

FACILE

Hygienic sound attenuator for rectangular ducts



QUICK FACTS

- Rectangular sound attenuator with extractable acoustic baffles.
- Used where there are stringent requirements for cleanability.
- ISOVER Cleantec® PLUS cleanable surface
- Low pressure drop via tapered acoustic baffle surfaces
- Connection sizes ranging from 400x300 to 2200x2200
- Provision for flange connection
- Included in the MagiCAD database

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Technical Description

General

The Facile is a hygienic sound attenuator for use where there are stringent requirements for cleanability and extractable acoustic baffles.

Function

The FACILE's low pressure drop has been achieved by designing the acoustic baffles according to the basic laws of aerodynamics through tapered acoustic baffle surfaces.

The low pressure drop can e.g. be utilised for the following:

- For reducing the space requirement in that a smaller sound attenuator can be selected.
- For reducing the pressure rise in the fan if the size is maintained.
- For reducing the inherent sound generation in the system thanks to lower velocity and lower pressure rise.
- For adapting the sound attenuator more easily to the connected duct system.

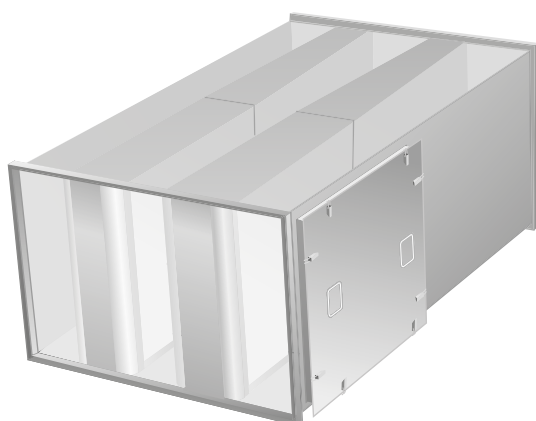


Figure 1. FACILE's acoustic baffles are designed according to the basic laws of aerodynamics.

The FACILE contains all the positive characteristics that previous Swegon sound attenuators have offered. By taking the properties of relevant materials into account and utilising the basic laws of aerodynamics, Swegon has optimized its sound attenuators with regard to the following factors:

- The acoustic properties of the sound attenuating materials.
- The thickness of the acoustic baffles.
- The width of the spaces between baffles.
- The length of the acoustic baffles.
- The surface covering.

By combining the factors above, Swegon can always offer the best sound attenuation with the lowest pressure drop to satisfy client requirements.

Design

- The FACILE is made as standard of galvanized sheet steel to Corrosivity class C3 (VVS-AMA 2019).
- The sound absorbing material ISOVER Cleantec® PLUS is type-approved for wet cleaning with a plastic brush or even with a high-pressure cleaning apparatus. Naturally it also conforms to relevant standards with regard to cleaning, fibre entrainment, resistance to ageing and emissions, etc.
- The standard FACILE is supplied with slip clamp connections, 20 mm.

Maintenance

The FACILE is under normal operating conditions a maintenance-free sound attenuator.

Environment

The declaration of construction materials is available for downloading from our website or can be ordered from one of our sales offices.

Installation

The slip clamps on this product are designed for connection to ducts only.

The product should be suspended with a support beam under its entire width.

Special versions

In addition to the accessories and variants described in the catalogue there is scope for customised variants if required.

Swegon can then in consultation with the customer optimize the sound attenuator in relation to sound attenuation, size, air handling unit adaptation and choice of material (example: stainless steel, zinc magnesium, etc). Please get in touch with Swegon for further information.

Accessories

Cleaning cover

In the basic design, the cleaning cover is located on the H side and the acoustic baffles are extractable through the side of the casing (Figure 2).

As an alternative, the cleaning cover can be positioned on the B side (Figure 3).

