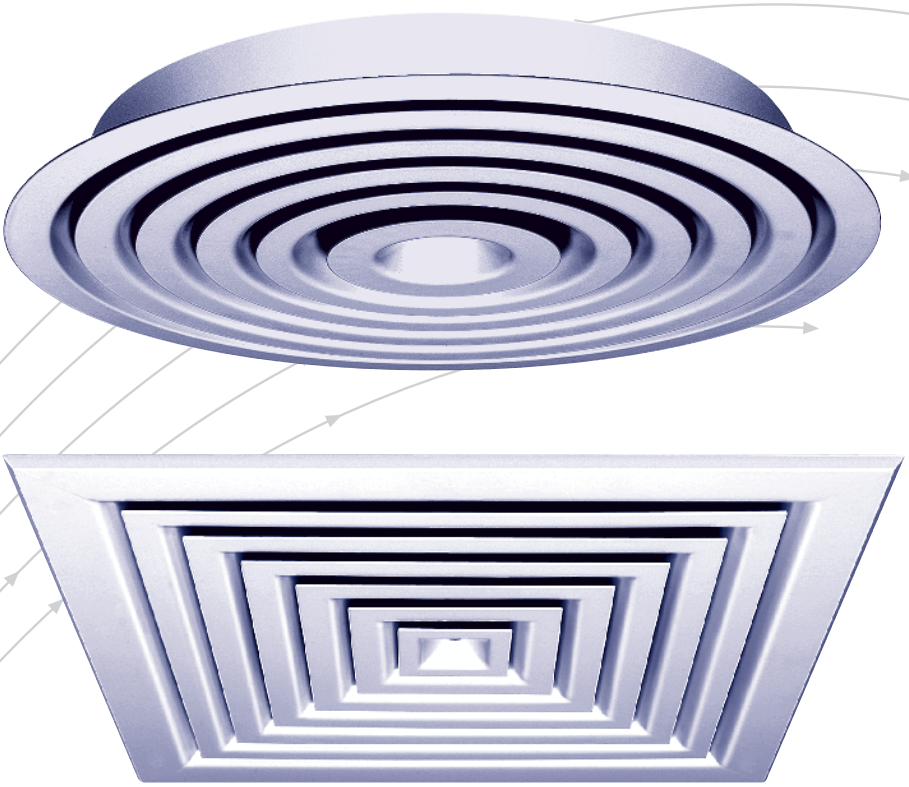
Ceiling diffusers

Type DD / DDRQ / DDQ

circular and square



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Contents

Application

The square ceiling diffusers and the circular ceiling diffusers are suitable for the introduction of supply air or the removal of extract air in the ceiling. They are available with circular or square exterior frames. The two designs, flat (type F) and conical (type K), differ - above all - in their free cross-section. They blow the air flat along the ceiling and therefore can be employed as well for rooms with a low height.

Ceiling diffusors are suitable for:
– Installations with constant flow rates
– Installations with variable air volumes (VAV)

Realisation

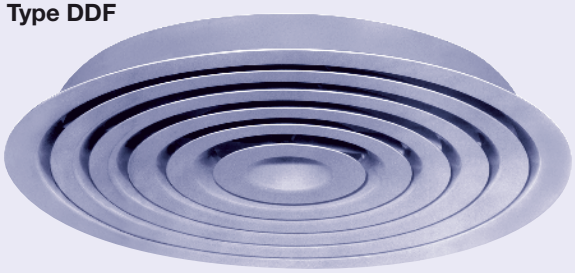
Circular with circular exterior frame type DD

Material and colour
Steel, powder-coated according to RAL 9010, matt, 25% brilliance

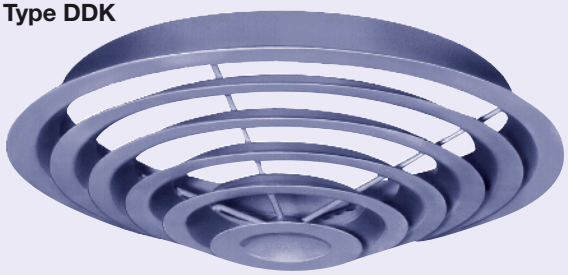
Fixation possibility
by means of a central screw

Damper
Sliding damper: Aluminium untreated (possibility of adjustment from below by means of a concealed lever)

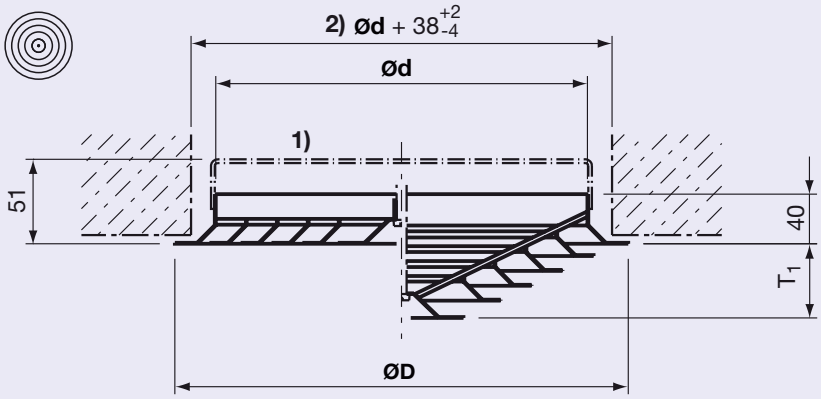
Type DDF



Type DDK



Dimensions



1) Sliding damper
2) Recess

Type	ND	ØD [mm]	Ød (external) [mm]	T1 [mm]
DD	150	216	152	24
	200	266	202	26
	250	316	252	48
	300	366	302	60
	400	466	402	84
	500	566	502	108

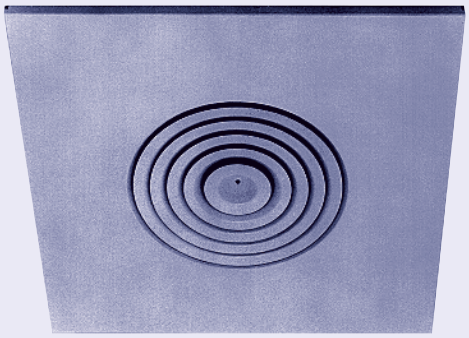
Realisation

Circular with square exterior ceiling plate type DDRQ
Material and colour
Steel, powder-coated according to RAL 9010, matt, 25% brilliance

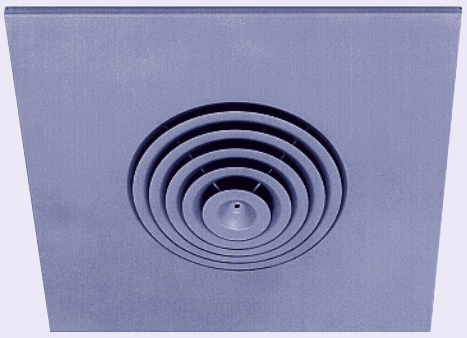
Fixation possibility
by means of a central screw or inserted in the ceiling construction

