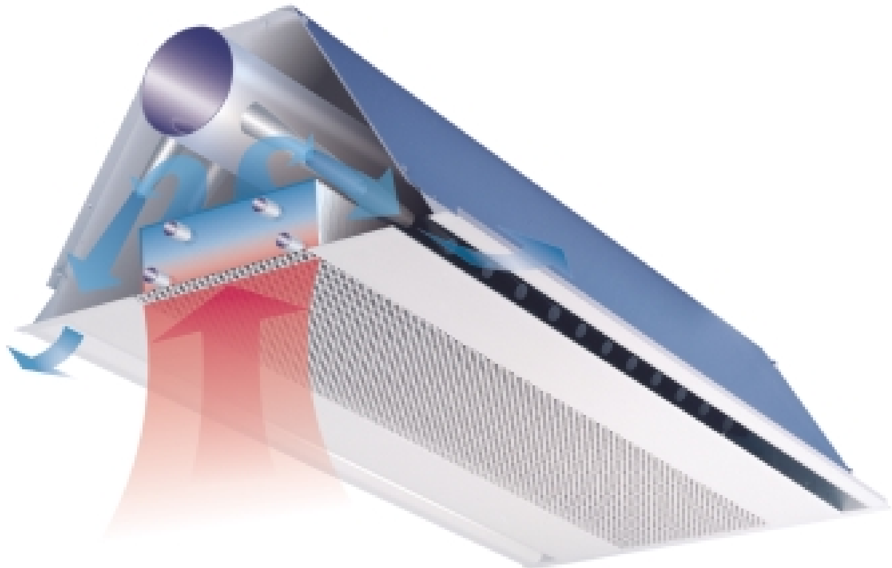
Ceiling Induction Diffuser

Type DID 600



TROX® TECHNIK

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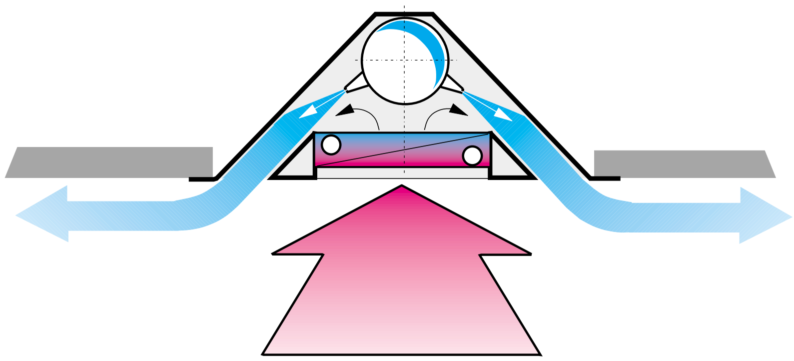
Description · Dimensions



Description

Ceiling induction diffusers type DID use a combination of air and water systems. They combine the air flow characteristics of ceiling diffusers with the energy benefits of load dissipation using water.

The primary volume flow required for fresh air is supplied through a duct into which nozzles are fitted. The induced air is drawn from the room through a heat exchanger carrying cold water. In the mixing section of the DID, the cooled secondary air is mixed with primary air and supplied to the room via slots.

Note: The cold water supply temperature must be selected such that condensation is avoided.

The integral heat exchanger can be supplied as a 4 pipe system for connection to warm water (technical data on request).

Construction

Type DID ceiling induction diffusers are particularly suitable for use in low ceiling void spaces because of their shallow construction.

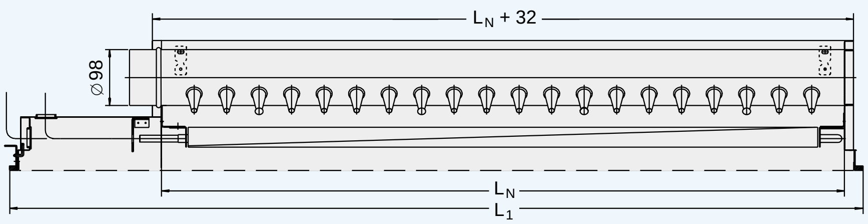
When connected appropriately, they can be used for both individual room control or form grouped zone control. Control valves are not supplied.

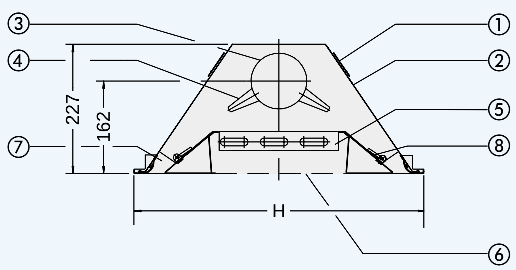
The type DID is suitable not only for use in new buildings but is also excellent for refurbishment projects. Despite small air volumes, the use of the heat exchanger – with the energy medium of water – gives disproportionately high cooling and heating performance.

The discharge nozzles in the primary air duct are available in three different sizes, selection depending on volume flow rate. Appropriate arrangement of different nozzle sizes can set an asymmetric air distribution – technical data on request.

Because of the variety of possible ceiling systems, options are available for integration into various ceilings.

Dimensions





① Suspension lug
② Casing
③ Primary air duct
④ Discharge nozzle
⑤ Heat exchanger (connection pipe diameter ⌀12)
⑥ Induction diffuser
⑦ Discharge slot
⑧ Fixing bolt

H*
510
593
598

* See installation examples

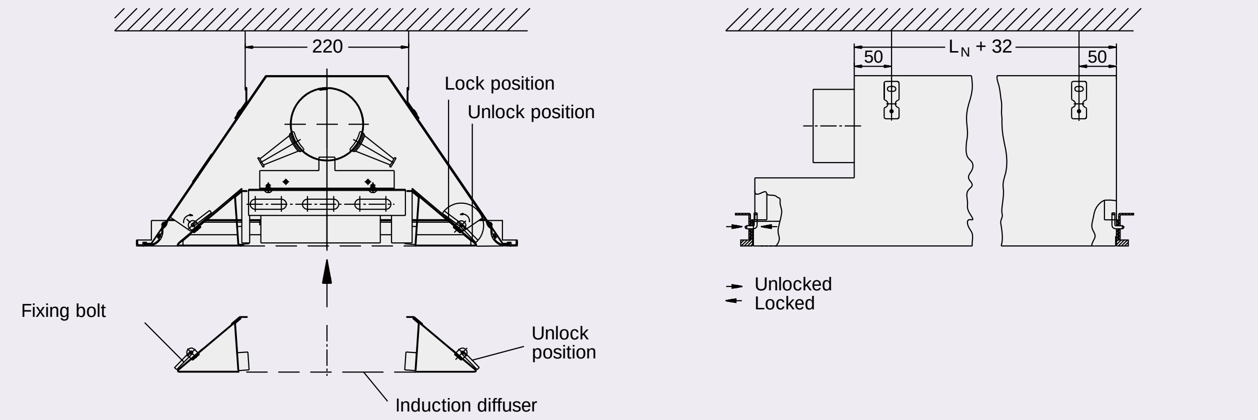
L_N \ L_1	1100	1200	1400	1500	1700	1800
900	●	●	●	●	●	●
1200			●	●	●	●
1500					●	●

Two suspension lugs are provided on each long side of the DID. The unit is mounted via the suspension brackets approved under the German Building Regulations. After installation, the front face can be removed. For this, the 4 fixing bolts must be released. When removing the face, observe the Accident Prevention Regulations. Disassembly and subsequent assembly should always be carried out by two engineers. When the face is removed, free access is given to the heat exchanger and connections. The water connections can be made from below. Depending on the installation requirements, rigid connections may be soldered or flexible hoses used with push fit connectors.

