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REPORT N. 146-2016-IAP

UNI EN ISO 10140-2:2010

LABORATORY MEASUREMENT OF SOUND INSULATION OF BUILDING ELEMENTS

MEASUREMENT OF AIRBORNE SOUND INSULATION

Issue place and date: Cerea (VR), 11/11/2016

Committee: Eclisse S.r.l.

Committee address: via Sernaglia, 76 - 31053 Pieve di Soligo (TV)

Sample delivery date: 10/26/2016

Sample provenance: Committee

Sample installation date: 10/27/2016

Sample installed in laboratory by: Committee (sampling made by the committee)

Test date: 10/27/2016

Test location: Z Lab S.r.l. – Via Pisa, 5/7 – 37053 Cerea (VR) – Italia

Sample denomination: Sliding door EC_004

LAB N° 1416

PREPARED	VERIFIED	APPROVED
Massimo Fiore	Antonio Scofano	Antonio Scofano

Sample description

The test sample is made of a panel having the following characteristics:

Width** [mm]	1918
Height** [mm]	2150
Nominal thickness** [mm]	95
Usable surface** [m^2]	4.0

In particular, the sample is composed of (*):

	Woodworking and carpentry
F1	MDF th.4 mm
F2	Solid fir wood 37x32
F3	Side lock frame
F4	Upper crosspiece
F5	Recessed side frame
F6	Coverprofile
F7	Galvanized sheet crosspiece
F8	Galvanized sheet frame lock side
F9	Galvanized sheet box frame
	Accessories
A1	Runner + door braket
A2	Hump profile
	Gaskets and isolation
G1	Mineral fiber sp.12 mm (pavaroc)
G2	Pregyplac plasterboard sp.10 mm
G3	Rabet gasket Eclisse
G4	Gasket Rover Plastik mod. A109S80
G5	Automatic drop down seal CCE art. Top Slide
G6	Automatic drop down seal CCE art. MEC
	Other materials
E1	Plasterboard th.12,5
E2	Rolled steel U-track and rolled C studs

code: EC_004

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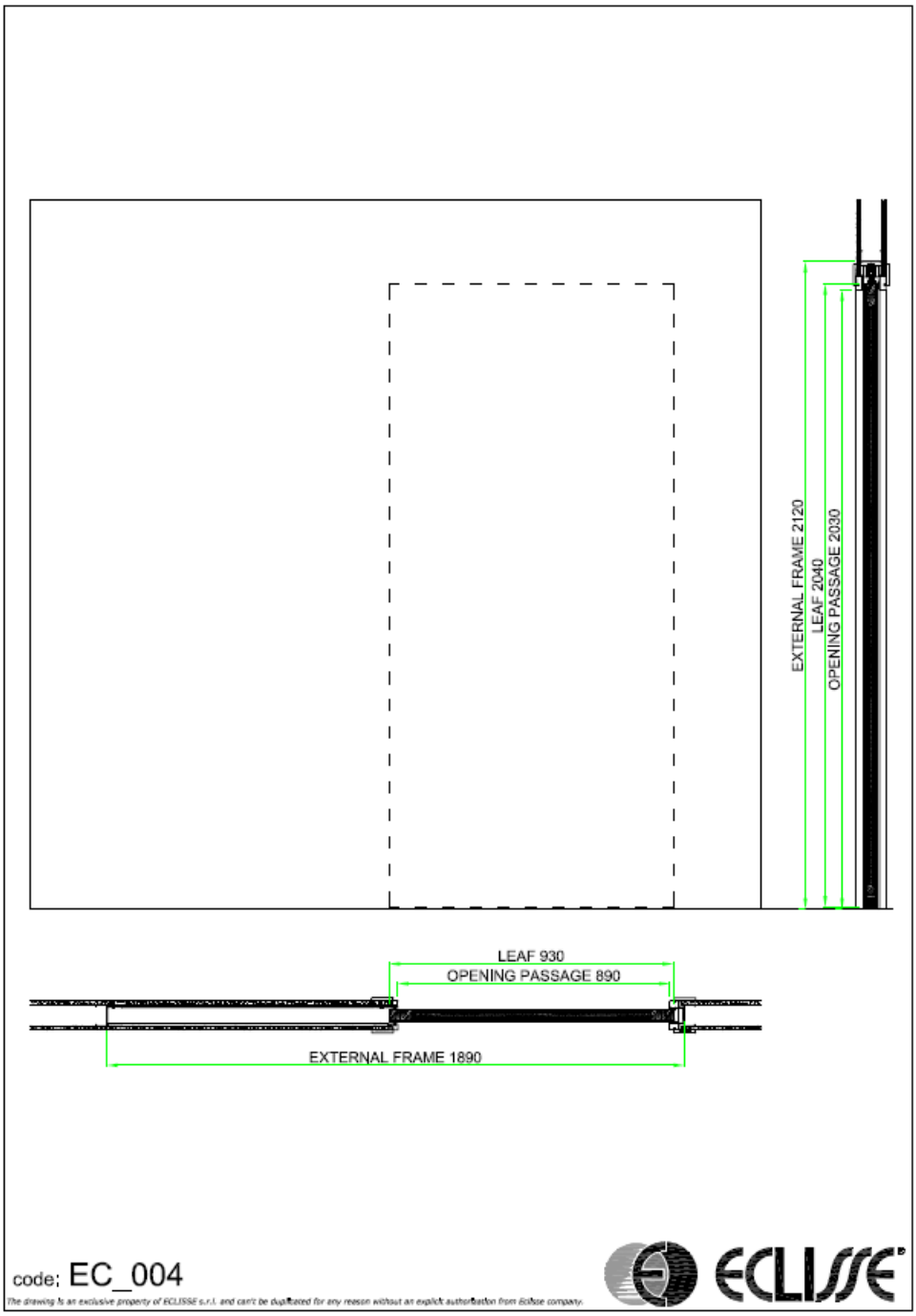

