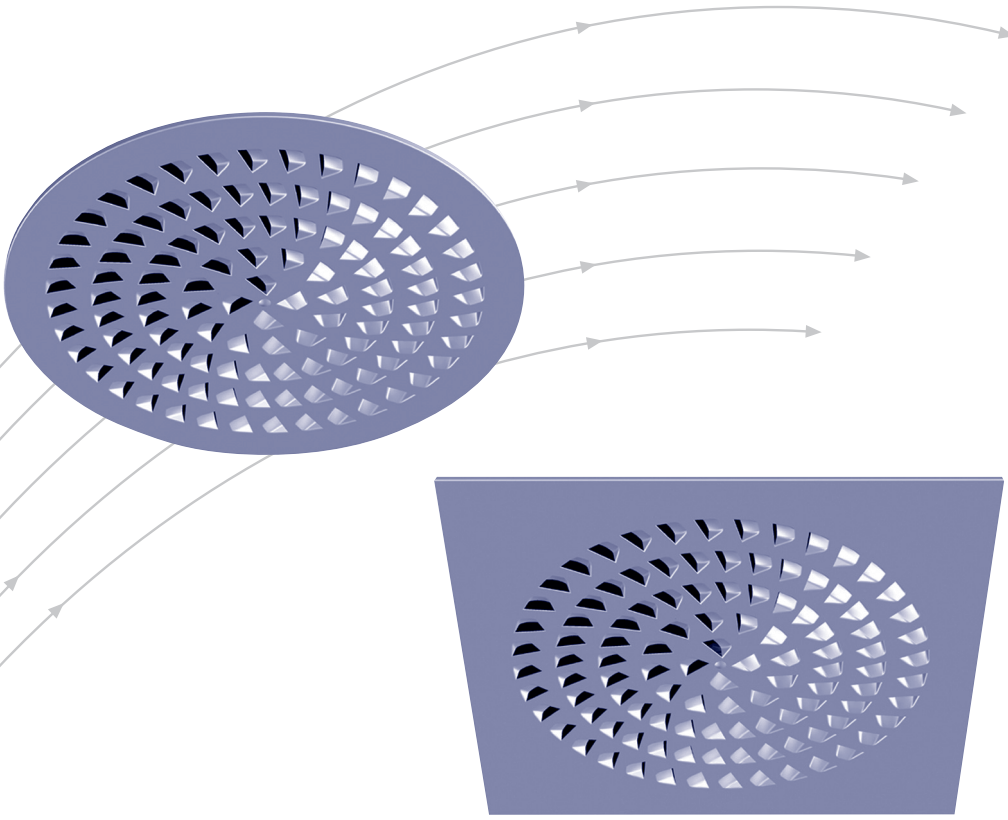
Ceiling air diffuser WAVEDRALL

Type WD

circular and circular/square



TROX® TECHNIK

The art of handling air

HESCO®

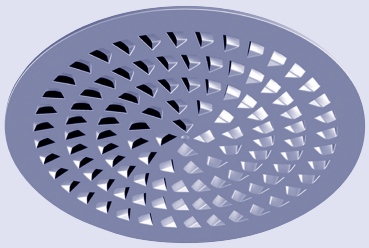
TROX HESCO Schweiz AG
Walderstrasse 125
Postfach 455
CH-8630 Rüti ZH

Tel. +41 55 250 71 11
Fax +41 55 250 73 10
www.troxhesco.ch
info@troxhesco.ch

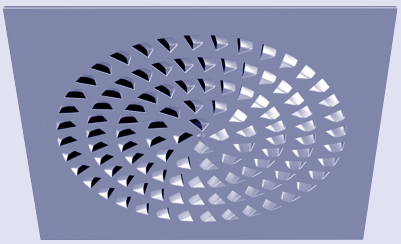
Contents · Application · Safety instructions

Contents

Type WDR



Type WDRQ



Application

The ceiling air diffuser WAVEDRALL is not only highly inductive, but also interesting from the energy standpoint. It can be installed in almost any room with a height of 2.4 to 4.4 m, for which a technical impeccable solution and perfect, aesthetic integration are considered important.

The air diffusers can be fitted harmoniously in mineral fibre and/or metal plate ceilings.
The WAVEDRALL can also be used for visual realisation, i. e. freely suspended.

The following executions are available:

circular  Type WDR

circular/square  Type WDRQ

Safety instructions

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.

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.

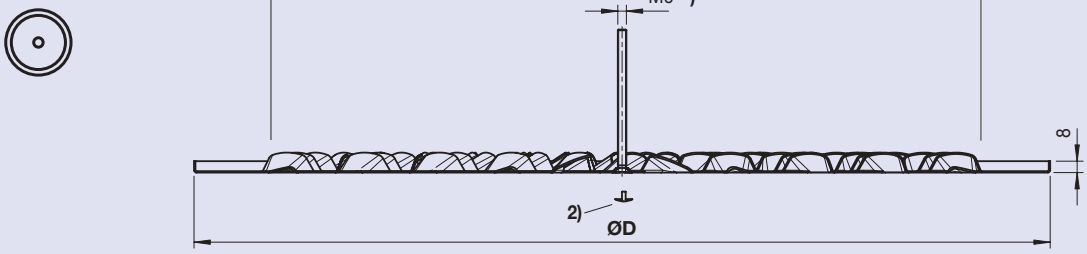
Realisation type WDR

The ceiling air diffuser WAVEDRALL is made of aluminium, powder coated, with waveshaped, air-guiding openings arranged in a circle.
Colour RAL 9010 matt, brilliance 25%.

The **square** standard plenum box is made of galvanised steel plate and designed also for use with WAVEDRALL type WDR (needs a panel of a false ceiling with a recess of ØAs, according to table of page 4).

The **square** standard plenum box with a **circular** adapter is necessary for the **visual realisation**, i.e. freely suspended.

Dimensions



2) Plastic plug
***)** Central screw M6 x 100 mm and plastig plug are delivered as loose part

Type	ND	ØD [mm]	Ød [mm]	Number of air-guiding openings
WDR	600×500	600	505	108
	480×400	480	401	72
	380×300	380	297	40

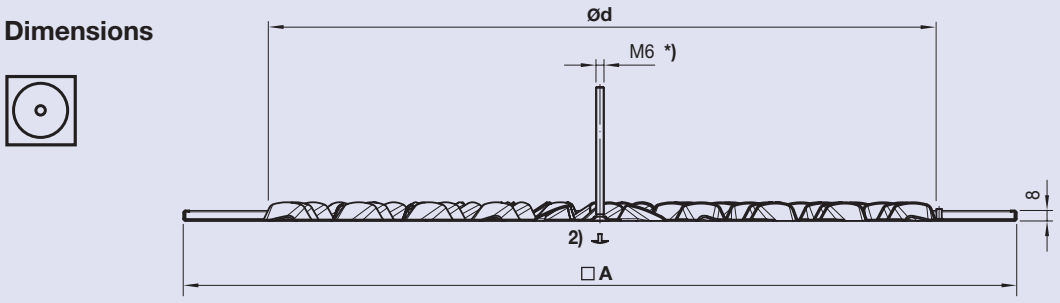
Realisation type WDRQ

The WAVEDRALL ceiling air diffuser is made of aluminium, powder coated, with waveshaped, air-guiding openings arranged in a circle.
Colour RAL 9010, matt, 25% brilliance.
Attachment by means of central screw.

