

KOOLAIR

series

DF-TR

Thermo ajustables



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DF-49-TR Long-throw temperature-adjustable nozzle



The DF-TR variable geometry diffuser is specially developed for applications where it is necessary to redirect the air jet and access to the diffuser is restricted, for example at heights over 3.5 m.

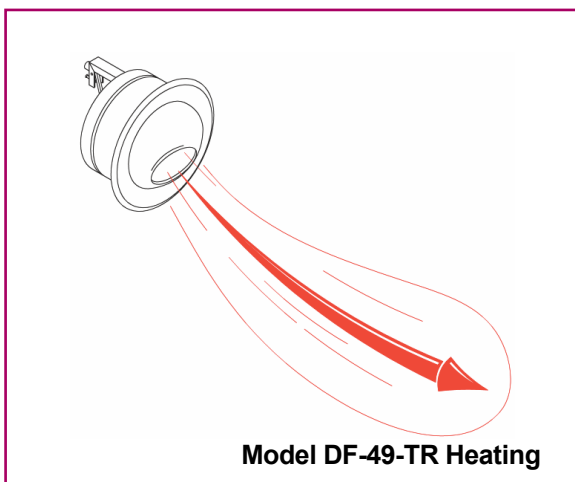
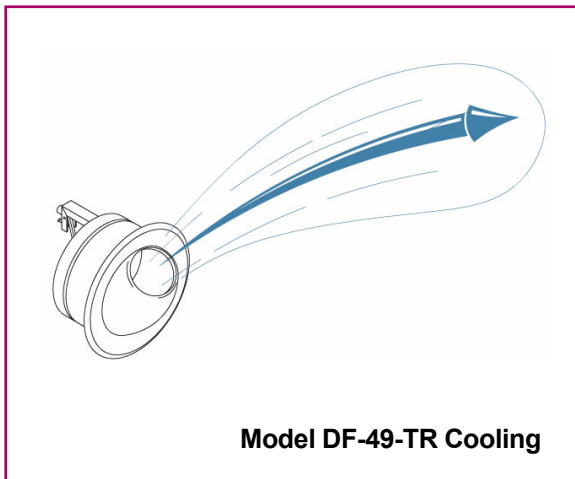
Operation

The temperature-adjustable diffuser includes a thermal element that expands or contracts as the temperature varies and triggers a mechanism that causes the air jet to be redirected $\pm 25^\circ$, according to the set-up. The angle of inclination of the air jet is lower when supplying cold air ($\leq 25^\circ\text{C}$), and greater when supplying hot air ($\geq 28^\circ\text{C}$). This is due to the density difference that exists between the two jets and modifies how they behave.

This approach seeks to avoid stratification occurring in the occupied area, which could occur if a fixed diffuser were used.

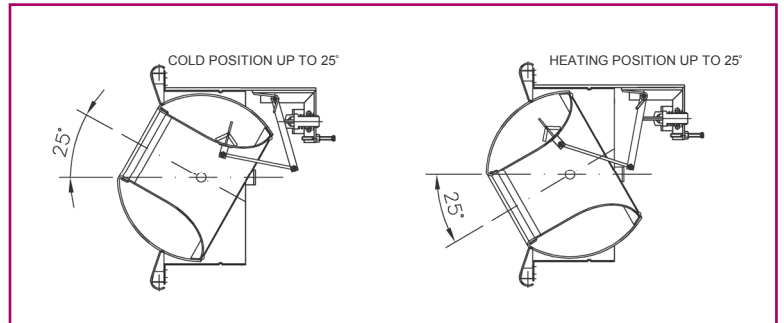
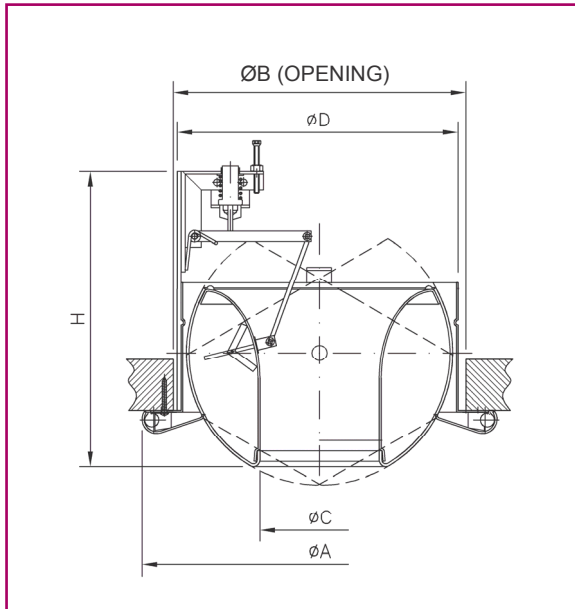
The penetration of the air jet is closely related to the flow rate (Q) and the temperature difference between the supply temperature and ambient temperature (ΔT). The higher the flow rate, the greater the supply velocity, and therefore the greater the throw. The temperature difference has an inversely proportional influence.

The values shown in the tables correspond to a ΔT (temperature difference between the supply air and the interior of the room being conditioned) of -10°C for cooling and $+10^\circ\text{C}$ for heating.



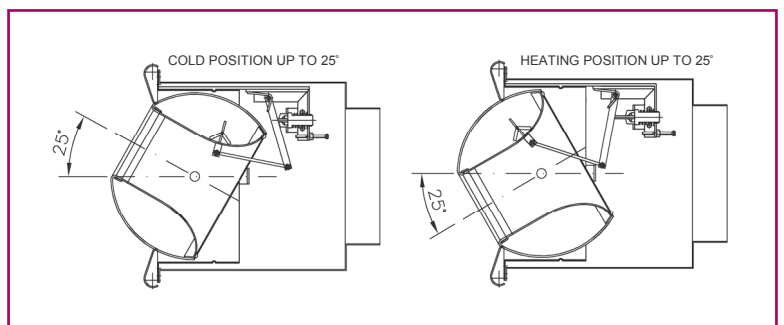
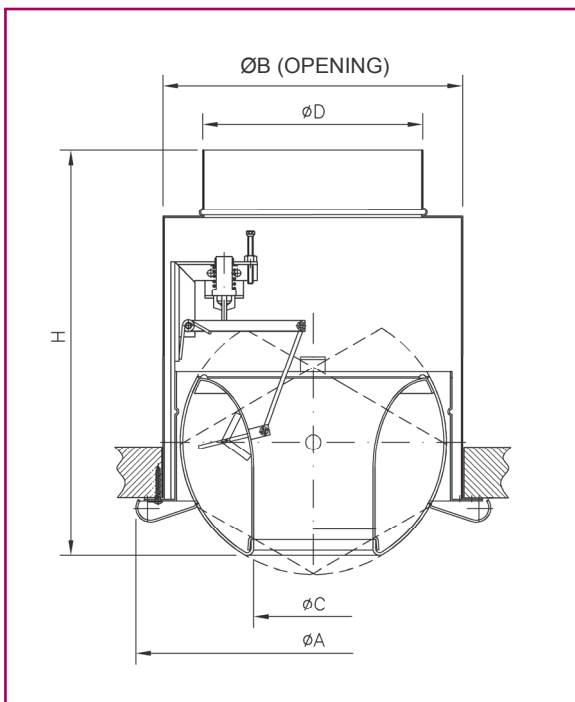
Models and dimensions

