

Chamber of Mechanical Engineers Central Laboratory

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Lande Industrial Metal Products Ltd

Acoustic Report

This report, applied by the company relevant, was made and signed by TMMOB chamber of mechanical engineers's specialists and theirs measurements.

16.08.2013

YEMİNLİ TERCÜMAN

Tercüme edilmek üzere bana verilen
Türkçe dilindeki asıl (fotokopi/faks)
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1. COMPANY INFORMATION

NAME:	LANDE END. METAL ÜR. SAN. TİC. LTD. ŞTİ.
ADRESS:	Organize Sanayi Bölgesi 20 Cd. No:14
TELEPHONES:	0 222 236 24 66
FACSIMILE NUMBER	0 222 236 13 53
DATE OF MEASUREMENT	16.08.2013
COMPANY EXECUTIVE	Aysun ALTINAY

2. IDENTIFICATION OF THE FACILITY

LANDE Endüstriyel Ürünler Sanayi Ticaret Ltd. Şti. ,which was found the adress above-stated, is in service of production of the cabinet of Rack and accessories. With the company's written application, it was made acoustic measurement and its results was below-stated in 16,08.2013.

3. MEASUREMENT PLACE

It was demanded the acoustic measurements of the computer cabinet on which listed the spots by the written application of the facility executives and theirs approved demandes. Computer Cabinet was fixed to the ground where it was.

LINE	MEASUREMENT PLACE / SOURCE CODE
01	Computer Cabinet Right Side
02	Computer Cabinet Back Side
03	Computer Cabinet Left Side
04	Computer Cabinet Front Side
05	Computer Cabinet Upper Side

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4. MEASUREMENT PLAN

Measurement Line No	Measurement Parameter	Measurement Date	Related Standard
	Noise		
01	x	16.08.2013	TS EN ISO 3744
02	x	16.08.2013	TS EN ISO 3744
03	x	16.08.2013	TS EN ISO 3744
04	x	16.08.2013	TS EN ISO 3744
05	x	16.08.2013	TS EN ISO 3744

5. MEASURED DEVICES

Noise Analyse Device			
Brand	Bruel&Kjaer	Measured Interval	20-140 dB
Type	2250	Oktav Bant	1/1 - 1/3
Serial Number	2630350	Class	IEC 60651 ve 60804 Type - 1, according to IEC 61672 Class-1

Calibrator			
Brand	Bruel&Kjaer	Level	94 dB ve 114 dB
Type	4231	Frequency	1000 hz
Serial Number	2637186	Class	1(IEC 60942)

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(Signature)

6. MEASUREMENTS

6.1. SOURCE POWER AND PROTECTION CASE

Specifications			
Brand	LANDE	Sizes	1000X750X600 mm
Type	17U / 32U / 42U 19"	Measured Intervals	1 m
Serial Number	0001	Measured Radius	1,5 m
Production Year	2013	Acoustic Environment Condition	Device is in a sterilized place.

