KOMPONENTEN®
Applied system solutions

Opticlean OC-Q....

DS 4136 E 06.2013/1

Opticlean

Preliminary remarks, mode of operation and construction design

Preliminary remarks

KRANTZ KOMPONENTEN has developed the Opticlean OC-Q in order to combine in a single product the main features of a ceiling-mounted supply air outlet for diffuse indoor air flow, i.e.

- high level of thermal comfort
- unobtrusive integration into the suspended ceiling
- low amount of dirt accumulated on the ceiling
- low sound power level and low pressure drop.

The Opticlean from KRANTZ KOMPONENTEN is suitable for use in suspended ceiling systems.
In grid ceilings with modules of 625 x 625 mm or 600 x 600 mm, the standard design can be laid from above onto the T-bars of the ceiling system, instead of ceiling tiles, and connected to the supply air ductwork.
Another square standard design [1] is available for integration into gypsum board ceilings.
Further, there are special solutions for a number of other quite common ceiling systems, e.g. metal tile ceilings with clip-in or lay-in tiles; these solutions are tailored to the specific ceiling systems.

As standard the outlet faceplate has round perforations with diagonal pitch; the hole diameter is 2.8 mm, the pitch 5.5 mm. This perforation pattern corresponds to the typical appearance of usual metal tiles for ceiling systems. Thus, the integration of this air outlet into the ceiling is unobtrusive. If the perforation pattern of the ceiling tiles is the same, it is hardly possible to distinguish the Opticlean within the ceiling. The Opticlean can be used with other perforation patterns, but this requires technical clarification with our product specialists.

Application

- For ceiling heights 2.5 to 4.5 m
- Maximum temperature difference between supply and indoor air: ±10 K [2]
- Volume flow rate range from 11 to 239 l/s [40 to 860 m^3/h]
- Also usable as return air inlet

Mode of operation

The supply air flows very evenly through the perforated faceplate and spreads radially and horizontally. As the supply air induces indoor air, the flow velocity and the temperature difference between supply and indoor air decrease rapidly; this results in a comfortable thermal environment with low indoor air velocities and even indoor air temperatures in the occupied zone.

The induced indoor air does not come into contact with the perforated faceplate because a layer acting as an air cushion forms under the air outlet. This is why far less dirt accumulates on the ceiling than is the case with turbulent-flow outlets.

If the Opticlean is installed near a wall or in a room corner, it is possible to alter the discharge direction by using segment covers in order to avoid air draughts in the occupied zone.

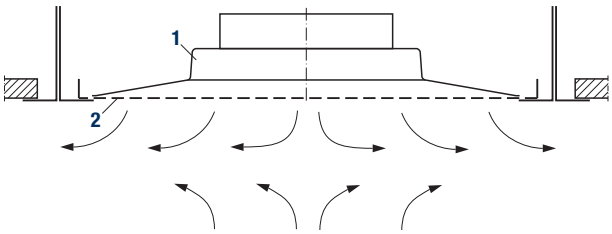

Figure 1: Air flow pattern of the Opticlean

Figure 2: Air flow pattern made visible by smoke tracer

Construction design

The Opticlean is available in 7 sizes.
It consists of the square air distribution element **1** which is fixed to the perforated faceplate **2**. The underside of the air distribution element has a black coating. The outlet is connected to the supply air ductwork either directly by a flexible duct (connection type O) or via a connection box **3** (connection type K) which can be optionally fitted with a volume flow damper **5** adjustable at the connection spigot **4**. For 2-way or 3-way discharge, the upper side of the perforated faceplate will be fitted with segment covers **6** made of acoustic fleece.

