LTG Aktiengesellschaft

Industrial Air Diffuser
Type DLD for Heating and Cooling

LTG Aktiengesellschaft
D - 70435 Stuttgart, Grenzstraße 7
+49 (0711) 82 01-180 Fax +49 (0711) 82 01-720
Internet: http://www.LTG-AG.de
E-Mail: info@LTG-AG.de

LTG Incorporated
105 Corporate Drive, Suite E
Spartanburg S.C. 29303 USA
(864) 599-6340 Fax (864) 599-6344
Internet: http://www.LTG-INC.net
E-Mail: info@LTG-INC.net

LTG S.r.l.
Via G. Leopardi 10
I-20066 Melzo
+02 9 55 05 35 Fax 02 9 55 08 28
Internet: http://www.LTG-SRL.com
E-Mail: info@LTG-SRL.com

DLD-E-TP-01 (07/03) 419-33
Components for Room Air Technology

**Germany**
Central Office (Frankfurt)
Sonntagstr. 27, D-60386 Frankfurt
(+069) 94 20 19-0, Fax -10
E-mail: Schilling@LTG-AG.de

Central Office (Herborn)
Sperberweg 16, D-35745 Herborn
(+02772) 570-725, Fax -727
E-mail: Hartmann@LTG-AG.de

Northern Office
Mesen 5, D-22113 Oststeinbek
(+040) 7 13 84 85, Fax 7 13 82 55
E-mail: Heinsch@LTG-AG.de

Southern Office
Grenzstraße 7, D-70435 Stuttgart
(+0711) 8201-180, Fax -720
E-mail: Gau@LTG-AG.de

Western Office
Demagstr. 47a, D-40597 Düsseldorf
(+0211) 71866-13, Fax -39
E-mail: Joswig@LTG-AG.de

**Austria**

*KTG Klimatechnische Gesellschaft mbH*
Autokaderstraße 31, A-1210 Wien
(+01) 2 70 25 90
Fax (01) 2 70 25 90 20
E-mail: info@ktg-wien.com

**France**

*INNTEK*
18, Avenue Gabriel Péri
F-78360 Montesson
(+01) 30 15 16 16, Fax (01) 30 15 16 17
E-mail: INNTEC.AC@wanadoo.fr

**Great Britain**

*MAP Motorised Air Products Ltd.*
Unit 5A, Sopwith Crescent
Wickford Business Park Wickford
GB-Essex SS11 8YU
(+01268) 57 44 42, Fax (01268) 57 44 43
E-mail: info@mapuk.com

**Poland**

*HTK Went Sp.z.o.o.*
ul. Chopina 13/3, Pl-30047 Krakow
(+012) 632 31 32, Fax (012) 632 81 93
E-mail: info@htk-went.pl

Components for Room Air Technology

**Portugal**

*Argelo S. A.*
R. Luis Pastor de Macedo, Lote 28 B,
P-1750-158 Lisboa
(+21) 752 01 20, Fax (+21) 752 01 29
E-mail: info@argelo.pt

**Slovenia**

*Energo Plus*
Kopriska 108 d
SLO-1000 Ljubljana
(+01) 200 73 67, Fax (+01) 42 33 346
E-mail: info@energoplus.si

**Turkey**

*Step Müh. Yapı Ltd.*
Yali Yolu Sok. Turanlı Apt. No: 24 D.1
TR-81110 Bostancı-Istanbul
(+0216) 445 2931, Fax (+0216) 445 2505
E-mail: info@stepyapi.com.tr

The Program for Room Air Technology Components

Air diffusers for walls, floors and ceilings - "LTG System clean®", Coandatrol® and Coandavent® air diffusers - LTG cool wave® chilling fans - Klimavent® induction units - Raumluf® fan coil units - Facade fan coil units - Airflow control units - labair® system

Engineering services

Technical services for investors, architects, engineers and plant builders during design, construction and operation of buildings. Reliable and precise data relating to the ventilation of air conditioning system are given already before realization of the project, determined by measurements, calculations, building simulations and experiments.

