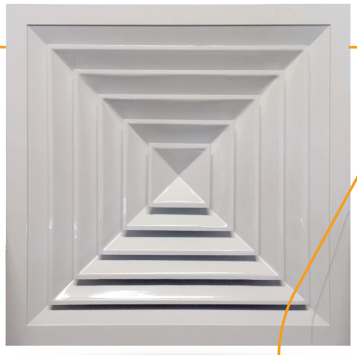
# Ceiling diffusers

# A1 ÷ A4

# Ceiling diffusers A1÷A4

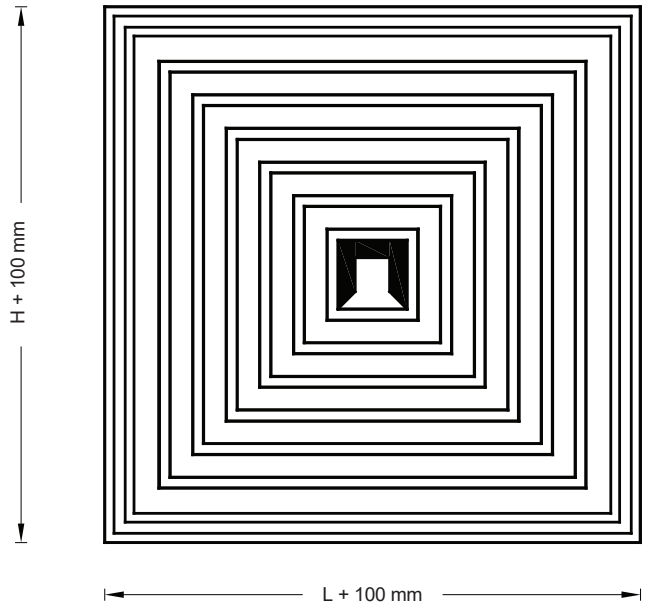


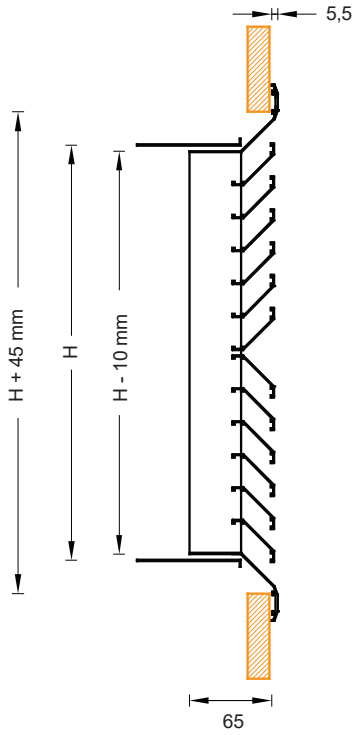

Ceiling diffusers **A1 ÷ A4** have fixed blades configured for air supply into **1 ÷ 4** directions. They are suitable for air supply in air-conditioning and ventilation systems and ceiling or air duct installation.

Ceiling diffusers **A1 ÷ A4** can be manufactured from anodized aluminium or aluminium painted in RAL color :
**A1 ÷ A4...** : Blades & frame from **anodized aluminium** or **aluminium painted in RAL color.**

They can be installed in spaces with height up to 4 m and they are ideal for systems with variable flow rate as the configuration of the blades achieves steady stream morphology at high velocities, eliminating the risk of flow detachment from the ceiling in case of low air supply. The ability to achieve airflow with high velocities makes the grilles **A1 ÷ A4** suitable for installation in spaces with large temperature difference between the air within the space and the supplied air.

**A1 ÷ A4**




## CEILING DIFFUSERS A1 ÷ A4 SIZE SELECTION

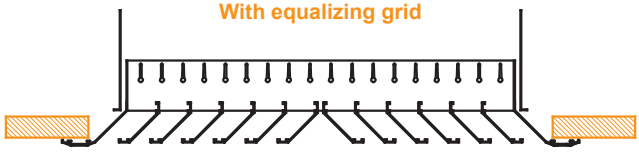
The selection of ceiling diffusers **A1 ÷ A4** will be made using the following diagrams and in accordance with the guideline CR 1752:1998 (Ventilation for buildings - Design criteria for the indoor environment).

The technical specifications for ceiling diffusers **A1 ÷ A4** are the following :

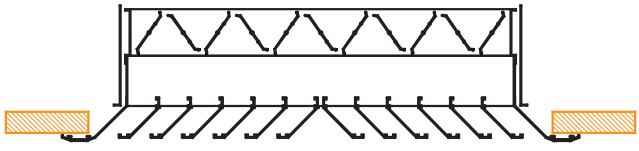
| | | |
|---|---|---|
| Diffuser lenght | **L** | [mm] |
| Diffuser height | **H** | [mm] |
| Diffuser surface factor | **Af** | |
| Pressure drop inside the diffuser | **ΔP** | [Pa] |
| Maximum air velocity inside the diffuser | $U_o$ | [m/s] |
| Noise level | **Θ** | dB[A] |
| Temperature difference Supply / Room | **ΔT** | °C |
| Horizontal stream range | $X_o$ | [m] |
| Horizontal stream vertical drop | $Y_o$ | [m] |
| Horizontal stream velocity at distance X | $u_T$ | [m/s] |
| Horizontal air-stream temperature | $T_T$ | °C |
| Distance between diffuser and point of stream collision | $A_s$ | [m] |

**Upon request** ceiling diffusers **A1 ÷ A4** may have volume damper, air supply equalizing grid, can be manufactured as accessible ceiling diffusers with removable blade core or can be installed in a false ceiling plate 595 x 595 mm.

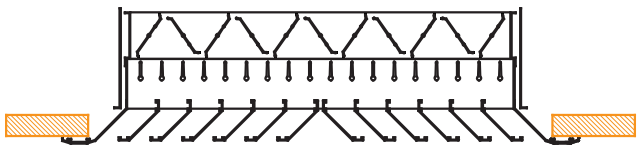
**With equalizing grid**



**With volume damper**



**With equalizing grid and volume damper**



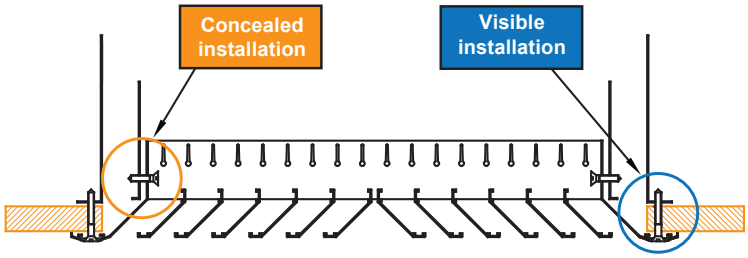
## CEILING DIFFUSERS A1 ÷ A4 TYPES

| | |
|---|---|
| **A1** | From **aluminium**. Fixed blades configured for air supply into **1 direction**. |
| **A2** | From **aluminium**. Fixed blades configured for air supply into **2 directions**. |
| **A3** | From **aluminium**. Fixed blades configured for air supply into **3 directions**. |
| **A4** | From **aluminium**. Fixed blades configured for air supply into **4 directions**. |
| **A1 ÷ A4 +D** | From **aluminium**. Diffusers A1 ÷ A4 **with volume damper.** |
| **A1 ÷ A4 +E** | From **aluminium**. Diffusers A1 ÷ A4 **with equalizing grid.** |
| **A1 ÷ A4 +D+E** | From **aluminium**. Diffusers A1 ÷ A4 **with volume damper** and **equalizing grid.** |

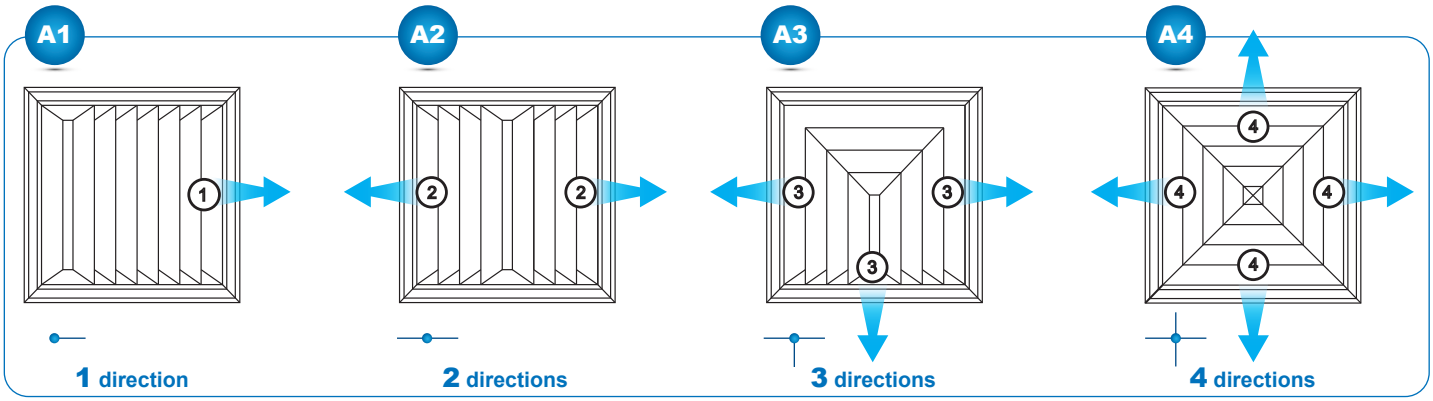
## CEILING DIFFUSERS A1 ÷ A4 INSTALLATION

**1. Visible installation with screws**
For easy, fast and safe installation. The number of screws needed is proportional to the size of the diffuser. In case the diffuser is very large, can be provided fragmented according to the requirements.

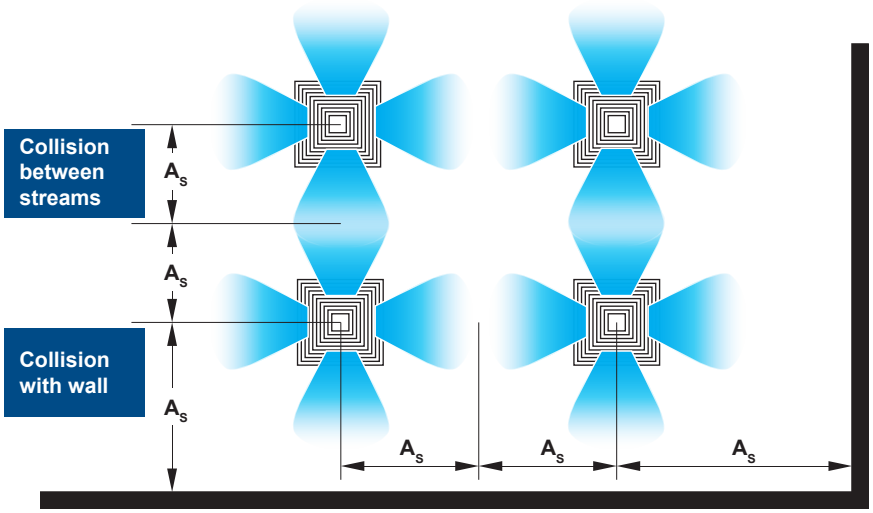
**2. Concealed placement with internal screws, on the side of the diffuser**
For an aesthetically better result and a secure installation. The diffuser is held in the hole with internal screws on the sides of the diffuser. The screws are accessible through the opening face of the diffuser.