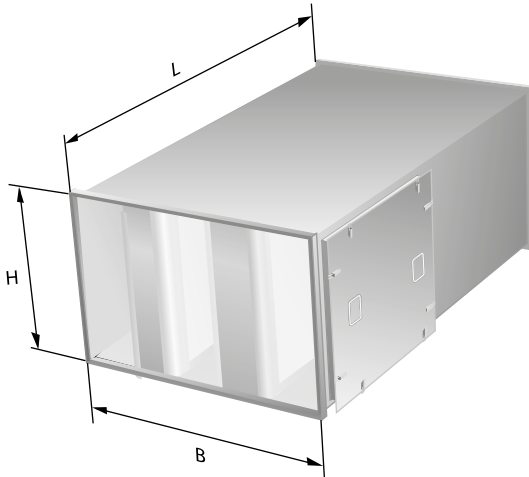


Figure 2. FACILE with extractable acoustic baffles and cleaning cover in the side of the casing.

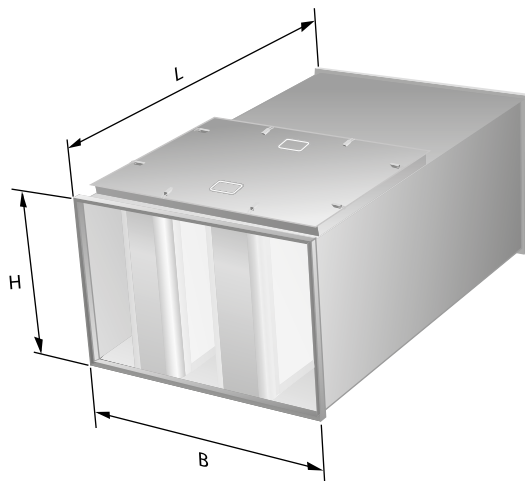


Figure 3. FACILE with extractable acoustic baffles and cleaning cover in the B side.

Flange connection T5

Available as an alternative to slip-clamp connection. Have robust flanges made of galvanized angle steel, with oval bolt holes designed to facilitate installation.

Flange connection accessory

FACILE T5 = Flange connections

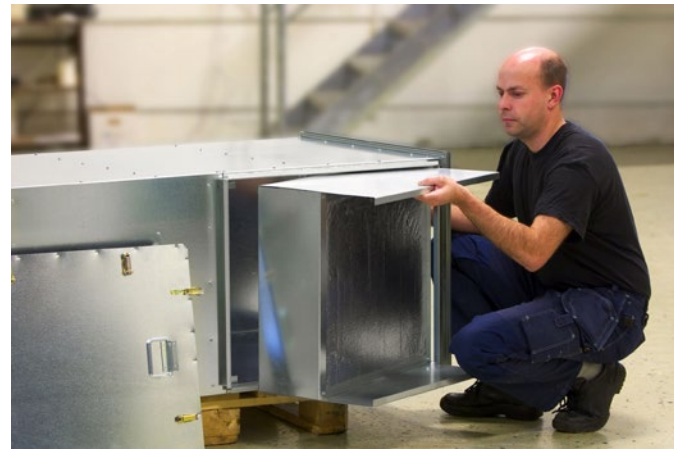


Figure 4. FACILE with the acoustic baffles extracted.

Cleaning cover T2 insulated with fire-resistant material

In many applications, sound attenuators are installed in duct systems insulated with fire-resistant material. In applications in which ventilation ducts are to be insulated with 50 mm thick fire-resistant stone wool, you can install external insulation over the sound attenuator directly at the building site.

FACILE T2, The insulation of the cleaning cover with 50 mm thick stone wool implies that the sound attenuator is ready to be covered over with insulation at the building site.

The technical data do not change if the FACILE T2 accessory is used.



figure 5. FACILE T2 cleaning cover insulated with fire-resistant material.

Fire-resistant insulation accessory

FACILE T2 = Fire-resistant insulated cleaning cover

Perforated sheet metal lining T4

If the air contains a high concentration of particles or if for some other reason a more robust design is required, the acoustic baffles can be covered with perforated sheet steel over the ISOVER Cleantec® PLUS insulation, FACILE T4 accessory.