Components for Process Air Technology

**Japan**

*Toho Engineering Co. Ltd.*
14-11, Shimizu 3-Chome, Kitu Ku
Japan 462 Nagoya
(+052) 991-10 40, Fax (+052) 9 14-98 22
E-mail: main@tohoeng.com

The Program for Process Air Technology Components

Axial-flow, centrifugal and tangential fans - Collector system for: coarse and fine particle filtration, separating and compacting, compressing and humidifying.

Engineering services

Technical services for construction engineers and plant designers during development and operation of assembly groups, machines and plants.
**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

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 draft phenomena in the occupied zone are avoided.

Heating mode
In the heating mode, the air is discharged 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

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

## Dimensions / Performance data

### Installation height

<table>
<thead>
<tr>
<th>Installation height</th>
<th>DLD.../D/N...</th>
<th>DLD.../D/H...</th>
<th>DLD.../D/K...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Installation type</strong></td>
<td><strong>400/D/N/W</strong></td>
<td><strong>500/D/N/W</strong></td>
<td><strong>400/D/K/F</strong></td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>DNenn [mm]</td>
<td>400</td>
<td>500</td>
</tr>
<tr>
<td><strong>Height</strong></td>
<td>L [mm]</td>
<td>770</td>
<td>950</td>
</tr>
<tr>
<td><strong>Connecting diameter</strong></td>
<td>D [mm]</td>
<td>399</td>
<td>499</td>
</tr>
<tr>
<td><strong>Installation height</strong></td>
<td>H [m]</td>
<td>3.5</td>
<td>3.5</td>
</tr>
<tr>
<td><strong>Recommended flow rate</strong></td>
<td>V [m³/h]</td>
<td>1500...3000</td>
<td>2500...4000</td>
</tr>
<tr>
<td><strong>Cooling mode</strong></td>
<td>Δtmax [K]</td>
<td>-10</td>
<td>-10</td>
</tr>
<tr>
<td><strong>Heating mode</strong></td>
<td>Δtmax [K]</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

### Installation height

<table>
<thead>
<tr>
<th>Installation height</th>
<th>DLD.../D/H...</th>
<th>DLD.../D/K...</th>
<th>DLD.../D/N...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Installation type</strong></td>
<td><strong>400/D/H/W</strong></td>
<td><strong>500/D/H/F</strong></td>
<td><strong>400/D/K/F</strong></td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>DNenn [mm]</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td><strong>Height</strong></td>
<td>L [mm]</td>
<td>770</td>
<td>950</td>
</tr>
<tr>
<td><strong>Connecting diameter</strong></td>
<td>D [mm]</td>
<td>399</td>
<td>399</td>
</tr>
<tr>
<td><strong>Installation height</strong></td>
<td>H [m]</td>
<td>5.7</td>
<td>5.7</td>
</tr>
<tr>
<td><strong>Recommended flow rate</strong></td>
<td>V [m³/h]</td>
<td>1500...3000</td>
<td>2000...4500</td>
</tr>
<tr>
<td><strong>Cooling mode</strong></td>
<td>Δtmax [K]</td>
<td>-10</td>
<td>-10</td>
</tr>
<tr>
<td><strong>Heating mode</strong></td>
<td>Δtmax [K]</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>
**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.

