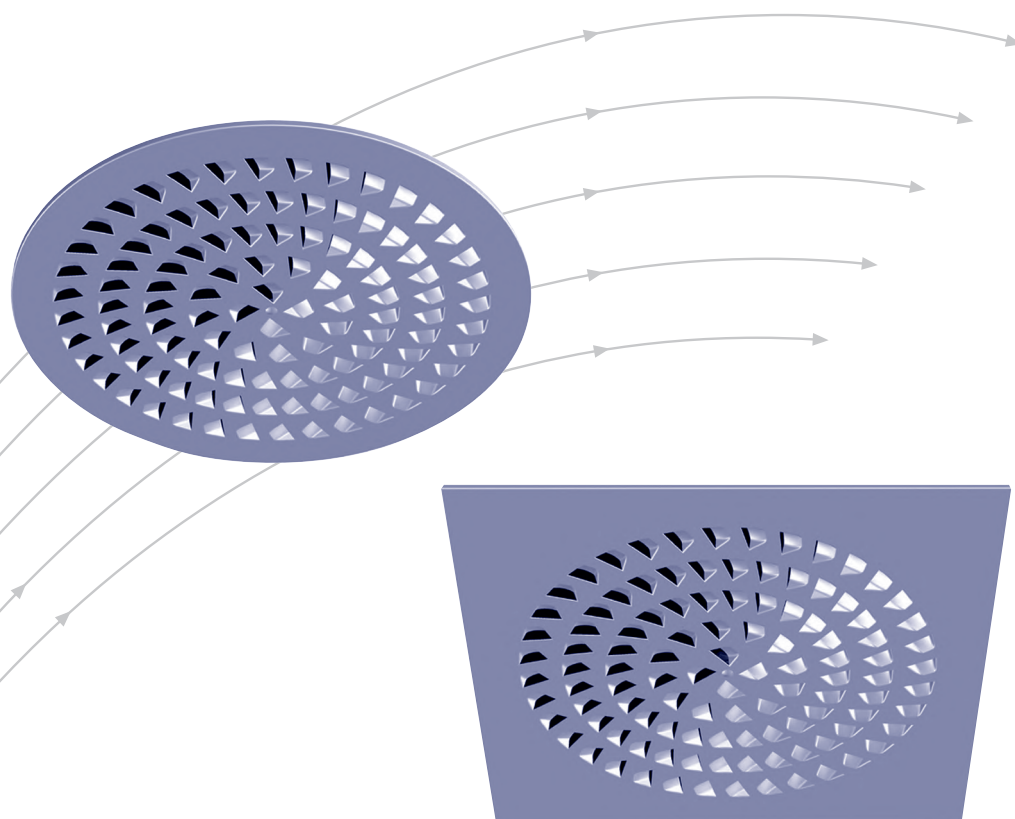


Ceiling air diffuser WAVEDRALL

- Type WD
- circular and circular/square



Int. mod. prot. reg.

TROX[®] TECHNIK



The art of handling air

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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

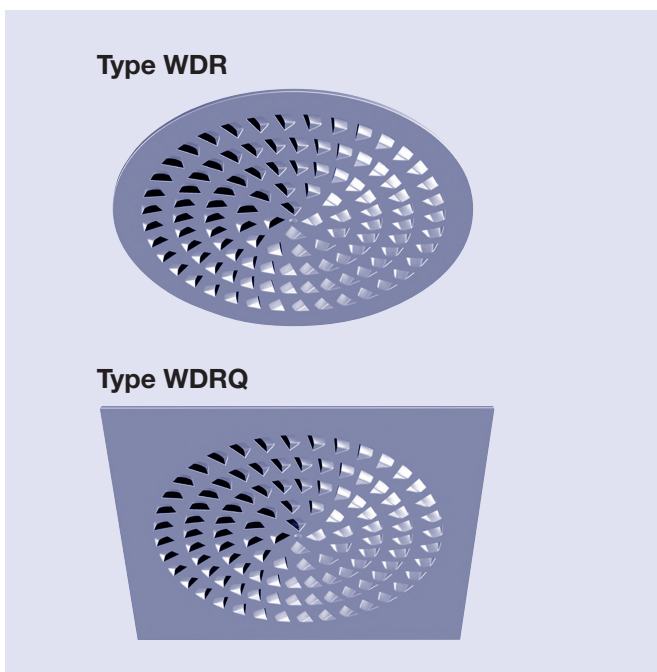


Type WDR

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.

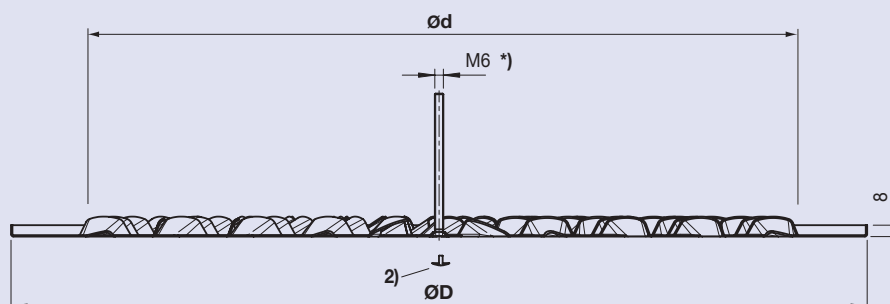
Colour RAL 9010 matt, brilliance 25%.

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	600x500	600	505	108
	480x400	480	401	72
	380x300	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.

