



Seit 1877

Kiefer

Luft- und Klimatechnik

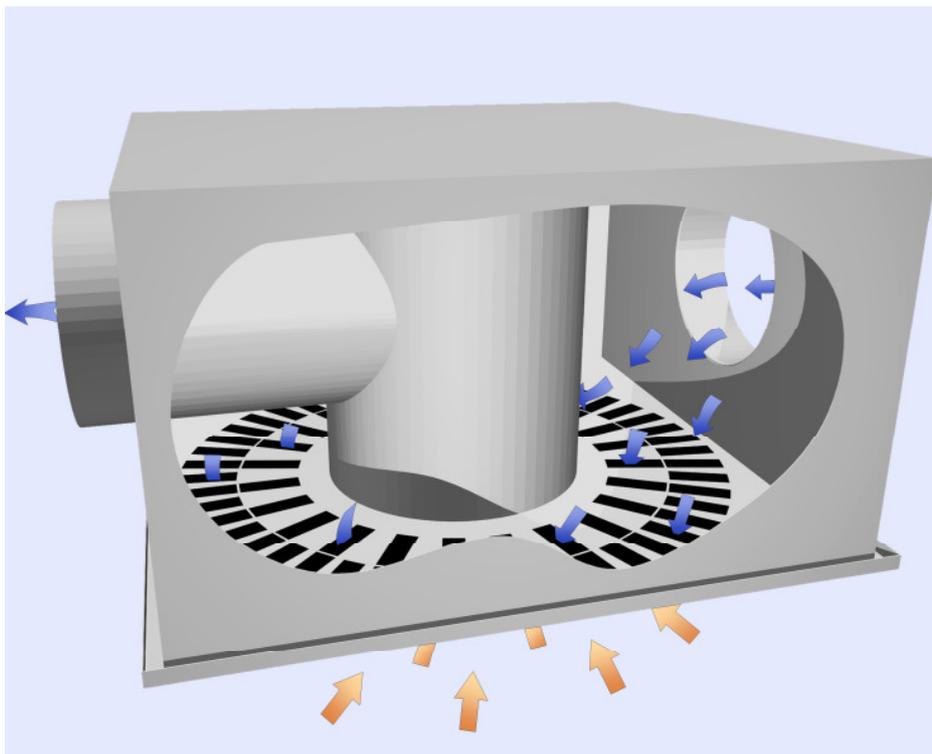
Neue Wege mit Luft

Technical Information

Ceiling Air Diffuser Supply Air / Extract air Combination

INDULCLIP Z-A

INDUDRALL Z-A



- Supply air and extract air in a single compact unit
- Large air flow rates
- High temperature difference
- Size 600 / 625 mm
- INDULVENT design



Function

INDULCLIP Z-A and INDUDRALL Z-A is a combination of supply air and extracts air in a compact unit.

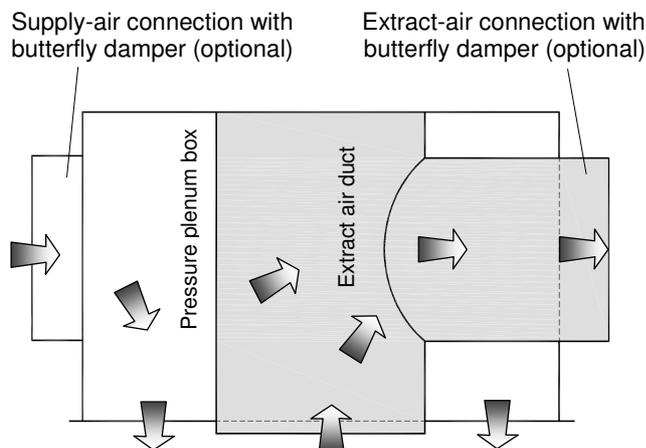
The supply air section, at the outer edge of the unit, feeds air into the room through a proven design of swirl diffuser. High-inductive and still comfortable, even at temperature differences of -10K and high air flow rates.

