

TEST REPORT

2025AU0693

DATE OF RECEPTION

Date Format: dd/MM/yyyy 10/06/2025

DATE TESTS

Starting: 13 May 2025

Ending: 22 May 2025

APPLICANT

ACTIU BERBEGAL Y FORMAS, S.A.
P.T. ACTIU; AUTOVIA CV.80 SALIDA ONIL-
CASTALLA
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Spain

Att. Pablo Miró Aparisi

IDENTIFICATION AND DESCRIPTION OF SAMPLES

Reference by AITEX	Reference by customer	AITEX sample description
2025AU0693-S01	QYOS 600	Material

Tests performed on models Qyos v3

TEST CARRIED OUT

- DETERMINATION OF THE BOOTH'S ACOUSTIC INSULATION CHARACTERISTICS.



RESULTS

DETERMINATION OF THE BOOTH'S ACOUSTIC INSULATION CHARACTERISTICS

Standard

UNE-EN ISO 11957:2010

Measurement date

May 2025

Material tested

2025AU0693-S01

Instrument used

Brüel and Kjaer acoustic level meter type 2255. SN: 2255-100392

Brüel & Kjaer micro 1/2" type 4966. SN: 3412663

Brüel & Kjaer preamplifier ZC-0043. SN: 3409190

Brüel & Kjaer micro 1/2" type 4231. SN: 3019977

Brüel & Kjaer dodecahedron source OmniPower 4292. SN: 085008

Brüel & Kjaer Stage amplifier 2755. SN: 2755-023002

Purpose of the test

This study was carried out at the request of the company ACTIU and the acoustics of the Q600 booth were evaluated in the reverberation chamber of the Universitat Politècnica de Valencia's Escuela Politécnica Superior de Gandia.

The main purpose of the study was to make measurements following Standard UNE-EN ISO 11957:2010. Acoustics. Determination of acoustic insulation characteristics in booths. Laboratory and on site measurements. (ISO 11957:1996). This international standard describes a laboratory method (chapter 6) and on-site methods (chapter 7) for the determination of the acoustic insulation characteristics of noise protection booths. The acoustic insulation characteristic is the reduction produced by the booth of the acoustic pressure level or acoustic power level. In this report the laboratory method is applied in the reverberation chamber of the Escuela Politécnica Superior de Gandia of the Universitat Politècnica de Valencia.

For the laboratory method described in the standard, the requirements concerning the laboratory test environment are based on those set out in Standard UNE-EN ISO 3741:2011. Acoustics. Determination of the acoustic strength levels and acoustic energy levels of noise sources from acoustic pressure. Laboratory methods in reverberation chambers. (ISO 3741:2010).

The measurements were carried out on 13 May 2025 in the acoustics laboratories and chambers of the Universitat Politècnica de Valencia's Escuela Politécnica Superior de Gandia.

Date of last report revision: 22 May 2025

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Procedure

This test was carried out in the reverberation chamber of the Escuela Politécnica Superior de Gandia (EPSG) of the Universitat Politècnica de Valencia on 13 May 2025. The environmental conditions were normal with no sudden changes in temperature or humidity. The tests with an empty chamber showed a temperature of 21.5°C and a relative humidity of 66.9%, with configuration 1 marking a temperature of 21.4°C and a relative humidity of 74.6%, and with configuration 2 marking a temperature of 21.4°C and a relative humidity of 75.0%.

Figures 1 and 2 show details of the reverberation chamber set up with the booth.



Figure 1: Reverberation chamber assembly position 1



Figure 2: Assembly with booth position 2

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The following is a summary of the method of LABORATORY MEASUREMENT OF ACOUSTIC INSULATION CHARACTERISTICS according to the standard.

The test environment shall be a reverberant room according to the specifications of ISO 3741 Standard. A reverberant acoustic field is generated in a room and the difference in acoustic pressure levels produced in the room and inside an empty booth is determined.

The booth shall be placed on the floor in an asymmetrical manner, i.e. no wall of the booth shall be parallel to the walls of the room.

For measurements in the frequency range 100 Hz to 10 000 Hz, the distance between the booth, the walls and the ceiling of the room shall be at least equal to half the wavelength corresponding to the average frequency of the lowest representative frequency band. In addition, the distance between the booth and any diffusing element in the room shall be at least half the wavelength. For measurements in the frequency range 50 Hz to 80 Hz, the distance shall be at least 2 m.

The booth shall be present for the entire duration of the measurements carried out in the room. The booth shall be installed in accordance with the manufacturer's instructions.

The booth shall be empty during the measurement. When measuring the acoustic insulation characteristics and, unless otherwise specified in the instructions for use of the booth, doors and windows shall be closed, and noise sources which are an integral part of the booth, such as fans, shall be switched off and valves or dampers of the ventilation system shall be open.