## AIR SUPPLY




## CEILING DIFFUSERS A1 ÷ A4 PLACEMENT



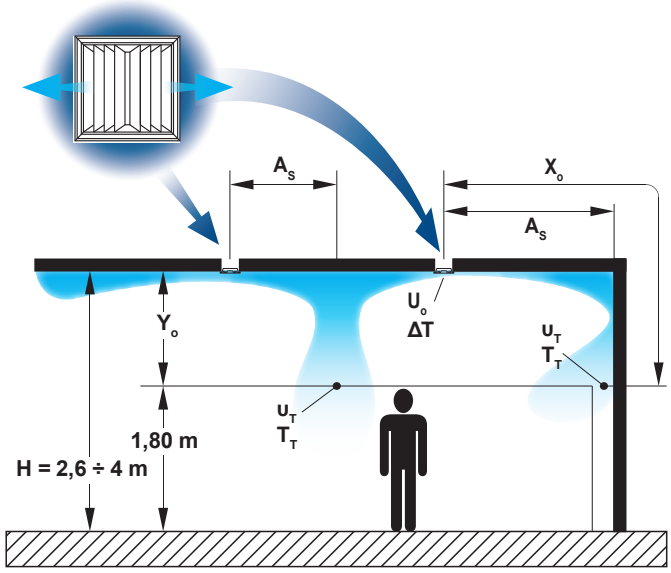

All diffusers can be **powder painted** in **any RAL color**, upon request.
For the full range of RAL colors please contact us.

| | | | | | | |
|---|---|---|---|---|---|---|
| RAL 1007 Daffodil yellow | RAL 2002 Vermillion | RAL 3017 Rose | RAL 5007 Brillant blue | RAL 6003 Olive green | RAL 60 Traffic gr | RAL 8028 Terra brown |
| RAL 1011 Brown beige | RAL 2003 Pastel orange | RAL 3018 Strawberry red | RAL 5008 Grey blue | RAL 6004 Blue green | RAL 6025 Fern green | RAL 9001 Cream |
| RAL 1012 Lemon yellow | RAL 2004 Pure orange | RAL 3020 Traffic red | RAL 5009 Azure blue | RAL 6005 Moss green | RAL 6026 Opal green | RAL 9002 Grey white |

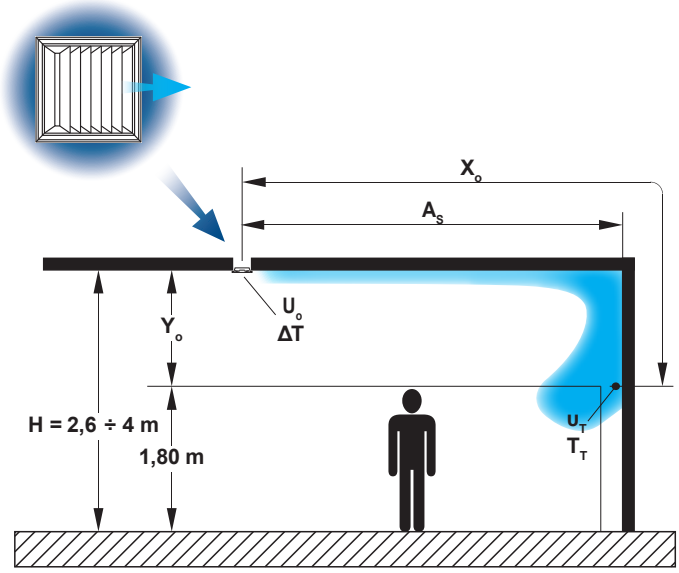

*Color examples*

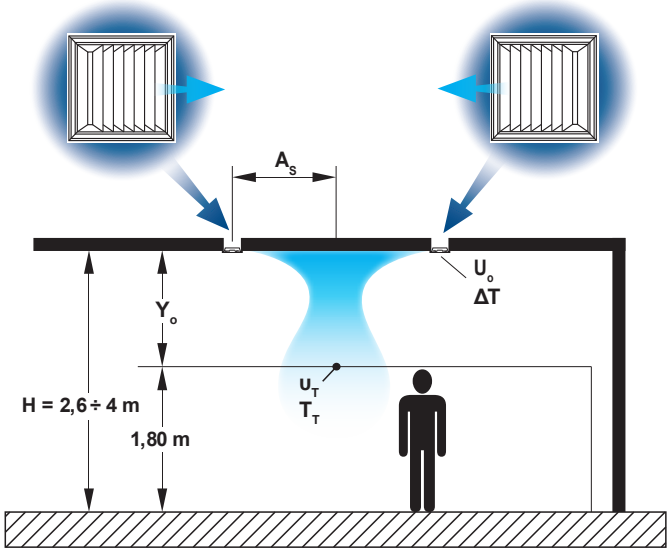
## AIR DISCHARGE OPTIONS

**Horizontal discharge to 2 directions and collision between streams and between stream and wall**




**Horizontal discharge to 1 direction and stream collision with wall**




**Horizontal discharge to 1 direction and collision between streams**

## PRESSURE DROP & NOISE LEVEL CALCULATION

**Selection example 1 :**

***Which is the pressure drop and the produced noise level in a diffuser A2 (2 directions) 300 x 300 mm, if the air flow is 400 m³/h;***

From the surface factor Af selection table, we establish that according to the diffuser's dimensions the surface factor Af is equal to 90. From diagram 1.1, for air flow of 400 m³/h and surface factor 90, we estimate that the maximum air velocity inside the diffuser is 2,6 m/s, while from diagram 1.2 we estimate that the produced noise is 27,4 dB(A). Simiral, from diagram 3 (A2), for air flow of 400 m³/h and surface factor 90, we estimate that the pressure drop is equal to 29,3 Pa.

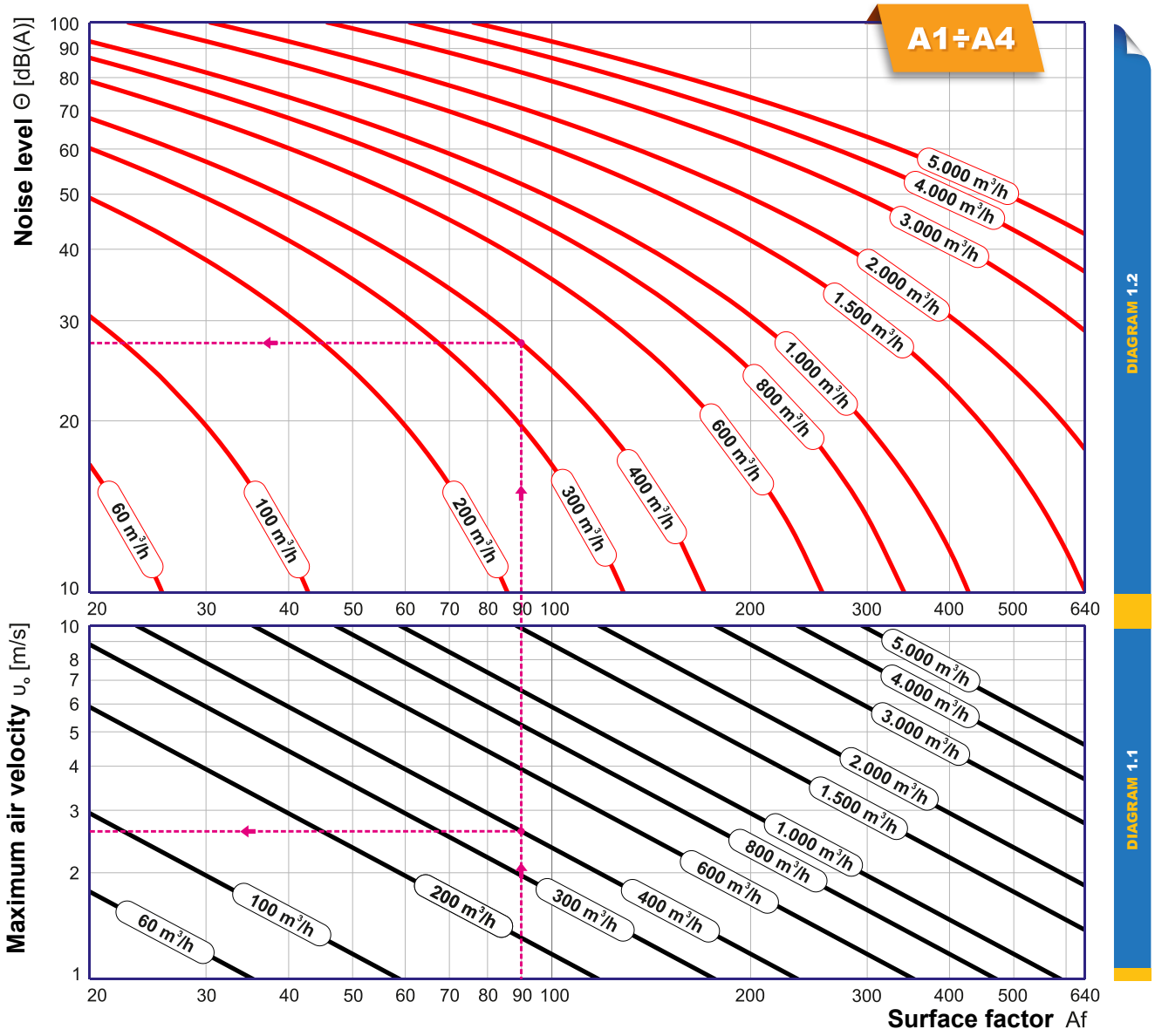
**NOTE :**

**The produced noise level and the velocity inside the diffuser are calculated using the following diagrams 1.2 and 1.1 respectively, which are the same for all types of A1 ÷ A4 diffusers. The calculation of the pressure drop, however, depends upon the type of the diffuser (A1, A2, A3, A4) and is done using the following diagrams 2 ÷ 5 respectively (page 6 ÷ 7).**