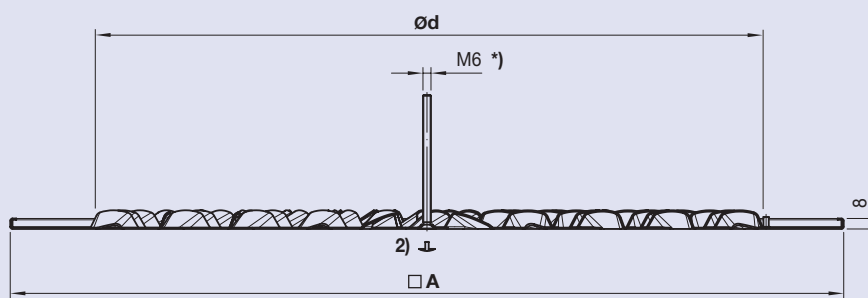
Attachment by means of central screw.

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

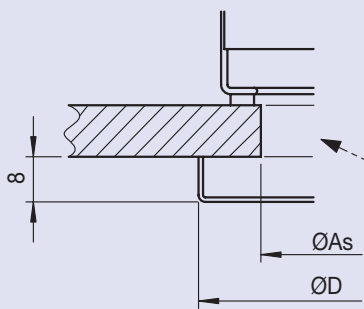
*) Central screw M6 x 100 mm and plastig plug are delivered as loose part

Type	ND	□A [mm]	Ød [mm]	Grid dimension [mm]	Number of air-guiding openings
 WDRQ	598x500	598	505	600x600	108
	623x500	623	505	625x625	
	598x400	598	401	600x600	72
	623x400	623	401	625x625	
	598x300	598	297	600x600	40
	623x300	623	297	625x625	

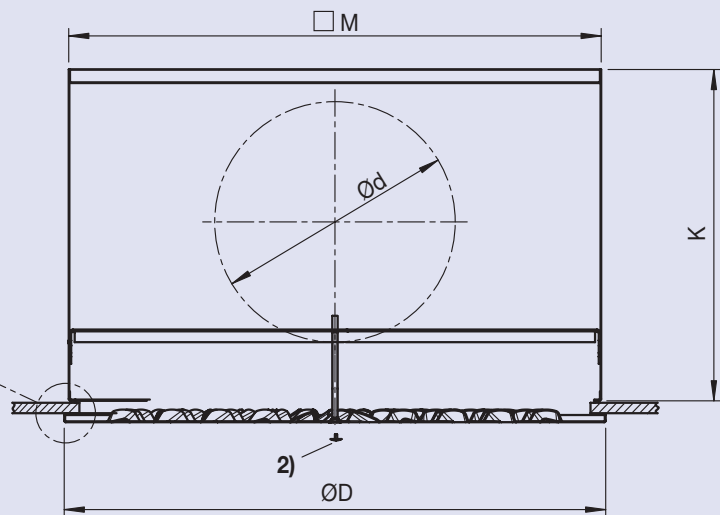
Installation

Type WDR

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



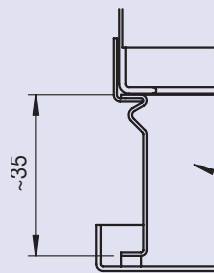
2) Plastic plug



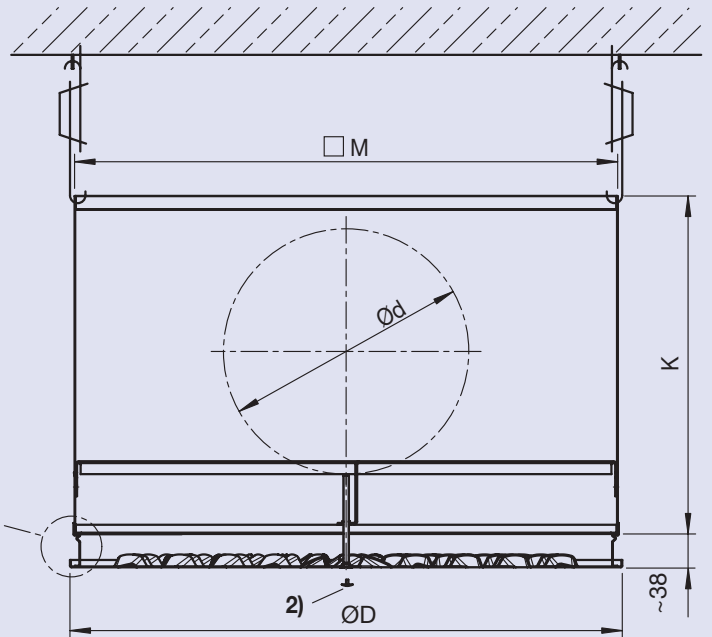
Type	ND	Recess ØAs [mm]	Plenum box Details see prospect L-04-1-31e (TROX HESCO) or 2/16.4/... (TROX)			
			K	□ M	Ød	Type
WDR	600×500	540	345	567	1×248	AKH04 ZL M0 (TROX HESCO) [AK004 ZL M0 (TROX)]
	480×400	440	295	476	1×198	AKH03 ZL M0 (TROX HESCO) [AK003 ZL M0 (TROX)]
	380×300	340	295	372	1×198	AKH02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

