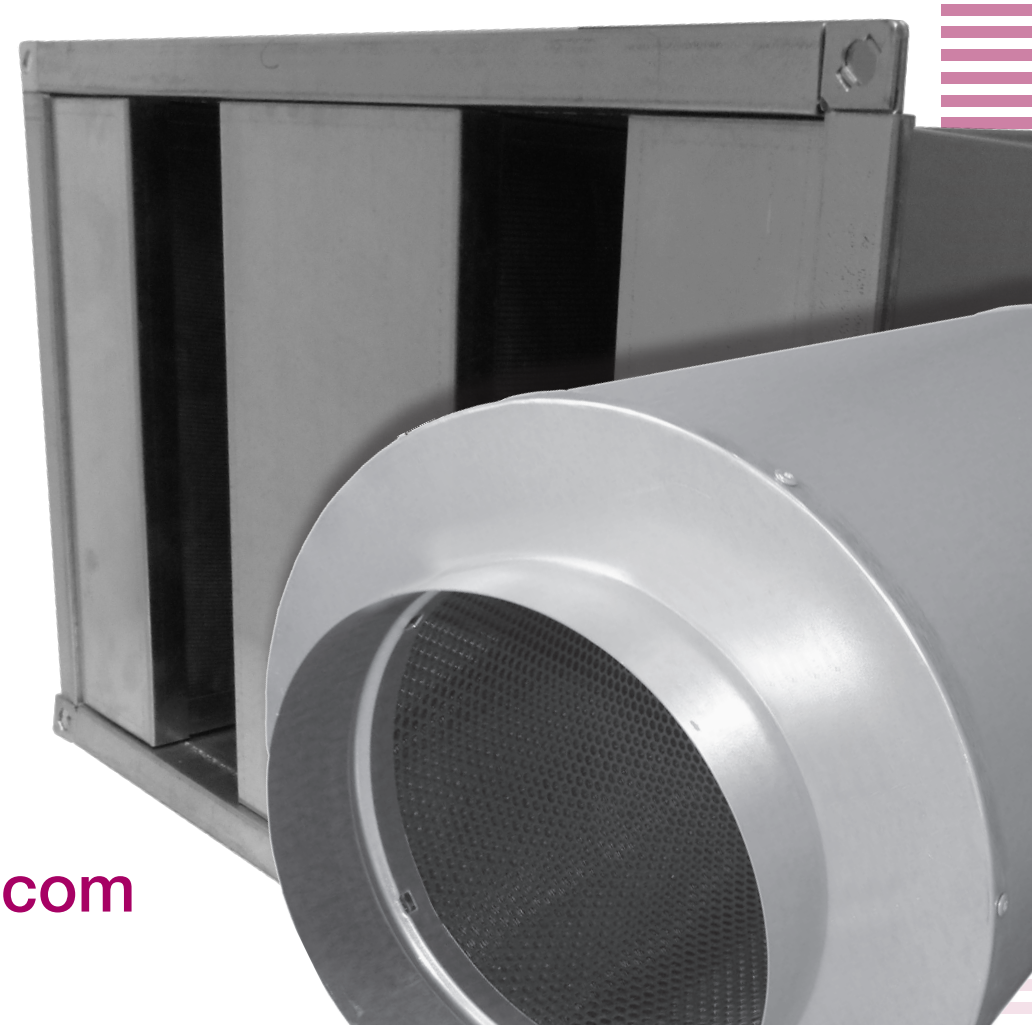
KOOLAIR

series SK

Silencers



ISO 9001
BUREAU VERITAS
Certification
Sistema de Gestión

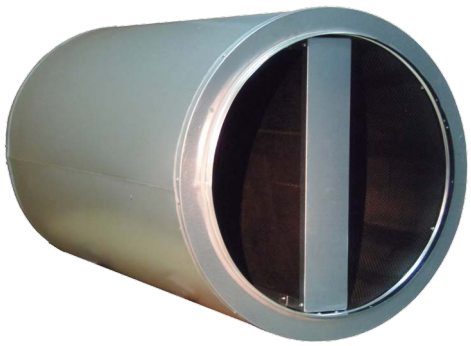
www.koolair.com

Silencers

CONTENTS

ASK-1 and ASK-2 Round Silencers

ASK-1



ASK-2

Description

The round silencers are suitable for controlling medium- and high-frequency HVAC noise, by absorbing a significant amount of incident energy inside the duct.

The ASK-1 model has no middle baffle; the ASK-2 model is fitted with a central baffle.

Applications

Specially designed for mounting in the suction opening of centrifugal fans as well as in suction inlets and discharge outlets of axial fans.

Additionally the ASK-1 and ASK-2 are fitted to variable (Koolair RVV) and constant (Koolair RCC) volume regulators to attenuate these units.

The circular silencers have been designed to prevent flow losses when used for high pressures.

The ASK-1 and ASK-2 model circular silencer has been tested and internally certified with the collaboration of an accredited, independent external laboratory and certified by the EU Directives (Ref. Test file:
21/25105-750). In line with the EN 1363-1:2020 standardised temperature-time curve it was exposed up to 400ºC for a total test duration of 120 minutes (400ºC/2h) without suffering dimensional deformations of more than 10%, i.e. integrity was maintained. It is therefore suitable for use in smoke extraction installations and fire risk areas, such as air and smoke extraction in car parks, tunnels, industrial kitchens and air and smoke exhaust systems in retail facilities and other buildings, etc.

Finishes

Outer housing and inner perforated plate of galvanized steel construction.

The acoustic material of the circular silencers is composed of a non-combustible rigid rockwool protected from air stream with a black mineral liner. The central baffle is manufactured of the same material.

Identification

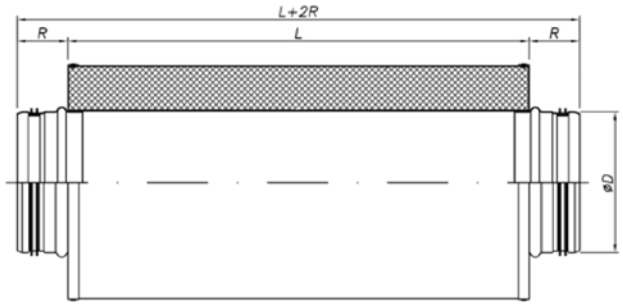
Dimensions listed on pages 5 and 6, connection collars on page 12.

The standard length may be increased upon request, in order to achieve greater attenuation.

Special orders can be manufactured according to specific requirements.

