

LTG Incorporated

Industrial Air Diffuser Type DLD for Heating and Cooling



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Diffusers are decisive in the performance of air conditioning and ventilation systems in rooms

Application

The Industrial Air Diffuser Type DLD has been designed specifically for production buildings characterized by large production equipment with thermal effect caused by high heat loads from machines or an extreme length/width of the hall (Type DLD.../H) where standard ventilation from the hall's side walls will provide insufficient cooling.

This diffuser is however suitable for installation close to the occupied zone (Type DLD.../N and DLD.../K).

Depending on the type, the installation of the Industrial Air Diffuser DLD may be performed either between the craneway and the hall ceiling at a height of 5...12 m or underneath the craneway at a height of 3...5 m.

Advantages

- One diffuser for any installation height providing both cooling and heating.
- Heavy-duty air diffuser with high heating and cooling capacity.
- Large range of adjustment.
- Low air speed in the occupied zone.
- Good penetration into the occupied space in both heating and cooling mode.
- Modular construction meeting individual requirements, e.g. when changing operating conditions.
- Adjustable air jet : electrical, manual or pneumatic actuator.



Industrial Air Diffuser Type DLD with nozzle facing



Industrial Air Diffuser Type DLD

Operation

The air diffuser comprises a cylindrical perforated sheet metal casing and integrated nozzle. The supply air enters the casing through a honeycomb flow guide and is deflected when contacting the interior orifice plate. Thus, the flow pattern is standardized even when branching pieces and elbows are used.

Cooling mode

In the cooling mode, the air is diffused horizontally. A wide radial spreading of the cold air ensures that drafts in the occupied zone are avoided.

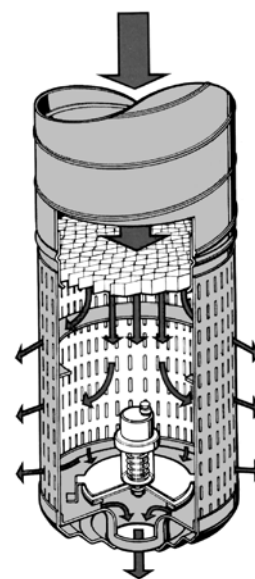
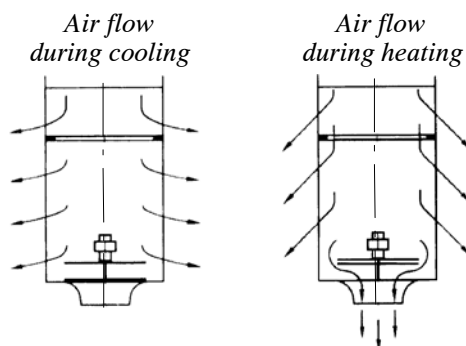
Heating mode

In the heating mode, the air discharged out downwards. An increased flow pulse ensures that the heated air reaches the occupied zone. With a supply air temperature higher than the ambient air temperature, the increased flow pulse is achieved through opening one of the nozzles pointing downwards. The penetration depth may be continuously adjusted depending on the temperature difference between the supply air and the ambient air, thus ensuring good penetration into the occupied zone. Continuous adjustment may be realized manually, pneumatically or electrically.

