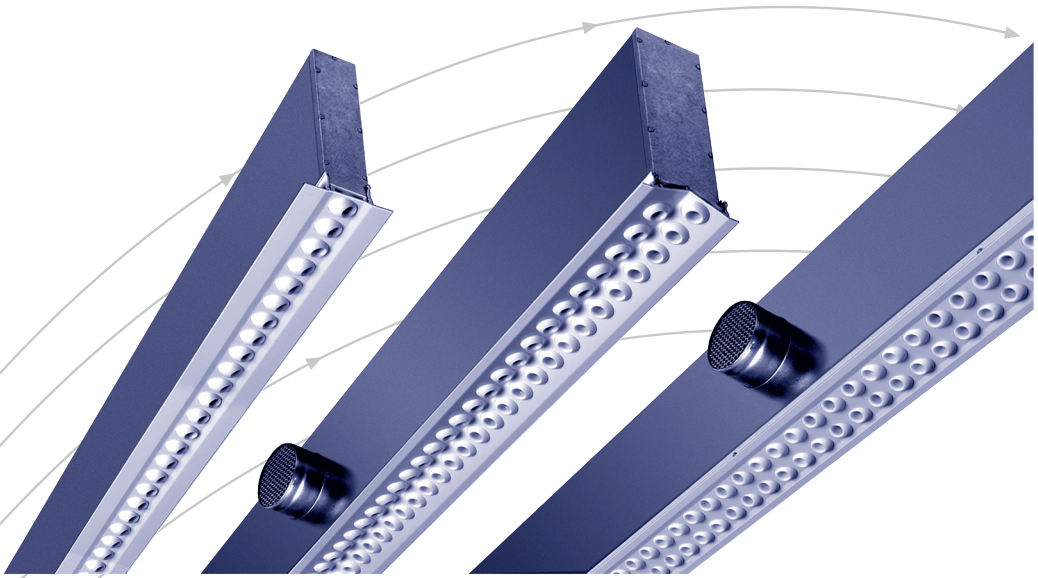
Ball diffuser rail

Type KS



TROX® TECHNIK

The art of handling air

HESCO®

TROX HESCO Schweiz AG
Walderstrasse 125
Postfach 455
CH-8630 Rüti ZH

Tel. +41 55 250 71 11
Fax +41 55 250 73 10
www.troxhesco.ch
trox-hesco@troxgroup.com

Contents · Application · Realisation · Safety instructions · Discharge positions

Contents

Application

Ball diffuser rails are supply air elements, which can be incorporated into ceilings especially aesthetically. They are suitable for air conditioning systems in open-plan offices, class rooms, laboratories, booking halls, etc. The adjustment possibilities for the individual ball jets are well-nigh unlimited, because they can be set to blow in any desired direction. The ball rails can be supplied in single or double-row versions.

Ball diffuser rails are suitable for:
- systems with constant air volume
- systems with variable air volume (VAV)
  min. air volume = 25% of the max. air quantity
- ΔT: - 12 to 10 K

Safety instructions

CAUTION!

Damage to the product due to improper handling. Check the device for damage and contamination prior to operation!

Improper handling may lead to considerable material damage of the product.
- Do not use any acid or abrasive cleaning agents.
- Adhesives from sticky tape may lead to colour damage.
- Excessive moisture may lead to colour damage and corrosion.
- Use only cleaning agents, greases and oils that are expressly specified.

CAUTION!

Risk of injury from sharp edges and corners, ridges and thin-walled sheet metal parts!
- Proceed carefully with all work.
- Wear protective gloves, safety shoes and protective helmet.

WARNING!

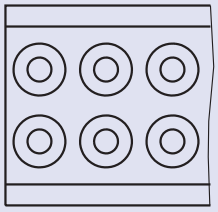
Danger from incorrect use. Misuse of the product may lead to dangerous situations.

The product must not be used:
- in areas subject to explosion hazards;
- in the open air without sufficient protection against weather effects;
- in atmospheres that may have a damaging and/or corrosive effect on the product due to scheduled or unscheduled chemical reactions.

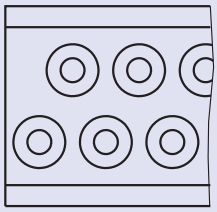
Realisation

Ball diffuser rails are made of aluminium profiles with a coloured matt-finish according to RAL 9010, 25% brilliance. The desired air discharge setting is adjusted at works. Subsequent resetting of the ball jets can be made with the aid of a setting pin. The ball rails can also be supplied in other RAL colours. The plenum box is made of galvanised steel. Fixed resistance FW0066 in the tube connection. Special designs on request.

Standard model
Balls arranged in parallel (F79 + W100)

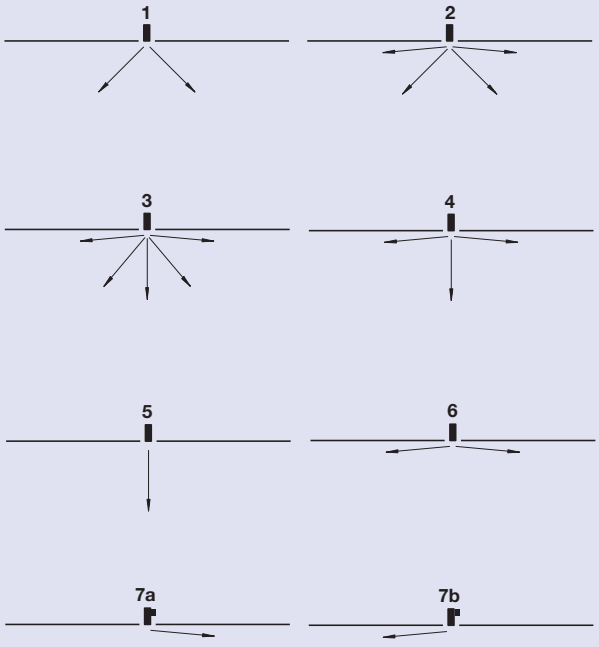


Special model
Ball diffusers offset (with VF79 + VW100)
Designation: **V**



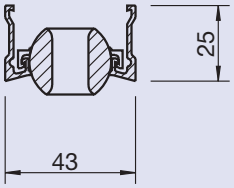
Standard model of KS2 WK 100

Discharge positions

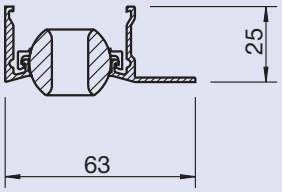


Ball rails, single row

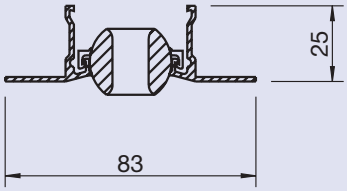
KS1 F43



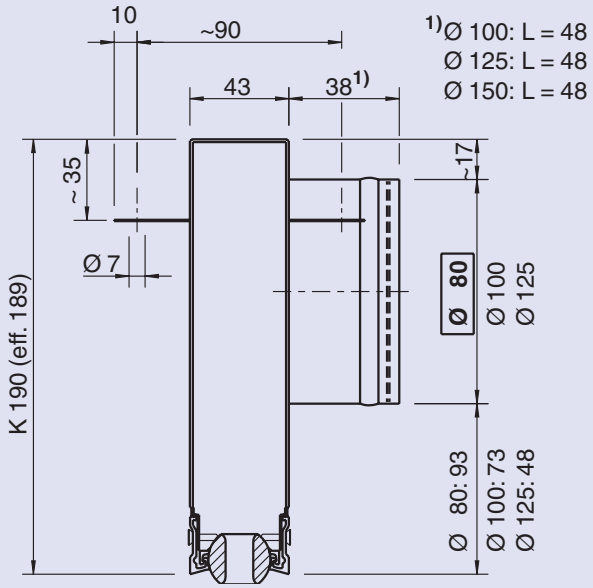
KS1 WE63



KS1 W83



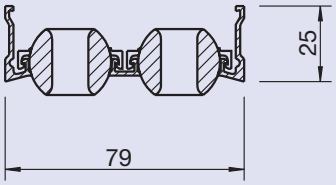
With plenum box KS1 F43 K190



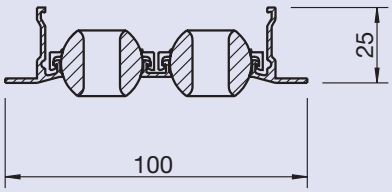
Ø 80 = Standard

Ball rails, double row

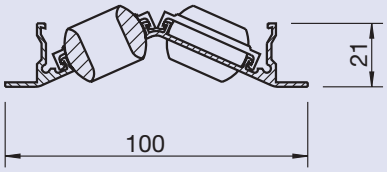
KS2 F79



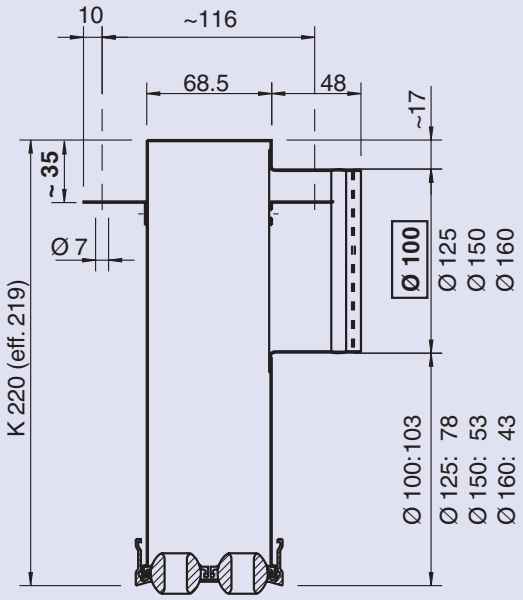
KS2 W100



KS2 WK100



With plenum box KS2 F79 K220

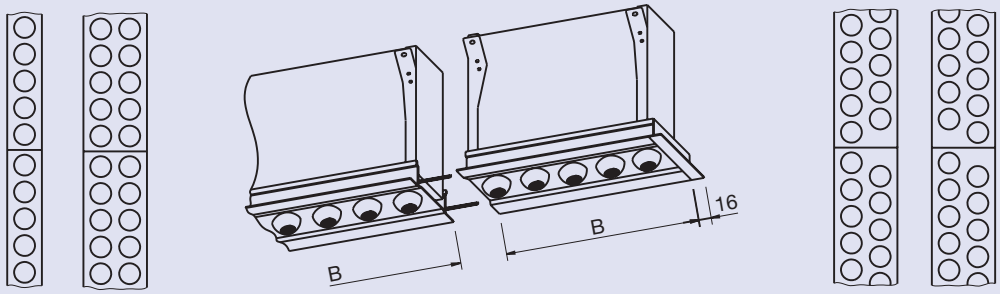


Ø 100 = Standard

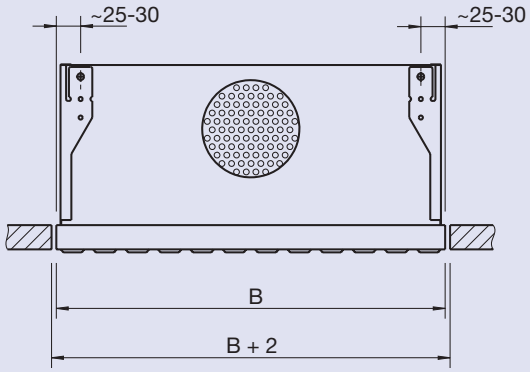
Dimensions · Installation

Lengths in excess of 2000 mm are supplied in sections. Longitudinal measurement B, where possible, divided by 33.3. They can be connected flush to form a continuous rail with the aid of grooved pins.

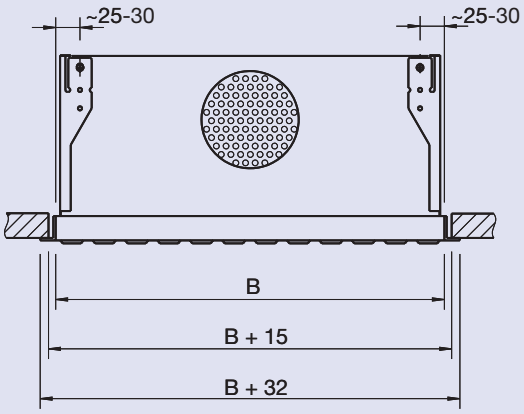
Attachment brackets for ball diffuser rails without connection boxes has to be ordered separately (surcharge).