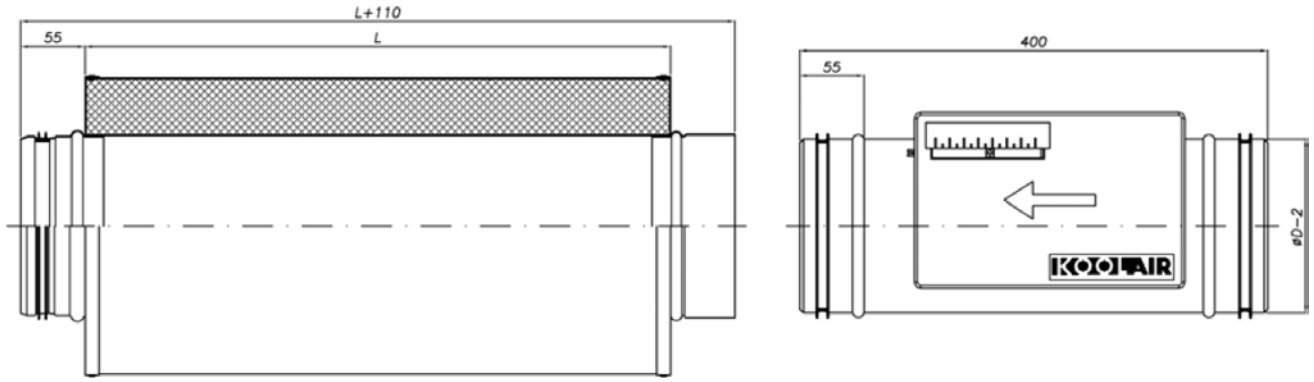
ASK-1 Overall Dimensions

ASK-1 silencer

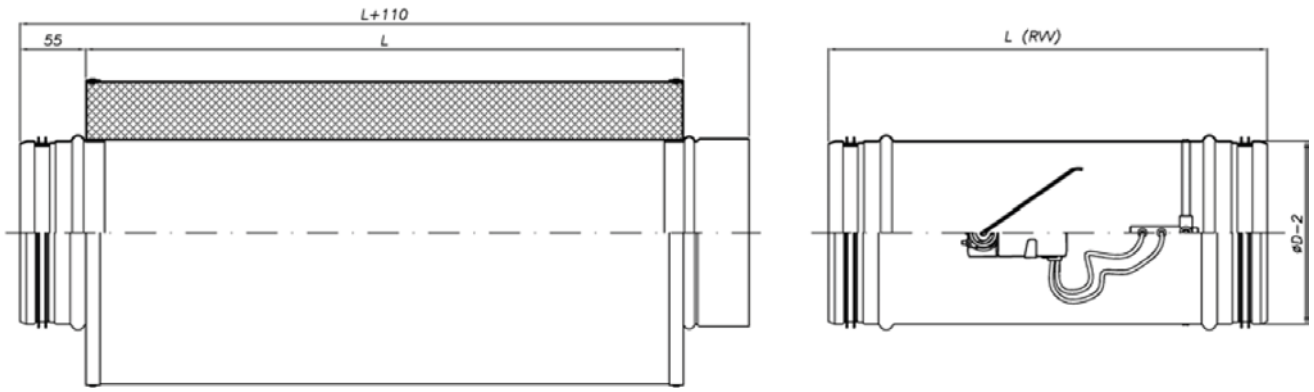


ASK-1	L				R	Ø D	F ASK-1-50
80	500	1000	1500	2000	70	78	180
100						98	200
125						123	225
160						158	260
180						178	280
200						198	300
225						223	325
250						248	350
315						313	415
355						353	455
400					95	398	500
450						448	550
500						498	600
560						558	660
630						628	730
710					115	708	810
800						798	900
900						898	1000
1000						998	1100

ASK-1 silencer with constant-air-volume regulator (refer to technical data in Koolair RCC Series catalogues)

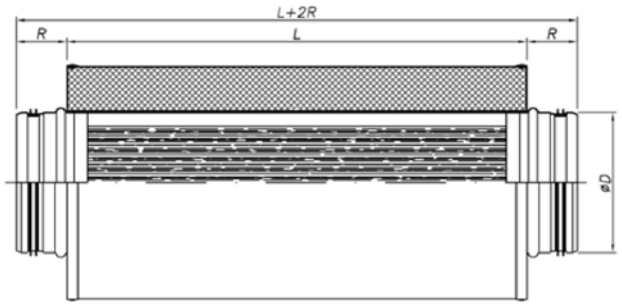


ASK-1 silencer with variable-air-volume regulator (refer to technical data in KOOLAIR RVV Series catalogues)



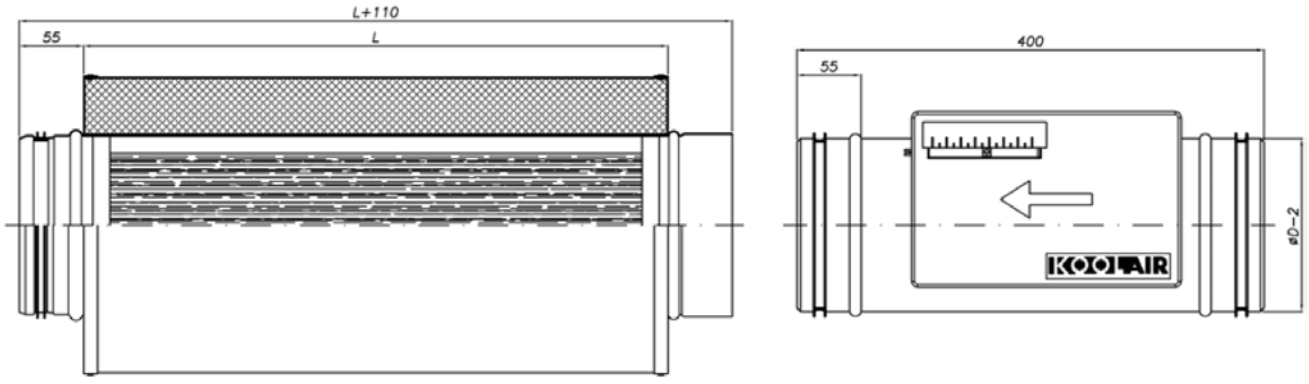
ASK-2 Overall Dimensions

ASK-2 silencer

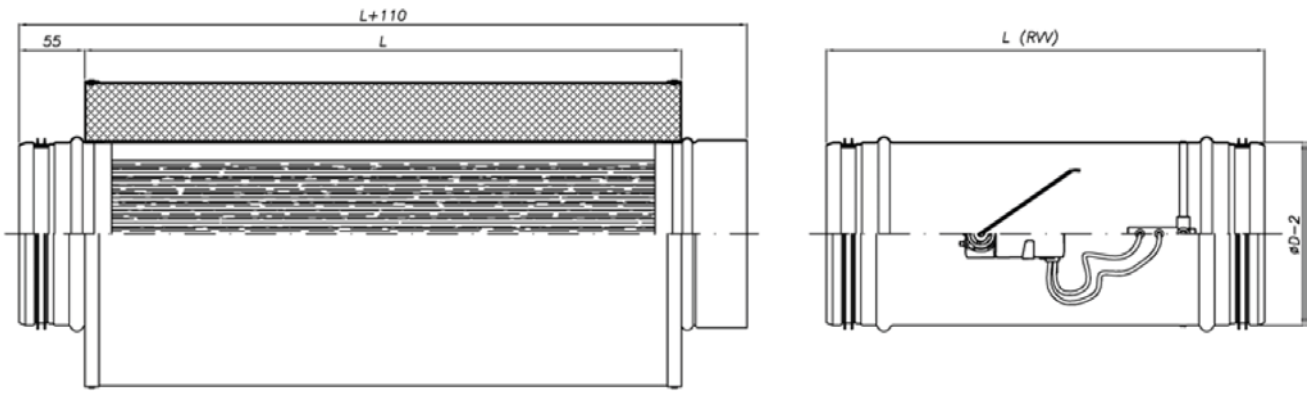


ASK-2	L				R	B	Ø D	F ASK-2-50
315	500	1000	1500	2000	95	100	313	415
355							353	455
400							398	500
450							448	550
500							498	600
560						150	558	660
630							628	730
710					115		708	810
800							798	900
900							898	1000

ASK-2 silencer with constant-air-volume regulator (refer to technical data in Koolair RCC Series catalogues)



ASK-2 silencer with variable-air-volume regulator (refer to technical data in KOOLAIR RVV Series catalogues)



ASK-1 Selection Table and Weights

ASK-1 - 1000				
Size	Q_{min} (m^3/h)	Q_{max} (m^3/h)	ΔP_{min} (Pa)	ΔP_{max} (Pa)
80	69	206	7	67
100	109	326	6	54
125	171	513	5	43
160	282	847	4	34
180	358	1075	3	30
200	443	1330	3	28
250	696	2087	2	22
315	1108	3324	2	18
355	1409	4228	2	17
400	1792	5375	2	15
450	2270	6810	2	14
500	2805	8415	1	12
560	3521	10564	1	11
630	4460	13381	1	10
710	5669	17007	1	9
800	7202	21606	1	8
900	9120	27361	1	7
1000	11265	33794	1	7

ASK-1 WEIGHT (Kg)			
Size	L=500	L=1000	L=1500
80	2,2	3,7	-
100	2,6	4,4	-
125	3,2	5,4	-
160	4,0	6,8	-
180	4,5	7,5	-
200	5,0	8,3	-
250	6,3	10,4	-
315	7,9	13,0	18,5
355	9,0	14,7	20,8
400	10,2	16,6	23,5
450	11,6	18,8	26,5
500	-	20,9	29,5
560	-	23,6	33,2
630	-	26,8	37,5
710	-	-	42,6
800	-	-	48,4
900	-	-	55,0
1000	-	-	61,7

