KOOLAIR

series

DF-89

Long-throw nozzles

ISO 9001
BUREAU VERITAS
Certification
Sistema de Gestión

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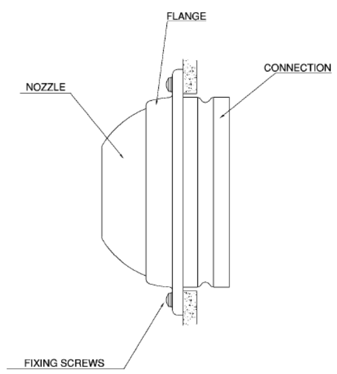
Long-throw jet nozzle DF-89

Description

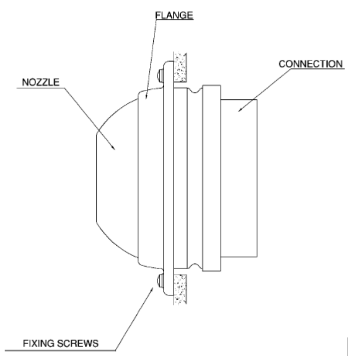
The DF-89 long-throw jet nozzle and its flange are made of aluminium painted white RAL 9010 as standard finish. The connection part is manufactured of galvanised steel sheet. The DF-89 nozzle has an extraordinarily good aesthetic design and can be painted by special order to fit any decorative need



DF-89-A

Application

The DF-89 nozzles provide long throws with a low noise level, releasing a long air jet with exceptional precision to a length of over 30 metres. They can be used for spot cooling and are especially appropriate for large rooms requiring a decorative look, for instance, large vestibules, nightclubs or entertainment areas, department stores, hotels, etc. The configuration allows the nozzle to swivel in all directions up to a maximum of ±30° in the horizontal or vertical direction.



DF-89-B

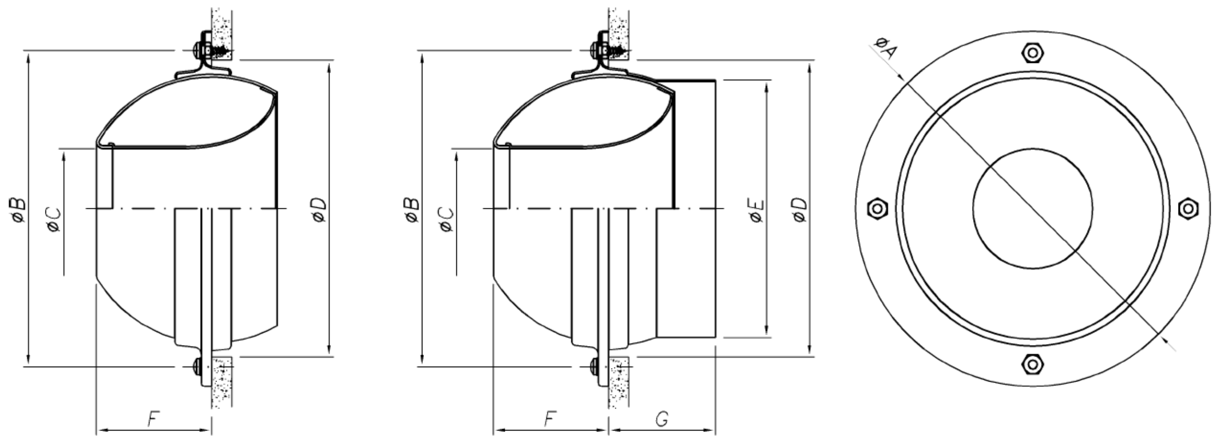
Identification

Five sizes with manual swiveling. The motor drive swivels the nozzle in the vertical direction (up and down) at an angle of approximately ± 30°. For motor-driven operation one motor is required per nozzle, even in assemblies containing several units.

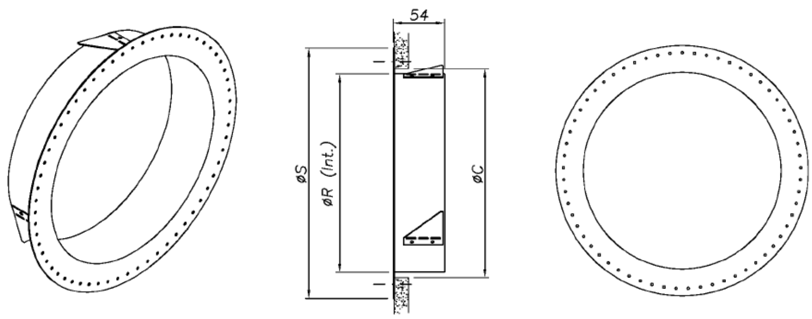
DF-89	*Long-throw nozzles, manual operation.*
A or C	*Connection system.*
5, 8, 10, 12, 16, 20	*Five sizes (see page 3).*
AC PAC PCL INJ	*Plenum or flan plate. Plenum box with connection to round duct. Integrated in plate to be adapted in round face duct. With “boot” to be installed in a round face duct.*

Long-throw jet nozzle DF-89

DF-89-A **DF-89-B**



MODEL	ØA	ØB	ØC	ØD	ØE	F	ØG
5	205	182	55	143	123	68	48
8	276	254	90	215	198	80	50
10	324	301	123	265	248	105	79
12	380	356	155	322	313	132	74
16	495	470	220	425	398	170	113
20	553	526	290	500	498	185	135



DIFFUSER	Ø C	Ø R	Ø S
5	145	138	200
8	219	212	270
10	269	262	319
12	325	318	374
16	432	425	490
20	508	496	547

øC = HOLE (Opening)

DF-89 Accessories

Dimensions

Version **A** of the DF-89 jet nozzles can be mounted directly to the duct, plenum box or surface.

Version **B** allows a flexible duct of standard dimensions to be coupled directly to each nozzle.

In both cases, the nozzles are fixed by screws.

In terms of the motor drive system, the motor may be placed inside or outside the unit, depending on the connection system and motor type (each case should be analysed separately). Please contact us for more information.

