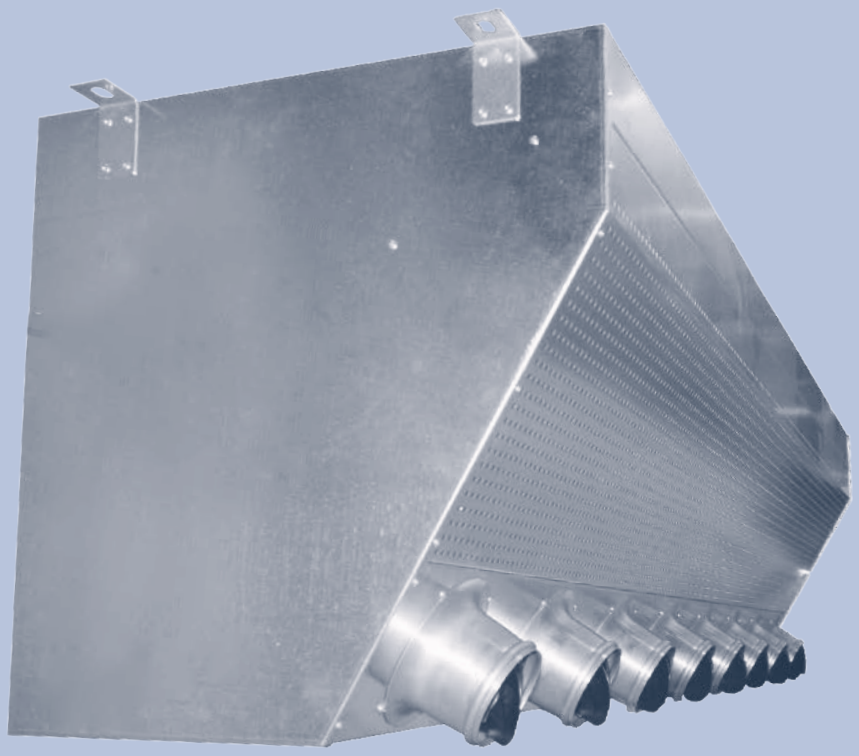
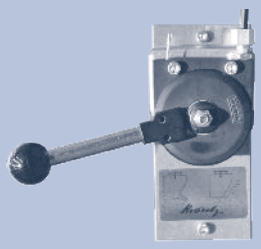
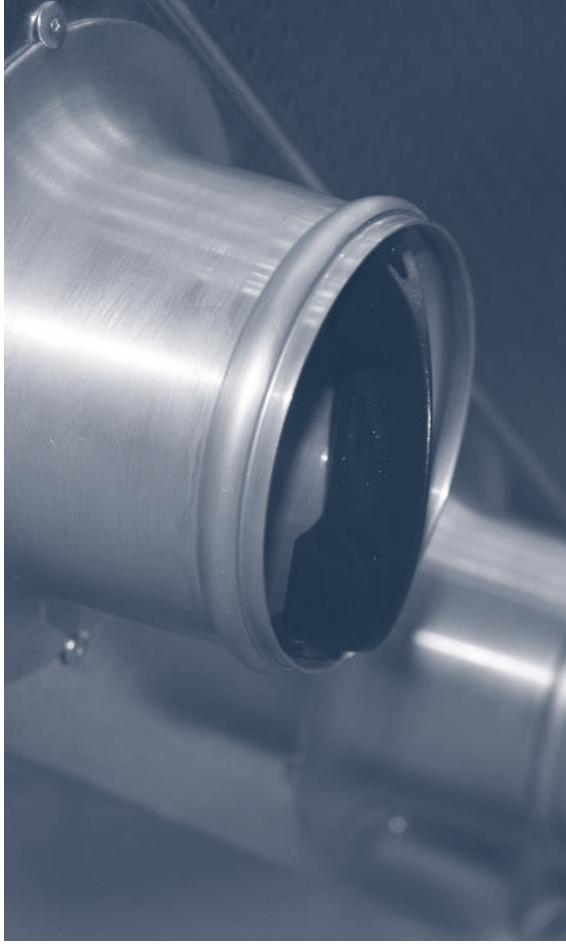






Krantz

Linear Hybrid Displacement Outlet VA-LH

Air Distribution Systems

DS 4202 E 12.2019

Linear Hybrid Displacement Outlet VA-LH

Preliminary remarks

If no chillers are used in the industrial sector for cooling the room air, but cooling is carried out by free cooling or adiabatically, the Linear Hybrid Displacement Outlet VA-LH from KRANTZ offers a solution for industrial halls with low pollution levels.

