Product information

Multi-outlet diffuser
type WSA

struli k

Table of contents

Multi-outlet diffuser type WSA

- WSA Multi-outlet swirl jet diffuser for supply air for wall installation: a solution for almost any room
- High user comfort with increased ventilation efficacy
- Individual adaptation as per spatial conditions

WSA Standard design

Description

The air supply for wall installation often involves the problem of considering high temperature differences $\Delta\vartheta$ (supply air – room air) with an adequate horizontal and vertical penetration depth to achieve a high user acceptance with increased ventilation efficacy.

The solution is the multi-outlet diffuser type WSA with the following advantages:

- High induction for controlling large temperature differences, especially in case of cooling
- Adaptable trajectory width, variable flow pattern

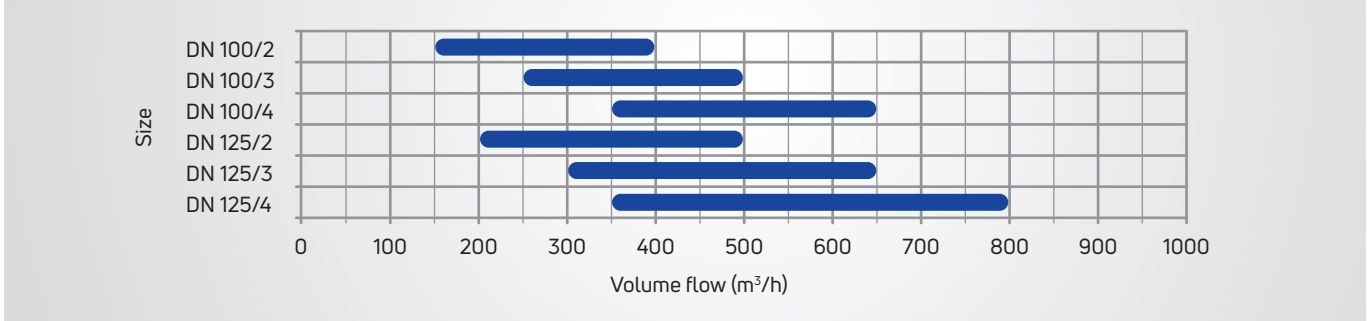
Areas of Application

Bed room, hotel room, office for 2 persons, restaurant, lecture hall, etc..

Application

The multi-outlet diffuser type WSA is a supply air diffuser for wall installation. Depending on the size it can be used to supply volume flow between 150 m^3/h and 800 m^3/h per diffuser into the room. Multi-outlet diffusers can be used for cooling and heating up to temperature differences of 8 K. Depending on the thermal load and volume flow rate, the mounting height ranges between 2.2 and 4 m.

In case of cooling the multi-outlet diffuser should not be installed at a greater distance than 0.3 m below a closed ceiling, as a horizontal introduction of the supply air can be ensured only by using the Coanda effect.



Recommended ranges of application for diffuser type WSA

Function

The WSA diffuser supplies the air into the room by a combination of 2 to 4 swirl diffusers with a nominal diameter of DN 100 or DN 125 and a perforated plate. Swirl nozzles create highly inductive jets, whose exit velocity and temperature difference between the supply air and the room air is reduced extremely quickly due to the twisting. Air discharged from the perforated sheet is immediately induced by the swirled jets. Multi-outlet diffusers generate a diffused air movement and a uniform, draft-free purging of the room.

Size

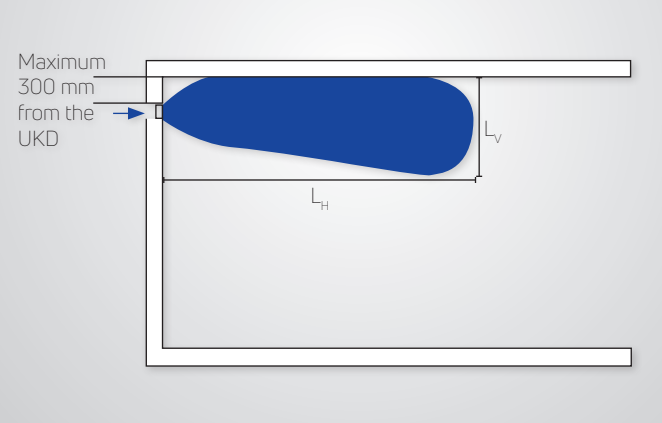
Multi-outlet diffusers are manufactured in six different sizes. Depending on the size, the standard designs of the WSA 2, 3 or 4 swirl diffusers with nominal width DN 100 or DN 125 are built in the air outlet face.
The diffusion faces have a height of 125 or 160 mm and a width of 425, 625 and 825 mm. Suitable sizes are selected depending on airflow and the permissible or desired horizontal and vertical penetration depths.

Object-specific Variants

- **Flow pattern:** The use of swirl nozzles, with 4 or 8 guide vanes integrated into the perforated plate with different free cross-section, allows numerous individual flow profiles. The use of swirl nozzles as swirl diffusers also allows the minimization of the penetration depth and changing the maximum temperature difference.
- **Design:** The visible active air outlet area with swirl nozzles and a perforated plant can be changed by installing design front face. This can be a perforated plate with 70 % free cross-section or wire grills (grill with horizontal round bars).

Standard system solutions

WSA Standard design



The WSA is a diffuser for mixed air systems with the requirement for a quick temperature and velocity reduction. The WSA creates a diffused air movement in the room with the smallest possible temperature gradients.

Application

Air outlet face with 2–4 swirl nozzles, DN 100/125 in the perforated plate front, LV 4/6. Circumferential frame, width 25 mm, made of AL profile.

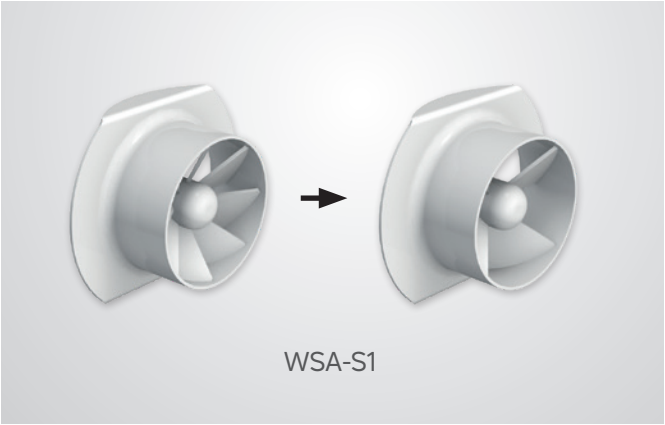
Connection Methods

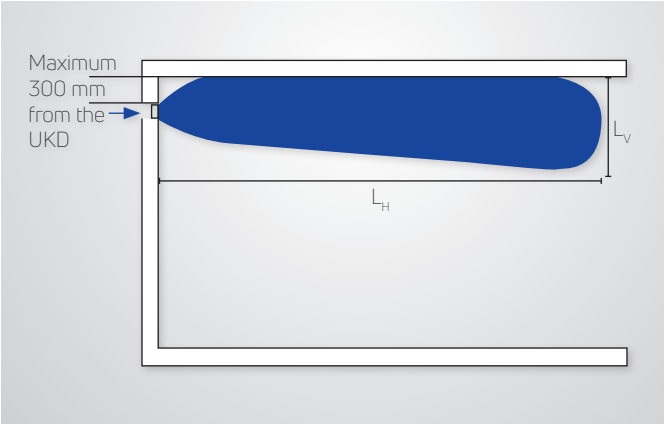
- Variant with ducts
- Variant with boxes

Technical data

- Volume flow: 150–800 m^3/h
- Temperature difference: ±8 K
- Room height: 2.4–4 m
- Room depth: 3.5–14 m

Type WSA-S1 (increased penetration depth)





WSA with modified swirl nozzles. A higher penetration depth can be achieved by reducing the number of swirl vanes in swirl nozzles of the WSA.

Application

Swirl nozzle with a reduced number of swirl vanes (4 instead of 8 vanes per swirling unit).

Function

The reduction in the flow resistance in swirl nozzles increases the volume flow component inside a swirl nozzle. The swirl effect is also minimised or the induction effect is reduced. As a result, the horizontal penetration depth can be increased by 30–40 %.

