

Adjustable induction outlet IN-V....

Adjustable induction outlet

Construction and function

Preliminary remarks

In addition to its induction outlet with preset discharge direction ¹⁾, KRANTZ KOMPONENTEN also provides the **adjustable** induction outlet in two types:

IN-V2:

- Element width 28 mm
- Discharge height 2.7 m to 5 m
- 1-row, 2-row, 3-row and 4-row design

IN-V3:

- Element width 15 mm
- Discharge height 2.5 m to 3.5 m
- 1-row design

Thanks to its small width, type IN-V3 is eminently suited for commercial rooms requiring unobtrusive air distribution systems in the ceiling.

Construction and function

The linear discharge element **2**, which is set inside the air outlet profile **1**, consists of a number of consecutive, rotatable single elements, each with two jet channels **3**. As the air flows through the jet channels, many single high-stability and high-induction jets form; this results in a rapid drop in jet velocity and fast equalization of supply air temperature and room temperature.

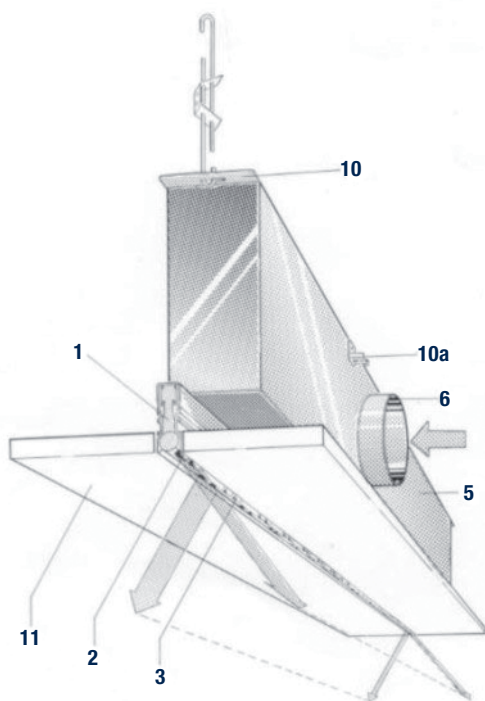


Fig. 1: IN-V2 and IN-V3, 1-row design

Rotating the cylindrical single elements alters the incline of the jet channels and adjusts the jet direction from horizontal to vertical. This enables to spread the total jet as broadly as required.

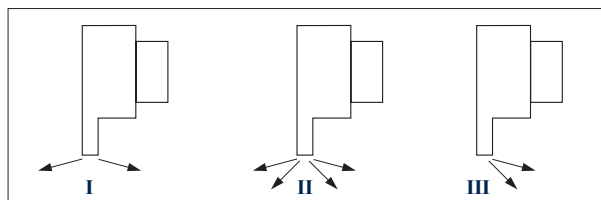


Fig. 2: Variable jet direction for total jet spread as required; I, II = alternate discharge, III = one-sided discharge

The air outlet volume flow rate can thus be delivered as required to the right or to the left in line with the setting of the single elements. Also, the entire supply air can be discharged on one side only (see Fig. 2-III). The single elements can be closed by turning beyond the horizontal jet direction (see page 3). The adjustable induction outlet is preset as in Fig. 2-II. If another setting (I or III) is required, the client must state it when ordering.

The adjustable induction outlet generates a diffuse indoor air flow with intensive, draught-free flushing of the occupied zone. Allowable indoor air velocities to EN 13779 are easily met (For layout see pages 8 ff).

For both outlet types, blank elements (without connection boxes) are available where continuous lines of outlets are required, and corner pieces where the air outlets are to be arranged at right angles to each other. If required, the diffuser element can be subsequently mounted from the room, e.g. in plasterboard ceilings, using an additional screw connection (IN-V2 only).

Optionally, the adjustable induction outlet can also be used as a return air inlet.

Volume flow rates and max. temperature difference

Induction outlet		IN-V2	IN-V3
Volume flow rate	l/(s·m)	11 – 111	3 – 17
	m ³ /(h·m)	40 – 400	10 – 60
Max. temperature difference $\Delta\vartheta$ between supply air and indoor air		-10 K when cooling + 6 K when heating	