**SURFACE FACTOR SELECTION TABLE**

| | 150 | 230 | 300 | 380 | 450 | 530 | 610 | 700 | 800 |
|---|---|---|---|---|---|---|---|---|---|
| **150** | 22,5 | **34,5** | 45,0 | **57,0** | 67,5 | **79,5** | 91,5 | **105,0** | 120,0 |
| **230** | 34,5 | **52,9** | 69,0 | **87,4** | 103,5 | **121,9** | 140,3 | **161,0** | 184,0 |
| **300** | 45,0 | **69,0** | **90,0** | **114,0** | 135,0 | **159,0** | 183,0 | **210,0** | 240,0 |
| **380** | 57,0 | **87,4** | 114,0 | **144,4** | 171,0 | **201,4** | 231,8 | **266,0** | 304,0 |
| **450** | 67,5 | **103,5** | 135,0 | **171,0** | 202,5 | **238,5** | 274,5 | **315,0** | 360,0 |
| **530** | 79,5 | **121,9** | 159,0 | **201,4** | 238,5 | **280,9** | 323,3 | **371,0** | 424,0 |
| **610** | 91,5 | **140,3** | 183,0 | **231,8** | 274,5 | **323,3** | 372,1 | **427,0** | 488,0 |
| **700** | 105,0 | **161,0** | 210,0 | **266,0** | 315,0 | **371,0** | 427,0 | **490,0** | 560,0 |
| **800** | 120,0 | **184,0** | 240,0 | **304,0** | 360,0 | **424,0** | 488,0 | **560,0** | 640,0 |

**The diagrams are an approximate selection method for A1 ÷ A4 diffusers. For more precise calculation, please use the *AIRTECHNIC* air grilles calculation software or contact us.**



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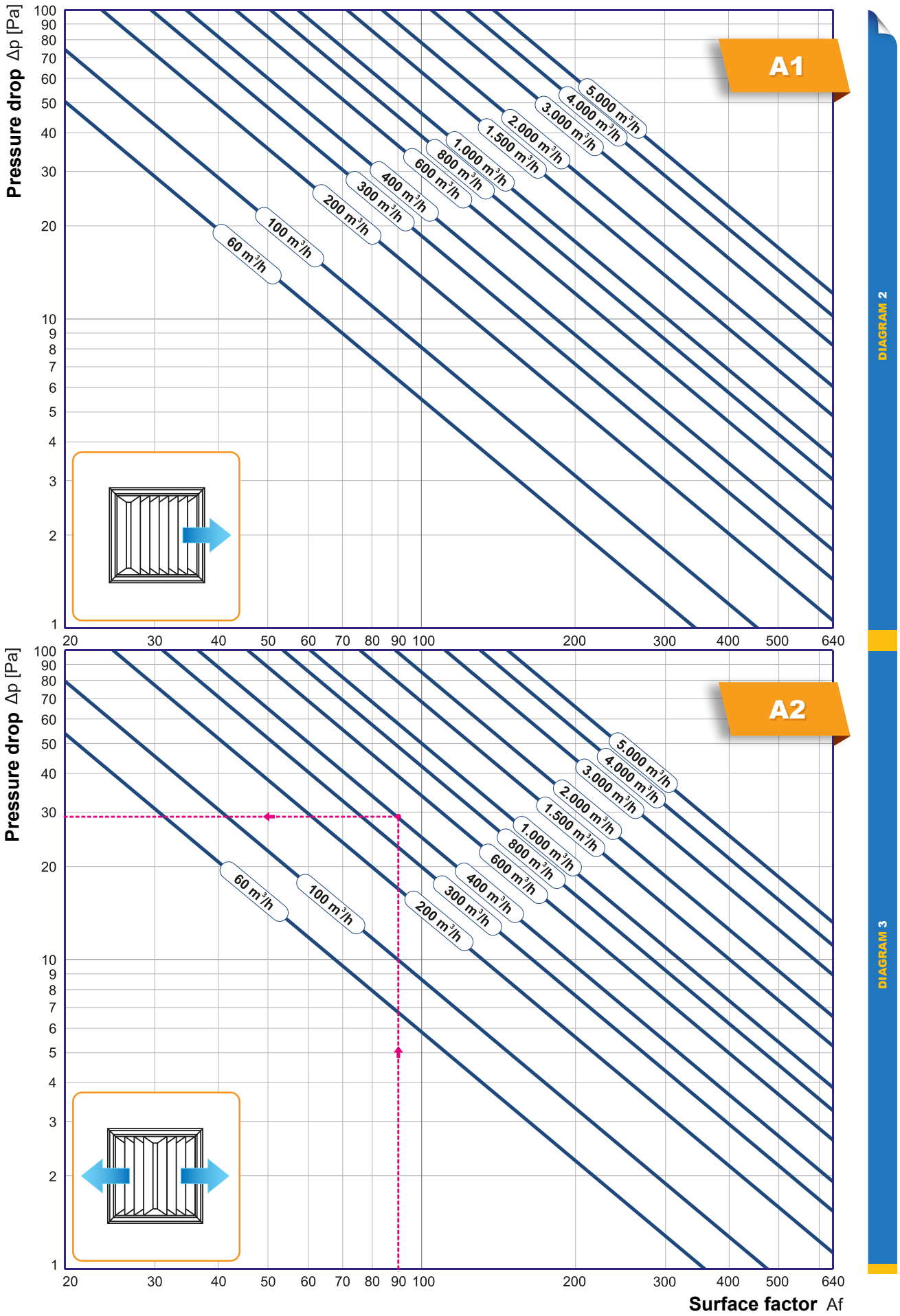

A1
Pressure drop Δp [Pa]
100
90
80
70
60
50
40
30
20
10
9
8
7
6
5
4
3
2
1
20
30
40
50
60
70
80
90
100
200
300
400
500
640
5.000 m³/h
4.000 m³/h
3.000 m³/h
2.000 m³/h
1.500 m³/h
1.000 m³/h
800 m³/h
600 m³/h
400 m³/h
300 m³/h
200 m³/h
100 m³/h
60 m³/h
DIAGRAM 2
A2
Pressure drop Δp [Pa]
Surface factor Af
DIAGRAM 3

DIAGRAM 4

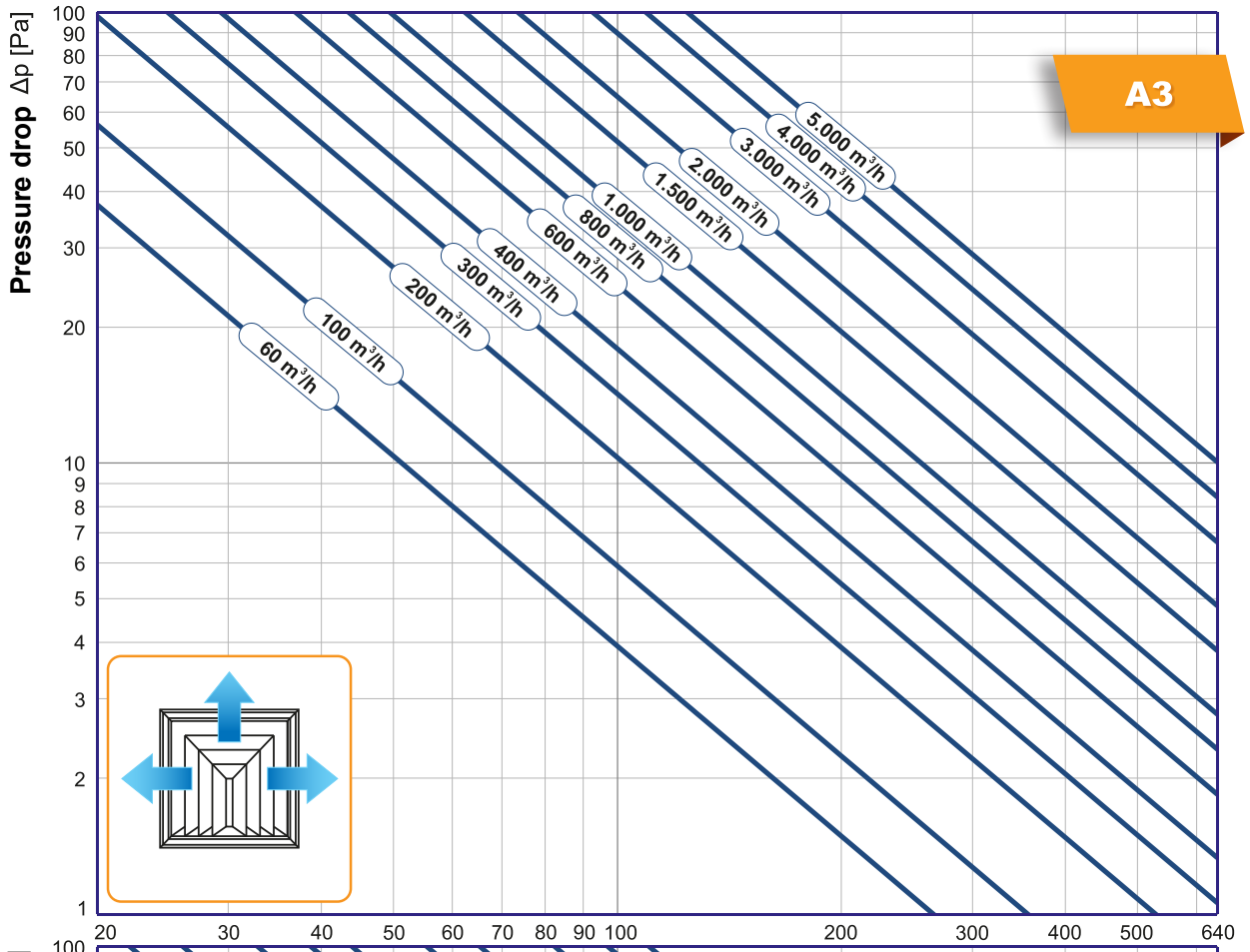
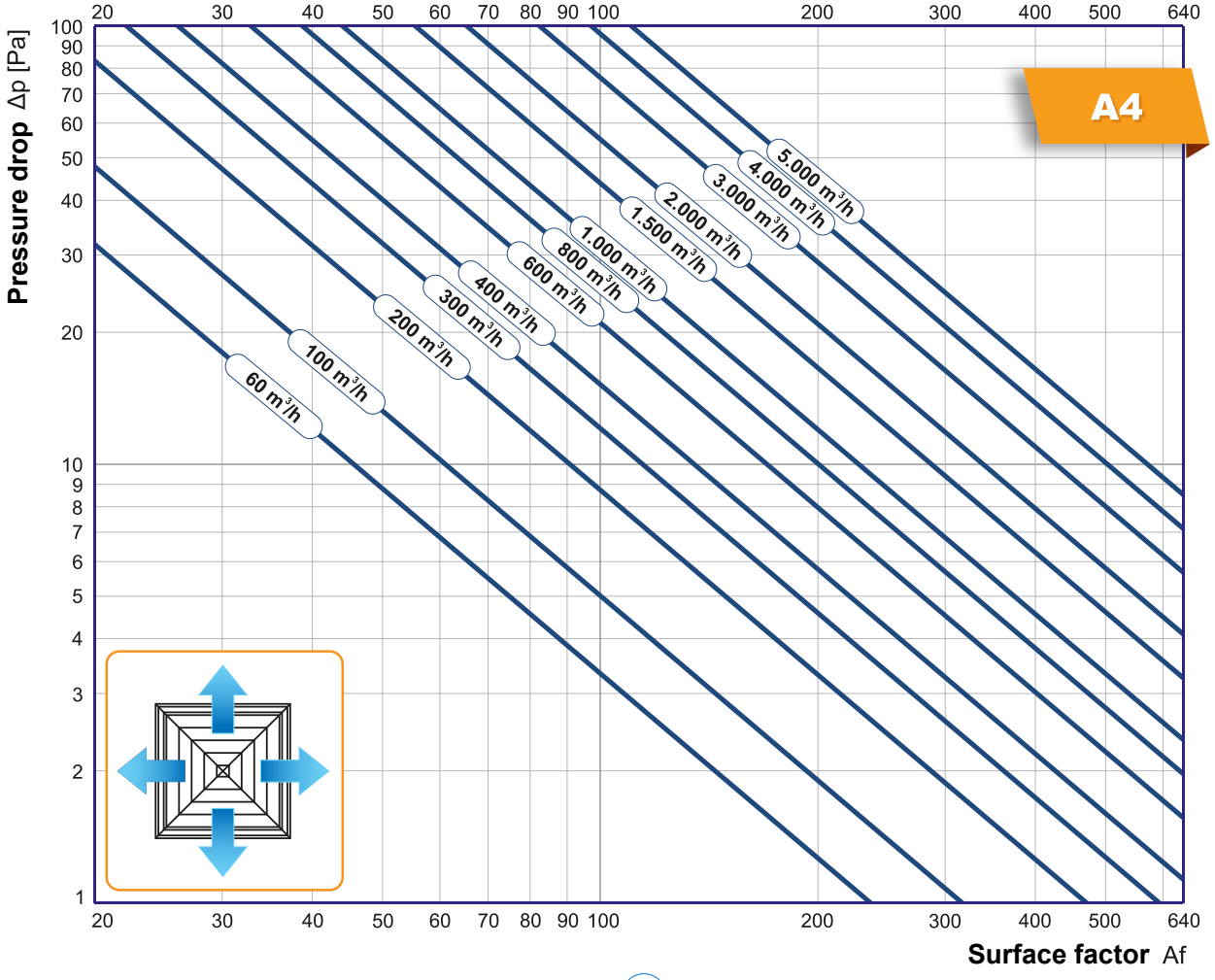
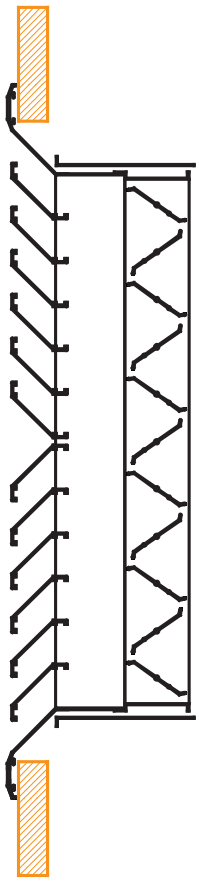