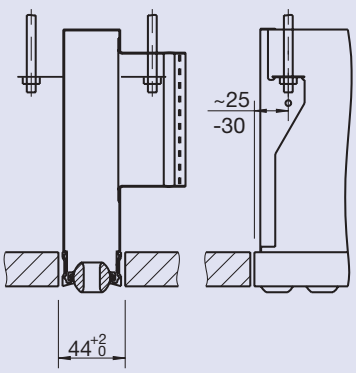
Recess dimensions **without** transversal angle

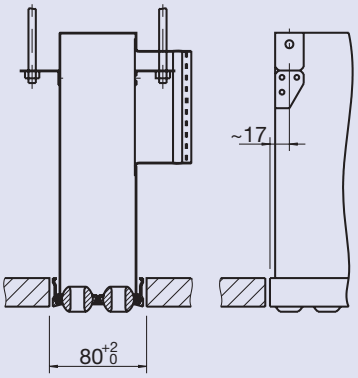


Recess dimensions **with** transversal angle (B + 15)



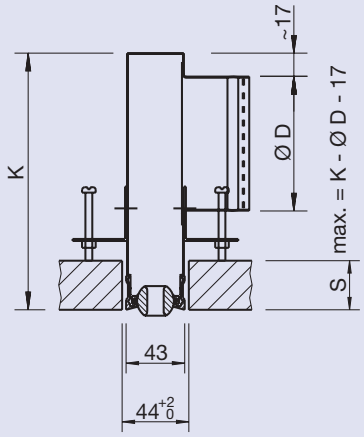
Standard models

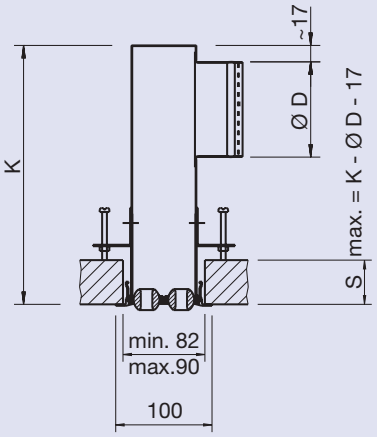




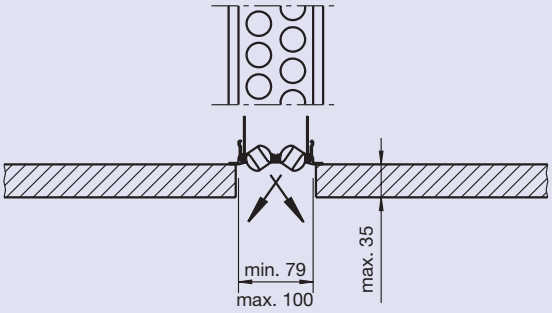
Attachment material, building contractors' supply

Special attachment angles on request

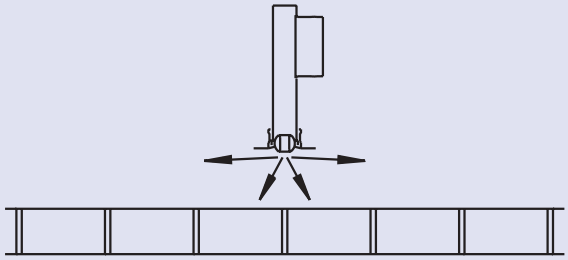




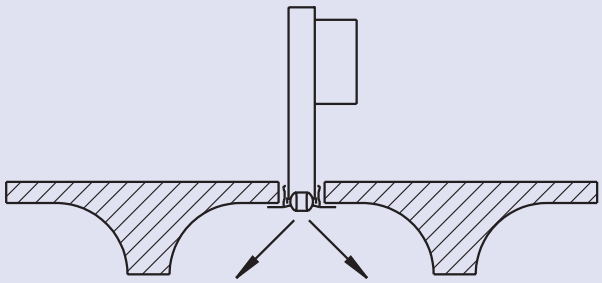
Installation in a ceiling recess
Ball diffuser rows in offset arrangment



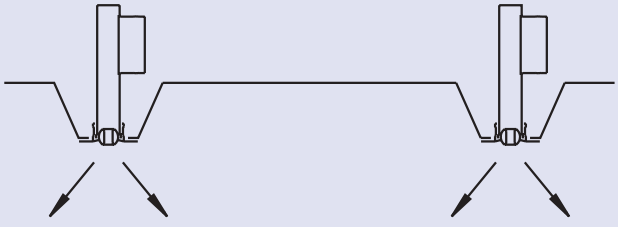
Installation over open grid ceiling



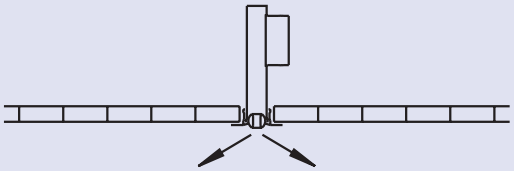
Installation between protruding ceiling elements



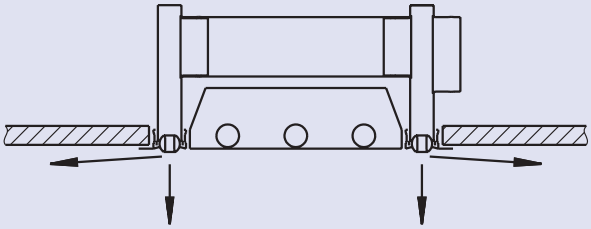
KS1 special



Installation flush with lower edge of grid ceiling



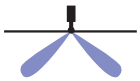
Installation in lighting fixtures



Quick selection

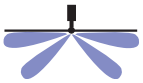
Type KS1

Position 1



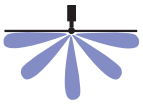
Dimension [mm]	A_{eff} [m²]	$\dot{q}_v$ [l/s,m] / $\dot{V}$ [m³/h,m]	8.3 / 30		11.1 / 40		13.9 nominal / 50		16.7 / 60		19.4 / 70		22.2 / 80		25.0 / 90	
KS1 pos 1	0.0034	Dp_t [Pa]	9		15		23		33		45		58		73	
		L_{wA} [dB(A)]	<20		21		26		31		35		38		41	
		$L_{0.5}/L_{0.3}$ [m]	-	-	-	1.4	1.4	1.5	1.4	1.7	1.5	1.9	1.6	2.2	1.7	2.5
		$\bar{v}_{H1}$ [m/s]				0.13	0.15	0.14	0.18	0.16	0.21	0.19	0.25	0.21	0.28	0.24
Distance		A [m]				2.8	2.8	3.0	2.8	3.4	2.9	3.9	3.2	4.4	3.5	5.0

Position 2



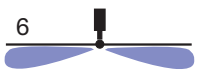
Dimension [mm]	A_{eff} [m²]	$\dot{q}_v$ [l/s,m] / $\dot{V}$ [m³/h,m]	8.3 / 30		11.1 / 40		13.9 / 50		16.7 nominal / 60		19.4 / 70		22.2 / 80		25.0 / 90	
KS1 pos 2	0.0028	Dp_t [Pa]	13		23		36		52		71		93		118	
		L_{wA} [dB(A)]	<20		25		30		35		39		42		45	
		$L_{0.5}/L_{0.3}$ [m]	-	-	-	1.4	1.4	1.5	1.4	1.6	1.5	1.8	1.6	2.1	1.7	2.3
		$\bar{v}_{H1}$ [m/s]				0.08	0.10	0.09	0.11	0.11	0.14	0.12	0.16	0.14	0.19	0.16
Distance		A [m]				2.8	2.7	3.0	2.8	3.3	2.9	3.7	3.2	4.1	3.4	4.6

Position 3



Dimension [mm]	A_{eff} [m²]	$\dot{q}_v$ [l/s,m] / $\dot{V}$ [m³/h,m]	8.3 / 30		11.1 / 40		13.9 / 50		16.7 nominal / 60		19.4 / 70		22.2 / 80		25.0 / 90	
KS1 pos 3	0.0028	Dp_t [Pa]	10		17		27		38		53		69		87	
		L_{wA} [dB(A)]	<20		25		30		35		39		42		45	
		$L_{0.5}/L_{0.3}$ [m]	-	-	-	1.4	-	1.4	1.4	1.6	1.4	1.8	1.5	2.0	1.7	2.2
		$\bar{v}_{H1}$ [m/s]				0.09		0.10	0.13	0.12	0.15	0.13	0.18	0.15	0.20	0.18
Distance		A [m]				2.7		2.9	2.8	3.2	2.9	3.5	3.1	3.9	3.3	4.4

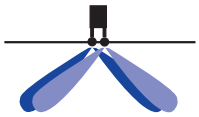
Positions 6 + 7



Dimension [mm]	A_{eff} [m²]	$\dot{q}_v$ [l/s,m] / $\dot{V}$ [m³/h,m]	8.3 / 30		11.1 / 40		13.9 nominal / 50		16.7 / 60		19.4 / 70		22.2 / 80		25.0 / 90	
KS1 pos 6 + 7	0.0017	Dp_t [Pa]	13		22		33		47		64		82		103	
		L_{wA} [dB(A)]	23		30		35		40		43		47		49	
		$L_{0.5}/L_{0.3}$ [m]	-	-	-	1.5	1.4	1.6	1.4	1.7	1.5	1.9	1.6	2.1	1.7	2.4
		$\bar{v}_{H1}$ [m/s]				0.11	0.14	0.13	0.17	0.15	0.20	0.16	0.23	0.18	0.25	0.19
Distance		A [m]				3.0	2.9	3.2	2.9	3.5	2.9	3.8	3.1	4.3	3.4	4.8

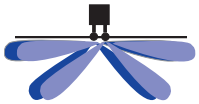
Type KS2

Position 1



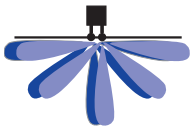
Dimension [mm]	A_{eff} [m²]	$\dot{q}_v$ [l/s,m] / $\dot{V}$ [m³/h,m]	13.9 / 50		16.7 / 60		19.4 nominal / 70		22.2 / 80		25.0 / 90		27.8 / 100		30.6 / 110		33.3 / 120	
KS2 pos 1	0.0067	D_{pt} [Pa]	9		12		16		21		27		33		40		47	
		L_{wA} [dB(A)]	<20		<20		23		26		29		32		34		36	
		$L_{0.5}/L_{0.3}$ [m]	1.5	1.6	1.5	1.8	1.5	2.0	1.6	2.2	1.7	2.4	1.9	2.6	2.0	2.9	2.1	3.1
		$\bar{v}_{H1}$ [m/s]	0.16	0.15	0.18	0.16	0.20	0.18	0.23	0.19	0.25	0.20	0.27	0.22	0.29	0.23	0.32	0.25
Distance		A [m]	2.9	3.3	3.0	3.6	3.1	4.0	3.2	4.3	3.5	4.8	3.7	5.2	4.0	5.7	4.3	6.2

Position 2



Dimension [mm]	A_{eff} [m²]	$\dot{q}_v$ [l/s,m] / $\dot{V}$ [m³/h,m]	13.9 / 50		16.7 / 60		19.4 / 70		22.2 / 80		25.0 / 90		27.8 nominal / 100		30.6 / 110		33.3 / 120	
KS2 pos 2	0.0057	D_{pt} [Pa]	8		12		16		21		27		33		40		47	
		L_{wA} [dB(A)]	<20		21		25		29		32		34		37		39	
		$L_{0.5}/L_{0.3}$ [m]	-	1.6	1.5	1.7	1.5	1.8	1.6	2.0	1.7	2.1	1.8	2.3	1.9	2.5	2.0	2.6
		$\bar{v}_{H1}$ [m/s]		0.09	0.10	0.10	0.12	0.11	0.13	0.12	0.15	0.13	0.16	0.14	0.18	0.15	0.20	0.17
Distance		A [m]		3.1	3.0	3.4	3.1	3.6	3.2	3.9	3.4	4.2	3.6	4.6	3.8	4.9	4.0	5.3

Position 3



Dimension [mm]	A_{eff} [m²]	$\dot{q}_v$ [l/s,m] / $\dot{V}$ [m³/h,m]	13.9 / 50		16.7 / 60		19.4 / 70		22.2 / 80		25.0 nominal / 90		27.8 / 100		30.6 / 110		33.3 / 120	
KS2 pos 3	0.0057	D_{pt} [Pa]	8		12		16		21		27		33		40		47	
		L_{wA} [dB(A)]	<20		21		25		29		32		34		37		39	
		$L_{0.5}/L_{0.3}$ [m]	-	1.5	-	1.6	1.5	1.7	1.5	1.8	1.6	2.0	1.7	2.1	1.8	2.3	1.9	2.5
		$\bar{v}_{H1}$ [m/s]		0.10		0.11	0.13	0.12	0.15	0.13	0.16	0.14	0.18	0.16	0.20	0.17	0.22	0.18
Distance		A [m]		2.9		3.1	3.0	3.4	3.0	3.7	3.2	4.0	3.4	4.3	3.6	4.6	3.8	4.9

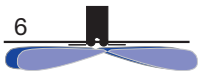
Positions 6 + 7

Dimension [mm]	A_{eff} [m²]	$\dot{q}_v$ [l/s,m] / $\dot{V}$ [m³/h,m]	13.9 / 50		16.7 / 60		19.4 nominal / 70		22.2 / 80		25.0 / 90		27.8 / 100		30.6 / 110		33.3 / 120	
KS2 pos 6 + 7	0.0035	Δp_t [Pa]	10		15		20		26		33		40		48		57	
		L_{wA} [dB(A)]	21		25		29		32		35		38		40		42	
		$L_{0.5}/L_{0.3}$ [m]	-	1.7	1.6	1.8	1.6	1.9	1.7	2.1	1.8	2.3	1.9	2.5	2.1	2.8	2.2	3.0
		$\bar{v}_{H1}$ [m/s]		0.10	0.13	0.12	0.16	0.13	0.18	0.14	0.20	0.16	0.22	0.17	0.24	0.18	0.26	0.19
Distance		A [m]		3.4	3.3	3.6	3.3	3.9	3.4	4.2	3.6	4.6	3.9	5.1	4.1	5.5	4.4	6.0

Quick selection

Type KS2WK100

Position 6

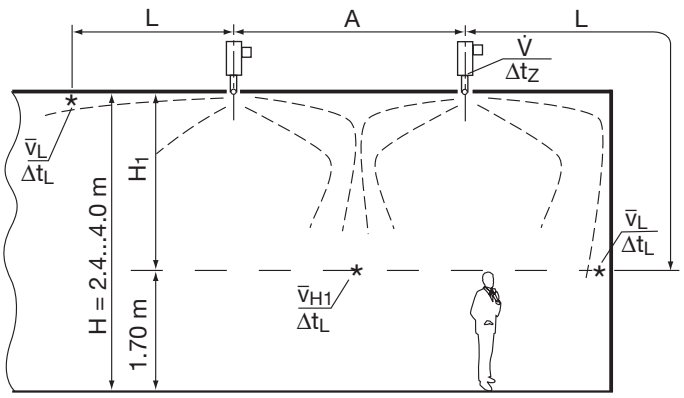


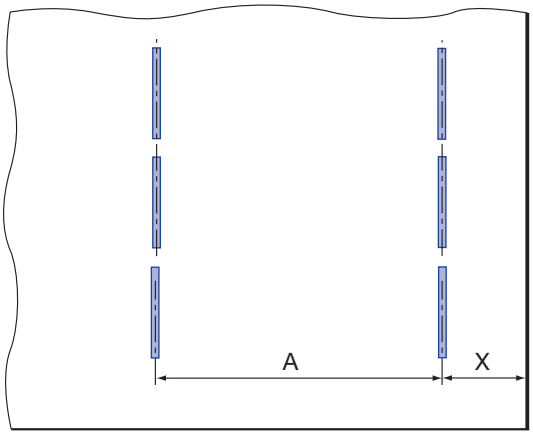
Dimension [mm]	**A_{eff}** [m²]	$\dot{q}_v$ [l/s,m] / $\dot{V}$ [m³/h,m]	**13.9** / **50**		**16.7** / **60**		**19.4** / **70**		**22.2** / **80**		**25.0 nominal** / **90**		**27.8** / **100**		**30.6** / **110**		**33.3** / **120**	
KS2WK100 pos6	0.0063	Dpt [Pa]	8		11		15		20		25		30		37		43	
		L_{wA} [dB(A)]	<20		<20		23		26		29		31		33		35	
		$L_{0.5}/L_{0.3}$ [m]	-	-	-	1.7	1.7	1.8	1.6	1.9	1.7	2.1	1.8	2.3	1.9	2.5	2.0	2.8
		$\bar{v}_{H1}$ [m/s]				0.11	0.14	0.13	0.16	0.14	0.19	0.15	0.21	0.17	0.24	0.18	0.26	0.19
Distance		A [m]				3.4	3.3	3.6	3.3	3.8	3.4	4.2	3.5	4.6	3.7	5.0	4.0	5.5

