PEUTZ

Laboratory for Acoustics

TESTEN
RvA L 334

Determination of acoustical characteristics of flexible ducted silencers type SEMI RIGID SILENCER, manufacturer AFS

Report number A 2692-5E-RA d.d. December 10, 2014

Laboratory for Acoustics

Determination of acoustical characteristics of flexible ducted silencers type SEMI RIGID SILENCER, manufacturer AFS

Principal	AFS Boru Sanayi A.S. 1468. Cadde No.: 153 Ostim 06370 Ankara Turkey
Report number	A 2692-5E-RA
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1 Introduction

At the request of AFS Boru Sanayi A.S. based in Ankara (Turkey) sound measurements have been carried out in order to determine the acoustical characteristics of

flexible ducted silencers
type SEMI RIGID SILENCER
manufacturer AFS Boru Sanayi A.S.

The measurements have been carried out in the Laboratory for Acoustics of Peutz bv, at Mook, The Netherlands (see figure 1).

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For these type of measurements the Laboratory for Acoustics has been accredited by the Dutch Accreditation Council (RvA).

The RvA is member of the EA MLA (**EA MLA**: **E**uropean **A**ccreditation Organisation **M**ulti**L**ateral **A**greement: http://www.european-accreditation.org).

EA: "Certificates and reports issued by bodies accredited by MLA and MRA members are considered to have the same degree of credibility, and are accepted in MLA and MRA countries."

2 Norms and guidelines

The measurements have been carried out according to the Quality Manual of the Laboratory for Acoustics aswell as:

ISO 7235:2003	"Acoustics - Laboratory measurement procedures for ducted silencers and air-terminal units - Insertion loss, flow noise and total pressure loss"
N.A.	*The norm ISO 7235 is within all countries of the European Union accepted as European Standard Norm EN ISO 7235:2003*

Other related norms:

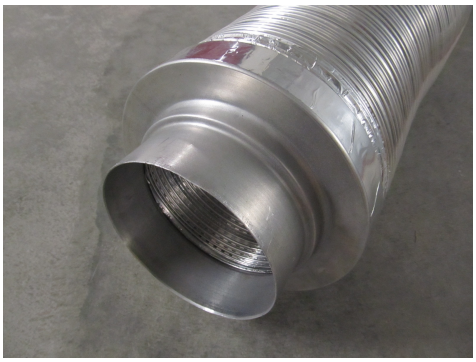
ISO 3741:2010[1]	Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Precision methods for reverberation test rooms
ISO 5135:1997	Acoustics - Determination of sound power levels of noise from air-terminal devices, air-terminal units, dampers and valves by measurement in a reverberation room
N.A.	*The norm ISO 5135 is within all countries of the European Union accepted as European Standard Norm EN ISO 5135:1997*

1 According to this norm, the report should include all measured sound pressure levels. Because these figures are not relevant for judging the quality of the product being tested, but merely for judging the accuracy of the calculations, they have been omitted in this report. It is possible of course to reproduce those figures at any time if the principal requests this.

3 Tested construction

The data presented here have been received from the principal (as thickness foils) or obtained by own observations.

Measurements have been carried out on the following flexible ducted silencers:

SEMI RIGID SILENCER Composition from inside to outside – corrugated perforated aluminium jacket – 25 mm glasswool – corrugated aluminium Diameter (inner duct) 100 / 125 / 160 / 200 / 250 mm Length 1,0 m	

The results as presented here relate only to the tested items and laboratory conditions as described in this report. The laboratory can make no judgement about the representativity of the tested samples. The test report ahead is valid as long as the tested constructions and/or materials are unchanged.

4 Measurements

4.1 Measurement setup

The measurements have been carried according to the reverberation room method as described in the norm ISO 7235.

4.2 Insertion Loss D_i

The specimens are mounted in an measuring duct as shown in figure 2.
Noise is introduced in the measuring duct using a loudspeaker system which is mounted at one and of this duct in ventilation room (6). The other end of the duct leads into the reverberation room (3). The sound pressure level in the reverberation room caused by the loudspeaker is measured in two situations:

- with the specimen to be tested installed in the measuring duct
- without the specimen. Instead of the specimen a substitution duct (dummy) with the same dimensions (length, diameter) is installed in the measuring duct

A microphone on a rotating boom is used in the reverberation room in order to measure the noise radiated from the measurement duct. The reverberation time of the room is also determined. From each set of measurements (sound pressure level and reverberation time) the sound power level L_W radiated into the reverberation room is calculated according to ISO 3741[1].
The insertion loss D_i is now calculated as

$$D_i = L_{wII} - L_{wI} \qquad (1)$$

in which:

L_{WI} is the level of the sound power in the frequencyband considered, radiating into the connected reverberation room when the test object is installed;

L_{WII} is the level of the sound power in the frequencyband considered, radiating into the connected reverberation room when the substitution duct replaces the test object.

The insertion loss is determined in third octave bands from 50 Hz to 10 kHz.

4.3 Transmission Loss D_t

The specimens are mounted in an measuring duct as shown in figure 3. Noise is introduced in the measuring duct using a loudspeaker system which is mounted at one and of this duct in ventilation room (6). The test duct is installed crossing the reverberation room, both ends of the pipe penetrating through the walls of the room. The penetrations have been sealed adequately. The opposite end of the pipe is terminated by means of a closed anechoic termination in room (2).

1 For this type of measurements the Laboratory for Acoustics has been accredited by the Dutch Council for Accreditation (RvA) as a test laboratory, registration number L334.

The sound pressure level in the reverberation room caused by the loudspeaker is measured in two situations:

- with the specimen to be tested installed in the measuring duct in the reverberation room;
- without the specimen and a open test duct.

A microphone on a rotating boom is used in the reverberation room in order to measure the noise radiated from the measurement duct. The reverberation time of the room is also determined. From each set of measurements (sound pressure level and reverberation time) the sound power level L_W radiated into the reverberation room is calculated according to ISO 3741. The wall insulation D_t is now calculated as

$$D_t = L_{wII} - L_{wI} + D_{td} \qquad (2)$$

in which:

L_{WI} is the level of the sound power in the frequencyband considered, radiating into the connected reverberation room when the test object is installed;

L_{WII} is the level of the sound power in the frequencyband considered, radiating into the connected reverberation room with the open end of the test duct

D_{td} reflection coefficient at the open end of the duct

The transmission loss at the open end of a straight and rigid duct is calculated from

$$D_{td} = 10\ lg\left[1 + \frac{\Omega}{\left(\frac{4\pi f\sqrt{S}}{c}\right)^2}\right] \text{ dB} \qquad (3)$$

in which:

Ω = the solid angle of radiation at the duct (here: $\Omega = 4\pi$)

c = speed of sound in air (340 m/s)

f = frequency [Hz]

S = cross-sectional area of the duct opening in the measuring room [m^2]

The wall insulation is determined in third octave bands from 50 Hz to 10 kHz.

4.4 Results measurements

4.4.1 Insertion Loss

The results of the measurements are summarized in the tables 4.1 up to and including 4.3 and presented in detail in the figures in Annex 1 of this report.

t4.1 Insertion loss ***SEMI RIGID SILENCER***

INSERTION LOSS [dB]								
AFS nr.	**31**		**32**		**33**		**34**	
diameter	**100 mm**		**100 mm**		**125 mm**		**125 mm**	
length	**1,0 m**		**1,0 m**		**1,0 m**		**1,0 m**	
record nr.	**#326**		**#327**		**#810**		**#809**	
figure nr.	**1.1**		**1.2**		**1.3**		**1.4**	
frequency [Hz]	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**
50	7,9		8,6		11,4		11,5	
63	13,9	7,9	12,2	7,2	4,3	2,3	5,0	2,6
80	5,4		4,3		-1,2		-1,0	
100	-0,1		0,7		6,3		6,4	
125	7,4	3,2	7,9	4,0	1,3	3,9	1,1	3,8
160	6,2		7,3		6,3		6,1	
200	5,9		7,3		4,2		4,2	
250	5,4	6,6	7,1	8,2	7,3	6,4	7,3	6,4
315	9,8		11,6		9,2		8,9	
400	14,4		17,3		12,5		11,8	
500	14,9	15,9	20,1	19,9	16,8	15,5	16,1	14,7
630	21,0		27,0		20,8		20,0	
800	27,2		35,0		25,9		25,4	
1000	34,6	31,1	44,9	39,3	33,5	29,9	32,9	29,3
1250	40,9		52,5		40,8		40,1	
1600	46,6		64,3		52,0		51,5	
2000	52,6	47,1	62,0	55,8	54,6	39,1	53,1	38,2
2500	45,0		51,6		34,4		33,5	
3150	36,2		34,1		22,1		21,0	
4000	25,0	23,9	23,8	22,9	16,0	15,7	15,1	14,9
5000	20,6		19,6		13,1		12,4	
6300	17,0		17,2		12,4		11,5	
8000	15,9	16,2	16,0	16,1	11,7	11,7	10,9	10,9
10000	15,8		15,3		11,2		10,3	

t4.2 Insertion loss ***SEMI RIGID SILENCER***

INSERTION LOSS [dB]								
AFS nr.	**35**		**36**		**37**		**38**	
diameter	**160 mm**		**160 mm**		**200 mm**		**200 mm**	
length	**1,0 m**		**1,0 m**		**1,0 m**		**1,0 m**	
record nr.	**#813**		**#814**		**#952**		**#953**	
figure nr.	**1.5**		**1.6**		**1.7**		**1.8**	
frequency [Hz]	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**
50	15,6		15,6		3,4		3,4	
63	6,4	-1,1	4,7	-0,7	6,0	4,2	6,4	4,4
80	-5,6		-5,0		3,6		4,0	
100	1,9		1,6		0,3		0,7	
125	1,1	1,8	1,2	1,7	2,6	2,1	2,5	2,2
160	2,4		2,5		4,3		4,1	
200	2,2		2,2		2,4		2,3	
250	5,5	4,1	5,5	4,1	2,8	3,6	2,9	3,5
315	5,5		5,6		6,5		6,5	
400	8,3		8,3		8,2		8,6	
500	10,8	10,7	11,3	10,9	10,1	10,2	10,5	10,7
630	15,8		16,8		14,6		15,7	
800	22,0		23,7		19,5		20,4	
1000	28,1	25,6	30,5	27,5	26,1	23,2	27,4	24,2
1250	33,8		36,5		31,6		33,5	
1600	42,0		44,1		38,4		41,1	
2000	46,5	36,0	46,5	34,2	34,0	24,3	32,2	23,1
2500	31,7		29,7		19,7		18,5	
3150	18,3		17,6		13,9		12,9	
4000	12,5	12,7	11,7	11,9	9,2	9,4	9,3	9,4
5000	10,5		9,7		7,3		7,5	
6300	10,5		10,2		8,9		8,6	
8000	10,4	11,2	10,1	10,9	11,5	9,5	11,0	9,2
10000	13,4		13,2		8,6		8,4	

t4.3 Insertion loss ***SEMI RIGID SILENCER***

	INSERTION LOSS [dB]			
AFS nr.	**39**		**40**	
diameter	**250 mm**		**250 mm**	
length	**1,0 m**		**1,0 m**	
record nr.	**#966**		**#967**	
figure nr.	**1.9**		**1.10**	
frequency [Hz]	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**
50	4,9		4,8	
63	0,0	0,3	1,6	1,4
80	-1,7		-0,7	
100	5,0		4,9	
125	0,5	2,3	0,6	2,4
160	2,5		2,7	
200	2,4		2,2	
250	5,0	4,1	4,8	4,0
315	5,8		6,0	
400	7,8		8,4	
500	10,6	10,1	11,2	10,8
630	13,8		15,3	
800	17,5		19,6	
1000	20,5	19,4	24,0	22,1
1250	21,3		24,5	
1600	14,8		15,8	
2000	12,4	12,1	13,0	12,3
2500	10,2		10,0	
3150	8,2		8,2	
4000	5,2	6,2	5,2	6,4
5000	5,8		6,4	
6300	6,7		7,0	
8000	4,9	5,0	5,5	5,5
10000	3,9		4,5	

4.4.2 Transmission Loss

The results of the measurements are summarized in the tables 4.4 up to and including 4.6 and presented in detail in the figures in Annex 2 of this report.

*t4.4 Transmission loss **SEMI RIGID SILENCER***

TRANSMISSION LOSS [dB]								
AFS nr.	**31**		**32**		**33**		**34**	
diameter	**100 mm**		**100 mm**		**125 mm**		**125 mm**	
length	**1,0 m**		**1,0 m**		**1,0 m**		**1,0 m**	
record nr.	**#483**		**#484**		**#951**		**#950**	
figure nr.	**2.1**		**2.2**		**2.3**		**2.4**	
frequency [Hz]	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**
50	27,8		27,5		27,3		26,4	
63	33,8	31,4	33,2	31,1	31,2	30,0	31,5	29,6
80	40,4		41,0		34,6		35,2	
100	37,5		36,9		26,2		25,9	
125	34,0	36,9	35,0	37,4	29,7	27,9	29,7	27,9
160	44,0		45,6		28,7		29,0	
200	45,1		45,0		33,6		33,4	
250	43,4	42,6	43,3	43,2	32,9	32,9	33,2	33,1
315	40,5		41,9		32,2		32,6	
400	39,9		41,9		34,2		34,7	
500	39,2	38,7	41,4	40,6	37,3	36,1	37,0	36,2
630	37,4		39,1		37,5		37,3	
800	37,3		39,0		38,0		38,6	
1000	39,1	38,8	41,7	40,9	39,5	39,4	40,5	40,0
1250	40,7		43,0		41,3		41,3	
1600	42,8		42,4		40,2		39,1	
2000	41,1	40,4	39,7	39,3	39,1	39,0	37,4	37,3
2500	38,5		37,2		38,1		35,9	
3150	39,1		37,9		37,0		35,3	
4000	37,3	36,8	37,7	36,8	33,7	33,4	33,2	32,4
5000	35,0		35,2		31,3		30,2	
6300	32,0		32,4		27,4		26,5	
8000	29,6	26,6	31,2	28,1	20,7	21,8	20,2	21,4
10000	23,1		24,8		20,3		20,0	