Depending on the ΔT between supply and room air and the setting of an adjusting lever, the VA-LH can noticeably increase the room air movement, displace or quickly dilute pollutants and cool or quickly heat up occupied areas. The hybrid displacement outlet is used where the supply air is to be discharged from the side (room wall/column row). An arrangement on both sides of assembly lines or along production machines (e.g. in printing, metal processing, injection molding, automotive industry, etc.) has proven to be very effective.

Construction Design

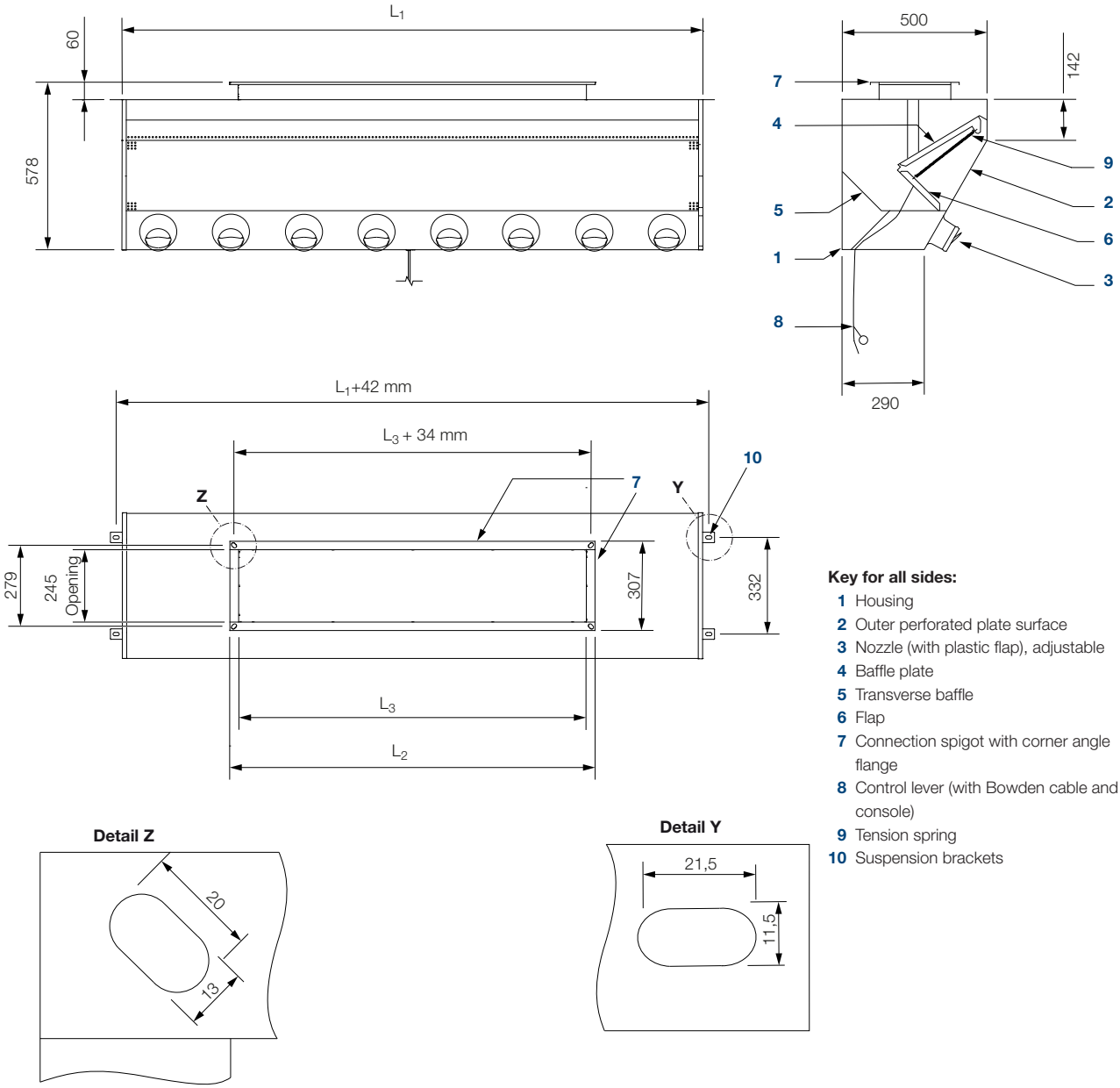
The Linear Hybrid Displacement Outlet VA-LH is available in lengths 1250, 1600 and 2000 (see Table 1, page 3). The width dimensions remain unchanged for all lengths and are listed in the dimension sheet.
The main components of the linear hybrid outlet are the housing **1** with a semi-trapezoidal outer perforated plate surface **2**.
Furthermore, depending on the length, five, six or eight individually adjustable nozzles **3** are mounted in a linear arrangement. They can be switched on manually by means of a control lever with Bowden cable **8**, which is already mounted on a console and thus allows the installation on a wall or a column. The flap **6** and the tension spring **9** are elementary for the corresponding switching mechanism.
Inside the hybrid displacement outlet there is also a baffle plate 4 to redirect the air and a transverse baffle **5**.
The connection to an air supply system is made at the connection piece **7**. An angle flange is already attached to the connection pieces.