The extract air in the centre of the diffuser is transferred through a connection socket to the exhaust side of the ventilation system.

Each INDULCLIP Z-A and INDUDRALL Z-A unit is made up of a plenum box and the front plate. The front plate is attached to the plenum box with a 4-point connection.

Visually, the two air diffusers correspond to the front plate of our ceiling fan coil system INDULVENT II. An INDULVENT II installation can, therefore, be supplemented with these innovative units for the supply and extract of air.

Dual-chamber plenum box



Dimensions and weights

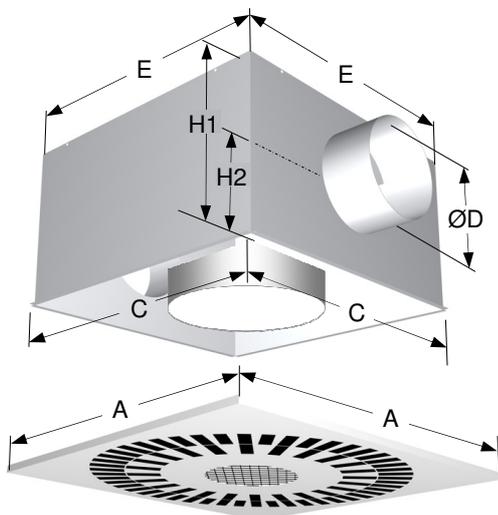
Both INDULCLIP Z-A and INDUDRALL Z-A are supplied as square units in the nominal sizes 600 and 625.

Dimensions

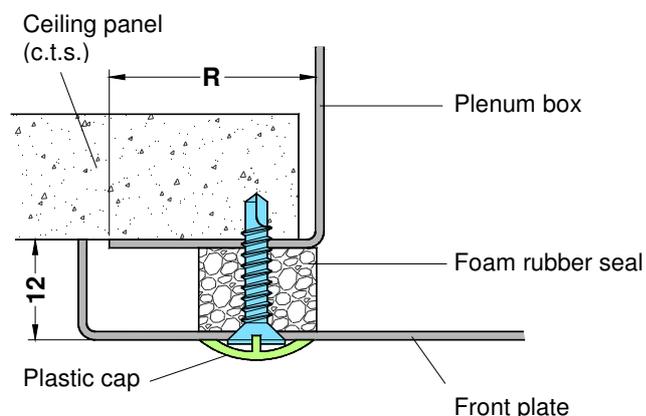
A	=	598 mm, Size 600, or 623 mm, Size 625
C	=	594 mm (fits both front plate sizes)
E	=	570 mm
R	=	12 mm
H1	=	335 mm
H2	=	185 mm
ØD	=	198 mm (supply or extract air)

Weights

Plenum box	11.5 kg
Front plate	2.5 kg



Front plate with 4-point mounting



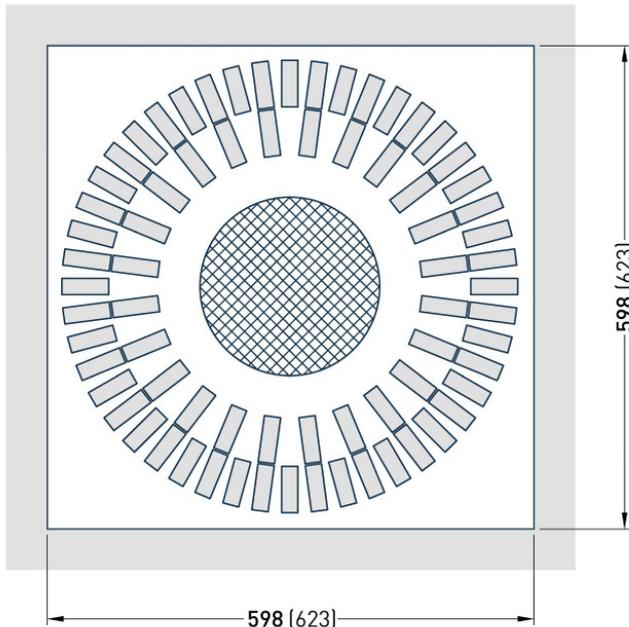
Please note:

The products we supply have general tolerances to DIN ISO 2768 Parts 1 and 2, which apply to the mechanical and plant engineering sectors.