t4.5 Transmission loss ***SEMI RIGID SILENCER***

TRANSMISSION LOSS [dB]								
AFS nr.	**35**		**36**		**37**		**38**	
diameter	**160 mm**		**160 mm**		**200 mm**		**200 mm**	
length	**1,0 m**		**1,0 m**		**1,0 m**		**1,0 m**	
record nr.	**#1062**		**#1063**		**#1069**		**#1070**	
figure nr.	**2.5**		**2.6**		**2.7**		**2.8**	
frequency [Hz]	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**
50	29,7		29,2		28,7		27,0	
63	29,5	30,3	30,4	30,6	26,8	28,3	26,1	27,3
80	32,3		33,0		29,9		29,4	
100	28,4		26,8		28,8		28,7	
125	42,5	32,6	41,2	31,1	38,9	32,7	38,6	32,5
160	38,3		37,2		37,7		36,8	
200	43,9		43,1		39,3		39,5	
250	43,6	41,4	43,1	40,9	38,8	38,2	37,1	37,2
315	38,7		38,4		36,9		35,7	
400	38,4		38,4		36,7		35,0	
500	40,5	38,9	40,3	38,6	36,7	36,6	35,1	35,1
630	38,2		37,5		36,3		35,3	
800	36,7		36,4		36,7		34,5	
1000	36,9	36,4	37,2	36,2	37,3	36,9	35,0	35,0
1250	35,7		35,2		36,8		35,5	
1600	36,7		36,1		36,1		34,7	
2000	37,5	36,9	36,3	36,1	35,6	35,1	33,8	33,1
2500	36,5		36,0		33,9		31,4	
3150	35,6		36,8		32,1		31,7	
4000	31,6	31,1	32,1	31,8	27,3	25,8	27,6	26,3
5000	28,7		29,4		22,6		23,4	
6300	25,3		26,7		17,6		19,2	
8000	21,1	21,7	22,6	22,6	20,1	19,9	21,0	20,9
10000	20,2		20,6		24,1		23,7	

t4.6 Transmission loss ***SEMI RIGID SILENCER***

	TRANSMISSION LOSS [dB]			
AFS nr.	**39**		**40**	
diameter	**250 mm**		**250 mm**	
length	**1,0 m**		**1,0 m**	
record nr.	**#1079**		**#1080**	
figure nr.	**2.9**		**2.10**	
frequency [Hz]	**1/3 oct.**	**1/1 oct.**	**1/3 oct.**	**1/1 oct.**
50	29,8		30,0	
63	34,0	31,6	34,0	31,4
80	31,9		31,2	
100	39,0		38,8	
125	38,8	38,2	37,0	37,5
160	37,0		36,9	
200	36,4		39,0	
250	38,2	36,4	39,8	37,3
315	35,1		34,8	
400	34,5		34,9	
500	33,8	33,3	35,3	34,8
630	32,1		34,2	
800	34,6		34,5	
1000	33,7	33,2	33,3	33,2
1250	31,7		32,2	
1600	31,2		31,1	
2000	30,2	30,7	30,9	31,1
2500	30,9		31,3	
3150	29,4		29,4	
4000	24,7	23,8	24,4	23,1
5000	21,0		20,0	
6300	17,7		17,9	
8000	22,5	20,5	21,8	20,3
10000	23,6		22,8	

The results as presented here relate only to the tested items and laboratory conditions as described in this report. The laboratory can make no judgement about the representativity of the tested samples. The test report ahead is valid as long as the tested constructions and/or materials are unchanged.

Mook,

Th. Scheers
Laboratory Supervisor

ir. G.M.A. Perquin
Manager

This report contains 15 pages, 3 figures and 2 annexes.

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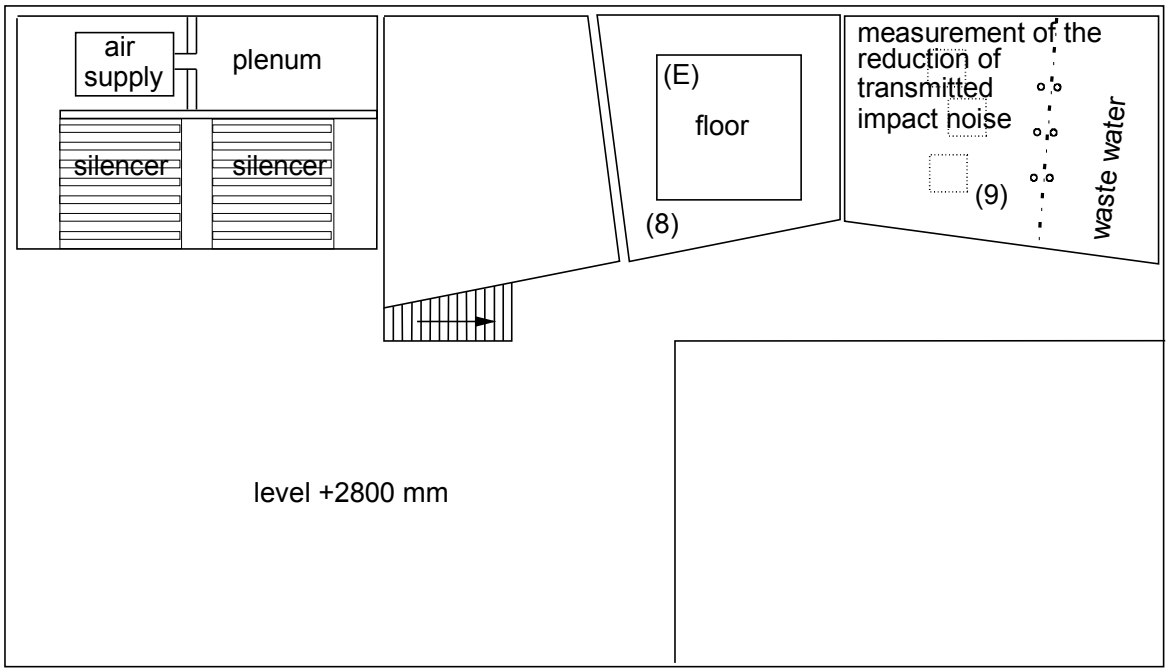
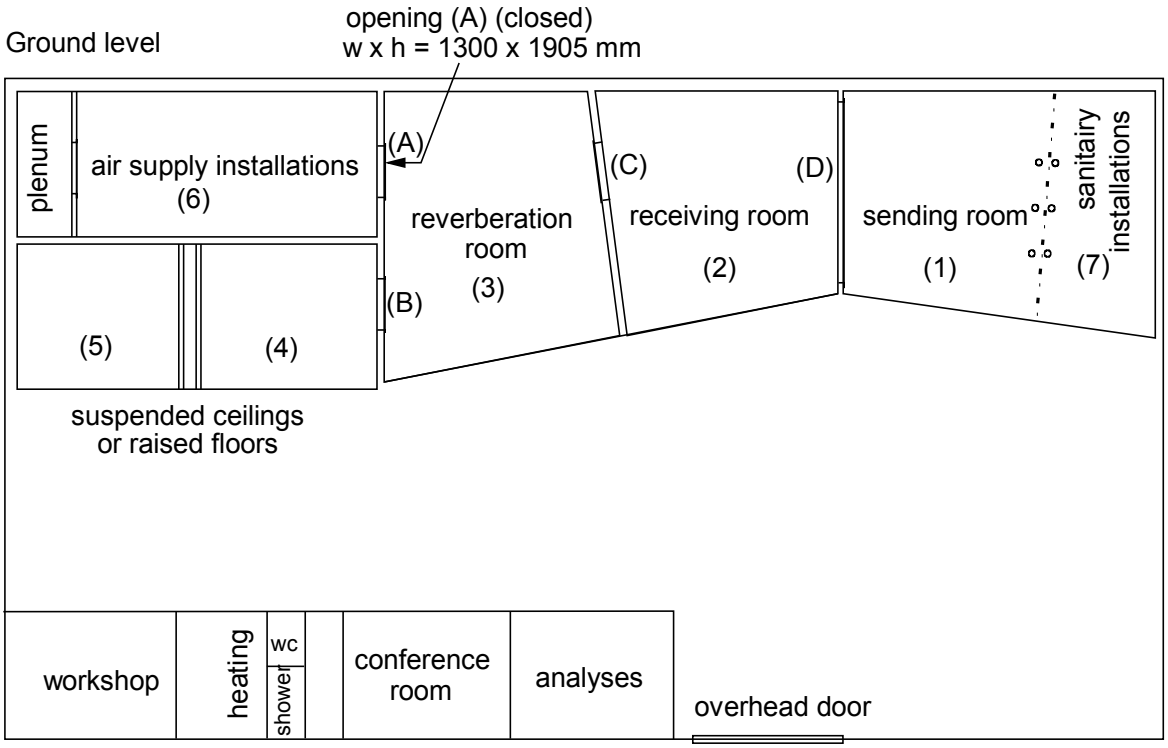
Lindenlaan 41, NL-6584 AC MOLENHOEK (LB), THE NETHERLANDS

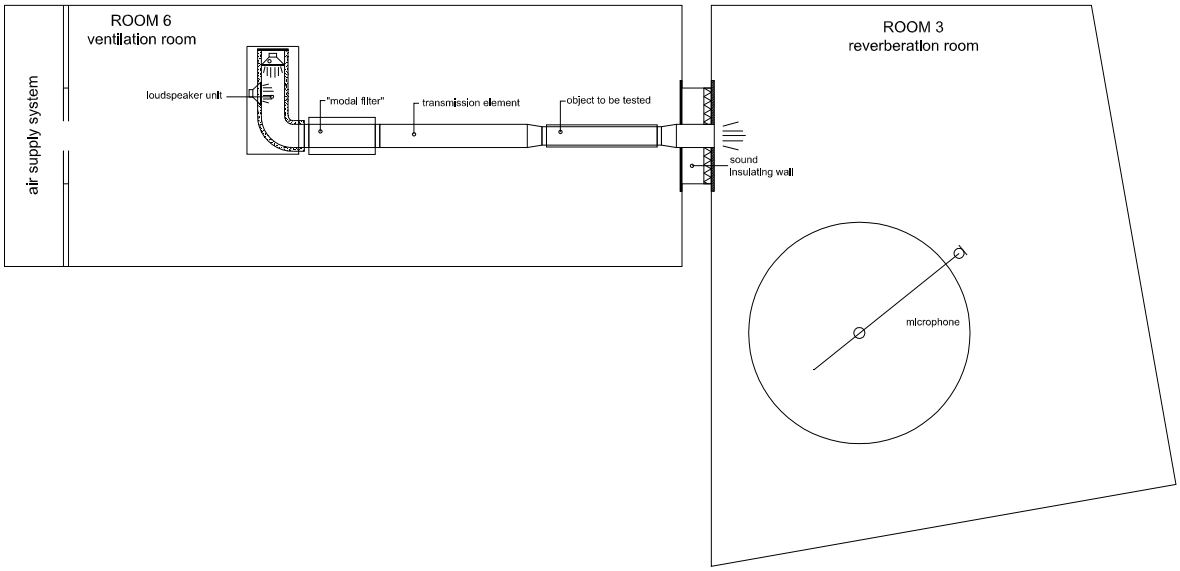
OVERVIEW



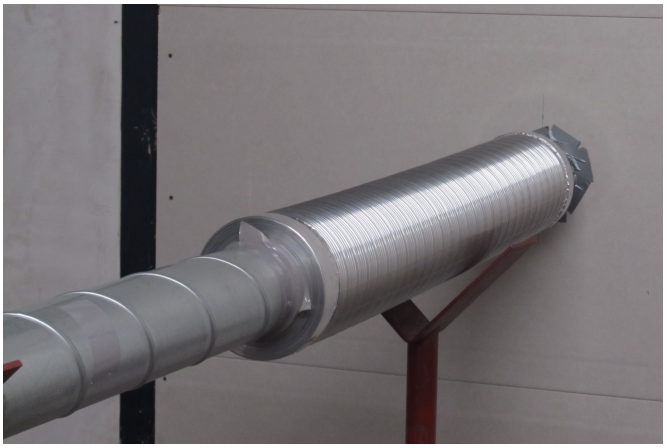


TEST OPENINGS (w x h in mm)
(B) 1000 x 2200
(C) 1500 x 1250
(D) 4300 x 2800
(E) 4000 x 4000