The heat exchanger stub tubes can also be supplied with couplings so that compression connections can be used.

All connections are also available with venting cocks. These are freely accessible when the front face is removed.

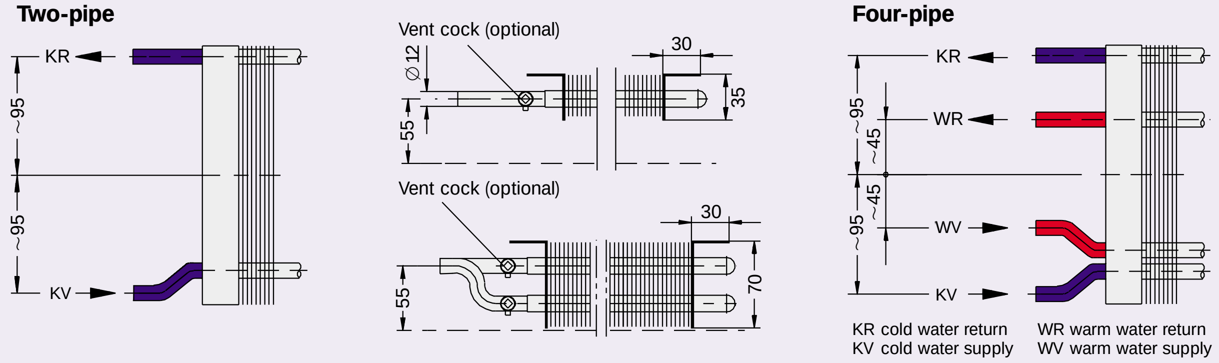
The air connection must be made from above or from the side. When all connections have been made, the front face is re-attached to the unit with the fixing bolts. The locking position of the fixing bolts must be selected.



Heat Exchanger Connection Dimensions

Two-pipe

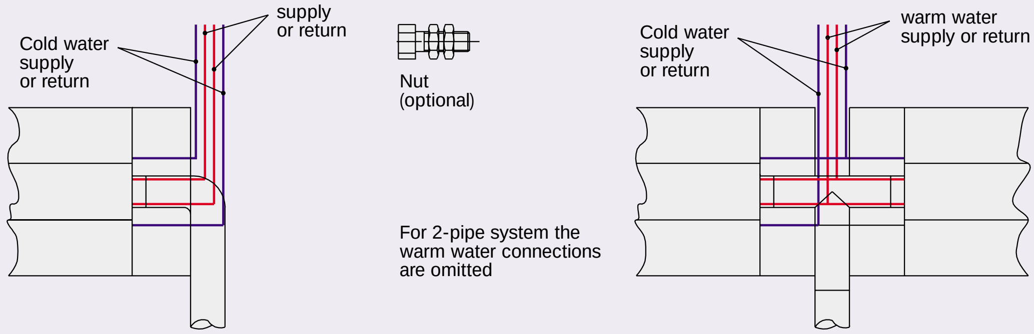
Four-pipe



Possible Connections

Individual connections

Double connection



Installation Examples

The DID can be equipped for most common ceiling systems with different edge and long side connection profiles.
The optimum ceiling integration is therefore guaranteed.
Unit width „H“ is shown in the dimension table on page 2.
Variants and unit widths must be shown in the order code on page 6.

Variant 1

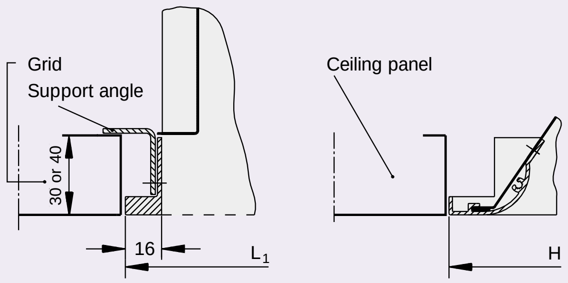
The support angle bracket on the front of the DID, also supplied, has two different leg lengths each with a hole. Appropriate fixing to the unit allows the selection of grid profile heights of 30 or 40 mm as a support.

Installation in T-bar Ceilings

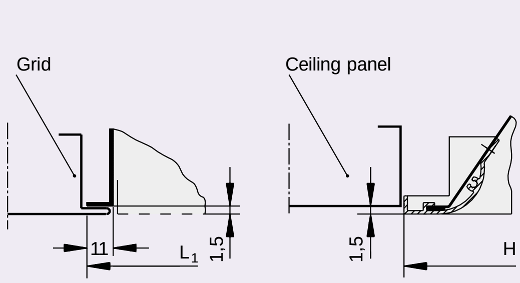
The dimension between the two T-bars is usually 600 mm longitudinally.
With Variant 3, unit width H therefore = 598 mm and for variant 5 H = 593 mm.