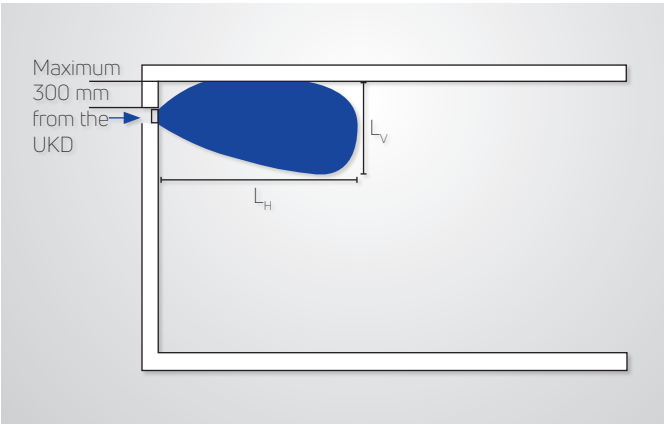
Connection Methods

- Variant with ducts
- Variant with boxes

Technical data

- Volume flow: 150–800 m^3/h
- Temperature difference: ±8 K
- Room height: 2.4–4 m
- Room depth: 4.5–20 m

Type WSA-S2 (reduced penetration depth)



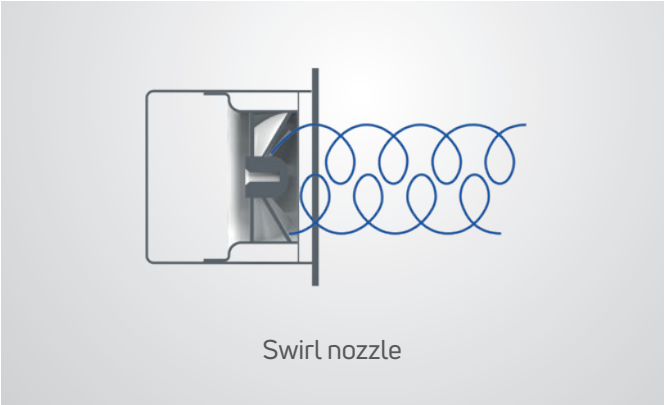
WSA with swirl diffusers. By using swirl diffusers instead of swirl nozzles, the induction effect of the WSA increases and the penetration depth is reduced by approximately 30 %.

In addition, a quick temperature reduction can be achieved, which the maximum temperature difference increases by -2 K in case of cooling. In case of heating the effect is negative, there the value $\Delta\vartheta$ should be considered as lower by 2 K.

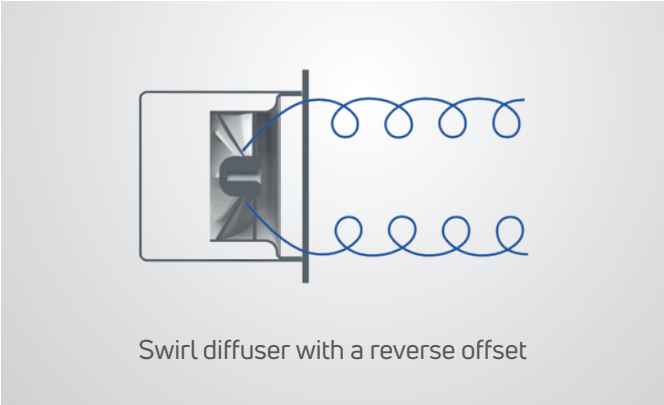
The swirl diffusers are installed back to the WSA-face so that still a forward directed pulse is generated through the housing shield (see the following page).

Application

Compared to the standard WSA, the swirl nozzles are turned by 180° and are working like swirl diffusers. The twisted single jet of the swirl nozzle is replaced by 2 linear flow



Swirl nozzle



Swirl diffuser with a reverse offset

profiles also swirled jets. The air outlet area is clad with an upstream design front.

Function

- Increased induction effect
- Higher $\Delta\vartheta$ in case of cooling –10 K, reduced $\Delta\vartheta$ of 6 K in case of heating
- Reduction of the horizontal penetration depth by up to 30%

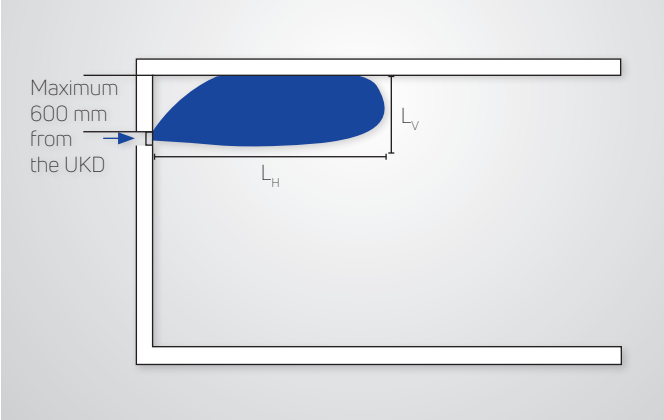
Connection Methods

- Variant with ducts
- Variant with boxes

Technical data

- Volume flow: 150–800 m^3/h
- Temperature difference: –10 K/6 K
- Room height: 2.6–4 m
- Room depth: 2.5–10.5 m

Type WSA-S3 (installation height up to 600mm from the UKD)



WSA with inclined swirl nozzles. The high penetration depth of the WSA is favoured by using the Coandă effect. The application is linked with the requirement indicating that the WSA should be installed at a maximum of 300 mm from UKD (lower edge of the ceiling). This requirement cannot be fulfilled always owing to special spatial conditions. By the inclination of swirl nozzles, the requirement of the installation height of 300 mm from the UKD can be extended to 600 mm from the UKD. All functions are retained with respect to the standard WSA.

The penetration depth reduced by 10–15 % must be reckoned. The WSA with inclined swirl nozzles are advantageous even when the use of the Coandă effect on the ceiling must be ruled out.

By the inclination the path for the reduction of temperature can be increased in case of cooling. In case of high rooms, a downward gradient can also be possible so that it works with the flow in the work area.

Application

Diffuser with an active air outlet face with an upward gradient of 8–15° and an additional upstream design front.

Function

Due to the upward gradient of the active air outlet face, the Coandă effect can be used on the ceiling. In his case higher induction of the supply air with the room air up to the inlet of the supply air in the lounge area is possible. The temperature difference and velocity are reduced. In case of large mounting heights and heating, the room purging can also be improved by using a downward gradient in the lounge area.

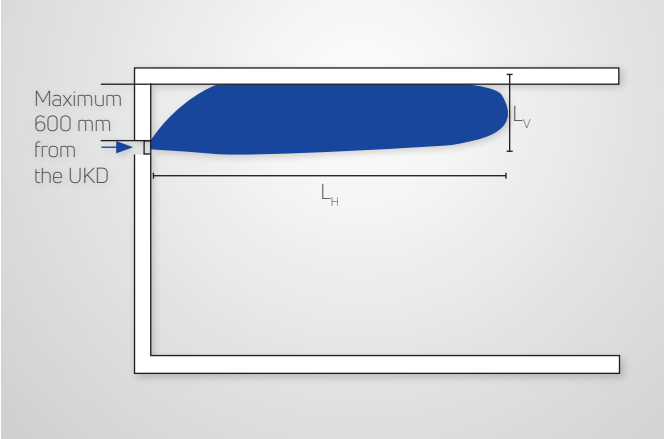
Connection Methods

- Variant with ducts
- Variant with boxes

Technical data

- Volume flow: 150–800 m^3/h
- Temperature difference: –8 K/4 K
- Room height: 3–5 m
- Room depth: 3–13 m
- Use for installation up to 600 mm below the ceiling
- Use without the Coandă effect on the ceiling in case of installation heights from 3 to 4 m

Type WSA-S4 (combination of WSA-S1 "increased penetration depth" and WSA-S3 "installation height up to 600 mm UKD")



WSA with inclined swirl nozzles and reduced number of swirl nozzle vanes. With this combination of WSA system solutions WSA-S1 and WSA-S3, a high penetration depth can be ensured even in case of large ceiling distances (600 mm from the UKD).

This system solution extremely suitable for a free blowing WSA if the Coandă effect cannot be used.

Application

The WSA-S4 combines system solutions WSA-S1 and WSA-S3.

Function

High penetration depths in case of installations up to 600 mm below the ceiling and use without the Coandă effect on the ceiling in case of installation heights from 3 to 6 m.

