



# Displacement Diffuser

## PUSH



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## Displacement Diffuser PUSH

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## Displacement Diffuser PUSH

### Description

Industrial plants with high levels of harmful emissions are usually ventilated using displacement ventilation, displacing harmful emissions from the occupied area towards the exhaust openings. In most cases, the air is blown in through large-volume displacement diffusers arranged near the floor. This type of diffuser, however, wastes a lot of space in the occupied area and restricts the freedom of movement.

The displacement diffuser type PUSH has been developed to **prevent this waste of space**. This diffuser is **installed at a height of 3-4 m**, i.e. 1-2 m above the occupied zone and can **disperse air volumes between 600-13,000 m<sup>3</sup>/h**, allowing **temperature differences of -10 K during cooling and +25 K during heating**.

The air throw pattern can be regulated individually by using a chain. However, a centrally controlled motorised adjustment of the air throw pattern is also possible.

The following air throw patterns are possible:

- horizontal throw (cooling mode):  
PUSH -1A / -1B / -2 / -3 / -4 / -5A / -5B / -5C / -6
- diagonally downward throw (isothermal)  
PUSH -1A / -1B / -2 / -4 / -5A / -5C / -6
- vertical throw (heating mode):  
PUSH -2 / -3 / -4 / -5B / -5C / -6

When the "horizontal air throw" pattern (cooling) is chosen, the air is discharged diagonally upwards in a horizontal direction. After a throw length of 2 - 3 m, the air jet sinks slowly into the occupied zone at velocities of  $\leq 0.15$  m/s displacing the polluted air towards the diffuser openings. The air blown in the "diagonally downward throw" pattern (isotherm) displaces the air in the room near the diffuser all the way to the diffuser openings. In order to effectively discharge warm air into the occupied area, in the "vertical throw" pattern (heating mode), the air is discharged in vertical direction. Owing to the stable air throw pattern, a large penetration depth is reached. This allows the room to be heated quickly and economically. In designs in which the floor is closed, the sizes that can be used go only up to 315 mm for the heating mode. Moreover, the impulse is not enough to achieve high penetration depths.

The displacement diffusers allow the air throw pattern to be adjusted easily and precisely according to individual customer requirements. Intermediate positions allow the throw length in horizontal direction or the penetration depth in vertical direction to be changed. This is done by means of:

- PUSH -1A/-2/-3/-4: a locking mechanism (-AA) on the diffuser casing or the locking plate (-AW) on walls / columns.
- PUSH -1B: a Magura lever mounted on the impact ring axis (standard)
- PUSH -5A/-5B/-5C: a thermal cylinder
- PUSH -6: an adjustment rod (at an extra charge)

The direction of the baffle plate or base plate can be adjusted on site by means of screws to suit the on-site construction.

The diffuser can either be suspended freely (-F) or fixed to a wall / column (-W). For wall or column mounting, the angle of throw can be reduced from 360° to 270° by means of the 1/4 cover, if desired.

The standard length of the chain/cable for PUSH models -1A / -2 / -3 / -4 / -5C is 3 m from the underside of the diffuser.

A longer cable must be specifically ordered if required (at an extra charge).

For air volume regulation, an adjustable damper (-DV) can be fitted to the diffuser, which can also be adjusted using a side-mounted lever.

A rubber lip seal (-GD) and / or honeycomb air flow straightener (-WG) can also be fitted to the connection side of the diffuser or damper type DV at an extra charge. The honeycomb air flow straightener allows direct connection to junctions and bends.

### Adjustment by means of a thermal cylinder

The thermocouple is used to control the baffle plate and thus the air throw direction independently as a function of the supply air temperature. It ensures optimum air distribution in the cooling and heating modes.

Please note that the thermocouple must not be subject to hot air of more than 40°C. This may result in a deformation of the piston rod and thus to damage and accidents!

The adjustment screw at the lower end of the thermocouple can be used to adjust the PUSH thermally. Turning it to the left extends the piston at higher temperatures. Analogously, turning it to the right extends the piston at lower temperatures. One turn corresponds to approximately 1°C.

Please make sure not to turn the adjusting screw inadvertently too much into the piston, since this will change the thermal adjustment! Non-observance of these instructions will damage the thermocouple.

For maintenance, service, retrofitting, etc., inspection openings in sufficient number and size must be provided on-site.

## Displacement Diffuser PUSH

### Construction

Locking mechanism (-AA)

- made of galvanised sheet steel at the diffuser casing (for PUSH -1A / -2 / -3 / -4 / -5C).

Diffuser casing

- Galvanised sheet steel, with perforated

base plate

- galvanised sheet steel

Chain

- galvanised steel (for PUSH -1A / -2 / -3 / -4 / -5C)

Damper leaf seal (for PUSH -2 / -3 / -4 / -5B / -5C / -6)

- made of PUR, silicone-free
- for tight sealing of the base plate

baffle plate

- Galvanised sheet steel, adjustable

Thermal cylinder

- for PUSH -5A / -5B / -5C

### Model

PUSH-1A - Upper baffle plate adjustable by chain, closed base.

PUSH-1B - Upper baffle plate with Magura lever (mounted directly to impact ring axis) adjustable, closed base.

PUSH-2 - Upper baffle plate and base plate individually adjustable by chain.

PUSH-3 - Upper baffle plate and base plate jointly adjustable by chain.

PUSH-4 - Upper baffle plate adjustable by chain and base plate by electric actuator.

PUSH-5A - Upper baffle plate adjustable by thermal cylinder, base closed.

PUSH-5B - Base plate adjustable by thermocouple, upper baffle plate fixed

PUSH-5C - Upper baffle plate adjustable by thermal cylinder, base adjustable by chain

PUSH-6 - Upper baffle plate and base plate individually adjustable using adjustment rod

### Accessories

1/4 cover (-AD)

- galvanised sheet steel

Locking plate (-AW)

- galvanised sheet steel
- painted to RAL 9010 (white) (for PUSH -1A / -2 / -3 / -4 / -5C)

Bowden cable (-BZ)

- for PUSH -1A / -2 / -3 / -4 / -5C

Adjustable damper (-DV)

- galvanised sheet steel

Rubber lip seal (-GD)

- special rubber

Adjustment rod (-ST)

- for PUSH -6

Honeycomb air flow straightener (-WG)

- plastic

Electric actuator (for PUSH -4)

- E1, 230 V AC, 3-point control
- E3, 24 V AC, 3-point control

### Fastening

Standard

- The displacement diffuser can be fitted directly to exposed ductwork

### Quick selection (horizontal throw)

Size	250	315	350/355	400	450	560	630
L <sub>WA</sub> [dB(A)]	45	45	45	45	45	45	45
Δp <sub>t</sub> (Pa)	48	41	32	28	32	32	39
V <sub>ZU</sub> (m <sup>3</sup> /h)	730	1400	1450	1900	2400	3600	4500
V <sub>ZU</sub> [l/s]	200	390	400	530	670	1000	1250

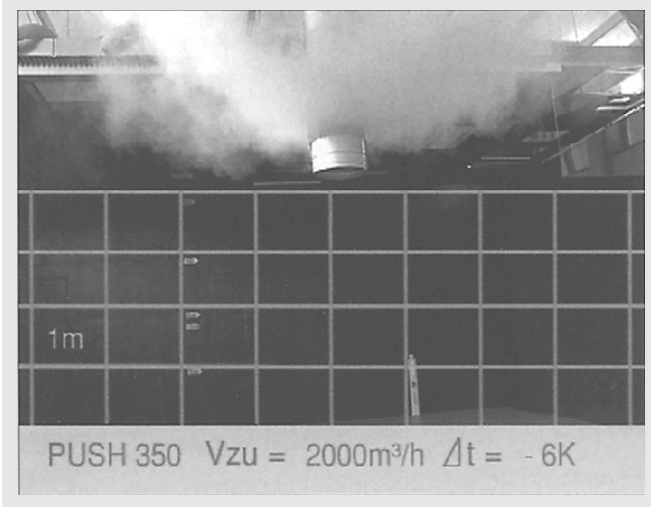
### Range of air volumes

Size	250	315	350/355	400	450	560	630
V <sub>ZU</sub> (m <sup>3</sup> /h) min.	600	1200	1200	1500	2000	3000	3800
V <sub>ZU</sub> (m <sup>3</sup> /h) max.	2200	4300	4500	6000	6800	11000	13000
V <sub>ZU</sub> [l/s] min.	170	330	330	420	560	830	1060
V <sub>ZU</sub> [l/s] max.	610	1190	1250	1670	1890	3060	3610