Installation in Ceiling Grid

Variant 1

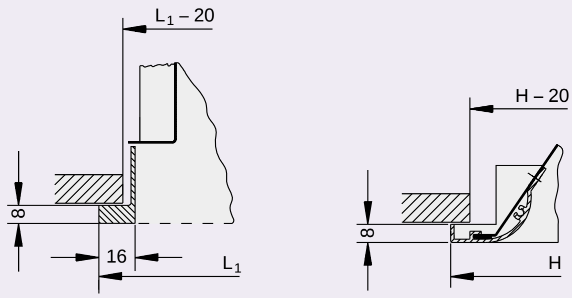


Variant 2

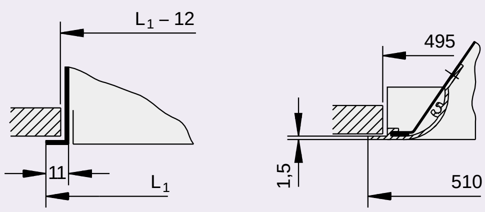


Installation in Gypsum Plasterboard or Closed Ceiling

Variant 3

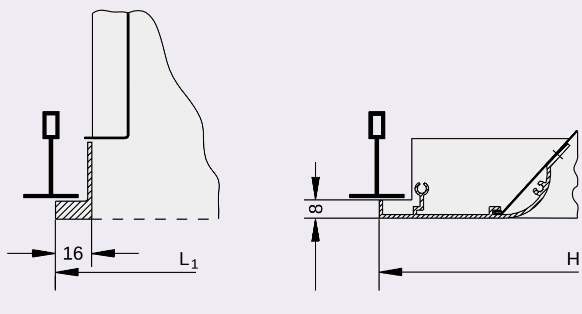


Variant 4

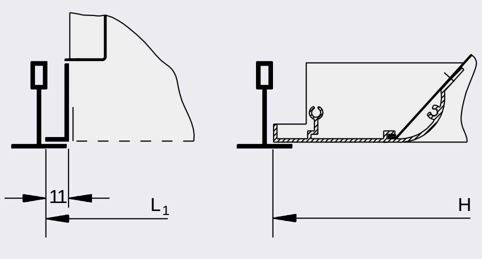


Installation in T-bar Ceiling

Variant 3

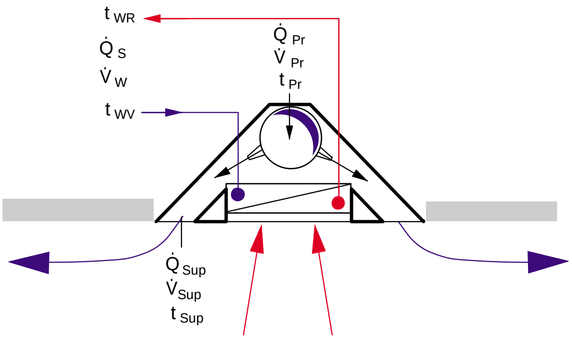


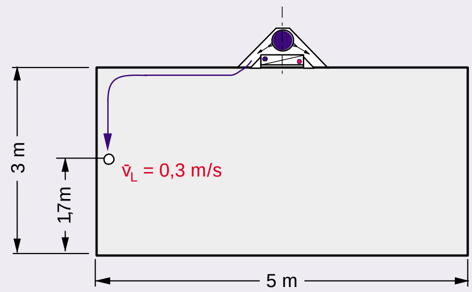
Variant 5

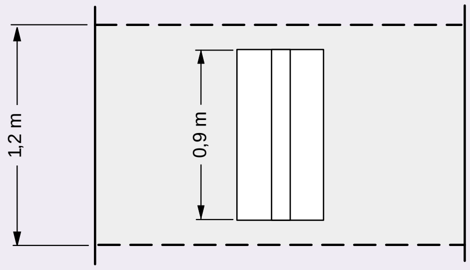


Nomenclature

t_{WV} = 16 °C Cold water supply temperature
t_{Pr} = 16 °C Primary air temperature
$\dot{V}_W$ = 110 l/h Cold water volume flow
$\dot{V}_{Sup}$ in l/s: Supply air volume flow
$\dot{V}_{Pr}$ in l/s: Primary air volume flow
$\dot{Q}_{Sup}$ in Watt: Total cooling capacity $\dot{Q}_{Pr} + \dot{Q}_S$
$\dot{Q}_{Pr}$ in Watt: Cooling capacity primary air
$\dot{Q}_S$ in Watt: Cooling capacity secondary air
$\dot{Q}_{S0}$ in Watt: Cooling capacity secondary air and $\dot{V}_{Pr} = 0$
$\dot{q}_{Sup}$ in W/m^2: Specific cooling capacity
Δp_t in Pa: Primary air pressure drop
Δp_W in kPa: Water pressure drop
L_{WA} in dB(A): A-weighted sound power level
$\bar{v}_L$ in m/s: Mean air velocity







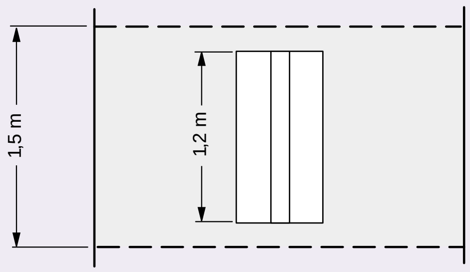
DID…L_N = 900 mm

Supply air temperature t_R = 24 °C

Nozzle type	$\dot{V}_{Pr}$ l/s	$\dot{V}_{Sup}$ l/s	$\dot{Q}_{Pr}$ Watt	$\dot{Q}_S$ Watt	$\dot{Q}_{Sup}$ Watt	$\dot{q}_{Sup}$ W/m^2	$\dot{V}_{Pr}/m^2$ $l/(s\,m^2)$	L_{WA} dB(A)	Δp_t Pa	Δp_W kPa	$\dot{Q}_{S0}$ Watt
„A“	11	58	106	243	349	58	1,8	32	169	1,11	42
„B“	14	58	134	238	372	62	2,3	31	91	1,11	42
„C“	17	58	163	232	395	66	2,8	30	57	1,11	42

Supply air temperature t_R = 26 °C

Nozzle type	$\dot{V}_{Pr}$ l/s	$\dot{V}_{Sup}$ l/s	$\dot{Q}_{Pr}$ Watt	$\dot{Q}_S$ Watt	$\dot{Q}_{Sup}$ Watt	$\dot{q}_{Sup}$ W/m^2	$\dot{V}_{Pr}/m^2$ $l/(s\,m^2)$	L_{WA} dB(A)	Δp_t Pa	Δp_W kPa	$\dot{Q}_{S0}$ Watt
„A“	11	58	132	304	436	73	1,8	32	169	1,11	53
„B“	14	58	168	297	465	78	2,3	31	91	1,11	53
„C“	17	58	204	290	494	82	2,8	30	57	1,11	53



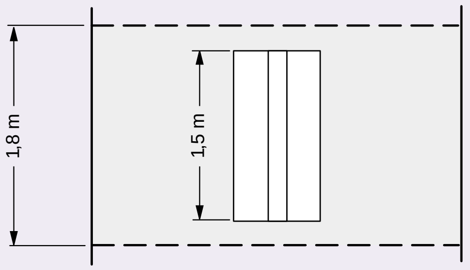
DID…L_N = 1200 mm

Supply air temperature t_R = 24 °C

Nozzle type	$\dot{V}_{Pr}$ l/s	$\dot{V}_{Sup}$ l/s	$\dot{Q}_{Pr}$ Watt	$\dot{Q}_S$ Watt	$\dot{Q}_{Sup}$ Watt	$\dot{q}_{Sup}$ W/m^2	$\dot{V}_{Pr}/m^2$ $l/(s\,m^2)$	L_{WA} dB(A)	Δp_t Pa	Δp_W kPa	$\dot{Q}_{S0}$ Watt
„A“	13	70	125	295	420	56	1,7	31	136	1,5	50
„B“	17	70	163	301	464	62	2,3	30	77	1,5	50
„C“	21	70	202	297	499	67	2,8	30	50	1,5	50

Supply air temperature t_R = 26 °C

Nozzle type	$\dot{V}_{Pr}$ l/s	$\dot{V}_{Sup}$ l/s	$\dot{Q}_{Pr}$ Watt	$\dot{Q}_S$ Watt	$\dot{Q}_{Sup}$ Watt	$\dot{q}_{Sup}$ W/m^2	$\dot{V}_{Pr}/m^2$ $l/(s\,m^2)$	L_{WA} dB(A)	Δp_t Pa	Δp_W kPa	$\dot{Q}_{S0}$ Watt
„A“	13	70	156	369	525	70	1,7	31	136	1,5	62
„B“	17	70	204	376	580	77	2,3	30	77	1,5	62
„C“	21	70	252	371	623	83	2,8	30	50	1,5	62



DID…L_N = 1500 mm

Supply air temperature t_R = 24 °C

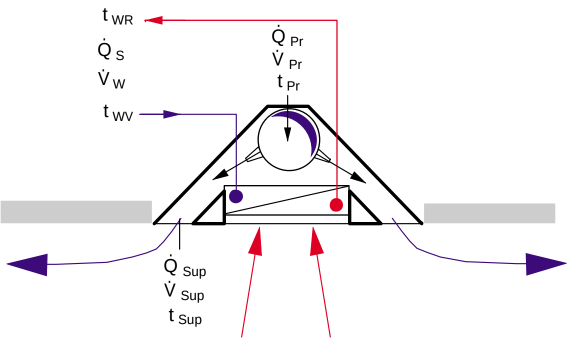
Nozzle type	$\dot{V}_{Pr}$ l/s	$\dot{V}_{Sup}$ l/s	$\dot{Q}_{Pr}$ Watt	$\dot{Q}_S$ Watt	$\dot{Q}_{Sup}$ Watt	$\dot{q}_{Sup}$ W/m^2	$\dot{V}_{Pr}/m^2$ $l/(s\,m^2)$	L_{WA} dB(A)	Δp_t Pa	Δp_W kPa	$\dot{Q}_{S0}$ Watt
„A“	16	85	154	363	517	57	1,8	33	135	1,9	58
„B“	20	85	192	369	561	62	2,2	32	70	1,9	58
„C“	24	85	240	367	607	67	2,7	31	46	1,9	58

