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Bellaterra: 10th March, 2023

File number: 21/25271-1590 M1 Corr2

Test petitioner: **URSA IBÉRICA AISLANTES, S.A.**
Ctra. Vila-rodona, Km 6,7
43810 – El Pla de Santa Maria (Tarragona)

TEST REPORT

The present report supersedes the English translation of test report no 21/25271-1590 M1 Corr1, issued the 11th of January 2022. It is responsibility of the client to replace the original and all the copies.

Description of the modification: The receiving room volume is corrected (page 16). The section no. is corrected (page 20).

The present document is a translation of the Spanish test report **21/25271-1590 M1**. In the case of dispute, the valid one is the Spanish version. This translation is issued on the 1st of December 2021.

Requested test: Laboratory measurement of the improvement of airborne sound insulation, in accordance with the standards UNE-EN ISO 10140-2:2011 and UNE-EN ISO 10140-1:2016 (Annex G).

Test element: Suspended ceiling composed of steel profile structure, suspended by means of rubber acoustic hangers ***SENOR F.RAPID GOMA/47DS***, air cavity of approx. 12 cm with mineral wool ***URSA TERRA Plus 32 T0003*** of 40 mm inside and plasterboard ***KNAUF Standard BA*** of 12,5 mm. Ceiling installed under standard reference floor.

Dates of test: 29/04/2020 and 07/07/2021

Test carried out by: Xavier Roviralta – (Acoustics Laboratory - LGAI Technological Center)

Xavier Roviralta
Technical Manager of Acoustics
LGAI Technological Center S.A. (APPLUS)

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1.- SCOPE OF THE TEST

Laboratory measurement of the improvement of airborne sound insulation, in accordance with the standards UNE-EN ISO 10140-2:2011 and UNE-EN ISO 10140-1:2016 (Annex G), by a suspended ceiling composed of steel profile structure, suspended by means of rubber acoustic hangers ***SENOR F.RAPID GOMA/47DS***, air cavity of approx. 12 cm with mineral wool ***URSA TERRA Plus 32 T0003*** of 40 mm inside and plasterboard ***KNAUF Standard BA*** of 12,5 mm. Ceiling installed under standard reference floor.

2.- MEASUREMENT EQUIPMENT

The equipment used in the test is the following:

- Spectrum analyser id. no.: 170701 (Bruel&Kjaer mod. Pulse LAN-XI)
- Microphone calibrator id. no.: 171067 (Bruel&Kjaer mod. 4231)
- Diffuse field microphones id. no.: 171214 and 171215 (Bruel&Kjaer mod. 4943)
- Rotating microphone booms id. no.: 170692 (Ntek mod. MB-01) and 171142 (Bruel&Kjaer mod. 3923)
- Sound sources id. no.: 103124, 170260 and 170261 (CESVA mod. BP012)
- Noise generator with power amplifier and equalizer id. no.: 171010 (CESVA mod. AP602)
- Thermo-hygrometer and barometer id. no.: 170680 (PCE mod. THB-40)
- Tape measurer id. no.: 103095 (Stanley mod. Powerlock)
- Distance meter id. no.: 170136 (Stanley mod. TLM130)

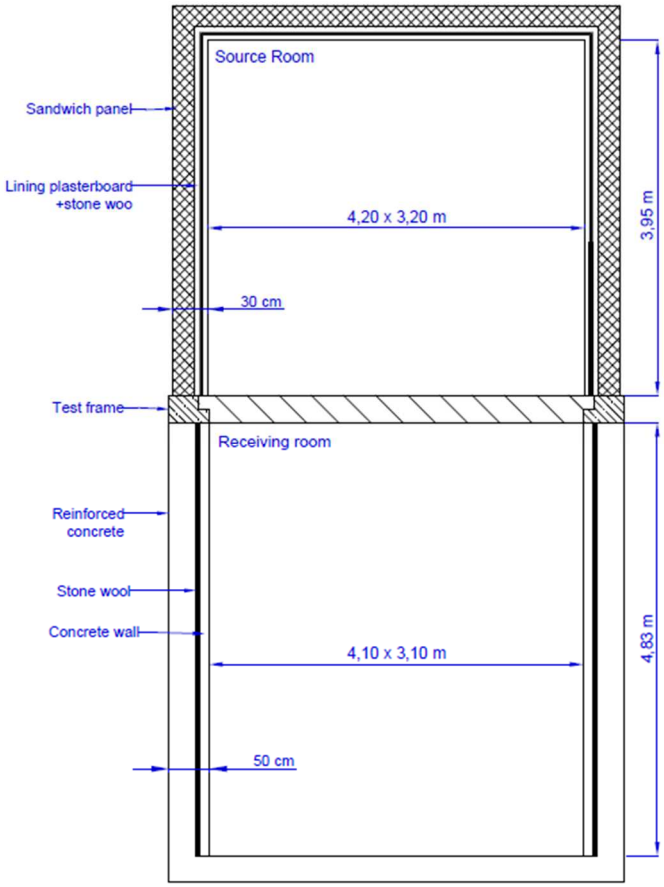
3.- TEST PROCEDURE AND EVALUATION

3.1. TEST METHOD

Test carried out in accordance with the standard UNE-EN ISO 10140-2:2011, "Measurement of airborne sound insulation", which is part 2 of the set of standards UNE-EN ISO 10140 "Laboratory measurement of sound insulation of building elements".

Two horizontally or vertically adjacent rooms are used, one being designated the source room and the other the receiving room. The test element is mounted in an opening in the partition between those rooms. In the source room, a diffuse sound field is generated with a level enough to measure, in the receiving room, a sound pressure level at least 6 dB higher (preferably more than

15 dB) than the background noise level, at any frequency band. If this is not fulfilled, corrections specified in the standard UNE-EN ISO 10140-4:2011 shall be applied.



Schematic drawing of the test rooms

The average sound pressure levels in the source room and in the receiving room are measured, according to the procedure specified in the standard UNE-EN ISO 10140-4:2011.

Sound reduction index, ***R***, is calculated using:

$$R = L_1 - L_2 + 10\ lg\ (\frac{S}{A})\ \text{[dB]}$$

where:

- L_1 is the energy average sound pressure level in the source room (dB)
- L_2 is the energy average sound pressure level in the receiving room (dB)
- S is the area of the free test opening in which the test element is installed (m^2)
- A is the equivalent sound absorption area in the receiving room (m^2)

The equivalent absorption area, *A*, in square meters, from the reverberation time using Sabine's formula is calculated by the following equation:

$$A = \left(\frac{0{,}16 \cdot V}{T}\right) \quad [m^2]$$

where:

- V is the receiving room volume (m^3)
- T is the receiving room reverberation time (s)

3.2. WEIGHTED SOUND REDUCTION INDEX R_w

The **weighted sound reduction index**, **R_w**, is defined in the standard UNE-EN ISO 717-1:2013 as the value, in decibels, of the reference curve (see table 3.1) at the frequency of 500 Hz, after shifting it according to the method laid down in this document.