DIAGRAM 5



## DIFFUSER'S PRESSURE DROP & NOISE LEVEL



### Calculation example 1 :

***Pressure drop and noise level calculation in a diffuser A3 + Damper with blade angle of 15°***

We have a diffuser A3 + Damper with dimensions **450 x 450** and air flow of 800 m³/h. A diffuser A3 with dimensions **450 x 450**, has, according to diagram 4 (page 7), for air flow equal to 800 m³/h, pressure drop equal to 11,8 Pa and according to diagram 1 (page 5), produces noise level of 24,2 dB. A damper with dimensions **450 x 450** has, according it's respective selection diagrams, for blade angle of 15° and air flow of 800 m³/h, pressure drop equal to 5,6 Pa and produces noise equal to 10,2 dB.

The total pressure drop inside the diffuser A3 + Damper with dimensions **450 x 450** is the algebraic sum of the pressure drop inside the diffuser and the pressure drop inside the damper: $\Delta p_{A3} + \Delta p_{Damper}$ = 11,8 + 5,6 = **17,4 Pa.**

The total noise level is calculated by using the following equation: $L_{tot} = L_{A3} \oplus L_{Damper}$ = Lmax + C(ΔL). The difference between the noise levels of the 2 independent sound sources (the diffuser A3 and the damper) is ΔL = 14 dB. Therefore from the following diagram we determine that for ΔL = 14 dB the correction factor C(ΔL) is equal to 0,1. So, the total noise level is $L_{tot}$ = Lmax + C(ΔL) = 24,2 + 0,1 = **24,3 dB.**

### Calculation example 2 :

***Pressure drop and noise level calculation in a diffuser A1 + Damper with blade angle of 45°***

We have a diffuser A1 + Damper with dimensions **450 x 450** and air flow of 1.000 m³/h.The diffuser A1 with dimensions **450 x 450** has, according to diagram 2 (page 6), for air flow equal to 1.000 m³/h, pressure drop equal to 17,8 Pa and according to diagram 1 (page 5), produces noise level of 30,2 dB. A damper with dimensions **450 x 450** has, according it's respective selection diagrams, for blade angle of 45° and air flow of 1000 m³/h, pressure drop equal to 59,4 Pa and produces noise equal to 40,5 dB.

The total pressure drop inside the diffuser A1 + Damper with dimensions **450 x 450** is the algebraic sum of the pressure drop inside the diffuser and the pressure drop inside the damper: $\Delta p_{A1} + \Delta p_{Damper}$ = 17,8 + 59,4 = **77,2 Pa.**

The total noise level is calculated by using the following equation: $L_{tot} = L_{A1} \oplus L_{Damper}$ = Lmax + C(ΔL). The difference between the noise levels of the 2 independent sound sources (the diffuser A1 and the damper) is ΔL = 10,3 dB. From the following diagram we determine that for ΔL = 10,3 dB the correction factor C(ΔL) is equal to 0,38. So, the total noise level is $L_{tot}$ = Lmax + C(ΔL) = 40,5 + 0,38 = **40,88 dB.**

## CALCULATING THE TOTAL NOISE LEVEL BETWEEN 2 INDEPENDENT SOUND SOURCES


Since noise in [dB] is a quantity that is defined in logarithmic scale, when we have 2 (or more) independent sound sources, the total noise is not calculated by the algebraic sum of the 2 sources. The "sum" of 2 sound sources L1, L2 is symbolized by the internationaly defined symbol ⊕ and is calculated by using the following equation :

**$L_{tot}$ = L1 ⊕ L2 = 10 x log($10^{0,1 \times L1} + 10^{0,1 \times L2}$)**

Because of the previous equation requiring some complex calculations, we can define the sum of 2 sound sources with sufficient accuracy using the following approximate equation :

**$L_{tot}$ = L1 ⊕ L2 = Lmax + C(ΔL),**

where Lmax is the largest noise level between L1 and L2 and C(ΔL) a correction factor (in dB) which depends on the difference ΔL = | L2 - L1 | and is calculated by using the following diagram.

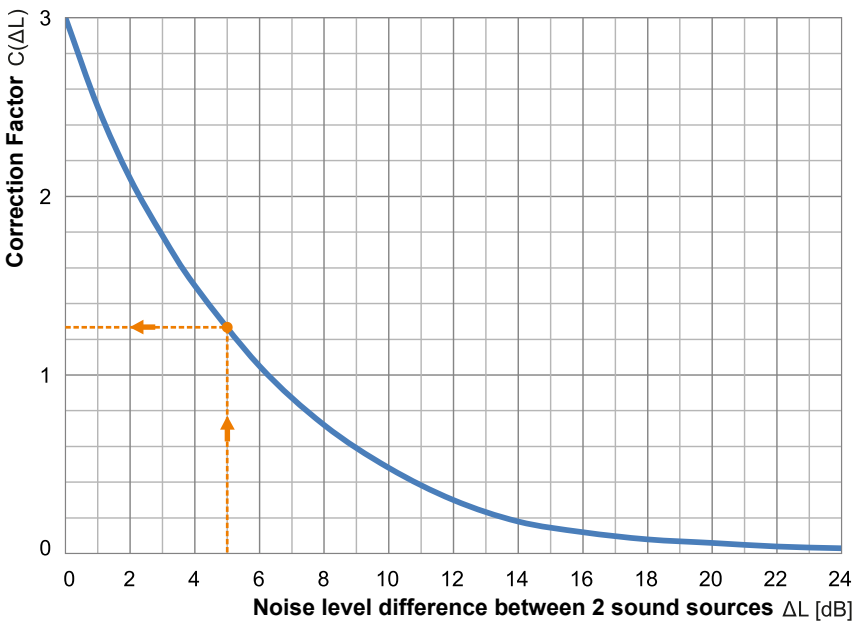
### Calculation example

We have a grille which produces noise L1 = 25 dB in an area. If, in the same area, the noise produced from a 2nd independent grille is L2 = 30 dB, then the total noise level is calculated as follows:
Ltot= L1 ⊕ L 2 = Lmax + C(ΔL).

We have
**Lmax** = L2 = 30 dB and
ΔL = L2 - L1 = 5 dB

From the adjacent diagram we define that for ΔL equal to 5 dB the correction factor is C(ΔL) = 1,2 dB.

Therefore the total noise level is:
**$L_{tot}$** = 25 ⊕ 30 =
= 30 + C(5) ≅ 30 + 1,2 = **31,2** dB.

