

KOOLAIR

series

MULTINOZZLES

Multinozzles diffusers

ISO 9001

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Certification

Sistema de Gestión



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Multinozzle Diffusers DF49MT3

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Multinozzle diffuser DF49MT3



INTRODUCTION

Due to the growing demand in the market for building large spaces in hotels, shopping malls, theatres, etc., we have developed a diffuser which is able to combine design and efficiency.

The long range offered by the DF49MT3 multinozzle diffusers coupled with their low noise level and their aesthetics make this diffuser a benchmark in the current marketplace.

DESCRIPTION

The long-range multinozzle diffusers of the DF49MT3 series comprise a rectangular faceplate in steel sheet where 3 to 10 nozzles can be incorporated per row in a maximum of 3 rows in a standard execution. The nozzles are manufactured in ABS, class V1 material, according to UL 94 standars.

There are several types of construction; on a plate without a frame or on a plate with a frame, which can be mounted on both the wall and the ceiling .

There is also a model which can be adapted to different duct diameters for a maximum of 2 rows of nozzles in a standard execution.

These diffusers can be finished in black (Ral 9005) or in white (Ral 9010).

The diffuser can be fixed by using either screws or a mounting frame. If you decide to fix it to the wall or a plaster ceiling with screws, it is also advisable to use a mounting frame so that the plaster is not damaged.



APPLICATIONS

The multinozzle diffusers of the DF49MT3 series allow long ranges of air to be obtained with a low noise level. They are designed to air-condition shopping-malls, museums, theatres, cinemas, large halls, etc.

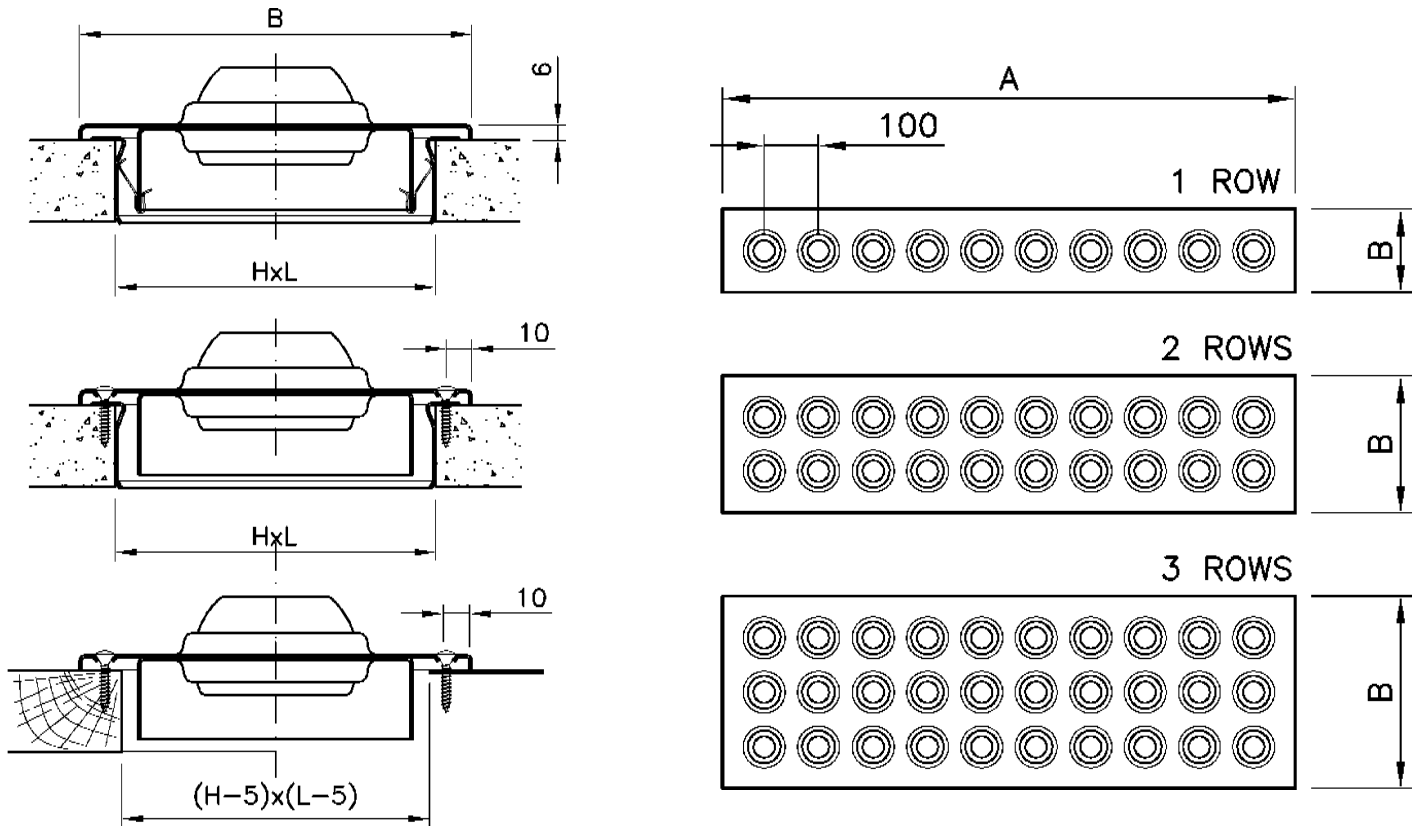
The shape of the nozzles allows them to be pointed separately, in all directions, up to a maximum of 30°.

All the different models can have a removable plenum fitted.



DF49MT3 SB (Without frame)