Type WDR

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



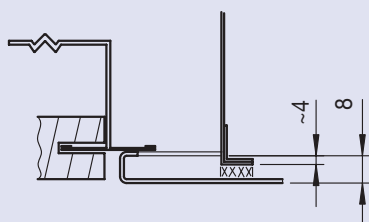
2) Plastic plug



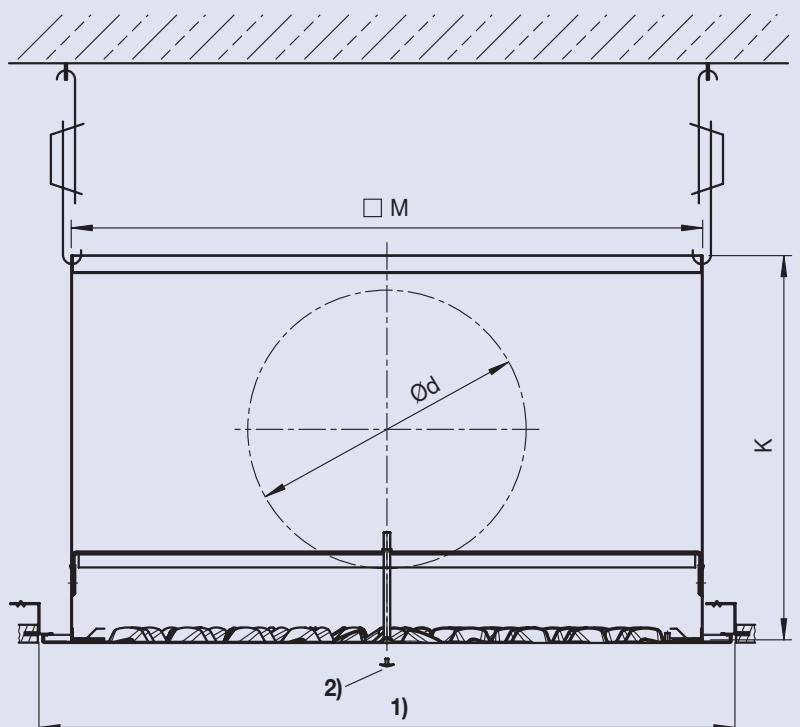
Type	ND	Plenum box			
		K	□ M	Ød	Typ
Details see prospect L-04-1-31e (TROX HESCO) or 2/16.4/... (TROX)					
WDR	600×500	345	590	1×248	AK017 ZL M0 (TROX)
	480×400	295	476	1×198	AK015 ZL M0 (TROX)
	380×300	295	372	1×198	AK014 ZL M0 (TROX)

Type WDRQ

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



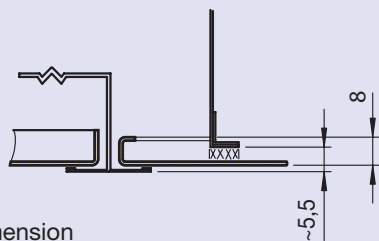
1) Grid dimension
2) Plastic plug



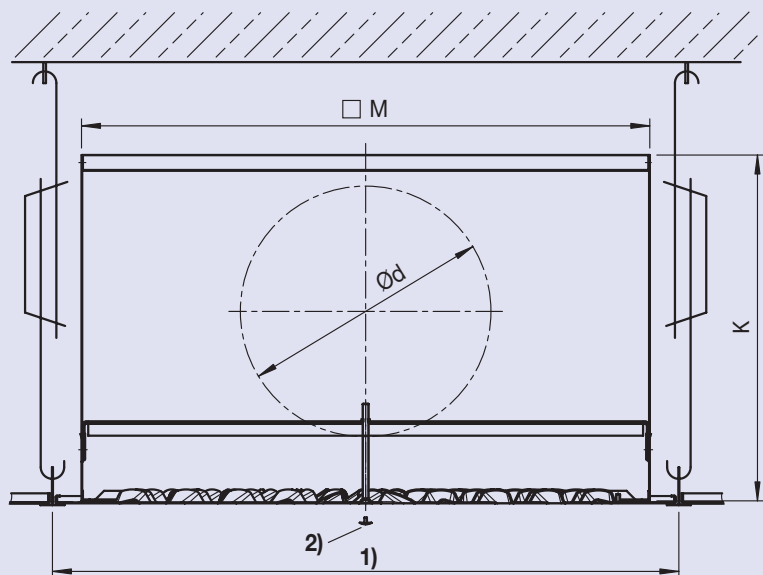
Installation

Type WDRQ

With TROX HESCO plenum box for grid dimension \square 600 or \square 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	\square M	\varnothing d	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} [m ²]	\dot{q}_v [l/s]	27.8		34.7		41.7		48.6 nominal		55.6		62.5	
		\dot{V} [m ³ /h]	100		125		150		175		200		225	
...x300	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} [m ²]	\dot{q}_v [l/s]	27.8		41.7		55.6		69.4		83.3 nominal		97.2		111.1			
		\dot{V} [m ³ /h]	100		150		200		250		300		350		400			
...x400	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

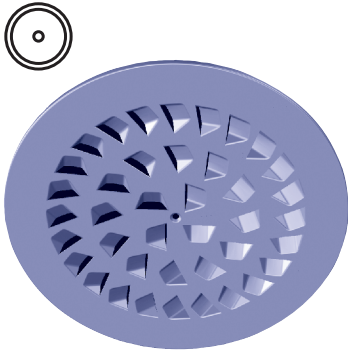
ND	A_{eff} [m ²]	\dot{q}_v [l/s]	41.7		55.6		69.4		83.3		97.2		111.1 nominal		125.0		138.9	
		\dot{V} [m ³ /h]	150		200		250		300		350		400		450		500	
...x500	0.0402	p_t [Pa]	2		4		6		8		11		15		18		23	
		L_{wA} [dB(A)]	<20		<20		<20		24		28		32		35		37	
		$L_{0.5}/L_{0.3}$ [m]	-	-	-	-	-	1.7	1.7	1.8	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
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 ...x300