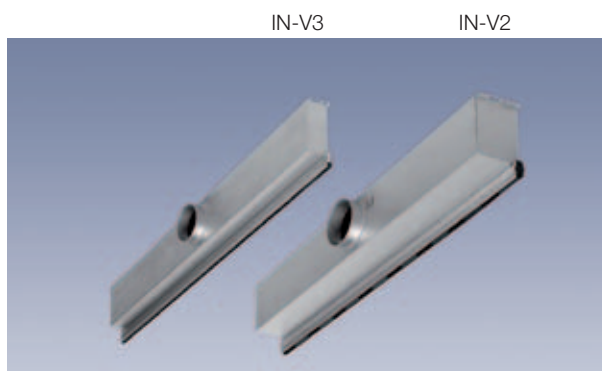


Fig. 3: Adjustable induction outlets with connection boxes

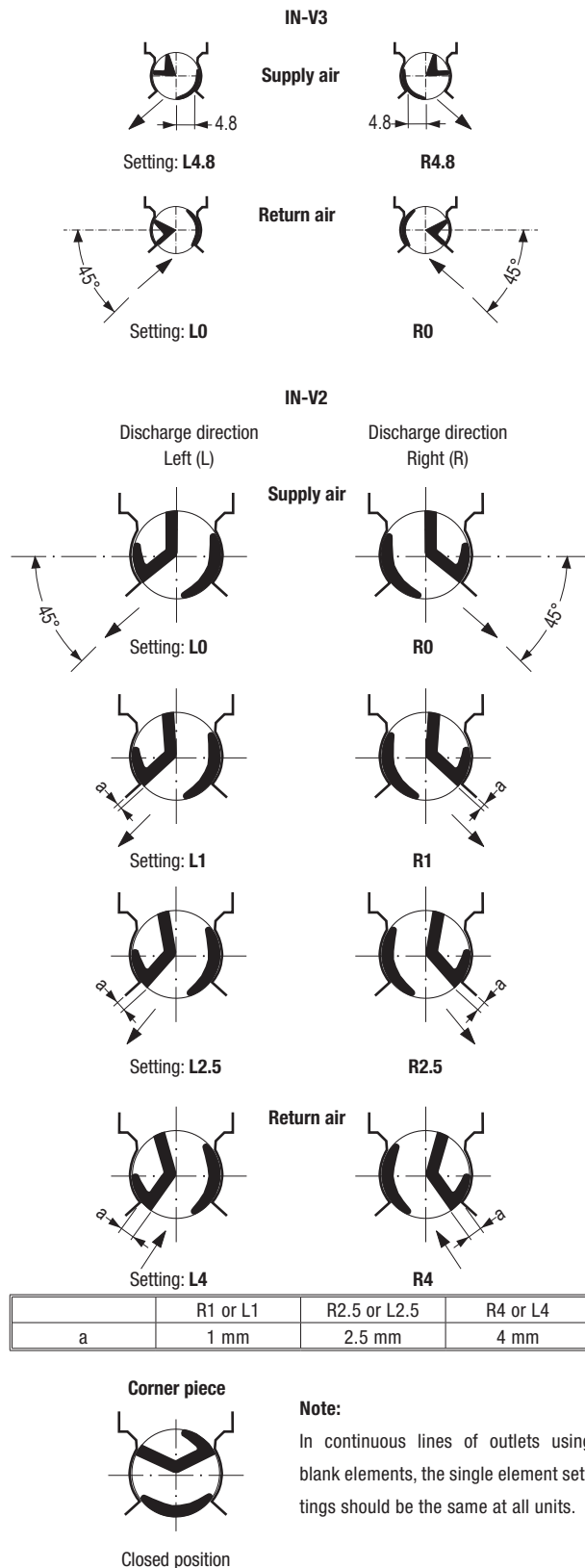
¹⁾ See publication No. DS 1125

Adjustable induction outlet

Construction and function

Setting of air discharge elements

The single elements inside the outlet profile are preset at the factory; those of type IN-V2 are also protected against unintentional alteration of setting. Resetting can be easily done on site using a key, as is shown below.



Standard setting of discharge direction

When used for supply air, the outlet is supplied with a preset discharge angle of 0 – 40°, which ensures a broad spread of the total supply air jet. This angle may vary a little depending on the temperature difference and the structure of the ceiling surface.

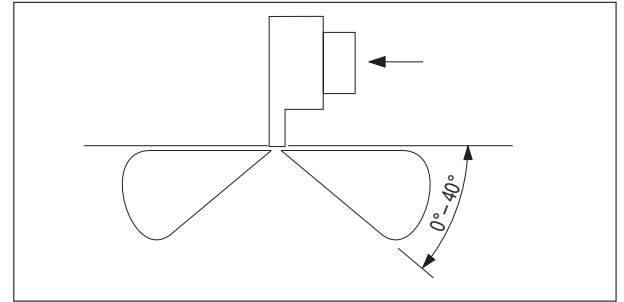
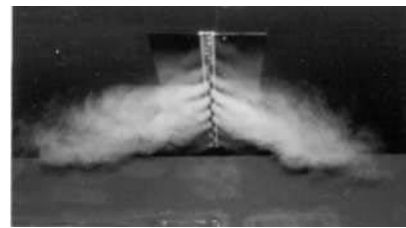


Fig. 5: Standard setting of discharge direction



Discharge angle I
approx. 0 – 20°



II
approx. 0 – 40°
(standard)

Fig. 6: Air jet pattern made visible with smoke tracer

Connection and suspension

The outlet connection to the air ductwork is done via a connection box **5** which, for higher insertion loss, is optionally available with acoustic lining. At the side of the connection box is a spigot **6** for connection to a circular duct; this spigot can be optionally fitted with a volume flow damper **7** which will be adjustable from the room (see page 6).

For suspension from the ceiling the induction outlet is fitted with endwise suspension strips **10**. To stabilize the vertical mounting position, it can be additionally fastened to the ceiling via a lateral suspension bracket **10a**.

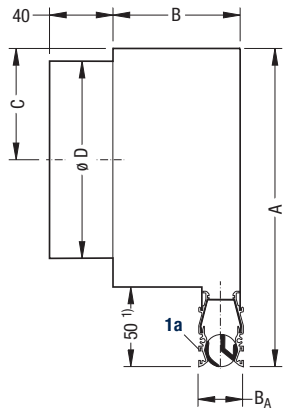


Fig. 4: IN-V2 and IN-V3; examples of settings of jet direction from horizontal to vertical, as well as closed position

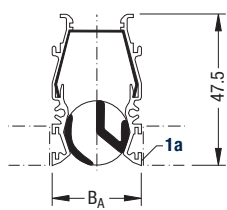
Adjustable induction outlet

Construction design of IN-V2

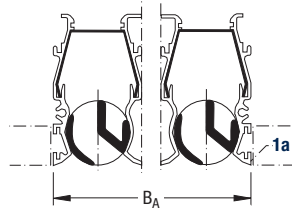
IN-V2 with flush contact profile 1a for false ceiling; connection box **without** acoustic lining



Flush contact profile
(e.g. for metal ceilings)

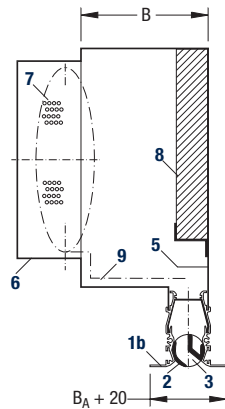


1-row design

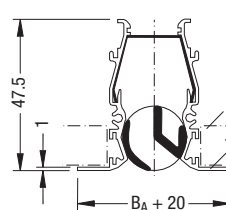


2-row to 4-row design

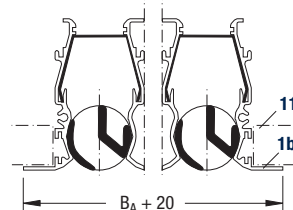
IN-V2 with fixed support profile 1b; connection box **with** acoustic lining and volume flow damper



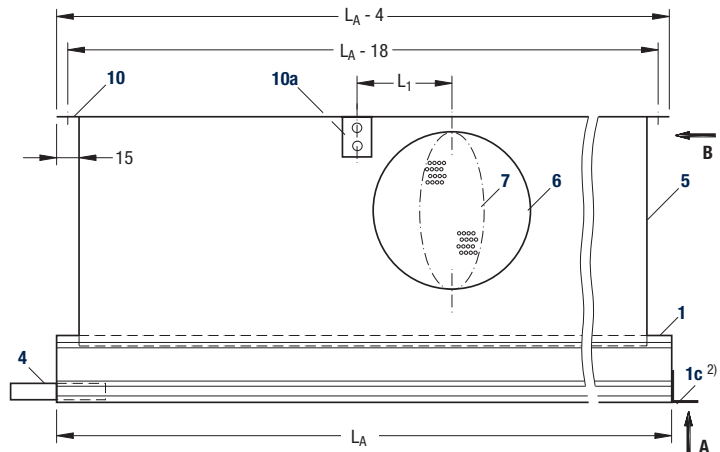
Ceiling support profile
(e.g. for plasterboard ceilings)