SIZES



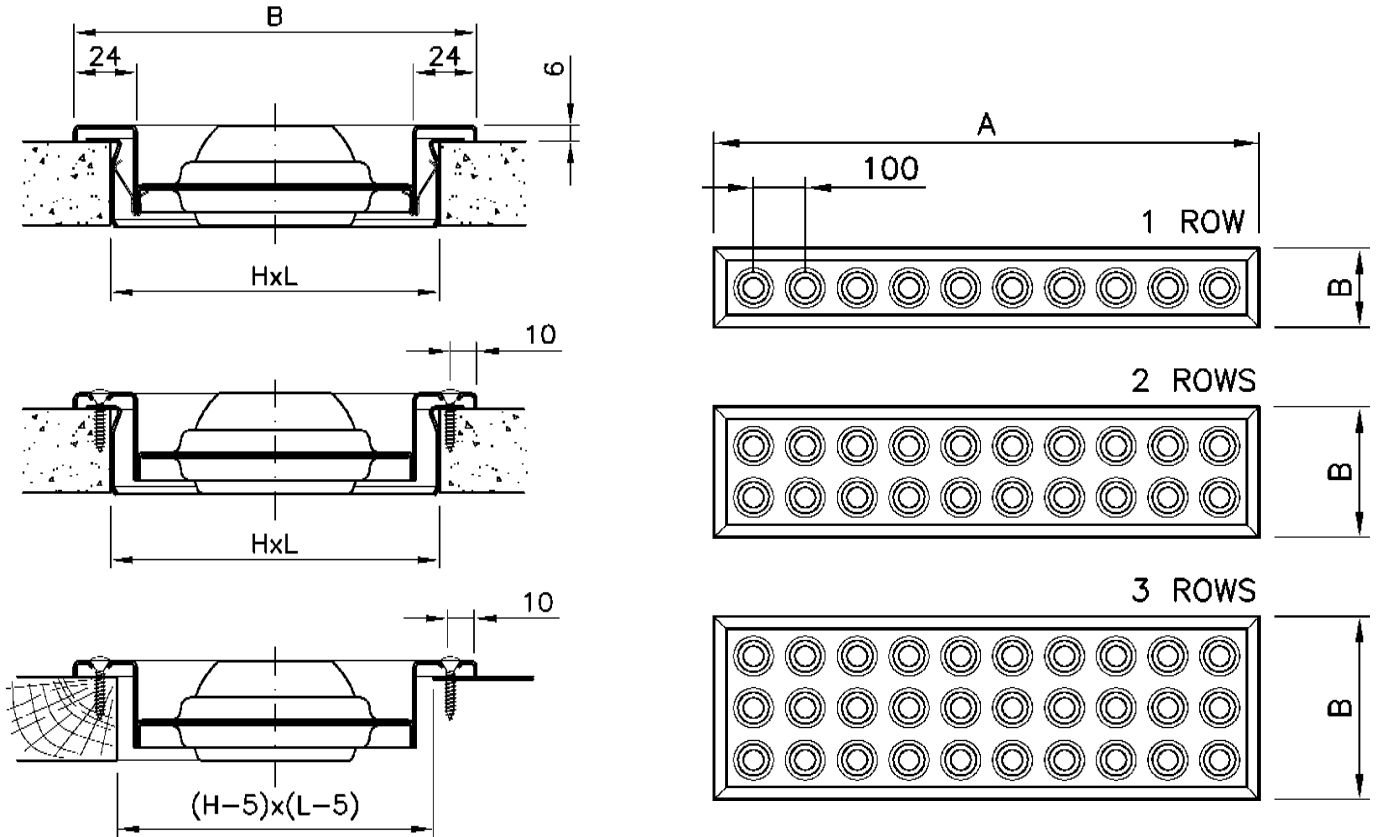
FOR HOLE IN WOOD OR SHEET METAL

NOZZLES	3	4	5	6	7	8	9	10
L	325	425	525	625	725	825	925	1025
A	353	453	553	653	753	853	953	1053

ROWS	H	B
1	125	153
2	225	253
3	325	353

DF49MT3 CB (With frame)

SIZES



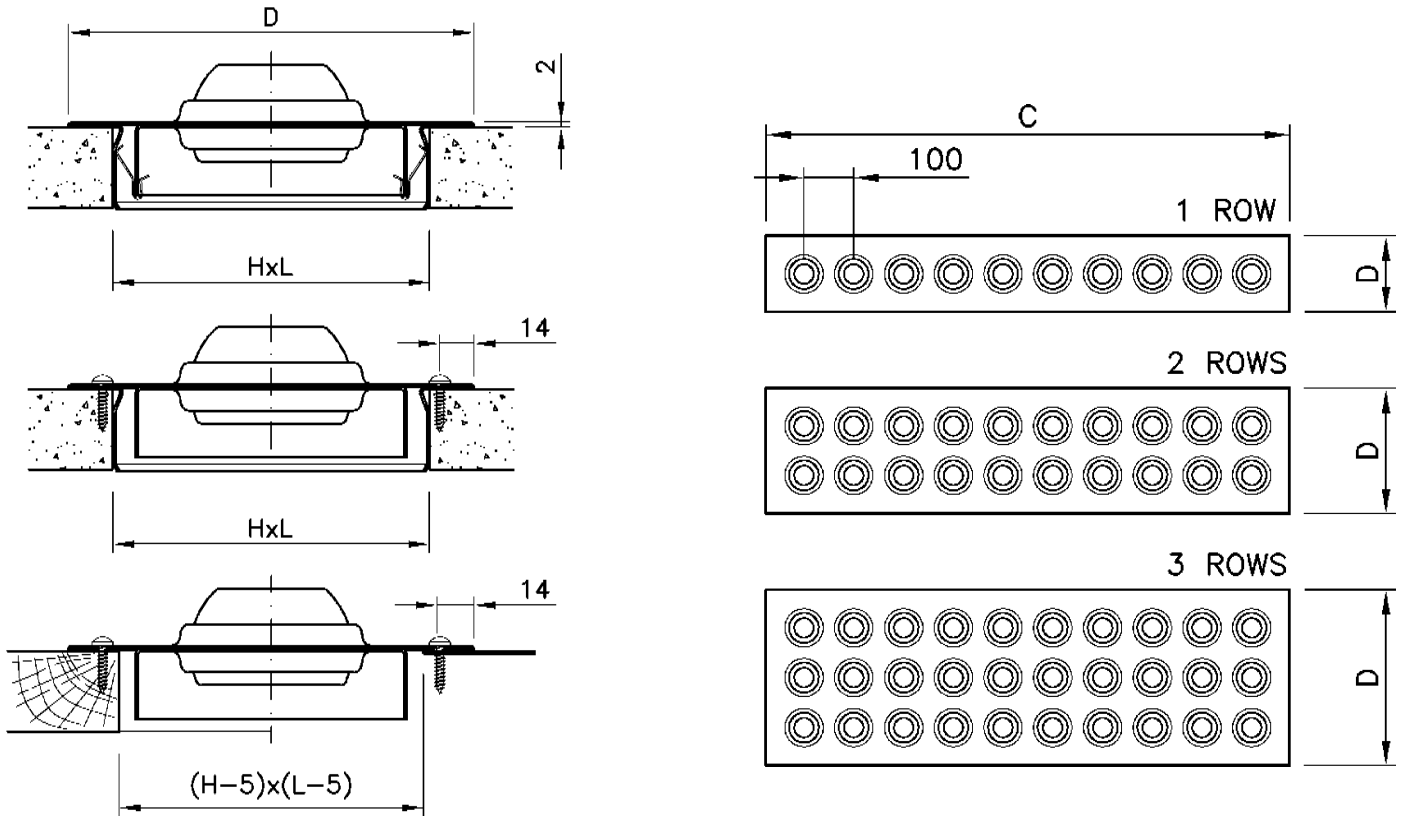
FOR HOLE IN WOOD OR SHEET METAL

NOZZLES	3	4	5	6	7	8	9	10
L	325	425	525	625	725	825	925	1025
A	353	453	553	653	753	853	953	1053

ROWS	H	B
1	125	153
2	225	253
3	325	353

DF49MT3 E (Plaster)

SIZES



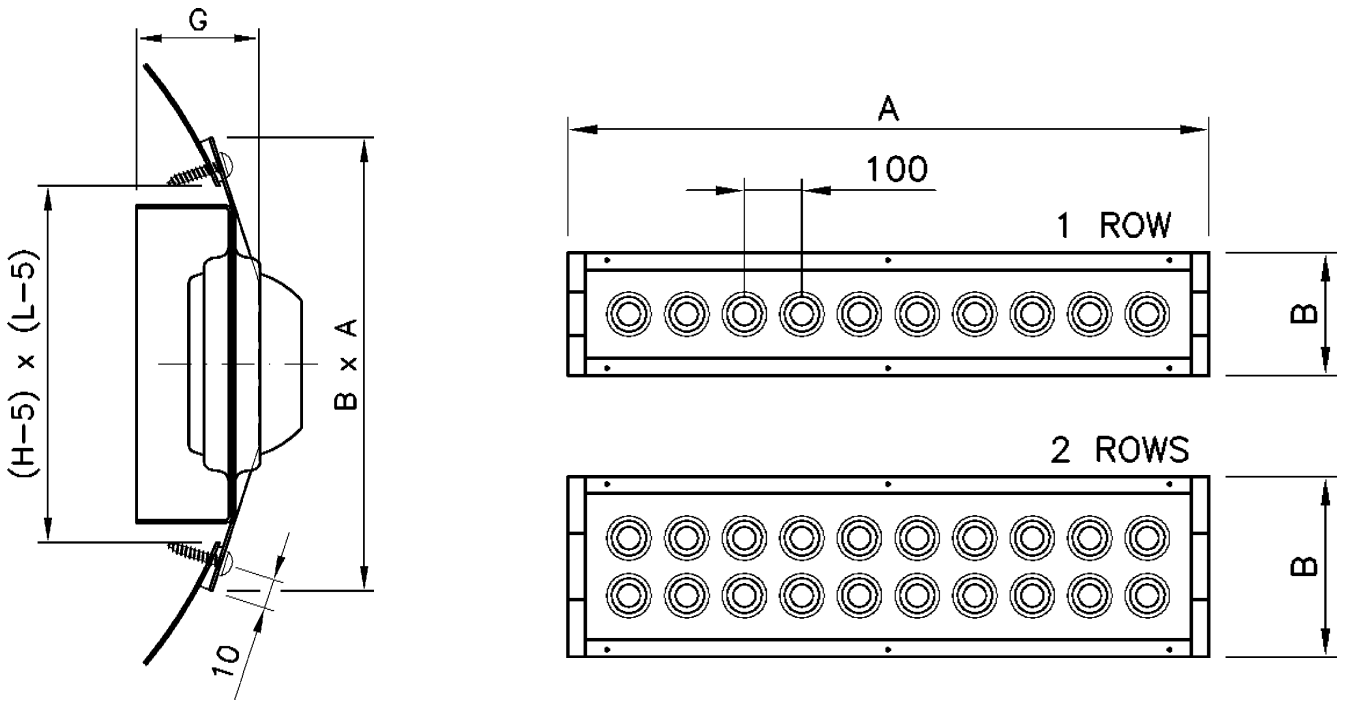
FOR HOLE IN WOOD OR SHEET METAL

NOZZLES	3	4	5	6	7	8	9	10
L	325	425	525	625	725	825	925	1025
C	360	460	560	660	760	860	960	1060

ROWS	H	D
1	125	160
2	225	260
3	325	360

DF49MT3 CC (Circular duct)