Damper
Sliding damper: Aluminium untreated (possibility of adjustment from below by means of a concealed lever)

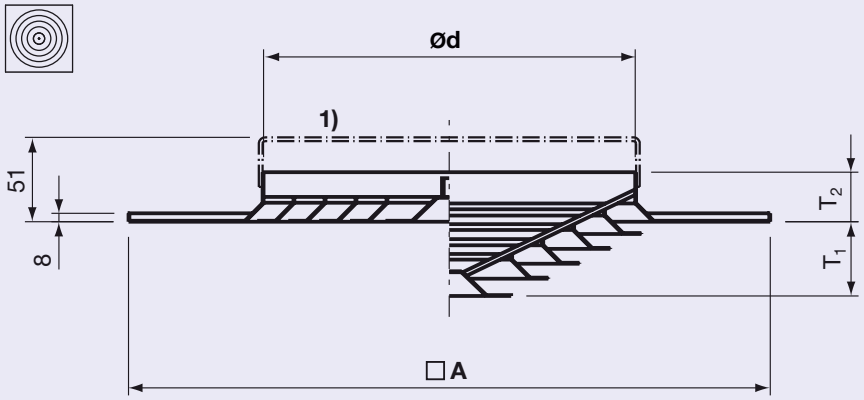
Type DDRQ F



Type DDRQ K



Dimensions



1) Sliding damper

Type	ND		□ A [mm]	Ød (external) [mm]	T1 [mm]	T2 [mm]
DDRQ	598×	150	598	152	24	40
		200		202	26	40
		250		252	48	40
	623×	300	623	302	60	24
		400		402	84	24
		500		502	108	24

Realisation · Dimensions

Realisation

Square type DDQ

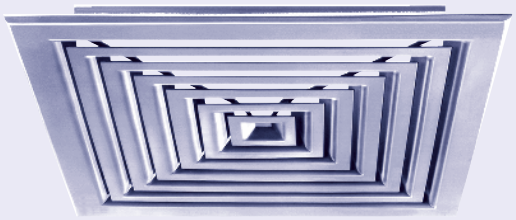
Material and colour
Steel, powder-coated according to RAL 9010, matt, 25% brilliance

Fixation possibility
by means of a central screw

Damper

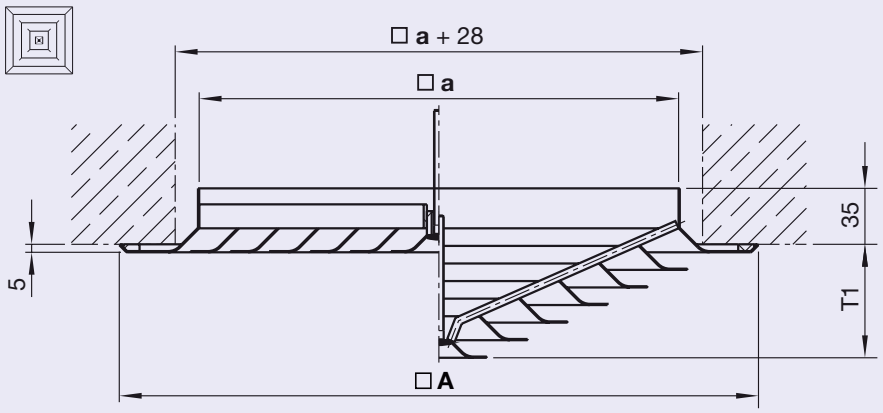
Sliding damper	Aluminium untreated
opposed blade damper	Frame: Hot galvanized steel Blades: Aluminium untreated (possibilities of adjustment from below by means of a concealed lever)

Type DDQF

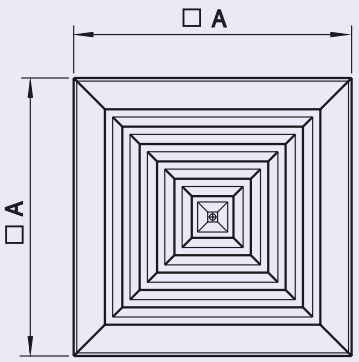


Type DDQK

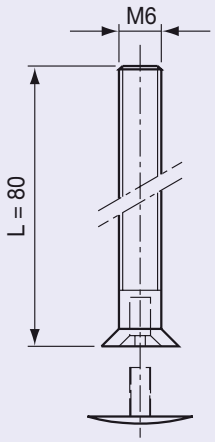
Dimensions



View from below



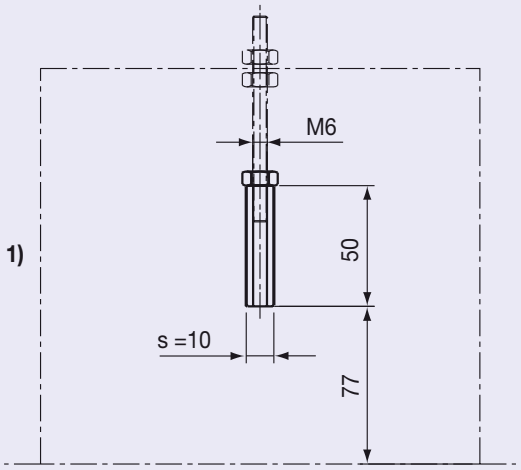
Type	ND	□ A [mm]	□ a (external) [mm]	T1 [mm]
DDQ	300×200	300	202	49
	400×300	400	302	71
	500×400	500	402	93
	600×500	600	502	115
	625×500	625	502	115



Central screw with plastic plug

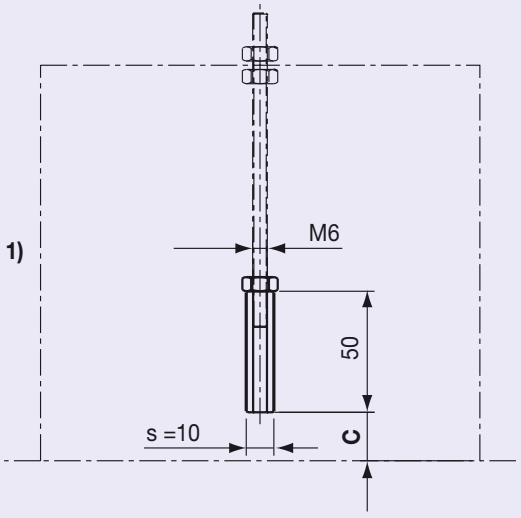
for type DDQ**F**, DD**F** and DDRQ**F**

For the installation with the plenum box AKH... and the **conical** diffuser we provide **longer** central screws.