Colour deviations due to different degrees of gloss, different ways of applying colour, and different materials are due to the manufacturing processes used and are not justification for complaints.

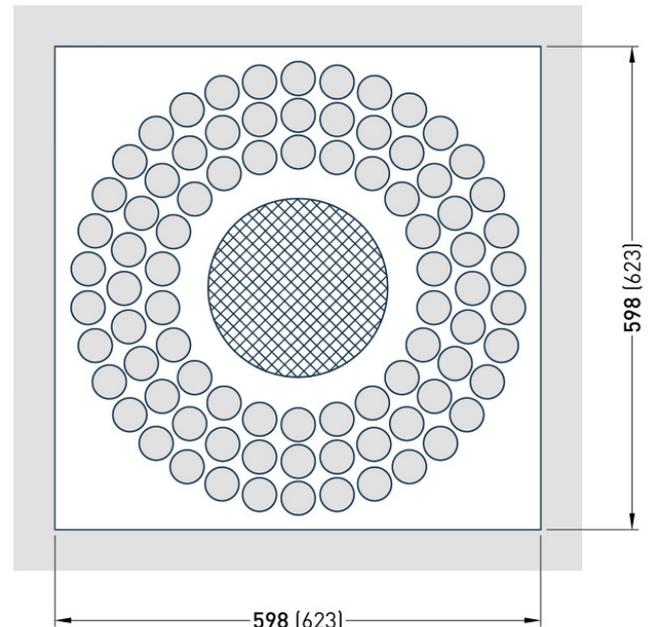
View of front plate of INDULCLIP Z-A (RQD)

Suitable for ceiling installation



View of front plate of INDUDRALL Z-A (RQF)

Suitable for ceiling installation and mounting without a suspended ceiling



Design information

The "local air velocity EN 7730:2006 is the average air velocity at any desired location within the common area.

Permissible velocity: DIN EN ISO 7730:2007
Method of measurement: DIN EN 13182:2002
Common area: DIN EN 13779:2007

The limits of the "common area" and the highest permissible "local air velocity" must be agreed between the owner and the planner or installer.

Our selection graphs give the "average local air velocity" when cooling at a supply air temperature difference of -6K. It is determined from numerous measurement points uniformly distributed in a room. Half of the velocities are higher than the value given by the graph and half are lower.

The "local air velocities" that occur in practice may differ from the predicted values due to, on the one hand, the degree of turbulence in the mixing air flows, or, on the other, to room air motions not caused by the air guidance system, such as cold facades, heating, proximity to a door and similar factors.

Arrangement information

The degree of comfort provided by an air-conditioning system is determined not just by having a low ambient air velocity at the smallest possible temperature difference in a room, but also by constant air distribution in the common area.

We recommend:

Air outlets should be uniformly distributed throughout the room.

Ventilation system design

Design is carried out using the smallest x dimension. The "average local air velocity" given in the graph is for $\Delta t_{SUP} = -6\text{ K}$. Correction factors for other supply air temperature differences are given in the table below.