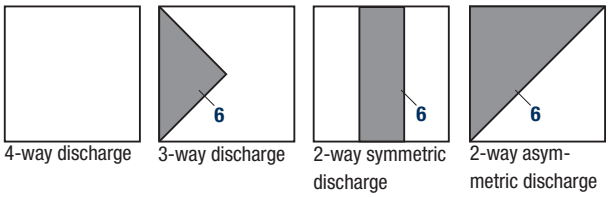

Figure 3: Alteration of discharge direction by use of segment covers

[1] For Opticlean with circular faceplate, see brochure ref. DS 4174

[2] When heating, +10 K up to 3 m ceiling height, +5 K up to 4.5 m ceiling height

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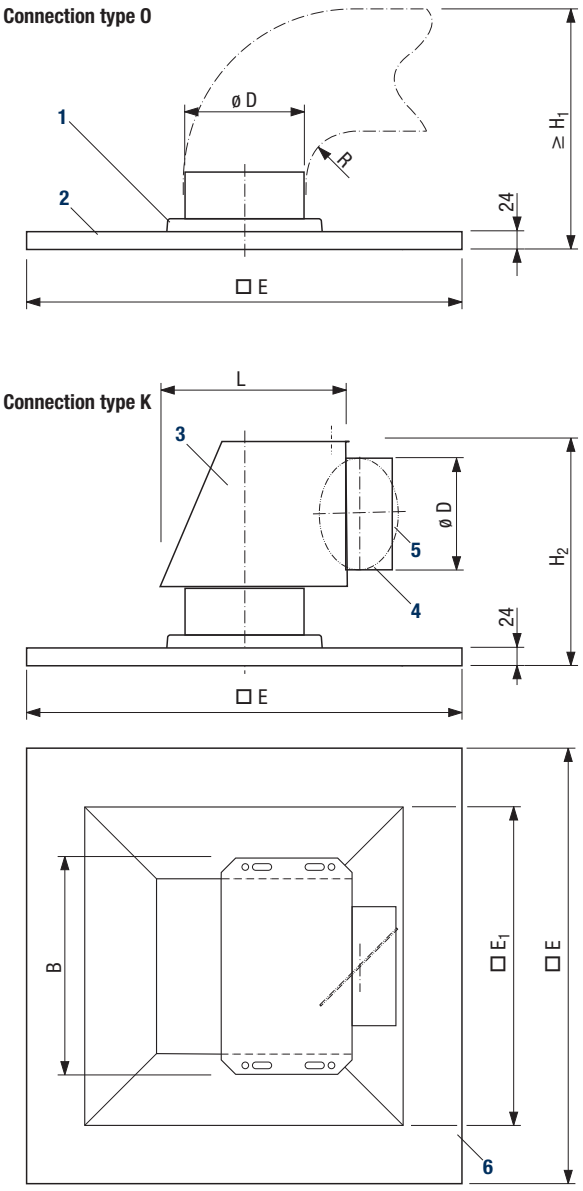
Construction design and dimensions

For integration into a gypsum board ceiling, the faceplate is turned out on two opposite sides and laid onto the mounting frame for gypsum board **7** which has already been inserted into the ceiling cutout from above and fixed using four drywall screws **8**. The joint between the frame and the gypsum board panel shall be filled at the client's expense and later painted to the desired colour together with the ceiling. The faceplate is centred by means of eight spacers **9**; this enables to get a regular joint between the mounting frame and the faceplate. This design is basically used for 12.5 mm thick gypsum board panels [3].



Size [1]	Supply air flow rate		Grid modules	□E	□E1 [1]	ø D	H1 [2]	H2	L	B	W in kg Connection type	
	l/s	m³/h	mm	mm	mm	mm	mm	mm	mm	mm	O	K
215	11– 31	40–110	600x600 625x625	595 620	214	79	190	—	—	—	2.1	—
270	18– 47	65–170			265	99	220	200	165	180	2.4	3.1
330	28– 69	100–250			321	124	260	230	190	205	2.6	3.6
400	36–119	130–430			391	159	320	280	225	240	3.1	4.6
500	50–161	180–580			491	199	390	325	265	280	3.7	5.7
600	75–239	270–860	600x600	595	591	249	500	410	315	330	4.0	6.7
625	75–239	270–860	625x625	620	616	249	500	410	315	330	4.2	6.9