Correction table, octave-centre frequencies

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

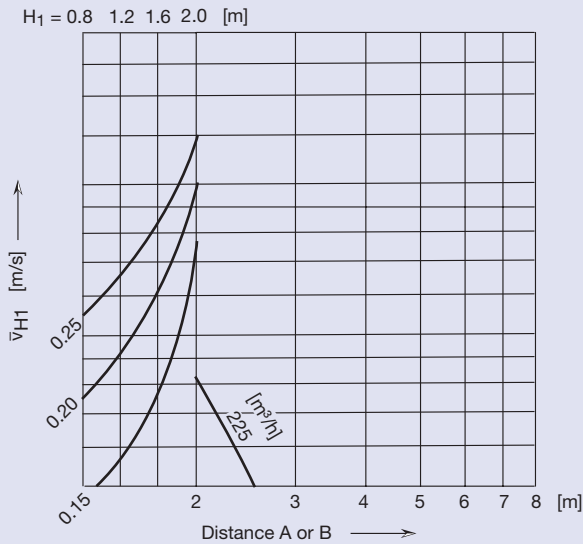
Insertion attenuation (incl. end reflection)

Interior of box not insulated

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

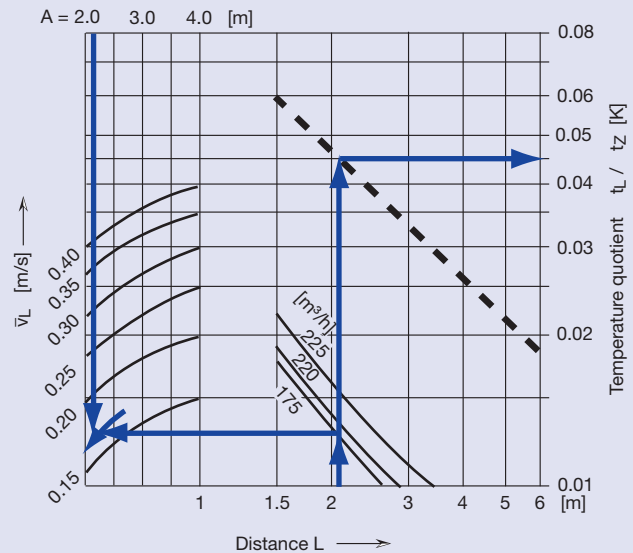
Room air velocity \bar{v}_{H1}

$\Delta t_z = +8 \text{ K}$ $A = B$



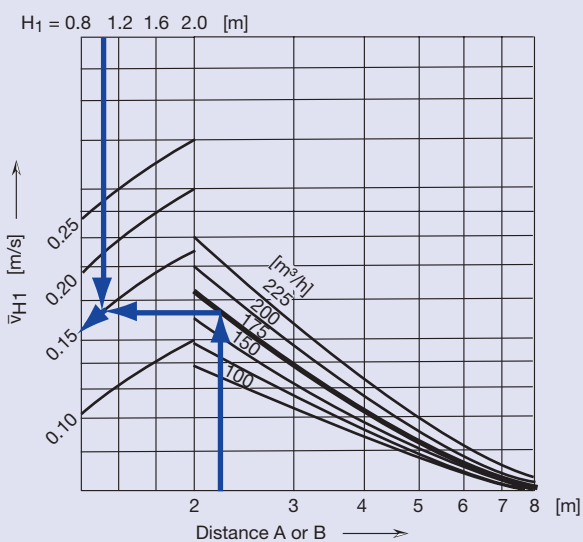
Room air velocity by the wall \bar{v}_L

$\Delta t_z = -8 \text{ K}$



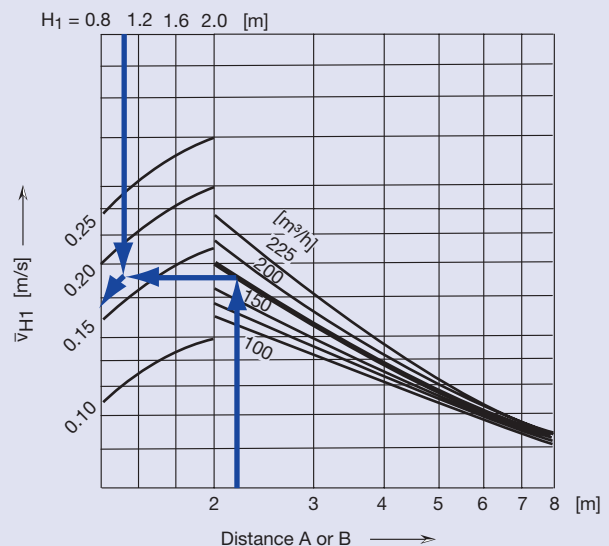
Room air velocity \bar{v}_{H1}

$\Delta t_z = -8 \text{ K}$ $A = B$



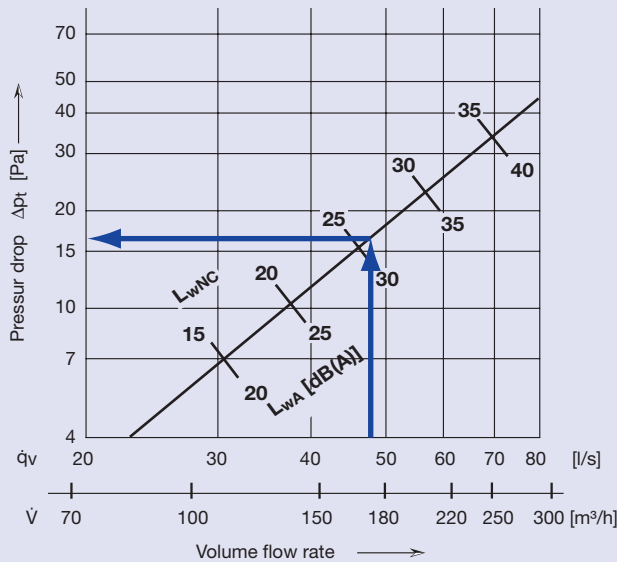
Room air velocity \bar{v}_{H1}

$\Delta t_z = -12 \text{ K}$ $A = B$

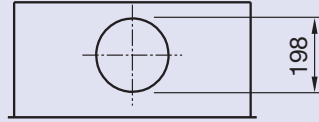


Type WDR ...x300

Sound power level and pressure drop



Connection diameter



The specifications are valid for standard plenum box of TROX HESCO

Eff. velocity of supply air

\dot{V} [m³/h]	\dot{q}_v [l/s]	v_{eff} [m/s]	$A_{eff} = 0.0149 \text{ m}^2$
100	27.8	1.9	
125	34.7	2.3	
150	41.7	2.8	
175	48.6	3.3	
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