DF-49-TR

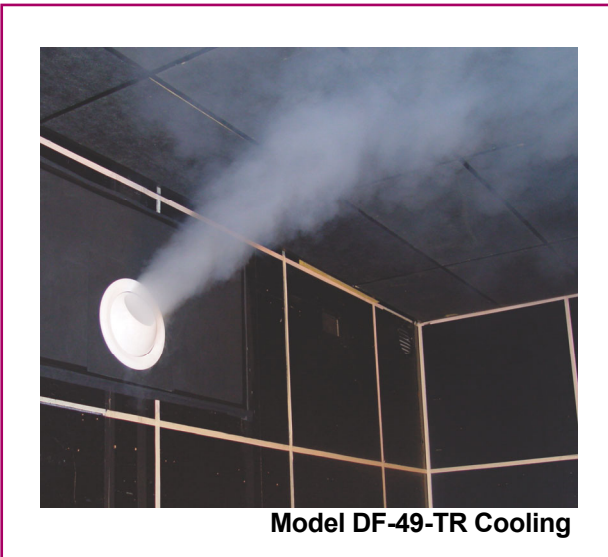
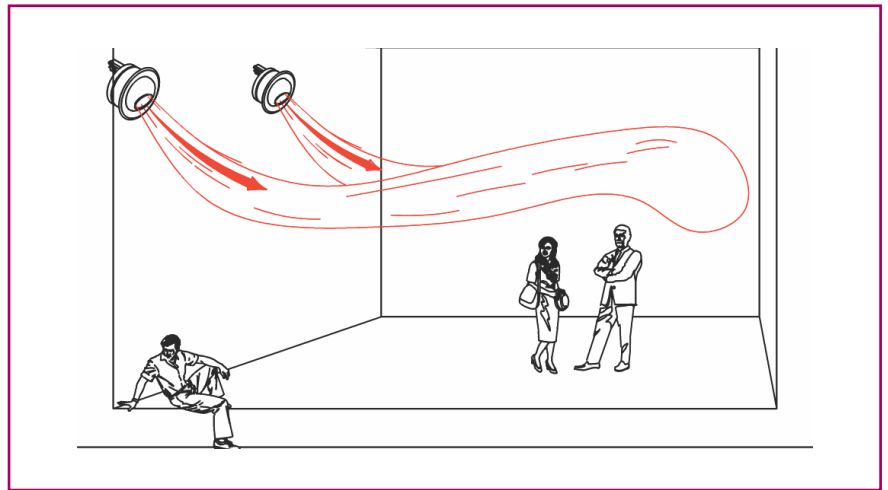
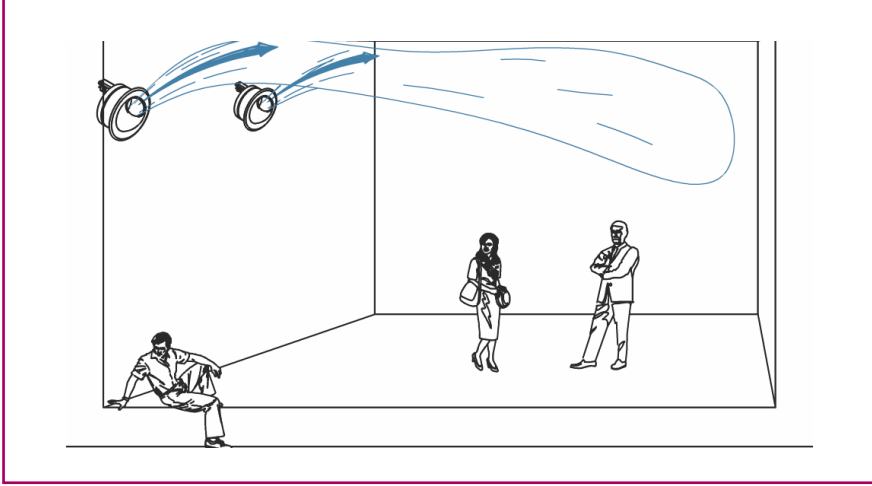


DF-49-TR WITHOUT DUCT ADAPTOR					
Model	A	B	C	D	H
5	210	160	55	145	179
8	268	230	90	215	218
10	317	282	123	264	251
12	376	335	155	318	294
16	511	445	220	425	388

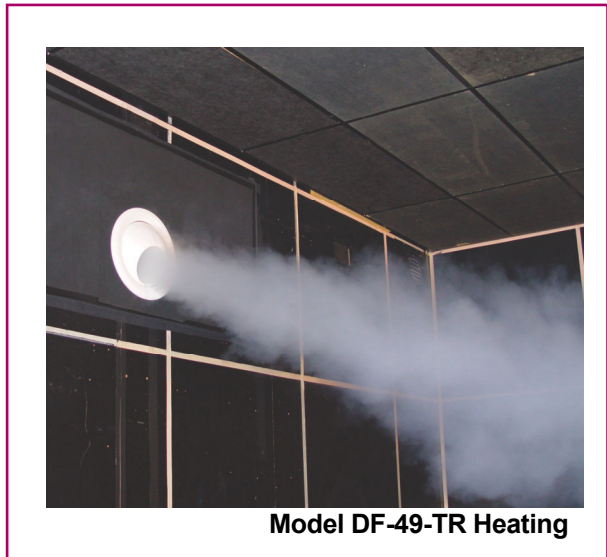
DF-49-TR WITH DUCT ADAPTOR



DF-49-TR WITH DUCT ADAPTOR					
Model	A	B	C	D	H
5	210	175	55	99	270
8	268	235	90	159	309
10	317	284	123	199	342
12	376	340	155	249	385
16	511	475	220	399	479



Model DF-49-TR Cooling



Model DF-49-TR Heating

44-SF-TR Temperature-adjustable circular diffuser



Description

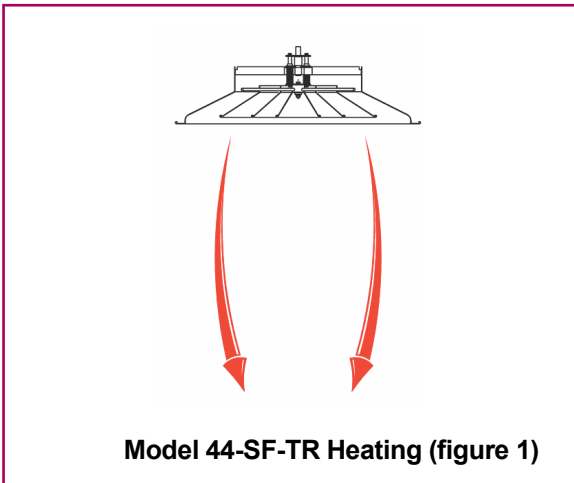
The new 44-SF-TR diffuser includes a thermal element that expands or contracts as the temperature varies and triggers a mechanism that varies the position of the cones without the need for any manual interaction.

Thus, when supplying hot air, the thermal element displaces the set of inner rings upwards, resulting in air being discharged vertically (figure 1).