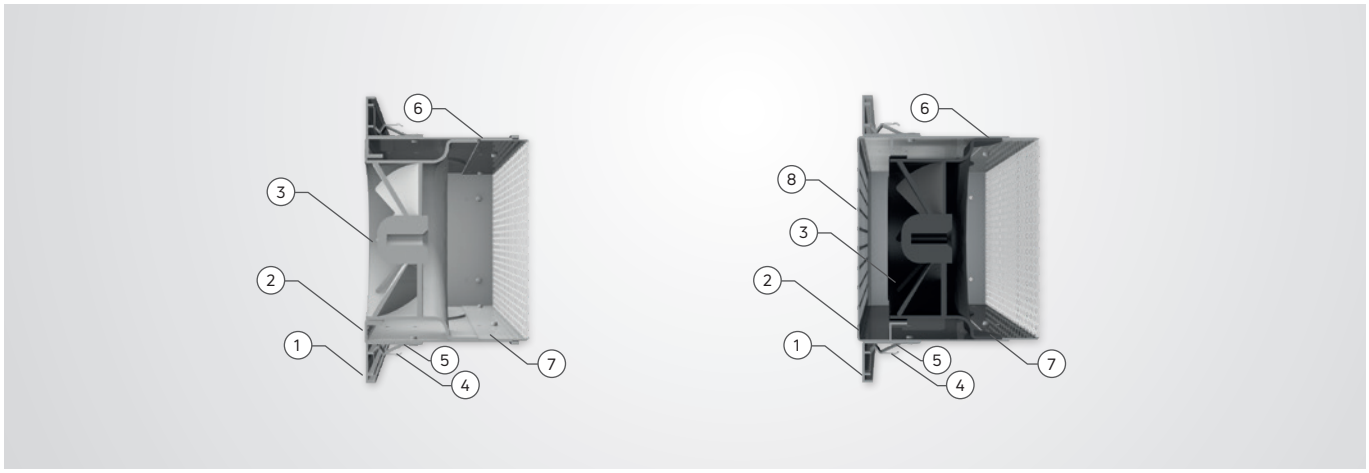
Connection Methods

- Variant with ducts
- Variant with boxes

Technical data

- Volume flow: 150–800 m^3/h
- Temperature difference: –10 K/6 K
- Room height: 3–6 m
- Room depth: 4–18.5 m

Multi-outlet diffuser type WSA



Application

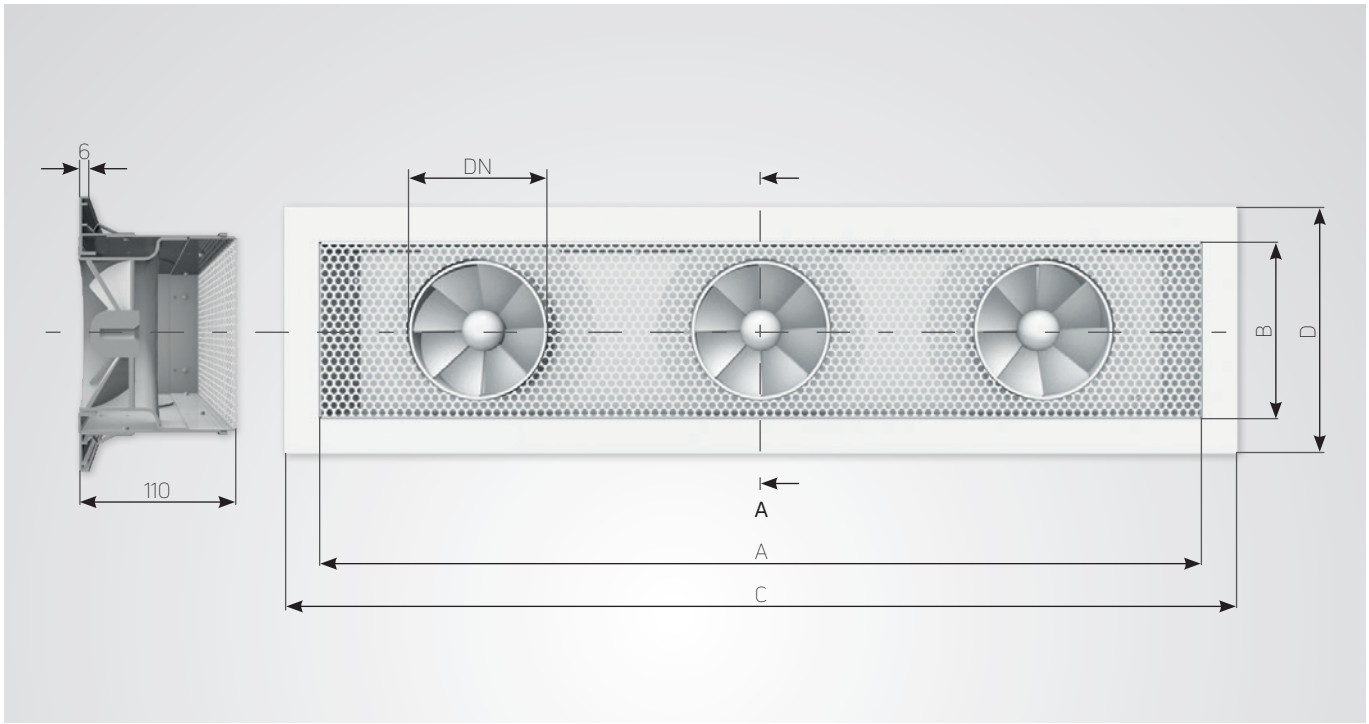
A frame (1) manufactured from extruded aluminium surrounds the diffusion face (2) consisting of 2 to 4 swirl diffusers (3) and the perforated area of displacement. The housing (6) is also made of aluminium.

The housing has a balancing perforated plate (7) to enable a uniform air flow and the required pressure loss.

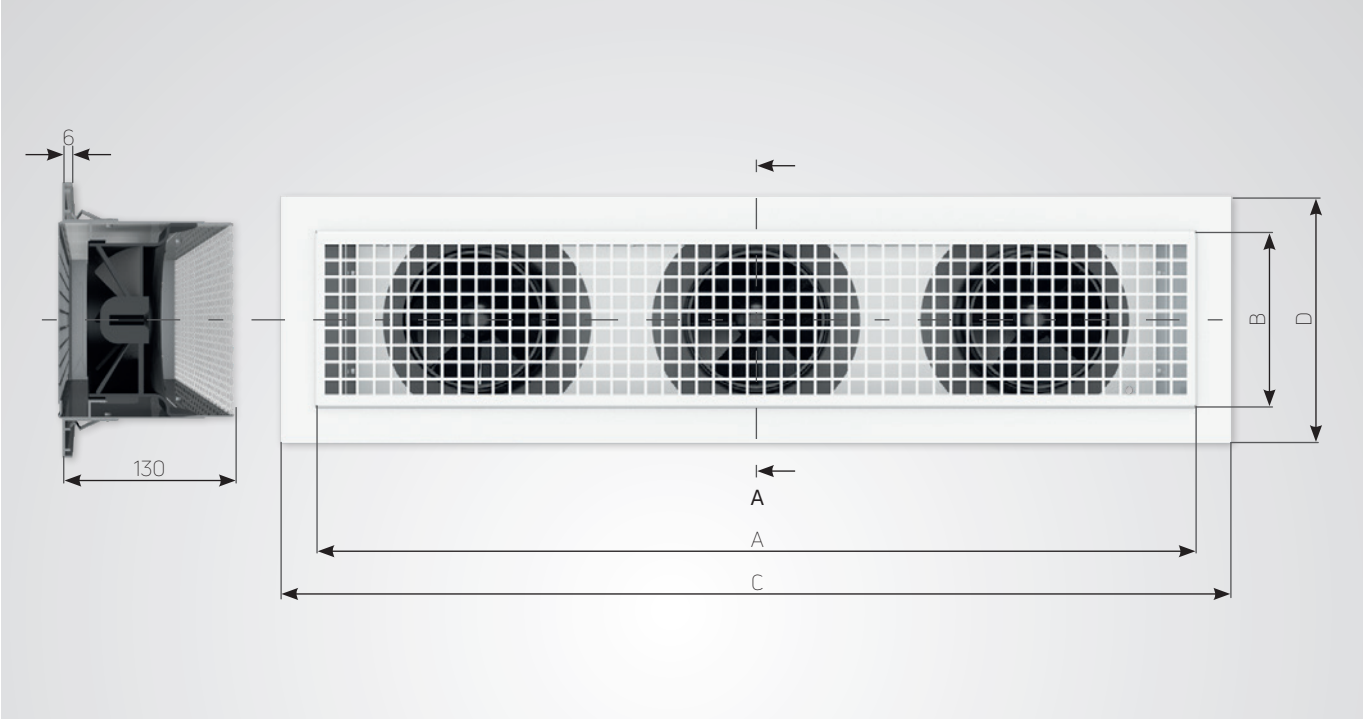
The clamps (5) at the grille frame of the multi-outlet diffuser secure the diffuser in the mounting frame (4). For decorate purposes, the multi-outlet diffuser can also be supplied with a perforated front plate (8). In case of this variant, the housing (6) and the grille plate (8) are made of galvanised steel sheet to ensure stability.