DF-89 selection table

Q		Size	5	8	10	12	16	20
(m³/h)	(l/s)	A_k (m²)	0,0025	0,0060	0,01262	0,0184	0,0390	0,0724
75	20,8	V_k (m/s)	8,3	3,5				
		$X_{0,3}$ $X_{0,5}$ $X_{1,0}$ (m)	11,4 6,9 3,4	6,9 4,1 2,1				
		ΔP_t (Pa)	37	6				
		L_{wA} - dB(A)	<15	<15				
150	41,7	V_k (m/s)	16,6	6,9	3,3			
		$X_{0,3}$ $X_{0,5}$ $X_{1,0}$ (m)	22,9 13,7 6,9	13,8 8,3 4,1	9,4 5,7 2,8			
		ΔP_t (Pa)	148	25	7			
		L_{wA} - dB(A)	34	<15	<15			
250	69,4	V_k (m/s)	27,7	11,5	5,5	3,8		
		$X_{0,3}$ $X_{0,5}$ $X_{1,0}$ (m)	>30 22,9 11,4	22,9 13,8 6,9	15,7 9,4 4,7	12,9 7,8 3,9		
		ΔP_t (Pa)	411	69	19	7		
		L_{wA} - dB(A)	49	26	<15	<15		
500	138,9	V_k (m/s)		23,0	11,0	7,5	3,6	
		$X_{0,3}$ $X_{0,5}$ $X_{1,0}$ (m)		>30 27,5 13,8	>30 18,9 9,4	25,9 15,5 7,8	17,3 10,4 5,2	
		ΔP_t (Pa)		274	75	28	6	
		L_{wA} - dB(A)		47	33	17	<15	
750	208,3	V_k (m/s)			16,5	11,3	5,3	
		$X_{0,3}$ $X_{0,5}$ $X_{1,0}$ (m)			>30 28,3 14,1	>30 23,3 11,6	26,0 15,6 7,8	
		ΔP_t (Pa)			169	64	15	
		L_{wA} - dB(A)			47	29	<15	
1000	277,8	V_k (m/s)				15,1	7,1	3,8
		$X_{0,3}$ $X_{0,5}$ $X_{1,0}$ (m)				>30 >30 15,5	>30 20,8 10,4	25,5 15,3 7,6
		ΔP_t (Pa)				113	26	6
		L_{wA} - dB(A)				38	23	<15
1500	416,7	V_k (m/s)				22,6	10,7	5,8
		$X_{0,3}$ $X_{0,5}$ $X_{1,0}$ (m)				>30 >30 23,3	>30 >30 15,6	>30 22,9 11,5
		ΔP_t (Pa)				255	58	13
		L_{wA} - dB(A)				50	35	17
2000	555,6	V_k (m/s)					14,2	7,7
		$X_{0,3}$ $X_{0,5}$ $X_{1,0}$ (m)					>30 >30 20,8	>30 >30 15,3
		ΔP_t (Pa)					103	23
		L_{wA} - dB(A)					44	25
2500	694,4	V_k (m/s)					17,8	9,6
		$X_{0,3}$ $X_{0,5}$ $X_{1,0}$ (m)					>30 >30 26,0	>30 >30 19,1
		ΔP_t (Pa)					161	35
		L_{wA} - dB(A)					50	32
3000	833,3	V_k (m/s)						11,5
		$X_{0,3}$ $X_{0,5}$ $X_{1,0}$ (m)						>30 >30 22,9
		ΔP_t (Pa)						51
		L_{wA} - dB(A)						37
3500	972,2	V_k (m/s)						13,4
		$X_{0,3}$ $X_{0,5}$ $X_{1,0}$ (m)						>30 >30 26,7
		ΔP_t (Pa)						69
		L_{wA} - dB(A)						42
4000	1111,1	V_k (m/s)						15,3
		$X_{0,3}$ $X_{0,5}$ $X_{1,0}$ (m)						>30 >30 >30
		ΔP_t (Pa)						90
		L_{wA} - dB(A)						46

Notes

- This selection table is based on laboratory tests as per ISO 5219 (UNE 100.710) and ISO 5135 and 3741.
- ΔT is equal to 0°C (isothermal air).
- The behaviour of the air jet with different Δt is shown in the following charts.

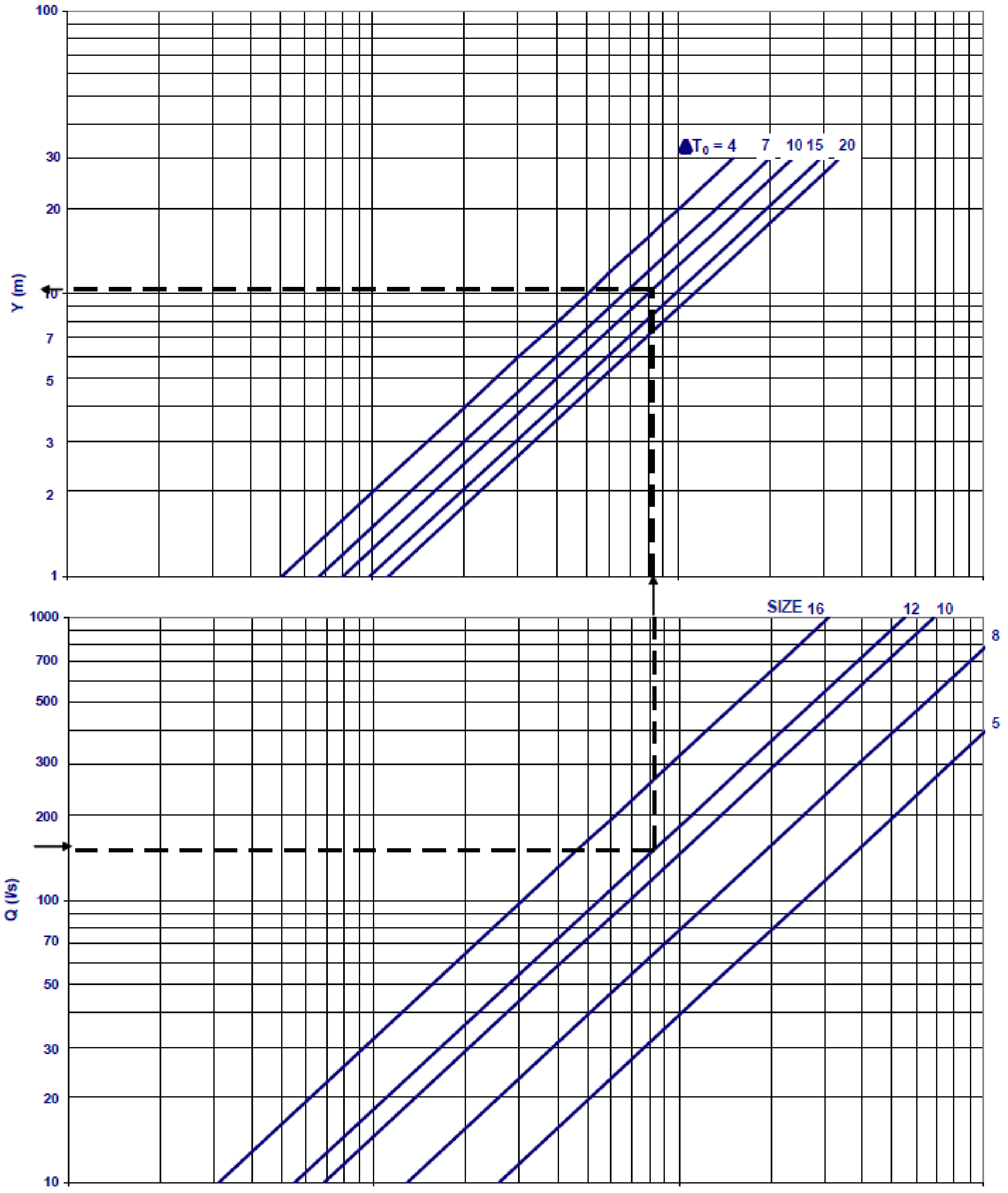
Symbols

Q = Air flow
V_K = Effective velocity
A_K = Effective area
ΔP_t = Total pressure drop
L_{wA} = Sound power
$X_{0,3}$ - $X_{0,5}$ - $X_{1,0}$ = Throw for a terminal air velocity of 0.3, 0.5 and 1.0 m/s, respectively.