The ceiling air diffusers are designed for supply air in ceilings with grid dimensions □ 600 or □ 625 mm.

Remark
The WAVEDRALL circular/square type WDRQ replaces a ceiling plate.

Dimensions

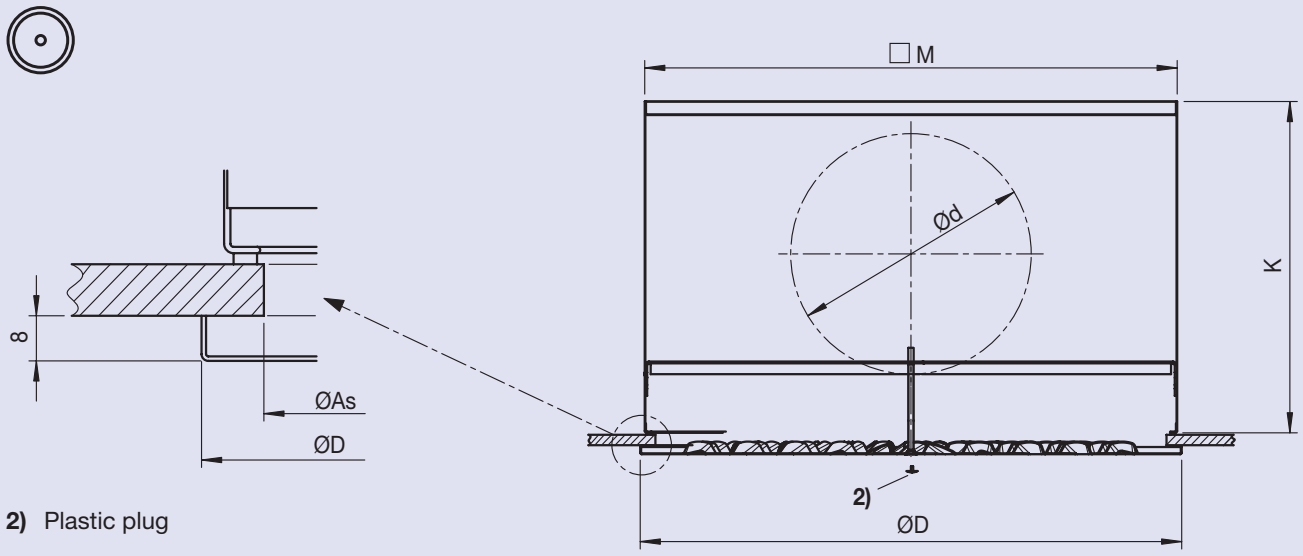


2) Plastic plug
***)** Central screw M6 x 100 mm and plastig plug are delivered as loose part

Type	ND	□A [mm]	Ød [mm]	Grid dimension [mm]	Number of air-guiding openings
WDRQ	598×500	598	505	600×600	108
	623×500	623	505	625×625	
	598×400	598	401	600×600	72
	623×400	623	401	625×625	
	598×300	598	297	600×600	40
	623×300	623	297	625×625	

Type WDR

Fitted in ceiling plates, already existing with **square** plenum box.

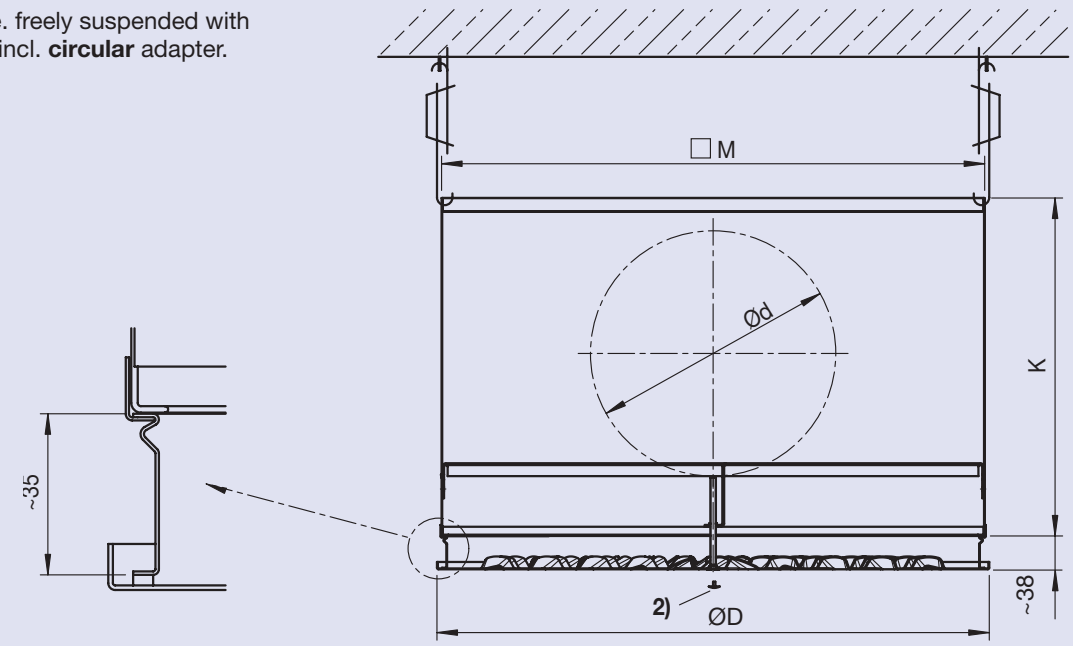


2) Plastic plug

Type	ND	Recess ØAs [mm]	Plenum box Details see prospect L-04-1-31e (TROX HESCO) or 2/16.4/… (TROX)			
			K	□M	Ød	Type
WDR	600×500	540	345	567	1×248	**AKH04 ZL M0 (TROX HESCO)** [AK004 ZL M0 (TROX)]
	480×400	440	295	476	1×198	**AKH03 ZL M0 (TROX HESCO)** [AK003 ZL M0 (TROX)]
	380×300	340	295	372	1×198	**AKH02 ZL M0 (TROX HESCO)** [AK002 ZL M0 (TROX)]

Type WDR

Visual realisation, i. e. freely suspended with square plenum box, incl. **circular** adapter.