Base to f_{H1}:

room height H	=	2.9	m
height of occupied zone	=	1.7	m
H_1	=	1.2	m
distance A look table			
difference of temperature	=	-8.0	K

Definitions



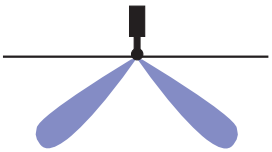


L	m	Distance ($X + H_1$) blowing against the wall
$L_{0.5}/L_{0.3}$	m	Distance in relation to the final velocities 0.3 m/s or 0.5 m/s
$^a{}_v$	l/s	Volume flow rate per diffuser
‡	m³/h	Volume flow rate per diffuser
$‡_{nominal}$	m³/h	Nominal volume flow rate with VAV: $V_{max} = 1.19 \cdot ‡_{nominal}$
v_{eff}	m/s	Eff. discharge velocity
A	m	Distance between the axes of two diffusers
X	m	Distance between diffuser centre and wall
H	m	Room height
H_1	m	Distance between ceiling and occupied zone
f_{H1}	m/s	Mean flow velocity of room air between two diffusers in ceiling distance H_1
f_L	m/s	Mean flow velocity of room air between wall in ceiling distance H_1
t_R	°C	Room air temperature
t_L	°C	Jet air temperature
Δt_z	K	Difference between room air and supply air temperature
Δt_L	K	Difference between room air and jet air temperature at distance $L = A/2 + H_1$ $L = X + H_1$
A_{eff}	m²	Effective air outlet surface area
Δp_t	Pa	Total pressure drop (supply air)
L_{wA}	dB(A)	A-weighted sound power level
L_{wNC}		NC rating of sound power level $L_{wNC} = L_{wA} - 6$ dB
L_{wNR}		$L_{wNR} = L_{wNC} + 2$ dB
L_{pA}, L_{pNC}		A-weighting or NC curve respectively of room sound power level $L_{pA} \sim L_{wA} - 8$ dB $L_{pNC} \sim L_{wNC} - 8$ dB
L_{wokt}	dB	Sound power level in the octave-centre frequencies
ΔL	dB	Insertion attenuation in the octave-centre frequencies
ΔL_A	dB	Octave-centre frequencies, correction value
f	Hz	Octave-centre frequencies
FW0066		Fixed resistance: plenum box without perforated plate, spigot 66%

Technical Data

Type KS1

Position 1



Correction table, octave-centre frequencies

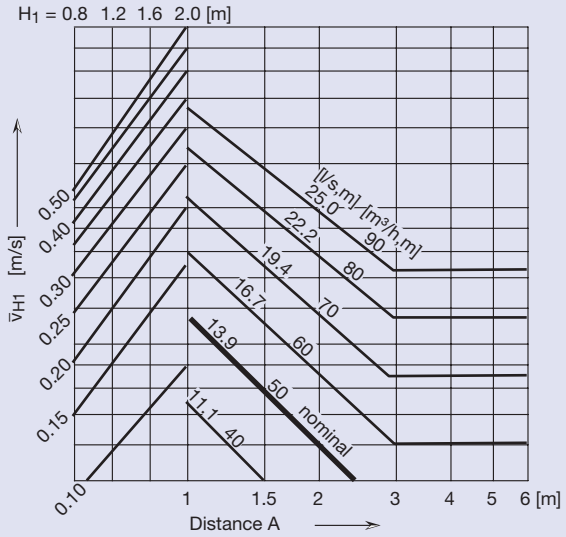
f	125	250	500	1k	2k	4k	8k	[Hz]
ΔLA	-5	+6	-1	-9	-18	<-20	<-20	[dB]

Insertion attenuation (incl. end reflection)
Interior of box not insulated

f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL	24	17	15	15	16	22	22	[dB]

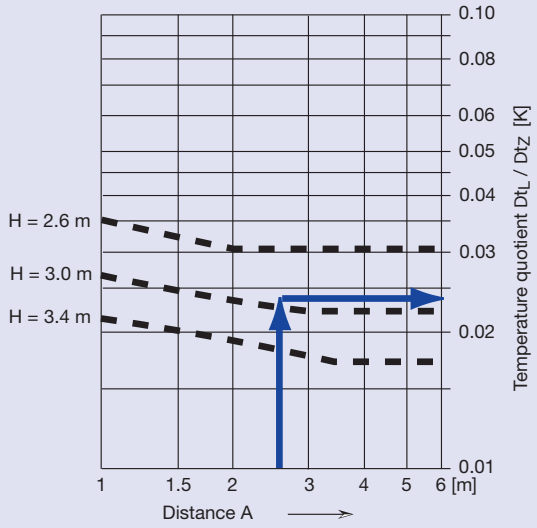
Room air velocity f_{H1}

Isotherm



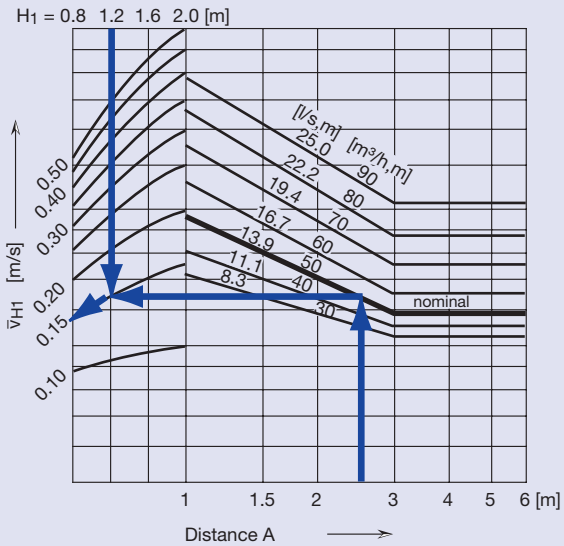
Temperature quotient

$\Delta t_L / \Delta t_Z$



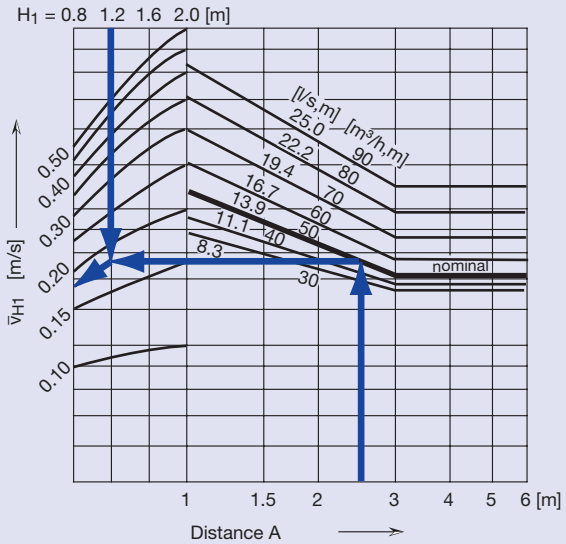
Room air velocity f_{H1}

Δt_z = - 8 K



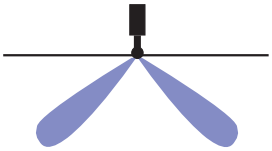
Room air velocity f_{H1}

Δt_z = - 12 K

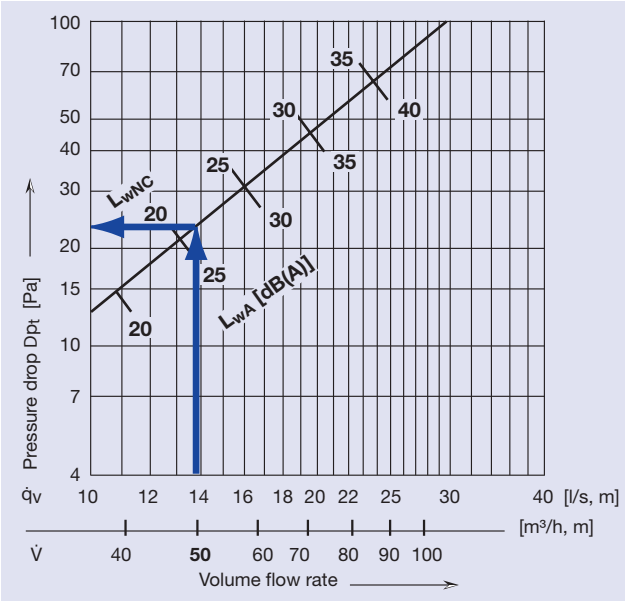


Type KS1

Position 1



Sound power level and pressure drop



Example

Given

Type KS1...K190 (FW0066) pos. 1	1 × Ø 80 mm	
Volume flow rate	13.9 l/s, m	$^{a}{}_{v}$
	50 m³/h, m	‡
Room height	2.9 m	H
Occupied zone height	1.7 m	
Distance to the ceiling	1.2 m	H_1
Distance between diffusers	2.5 m	A
Difference of temperature	- 12 K / - 8 K / 0 K	Δt

Solution

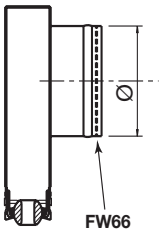
Sound power level	26 dB(A)	L_{wA}
Limite curve	21	L_{wNC}
Pressure drop	24 Pa	Δp_t

Insertion attenuation see p. 12

Room air velocity 1.7 m over ground			
at - 12 K	=	0.18 m/s	f_{H1}
at - 8 K	=	0.15 m/s	f_{H1}
at Isotherm	=	<0.10 m/s	f_{H1}
Difference of temperature		0.024	Δt_L / Δt_z
$(t_R - t_L)$ at Δt_L - 8 K = 0.024 × 8 =		~0.2 K	Δt_L

Eff. air outlet surface area

A_{eff} = 0.0034 m²



Correction of the sound power level L_{wA} and the pressure drop Δp_t

Spigot Ø [mm]	Length [mm] 1000 DLwA [dB]	1000 fDpt -	1500 DLwA [dB]	1500 fDpt -	2000 DLwA [dB]	2000 fDpt -
1× 80	0	1	+5	1.6	+8	2.5
1×100	-4	0.7	+2	1.0	+6	1.4
1×125	-5	0.6	0	0.8	+5	1.0
2× 80	-6	0.6	-1	0.8	+3	1.0
2×100	-8	0.5	-4	0.6	-1	0.7
2×125	-8	0.5	-5	0.6	-2	0.6

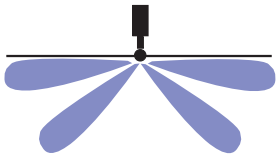
Octave spectrum

f	125	250	500	1000	2000	4000	8000	[Hz]
L_{wA}	26	26	26	26	26	26	26	[dB(A)]
ΔL_A	-5	+6	-1	-9	-18	<-20	<-20	[dB]
L_{wOkt}	21	32	25	17	<15	<15	<15	[dB]

Technical Data

Type KS1

Position 2



Correction table, octave-centre frequencies

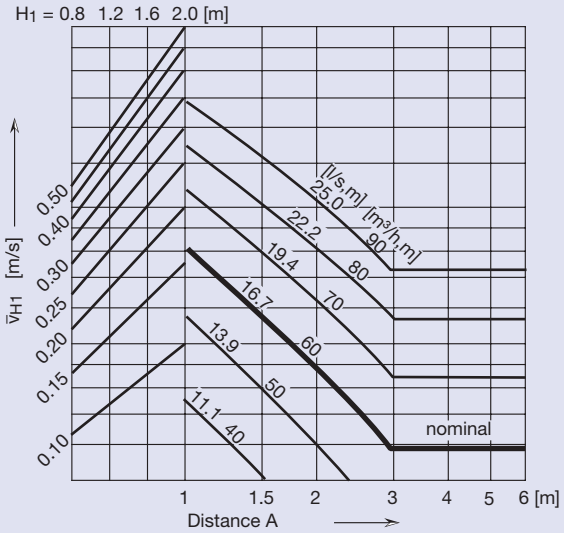
f	125	250	500	1k	2k	4k	8k	[Hz]
ΔLA	-5	+6	-1	-9	-18	<-20	<-20	[dB]

Insertion attenuation (incl. end reflection)
Interior of box not insulated

f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL	24	17	15	15	16	22	22	[dB]