Dimensions

WSA Standard design



WSA design with grille plate

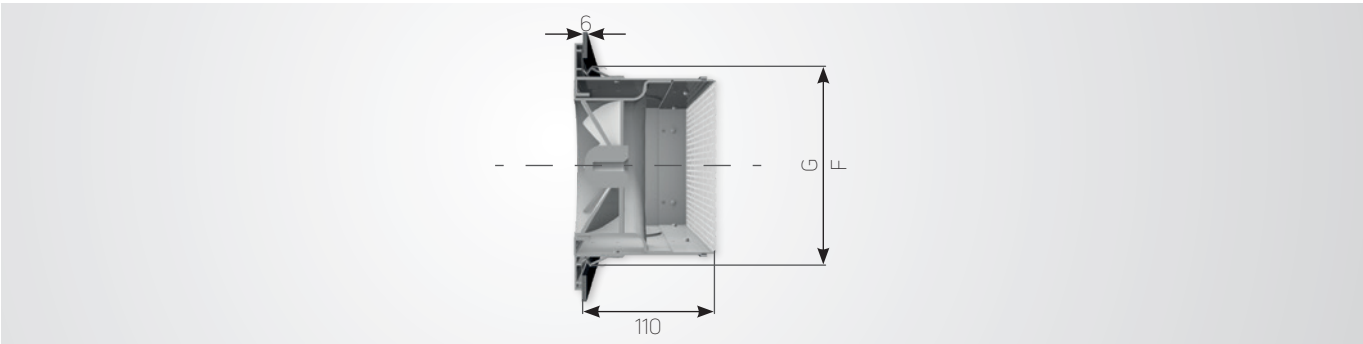


Sizes	DN	n*	A	B	C	D
100/2	100	2	425	125	475	175
100/3	100	3	625	125	675	175
100/4	100	4	825	125	875	175
125/2	125	2	425	160	475	210
125/3	125	3	625	160	675	210
125/4	125	4	825	160	875	210

* Number of nozzles

Connection methods

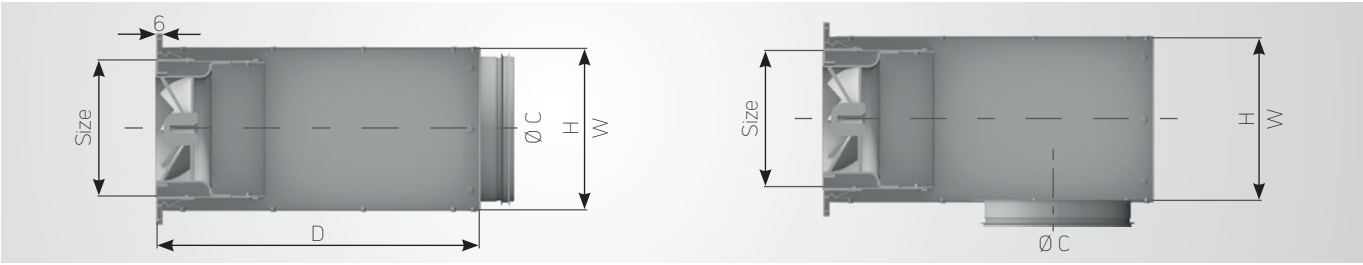
Connection with ducts



The unassembled mounting frame is fastened to the duct opening. Clamping springs hold the multi-outlet diffuser within the mounting frame. The dimensions F and G of the duct opening have to be as shown on the table.

Sizes	F	G
100/2	445	150
100/3	645	150
100/4	845	150
125/2	445	185
125/3	645	185
125/4	845	185

Connection with box



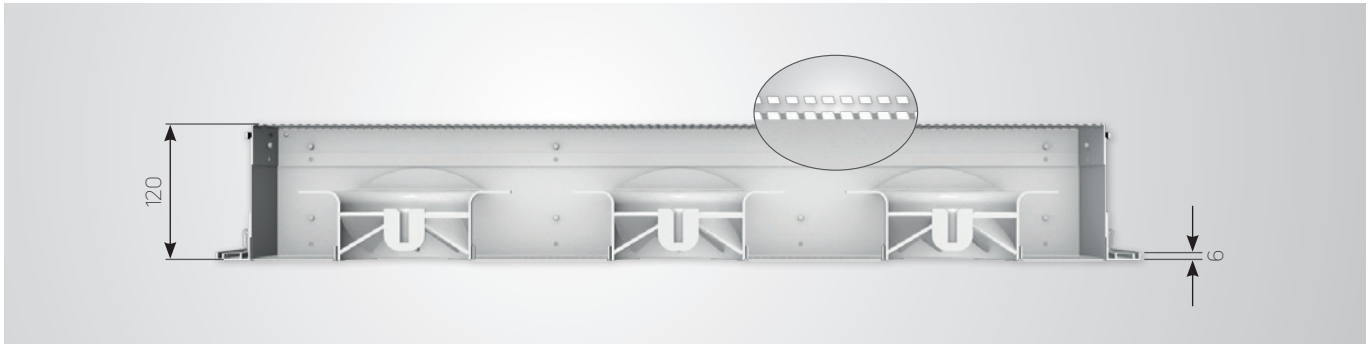
The multi-outlet diffuser is mounted in the same manner as for ducts by means of clamping springs into the mounting frame. All sizes can also be delivered with vertically positioned supply air connectors on request.

Sizes	W**	Ø C	H**	D**
100/2	440	2 x DN 125	145	325
100/3	640	3 x DN 125	145	325
		2 x DN 160	145	360*
100/4	840	3 x DN 125	145	325
		2 x DN 160	145	360*
125/2	440	2 x DN 125	180	325
125/3	640	2 x DN 160	180	360
125/4	840	3 x DN 160	180	360

* Only for a vertical connection, ** outer dimensions

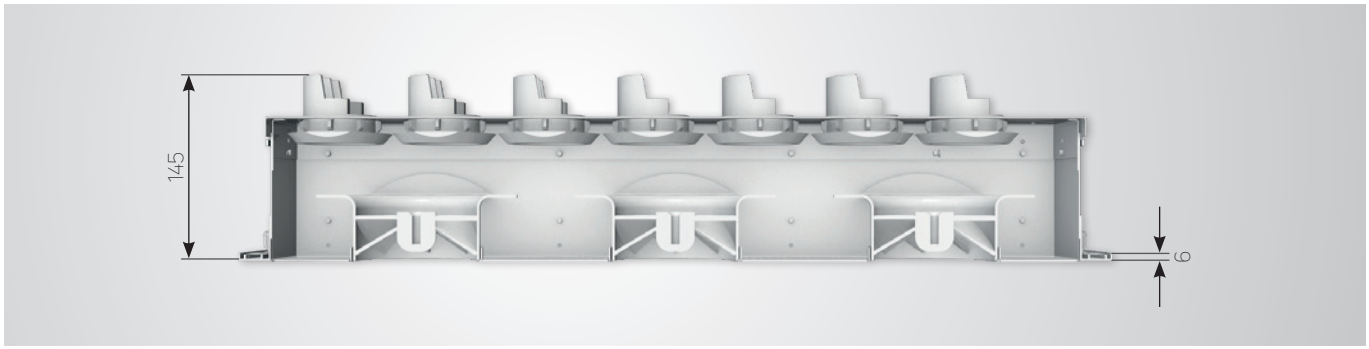
Accessories

Flow control



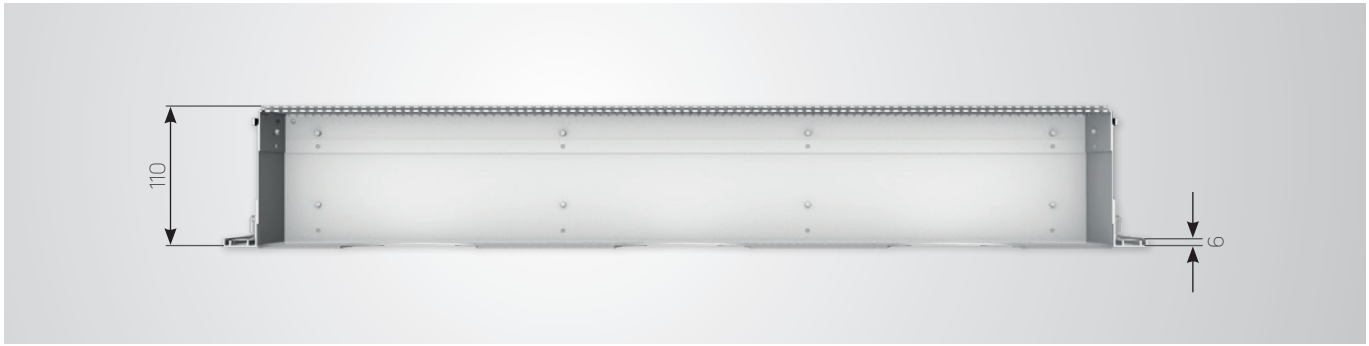
All diffuser size can be supplied with a flow control for the adjustment of the airflow. Flow control can be fitted for duct mounted diffusers as well as for diffusers with plenums.