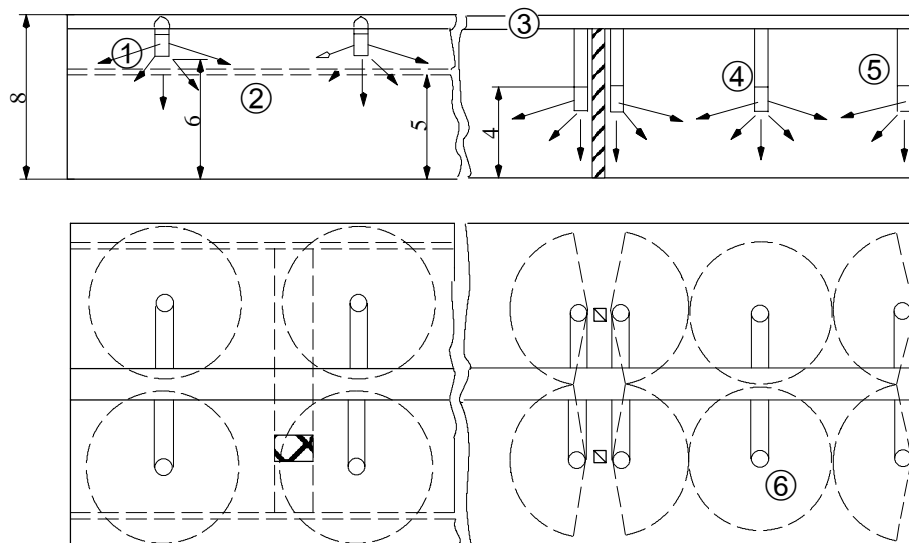
Installation

The diffuser can be mounted on a duct bend or take-off below the main duct.

In addition to plug and flange connections, a METU quick-acting clamping device is also available.



Industrial Air Diffuser Type DLD.../D/..
with nozzle and nozzle facing (option)

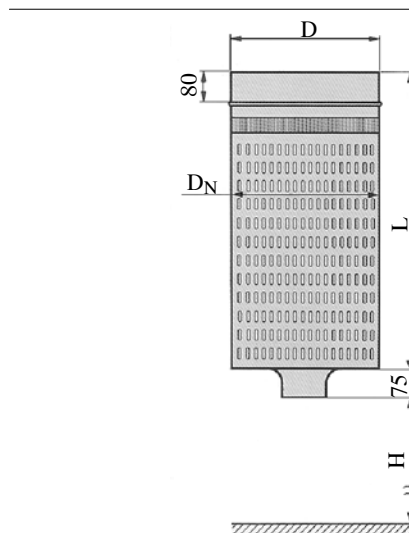


- ① DLD 400D/H/F
- ② craneway
- ③ supply air duct
- ④ DLD 400D/N/F
- ⑤ DLD 400D/N/W
- ⑥ radial air spreading

Industrial Air Diffuser Type DLD

Product range

Size:	Ø 400 mm; Ø 500 mm; Ø 630 mm
Type:	D = with nozzle
Installation height:	H = high (with nozzle) N = low (standard version) K = low (for low-activity workplaces)
Installation type:	F = 360°, freely suspended W = 180°, wall or column mounted
Duct connection:	plug connection flange METU
Surface finish:	powder coated - similar to RAL, galvanized
Adjustment:	manual, pneumatic, electric



Dimensions / Performance data

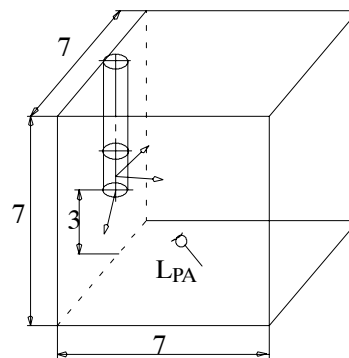
Installation height		DLD.../D/ <u>N</u> /..			
Installation type		400/D/N/ <u>W</u>	500/D/N/ <u>W</u>	400/D/N/ <u>F</u>	500/D/N/ <u>F</u>
Size	D _{Nenn} [mm]	400	500	400	500
Height	L [mm]	770	950	770	950
Connecting diameter	D [mm]	399	499	399	499
Installation height	H [m]	3...5	3...5	3...5	3...5
Recommended flow rate	V [m³/h]	1500...3000	2500...4000	1500...3500	2500...4500
Cooling mode	Δt _{max} [K]	-10	-10	-10	-10
Heating mode	Δt _{max} [K]	20	20	20	20
Installation height		DLD.../D/ <u>K</u> /..			
Installation type		400/D/K/ <u>W</u>	500/D/K/ <u>W</u>	400/D/K/ <u>F</u>	500/D/K/ <u>F</u>
Size	D _{Nenn} [mm]	400	500	400	500
Height	L [mm]	770	950	770	950
Connecting diameter	D [mm]	399	499	399	499
Installation height	H [m]	3...5	3...5	3...5	3...5
Recommended flow rate	V [m³/h]	1000...2500	2000...3500	1000...3000	2500...4000
Cooling mode	Δt _{max} [K]	-10	-10	-10	-10
Heating mode	Δt _{max} [K]	20	20	20	20
Installation height		DLD.../D/ <u>H</u> /..			
Installation type		400/D/H/ <u>W</u>	400/D/H/ <u>F</u>	500/D/H/ <u>F</u>	630/D/H/ <u>F</u>
Size	D _{Nenn} [mm]	400	400	500	630
Height	L [mm]	770	770	950	1085
Connecting diameter	D [mm]	399	399	499	629
Installation height	H [m]	5...7	5...7	7...9	9...12
Recommended flow rate	V [m³/h]	1500...3000	2000...4500	3500...6000	6000...9000
Cooling mode	Δt _{max} [K]	-10	-10	-10	-10
Heating mode	Δt _{max} [K]	20	20	20	20