1-row design



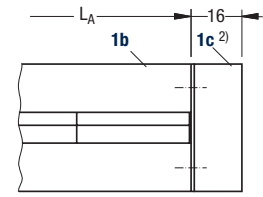
2-row to 4-row design



Key for all pages

- 1 Air outlet profile
- 1a Flush contact profile
- 1b Ceiling support profile
- 1c Endwise angle piece
- 2 Air discharge element
- 3 Jet channel
- 4 Alignment piece
- 5 Connection box
- 6 Connection spigot
- 7 Volume flow damper (optional)
- 8 Acoustic lining (optional)
- 9 Adjusting device
- 10 Suspension strip
- 10a Suspension bracket
- 11 False ceiling
- 12 Bore for suspension
- 13a Quick fastener (by others)
- 13b Threaded rod (by others)

Air outlet profile **IN-V2**, with lateral ceiling support profile **1b**



View A

Type	Design	Length $L_A^{1)}$ mm	Air outlet				Connection box ³⁾						
			Volume flow rate \dot{V}_A l/(s·m) m ³ /(h·m)	Discharge height m	B_A mm	A mm	C mm	D mm	L_1 mm	B mm	$G^4)$ kg	L_E mm	
IN-V2	1-row	1 050	11 – 36	40 – 130	2.7 – 4.0	28	175	62.5	99	100	100	4.9	123
		1 200					6.1						
		1 350					6.8						
		1 500					7.5						
	2-row	1 050	19 – 67	70 – 240	2.7 – 4.5	56	235	92.5	159	130	130	7.1	151
		1 200					8.5						
		1 350					9.5						
		1 500					10.5						
	3-row	1 050	33 – 89	120 – 320	3.0 – 5.0	84	255	102.5	179	140	160	8.7	179
		1 200					10.2						
		1 350					11.4						
		1 500					12.6						
	4-row	1 050	44 – 111	160 – 400	3.5 – 5.0	112	275	112.5	199	150	190	10.2	207
		1 200					12.1						
		1 350					13.5						
		1 500					14.9						

¹⁾ Other lengths and greater heights on request; for IN-V2: length L_A = number of single elements x 75

²⁾ Accessories: endwise angle pieces **1c** for IN-V2, supplied loose, with fastening screws

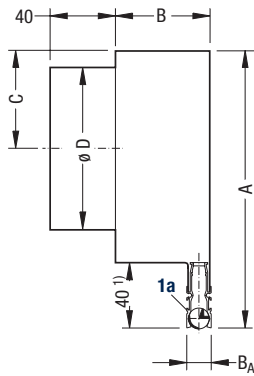
³⁾ Connection box with 2 or more spigots on request

⁴⁾ Weights stated for design with acoustic lining; without acoustic lining the values are reduced by up to 0.5 kg

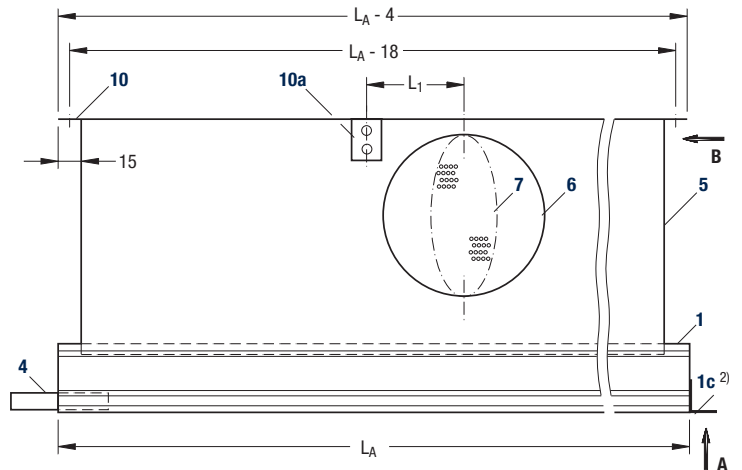
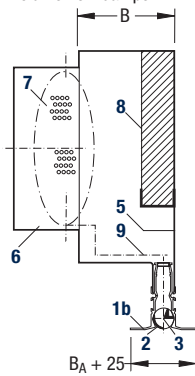
Adjustable induction outlet

Construction design of IN-V3

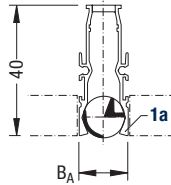
IN-V3 with flush contact profile **1a** for false ceiling; connection box **without** acoustic lining



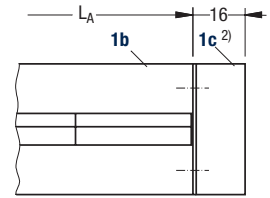
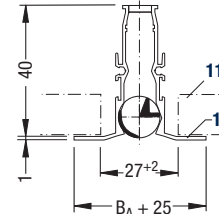
IN-V3 with fixed support profile **1b**; connection box **with** acoustic lining and volume flow damper



Flush contact profile
(e.g. for metal ceilings)



Ceiling support profile
(e.g. for plasterboard ceilings)



Air outlet profile **IN-V3**,
with lateral ceiling support
profile **1b**

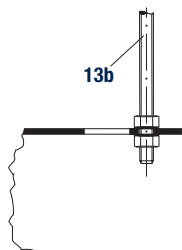
View A

Type	Design	Length L_A ¹⁾ mm	Air outlet				Connection box ³⁾						L_E mm
			Volume flow rate \dot{V}_A l/(s·m)	$m^3/(h·m)$	Discharge height m	B_A mm	A mm	C mm	D mm	L_1 mm	B mm	G ⁴⁾ kg	
IN-V3	1-row	1 050	3 - 17	10 - 60	2.5 - 3.5	15	170	65	99	90	80	4.3	110
		1 200										4.9	
		1 350										5.5	
		1 500										6.1	

Suspension examples

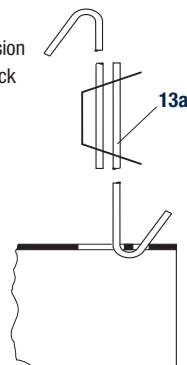
View B

Suspension with threaded rod M8 and lock nuts

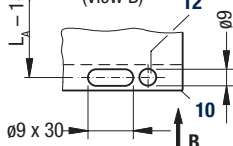


View B

Suspension with quick fastener

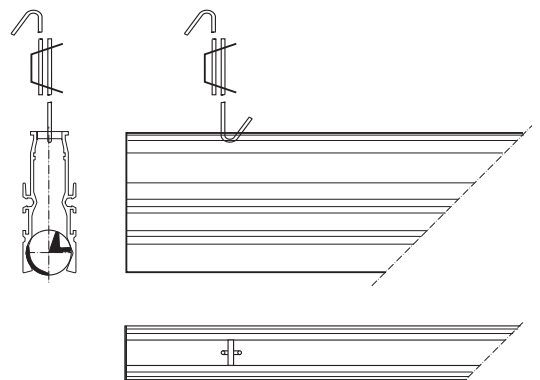


Top view (View B)



Blank element with standard quick fastener

(by others)



- 1) Other lengths and greater heights on request;
for IN-V2: length L_A = number of single elements x 75
- 2) Accessories: endwise angle pieces **1c** for IN-V3,
supplied loose, with fastening screws
- 3) Connection box with 2 or more spigots on request
- 4) Weights stated for design with acoustic lining; without acoustic
lining the values are reduced by approx. 0.2 kg

Adjustable induction outlet

Corner pieces and adjustment of volume flow damper (IN-V2 and IN-V3)

Corner pieces

For arranging air outlets at right angles to each other, e.g. for getting square or rectangular areas, corner pieces are available as accessories for IN-V2 in the 1-row to 4-row design and for IN-V3 in the 1-row design. The single elements are in closed position (see page 3).