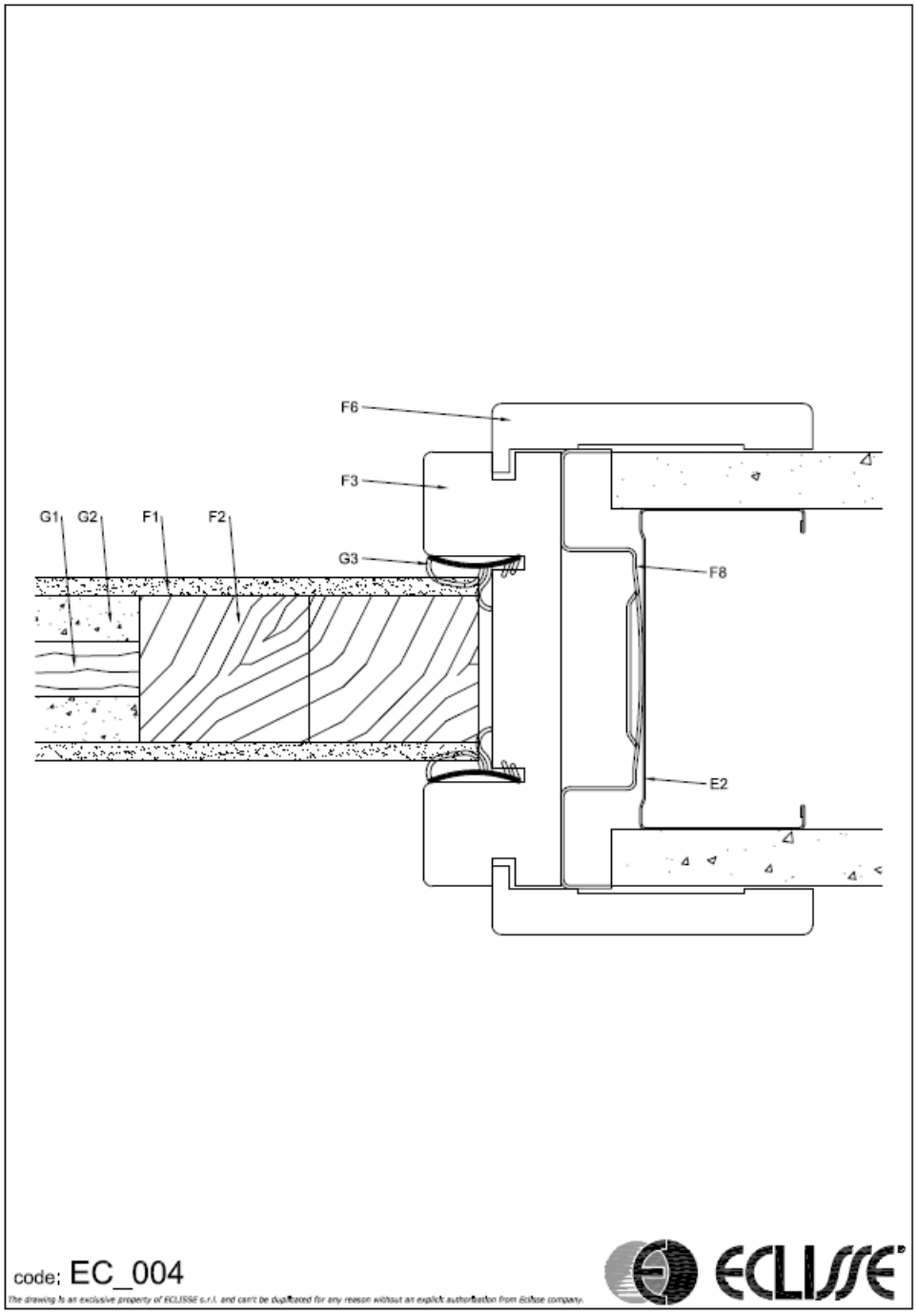