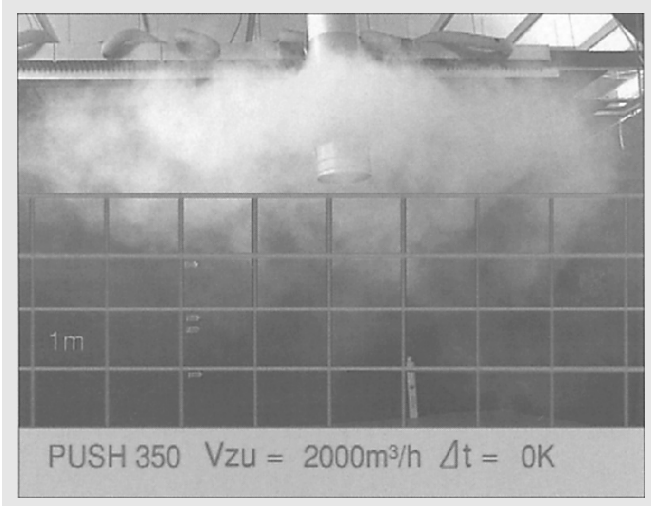
## Displacement Diffuser PUSH

### Throw pattern

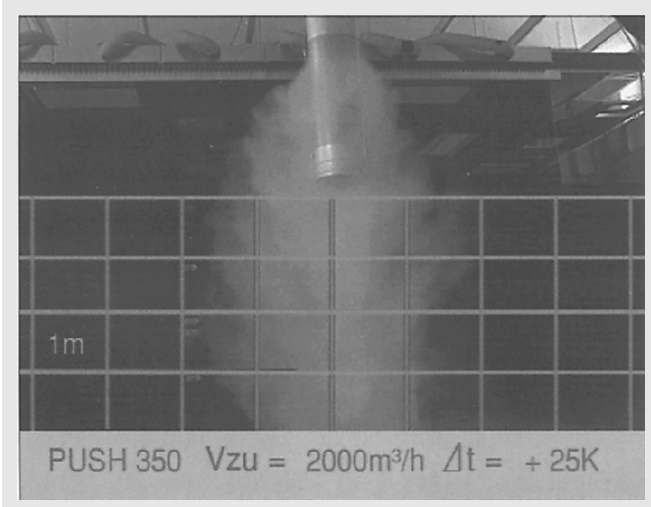
horizontal throw (cooling mode)



diagonally downward throw (isothermal)



vertical throw (heating mode):



## Models and dimensions

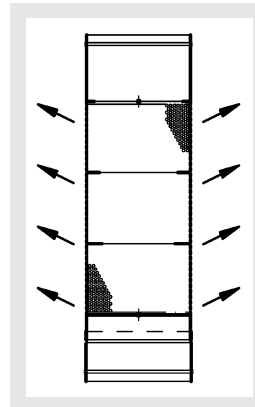
### Throw pattern

Possible settings of the air throw pattern

	Throw pattern					
PUSH-1A	←	→	↙	↘		
PUSH-1B	←	→	↙	↘		
PUSH-2	←	→	↙	↘	↓	↓
PUSH-3	←	→			↓	↓
PUSH-4	←	→	↙	↘	↓	↓
PUSH-5A	←	→	↙	↘		
PUSH-5B	←	→			↓	↓
PUSH-5C	←	→	↙	↘	↓	↓
PUSH-6	←	→	↙	↘	↓	↓

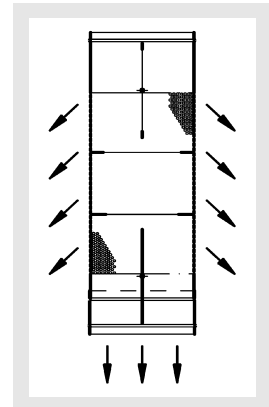
Different throw patterns are achieved by turning the baffle plate or base plate by means of the chain into different positions. Intermediate positions are also possible.

horizontal throw: cooling mode



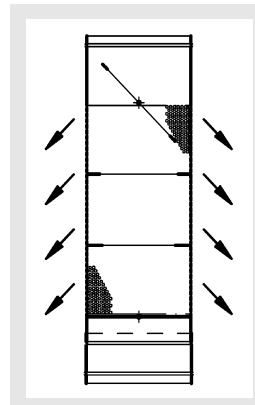
applicable to:

vertical throw: heating mode



applicable to:

diagonally downward throw: isothermal

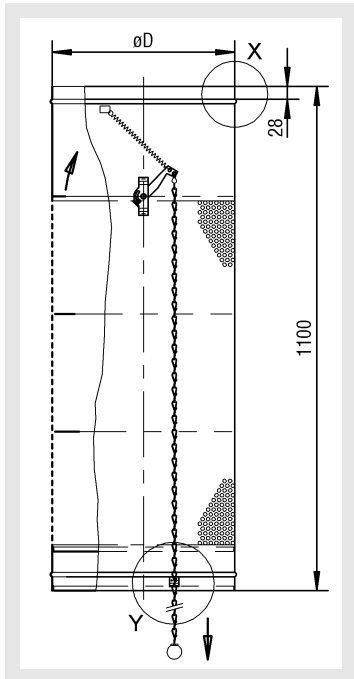


applicable to:

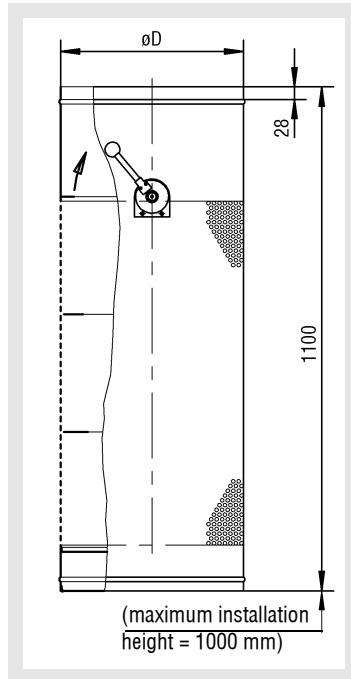
# Displacement Diffuser PUSH

## Dimensions

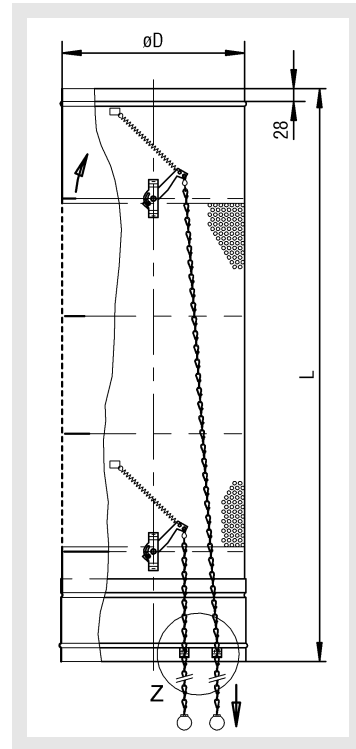
**PUSH-1A**



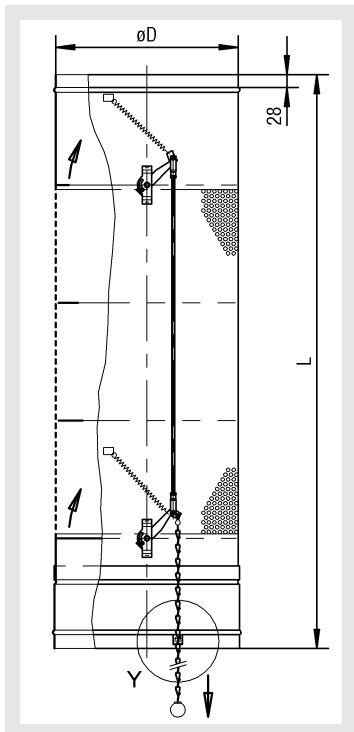
**PUSH-1B**



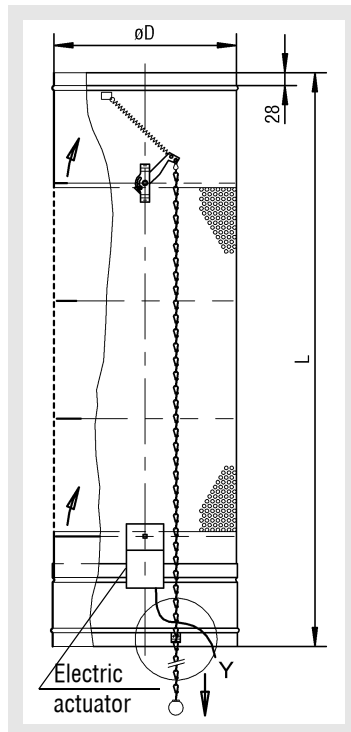
**PUSH-2**



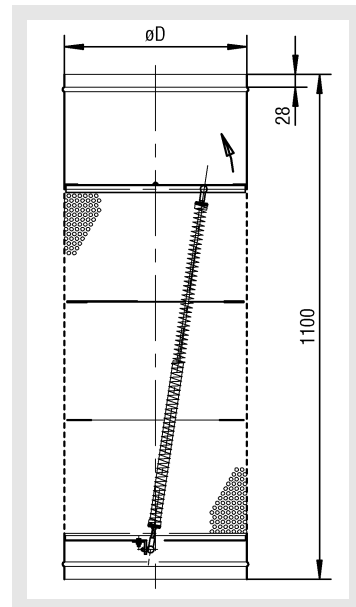
**PUSH-3**



**PUSH-4**



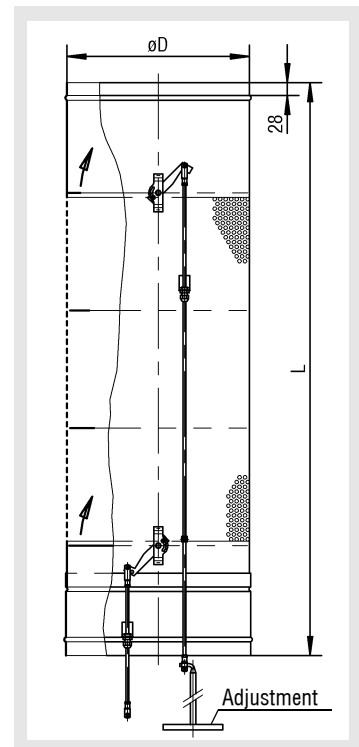
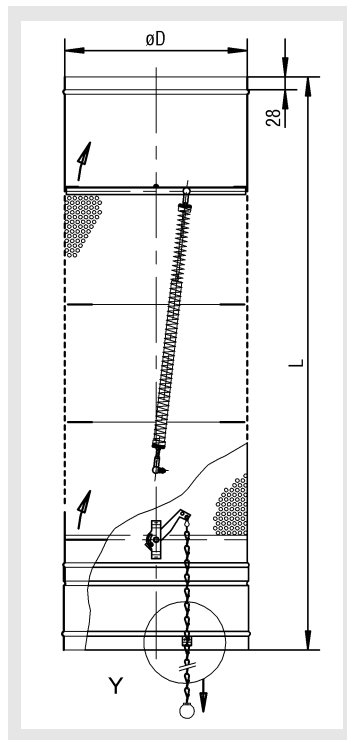
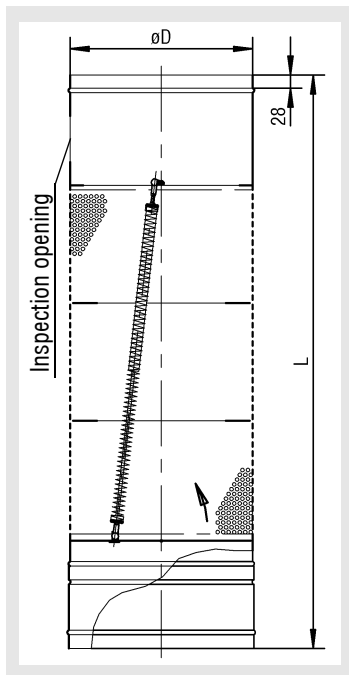
**PUSH-5A**



### List of motors for PUSH-4

	Motor
-E1	Belimo NM230A-F
-E3	Belimo NM24A-F

## Displacement Diffuser PUSH



### Available sizes

Size	250	315	350	355	400	450	560	630
$\varnothing D$	248	313	348	353	398	448	558	628
L	1220				1250		1300	1350

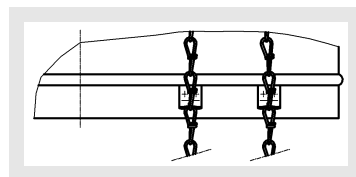
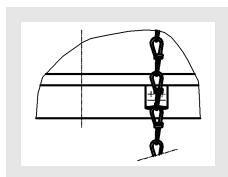
### locking mechanism (-AA)

#### Detail Y

for PUSH -1A / -3 / -4 / -5C

#### Detail Z

for PUSH -2



### Air throw pattern settings (for PUSH -1A / -2 / -3 / -4 / -5c):

#### at the diffuser casing (including locking mechanism AA):

- Adjustable by chain. 3m long from underside of diffuser.

#### on walls / columns (including locking plate -AW

#### with bowden cable -BZ):

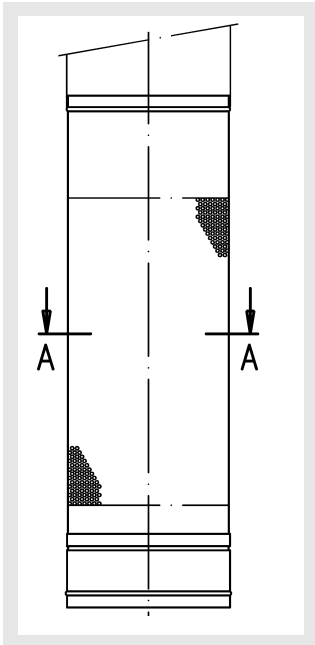
- adjustable by chain / cable. 3m long from underside of diffuser. Chain length approx. 30 cm



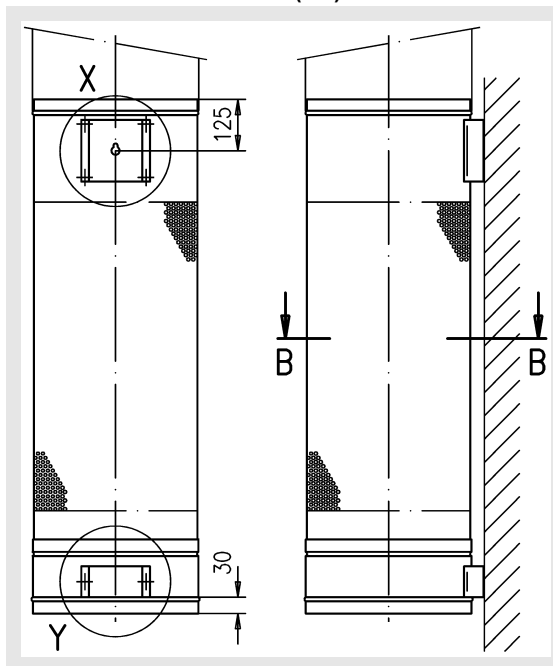
# Displacement Diffuser PUSH

## Mounting options

### Suspended installation (-F)

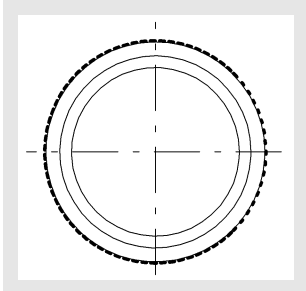


### Wall / column installation (-W)



### Section A-A

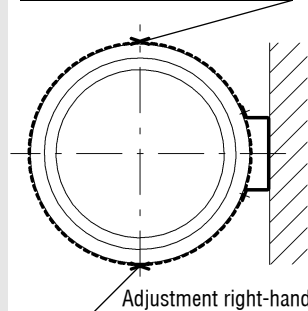
360° throw



### Section B-B

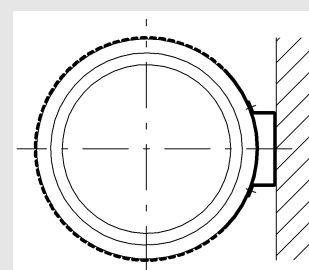
360° throw (standard)

Adjustment left-hand



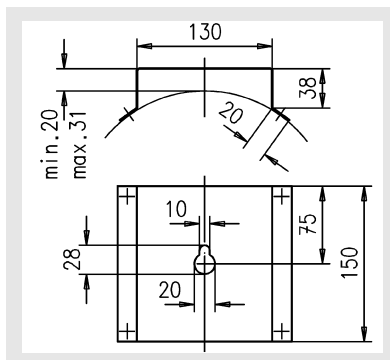
270° throw

(on request)