Similarly, when supplying cold air, the thermal element moves the set of inner rings downwards, resulting in a horizontal air supply, thus achieving the Coandă or ceiling effect, (figure 2).

The new 44-SF-TR diffuser is ideal for use in high ceilings (between 4 and 7 m).

It avoids stratification and controls the air velocity in the occupied area.



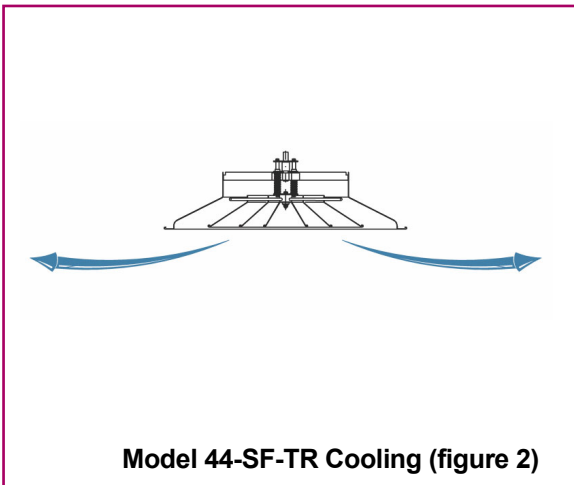
Quick selection tables

44-SF-TR Horizontal

Size	m³/h (Pa)				
	25 dB(A)	30 dB(A)	35 dB(A)	40 dB(A)	45 dB(A)
160	225 (14)	260 (20)	300 (27)	350 (39)	410 (52)
200	350 (9)	410 (13)	475 (17)	560 (24)	675 (35)
250	525 (12)	625 (17)	725 (23)	875 (33)	1025 (45)
315	850 (12)	1000 (17)	1150 (22)	1350 (31)	1600 (43)
355	975 (11)	1150 (15)	1380 (21)	1650 (30)	1950 (42)

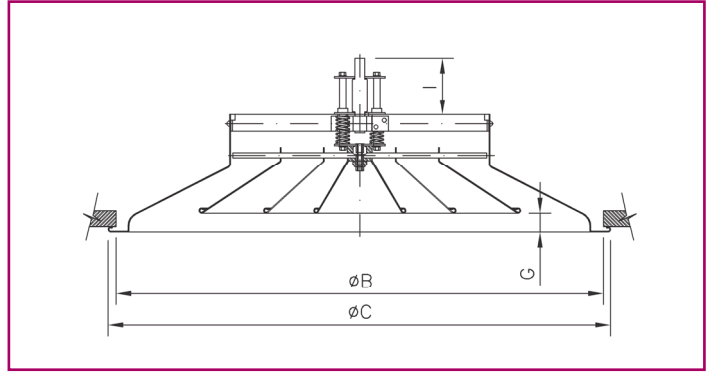
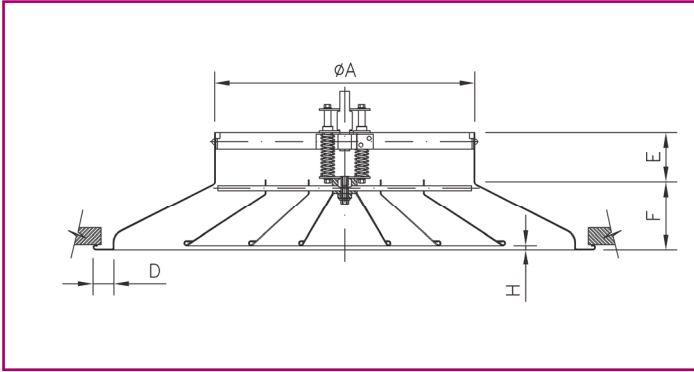
44-SF-TR Vertical

Size	m³/h (Pa)				
	25 dB(A)	30 dB(A)	35 dB(A)	40 dB(A)	45 dB(A)
160	190 (13)	230 (20)	270 (27)	320 (38)	375 (52)
200	230 (8)	285 (13)	350 (19)	425 (28)	515 (42)
250	425 (11)	500 (15)	600 (21)	725 (31)	875 (46)
315	675 (11)	800 (15)	950 (21)	1150 (31)	1360 (43)
355	780 (10)	925 (14)	1100 (19)	1300 (27)	1550 (38)



Models and dimensions

44-SF-TR



Nominal	A	B (Opening)	C	D	E	F	G	H	I
160	159	286	316	20	45	45	14	2	48
200	199	385	415		55	66.5	32	8	67
250	249	468	498	25	60	68	26	2	77
315	314	566	606			82	31	7	74
355	354	664	714			106			43

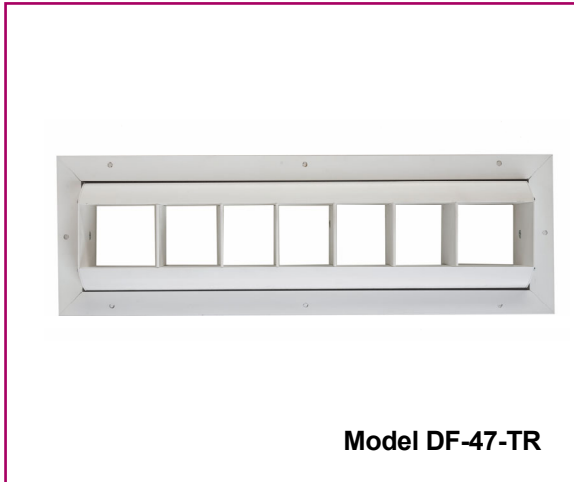


Model 44-SF-TR Cooling



Model 44-SF-TR Heating

DF-47-TR Long-throw temperature-adjustable diffuser



Description

The new DF-47-TR diffuser includes an internal mechanism that is activated in line with the temperature of the supply air, varying the position of the diffuser core without the need for any manual interaction or by means of an electric servomotor. It uses a mechanism based on the expansion of a bimetallic element.

With hot air (temperature of supply air $\geq 28^{\circ}\text{C}$), a piston associated to the mechanism is moved and, via a crank, the diffuser core is moved downwards up to a maximum angle of -20° . This setting is easily altered via a screw that creates a stop, and which is regulated during the commissioning phase of the installation.

Similarly, when cold air is supplied ($\leq 25^{\circ}\text{C}$), the bimetallic element contracts and a spring returns the mechanism to its initial previously established position ($+20^{\circ}$ maximum), which can also be modified during installation.

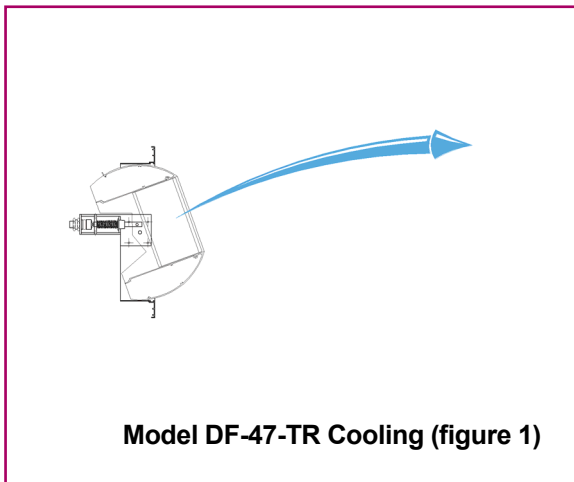
The diffuser has deflector blades that allow the air jet to be redirected with respect to the horizontal axis, to either achieve a larger opening or to focus it on a specific point.