To evaluate the results of a measurement of R (airborne sound insulation in one-third octave bands), the reference curve is shifted in steps of 1 dB (positive or negative) towards the measured curve until the sum of the unfavourable deviations is as large as possible but no more than 32 dB. Only frequencies within the range of 100 to 3150 Hz are taken into account. An unfavourable deviation at a particular frequency occurs when the result of measurement is less than the reference curve.

Freq. (Hz)	100	125	160	200	250	315
Ref.	33	36	39	42	45	48
Freq. (Hz)	400	500	630	800	1000	1250
Ref.	51	52	53	54	55	56
Freq. (Hz)	1600	2000	2500	3150	4000	5000
Ref.	56	56	56	56	-	-

Table 3.1: Values of the reference curve

Single-number rating determination in accordance with UNE-EN ISO 717-1:2013 has been based on a result (sound reduction index, *R*) obtained by a laboratory measurement.

3.3. ADAPTATION TERMS (C; C_{tr})

As defined in the standard UNE-EN ISO 717-1:2013, the adaptation term is the value, in decibels, that can be added to the global rating (R_w,…) to take into account the features of peculiar spectrums.

These terms are introduced by the standard to take into account the different spectrums of noise sources (such as pink noise and traffic noise) and to evaluate sound insulation curves with excessive low values in a single frequency band.

In the next informative table, several cases are presented and which adaptation terms can be used:

Suitable Adaptation Term	Type of noise source
C (Adaptation term for pink noise)	Human Activities (conversations, music, radio, TV) Kinder games High and middle velocity trains Motorway (> 80 Km/h) Jet aircraft, (short distances) Factory emitting middle and high frequency noise
C_{tr} (Adaptation term for traffic noise)	Urban traffic Low speed trains Jet aircraft Music from discotheque Factory emitting low frequency noise

Table 3.2: Adaptation terms and its suitable use

3.4. A-WEIGHTED SOUND REDUCTION INDEX CALCULATION, R_A

The **A-weighted sound reduction index, R_A**, of a building element is the global rating, in dBA, of the sound reduction index, R, for an incident A-weighted normalized pink noise. In the Annex A of the *Documento Básico "DB-HR Protección frente al ruido" del Código Técnico de la Edificación*, R_A is defined by the following formula from the values of sound reduction index R obtained by laboratory testing:

$$R_A = -10\ Log \sum_{i=1}^{n} 10^{(L_{Ar,i} - R_i)/10} \text{ [dBA]}$$

where:

- R_i is the sound reduction index in the i frequency band, in dB.
- $L_{Ar,i}$ is the value of A-weighted pink noise spectrum in the i frequency band, in dBA.
- i covers all the one-third octave frequency bands from 100 Hz to 5 kHz.

Frec. (Hz)	100	125	160	200	250	315
$L_{Ar,i}$	-30,1	-27,1	-24,4	-21,9	-19,6	-17,6
Frec. (Hz)	400	500	630	800	1000	1250
$L_{Ar,i}$	-15,8	-14,2	-12,9	-11,8	-11,0	-10,4
Frec. (Hz)	1600	2000	2500	3150	4000	5000
$L_{Ar,i}$	-10,0	-9,8	-9,7	-9,8	-10,0	-10,5

Table 3.3. A-weighted normalized pink noise spectrum

3.5. IMPROVEMENT OF AIRBORNE SOUND INSULATION

The Annex G of standard UNE-EN ISO 10140-1:2016 "Application rules for specific products", which is part 1 of the set of standards UNE-EN ISO 10140:2011 "Laboratory measurement of sound insulation of building elements", specifies the procedure for determining the improvement of airborne sound insulation of acoustical linings on walls and floors.

The quantity determined is the **sound reduction improvement index ΔR**, in decibels, which is defined as the difference between the sound reduction indices of the basic element with and without the lining for each one-third octave band:

$$\Delta R = R_{with} - R_{without} \quad [dB]$$

The constructions specified in UNE EN-ISO 10140-5:2011, Annex B, shall be used as standard basic elements. In case of floor coverings, the lining shall be applied to the standard floor with low critical frequency ("heavy floor") in accordance with UNE EN-ISO 10140-5:2011, Annex C. This standard heavyweight reference floor consists of a reinforced concrete slab of thickness 120^{+40}_{-20} mm, preferably 140 mm for the construction of new laboratories.

3.5.1 SINGLE-NUMBER RATING

3.5.1.1 IN ACCORDANCE WITH UNE-EN ISO 10140-1:2016 Annex G

To evaluate the single-number rating ΔR_w, **weighted sound reduction improvement index**, from the one-third octave band ΔR values given to one decimal place, the measured values of the sound reduction improvement are used in conjunction with standard reference curves for the standard basic elements (specified in UNE-EN ISO 10140-5:2011, Annex B) by calculation.

The one-third octave band sound reduction improvement index ΔR values, are taken as measured and added to the reference values of the sound insulation index, $R_{ref,without}$, of the matching standard basic element:

$$R_{ref,with} = R_{ref,without} + \Delta R \quad [dB]$$

In case of using the standard floor with low critical frequency ("heavy floor") as standard basic element, the standard reference curve shall be the following:

Freq. (Hz)	100	125	160	200	250	315
R	40,0	40,0	40,0	40,0	40,0	41,8
Freq. (Hz)	400	500	630	800	1000	1250
R	44,4	46,8	49,3	51,9	54,4	56,8
Freq. (Hz)	1600	2000	2500	3150	4000	5000
R	59,5	61,9	64,3	65,0	65,0	65,0

R_w (C;C_{tr}) (dB)	**52 (-1;-5)**	**R_A** (dBA)	**51,5**

Table 3.4: Reference values of the sound insulation index of heavyweight reference floor, in accordance with UNE-EN ISO 10140-5:2011, Annex B (R_A according DB-HR Annex E)

Weighted sound reduction indices, $R_{w,ref,with}$ and $R_{w,ref,without}$, and the corresponding spectrum adaptation terms are determined in accordance with UNE-EN ISO 717-1:2013. The weighted improvement of sound reduction index, ΔR_w, is then given by the next equation:

$$\Delta R_w = R_{w,ref,with} - R_{w,ref,without} \quad [dB]$$

The A-weighted improvement of sound reduction indices $\Delta(R_w+C)$, respectively $\Delta(R_w+C_{tr})$, are calculated in an equivalent way.

An additional index indicates the reference basic element used: "heavy" for the heavyweight reference floor in accordance with UNE-EN ISO 10140-5:2011, Annexes B and C.

3.5.1.2 IN ACCORDANCE WITH DB-HR

In the Annex A of the document *Documento Básico "DB-HR Protección frente al ruido" del Código Técnico de la Edificación*, the **A-weighted sound reduction improvement index**, ΔR_A, is defined as the increase of the A-weighted sound reduction index of a building element by an additional lining applied to the basic building element. The improvement is determined by calculating the difference between the A-weighted sound reduction index, R_A, of the basic building element with and without the additional lining.