Features at a glance

- Low secondary air induction due to jet nozzles located below the discharge surface.
- Air discharge direction and room air velocity adjustable via angle-adjustable deflection flaps (0-360°) for each nozzle.
- Nozzles continuously connectable by means of integrated air deflection device (via adjusting lever with Bowden cable).
- Low-turbulence displacement flow with low induction effect for minimum mixing with the room air (for optimum displacement of dust particles and pollutants from the occupied zone).
- Displacement mixing flow;
  Air supply from perforated plate surface supported by nozzle operation
- Mixed flow (boost mode) for
  - fast heating of working areas
  - noticeable indoor air movement when heat loads are high
  - fast dilution (rinsing) of short-term pollutant emissions
- Standard for installation heights of 3 - 5 m above the floor. (4 m recommended)
- Design of the connection piece suitable for corner angle flange.
- Also ideally suited for air conditioning systems with free or adiabatic cooling.

Linear Hybrid Displacement Outlet VA-LH

Construction design and dimensions



Key for all sides:

1 Housing
2 Outer perforated plate surface
3 Nozzle (with plastic flap), adjustable
4 Baffle plate
5 Transverse baffle
6 Flap
7 Connection spigot with corner angle flange
8 Control lever (with Bowden cable and console)
9 Tension spring
10 Suspension brackets

Table 1: Technical specifications

Length	Flow rate range m^3/h	Quantity of nozz-les	Lengths-dimensions in mm			Weight in kg	Heating mode Horizontal penetration depth at $\dot{V}_{max}$ in m		Cooling mode Horizontal penetration depth at $\dot{V}_{max}$ in m
			L1	L2	L3		bei 4 K	bei 8 K	
1250	750 -1900	5	1250	809	747	37	15	10	20
1600	950 - 2400	6	1600	986	924	46	20	15	25
2000	1200 - 3000	8	2000	1257	1195	55	25	20	30

Mode of operation

Displacement flow

By operating the adjusting lever **8** the flap **6** is brought into the horizontal position. This switches off the nozzles **3**. The air entering through the connection piece with corner angle flange **7** is then discharged slightly upwards through the outer perforated plate surface **2**.

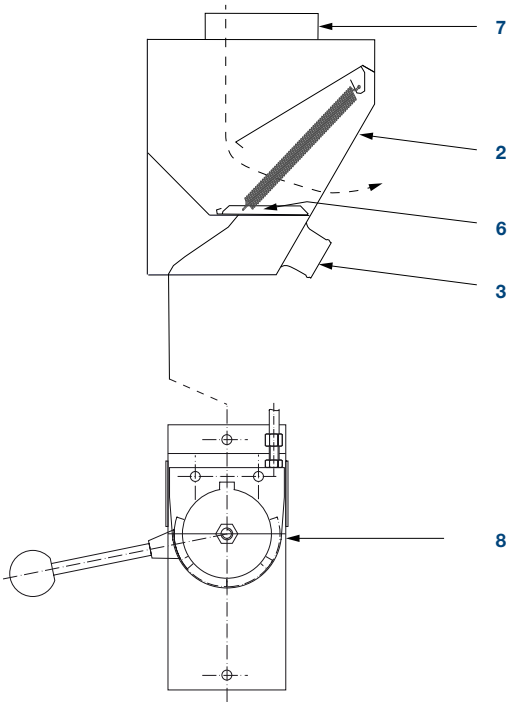


Figure 1: Setting for displacement flow

The resulting pure displacement flow is ideally suited for cooling purposes, provided that the supply air is colder than the room air.
The colder supply air, which flows slightly upwards, sinks into the occupied zone due to the difference in density.
Compared to turbulent mixing ventilation the low induction results in a lower level of air pollution and thermal load in the occupied zone