Q_{min} (m^3/h): For velocity in duct 4 m/s
Q_{max} (m^3/h): For velocity in duct 12 m/s
ΔP (Pa): Total pressure drop, in Pa

ASK-2 Selection Table and Weights

ASK-2 - 1000				
Size	Q_{min} (m^3/h)	Q_{max} (m^3/h)	ΔP_{min} (Pa)	ΔP_{max} (Pa)
315	838	2513	4	34
355	1104	3313	3	30
400	1218	3655	3	28
450	1625	4874	3	25
500	2088	6263	2	22
560	2316	6948	2	21
630	3104	9312	2	18
710	4140	12420	2	16
800	5478	16435	2	14
900	7181	21542	1	12

ASK-2 WEIGHT (Kg)			
Size	L=500	L=1000	L=1500
315	9,3	15,5	22,0
355	10,5	17,3	24,7
400	12,8	21,3	30,2
450	14,5	23,8	33,8
500	-	26,5	37,4
560	-	29,6	41,8
630	-	33,4	47,0
710	-	-	57,7
800	-	-	65,1
900	-	-	73,5

Q_{min} (m^3/h): For velocity in duct 4 m/s
Q_{max} (m^3/h): For velocity in duct 12 m/s
ΔP (Pa): Total pressure drop, in Pa

ASK-1 Attenuation

The acoustic attenuation values were obtained by laboratory tests conducted in accordance with UNE-EN ISO 7235 and UNE-EN ISO 11691.

ASK-1. L = 500 mm								
	f_m in Hz							
Size	63	125	250	500	1k	2k	4k	8k
80	5	9	12	14	28	44	35	24
100	4	7	10	13	27	43	34	23
125	4	7	10	13	27	42	22	11
160	4	7	9	12	25	35	18	10
180	4	7	9	11	24	30	16	10
200	3	5	6	11	24	24	15	9
250	3	5	6	9	22	19	13	9
315	2	4	5	8	15	15	9	8
355	2	4	5	8	14	14	9	8
400	2	4	5	7	13	13	8	7
450	2	4	5	7	11	12	7	7
500	2	3	4	7	8	7	6	5

ASK-1. L = 1000 mm								
	f_m in Hz							
Size	63	125	250	500	1k	2k	4k	8k
80	6	13	19	27	47	50	50	36
100	5	11	17	26	46	50	50	35
125	5	10	15	24	44	50	39	21
160	5	9	13	21	41	48	28	17
180	5	9	13	20	40	43	26	17
200	4	7	11	18	39	33	22	14
250	4	6	10	15	36	26	18	14
315	3	6	8	16	30	21	13	12
355	3	5	7	14	27	20	12	11
400	3	5	6	14	27	19	11	11
450	3	5	5	14	18	19	11	11
500	2	5	5	12	17	13	10	8
560	2	5	5	12	17	12	10	7
630	1	4	5	11	16	11	8	5

ASK-1. L = 1500 mm								
	f_m in Hz							
Size	63	125	250	500	1k	2k	4k	8k
250	8	11	17	26	50	35	19	15
315	6	9	12	21	46	29	18	14
355	5	8	11	20	37	24	16	14
400	5	8	9	20	37	21	14	12
450	4	7	9	19	22	18	13	12
500	4	7	9	19	22	16	11	10
560	3	7	8	19	21	14	11	9
630	2	6	8	18	21	13	10	7
710	2	5	7	17	19	11	9	7
800	1	4	6	16	18	9	8	6
900	1	3	5	15	17	7	7	6
1000	1	2	5	14	16	6	6	5

ASK-1. L = 2000 mm								
	f_m in Hz							
Size	63	125	250	500	1k	2k	4k	8k
250	10	15	24	38	50	41	27	19
315	8	13	18	29	50	34	25	18
355	7	11	16	29	49	31	22	17
400	7	11	14	28	47	25	20	15
450	6	10	14	28	34	24	20	15
500	6	9	13	25	30	19	16	12
560	5	8	12	24	29	17	15	10
630	4	8	11	21	25	16	13	9
710	4	7	9	21	23	13	10	8
800	3	6	8	20	22	11	9	7
900	3	5	7	19	21	9	8	7
1000	3	4	7	18	20	8	7	6

f_m: Mean frequency per octave band, in Hz

The sound attenuation data provided corresponds to the use of 200 mm wide interior baffles.

ASK-2 Attenuation

The acoustic attenuation values were obtained by laboratory tests conducted in accordance with UNE-EN ISO 7235 and UNE-EN ISO 11691.

ASK-2. L = 500 mm

Size	f_m in Hz							
	63	125	250	500	1k	2k	4k	8k
315	3	7	9	13	20	18	15	11
355	2	6	8	12	19	17	14	10
400	2	5	7	11	18	16	13	9
450	2	5	6	10	17	15	12	8
500	2	4	5	9	16	14	11	7

ASK-2. L = 1000 mm

Size	f_m in Hz							
	63	125	250	500	1k	2k	4k	8k
315	5	8	15	30	42	29	19	14
355	4	7	14	29	39	26	18	13
400	4	6	13	23	37	25	17	12
450	4	6	12	22	35	24	16	11
500	4	5	11	21	34	23	15	10
560	3	5	10	21	33	22	14	9
630	3	5	9	20	32	21	13	8

ASK-2. L = 1500 mm

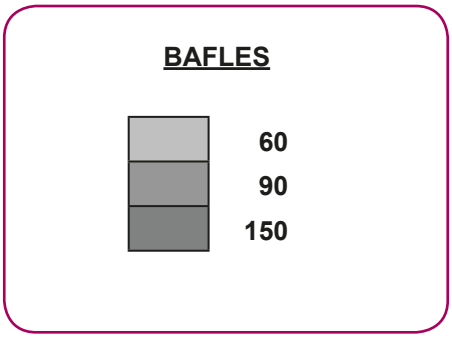
Size	f_m in Hz							
	63	125	250	500	1k	2k	4k	8k
315	7	10	17	35	50	36	21	16
355	5	9	16	34	47	33	20	15
400	5	9	15	28	45	32	19	14
450	4	9	14	27	43	31	18	13
500	4	6	13	26	42	30	17	12
560	3	6	12	26	41	29	16	11
630	3	6	11	25	40	28	15	10
710	3	5	10	24	39	27	14	9
800	3	5	9	23	38	26	13	8
900	3	5	8	22	37	25	12	7

ASK-2. L = 2000 mm

Size	f_m in Hz							
	63	125	250	500	1k	2k	4k	8k
315	9	13	23	41	50	46	25	18
355	8	12	22	40	50	43	24	17
400	8	12	21	34	50	42	23	16
450	6	12	20	33	50	41	22	15
500	6	9	19	32	50	40	21	14
560	5	9	18	32	49	39	20	13
630	4	9	17	31	48	38	19	12
710	4	8	16	30	47	37	18	11
800	4	8	15	29	46	36	17	10
900	4	8	14	28	45	35	16	9

f_m: Mean frequency per octave band, in Hz

The sound attenuation data provided corresponds to the use of 200 mm wide interior baffles.



ASK-1 Regenerated Noise

The following tables list the regenerated noise produced by air flow friction on the absorbent surfaces that line the silencer walls.
The values were obtained by laboratory tests conducted in accordance with UNE-EN ISO 7235.