Sheet metal lining accessory

FACILE T4 = Perforated sheet metal lining

Flange connection T5

Available as an alternative to slip-clamp connection. Has robust flanges made of galvanized angle steel, with oval bolt holes designed to facilitate installation.

Flange connection accessory

FACILE T5: Flange connections

Euroflange T6

- Available as an alternative to slip-clamp connection
- 30mm flange with a bolt hole in each corner

Accessory Euroflange

FACILE T6: Euroflange

Sizing

General

All specified technical data apply to the FACILE in the standard version. Dampers, duct bends and other equipment in the vicinity of the sound attenuator will increase its inherent sound generation and pressure drop. The specified data are based on a uniform air stream in and out of the sound attenuator.

See also the section on System effect and pressure drop.

If the inner acoustic baffle surfaces are lined with perforated sheet steel, this will increase the level of inherent sound generation. See the section on Inherent sound generation.

See also under: Sizing, Dimension.

Dimensions

Total overall dimensions in H direction: H+40 mm

Total overall dimensions in B direction (incl. cleaning cover): B+70 mm

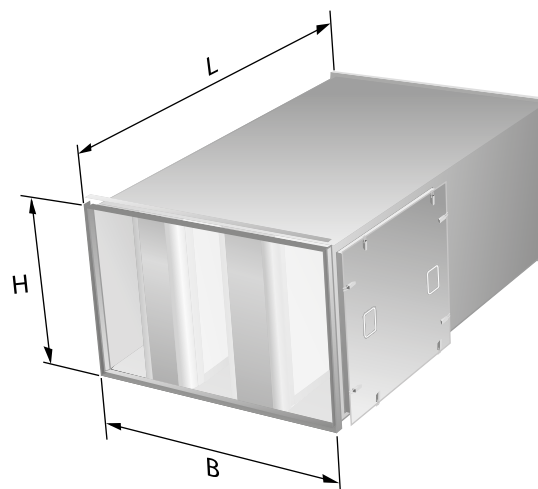


Figure 6. Dimension print

B dim.: 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1800, 2000, 2200

H dim.: 300, 400, 500, 600, 700, 800, 900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2200

L dimensions: See Technical Data Table.

Weights: Get in touch with your nearest Swegon Representative.

Technical Data

B dim. (mm)	Code	Length (mm)	Static integral attenuation, (dB) to ISO 7235								P-value
			63	125	250	500	1K	2K	4K	8K	
400	0410	750	2	4	9	14	15	18	10	7	1.3
400	0420	1350	3	7	15	21	29	24	13	9	1.5
400	0430	1950	4	8	23	31	34	27	15	11	1.6
500	0510	750	3	5	10	15	27	27	17	13	2.9
500	0520	1350	4	7	17	25	35	36	27	19	3.4
500	0530	1950	4	8	24	36	40	40	30	22	3.6
600	0610	750	4	8	13	19	30	27	17	13	4.9
600	0620	1350	5	11	23	32	39	36	25	19	5.8
600	0630	1950	6	13	31	44	43	40	30	22	6.2
700	0710	750	3	6	11	15	22	22	12	9	2.2
700	0720	1350	4	9	18	26	33	29	17	13	2.5
700	0730	1950	5	10	25	38	38	32	22	15	2.8
800	0810	750	2	4	9	14	15	18	10	7	1.3
800	0820	1350	3	7	15	21	29	24	13	9	1.5
800	0830	1950	4	8	23	31	34	27	15	11	1.6