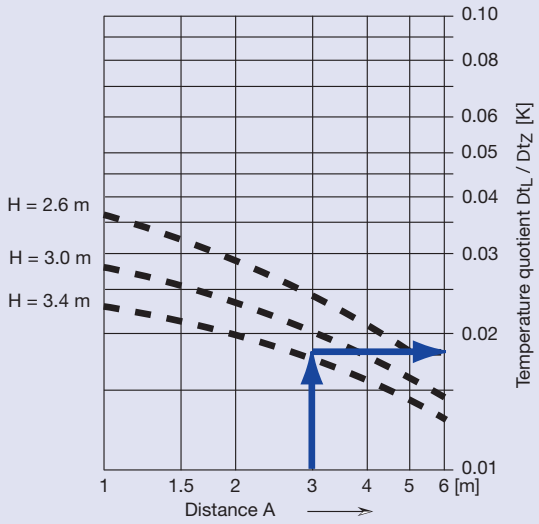
Room air velocity f_{H1}

Isotherm



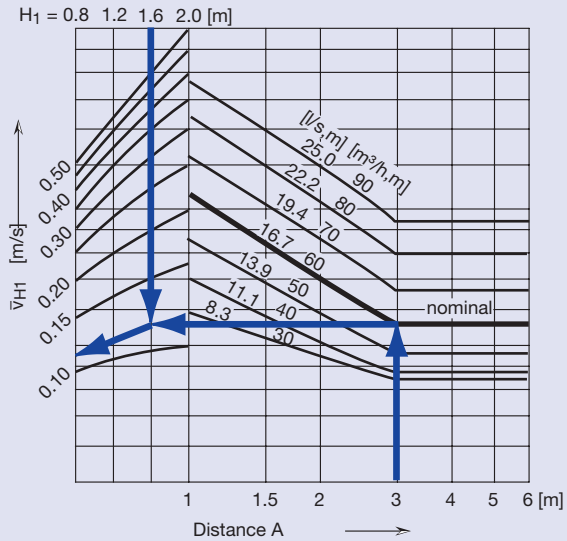
Temperature quotient

$\Delta t_L / \Delta t_Z$



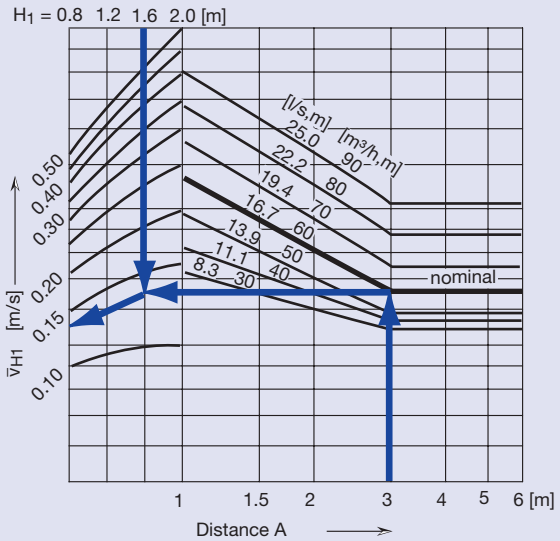
Room air velocity f_{H1}

Δt_z = - 8 K



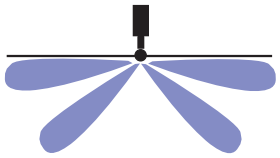
Room air velocity f_{H1}

Δt_z = - 12 K



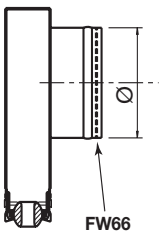
Type KS1

Position 2

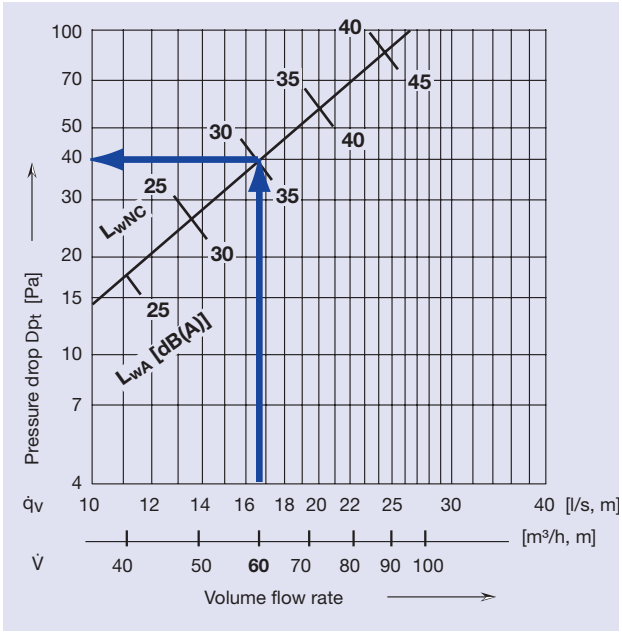


Eff. air outlet surface area

A_{eff} = 0.0028 m²



Sound power level and pressure drop



Correction of the sound power level L_{wA} and the pressure drop Δp_t

Spigot Ø [mm]	Length [mm] 1000 DLwA [dB]	1000 fDpt -	1500 DLwA [dB]	1500 fDpt -	2000 DLwA [dB]	2000 fDpt -
1× 80	0	1	+5	1.6	+8	2.4
1×100	-1	0.8	+3	1.1	+7	1.4
1×125	-1	0.7	+3	0.8	+7	1.0
2× 80	-3	0.6	0	0.8	+3	1.0
2×100	-4	0.6	-1	0.6	+2	0.8
2×125	-4	0.5	-1	0.6	+2	0.8

Example

Given

Type KS1...K190 (FW0066) pos. 2	1 × Ø 80 mm	
Volume flow rate	16.7 l/s, m	$^{a}_{v}$
	60 m³/h, m	‡
Room height	3.3 m	H
Occupied zone height	1.7 m	
Distance to the ceiling	1.6 m	H_1
Distance between diffusers	3.0 m	A
Difference of temperature	- 12 K / - 8 K / 0 K	Δt

Solution

Sound power level	35 dB(A)	L_{wA}
Limite curve	30	L_{wNC}
Pressure drop	24 Pa	Δp_t

Octave spectrum

f	125	250	500	1000	2000	4000	8000	[Hz]
L_{wA}	35	35	35	35	35	35	35	[dB(A)]
ΔL_A	-5	+6	-1	-9	-18	<-20	<-20	[dB]
L_{wOkt}	30	41	34	26	17	<15	<15	[dB]

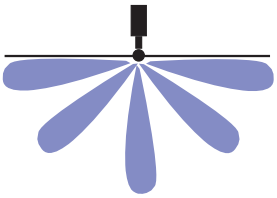
Insertion attenuation **see p. 14**

Room air velocity 1.7 m over ground			
at - 12 K	=	0.14 m/s	f_{H1}
at - 8 K	=	0.12 m/s	f_{H1}
at Isotherm	=	<0.10 m/s	f_{H1}
Difference of temperature 0.018		$\Delta t_L / \Delta t_z$	
$(t_R - t_L)$ at Δt_L - 8 K = 0.018 × 8 =		~0.2 K	Δt_L

Technical Data

Type KS1

Position 3



Correction table, octave-centre frequencies

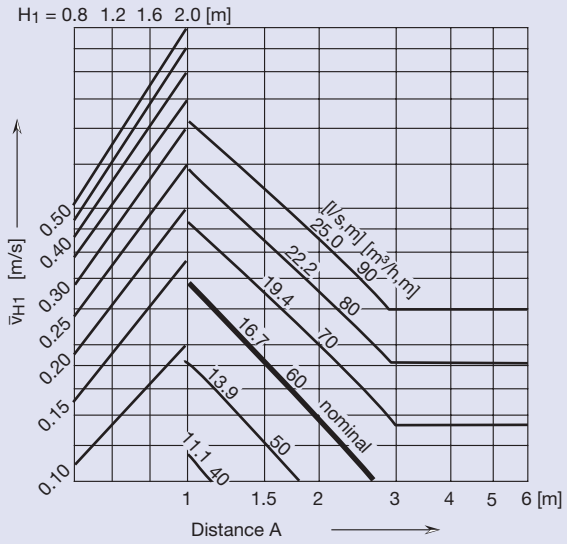
f	125	250	500	1k	2k	4k	8k	[Hz]
ΔLA	-5	+6	-1	-9	-18	<-20	<-20	[dB]

Insertion attenuation (incl. end reflection)
Interior of box not insulated

f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL	24	17	15	15	16	22	22	[dB]

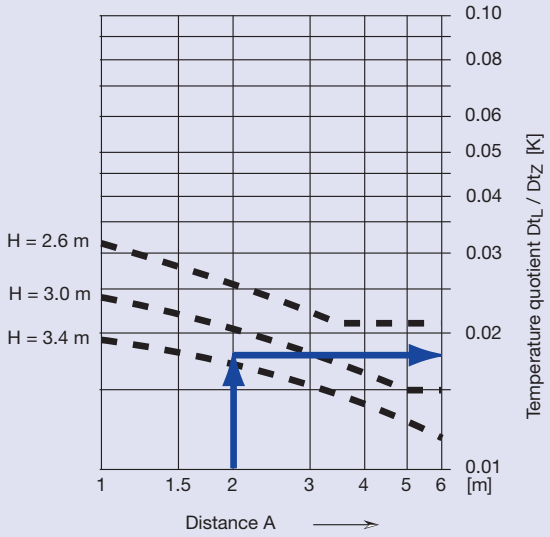
Room air velocity f_{H1}

Isotherm



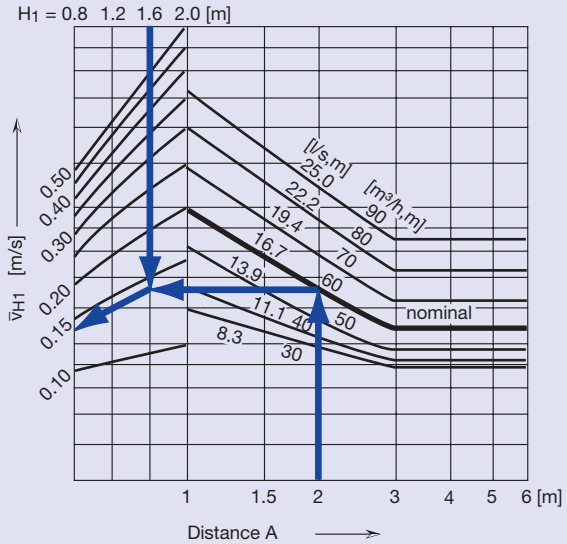
Temperature quotient

$\Delta t_L / \Delta t_Z$



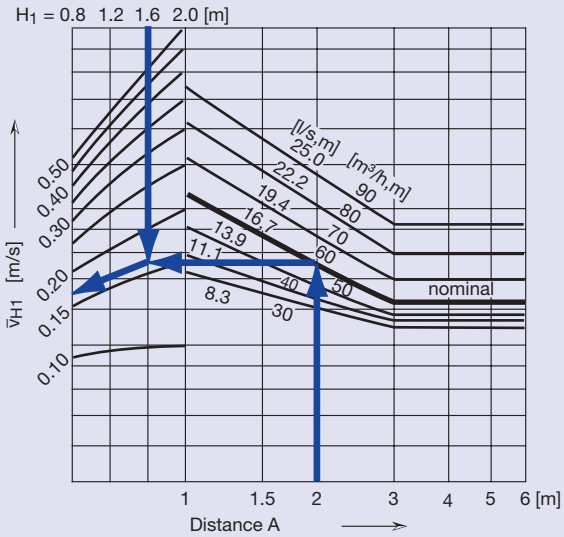
Room air velocity f_{H1}

Δt_z = - 8 K



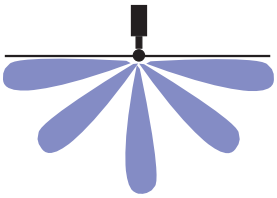
Room air velocity f_{H1}

Δt_z = - 12 K



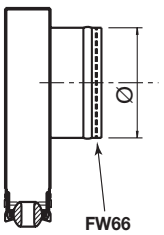
Type KS1

Position 3

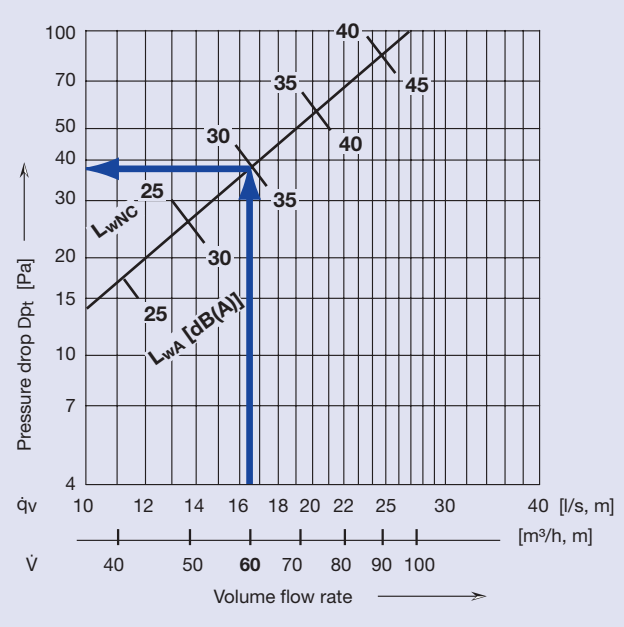


Eff. air outlet surface area

A_{eff} = 0.0028 m²



Sound power level and pressure drop



Correction of the sound power level L_{wA} and the pressure drop Δp_t

Spigot Ø [mm]	Length [mm] 1000 DLwA [dB]	1000 fDpt -	1500 DLwA [dB]	1500 fDpt -	2000 DLwA [dB]	2000 fDpt -
1× 80	0	1	+5	1.6	+8	2.4
1×100	-1	0.8	+3	1.1	+7	1.4
1×125	-1	0.7	+3	0.8	+7	1.0
2× 80	-3	0.6	0	0.8	+3	1.0
2×100	-4	0.6	-1	0.6	+2	0.8
2×125	-4	0.5	-1	0.6	+2	0.8

Example

Given

Type KS1...K190 (FW0066) pos. 3	1 × Ø 80 mm	
Volume flow rate	16.7 l/s, m	$^{a}_{v}$
	60 m³/h, m	‡
Room height	3.3 m	H
Occupied zone height	1.7 m	
Distance to the ceiling	1.6 m	H_1
Distance between diffusers	2.0 m	A
Difference of temperature	- 12 K / - 8 K / 0 K	Δt

Solution

Sound power level	35 dB(A)	L_{wA}
Limite curve	30	L_{wNC}
Pressure drop	39 Pa	Δp_t

Octave spectrum

f	125	250	500	1000	2000	4000	8000	[Hz]
L_{wA}	35	35	35	35	35	35	35	[dB(A)]
ΔL_A	-5	+6	-1	-9	-18	<-20	<-20	[dB]
L_{wOkt}	39	41	34	26	17	<15	<15	[dB]