SIZES

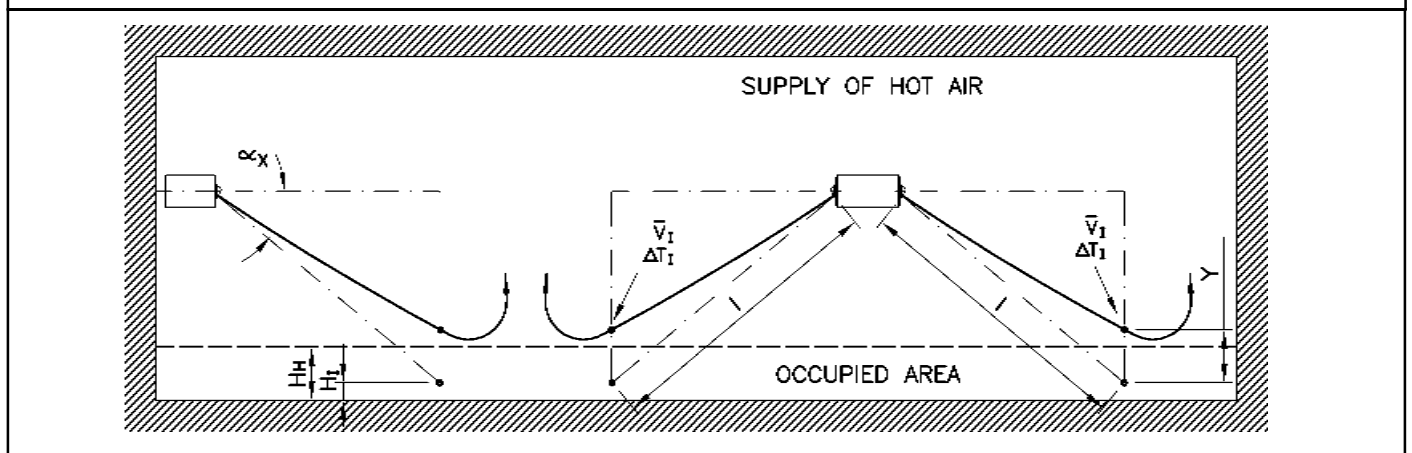
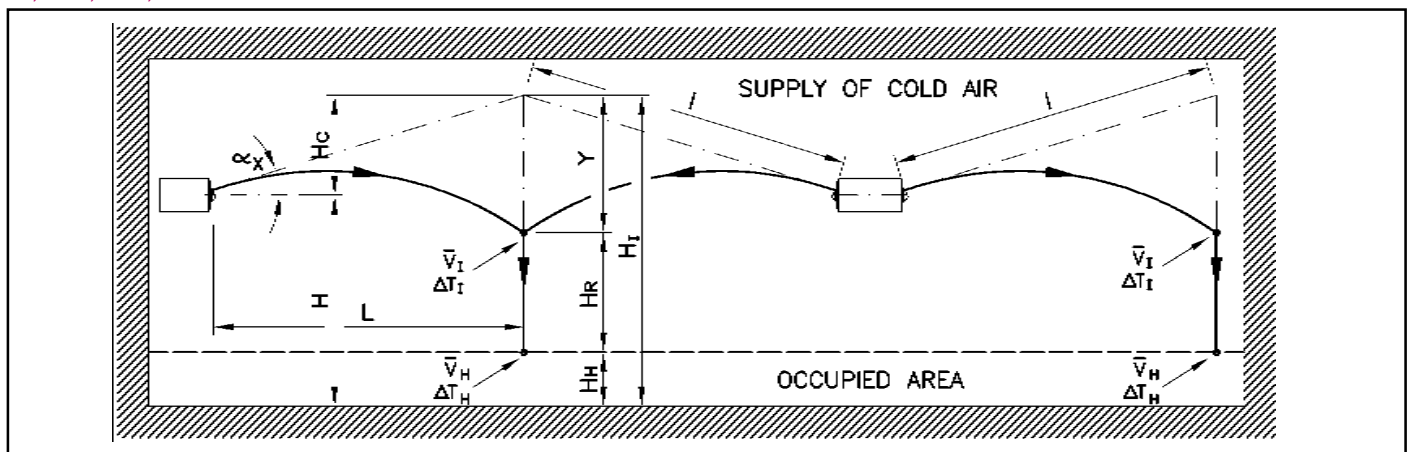


ROWS	H	B	G	DUCT	
				MINIMUM	MAXIMUM
1	125	153	34	Ø315	Ø900
2	225	253	43	Ø630	Ø1400

NOZZLES	3	4	5	6	7	8	9	10
L	325	425	525	625	725	825	925	1025
A	355	455	555	655	755	855	955	1055

Key to symbols

l (m)	Distance travelled from the equipment to the impact point of the air jet (with another air jet or the wall) in isothermal conditions.
α_x (°)	Discharge angle.
L (m)	Horizontal distance from the equipment to the impact point of the air jet (with another air jet or the wall).
X (m)	Air jet range.
Y (m)	Deviation in the air jet caused by the difference in temperature between the supplied air and the environment.
H (m)	Equipment location height.
H_H (m)	Height of habitability area.
H_C (m)	Height from the impact point of the air jet (with another air jet or the wall) in isothermal conditions in respect of the location of the equipment.
H_I (m)	Height from the impact point of the air jet (with another air jet or the wall) in isothermal conditions.
H_R (m)	Height from the impact point of the air jet (with another air jet or the wall) in respect of the point at which we want to know the air speed and temperature (generally in the habitability area).
Q (m ³ /h o l/s)	Air flow.
A_K (m ²)	Effective supply area.
V_X (m/s)	Speed of the corresponding air jet to range X.
V_H (m/s)	Speed on the air jet in the habitability area.
V_K (m/s)	Effective supply speed.
V_{HR} (m/s)	Speed of the air jet to a distance H_R below the impact point of the air jet (with another air jet or the wall).
ΔT_o (°C)	Difference in temperature between the air jet being supplied and the enclosure to be air conditioned.
ΔT_x (°C)	Difference in temperature between the air jet (for range X) and the enclosure to be air conditioned.
ΔT_h (°C)	Difference in temperature between the air jet (in the habitability area) and the enclosure to be air conditioned.
q_x / q_o	Induction rate. Quotient between the air jet volume for range X and the air volume supplied in the enclosure
ΔP_{est} (Pa)	Pressure drop.
L_{WA} dB(A)	Sound power.
$X_{0,3} - X_{0,5} - X_{1,0}$	Range. For end air speed of 0,3, 0,5 y 1,0 m/s



Selection table

By using the quick selection table, we can obtain data on range, pressure drop and sound power in isothermal conditions and for different end speeds.

The data are for different lengths and for one row of nozzles. For a larger number of nozzles, apply the constants on the table.

Table of correction quotients for noise output (F_L) and range (F_X), static pressure does not have to be corrected.