Deflector



For improving the flow of the multi-outlet diffusers in case of a channel installation, a deflector level is provided (recommended for velocities > 3 m/s in the channel).

Exhaust air variant



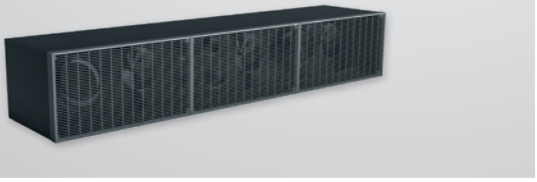
In order to achieve a uniformly designed room pattern, exhaust air variants of the WSA without swirl nozzles are available. Hole pattern of the front is optionally similar to that of the standard version or similar to the grille plate.

Design variants

Design variants of the front area

The multi-outlet diffuser is available as supply and exhaust air diffuser in different sizes and with different fronts. Independently of the flow-specific outline conditions, each unit can be manufactured with different design fronts.

These variants can be delivered in all RAL colours as well as in the stainless steel design for the Wire-Grill.
The following design front areas are available for the standard design and for the system solutions WSA-S1 to WSA-S4:

A	Perforated plate R_V10/12 Round holes with 10 mm hole and 12 mm distance, FO = 63%	
B	Perforated plate Q_G10/12* Square holes with 10 mm hole and 12 mm distance, FO = 70%	
C	Wire-Grill (LSE) Round bar grill, wire ≈ 4 mm** Support profile wire ≈ 4 mm Distance of support profile ≈ 50 mm	

* Other diameters are possible

Possible design fronts

WSA diffuser	Option	Required
Standard design	A, B, C	
WSA-S1	A, B, C	
WSA-S2		A, B, C
WSA-S3		A, B, C
WSA-S4		A, B, C

Design variant with supply or exhaust air line

Instead of individual wall diffusers, the supply air can also be supply via a continuous line with active and concealed elements.

These lines comprise:

- An end piece on the left (E)
- An end piece on the right (E)
- A covering panel (LB-B)
- A wall panel (WB-B)

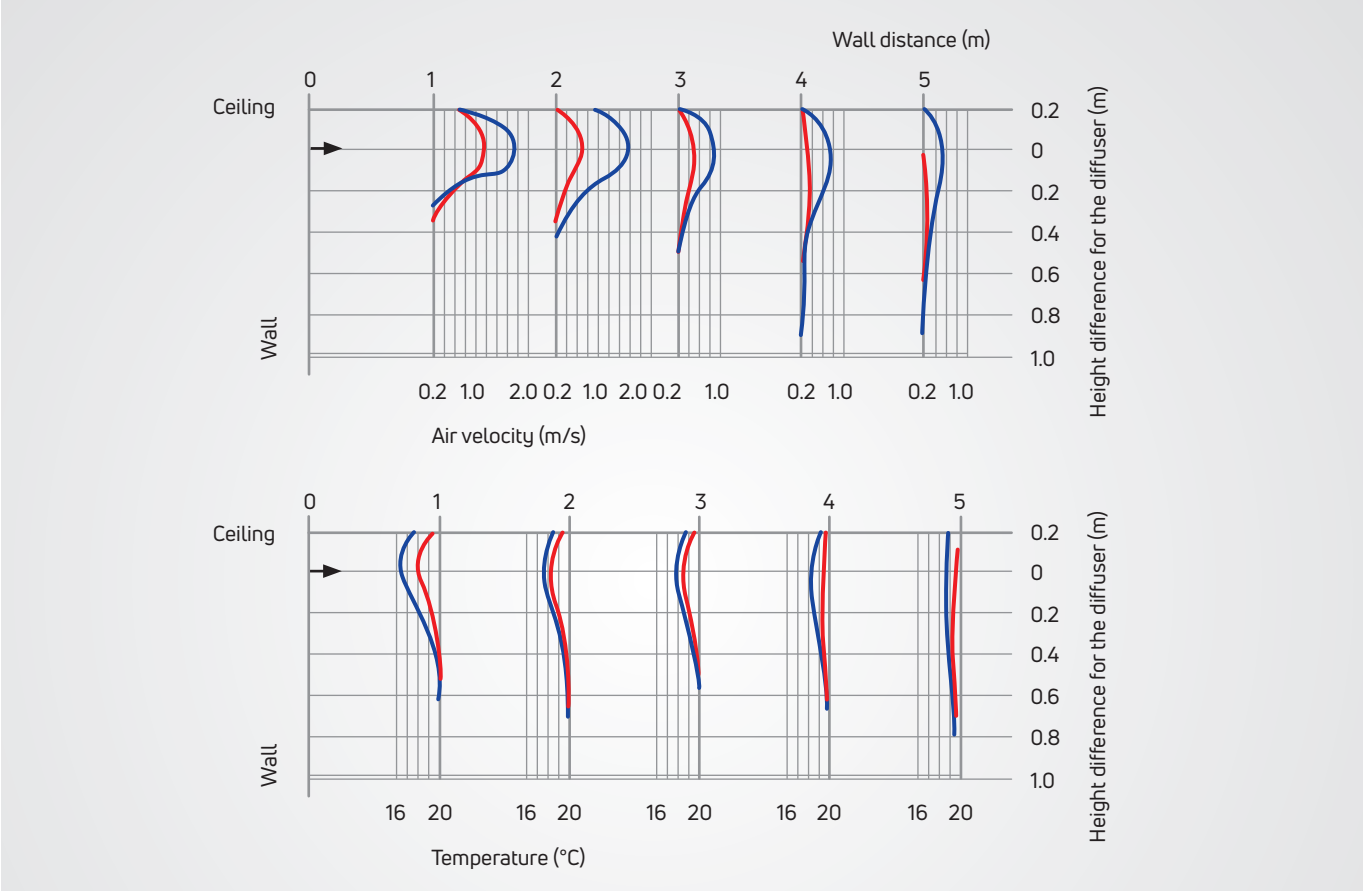
All parts can be designed as active or concealed elements.

Design data

Multi-outlet as a feed air outlet for wall installation

Multi-outlet diffusers enable a quick reduction of temperature and velocity. The following figure shows a comparison between a multi-outlet diffuser and a double deflection grille with an airflow rate of 300 m^3/h and a temperature difference of 6 K for cooling. The temperature and velocity profiles of a multi-outlet diffuser (red) and a grille (blue) are shown for a horizontal penetration depth of 5 m and a vertical of 1.0 m.

Compared to the grille, the multi-outlet diffuser rapidly reduces the face velocity and temperature difference between supply and room air in half the time.