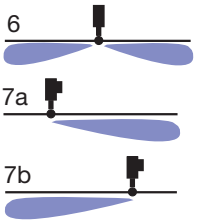
Insertion attenuation see p. 16

Room air velocity 1.7 m over ground			
at - 12 K	=	0.17 m/s	f_{H1}
at - 8 K	=	0.14 m/s	f_{H1}
at Isotherm	=	<0.10 m/s	f_{H1}
Difference of temperature	0.018	$\Delta t_L / \Delta t_z$	
(t_R - t_L) at Δt_L - 8 K = 0.018 × 8 =		~0.2 K	Δt_L

Technical Data

Type KS1

Positions 6 + 7



Correction table, octave-centre frequencies

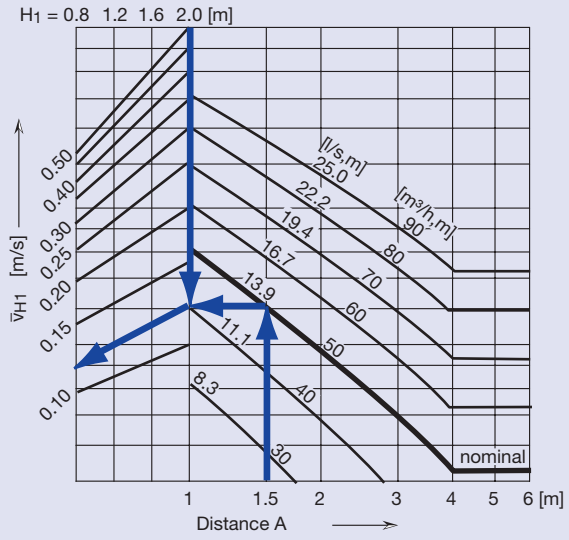
f	125	250	500	1k	2k	4k	8k	[Hz]
ΔLA	-5	+6	-1	-9	-18	<-20	<-20	[dB]

Insertion attenuation (incl. end reflection)
Interior of box not insulated

f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL	24	17	15	15	16	22	22	[dB]

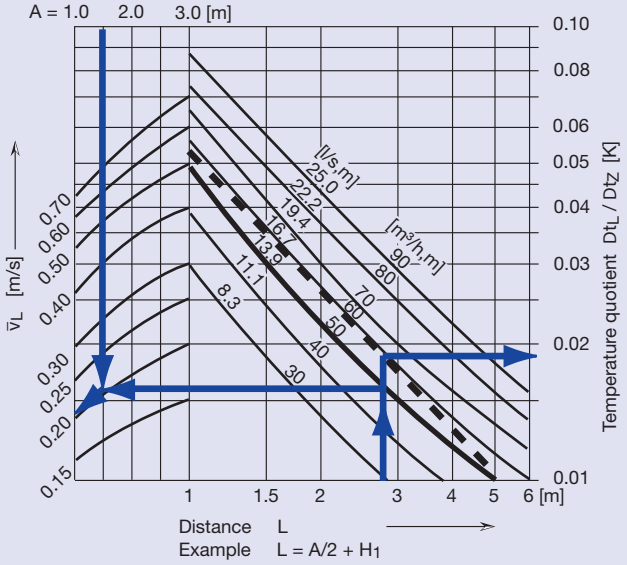
Room air velocity f_{H1}

Isotherm



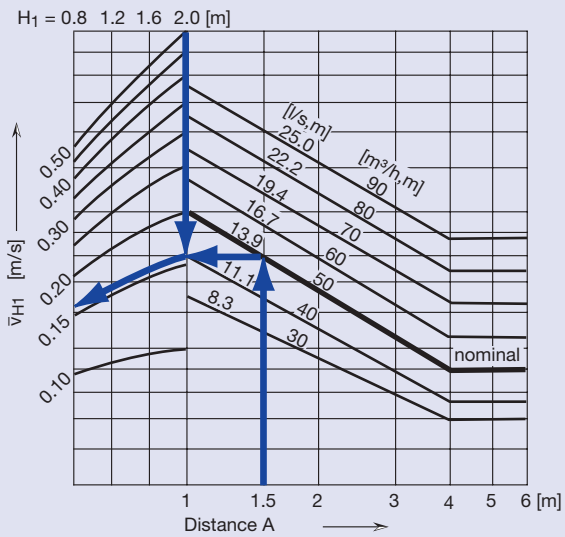
Room air velocity by the wall f_L

Δt_z = - 8 K



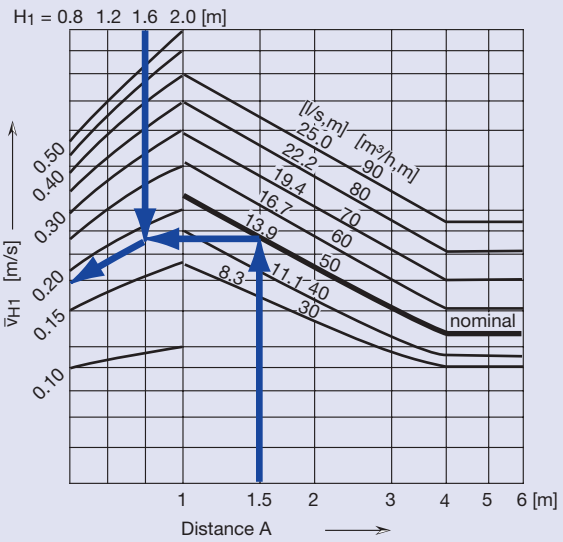
Room air velocity f_{H1}

Δt_z = - 8 K



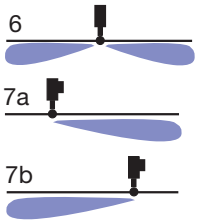
Room air velocity f_{H1}

Δt_z = - 12 K



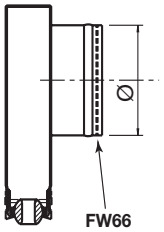
Type KS1

Positions 6 + 7

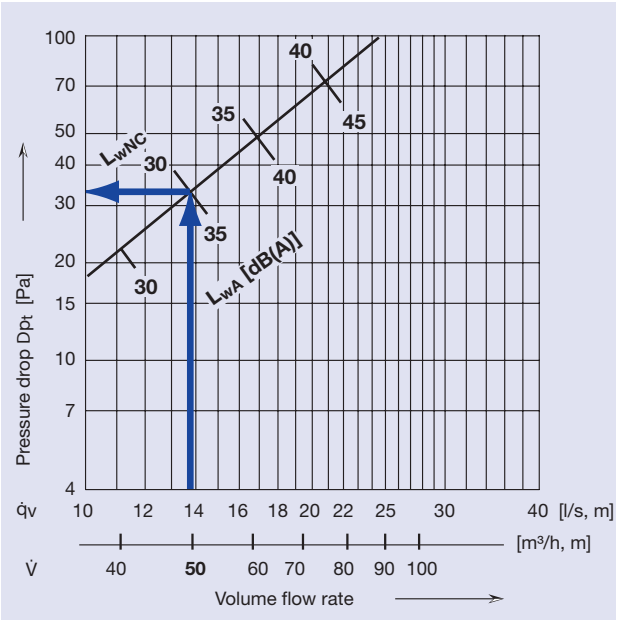


Eff. air outlet surface area

A_{eff} = 0.0017 m²



Sound power level and pressure drop



Correction of the sound power level L_{wA} and the pressure drop Δp_t

Spigot Ø [mm]	Length [mm] 1000 DLwA [dB]	1000 fDpt -	1500 DLwA [dB]	1500 fDpt -	2000 DLwA [dB]	2000 fDpt -
1× 80	0	1	+4	1.5	+7	2.1
1×100	0	0.8	+4	1.1	+7	1.4
1×125	0	0.7	+3	0.9	+7	1.1
2× 80	-2	0.7	+1	0.8	+3	1.0
2×100	-2	0.6	0	0.7	+3	0.8
2×125	-2	0.6	0	0.7	+3	0.7

Example

Given

Type KS1...K190 (FW0066) pos. 6 + 7	1 × Ø 80 mm	
Volume flow rate	13.9 l/s, m	$^a{}_v$
	50 m³/h, m	‡
Room height	3.7 m	H
Occupied zone height	1.7 m	
Distance to the ceiling	2.0 m	H_1
Distance between diffusers	1.5 m	A
Difference of temperature	- 12 K / - 8 K / 0 K	Δt

Solution

Sound power level	35 dB(A)	L_{wA}
Limite curve	30	L_{wNC}
Pressure drop	33 Pa	Δp_t

Octave spectrum

f	125	250	500	1000	2000	4000	8000	[Hz]
L_{wA}	35	35	35	35	35	35	35	[dB(A)]
ΔL_A	-5	+6	-1	-9	-18	<-20	<-20	[dB]
L_{wOkt}	30	41	34	26	17	<15	<15	[dB]

Insertion attenuation see p. 18

Room air velocity 1.7 m over ground

at - 12 K	=	0.18 m/s	f_{H1}
at - 8 K	=	0.16 m/s	f_{H1}
at Isotherm	=	0.12 m/s	f_{H1}

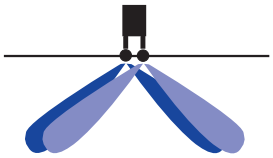
Difference of temperature 0.019 $\Delta t_L / \Delta t_z$

$(t_R - t_L)$ at Δt_L - 8 K = 0.019 × 8 = ~0.2 K Δt_L

Technical Data

Type KS2

Position 1



Correction table, octave-centre frequencies

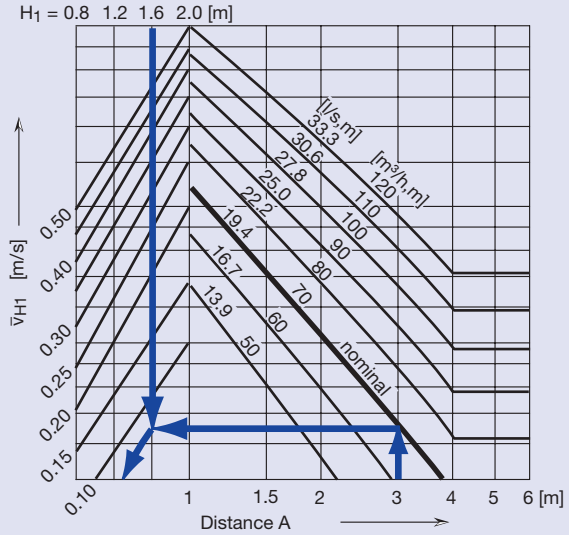
f	125	250	500	1k	2k	4k	8k	[Hz]
ΔLA	-5	+6	-1	-9	-18	<-20	<-20	[dB]

Insertion attenuation (incl. end reflection)
Interior of box not insulated

f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL	21	13	16	11	16	15	29	[dB]

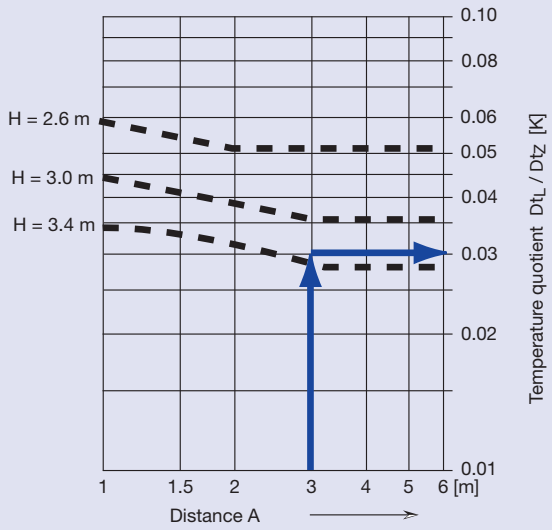
Room air velocity f_{H1}

Isotherm



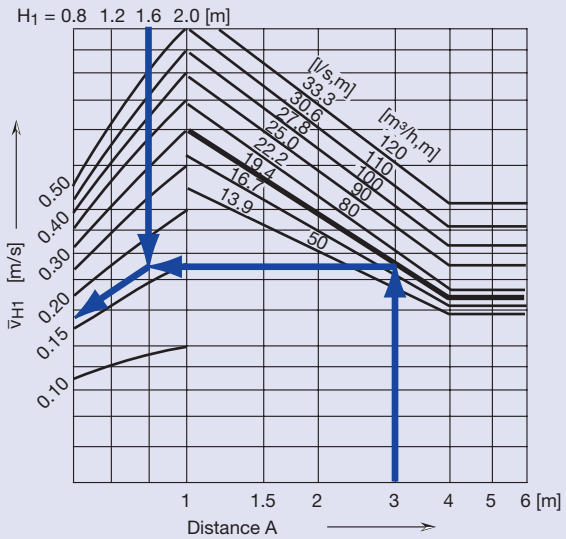
Temperature quotient

$\Delta t_L / \Delta t_Z$



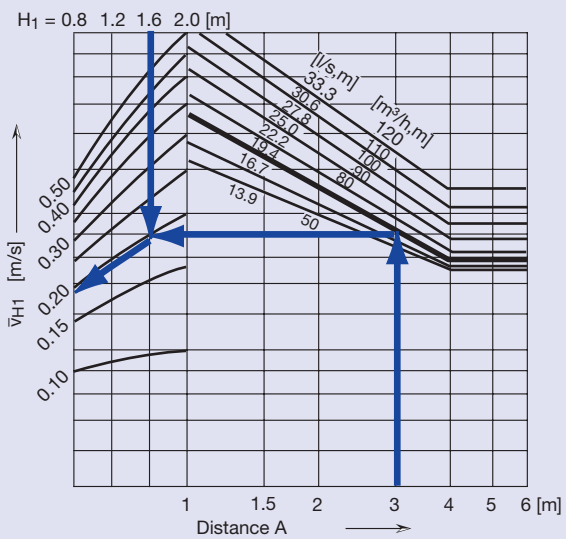
Room air velocity f_{H1}

Δt_z = - 8 K



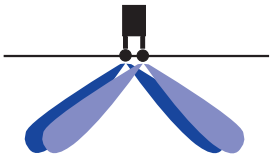
Room air velocity f_{H1}

Δt_z = - 12 K

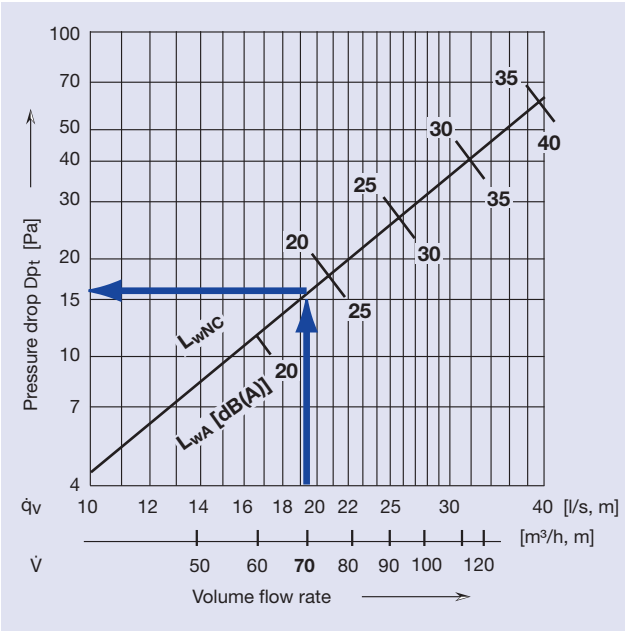


Type KS2

Position 1



Sound power level and pressure drop



Example

Given

Type KS2...K220 (FW0066) pos. 1	1 × Ø 100 mm	
Volume flow rate	19.4 l/s, m	$^{a}{}_{v}$
	70 m³/h, m	‡
Room height	3.3 m	H
Occupied zone height	1.7 m	
Distance to the ceiling	1.6 m	H_1
Distance between diffusers	3.0 m	A
Difference of temperature	- 12 K / - 8 K / 0 K	Δt