Corrections for local air velocities at $\Delta t_{SUP} \neq -6\text{ K}$

Supply air temp. difference Δt_{SUP} [K]	-2K	-6K	-10K
Approx. velocity change Δv_{xy} [m/s]	-0.02	0	+0.04

Please note:

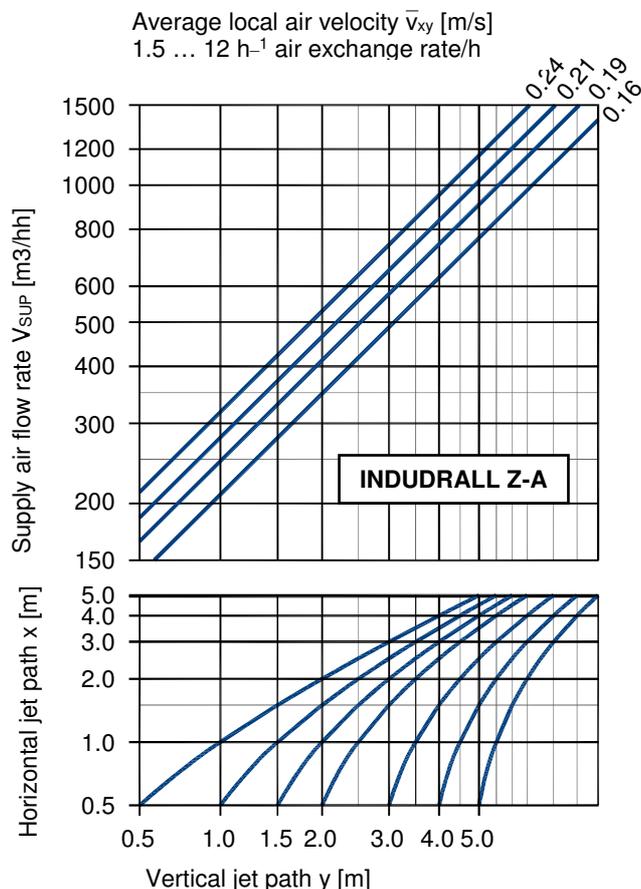
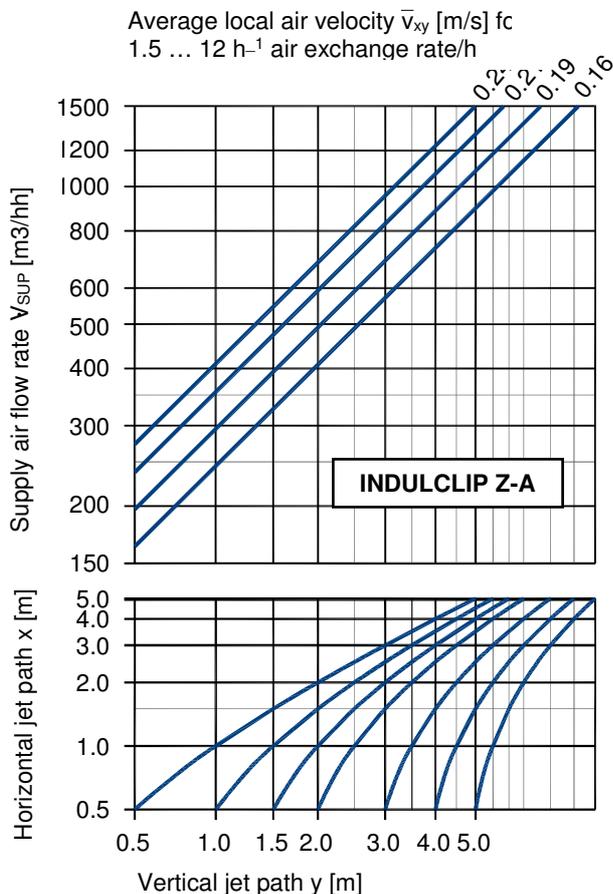
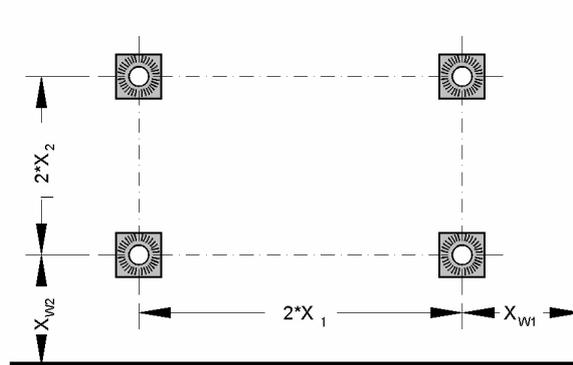
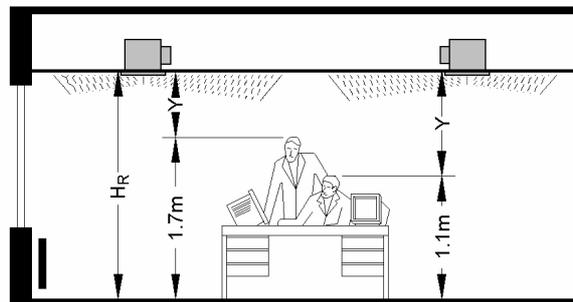
Be sure to follow the instructions on page 3 of this Technical Information! The design information lays down definitions and terminology. The permissible "local air velocity" must be determined in accordance with DIN EN ISO 7730.