In this way, the diffuser is able to prevent stratification of hot air and control the residual air velocities in the occupied zone when supplying either hot or cold air.

The DF-47-TR diffuser is suitable for installations that require long reaches at heights between 3.5 and 7 m.

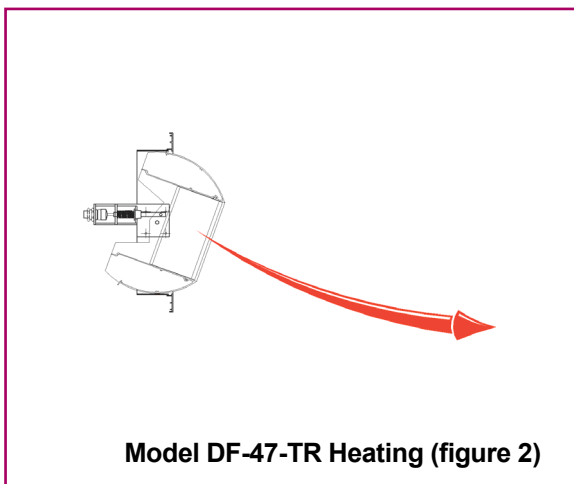
The diffuser can be adapted to connect directly to circular ductwork (DF-47-CC-TR).

Option to include a regulating damper (29-O-47).



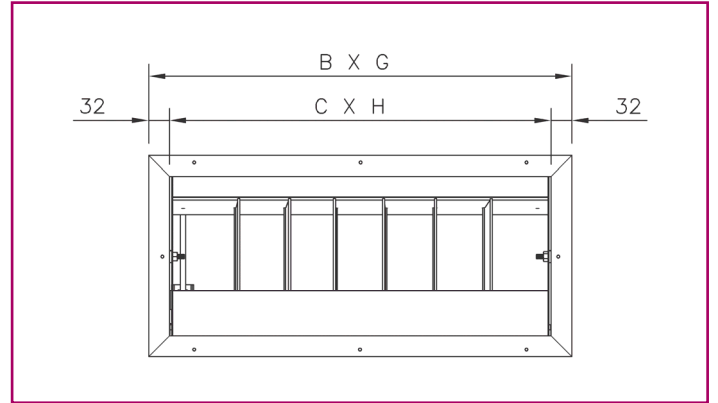
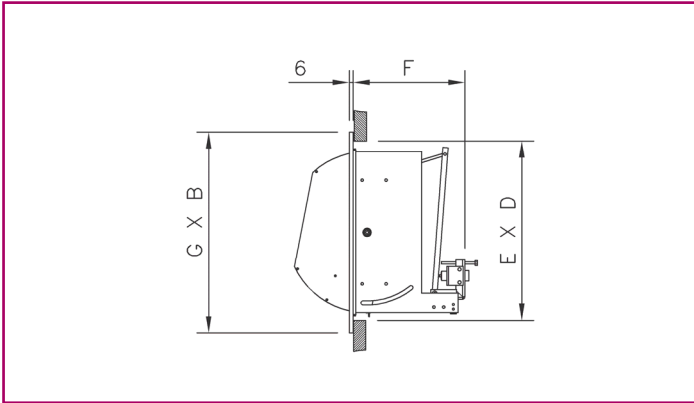
Quick selection tables

Model	NOISE LEVEL - FLOW RATE - ΔPt				
	m ³ /h (Pa)				
	30 dB(A)	35 dB(A)	40 dB(A)	45 dB(A)	50 dB(A)
DF-47-23-TR	500 (29)	590 (40)	690 (56)	810 (77)	950 (106)
DF-47-26-TR	880 (24)	1,040 (33)	1,220 (36)	1,430 (63)	1,680 (86)
DF-47-36-TR	1,320 (21)	1,550 (29)	1,820 (40)	2,130 (54)	2,500 (75)
DF-47-312-TR	2,350 (17)	2,750 (23)	3,250 (32)	3,820 (44)	4,470 (61)



Models and dimensions

DF-47-TR



Nominal D x E	DF-47	B	C	F	G	H	No. of Blades
305x165	23	348	284	143	210	144	2
610x165	26	652	588				6
610x267	36			1262	1198	173	310
1219x267	312*						

*Note: Model 312 has 2 temperature-adjustable elements (one at each end)

Long-throw temperature-adjustable diffuser DGV-TR



Model DGV-TR

Description

The new DGV-TR diffuser includes a thermal element that expands or contracts as the temperature varies and triggers a mechanism that varies the position of an internal disc without the need for any manual interaction or by the use of an electric servomotor.

When supplying hot air, the thermal element displaces the disc downwards, causing the air to be discharged vertically (figure 1).

Similarly, when cold air is supplied, the thermal element moves the disc upwards, causing the air to be supplied horizontally, thus achieving the Coandă effect if the diffuser is integrated in the ceiling (figure 2).

In this way, the diffuser is able to prevent stratification of hot air and controls the residual air velocities in the occupied zone when supplying cold air.

The DGV-TR diffuser can be used in all types of installations, including both hidden and exposed ductwork, for heights between 4 and 15 m.

The temperature-adjustable mechanism starts to operate in heating mode for supply temperatures $\geq 28^\circ\text{C}$ and in cooling mode for temperatures $\leq 25^\circ\text{C}$.

Option to include a lateral connection plenum complete with a regulating damper in the inlet spigot.