Technical Data

B dim. (mm)	Code	Length (mm)	Static integral attenuation, (dB) to ISO 7235								P-value
			63	125	250	500	1K	2K	4K	8K	
900	0910	750	4	8	13	19	30	27	17	13	4.9
900	0920	1350	5	11	23	32	39	36	25	19	5.8
900	0930	1950	5	13	31	44	43	40	30	22	6.2
1000	1010	750	3	7	12	17	24	23	13	10	2.8
1000	1020	1350	4	10	19	28	35	31	20	15	3.3
1000	1030	1950	5	11	27	39	39	34	24	17	3.6
1100	1110	750	3	5	10	15	19	21	11	8	1.7
1100	1120	1350	4	8	17	25	32	28	16	11	2.0
1100	1130	1950	4	9	24	36	37	29	20	13	2.3
1200	1210	750	4	8	13	19	30	27	17	13	4.9
1200	1220	1350	5	11	23	32	39	36	25	19	5.8
1200	1230	1950	6	13	31	44	43	40	30	22	6.2
1300	1310	750	3	7	12	18	25	24	14	11	3.2
1300	1320	1350	5	10	20	29	36	32	21	16	3.9
1300	1330	1950	6	11	28	40	39	36	25	18	4.1
1400	1410	750	3	6	11	15	22	22	12	9	2.2
1400	1420	1350	4	9	18	26	33	29	17	13	2.5
1400	1430	1950	5	10	25	38	38	32	22	15	2.8
1500	1510	750	3	5	10	15	17	20	11	8	1.6
1500	1520	1350	4	8	16	24	31	27	15	10	1.9
1500	1530	1950	5	9	23	35	35	30	18	12	2.1
1600	1610	750	3	7	12	18	26	25	15	11	3.4
1600	1620	1350	4	10	21	30	37	33	22	17	3.9
1600	1630	1950	5	12	29	41	40	37	26	19	4.5
1800	1810	750	4	8	13	19	30	27	17	13	4.9
1800	1820	1350	5	11	23	32	39	36	25	19	5.8
1800	1830	1950	6	13	31	44	43	40	30	22	6.2
2000	2010	750	3	7	12	17	24	23	13	10	2.8
2000	2020	1350	4	10	19	28	35	31	20	15	3.3
2000	2030	1950	5	11	27	39	39	34	24	17	3.6
2200	2210	750	3	5	10	15	19	21	11	8	1.7
2200	2220	1350	4	8	17	25	32	28	16	11	2.0
2200	2230	1950	5	9	24	36	37	29	20	13	2.3

Dimension/Sound attenuation

- Calculate the required sound attenuation manually or use Swegon's ProSilencer acoustic calculation software (available at our home page).
- Select sound attenuators that will meet the calculated sound attenuation requirement in the low frequencies (mainly 125 Hz) under Technical Data. Also check the sound attenuation in the higher frequencies.
- Check the H dimension of the sound attenuator to optimize the pressure drop; also observe the system effect.
- The p-value read under Technical Data are used for determining the pressure drop of the sound attenuator. The higher the p-value, the higher the pressure drop, see Nomogram 1.
- Check the sound attenuator's level of inherent sound generation.

Pressure drop

- Calculate the gross face area, $B \times H$ (m^2).
- Find the contemplated airflow in Nomogram 1.
- Go vertically upward to the p-value obtained for the selected sound attenuator under Technical Data.
- Read the pressure drop that refers to duct/duct installation.
- If you select an alternative other than duct/duct, correct the pressure drop using Diagram 1.
- Multiply the pressure drop in Nomogram 1 by the value obtained in Diagram 1 in relation to how the sound attenuator is to be installed.

Example:

A sound attenuator is positioned by a ventilation unit in a fan room. The airflow is $4 m^3/s$ and the sound attenuator is mounted in a duct having a width of 1200 mm. Sound attenuator FACILE 1210 with p-value 4.9 has been selected from Technical Data. The sound attenuator is 1200 mm wide and 1100 mm high. The gross face area will be $1.3 m^2$. Nomogram 1 gives a pressure drop of approx. 27 Pa.

If the sound attenuator is instead installed in a duct/plenum, multiply the pressure drop by 1.9 according to Diagram 1. You will then obtain a pressure drop of approx. 51 Pa.