The Annex E of the document *Documento Básico "DB-HR Protección frente al ruido" del Código Técnico de la Edificación* specifies the measurement and rating procedure for the ΔR_A improvement.

The ΔR_A index is obtained by the following equation:

$$\Delta R_A = (R_0 + \Delta R)_A - R_{0,A} \quad \text{[dBA]}$$

where:

- $(R_0+\Delta R)_A$ is the A-weighted sound reduction index of the basic building element with the lining
- $R_{0,A}$ is the A-weighted sound reduction index of the basic building element.

To determinate the $(R_0+\Delta R)_A$ value, the third-octave values of the sound reduction improvement index ΔR are added to the reference values of sound reduction index, R_0, of the corresponding standard basic element. In case the test is carried out using the standard wall with low critical frequency ("heavy wall"), in accordance with UNE EN-ISO 10140-5:2011 Annex B as standard basic element, the sound reduction index values of the corresponding reference curve (see table 3.4) should be taken as R_0 values.

The A-weighted sound reduction index of this "heavy wall" (see table 3.4) should be taken as $R_{0,A}$.

Each reference curve leads to a different value of ΔR improvement, being $\Delta R_{A,m}$ the A-weighted sound reduction improvement index for the reference curve with medium critical frequency.

3.6. UNCERTAINTY OF RESULTS

The uncertainty associated to the test has been calculated and is available to the petitioner. The expanded uncertainty has been calculated as the typical measurement uncertainty multiplied by a coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

4.- TEST ELEMENT DESCRIPTION

The main characteristics of the test element, provided by the test petitioner, are listed below. The references/models and the information indicated with *(*)* is provided by the test petitioner. LGAI Technological Center, S.A. is not responsible for the documentation and/or information provided for the petitioner.

Applus test specimen no.	21/1590
Type of test element	Suspended ceiling
Manufacturer	Mineral wool: URSA IBÉRICA AISLANTES, S.A. Rubber acoustic hangers: SENOR Plasterboard: KNAUF Other materials: several manufacturers
Model / Reference	Mineral wool: ***URSA TERRA Plus 32 T0003*** Rubber acoustic hangers: ***SENOR F.RAPID GOMA/47DS*** Plasterboard: ***KNAUF Standard BA***
Supplied by	Mineral wool: URSA IBÉRICA AISLANTES, S.A. Rubber acoustic hangers: SENOR Plasterboard: KNAUF Other materials: several suppliers
Date received	Mineral wool: 15/06/2021 Rubber acoustic hangers: 01/07/2021 Other materials: 02/07/2021
Area of test element, *S* (test opening)	12,71 m^2 – 4,10 x 3,10 m
Test element thickness	≈272,5 mm (reference floor: 140 mm; suspended ceiling: ≈132,5 mm)
Mass per unit area, *m* (estimated)	≈359,2 kg/m^2 (reference floor: ≈350 kg/m^2; suspended ceiling without structure: ≈9,2 kg/m^2)
Type of mounting	In the opening of a concrete frame (test frame)

Composition	- Reference floor: Standard reference floor with low critical frequency ("heavy floor"). Reinforced concrete slab of thickness 140 mm, in accordance with Annexes B and C of the standard UNE-EN ISO 10140-5:2011.
	- Suspended ceiling of 4,1x3,1 m composed of (top to bottom): *(*)*
	  - Air cavity of approx. 120 mm with mineral wool ***URSA TERRA Plus 32 T0003*** of 40 mm thickness inside. Mineral wool placed on the structure.
	  - Structure of primary and secondary steel profiles suspended by means of rubber acoustic hangers ***SENOR F.RAPID GOMA/47DS*** composed of:
	  ▪ *F47/17* profiles of dimensions 17,5x47x17,5 mm and 0,6 mm thickness: primary profiles every 700 mm and secondary profiles clicked every 600 mm.
	  - Plasterboard ***KNAUF Standard BA*** of 12,5 mm nominal thickness and 8,0 kg/m^2 nominal mass.

Fixation / union	Rubber acoustic hangers – base floor: screwed Plasterboard – *F47/17* profiles: TMN 25x3,5 mm screws Perimetral elastic band – test frame: auto adhesive
Sealing	Joints between plasterboards: joint paste for plasterboard and paper joint tape of 50 mm width Plasterboard – test frame: perimetral elastic band of 80 x 10 mm (width x thickness) and silicone
Test arrangement	In accordance with the specifications in Section 6 of UNE-EN ISO 10140-2:2011 and Annex G of the UNE-EN-ISO 10140-1:2016
Test element assembling (carried out by/date)	SUSPENSIONES ELÁSTICAS DEL NORTE, S.L. (SENOR) / 06/07/2021
Sectional drawings	See figure 1 and Annex

In order to determinate the improvement of airborne sound insulation provided by the floor covering two measurements are carried out: the measurement of the reference floor without the suspended ceiling (29/04/2020) and the measurement of the reference floor with the suspended ceiling (07/07/2021).

Images 1 to 3 Details of *URSA TERRA Plus 32 T0003*

Images 4 to 6 Details of *SENOR F.RAPID GOMA/47DS*

Images 7 to 9 Details of structure, plasterboard and elastic band

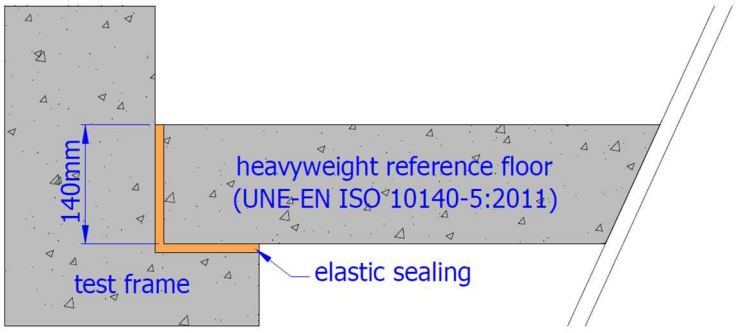
Images 10 to 13 Structure installation

Images 14 to 17 Structure and mineral wool installation

Images 18 to 21 Installation and sealing of plasterboard


Images 22 and 23 Test specimen installed and ready for the test, view form source and receiving room

The following figure show the sectional drawings of the heavyweight reference floor. The section of the reference floor with the suspended ceiling installed (provided by test petitioner) attached in the Annex.