1) builder's supply (p.e. duct)

Threaded pipe coupling
GRM6 for type DDQ**F**, DD**F** and DDRQ**F**



1) builder's supply (p.e. duct)

Threaded pipe coupling
GRM6 for type DDQ**K**, DD**K** and DDRQ**K**

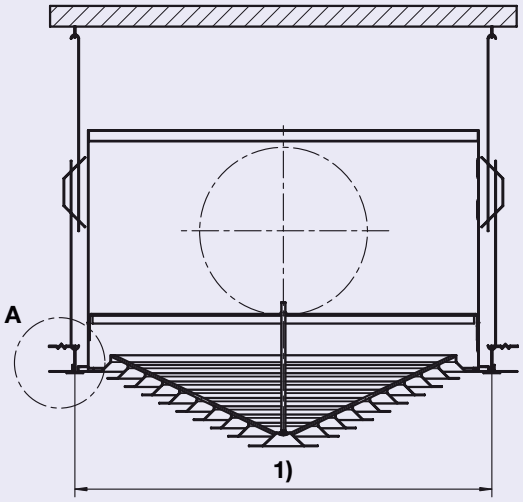
Type DD / DDRQ	**Ød**	**[mm]**	**152**	**202**	**252**	**302**	**402**	**502**
	C	**[mm]**	80	50	37	25	0	-22

Type DDQ	**□ a**	**[mm]**	**202**	**302**	**402**	**502**
	C	**[mm]**	32	10	-12	-34

Installation

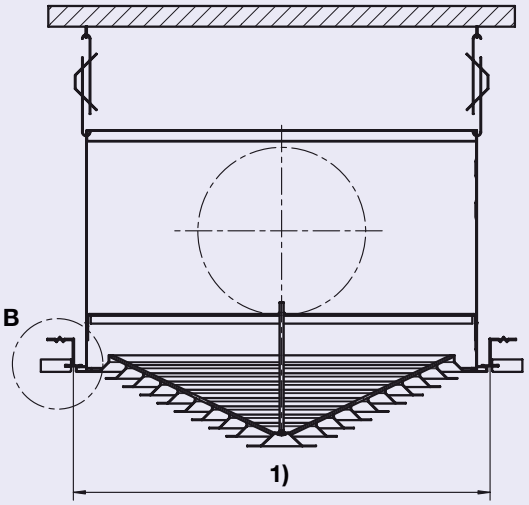
Circular with square exterior ceiling plate type DDRQ with plenum box

Type DDRQK
Inserted in ceiling profile from above.

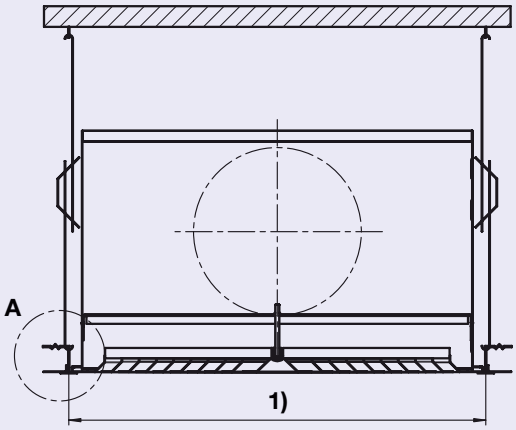


1) Grid dimension

Type DDRQK
Pressed onto ceiling profile from below.

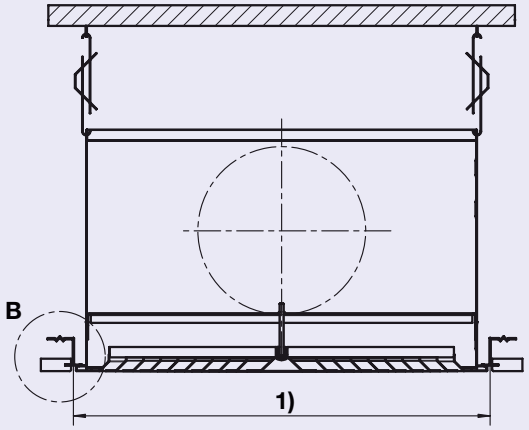


Type DDRQF
Inserted in ceiling profile from above.

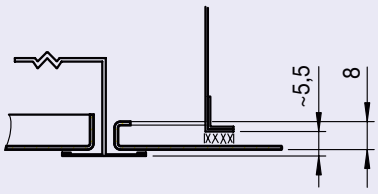


1) Grid dimension

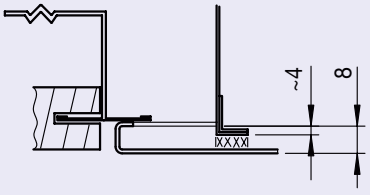
Type DDRQF
Pressed onto ceiling profile from below.



A



B



Type	ND	Grid dimension [mm]	Plenum box
DDRQ	598×...	600×600	Details see prospect L-04-1-31e (TROX HESCO) or 2/16.4/… (TROX)
	623×...	625×625	

Technical documentation

1. Our datas are based on a maximum difference in temperature Δt of -10 K between th room air and supply temperature. The expected room air velocities are still within the comfort range. Columns located within the stream of air are to be protected by blocking the corresponding sector in the diffuser.

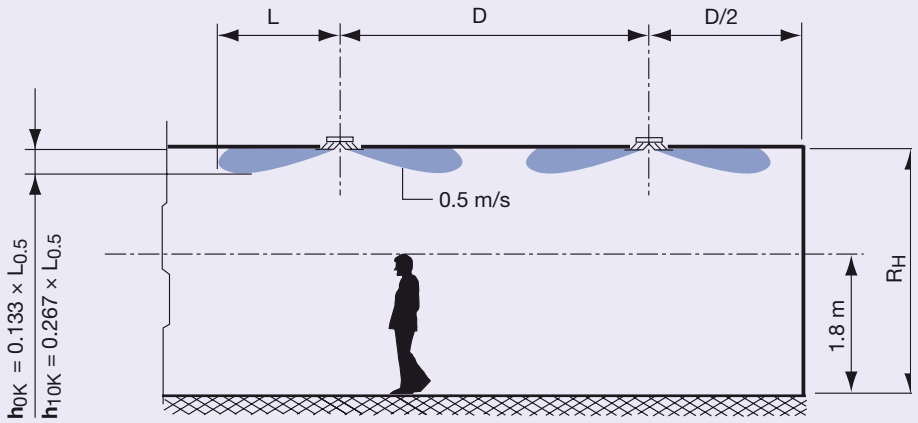
2. In the case of systems supplying hot air, it is advisable to locate the ceiling diffusers only up to a maximum room height R_H of 3.2 m.