DF-89 model

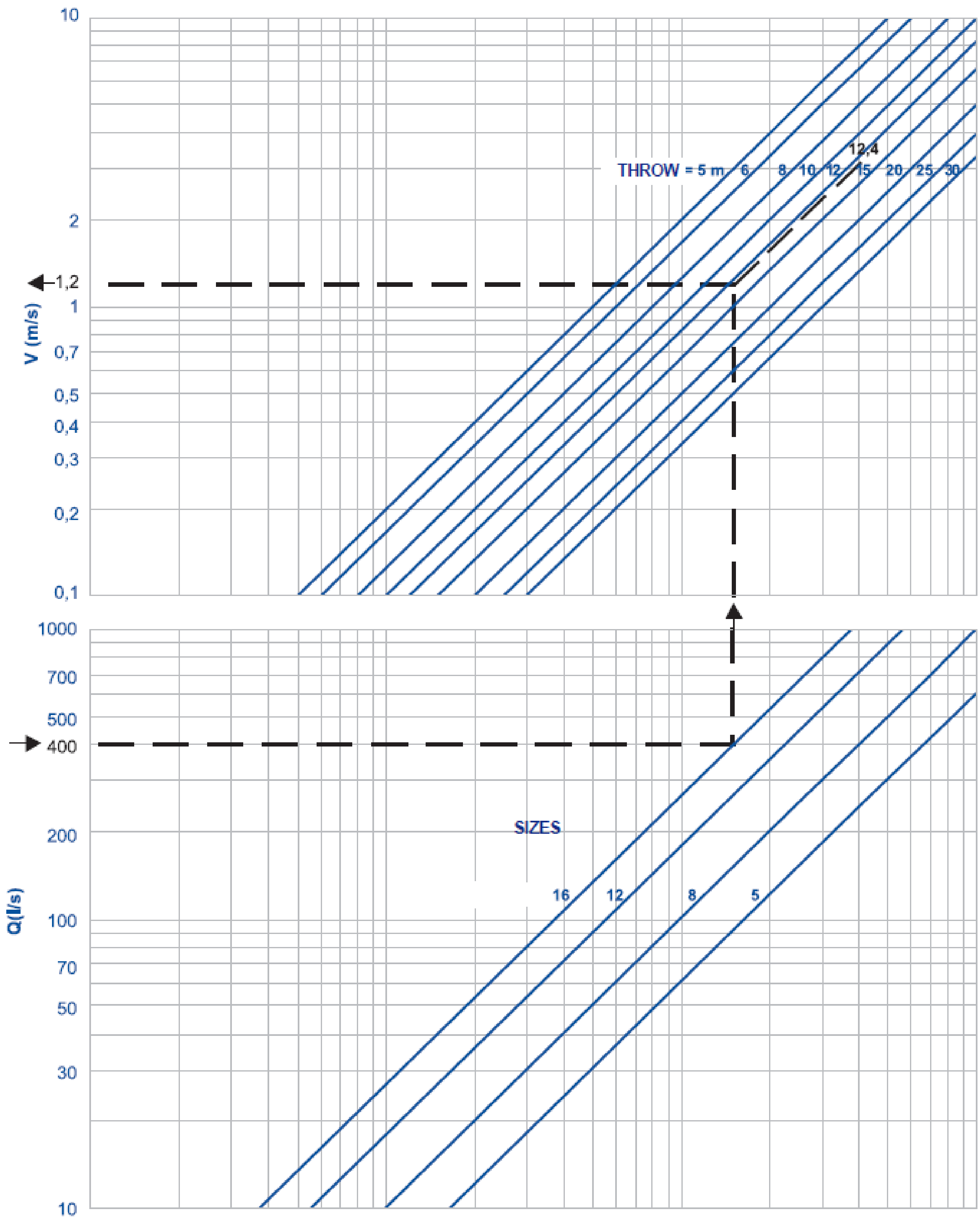
Selection charts

DF-89-1.- Maximum vertical penetration.