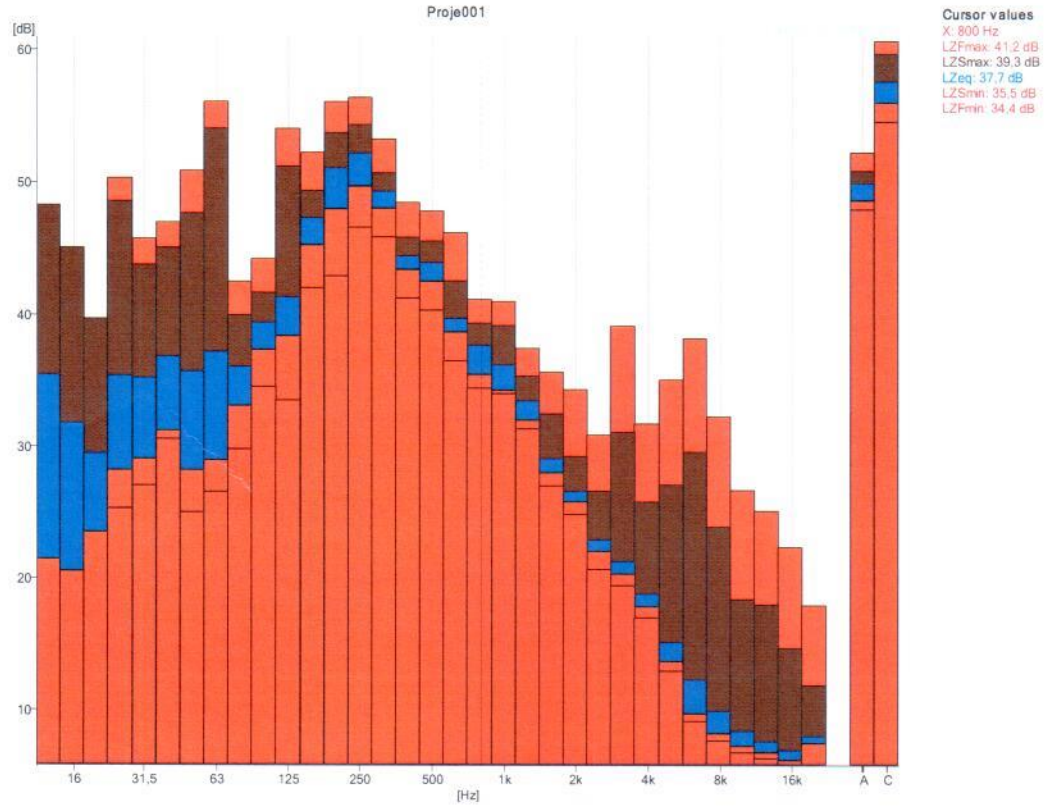
Measurement Line Number	Measurement Value (leq dBA)	Measurement Date	Related Standart
01	49,9	16.08.2013	TS EN ISO 3744
02	50,3	16.08.2013	TS EN ISO 3744
03	49,7	16.08.2013	TS EN ISO 3744
04	49,9	16.08.2013	TS EN ISO 3744
05	49,2	16.08.2013	TS EN ISO 3744

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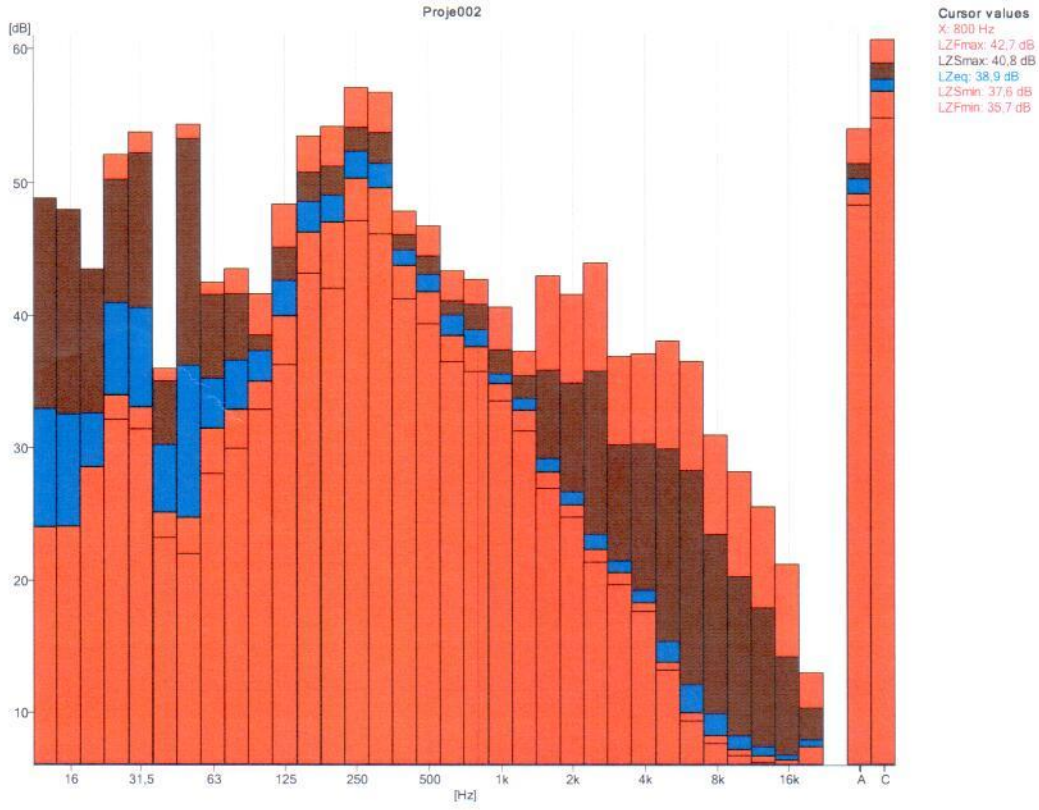
1. Measurement Point: Computer Cabinet Right Side