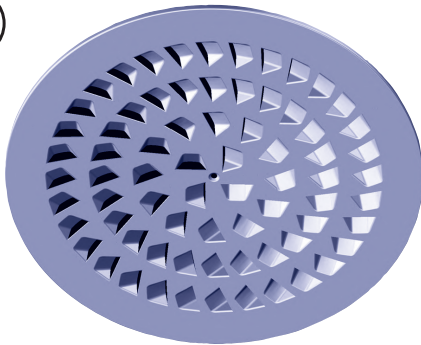
Room air velocity 1.7 m over ground		
at -12 K	= 0.17 m/s	\bar{v}_{H1}
at -8 K	= 0.15 m/s	\bar{v}_{H1}
at +8 K	= < 0.10 m/s	\bar{v}_{H1}

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	$\Delta t_L / \Delta t_z$
($t_R - t_L$) at $\Delta t_L -8 \text{ K} = 0.045 \times 8$	= ~0.4 K	Δt_L

Technical Data

Type WDR ...x400



Correction table, octave-centre frequencies

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

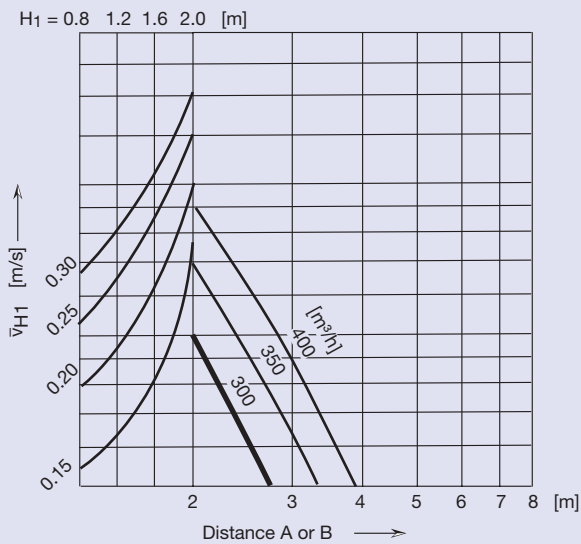
Insertion attenuation (incl. end reflection)