Supply air temperature t_R = 26 °C

Nozzle type	$\dot{V}_{Pr}$ l/s	$\dot{V}_{Sup}$ l/s	$\dot{Q}_{Pr}$ Watt	$\dot{Q}_S$ Watt	$\dot{Q}_{Sup}$ Watt	$\dot{q}_{Sup}$ W/m^2	$\dot{V}_{Pr}/m^2$ $l/(s\,m^2)$	L_{WA} dB(A)	Δp_t Pa	Δp_W kPa	$\dot{Q}_{S0}$ Watt
„A“	16	85	192	454	646	72	1,8	33	135	1,9	72
„B“	20	85	240	461	701	78	2,2	32	70	1,9	72
„C“	24	85	300	459	759	84	2,7	31	46	1,9	72

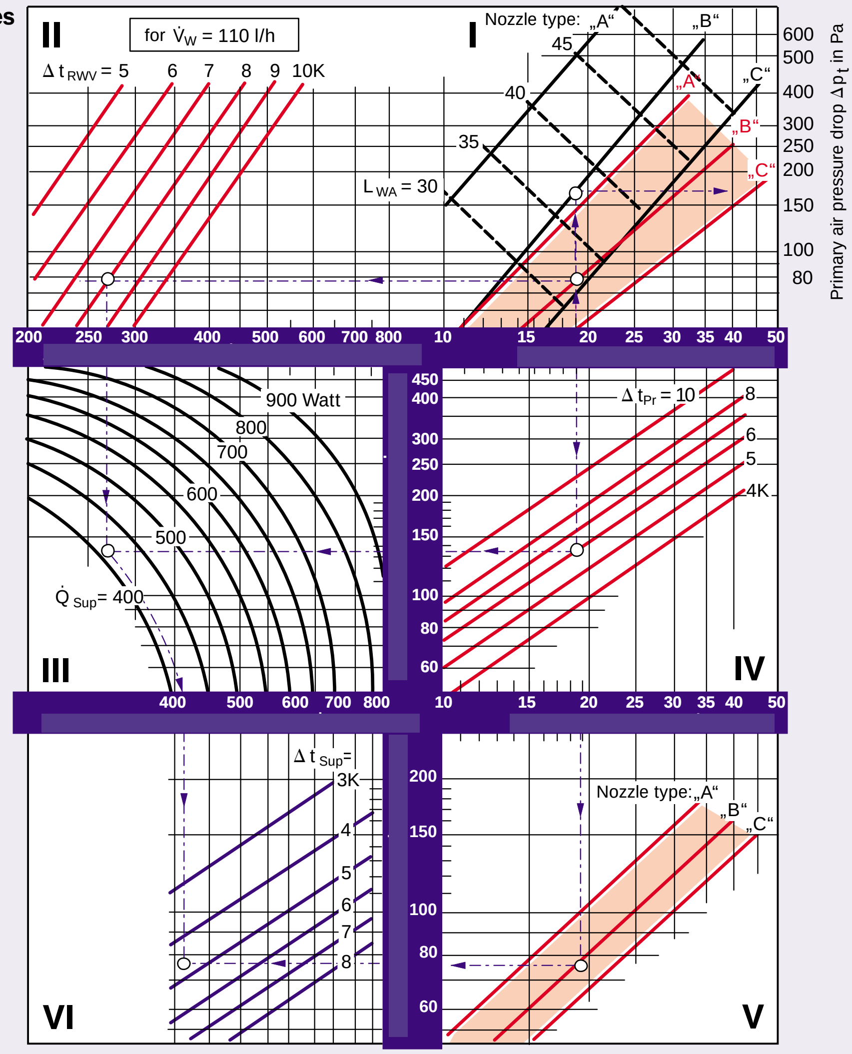
Nomenclature

$\dot{Q}_{Sup}$ in Watt: Total cooling capacity $\dot{Q}_{Pr} + \dot{Q}_S$
$\dot{Q}_{Pr}$ in Watt: Cooling capacity primary air
$\dot{Q}_S$ in Watt: Cooling capacity secondary air
$\dot{V}_{Sup}$ in l/s: Supply air volume flow
$\dot{V}_{Pr}$ in l/s: Primary air volume flow
$\dot{V}_W$ in l/h: Chilled water volume flow
Δt_{Sup} in K: Temperature difference between room air t_R and supply air t_{Sup}
Δt_{Pr} in K: Temperature difference between room air t_R and primary air t_{Pr}
Δt_{RWV} in K: Temperature difference between room air t_R and water supply t_{WV}
Δp_t in Pa: Primary air pressure drop
Δp_W in kPa: Water pressure drop
L_{WA} in dB(A): A-weighted sound power level



Water Side Pressure Drop and Correction Values for other Water Volume Flows (Δt_{RWV} = const)

$\dot{V}_W$ [l/h]	80	90	100	110	120	130	140
$\dot{Q}_S$ [W] x	0,86	0,91	0,95	1,00	1,03	1,07	1,11



Example:

Given:

Unit DID L_N = 900 mm
Sound pressure level max L_{WA} = 40 dB(A)
Primary air volume flow $\dot{V}_{Pr}$ = 19 l/s
Room air temperature t_R = 24 °C
Primary air temperature t_{Pr} = 18 °C
Water supply temperature t_{WV} = 16 °C

Solution:

From Diagram I:
Nozzle type „B“
Sound pressure level L_{WA} = 38 dB(A)
Pressure drop Δp_t = 160 Pa

From Diagram IV:
At Δt_{Pr} = 24 – 18 = 6 K
Primary cooling capacity $\dot{Q}_{Pr}$ = 136 Watt

From Diagrams I and II:
At Δt_{RWV} = 24 – 16 = 8 K
Secondary cooling capacity $\dot{Q}_S$ = 275 Watt

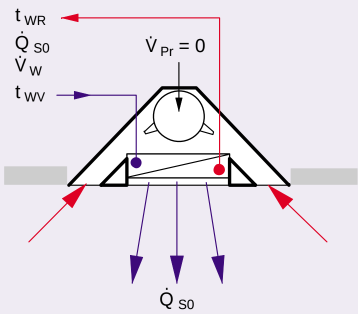
From Diagrams II and III:
Supply air cooling capacity $\dot{Q}_{Sup}$ = 411 Watt

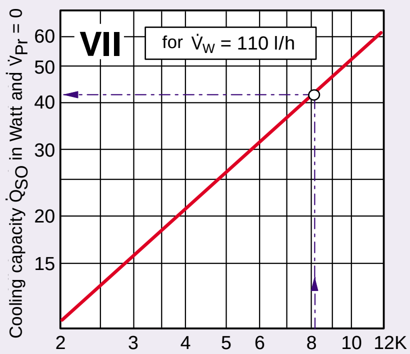
From Table:
For $\dot{V}_W$ = 110 l/h
Water pressure drop Δp_W = 1.11 kPa

From Diagram V:
Supply air volume flow $\dot{V}_{Sup}$ = 78 l/s

From Diagrams V and VI:
Temperature difference Δt_{Sup} = 4.5 K

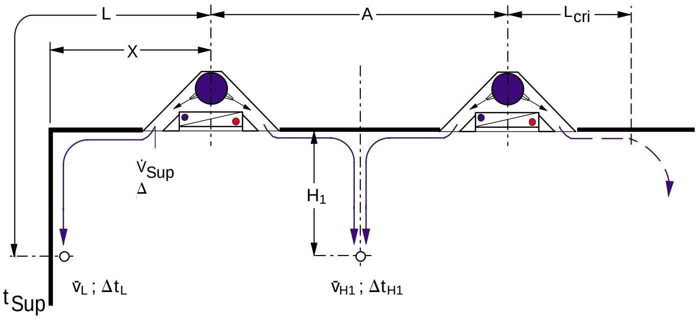
From Diagram VII:
At $\dot{V}_{Pr}$ = 0 and Δt_{RWV} = 8 K
Cooling capacity $\dot{Q}_{S0}$ = 42 Watt