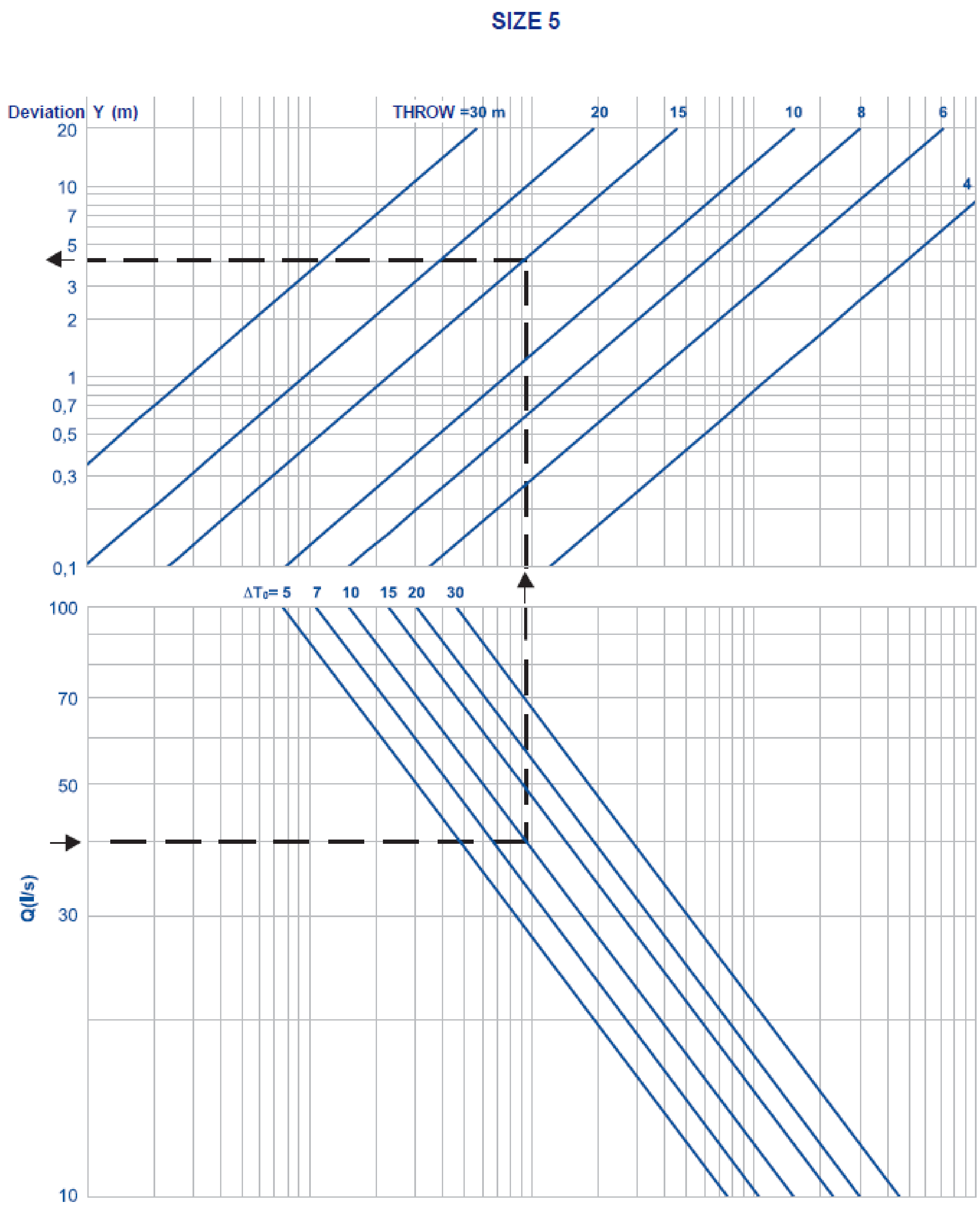
DF-89 model

DF-89-2.- Velocity of the air jet for the throw.



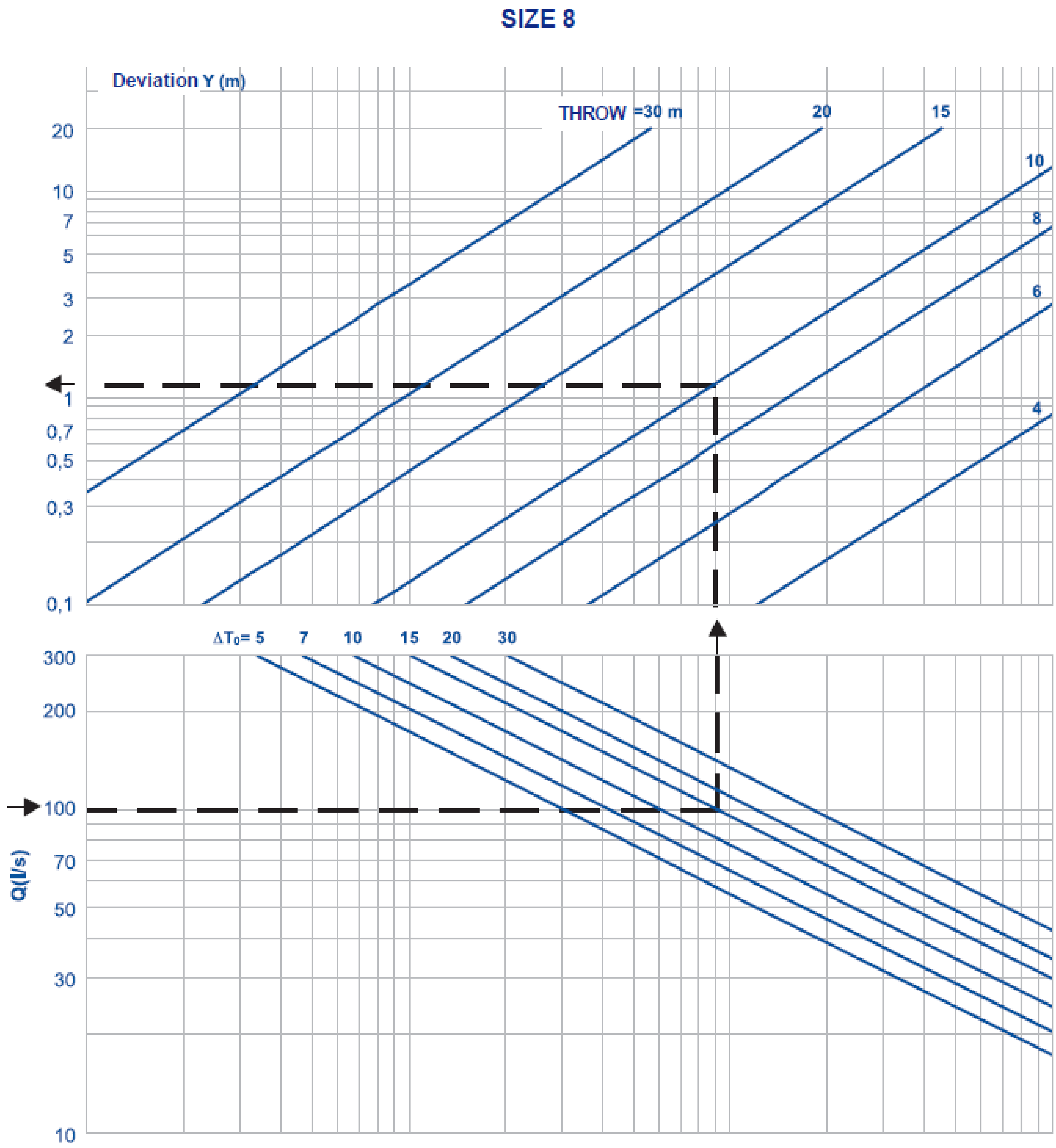
DF-89 model

DF-89-3.1.- Vertical deviation of the air jet (non-isothermal jets).