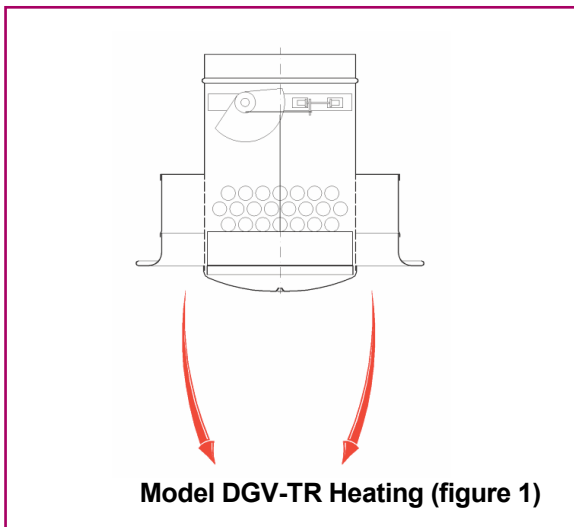
Quick selection tables

DGV-TR Horizontal

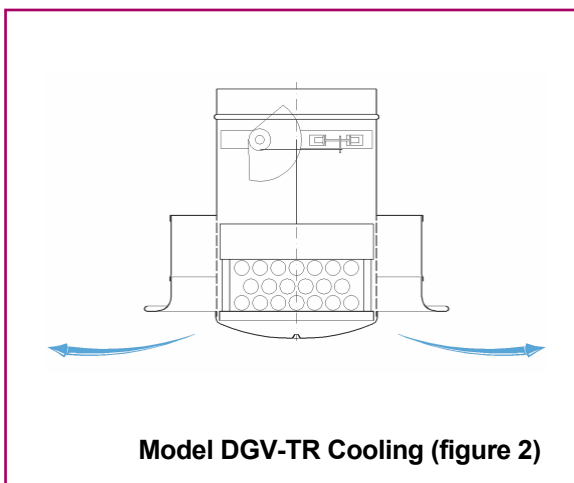
Size	m ³ /h (Pa)				
	30 dB(A)	35 dB(A)	40 dB(A)	45 dB(A)	50 dB(A)
250	502 (21)	601 (31)	720 (44)	863 (63)	1034 (91)
315	648 (15)	777 (22)	930 (32)	1114 (45)	1334 (65)
400	894 (12)	1071 (18)	1282 (25)	1536 (36)	1840 (52)
500	1264 (13)	1514 (19)	1813 (28)	2172 (40)	2601 (57)

DGV-TR Vertical

Size	m ³ /h (Pa)				
	30 dB(A)	35 dB(A)	40 dB(A)	45 dB(A)	50 dB(A)
250	482 (20)	578 (28)	692 (41)	829 (58)	993 (84)
315	605 (13)	724 (19)	867 (27)	1039 (39)	1244 (56)
400	810 (10)	970 (14)	1162 (21)	1391 (30)	1666 (43)
500	118 (10)	1339 (15)	1604 (21)	1921 (31)	2301 (44)



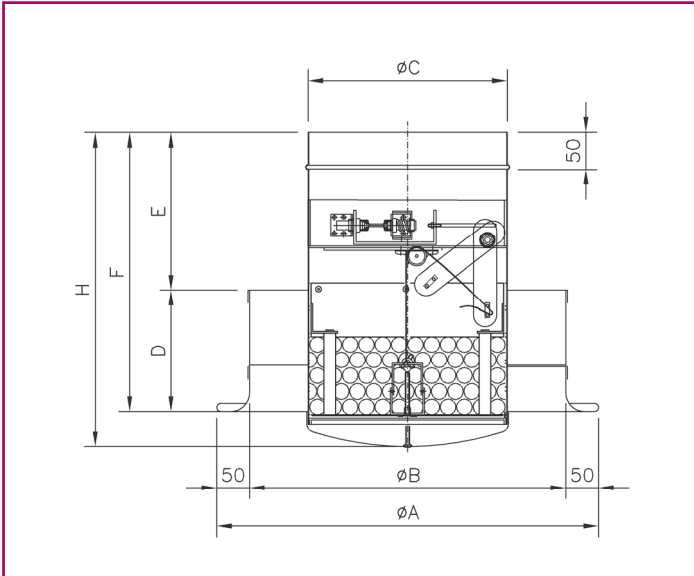
Model DGV-TR Heating (figure 1)



Model DGV-TR Cooling (figure 2)

Models and dimensions

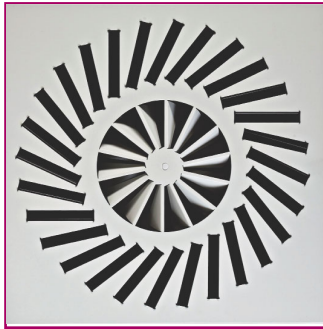
DGV-TR



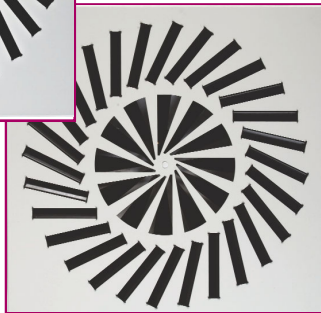
Model	ØA	ØB	ØC	D	E	F	H
250	425	325	249	190	250	440	495
315	500	400	314				
400	600	500	399				
500	730	630	499				510



DF-TR Temperature-adjustable swirl diffuser



DF-TR-R



DF-TR-V

The DF-TR variable geometry diffuser is specially developed for spaces with ceiling heights over 3.5 m.

Operation

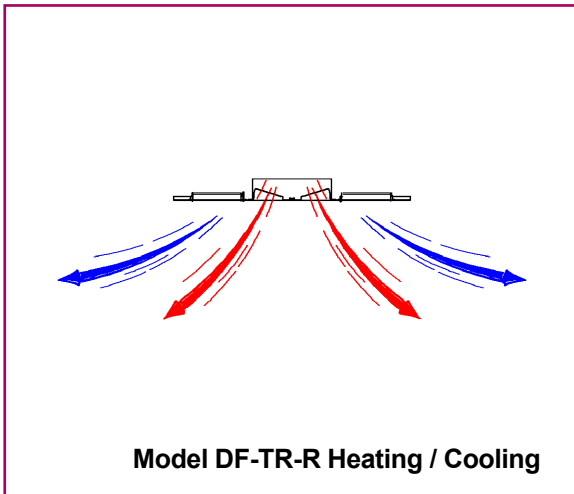
The temperature-adjustable diffuser includes a thermal element that expands or contracts as the temperature varies and triggers a mechanism that causes air to be supplied horizontally when cooling and vertically when heating. The air jet is completely horizontal when the supply temperature is below 22° C, and totally vertical when the supply temperature is above 28° C.

In this model the temperature-adjustable mechanism activates a damper that is oriented parallel to the plate and redirects the air flow to the internal or external part of the diffuser.

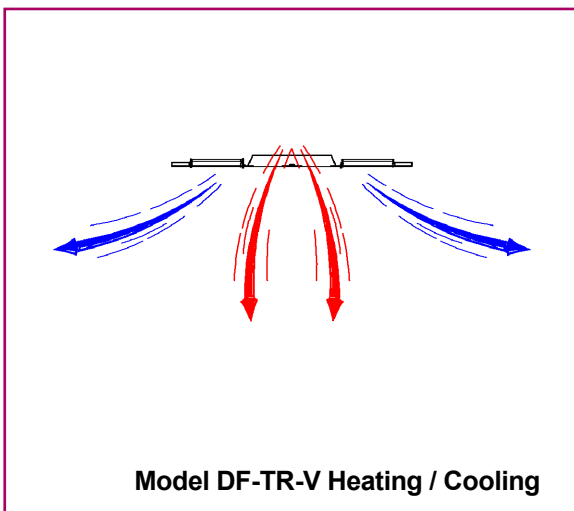
This element helps avoid any potential problems with the stratification of hot air when air is supplied horizontally using a conventional swirl diffuser at heights above 3.5 m.

The throw of the air jet varies with the difference between the supply air temperature the ambient temperature and with the supply flow rate: the distance decreases as the temperature difference increases and also as the flow rate decreases.

The values shown in the tables correspond to a ΔT (temperature difference between the supply air and the interior of the area being conditioned) of -10° C for cooling and +10° C for heating.