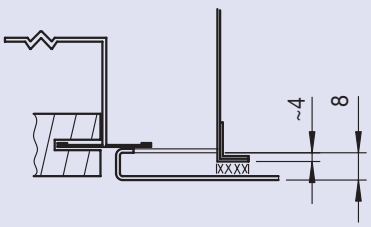


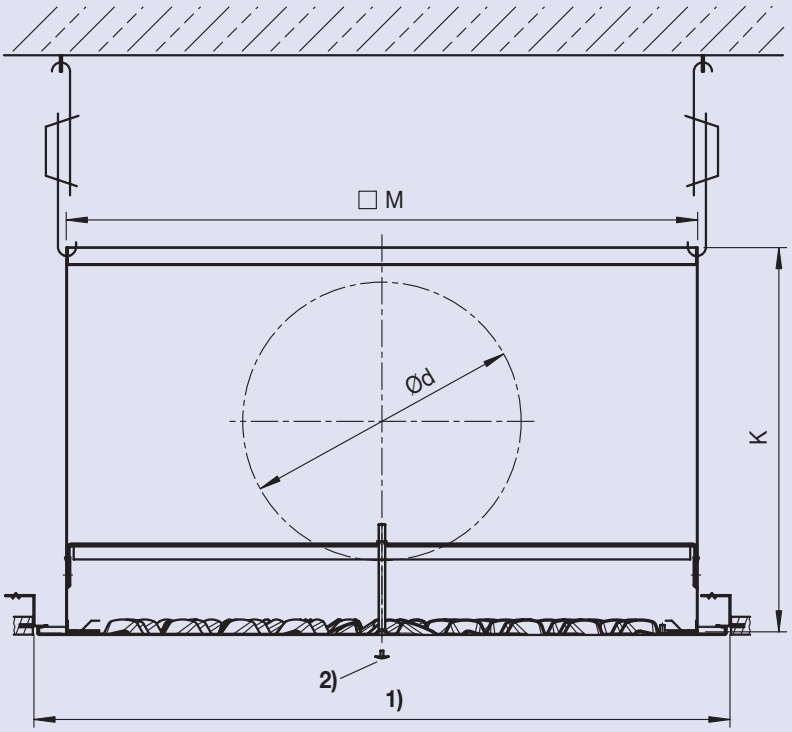
2) Plastic plug

Type	ND	Plenum box Details see prospect L-04-1-31e (TROX HESCO) or 2/16.4/… (TROX)			
		K	☐M	Ød	Typ
 **WDR**	600×500	345	590	1×248	**AK017 ZL M0 (TROX)**
	480×400	295	476	1×198	**AK015 ZL M0 (TROX)**
	380×300	295	372	1×198	**AK014 ZL M0 (TROX)**

Type WDRQ

With TROX HESCO plenum box for grid dimension ☐ 600 or ☐ 625 mm **pressed** onto ceiling profile **from below** with **square** plenum box.



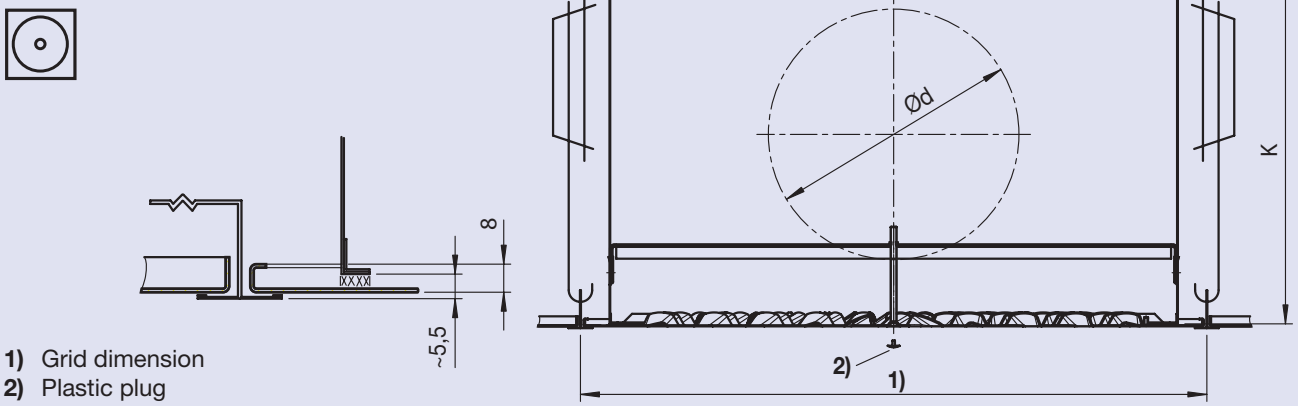


1) Grid dimension
2) Plastic plug

Installation

Type WDRQ

With TROX HESCO plenum box for grid dimension ☐ 600 or ☐ 625 mm **inserted** in ceiling profile **from above** with **square** plenum box.



1) Grid dimension
2) Plastic plug

Type	ND	Grid dimension [mm]	Plenum box Details see prospect L-04-1-31e (TROX HESCO) or 2/16.4/… (TROX)			
			K	☐ M	Ød	Type
WDRQ	598×500	600×600	345	567	1×248	**AKH04 ZL M0 (TROX HESCO)** [AK004 ZL M0 (TROX)]
	623×500	625×625				
	598×400	600×600	295	476	1×198	**AKH03 ZL M0 (TROX HESCO)** [AK003 ZL M0 (TROX)]
	623×400	625×625				
	598×300	600×600	295	372	1×198	**AKH02 ZL M0 (TROX HESCO)** [AK002 ZL M0 (TROX)]
	623×300	625×625				

Type WDR / WDRQ

ND	A_{eff}	$\dot{q}_v$ [l/s]			**27.8**		**34.7**		**41.7**		**48.6 nominal**		**55.6**		**62.5**			
	[m²]	$\dot{V}$ [m³/h]			**100**		**125**		**150**		**175**		**200**		**225**			
...×300	0.0149	p_t [Pa]			6		9		13		17		23		28			
		L_{WA} [dB(A)]			<20		23		28		31		35		38			
		$L_{0.5}/L_{0.3}$ [m]			-	-	-	-	-	-	-	1.7	-	1.7	1.7	1.8		
		$\bar{v}_{H1}$ [m/s]										0.09		0.10	0.11	0.10		
Distance		A [m]										3.3		3.4	3.3	3.6		

ND	A_{eff}	$\dot{q}_v$ [l/s]			**27.8**		**41.7**		**55.6**		**69.4**		**83.3 nominal**		**97.2**		**111.1**	
	[m²]	$\dot{V}$ [m³/h]			**100**		**150**		**200**		**250**		**300**		**350**		**400**	
...×400	0.0268	p_t [Pa]			2		4		8		12		18		25		33	
		L_{WA} [dB(A)]			<20		<20		24		30		34		38		42	
		$L_{0.5}/L_{0.3}$ [m]			-	-	-	-	-	1.7	-	1.7	1.7	1.9	1.7	2.0	1.8	2.0
		$\bar{v}_{H1}$ [m/s]								0.09		0.10	0.12	0.11	0.14	0.12	0.16	0.13
Distance		A [m]								3.3		3.4	3.3	3.7	3.4	4.1	3.6	4.4