Solution

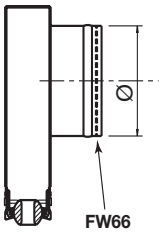
Sound power level	23 dB(A)	L_{wA}
Limite curve	18	L_{wNC}
Pressure drop	16 Pa	Δp_t

Insertion attenuation see p. 20

Room air velocity 1.7 m over ground			
at - 12 K	=	0.19 m/s	f_{H1}
at - 8 K	=	0.16 m/s	f_{H1}
at Isotherm	=	<0.10 m/s	f_{H1}
Difference of temperature	0.03	Δt_L / Δt_z	
(t_R - t_L) at Δt_L - 8 K = 0.03 × 8 =		~0.3 K	Δt_L

Eff. air outlet surface area

A_{eff} = 0.0067 m²



Correction of the sound power level L_{wA} and the pressure drop Δp_t

Spigot Ø [mm]	Length [mm] 1000 DLwA [dB]	1000 fDpt -	1500 DLwA [dB]	1500 fDpt -	2000 DLwA [dB]	2000 fDpt -
1× 80	+9	1.8	+18	3.6	+25	6.1
1×100	0	1	+9	1.8	+17	2.8
1×125	-7	0.7	+2	1.0	+10	1.5
2× 80	-1	0.7	+6	1.2	+12	1.8
2×100	-9	0.5	-3	0.7	+3	1.0
2×125	-13	0.4	-8	0.5	-4	0.7

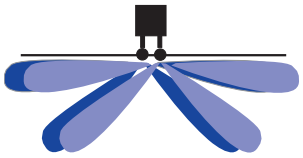
Octave spectrum

f	125	250	500	1000	2000	4000	8000	[Hz]
L_{wA}	23	23	23	23	23	23	23	[dB(A)]
ΔL_A	-5	+6	-1	-9	-18	<-20	<-20	[dB]
L_{wOkt}	18	29	22	14	<14	<14	<14	[dB]

Technical Data

Type KS2

Position 2



Correction table, octave-centre frequencies

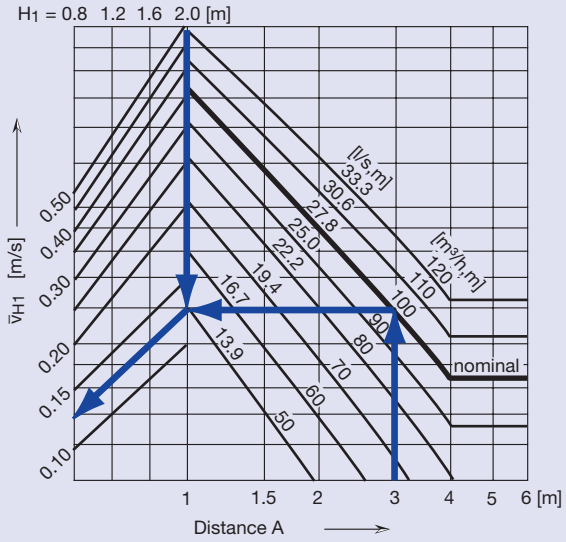
f	125	250	500	1k	2k	4k	8k	[Hz]
ΔLA	-5	+6	-1	-9	-18	<-20	<-20	[dB]

Insertion attenuation (incl. end reflection)
Interior of box not insulated

f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL	21	13	16	11	16	15	29	[dB]

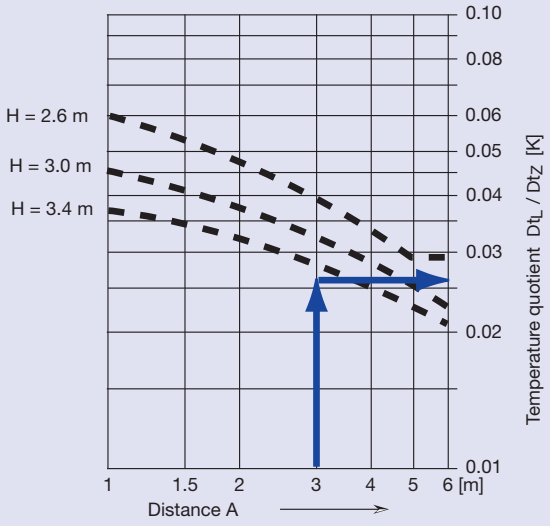
Room air velocity f_{H1}

Isotherm



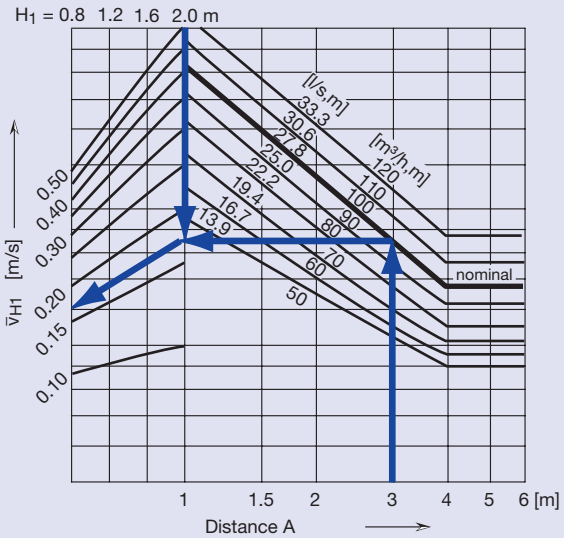
Temperature quotient

$\Delta t_L / \Delta t_Z$



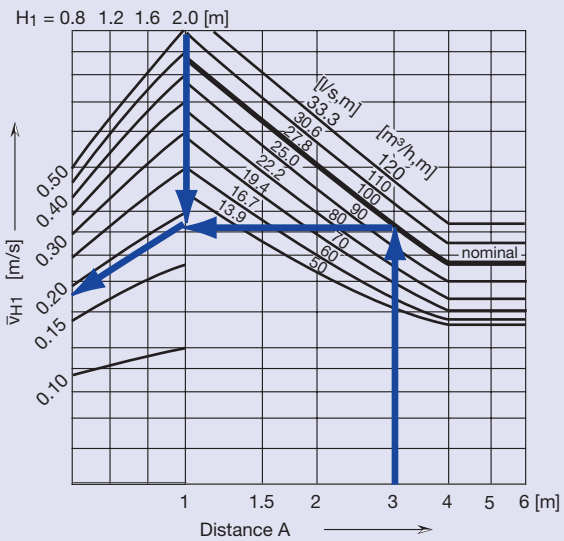
Room air velocity f_{H1}

Δt_z = - 8 K



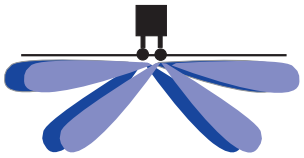
Room air velocity f_{H1}

Δt_z = - 12 K



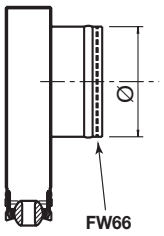
Type KS2

Position 2

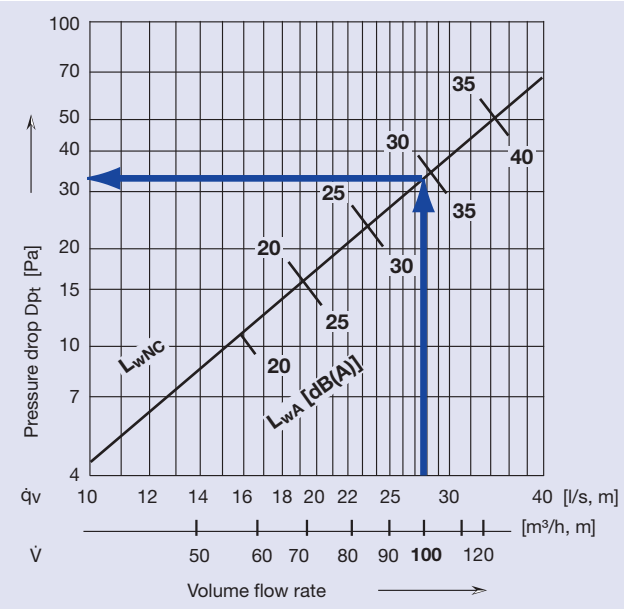


Eff. air outlet surface area

A_{eff} = 0.0057 m²



Sound power level and pressure drop



Correction of the sound power level L_{wA} and the pressure drop Δp_t

Spigot Ø [mm]	Length [mm] 1000 DLwA [dB]	1000 fDpt -	1500 DLwA [dB]	1500 fDpt -	2000 DLwA [dB]	2000 fDpt -
1× 80	+7	1.7	+16	3.4	+23	5.6
1×100	0	1	+8	1.7	+15	2.7
1×125	-3	0.7	+4	1.0	+10	1.5
2× 80	-2	0.7	+5	1.2	+10	1.7
2×100	-6	0.5	-2	0.7	+3	1.0
2×125	-7	0.5	-3	0.6	0	0.7

Example

Given

Type KS2...K220 (FW0066) pos. 2	1 × Ø 100 mm	
Volume flow rate	27.8 l/s, m	$^{a}{}_{v}$
	100 m³/h, m	‡
Room height	3.7 m	H
Occupied zone height	1.7 m	
Distance to the ceiling	2.0 m	H_1
Distance between diffusers	3.0 m	A
Difference of temperature	- 12 K /- 8 K / 0 K	Δt

Solution

Sound power level	34 dB(A)	L_{wA}
Limite curve	29	L_{wNC}
Pressure drop	34 Pa	Δp_t

Octave spectrum

f	125	250	500	1000	2000	4000	8000	[Hz]
L_{wA}	34	34	34	34	34	34	34	[dB(A)]
ΔL_A	-5	+6	-1	-9	-18	<-20	<-20	[dB]
L_{wOkt}	29	40	33	25	16	<14	<14	[dB]

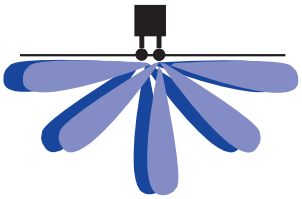
Insertion attenuation **see p. 22**

Room air velocity 1.7 m over ground			
at - 12 K	=	0.19 m/s	f_{H1}
at - 8 K	=	0.17 m/s	f_{H1}
at Isotherm	=	0.13 m/s	f_{H1}
Difference of temperature	0.026	Δt_L / Δt_z	
(t_R - t_L) at Δt_L - 8 K = 0.026 × 8 =		~0.2 K	Δt_L

Technical Data

Type KS2

Position 3



Correction table, octave-centre frequencies

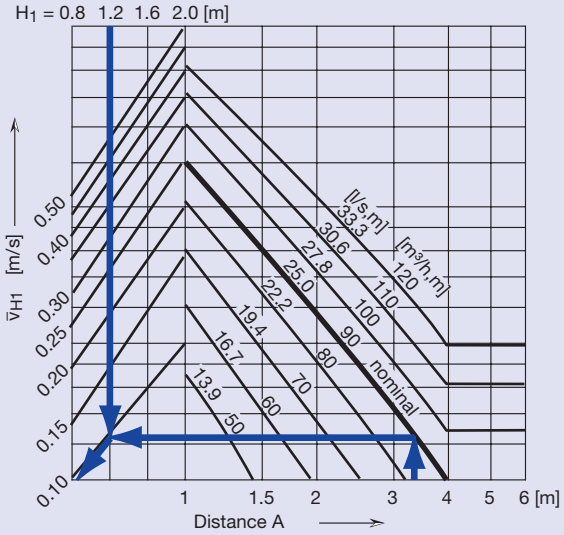
f	125	250	500	1k	2k	4k	8k	[Hz]
ΔLA	-5	+6	-1	-9	-18	<-20	<-20	[dB]

Insertion attenuation (incl. end reflection)
Interior of box not insulated

f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL	21	13	16	11	16	15	29	[dB]