At least two loudspeaker positions must be used to generate the acoustic field in the reverberant room. Measurements can be taken either sequentially by moving a loudspeaker between the chosen positions, or by using several loudspeakers simultaneously, provided that each loudspeaker has its own noise generator and power amplifier.

The distance between each loudspeaker shall be at least 3 m. The distance between each loudspeaker position and the booth shall be as large as possible and at least 2 m. The distance between the loudspeakers and any microphone position shall be at least 2 m.

The emitted sound shall be stable and its spectrum shall be continuous over the frequency range considered. If the measurement is carried out using octave bands, the spectrum shall be more or less flat for each of the octave bands. The 3 third octave band levels within each octave band shall not differ by more than 6 dB in the 125 Hz octave band, 5 dB in the 250 Hz band and 4 dB in the higher frequency bands. The sound emission shall be loud enough to produce an acoustic pressure level inside the booth that exceeds the background noise level by at least 6 dB and preferably by more than 12 dB for all representative frequency bands. Background noise correction inside the booth shall be carried out in accordance with ISO 3741 Standard.

The frequency range shall extend at least from 100 Hz to 5 000 Hz for third octave bands and from 125 Hz to 4 000 Hz for octave bands. The frequency ranges shall preferably be 50 Hz to 10 000 Hz for third octave bands and 63 Hz to 8 000 Hz for octave bands.

Acoustic pressure levels in octave bands or octave thirds in the room shall be measured, for each microphone position, at least at six fixed positions evenly distributed around and above the booth. The mean acoustic pressure level at different loudspeaker positions in the reverberant room shall be determined by quadratic averaging.

The distance between each microphone position and the inner limits of the booth shall not be less than 0.2 d, where d is the smallest inner dimension of the booth. All positions shall be at least 1 m above the ground.

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The acoustic pressure level for each loudspeaker position shall be measured at least at six fixed microphone positions. The root mean square value of the acoustic pressure levels measured at the different microphone positions shall be calculated.

Acoustic insulation in one-third octave or octave bands, D_p , is obtained from the relationship

$$D_p = (L_p)_{\text{room}} - (L_p)_{\text{booth}}$$

where

$(L_p)_{\text{room}}$ is the average sound pressure level, in decibels, in one-third octave or octave bands in the room;

$(L_p)_{\text{booth}}$ is the average sound pressure level, in decibels, in one-third or octave bands in the booth;

If the booth contains noise sources (e.g. fans) installed as integrated elements in the booth, the A-weighted acoustic pressure level, L_{pA} , induced by these noise sources inside the booth shall be determined, when the external noise sources present in the room have been removed. For booths where none of the operator positions are well defined, the acoustic pressure level shall be measured near the centre of the booth at three positions on a sphere with a radius of 0,3 m or averaged over a circular path of the microphone with a radius of 0.3 m. This path shall be inclined at 45° to the horizontal plane. The centre of this measuring sphere shall be 1.55 m \pm 0.075 m above ground level. The measurement result, L_{pA} , is the root mean square value of the measured values.

The background noise level inside the booth (when the integrated acoustic sources are stationary) shall be at least 6 dB and preferably 12 dB below the acoustic pressure level determined in the presence of the noise sources to be measured. If the difference is in the range of 6 dB to 10 dB, the measurement results shall be corrected for background noise according to ISO 3741 Standard.

The weighted acoustic insulation, $D_{p,w}$ is calculated according to ISO 717-1 Standard using D_p which are the basic values used in ISO 717-1 Standard.

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Reverberation chamber set-up

In order to obtain the power levels that meet the standard, the reverberation time and the background noise inside the reverberation chamber must also be measured. Table 2 shows the background noise measurements in the reverberation chamber before the measurements and the background noise with the ventilation system on.

<i>Frequency (Hz)</i>	<i>Recorded background noise levels (dB)</i>	<i>Ventilation system levels in service (dB)</i>
100	8.8	40.4
125	8.5	39.4
160	7.4	37.1
200	8.3	27.9
250	8.6	24.6
315	9.0	20.8
400	7.3	19.2
500	6.9	17.2
630	5.0	15.6
800	2.6	12.1
1000	1.7	10.1
1250	2.3	6.9
1600	3.4	3.4
2000	5.2	1.7
2500	6.2	1.7
3150	6.6	2.4
4000	7.1	4.0
5000	7.5	4.9

Table 2. Recorded background noise levels during tests.

The average background noise value of the reverberation chamber in the defined frequency range is $L_{PA} = 20.0 \text{ dBA}$. The A-weighted acoustic pressure level, L_{pA} , induced by these noise sources inside the booth is $L_{pA} = 21.6 \text{ dBA}$.

Table 3 below shows the reverberation time data.