Interior of box not insulated

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

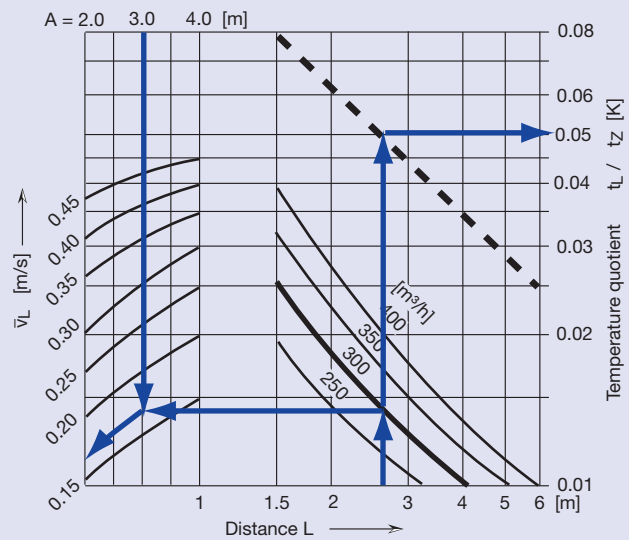
Room air velocity \bar{v}_{H1}

$\Delta t_z = +8 \text{ K}$ A = B



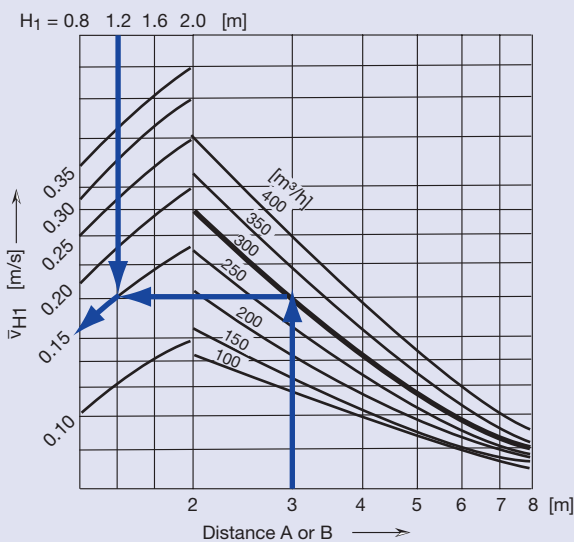
Room air velocity by the wall \bar{v}_L

$\Delta t_z = -8 \text{ K}$



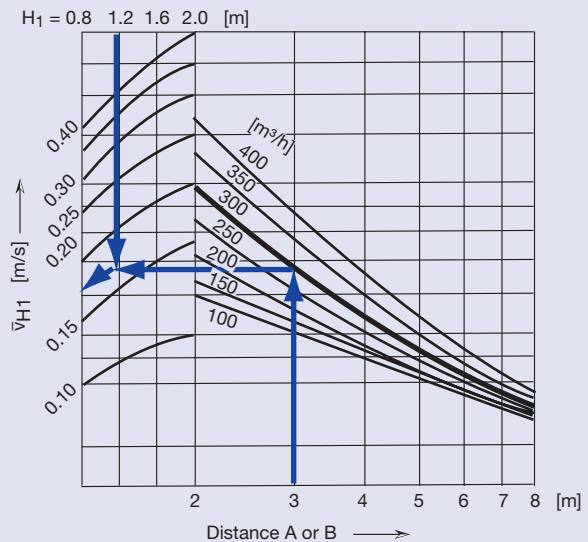
Room air velocity \bar{v}_{H1}

$\Delta t_z = -8 \text{ K}$ A = B



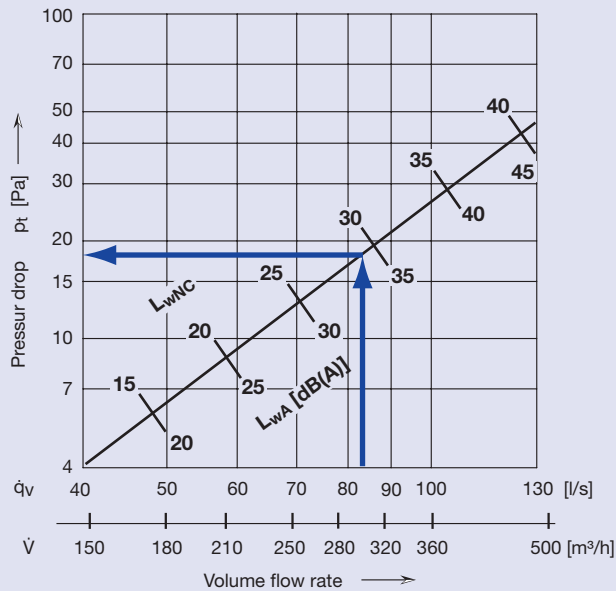
Room air velocity \bar{v}_{H1}

$\Delta t_z = -12 \text{ K}$ A = B

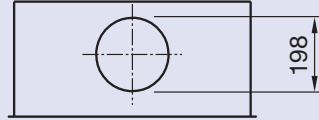


Type WDR ...x400

Sound power level and pressure drop



Connection diameter



The specifications are valid for standard plenum box of TROX HESCO

Eff. velocity of supply air

\dot{V} [m³/h]	\dot{q}_v [l/s]	v_{eff} [m/s]	$A_{eff} = 0.0268 \text{ m}^2$
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	
350	97.2	3.6	
400	111.1	4.1	
450	125.0	4.7	

Example

Given

WAVEDRALL ...400	Spigot $\varnothing 198 \text{ mm}$	
Volume flow rate	83 l/s	\dot{q}_v
	300 m³/h	\dot{V}
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

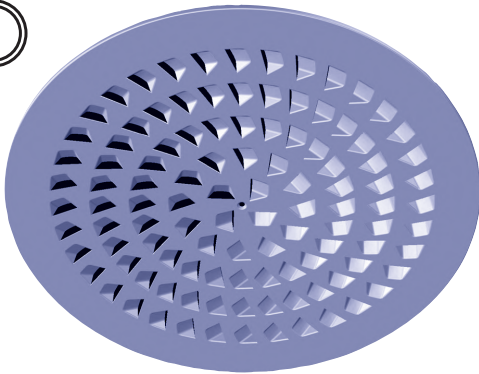
Room air velocity 1.7 m over ground		
at -12 K	= 0.17 m/s	\bar{v}_{H1}
at -8 K	= 0.15 m/s	\bar{v}_{H1}
at +8 K	= < 0.10 m/s	\bar{v}_{H1}

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	$\Delta t_L / \Delta t_z$
$(t_R - t_L)$ at $\Delta t_L - 8 \text{ K} = 0.05 \times 8$	= ~0.4 K	Δt_L

Technical Data

Type WDR ...x500



Correction table, octave-centre frequencies

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

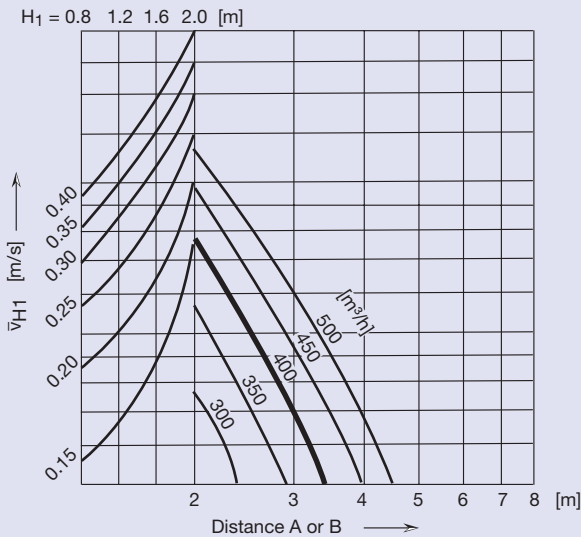
Insertion attenuation (incl. end reflection)