Figure 4: Dimensions

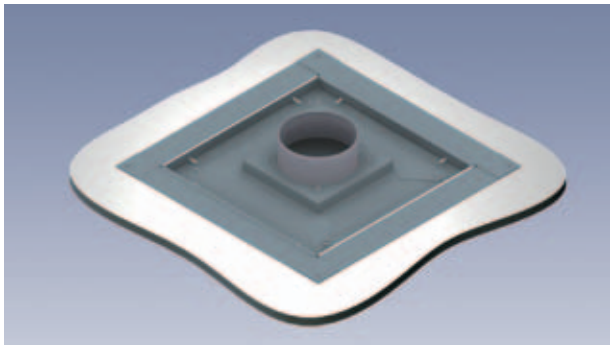
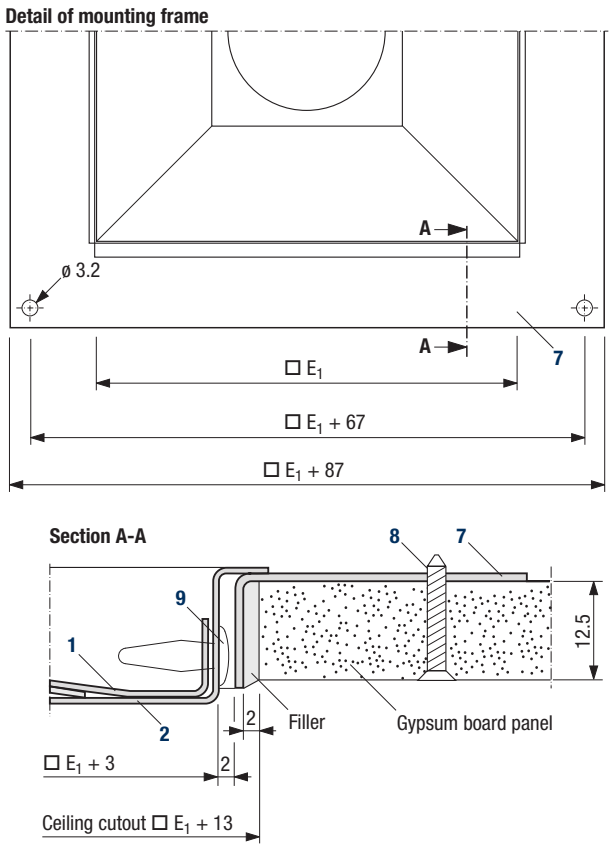


Figure 5: Opticlean with mounting frame for gypsum board ceiling



Key

1 Air distribution element
2 Perforated faceplate
3 Connection box
4 Connection spigot
5 Volume flow damper
6 Segment covers (made of acoustic fleece)
7 Mounting frame for gypsum board
8 Drywall screw TN 3.5 x 25 (by others)
9 Spacer

1) The design for integration into gypsum board ceilings is not available for size 625

2) The total height is based on a minimum bending radius of R/D = 0.5. Smaller radii are allowable depending on the type of flexible duct used.