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Tercüme edilmek üzere bana verilen
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2. Measurement Point: Computer Cabinet Back Side

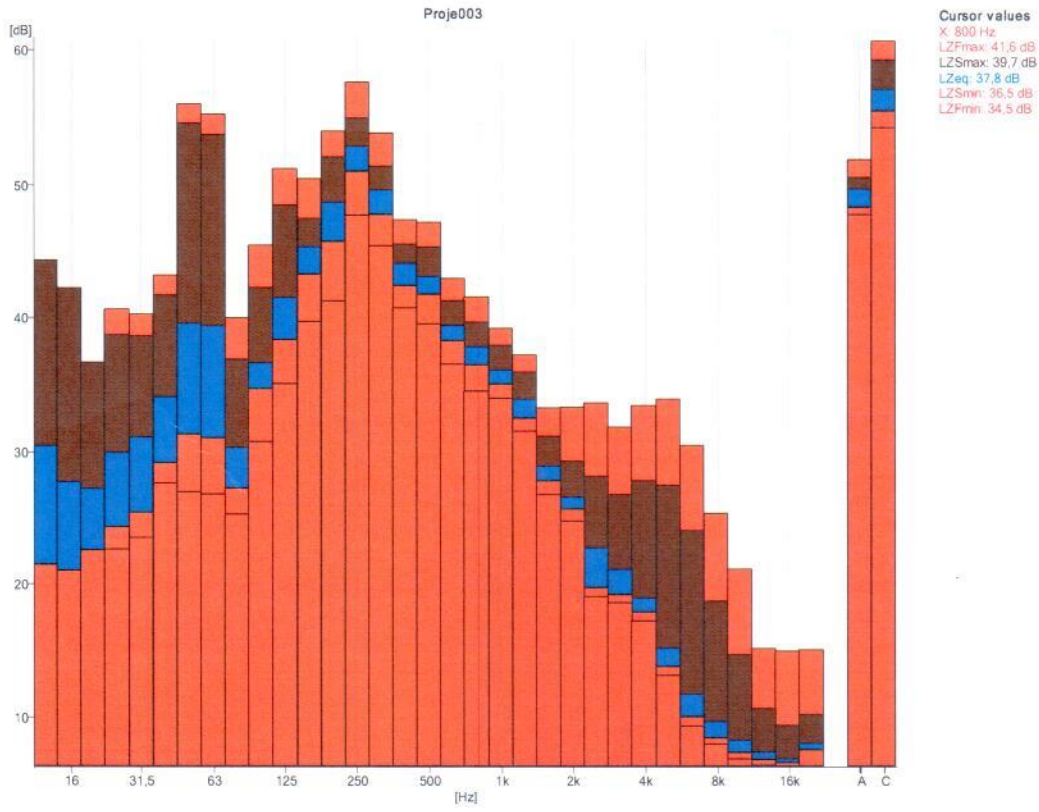


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Ilknur Didem Bilgiç

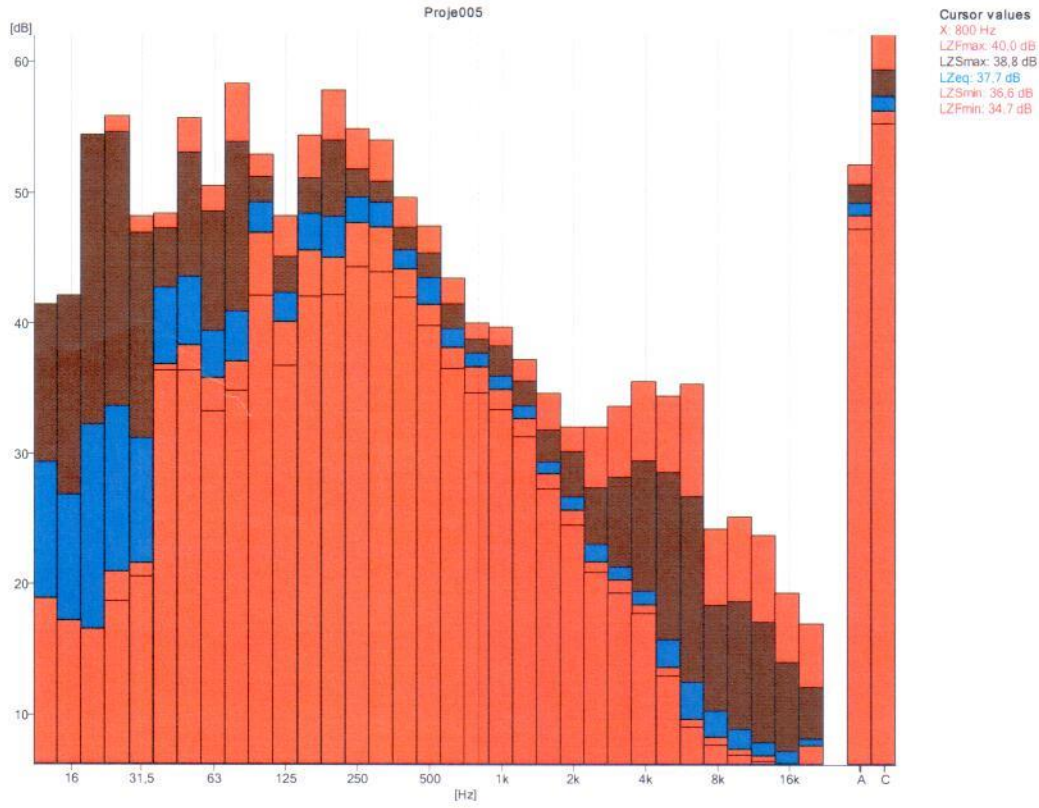
2. Measurement Point: Computer Cabinet Left Side



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5. Measurement Point: Computer Cabinet Upper Side



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belgeyi.....~~ingilizce~~.....dilinde tam ve doğru
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Ilknur Didem Bilgici

Table-2