ASK1 - 80

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	19	69	<15	<15	<15	<15	<15	<15	<15	<15	<15
6	29	103	16	<15	<15	<15	<15	<15	<15	<15	<15
8	38	137	23	20	15	<15	<15	<15	<15	<15	15
10	48	172	29	26	21	19	16	<15	<15	<15	21
12	57	207	33	30	25	23	20	17	<15	<15	25

ASK1 - 100

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	30	109	<15	<15	<15	<15	<15	<15	<15	<15	<15
6	45	163	20	17	<15	<15	<15	<15	<15	<15	<15
8	60	217	27	24	19	17	<15	<15	<15	<15	20
10	76	272	33	30	25	23	20	17	<15	<15	25
12	91	326	37	34	29	27	24	21	16	<15	30

ASK1 - 125

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	48	171	<15	<15	<15	<15	<15	<15	<15	<15	<15
6	71	257	24	22	17	<15	<15	<15	<15	<15	17
8	95	342	31	29	24	21	18	15	<15	<15	24
10	119	428	37	34	29	27	24	21	16	<15	29
12	143	513	41	39	34	31	28	25	20	18	34

ASK1 - 160

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	78	282	19	16	<15	<15	<15	<15	<15	<15	<15
6	118	424	29	26	21	19	16	<15	<15	<15	21
8	157	565	36	33	28	26	23	20	<15	<15	28
10	196	706	41	39	34	31	28	25	20	18	34
12	235	847	46	43	38	36	33	30	25	23	38

ASK1 - 180

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	99	358	21	18	<15	<15	<15	<15	<15	<15	<15
6	149	538	31	28	23	21	18	<15	<15	<15	23
8	199	717	38	35	30	28	25	22	17	<15	30
10	249	896	43	41	36	33	31	27	23	20	36
12	299	1075	48	45	40	38	35	32	27	25	40

ASK1 - 200

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	123	443	20	17	<15	<15	<15	<15	<15	<15	<15
6	185	665	30	27	22	20	17	<15	<15	<15	22
8	246	887	37	34	29	27	24	21	16	<15	29
10	308	1108	42	40	35	32	29	26	22	19	35
12	369	1330	47	44	39	37	34	31	26	24	39

ASK1 - 250

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	193	695	21	18	<15	<15	<15	<15	<15	<15	<15
6	290	1043	31	28	23	21	18	<15	<15	<15	23
8	387	1392	38	35	30	28	25	22	17	<15	30
10	483	1738	43	41	36	33	30	27	23	20	36
12	580	2087	48	45	40	38	35	32	27	25	40

SYMBOLS

V	Air velocity through cross-section, in m/s
Q	Air flow, in m3/h and in L/s
$L_{w\ oct}$	Sound power level per octave band, in dB/Hz
L_w	Sound power level, in dB(A)

ASK-1 Regenerated Noise

ASK1 - 315

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	308	1108	22	19	<15	<15	<15	<15	<15	<15	<15
6	462	1662	32	29	24	22	19	16	<15	<15	25
8	616	2216	39	36	31	29	26	23	18	16	32
10	769	2770	45	42	37	35	32	29	24	22	37
12	923	3324	49	46	41	39	36	33	28	26	42

ASK1 - 355

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	391	1409	24	22	17	<15	<15	<15	<15	<15	17
6	587	2114	34	32	27	24	21	18	<15	<15	27
8	783	2819	41	39	34	31	28	25	21	18	34
10	979	3523	47	44	39	37	34	31	26	24	39
12	1174	4228	51	49	44	41	38	35	31	28	44

ASK1 - 400

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	498	1792	23	21	16	<15	<15	<15	<15	<15	16
6	746	2687	33	31	26	23	20	17	<15	<15	26
8	995	3583	40	38	33	31	28	24	20	17	33
10	1244	4479	46	43	38	36	33	30	25	23	38
12	1493	5375	50	48	43	41	38	34	30	27	43

ASK1 - 450

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	631	2270	26	23	18	16	13	9	5	2	18
6	946	3405	36	33	28	26	23	19	15	12	28
8	1261	4540	43	40	35	33	30	27	22	19	35
10	1576	5675	48	45	40	38	35	32	27	25	41
12	1892	6810	53	50	45	43	40	36	32	29	45

ASK1 - 500

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	779	2805	49	51	40	32	22	19	18	25	18
6	1169	4207	59	54	49	43	36	34	25	26	28
8	1558	5610	60	59	56	50	44	44	36	34	35
10	1948	7012	64	65	61	55	50	50	44	43	40
12	2338	8415	71	69	66	59	55	56	50	49	45

ASK1 - 560

	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	978	3522	49	51	40	32	22	19	18	25	20
6	1467	5282	59	54	49	43	36	34	25	26	30
8	1956	7043	60	59	56	50	44	44	36	34	37
10	2445	8803	64	65	61	55	50	50	44	43	43
12	2935	10565	71	69	66	59	55	56	50	49	47