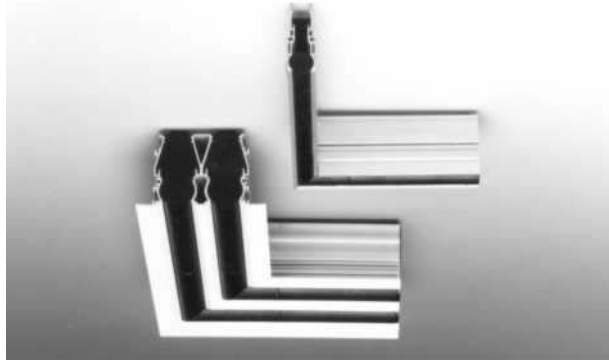


Fig. 7: Corner pieces for IN-V2, 2-row design, with lateral ceiling support profile (bottom) and for IN-V3 with flush contact profile (top)

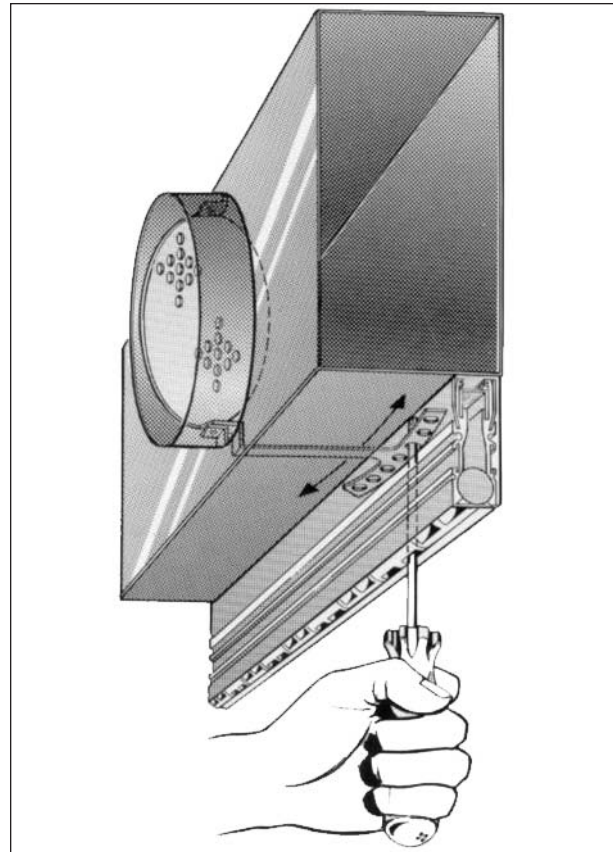
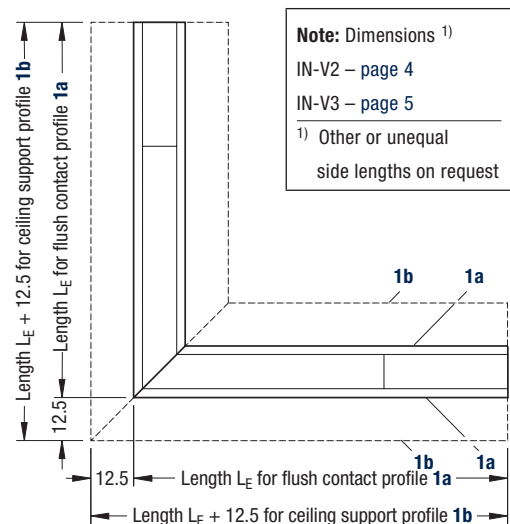
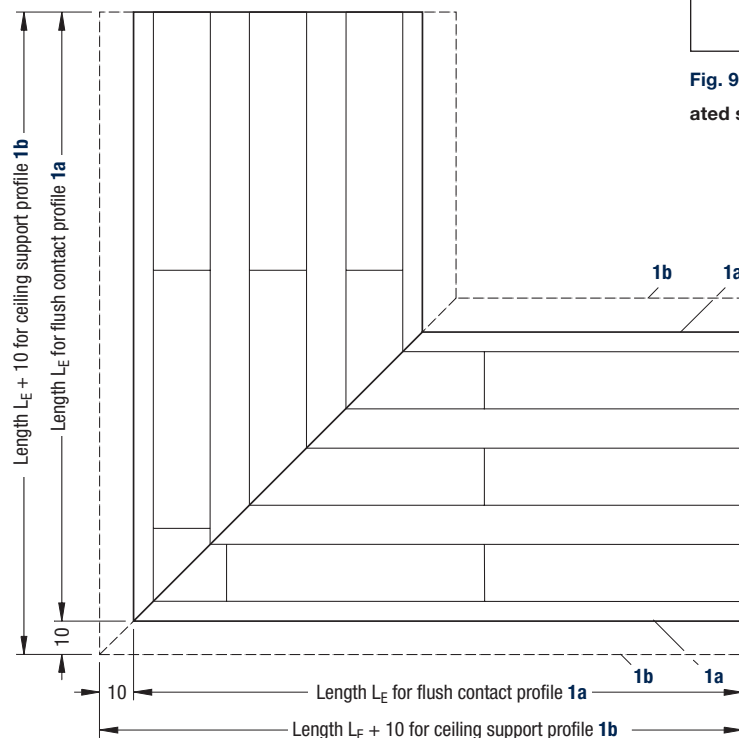


Fig. 9: Adjustment of volume flow damper from below at perforated slide (perforation \varnothing 4 mm) using a rod, e.g. a screwdriver



Note: Dimensions ¹⁾
 IN-V2 – page 4
 IN-V3 – page 5
¹⁾ Other or unequal side lengths on request

