ m/s}$.
 This results in $\bar{v}_{H1} = 0.17 \text{ m/s}$

Diagram 15: Air velocity at the wall and temperature quotient
 $L = X + H_1 = 1.60 \text{ m} + 1.30 \text{ m} = 2.90 \text{ m}$
 $A = 3.20 \text{ m}$
 Note the line $A = 3.0 \text{ m}$ is also valid for all values above 3.0 m .

11 Sound power level and pressure drop Size 400
 Construction with discharge nozzle



12 Sound power level and pressure drop Size 400
 Construction without discharge nozzle



Correction to Diagram 11: Damper angle

Blade angle	0°	45°	90°
Δp_t	x 1	x 1.1	x 2.3
L_{WA}	-	-	+ 2
L_{WNC}	-	-	+ 2

Correction to Diagram 12: Damper angle

Blade angle	0°	45°	90°
Δp_t	x 1	x 1.1	x 2.0
L_{WA}	-	-	+ 2
L_{WNC}	-	-	+ 2

Aerodynamic Data RFD 125

Air velocity at a distance 75 mm from the wall
 $\bar{v}_L = 0.21 \text{ m/s}$

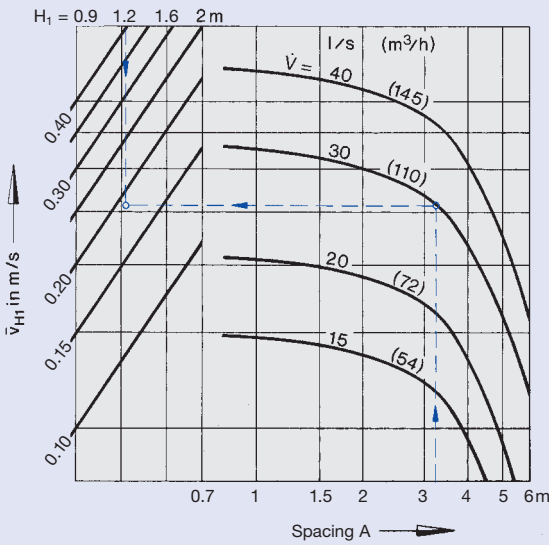
$L = X + H_1 = 2.90 \text{ m}$
 $L = A/2 + H_1 = 2.90 \text{ m}$
 $\Delta t_L / \Delta t_z = 0.019$
 $\Delta t_L = 0.019 \times (-8) = -0.15 \text{ K}$

Diagrams 13 to 16:
Permitted volume flow ranges
see Selection Table Page 6.

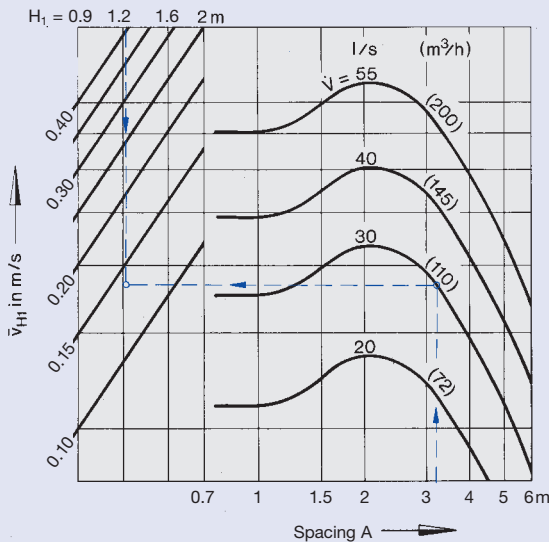
Diagrams 13 to 16 are applicable to configurations with discharge nozzle. The following corrections should be used for configurations without discharge nozzle:

$\Delta t_L / \Delta t_z$	\bar{v}_{H1}	\bar{v}_L
x 0.76	x 1.37	x 1.31

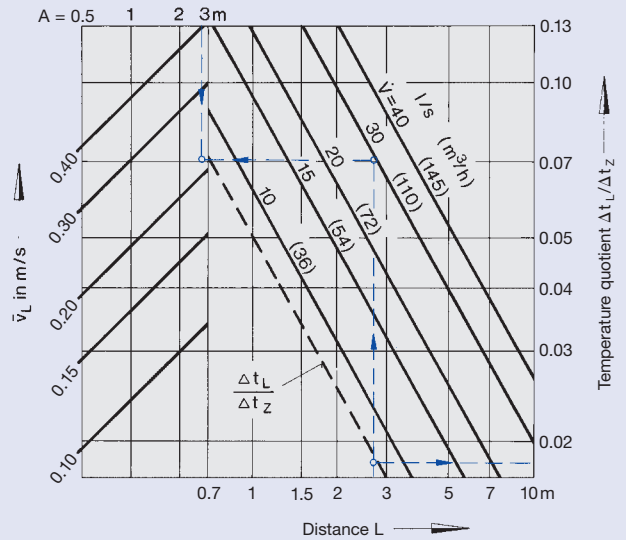
13 Diffuser arrangement: more than one row if $B = 2.80 \text{ m}$



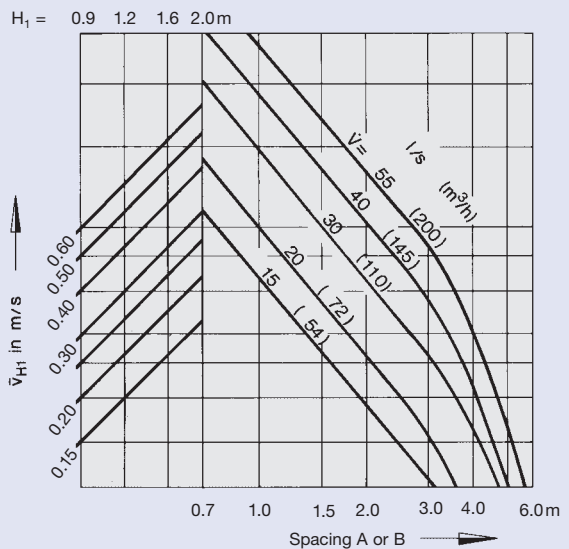
14 Diffuser arrangement: single or more than one row if $B \geq 4.00 \text{ m}$



15 Air velocity at the wall and temperature quotient



16 Square diffuser



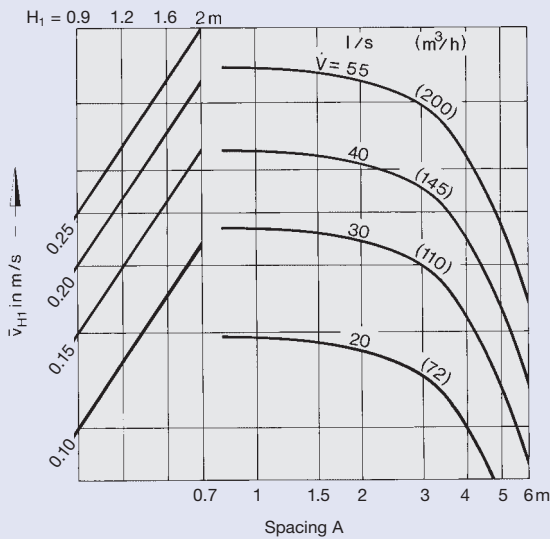
Aerodynamic Data RFD 160

Diagrams 17 to 20:
Permitted volume flow ranges
 see Selection Table Page 6.

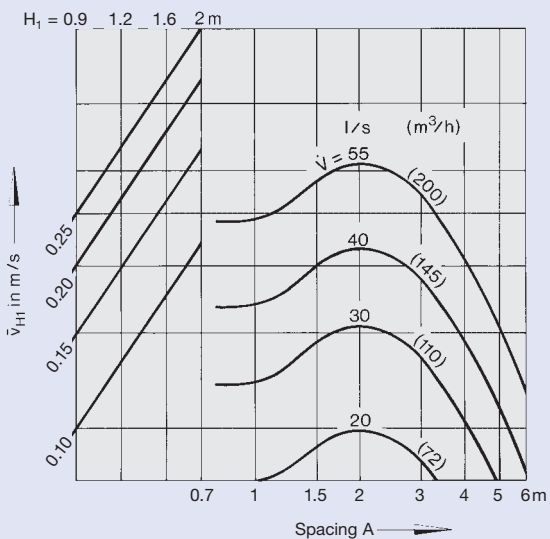
Diagrams 17 to 20 are applicable to configurations with discharge nozzle. The following corrections should be used for configurations without discharge nozzle:

$\Delta t_L / \Delta t_z$	\bar{v}_{H1}	\bar{v}_L
x 0.74	x 1.40	x 1.32

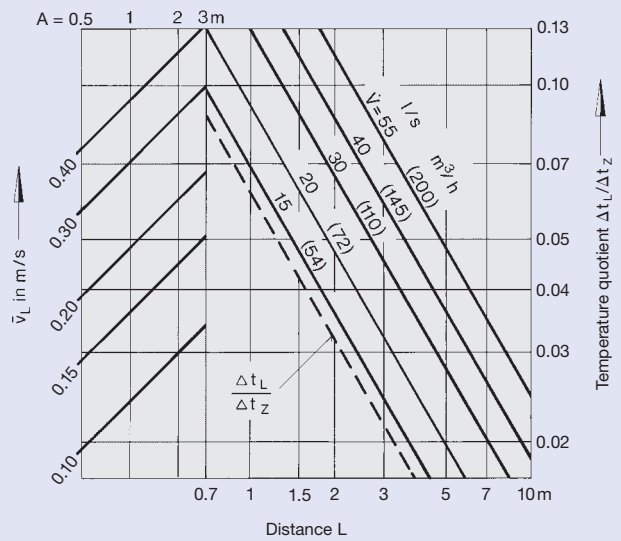
17 Diffuser arrangement: more than one row if $B = 2.80$ m



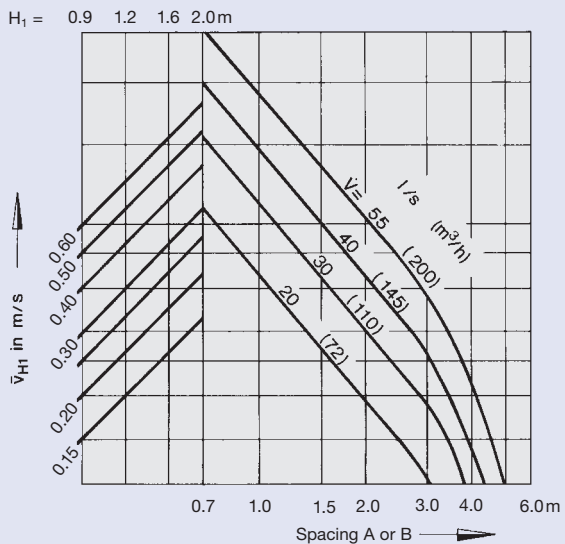
18 Diffuser arrangement single or more than one row if $B \geq 4.00$ m



19 Air velocity at the wall and temperature quotient



20 Square diffuser



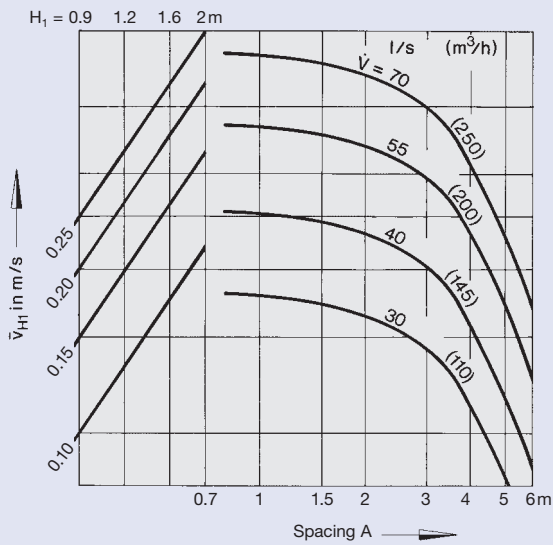
Aerodynamic Data RFD 200

Diagrams 21 to 24:
Permitted volume flow ranges
see Selection Table Page 6.

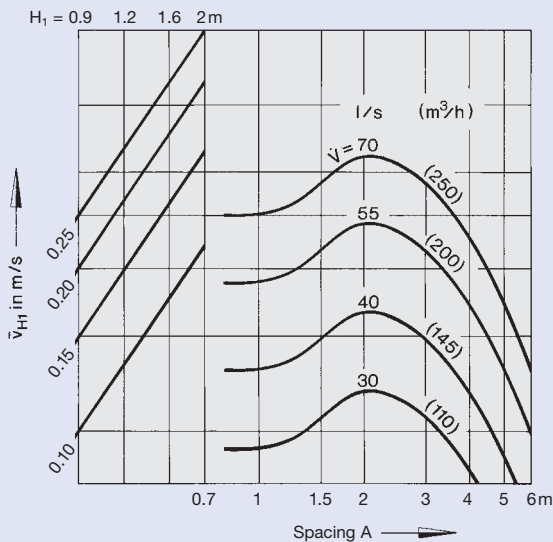
Diagrams 21 to 24 are applicable to configurations with discharge nozzle. The following corrections should be used for configurations without discharge nozzle:

$\Delta t_L / \Delta t_z$	\bar{v}_{H1}	\bar{v}_L
x 0.84	x 1.20	x 1.18

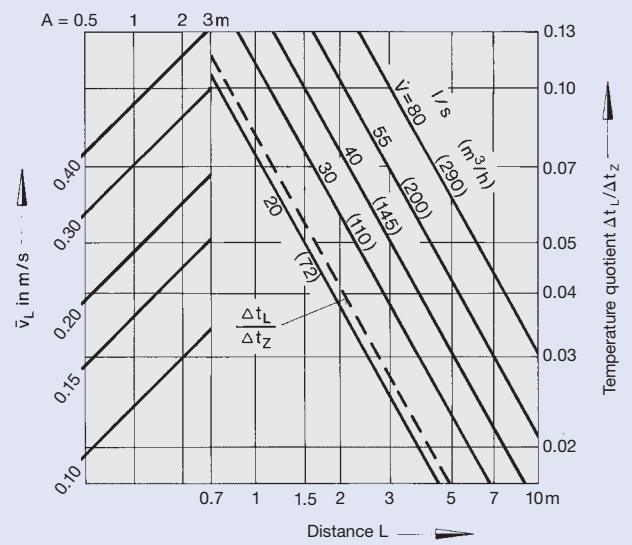
21 Diffuser arrangement: more than one row if $B = 2.80$ m



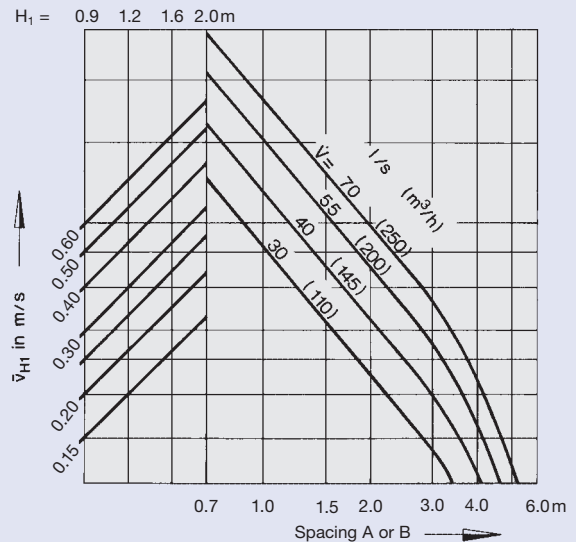
22 Diffuser arrangement: single or more than one row if $B \geq 4.00$ m



23 Air velocity at the wall and temperature quotient



24 Square diffuser



Aerodynamic Data RFD 250

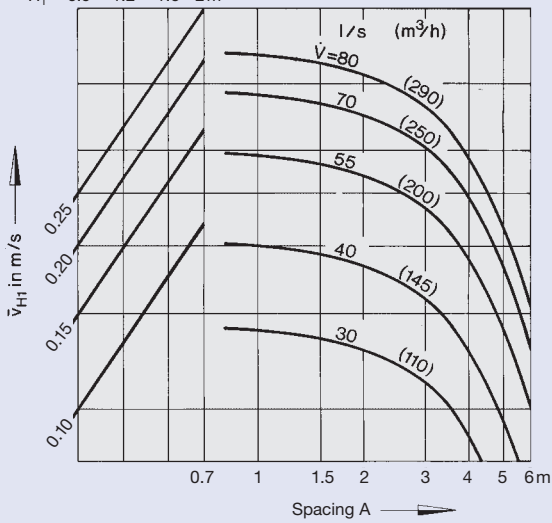
Diagrams 25 to 28:
Permitted volume flow ranges
see Selection Table Page 6.