0 1 2 3 4 5 m
scale

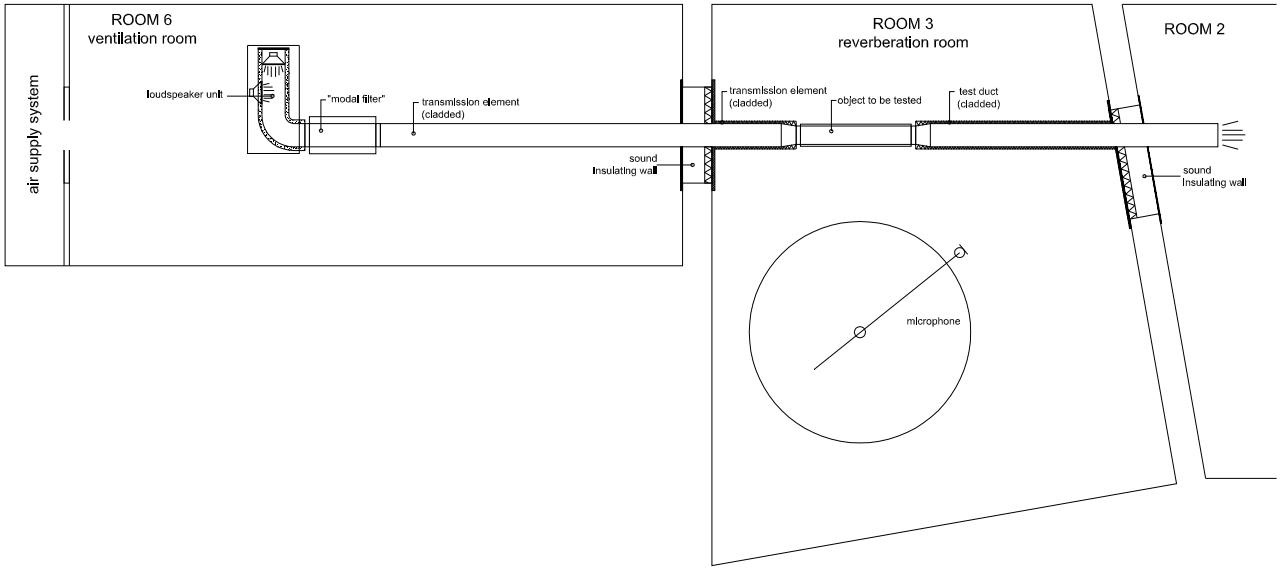


Without silencer; L_{wII}



With silencer; L_{wI}

Measurement set-up insertion loss



Open end; L_{wII}

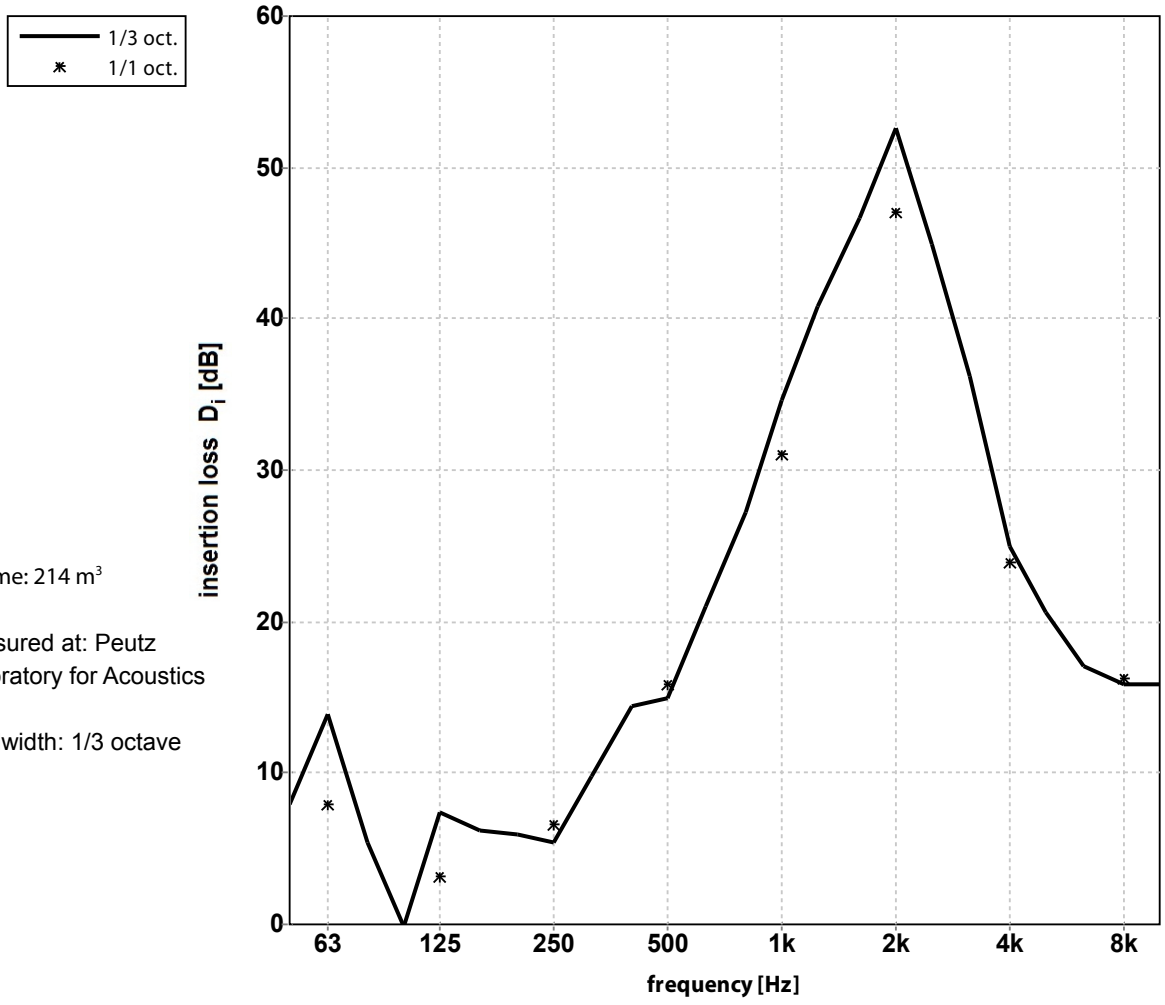
With silencer; L_{wII}

Measurement set-up transmission loss

INSERTION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #31; SEMI RIGID SILENCER
diameter 100 mm
length 1,0 m



volume: 214 m³

measured at: Peutz Laboratory for Acoustics

bandwidth: 1/3 octave

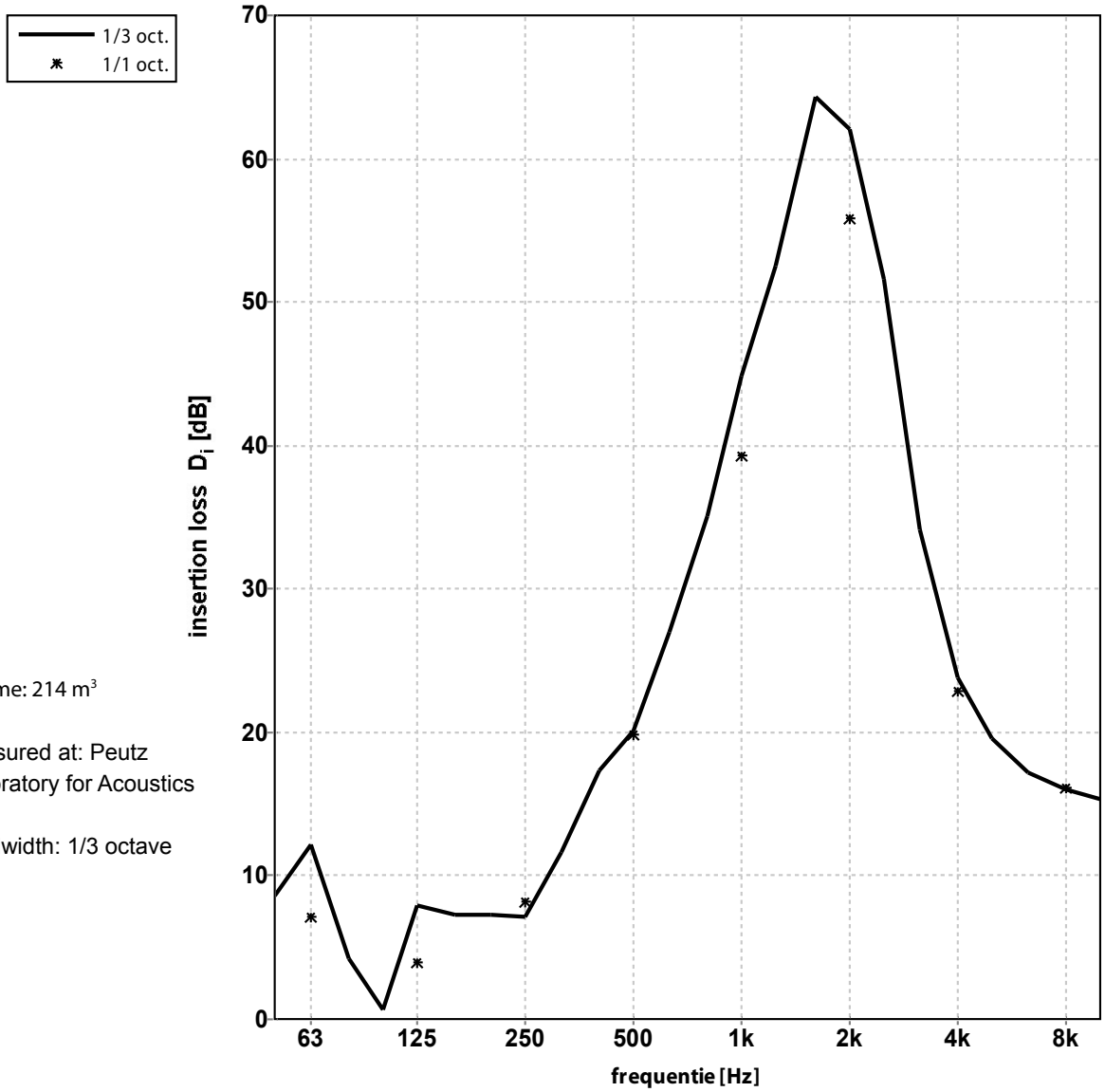
	7,9	-0,1	5,9	14,4	27,2	46,6	36,2	17,0	
1/3 oct.	13,9	7,4	5,4	14,9	34,6	52,6	25,0	15,9	dB
	5,4	6,2	9,8	21,0	40,9	45,0	20,6	15,8	
1/1 oct.	**7,9**	**3,2**	**6,6**	**15,9**	**31,1**	**47,1**	**23,9**	**16,2**	**dB**

Mook, 24-04-2014

INSERTION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #32; SEMI RIGID SILENCER
diameter 100 mm
length 1,0 m



volume: 214 m³

measured at: Peutz Laboratory for Acoustics

bandwidth: 1/3 octave

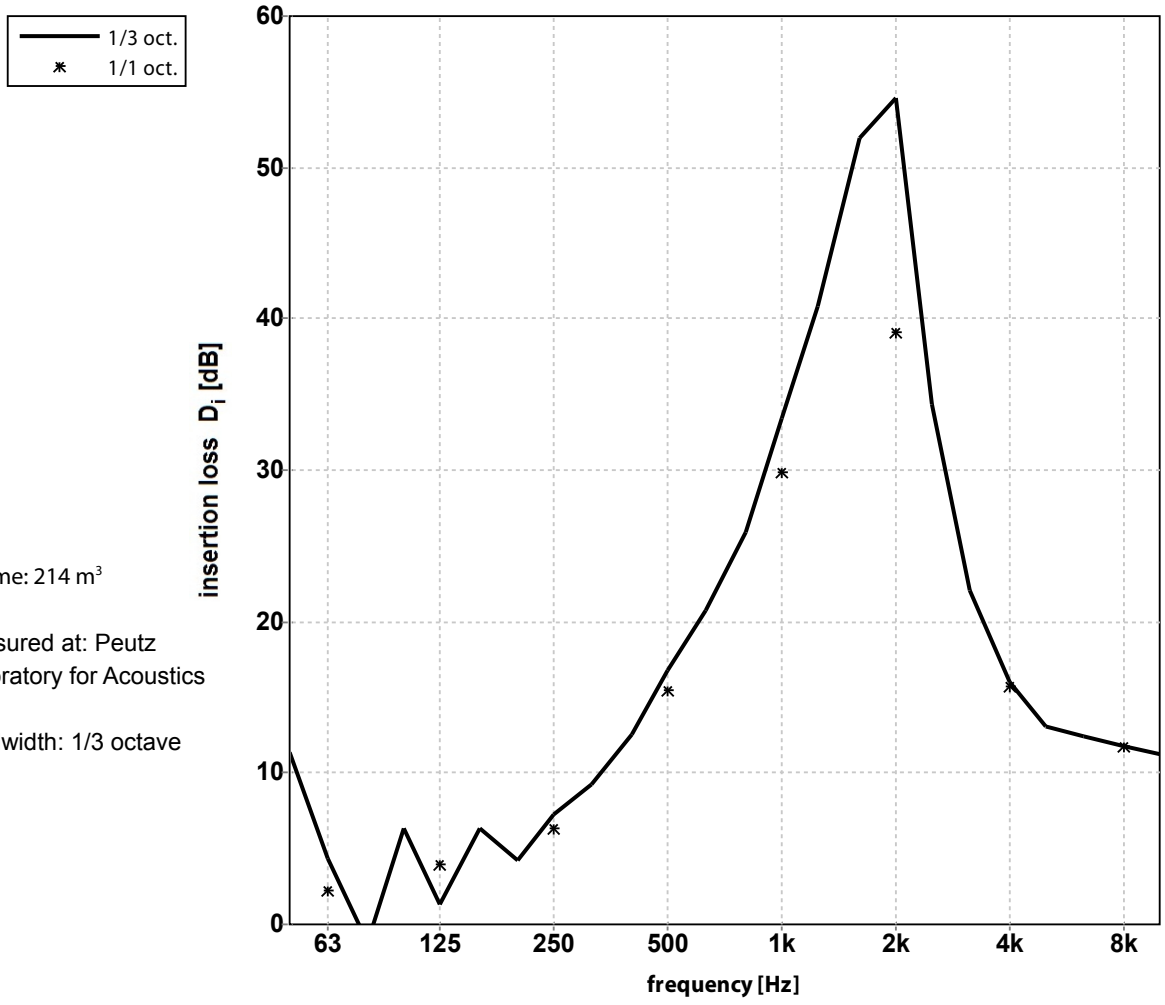
	8,6	0,7	7,3	17,3	35,0	64,3	34,1	17,2	
1/3 oct.	12,2	7,9	7,1	20,1	44,9	62,0	23,8	16,0	dB
	4,3	7,3	11,6	27,0	52,5	51,6	19,6	15,3	
1/1 oct.	**7,2**	**4,0**	**8,2**	**19,9**	**39,3**	**55,8**	**22,9**	**16,1**	**dB**

Mook, 23-04-2014

INSERTION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #33 SEMI RIGID SILENCER
diameter 125 mm
length 1,0 m



volume: 214 m³

measured at: Peutz
Laboratory for Acoustics

bandwidth: 1/3 octave

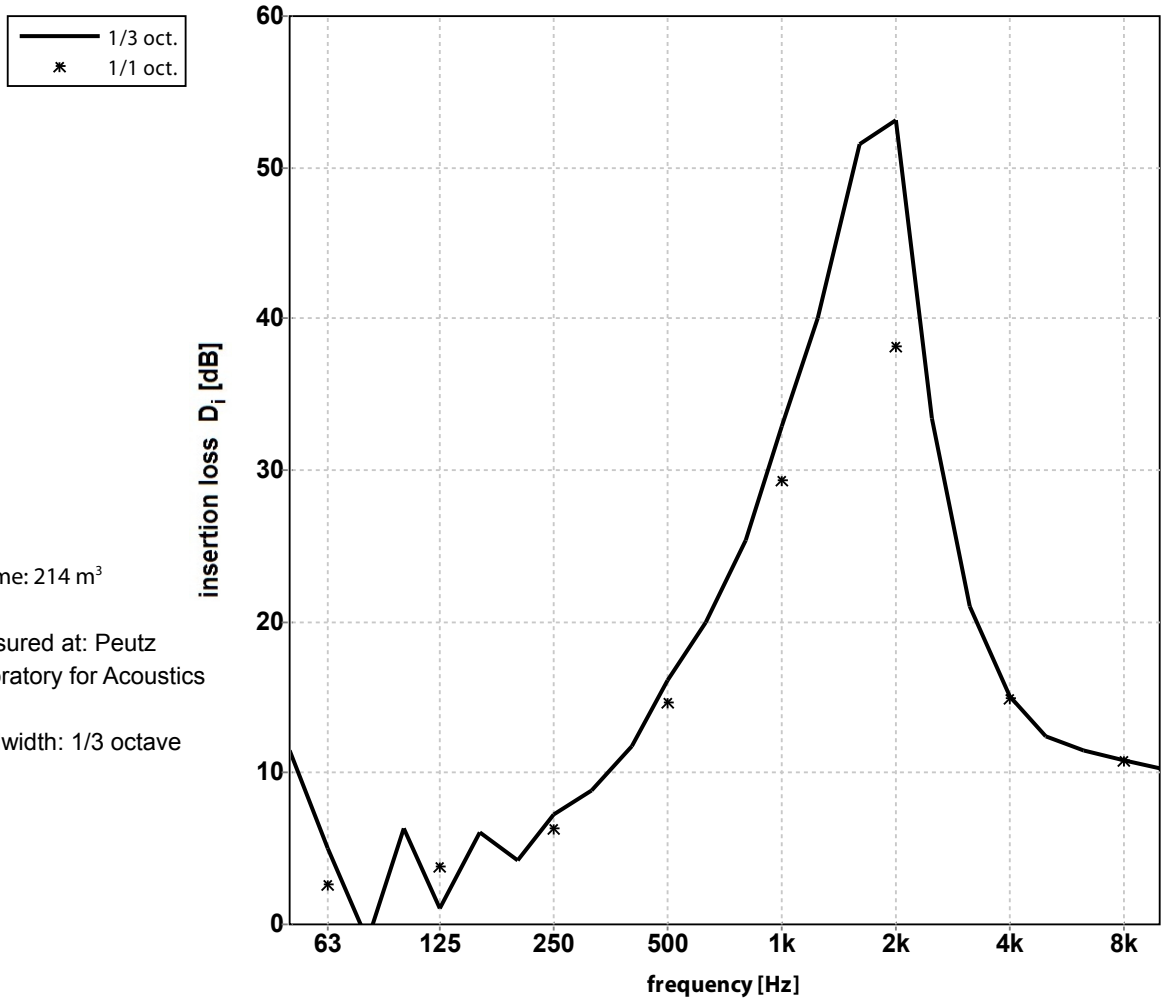
	11,4	6,3	4,2	12,5	25,9	52,0	22,1	12,4	
1/3 oct.	4,3	1,3	7,3	16,8	33,5	54,6	16,0	11,7	dB
	-1,2	6,3	9,2	20,8	40,8	34,4	13,1	11,2	
1/1 oct.	**2,3**	**3,9**	**6,4**	**15,5**	**29,9**	**39,1**	**15,7**	**11,7**	**dB**