N° Rows	1	2	3
F_X	1	1,414	1,732
F_L	0	3	4,8

$X_{TOTAL} = X_{TABLE} \times F_X$
$L_{WTOTAL} = L_{WTABLE} + F_L$

MULTINOZZLE DIFFUSER DF49MT3 QUICK SELECTION TABLE																	
Q		Size	1 ROW														
			3			5			6			8		10			
(m³/h)	(l/s)	A_k (m²)	0,003770			0,006283			0,007540			0,010053		0,012566			
120	33,3	$X_{0,3} X_{0,5} X_{1,0}$ (m) V_k (m/s) ΔP_{est} (Pa) $L_{WA} - dB(A)$	9,5	5,7	2,8												
150	41,7	$X_{0,3} X_{0,5} X_{1,0}$ (m) V_k (m/s) ΔP_{est} (Pa) $L_{WA} - dB(A)$	11,8	7,1	3,5												
200	55,6	$X_{0,3} X_{0,5} X_{1,0}$ (m) V_k (m/s) ΔP_{est} (Pa) $L_{WA} - dB(A)$	15,8	9,5	4,7	12,2	7,3	3,7	11,2	6,7	3,3						
250	69,4	$X_{0,3} X_{0,5} X_{1,0}$ (m) V_k (m/s) ΔP_{est} (Pa) $L_{WA} - dB(A)$	19,7	11,8	5,9	15,3	9,2	4,6	13,9	8,4	4,2	12,1	7,2	3,6			
300	83,3	$X_{0,3} X_{0,5} X_{1,0}$ (m) V_k (m/s) ΔP_{est} (Pa) $L_{WA} - dB(A)$	23,7	14,2	7,1	18,3	11,0	5,5	16,7	10,0	5,0	14,5	8,7	4,3			
350	97,2	$X_{0,3} X_{0,5} X_{1,0}$ (m) V_k (m/s) ΔP_{est} (Pa) $L_{WA} - dB(A)$	27,6	16,6	8,3	21,4	12,8	6,4	19,5	11,7	5,9	16,9	10,1	5,1	15,1	9,1	4,5
400	111,1	$X_{0,3} X_{0,5} X_{1,0}$ (m) V_k (m/s) ΔP_{est} (Pa) $L_{WA} - dB(A)$				24,4	14,7	7,3	22,3	13,4	6,7	19,3	11,6	5,8	17,3	10,4	5,2
500	138,9	$X_{0,3} X_{0,5} X_{1,0}$ (m) V_k (m/s) ΔP_{est} (Pa) $L_{WA} - dB(A)$				>30	18,3	9,2	27,9	16,7	8,4	24,1	14,5	7,2	21,6	13,0	6,5
600	166,7	$X_{0,3} X_{0,5} X_{1,0}$ (m) V_k (m/s) ΔP_{est} (Pa) $L_{WA} - dB(A)$				>30	22,0	11,0	>30	20,1	10,0	29,0	17,4	8,7	25,9	15,6	7,8
700	194,4	$X_{0,3} X_{0,5} X_{1,0}$ (m) V_k (m/s) ΔP_{est} (Pa) $L_{WA} - dB(A)$							>30	23,4	11,7	>30	20,3	10,1	>30	18,1	9,1
800	222,2	$X_{0,3} X_{0,5} X_{1,0}$ (m) V_k (m/s) ΔP_{est} (Pa) $L_{WA} - dB(A)$										>30	23,2	11,6	>30	20,7	10,4
1000	277,8	$X_{0,3} X_{0,5} X_{1,0}$ (m) V_k (m/s) ΔP_{est} (Pa) $L_{WA} - dB(A)$													>30	25,9	13,0

Selection Graphs

The graphs which are shown below all correspond to 1 row of nozzles. If you would like to make a study of 2 or 3 rows, you must choose the air flow volume corresponding to 1 row and then apply the correction quotients which appear on the respective tables which are shown with the graphs.

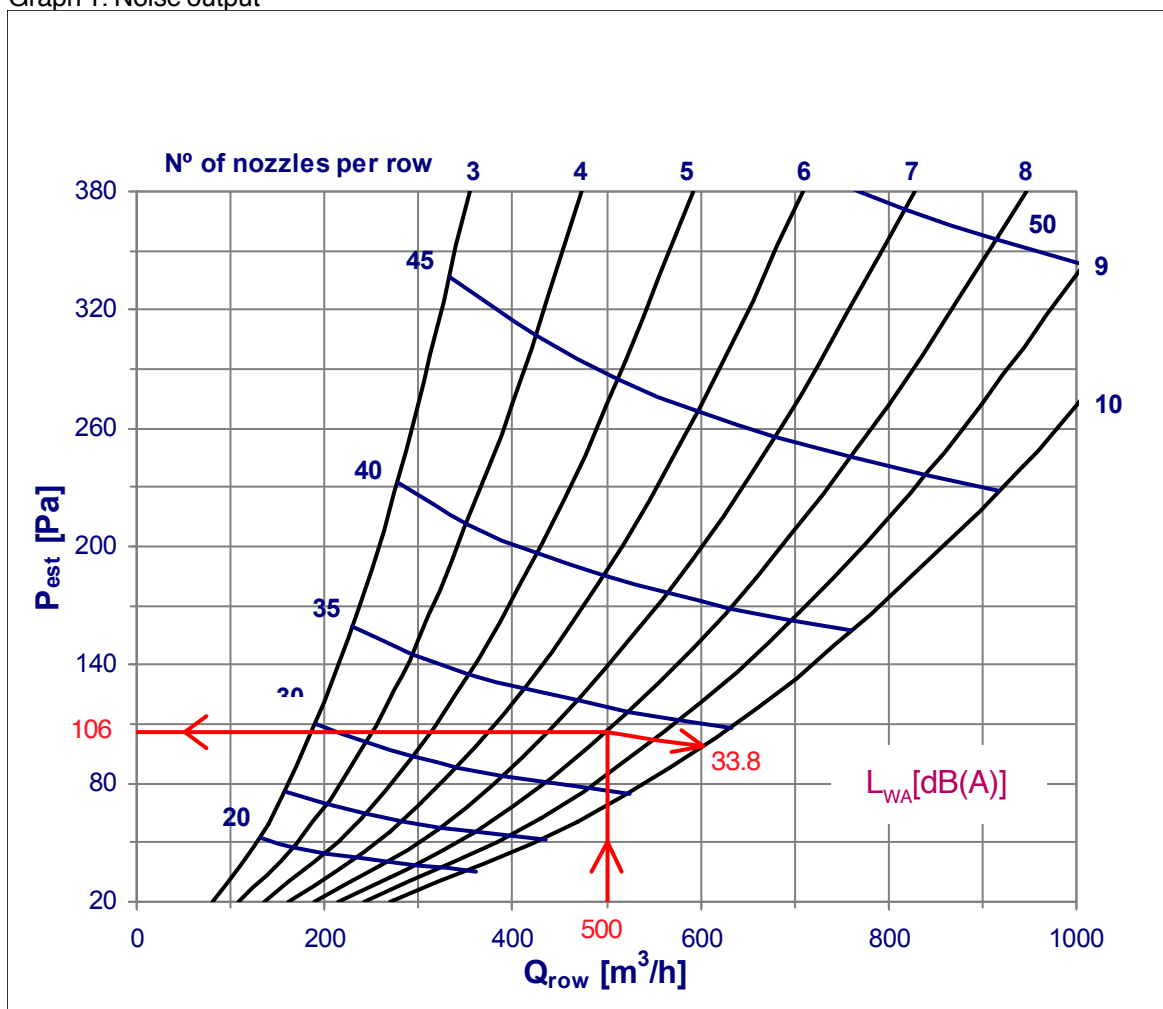
For example, if we have an air flow volume of 1000 m³/h and we want to install a 2-row multinozzle diffuser, on the graph we must select an air flow volume of 500 m³/h (the volume which would correspond to one row) and apply the corresponding correction quotient, in this case 3, from which we can deduce that the noise output would be 36,8 dB(A).