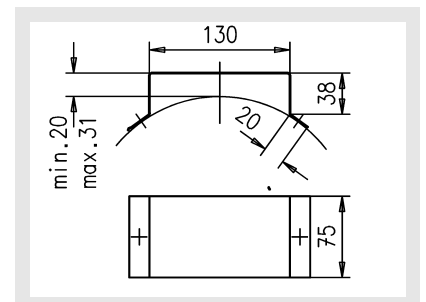


Adjustment for type PUSH -1A / -1B / -2 / -3 / -4 / -5C / 6

### Detail X



### Detail Y

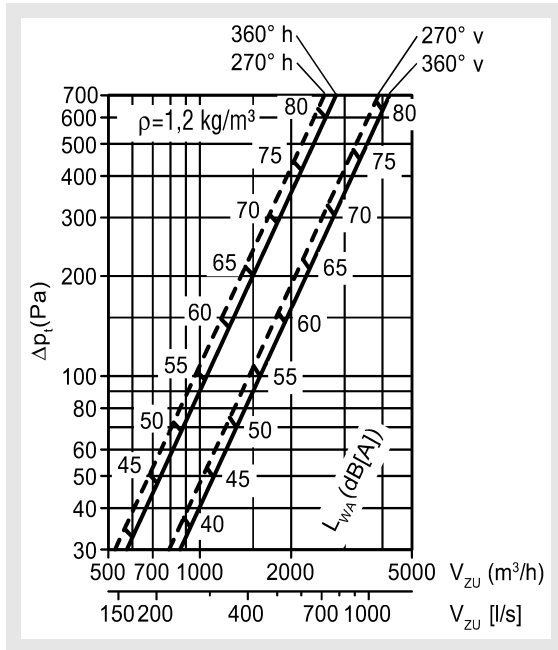


# Displacement Diffuser PUSH

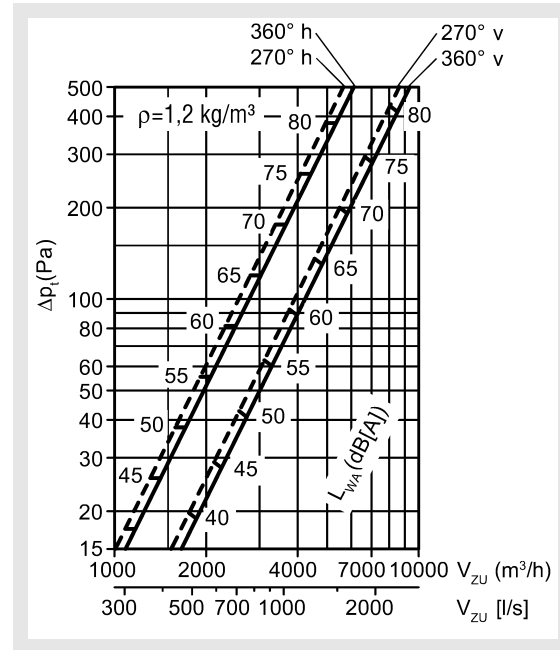
## Technical Data

### Pressure loss and noise level

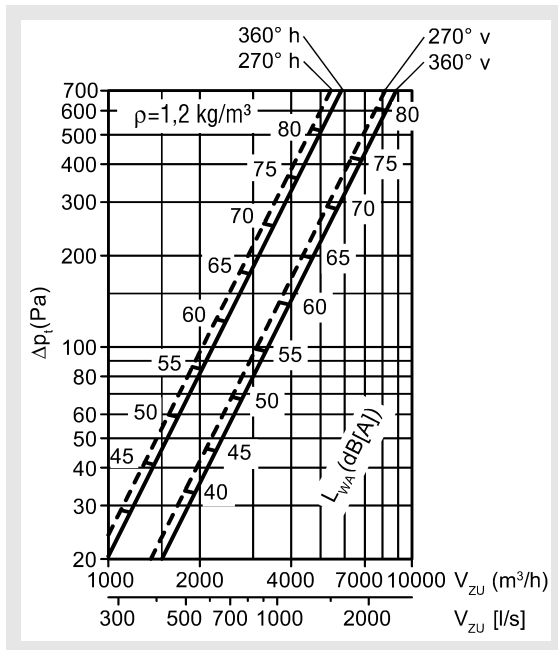
#### PUSH 250



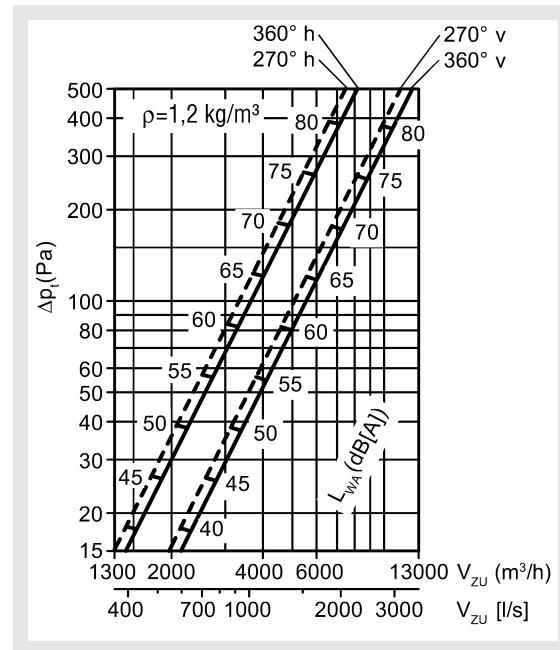
#### PUSH 350/355



#### PUSH 315



#### PUSH 400

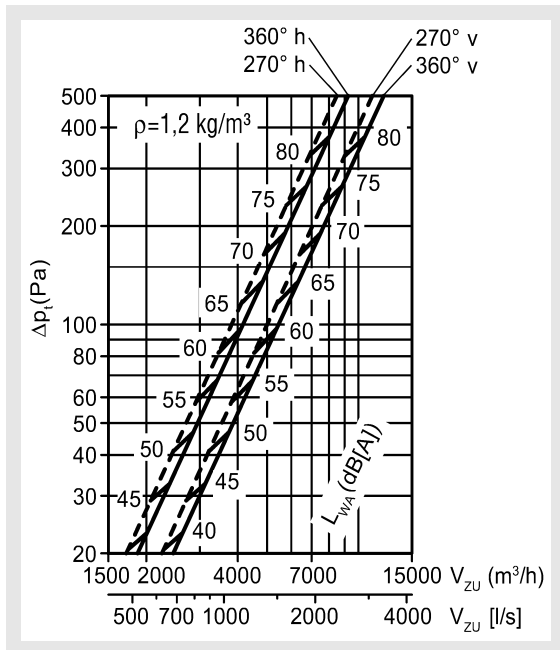


h = horizontal  
v = vertical

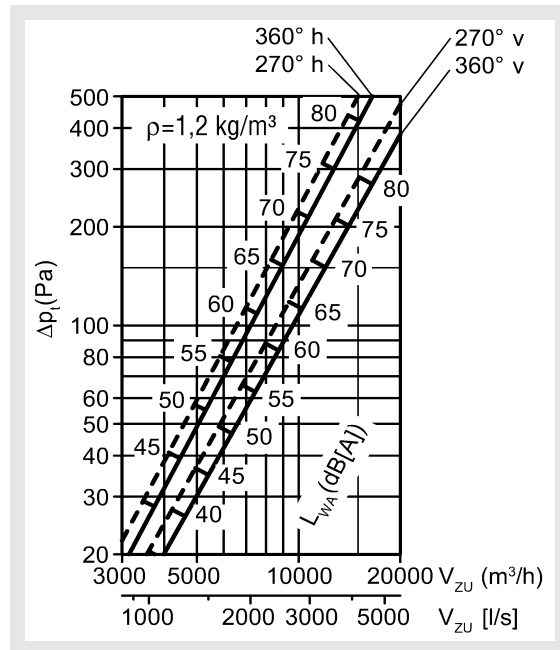
----- 270° throw for wall / column installation

# Displacement Diffuser PUSH

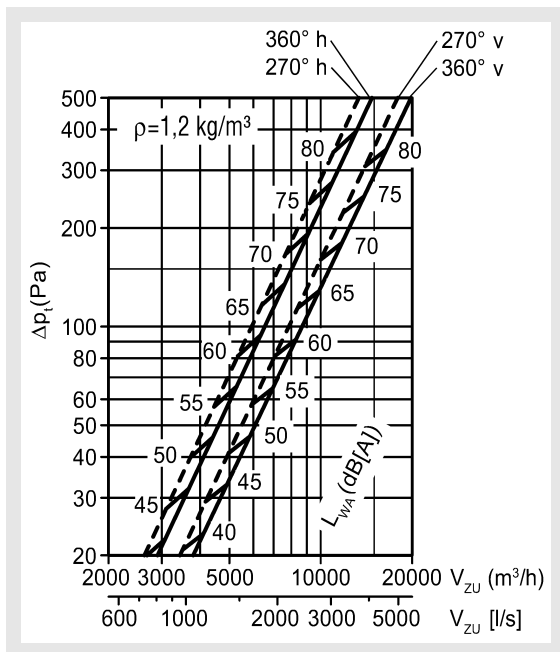
## PUSH 450



## PUSH 630



## PUSH 560



## Correction factor for damper adjustment (-DV)

Size	250	315	350/355	400	450	560	630
100%	$L_{WA}$	x1,2	x1,2	x1,3	x1,3	x1,4	x1,5
	$\Delta p_t$	x2,3	x3,0	x3,5	x3,8	x4,0	x4,3
66%	$L_{WA}$	x1,4	x1,5	x1,5	x1,6	x1,6	x1,7
	$\Delta p_t$	x6,4	x6,8	x7,1	x7,3	x7,4	x7,5
33%	$L_{WA}$	x1,7	x1,9	x2,1	x2,4	x2,6	x3,0
	$\Delta p_t$	x10	x13	x14	x15	x15	x15