**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 \( Q_{K_{\text{max}}} \): 27 kW
Max. heating load \( Q_{H_{\text{max}}} \): 50 kW

Installation height \( H \): 3 m

**Factory building layout**

Unknown values:
Flow rate \( V \) [m³/h]
Sound power level \( L_{WA} \) [dB(A)]
Static pressure loss \( \Delta p \) [Pa]
Max. air jet diffusion \( A_{\text{max}} \) [m]
Ventilated hall area \( F \) [m²]

1. \( H = 3 \) m
2. \( \Delta t_{\text{max}} = 16 \) K (heating)

Reading:
3. \( V = 2600 \, \text{m}^3/\text{h} \)
   Max. heating capacity/diffuser \( Q_{H_{\text{max}}} \)
   \[ = c \cdot q \cdot V \cdot \Delta t \]
   \[ = 1007 \cdot 1.13 \cdot 16 = 13 \, \text{kW} \]
   Total capacity = 52 kW
   \[ = 52 \, \text{kW} < 50 \, \text{kW} \] (heating mode)
   O.K.
4. \( L_{WA} = 65 \, \text{dB(A)} \) /diffuser
   \( L_{PA} = L_{WA} + 10 \, \lg T_{\text{N}} - 10 \, \lg V + 14 \)
   \[ = L_{WA} + \frac{2 - 25 + 14}{10} \]
   \[ = L_{WA} - 9 \, \text{(acc. to the example given)} \]
5. \( \Delta p = 88 \, \text{Pa} \)
6. \( A_{\text{max}} = 6.2 \, \text{m} \)
7. \( F = 60.4 \, \text{m}^2 \)

required cooling capacity/diffuser
\[ = 27 \, \text{kW} / 4 = 6750 \, \text{W} \]
8. Selected: \( \Delta t = -8 \, \text{K} \)
   \( Q_{K_{\text{max}}} = c \cdot q \cdot V \cdot \Delta t \)
   \[ = 6980 \, \text{W} \]
   Total cooling capacity = 4 \cdot 6980 \, \text{W}
   \[ = 27.9 \, \text{kW} > 27 \, \text{kW} \]
   O.K.
9. \( c_{\text{max}} = 33 \, \text{cm/s} \) (cooling mode)
**Industrial Air Diffuser Type DLD**

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

<table>
<thead>
<tr>
<th>H [m]</th>
<th>Δt_{max} [K] cooling</th>
<th>Δt_{max} [K] heating</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>-10</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>-8</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>-6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F [m²]</th>
<th>ε_{max} [cm/s]</th>
<th>V [m³/h]</th>
<th>Δp [Pa]</th>
<th>LWA [dB]</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>50</td>
</tr>
<tr>
<td>100</td>
<td>200</td>
<td>200</td>
<td>100</td>
<td>50</td>
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<tr>
<td>50</td>
<td>300</td>
<td>300</td>
<td>80</td>
<td>45</td>
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<tr>
<td>40</td>
<td>400</td>
<td>400</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>30</td>
<td>500</td>
<td>500</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>25</td>
<td>600</td>
<td>600</td>
<td>40</td>
<td>25</td>
</tr>
<tr>
<td>20</td>
<td>700</td>
<td>700</td>
<td>30</td>
<td>20</td>
</tr>
</tbody>
</table>

**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/ ...**

<table>
<thead>
<tr>
<th>F [m²]</th>
<th>100</th>
<th>75</th>
<th>50</th>
<th>40</th>
<th>30</th>
<th>20</th>
<th>15</th>
<th>10</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>V [m³/h]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cₘₐₓ [cm/s]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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/ ...**

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)

**Characteristic at standard setting**

![Characteristic Graph]

**Potentiometer for characteristic trimming**

**Air Flow Control Unit type LSE**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 VAC</td>
<td>NI 1000 Supply air</td>
<td>NI 1000 Room</td>
<td>Control aut. man.</td>
<td>Manual Potentiometer</td>
<td>24 VAC 0...10 VDC</td>
</tr>
</tbody>
</table>

**Controller output voltage [VDC]**

- Heating
- Cooling

Temperature difference $t_{Su} - t_{Ro}$ [K]

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Grenzstraße 7  D-70435 Stuttgart  
E-Mail: info@LTG-AG.de  
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Former editions are invalid  
Subject to technical modifications.
### Industrial Air Diffuser Type DLD