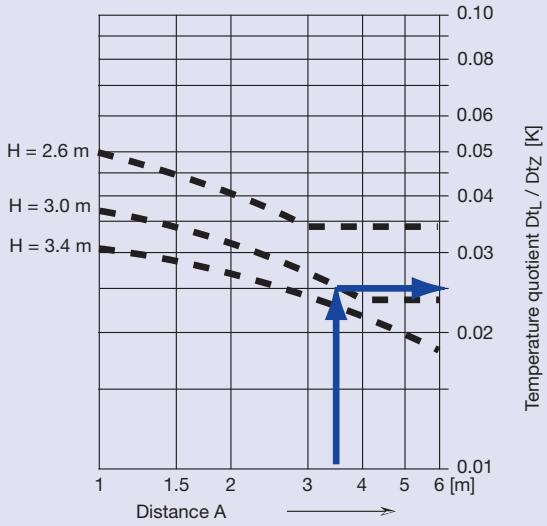
Room air velocity f_{H1}

Isotherm



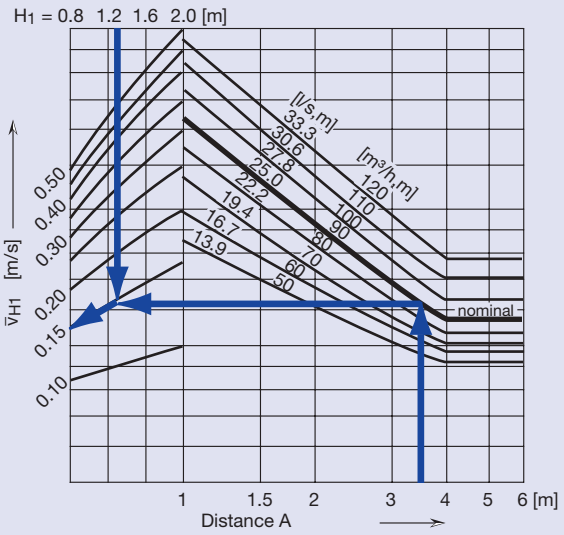
Temperature quotient

$\Delta t_L / \Delta t_Z$



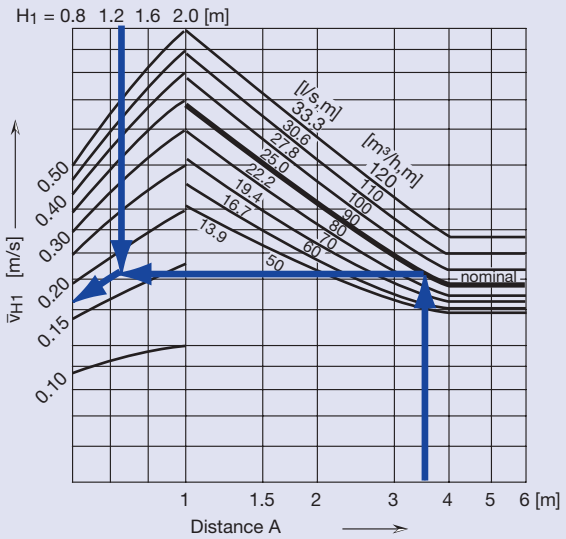
Room air velocity f_{H1}

Δt_z = - 8 K



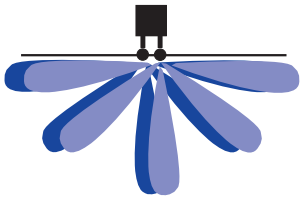
Room air velocity f_{H1}

Δt_z = - 12 K



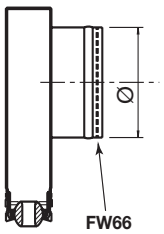
Type KS2

Position 3

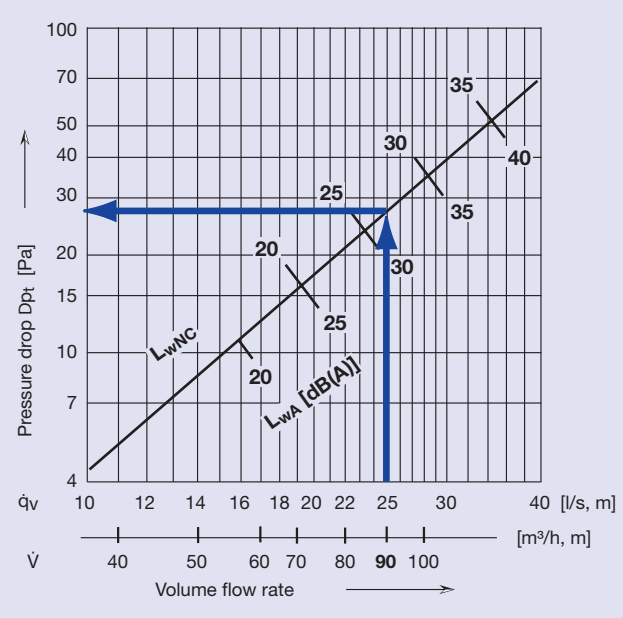


Eff. air outlet surface area

A_{eff} = 0.0057 m²



Sound power level and pressure drop



Correction of the sound power level L_{wA} and the pressure drop Δp_t

Spigot Ø [mm]	Length [mm] 1000 DLwA [dB]	1000 fDpt -	1500 DLwA [dB]	1500 fDpt -	2000 DLwA [dB]	2000 fDpt -
1× 80	+7	1.7	+16	3.4	+24	5.7
1×100	0	1	+8	1.7	+16	2.7
1×125	-3	0.7	+4	1.0	+10	1.5
2× 80	-2	0.7	+5	1.2	+10	1.7
2×100	-6	0.5	-2	0.7	+3	1.0
2×125	-7	0.5	-3	0.6	0	0.7

Example

Given

Type KS2...K220 (FW0066) pos. 3	1 × Ø 100 mm	
Volume flow rate	25.0 l/s, m	$^{a}{}_{v}$
	90 m³/h, m	‡
Room height	3.0 m	H
Occupied zone height	1.7 m	
Distance to the ceiling	1.3 m	H_1
Distance between diffusers	3.5 m	A
Difference of temperature	- 12 K / - 8 K / 0 K	Δt

Solution

Sound power level	31 dB(A)	L_{wA}
Limite curve	26	L_{wNC}
Pressure drop	28 Pa	Δp_t

Octave spectrum

f	125	250	500	1000	2000	4000	8000	[Hz]
L_{wA}	31	31	31	31	31	31	31	[dB(A)]
ΔL_A	-5	+6	-1	-9	-18	<-20	<-20	[dB]
L_{wOkt}	26	37	30	22	<15	<15	<15	[dB]

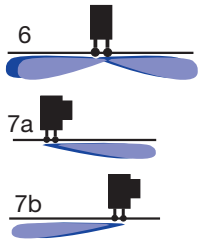
Insertion attenuation see p. 24

Room air velocity 1.7 m over ground			
at - 12 K	=	0.17 m/s	f_{H1}
at - 8 K	=	0.15 m/s	f_{H1}
at Isotherm	=	<0.10 m/s	f_{H1}
Difference of temperature	0.025	Δt_L / Δt_z	
(t_R - t_L) at Δt_L - 8 K = 0.025 × 8 =		~0.2 K	Δt_L

Technical Data

Type KS2

Positions 6 + 7



Correction table, octave-centre frequencies

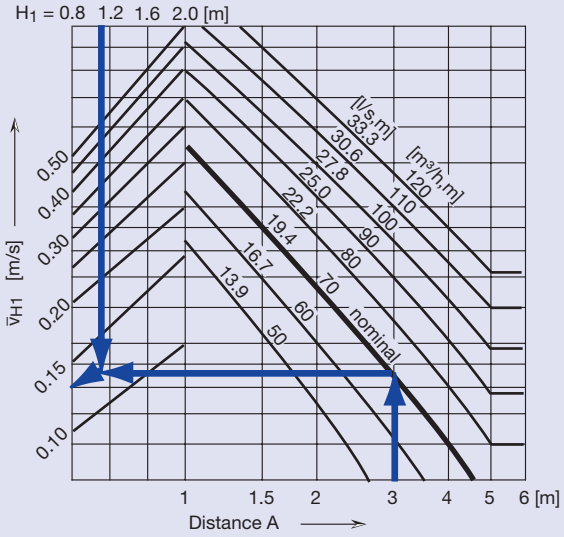
f	125	250	500	1k	2k	4k	8k	[Hz]
ΔLA	-5	+6	-1	-9	-18	<-20	<-20	[dB]

Insertion attenuation (incl. end reflection)
Interior of box not insulated

f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL	21	13	16	11	16	15	29	[dB]

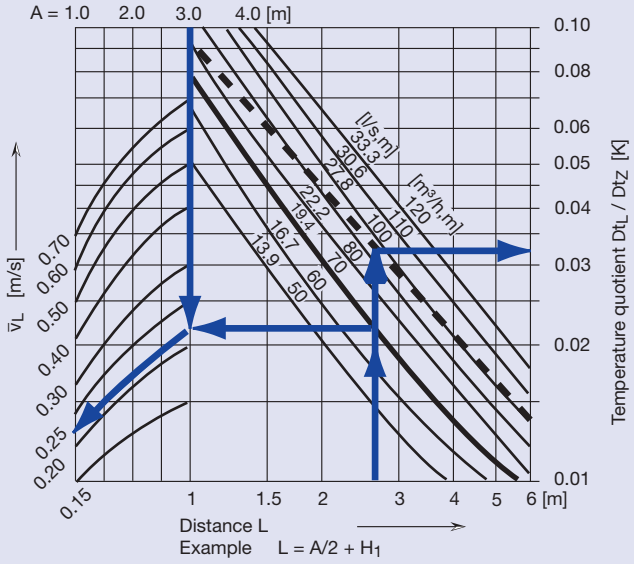
Room air velocity f_{H1}

Isotherm



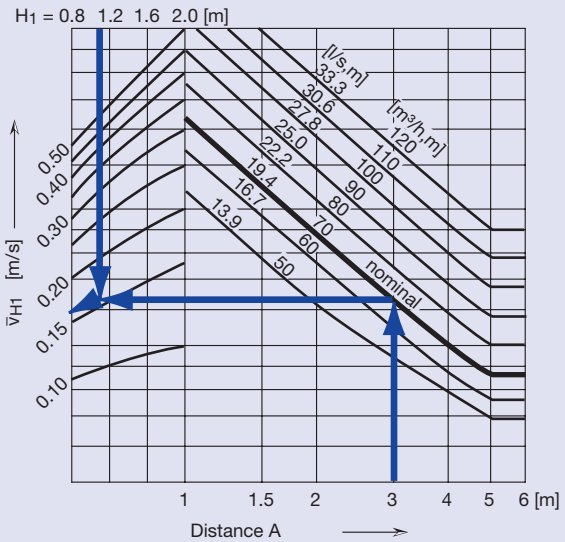
Room air velocity by the wall f_L

Δt_z = - 8 K



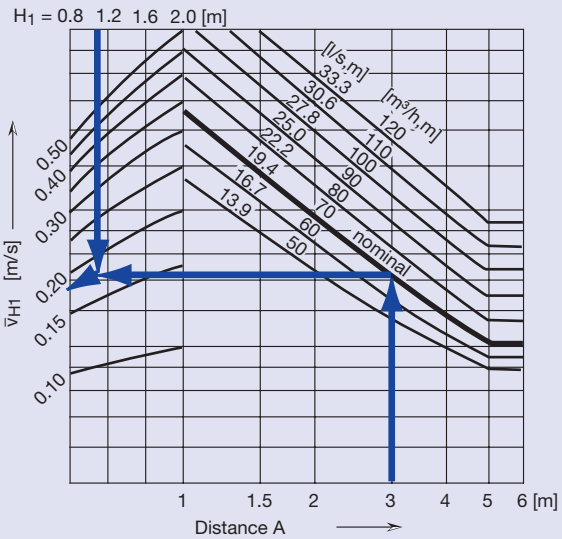
Room air velocity f_{H1}

Δt_z = - 8 K



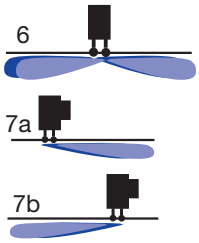
Room air velocity f_{H1}

Δt_z = - 12 K



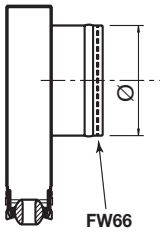
Type KS2

Positions 6 + 7

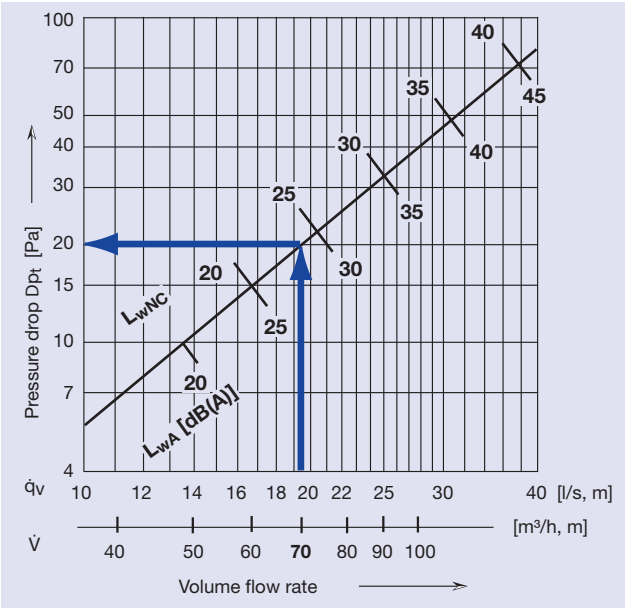


Eff. air outlet surface area

A_{eff} = 0.0035 m²



Sound power level and pressure drop



Correction of the sound power level L_{wA} and the pressure drop Δp_t

Spigot Ø [mm]	Length [mm] 1000 DL_{wA} [dB]	1000 f_{Dpt} -	1500 DL_{wA} [dB]	1500 f_{Dpt} -	2000 DL_{wA} [dB]	2000 f_{Dpt} -
1× 80	+4	1.6	+13	3.0	+20	4.9
1×100	0	1	+7	1.6	+13	2.4
1×125	-1	0.7	+5	1.0	+10	1.4
2× 80	-3	0.8	+2	1.1	+7	1.6
2×100	-5	0.6	-1	0.8	+3	1.0
2×125	-5	0.5	-1	0.6	+2	0.7

Example

Given

Type KS2...K220 (FW0066) pos. 6+7,	1 × Ø 100 mm	
Volume flow rate	19.4 l/s, m	$^a{}_v$
	70 m³/h, m	‡
Room height	2.8 m	H
Occupied zone height	1.7 m	
Distance to the ceiling	1.1 m	H_1
Distance between diffusers	3.0 m	A
Difference of temperature	- 12 K / - 8 K / 0 K	Δt