Definitionen

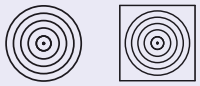
A	m²	Nominal area of diffuser
A_{eff}	m²	Effective free area
A_0	m²	Nominal reference area
Ød	mm	The diffuser size for circular ceiling diffuser
□ a	mm	The diffuser size for square ceiling diffuser
b	mm	Width of jet for square ceiling diffuser
D	m	Distance between two ceiling diffusers as a function of the room height R_H
f	Hz	Octave-centre-frequencies
h_{0K}	m	Thickness of jet (from ceiling) with isothermal air jet
h_{10K}	m	Thickness of jet (from ceiling) with cold air stream Δt =10 K(-)
L	m	Distance (by a final velocity of 0.5 m/s in the throw axis)
L_W	dB(A)	Sound power level
Lw_{A0}	dB(A)	Sound power level in relation to the nominal reference area A_o
ΔL_W	dB	Correction "sound power level" [dB(A)] as a function of the diffuser size
Δp_S	Pa	Static pressure drop
$r_{ØF}$	-	Ration A"/A with circular, flat ceiling diffuser = abt. 0.33 = abt. 33%
$r_{ØK}$	-	Ration A"/A with circular, conical ceiling diffuser = abt. 0.73 = abt. 73%
$r_{□F}$	-	Ration A"/A with square, flat ceiling diffuser = env. 0.32 = env. 32%
$r_{□K}$	-	Ration A"/A with square, conical ceiling diffuser = env. 0.575 = env. 57,5%
R_H	m	Room height
v_{eff}	m/s	Effective blow-out velocity
$\dot{V}$	m³/h	Air flow rate