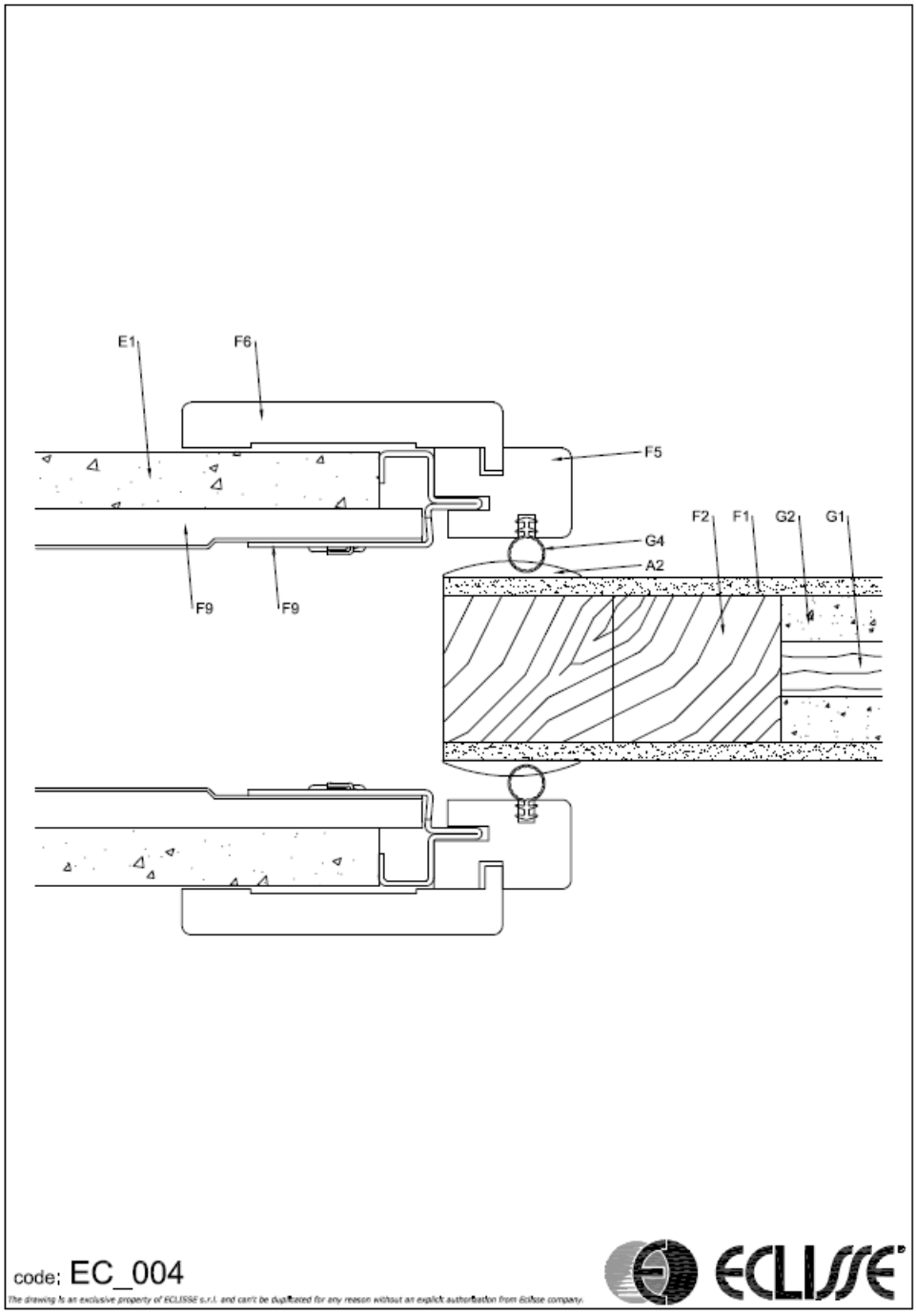