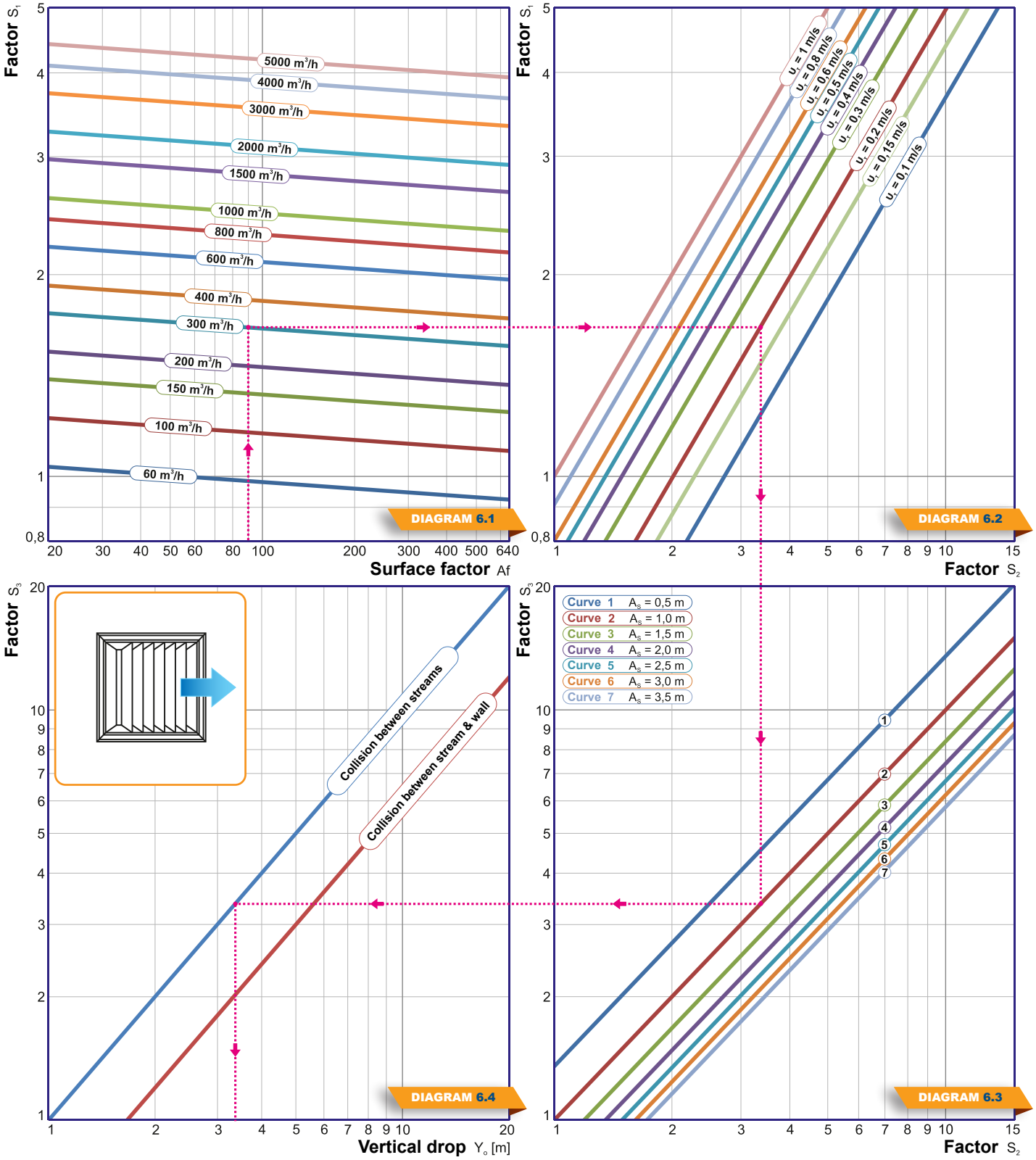


## RANGE CALCULATION - A1

**Selection example 2 :**

***Which is the total range of a diffuser A1 with dimensions 300 x 300, if the air flow is 300 m³/h, we have collision between the air stream of this diffuser and the air stream of another's, at a distance of 1 m from each diffuser and the stream velocity at total range is 0,2 m/s?***

From the surface factor Af selection table (page 5) we establish that, for a diffuser with dimensions **300 x 300**, the surface factor Af is equal to 90. Therefore, from diagram 6.1, for air flow of 300 m³/h and surface factor Af = 90, we determine the factor $S_1$ = 1,74. We continue to diagram 6.2, where, for factor $S_1$ = 1,74 and stream velocity at total range equal to 0,2 m/s, we determine the factor $S_2$ = 3,4. From diagram 6.3, for factor $S_2$ = 3,4 and the curve for collision distance equal to $A_S$ = 1 m, we determine the factor $S_3$ = 3,4. Finally, from diagram 6.4 for factor $S_3$ = 3,4 and the curve for collision between streams, we determine that the stream vertical drop $Y_o$ is equal to 3,4 m. The total range is calculated by the equation $X_o = A_S + Y_o = 1 + 3,4 = 4,4$ m.



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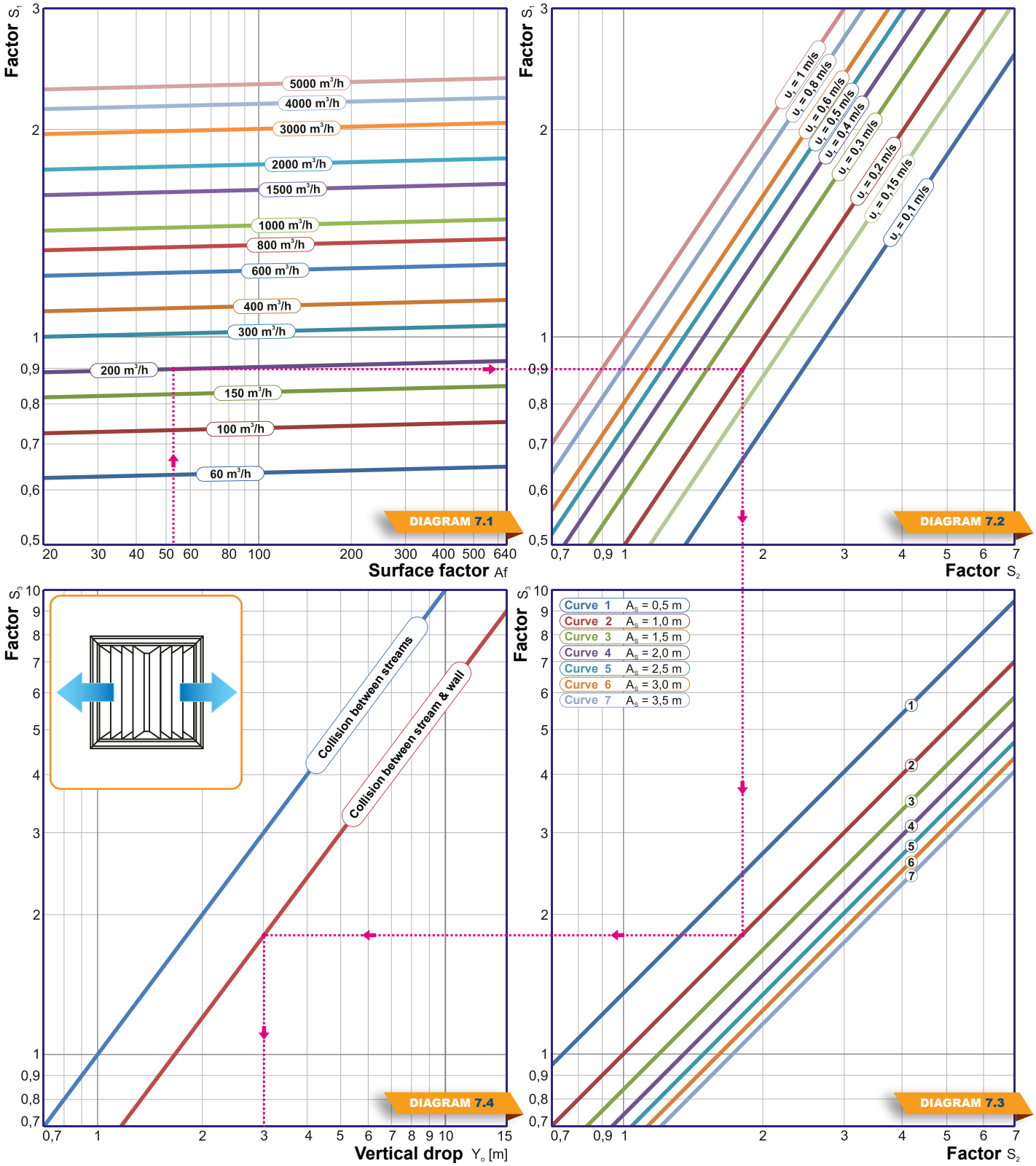
## RANGE CALCULATION - A2

**Selection example 3 :**

***Which is the total range, per direction, of a diffuser A2 with dimensions 230 x 230, if the air flow is 200 m³/h, we have collision between the stream of the diffuser and the wall located 1 m away from the diffuser and the stream velocity at total range is 0,2 m/s?***

From the surface factor Af selection table (page 5) we establish that, for a diffuser with dimensions **230 x 230**, the surface factor Af is equal to 52,9. Therefore, from diagram 7.1, for air flow of 200 m³/h and surface factor 52,9, we determine the factor $S_1$ = 0,89. We continue to diagram 7.2, where, for factor $S_1$ = 0,89 and stream velocity at total range equal to 0,2 m/s, we determine the factor $S_2$ = 1,86. From diagram 7.3, for factor $S_2$ = 1,86 and the curve for collision distance equal to $A_S$ = 1 m, we determine the factor $S_3$ = 1,86. Finally, from diagram 7.4 for factor $S_3$ = 1,86 and the curve for collision between the stream of the diffuser and the wall, we determine that the stream vertical drop $Y_o$ is equal to 3,02 m. The total range **per direction** is calculated by the equation $X_o = A_S + Y_o = 1 + 3,02 = 4,02$ m.