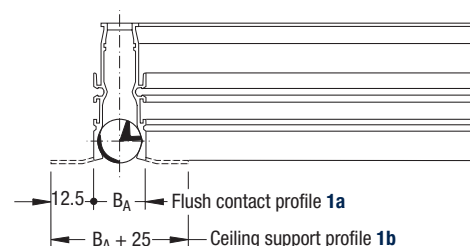
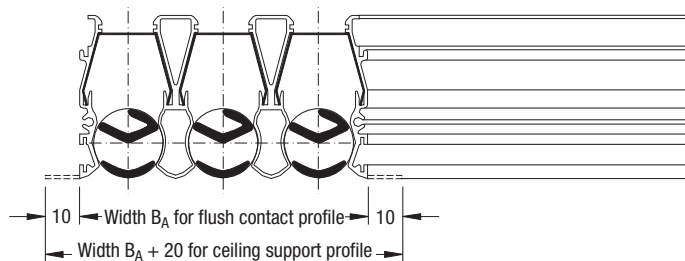


Fig. 8: Sketches of corner pieces for IN-V2; 1-row to 4-row design (3-row design shown here)

for IN-V3; 1-row design

Adjustable induction outlet

Installation of the IN-V2 from the room

Installation of the IN-V2 from the room ¹⁾

For IN-V2 installation from the room, the diffuser elements and the connection boxes are supplied separately. Fig. 10a shows the "shaft system" (ceiling support profile) for plasterboard ceilings. In this case the connection boxes are mounted prior to the installation of the suspended ceiling and connected to the air ductwork. The diffuser elements are installed only upon completion of the room ceiling. Fig. 10b shows the "push-in system" (flush contact profile) for metal ceilings. Expansion brackets for blank elements are used for metal or plasterboard ceilings, see Fig. 10c.

Sound power level and pressure drop

The adjustable induction outlet is quiet. For sound power level and insertion loss in relation to octave band centre frequency, see pages 10 – 12.

The sound power level of the air outlet with lined connection box is lower by about 2 dB(A) ref. 10^{-12} W and its insertion loss is much higher. The pressure drop is not changed by the lining.

¹⁾ Solution for the IN-V3 on request

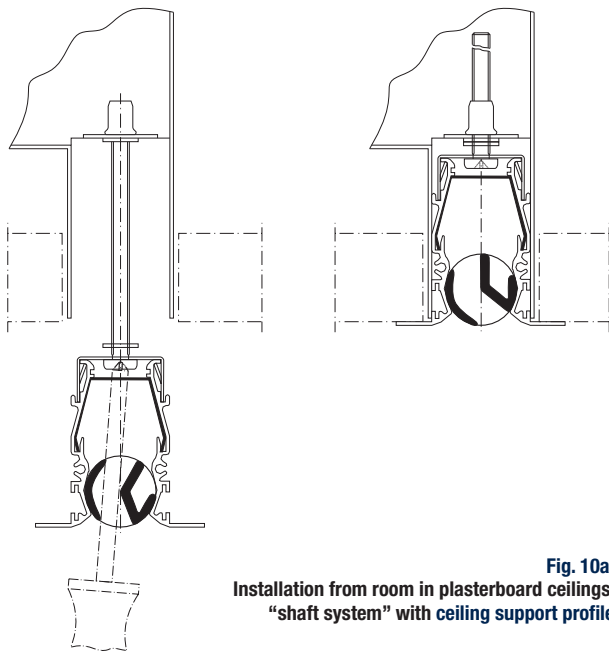


Fig. 10a:
Installation from room in plasterboard ceilings,
"shaft system" with ceiling support profile

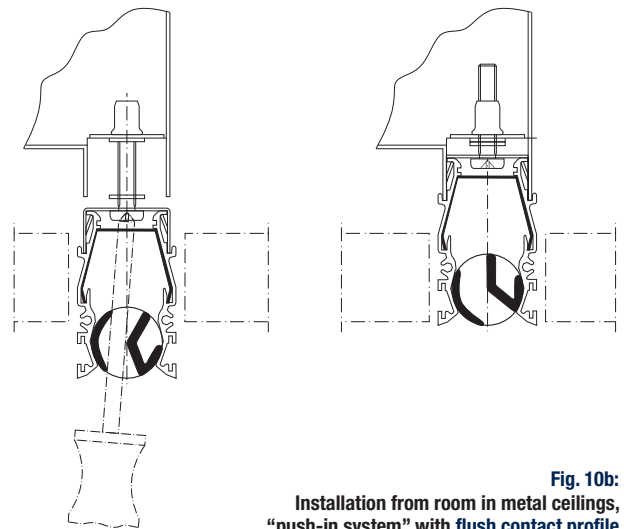


Fig. 10b:
Installation from room in metal ceilings,
"push-in system" with flush contact profile

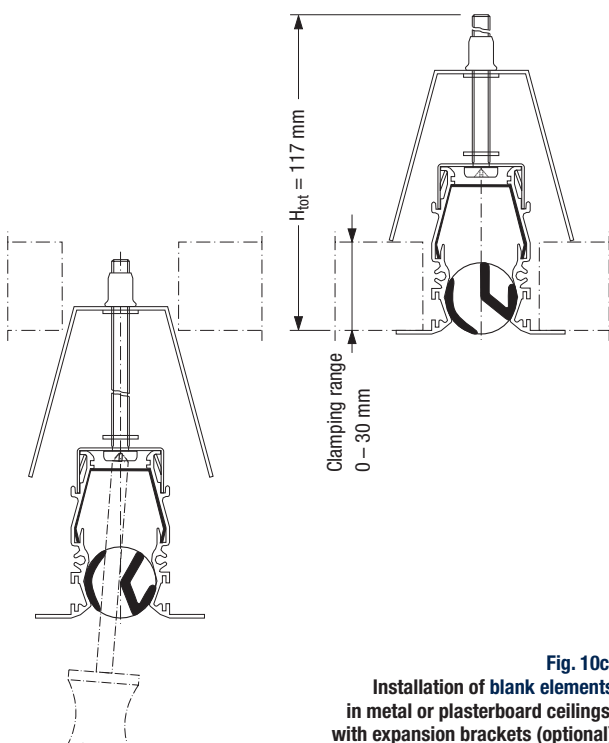


Fig. 10c:
Installation of blank elements
in metal or plasterboard ceilings,
with expansion brackets (optional)