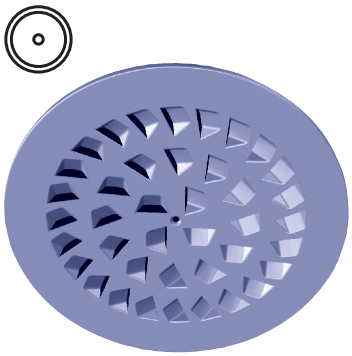
ND	A_{eff}	$\dot{q}_v$ [l/s]	**41.7**		**55.6**		**69.4**		**83.3**		**97.2**		**111.1 nominal**		**125.0**		**138.9**	
	[m²]	$\dot{V}$ [m³/h]	**150**		**200**		**250**		**300**		**350**		**400**		**450**		**500**	
...×500	0.0402	p_t [Pa]	2		4		6		8		11		15		18		23	
		L_{WA} [dB(A)]	<20		<20		<20		24		28		32		35		37	
		$L_{0.5}/L_{0.3}$ [m]	-	-	-	-	-	1.7	1.7	1.8	1.7	2.0	1.8	2.1	1.8	2.3	2.0	2.4
		$\bar{v}_{H1}$ [m/s]						0.10	0.12	0.11	0.14	0.12	0.15	0.13	0.17	0.14	0.18	0.15
Distance		A [m]						3.4	3.3	3.6	3.4	3.9	3.5	4.2	3.7	4.5	3.9	4.8

Basis zu $\bar{v}_{H1}$:

Room height H	=	2.9 m
Height of the occupied zone	=	1.7 m
H_1	=	1.2 m
Distance A see table		
Distance B	=	4.0 m
Difference of temperature	=	-8.0 K

Technical Data

Type WDR ...×300



Correction table, octave-centre frequencies

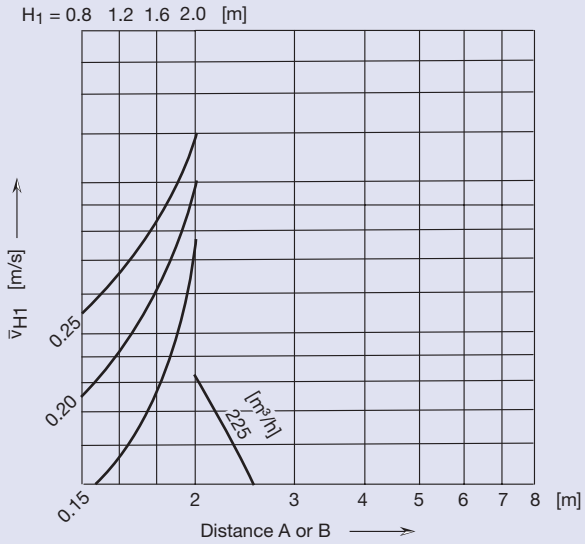
f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL_A	6	5	-2	-10	-16	-20	-21	[dB]

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

f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL	11	6	4	5	8	10	9	[dB]

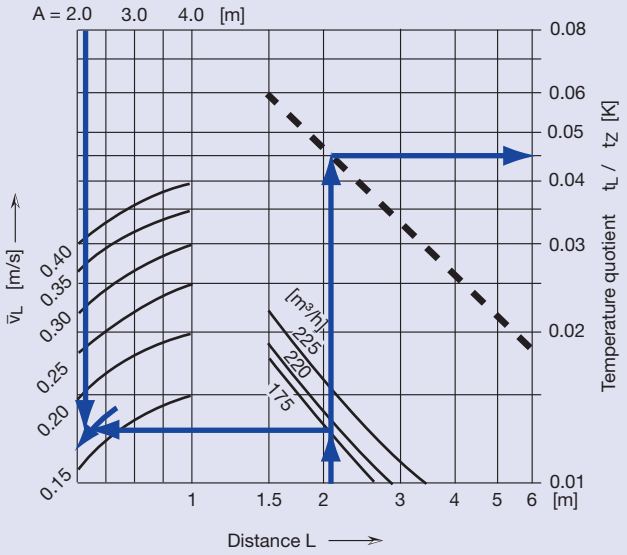
Room air velocity $\bar{v}_{H1}$

Δt_Z = +8 K A = B



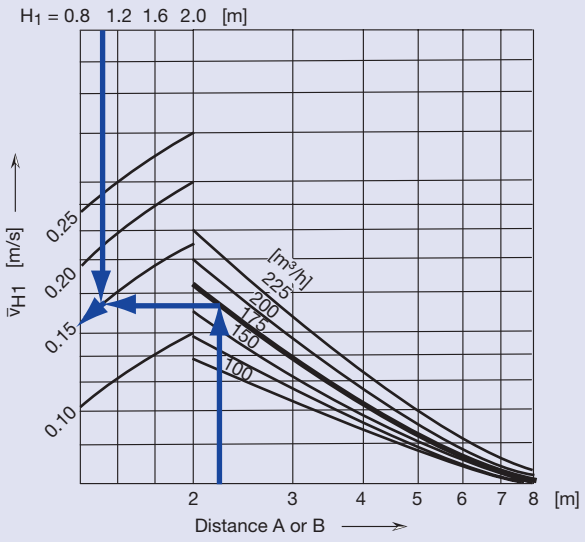
Room air velocity by the wall $\bar{v}_L$