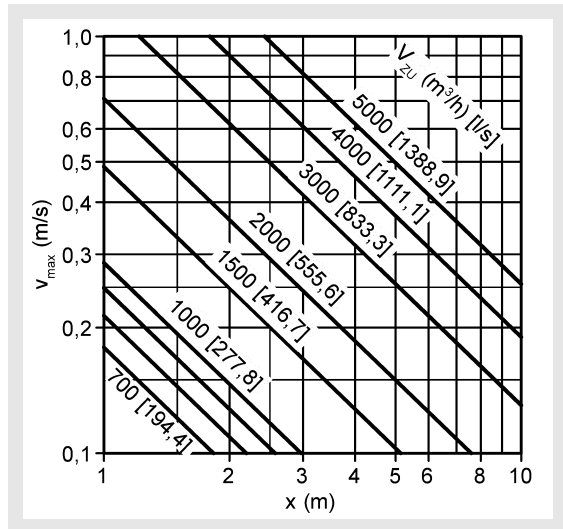
The correction factors refer to the sound power level  $L_{WA}$  with a horizontal throw  
 Damper position OPEN in %

h = horizontal  
 v = vertical  
 - - - - 270° throw for wall / column installation

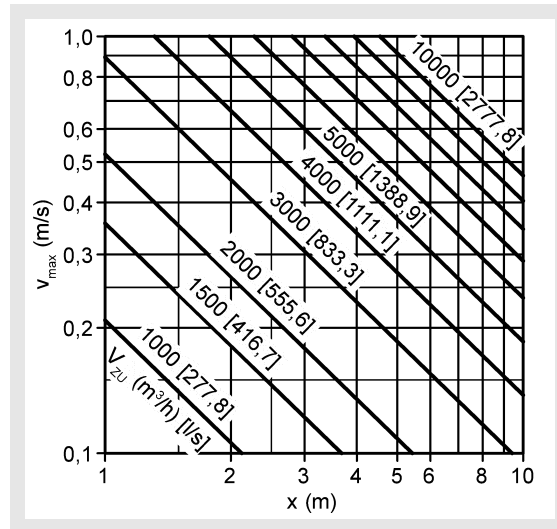
## Displacement Diffuser PUSH

### Maximum end velocity of jet

#### PUSH 250

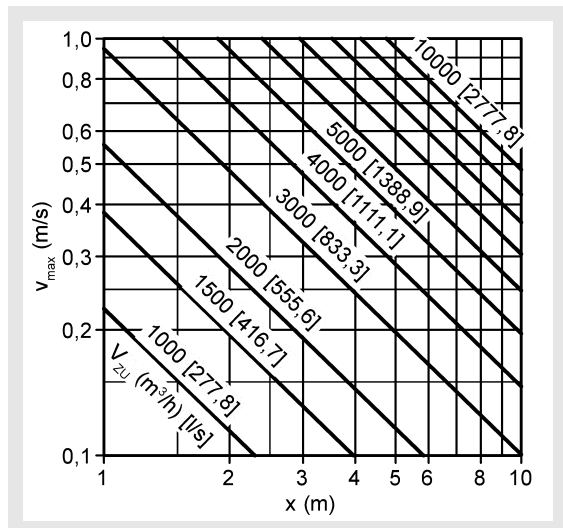


270° throw for wall / column installation:

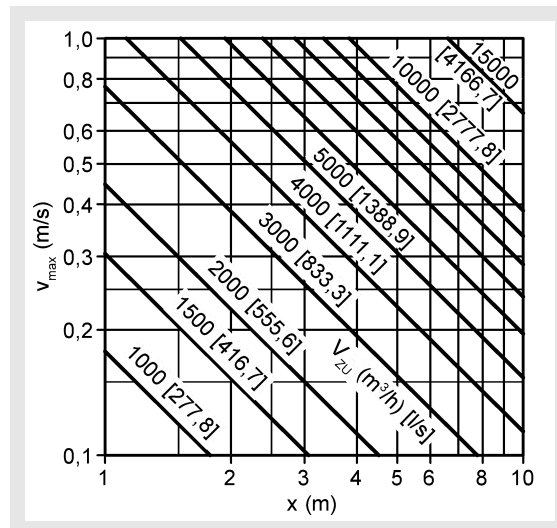


270° throw for wall / column installation:

#### PUSH 315

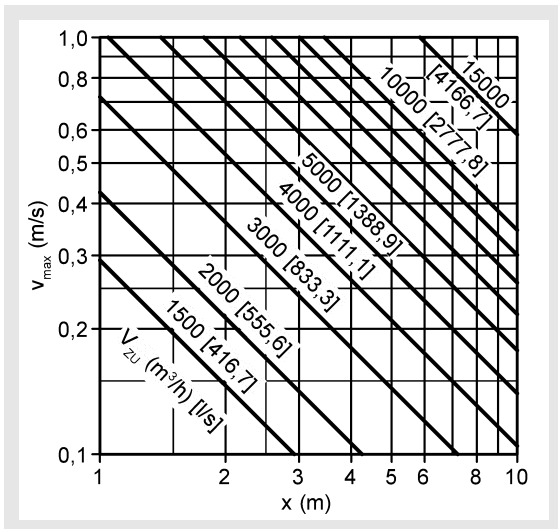


270° throw for wall / column installation:

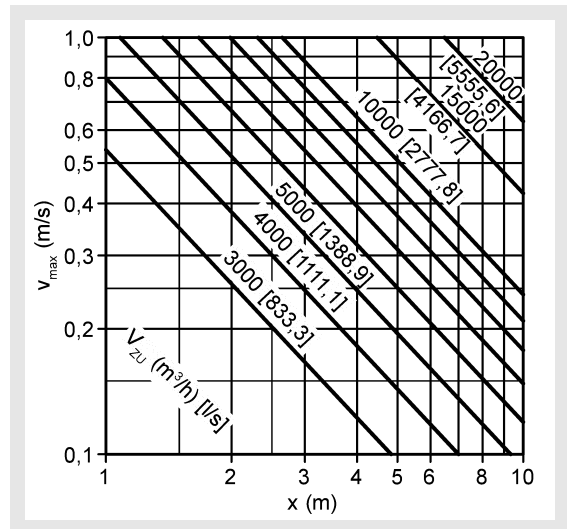


270° throw for wall / column installation:

## Displacement Diffuser PUSH

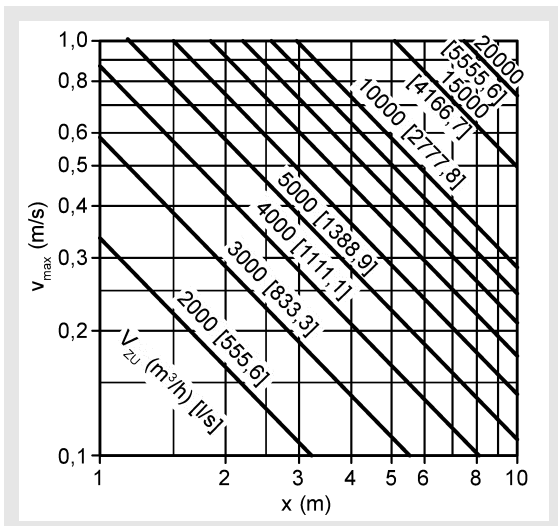


270° throw for wall / column installation:



270° throw for wall / column installation:

## PUSH 560

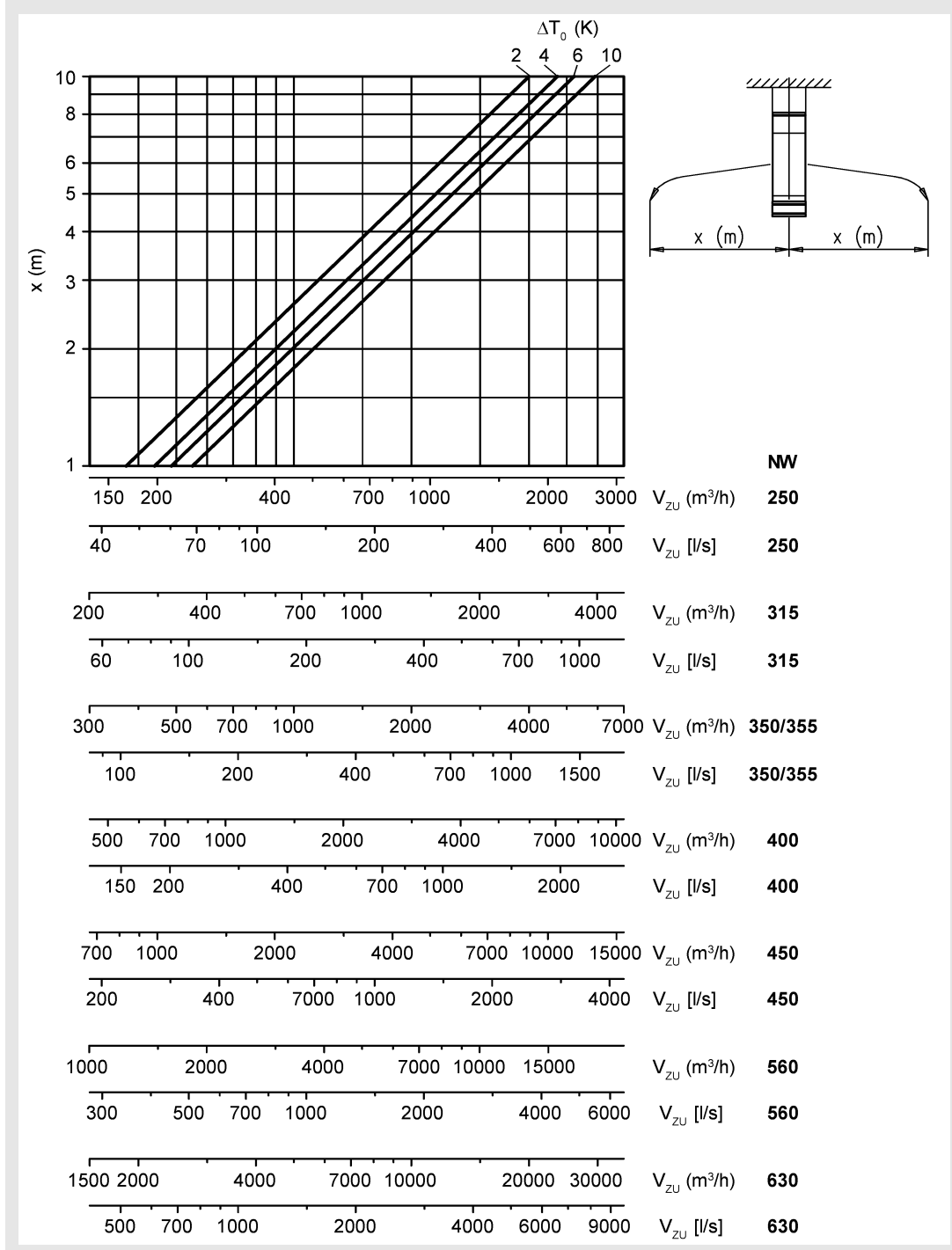


270° throw for wall / column installation:

# Displacement Diffuser PUSH

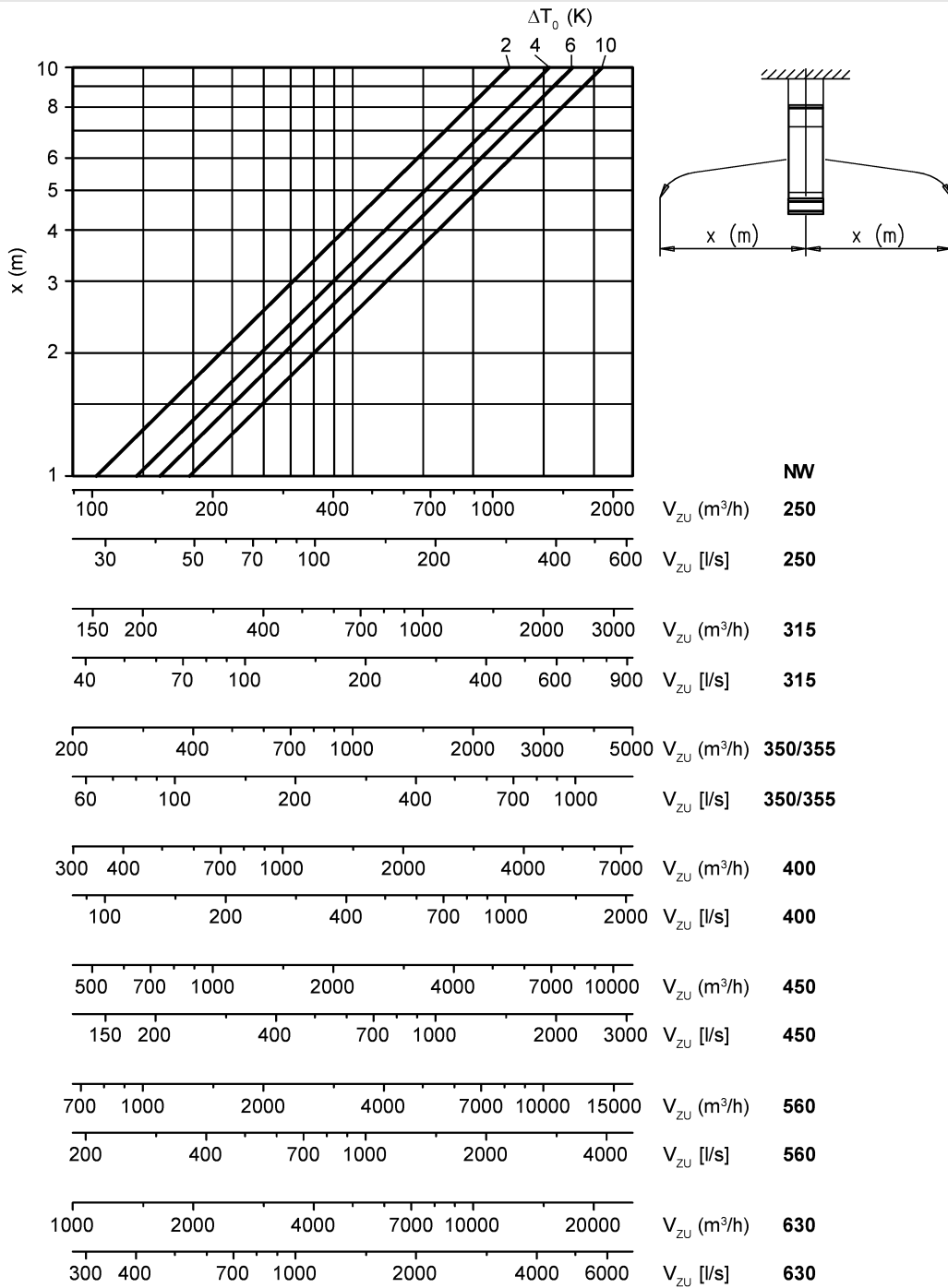
## Jet path

Suspended installation (-F) (cooling mode)



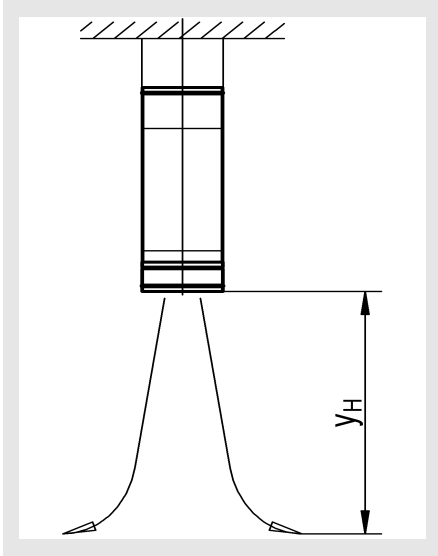
# Displacement Diffuser PUSH

Wall / column installation, 270° throw (cooling mode)

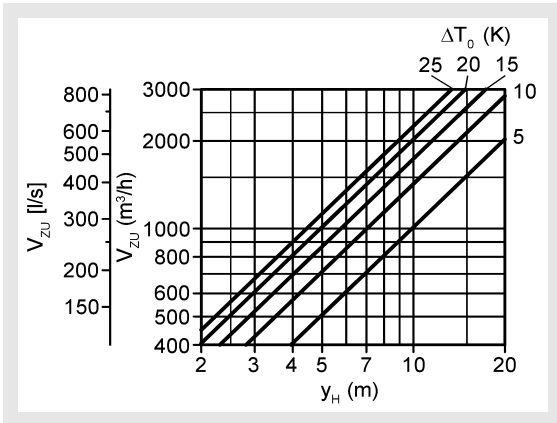


# Displacement Diffuser PUSH

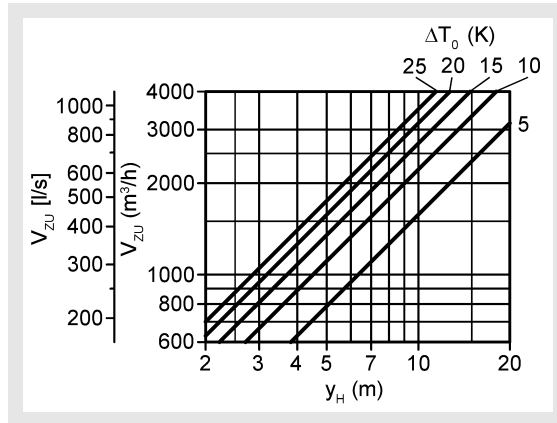
## Vertical throw (in heating mode)