Figures 1 Heavyweight reference floor

5.- TEST ENVIRONMENT

5.1. STANDARD REFERENCE FLOOR (heavyweight reference floor in accordance with UNE-EN ISO 10140-5:2011 Annexes B and C)

	Source Room	Receiving Room
Room volumes	52,9 m^3	62,9 m^3
Climatic conditions	Temperature: 19,5 ±0,5 ºC	Temperature: 19,1 ±0,5 ºC
	Humidity: 64,7 ±3,9 %	Humidity: 67,2 ±3,9 %
	Static pressure: 989,9 ±0,7 hPa	

5.2. STANDARD REFERENCE FLOOR + SUSPENDED CEILING

	Source Room	Receiving Room
Room volumes	52,9 m^3	61,1 m^3
Climatic conditions	Temperatura: 22,5 ±0,6 ºC	Temperatura: 22,1 ±0,6 ºC
	Humidity: 61,8 ±6,6 %	Humidity: 63,6 ±6,6 %
	Static pressure: 999,1 ±1,0 hPa	

6.- RESULTS

The obtained results for the basic floor (reference floor) test (section 6.1), the basic floor with the suspended ceiling (section 6.2), and the improvement of airborne sound insulation due to the application of the suspended ceiling on the basic floor (section 6.3) are showed below.

NOTE:

At the frequency bands indicated with the '≥' symbol the value of sound reduction index, R, shall be understood as a minimum value (it may be slightly higher) due to the flanking transmission. In these frequency bands the R' value is bigger than R'_{max} - 15 dB (where R'_{max} is the maximum measurable R in the test facility). It has been verified that a slight increase in the values of R in these frequency bands may cause a slight increase of $\Delta R_{A,I}$ (decimals, <1 dBA) but not in R_w, R_A, and ΔR_w.

At the frequency bands indicated with '*', the difference between the background noise level and the level of signal and background noise combined is less than 6 dB, so that the correction of 1,3 dB specified by the test standard is applied.

6.1. STANDARD REFERENCE FLOOR

Sound reduction index, *R*, in accordance with ISO 10140-2

Client: URSA IBÉRICA AISLANTES, S.A.

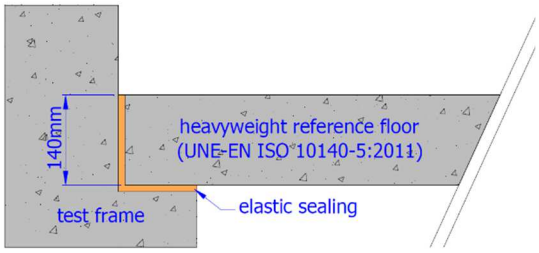
Test element :

Standard reference floor with low critical frequency ("heavy floor") in accordance with UNE-EN ISO 10140-5:2011 Annexes B and C: reinforced concrete slab of 140 mm thickness.

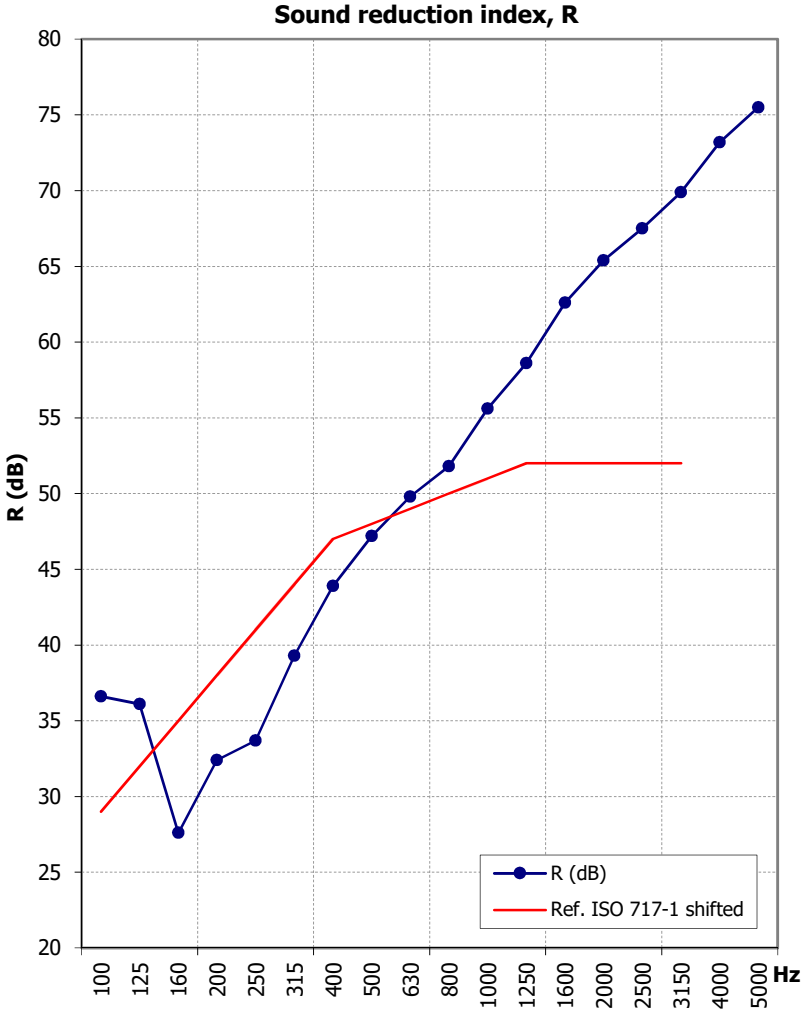
Mass per unit area, *m*: ≈350 kg/m²

Area of test element, *S*: 12,71 m² (4,10 x 3,10 m)

Date of test: 29/04/2020



Frequency (Hz)	R (dB)
100	36,6
125	36,1
160	27,6
200	32,4
250	33,7
315	39,3
400	43,9
500	47,2
630	49,8
800	51,8
1000	55,6
1250	58,6
1600	62,6
2000	65,4
2500	67,5
3150	69,9
4000	73,2
5000	75,5



UNE-EN ISO 717-1:2013	Weighted sound reduction index, R_w (C; C_{tr}):	**48 (-2; -6) dB**
CTE DB-HR	A-weighted sound reduction index, R_A:	**46,8 dBA**

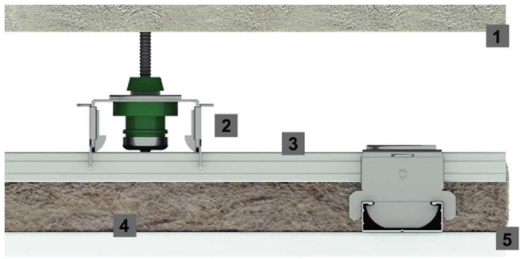
6.2. STANDARD REFERENCE FLOOR + SUSPENDED CEILING

Sound reduction index, *R*, in accordance with ISO 10140-2

Client: URSA IBÉRICA AISLANTES, S.A.