Fig. 10: Different systems for IN-V2 installation from the room

Adjustable induction outlet

Layout sheet

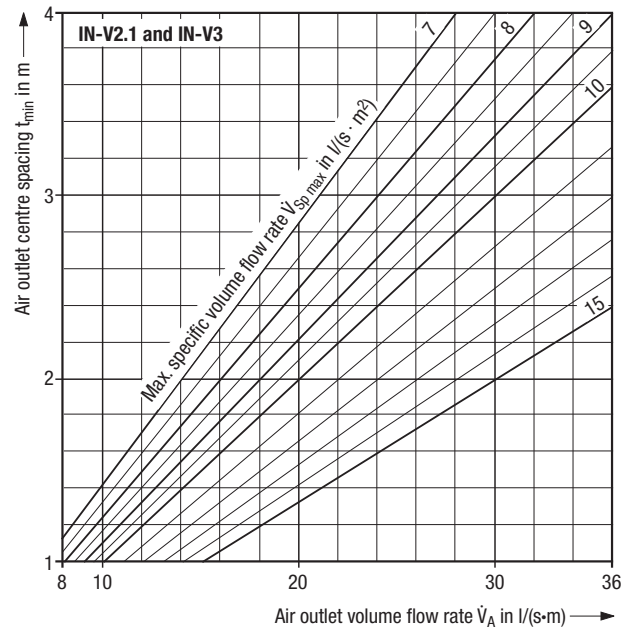
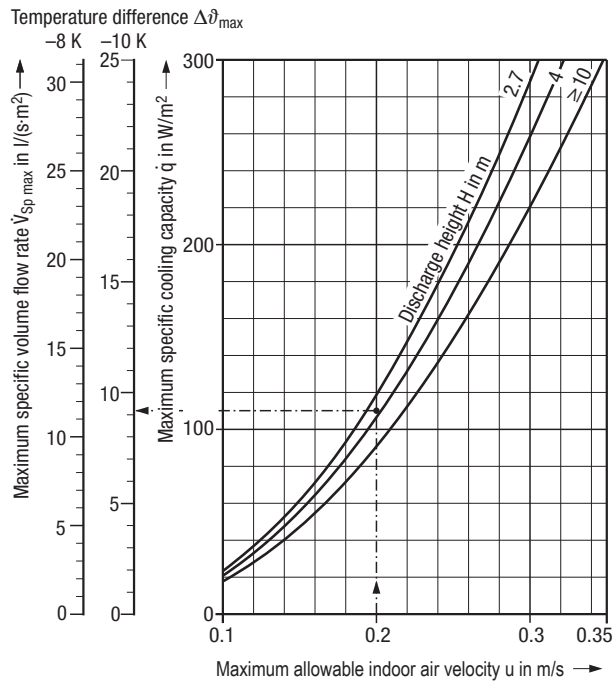
Comfort criteria ¹⁾

The outlet layout must comply with the maximum allowable indoor air velocities u in the occupied zone in the cooling mode. The indoor air velocity depends on the cooling load that is to be removed from the room. The maximum specific cooling capacity \dot{q} depends on the discharge height and the maximum allowable indoor air velocity u (Graph 1).

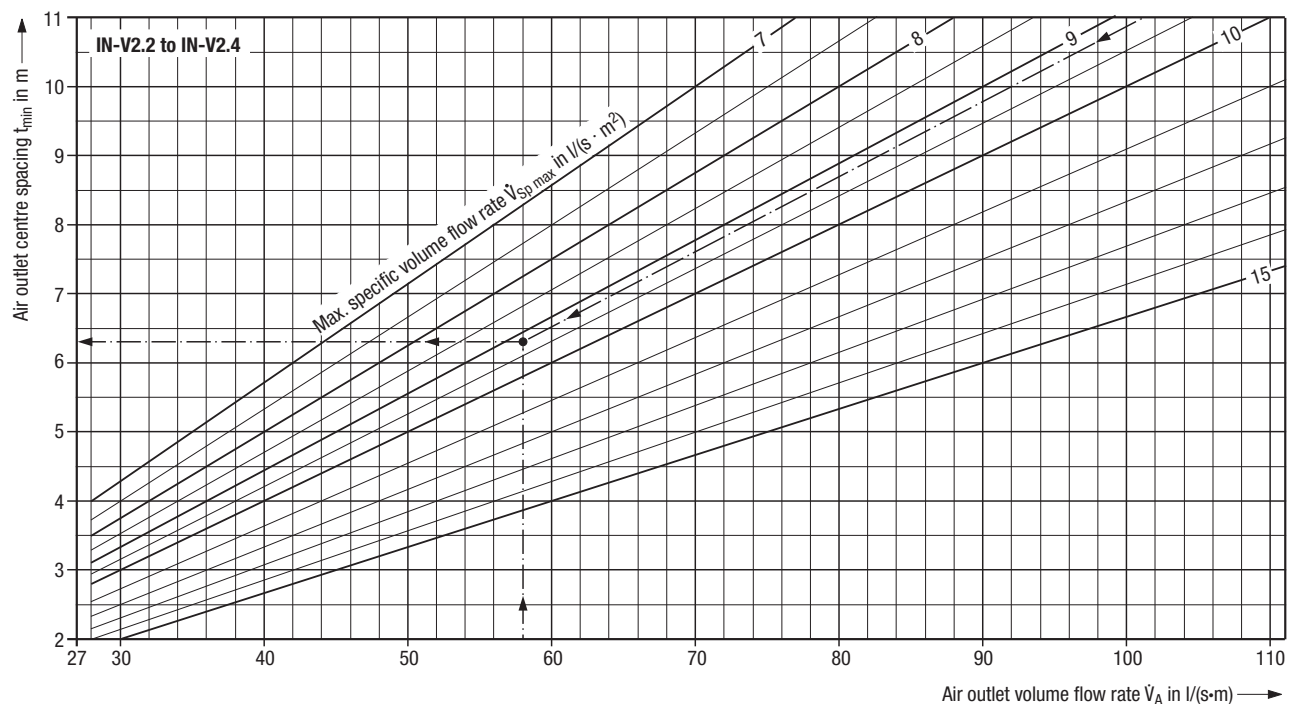
Graph 1 enables to determine for the cooling mode the maximum specific volume flow rate $\dot{V}_{Sp\ max}$ in relation to the maximum specific cooling capacity and the maximum temperature difference $\Delta\vartheta_{max}$. The volume flow rate supplied to the room $\dot{V}_{Sp\ tats}$ may not exceed this value.

Graph 2 enables to determine the minimum centre spacing between two outlet rows on the basis of the maximum specific volume flow rate.