3) Mounting frame for other thicknesses of gypsum board panels on enquiry

Figure 6: Opticlean installed in a grid ceiling

Figure 7: Opticlean installed in a gypsum board ceiling

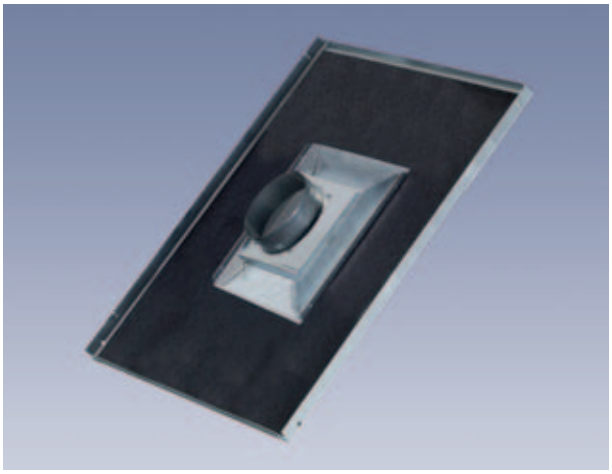


Figure 8: Opticlean for connection to a flexible duct or 90° elbow

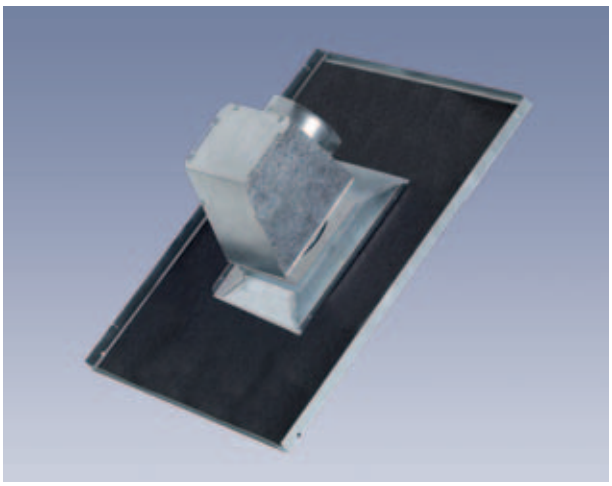


Figure 9: Opticlean with connection box

Design specifications

Return air inlets

The Opticlean is mainly designed for supply air distribution. It is also possible to use it for return air extraction, but then it is not protected from dirtying (no 'clean' function). This is in particular true when installed in rooms with higher particle load (e.g. corridors, smoking area, etc.).

Connection types

The outlet connection to the ductwork is possible via

- a flexible duct or a 90° elbow (Figure 8) or
- a connection box (Figure 9).

The connection box option is recommended in particular when a volume flow damper is required. As a rule, this connection type is louder by about 3 – 5 dB(A) ref. 10^{-12}W than the flexible duct connection at the same air flow rate.

With connection box the space requirement in height is less than with direct flexible duct connection. The values are given in the table of dimensions.

For installation in false ceilings with very low plenums, the solution is to use a very flat connection box [1].

As standard, the Opticlean diffusers are designed for use with metal ceiling tiles having a thickness of 0.6 mm [2] and fitted with round perforations 2.8 mm in diameter with diagonal pitch of 5.5 mm. Their mode of operation has been optimized for use with such ceiling tiles. Basically, they can also be used with other ceiling tiles, but then the air flow and acoustic data are likely to differ. It is recommended not to use the Opticlean with ceiling tiles thicker than 0.6 mm and perforations smaller than 2 mm. For such configurations a technical check should be made by our product specialists.

1) More information on enquiry

2) Without powder coating or paint

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Design specifications

There are adequate solutions for most common metal ceiling tiles. Further, special sizes (170, 300 and 350) are available. Technical data can be provided on request.

Minimum air outlet centre spacing

When designing the ventilation system, the minimum air outlet centre spacing given in Graph 2 is to be taken into consideration. The spacing shall be halved for outlet placement near a wall.

If the space configuration does not make it possible to comply with the minimum centre spacing, the Opticlean outlets can be fitted with segment covers which will enable to reduce the air flow rate by 25% or 50%.

a) The segment cover in Fig. 10 is for 3-way discharge

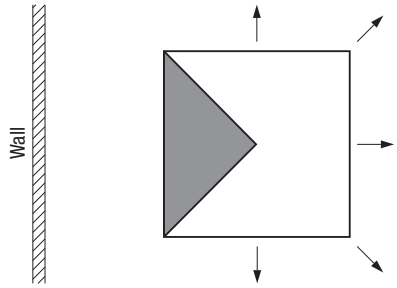


Figure 10: 3-way discharge in front of a wall

b) If the specified minimum centre spacing between two outlets cannot be complied with, we recommend an arrangement as shown in Figure 11.

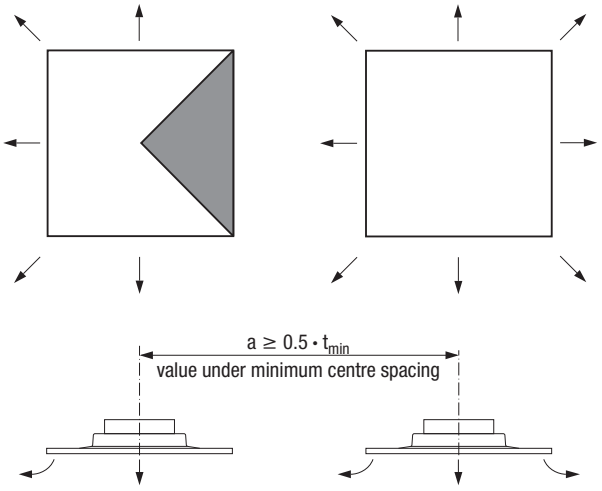


Figure 11: Position of segment cover when the outlet spacing is under the minimum value

c) In narrow spaces (e.g. corridors) we recommend a segment cover as shown in Figure 12.