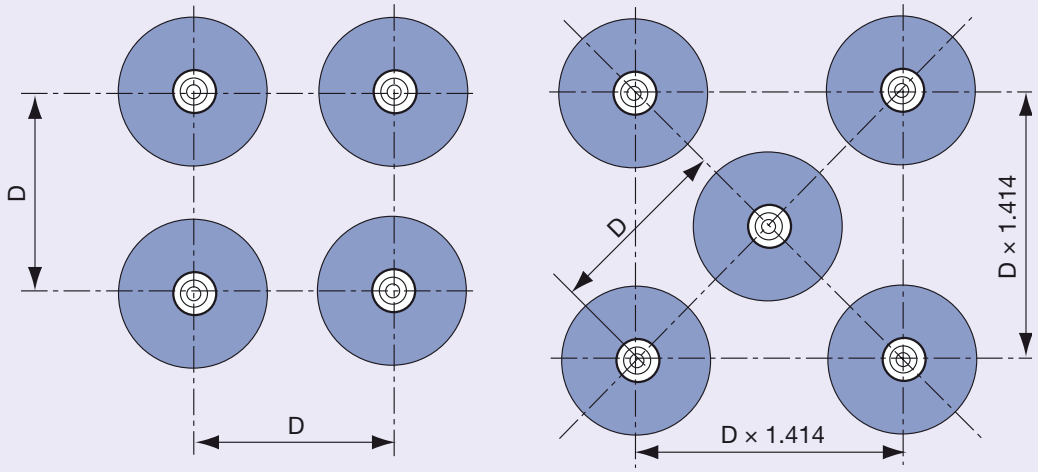
Minimum distances D

a) Min. distances D as a function of room height R_H

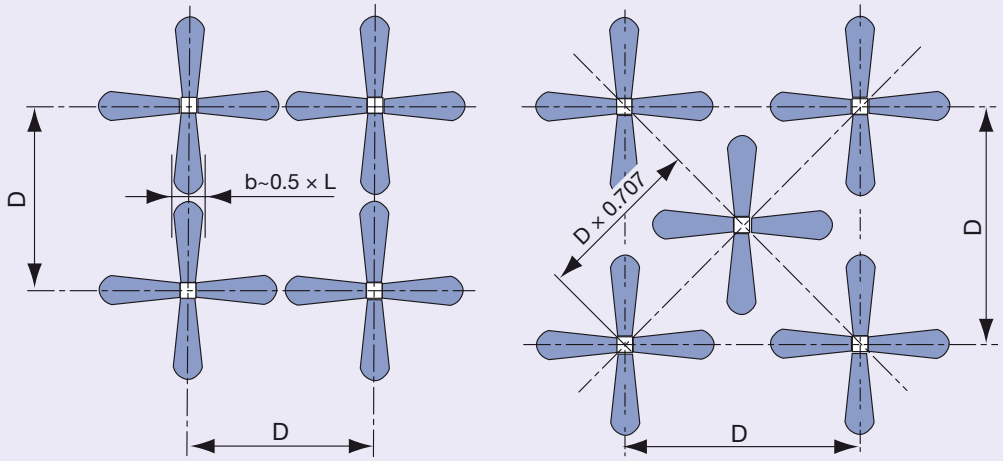


b) Minimum distances by type DD and DDRQ





c) Minimum distances by type DDQ



Selection diagram – Zuluft

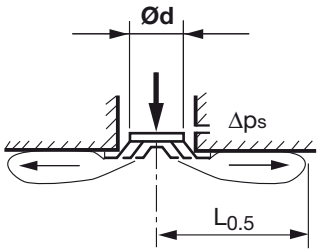
flat

Type DD F0

Type DD F5

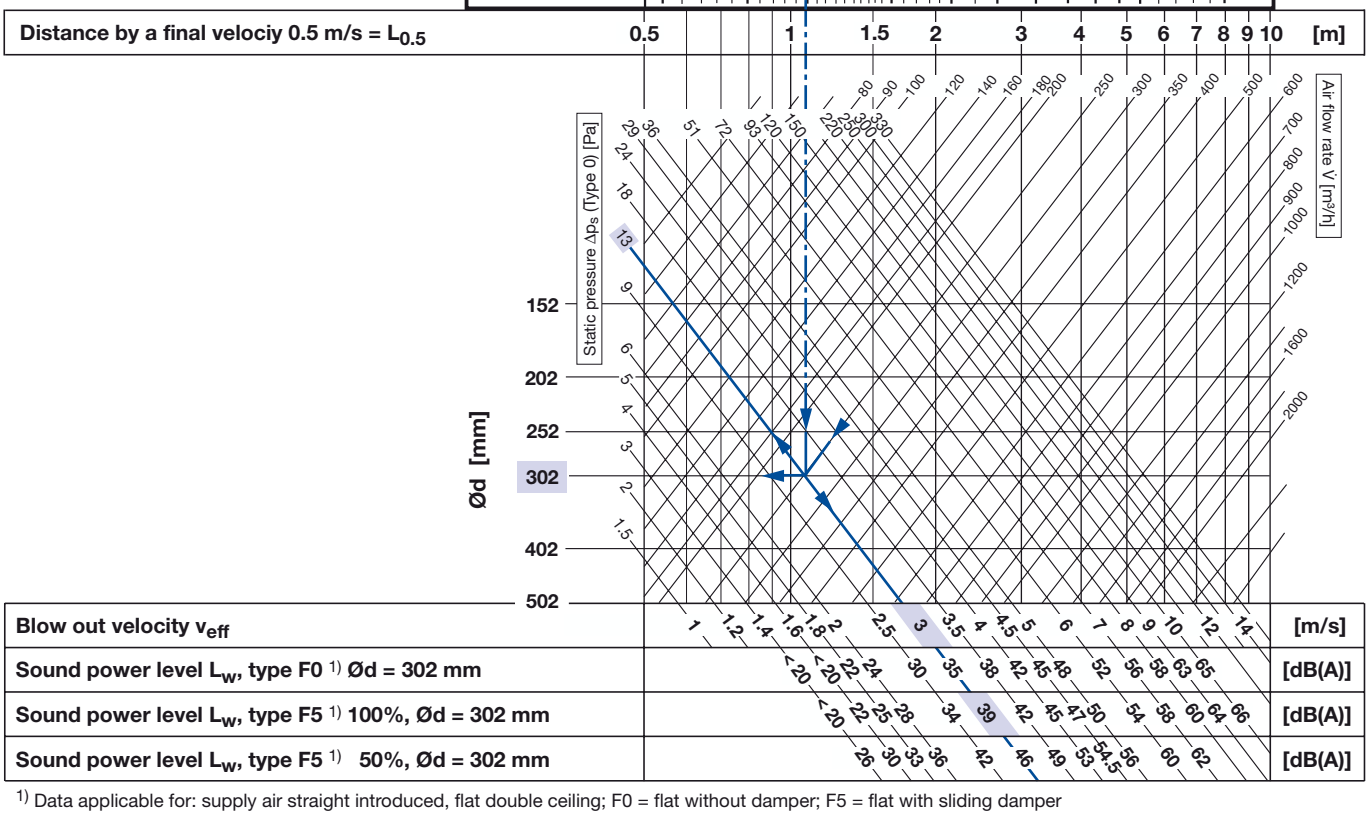
Type DDRQ F0

Type DDRQ F5



eff. free cross section: ~33%

Room height R_H [m]	Min. distance D as a function of room height R_H [m]
2.25 - 2.50	1.5 2 3 4 5 6 7 8 9 10 15
2.51 - 2.80	1.5 2 3 4 5 6 7 8 9 10 15
2.81 - 3.20	1.5 2 3 4 5 6 7 8 9 10 15
3.21 - 3.75	1 1.5 2 3 4 5 6 7 8 9 10 15
3.76 - 4.50	1 1.5 2 3 4 5 6 7 8 9 10 15



1) Data applicable for: supply air straight introduced, flat double ceiling; F0 = flat without damper; F5 = flat with sliding damper

Corrections

Correction 'pressure drop'

with **F5 - 100%** open	Δp_s = **1.32** × Δp_{s0}	[Pa]
with **F5 - 50%** open	Δp_s = **2.45** × Δp_{s0}	[Pa]

Δp_{s0} = static pressure drop without damper

Correction 'sound power level' as a function of the diffuser size

Ød	152	202	252	302	402	502	[mm]
ΔL_w	-3	-2	-1	0	+1	+2	[dB]

Example given

R_H = 3.0 m
D = 2.4 m
$\dot{V}$ = 250 m³/h

Solution

Type DD F5 (with sliding damper)
Ød = 302 mm
v_{eff} = 3.0 m/s
Δp_s = 13 × 1.32 = 17 Pa
L_w = 39 dBA
$L_{0.5}$ = 1.1 m

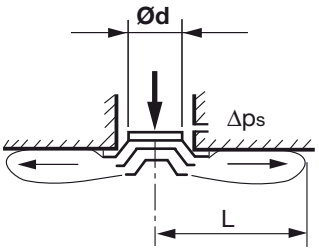
Technical Data

Selection diagram – supply air


conical

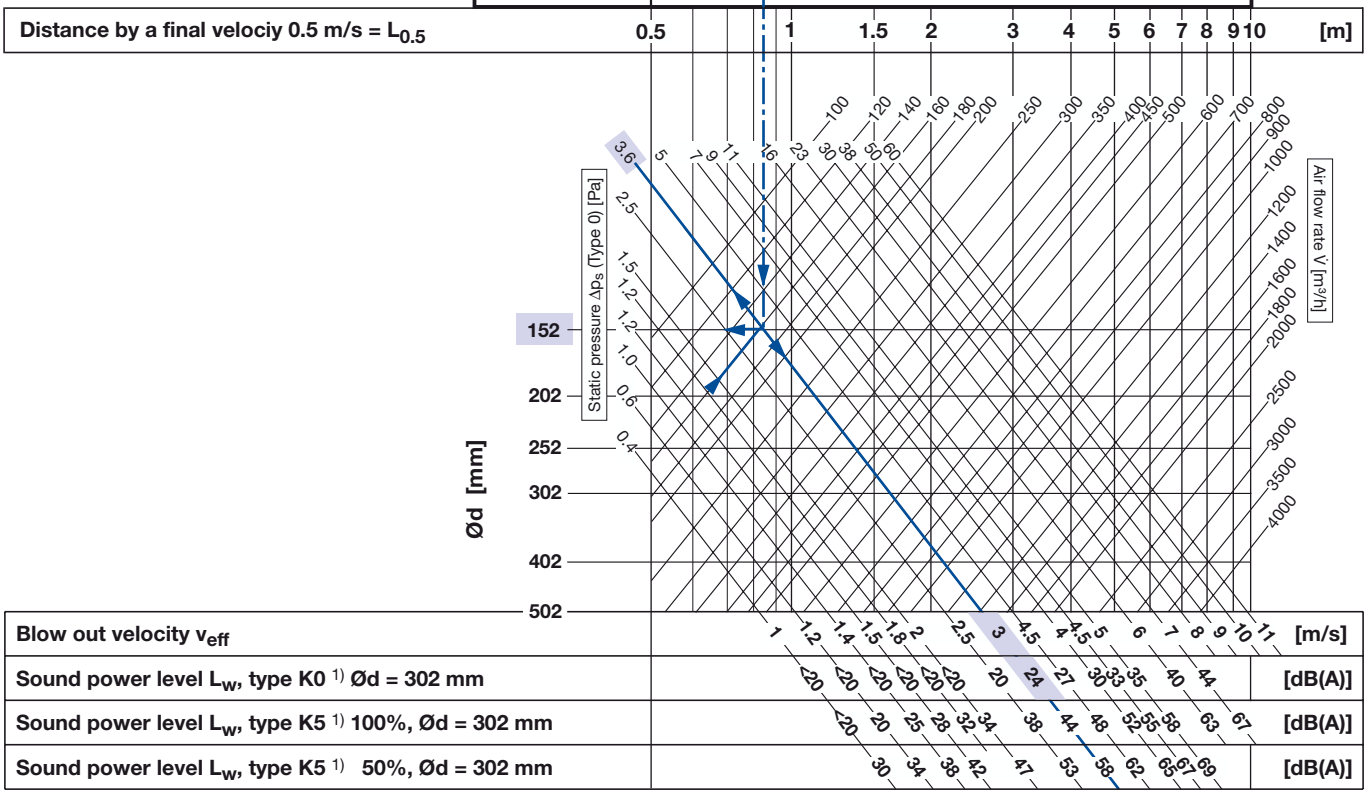
Type DD K0
Type DD K5

Type DDRQ K0
Type DDRQ K5



eff. free cross section: ~73%

Room height R_H [m]	Min. distance D as a function of room height R_H [m]
2.25 - 2.50	1.5 2 3 4 5 6 7 8 9 10 15
2.51 - 2.80	1.5 2 3 4 5 6 7 8 9 10 15
2.81 - 3.20	1.5 2 3 4 5 6 7 8 9 10 15
3.21 - 3.75	1.5 2 3 4 5 6 7 8 9 10 15
3.76 - 4.50	1 1.5 2 3 4 5 6 7 8 9 10 15