¹⁾ See our brochure ref. TB 69 'Layout specifications for thermal comfort'



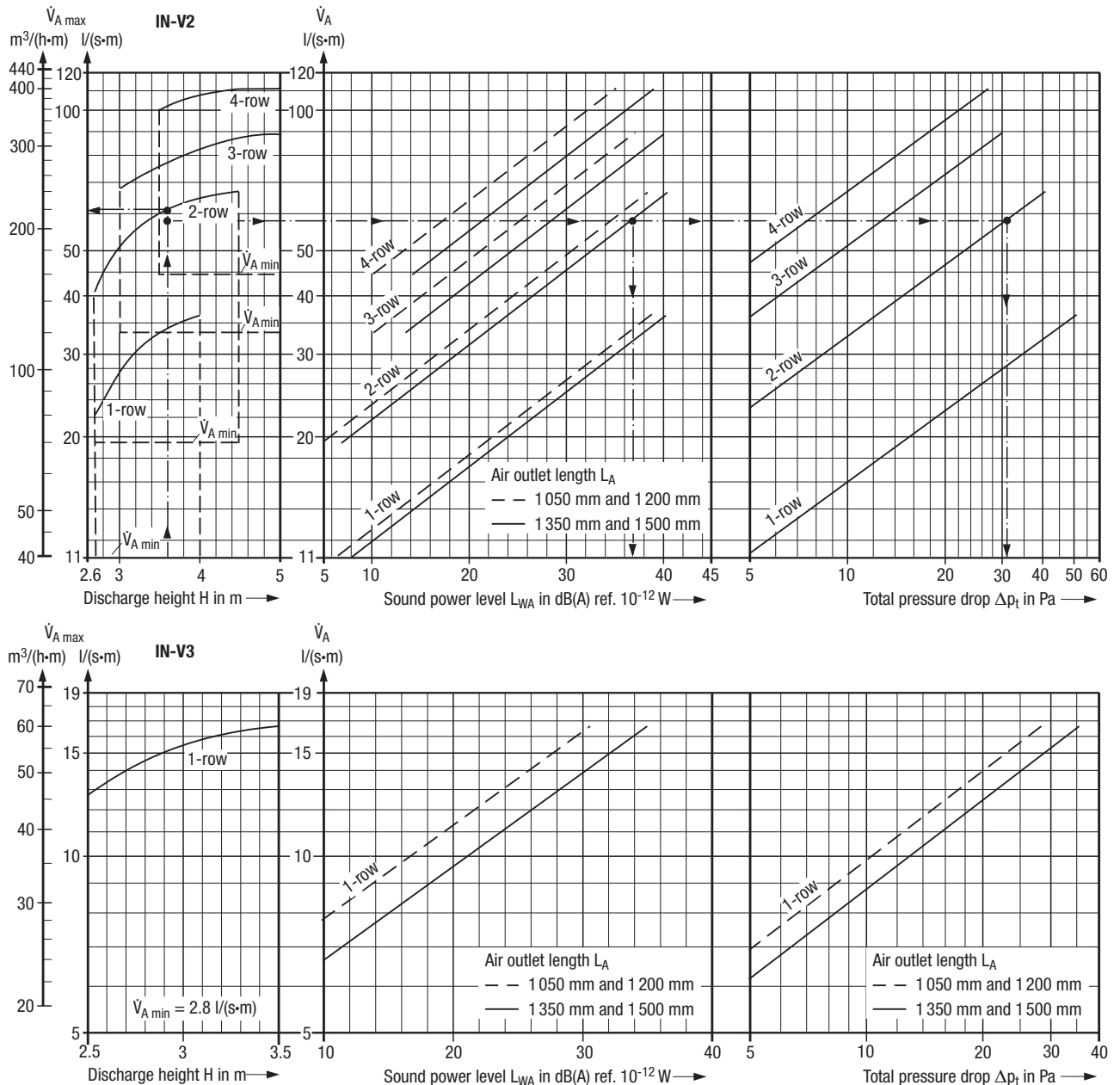
Graph 1: Maximum specific volume flow rate



Graph 2: Minimum air outlet centre spacing

Adjustable induction outlet

Layout as supply air outlet



Layout example

Induction outlet		IN-V2
1 Length / Design		1 350 / 2-row
2 Supply air volume flow rate \dot{V}		6 945 l/s
3 Discharge height H		3.6 m
4 Room area A		1 000 m ²
5 Max. allowable sound power level L_{WA}		40 dB(A) ref. 10^{-12} W
6 Comfort criteria (see page 6)		
– Max. allowable indoor air velocity u		0.2 m/s
– Max. specific volume flow rate $\dot{V}_{Sp,max}$ at $\Delta\vartheta_{max} = -10$ K [from Graph 1 on page 8]		9.2 l/(s·m ²)
– Actual specific volume flow rate $\dot{V}_{Sp,tats}$ [from 1 : 3]		6.9 l/(s·m ²)
Criterion is met if $\dot{V}_{Sp,tats} < \dot{V}_{Sp,max}$		
From nomogram:		
7 $\dot{V}_{A,max}$		62 l/(s·m)
8 \dot{V}_A selected		58 l/(s·m)
9 Z_1 [from 2 : 8]		120 m
10 Z_2 [from 9 : 1]		89 units
11 L_{WA}		≈ 37 dB(A) ref. 10^{-12} W
12 Δp_t		≈ 32 Pa
13 t_{min} [from Graph 2 on page 8]		≈ 6,3 m

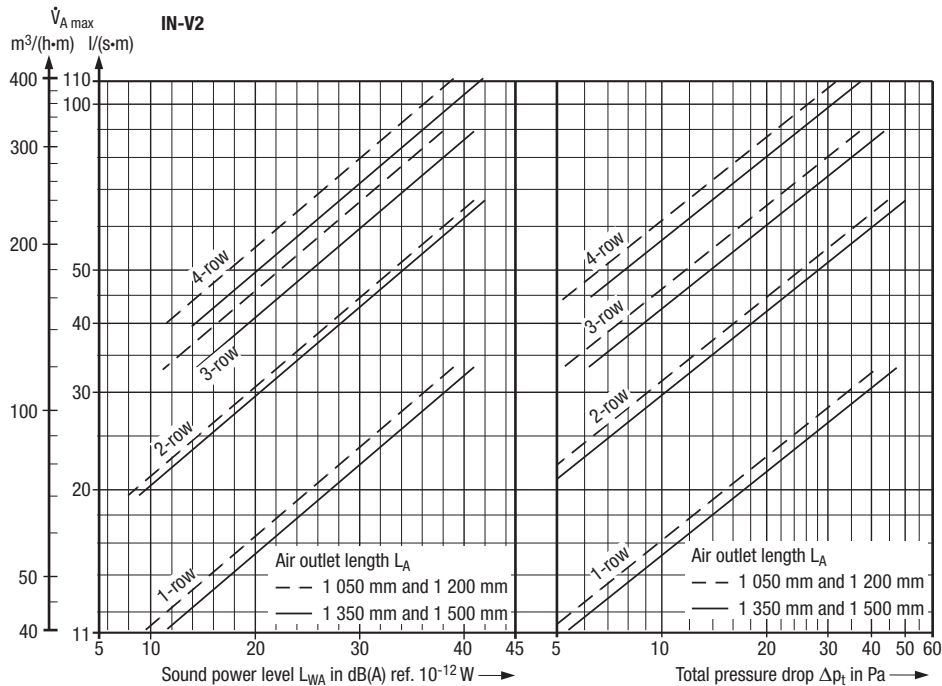
The graph values for sound power level and pressure drop apply for an induction outlet with connection box fitted with acoustic lining, discharge direction 0° to 40° as well as built-in volume flow damper in position "open". If the connection box is without acoustic lining, the sound power level is higher by 1 – 2 dB(A) ref. 10^{-12} W, but the pressure drop remains unchanged. If the volume flow damper is closed, the sound power level rises by 2 – 6 dB(A) ref. 10^{-12} W while the pressure drop doubles or even triples.