Table of correction quotients for noise output (F_L), the static pressure does not have to be corrected:

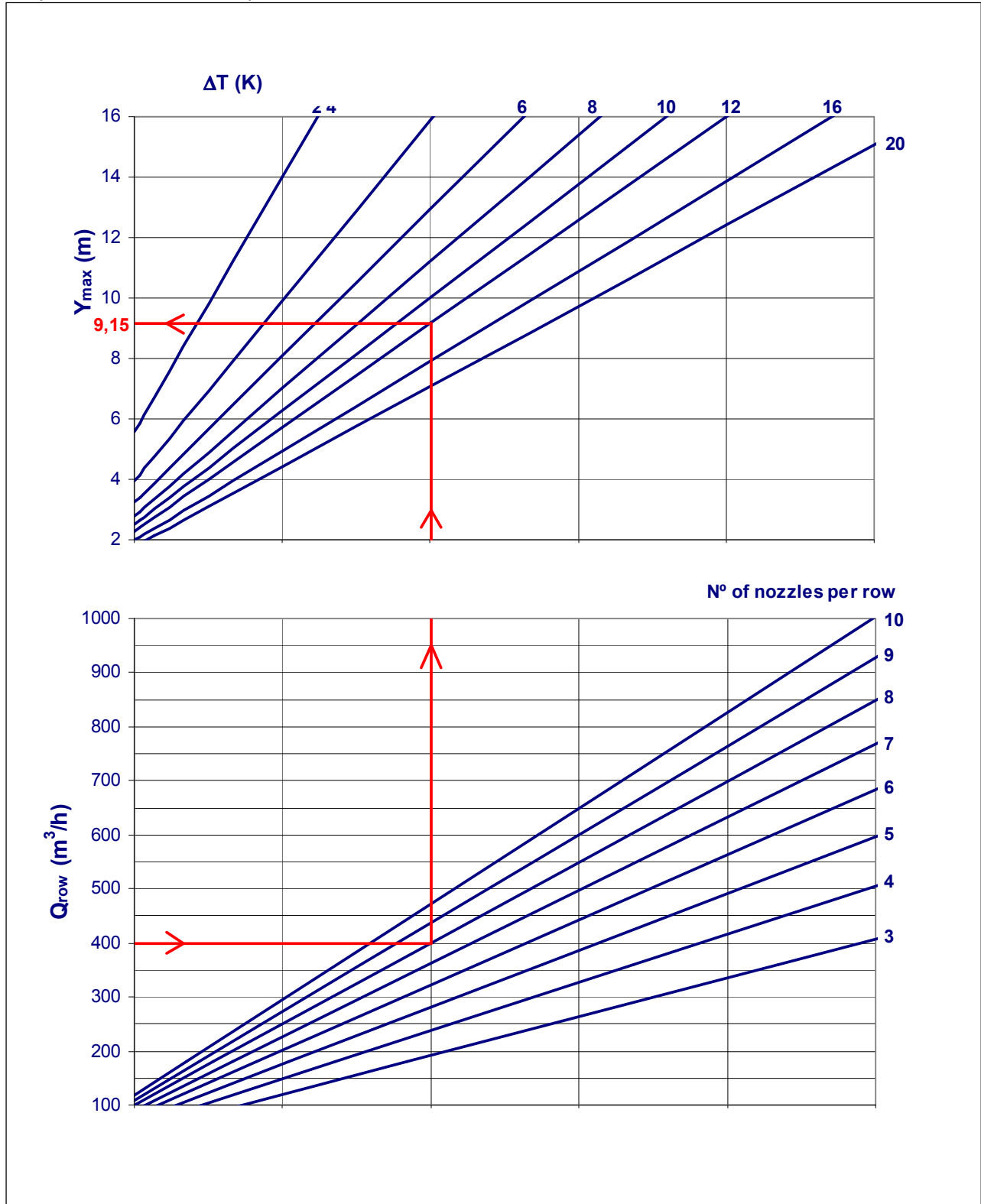
N° of Rows	1	2	3
F_L	0	3	4,8
F_p	1	1	1

$$L_{WTOTAL} = L_{WGRAPH} + F_L$$

Graph 1. Noise output



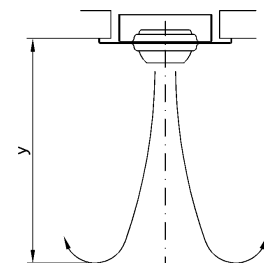
Graph 2. Maximum vertical penetration