Δt_Z = -8 K



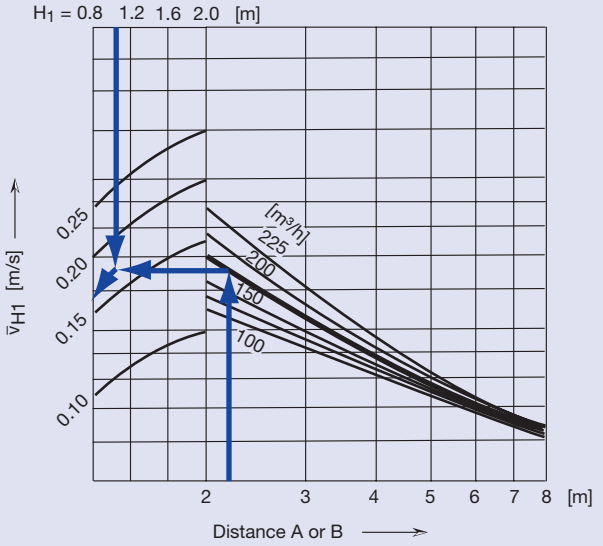
Room air velocity $\bar{v}_{H1}$

Δt_Z = -8 K A = B



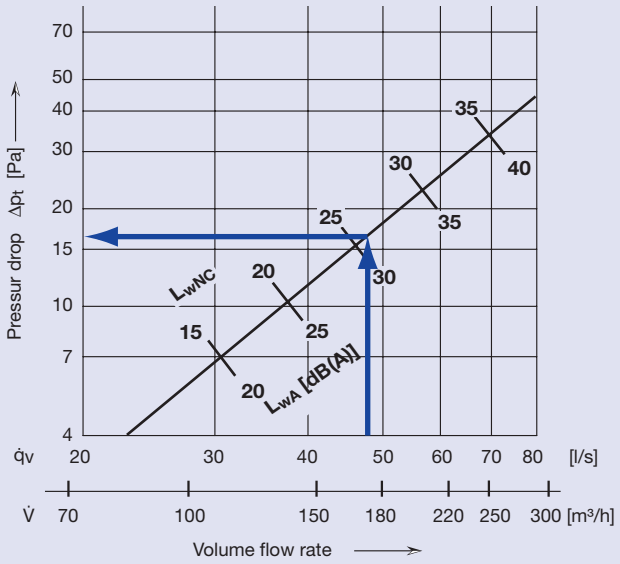
Room air velocity $\bar{v}_{H1}$

Δt_Z = -12 K A = B

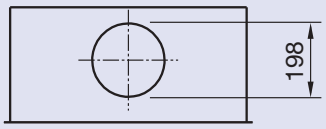


Type WDR ...×300

Sound power level and pressure drop



Connection diameter



The specifications are valid for standard plenum box of TROX HESCO

Eff. velocity of supply air

V̇ [m³/h]	q̇v [l/s]	veff [m/s]	
100	27.8	1.9	
125	34.7	2.3	
150	41.7	2.8	
175	**48.6**	**3.3**	**Aeff = 0.0149 m²**
200	55.6	3.7	
225	62.5	4.2	
250	69.4	4.7	

Example

Given

WAVEDRALL ...300	Spigot Ø198 mm	
Volume flow rate	49 l/s	$\dot{q}_v$
	175 m³/h	$\dot{V}$
Room height	2.7 m	H
Occupied zone height	1.7 m	
Distance to the ceiling	1.0 m	H_1
Distance between diffusers	2.2 m	A = B
Difference of temperature	-12 K / -8 K / +8 K	Δt

Solution

Sound power level	31 dB(A)	L_{wA}
Limite curve	26	L_{wNC}
Pressure drop	17 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	6	5	-2	-10	-16	-20	-21	**[dB]**
L_{wOkt}	37	36	29	21	15	11	10	**[dB]**

Insertion attenuation see page 8

Room air velocity 1.7 m over ground

at -12 K	=	0.17 m/s	$\bar{v}_{H1}$
at -8 K	=	0.15 m/s	$\bar{v}_{H1}$
at +8 K	=	< 0.10 m/s	$\bar{v}_{H1}$

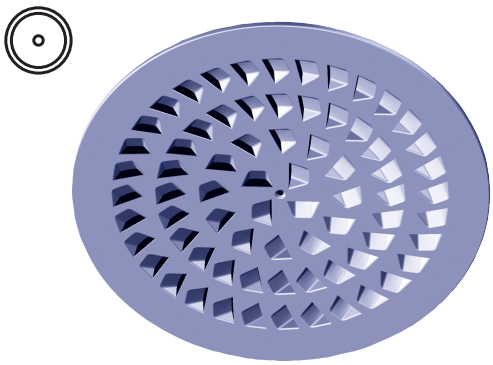
Velocity by the wall 1.7 m over ground

Throw of the jet = A/2 + H_1	=	2.1 m	L
bei -8 K	=	0.17 m/s	$\bar{v}_L$

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

Technical Data

Type WDR ...×400



Correction table, octave-centre frequencies

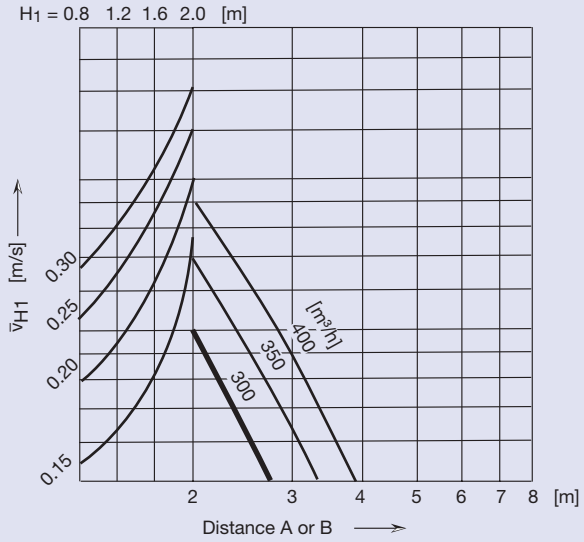
f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL_A	4	6	-2	-10	-14	-17	-18	[dB]

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

f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL	11	6	4	5	8	10	9	[dB]

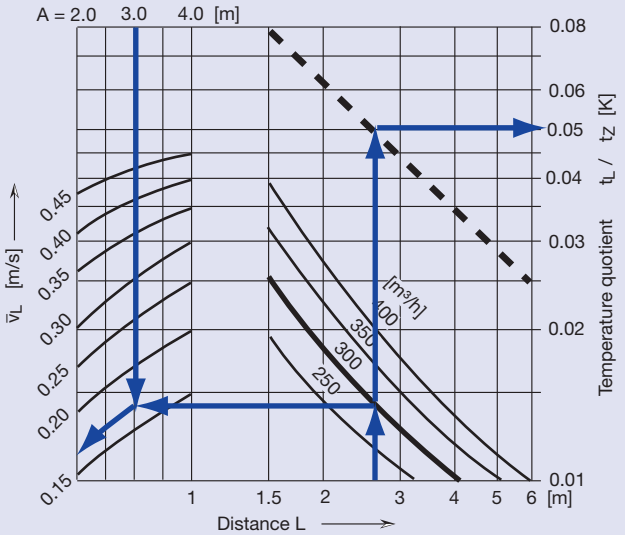
Room air velocity $\bar{v}_{H1}$

Δt_z = +8 K A = B



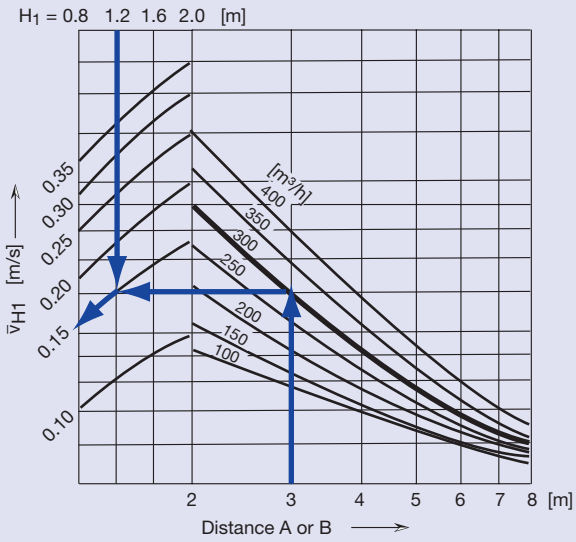
Room air velocity by the wall $\bar{v}_L$