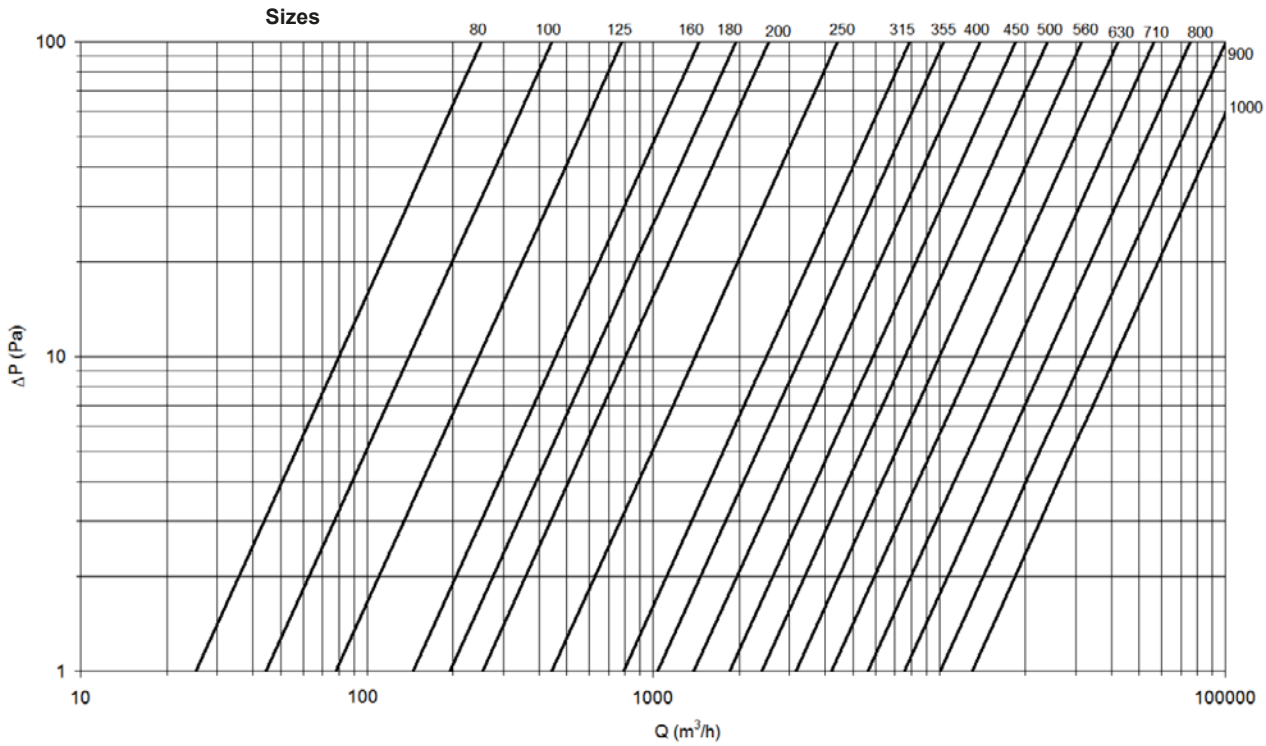
ASK1 - 630

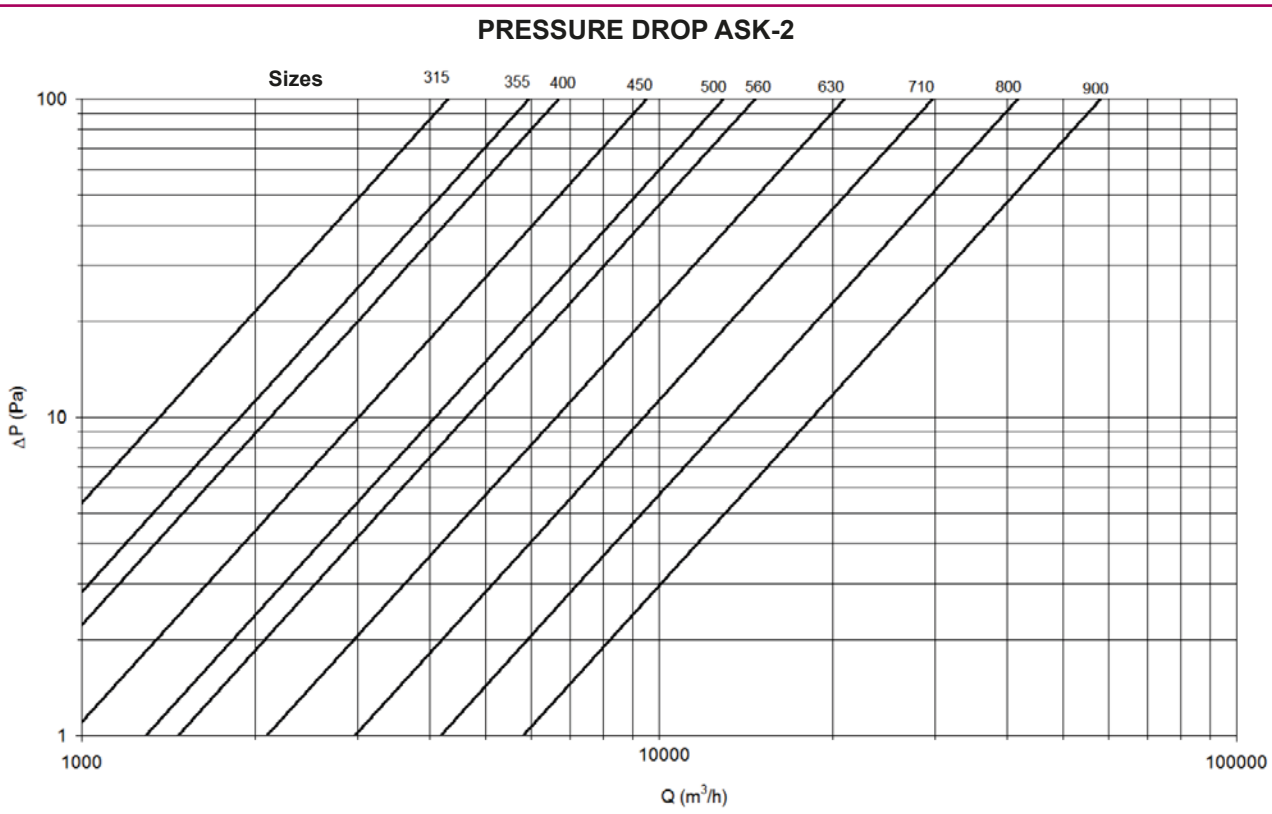
	Q		L_w in dB / f_{oct} in Hz								L_w
V (m/s)	[l/s]	[m³/h]	63	125	250	500	1k	2k	4k	8k	dB(A)
4	1239	4461	49	51	40	32	22	19	18	25	22
6	1858	6690	59	54	49	43	36	34	25	26	32
8	2478	8921	60	59	56	50	44	44	36	34	39
10	3097	11151	64	65	61	55	50	50	44	43	45
12	3717	13382	71	69	66	59	55	56	50	49	49

SYMBOLS

V	Air velocity through cross-section, in m/s
Q	Air flow, in m3/h and in L/s
$L_{w\ oct}$	Sound power level per octave band, in dB/Hz
L_w	Sound power level, in dB(A)

Pressure drop graphs ASK-1 and ASK-2





Product Codes

ASK-1	Round silencer
ASK-2	Round silencer with baffle

Airtight	Airtight seal connection
Metu	Metu flange connection

80 to 1000	Diameter

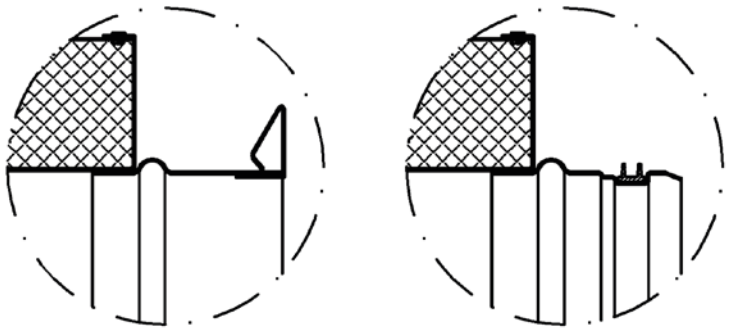
500	
1000	Length
1500	
2000	

Example:

ASK-1-50-Metu-80-1000

ASK-1 round silencer with Metu connection flange with an isolation thickness 50 mm, diameter 80 mm and length 1000 mm.

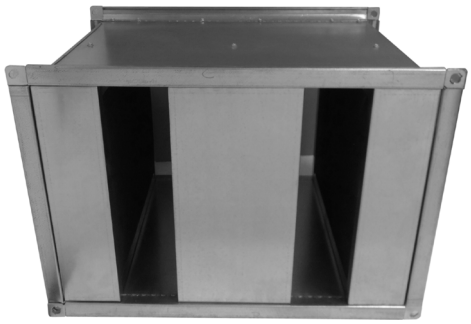
Silencer and regulator connection to the duct



With Metu flange

With airtight seal

Rectangular Silencers



PAK

PAK

Description

The rectangular silencers are suitable for controlling medium and high frequency HVAC noise by absorbing a significant amount of incident energy inside the duct.

The silencer is composed of inner baffles (number according to silencer size) and side panels designed to enhance air flow.

Applications

The rectangular silencers are designed for installation in areas where a low-noise air supply is required, e.g.: inlets and outlets of air handling units, ventilation units, plant rooms, autonomous units, etc.

Additionally the PAK silencer can be added to variable (VAV boxes, KS, KSL models and RVV, JVR regulators) and constant (KSV boxes and RCQK regulators) air volume devices to attenuate these units.

The PBK model rectangular silencer with inside perforated sheet metal is tested and certified by an independent external Notified Body according to EU Directives (Ref. Test file: 21/25105-750). In line with the EN 1363-1:2020 standardised temperature-time curve it was exposed up to 400ºC for a total test duration of 120 minutes (400ºC/2h) without suffering dimensional deformations of more than 10%, i.e. integrity was maintained. It is therefore suitable for use in smoke extraction installations and fire risk areas, such as air and smoke extraction in car parks, tunnels, industrial kitchens and air and smoke exhaust systems in retail facilities and other buildings, etc.

Finishes

Outer housing and inner perforated plate of galvanized steel construction.

The acoustic material of the rectangular silencers is composed of non-combustible rigid rockwool protected from the air stream with a black mineral liner.

Identification

Dimensions listed on page 15.

The standard length may be increased upon request, in order to achieve greater attenuation.

Special orders can be manufactured according to specific requirements.

Rectangular Silencer Models

PAK
Rectangular silencer with sound insulation protected against erosion from air flow by a flame-retardant protective layer. The unit is normally used for HVAC systems.

PBK
Same as PAK, but fitted with perforated plate. Recommended for high velocities.

PAKM
Same as PAK, with additional polyester film (Melinex) coating. Used for applications with acidic, alkaline or oily gases, as it can be steam-cleaned. Recommended for hospitals, since bacterial colony formation is not possible.

PBKM
Same as PAKM, but fitted with perforated plate.

Applications

The acoustic module widths, in mm, are: 250, 275, 300, 325, 350, 375 and 400. Multiply this width by the total number of modules to obtain the total width of the silencer.

The B200 silencer (200-mm baffle) with a width of 150 to 300 mm only has outer baffles configured; widths above 400 mm include inner baffles (number according to silencer width).

- The silencer length is defined according to the required attenuation, and may be: 600, 900, 1200, 1500, 1800, 2100 and 2400 mm.