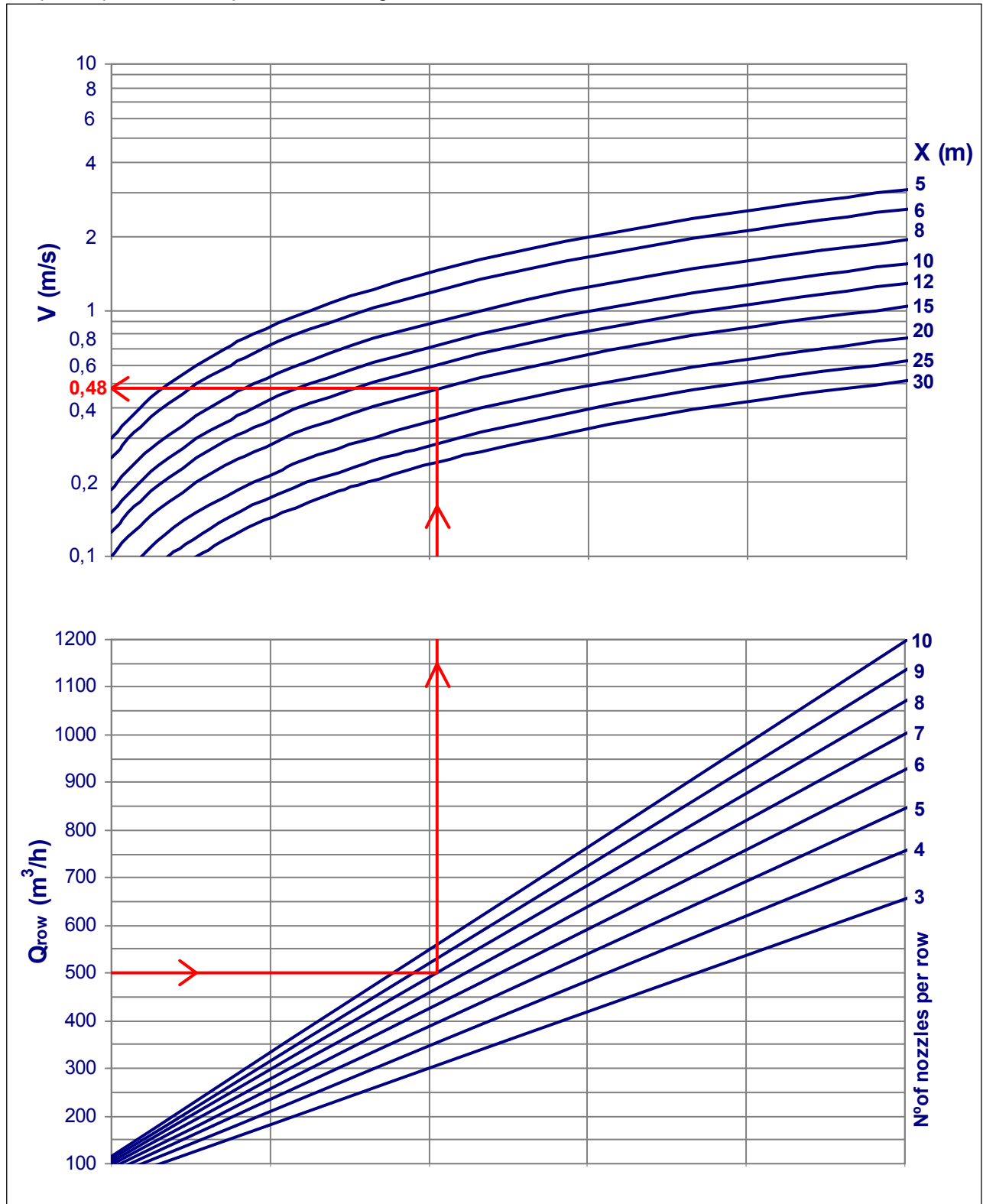
Correction quotient table

N° of rows	1	2	3
F_y	1	1,189	1,316

$$(Y_{MAX})_{TOTAL} = (Y_{MAX})_{GRAPH} \times F_y$$



Graph 3. Speed of the air jet within the range

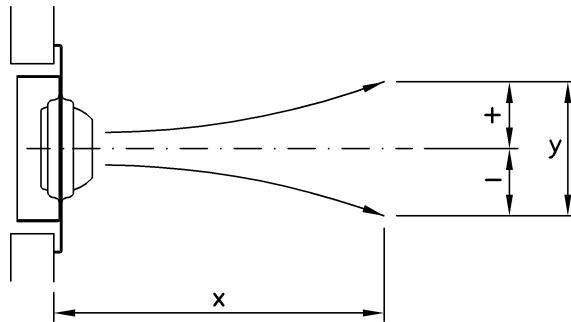
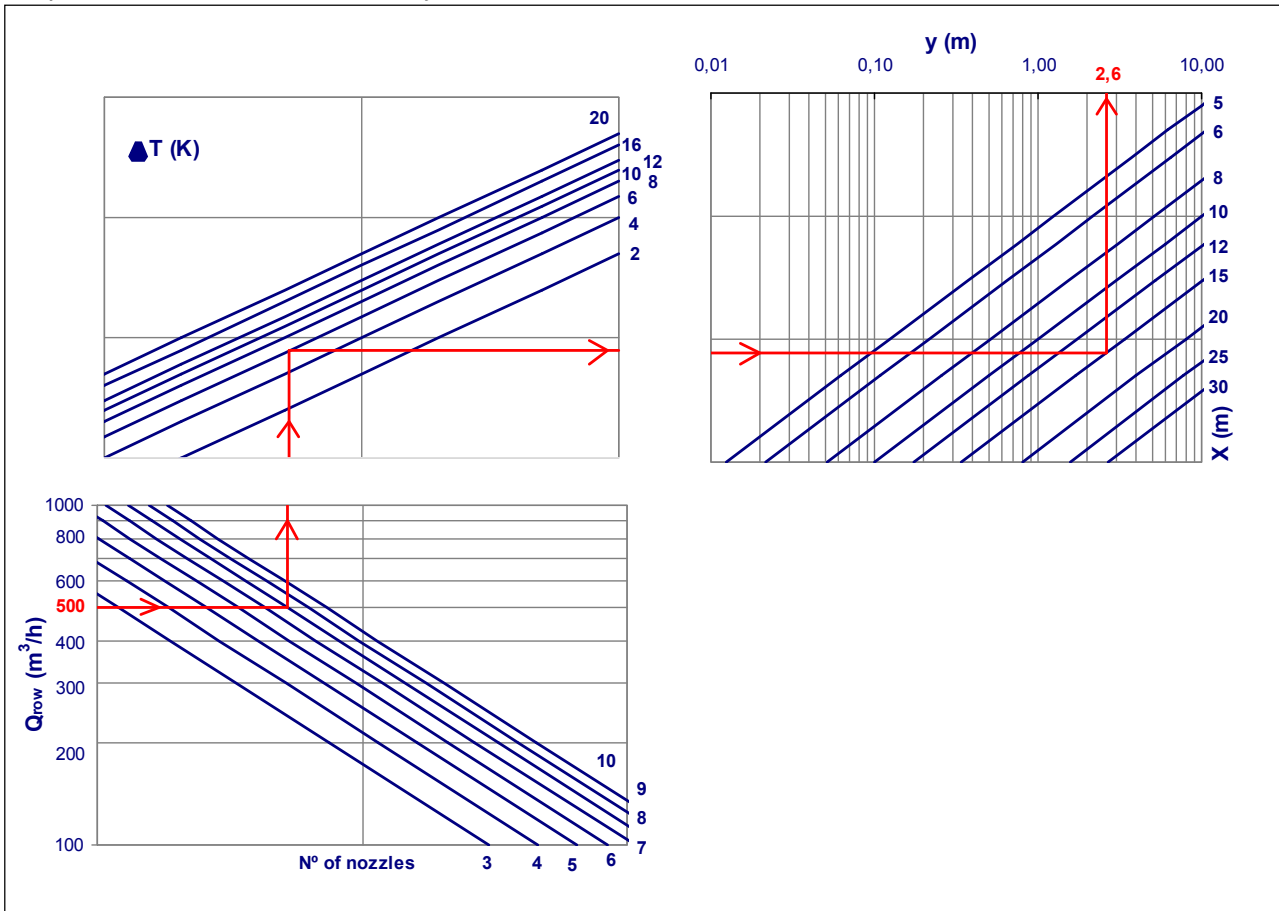