Mook, 24-07-2014

INSERTION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #34; SEMI RIGID SILENCER
diameter 125 mm
length 1,0 m



volume: 214 m³

measured at: Peutz
Laboratory for Acoustics

bandwidth: 1/3 octave

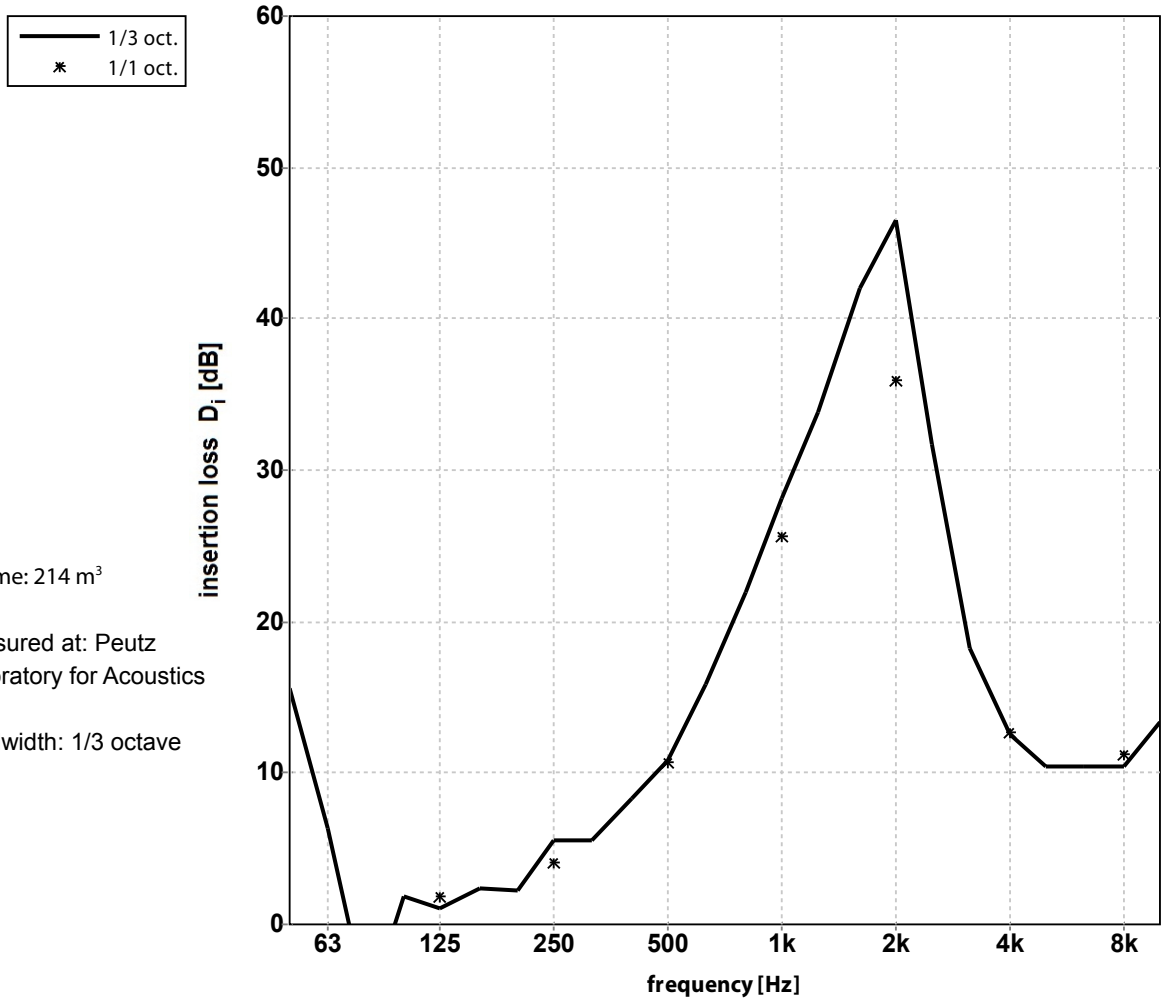
	11,5	6,4	4,2	11,8	25,4	51,5	21,0	11,5	
1/3 oct.	5,0	1,1	7,3	16,1	32,9	53,1	15,1	10,9	dB
	-1,0	6,1	8,9	20,0	40,1	33,5	12,4	10,3	
1/1 oct.	**2,6**	**3,8**	**6,4**	**14,7**	**29,3**	**38,2**	**14,9**	**10,9**	**dB**

Mook, 24-07-2014

INSERTION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #35; SEMI RIGID SILENCER
diameter 160 mm
length 1,0 m



volume: 214 m³

measured at: Peutz Laboratory for Acoustics

bandwidth: 1/3 octave

	15,6	1,9	2,2	8,3	22,0	42,0	18,3	10,5	
1/3 oct.	6,4	1,1	5,5	10,8	28,1	46,5	12,5	10,4	dB
	-5,6	2,4	5,5	15,8	33,8	31,7	10,5	13,4	
1/1 oct.	**-1,1**	**1,8**	**4,1**	**10,7**	**25,6**	**36,0**	**12,7**	**11,2**	**dB**

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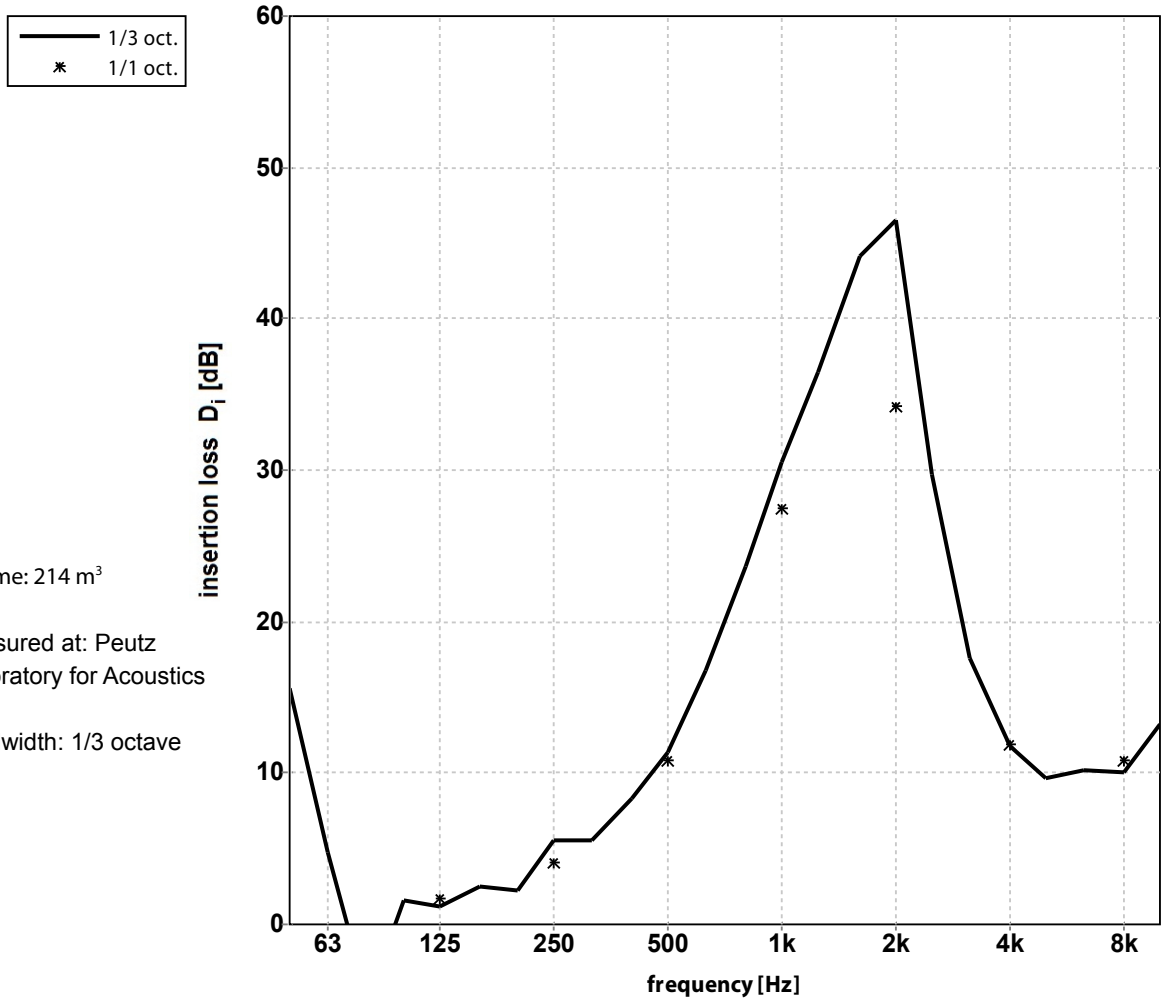
Mook, 24-07-2014

INSERTION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #36; SEMI RIGID SILENCER
diameter 160 mm
length 1,0 m



volume: 214 m³

measured at: Peutz Laboratory for Acoustics

bandwidth: 1/3 octave

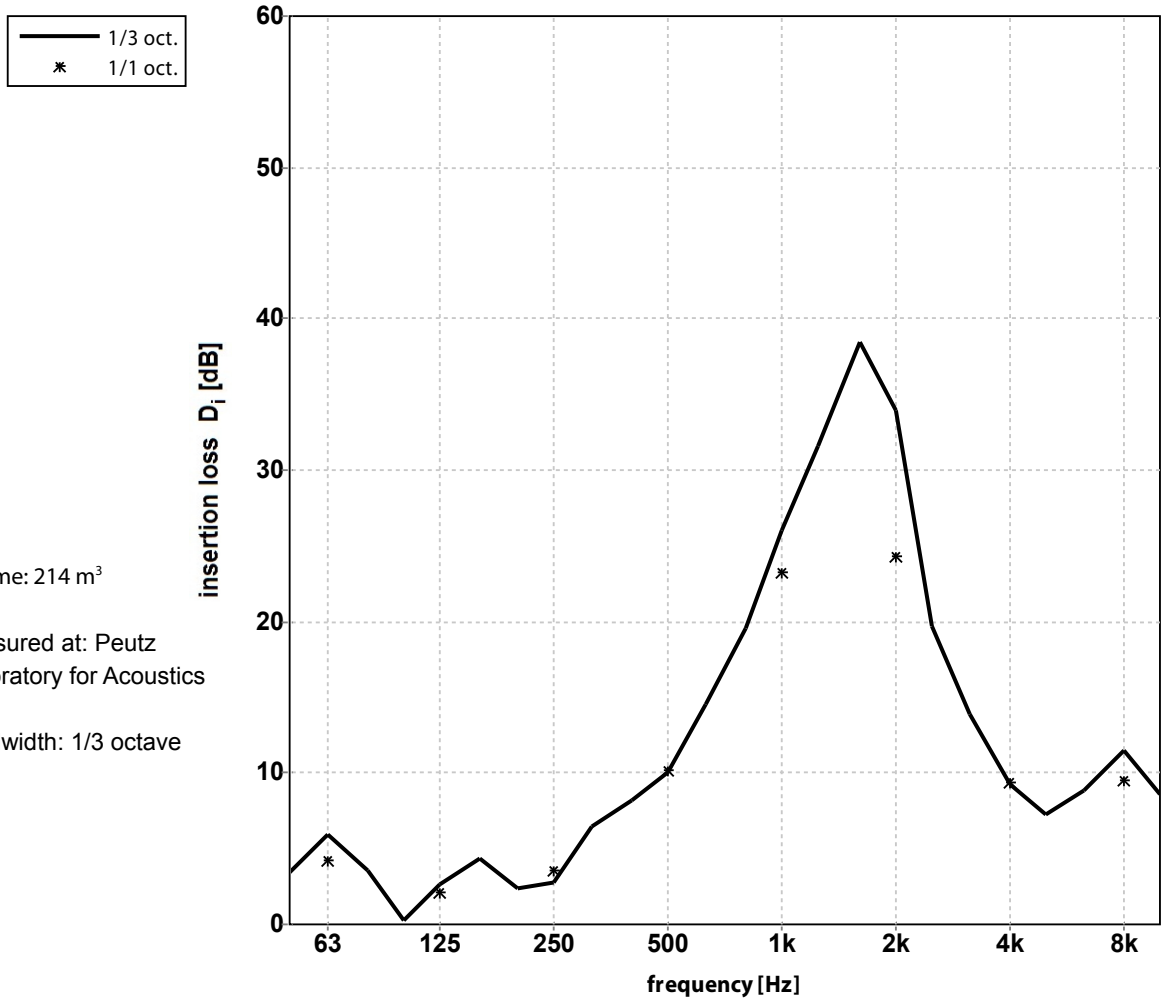
	15,6	1,6	2,2	8,3	23,7	44,1	17,6	10,2	
1/3 oct.	4,7	1,2	5,5	11,3	30,5	46,5	11,7	10,1	dB
	-5,0	2,5	5,6	16,8	36,5	29,7	9,7	13,2	
1/1 oct.	**-0,7**	**1,7**	**4,1**	**10,9**	**27,5**	**34,2**	**11,9**	**10,9**	**dB**