Model DF-TR-R Heating / Cooling



Model DF-TR-V Heating / Cooling

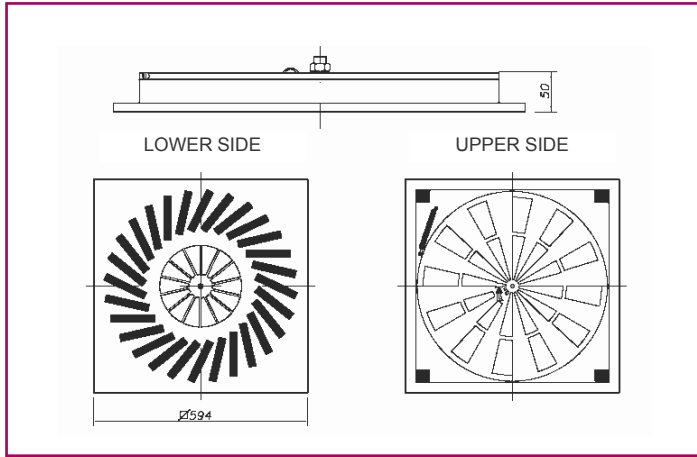
Models

There are two models: they both share the same the geometry in the area that supplies cold air, with differences in the central area, which is the part that defines the vertical configuration.

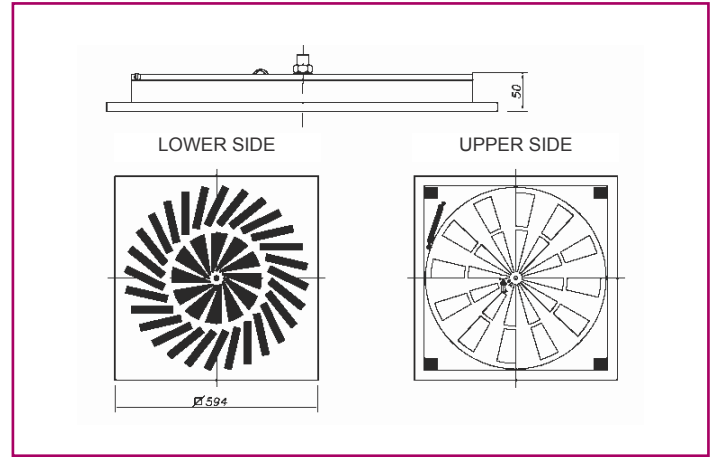
The central part of the DF-TR-V model does not have any blades. This is used in installations with ceiling heights over 5 m. When heating, it supplies air completely vertically.

The DF-TR-R model has a swirl diffuser at its centre with blades fixed at 60°. In this case, the vertical air jet is supplied with rotation, meaning its throw is not as great as the previous model. The recommended installation height is between 3.5 and 5 m.

Models and dimensions

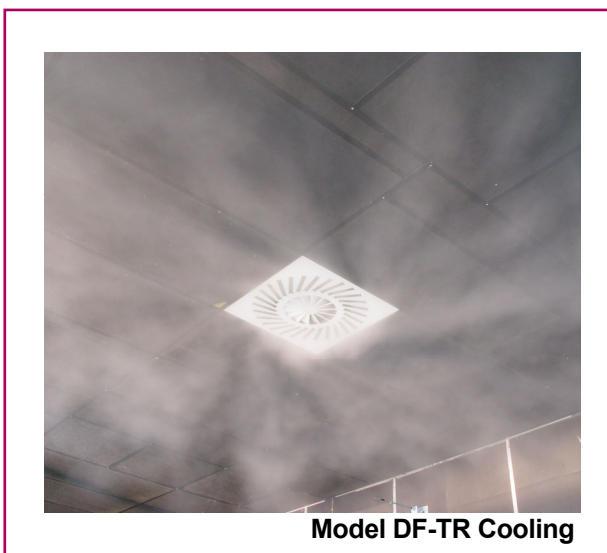
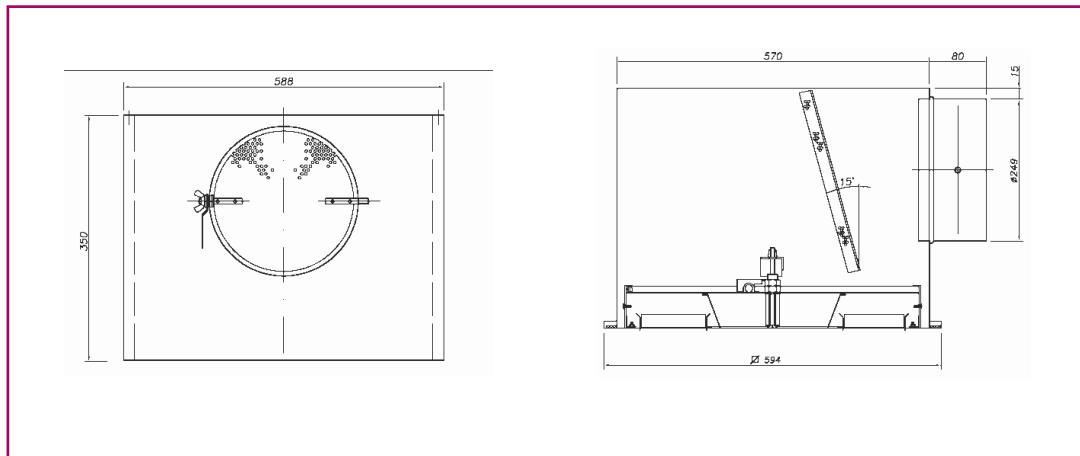


Model DF-TR-R



Model DF-TR-V

PLENUM FOR DF-TR



Model DF-TR Cooling



Model DF-TR Heating

Technical data. Selection tables

HORIZONTAL SUPPLY OF COLD AIR
(COMMON FOR BOTH MODELS)

Table 1

Q		Horizontal Configuration	
(m ³ /h)	(l/s)		
300	83.3	X (m)	1.4
		ΔP_t (Pa)	8
		LwA - dB(A)	18
400	111.1	X (m)	1.9
		ΔP_t (Pa)	12
		LwA - dB(A)	26
500	138.9	X (m)	2.4
		ΔP_t (Pa)	18
		LwA - dB(A)	32
600	166.7	X (m)	2.9
		ΔP_t (Pa)	25
		LwA - dB(A)	37
700	194.4	X (m)	3.4
		ΔP_t (Pa)	34
		LwA - dB(A)	41
800	222.2	X (m)	3.8
		ΔP_t (Pa)	44
		LwA - dB(A)	45
900	250.0	X (m)	4.3
		ΔP_t (Pa)	55
		LwA - dB(A)	48

KEY

ΔP_t Total pressure loss in Pa

LwA-dB(A) Noise level

X Horizontal throw of the air jet for a maximum velocity of 0.25 m/s in the occupied area, for a $\Delta T = -10^\circ \text{C}$