Correction quotient table

N° f ows	o fl	2	3
F_v	1	1,414	1,732

$$V_{TOTAL} = V_{GRAPH} \times F_v$$

Graph 4. Vertical deviation of the air jet

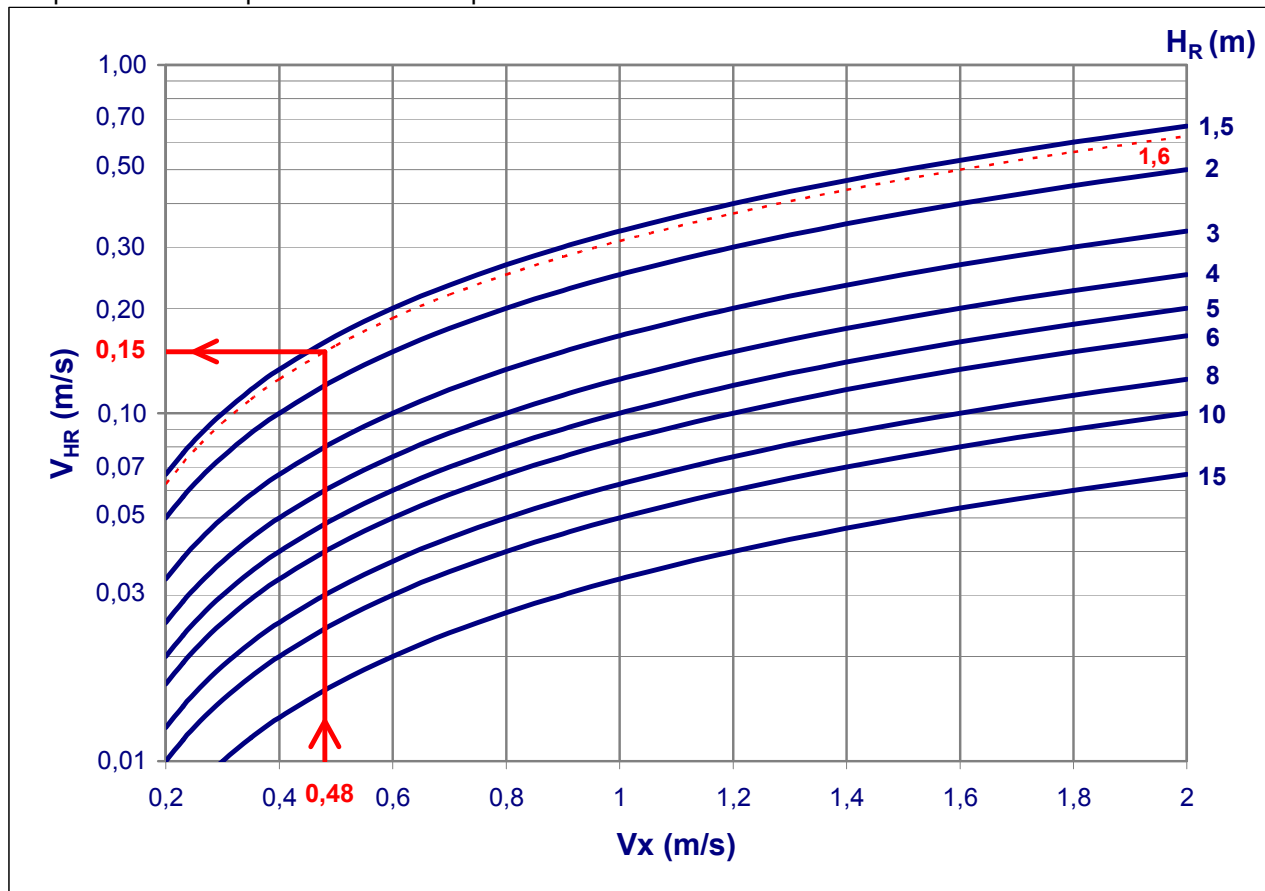


Correction quotient table

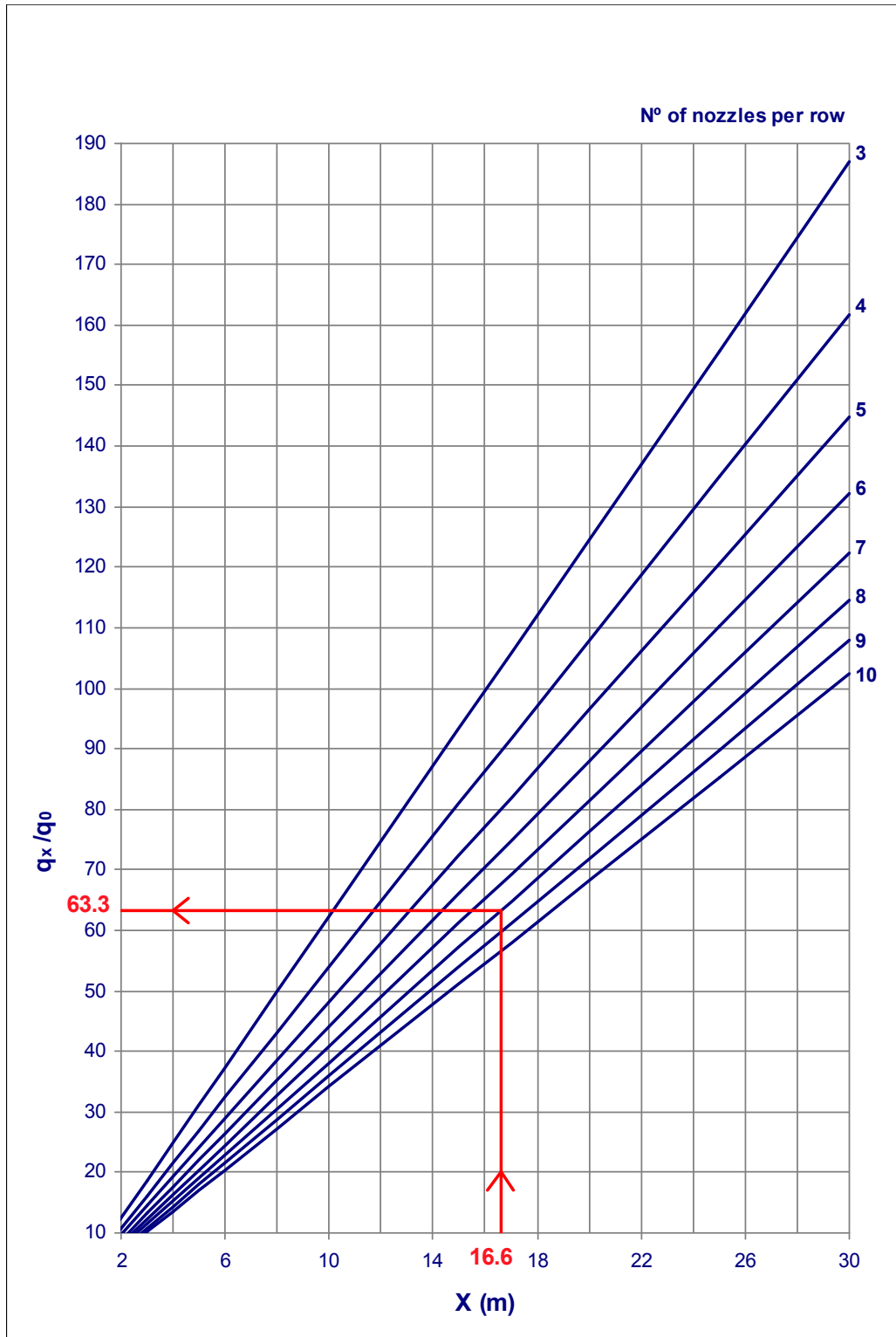
N° f ows	o n	2	3
Fd	1	0,707	0,577

$$Y_{TOTAL} = Y_{GRAPH} \times Fd$$

Graph 5. Relationship between air flow speeds



Graph 6. Induction rate

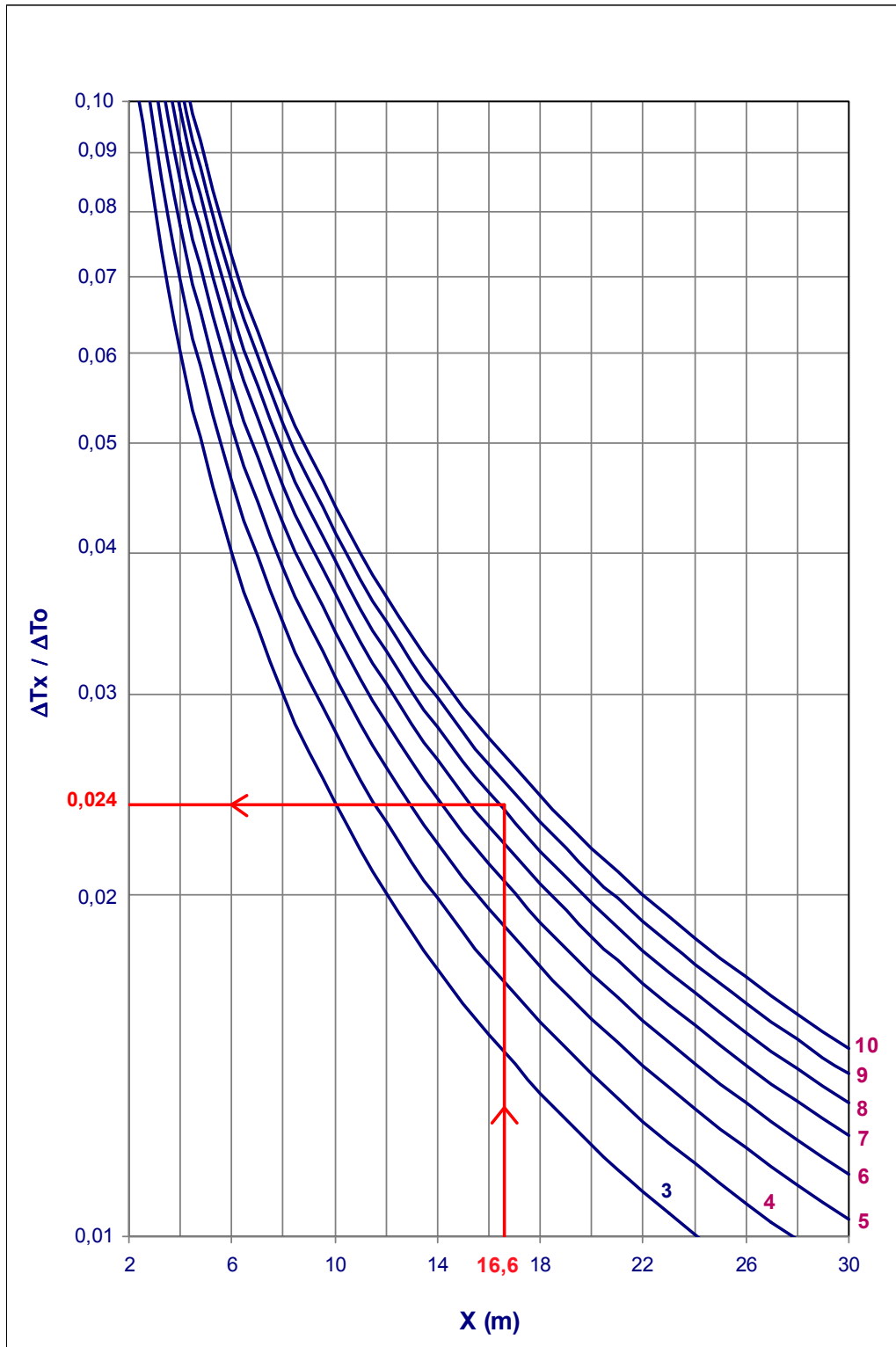


Correction quotient table

N° of rows	of	2	3
F_q	1	0,707	0,577

$$(q_x/q_0)_{TOTAL} = (q_x/q_0)_{GRAPH} \times F_q$$

Graph 7. Temperature quotient



Correction quotient table

N° f ows	o fl	2	3
F_T	1	1,414	1,732

$$(\Delta T_x / \Delta T_0)_{TOTAL} = (\Delta T_x / \Delta T_0)_{GRAPH} \times F_T$$