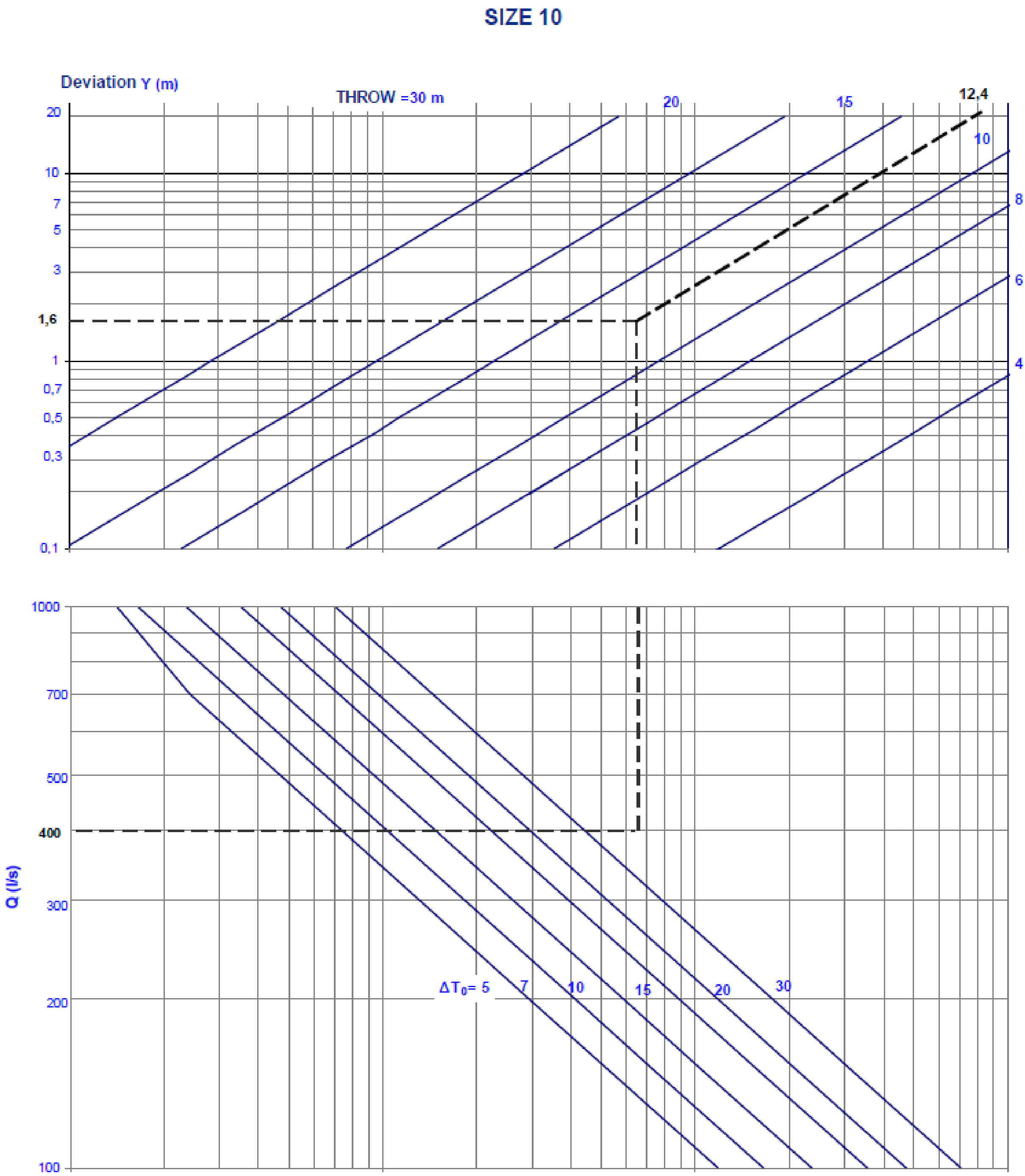
DF-89 model

DF-89-3. 2.- Vertical deviation of the air jet (non-isothermal jets).



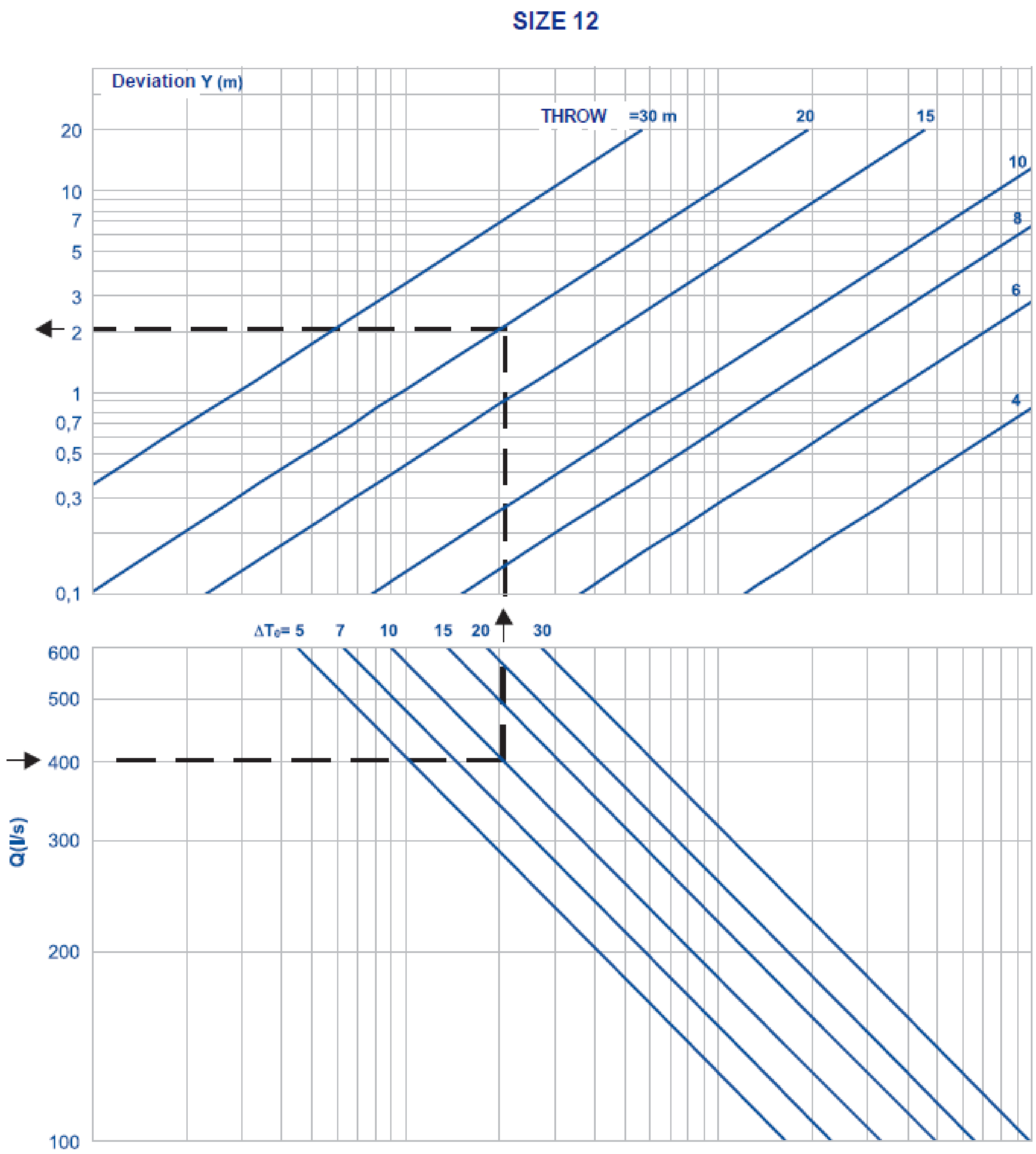
DF-89 model

DF-89-3. 3.- Vertical deviation of the air jet (non-isothermal jets).