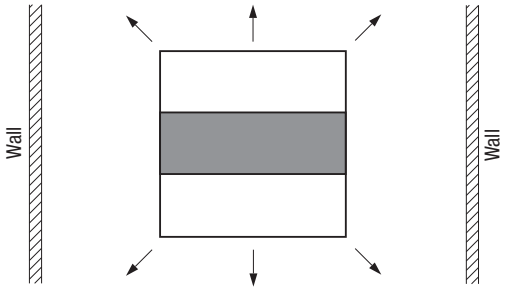


Figure 12: Segment cover for narrow spaces, for instance

d) If the Opticlean is placed in a room corner, the segment cover should be as shown in Figure 13.

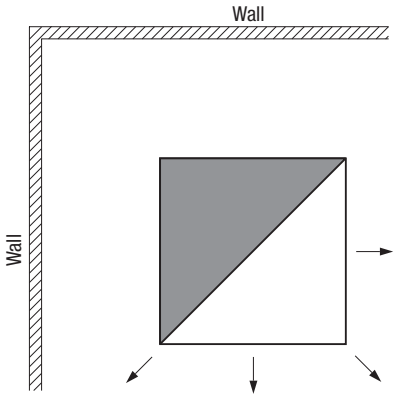


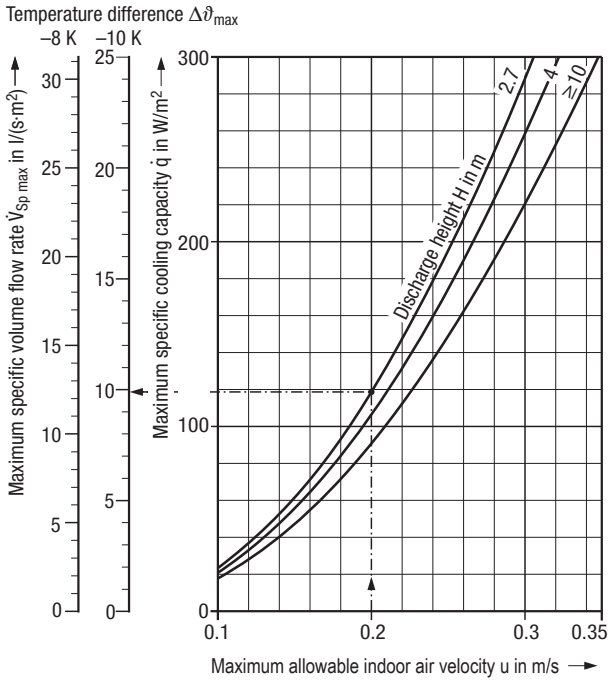
Figure 13: Segment cover for asymmetric discharge, e.g. for outlet placement in a room corner

Comfort criteria [1)]

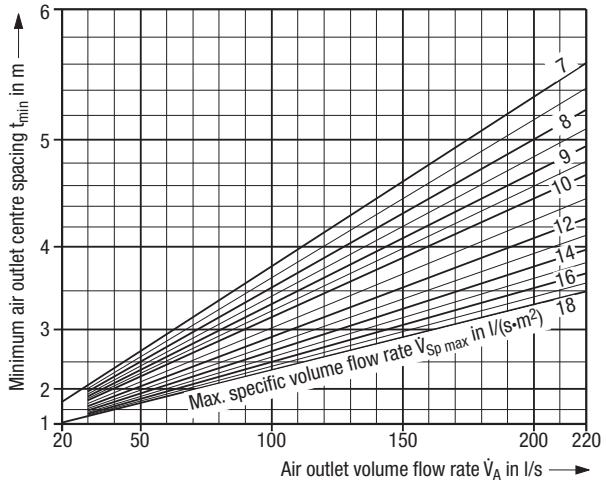
The outlet layout must comply with the maximum allowable indoor air velocities u in the occupied zone in the cooling mode. The indoor air velocity depends on the cooling load that is to be removed from the room. The maximum specific cooling capacity $\dot{q}$ depends on the discharge height and the maximum 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 outlets on the basis of the maximum specific volume flow rate.