1) Data applicable for: supply air straight introduced, flat double ceiling; K0 = conical without damper; K5 = conical with sliding damper

Corrections

Correction 'pressure drop'

with **K5 - 100%** open	Δp_s = **1.32** × Δp_{s0}	[Pa]
with **K5 - 50%** open	Δp_s = **2.45** × Δp_{s0}	[Pa]

Δp_{s0} = static pressure drop without damper

Correction 'sound power level' as a function of the diffuser size

Ød	152	202	252	302	402	502	[mm]
ΔL_w	-3	-2	-1	0	+1	+2	[dB]

Example

given
R_H = 2.3 m
D = 2.2 m
V̇ = 160 m³/h

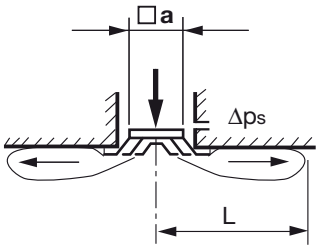
Solution
Type DD K0
Ød = 152 mm
v_{eff} = 3.0 m/s
Δp_s = 4 Pa
L_w = 24 - 3 = 21 dB(A)
$L_{0.5}$ = 0.85 m

Selection diagram – supply air

flat

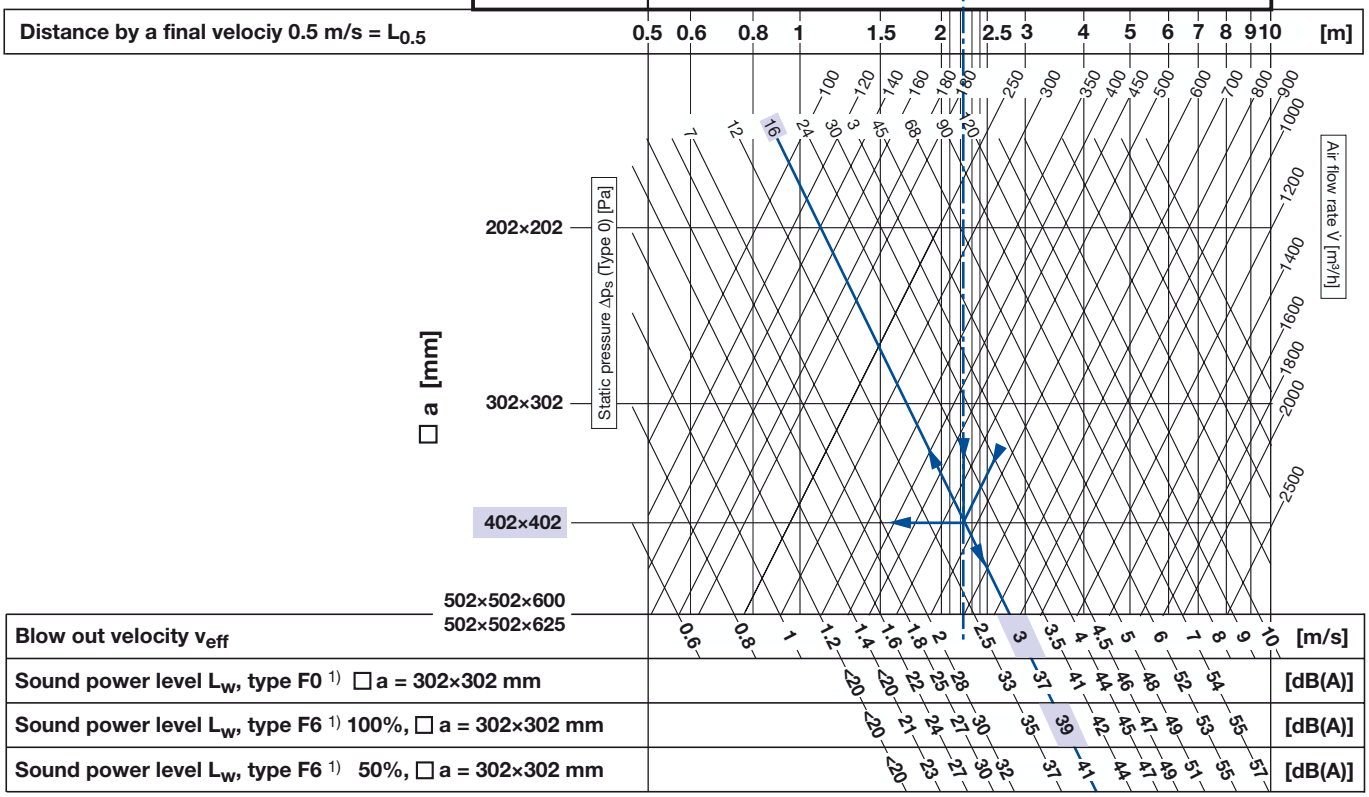
Type DDQ F0

Type DDQ F6



eff. free cross section: ~32%

Room height R_H [m]	Min. distance D as a function of room height R_H [m]
2.25 - 2.50	1.5 2 3 4 5 6 7 8 9 10 15
2.51 - 2.80	1.5 2 3 4 5 6 7 8 9 10 15
2.81 - 3.20	1.5 2 3 4 5 6 7 8 9 10 15
3.21 - 3.75	1.5 2 3 4 5 6 7 8 9 10 15
3.76 - 4.50	1 1.5 2 3 4 5 6 7 8 9 10



1) Data applicable for: supply air straight introduced, flat double ceiling; F0 = flat without damper; F6= flat with sliding damper

Corrections

Correction 'pressure drop'

with **F6 - 100%** open	$\Delta p_s = 1.10 \times \Delta p_{s0}$	[Pa]
with **F6 - 50%** open	$\Delta p_s = 1.50 \times \Delta p_{s0}$	[Pa]

Δp_{s0} = static pressure drop without damper

Correction 'sound power level' as a function of the diffuser size

□ a	202×202	302×302	402×402	502×502	[mm]
ΔL_w	-1	0	+1	+2	[dB]

Example

given

R_H = 3.0 m
D = 5.0 m
V̇ = 560 m³/h

Solution

Type DDQ F6
□ **a** = 402×402 mm
v_{eff} = 3.0 m/s
Δp_s = 16 × 1.1 = 18 Pa
L_w = 39 + 1 = 40 dB(A)
$L_{0.5}$ = 2.2 m