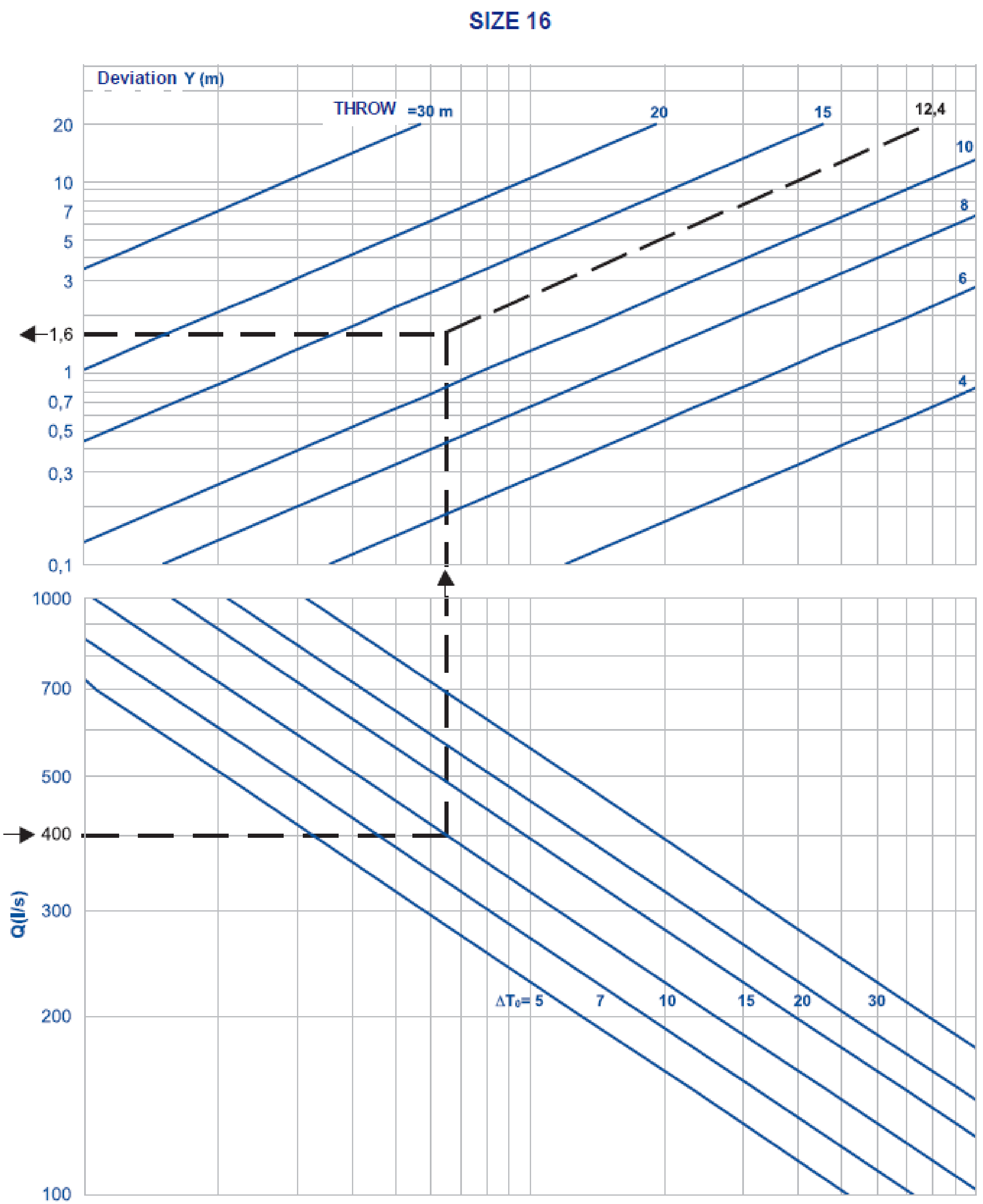
DF-89 model

DF-89-3. 3.- Vertical deviation of the air jet (non-isothermal jets).



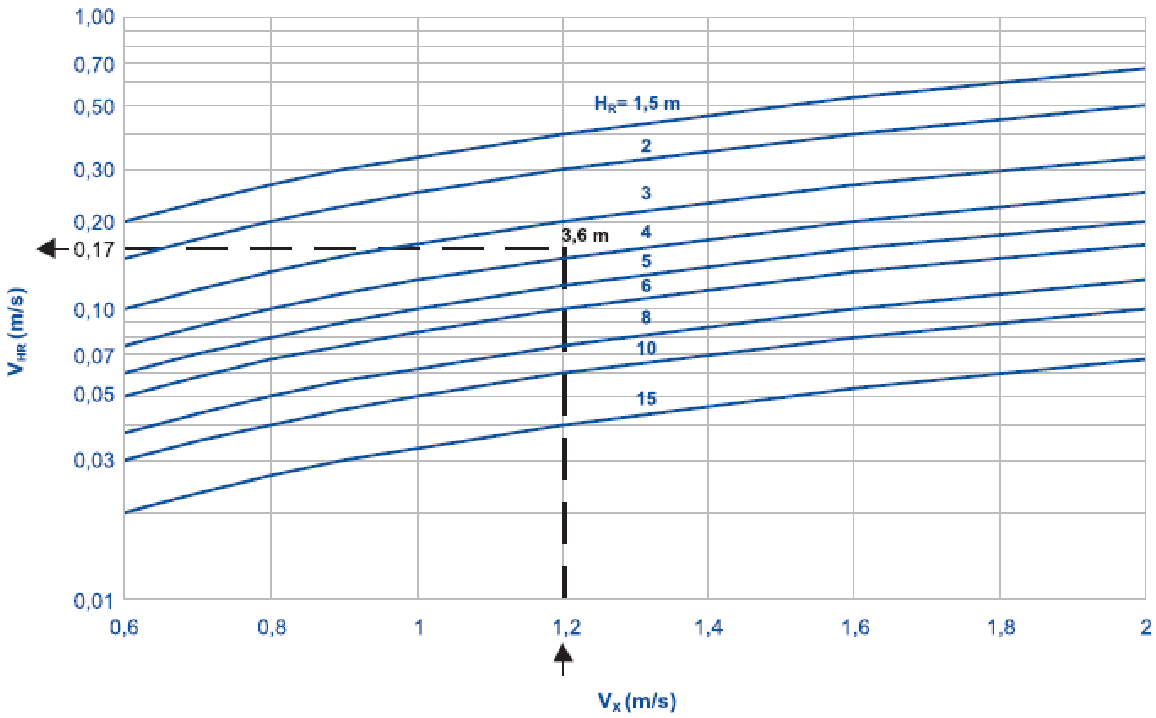
DF-89 model

DF-89-3. 4.- Vertical deviation of the air jet (non-isothermal jets).