Δt_z = -8 K



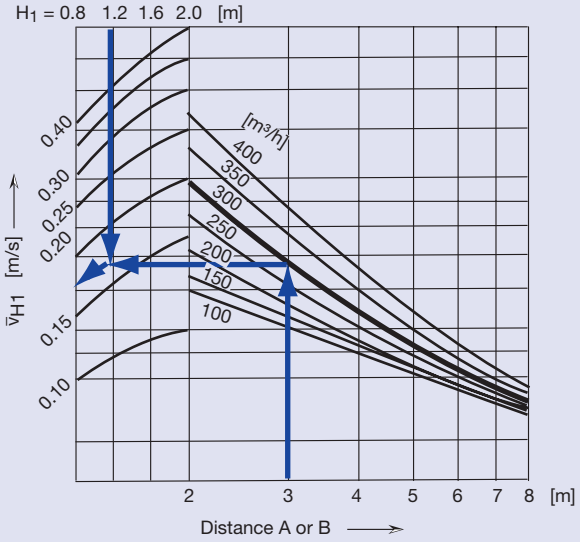
Room air velocity $\bar{v}_{H1}$

Δt_z = -8 K A = B



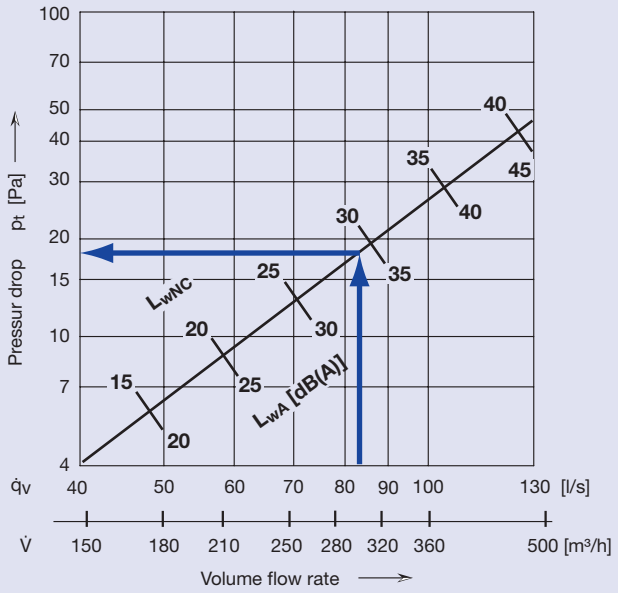
Room air velocity $\bar{v}_{H1}$

Δt_z = -12 K A = B

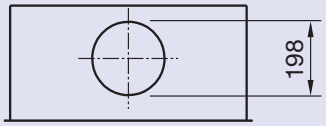


Type WDR ...×400

Sound power level and pressure drop



Connection diameter



The specifications are valid for standard plenum box of TROX HESCO

Eff. velocity of supply air

V̇ [m³/h]	q̇v [l/s]	veff [m/s]	
100	27.8	1.0	
150	41.7	1.6	
200	55.6	2.1	
250	69.4	2.6	
300	**83.3**	**3.1**	**Aeff = 0.0268 m²**
350	97.2	3.6	
400	111.1	4.1	
450	125.0	4.7	

Example

Given

WAVEDRALL ...400	Spigot Ø198 mm	
Volume flow rate	83 l/s	$\dot{q}_v$
	300 m³/h	V̇
Room height	2.9 m	H
Occupied zone height	1.7 m	
Distance to the ceiling	1.2 m	H_1
Distance between diffusers	3.0 m	A = B
Difference of temperature	-12 K / -8 K / +8 K	Δt

Solution

Sound power level	34 dB(A)	L_{wA}
Limite curve	29	L_{wNC}
Pressure drop	18 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	4	6	-2	-10	-14	-17	-18	**[dB]**
L_{wOkt}	38	40	32	24	20	17	16	**[dB]**

Insertion attenuation see page 10

Room air velocity 1.7 m over ground

at -12 K	=	0.17 m/s	$\bar{v}_{H1}$
at -8 K	=	0.15 m/s	$\bar{v}_{H1}$
at +8 K	=	< 0.10 m/s	$\bar{v}_{H1}$

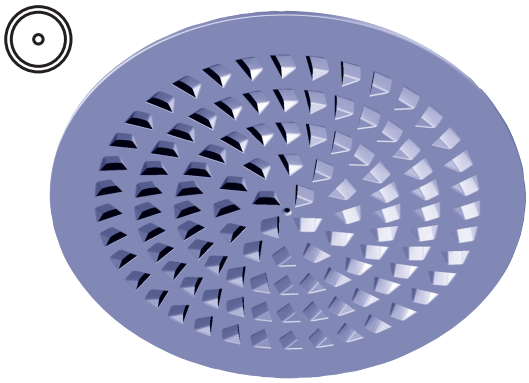
Velocity by the wall 1.7 m over ground

Throw of the jet = A/2 + H_1	=	2.7 m	L
at -8 K	=	0.17 m/s	$\bar{v}_L$

Difference of temperature		0.05	Δt_L / Δt_z
(t_R - t_L) at Δt_L -8 K = 0.05 × 8	=	~0.4 K	Δt_L

Technical Data

Type WDR ...×500



Correction table, octave-centre frequencies

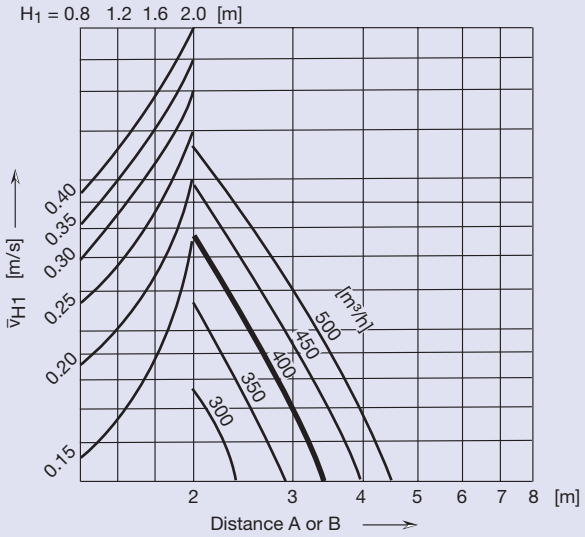
f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL_A	5	5	-2	-11	-17	-13	-15	[dB]