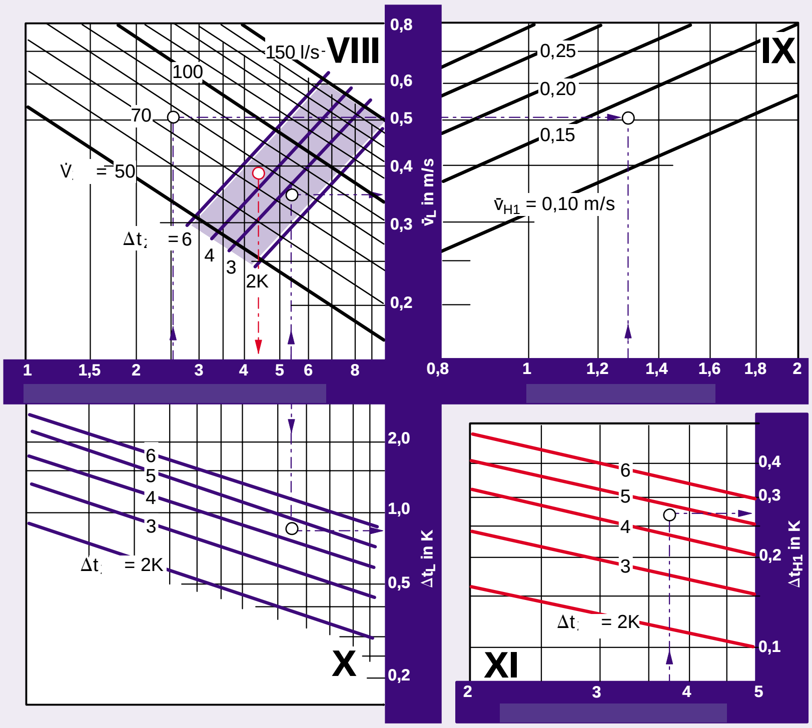




Nomenclature

$\dot{V}_{Sup}$ in l/s: Supply air volume flow (from Diagram V)
L in m: Distance horizontal + vertical ($X + H_1$) discharge to the wall
L_{crit} in m: Horizontal distance from diffuser at which air jet leaves ceiling
A in m: Spacing between 2 diffusers
$\bar{v}_L$ in m/s: Air velocity at distance L
$\bar{v}_{H1}$ in m/s: Air velocity at distance H_1
Δt_{Sup} in K: Temperature difference between room air t_R and supply air t_{Sup}
Δt_L in K: Temperature difference between room air t_R and jet t_L
Δt_{H1} in K: Temperature difference between room air t_R and jet t_{H1}





Example:

Given:

Unit DID L_N = 900 mm
Nozzle type „B"
Distance from diffuser to wall X = 4.0 m
Distance between diffusers A = 5.0 m
Distance from ceiling H_1 = 1.3 m

From Diagram V:
Supply air volume flow $\dot{V}_{Sup}$ = 78 l/s

From Diagram VI:
Temperature difference Δt_{Sup} = 4.5 K

Solution:

From Diagram VIII:
Air velocity at wall
at L = 4.0 + 1.3 = 5.3 m $\bar{v}_L$ = 0.35 m/s

From Diagram VIII:
At $\dot{V}_{Sup}$ = 78 l/s and Δt_{Sup} = 4.5 K
L_{crit} = 4.6 m > X

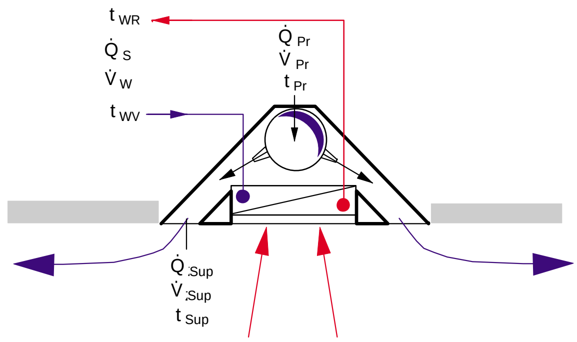
From Diagrams VIII and IX:
Air velocity between diffusers
at A/2 = 2.5 m; H_1 = 1.3 m; $\bar{v}_{H1}$ = 0.14 m/s

From Diagram X:
Temperature difference Δt_L = 0.9 K

From Diagram XI:
Temperature difference Δt_{H1} = 0.26 K

Nomenclature

$\dot{Q}_{Sup}$ in Watt: Total cooling capacity $\dot{Q}_{Pr} + \dot{Q}_S$
$\dot{Q}_{Pr}$ in Watt: Cooling capacity primary air
$\dot{Q}_S$ in Watt: Cooling capacity secondary air
$\dot{V}_{Sup}$ in l/s: Supply air volume flow
$\dot{V}_{Pr}$ in l/s: Primary air volume flow
$\dot{V}_W$ in l/h: Cold water volume flow
Δt_{Sup} in K: Temperature difference between room air t_R and supply air t_{Sup}
Δt_{Pr} in K: Temperature difference between room air t_R and primary air t_{Pr}
Δt_{RWV} in K: Temperature difference between room air t_R and water supply t_{WV}
Δp_t in Pa: Primary air pressure drop
Δp_W in kPa: Water pressure drop
L_{WA} in dB(A): A-weighted sound power level



Water Side Pressure Drop and Correction Values for other Water Volume Flows (Δt_{RWV} = const)

$\dot{V}_W$ [l/h]	80	90	100	110	120	130	140
$\dot{Q}_S$ [W] x	0,86	0,91	0,95	1,00	1,03	1,07	1,11

Example:

Given:

Unit DID L_N = 1200 mm
Sound pressure level max L_{WA} = 40 dB(A)
Primary air volume flow $\dot{V}_{Pr}$ = 20 l/s
Room air temperature t_R = 24 °C
Primary air temperature t_{Pr} = 18 °C
Water supply temperature t_{WV} = 16 °C

Solution:

From Diagram I:
Nozzle type „A“
Sound pressure level L_{WA} = 40 dB(A)
Pressure drop Δp_t = 323 Pa

From Diagram IV:
At Δt_{Pr} = 24 – 18 = 6 K
Primary cooling capacity $\dot{Q}_{Pr}$ = 144 Watt

From Diagrams I and II:
At Δt_{RWV} = 24 – 16 = 8 K
Secondary cooling capacity $\dot{Q}_S$ = 377 Watt