This Technical Information become invalid if combined with other diffuser types. In case of doubt, please ask our technical consultants.

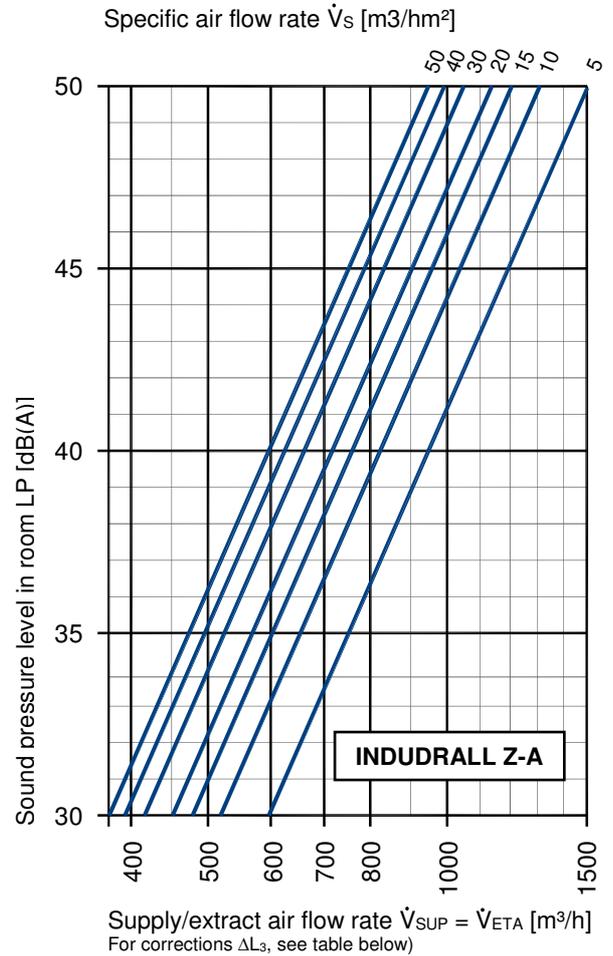
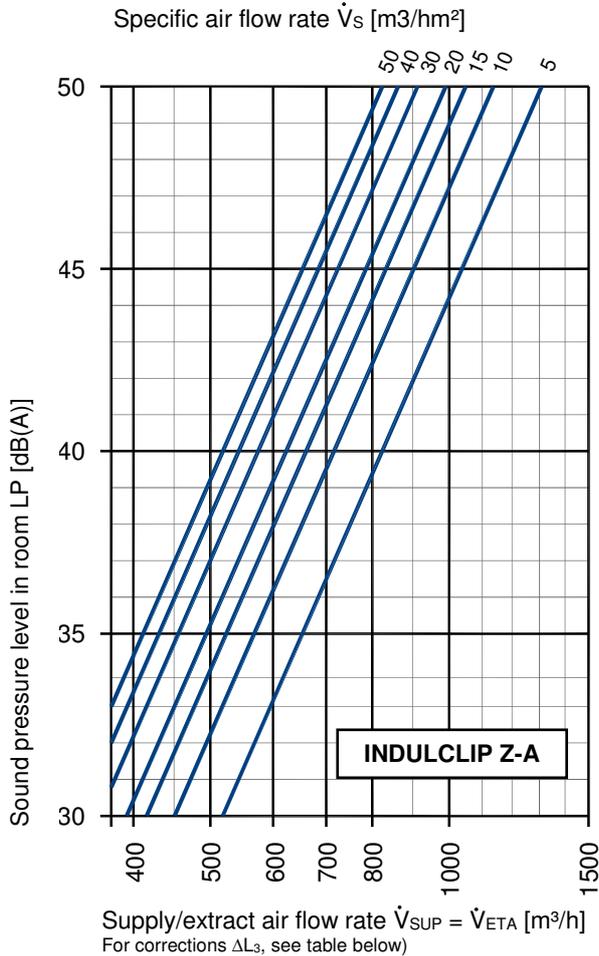
Minimum supply air flow rate