<i>Frequency (Hz)</i>	<i>Reverberation time (s)</i>
100	8,8
125	6,4
160	5,8
200	6,0
250	6,6
315	7,1
400	7,1
500	7,3
630	7,3
800	7,2
1000	6,9
1250	6,4
1600	5,7
2000	5,0
2500	4,3
3150	3,5
4000	2,8
5000	2,1
6300	1,5
8000	1,1
10000	0,9

Table 3. Reverberation time in the reverberation chamber.

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Measurement of acoustic insulation

The acoustic insulation measurement results are shown below. Table 4 shows the results obtained averaged over frequency bands of $(L_p)_{\text{room}}$, $(L_p)_{\text{booth}}$ and acoustic insulation D_p .

<i>Frequency</i>	<i>Emission level</i>	<i>Reception level</i>	<i>Acoustic insulation</i>
f (Hz)	$(L_p)_{\text{room}}$ (dB)	$(L_p)_{\text{booth}}$ (dB)	D_p (dB)
100	106.0	91.9	14.1
125	107.5	90.1	17.5
160	109.7	94.5	15.2
200	109.2	93.0	16.2
250	107.8	90.6	17.3
315	106.6	88.4	18.2
400	105.6	84.3	21.3
500	104.2	80.6	23.6
630	102.7	76.7	26.1
800	101.3	72.5	28.8
1000	100.2	68.1	32.1
1250	100.5	66.6	33.9
1600	102.1	66.6	35.6
2000	99.5	62.2	37.3
2500	100.7	62.7	38.0
3150	98.5	60.3	38.3
4000	96.7	58.0	38.7
5000	95.6	55.1	40.6

Table 4. Results of acoustic insulation measurement in booth Q600

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**Assessment according to UNE-EN ISO 11957:2010**

This section shows the overall assessment according to the UNE-EN ISO 11957:2010 Standard for the Q600 booth.

The weighted acoustic insulation, $D_{p,w}$ which is calculated according to ISO 717-1 Standard using D_p which are the basic values used in ISO 717-1 Standard, and an expanded uncertainty of 95% is as follows:

$$D_{p,w} = 29 \pm 1 \text{ dB}$$

ANNEX I shows the results presentation sheet according to the above-mentioned standard.


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APPENDIX 1. DATA SHEETS ACCORDING TO UEN-EN ISO 11957:2010 STANDARD

Cámara reverberante. Escuela Politécnica Superior de Gandía
Aislamiento acústico de cabina según Norma UNE-EN ISO 11957:2010

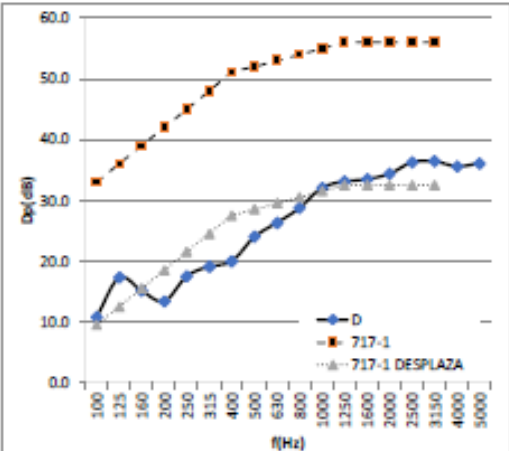
Solicitante: ACTIU			
Muestra Ensayada:	Q100	Fecha ensayo:	13/05/2025
		Fecha Informe:	22/05/2025




Cálculos acordes a norma / Calculations according to norm

Frecuencia	Nivel emisión	Nivel recepción	Aislamiento acústico	Curva referencia ISO 717-1	Curva referencia ISO 717-1 Desplazada
f (Hz)	(Lp)sala (dB)	(Lp)cabina (dB)	Dp (dB)	REF (dB)	REF (dB)
100	106.0	95.2	10.8	33.0	9.5
125	107.5	90.1	17.4	36.0	12.5
160	109.7	94.8	15.0	39.0	15.5
200	109.2	95.5	13.6	42.0	18.5
250	107.8	90.3	17.5	45.0	21.5
315	106.6	87.4	19.1	48.0	24.5
400	105.6	85.6	20.0	51.0	27.5
500	104.2	80.2	24.0	52.0	28.5
630	102.7	76.4	26.3	53.0	29.5
800	101.3	72.6	28.7	54.0	30.5
1000	100.2	68.1	32.0	55.0	31.5
1250	100.5	67.4	33.1	56.0	32.5
1600	102.1	68.6	33.5	56.0	32.5
2000	99.5	65.1	34.4	56.0	32.5
2500	100.7	64.4	36.2	56.0	32.5
3150	98.5	62.1	36.4	56.0	32.5
4000	96.7	61.1	35.6		
5000	95.6	59.6	36.1		

D_{pw} (dB)	29	±	1	(Incertidumbre ensayo 95%)
LPA (dBA)	22			





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