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

f	125	250	500	1k	2k	4k	8k	[Hz]
ΔL	11	6	4	5	8	10	9	[dB]

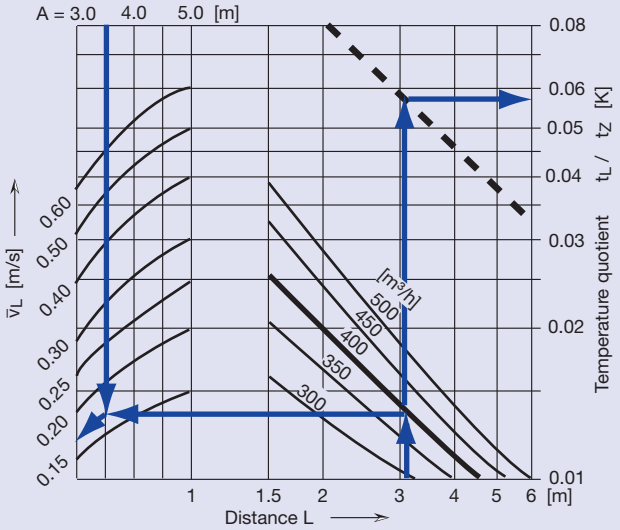
Room air velocity $\bar{v}_{H1}$

Δt_z = +8 K A = B



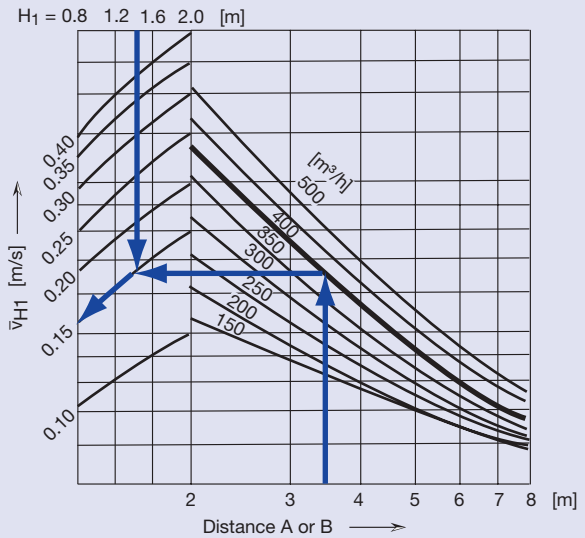
Room air velocity by the wall $\bar{v}_L$

Δt_z = -8 K



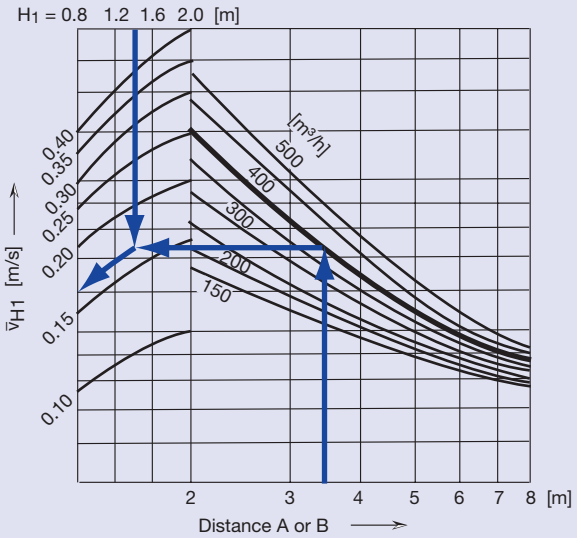
Room air velocity $\bar{v}_{H1}$

Δt_z = -8 K A = B



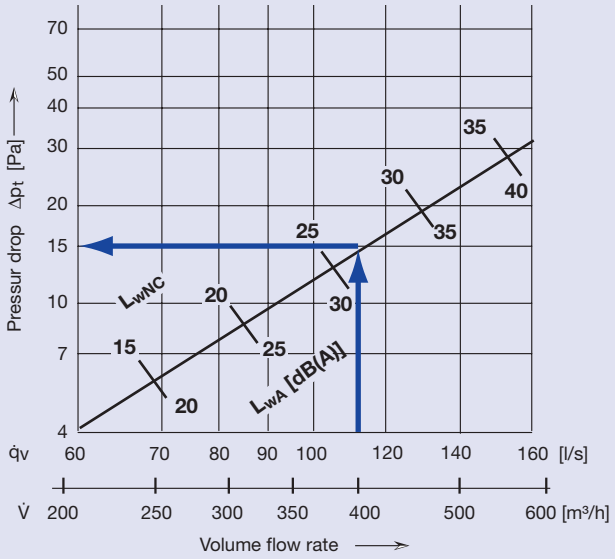
Room air velocity $\bar{v}_{H1}$

Δt_z = -12 K A = B

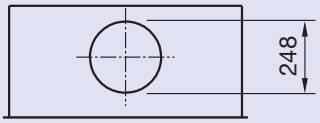


Type WDR ...×500

Sound power level and pressure drop



Connection diameter



The specifications are valid for standard plenum box of TROX HESCO

Eff. velocity of supply air

V̇ [m³/h]	q̇v [l/s]	veff [m/s]	
150	41.7	1.0	
200	55.6	1.4	
250	69.4	1.7	
300	83.3	2.1	
350	97.2	2.4	
400	**111.1**	**2.8**	**A_{eff} = 0.0402 m²**
450	125.0	3.1	
500	138.9	3.5	
550	152.8	3.8	

Example

Given

WAVEDRALL ...500	Spigot Ø248 mm	
Volume flow rate	111 l/s	$\dot{q}_v$
	400 m³/h	$\dot{V}$
Room height	3.1 m	H
Occupied zone height	1.7 m	
Distance to the ceiling	1.4 m	H_1
Distance between diffusers	3.5 m	A = B
Difference of temperature	-12 K / -8 K / +8 K	Δt

Solution

Sound power level	32 dB(A)	L_{wA}
Limite curve	27	L_{wNC}
Pressure drop	15 Pa	Δp_t

Octave spectrum

f	125	250	500	1000	2000	4000	8000	[Hz]
L_{wA}	32	32	32	32	32	32	32	**[dB(A)]**
ΔL_A	5	5	-2	-11	-17	-13	-15	**[dB]**
L_{wOkt}	37	37	30	21	15	19	17	**[dB]**