If these diffusers are operated at supply air temperature differences down to $\Delta t_{SUP} = -10\text{ K}$, make sure the minimum supply air flow rate does not fall below $\dot{V}_{SUP}=150\text{ m}^3/\text{h}$.

Definitions of x and y jet paths



Acoustic design and pressure loss



Acoustic diagrams

The graphs apply for:

Room height $H_R = 3.0 \text{ m}$

Reverberation time $T_N = 0.6 \text{ s}$

Air flow rate $\dot{V}_{SUP} = \dot{V}_{ETA}$

Acoustic power

INDULCLIP Z-A: $L_W = 60 \times \log(\dot{V}_{SUP}) - 120 + \Sigma \Delta L_i \text{ [dB(A)]}$

INDUDRALL Z-A: $L_W = 60 \times \log(\dot{V}_{SUP}) - 123 + \Sigma \Delta L_i \text{ [dB(A)]}$

Correction factor ΔL_1 for other room heights H_R

H_R [m]	2.5	2.75	3.0	3.5	4.0	4.5	5.0	6.0
ΔL_1 [dB(A)]	+0.8	+0.4	0	-0.7	-1.2	-1.8	-2.2	-3.0

Correction factor ΔL_2 for other reverberation times T_N

T_N [s]	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.2
ΔL_2 [dB(A)]	-1.8	-0.8	0	+0.7	+1.2	+1.8	+2.2	+3.0

Correction factor ΔL_3 for an extract air flow rate \dot{V}_{SUP} which differs from the supply air flow rate \dot{V}_{ETA} :

$$\text{Deviation} = ((\dot{V}_{ETA} / \dot{V}_{SUP}) - 1) \times 100 \text{ [%]}$$

Deviation %	-50	-25	-10	0	+10	+20	+30	+50
ΔL_3 [dB(A)]	-3.0	-2.0	-1.3	0.0	+1.5	+3.0	+4.5	+8.0

Relative sound power level

Frequency [Hz]	63	125	250	500	1 K	2 K	4 K	8 K
ΔL [dB]	+12	+5	-2	-5	-6.5	-8	-9	-15

Pressure losses:

INDULCLIP Z-A: $\Delta p_{sSUP} = \dot{V}_{SUP}^2 / 5500 \text{ [Pa]}$
 $\Delta p_{sETA} = \dot{V}_{ETA}^2 / 4200 \text{ [Pa]}$

INDUDRALL Z-A: $\Delta p_{sSUP} = \dot{V}_{SUP}^2 / 7050 \text{ [Pa]}$
 $\Delta p_{sETA} = \dot{V}_{ETA}^2 / 4200 \text{ [Pa]}$

Ceiling air diffuser supply air/extract air combinations INDULCLIP Z-A and INDUDRALL Z-A

Compact unit providing combined air supply and extract air as square panel, supply side as high inductive swirl diffusers which can accommodate a supply air temperature difference up to -10K over a wide range of air flow rate. Also suitable for variable air flow rate systems (VVS).