Diagrams 25 to 28 are applicable to configurations with discharge nozzle. The following corrections should be used for configurations without discharge nozzle:

$\Delta t_L / \Delta t_z$	\bar{v}_{H1}	\bar{v}_L
x 0.84	x 1.20	x 1.18

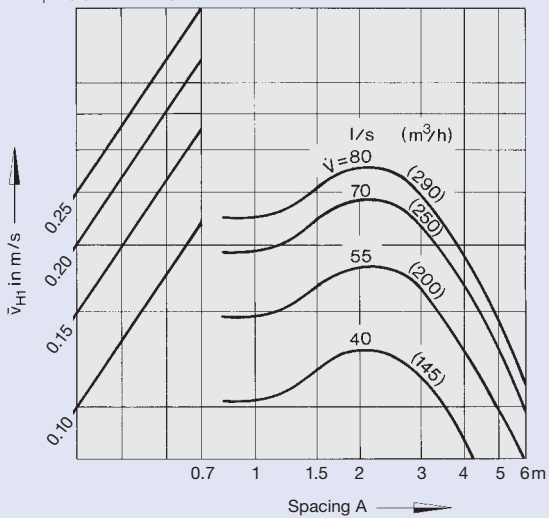
25 Diffuser arrangement: more than one row
if $B = 2.80$ m

$H_1 = 0.9 \quad 1.2 \quad 1.6 \quad 2.0$ m



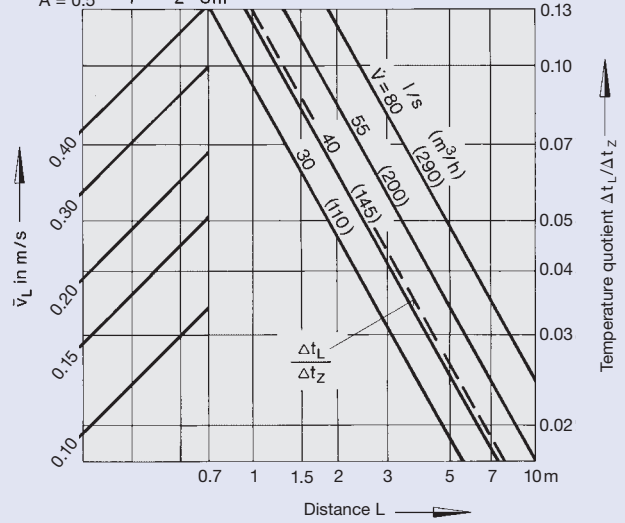
26 Diffuser arrangement: single or more than one row
if $B \geq 4.00$ m

$H_1 = 0.9 \quad 1.2 \quad 1.6 \quad 2.0$ m



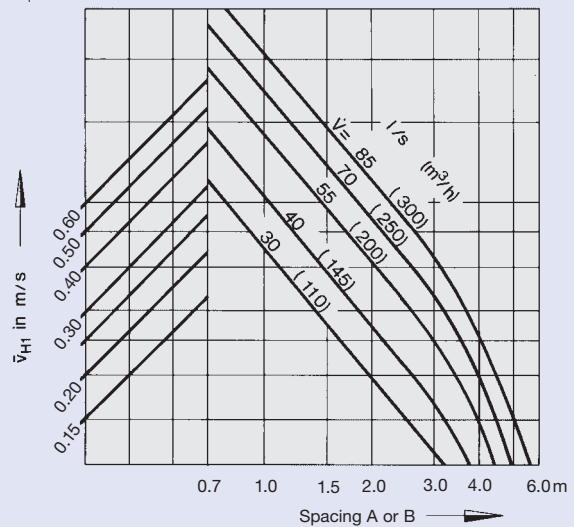
27 Air velocity at the wall and temperature quotient

$A = 0.5 \quad 1 \quad 2 \quad 3$ m



28 Square diffuser

$H_1 = 0.9 \quad 1.2 \quad 1.6 \quad 2.0$ m



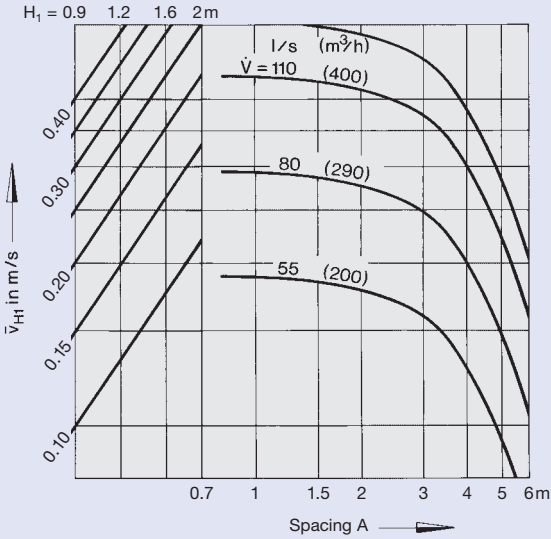
Aerodynamic Data RFD 315

Diagrams 29 to 32:
Permitted volume flow ranges
see Selection Table Page 6.