Mook, 24-07-2014

INSERTION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #37; SEMI RIGID SILENCER
diameter 200 mm
length 1,0 m



volume: 214 m³

measured at: Peutz
Laboratory for Acoustics

bandwidth: 1/3 octave

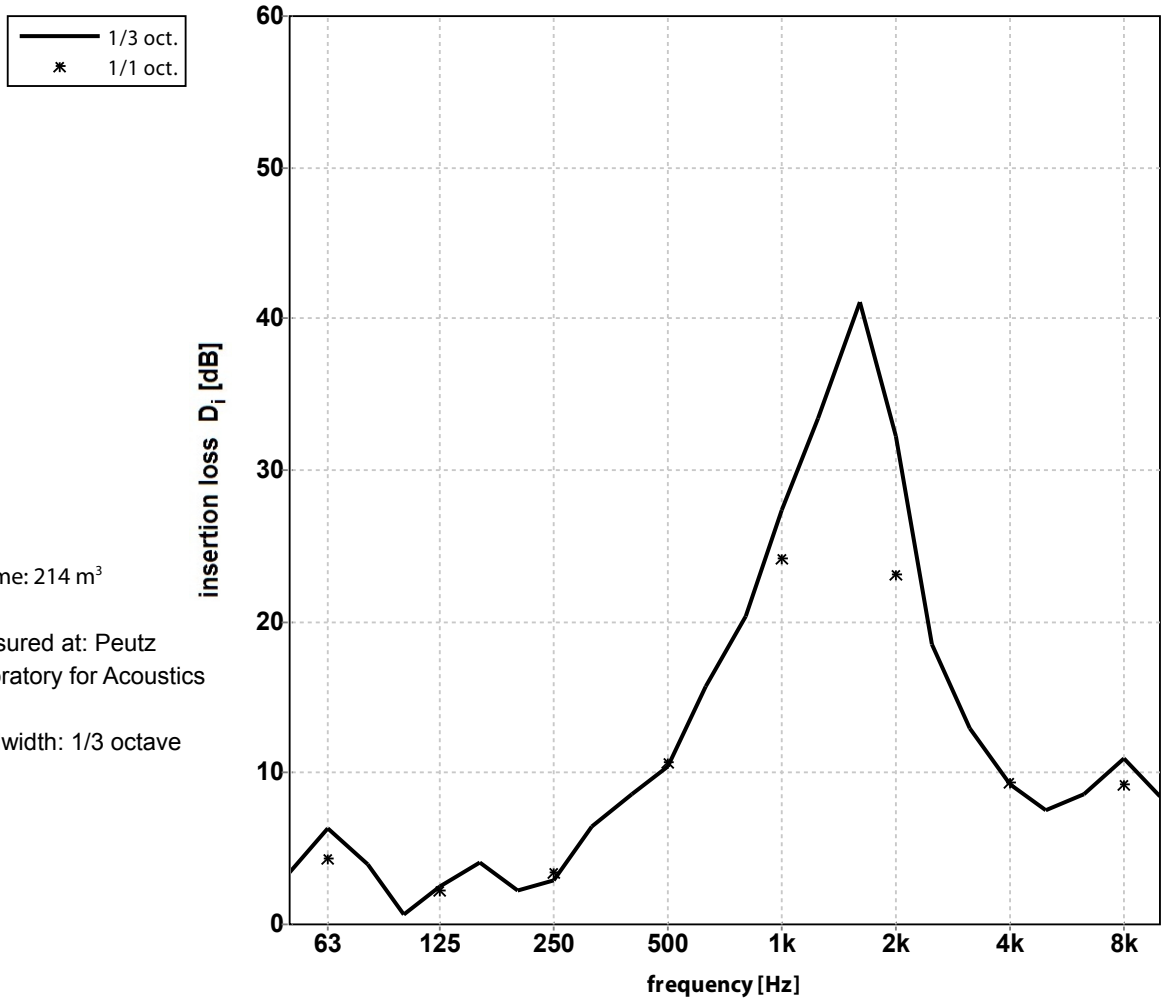
	3,4	0,3	2,4	8,2	19,5	38,4	13,9	8,9	
1/3 oct.	6,0	2,6	2,8	10,1	26,1	34,0	9,2	11,5	dB
	3,6	4,3	6,5	14,6	31,6	19,7	7,3	8,6	
1/1 oct.	**4,2**	**2,1**	**3,6**	**10,2**	**23,2**	**24,3**	**9,4**	**9,5**	**dB**

Mook, 27-08-2014

INSERTION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #38; SEMI RIGID SILENCER
diameter 200 mm
length 1,0 m



volume: 214 m³

measured at: Peutz
Laboratory for Acoustics

bandwidth: 1/3 octave

	3,4	0,7	2,3	8,6	20,4	41,1	12,9	8,6	
1/3 oct.	6,4	2,5	2,9	10,5	27,4	32,2	9,3	11,0	dB
	4,0	4,1	6,5	15,7	33,5	18,5	7,5	8,4	
1/1 oct.	**4,4**	**2,2**	**3,5**	**10,7**	**24,2**	**23,1**	**9,4**	**9,2**	**dB**

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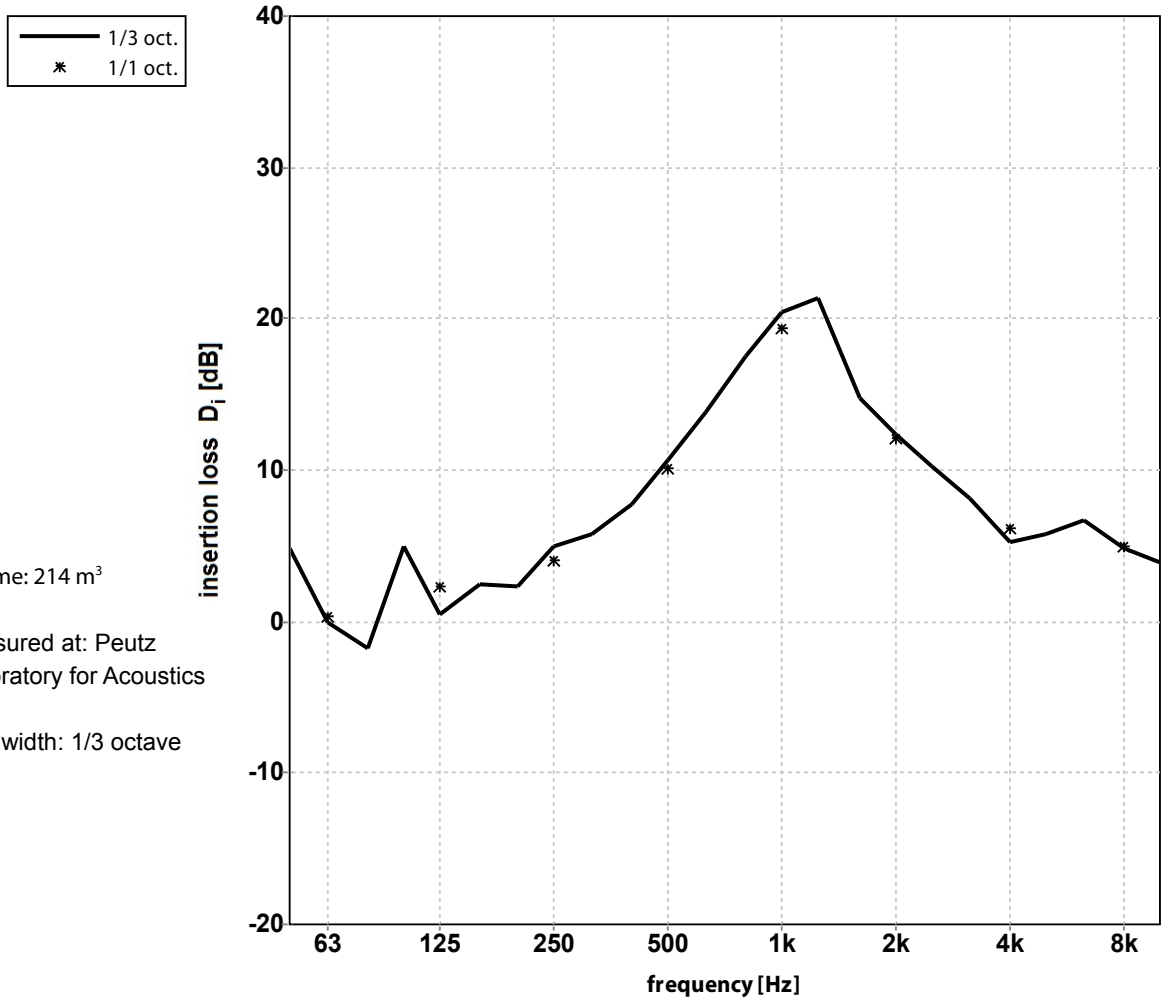
Mook, 27-08-2014

INSERTION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #39; SEMIRIGID SILENCER
diameter 250 mm
length 1,0 m



volume: 214 m³

measured at: Peutz
Laboratory for Acoustics

bandwidth: 1/3 octave

	4,9	5,0	2,4	7,8	17,5	14,8	8,2	6,7	
1/3 oct.	0,0	0,5	5,0	10,6	20,5	12,4	5,2	4,9	dB
	-1,7	2,5	5,8	13,8	21,3	10,2	5,8	3,9	
1/1 oct.	**0,3**	**2,3**	**4,1**	**10,1**	**19,4**	**12,1**	**6,2**	**5,0**	**dB**

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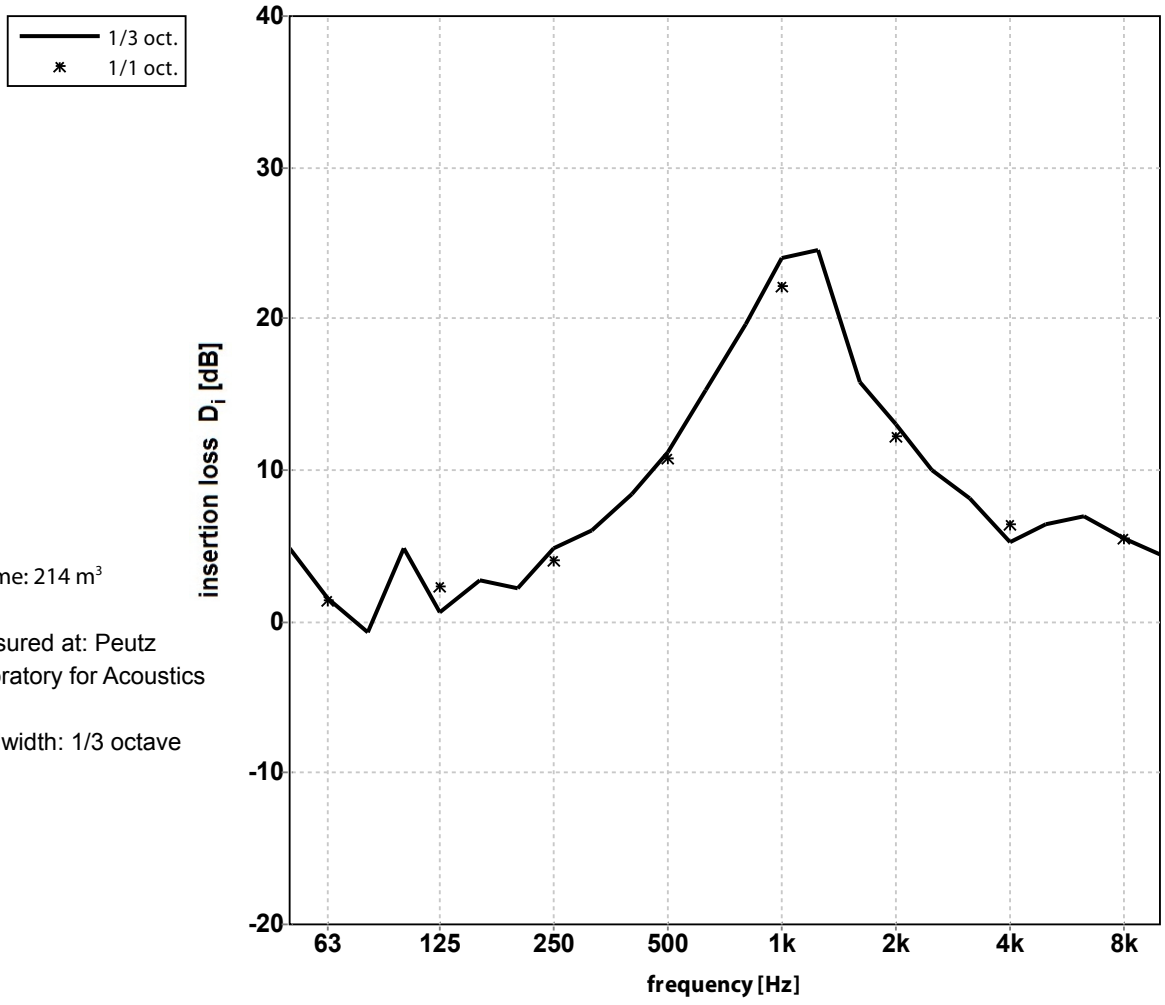
Mook, 27-08-2014