Figure 2: Setting for cooling mode

Mixing flow

By actuating the adjusting lever in the opposite direction until the stop, the system switches over to nozzles **3**.
This creates a boost that increases air movement in the discharge area and occupied zone (Figure 4). Even if the supply air has the same temperature as the room air, a cooling effect is produced for the user.
Additionally, a rapid heating effect can be achieved by switching on the nozzles, provided that the supply air is warmer than the room air.
In the case of a short-term presence of pollutants, a flushing operation can also be generated by which the pollutant concentration is quickly diluted.

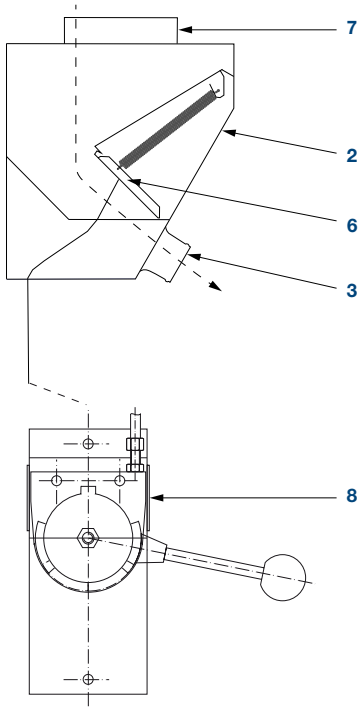


Figure 3: Setting for mixing ventilation

Figure 4: Setting for higher air movement in summer or for heating

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Linear Hybrid Displacement Outlet VA-LH

Mode of operation

The nozzles, which are switched on simultaneously via the control lever, can be adjusted individually by hand:
On the one hand, the plastic flap of each nozzle can be turned by 360° in its opening angle (Figure 5, Figure 10).

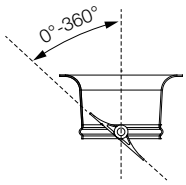

Figure 5: Top view; flap rotatable by 360°

Secondly, the plastic flap of each nozzle can be rotated by 360° in its flow axis (Figure 6).

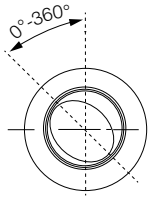

Figure 6: Front view; flap can be rotated by 360° along the flow axis

This allows the direction of the discharged supply air to be infinitely adjusted to the left, right, up or down. (Figure 7)

Figure 7: Setting to the side

Displacement mixing flow

For the displacement mixing flow the setting lever **8** is moved to a middle position. This enables the supply air to flow simultaneously through the nozzles **3** and the outer perforated plate surface **2**.
If the nozzles were installed above the displacement flow, this would have a decisive disadvantage: warmer or more polluted air from the area above the outlet would be induced and introduced into the occupied zone.

The Linear Hybrid Displacement Outlet VA-LH has the advantage that the nozzles **3** are installed below the perforated plate area **2**. Thus, the mixed flow (from the nozzles) supports the displacement flow so that fresh supply air is discharged into the occupied zone.
The intensity of the displacement mixing flow can be regulated by the flap opening **6**, i.e. by adjusting the setting lever **8**. For normal heating operation, for example, slightly warm air would be supplied from the nozzles, whereas the nozzles are opened only partially.
The displacement mixing flow is suitable for both permanent heating operation and isothermal operation.

Figure 8: Setting for isothermal case

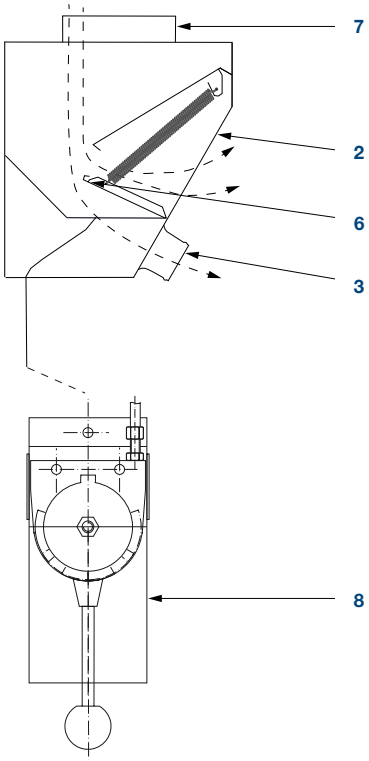

Figure 9: Setting for displacement mixing flow

Linear Hybrid Displacement Outlet VA-LH

The flow axis adjustment of the plastic flaps of the nozzles is not relevant for frontal discharge of the supply air. It is only necessary to turn the plastic flaps by 180° (Figure 10).