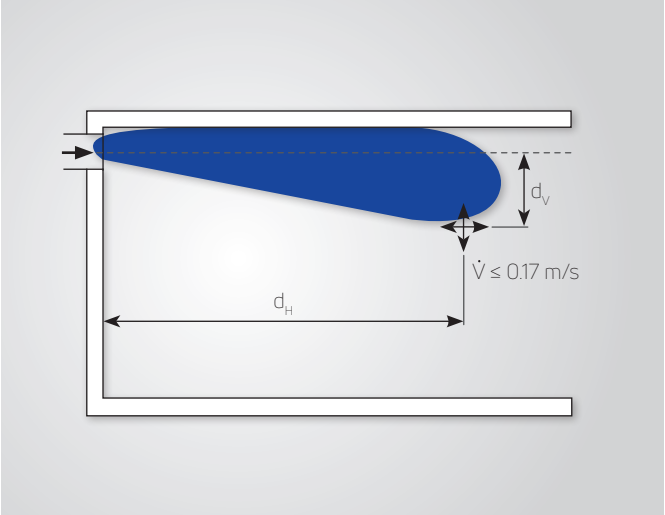
References

Hyundai, headquarters in Offenbach

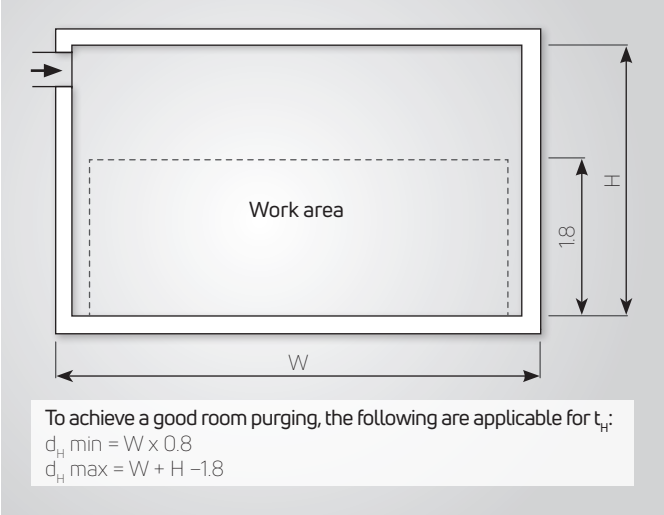
Gosch, Sylt

Determination of diffuser size

For draft-free room conditions, the selection of a suitable diffuser size is important. Therefore, each type of diffuser has a horizontal and vertical penetration depth relative to the airflow and thermal loading. The horizontal penetration depth is defined as the distance between the diffuser and the point in the room, at which the horizontal velocity has reduced to a value of 0.17 m/s. The vertical penetration depth is defined as the distance between the mounting height of the diffuser and the highest point in room, at which the vertical velocity has also reduced to 0.17 m/s.



Horizontal and vertical penetration depths of multi-outlet diffusers

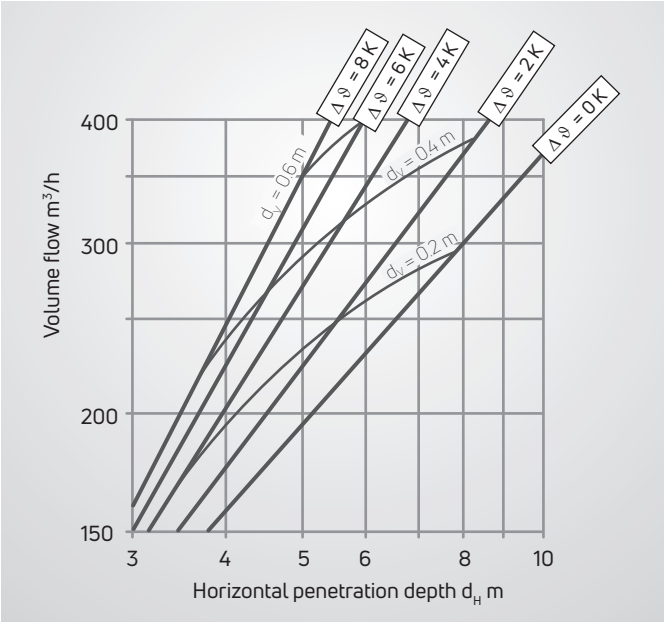


Minimum and maximum horizontal penetration depths

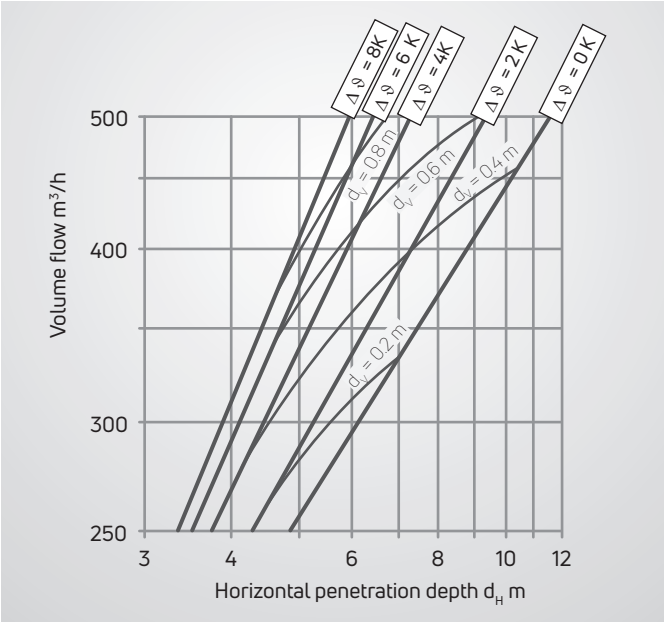
Ventilation-related design

The following figures give information about the horizontal and vertical penetration depths of multi-outlet diffusers depending on the airflow per diffuser and thermal loading between 0 and 8 K cooling.

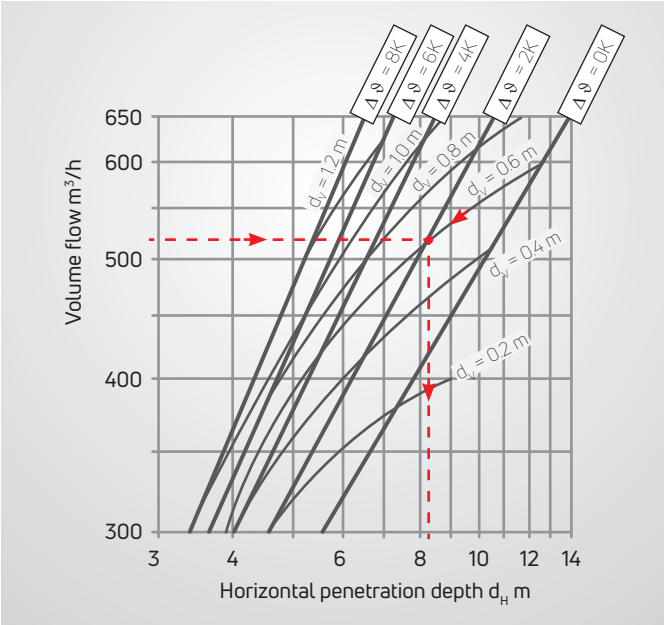
Horizontal and vertical penetration depths



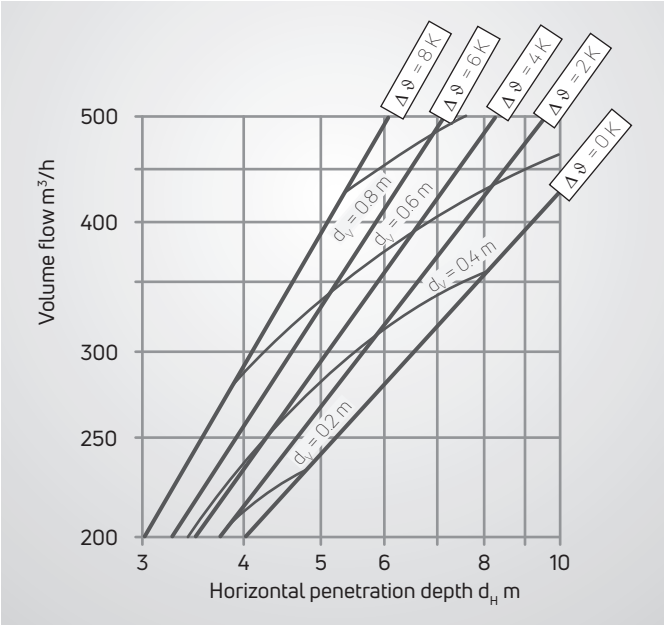
Penetration depths of WSA 100/2 for cooling ≤ 8 K to isotherm



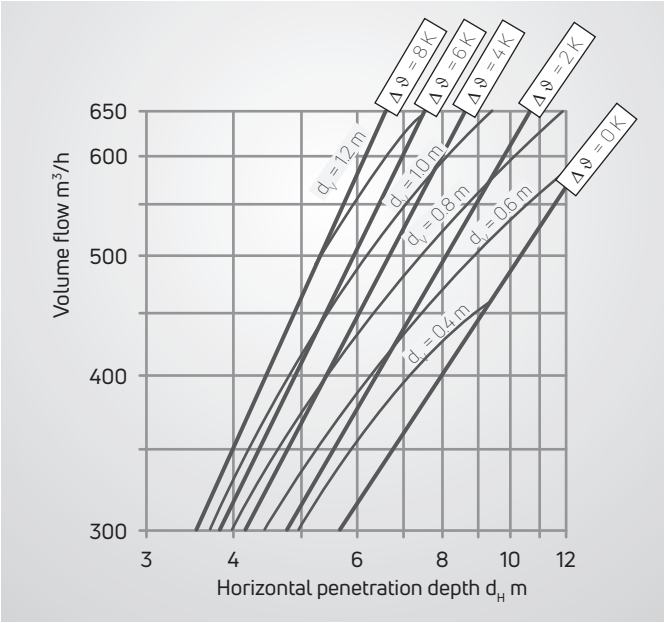
Penetration depths of WSA 100/3 for cooling ≤ 8 K to isotherm