Ölçüm No	63 Lpi - (hz) Lport	125 Lpi - (hz) Lport	250 Lpi - (hz) Lport	500 Lpi - (hz) Lport	1000 Lpi - (hz) Lport	2000 Lpi - (hz) Lport	4000 Lpi - (hz) Lport	8000 Lpi - (hz) Lport
1	37,22 -0,28	41,32 -0,42	52,17 0,43	43,09 -0,23	36,2 0,10	26,58 -0,15	18,8 -0,76	9,96 -0,12
2	35,23 -2,27	42,61 0,87	52,37 0,63	43,07 -0,25	35,5 -0,56	26,7 -0,03	19,2 -0,34	9,94 -0,14
3	39,4 1,90	41,53 -0,21	52,85 1,11	43,12 -0,20	36,1 -0,02	26,55 -0,02	18,9 -0,69	9,68 -0,40
4	33,31 -4,19	40,64 -1,10	50,95 -0,79	43,78 0,46	36,7 0,60	27,12 0,39	21,1 1,50	10,5 0,44
5	39,39 1,89	42,34 0,60	49,69 -2,05	43,52 0,20	35,9 -0,18	26,7 -0,03	19,5 -0,13	10,3 0,22

Lport

49,8 dBA

1st Step, Lp

Through the measurement line, around the device, it was determined 6 microfon points. On these 6 measurement point, for every single octave band, sound pressure level; Lp level was stated below.