Interior of box not insulated

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

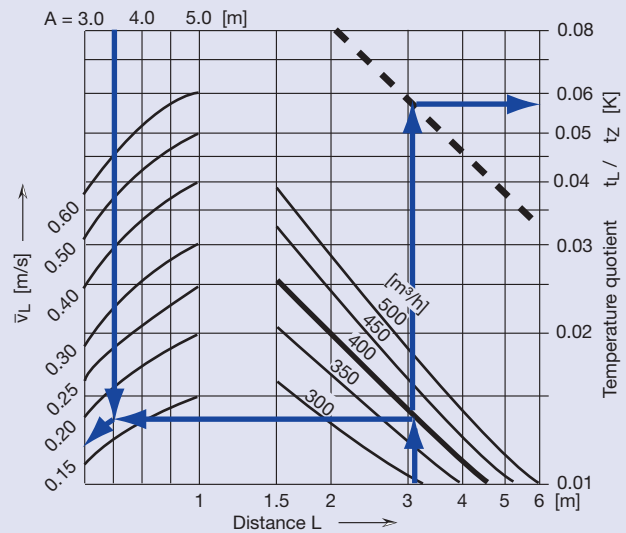
Room air velocity \bar{v}_{H1}

$\Delta t_z = +8 \text{ K}$ $A = B$



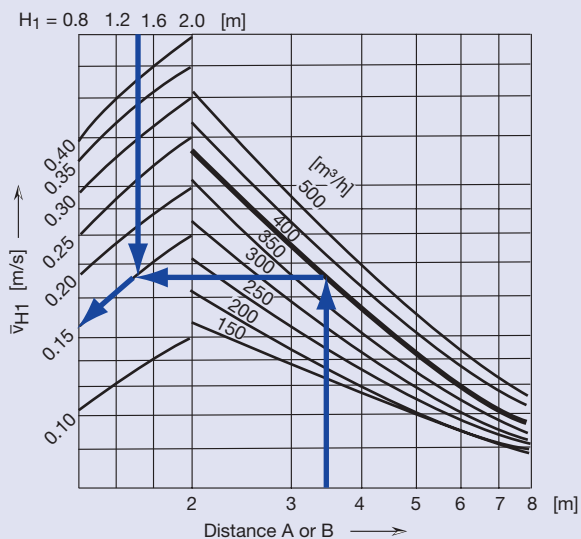
Room air velocity by the wall \bar{v}_L

$\Delta t_z = -8 \text{ K}$



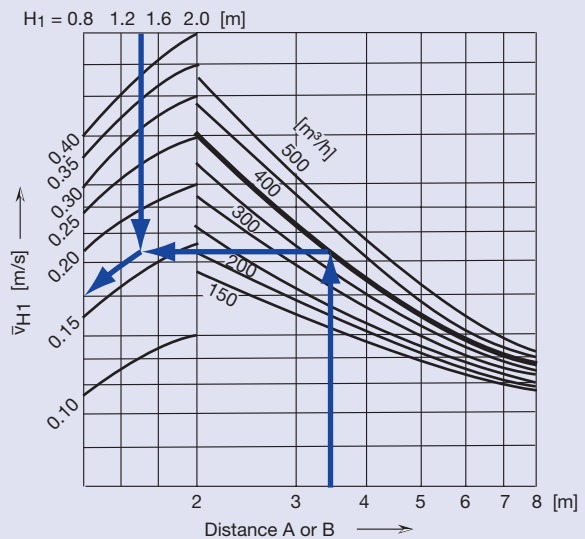
Room air velocity \bar{v}_{H1}

$\Delta t_z = -8 \text{ K}$ $A = B$



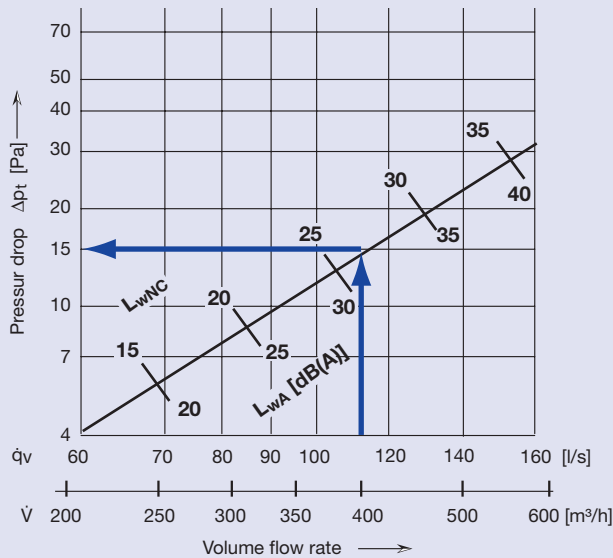
Room air velocity \bar{v}_{H1}

$\Delta t_z = -12 \text{ K}$ $A = B$

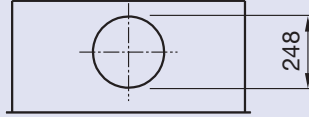


Type WDR ...x500

Sound power level and pressure drop



Connection diameter



The specifications are valid for standard plenum box of TROX HESCO

Eff. velocity of supply air

\dot{V} [m³/h]	\dot{q}_v [l/s]	v_{eff} [m/s]	$A_{eff} = 0.0402 \text{ m}^2$
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	
450	125.0	3.1	
500	138.9	3.5	
550	152.8	3.8	

Example

Given

WAVEDRALL ...500	Spigot $\varnothing 248$ 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]

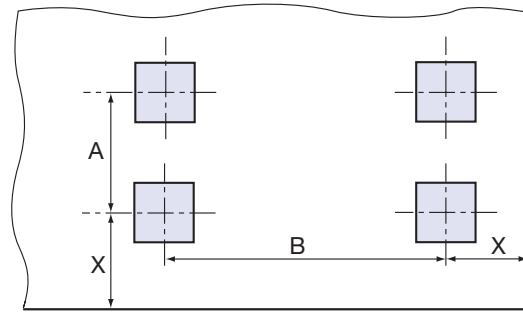
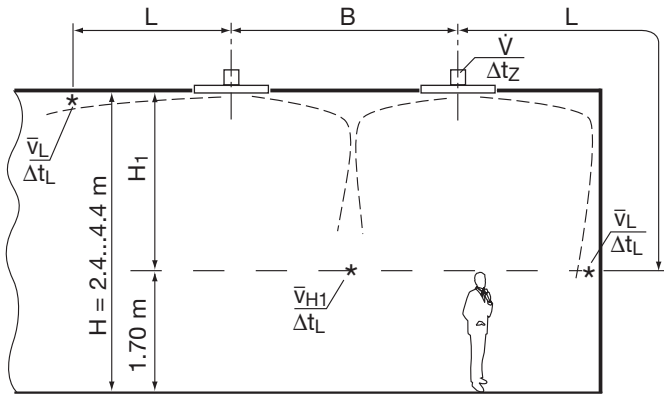
Insertion attenuation see page 12