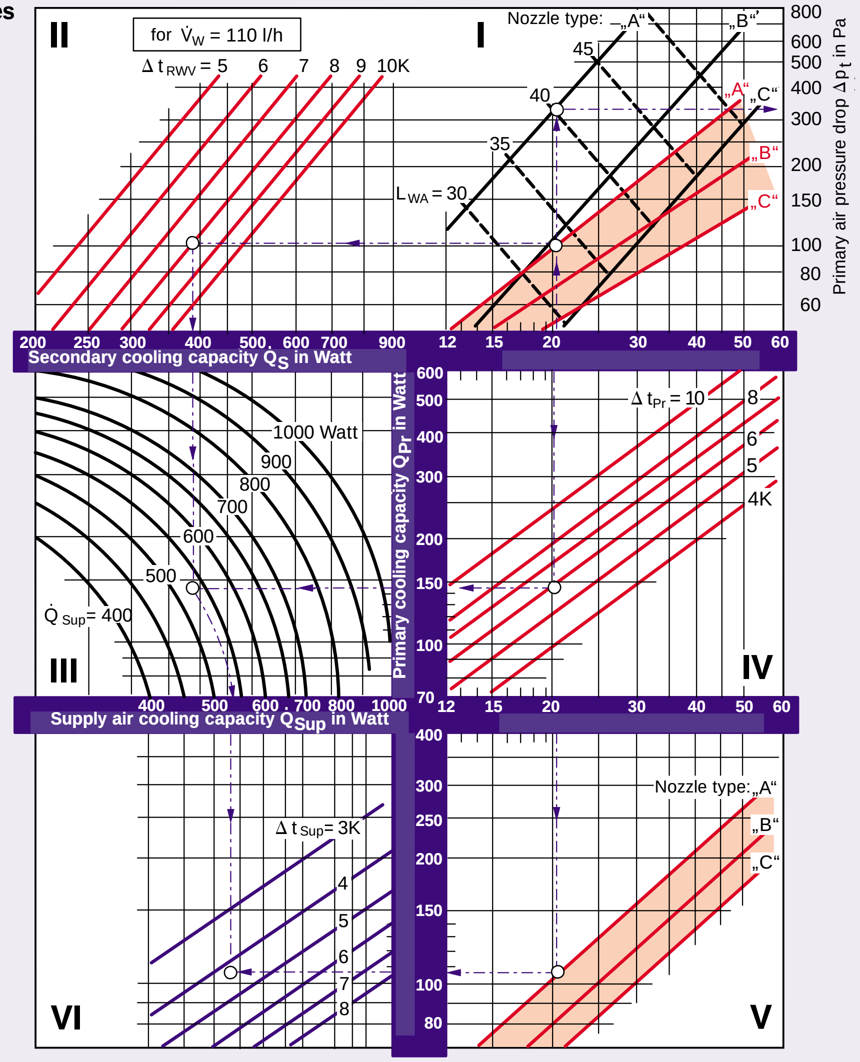
From Diagrams II and III:
Supply air cooling capacity $\dot{Q}_{Sup}$ = 521 Watt

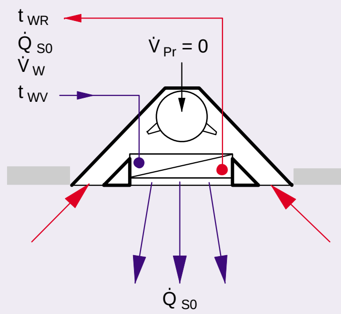
From Table:
For $\dot{V}_W$ = 110 l/h
Water pressure drop Δp_W = 1.48 kPa

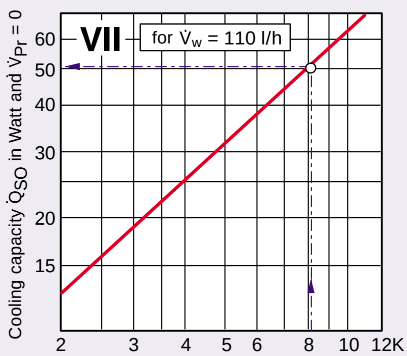
From Diagram V:
Supply air volume flow $\dot{V}_{Sup}$ = 106 l/s

From Diagrams V and VI:
Temperature difference Δt_{Sup} = 4.1 K

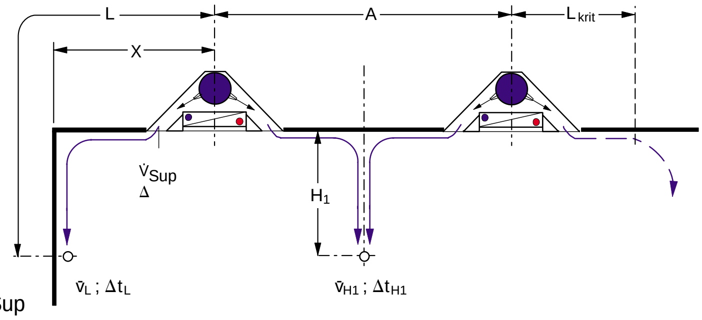
From Diagram VII:
At $\dot{V}_{Pr}$ = 0 and Δt_{RWV} = 8 K
Cooling capacity $\dot{Q}_{S0}$ = 50 Watt







Nomenclature



$\dot{V}_{Sup}$ in l/s: Supply air volume flow (from Diagram V)

L in m: Distance horizontal + vertical ($X + H_1$) discharge to the wall

L_{crit} in m: Horizontal distance from diffuser at which air jet leaves ceiling

A in m: Spacing between 2 diffusers

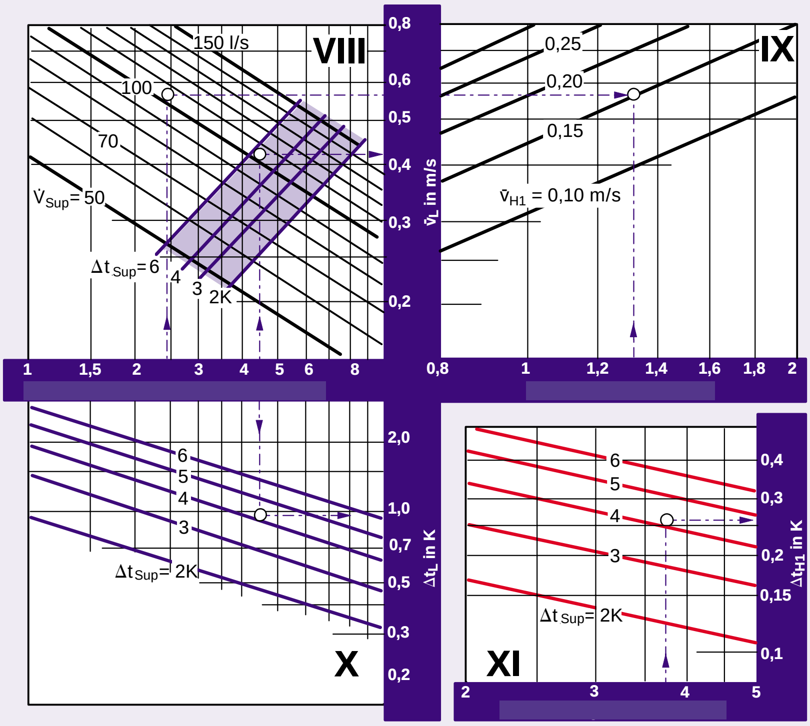
$\bar{v}_L$ in m/s: Air velocity at distance L

$\bar{v}_{H1}$ in m/s: Air velocity at distance H_1

Δt_{Sup} in K: Temperature difference between room air t_R and supply air t_{Sup}

Δt_L in K: Temperature difference between room air t_R and jet t_L

Δt_{H1} in K: Temperature difference between room air t_R and jet t_{H1}



Example:

Given:

Unit DID L_N = 1200 mm

Nozzle type „B“

Distance from diffuser to wall	X = 3.0 m
Distance between diffusers	A = 5.0 m
Distance from ceiling	H_1 = 1.3 m

From Diagram V:

Supply air volume flow $\dot{V}_{Sup}$ = 106 l/s

From Diagram VI:

Temperature difference Δt_{Sup} = 4.1 K

Solution:

From Diagram VIII:

Air velocity at wall
at L = 3.0 + 1.3 = 4.3 m $\bar{v}_L$ = 0.42 m/s

From Diagrams VIII and IX:

Air velocity between diffusers
at A/2 = 2.5 m; H_1 = 1.3 m; $\bar{v}_{H1}$ = 0.15 m/s

From Diagram X:

Temperature difference Δt_L = 0.9 K

From Diagram XI:

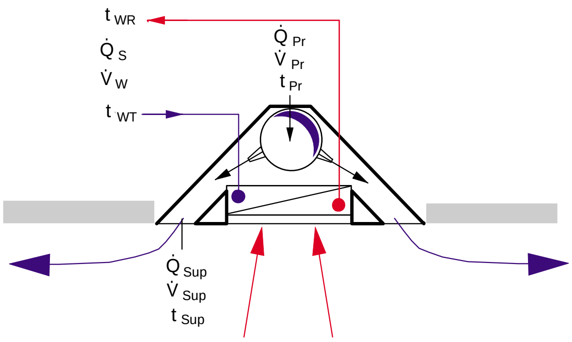
Temperature difference Δt_{H1} = 0.25 K

Technical Data

DID... L_N = 1500

Nomenclature

$\dot{Q}_{Sup}$ in Watt: Total cooling capacity $\dot{Q}_{Pr} + \dot{Q}_S$
$\dot{Q}_{Pr}$ in Watt: Cooling capacity primary air
$\dot{Q}_S$ in Watt: Cooling capacity secondary air
$\dot{V}_{Sup}$ in l/s: Supply air volume flow
$\dot{V}_{Pr}$ in l/s: Primary air volume flow
$\dot{V}_W$ in l/h: Cold water volume flow
Δt_{Sup} in K: Temperature difference between room air t_R and supply air t_{Sup}
Δt_{Pr} in K: Temperature difference between room air t_R and primary air t_{Pr}
Δt_{RWV} in K: Temperature difference between room air t_R and water supply t_{WV}
Δp_t in Pa: Primary air pressure drop
Δp_W in kPa: Water pressure drop
L_{WA} in dB(A): A-weighted sound power level



Water Side Pressure Drop and Correction Values for other Water Volume Flows (Δt_{RWV} = const)

$\dot{V}_W$ [l/h]	80	90	100	110	120	130	140
$\dot{Q}_S$ [W] x	0,86	0,91	0,95	1,00	1,03	1,07	1,11

Example:

Given:

Unit DID L_N = 1500 mm
Sound pressure level max — L_{WA} = 40 dB(A)
Primary air volume flow — $\dot{V}_{Pr}$ = 20 l/s
Room air temperature — t_R = 24 °C
Primary air temperature — t_{Pr} = 18 °C
Water supply temperature — t_{WV} = 16 °C

Solution:

From Diagram I:
Nozzle type „A"
Sound pressure level — L_{WA} = 38 dB(A)
Pressure drop — Δp_t = 210 Pa

From Diagram IV:
At Δt_{Pr} = 24 – 18 = 6 K
Primary cooling capacity — $\dot{Q}_{Pr}$ = 144 Watt

From Diagrams I and II:
At Δt_{RWV} = 24 – 16 = 8 K
Secondary cooling capacity — $\dot{Q}_S$ = 412 Watt

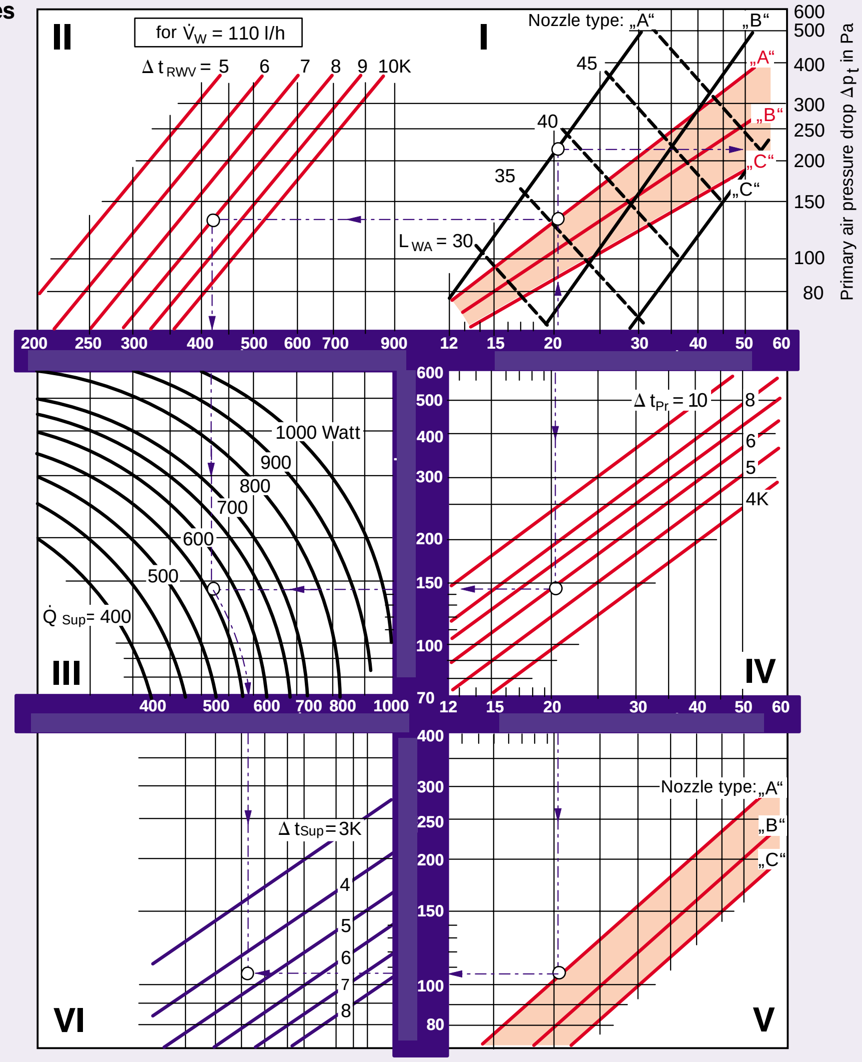
From Diagrams II and III:
Supply air cooling capacity — $\dot{Q}_{Sup}$ = 556 Watt

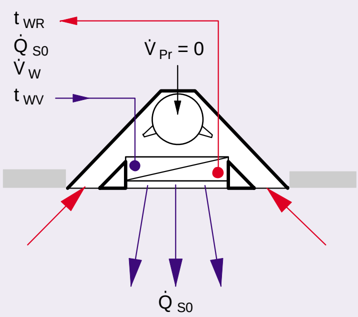
From Table:
For $\dot{V}_W$ = 110 l/h
Water pressure drop — Δp_W = 1.85 kPa

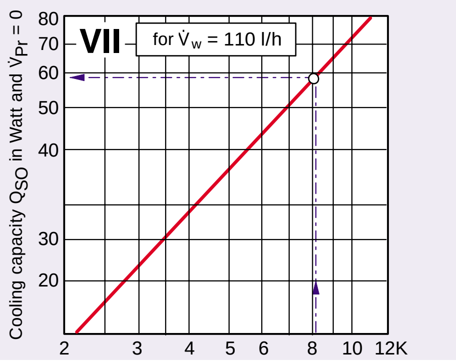
From Diagram V:
Supply air volume flow — $\dot{V}_{Sup}$ = 106 l/s

From Diagrams V and VI:
Temperature difference — Δt_{Sup} = 4.4 K

From Diagram VII:
At $\dot{V}_{Pr}$ = 0 and Δt_{RWV} = 8 K
Cooling capacity — $\dot{Q}_{S0}$ = 58 Watt







Nomenclature

$\dot{V}_{Sup}$ in l/s: Supply air volume flow (from Diagram V)