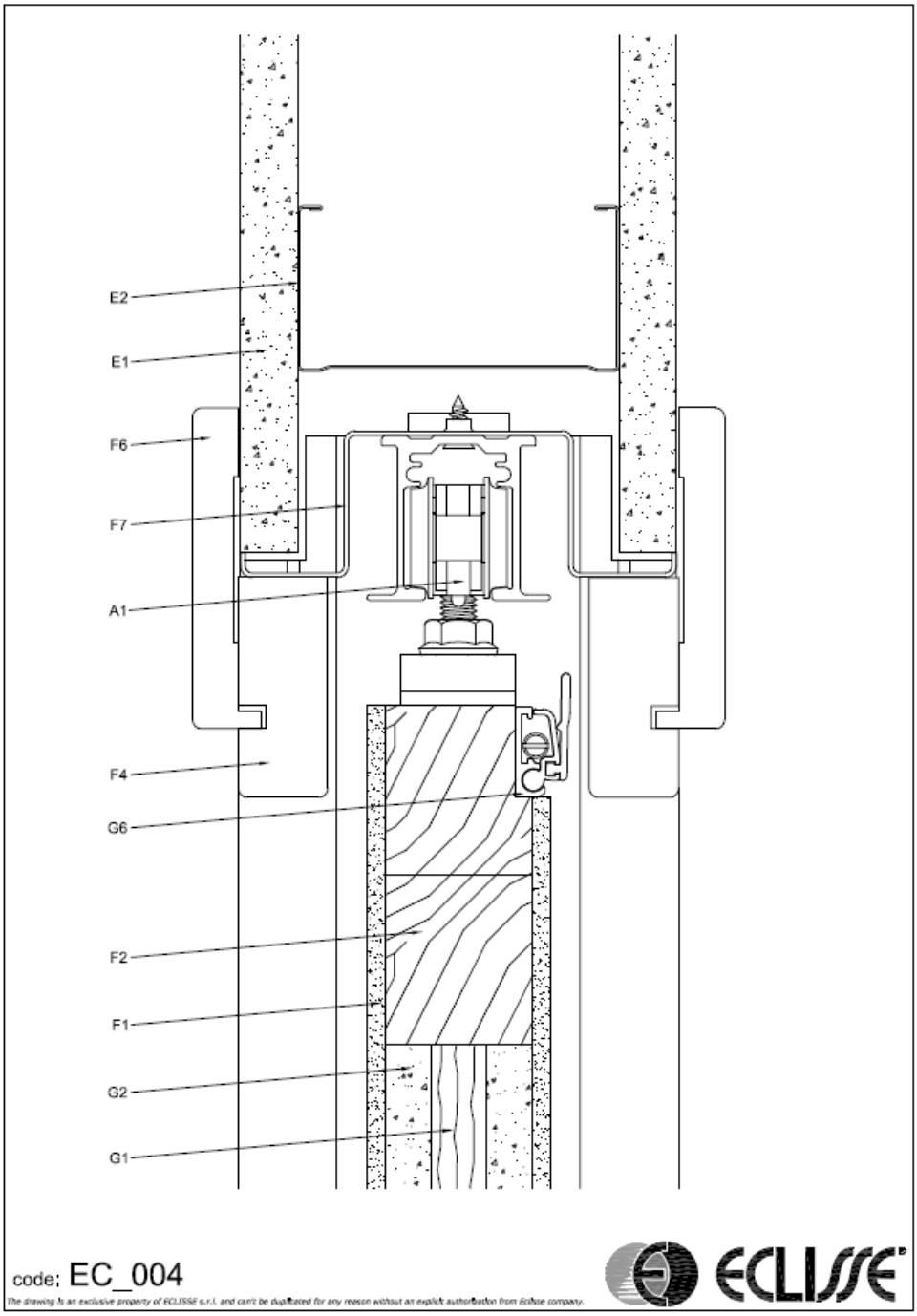