Industrial Air Diffuser Type DLD

Selection

With a given installation height and flow rate per diffuser, the DLD dimensioning diagram may be used to determine the following values :

- The recommended maximum temperature difference between the supply air and the ambient air in the occupied zone in the heating and cooling mode.
- The sound power level based on which the sound pressure level may be determined for the occupied zone.
- The static pressure loss for duct system calculation.
- The radial air jet diffusion range.
- The size of the ventilated hall area as a criterion for the arrangement of the air diffusers in the hall. The minimum distance between two diffusers should not be lower than the diffusion range.



$$\begin{aligned}
 T_N &= \text{Reverberation time (abt. 1.5 s)} \\
 V &= \text{Hall segment volume} \\
 L_{PA} &= L_{WA} + 10 \lg T_N - 10 \lg V + 14 \\
 &= L_{WA} + 2 - 25 + 14 \\
 &= L_{WA} - 9 \text{ (acc. to the example given)}
 \end{aligned}$$

Example in the diagram

The example refers to the diagram DLD..../D/N/W on the following page.

Given:

Factory building section (s. sketch)

Depth of section: 7 m

Max. cooling load Q_{Kmax} : 27 kW

Max. heating load Q_{Hmax} : 50 kW
(heating mode)

Installation height H: 3 m

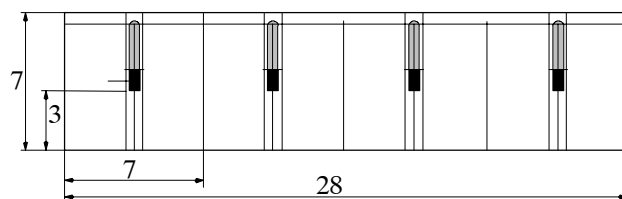


Bild: Aufrißskizze eines Industriehallenabschnitts
Factory building layout

Unknown values:

Flow rate	V	[m ³ /h]
Sound power level	L_{WA}	[dB(A)]
Static pressure loss	Δp	[Pa]
Max. air jet diffusion	A_{max}	[m]
Ventilated hall area	F	[m ²]

1. $H = 3 \text{ m}$

2. $\Delta t_{max} = 16 \text{ K (heating)}$

Reading:

3. $V = 2600 \text{ m}^3/\text{h}$

Max. heating capacity/diffuser Q_{Hmax}

$$= c \cdot \rho \cdot V \cdot \Delta t$$

$$= 1007 \cdot 1.13 \cdot 16 = 13 \text{ kW}$$

Total capacity = 52 kW

= 52 kW < 50 kW → heating mode
O.K.