$L_p = 10 \log[1/N \sum 10^{0,1L_{pi}}]$ from this formule;

$$\overline{L_p} = 10 \log\left(\frac{1}{5} \sum_{i=1}^5 10^{0,1L_{pi}}\right) = 49,8 \text{ dB was calculated. (table 2)}$$

2nd Step

It was seen from the calculations on the Table 1, the difference between measured sound pressure level and averaged sound pressure level, is not more than 5 dB;

$$L_{pi} - L_{port} < 5 \text{ dB}$$

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3rd Step

Around the measurement line, according to the every single octave band, a second fixed sound pressure level TS 3744 standard's item 8.1 using the formule stated below;

$$\bar{L}_p^* = 10 \lg \left[\frac{1}{N} \sum_{i=1}^N 10^{0.1 L_{p_i}^*} \right] \text{ dB}$$

Lp back plan = because there was a calculation measurement in a place where it wasn't any noise from the back side, there was no any correction \bar{L}^* port.

$$L_p = 10 \log(10^{0.1 L_N + S} - 10 \log 10^{0.1 L_N})$$

4th Step

The term of the correction was found using this formul below

$$K_1 = 10 \log(1 - 10^{-0.1 \Delta L}) \text{ dB}$$

-

$$\Delta L = \bar{L} \bar{P} - L * \bar{P}$$

Because it is $\Delta L > 15 \text{ dB}$ there was no correction.

5th Step

Because of the device's (BruelKjaer) perception of the sound from everywhere, is $\Delta LM = 0$.

6th Step

$$L_w = \bar{L}_{pf} + 10 \log \frac{(S)}{(S_0)}$$

$$\bar{L}_{pf} = \bar{L}' \bar{p} - K_1 - K_2$$

K_2 for semi-no-reverbant field rooms were ignored.

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$$S=1 \text{ m}^2, S_0 =1 \text{ m}^2$$

S : as square meter, measurement surface side,

$$L_w = 49,8 \text{ dB}$$

7. RESULT

It was made noise measurements on 5 point around the computer cabinet for befall of LANDE Endüstriyel Ürünler Sanayi Ticaret Ltd.Şti by written application in 16.08.2013. In every single point of the measurement, results were stated one by one. In this result of the noise measurement, power of the noise in the source of noise, was found **Lw= 49,8 dB.**

Herein report was realised and signed by TMMOB The Central Laboratory of Chamber of Mechanical Engineers. (09.09.2013)

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7.12.2013 tarihinde dilindeki asıl (fotokopi/faks)
belgeyi 10.12.2013 tarihinde tam ve doğru
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TÜRKAK
TÜRK AKREDİTASYON KURUMU
TURKISH ACCREDITATION AGENCY

was accredited.

AVL ACOUSTIC VIBRATION
CALIBRATION LABORATORY

İvedik O.S.B 1385 Sk. No: 10 OSTİM/ANKARA

Calibration Certificate

Customer: TMMMOB CHAMBER OF THE MECHANICAL ENGINEERS
KIZILCIKLI MAHMUT PEHLİVAN CAD. ALTIN SOK. NO: 1 KÜPELİ APT.
KAT :3 26130- ESKİŞEHİR

Order No: ISK-0085

Instrument/Device: Sound Calibrator

AB-0089-K

2013-0085

02-2013

Manufacturer: Bruel&Kajer

Type: 4231

Serial Number: 2637186

Date of calibration: 01.02.2013

Number of pages of the certification : 2

This calibration certificate documents the traceability to national standards, which realize the unit of measurement according to the International System of Units (SI). The Turkish Accreditation Agency (TÜRKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation (EA) and of the International Laboratory Accreditation (ILAC) for the Mutual recognition of calibration certificates.

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The measurements, the uncertainties with confidence probability and calibration methods are given on the following pages which are part of this certificate.

Seal Date Certified by Head of the Calibration Laboratory

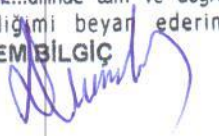
01.02.2013 Younes NEVAYE SHIRAZI Younes NEVAYE SHIRAZI

this certificate shall not be reproduced other than in full except with the permission of the laboratory calibration certificates without signature and the seal are not valid.

Tel: +90 312 394 15 50 web site: www.avi.com.tr e-mail: bilgi@avi.com.tr

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AVL ACOUSTIC VIBRATION
CALIBRATION LABORATORY

AB-0089-K

2013-0085

02-2013

1. Device to be Calibrated : Sound Calibrator
Name of the instrument :
Manufacturer : Brüel&Kjaer
Serial Number : 2637186
Type : 4231

2. Date of Receipt of Device : 01.02.2013

3. Calibration Method

Calibration was performed in accordance with TS EN 60942 standards with the comparative method.