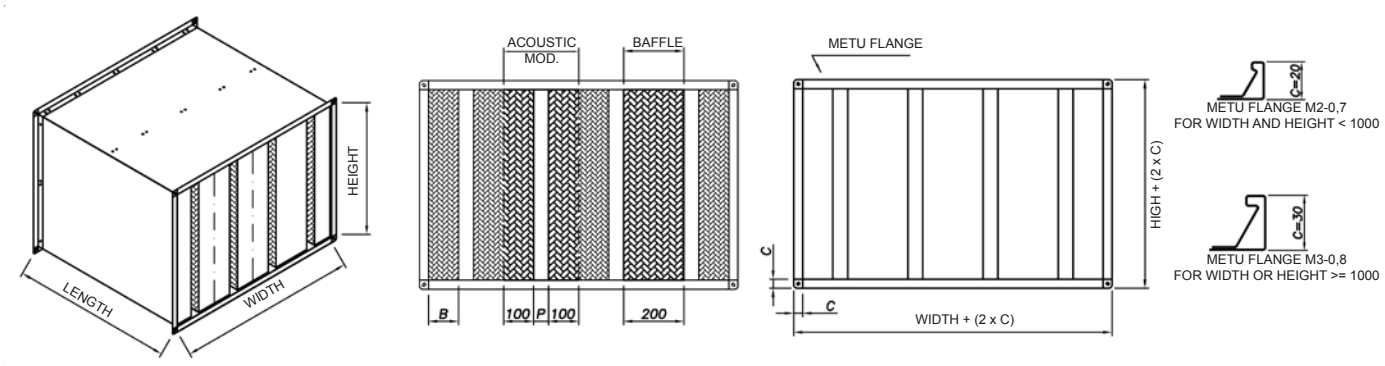
- Depending on its total dimensions, the silencer is supplied as a single component or as several components for assembly; the connection process is described in detail on page 16.

Weight calculation

This method yields somewhat approximate values. Please enquire if you wish to know the exact weight.

1. Calculate the total surface area of the silencer (surface area of all six sides).
2. Multiply this surface area in m^2 by 21.5. This gives the approximate weight in kg.

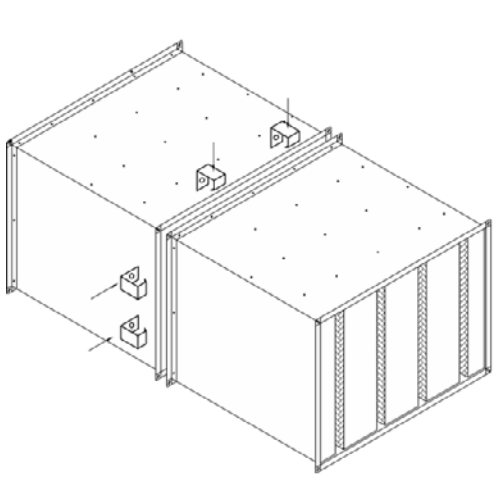
Overall Dimensions



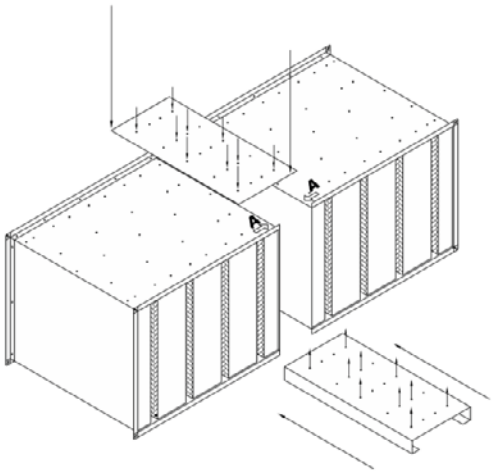
For width ≤ 350 B = 50

For width > 350 B = 100

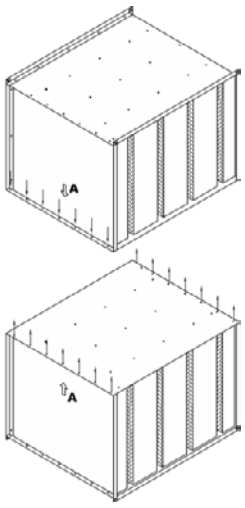
Connection of rectangular silencers



Longitudinal connection



Transversal connection



Vertical connection

PAK Attenuation

The acoustic attenuation values were obtained by laboratory tests conducted to UNE-EN ISO 7235 and UNE-EN ISO 11691.

PAK (L = 600 mm)								
P	f_m - Hz							
	63	125	250	500	1k	2k	4k	8k
50	6	12	21	33	35	40	25	21
75	4	9	16	26	31	37	19	16
100	4	8	16	19	27	30	16	14
125	3	7	12	17	24	23	14	12
150	3	7	10	15	19	21	12	11
175	2	6	10	15	17	19	12	9
200	2	4	9	12	15	15	11	7

PAK (L=900)								
P	f_m - Hz							
	63	125	250	500	1k	2k	4k	8k
50	7	16	30	45	49	50	42	28
75	5	11	23	37	47	50	32	23
100	5	10	21	29	42	42	26	19
125	4	9	19	26	34	36	22	16
150	4	8	16	23	29	31	20	14
175	3	7	15	21	26	27	18	12
200	3	7	14	18	23	22	16	12

PAK (L=1200)								
P	f_m - Hz							
	63	125	250	500	1k	2k	4k	8k
50	10	21	41	50	50	50	45	31
75	7	15	31	50	50	50	43	31
100	6	12	28	40	50	50	35	26
125	5	11	25	35	45	47	28	21
150	5	11	20	34	38	40	28	20
175	4	10	18	27	36	37	25	18
200	3	9	17	23	30	31	22	17

PAK (L = 1500 mm)								
P	f_m - Hz							
	63	125	250	500	1k	2k	4k	8k
50	11	25	48	50	50	50	50	38
75	8	17	39	50	50	50	50	34
100	8	16	36	50	50	50	45	32
125	6	13	32	45	50	50	36	26
150	6	11	26	41	47	50	35	25
175	4	10	24	35	44	45	31	22
200	4	9	22	29	38	38	27	21

P: Distance between baffles.
f_m: Mean frequency per octave band, in Hz.

The sound attenuation data provided corresponds to the use of 200 mm wide interior baffles.

PAK Attenuation

PAK (L = 1800 mm)								
P	f_m - Hz							
	63	125	250	500	1k	2k	4k	8k
50	13	28	48	50	50	50	50	39
75	9	20	47	50	50	50	50	37
100	9	18	43	50	50	50	50	37
125	7	16	37	50	50	50	44	32
150	7	13	30	49	48	50	41	29
175	5	11	27	40	46	50	37	26
200	5	10	26	36	45	45	33	26

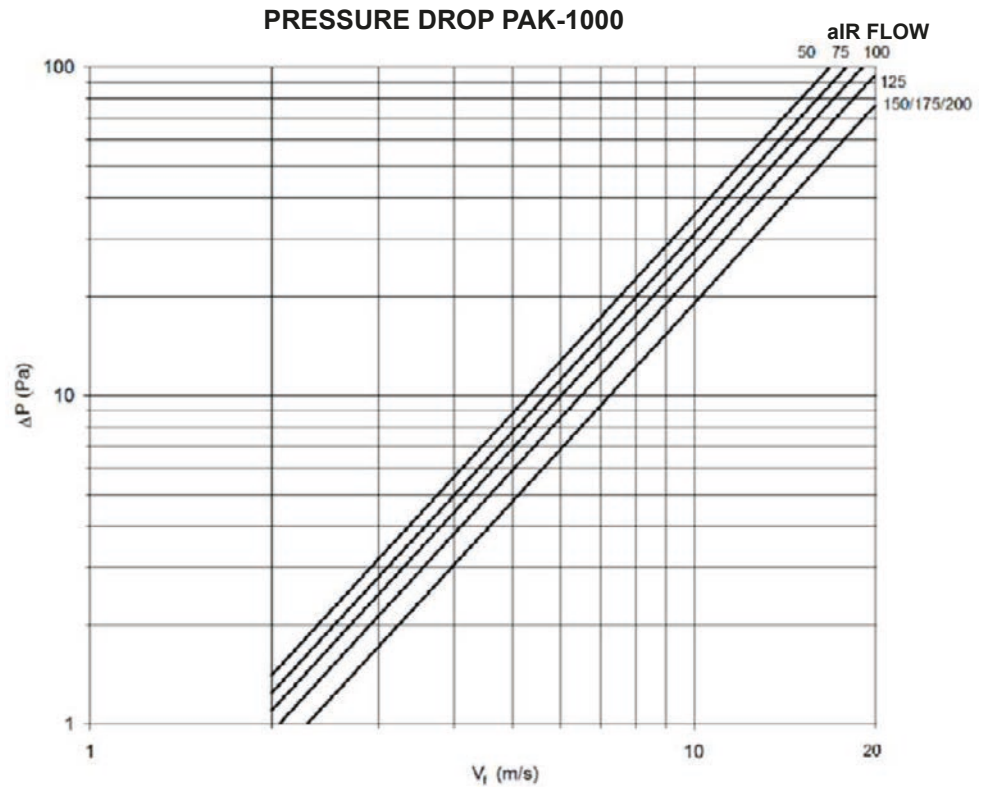
PAK (L = 2100 mm)								
P	f_m - Hz							
	63	125	250	500	1k	2k	4k	8k
50	15	33	50	50	50	50	50	41
75	12	25	50	50	50	50	50	39
100	12	22	50	50	50	50	50	38
125	10	22	44	50	50	50	50	37
150	8	15	35	50	48	50	48	34
175	6	13	33	47	48	50	43	30
200	6	13	31	42	47	50	38	30