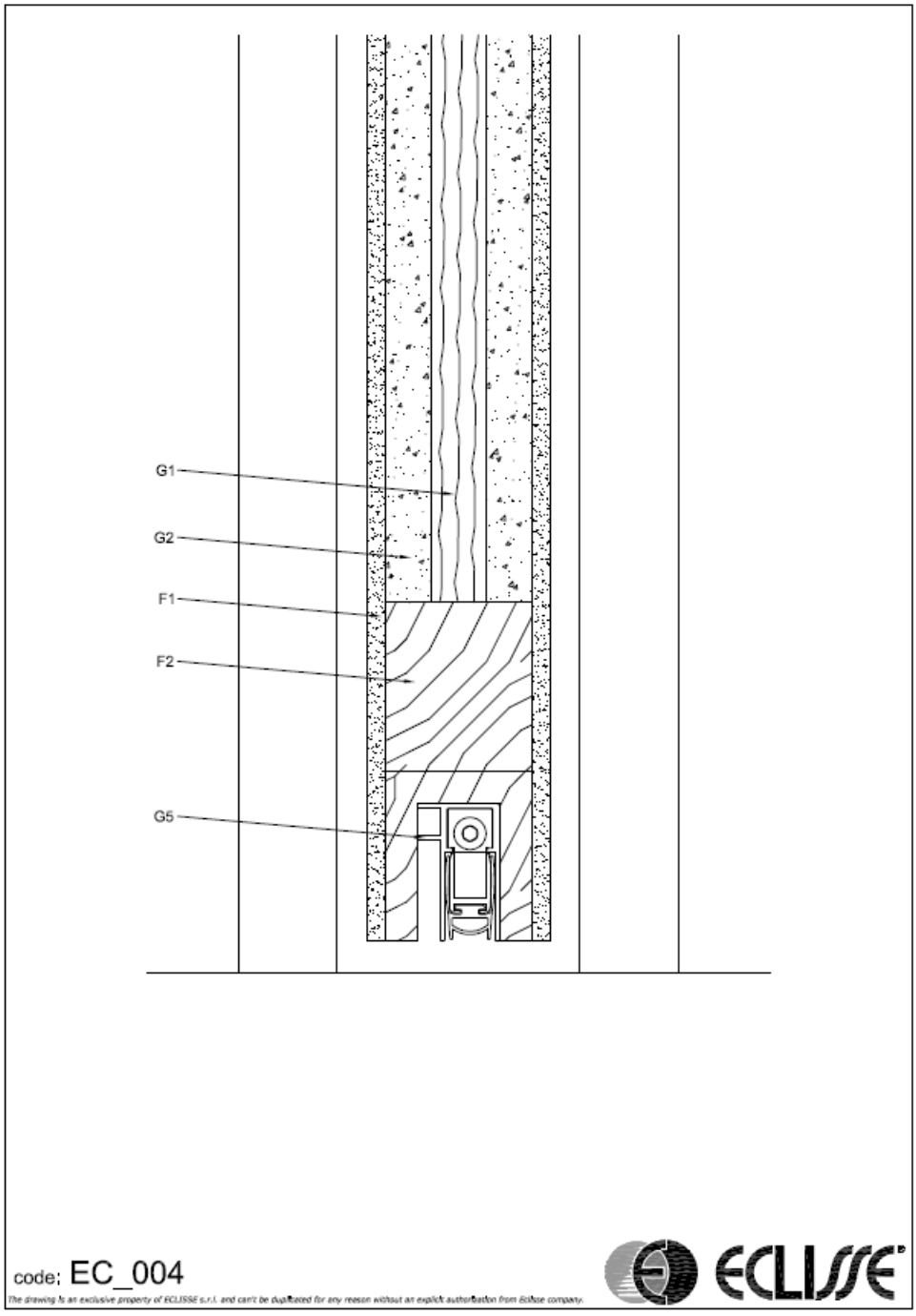