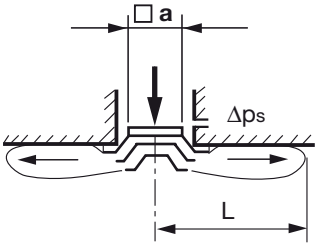
Technical Data

Selection diagram – supply air

konisch

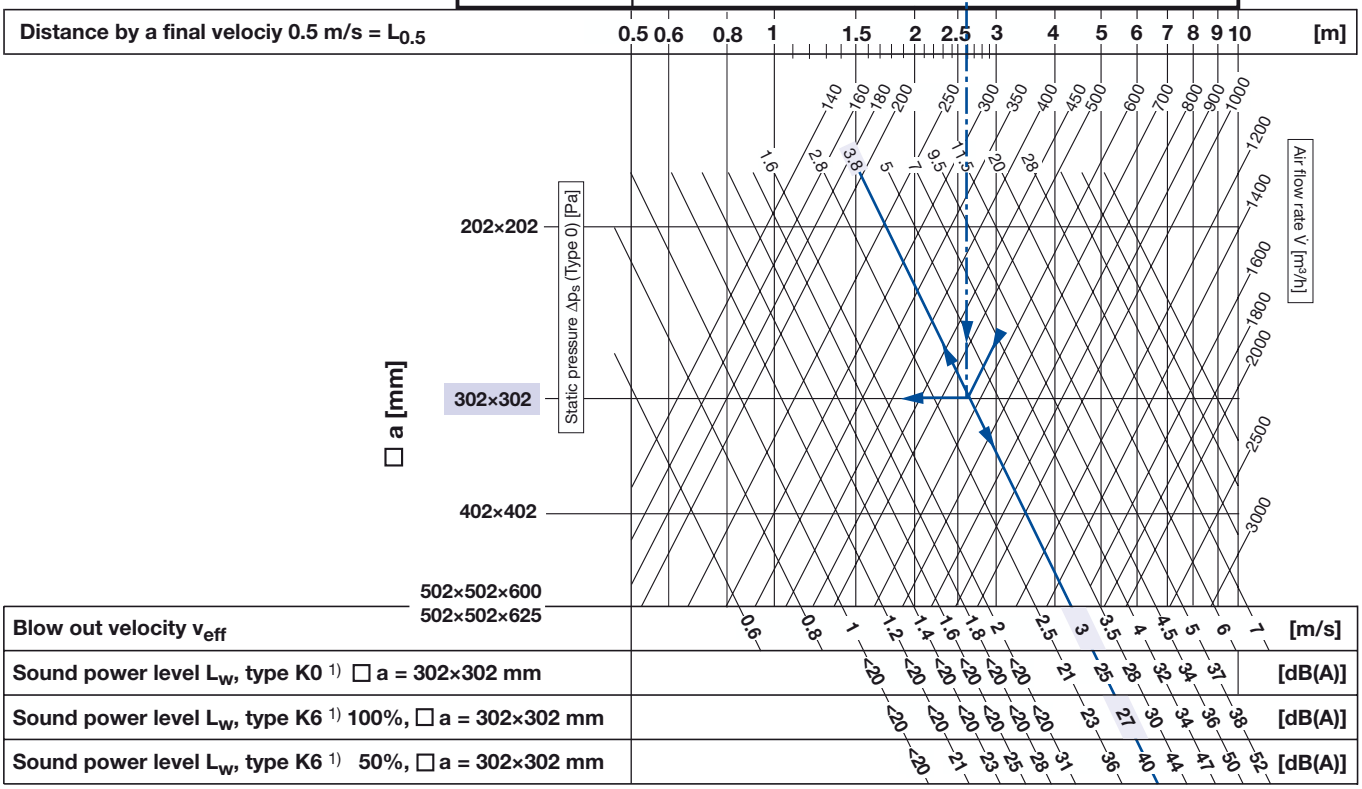
Type DDQ K0

Type DDQ K6



Room height R_H [m]	Min. distance D as a function of room height R_H [m]
2.25 - 2.50	1.5 2 3 4 5 6 7 8 9 10 15
2.51 - 2.80	1.5 2 3 4 5 6 7 8 9 10 15
2.81 - 3.20	1.5 2 3 4 5 6 7 8 9 10 15
3.21 - 3.75	1.5 2 3 4 5 6 7 8 9 10 15
3.76 - 4.50	1 1.5 2 3 4 5 6 7 8 9 10 15

eff. free cross section: ~57.5%



1) Data applicable for: supply air straight introduced, flat double ceiling; K0 = conical without damper; K6= conical with sliding damper

Corrections

Correction 'pressure drop'

with **K6 - 100%** open	Δp_s = **1.15** × Δp_{s0}	[Pa]
with **K6 - 50%** open	Δp_s = **5.60** × Δp_{s0}	[Pa]

Δp_{s0} = static pressure drop without damper

Correction 'sound power level' as a function of the diffuser size

□ a	202×202	302×302	402×402	502×502	[mm]
ΔL_w	-1	0	+1	+2	[dB]

Example

given

R_H = 3.0 m
D = 5.8 m
$\dot{V}$ = 560 m³/h

Solution

Type DDQ K6
□ **a** = 302×302 mm
v_{eff} = 3.0 m/s
Δp_s = 3.8 × 1.15 = 5 Pa
L_w = 27 dB(A)
$L_{0.5}$ = 2.7 m

Correction table for the octave centre frequencies

Type	Damper position	f / Type	125	250	500	1k	2k	4k	8k	[Hz]
 **DD**	**flat**  100, 75 and 50% open	**DD F0** **DDRQ F0** **DD F5** **DDRQ F5**	-2	+1	0	-6	-12	-20	< (-22)	**[dB]**
	25% open	**DD F5** **DDRQ F5**	-2	+4	-2	-7	-9	-11	< (-20)	
 **DDRQ**	**conical**  100, 75, 50 and 25% open	**DD K0** **DDRQ K0**	+1	-1	-3	-5	< (-11)	< (-18)	< (-22)	
		DD K5 **DDRQ K5**	+2	+4	0	-5	-5	-8	< (-22)	
Tolerances of the octave corrections: **±4 [dB]**										

Type	Damper position	f / Type	125	250	500	1k	2k	4k	8k	[Hz]
 **DDQ**	**flat**  100, 75, 50 and 25% open	**DDQ F0** **DDQ F6**	0	+2	-3	-7	-14	< (-20)	< (-20)	**[dB]**
	conical  100, 75 and 50% open	**DDQ K0** **DDQ K6**	+4	+6	-2	-5	-12	< (-20)	< (-20)	
	25% open	**DD K6**	-6	-4	-7	-3	-7	-13	< (-20)	
Tolerances of the octave corrections: **±4 [dB]**										

Example
Given
Example from page 9, (DD F5, 100% open, instead of Ød = 302 mm Ød = 402 mm mm is selected)