Graph 1: Maximum specific volume flow rate



Graph 2: Minimum air outlet centre spacing

Key for layout:

$\dot{V}_A$ = volume flow rate per air outlet in l/s
$\dot{V}_{A\ max}$ = max. volume flow rate per air outlet when cooling in l/s
$\dot{V}_{A\ min}$ = min. volume flow rate per air outlet when cooling in l/s
$\dot{V}_{Sp\ max}$ = max. specific volume flow rate per m² in l/(s·m²)
$\dot{V}_{Sp\ tats}$ = actual specific volume flow rate per m² of floor area in l/(s·m²)
u = max. allowable indoor air velocity in m/s
$\dot{q}$ = max. specific cooling capacity in W/m²
$\Delta\vartheta_{max}$ = 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

Layout example			
Size			**500**
Application			Office building
1 Supply air volume flow rate	$\dot{V}$	l/s	666
2 Discharge height	H	m	2.7
3 Floor area	A	m²	120
4 Maximum allowable sound power level	L_{WA}	dB(A) ref. 10^{-12}W	38
5 Temperature difference	$\Delta\vartheta_{max}$	K	–10
6 Comfort criteria			
– Maximum indoor air velocity	u	m/s	0,2
– Maximum specific volume flow rate	$\dot{V}_{Sp\ max}$	l/(s·m²)	10
– Actual specific volume flow rate	$\dot{V}_{Sp\ tats}$	l/(s·m²)	[from **1** : **3**] 6
Criterion is met if $\dot{V}_{Sp\ tats} < \dot{V}_{Sp\ max}$			
From nomogram			
7 $\dot{V}_{A\ max}$		l/s	111
8 Z	[≥ $\dot{V}$: $\dot{V}_{A\ max}$]	units	6
9 $\dot{V}_A$	[$\dot{V}$: Z]	l/s	111
10 L_{WA}		dB(A) ref. 10^{-12}W	≈36
11 Δp_t		Pa	≈40
12 t_{min}	[Graph 2]	m	≈3.3

[1)] See our brochure ref. TB 69 ‘Layout specifications for thermal comfort’

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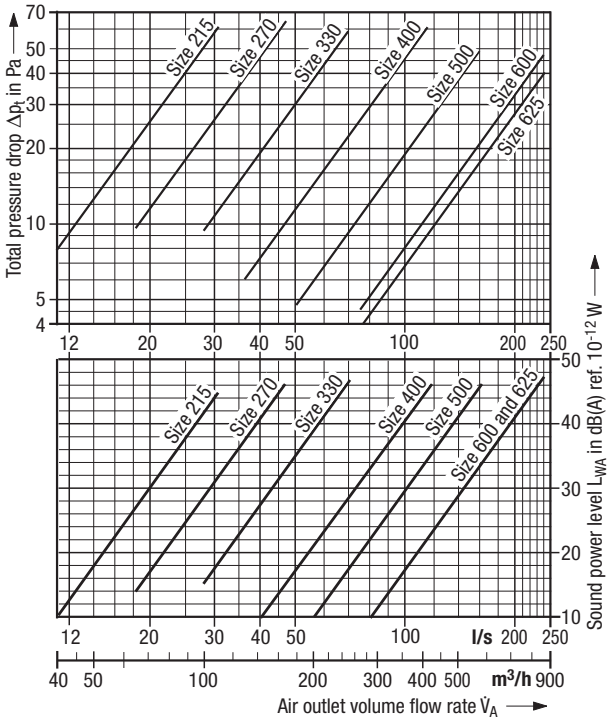
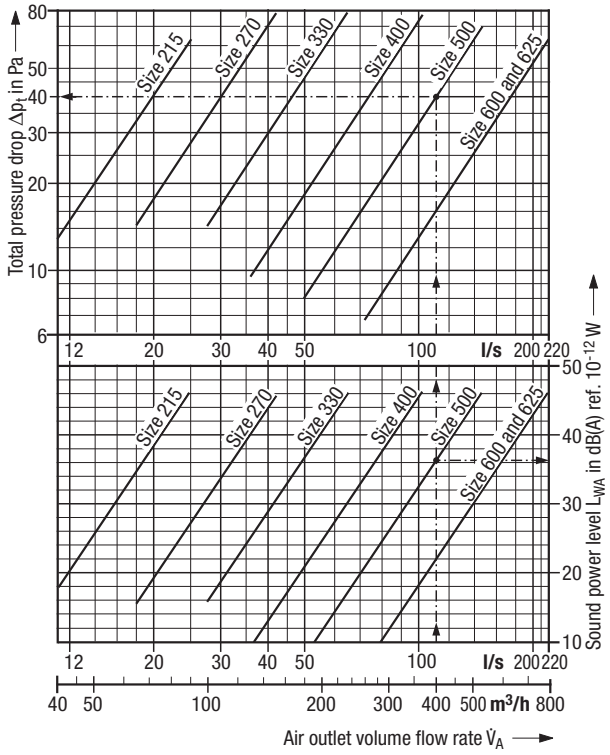
Layout sheet