PAK (L = 2400 mm)								
P	f_m - Hz							
	63	125	250	500	1k	2k	4k	8k
50	17	37	50	50	50	50	50	43
75	13	28	50	50	50	50	50	41
100	13	26	50	50	50	50	50	39
125	11	25	50	50	50	50	50	38
150	9	17	40	50	48	50	50	36
175	7	14	36	47	48	50	50	35
200	6	14	35	45	45	50	45	34

P: Distance between baffles.
f_m: Mean frequency per octave band, in Hz

The sound attenuation data provided corresponds to the use of 200 mm wide interior baffles.

Pressure drop graph PAK



V_f (m/s): Air veloicty based on BxH section.

For other lengths, the pressure drop is:

L (m)	600	900	1200	1500	1800	2100	2400
K_p	0,85	0,98	1,08	1,12	1,15	1,21	1,23

$\Delta P_L = \Delta P_{L=1000} * K_p$

Verification of the selection

Rules:

Once the model is selected and its dimensions are determined, check that the selection is correct by checking that the silencer's own noise regeneration due to air flow through the silencer does not affect the resulting sound level.

The attached diagram gives the sound power level regenerated by the silencer according to its height and air flow velocity.

To this value, the value listed below must be added, according to the number of silencer modules selected:

2 modules + 3 dB
3 modules + 5 dB
4 modules + 6 dB
5 modules + 7 dB
6 modules + 8 dB

The sound power levels at the various frequency bands are obtained from the following corrections:

Hz	125	250	500	1000	2000	4000
dB	-5	-5	-9	-12	-18	-24

When the difference between the sound power downstream of the silencer and the power regenerated by the silencer is above 10 dB, the calculation will be correct because the sum of two source sound power levels is performed logarithmically. When the value of the stronger one is 10 dB higher than the other, the result is as if the weaker source did not exist

Example:

We will use the example given in the "Fast Calculation Method" publication and continue assuming a 250-Hz band to simplify the calculation.

Data:

- Air velocity = 14 m/s
- Number of modules = 4
- Silencer height = 1200 mm

a) Sound power level regenerated by the silencer (attached diagram) = 49 dB

b) Correction according to the number of modules: + 6 dB

c) Correction in 250-Hz band: - 5 dB

d) Sound power regenerated: = 50 dB

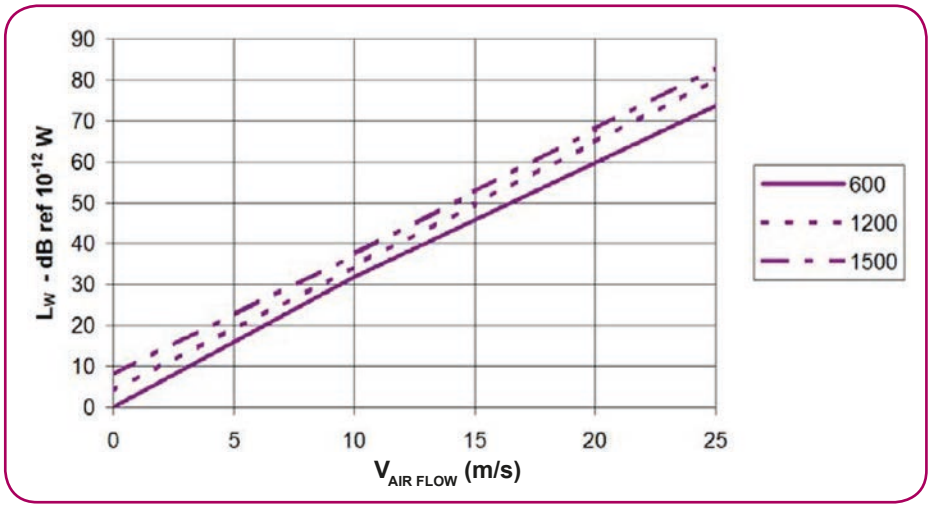
e) Sound power produced by the fan: 9

f) PAK-150 silencer attenuation: - 20 dB

g) Sound power downstream from the silencer: = 74 dB

g - d = 74 – 50 = 24 dB > 10 dB

Therefore, the selection is correct.



Silencer calculation, fast method

Required sound attenuation:

Introduction:

Because many factors must be taken into account, it is complicated and time-consuming to accurately calculate the sound level in a specific room due to fan noise and the silencer needed to lower this noise to the required level, depending on the type of room to be conditioned.
However, this calculation often cannot be done, sometimes due to time pressures and sometimes due to a lack of data. A fast, simplified procedure to obtain sufficiently accurate results is described below.
Nevertheless, we recommend a more detailed study for the following applications:

a) Systems in which the required sound criterion is below NC 35.
b) High-velocity systems, where the pressures are high and the noise generated by the boxes should also be considered.

The calculation is done using the third octave band, i.e., the 250 Hz (cycles/s) frequency, as experience in most applications that achieve this required sound level at this band will also work at all other frequencies.

Description of the calculation method:

First, the sound power level at the system inlet must be known, based on the fan air flow and pressure.
The value of this sound power in the 250-Hz band will be obtained by subtracting the value obtained, the one listed in Table 1, according to the type of fan used.
Table 1 assumes the hypothesis that the fan and the first discharge outlet (diffuser or grille) has a duct length of 8 m. If this length is longer, the attenuation would be higher, in which case the corrections listed in Table 2 should be applied.
Table 3 assumes the percent of total air flow from the fan enters the room.
Lastly, Table 4 assumes the inherent sound absorption of the room, which depends on its dimensions.
Once all the corrections described above are made, the resulting sound pressure in the room will be obtained, which should be compared with the recommended noise level according to the type of room to be conditioned.
The difference between the two values is the attenuation that the silencer should produce in the 250-Hz band.

Table 1

Fan Type	Correction
Action Centrifugal (forward curved vane type).	- 12 dB
Reaction Centrifugal (backward curved vane type).	- 7 dB
Axial	- 6 dB

Table 2

Fan Type	Correction
Up to 8 m	0 dB
From 8 to 16 m	- 5 dB
From 16 to 32 m	- 10 dB

Table 3

%	Correction
200	+ 3 + 2 + 1
100	0 - 1 - 2
50	- 3 - 4 - 5 - 6
20	- 7 - 8 - 9
10	- 10 - 11 - 12
5	- 13 - 14 - 15 - 16
2	- 17 - 18 - 19
1	- 20

Table 4

m^3	Correction
15	+ 3 + 2 + 1
25	0 - 1 - 2
50	- 3 - 4 - 5
100	- 6 - 7
150	- 8 - 9
200	- 10
250	- 11 - 12 - 13 - 14
500	- 15 - 16
1000	- 17 - 18 - 19
2000	- 20

Example

An action centrifugal fan for AC of offices yields an air flow of 50000 m^3/h and a static pressure of 75 mm w.g. The most adverse duct length between the fan and the discharge outlet is 12 m.

Air flow into the room (acoustically worst case) is 1000 m^3/h.