Front plate consisting of:

- Zinc-plated steel sheet, coated (colour RAL 9010), with high-induction, matt-black or grey (similar to RAL 7035) INDULCLIP / INDUDRALL discharge elements.
- Outlet hole in the centre of the front plate with a wire grille, matt black or grey (similar to RAL 7035).
- Four-point fastening between front plate and plenum box: four fastening screws with white plastic caps.

Size: 600 x 600 mm or 625 x 625 mm

Manufacturer: Kiefer

Type: INDULCLIP Z-A or INDUDRALL Z-A

Pos.	Quantity	Type	Size: mm	Price per piece €
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Extra charge for coating front plate in an RAL-colour of your choice

Pos.	Quantity	Type	Size mm	Price per piece €
_____	_____	_____	_____	_____

Dual-chamber plenum box consisting of:

- Zinc-plated steel sheet with peripheral supply air pressure chamber and central extract air tube, inner cylinder in plenum box, visible parts painted black, two connection sockets Ø 198 mm on opposite sides for supply air and extract air, eight mounting points Ø 9 mm in housing cover.

Manufacturer: Kiefer

Type: INDULCLIP Z-A / INDUDRALL Z-A

Pos.	Quantity	Type	Size mm	Price per piece €
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Additional charge for supply air butterfly damper (controllable from the room side without dismantling the front plate)

Pos.	Quantity	Price per piece €
_____	_____	_____

Additional charge for extract air butterfly damper (controllable from the room side without dismantling the front plate)

Pos.	Quantity	Price per piece €
_____	_____	_____

Index to Technical Information - Ventilation System Components

Jet paths

$X_1, X_2 \dots X_n$	Horizontal ceiling jet paths to point where two ceiling jet paths meet	[m]
$XW_1, XW_2 \dots XW_n$	Horizontal ceiling jet paths to wall or facade	[m]
y	Vertical jet path	[m]

Media flows

\dot{V}	Air flow rate, general	[m ³ /h]
\dot{V}_S	Specific air flow rate, general	[m ³ /hm ²]
\dot{V}_{Spez}	Specific air flow rate per metre	[m ³ /hm]
\dot{V}_{ges}	Total air flow rate	[m ³ /h]
\dot{V}_{RCA}	Recirculation air flow rate	[m ³ /h]
Vk_1	Recirculation air flow rate, set value I for INDULVENT remote switch	[m ³ /h]
Vk_2	Recirculation air flow rate, set value II for INDULVENT remote switch	[m ³ /h]
\dot{V}_1	Recirculation air flow rate, min.setting for automatic operation of INDULVENT	[m ³ /h]
\dot{V}_2	Recirculation air flow rate, max. for automatic operation of INDULVENT	[m ³ /h]
\dot{V}_{SUP}	Supply air flow rate per diffuser	[m ³ /h]
\dot{V}	Supply air flow rate per metre	[m ³ /hm]
\dot{V}_{AB}	Extract air flow rate	[m ³ /h]
\dot{V}_{ODA}	Extract air flow rate per room	[m ³ /h]
\dot{V}_{TRA}	Cross flow air flow rate per diffuser	[m ³ /h]
\dot{V}_{ETA}	Extract air vol. flow per diffuser	[m ³ /h]
\dot{V}_{RCA}	Recirculation air flow rate per room	[m ³ /h]
\dot{V}_{EHA}	Exhaust air flow rate per room	[m ³ /h]
\dot{V}_{SEC}	Secondary air flow rate per diffuser	[m ³ /h]
\dot{m}_W	Cooling water mass flow	[kg/h]
\dot{m}_K	Condensate mass flow	[kg/h]