Nomogram 1. Determining the pressure drop

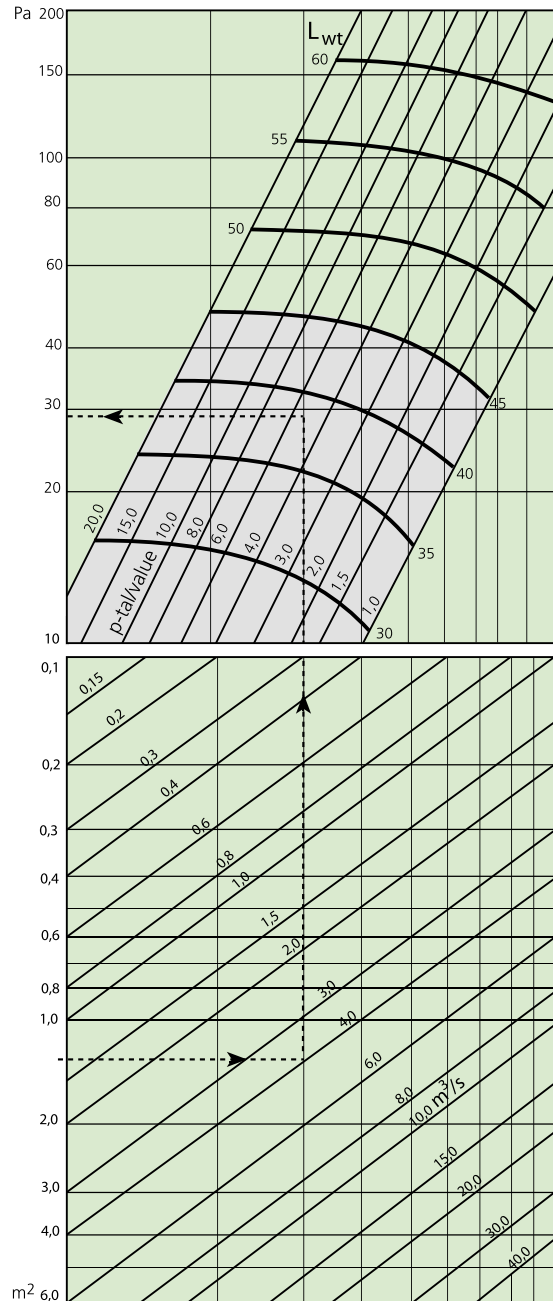
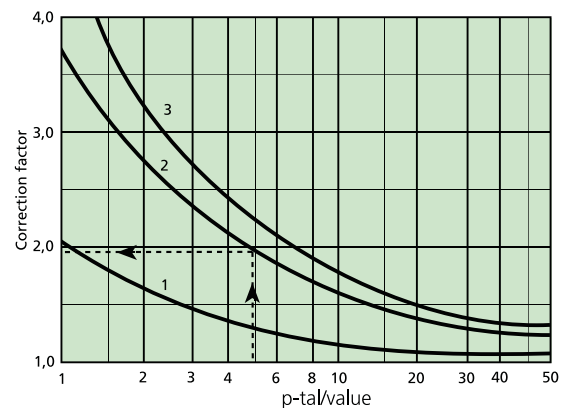


Diagram 1. Correction for a different connection



Curve 1: Plenum/Duct, Curve 2: Duct/Plenum,
Curve 3: Plenum/Plenum

Inherent sound generation

A sound attenuator not only attenuates sound, it also generates sound when air passes through it at high velocity and if the pressure drop is substantial. Normally no problems will occur if the recommended operating range marked in Nomogram 1 is observed.