4. $L_{WA} = 65 \text{ dB(A) /diffuser}$

$$L_{PA} = L_{WA} - 10 \lg 343 + 16 = 56 \text{ dB(A)}$$

5. $\Delta p = 88 \text{ Pa}$

6. $A_{max} = 6.2 \text{ m}$

7. $F = 60.4 \text{ m}^2$

required cooling capacity/diffuser
= 27 kW/4 = 6750 W

8. Selected: $\Delta t = -8 \text{ K}$

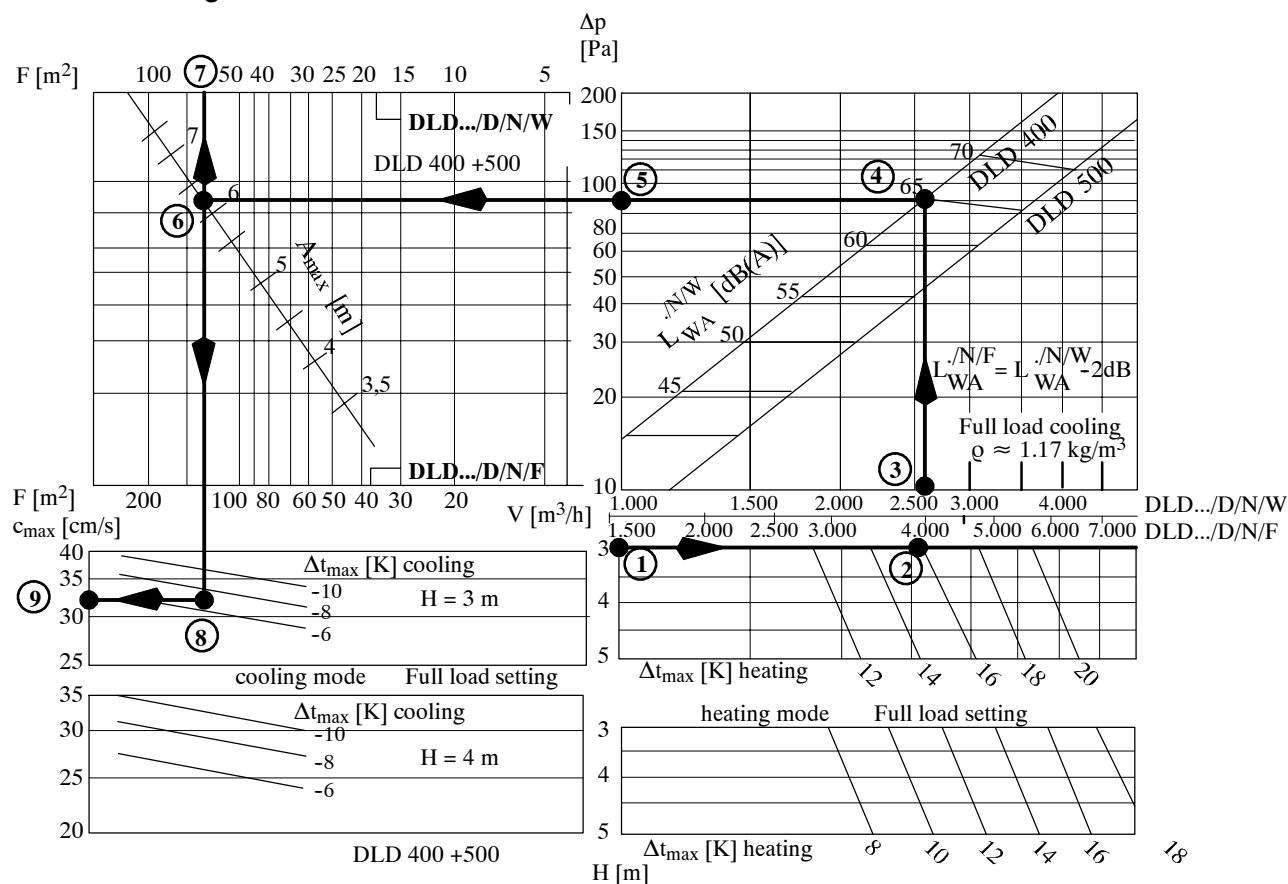
$$Q_{Kmax} = c \cdot \rho \cdot V \cdot \Delta t = 6980 \text{ W}$$

Total cooling capacity = 4 • 6980 W
= 27.9 kW > 27 kW → O.K.

9. $c_{max} = 33 \text{ cm/s (cooling mode)}$

Industrial Air Diffuser Type DLD

Selection diagram DLD .../ D/ N/ ...