L in m: Distance horizontal + vertical ($X + H_1$) discharge to the wall

L_{crit} in m: Horizontal distance from diffuser at which air jet leaves ceiling

A in m: Spacing between 2 diffusers

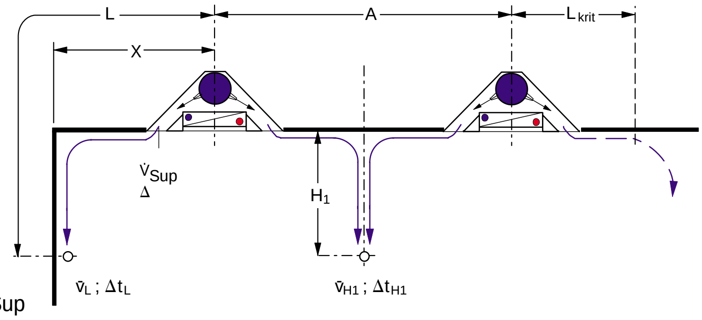
$\bar{v}_L$ in m/s: Air velocity at distance L

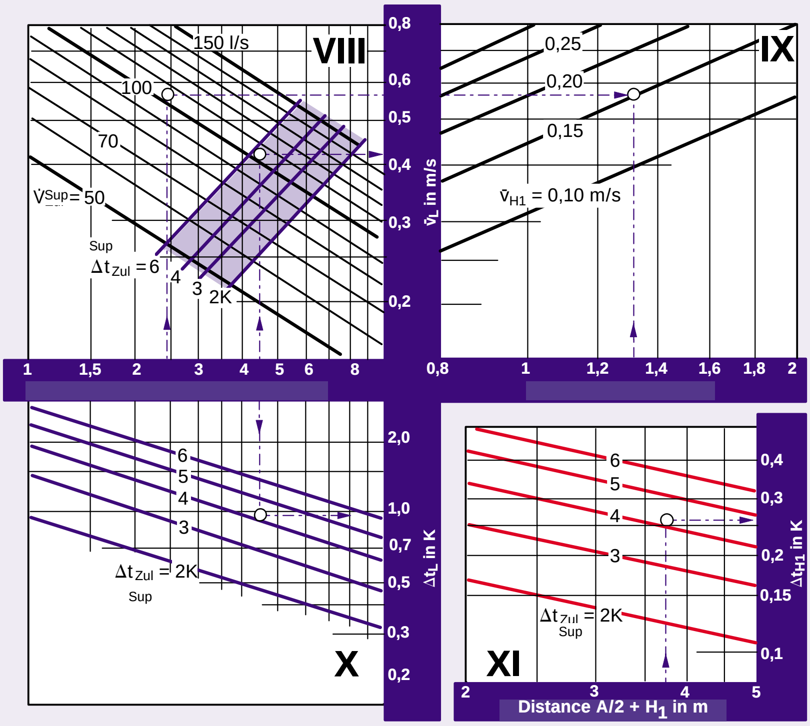
$\bar{v}_{H1}$ in m/s: Air velocity at distance H_1

Δt_{Sup} in K: Temperature difference between room air t_R and supply air t_{Sup}

Δt_L in K: Temperature difference between room air t_R and jet t_L

Δt_{H1} in K: Temperature difference between room air t_R and jet t_{H1}





Example:

Given:

Unit DID L_N = 1500 mm

Nozzle type „A“

Distance from diffuser to wall	X = 3.0 m
Distance between diffusers	A = 5.0 m
Distance from ceiling	H_1 = 1.3 m

From Diagram V:

Supply air volume flow $\dot{V}_{Sup}$ = 106 l/s

From Diagram VI:

Temperature difference Δt_{Sup} = 4.4 K

Solution:

From Diagram VIII:

Air velocity at wall at L = 3.0 + 1.3 = 4.3 m $\bar{v}_L$ = 0.37 m/s

From Diagrams VIII and IX:

Air velocity between diffusers at A/2 = 2.5 m; H_1 = 1.3 m; $\bar{v}_{H1}$ = 0.13 m/s

From Diagram X:

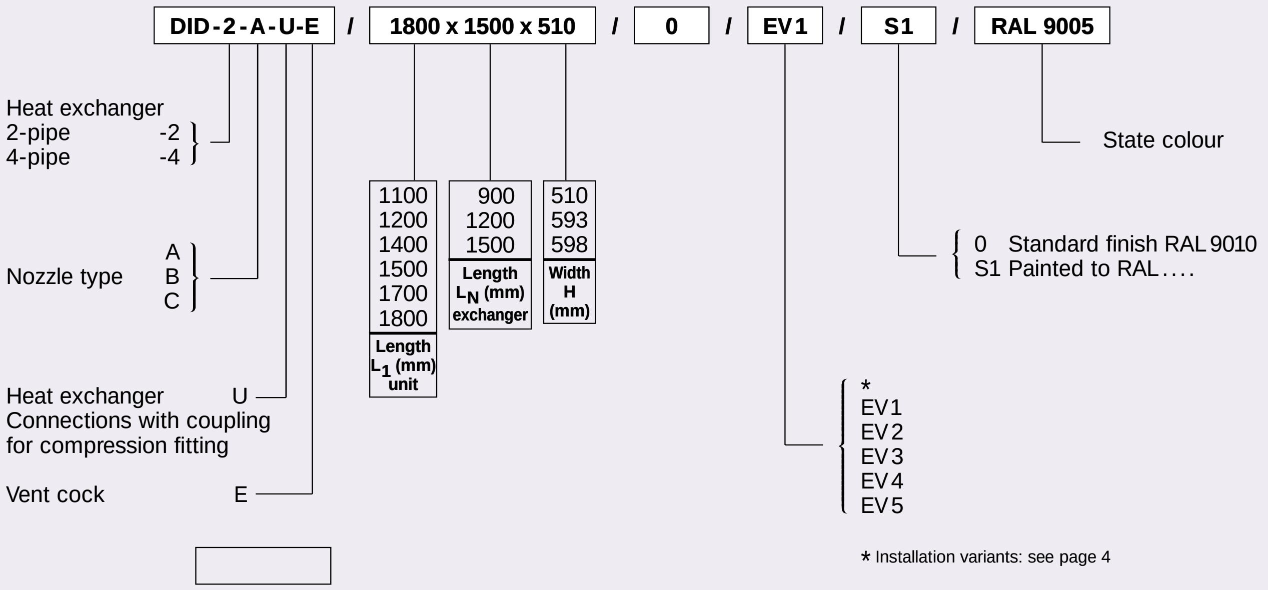
Temperature difference Δt_L = 1.1 K

From Diagram XI:

Temperature difference Δt_{H1} = 0.28 K

Order Details

Order Code



* Installation variants: see page 4

Specification Text

Ceiling induction diffuser type DID suitable for removing high internal thermal loads using a combination of water and air, consists of a trapezoidal casing with an integral air supply duct and nozzles discharging in two directions (different nozzle sizes available).
Under the outlet duct a heat exchanger is centrally fitted, each side steel profiles form two outlet slots which are created between the casing and the sheet steel profile. Below the heat exchanger is a perforated face. The heat exchanger can be used either for cooling or heating (2-pipe system) or for cooling and heating (4-pipe system).
Primary and induced air are mixed in the unit and discharged horizontally via the two-slot diffusers with coanda effect.
A special aluminium profile is mounted on both sides of the housing to create the slot diffuser face. Suspension lugs are provided on the casing for installation, and end angles are mounted on the face.

Materials:
Casing, outlet duct, steel profile and perforated panel of galvanised sheet steel, outlet profile and end angle of aluminium, unit surface white (RAL 9010) powder coated, discharge nozzles of black plastic, heat exchanger with copper pipe and formed aluminium fins.

Order Example

Make: TROX
Type: DID-2-A-U/1800 x 1500 x 510/0/EV1/S1/RAL9005