4. References used in calibration

Device	Manufacturer	Serial No:	Type	Certificate No:	Traceability
Calibration System	Spektra	201003	CS 18 VLF MF	D-K-15183-01-00-0277	Spektra
Acoustic Calibrator	Brüel & Kjaer	2705957	4231	D-K-15183-01-00-0228	Spektra
Microphone	Brüel & Kjaer	27009959-2154	4192-MV203	D-K-15183-01-00-0289	Spektra

5. Environment Conditions

Ambent Temperature : 22.00.± 3 °C

Relative Humidity : 38.0± 25 %

Ambent Pressure : 910 ± 1 hPa

6. Measurement Uncertainty

6.1 94 dB 1000 Hz:

Sound Pressure Level : 0.14 Db

Sound Frequency : 0.10 Hz

Distortion Factor : 0.59 %

6.2 114 dB 1000 Hz

Sound Pressure Level : 0.14 Db

Sound Frequency : 0.10 Hz

Distortion Factor : 0.38 %

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7. Calibration Results	: Nominal Value	94.00 dB	114,00 dB
Sound Pressure Level	: Measured Value	93,82 dB	113,79 dB
	Deviation	-0,18 dB	-0.21 dB
Sound Frequency	: Nominal Value	999,987 Hz	1000,007 Hz
	Measured Level	1000,042 Hz	1000,016 Hz
	Deviation	0.055 Hz	0.009 Hz
Distortion Factor	: Measured Value	0.300 %	0.330 %
Reference Sound Pressure		20 µPa	

8. Statement of Compliance

The measurement results and measurement uncertainty were given. The user have to consider the results and decide compliance of the device. The reported expended uncertainty for measurement is stated as the standart uncertainty of multitude by coverage factor $k=2$ which for a normal distribution corresponds to coverage of approximately 95%. The Standard measurement uncertainty is defined according to the GUM and EA-4/02 documents. Measurement results, the expended measurement uncertainty of measurement and calibration methods, is an integral part of this certificate.

9. Remarks

The result reported in this certificate refer to the condition of the instrument on the date of calibration and carry no implication stability of the instrument.

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UME
G2AK-0205
12-11

TUBITAK NATIONAL METROLOGIE INSTITUTE
Calibration Certificate

Customer / Adress : Kızılcıklı Mahmut Pehlivan Cd. Altın Sk. No:
1Kat : 3 26130 ESKİŞEHİR

Order No : 2011.01626

Instrument/ Device : Hand-held Analyzer

Manufacturer : Bruel & Kjaer

Type : 2250

Serial Number : 2630350

Date of Calibration : 30.11.2011 – 01.12.2011

Total Number of Pages : 6

This calibration certificate documents traceability to national standards, which realize units of measurement according to the International System of Units (SI), UME is a signatory of the BIPM Mutual Recognition Arrangement (MRA).

Measurement results, expanded uncertainties and calibration methods are given on the following pages, which are part of this certificate.

02.12.2011

Dr.Fatih Üstüner

Date

Acting Director

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Instrument/Device

Line No :	Device Name	Producer Company	Type	Serial No.	Measurement Interval or Appropriate description
1.	Hand-held analyzer	Brüel& Kjaer	2250	2630350	Classe :1 (IEC 61672) Frequency Weight: A,B,C, Z (Lin.) Time Weight: Fast - Slow

Location

TUBİTAK UME

Date of Receipt of the Device

23.11.2013

Reference(s) Used in Calibration

Line No	Device Name	Producer Company	Type/Model	Serial No	Traceability
1.	Multifunction Acoustic Calibrator	Brüel & Kjaer	4226	2433717	UME, G2AK- 0170, 15.11.2011

Calibration Method and Procedure

Calibration of hand-held analyzer was made according to Sounding-Level Meter Calibration's regulation TLM-05-G2AK-04-08.

Microphone of Hand-made Analyzer (SLM) type B&K 4226 inserted as acoustic calibrator. It was controlled the reactions of produced reference sound pressure

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measured with SLM mainly A, mainly B, mainly C and Lin. Filters in the level of 94 dB, in between 31.5 Hz – 16 kHz octav band frequencies.

It was controlled of the SLM's linearity, producing reference sound pressure conjunction of the acoustic calibration in 1kHz 94 dB, 104 dB and 114 dB.