INSERTION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #40; SEMIRIGID SILENCER
diameter 250 mm
length 1,0 m



volume: 214 m³

measured at: Peutz Laboratory for Acoustics

bandwidth: 1/3 octave

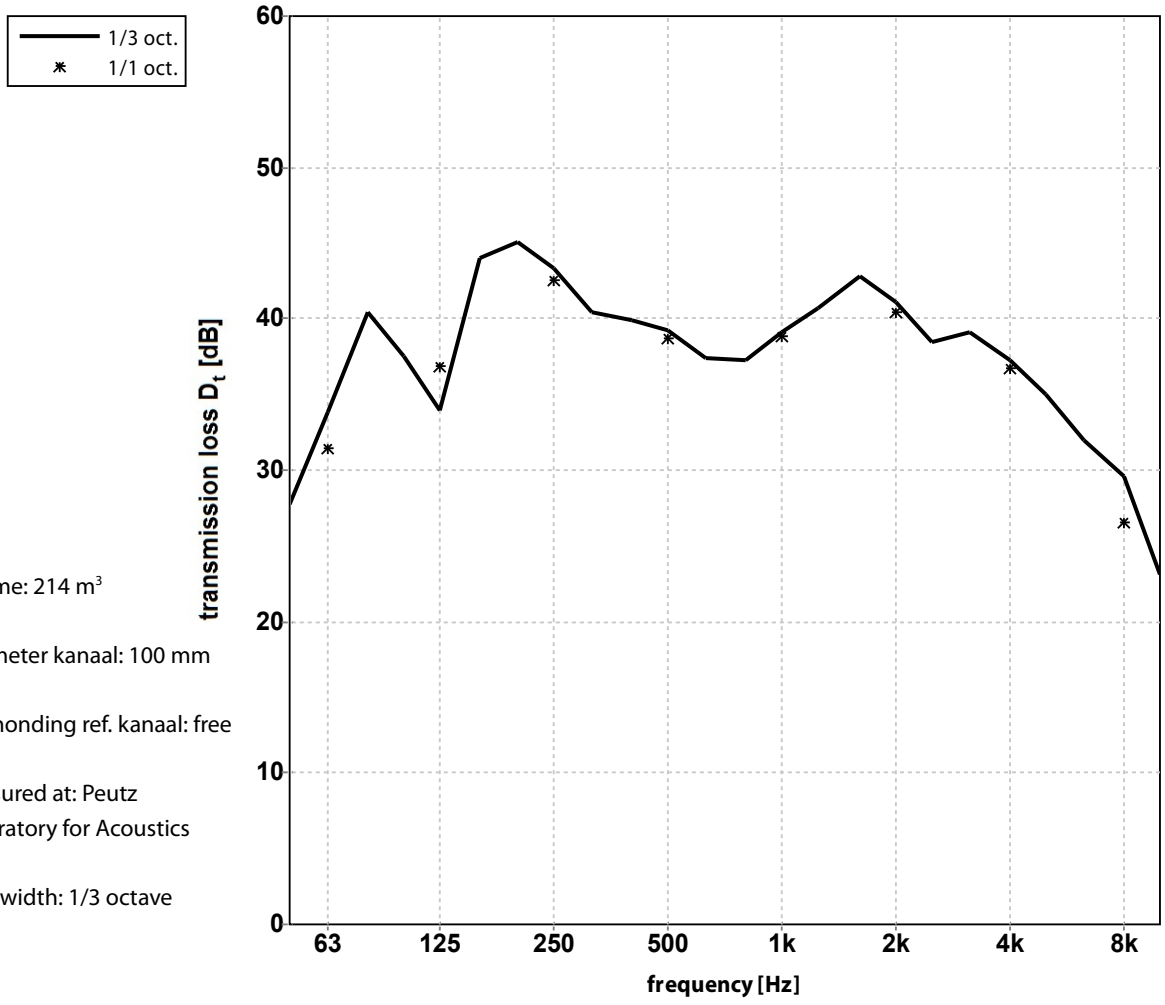
	4,8	4,9	2,2	8,4	19,6	15,8	8,2	7,0	
1/3 oct.	1,6	0,6	4,8	11,2	24,0	13,0	5,2	5,5	dB
	-0,7	2,7	6,0	15,3	24,5	10,0	6,4	4,5	
1/1 oct.	**1,4**	**2,4**	**4,0**	**10,8**	**22,1**	**12,3**	**6,4**	**5,5**	**dB**

Mook, 27-08-2014

TRANSMISSION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #31; SEMI RIGID SILENCER
diameter 100 mm
length 1,0 m



volume: 214 m³

*diameter kanaal: 100 mm

*uitmonding ref. kanaal: free

measured at: Peutz
Laboratory for Acoustics

bandwidth: 1/3 octave

	27,8	37,5	45,1	39,9	37,3	42,8	39,1	32,0	
1/3 oct.	33,8	34,0	43,4	39,2	39,1	41,1	37,3	29,6	dB
	40,4	44,0	40,5	37,4	40,7	38,5	35,0	23,1	
1/1 oct.	**31,4**	**36,9**	**42,6**	**38,7**	**38,8**	**40,4**	**36,8**	**26,6**	**dB**

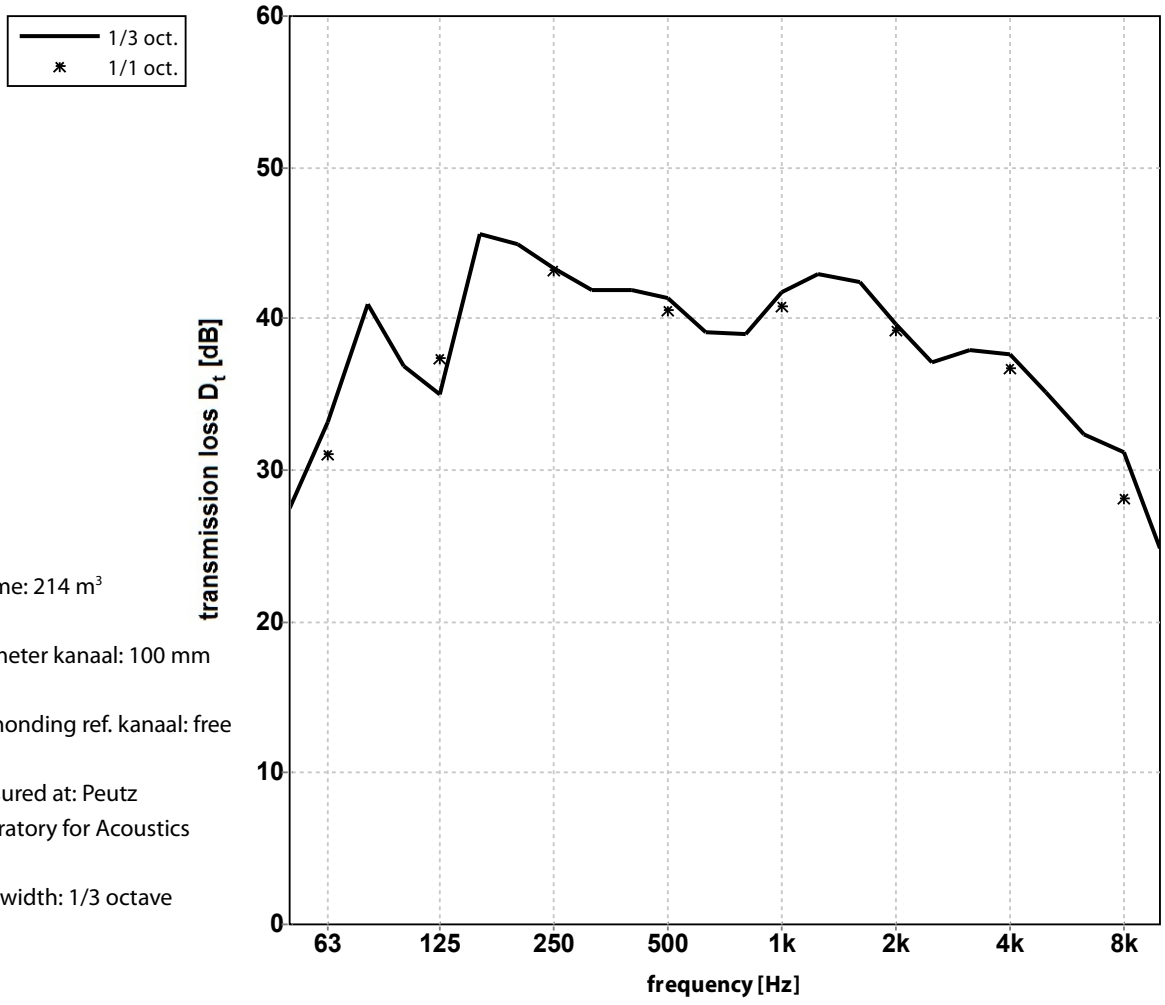
Mook, 22-05-2014

LABORATORY FOR ACOUSTICS

TRANSMISSION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #32; SEMI RIGID SILENCER
diameter 100 mm
length 1,0 m



volume: 214 m³

*diameter kanaal: 100 mm

*uitmonding ref. kanaal: free

measured at: Peutz
Laboratory for Acoustics

bandwidth: 1/3 octave

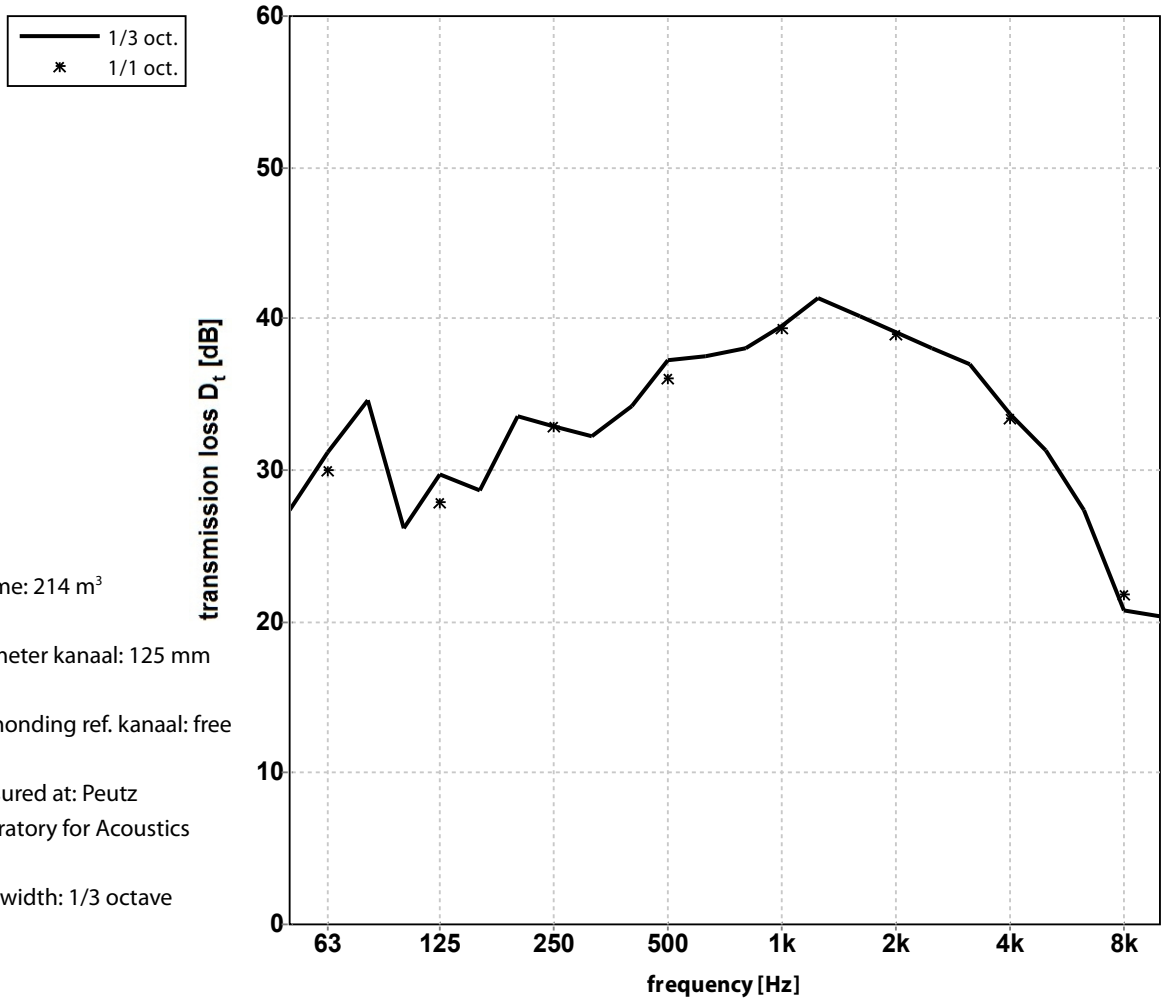
	27,5	36,9	45,0	41,9	39,0	42,4	37,9	32,4	
1/3 oct.	33,2	35,0	43,3	41,4	41,7	39,7	37,7	31,2	dB
	41,0	45,6	41,9	39,1	43,0	37,2	35,2	24,8	
1/1 oct.	**31,1**	**37,4**	**43,2**	**40,6**	**40,9**	**39,3**	**36,8**	**28,1**	**dB**

Mook, 22-05-2014

TRANSMISSION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #33; SEMI RIGID SILENCER
diameter 125 mm
length 1,0 m



volume: 214 m³

*diameter kanaal: 125 mm

*uitmonding ref. kanaal: free

measured at: Peutz Laboratory for Acoustics

bandwidth: 1/3 octave

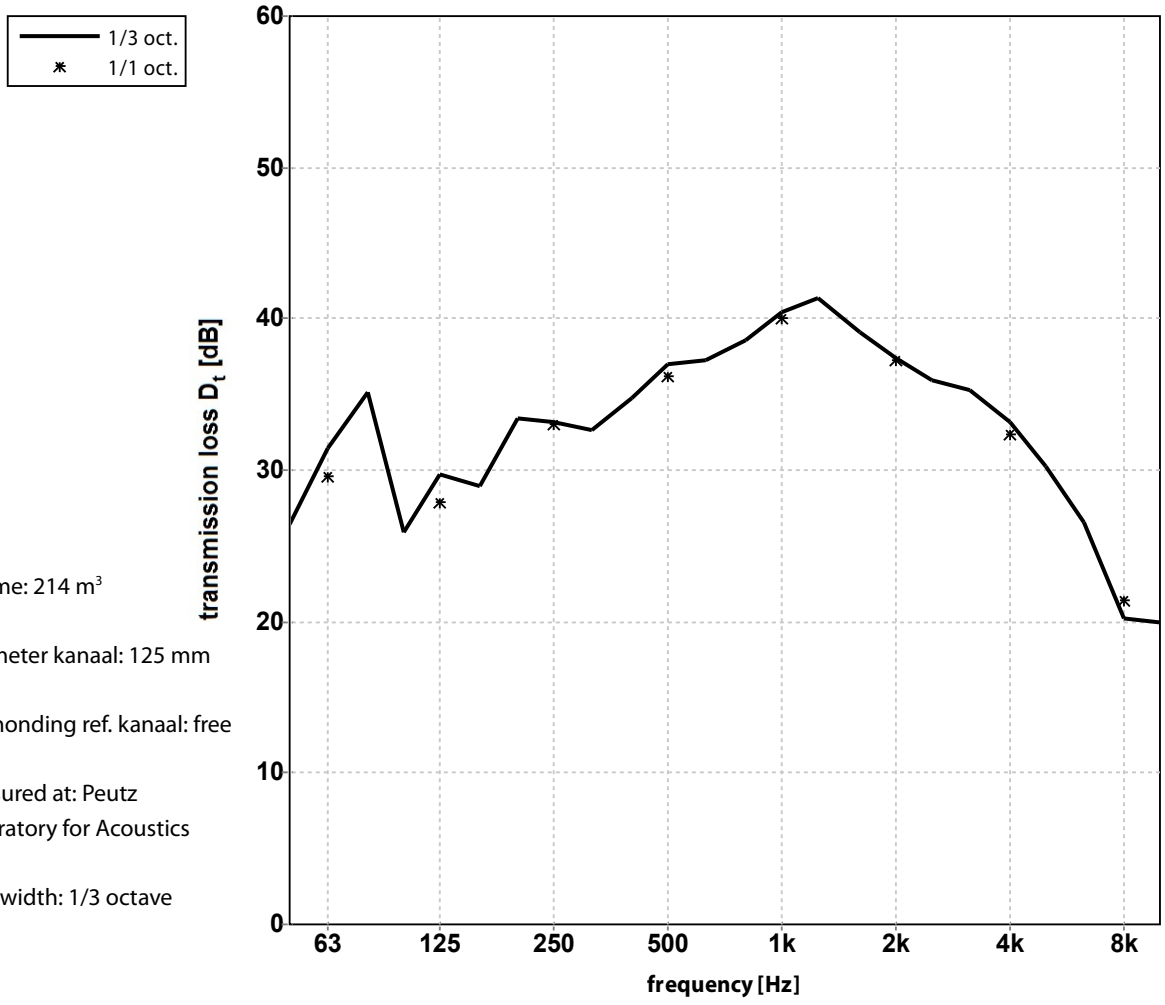
	27,3	26,2	33,6	34,2	38,0	40,2	37,0	27,4	
1/3 oct.	31,2	29,7	32,9	37,3	39,5	39,1	33,7	20,7	dB
	34,6	28,7	32,2	37,5	41,3	38,1	31,3	20,3	
1/1 oct.	**30,0**	**27,9**	**32,9**	**36,1**	**39,4**	**39,0**	**33,4**	**21,8**	**dB**