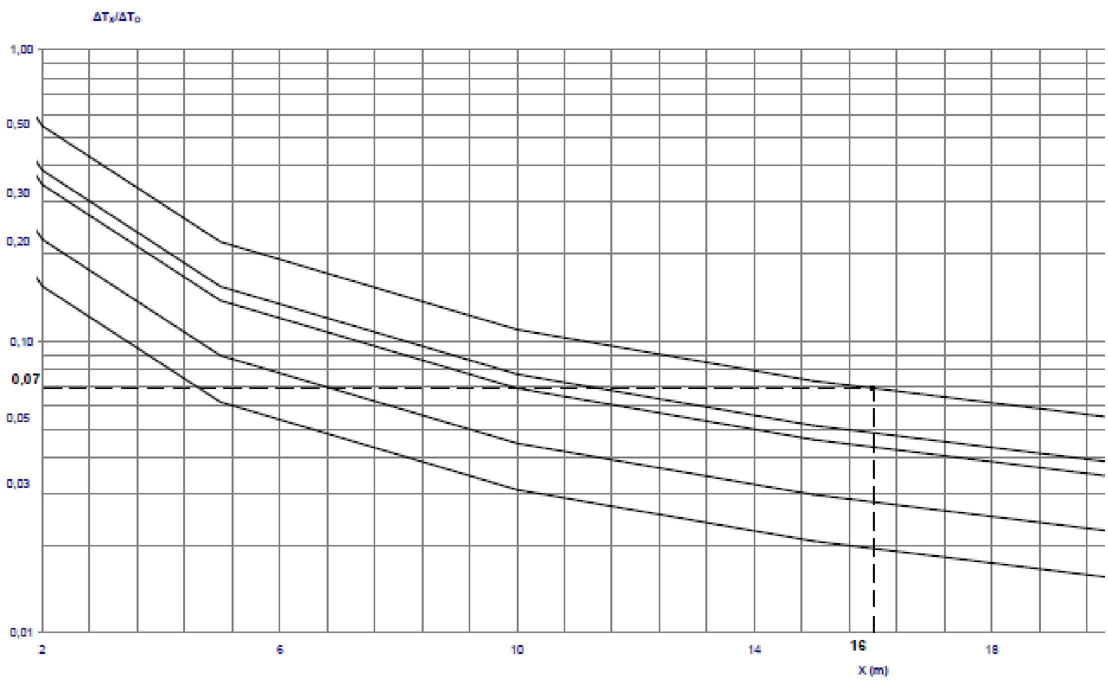


DF-89 model

DF-89-4.- Ratio between air flow velocities.

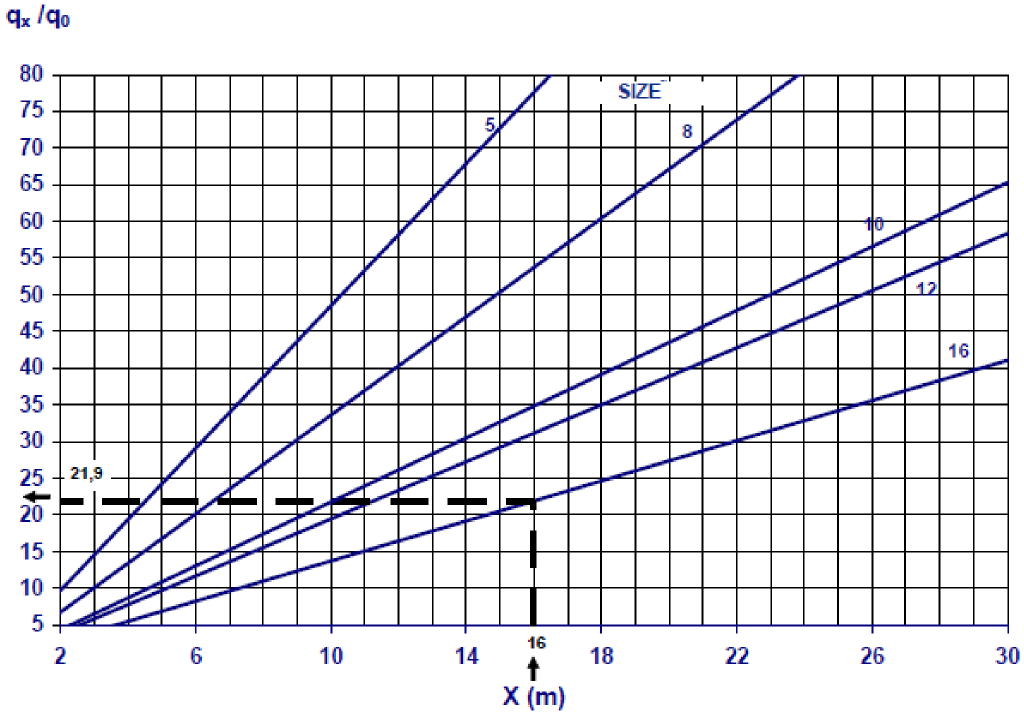


DF-89-5.- Ratio between temperature differences.

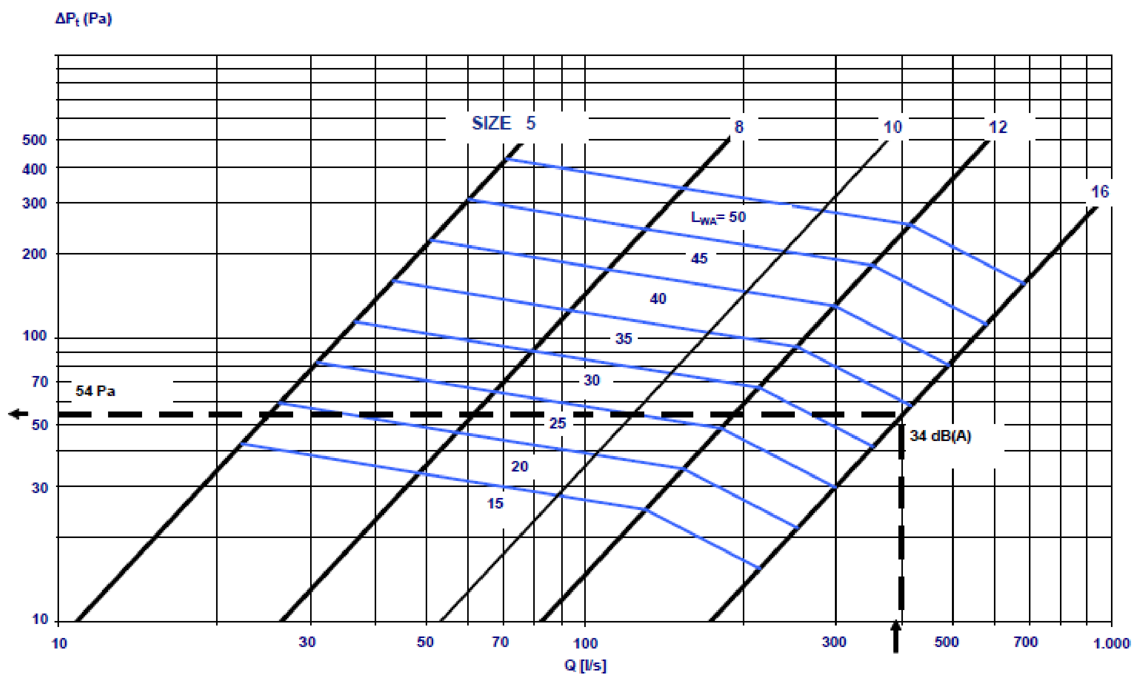


DF-89 model

DF-89-6.- Induction rate.