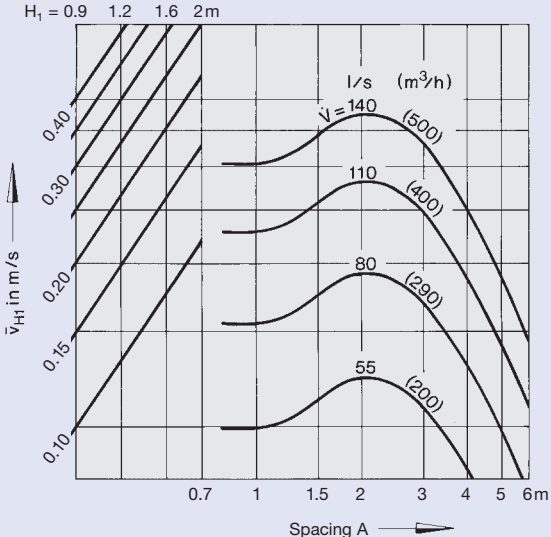
Diagrams 29 to 32 are applicable to configurations with discharge nozzle. The following corrections should be used for configurations without discharge nozzle:

$\Delta t_L / \Delta t_z$	\bar{v}_{H1}	\bar{v}_L
x 0.88	x 1.16	x 1.13

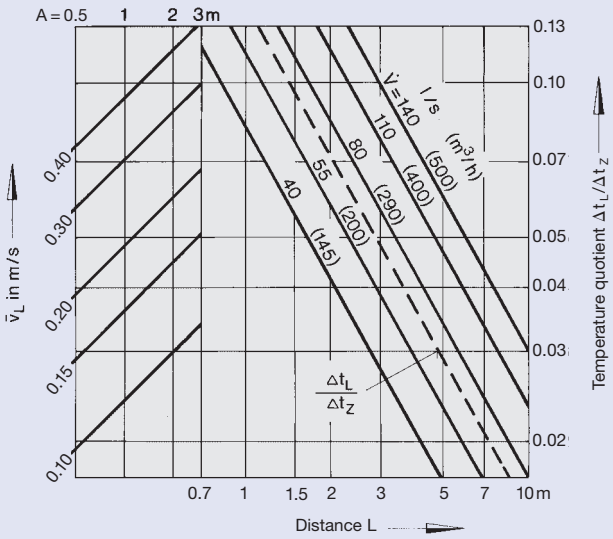
29 Diffuser arrangement: more than one row if $B = 2.80$ m



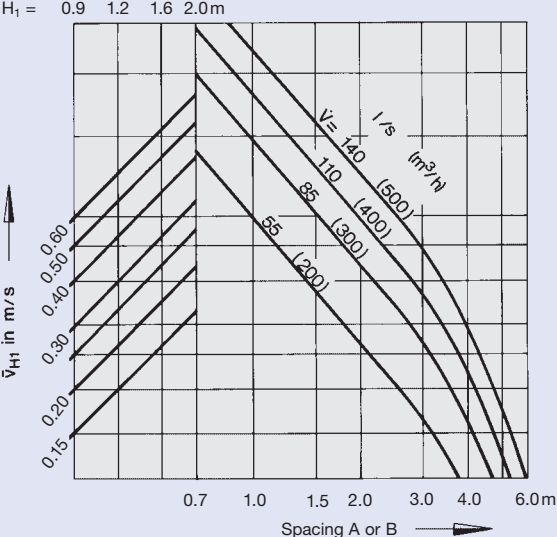
30 Diffuser arrangement: single or more than one row if $B \geq 4.00$ m