Mook, 15-08-2014

TRANSMISSION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #34; SEMI RIGID SILENCER
diameter 125 mm
length 1,0 m



volume: 214 m³

*diameter kanaal: 125 mm

*uitmonding ref. kanaal: free

measured at: Peutz Laboratory for Acoustics

bandwidth: 1/3 octave

		26,4	25,9	33,4	34,7	38,6	39,1	35,3	26,5	
	1/3 oct.	31,5	29,7	33,2	37,0	40,5	37,4	33,2	20,2	dB
		35,2	29,0	32,6	37,3	41,3	35,9	30,2	20,0	
	1/1 oct.	**29,6**	**27,9**	**33,1**	**36,2**	**40,0**	**37,3**	**32,4**	**21,4**	**dB**

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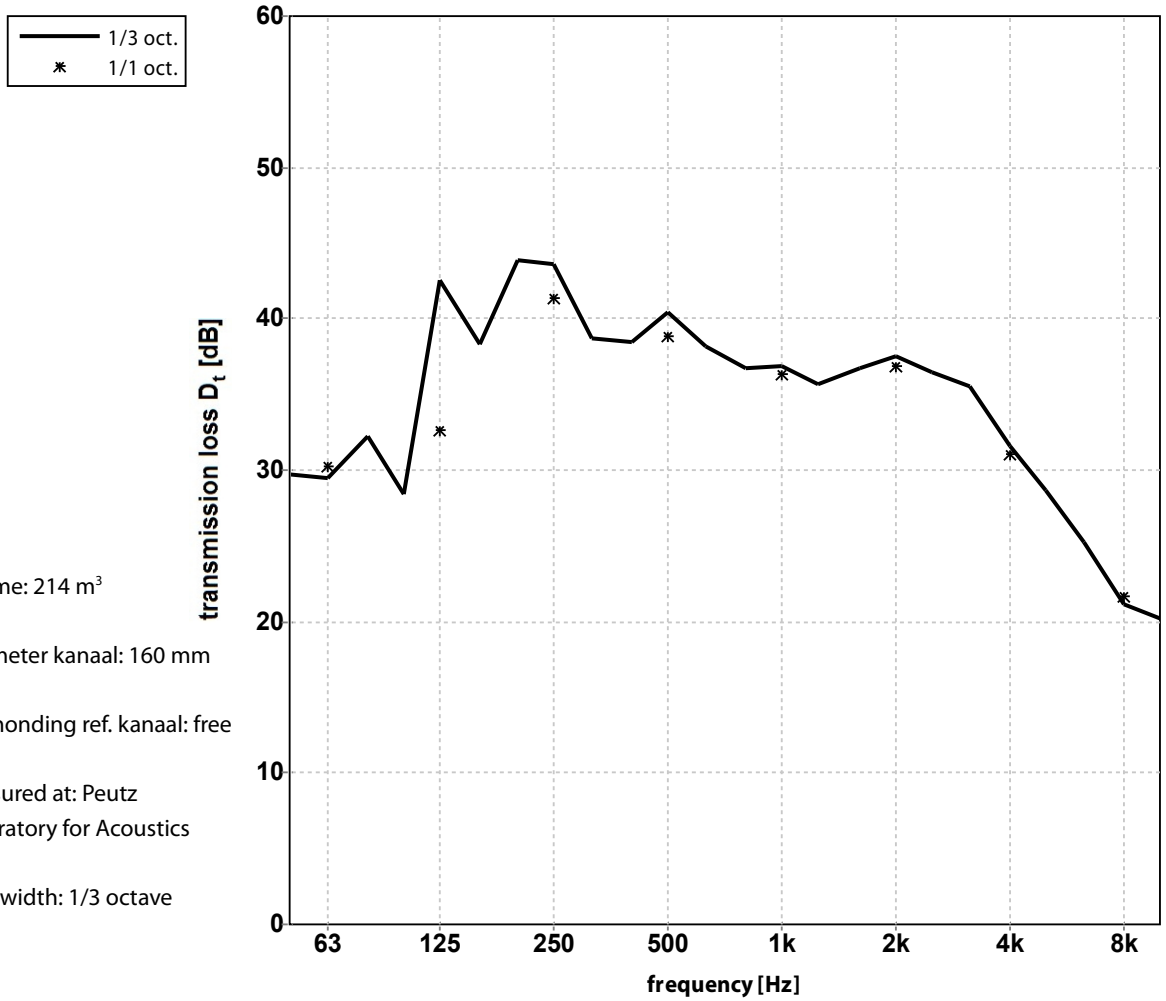
Mook, 15-08-2014

TRANSMISSION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #35; SEMI RIGID SILENCER
diameter 160 mm
length 1,0 m



volume: 214 m³

*diameter kanaal: 160 mm

*uitmonding ref. kanaal: free

measured at: Peutz Laboratory for Acoustics

bandwidth: 1/3 octave

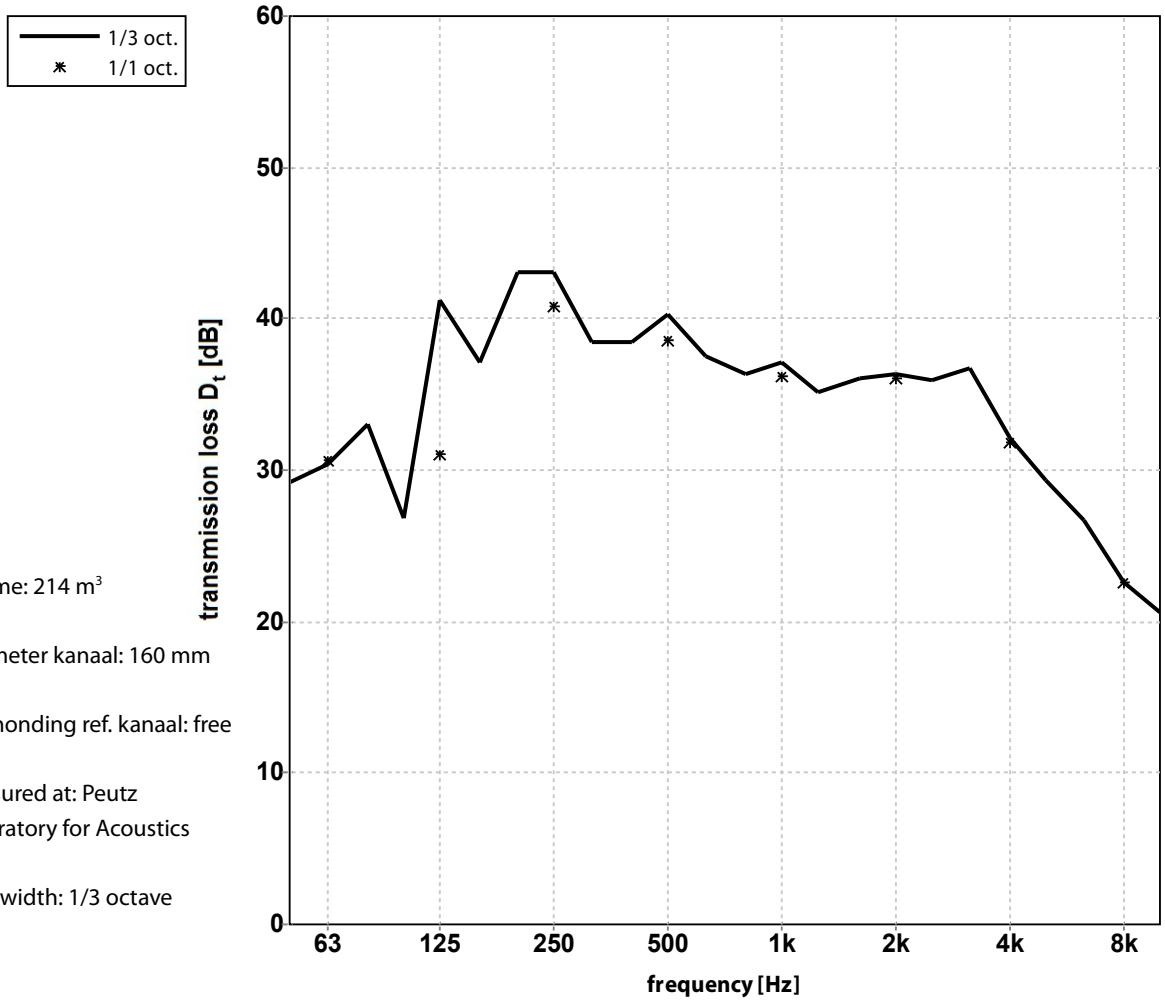
	29,7	28,4	43,9	38,4	36,7	36,7	35,6	25,3	
1/3 oct.	29,5	42,5	43,6	40,5	36,9	37,5	31,6	21,1	dB
	32,3	38,3	38,7	38,2	35,7	36,5	28,7	20,2	
1/1 oct.	**30,3**	**32,6**	**41,4**	**38,9**	**36,4**	**36,9**	**31,1**	**21,7**	**dB**

Mook, 11-09-2014

TRANSMISSION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #36; SEMI RIGID SILENCER
diameter 160 mm
length 1,0 m



volume: 214 m³

*diameter kanaal: 160 mm

*uitmonding ref. kanaal: free

measured at: Peutz Laboratory for Acoustics

bandwidth: 1/3 octave

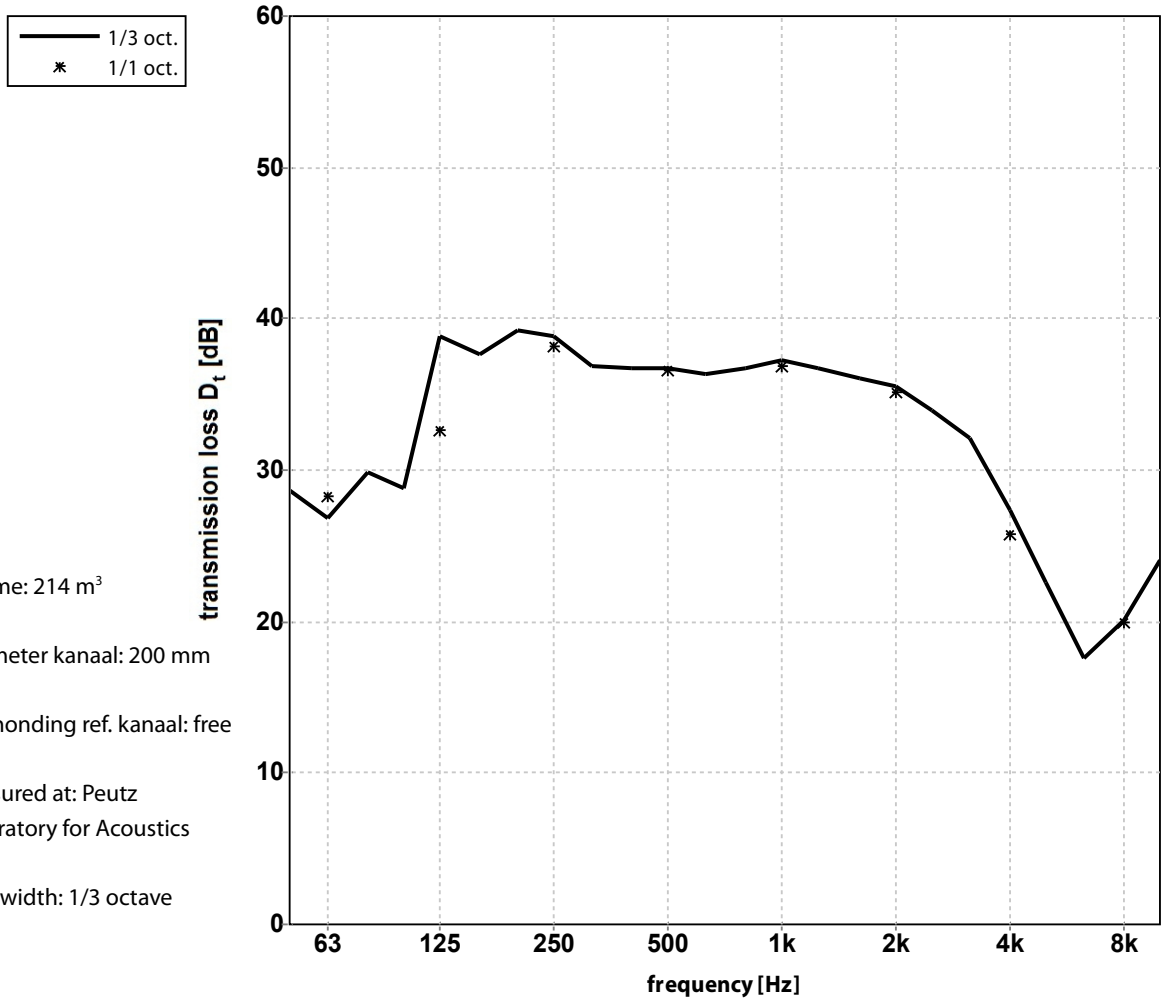
	29,2	26,8	43,1	38,4	36,4	36,1	36,8	26,7
1/3 oct.	30,4	41,2	43,1	40,3	37,2	36,3	32,1	22,6 dB
	33,0	37,2	38,4	37,5	35,2	36,0	29,4	20,6
1/1 oct.	**30,6**	**31,1**	**40,9**	**38,6**	**36,2**	**36,1**	**31,8**	**22,6 dB**