DF-89-7.- Pressure drop and sound power level.



Selection in a sample project

Initial data

Two DF-89 nozzles are located, one in front of the other at a distance of 24 m, with the following starting data based on the sketch attached in the Symbols section on page 16.

- L = 12 m

- H = 4 m (height from floor)

- Q_{nozzle} = 400 l/s

- Supply temperature = 15° C

- Room temperature = 25° C

- ΔT_0 = -10° C

- H_H = 2 m (height of occupied area)

The diffuser should be selected to obtain the following:

- Maximum velocity in the occupied area: 0,2 m/s.

- The vertical temperature gradient must not exceed 3 ºC.

- The sound power level of the selected equipment must not exceed 40 dB(A).

Selection

- DF-89 quick selection table (page 4)

Based on the sound power limit, size 16 is preselected.

- DF-89-7 chart (page 13)

Using size 16 for 400 l/s, the following values are obtained:

- **ΔP_t = 54 Pa** (pressure drop)

- **L_{wA} = 34 dB(A)** (sound power level)

- DF-89-2 chart (page 6)

For a supply angle of α_X= +15° C,
The throw will be **I**=L/cos 15°=12/0,966=12,42 m
According to the chart, the velocity for this throw is **V_X=1,2 m/s**

- DF-89-3.4 chart (page 11)

The impact point under isothermal conditions would be $H+H_C$=H+(L x tan 15°)=4+(12x0,268)=7,2 m
The chart indicates that for ΔT_0 = -10° C, throw: 12,42 m and Q: 400 l/s the vertical deviation is **Y = 1,6 m**, as the air jet is non-isothermal.
Therefore, the air jets have an impact point situation at a height from the floor of: 7,2-1,6=5,6 m.

- DF-89-4 chart (page 12)

For a height H_R=5,6-2=3,6m, entering with V_X=1,2 m/s gives a velocity of **V_{HR}=V_H=0,17 m/s** in the occupied area.

- DF-89-6 chart (page 13)

For a throw of **I**+H_R=12,42+3,6=16,02 we have **q_x/q_o=21,9**.

- DF-89-5 chart (page 12)

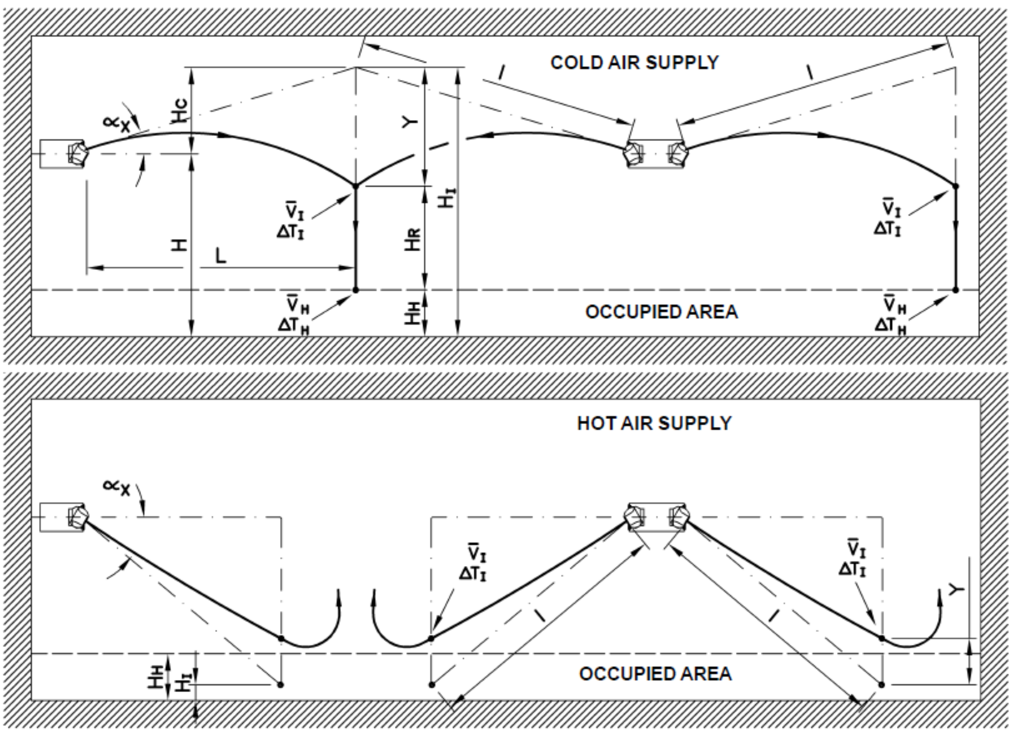
For a throw of **I**+HR=12,42+3,6=16,02 we have ΔTX/ΔT0=0,07.
Therefore, the temperature of the air jet at its inlet in the occupied zone will be:

$\Delta T_X = T_X - T_{Temperature}$ $\quad$ $T_X = T_{Temperature} + \Delta T_X$=25+[0,07x(-10)] $\quad$ **T_X= 24,3° C**

Symbols

Common symbols used in all tables and charts in the catalogue.

I(m): Distance between the equipment to the impact point of the jets (with another jet or wall) under isothermal conditions.
α_x(°): Supply angle.
L(m): Horizontal distance from the equipment to the impact point of the jets (with another jet or wall).
X(m): Throw of the air jet.
Y(m): Deviation of the air jet caused by a temperature difference between the supply and ambient air.
H(m): Installation height of the equipment.
H_H(m): Height of occupied area.
H_C(m): Height from the impact point of the jets (with another jet or wall) under isothermal conditions with respect to the equipment location.
H_I(m): Height from the impact point of the jets (with another jet or wall) under isothermal conditions.
H_R(m): Height from impact point of the jets (with another jet or wall) with respect to the point where the air velocity and temperature are to be determined (generally the occupied area).
Q(m^3/h ó l/s): Supply air flow.
A_K(m^2): Effective area.
V_X(m/s): Velocity of the jets at throw X.
V_H(m/s): Velocity of the jets in the occupied area.
V_K(m/s): Effective supply velocity.
V_{HR}(m/s): Velocity of the jets at a distance, HR, below the impact point of the jets (with another jet or wall).
ΔT_O(°C): Temperature difference between the supply jets and room air.
ΔT_X(°C): Temperature difference between the jets (for throw X) and room air.
ΔT_h(°C): Temperature difference between the jets (in occupied area) and room air.
q_x/q_o: Induction rate. Quotient between the air flow for a throw X and the air flow supplied in the zone.
Y_{max}(m): Maximum throw with vertical supply of hot air (Vx=0 m/s).
ΔP_t(Pa): Total pressure drop.
L_{wA}[dB(A)]: Sound power level.



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