#### Nomenclature

<table>
<thead>
<tr>
<th>Size:</th>
<th>Ø 400, 500, 630 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type:</td>
<td>D = with nozzle</td>
</tr>
<tr>
<td>Installation height:</td>
<td>H = high, N = low (standard), K = low (for low-activity workplaces)</td>
</tr>
<tr>
<td>Installation type:</td>
<td>W = wall-mounted (diffusion angle 180°), F = freely suspended (diffusion angle 360°)</td>
</tr>
<tr>
<td>Duct connection</td>
<td>S = plug connection, F = flange, M = METU (recommended standard)</td>
</tr>
<tr>
<td>Adjustment:</td>
<td>mk = manually adjustable with crank (optional), mv = manually adjustable with conternut (preset), p = pneumatic 0.2 ... 10 bar, e = electric (24 VAC)</td>
</tr>
<tr>
<td>Surface:</td>
<td>V = galvanized, P = powder coated similar to RAL, (please indicate color code)</td>
</tr>
<tr>
<td>Nozzle facing:</td>
<td>J = with, O = without</td>
</tr>
</tbody>
</table>
**Industrial Air Diffuser Type DLD**

*Specification and Schedule of Prices*

<table>
<thead>
<tr>
<th>Qty</th>
<th>Description</th>
<th>Unit price €</th>
<th>Total €</th>
</tr>
</thead>
</table>

**Features:**
Industrial air diffuser for heating and cooling halls at installation heights of 3 to 12 m.

**Cooling:**
In the cooling mode, the air is blown out horizontally. Through broad radial spreading of the cold air, drafts in the occupied space are avoided.

**Heating:**
In the heating mode, the air is discharged downwards into the occupied zone. In case of large installation heights, huge excess temperatures of the supplied air during heating or small volume flow rates and low installation heights, the increased flow impulse is achieved by opening a nozzle pointing downward. The penetration depth is infinitely variable depending on the temperature difference between supply and ambient air, thus ensuring an excellent air exchange in the zone close to the floor.

**Diffuser comprising of:**
Cylindrical perforated sheet jacket with deflection plate and diffuser head with integrated nozzle including a honeycomb rectifier for unifying the flow pattern when bends are connected in line

**Manufacturer:** LTG Aktiengesellschaft

**Series:** Industrial Diffuser

**Type:** DLD

**Sizes:**
- 400 mm Ø
- 500 mm Ø
- 630 mm Ø

**Suspension height:**
- H = height (5-7 m or 9-12 m resp.)
- N = low (3-5 m)

**Installation:**
- W = wall/column mounting (diffusion angle: 180°)
- F = freely suspended (diffusion angle: 360°)
# Industrial Air Diffuser Type DLD

## Specification and Schedule of Prices

<table>
<thead>
<tr>
<th>Qty</th>
<th>Description</th>
<th>Unit price €</th>
<th>Total €</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 2 -</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Duct connection:**
  - M = metu (recommended standard)
  - S = plug connector
  - F = flanged connection

- **Adjustment:**
  - m = manual
  - p = pneumatic (0.2..1.0 bar)
  - e = electrical (0...10 VDC)

- **Surface finish:**
  - V = galvanized
  - P = powder coated similar to RAL

- **Nozzle jacket:**
  - J = with
  - O = without

- **Accessories:**
  - Air guide control unit Type LSE suitable for max. 10 DLD.../e for connection to 24 V ~ power supply, w/o transformer, w/o distributor, w/o temperature probe, w/o manual control unit.
  - Manual control unit suitable for LSE in IP 65 casing.
  - Air control unit, transformer and distributor in IP 65 casing, suitable for max. 4 DLD.../e for connection to 230 V ~ power supply, w/o temperature probe, w/o manual control unit.
  - Complete control unit for DLD.../e comprising of: air guide control unit, transformer and distributor in IP 65 casing, suitable for 4 DLD.../e for connection to 230 V ~ power supply, with room temperature and duct temperature probe including IP 65 manual control unit, however w/o wiring between temperature probe and controller or between manual control unit and controller, respectively.