Opticlean – Supply air outlet

Flexible duct connection [1)]

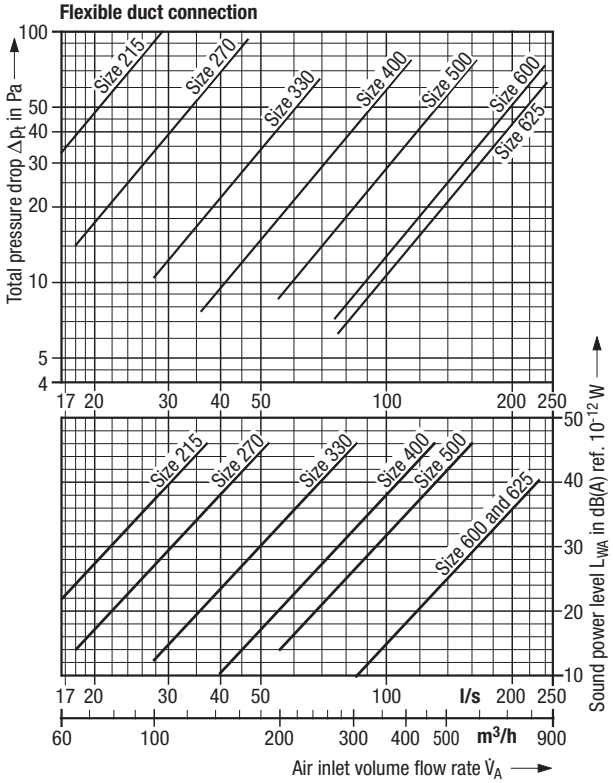


Connection box

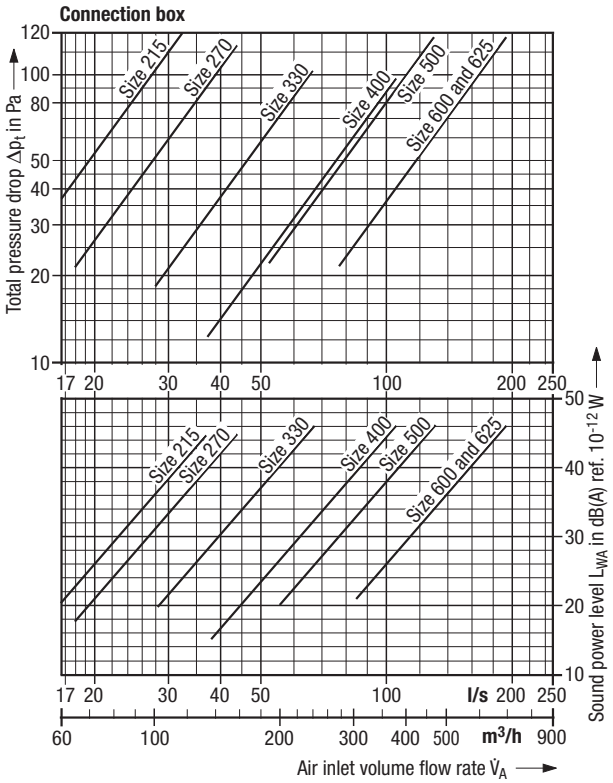


Opticlean used as return air inlet

Flexible duct connection



Connection box



Notes:

Sound power levels related to octave band centre frequencies are available on request.

The above-mentioned values for sound power level and pressure drop apply to the standard design. The faceplate design has an effect on the outlet operation and its technical features. Where necessary, the suitability of other faceplate designs is to be confirmed by tests.