Example of selection

Input data:

$L = 15$ m
 $H = 6$ m (Height of location above the floor)
 $Q_{\text{MULTINOZZLE}} = 500$ m³/h
 Supply temperature = 19 °C
 Ambient temperature = 25 °C
 $\Delta T_o = -6$ °C
 $H_H = 1,8$ m (Height of the habitability area)

We must make a selection in order to obtain:

- A maximum speed in the habitability area of **0,2** m/s.
- The vertical temperature gradient must not exceed **3** °C.
- The noise output level must not exceed **35** dB(A).

Selection:

With the air flow volume we have and on the basis of the noise output limit, on the quick selection table we obtain a multinozzle diffuser of **1 row with 8 nozzles** per row.

With **graph 1**, showing load loss and noise output level, we obtain:

$\Delta P_{\text{Est}} = 106$ Pa (Load loss)
 $L_{\text{WA}} = 33,8$ dB(A) (Noise output level)

In **graph 3** showing the speed of the air jet in the range, we take a discharge angle $\alpha = 0^\circ$, and thus we have:

The range will be $l = L / \cos 0^\circ = 15 / 1 = 15$ m

looking at the graph, the speed corresponding to this range is $V_x = 0,48$ m/s

Due to the thermal step (we are supplying cold air), a deviation in the air jet occurs. Looking at **graph 4**, the impact point in isothermal conditions would be:

$$H + H_c = H + (L \times \tan 0^\circ) = 6 + (15 \times 0) = 6 \text{ m}$$

From the graph, we also get that for a $\Delta T_o = -6$ °C, a range of 15 m and a volume of $Q = 500$ m³/h, the vertical deviation for being a non-isothermal air jet is $Y = 2,6$ m

Therefore, the air jet impact point occurs at a height above the floor of: $6 - 2,6 = 3,4$ m

On the air flow speed graph, (**graph 5**), for a height of $H_R = 3,4 - 1,8 = 1,6$ m, using $V_x = 0,48$ m/s, our result is that the speed in the habitability area will be $V_{HR} = V_H = 0,15$ m/s.

Graph 6 or the induction graph gives us, for a range of $l + H_R = 15 + 1,6 = 16,6$, un $q_x/q_o = 63,3$

Using **graph 7** or the temperature quotient graph, we can see that $\Delta T_x / \Delta T_o = 0,026$, therefore, the temperature of the air jet on entering the habitability area will be:

$$\Delta T_x = T_x - T_{\text{AMBIENT}}$$

$$T_x = T_{\text{AMBIENT}} + \Delta T_x = 25 + [0,026 \times (-6)] = 24,84 \text{ °C}$$

Coding. Example

The coding describes the model ordered by the customer.

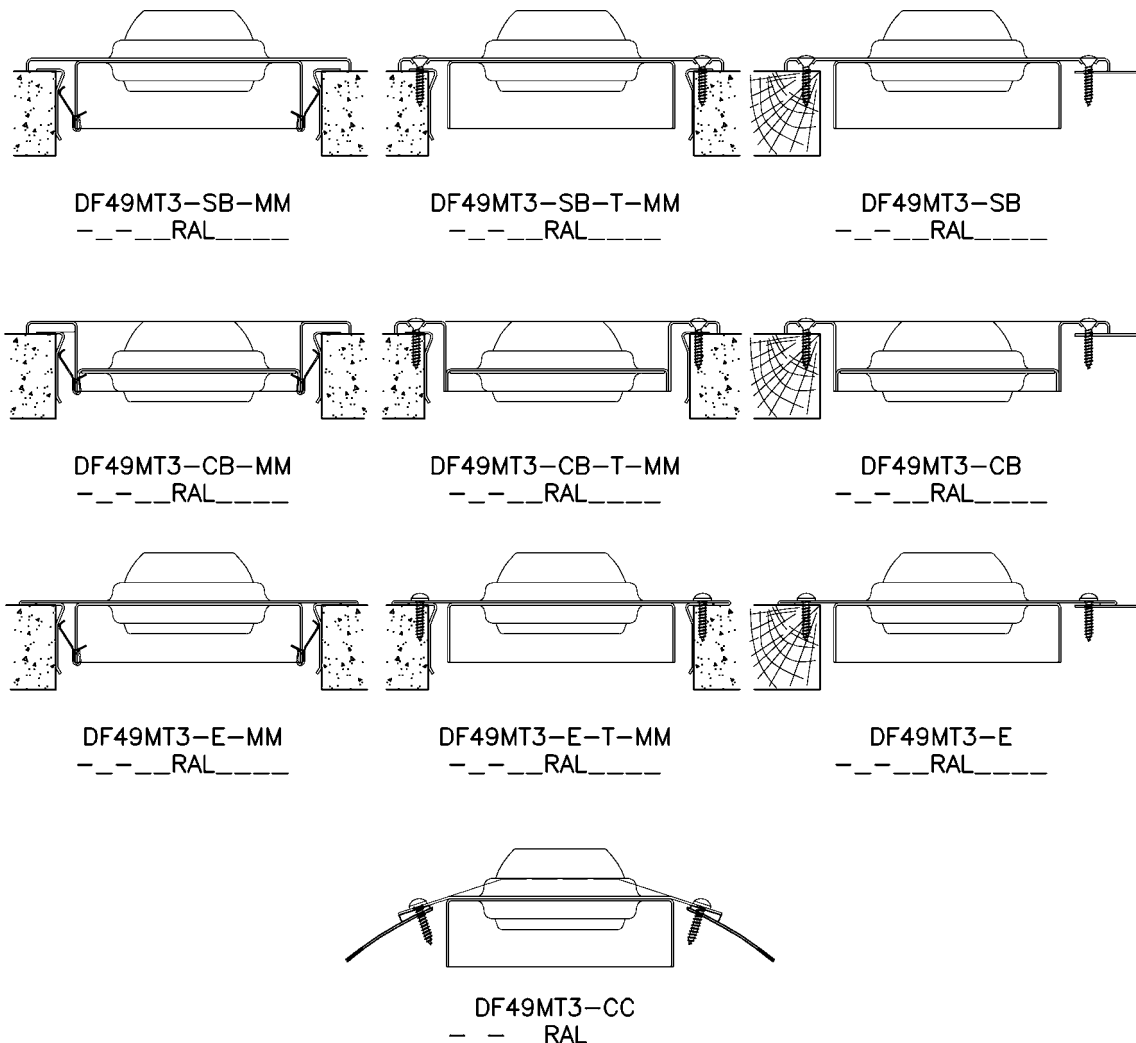


DF49MT3 SB	Multinozzle without frame
CB	With frame
CC	For circular duct
E	For ceiling or plaster wall
MM	With mounting frame
T	With screw holes
1...3	N° of rows
3...10	N° of nozzles per row
Ral	Diffuser finish

Example of coding:

DF49MT3 - CB - 1 - 05 - Ral 9005

Long-range multinozzle diffuser, with frame, with 1 row and 5 nozzles per row, painted in Ral 9005





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