In this conjunction, SLM's Fast and Slow time weight was controlled in the level of 1, 2, and 4 kHz in 106 dB.

It was measured "Crest" factor, producing reference sound pressure in the conjunction 2 kHz 94 and 104 dB.

Sound pressure which was produced in 1 kHz 94 dB was observed and measured its maximum deviation in that level.

During the calibration, sound pressure level rates which were produced by reference device, it was considered with recorrecting ambient conditions.

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belgeyi.....~~Türkçe~~ İngilizce dilinde tam ve doğru
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Environmental Conditions

Temperature : (24,4 ± 0.5) °C

Relative Humidity : % (36.3 ± 1.0)

Pressure : (1004,4 ± 1.0) mbar

Calibration Results

Table 1. Results of Frequency Reply of mainly filter A

Frequency (Hz)	Nominal SPL (dB)	Characteristic of the Filter mainly A (dB)	Calculated SPL (dB)	Measured SPL (dB)	Reaction Difference	Tolerance (dB)
31,5	93,97	-39,4	54,6	54,7	0,1	± 2,0
63	94,00	-26,2	67,8	67,8	0,0	± 1,5
125	93,99	-16,1	77,9	77,9	0,0	± 1,5
250	93,99	-8,6	85,4	85,3	-0,1	± 1,4
500	93,97	-3,2	90,8	90,7	-0,1	± 1,4
1000	93,99	0,0	94,0	94,0	0,0	± 1,1
2000	94,03	1,2	95,2	95,3	0,1	± 1,6
4000	94,03	1,0	95,0	95,2	0,2	± 1,6
8000	94,00	-1,1	92,9	92,9	0,0	+ 2,0 ; -3,1
12500	94,19	-4-3	89,9	90,4	0,5	+ 3,0 ; - 6,0
16000	94,10	-6,6	87,5	87,6	0,1	+ 3,5 ; -17,0

Values on the table was taken, when the hand-held analyzer in the filter "mainly A" and "Fast" mode.

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Table 2. Results of Frequency Reply of mainly filter B

Frequency (Hz)	Nominal SPL (dB)	Characteristic of the Filter mainly B (dB)	Calculated SPL (dB)	Measured SPL (dB)	Reaction Difference	Tolerance (dB)
31,5	93,97	-17,1	76,9	77,0	0,1	± 2,0
63	94,00	-9,3	84,7	84,8	0,1	± 1,5
125	93,99	-4,2	89,8	89,8	0,0	± 1,5
250	93,99	-1,3	92,7	92,7	0,0	± 1,4
500	93,97	-0,3	93,7	93,6	-0,1	± 1,4
1000	93,99	0,0	94,0	94,0	0,0	± 1,1
2000	94,03	-0,1	93,9	94,0	0,1	± 1,6
4000	94,03	-0,7	93,3	93,5	0,2	± 1,6
8000	94,00	-2,9	91,1	91,1	0,0	+ 2,0 ; -3,1
12500	94,19	-6,1	88,1	88,6	0,5	+ 3,0 ; - 6,0
16000	94,10	-8,4	85,7	85,7	0,1	+ 3,5 ; -17,0

Values on the table was taken, when the hand-held analyzer in the filter "mainly B" and "Fast" mode.

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Table 3. Results of Frequency Reply of mainly filter C

Frequency (Hz)	Nominal SPL (dB)	Characteristic of the Filter mainly C (dB)	Calculated SPL (dB)	Measured SPL (dB)	Reaction Difference	Tolerance (dB)
31,5	93,97	-3,0	91,0	91,1	0,1	± 2,0
63	94,00	-0,8	93,2	93,2	0,0	± 1,5
125	93,99	-0,2	93,8	93,8	0,0	± 1,5
250	93,99	0,0	94,0	93,9	-0,1	± 1,4
500	93,97	0,0	94,0	93,9	-0,1	± 1,4
1000	93,99	0,0	94,0	94,0	0,0	± 1,1
2000	94,03	-0,2	93,8	93,9	0,1	± 1,6
4000	94,03	-0,8	93,2	93,4	0,2	± 1,6
8000	94,00	-3,0	91,0	91,0	0,0	+ 2,0 ; -3,1
12500	94,19	-6,2	88,0	88,5	0,5	+ 3,0 ; - 6,0
16000	94,10	-8,5	85,6	86,1	0,5	+ 3,5 ; -17,0

Values on the table was taken, when the hand-held analyzer in the filter "mainly C" and "Fast" mode.