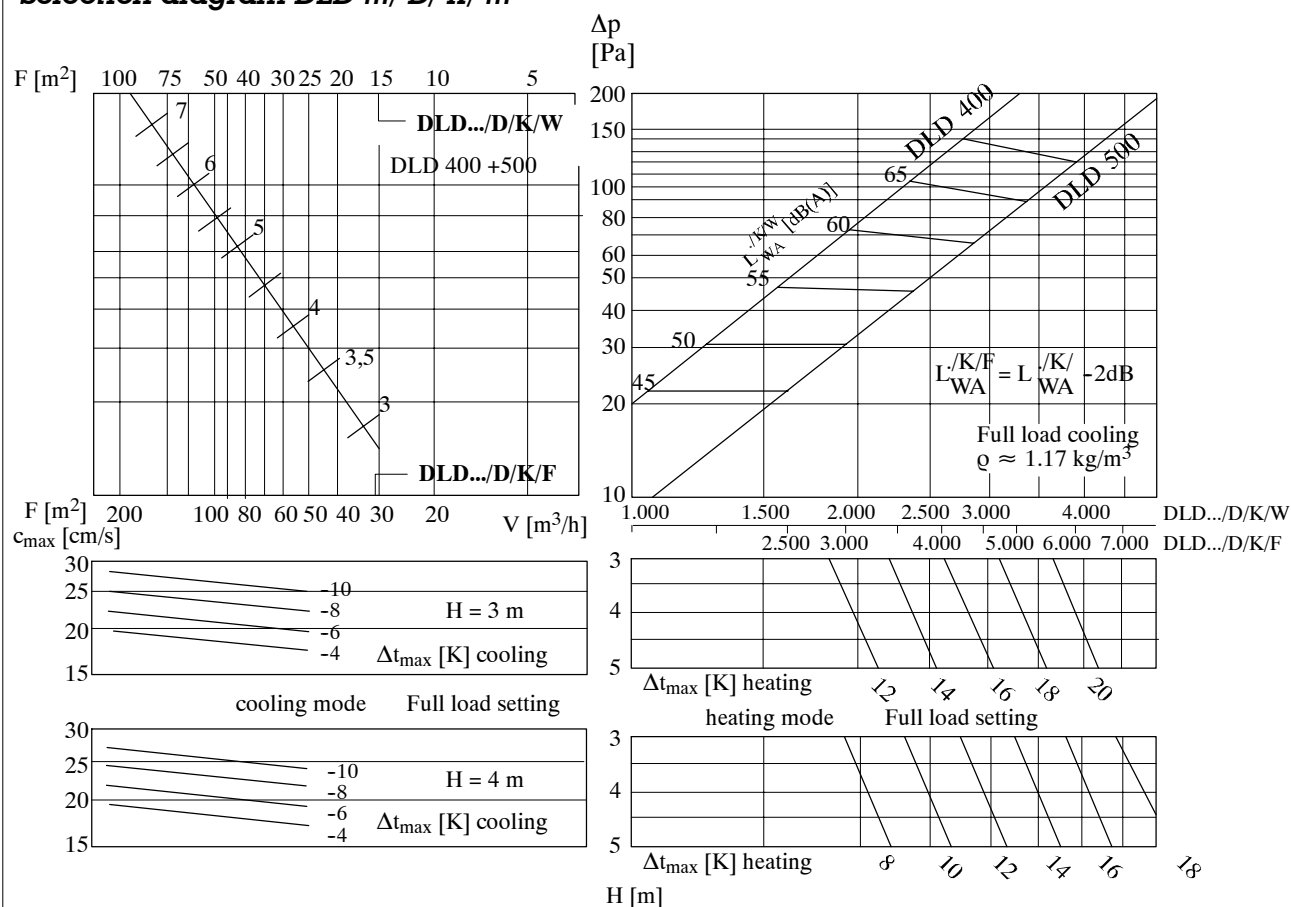


Type DLD.../ D/ N/ ...

The Air Diffusers Type DLD.../D/N/W and .../D/N/F are suitable for low installation heights of 3-5 m and high cooling loads. Sizes 400 and 500 are available with a diffusion angle of 180° for wall/column mounting or alternatively with a diffusion angle of 360° when freely suspended.

Industrial Air Diffuser Type DLD

Selection diagram DLD .../ D/ K/ ...