Mook, 11-09-2014

TRANSMISSION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #37; SEMI RIGID SILENCER
diameter 200 mm
length 1,0 m



volume: 214 m³

*diameter kanaal: 200 mm

*uitmonding ref. kanaal: free

measured at: Peutz Laboratory for Acoustics

bandwidth: 1/3 octave

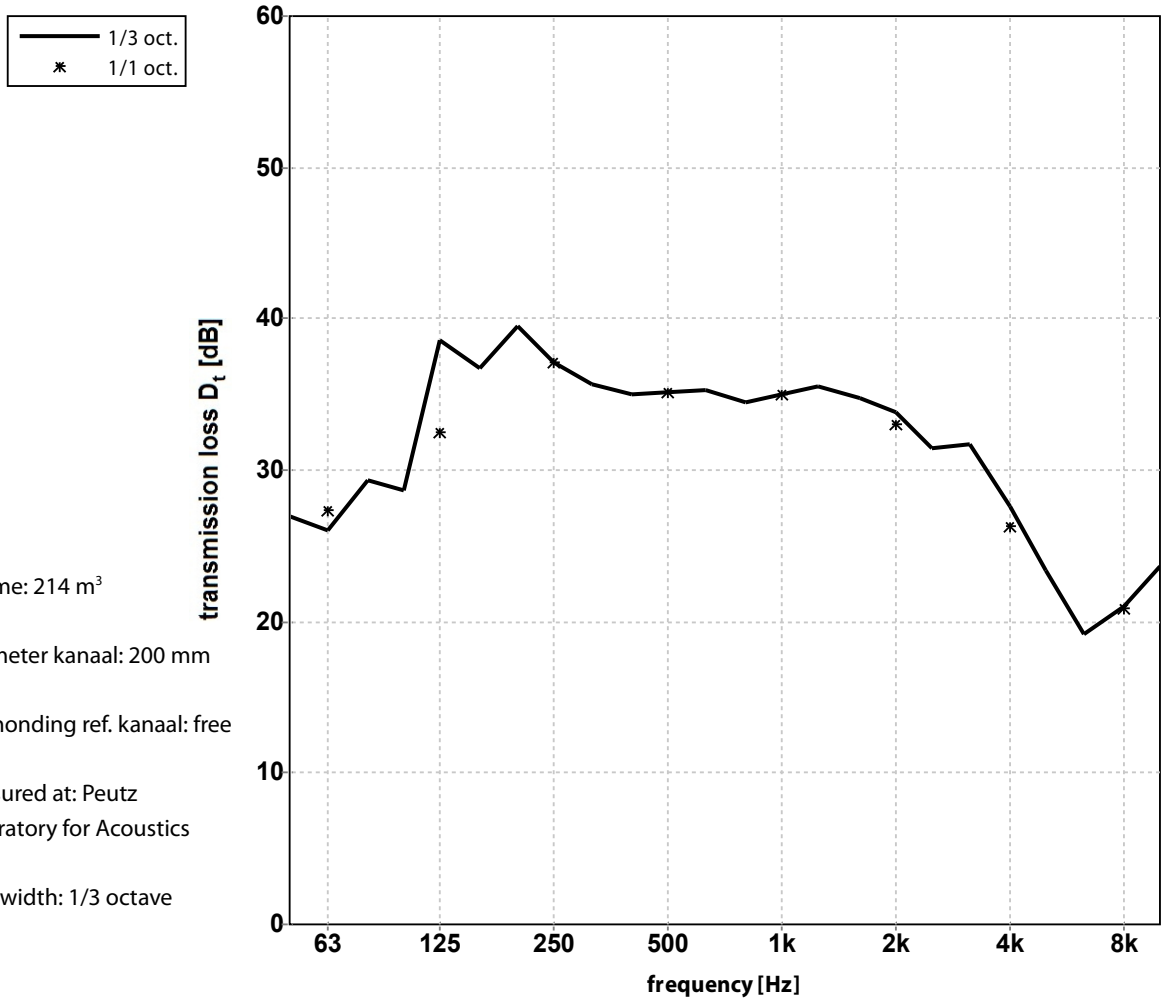
	28,7	28,8	39,3	36,7	36,7	36,1	32,1	17,6	
1/3 oct.	26,8	38,9	38,8	36,7	37,3	35,6	27,3	20,1	dB
	29,9	37,7	36,9	36,3	36,8	33,9	22,6	24,1	
1/1 oct.	**28,3**	**32,7**	**38,2**	**36,6**	**36,9**	**35,1**	**25,8**	**19,9**	**dB**

Mook, 11-09-2014

TRANSMISSION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #38; SEMI RIGID SILENCER
diameter 200 mm
length 1,0 m



volume: 214 m³

*diameter kanaal: 200 mm

*uitmonding ref. kanaal: free

measured at: Peutz Laboratory for Acoustics

bandwidth: 1/3 octave

	27,0	28,7	39,5	35,0	34,5	34,7	31,7	19,2	
1/3 oct.	26,1	38,6	37,1	35,1	35,0	33,8	27,6	21,0	dB
	29,4	36,8	35,7	35,3	35,5	31,4	23,4	23,7	
1/1 oct.	**27,3**	**32,5**	**37,2**	**35,1**	**35,0**	**33,1**	**26,3**	**20,9**	**dB**

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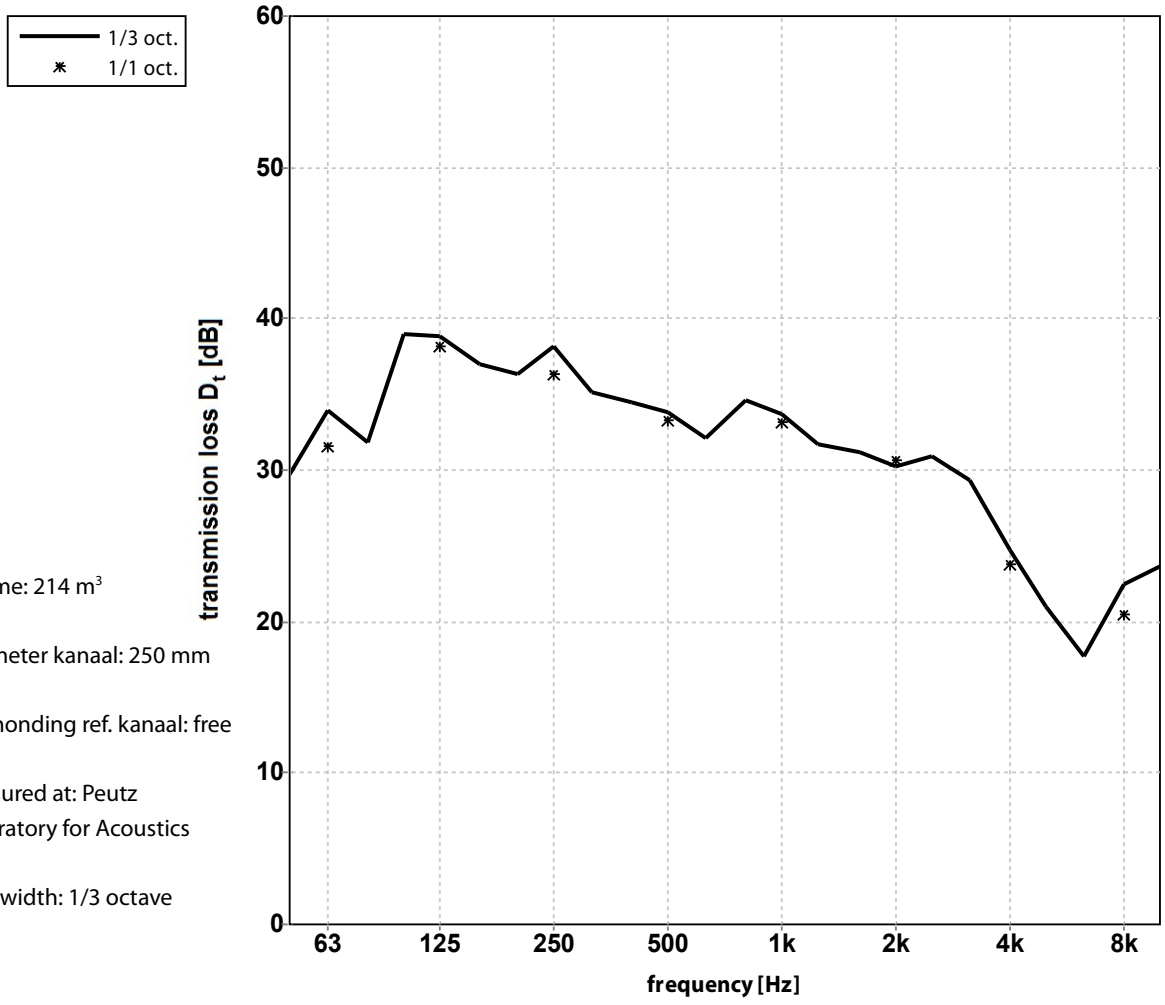
Mook, 11-09-2014

TRANSMISSION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #39; SEMI RIGID SILENCER
diameter 250 mm
length 1,0 m



volume: 214 m³

*diameter kanaal: 250 mm

*uitmonding ref. kanaal: free

measured at: Peutz
Laboratory for Acoustics

bandwidth: 1/3 octave

	29,8	39,0	36,4	34,5	34,6	31,2	29,4	17,7	
1/3 oct.	34,0	38,8	38,2	33,8	33,7	30,2	24,7	22,5	dB
	31,9	37,0	35,1	32,1	31,7	30,9	21,0	23,6	
1/1 oct.	**31,6**	**38,2**	**36,4**	**33,3**	**33,2**	**30,7**	**23,8**	**20,5**	**dB**

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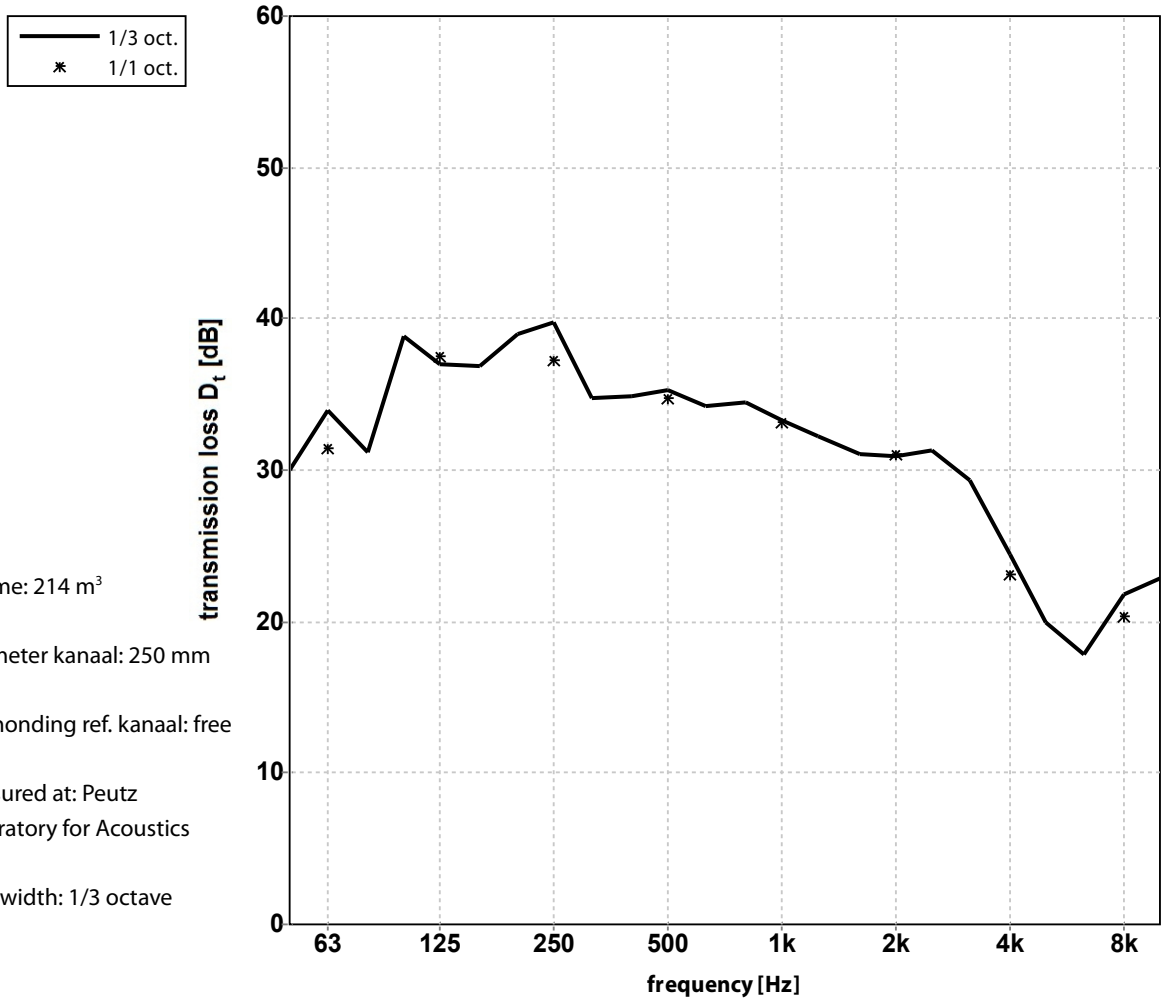
Mook, 11-09-2014

TRANSMISSION LOSS ACCORDING TO ISO 7235:2003

principal: AFS Boru Sanayi A.S.

construction tested: #40; SEMI RIGID SILENCER
diameter 250 mm
length 1,0 m



volume: 214 m³

*diameter kanaal: 250 mm

*uitmonding ref. kanaal: free

measured at: Peutz
Laboratory for Acoustics

bandwidth: 1/3 octave

		30,0	38,8	39,0	34,9	34,5	31,1	29,4	17,9	
	1/3 oct.	34,0	37,0	39,8	35,3	33,3	30,9	24,4	21,8	dB
		31,2	36,9	34,8	34,2	32,2	31,3	20,0	22,8	
1/1 oct.		**31,4**	**37,5**	**37,3**	**34,8**	**33,2**	**31,1**	**23,1**	**20,3**	**dB**

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Mook, 11-09-2014