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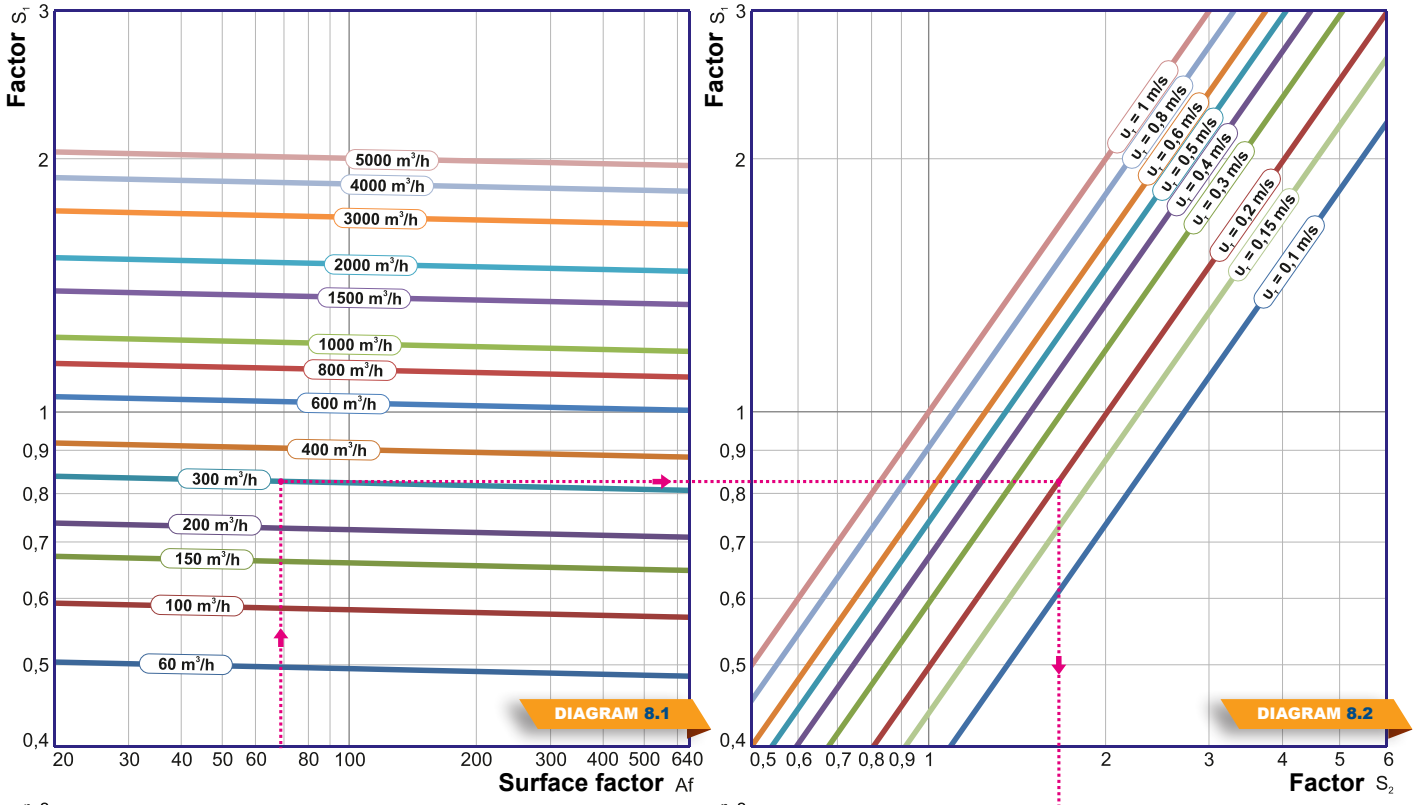
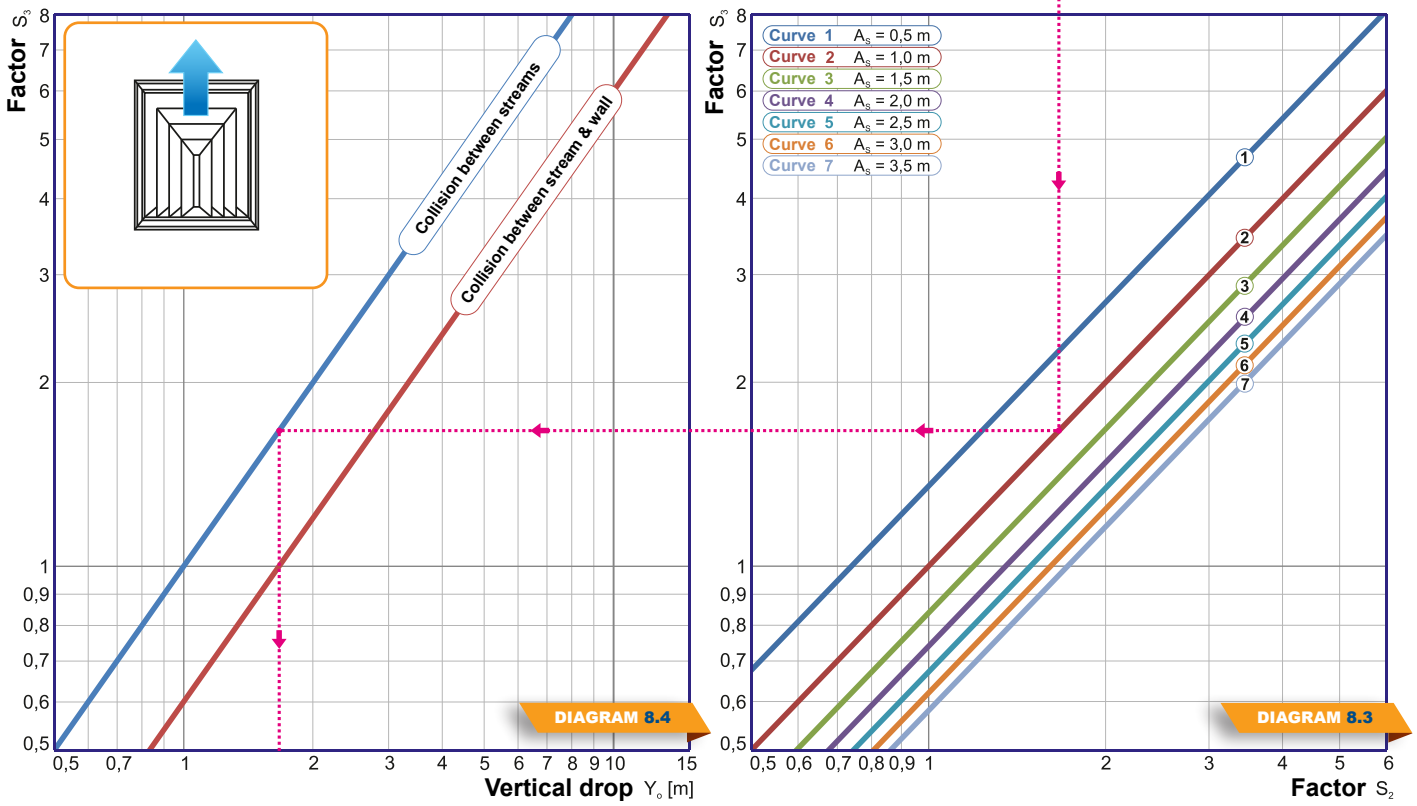
## RANGE CALCULATION - A3 / TRIANGULAR SURFACE

**Selection example 4 :**

***Which is the total range of the stream discharged from the triangular surface af a diffuser A3 with dimensions 300 x 230 if the total air flow is 300 m³/h, we have collision between the air stream of this diffuser and the air stream of another's, at a distance of 1 m from each diffuser and the stream velocity at total range is 0,2 m/s?***

From the surface factor Af selection table (page 5) we establish that, for a diffuser with dimensions **300 x 230** the surface factor Af is equal to 69. From diagram 8.1 for air flow of 300 m³/h and surface factor 69, we determine the factor $S_1$ = 0,83. We continue to diagram 8.2, where, for factor $S_1$ = 0,83 and stream velocity at total range equal to 0,2 m/s, we determine the factor $S_2$ = 1,75. From diagram 8.3, for factor $S_2$ = 1,75 and the curve for collision distance equal to $A_S$ = 1 m, we determine the factor $S_3$ = 1,74. Finally, from diagram 8.4 for factor $S_3$ = 1,74 and the curve for collision between streams, we determine that the stream vertical drop $Y_o$ is equal to 1,75 m. The total range is calculated by the equation $X_o = A_S + Y_o = 1 + 1,75 = 2,75$ m.



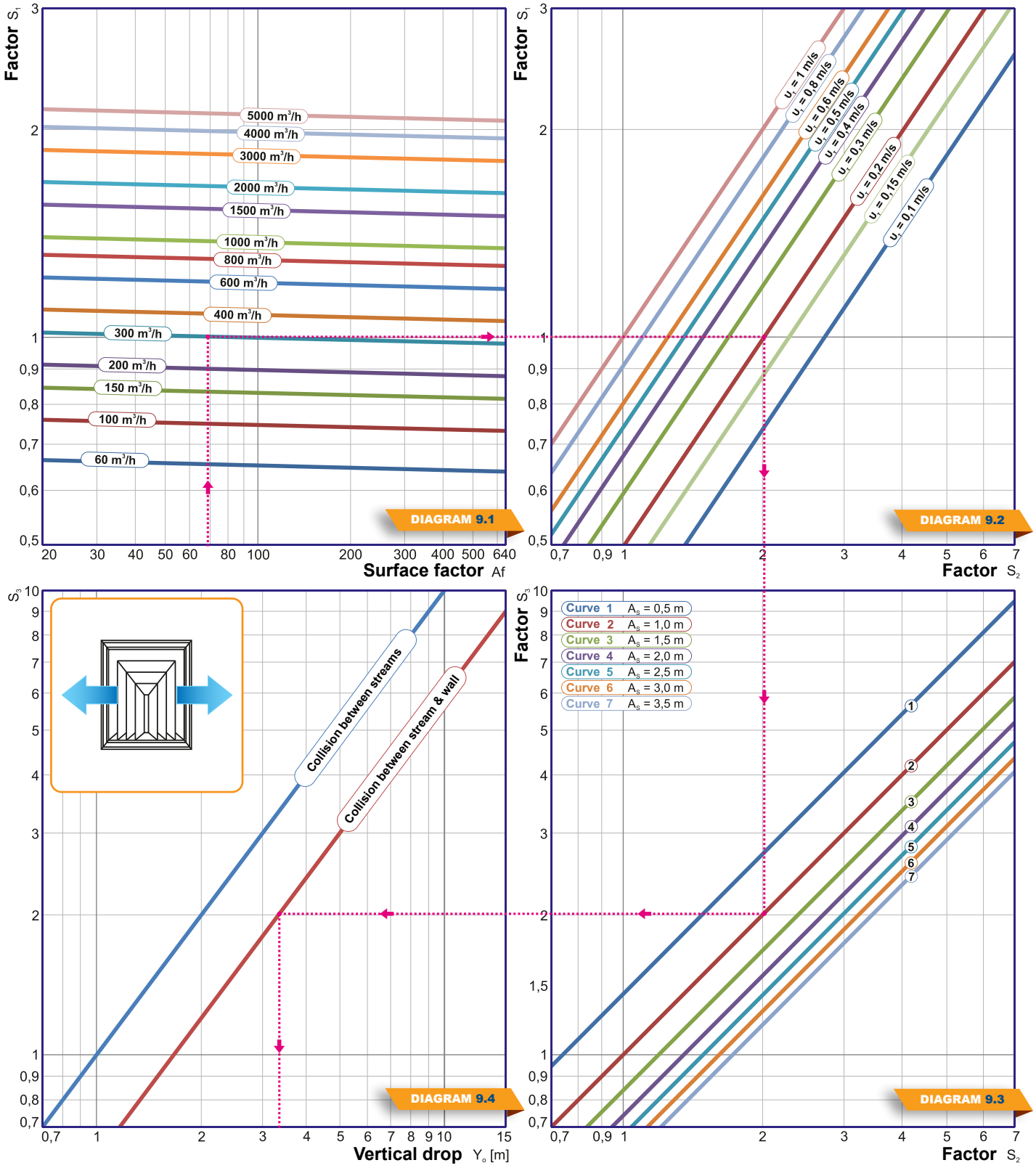



## RANGE CALCULATION - A3 / TRAPEZOIDAL SURFACE

**Selection example 5 :**

***Which is the total range of the stream discharged from the trapezoidal surface af a diffuser A3 with dimensions 300 x 230, of selection example 4 on page 11, if we have collision between the air stream of the diffuser and a wall located 1 m away from the diffuser and the stream velocity at total range is 0,2 m/s?***

From diagram 9.1 for total air flow of 300 m³/h and surface factor equal to 69, we determine the factor $S_1$ = 1. We continue to diagram 9.2, where, for factor $S_1$ = 1 and stream velocity at total range equal to 0,2 m/s, we determine the factor $S_2$ = 2,01. From diagram 9.3, for factor $S_2$ = 2,01 and the curve for collision distance equal to $A_S$ = 1 m, we determine the factor $S_3$ = 2,01. Finally, from diagram 9.4 for factor $S_3$ = 2,01 and the curve for collision between the stream and the wall, we determine that the stream vertical drop $Y_o$ to is equal to 3,4 m. The total range of the stream discharged from each trapezoidal surface is calculated by the equation $X_o = A_S + Y_o = 1 + 3,4 = 4,4$ m.