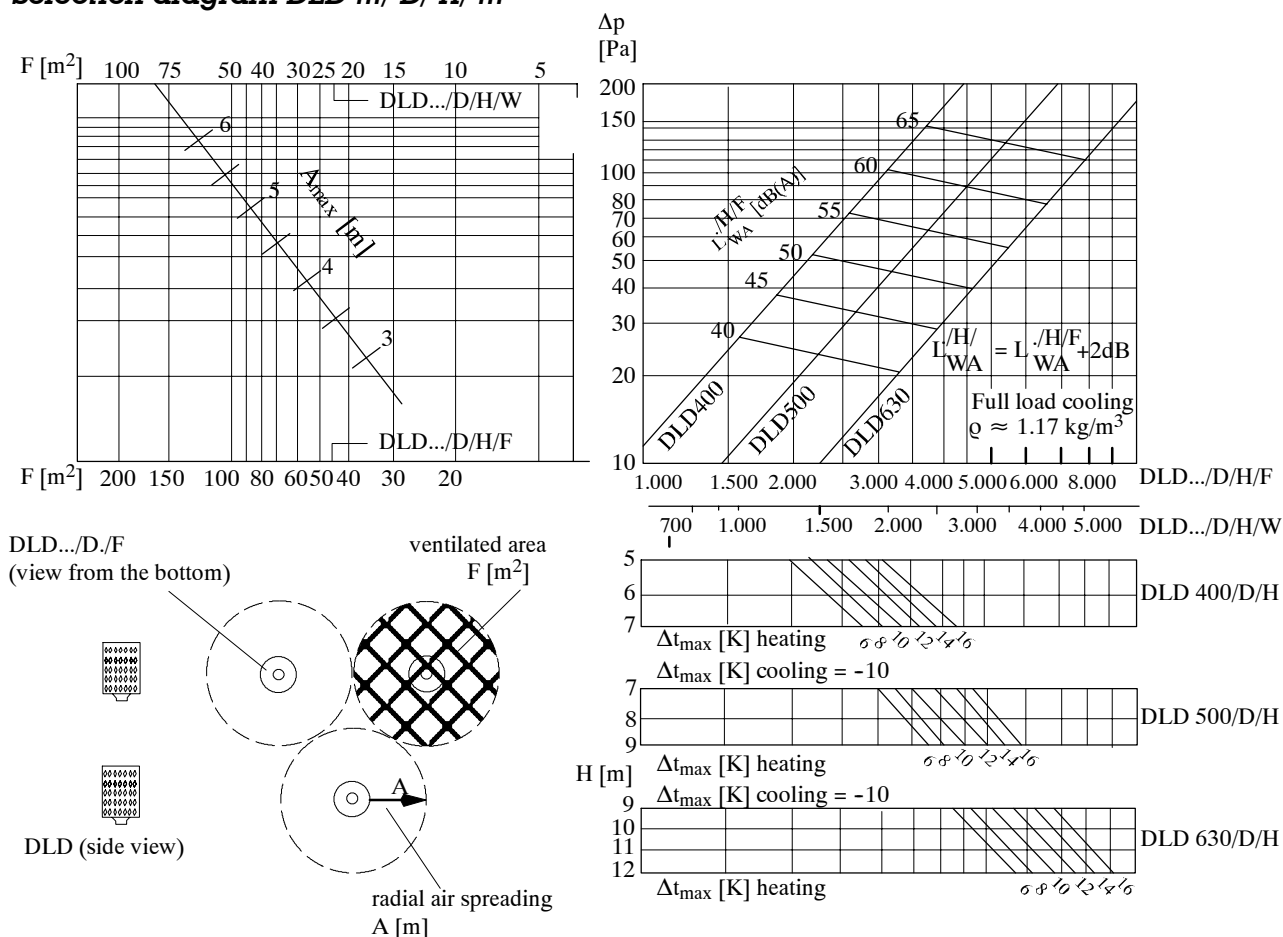


Type DLD.../ D/ K/ ...

The Air Diffusers Type DLD.../D/K/W and .../D/K/F are specifically designed for workplaces with a low activity level and allow very low air speeds in the occupied zone at a low installation height. Sizes 400 and 500 are available with a diffusion angle of 180° or 360°.

Industrial Air Diffuser Type DLD

Selection diagram DLD .../ D/ H/ ...



Type DLD.../ D/ H/ ...

The Air Diffuser Type DLD.../D/H is suitable for significantly higher temperatures of the supply air in the heating mode and for suspension heights of 5 to 12 m, but it may equally be used at lower installation heights in case of high heating loads and low flow rates. Depending on the flow rate, size 400, 500 or 630 may be selected.

Apart from the freely suspended version (Type DLD.../D/H/F) with a diffusion angle of 360°, size 400 is also available in a version for wall/column mounting (Type DLD.../D/H/W) with a diffusion angle of 180°.