31 Air velocity at the wall and temperature quotient



32 Square diffuser



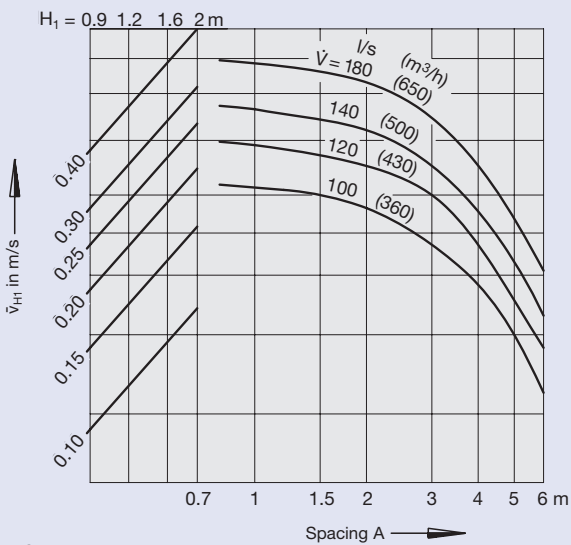
Aerodynamic Data RFD 400

Diagrams 33 to 36:
Permitted volume flow ranges
 see Selection Table Page 6.

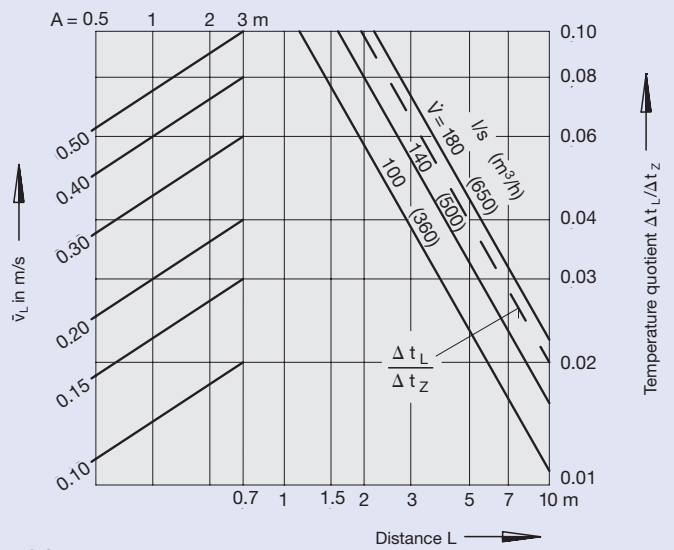
Diagrams 33 to 36 are applicable to configurations with discharge nozzle. The following corrections should be used for configurations without discharge nozzle:

$\Delta t_L / \Delta t_z$	\bar{v}_{H1}	\bar{v}_L
x 0.89	x 1.15	x 1.13

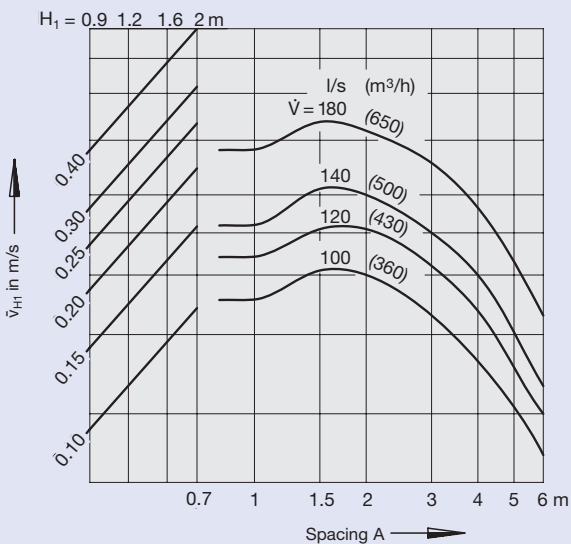
33 Diffuser arrangement: more than one row if $B = 2.80$ m



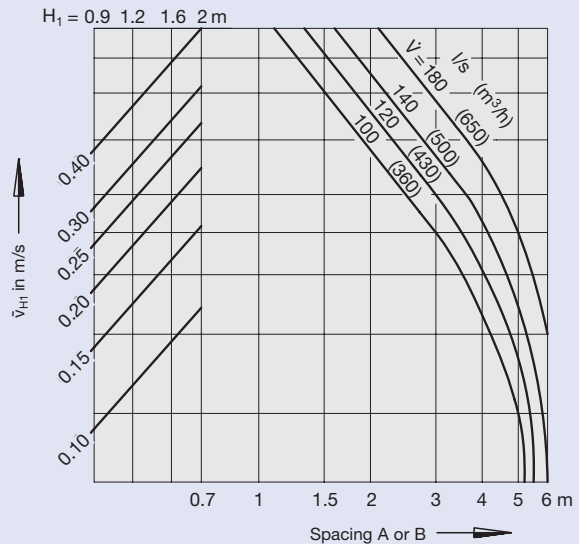
35 Air velocity at the wall and temperature quotient