Test element :

Suspended ceiling composed of steel profile structure suspended by means of rubber acoustic hangers ***SENOR F.RAPID GOMA/47DS,*** air cavity of approx. 12 cm with mineral wool ***URSA TERRA Plus 32 T0003*** of 40 mm and plasterboard ***KNAUF Standard BA*** of 12,5 mm. Installed under a heavyweight reference floor (in accordance with UNE-EN ISO 10140-5:2011 Annexes B and C)



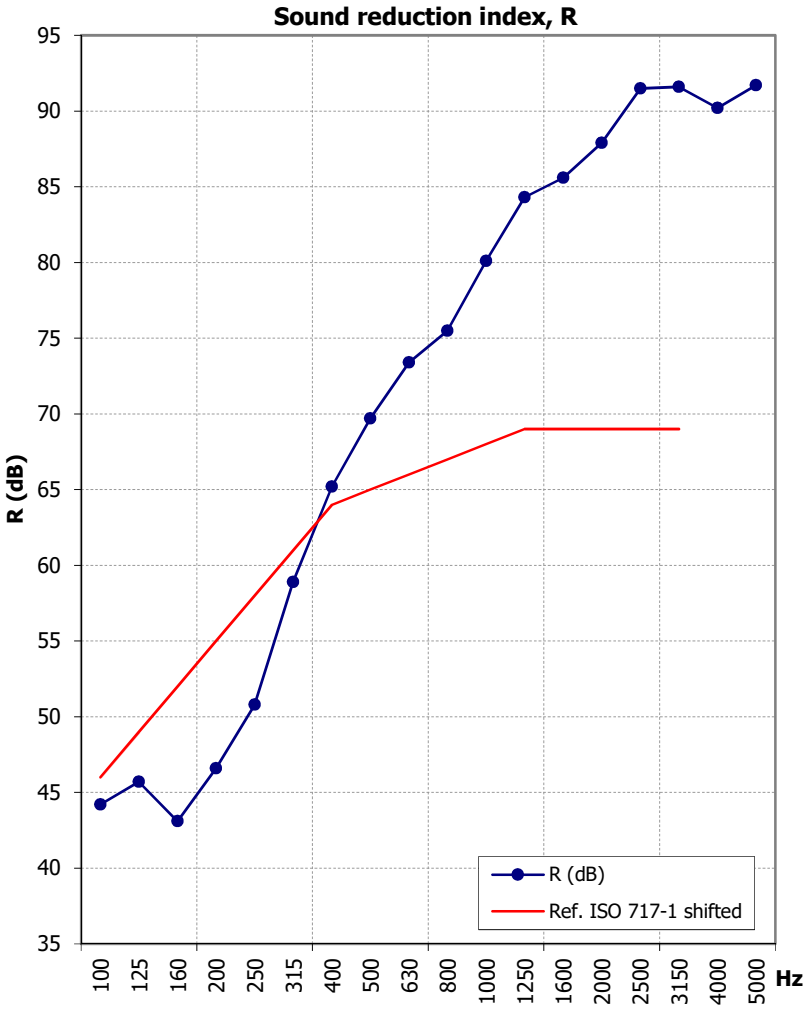
Mass per unit area, *m*: ≈359,2 kg/m^2
(≈9,2 kg/m^2 suspended ceiling without structure)

Area of test element, *S*: 12,71 m^2 (4,10 x 3,10 m)

Date of test: 07/07/2021

Frequency (Hz)	R (dB)
100	44,2
125	45,7
160	43,1
200	46,6
250	50,8
315	58,9
400	65,2
500	≥ 69,7
630	≥ 73,4
800	≥ 75,5
1000	≥ 80,1
1250	≥ 84,3
1600	≥ 85,6
2000	≥ 87,9
2500	≥ 91,5
3150	≥ 91,6
4000	≥ 90,2 *
5000	≥ 91,7 *

Frequency bands indicates with '≥' and '' see **NOTE** on page 17*



UNE-EN ISO 717-1:2013	Weighted sound reduction index , R_w (C; C_{tr}):	**65 (-3; -9) dB**
CTE DB-HR	A-weighted sound reduction index, R_A:	**62,7 dBA**

6.3. IMPROVEMENT OF AIRBORNE SOUND INSULATION

Improvement of airborne sound insulation in accordance with Standard ISO 10140 (all parts)

Client: URSA IBÉRICA AISLANTES, S.A. **Date of test:** 29/04/2020 and 07/07/2021

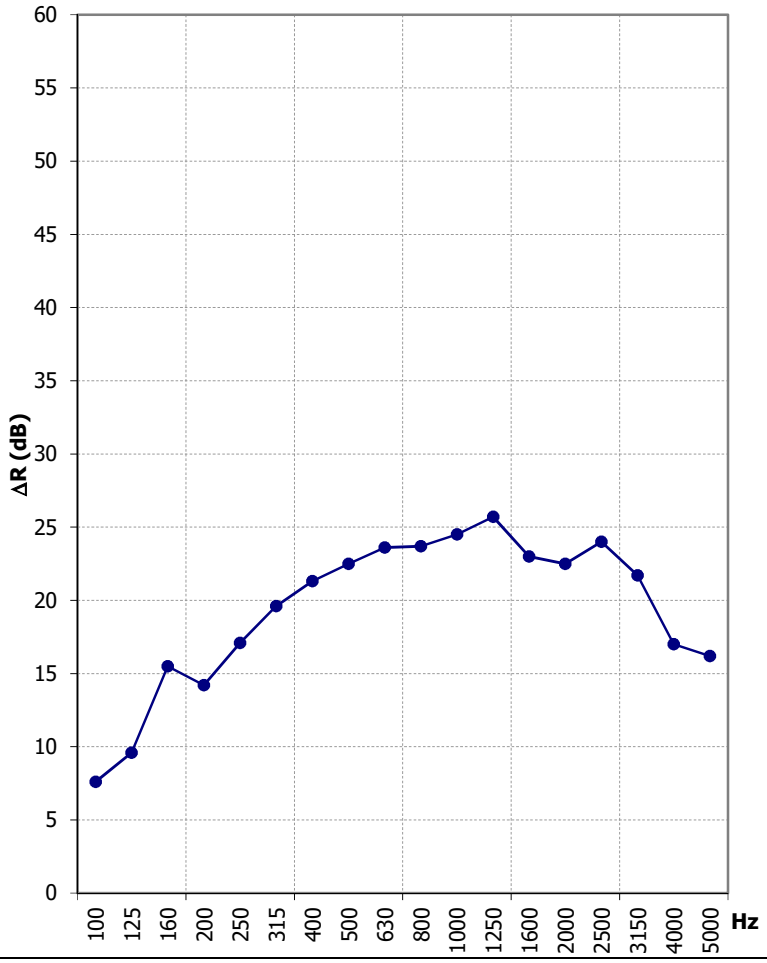
Test element: Suspended ceiling composed of steel profile structure suspended by means of rubber acoustic hanger ***SENOR F.RAPID GOMA/47DS,*** air cavity of approx. 12 cm with mineral wool ***URSA TERRA Plus 32 T0003*** of 40 mm and plasterboard ***KNAUF Standard BA*** of 12,5 mm. Installed under a heavyweight reference floor (in accordance with UNE-EN ISO 10140-5:2011 Annexes B and C)