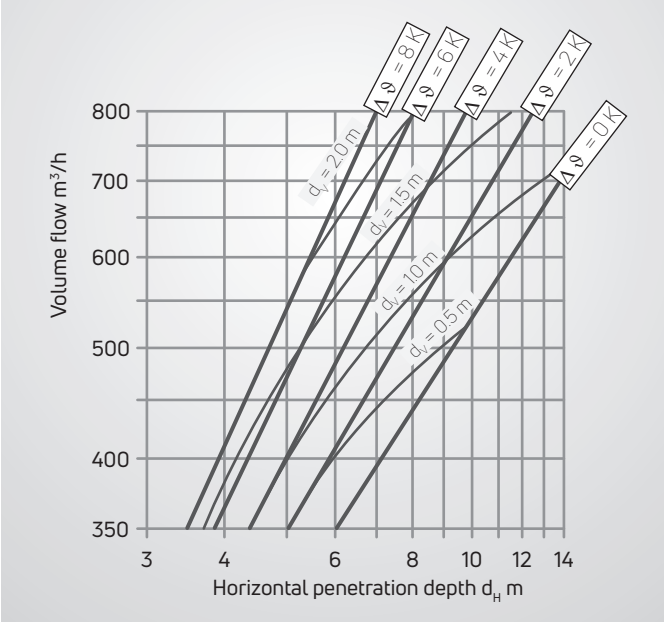
Penetration depths of WSA 100/4 for cooling ≤ 8 K to isotherm



Penetration depths of WSA 125/2 for cooling ≤ 8 K to isotherm



Penetration depths of WSA 125/3 for cooling ≤ 8 K to isotherm



Penetration depths of WSA 125/4 for cooling ≤ 8 K to isotherm

	Horizontal penetration depth	Vertical penetration depth
WSA-S1	d_H x 1.4	d_V x 0.9
WSA-S2	d_H x 0.7	d_V x 1.3
WSA-S3	d_H x 0.9	d_V x 0.9
WSA-S4	d_H x 1.25	d_V x 0.85

Example

WSA 100/4

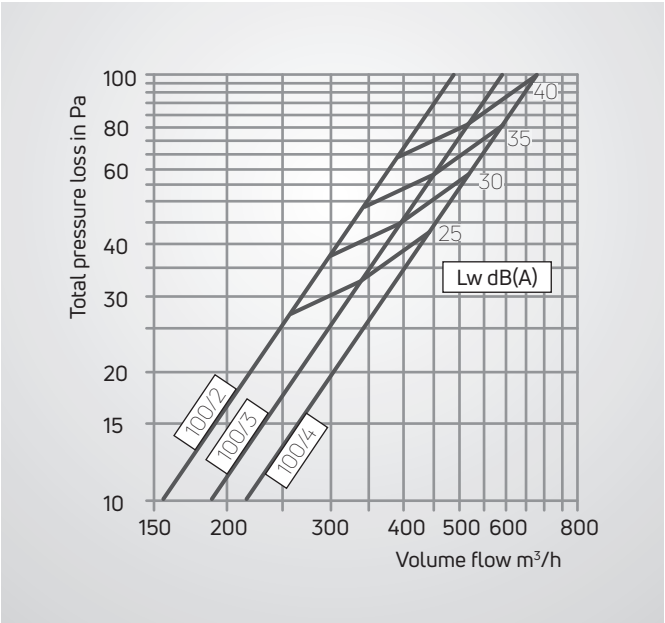
$\dot{V}$ = 515 m³/h
Δ ϑ = 2 K

From the given parameters, the following vertical and horizontal penetration depths are derived in accordance with the diagrams:

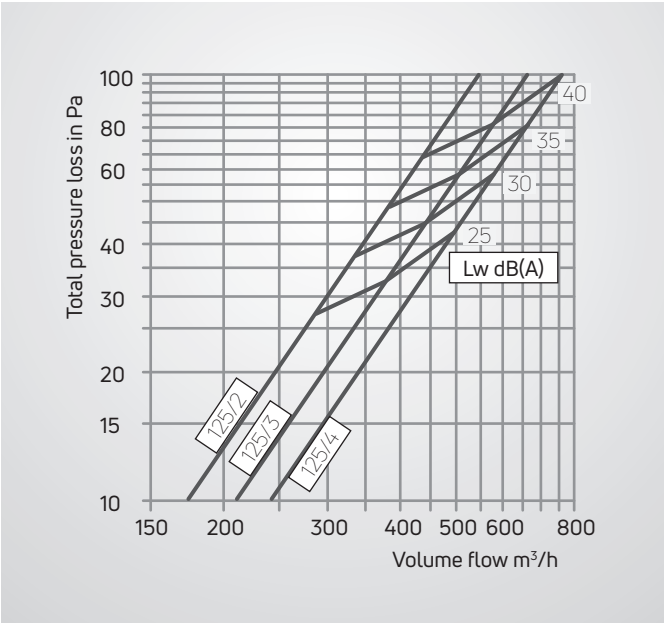
d_H = 8.1 m
d_V = 0.6 m

Pressure loss and noise level

The following two figures show total pressure losses and noise level for multi-outlet diffusers. These values apply to the standard construction. With perforated front plate, the noise level increases by 1-2 dB(A); the pressure loss remains the same.



Pressure losses and sound power levels for multi-outlet diffusers 100/2, 100/3, 100/4



Pressure losses and sound power levels for multi-outlet diffusers 125/2, 125/3, 125/4

	Noise level	Pressure loss
WSA-S1	–	– 2 Pa
WSA-S2	+ 3 dB(A)	+ 5 Pa
WSA-S3	+ 2 dB(A)	+ 2 Pa
WSA-S4	+ 2 dB(A)	–

Noise level per octave

The noise levels per octave are calculated from the evaluated sound power level and an octave correction factor according to the follwing formula:

$L_{WO} = L_{WA} + Ko$

L_{WA} [dB(A)] | evaluated noise level
L_{WO} [dB] | noise per octave
Ko [dB] | octave correction value

Calculation example type WSA

Given information: L_{WA} = 35dB(A)
To find: L_{WO} at 1000Hz
$L_{W\,1000}$ = 35–7 = 28dB

Correction table for octave evaluation [dB/Oct]

F	63	125	250	500	1000	2000	4000	[Hz]
Ko	–18	–7	–6	–7	–7	–14	–28	[dB]

Example

Given information:

- Room - length 8 m, width 6 m, height 3 m
- Volume flow: 1440 m^3/h
- Temperature difference: –6 K
- Maximum noise level: 40 dB(A)

The air supply duct is arranged alongside the room underneath the ceiling.

Selection:

Design type and the number of multi-outlet diffusers as well as the pressure loss and the actual noise level LWA.

Calculation:

Vertical penetration depth: For a room height of 3 m, the maximum vertical penetration depth is 3.0–1.8 = 1.2 m

$d_{v\,max}$ = 1.2 m

Horizontal penetration depth:

Maximum: $d_{H\,max}$ = 6+3–1.8 = 7.2 m

Minimum: $d_{H\,min}$ = 6 x 0.8 = 4.8 m

With the given room length and technical outline conditions; at least 3 to 4 diffusers must be used to achieve a good room air movement.

With 3 diffusers, $\dot{V}$ is 480 m^3/h per diffuser.

With $\Delta\vartheta$ = 6 K for cooling a diffuser to be chosen must have its operating point in the upper third of the recommended volume flow range. In our example, the 100/3 type is selected. The figure shows for this type with 480 m^3/h and $\Delta\vartheta$ = 6 K t_H = ~ 6.2 m, t_V = 0.8 m for cooling. The noise level is 35 dB (A) and the pressure loss is 60 Pa.

Result:

3 swirl jet outlets 100/3, which are operated with 480 m^3/h, are required.

Pressure loss: Δp = 60 Pa

Noise level: L_{WA} = 35 dB

Alternative linear multi-component wall diffusers

Linear nozzle diffusers with a source area

WSA with a rubber nozzle. An individual flow pattern is possible due to multi-stage adjustable rubber nozzles that can be rotated by 360°. When using the WSA with rubber nozzles (DN 25, DN 50, DN 70, DN 80), a flow pattern, which is customised as per the requirements, with a penetration depth of up to 18m can be generated.

Application

Rubber jet nozzles with direction adjustment have been integrated into a perforated plate area. Nozzles: DN 25–80.