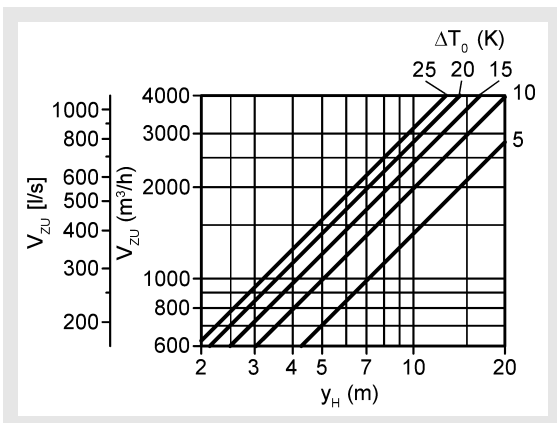
**PUSH 250**



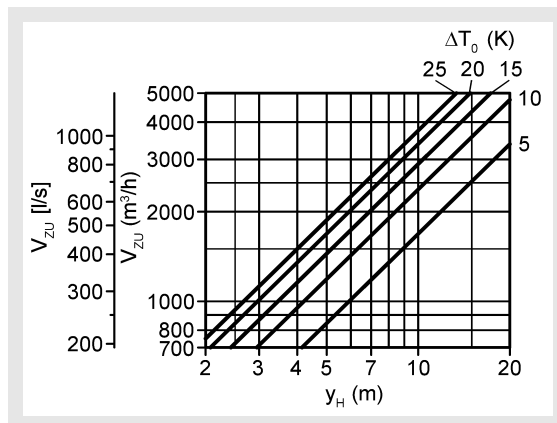
**PUSH 350/355**



**PUSH 315**

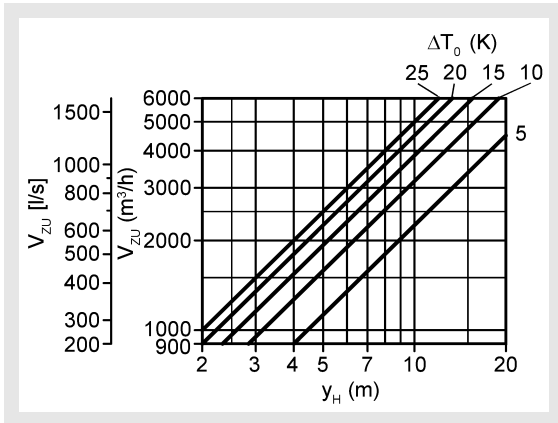


**PUSH 400**

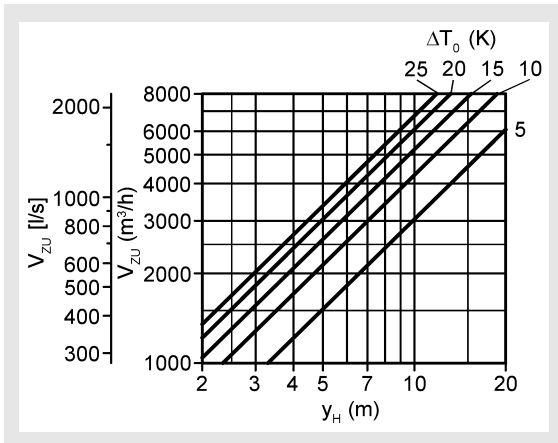


# Displacement Diffuser PUSH

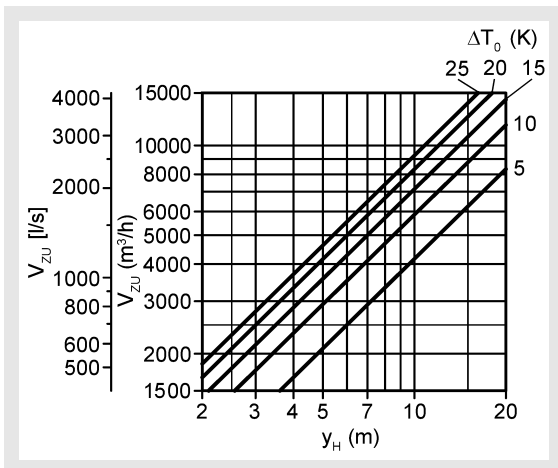
## PUSH 450



## PUSH 560



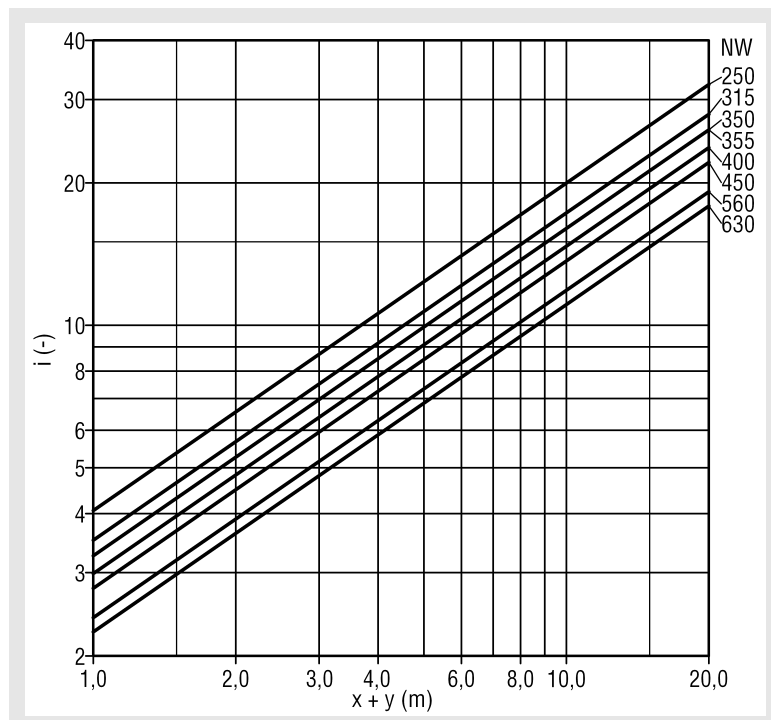
## PUSH 630



## Displacement Diffuser PUSH

### Induction ratio

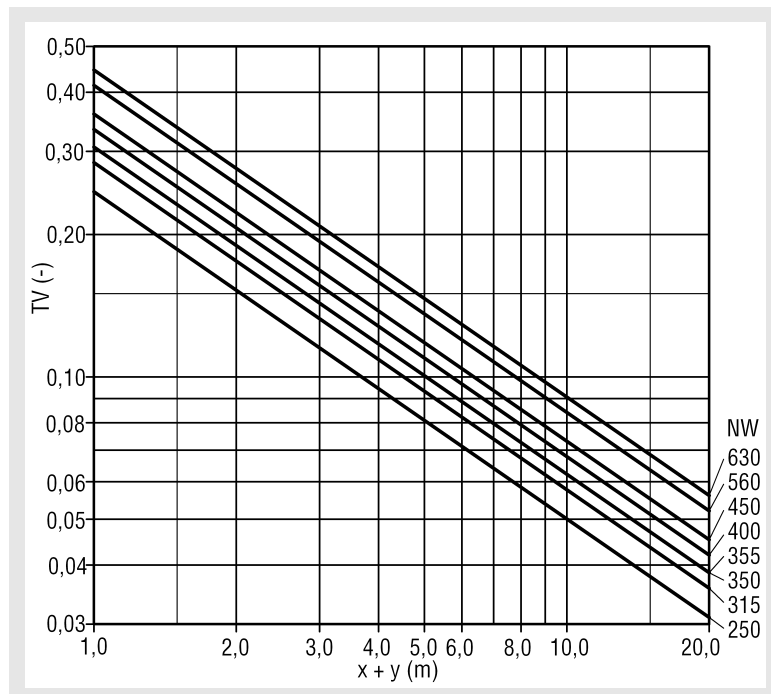
(only applicable with horizontal throw)



Correction factor for 270° throw =  $i$  (-)  $\times$  0.714

### Temperature ratio

(only applicable with horizontal throw)

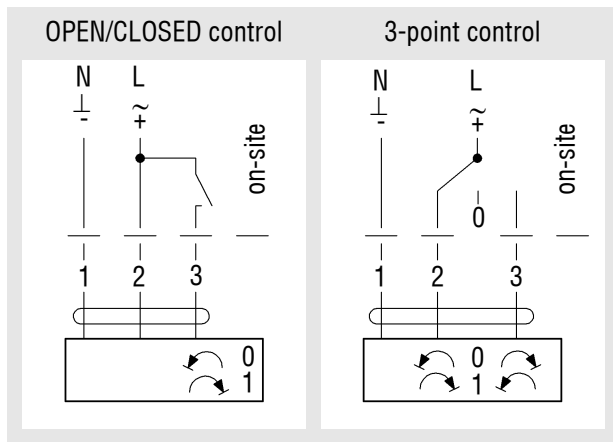


Correction factor for 270° throw =  $TV$  (-)  $\times$  1.4

## Displacement Diffuser PUSH


### Connection diagrams of electric actuators

#### Make Belimo



### Technical data of electric actuators

#### Make Belimo (-E1) NM230A-F

Rated voltage:	AC 100 ... 240 V, 50 / 60 Hz
Functional range:	AC 85 ... 265 V
Power consumption	
- Operation:	2.5 W @ rated torque
- idle position	0.6 W
Dimensioning:	5.5 VA
Torque (rated torque):	Min. 10 Nm at the rated voltage
Running time:	150 s / 90°
Sound power level	max. 35 dB (A)
Protection class:	II protective insulation 
Protection type:	IP54 in all mounting positions
EMC:	CE according to 89 / 336 / EEC
Low voltage directive:	CE according to 73 / 23 / EEC
Ambient temperature:	-30 ... +50°C