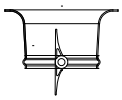

Figure 10: Top view; plastic flap of the nozzle turned by 180°

Figure 11: Adjustment to the front, slightly fanned out

Arrangement and connection

When used in a production hall, for example, the Linear Hybrid Displacement Outlet VA-LH can be arranged in a continuous row on the walls. The advantage here is that the maneuverability of a crane runway, for example, is not impaired.

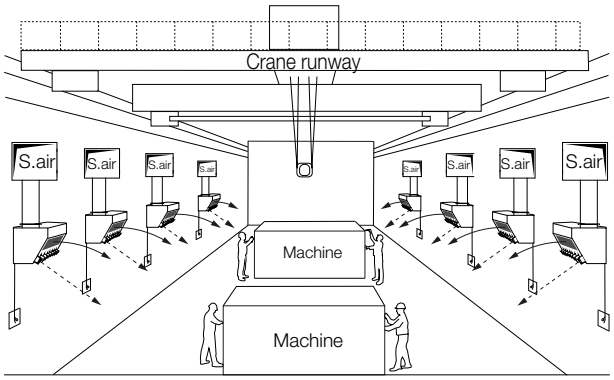

Figure 12: Example for use in a production hall

In the case of parallel assembly lines, such as those frequently found in automotive production, it is advisable to install the VA-LH on both sides of the walls or columns.

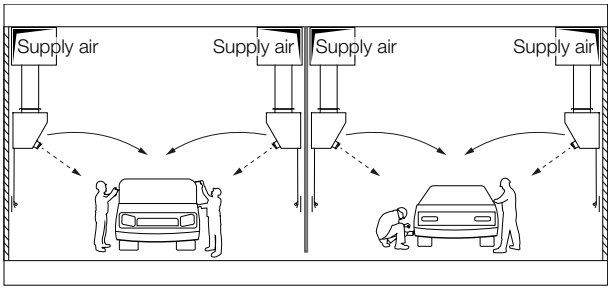

Figure 13: Example for use in automotive production

In all application areas of the VA-LH, the people in the occupied area can individually regulate the air movement by means of the adjusting lever and the adjustable nozzle flaps.
The individual adjustment of the nozzle flaps is usually carried out after installation or commissioning in order to optimally adapt the air movement to the workplaces. During operation, only the adjustment of the inner flap 6 will be necessary for adaptation to the respective load case (heating, cooling...).

Selection and Layout

Layout example: Industrial hall
The HVAC plant has no mechanical refrigeration system. The specific supply air volume flow rate should be dimensioned using VDI 3802 „Air conditioning systems for factories“.
For assembly areas, for example a range of 20 to 30 $m^3/h \cdot m^2$ floor surface is provided there, and for mechanical production areas 20 to 75 $m^3/h \cdot m^2$.
When selecting the specific supply air volume flow rate, it should be noted that no mechanical cooling is available and should therefore be designed in the upper range of the volume flow rate according to VDI 3802.
Based on an application according to Figure 12, the following technical layout would result:

Specific air volume flow rate:	14 $l/s \cdot m^2$
Supply area:	B · L = 20 m · 60 m
Supply surface:	1200 m^2
Total of supply air volume flow rate:	16800 l/s
Wall length on both sides:	120 m
Length of hybrid outlet:	2000
Quantity:	40
Supply air volume flow rate per outlet:	420 l/s

Read from diagram „Length 2000“ (Page 7):

Normal mode	
Total pressure drop:	20 Pa
Sound power level:	37 dB(A)
Boost and rapid heating	
Total pressure drop:	57 Pa
Sound power level:	51 dB(A)

Key for selection:

L	=	Length of supply area
B	=	Width of supply area
$\dot{V}_A$	=	Volume flow rate per air outlet in m^3/h
L_{WA}	=	Sound power level in dB(A)
Δp_t	=	Total pressure drop in Pa
$\dot{V}_{Sp}$	=	Specific volume flow rate in $l/s \cdot m^2$

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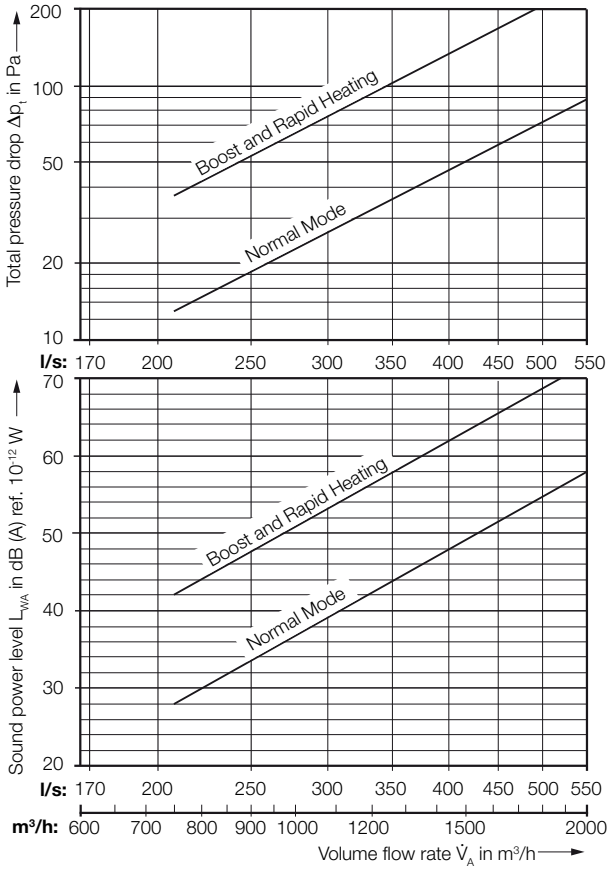
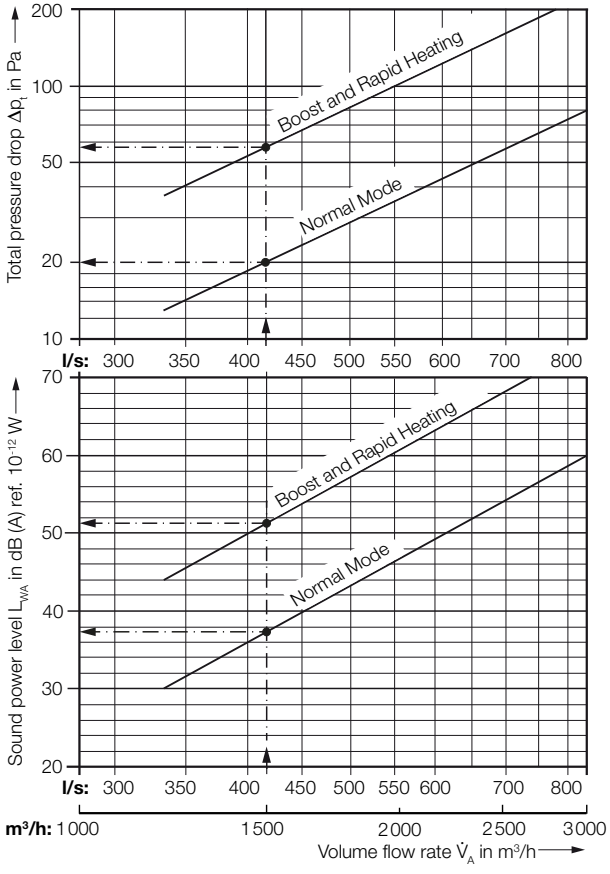
Linear Hybrid Displacement Outlet VA-LH