Reference floor	Reference floor + suspended ceiling
R_w (C; C_{tr})= 48 (-2; -6) dB	R_w (C; C_{tr})= 65 (-3; -9) dB
R_A = 46,8 dBA	R_A = 62,7 dBA

Frequency (Hz)	ΔR (dB)
100	7,6
125	9,6
160	15,5
200	14,2
250	17,1
315	19,6
400	21,3
500	≥ 22,5
630	≥ 23,6
800	≥ 23,7
1000	≥ 24,5
1250	≥ 25,7
1600	≥ 23,0
2000	≥ 22,5
2500	≥ 24,0
3150	≥ 21,7
4000	≥ 17,0
5000	≥ 16,2

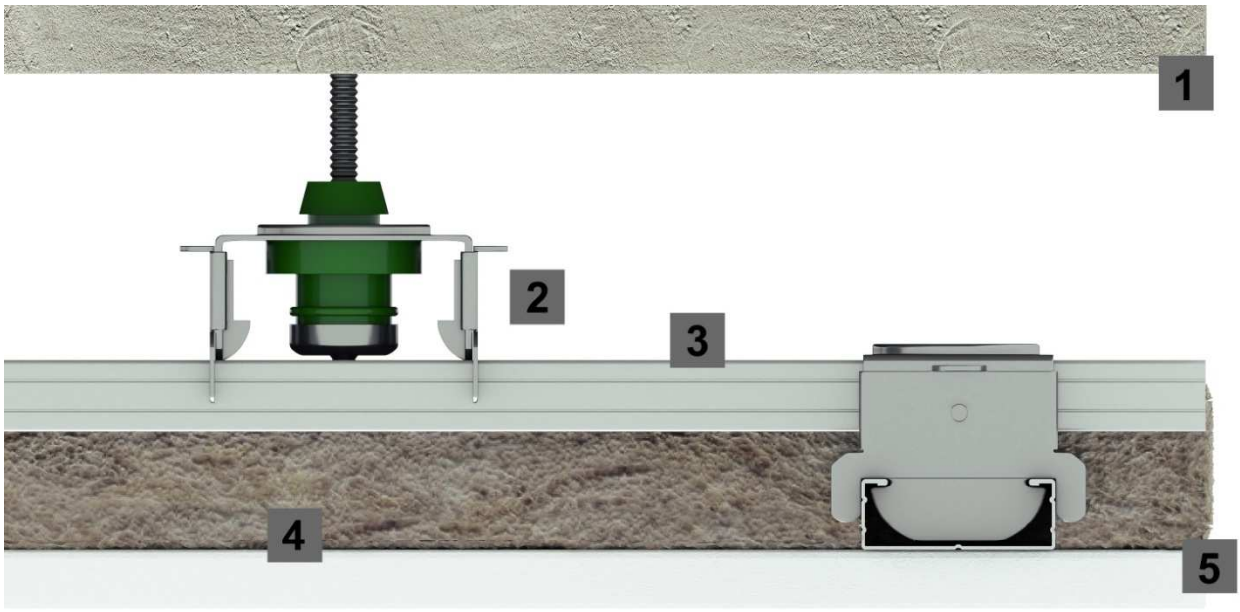
Frequency bands indicates with '≥' see ***NOTE*** *on page 17*

Sound reduction improvement index, ΔR



UNE-EN ISO 10140-1:2016	Weighted sound reduction improvement index, $\Delta R_{w,heavy}$:	**18 dB**
	$\Delta(R_w+C)_{heavy}$; $\Delta(R_w+C_{tr})_{heavy}$:	**17 ; 16 dB**
CTE DB-HR	A-weighted sound reduction improvement index, $\Delta R_{A,I}$:	**≥17,5 dBA**

ANNEX. TECHNICAL INFORMATION PROVIDED BY THE TEST PETITIONER



1. Forjado normalizado
2. Amortiguador F. Rapid Goma/47DS
3. Perfilería de techo suspendido
4. Lana mineral URSA TERRA Plus 32 T0003
5. Placa de yeso laminado

URSA TERRA

Plus 32 T0003

λ 0,032

DoP 34TER32NK21061

Garantía de calidad medioambiental >50% vidrio reciclado 270/001

TERRA NATURAL PERFORMANCE TECHNOLOGY

ÉMISSIONS DANS L'AIR INTÉRIEUR A+ A B C

Panel semirígido de lana mineral URSA TERRA conforme a la norma UNE EN 13162, no hidrófila de altas prestaciones mecánicas, sin revestimiento. Suministrado en panel y panel enrollado.

Aplicación recomendada

- Tabiques, trasdosado y falsos techos de placa de yeso laminado.
- Aislamiento intermedio en paredes de doble hoja de fábrica.
- Apto para la colocación bajo forjado mediante fijación mecánica.

0099/CPR/A43/0616 020/003847 DIT 380R/21

Características	Norma UNE	Valor
Código designación		MW-EN 13162-T3-MU1-WS-AFr10-WL(P)
Lambda (λ90/90)	EN 12667 / EN 12939	0,032 W/m·K
Reacción al fuego (Euroclases)	EN 13501-1	A1
Tolerancia en el espesor	EN 823	T3
Resistencia específica al paso del aire (r')	EN 29053	AFr10 ≥ 10 kPa·s/m²
Absorción acústica (α)		AW
Permeabilidad al vapor de la lana (μ)	EN 12086	MU1
Absorción de agua a corto plazo	EN 1609	≤ 1 Kg/m²
Absorción de agua a largo plazo	EN 12087	≤ 3 Kg/m²
Densidad nominal aproximada		30 Kg/m³
Calor específico aproximado (C_p)		800 J/Kg·K

Rollo

Código	Espesor mm	Ancho m	Largo m	Resistencia térmica m²·K/W	Alfa global α_w	Ud /paquete	m² /paquete	paquete /palet	m² /palet
2142291	30	1,20	13,50	0,90	0,80	1	16,20	18	291,60
2142773	40	0,40	9,20	1,25	0,85	3	11,04	18	198,72
2141356	50	0,40	8,10	1,55	0,95	3	9,72	18	174,96
2141357	60	0,40	8,10	1,85	1,00	3	9,72	18	174,96
2141623	60	0,60	8,10	1,85	1,00	2	9,72	18	174,96
2141358	80	0,40	5,40	2,50	1,00	3	6,48	18	116,64
2141943	80	1,20	5,40	2,50	1,00	1	6,48	18	116,64
2141359	100	0,40	5,40	3,10	1,00	3	6,48	18	116,64
2142494	100	1,20	5,40	3,10	1,00	1	6,48	18	116,64