Table 4. The Results of Z (Lin.) Filter's Frequency Response Control

Frequency (Hz)	Nominal SPL (dB)	Measured SPL (dB)	Reaction Difference (dB)	Tolerance (dB)
31,5	93,97	94,1	0,1	± 2,0
63	94,00	94,0	0,0	± 1,5
125	93,99	94,0	0,0	± 1,5
250	93,99	94,0	0,0	± 1,4
500	93,97	93,9	-0,1	± 1,4
1000	93,99	94,0	0,0	± 1,1
2000	94,03	94,1	0,1	± 1,6
4000	94,03	94,2	0,2	± 1,6
8000	94,00	94,0	0,0	+2,0; -3,1
12500	94,19	94,8	0,6	+3,0; -6,0
16000	94,10	94,2	0,1	+3,5; -17,0

Values on the table was taken, when the hand-held analyzer in the filter "mainly Z" and "Fast" mode.

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Table 5. Results of Linearity Control of Hand-held Analyzer in 1 kHz.

Frequency (Hz)	Applicated		Measured		Linearity Reaction Difference (dB)	Tolerance (dB)
	SPL (dB)	Line Up (dB)	SPL (dB)	Line Up (dB)		
1000	93,99	0,00	94,0	0,0	0,00	±0,6
	103,99	10,00	104,0	10,0	0,00	
	113,98	19,98	114,0	20,0	0,02	

Values on the table was taken, when the hand-held analyzer in the filter "mainly A" and "Fast" mode.

Table 6. Results of Hand-held Analyser's Fast and Slow Time Time-Weighted Filters Control

Frequency (Hz)	Fast				Slow			
	Nomin al (SPL) (dB)	Mesaur ed (SPL) (dB)	Reaction Differen ce (dB)	Toleren ce (dB)	Nomin al SPL (dB)	Measur ed SPL (dB)	Reaction Differen ce (dB)	Tolere nce (dB)
1000	105,0	105,0	0,0	±0,8	101,9	102,0	0,1	±0,8
2000	105,0	105,0	0,0	±0,8	101,9	102,0	0,1	±0,8
4000	105,0	105,0	0,0	±0,8	101,9	102,0	0,1	±0,8

Values on the table was taken, when the hand-held analyzer in the filter "mainly A" .

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Table 7. Results of Hand-held Analyzer's Control "Crest Factor CF=3"

Frequency (Hz)	Nominal SPL (dB)	Measured SPL (dB)	Reaction Difference (dB)	Tolerance (dB)
2000	94,0	94,3	0,3	± 0,5
	104,0	104,2	0,2	

Values on the table was taken, when the hand-held analyzer in the filter "mainly A" .

Table 8. Maximum deriation of Hand-held Analyzer for An Hour Work

Nominal SPL (dB)	Measured SPL (dB)	Maximum Deriation* (dB)	Tolerance(dB)
93,99	94,0	0,1	± 0,3

*Maximum deriation is a change measured in an hour.

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Measurement Uncertainty

Measurement approximate uncertainty in calibration of Hand-held Analyser is 0,2 dB.

Explained extended uncertainty value, is the result of multiplication with coverage factor $k=2$ which provides reliability, approximately %95 for normal value of Standard uncertainty. Standard measurement uncertainty is determined for documents GUM and EA-4/02.

Comments, Remarks and Statement of Compliance

Measurements Results were compared with tolerances in IEC 61672-1 standards 1st Class Sound Level Meters. All characteristics of the device are determined with the conditions.

Calibration Results were obtained when microphone sensibility level was set 52,79 mV/Pa.

Calibration Results are just belong to Hand-held Analyser which is made its calibration. The user is responsible of the requirements and its calibration for performance of the device.

<i>Performed by</i>		<i>Head of the Laboratory</i>	
<i>Name</i>	<i>Sign</i>	<i>Name</i>	<i>Sign</i>
Dr. Enver SADIKOĞLU		Dr. Enver SADIKOĞLU	

YEMİNLİ TERCÜMAN

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