Function

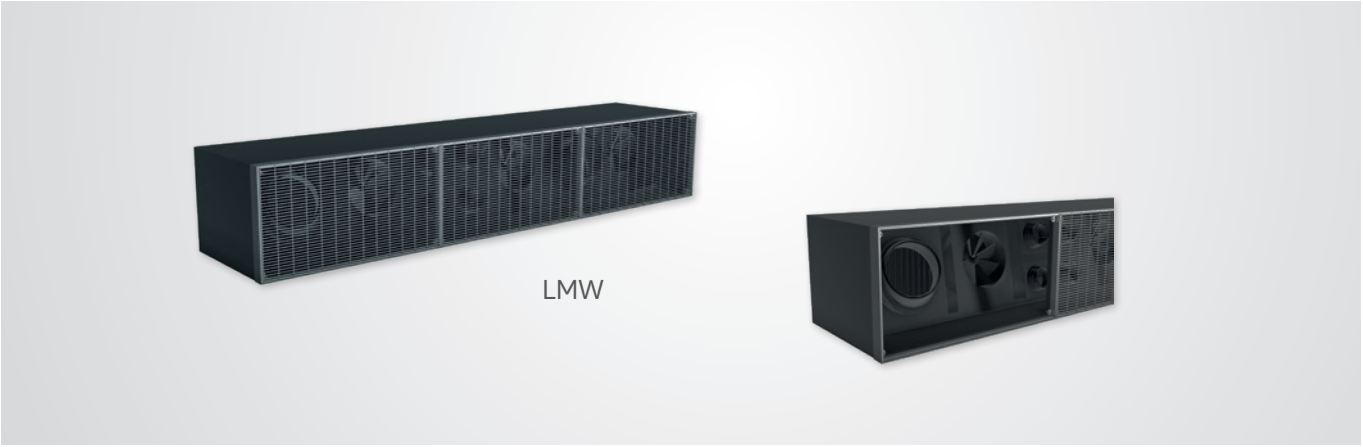
An individual flow profile can be set using rubber jet nozzles with direction adjustment. These nozzles allow a large horizontal penetration depth.

Connection Methods

- Variant with ducts
- Variant LDQ with box

Technical data

- Volume flow: 100–1250 $m^3/(hxm)$
- Temperature difference: –10 K/4 K
- Room height: 3,5–6 m



Linear multi-component wall diffuser

High volume flows and at the same time a large $\Delta\vartheta$ can be implemented without any problem using linear multi-component wall outlets.

Application

Rubber jet nozzles with direction adjustment (DN 50–160) combined with swirl nozzles and/or swirl diffusers are integrated into the perforated plate front.

Function

Owing to the volume flow-related coordination of individual components and the direct adjustment of jet nozzles, flow profiles adapted as per the room geometry can be generated.

Connection Methods

- Variant with ducts
- Variant LMW with box

Technical data

- Diffuser suitable for rooms with a special room geometry and large volumes
- Volume flow: 500–1500 m³/(hxm)
- Temperature difference: –10 K/6 K
- Room height: 3.5–6 m

Quick selection of WSA variants

Type	Volume flow	Temperature difference	Room depth	Room height	Speciality
Standard design	150–800 m³/h	±8 K	3.5–14.0 m	2.4–4.0 m	–
WSA-S1	150–800 m³/h	±8 K	4.5–20.0 m	2.4–4.0 m	Increased penetration depth
WSA-S2	150–800 m³/h	–10 K/6 K	2.5–10.5 m	2.6–4.0 m	Reduced penetration depth
WSA-S3	150–800 m³/h	–8 K/4 K	3.0–13.0 m	3.0–5.0 m	Installation height up to 600 mm from the UKD
WSA-S4	150–800 m³/h	–10 K/6 K	4.0–18.5 m	3.0–6.0 m	Combination of S1 and S3
LDQ	100–1250 m³/h	–10 K/4 K	Up to 18.0 m	3.5–6.0 m	Adjustable flow pattern
LMW	500–1500 m³/h	–10 K/6 K	> 20.0 m possible	3.5–6.0 m	Optimal adaptation to any room geometry

Tender text

Pos.	Description	Unit	Unit price in EUR	Total price in EUR
	Multi-outlet type WSA The WSA multi-outlet diffuser is used as a supply air diffuser for the wall or duct installation and generation of a diffused air movement in a room at a minimum possible temperature gradient. System designs: **Standard design:** Aluminium outlet element consisting of a frame with perforated plate, a balancing perforated plate installed at the inlet and, depending on the size, two or four integral swirl nozzles. **WSA-S1:** System variant for increased penetration depth, with aluminium outlet element consisting of a frame with perforated plate, a balancing perforated plate installed at the inlet and, depending on the size, two or four integral modified swirl nozzles. Swirl nozzle with a reduced number of swirl vanes (4 instead of 8 vanes per swirling unit). **WSA-S2:** System variant for reduced penetration depth, with a steel outlet element consisting of a frame with an integrated grille front, perforation QG10/12, a balancing perforated plate installed at the inlet and, depending on the size, two or four integral, modified swirl nozzles. Swirl nozzle with a reverse offset, turned (function as a swirl diffuser), and integrated into a perforated plate level. **WSA-S3:** System variant for a changed mounting height (up to 600 mm from the UKD), with a steel outlet element consisting of a frame with an integrated grille front, perforation QG10/12, a balancing perforated plate installed at the inlet and, depending on the size, two or four integral swirl nozzles, mounted in a perforated plate level with a gradient of 8-10°. **WSA-S4:** System variant for a changed mounting height (up to 600 mm from the UKD) and high penetration depth - combination of system variants S1 and S3, with a steel outlet element consisting of a frame with an integrated grille front, perforation QG10/12, a balancing perforated plate installed at the inlet and, depending on the size, two to four integral, modified swirl nozzles, mounted in a perforated plate level with a gradient of 8-10°. Swirl nozzle with a reduced number of swirl vanes (4 instead of 8 vanes per swirling unit).			

Tender text

Pos.	Description	Unit	Unit price in EUR	Total price in EUR
	Size: ☐ 100/2 ☐ 100/3 ☐ 100/4 ☐ 125/2 ☐ 125/3 ☐ 125/4 ☐ Special model _____ **Design of front plate:** ☐ Standard with a visible swirl level (possible only in standard WSA and WSA-S1) ☐ With an upstream grid front QG 10/12, F0=70 % (Perforated cover plate) ☐ With an upstream grid front RV 10/12, F0=63 % ☐ With an upstream round bar grid made of steel, powder-coated ☐ With an upstream round bar grid made of stainless steel, LSE-Wire-Grill ☐ Exhaust air version without swirl diffusers (please select the applicable front plate variant) **Design:** ☐ For duct installation (including the installation frame) ☐ With a box, with horizontal connectors AK-H ☐ With a box, with vertical connectors AK-V **Accessories:** ☐ Quantity control DK ☐ Flap SZ **Surface of front plate:** ☐ Powder-coated RAL 9010 ☐ Powder-coated in RAL as per choice, RAL _____ **Volume flow:** ☐ Volume flow _____ m^3/h ☐ Maximum noise level _____ dB (A) ☐ Maximum pressure loss _____ Pa Type: **Multi-outlet diffuser type WSA** Manufacturer: **Strulik GmbH**			

Tender text

Pos.	Description	Unit	Unit price in EUR	Total price in EUR
	WSA cover plate **WSA-SR** – multi-outlet diffuser with a special frame, for inserting a perforated plate cover LB-B. Design details as per description mentioned above. Grid cover for the WSA and wall panel WSA-LB Cover panel, hole pattern QG 10/12, powder-coated RAL 9010 silk-matt **Size:** ☐ 100 (H = 183 mm) ☐ 125 (H = 218 mm) **Available installation lengths:** ☐ Installation length 492 mm ☐ Installation length 984 mm ☐ Installation length 1476 mm ☐ Installation length 1968 mm ☐ Installation length 2460 mm **Wall panel WSA-WB** Wall panel, between active diffusers, powder-coated RAL 9010, black, for cutting to the desired length on the site **Size:** ☐ 100 (H = 180 mm) ☐ 125 (H = 215 mm) **Available installation lengths:** ☐ Installation length 250 mm ☐ Installation length 500 mm ☐ Installation length 1000 mm ☐ Installation length 1500 mm ☐ Installation length 2000 mm End piece WSA-E End piece, powder-coated RAL 9010 silk-matt **Size:** ☐ 100 ☐ 125 Type: **Multi-outlet diffuser type WSA-SR** Manufacturer: **Strulik GmbH**			

Notes

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Issue 10.2019