Technical data. Selection tables

VERTICAL SUPPLY OF HOT AIR
MODEL DF-TR-R

Table 2

Q		MODEL	DF-TR-R		
(m ³ /h)	(l/s)	Supply	VERTICAL ($\Delta T = +10^{\circ} \text{C}$)		
300	83.3	Y _{0.5} Y _{0.3} Y _{max} (m)	1.5	1.8	2.0
		ΔPt (Pa)	10		
		LwA - dB(A)	21		
400	111.1	Y _{0.5} Y _{0.3} Y _{max} (m)	2.0	2.5	2.7
		ΔPt (Pa)	17		
		LwA - dB(A)	29		
500	138.9	Y _{0.5} Y _{0.3} Y _{max} (m)	2.5	3.1	3.4
		ΔPt (Pa)	26		
		LwA - dB(A)	36		
600	166.7	Y _{0.5} Y _{0.3} Y _{max} (m)	3.0	3.8	4.1
		ΔPt (Pa)	38		
		LwA - dB(A)	41		
700	194.4	Y _{0.5} Y _{0.3} Y _{max} (m)	3.5	4.4	4.7
		ΔPt (Pa)	52		
		LwA - dB(A)	46		
800	222.2	Y _{0.5} Y _{0.3} Y _{max} (m)	4.0	5.0	5.4
		ΔPt (Pa)	68		
		LwA - dB(A)	50		
900	250.0	Y _{0.5} Y _{0.3} Y _{max} (m)	4.5	5.6	6.1
		ΔPt (Pa)	86		
		LwA - dB(A)	53		

KEY

Y_{0.5}, Y_{0.3} Vertical throw for a terminal velocity of the air jet of 0.5 or 0.3 m/s respectively, with a $\Delta T = 10^{\circ} \text{C}$

Y_{max} Maximum vertical penetration, with a $\Delta T = 10^{\circ} \text{C}$

Technical data. Selection tables

VERTICAL SUPPLY OF HOT AIR
MODEL DF-TR-V

Table 3

Q		MODEL	DF-TR-V		
(m ³ /h)	(l/s)	Supply	VERTICAL ($\Delta T = +10^{\circ} \text{C}$)		
300	83.0	Y0.5 Y0.3 Ymax (m)	2.0	2.3	2.4
		ΔPt (Pa)	11		
		LwA - dB(A)	21		
400	111.0	Y0.5 Y0.3 Ymax (m)	2.6	3.1	3.2
		ΔPt (Pa)	19		
		LwA - dB(A)	29		
500	138.0	Y0.5 Y0.3 Ymax (m)	3.3	3.8	4.0
		ΔPt (Pa)	29		
		LwA - dB(A)	35		
600	166.0	Y0.5 Y0.3 Ymax (m)	3.9	4.6	4.8
		ΔPt (Pa)	40		
		LwA - dB(A)	40		
700	194.0	Y0.5 Y0.3 Ymax (m)	4.6	5.4	5.6
		ΔPt (Pa)	54		
		LwA - dB(A)	44		
800	222.0	Y0.5 Y0.3 Ymax (m)	5.2	6.1	6.4
		ΔPt (Pa)	70		
		LwA - dB(A)	48		
900	250.0	Y0.5 Y0.3 Ymax (m)	5.9	6.9	7.2
		ΔPt (Pa)	88		
		LwA - dB(A)	51		

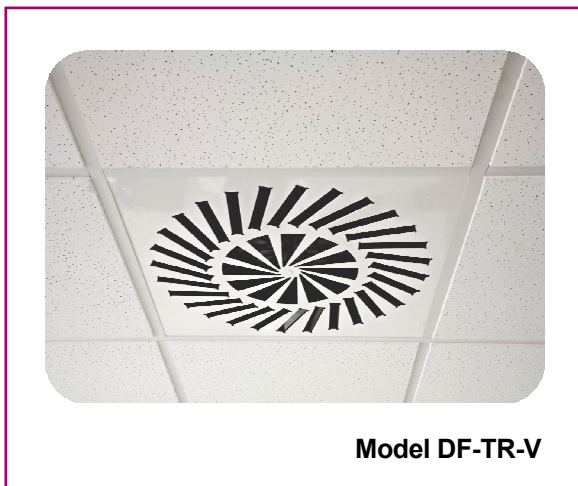
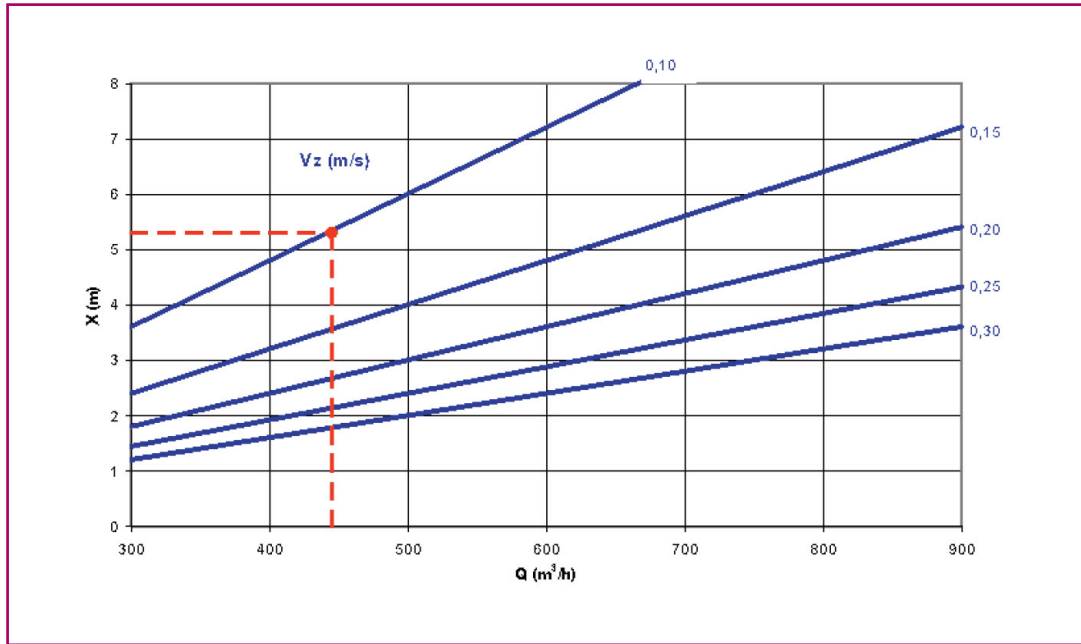
KEY

Y_{0.5} , Y_{0.3} Vertical throw for a terminal velocity of the air jet of 0.5 or 0.3 m/s respectively, with a $\Delta T = 10^{\circ} \text{C}$