34 Diffuser arrangement: single or more than one row if $B \geq 4.00$ m



36 Square diffuser



Specification Text

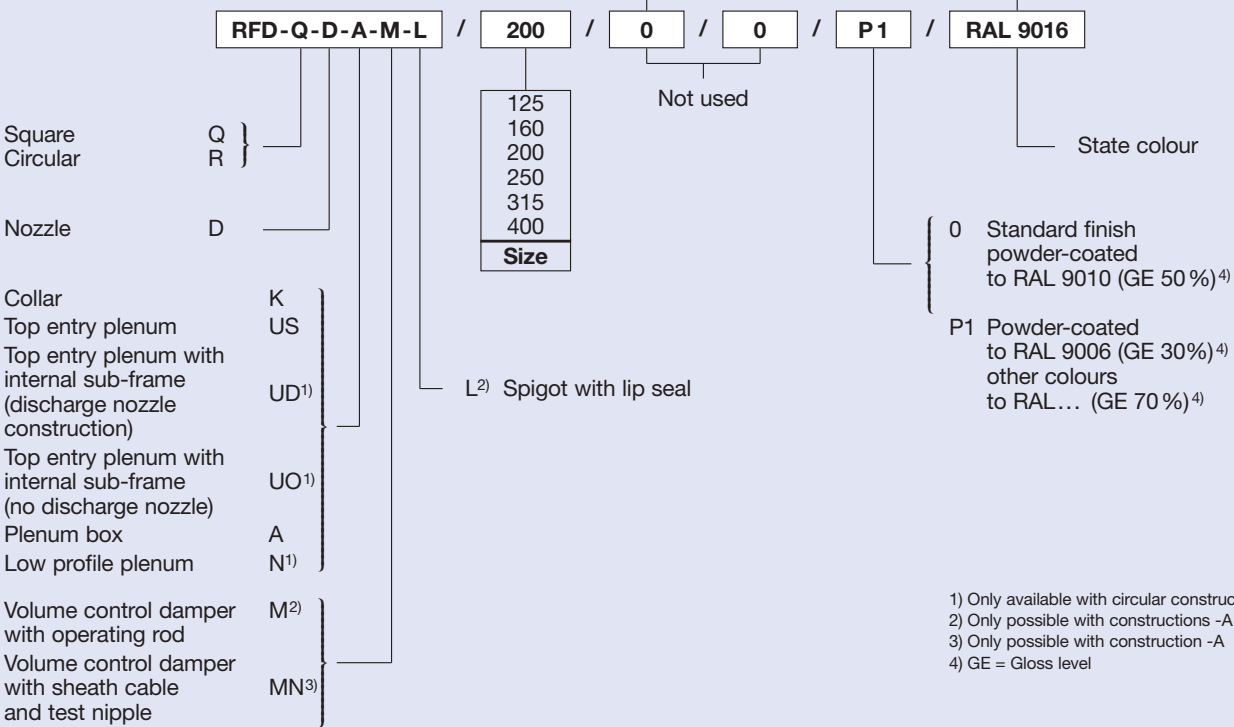
Swirl Diffusers with square or circular face with swirling horizontal discharge of supply air with high induction, consisting of a pressed front face with radially angled fixed air guide blades. Optionally with fixed top entry plenum or top entry plenum with internal sub frame, maximum tile thickness 20 mm, or with circular side entry plenum box with circular spigot and additional options of lip seal or volume control damper. To measure reference pressure, the spigot can be fitted with sheathed cable adjusted volume control damper and measuring nipple on request. Plenum boxes complete with holes in top flange or fitted brackets for mounting. The diffuser face can be fixed or removed by means of a centre fix screw.

Materials:

The diffuser face and plenum box are made from sendzimir galvanised sheet steel.
 The lip seal is made from black rubber.
 The discharge nozzle ring is made of sheet steel and the top entry spigot is made of aluminium.
 The diffuser face and nozzle surfaces are pre-treated and powder-coated in white (RAL 9010).

Order Code

These codes do not need to be completed for standard products



Order Example

Make: TROX
 Type: RFD-Q-D-A-M-L/200/P1/RAL 9016