1. Sound power of the fan 106 dB

2. Correction according to fan used (Table 1) 12 dB

3. Correction for duct length (Table 2) -5 dB

4. Correction based on the percent flow generated by the fan that enters the room

$$\frac{1000}{50000} \times 100\% = 2\% \text{ (Table 3)} \qquad -17 \text{ dB}$$

5. Correction according to room volume (Table 4) -9 dB

6. Level required in some offices
db(A) 40 = 45 dB

Attenuation to be obtained with the silencer = 23 dB

This will achieve the necessary attenuation: 23 dB

- With a PAK-150 rectangular silencer of 1600 x 1200 x 1500

Product Codes

PAK	Rectangular silencer
PBK	Rectangular silencer with perforated plate
PAKM	Rectangular silencer with Melinex film
PBKM	Rectangular silencer with perforated plate and Melinex film
150 to 5000	Silencer width
100 to 4200	Silencer height
600 900 1200 1500 1800 2100 2400	Silencer length
1 to 16	Number of modules
200	Baffle width 200 mm
Metu	Metu flange connection

Example:

PAK-150-1600 x 1200 x 1500-Metu

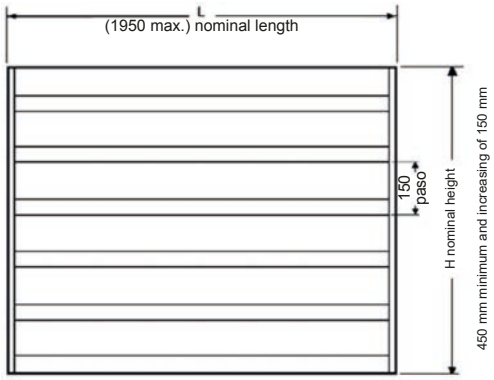
PAK-150 rectangular silencer of 1600 x 1200 x 1500, with air flow between 150-mm baffles, with Metu connection flange.

Model 250 acoustic air intakes

250-TAA

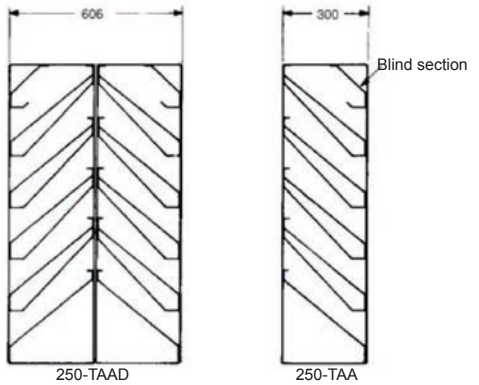
Description
Acoustic air intake models 250 TAA and 250 TAAD (double) are made of galvanized steel sheet.

Finishes
Natural galvanized steel sheet.
Special finishes upon request.



Standardized dimensions
See table page 22.

Applications
Acoustic air intakes are used to intake or return air with a resulting decreasing of the initial noise level in: ventilation and air conditioning installations, plant rooms, generator rooms, generating plants, etc.



Characteristics
The acoustic material in the 250 models is made of heat-resistant high density mineral wool which is protected against air erosion by perforated sheet on the reverse side of the blades.

The maximum recommended temperature is 135 °C. It also features a birdscreen (standard finish) or insect mesh screen (upon request).

250	Standard acoustic air intake
TAA	Single
TAAD	Double
-	With birdscreen
insectscreen	With insectscreen
L x H	Opening nominal dimensions. Length x height in mm

Product codes
With a face velocity of approximately 2 m/s in the 250 TAA and 1.5 m/s in the 250 TAAD absorption values are achieved despite the short distance that the airflow travels through the blades.
The nominal dimensions of the intakes are L x H (opening). The total external dimensions of the intake are L-20 mm x H-20 mm.

General dimensions and approximate weights

Detailed below are the standard length and height dimensions for acoustic air intakes. The length can be made to another intermediate length than those given upon request. To calculate the weights of the 250 TAAD, multiply the figures by two (weights in kg).

L x H	600	750	900	1050	1200	1350	1500	1650	1800	1950
450	12	15	18	21	24	27	30	33	36	39
600	16	20	24	28	32	36	40	44	48	52
750	21	27	33	39	45	51	57	63	69	75
900	26	33	40	47	54	61	68	75	82	89
1050	31	39	47	55	63	71	79	87	95	103
1200	37	46	55	64	73	82	91	100	109	118
1350	42	52	62	72	82	92	102	112	122	132
1500	47	58	69	80	91	102	113	124	135	146
1650	52	64	76	88	100	112	124	136	148	160
1800	58	71	84	97	110	123	136	149	162	175
1950	63	77	91	105	119	133	147	161	175	189
2100	68	83	98	113	128	143	158	173	188	193

Acoustic performance

The sound reduction ratios per frequency octave band and the weighted isolation index (R_w) for the 250 TAA and 250 TAAD models are the following:

	63	125	250	500	1k	2k	4k	8k	R_w	(Hz)
250 TAA	13	13	15	18	24	26	21	21	22	(dB)
250 TAAD	17	17	20	27	37	41	40	45	32	(dB)

Selection example

Details:
- Airflow: 25.000 m^3/h
- Required attenuation: 15 dB en 250 Hz

Based on the premise that for this type of intake (in this case the 250 TAA by attenuation) the frontal recommended velocity is approximately 2 m/s, the front area is calculated
using the following formula:

Frontal area (m^2) = Airflow (m^3/h) / (Frontal velocity (m/s) • 3,600) = 25,000 / (2 • 3,600) = 3.47 m^2

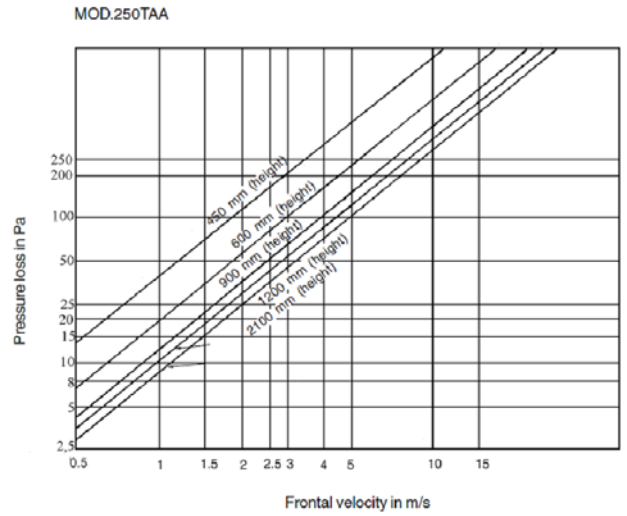
Therefore you need to work with dimensions that approximate an equivalent area, for example:

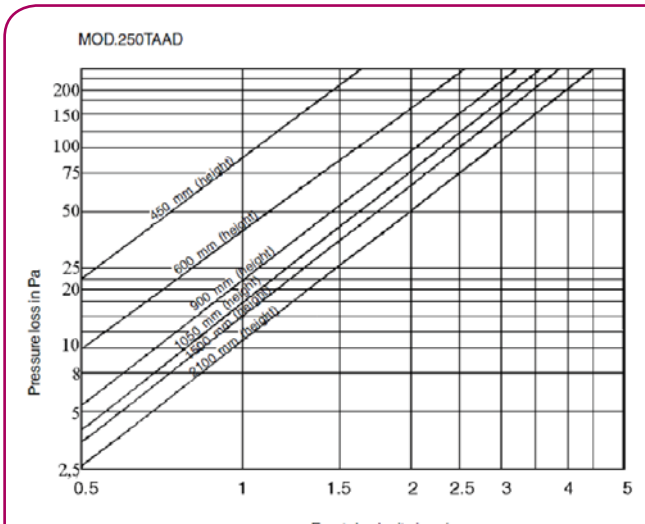
250 TAA de 1.950 x 1.800

(or other model with the dimensions for an equivalent surface area).

The tables below detail the pressure losses, which in this particular case would be a pressure loss of 30 Pa.

Pressure loss





V_f (m/s)	L_{wa} (dB(A))
1	30
1,5	40
2	50

Regenerated noise in acoustic air intakes depending on the frontal velocity (in hole) LxH.

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