#### Make Belimo (-E3) NM24A-F

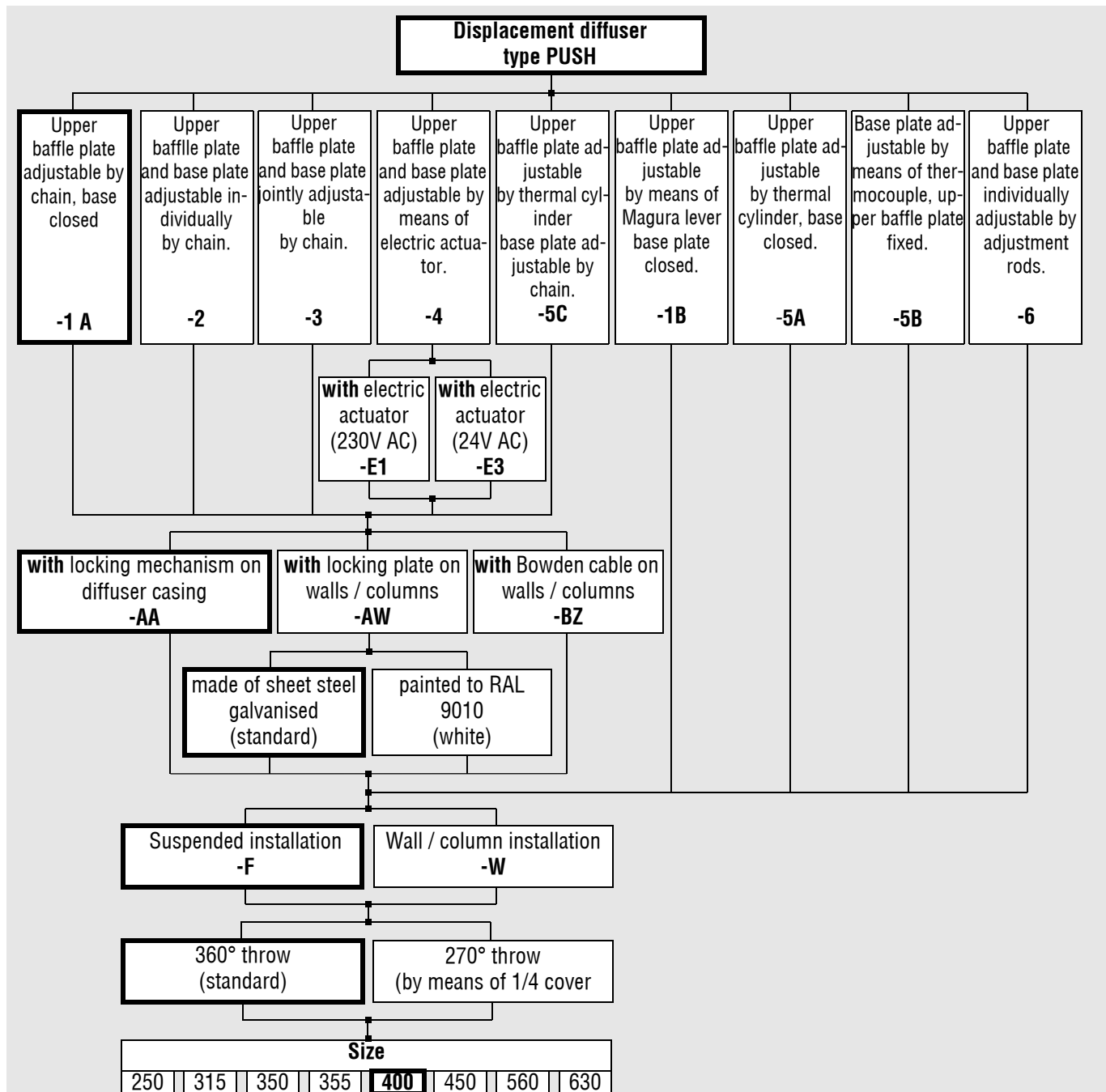
Rated voltage:	AC 24 V / DC 24 V, 50 / 60 Hz
Functional range:	AC / DC 19,2 ... 28.8 V
Power consumption	
- Operation:	1.5 W @ rated torque
- idle position	0.2 W
Dimensioning:	3.5 VA
Torque (rated torque):	Min. 10 Nm at the rated voltage
Running time:	150 s / 90°
Sound power level	max. 35 dB (A)
Protection class:	III Safety extra low voltage
Protection type:	IP54 in all mounting positions
EMC:	CE according to 89 / 336 / EEC
Ambient temperature:	-30 ... +50°C

### Legend

$V_{ZU}$ (m <sup>3</sup> /h)	= Supply air volume
$V_{ZU}$ [l/s]	= Supply air volume
$\Delta T_0$ (K)	= Temperature difference between supply air temperature and room temperature ( $\Delta T_0 = t_{supply} - t_R$ )
$t_{ZU}$ (°C)	= Supply air temperature
$t_R$ (°C)	= Room temperature
$y_H$ (m)	= Maximum penetration in heating mode
$x$ (m)	= Horizontal throw
$v_{max}$ (m/s)	= Maximum end velocity of jet
$v_{mittel}$ (m/s)	= Average end velocity of jet ( $v_{mittel} = v_{max} \times 0.5$ )
$\Delta p_t$ (Pa)	= Pressure loss
$L_{WA}$ [dB(A)]	= A-weighted sound power level
$\rho$ (kg/m <sup>3</sup> )	= Density
$h$ (-)	= horizontal
$v$ (-)	= vertical
Size (mm)	= Nominal width

# Displacement Diffuser PUSH

## Order details



### Accessories:

Adjustable damper <b>-DV</b>	1/4 cover <b>-AD</b>	Adjustment rod <b>-ST</b>	Honeycomb air flow straightener <b>-WG</b>	Rubber lip seal <b>-GD</b>
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### Order example:

PUSH-1A-AA-F-400-DV

**Unless stated otherwise, the thick-frame model will be delivered!**

## Displacement Diffuser PUSH

### Specification texts

Displacement diffuser type PUSH, suitable for ventilating and air-conditioning factory buildings and assembly halls. For optimum room use, a mounting height of 3-4 m is recommended. An installation near the floor is possible. The diffuser can either be suspended freely or fixed to walls and columns. The displacement diffuser can be used for isothermal throws, both for cooling at a temperature difference of max. -10 K and for heating at a temperature difference of max. +25 K. In cooling mode and with isothermal throws, the diffuser works at low exit speeds and is distinguished by a laminar displacement flow. In the heating mode, the diffuser guarantees an efficient heating phase with the base plate open. The adjustment of the aerodynamically shaped baffle plate and the optional adjustment of the base plate allow the throw pattern to be adjusted to individual requirements. Air throw patterns ranging from diagonally upwards to horizontal, diagonally downwards and vertical are possible. The optionally adjustable base plate with damper leaf seal made of PUR can be closed air-tight, in order to prevent a vertical throw of cold supply air in cooling mode. The diffuser can be connected directly to the round duct. It consists of a perforated diffuser casing, adjustable baffle and base plates made of galvanised sheet steel.

#### Models:

- Model 1A: Upper baffle plate adjustable by chain, closed base.
- Model 1B: Upper baffle plate with Magura lever mounted to impact ring axis adjustable, closed base.
- Model 2: Upper baffle plate and base plate with damper leaf seal individually adjustable by chain.
- Model 3: Upper baffle plate and base plate with damper leaf seal jointly adjustable by chain.
- Model 4: Upper baffle plate adjustable by chain and base plate with damper leaf seal adjustable by electric actuator (3-point activation).  
E1: 230 V AC  
E3: 24 V AC
- Model 5A: Upper baffle plate adjustable by thermal cylinder, closed base.
- Model 5B: Base plate with damper leaf seal adjustable by thermocouple, upper baffle plate fixed
- Model 5C: Upper baffle plate adjustable by thermal cylinder, base plate with damper leaf seal adjustable by chain
- Model 6: Upper baffle plate and base plate with damper leaf seal individually adjustable by adjustment rod.

#### Air throw settings (for PUSH -1A / -2 / -3 / -4 / -5C):

- at the diffuse casing with locking mechanism (-AA)
- on walls / columns:
  - with locking plate (-AW)
  - with self-locking Bowden cable (-BZ)

#### Installation situation:

- Suspended installation (-F), 360° throw.
- Wall / column installation (-W)
  - 360° throw (standard)
  - 270° throw by means of 1/4 cover plate

#### Product: SCHAKO type PUSH

#### Accessories:

- Adjustable damper (-DV) for air volume regulation, with side adjustment lever made of galvanised sheet steel.
- Rubber lip seal (-GD), made of special rubber.
- Plastic honeycomb straightener (-WG)
- Measuring sensor for adjusting the supply air volume.
- Metu flange duct flange AF with tension ring SR.
- Flat flange to DIN 24154 / 5
- Adjustment rod for PUSH -6