Temperatures and temperature differences

T	Temperature, general	[°C]
T_{Ida}	Measured ambient air temperature	[°C]
t_{wV}	Cooling water supply temperature	[°C]
t_{wR}	Cooling water return temperature	[°C]
t_{mW}	Average cooling water temperature	[°C]
	$t_{mW} = (t_{wV} + t_{wR}) / 2$	
T_1	Ambient air temp., minimum setting for automatic operation of INDULVENT	[°C]
T_2	Ambient air temp., maximum setting for automatic operation of INDULVENT	[°C]
Δt_{SUP}	Temp. difference supply air/ambient air	[K]
$\Delta t_{w V-R}$	Temperature difference cooling water supply / return	[K]
Δt_{mW-RL}	Temperature difference average cooling water / ambient air	[K]

Static pressures and pressure differences

p_{sSUP}	Minimum pressure on supply air side	[Pa]
p_{sRCA}	Static pressure of recirculation part	[Pa]
Δp_s	Static pressure loss, general	[Pa]
Δp_{sW}	Cooling water pressure drop	[kPa]
Δp_{sSUP}	Pressure drop on supply air side	[Pa]
Δp_{sETA}	Pressure drop on extract air side	[Pa]
Δp_{sges}	Total pressure drop	[Pa]

Velocities

v_0	Velocity of air leaving diffuser	[m/s]
\bar{v}_{xy}	Average ambient air velocity after jet path x + y	[m/s]
\bar{v}_x	Average ambient air velocity after jet path x	[m/s]
\bar{v}_y	Average ambient air velocity after jet path y	[m/s]

Cooling capacities

Q_W	Cooling capacity on cooling water side	[W]
Q_{SUP}	Cooling capacity on supply air side	[W]
Q_{ges}	Total power	[W]

Acoustics

L_W	Sound power level	[dB(A)]
L_P	Sound pressure level	[dB(A)]
$\Delta L...$	Correction for sound level	[dB]
D	Input attenuation	[dB]

Other data

H_R	Room height	[m]
T_N	Reverberation time	[s]
ρ_{RL}	Room air humidity	[%RH]
$A...$	Area (e.g. floor area of room)	[m ²]
Y_1	Control voltage minimum setting	[V]
Y_2	Control voltage maximum setting	[V]

Designation of types of air to DIN EN 13779:2007

Outdoor air	ODA
Supply air	SUP
Indoor air	IDA
Transferred air	TRA
Extract air	ETA
Recirculation air	RCA
Exhaust air	EHA
Secondary air	SEC
Leakage air	LEA
Mixed air	MIA

Status: March 2009



Product Range

Components

Linear, wall, ceiling, and displacement outlets, chilled ceilings, ceiling fan coil systems, transfer grilles, concrete core cooling with supply air.

Axial and radial ventilators, hot-gas ventilators, plastic ventilators.

Systems

Air conditioning systems of all types for comfort (offices, administration buildings, department stores, libraries, museums, etc.) and industrial purposes (mechanical engineering, high technology, textile, plastics, chemical, automobile, drinks, foodstuffs and other industries).

Services

Advice and Planning

We will advise you in all questions concerning the application of our systems, carry out system investigations, and prepare cost estimates including calculation of cooling loads, piping networks, energy costs, and operating efficiency. Preparation of structure proposals for air distribution, lighting, ceiling systems. Illumination calculations using the latest software tools. Design and implementation of control concepts in our own instrumentation and control department

We incorporate our knowledge and experience in product innovations and new projects.

Air-conditioning laboratory

Expert reports, ambient air flow analyses in full-scale trials in our laboratory. Acoustic and aerodynamic investigations of air-conditioning components. Development of innovative air-conditioning components. Calorific performance measurements of air and water components on the test stand.

Comfort measurements on site to assess thermal comfort and room air quality.

Maintenance and Service

Maintenance service contracts for all types of ventilation and air-conditioning systems.