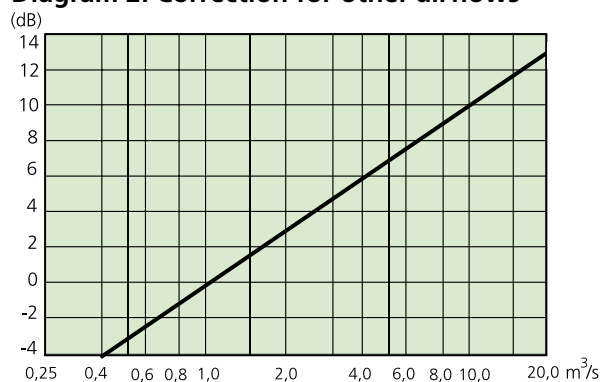
Flow-generated sound curves have been plotted in Nomogram 1 as an aid for accurate calculations. You are welcome to use ProSilencer in which we not only specify inherent sound but also pressure drop. Specified L_{wt} -values are sound power level for FACILE with reference value 10^{-12} W for an airflow of $1 \text{ m}^3/\text{s}$. By correcting L_{wt} with K_1 for the FACILE, you can obtain the sound power level in each octave band. For FACILE with perforated sheet steel, first add 12 dB to specified L_{wt} and then correct it with K_2 .

Hz	63	125	250	500	1K	2K	4K	8K
K_1	-5	-5	-9	-11	-14	-17	-18	-20
K_2	-1	-2	-10	-17	-22	-24	-25	-20

Airflows other than $1 \text{ m}^3/\text{s}$ can be corrected using Diagram 2 below.

The flow-generated sound should be 8–10 dB lower in each octave band than the required sound power level downstream of the sound attenuator.

Diagram 2. Correction for other airflows



Example:

A sound attenuator in the horizontal version is positioned by a ventilation unit in a fan room. The airflow is $4 \text{ m}^3/\text{s}$ and the sound attenuator is mounted in a duct having a width of 1200 mm. Sound attenuator, FACILE 1210, with p-value 4.9 has been selected from the Technical Data Table. For a height of 1100 mm, the gross face area will be 1.3 m^2 .

Nomogram 1 indicates $L_{wt} = 38 \text{ dB}$. Correct with K_1 to break down the sound into octave bands and for $4 \text{ m}^3/\text{s}$ according to Diagram 2:

Hz	63	125	250	500	1K	2K	4K	8K
L_{wt}	38	38	38	38	38	38	38	38
K_1	-5	-5	-9	-11	-14	-17	-18	-20
$4 \text{ m}^3/\text{s}$	6	6	6	6	6	6	6	6
L_w	39	39	35	33	30	27	26	24

System effect

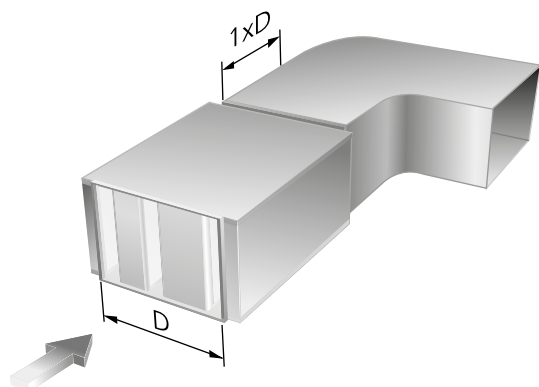


Figure 8. Sound attenuator upstream or downstream of a bend

Sound attenuator installed upstream or downstream of a bend

The corrections below should be multiplied by the pressure drops specified in the diagram.

Sound attenuator upstream of a bend		Sound attenuator downstream of a bend	
Distance	Corr. factor	Distance	Corr. factor
3xD	1.1	1xD	1.2
2xD	1.2	0 (direct)	1.3
1xD	1.35		
0 (direct)	1.5		

Distance and D refer to the distance between the sound attenuator and bend or the biggest side of the sound attenuator.

Total pressure drop = sound attenuator's pressure drop according to Nomogram 1 x correction factor above.

Sound attenuator installed upstream or downstream of a plenum

The total pressure drop across the sound attenuator can be obtained by multiplying the correction factor according to Diagram 1 by the pressure drop according to Nomogram 1.