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

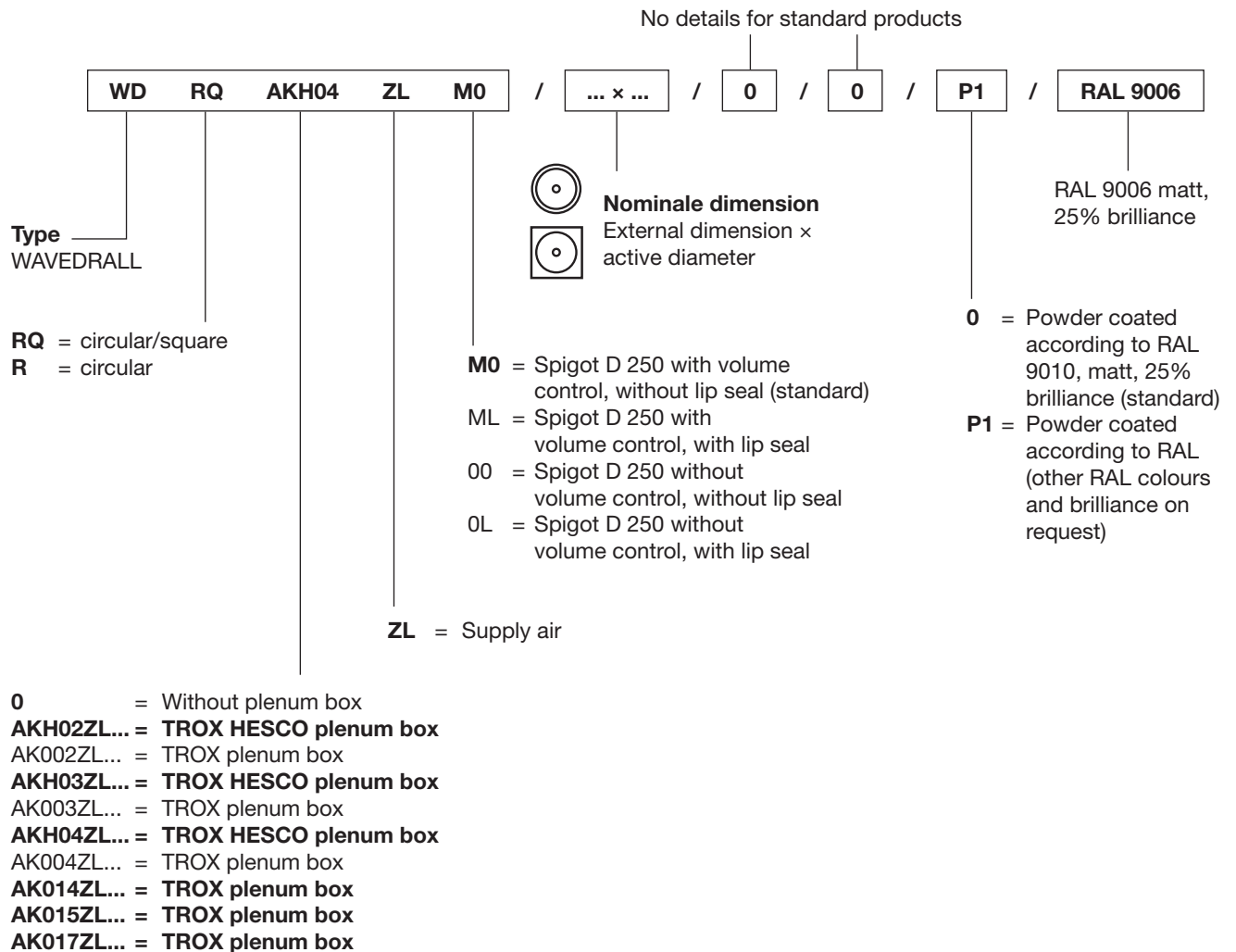
Difference of temperature	0.06	$\Delta t_L / \Delta t_z$
$(t_R - t_L)$ at $\Delta t_L - 8 \text{ K} = 0.06 \times 8$	= ~0.5 K	Δt_L

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}	m ³ /h	Volume flow rate per diffuser
\dot{V}_{nominal}	m ³ /h	Nominal volume (flow rate with VAV: $\dot{V}_{\text{max}} = 1.19 \times \dot{V}_{\text{nominal}}$)
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}	m ²	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 $L_{wNC} = L_{wA} - 6 \text{ dB}$
L_{wNR}		$L_{wNR} = L_{wNC} + 2 \text{ dB}$
L_{pA}, L_{pNC}		A-weighting or NC curve respectively of room sound power level $L_{pA} \sim L_{wA} - 8 \text{ dB}$ $L_{pNC} \sim L_{wNC} - 8 \text{ dB}$
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



Order examples

45 off WDRQ AKH04ZL M0 / 623x500
 30 off WDRQ AKH04ZL M0 / 598x500 / P1 / RAL 9006
 20 off WDR / 480x400
 25 off WDR AKH02ZL ML / 380x300 / 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