Panel

Código	Espesor mm	Ancho m	Largo m	Resistencia térmica m²·K/W	Alfa global α_w	Ud /paquete	m² /paquete	paquete /palet	m² /palet
2141708	40	0,60	1,35	1,25	0,85	15	12,15	16	194,40
2142452	50	0,40	1,35	1,55	0,95	12	6,48	24	155,52
2141709	50	0,60	1,35	1,55	0,95	12	9,72	16	155,52
2142866	60	0,40	1,35	1,85	1,00	10	5,40	24	129,60
2141731	60	0,60	1,35	1,85	1,00	10	8,10	16	129,60
2142867	80	0,40	1,35	2,50	1,00	7	3,78	24	90,72
2141732	80	0,60	1,35	2,50	1,00	7	5,67	16	90,72
2141733	100	0,60	1,35	3,10	1,00	6	4,86	16	77,76
2141735	120	0,60	1,35	3,75	1,00	5	4,05	16	64,80
2141736	140	0,60	1,35	4,35	1,00	4	3,24	16	51,84

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Disponibles las Declaraciones Ambientales de Producto (DAP)

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SENOR

F/RAPID GM 47 V DS2

EL AMORTIGUADOR DE **GOMA** CON **DOBLE** DISPOSITIVO DE **BLOQUEO** MÁS **AVANZADO** EN LA PROTECCIÓN DE VIBRACIONES.

Es un amortiguador de **GOMA** de altas prestaciones, diferente y renovado. Fabricado con una tecnología más avanzada y diseñado para la suspensión de falsos techos acústicos mediante perfiles de acero galvanizado tipo **TC47**, **F530**, **MAESTRA 47/17** o similar.

Este **NUEVO diseño** permite convertir al amortiguador con un simple gesto en el caballete más seguro y puntero del mercado. **Nuestros ingenieros** trabajan cada día para ofrecer nuevas alternativas de futuro.

CARACTERISTICAS **PRINCIPALES**:

- Polímero: **KRAIBURG-TPE** (Sistema de ensayo según norma **UNE-EN ISO 10846-1:2009**).
- ✓Frecuencia de resonancia: **7-15 Hz**.
- Carcasa de acero con **EMBUTICIÓN** semi-cerrada, para una nivelación diferente.
- **Doble** dispositivo de bloqueo (**DS2**) para una seguridad infinita.

REF	COLOR	MÉTRICA MIN-MAX	PERFIL (mm)	CARGA (Kg) MIN-MAX	EMBALAJE
SE-F/RAPID/GM 47 VDS2		6 - 8	45 - 48	3 - 25	50

SENOR Productos **Techo ACÚSTICO**

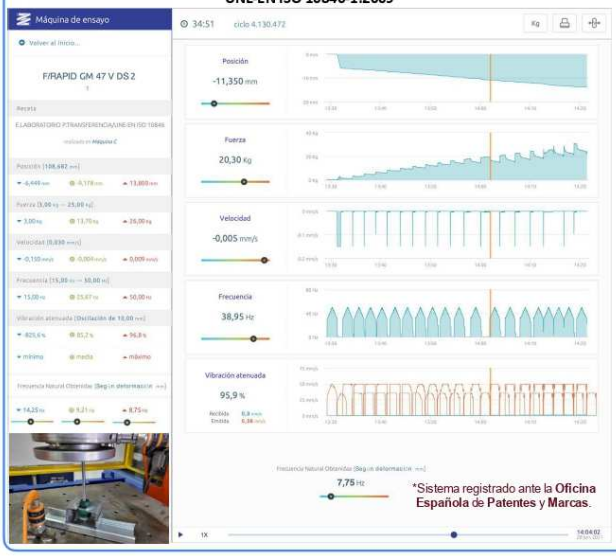
YouTube

SENOR Aisladores **Acústicos**

Ref. F/RAPID GM 47 V DS2

Ensayo LABORATORIO

UNE-EN ISO 10846-1:2009



Gráfica 1

Gráfica 2

Tabla de resultados

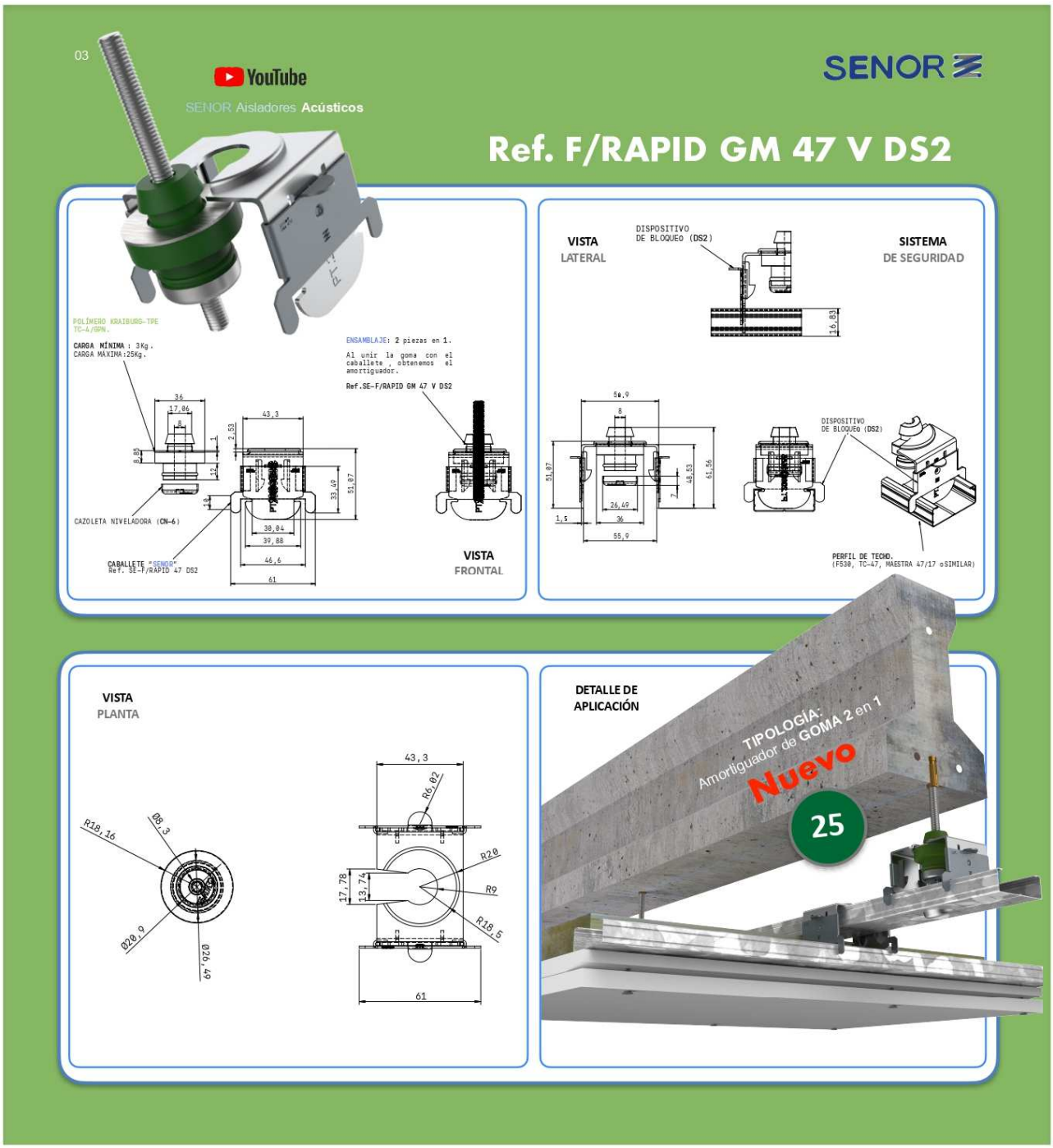
CARGA (Kg)	FLECHA (mm)	FRECUENCIA RESONANCIA (Hz)	BARRIDO (Hz)		GRADO DE AISLAMIENTO (%)	
3	6,449	14,25	25	50	51,87	91,16
9	8,001	9,75	25	50	82,06	96,05
15	9,552	8,85	25	50	85,67	96,77
19	10,835	7,80	25	50	89,22	97,51
23	11,986	7,50	25	50	90,11	97,70
26	13,855	8,75	25	50	86,04	96,84