Industrial Air Diffuser Type DLD

Air Flow Control Unit

Type LSE

Application

In order to obtain a nearly constant air penetration, while considering the temperature difference between the room air and the supply air, the heating and cooling mode flow directions are automatically controlled.

Operation

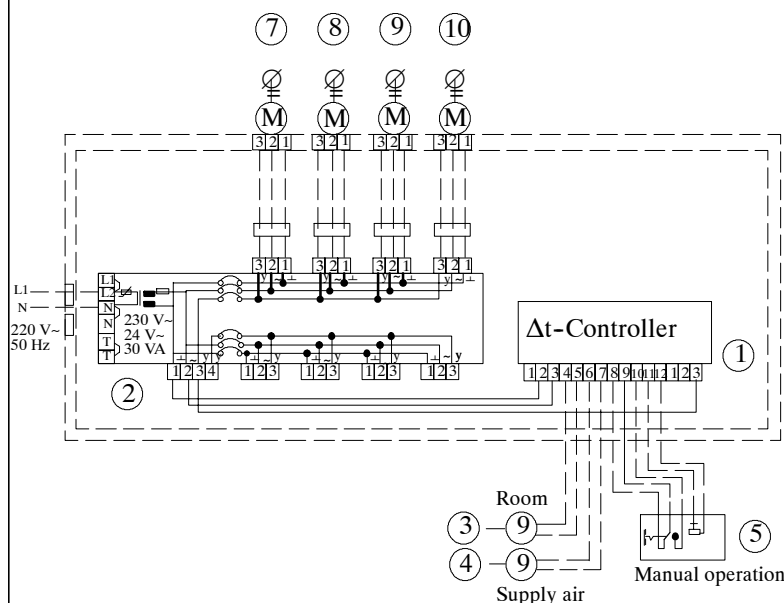
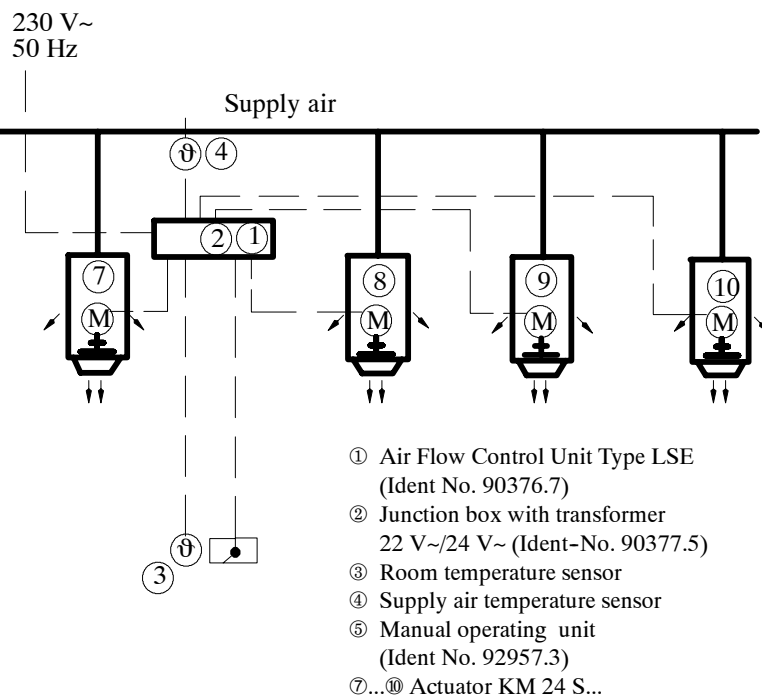
Room temperature and supply air temperature are measured through one sensor each and transmitted to the Air Flow Control Unit LSE capturing and analyzing the analog signals. Depending on the set parameters, an analog output voltage of 0...10 V is released to the DLD diffusers to activate the actuators.

Design

The Air Flow Control Unit LSE comprises a casing for installation in the switch cabinet, a room temperature sensor for installation in the occupied zone and a duct temperature sensor for integration into the supply air run. Wiring is by the installer according to the diagram.