Sought
Level of the octave centre frequencies

Solution

Step 1:
Make size correction, i.e.:
L_w = L_w Ød = 302 mm + correction for Ød = 402 mm
= 39 +1 = 40 [dB(A)]

Step 2:
Calculate level of the octave centre frequencies

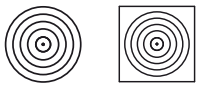
f	125	250	500	1k	2k	4k	8k	[Hz]
L_{wA} Ød = 402 mmm	**40**	**40**	**40**	**40**	**40**	**40**	**40**	**[dB(A)]**
ΔL_A	-2	+1	0	-6	-12	-20	< (-22)	**[dB]**
L_{wOkt}	**38**	**41**	**40**	**34**	**28**	**20**	**< 18**	**[dB]**

Technical Data

Extract air

Correction table for circular ceiling diffusers

Circular with circular exterior frames Type DD
Circular with square exterior ceiling plate Type DDRQ



Extract air (only diffusers with and without damper)

Basis:
Diagram values of DD-dimensions (supply air)
a) Sound power level $L_{wA\,AL} = L_{wA\,ZL} + \Delta L_w$
b) Static pressure drop: $\Delta p_{SAL} = \Delta p_{SZL} \times f\,\Delta ps$

Extract air

Type	Ød	flat						conical					
		F0		F5 – 100%		F5 – 50%		K0		K5 – 100%		K5 – 50%	
		ΔL_w	$f\Delta p_s$	ΔL_w	$f\Delta p_s$	ΔL_w	$f\Delta p_s$	ΔL_w	$f\Delta p_s$	ΔL_w	$f\Delta p_s$	ΔL_w	$f\Delta p_s$
DD	202	-12	1.15	-8	2.25	-5	8.1	-9	3.55	-6	4.05	-5	8.40
	252	-5	1.20	-5	2.55	-3.5	8.95	-4	3.85	-3.5	4.35	-3	8.95
	302	+1	1.25	-3	2.85	-2	9.70	+1	4.25	-2	5.00	-1	9.50
DDRQ	402	+6	1.35	-1	3.1	0	10.55	+6	5.00	0	5.30	+1	10.35
	502	+7	1.60	+1	2.85	+2	10.40	+7	6.15	+1	6.65	+2	10.35

Example
Given
– Extract air
– DD F5 / Ød = 302 mm, 50%
– v_{eff} = 2.0 m/s

Sought
a) L_w = ?
b) Δp_s = ?

Solution from diagram page 9
a) L_w = 36 dB(A)
correction for AKH04 AL Ød = 302 mm: ΔL_w = – 2
L_w = 36 – 2 **= 34 dB(A)**

b) Δp_s = 6 Pa
correction for AKH04 AL Ød = 302 mm: $f\Delta p_s$ = 9.70
Δp_s = 6 × 9.70 **= 58 Pa**

Extract air

Correction table for square ceiling diffusers

Square Type DDQ

Extract air (only diffusers with and without dampers)

Base:
Diagram values of DDQ - dimensions (supply air)
a) Sound power level $L_{wA\,AL} = L_{wA\,ZL} + \Delta L_w$
b) Static pressure drop: $\Delta p_{SAL} = \Delta p_{SZL} \times f\,\Delta ps$

Extract air

Typ	□ a	flach						konisch					
		F0		F6 – 100%		F6 – 50%		K0		K6 – 100%		K6 – 50%	
		ΔL_w	$f\Delta p_s$	ΔL_w	$f\Delta p_s$	ΔL_w	$f\Delta p_s$	ΔL_w	$f\Delta p_s$	ΔL_w	$f\Delta p_s$	ΔL_w	$f\Delta p_s$
 DDQ	**202**	< (-10)	0.85	< (-10)	0.85	< (-10)	0.90	< (-10)	1.50	-3	1.45	-9	1.95
	302	-5	1.05	-5	1.0	-8	1.13	< (-10)	1.70	-2	1.60	-8	2.80
	402	-2	1.30	-5	1.20	-6	1.28	< (-10)	1.90	0	1.85	-6	3.65
	502	-1	1.30	-4	1.20	-5	1.28	< (-10)	1.90	+4	1.85	0	3.65

Example
Given
– Extract air
– DDQ K6 / □ a = 302×302 mm, 100%
– v_{eff} = 3 m/s

Sought
a) L_w = ?
b) Δp_s = ?

Solution from diagram page 12
a) L_w = 27 dB(A)
correction for AKH04 AL □ a = 302×302 mm: ΔL_w = – 2
L_w = 27 – 2 **= 25 dB(A)**

b) Δp_s = 3.8 Pa
correction for AKH04 AL □ a = 302×302 mm: $f\Delta p_s$ = 1.60
Δp_s = 3.8 x 1.60 **= 6 Pa**

Order details

Order code

No details for standard products

DD	Q	F	6	/	... × ...	/	0	/	0	/	P1	/	RAL 9006

RAL 9006 matt, 25% brilliance

Type
Ceiling diffuser

DD = circular
DD**RQ** = circular/square
DD**Q** = square

F = flat
K = conical

0 = without damper
5 = with sliding damper (DD + DDRQ)
6 = with opposed blade damper (DDQ)

Nominal dimension
.... = diameter for Type DD
...×... = external dimension × nominal dim. for Type DDRQ + DDQ

0 = powder coated according to RAL 9010 mat, 25% brilliance (standard)
P1 = powder coated according to RAL .... (other RAL colours and brilliance on request)

Order examples

15 off	DDQ F 0 / 500×400 / P1 / RAL 9006
20 off	DDQ K 6 / 600x500
15 off	DD F 5 / 500 / P1 / RAL 9006
20 off	DDRQ K 5 / 623×400

Text for tendering purposes

Type DD / DDRQ
Circular ceiling diffusers with or without square exterior frames for installation flush with the ceiling and uniform, circular air circulation. Comprising conical circular blades and flat exterior frames flush with the ceiling. Flat or conical design. With or without sliding damper for air volume control. Fixation by means of central screw.

Type DDQ
Square ceiling diffusers, blowing on all four sides, suitable for the horizontal introduction of air (or the removal of extract air). Flat or conical design.
Comprising a front frame with plastic foam sealing and suitably-formed air-guidance blades.
With or without opposed volume control.
Fixation by means of central screw.

Plenum box for type DD / DDRQ and DDQ (see sep. prospect)
A standard plenum box of galvanised steel, with integrated cross bar for the M6 central screw, for quick and simple installation of the ceiling panel air diffuser. A connection with volume control for connecting a coiled tube or hose is included; the inlet box also contains an air distributor element.

Material

Diffuser
Steel, powder-coated according to RAL 9010, matt, 25% brilliance

Damper

Sliding damper	Aluminium untreated
Opposed blade damper	Frame: Hot galvanized steel Blades: Aluminium untreated

Plenum box
– Galvanised steel plate
– Deliveries with AKH ZL MO and AK1 ZL MO are without opposed blade damper.

Option
– Other RAL-colours