Key for layout:

\dot{V}_A	= volume flow rate per air outlet in l/(s·m)
$\dot{V}_{A,max}$	= max. volume flow rate per air outlet when cooling in l/(s·m)
$\dot{V}_{A,min}$	= min. volume flow rate per air outlet when cooling in l/(s·m)
$\dot{V}_{Sp,max}$	= max. specific volume flow rate per m ² of floor area in l/(s·m ²)
$\dot{V}_{Sp,tats}$	= actual specific volume flow rate per m ² of floor area in l/(s·m ²)
u	= max. allowable indoor air velocity in m/s
\dot{q}	= max. specific cooling capacity in W/m ²
$\Delta\vartheta_{max}$	= max. temperature difference supply air to return air in K
t_{min}	= minimum air outlet centre spacing in m
H	= discharge height in m
L_{WA}	= sound power level in dB(A) ref. 10^{-12} W
Δp_t	= total pressure drop in Pa

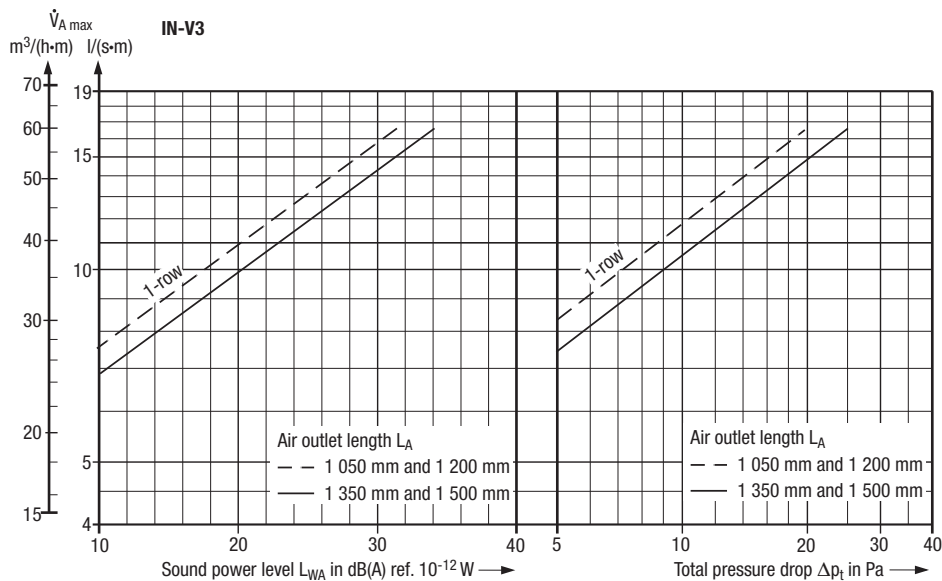
Adjustable induction outlet

Layout as return air inlet - Insertion loss



The graph values for sound power level and total pressure drop apply for an induction outlet with acoustic lining and open volume flow damper.

If the damper is closed, the sound power level rises by 1 – 2 dB(A) ref. 10⁻¹² W while the pressure drop doubles.



	Insertion loss in dB							
	Connection box with acoustic lining							
	Octave band centre frequency in Hz							Mean value
125	250	500	1 K	2 K	4 K	8 K		
IN-V2								
1-row	1	6	8	17	11	13	14	10
2-row	3	6	11	12	12	15	12	10
3-row	3	4	9	8	9	12	9	7
4-row	2	4	9	7	8	10	9	7
IN-V3								
1-row	3	7	11	20	14	11	14	11

	Insertion loss in dB							
	Connection box without acoustic lining							
	Octave band centre frequency in Hz							Mean value
125	250	500	1 K	2 K	4 K	8 K		
	1	3	7	10	6	8	9	6
	2	6	8	10	8	11	10	8
	3	4	5	4	4	6	7	5
	2	3	5	4	4	5	7	4
	2	3	4	12	12	7	10	7

Adjustable induction outlet

Tender text

Tender text

..... units

Adjustable induction outlet ¹⁾

of small width, with high induction effect for diffuse indoor air flow and high thermal comfort in the occupied zone, well suited for installation in suspended ceiling systems, with discharge direction adjustable from horizontal to vertical as required, for use as supply air outlet or return air inlet,

consisting of:

- linear discharge element with consecutive cylindrical and rotatable single elements for alternate air discharge to the right and to the left or one-sided air discharge, or even in closed position; 1-row to 4-row design (only 1-row design for IN-V3)
- air outlet profile for lateral attachment of false ceiling, or with lateral ceiling support profile
- connection box with endwise suspension strips and lateral bracket for stabilizing the vertical mounting position, optional volume flow damper adjustable from room; optional acoustic lining; connection box for IN-V2 optionally prepared for subsequent mounting of diffuser element from the room

Material:

- Linear discharge element made of polycarbonate, body-tinted in black similar to RAL 9005 ²⁾ or white similar to RAL 9010 ²⁾
- Air outlet profile made of aluminium anodized in natural colour or painted to RAL 9010 ²⁾ pure white
- Ceiling support profile made of aluminium anodized in natural colour or painted to RAL 9010 ²⁾ pure white
- Connection box made of galvanized sheet metal

Make: KRANTZ KOMPONENTEN

Type: IN-V_ / _ - _ _ _ _ - _ - _ _ _

Blank element

..... units

Induction outlet with linear discharge element and air outlet profile as described before, but without connection box, as blank element for continuous lines of outlets where required, open or closed at the rear; for IN-V2 optional fastening with expansion brackets

Accessories

..... units

Corner piece for outlet arrangement at 90°, to fit air outlet profile and linear discharge element as described before

..... units

Endwise angle piece to fit ceiling support profile as described before, supplied loose, with boreholes and fastening screws

Make: KRANTZ KOMPONENTEN

Subject to technical alterations.

¹⁾ If the adjustable induction outlet is required for use as return air inlet, the tender text is the same as for the supply air outlet

²⁾ Other lengths and colours on request