Y_{max} Maximum vertical penetration, with a $\Delta T = 10^{\circ} \text{C}$

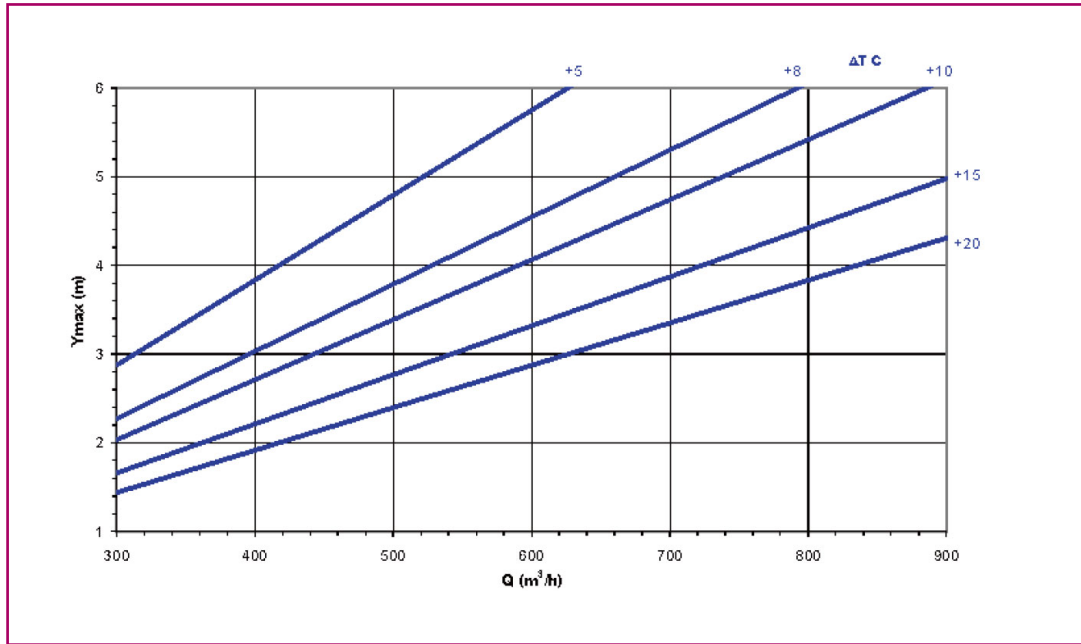
Technical data. Selection graphs

Graph 1. HORIZONTAL THROW. DF-TR-R AND DF-TR-V DIFFUSERS

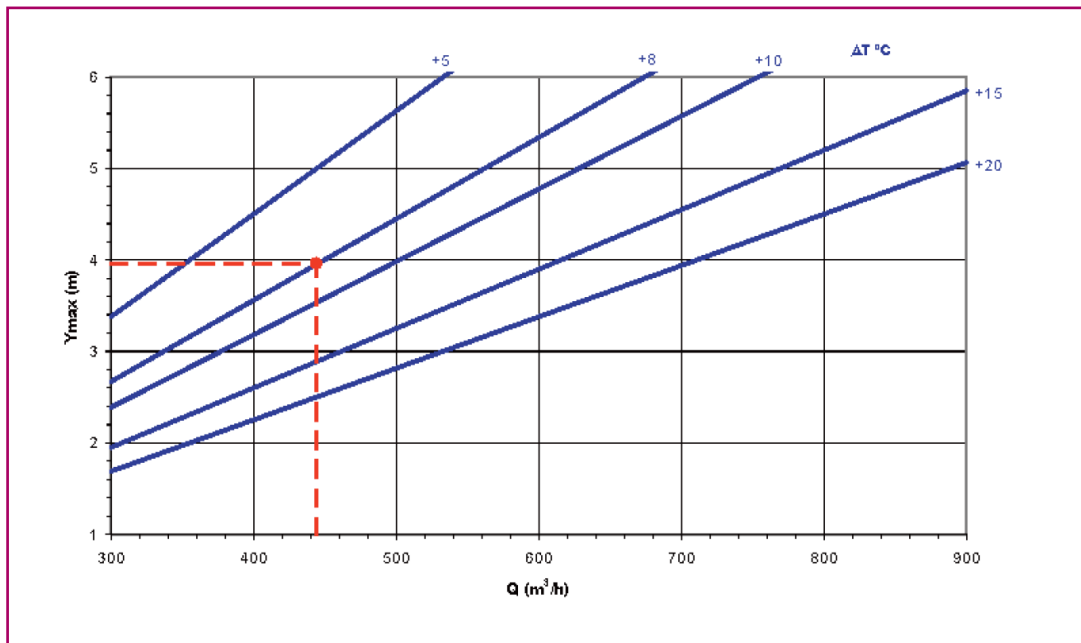


Technical data. Selection graphs

Graph 2. MAXIMUM VERTICAL PENETRATION. DIFFUSER DF-TR-R



Graph 3. MAXIMUM VERTICAL PENETRATION. DIFFUSER DF-TR-V



Selection example

DESIGN CONDITIONS

- Room type: Conference hall
- Dimensions: (L x W) 10 x 10 m. Ceiling height 5 m
- Total supply flow rate: 4,000 m³/h
- Summer conditions: Supply temperature 14° C; Ambient temperature 24° C
- Winter conditions: Supply temperature 31° C; Ambient temperature 23° C
- Maximum sound level required 35 dB(A)
- Height of occupied zone 1.3 m (person sitting)

SOLUTION:

Nine diffuser units are selected, with a 3x3 distribution (distance between the centres of the diffusers is 3.3 m). Unit flow rate per diffuser = 445 m³/h.

The diffusers are installed at a height of 5 m, the height of the occupied area is 1.3 and a vertical penetration of 3.7 m is required. Also, for correct air diffusion, the velocity of the air jet should not exceed a maximum of 0.25 m/s nor be below a minimum of 0.10 m/s.

If we refer to the selection tables (vertical supply) of the different models, it can be seen that the diffuser that best meets the air velocity demands in the occupied area while fulfilling the established acoustic conditions is the DF-TR-V model.

For the selected diffuser with a flow rate of 445 m³ / h and a $\Delta T = 8^\circ \text{C}$ the graph of maximum vertical penetration (Graph 3) gives a maximum penetration of the air jet of 4 m. This value is within the required limits for correct air diffusion for the established design conditions.

TECHNICAL DATA, HOT AIR SUPPLY:

$L_{WA} = 32 \text{ dB(A)}$	(Table 3)
$\Delta P_t = 23 \text{ Pa}$	
$Y_{\max} = 4 \text{ m}$	(Graph 3)

TECHNICAL DATA, COLD AIR SUPPLY:

$L_{WA} = 32 \text{ dB(A)}$	(Table 1)
$\Delta P_t = 23 \text{ Pa}$	

Using a flow rate of 445 m³/h and a throw X (m) that is equal to half the distance between diffuser centres plus the distance from the ceiling to the occupied area, i.e. $X \text{ (m)} = 1.6 + 3.7 = 5.3 \text{ m}$, in the graph of horizontal throw (Graph 1), we find a maximum velocity in occupied zone of 0.10 m/s.

Coding

We can use the following coding to define both the diffuser and the plenum:

DF-TR C	600x600 temperature-adjustable swirl diffuser Circular plate
R V	Central part with swirl diffuser Central part with no blades
-- E	For modular ceiling For plaster ceiling
PD PDA	Uninsulated removable plenum with lateral spigot and regulating damper Insulated removable plenum with lateral spigot and regulating damper
RAL 9010 RAL...	Standard white finish Finished in another RAL colour

Coding example:

DF-TR-R PD RAL 9010

600x600 mm temperature-adjustable swirl diffuser made from galvanised sheet steel, with uninsulated removable plenum, painted white.

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KOOLAIR, S.L.

Calle Urano, 26

Poligono industrial nº 2 – La Fuensanta

28936 Móstoles - Madrid - (España)

Tel: +34 91 645 00 33

Fax: +34 91 645 69 62

e-mail: info@koolair.com

www.koolair.com