Sound attenuator installed upstream or downstream of a duct branch

Sound attenuator installed downstream of a duct branch can be compared with one installed downstream of a plenum. See Curve 1 in Diagram 1.

The total pressure drop across the sound attenuator can be obtained by multiplying the correction factor by the pressure drop according to Nomogram 1.

Sound attenuator installed upstream of a duct branch can in a corresponding way be compared with one installed upstream of a plenum. See curve 2 in Diagram 1.

The total pressure drop across the sound attenuator can be obtained by multiplying the correction factor by the pressure drop according to Nomogram 1.

Sound attenuator installed by a ventilation unit

It is difficult to produce correct correction factors for sound attenuators installed by ventilation units. This is mainly due to the fact that different air handling unit manufacturers have different solutions on the fan outlet. The most common solution is one where a relatively small fan outlet (produces high outlet velocity) is combined with a large duct connection (producing air velocities of approx. 4-6 m/s). Generally speaking, the angle of the transition between fan outlet and duct should not exceed 15 degrees. To ensure satisfactory distribution of the air stream, it is advantageous to utilise a diffuser.

Sound attenuator installed by a damper

A sound attenuator installed by a damper can give rise to substantial pressure drops. As the damper angle is increased, greater difference in velocity profile is generated. This produces increased air velocity between the sound attenuator baffles and thus increases the pressure drop.

Sound attenuators connected in series

If the sound attenuators are connected in series, the basic rule should be to avoid a change in velocity profile between the dampers connected in series. If the length of straight ducting can be arranged to be sufficiently long ($4 \times D$), you can at best calculate the stated pressure drop per individual sound attenuator. An important aspect is also to make sure that the acoustic baffles of one sound attenuator do not cover the spaces between the baffles of the next sound attenuator.

Ordering key

Product

Rectangular sound attenuator

FACILE	a	aaaa-	bbbb x cccc x dddd	e	f	g
Version:						
Code According to Technical Data						
Dimensions B-dim. x H- dim. x L-dim. (mm)						
Cleaning cover 1 = Cleaning cover in H side and extractable acoustic baffles 2 = Cleaning cover in B side and extractable acoustic baffles						
Method of mounting 1 = Horizontally 2 = Vertically						
Material 1 = Galvanized sheet steel 2 = Fully welded casing of black plate, baffles made of galvanized sheet steel (flange connection only)						

Accessories

FACILE T2 = Cleaning cover insulated with fire-resistant material

FACILE T4 = Perforated sheet metal lining

FACILE T5 = Flange connection

FACILE T6 = Euroflange, 30 mm.

Specification text

Example of a specification text conforming to Swedish VVS AMA Standard.

Swegon's type FACILE cleanable rectangular sound attenuator, with the following functions:

- Extractable acoustic baffles
- Tapered acoustic baffles for low pressure drop
- Can be washed under high-pressure
- Pressure drop in Pa (to be specified in clear text).
- Sound attenuation in dB (to be specified in clear text for the various frequency bands)

Size:	FACILE a aaaa - bbbb x cccc x dddd - e	xx items
	FACILE T	xx items

Ordering example 1:

Straight sound attenuator with code 0610 having a height of 500 mm conforming to the sound attenuating requirements that have been calculated. The sound attenuator must be installed vertically in a shaft and have extractable acoustic baffles in the B side.

Ordering key:	FACILE a 0610 - 600x500x750-2-2-1
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Ordering example 2:

Straight sound attenuator with code 1230 having a height of 600 mm conforming to the sound attenuating requirements that have been calculated. The sound attenuator must be installed horizontally in a plant room and have extractable acoustic baffles in the H side. The sound attenuator must have a fire-resistant insulated cleaning cover and be ready to be covered with external insulation at the site.

Ordering key:	FACILE a 1230 - 1200x600x1950-1-1-1 FACILE T2
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