Insertion attenuation see page 12

Room air velocity 1.7 m over ground

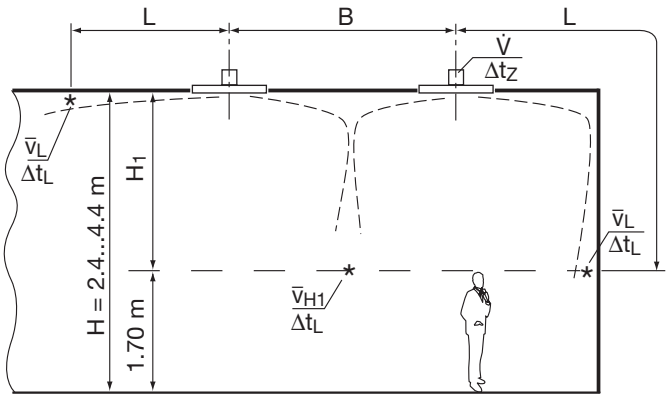
at -12 K	=	0.17 m/s	$\bar{v}_{H1}$
at -8 K	=	0.15 m/s	$\bar{v}_{H1}$
at +8 K	=	< 0.10 m/s	$\bar{v}_{H1}$

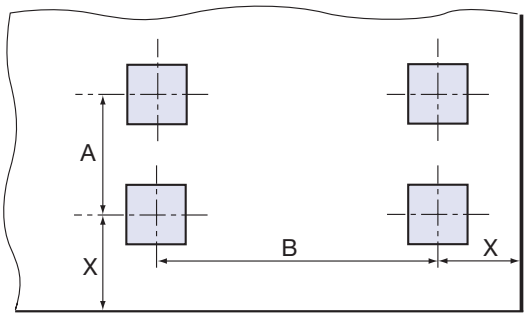
Velocity by the wall 1.7 m over ground

Throw of the jet = A/2 + H_1	=	3.15 m	L
at -8 K	=	0.17 m/s	$\bar{v}_L$

Difference of temperature		0.06	Δt_L / Δt_z
(t_R - t_L) at Δt_L -8 K = 0.06 × 8	=	~0.5 K	Δt_L

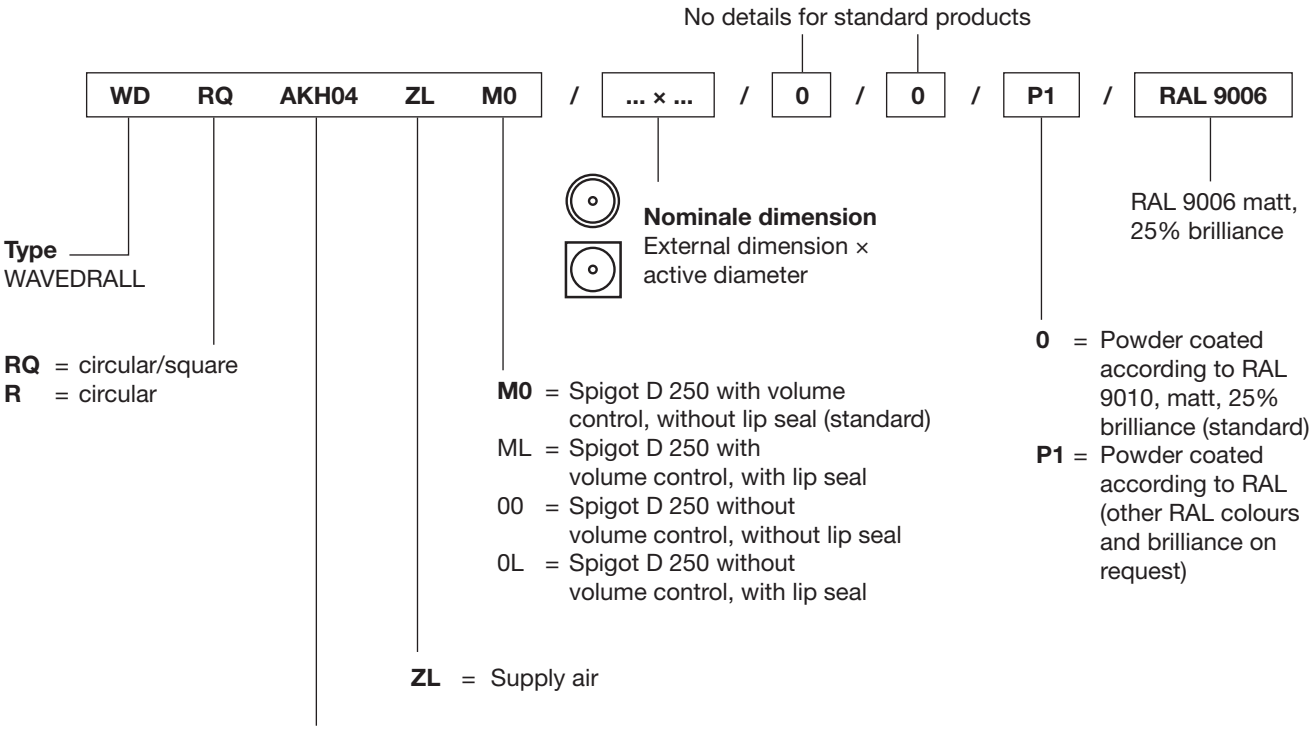
Definitions





L	m	Distance blowing against the wall
$L_{0.5}/L_{0.3}$	m	Distance of the jet in relation to the end velocities 0.5 m/s resp. 0.3 m/s
$\dot{q}_v$	l/s	Volume flow rate per diffuser
$\dot{V}$	m³/h	Volume flow rate per diffuser
$\dot{V}_{nominal}$	m³/h	Nominal volume (flow rate with VAV: $\dot{V}_{max} = 1.19 \times \dot{V}_{nominal}$)
v_{eff}	m/s	eff. discharge velocity
A, B	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
$\bar{v}_{H1}$	m/s	Mean flow velocity of room air between two diffusers in ceiling distance H_1
$\bar{v}_L$	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

Order code



0 = Without plenum box
AKH02ZL... = TROX HESCO plenum box
AK002ZL... = TROX plenum box
AKH03ZL... = TROX HESCO plenum box
AK003ZL... = TROX plenum box
AKH04ZL... = TROX HESCO plenum box
AK004ZL... = TROX plenum box
AK014ZL... = TROX plenum box
AK015ZL... = TROX plenum box
AK017ZL... = TROX plenum box

Order examples

45 off	WDRQ AKH04ZL M0 / 623×500
30 off	WDRQ AKH04ZL M0 / 598×500 / P1 / RAL 9006
20 off	WDR / 480×400
25 off	WDR AKH02ZL ML / 380×300 / P1 / RAL 9006

Text for tendering purposes

The WAVEDRALL ceiling air diffuser is made of aluminium, powder coated, with waveshaped, air-guiding openings arranged in a circle.
Attachment by means of central screw (delivered separately). 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

Ceiling air diffuser:	Aluminium, colour RAL 9010, matt, 25% brilliance
Plenum box:	Galvanised steel plate

Details for the plenum box see pages 4 and 5.

The **square** standard plenum box, incl. **circular** adapter, is necessary for visual realisation, i. e. freely suspended.

Option
– Other RAL colours
– Utilisation for exhaust air