Solution

Sound power level	28 dB(A)	L_{wA}
Limite curve	23	L_{wNC}
Pressure drop	20 Pa	Δp_t

Octave spectrum

f	125	250	500	1000	2000	4000	8000	[Hz]
L_{wA}	28	28	28	28	28	28	28	[dB(A)]
ΔL_A	-5	+6	-1	-9	-18	<-20	<-20	[dB]
L_{wOkt}	23	34	27	19	<15	<15	<15	[dB]

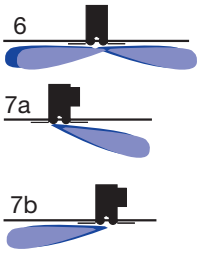
Insertion attenuation see p. 26

Room air velocity 1.7 m over ground			
at - 12 K	=	0.19 m/s	f_{H1}
at - 8 K	=	0.17 m/s	f_{H1}
at Isotherm	=	0.14 m/s	f_{H1}
Difference of temperature	0.033	$\Delta t_L / \Delta t_z$	
$(t_R - t_L)$ at Δt_L - 8 K = 0.033 × 8 =		~0.3 K	Δt_L

Technical Data

Type KS2WK100

Positions 6 + 7



Correction table, octave-centre frequencies

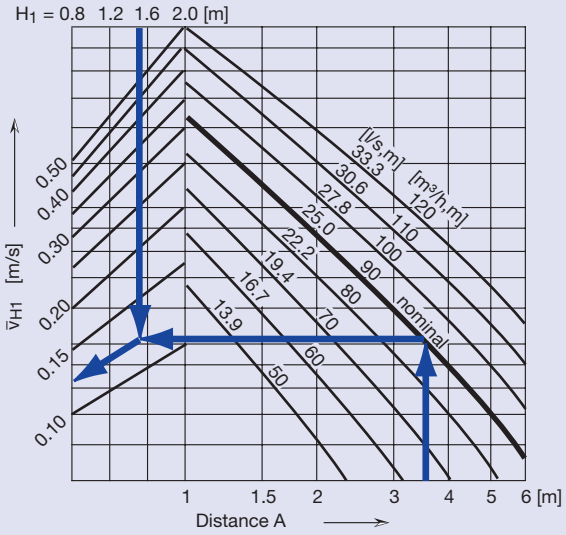
f	125	250	500	1k	2k	4k	8k	[Hz]
ΔLA	-5	+6	-1	-9	-18	<-20	<-20	[dB]

Insertion attenuation (incl. end reflection)
Interior of box not insulated

f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL	21	13	16	11	16	15	29	[dB]

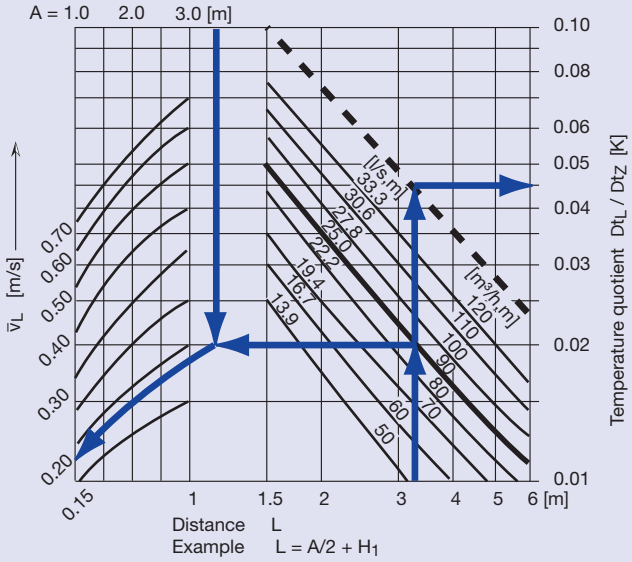
Room air velocity f_{H1}

Isotherm



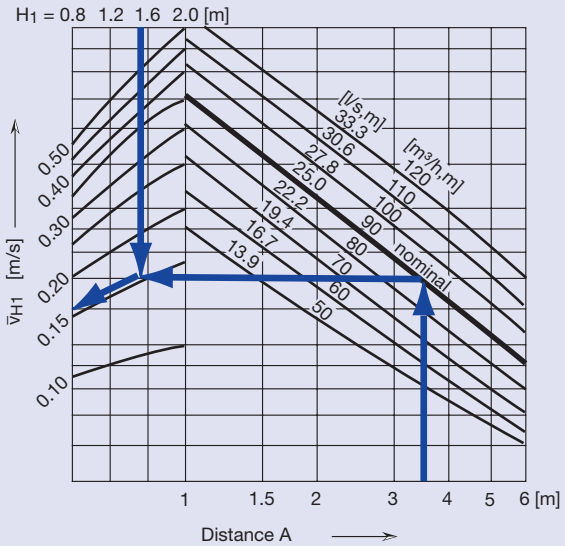
Room air velocity by the wall f_L

Δt_z = - 8 K



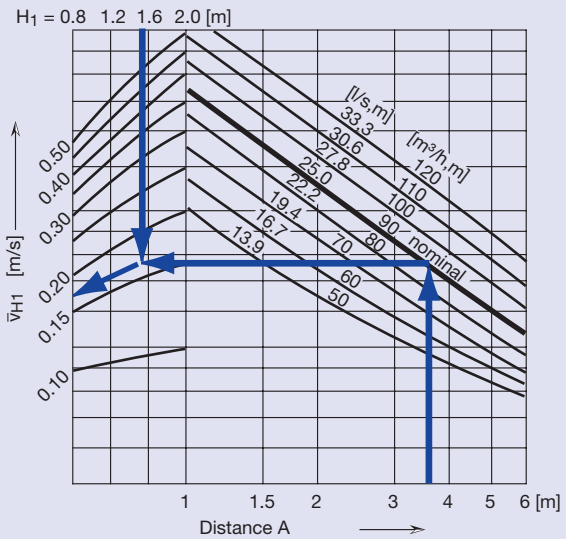
Room air velocity f_{H1}

Δt_z = - 8 K



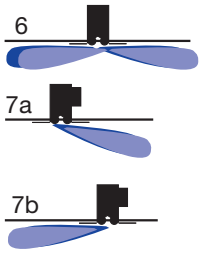
Room air velocity f_{H1}

Δt_z = - 12 K



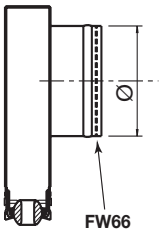
Type KS2WK100...K220

Positions 6 + 7

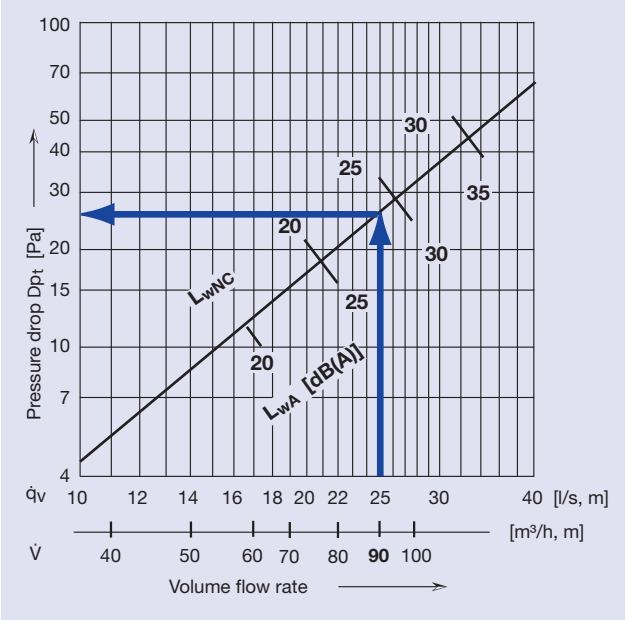


Eff. air outlet surface area

A_{eff} = 0.0063 m²



Sound power level and pressure drop



Example

Given

Type KS2WK100...K220 (FW0066)		
pos.6+7	1 × Ø 100 mm	
Volume flow rate	25.0 l/s, m	$^{a}{}_{v}$
	90 m³/h, m	‡
Room height	3.2 m	H
Occupied zone height	1.7 m	
Distance to the ceiling	1.5 m	H_1
Distance between diffusers	3.5 m	A
Difference of temperature	- 12 K / - 8 K / 0 K	Δt

Solution

Sound power level	29 dB(A)	L_{wA}
Limite curve	24	L_{wNC}
Pressure drop	26 Pa	Δp_t

Insertion attenuation see p. 28

Room air velocity 1.7 m over ground			
at - 12 K	=	0.18 m/s	f_{H1}
at - 8 K	=	0.16 m/s	f_{H1}
at Isotherm	=	0.13 m/s	f_{H1}
Difference of temperature	0.045	Δt_L / Δt_z	
(t_R - t_L) at Δt_L - 8 K = 0.045 × 8 =		~0.4 K	Δt_L

Correction of the sound power level L_{wA} and the pressure drop Δp_t

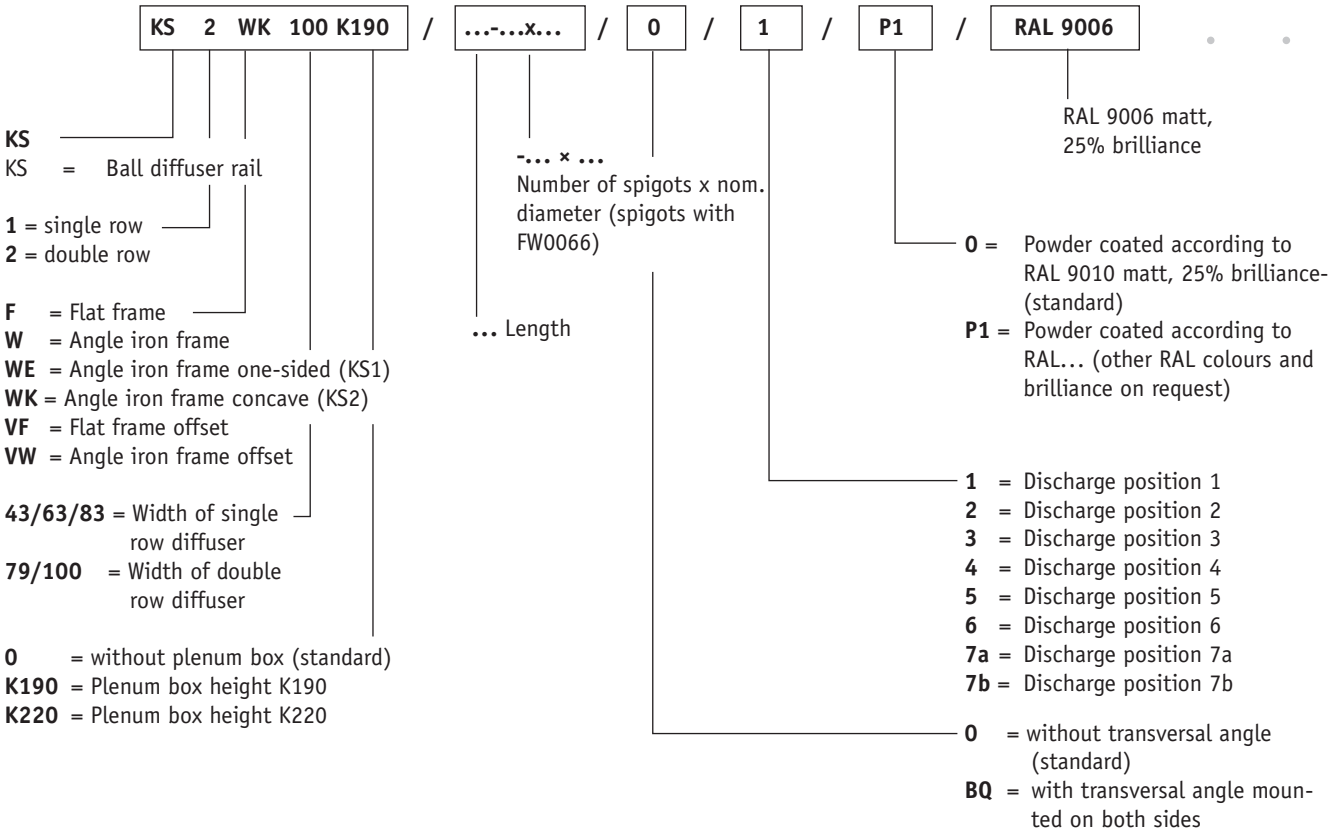
Spigot Ø [mm]	Length [mm] 1000 DLwA [dB]	1000 fDpt -	1500 DLwA [dB]	1500 fDpt -	2000 DLwA [dB]	2000 fDpt -
1× 80	+9	1.8	+18	3.6	+25	6.1
1×100	0	1	+9	1.8	+17	2.8
1×125	-7	0.7	+2	1.0	+10	1.5
2× 80	-1	0.8	+6	1.2	+12	1.8
2×100	-9	0.5	-3	0.7	+3	1.0
2×125	-13	0.4	-8	0.5	-4	0.7

Octave spectrum

f	125	250	500	1000	2000	4000	8000	[Hz]
L_{wA}	29	29	29	29	29	29	29	[dB(A)]
ΔL_A	-5	+6	-1	-9	-18	<-20	<-20	[dB]
L_{wOkt}	24	35	28	20	<15	<15	<15	[dB]

Order details

Order codes



Order examples

45 off KS1 WE 43 / 2000 / BQ / 2

40 off KS2 W 79 K220 / 1000 / BQ / 1 / P1 / RAL9006

Text for tendering purposes

Ball diffuser rails with swivelling ball jets. Adjustment range of discharge direction 360° on all sides.
Consequently, they may be set to blow in small single jets or in one compact air jet. Air jet control along ceiling or in a room. Also suitable for installation in a ceiling recess with offset ball arrangement. Air discharge suitable for variable air quantities of 100 to 25%.
Air diffuser consisting of swivelling ball jets made of synthetic material, which are held aluminium profiles by means of a clamping device. Setting of balls according to customer's instructions, pre-set at works. Connection box (with/without insulation) with round tube connection and integrated fixed resistance FW0066 including 4 aluminium brackets of galvanised metal sheet. Visible areas with matt lacquered finish according to RAL 9010, 25% brilliance.