1) With a straight duct, the sound power level is lower by 2 – 4 dB(A) ref. 10^{-12}W

Features

- High level of thermal comfort thanks to diffuse indoor air flow
- For insertion into suspended ceiling systems with grid modules of 600 or 625 mm
- Also suitable for installation into 12.5 mm thick gypsum board ceilings if fitted with additional mounting frame [1)]
- Perforated square faceplate – round perforations with diagonal pitch Rd 2.8 / 5.5 [2)] – coated to RAL 9010, gloss 20 – 40
- Can be laid onto perforated ceiling tiles (for specific projects, on enquiry)
- Steady radial air spread
- Very uniform air discharge; as a result, no or extremely low amount of dirt accumulated on the ceiling
- For ceiling heights 2.5 to 4.5 m
- Large volume flow rate range: from 11 to 239 l/s [40 to 860 m^3/h]
- 7 sizes available: 215, 270, 330, 400, 500, 600 and 625
- Maximum temperature difference: ±10 K [3)]
- Also usable as return air inlet
- Low sound power level and low pressure drop
- Optional segment covers available for placement near a wall or in a room corner
- Suitable for direct connection to a flexible or straight duct, or fitted with a connection box
- Connection box optionally available with volume flow damper adjustable at the connection spigot
- Air outlet element and connection box made of galvanized sheet metal

1) Except for size 625; other gypsum board thicknesses subject to enquiry
2) Other perforation patterns on enquiry
3) When heating, +10 K up to 3 m ceiling height, +5 K up to 4.5 m ceiling height

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Type code and tender text

Type code

OC – __ / ___ / _ – _ – ___

Opticlean | Geometry | Size | Segment cover | Connection type | Damper | Surface finish

Geometry

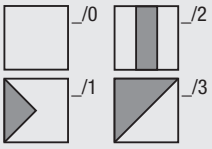
Q1 = square faceplate for square tile ceiling 600 mm x 600 mm
Q2 = square faceplate for square tile ceiling 625 mm x 625 mm
QG = square faceplate with mounting frame for 12.5 mm thick gypsum board ceiling (except for size 625) [1)]

Size

215	=	size 215	500	=	size 500
270	=	size 270	600	=	size 600
330	=	size 330	625	=	size 625
400	=	size 400			

Segment cover [2)]

0 = none (4-way discharge)
1 = 3-way discharge
2 = 2-way symmetric discharge
3 = 2-way asymmetric discharge



Connection type

0 = no connection piece (only outlet element) [3)]
K = connection box

Damper

0 = no volume flow damper
S = with volume flow damper adjustable at spigot

Surface finish

9010 = face painted to RAL 9010, semi-matt
.... = face painted to RAL ....

Tender text

..... units
Opticlean – Supply air outlet with horizontal discharge for insertion into suspended ceiling systems with grid modules of 625 x 625 mm and 600 x 600 mm or for integration into 12.5 mm thick gypsum board ceilings, designed to generate a high-quality indoor air flow at low velocities and uniform indoor air temperatures;
unobtrusive integration into the ceiling;
extremely low amount of dirt accumulated on the ceiling thanks to very uniform air spread and the resultant air cushion.

Outlet consisting of:
- square faceplate fitted with round perforations with diagonal pitch, hole diameter 2.8 mm, pitch 5.5 mm;
- where applicable, with mounting frame for integration into a 12.5 mm thick gypsum board ceiling [1)];
- optional segment covers to enable 3-way or 2-way discharge;
- air distribution element with top connection spigot for connection to a flexible or straight duct;
- optional connection box with lateral connection spigot as well as suspension brackets, optionally fitted with volume flow damper adjustable at the connection spigot.

Material:
- Faceplate made of galvanized sheet metal powder coated to RAL ....
- Mounting frame made of galvanized sheet metal
- Air distribution element made of galvanized sheet metal
- Connection box made of galvanized sheet metal

Make: KRANTZ KOMPONENTEN
Type: OC – Q_ / __ / _ – _ _ – ___

Subject to technical alterations.

1) On enquiry also available for other gypsum board thicknesses
2) If nothing is specified, the outlet will be supplied without segment cover. The segment covers serve to reduce the volume flow rate.
3) For direct connection using a flexible duct or 90° elbow

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