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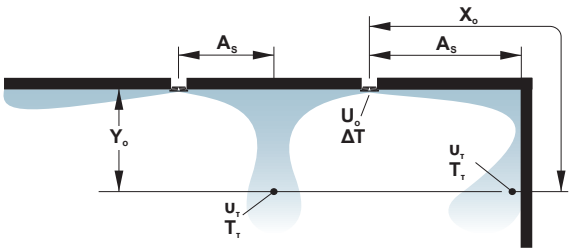
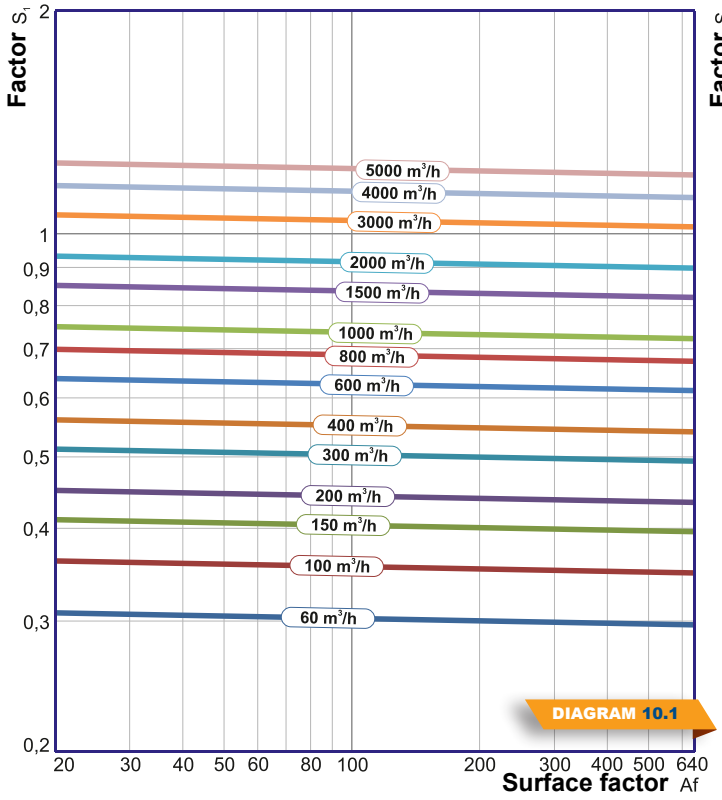
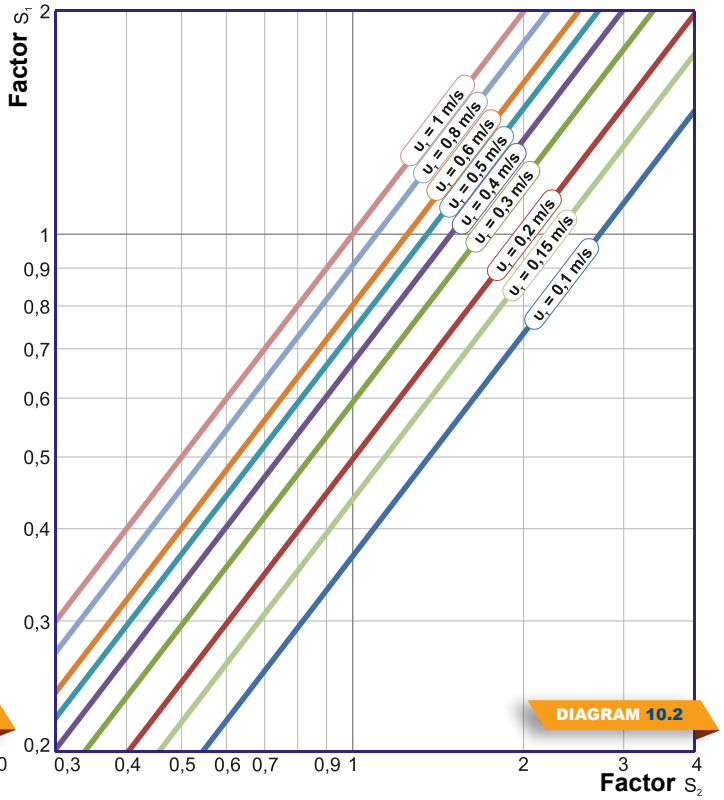
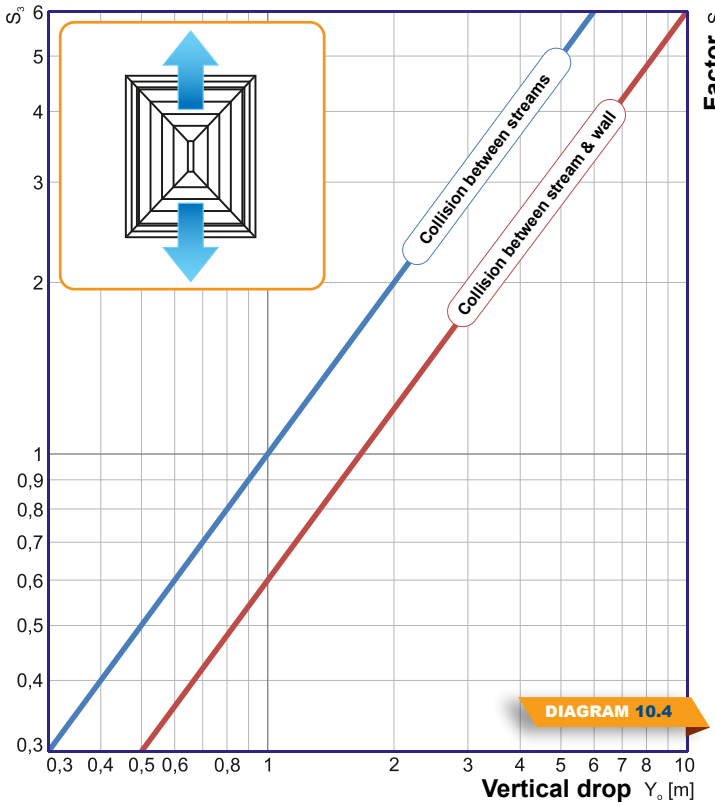
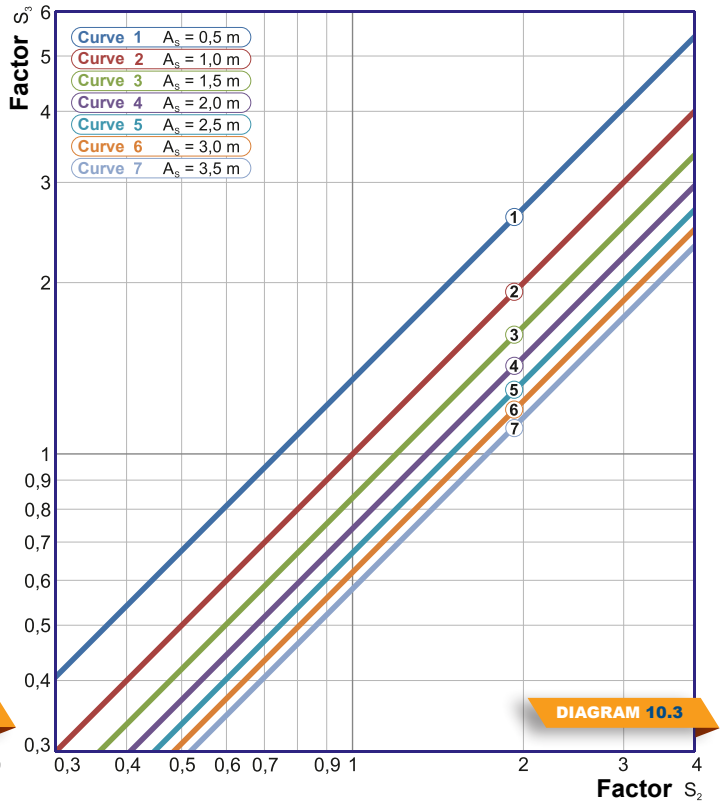
## RANGE CALCULATION - A4 / TRIANGULAR SURFACE