Ensayo LABORATORIO

UNE-EN ISO 10846-1:2009

Gráfica 3

02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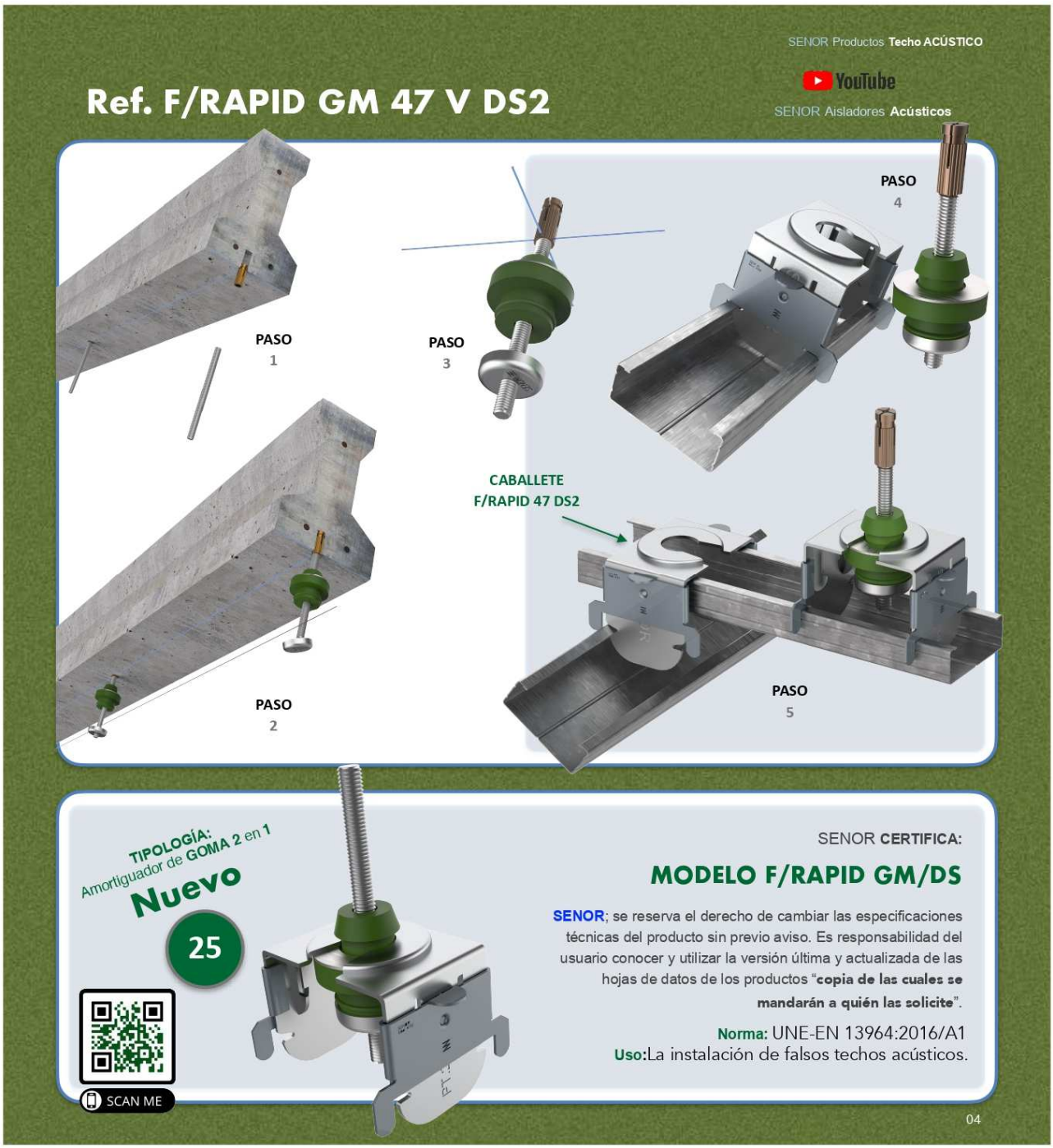
SENOR Aisladores Acústicos
SENOR
Ref. F/RAPID GM 47 V DS2
VISTA LATERAL
DISPOSITIVO DE BLOQUEO (DS2)
SISTEMA DE SEGURIDAD
POLÍMERO KRAIBURG-TPE TC-4/8PN.
CARGA MÍNIMA : 3Kg.
CARGA MÁXIMA:25Kg.
ENSAMBLAJE: 2 piezas en 1.
Al unir la goma con el caballete , obtenemos el amortiguador.
Ref.SE-F/RAPID GM 47 V DS2
CAZOLETA NIVELADORA (CN-6)
CABALLETE "SENOR" Ref. SE-F/RAPID 47 DS2
VISTA FRONTAL
PERFIL DE TECHO. (F530, TC-47, MAESTRA 47/17 oSIMILAR)
VISTA PLANTA
DETALLE DE APLICACIÓN
TIPOLOGÍA: Amortiguador de GOMA 2 en 1
Nuevo
25


SENOR Productos Techo ACÚSTICO
YouTube
SENOR Aisladores Acústicos
Ref. F/RAPID GM 47 V DS2
PASO 1
PASO 2
PASO 3
PASO 4
PASO 5
CABALLETE F/RAPID 47 DS2
TIPOLOGÍA: Amortiguador de GOMA 2 en 1
Nuevo
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SCAN ME
SENOR CERTIFICA:
MODELO F/RAPID GM/DS
SENOR; se reserva el derecho de cambiar las especificaciones técnicas del producto sin previo aviso. Es responsabilidad del usuario conocer y utilizar la versión última y actualizada de las hojas de datos de los productos "copia de las cuales se mandarán a quién las solicite".
Norma: UNE-EN 13964:2016/A1
Uso:La instalación de falsos techos acústicos.
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