Performance data

Casing:	temperature resistant up to +100 °C.
Protective system:	IP 20
Dimensions:	100 x 75 x 55 mm
Max. temperature difference between room air and supply air	+/- 10 K
Supply voltage:	24 VAC
Analog output:	0...10 Volt DC
Temperature sensor:	Ni 1000



Special version: Transformer and Air Flow Control Unit together in **one** casing, to control up to 4 actuators (Ident No. 92958.1).

Protective system: IP65.

Dimensions: 360 x 200 x 150 mm.

Industrial Air Diffuser Type DLD

Air Flow Control Unit Type LSE

Setting

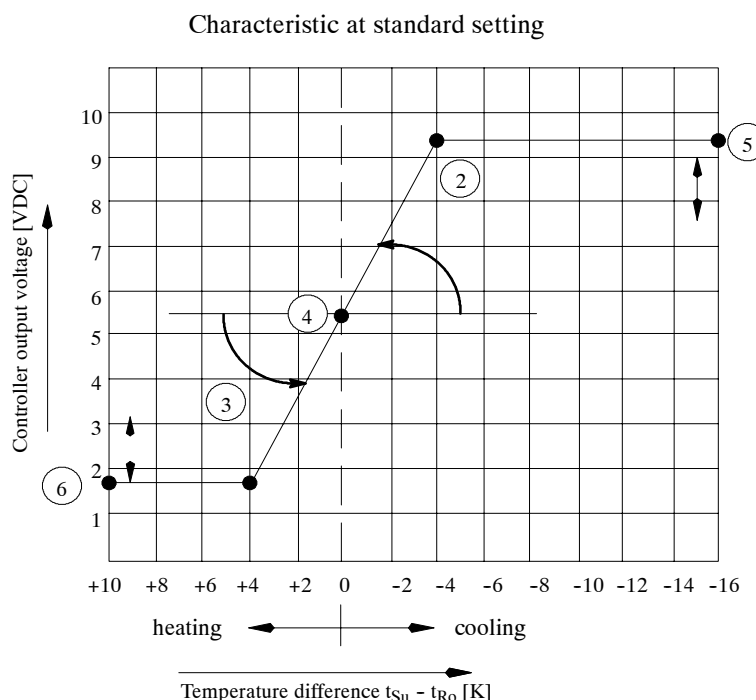
Various potentiometer settings are possible:

- Characteristics for cooling mode and heating mode can be changed.
- Min./max. boundaries of the actuating signal
- Shifting of the characteristic's break-point

Potentiometers are factory-set.

Potentiometer occupancy for characteristic trimming:

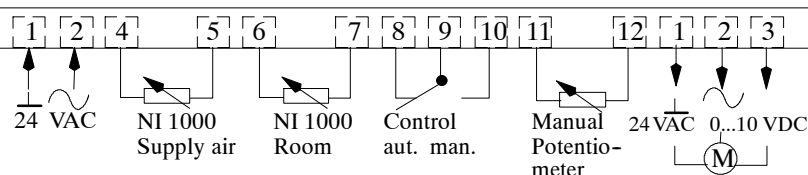
- ① Sensor balancing (compensation of resistance tolerances)
- ② Slope of the upper characteristic (cooling)
- ③ Slope of the lower characteristic (heating)
- ④ Zero shift (isothermal operation)
- ⑤ Variation of full-load setting (cooling)
- ⑥ Variation of full-load limit (heating)



(6) (5) (4) (3) (2) (1)

Potentiometer for characteristic trimming

Air Flow Control Unit type LSE



Industrial Air Diffuser Type DLD

Nomenclature

DLD ... / . / . / . / . / . / . / . / . /

Size:

Ø 400, 500, 630 mm

Type:

D = with nozzle

Installation height:

H = high

N = low (standard)

K = low (for low-activity workplaces)

Installation type:

W = wall-mounted (diffusion angle 180°)

F = freely suspended (diffusion angle 360°)

Duct connection

S = plug connection

F = flange

M = METU (recommended standard)

Adjustment:

mk = manually adjustable with crank (optional)

mv = manually adjustable with conternut (preset)

p = pneumatic 0,2 ... 10 bar)

e = electric (24 VAC)

Surface:

V = galvanized

P = powder coated similar to RAL,
(please indicate color code)

Nozzle facing:

J = with

O = without