Sound power level and pressure drop

Length 1250



Length 2000



Length 1600

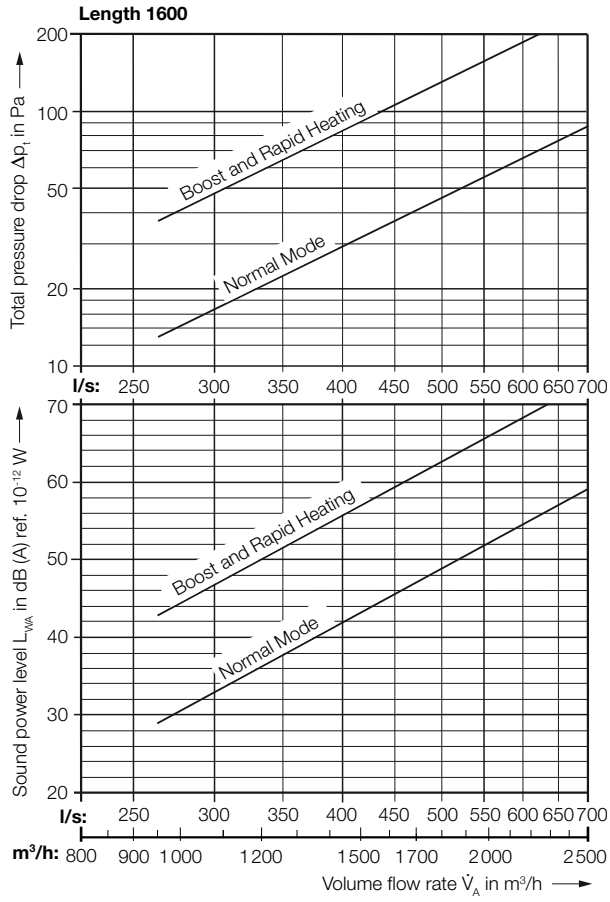


Tabelle 1: Octave spectra in Normal Mode

Air outlet volume flow rate $\dot{V}_A$		Total pressure drop Δp_t	Sound power level L_W in dB								
			L_{WA}	Octave band centre frequency in Hz							
l/s	m³/h	Pa	dB(A)	63	125	250	500	1 K	2 K	4 K	8 K
Length 1250											
208	750	11	28	< 10	32	32	29	25	< 10	< 10	< 10
347	1250	32	44	< 10	41	42	42	40	27	< 10	< 10
520	1875	72	58	< 10	50	52	54	54	46	< 10	< 10
Length 1600											
264	950	11	29	< 10	34	34	31	27	< 10	< 10	< 10
444	1600	32	45	< 10	43	44	44	42	29	< 10	< 10
667	2400	72	59	< 10	52	54	57	56	48	< 10	< 10
Length 2000											
333	1200	11	30	< 10	35	35	32	28	< 10	< 10	< 10
556	2000	32	47	< 10	45	46	46	44	31	< 10	< 10
833	3000	72	60	< 10	53	55	57	57	49	< 10	< 10

Normal Mode: Cooling, heating, isothermal; with displacement flow and partially switched on nozzles.

Boost and Rapid Heating: Nozzles complete open, no displacement flow.

Linear Hybrid Displacement Outlet VA-LH

Type code

VA – LH – ____ – B – ____

Displacement outlet – Function / Type – Length – Adjustment – Surface

Function/Type
LH = Linear Hybrid

Length
1250 = 1250 mm
1600 = 1600 mm
2000 = 2000 mm

Adjustment
B = Bowden cable [1)]

Surface
galv = galvanized
…. = on request color of the visible surface according to RAL

[1)] The length of the Bowden cable is dimensioned for an outlet installation height of 4m above the floor (other lengths on request.)

Tender text

… units
Linear Hybrid Displacement Outlet VA-LH, mainly for use in systems without mechanical cooling or with adiabatic cooling.
Available in three different lengths for optimum dissipation of heat and material loads from manufacturing and production facilities.

VA-LH consisting of:
Semi-trapezoidal housing with perforated discharge surface, linearly arranged nozzles, and connecting spigot.
Socket arrangement on top, rectangular socket design, suitable for corner angle flange.

By adjusting the lever with Bowden cable the integrated air steering device is infinitely variable to:
- displacement flow from the air discharge surface,
- mixed flow from nozzles or
- displacement mixing flow from air discharge surface and nozzles
Air flow direction and room air velocity adjustable via angle-adjustable deflection flaps (0-360°) for each nozzle.

Materials:
Housing and perforated plate made of galvanized sheet steel, nozzles made of aluminum, unpainted.
Powder coating according to RAL ... on request.
Nozzle flaps made of polycarbonate (PC, GF 10).

Make: Krantz
Type: VA – LH – ____ – B – ____

Subject to technical alteration.

Krantz GmbH
Uersfeld 24, 52072 Aachen, Germany
Phone: +49 241 441-1
Fax: +49 241 441-555
info@krantz.de | www.krantz.de