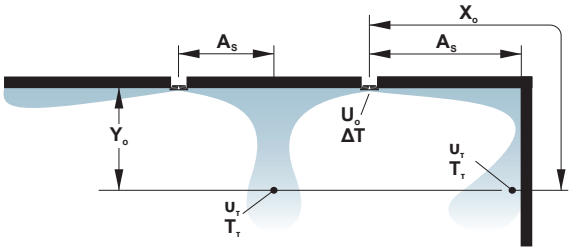



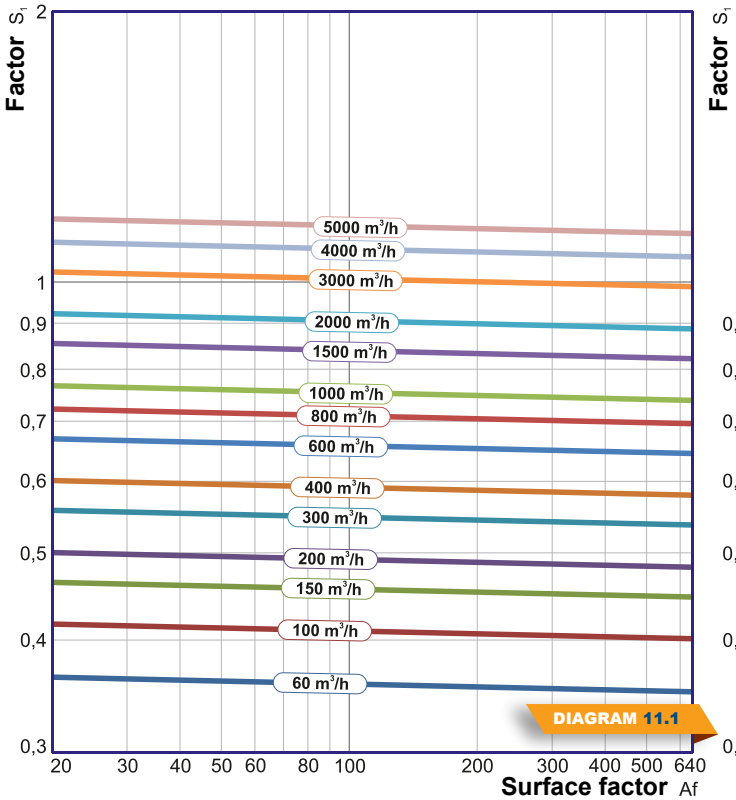



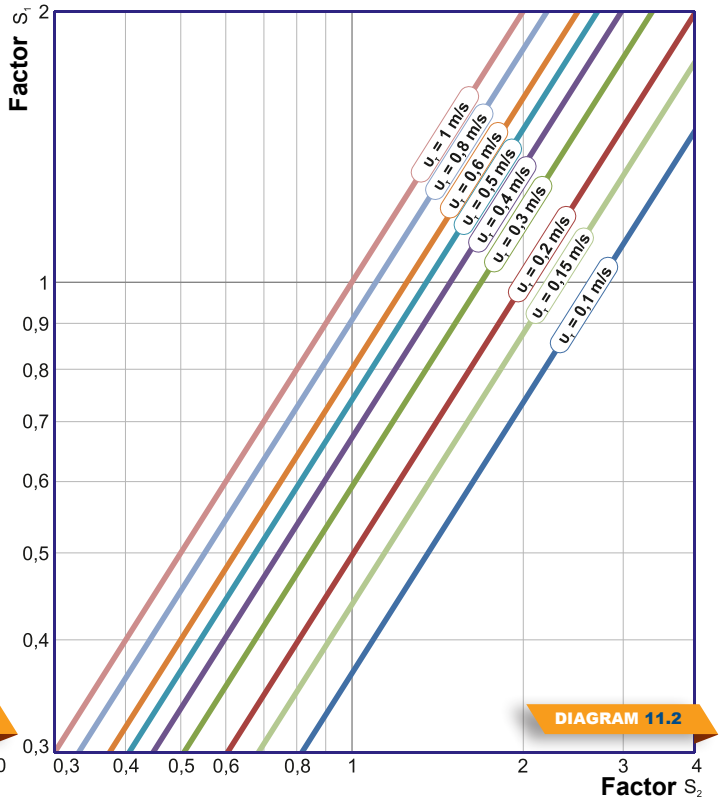



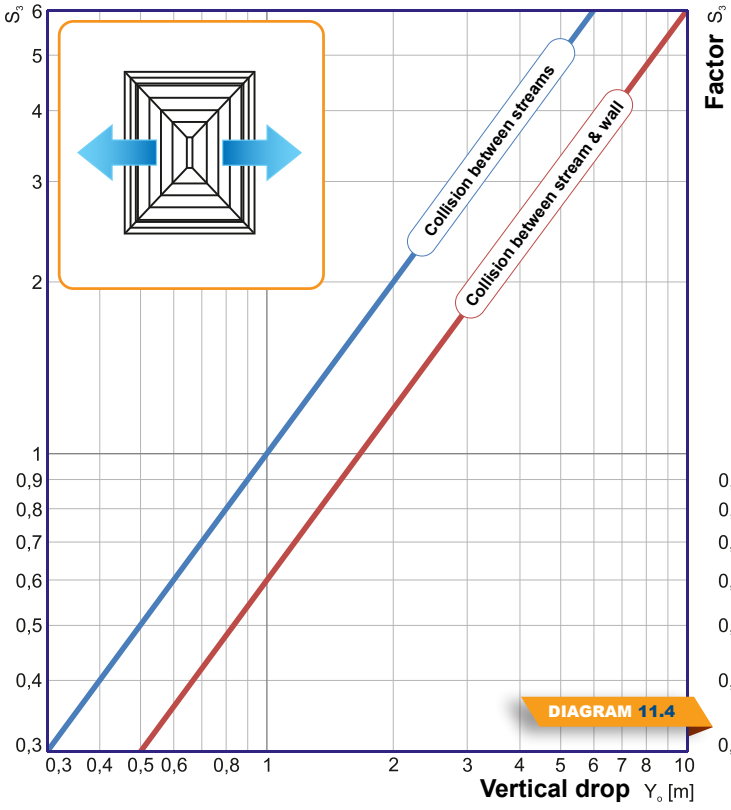



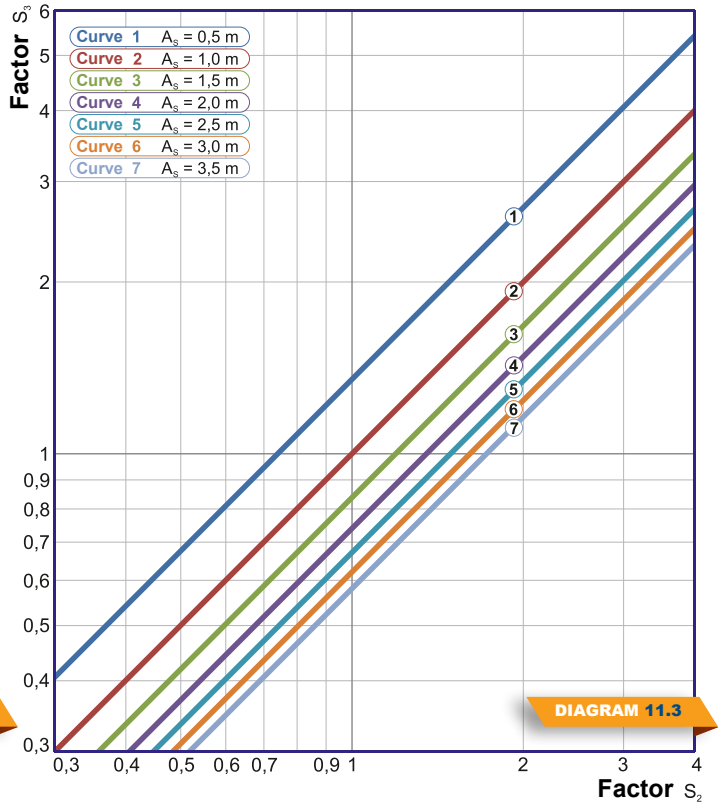
## RANGE CALCULATION - A4 / TRAPEZOIDAL SURFACE



## A1 ÷ A4 - ORDER

For the proper order of ceiling diffusers **A1 ÷ A4** please use the following code :

**A1** | **400** x **400** + **E, D** | **RAL**

| | |
|---|---|
| **RAL...** | = Blades & frame from **aluminium painted in RAL color** |
| **Blank** | = Blades & frame from **anodized aluminium** |
| **E** | = with **equalizing grid** |
| **D** | = with **volume damper** |
| **Blank** | = without additional accessories |
| Diffuser **height** [mm] | |
| Diffuser **length** [mm] | |
| **A1** | = Air supply into 1 direction |
| **A2** | = Air supply into 2 directions |
| **A3** | = Air supply into 3 directions |
| **A4** | = Air supply into 4 directions |

**Examples**

**A2 300 x 300 + E | 9010 =**
Ceiling diffuser A2 (air supply into 2 directions) **300 mm** in length and height, with blades and frame from aluminium, powder painted in RAL 9010 and equalizing grid.

**A3 380 x 450 + D =**
Ceiling diffuser A3 (air supply into 3 directions), **380 mm** in length, **450 mm** in height, with blades and frame from anodized aluminium and volume damper.

**A4 380 x 450 + E + D =**
Ceiling diffuser A4 (air supply into 4 directions), **380 mm** in length, **450 mm** in height, with blades and frame from anodized aluminium, with equalizing grid and volume damper.

## SPECIFICATION

**Ceiling diffuser, 1 / 2 / 3 / 4 directions, A1 / A2 / A3 / A4**
Ceiling diffuser, indicative type **A1 / A2 / A3 / A4** of **AIRTECHNIC**, manufactured of anodized aluminum / aluminum painted in RAL… color, with fixed blades configured for air supply into 1 direction (**A1**) / 2 directions (**A2**) / 3 directions (**A3**) / 4 directions (**A4**). The manufacturer will have performed measurements of the technical characteristics of the diffuser, in an independent laboratory according to the standard ELOT EN 12238: 2002. It will have a volume damper [**D**] / equalizing grid [**E**]. It will be suitable for ceiling or air duct placement, for air supply and visible installation with screws / concealed placement with internal screws, on the side of the diffuser. It will be possible to be manufactured as accessible ceiling diffuser with removable blade core. The factory will be certified according to **ISO 9001:2015** (Quality Management Systems) and according to **ISO 14001:2015** (Environmental Management Systems).
It will be manufactured by **AIRTECHNIC** type **A1 / A1 +D, +E.**
It will be manufactured by **AIRTECHNIC** type **A2 / A2 +D, +E.**
It will be manufactured by **AIRTECHNIC** type **A3 / A3 +D, +E.**
It will be manufactured by **AIRTECHNIC** type **A4 / A4 +D, +E.**

# AIRTECHNIC

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*Air-Conditioning & Ventilation Components & Systems*

ISO 9001:2015 ISO 14001:2015

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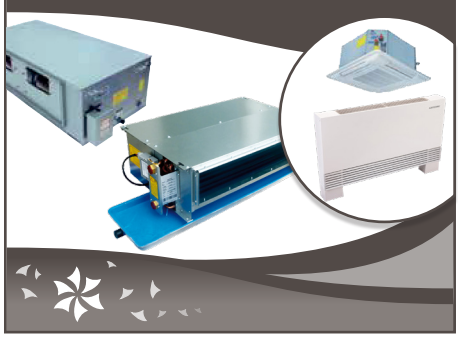
## HEAT EXCHANGERS


## FAN COIL UNITS



## FANS & FAN SECTIONS


## FIRE DAMPERS

## AIR OUTLETS

## STEAM HUMIDIFIERS - DEHUMIDIFIERS

## CENTRAL VACUUM SYSTEMS


## STAINLESS STEEL CHIMNEYS

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## AIR CURTAINS

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