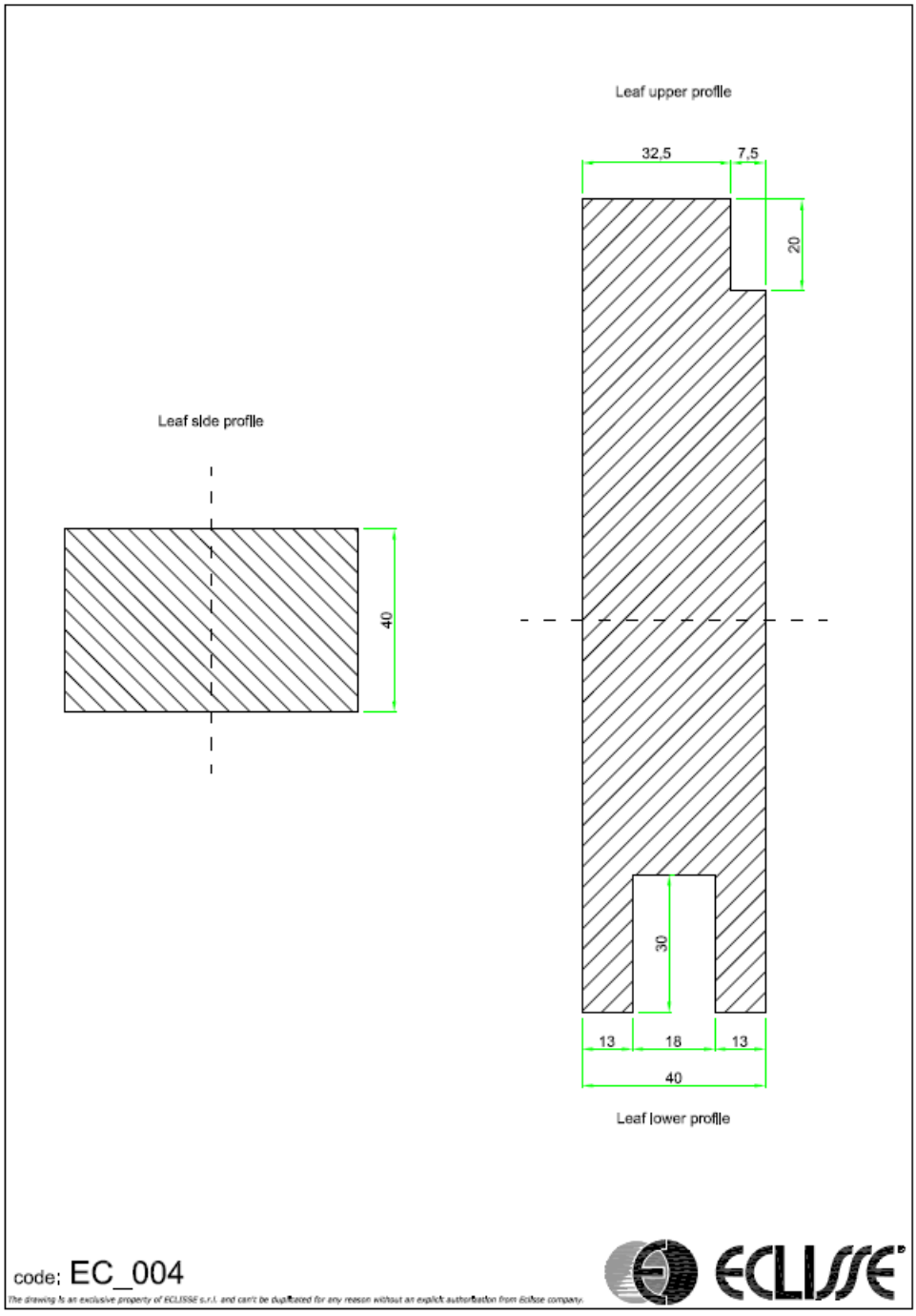

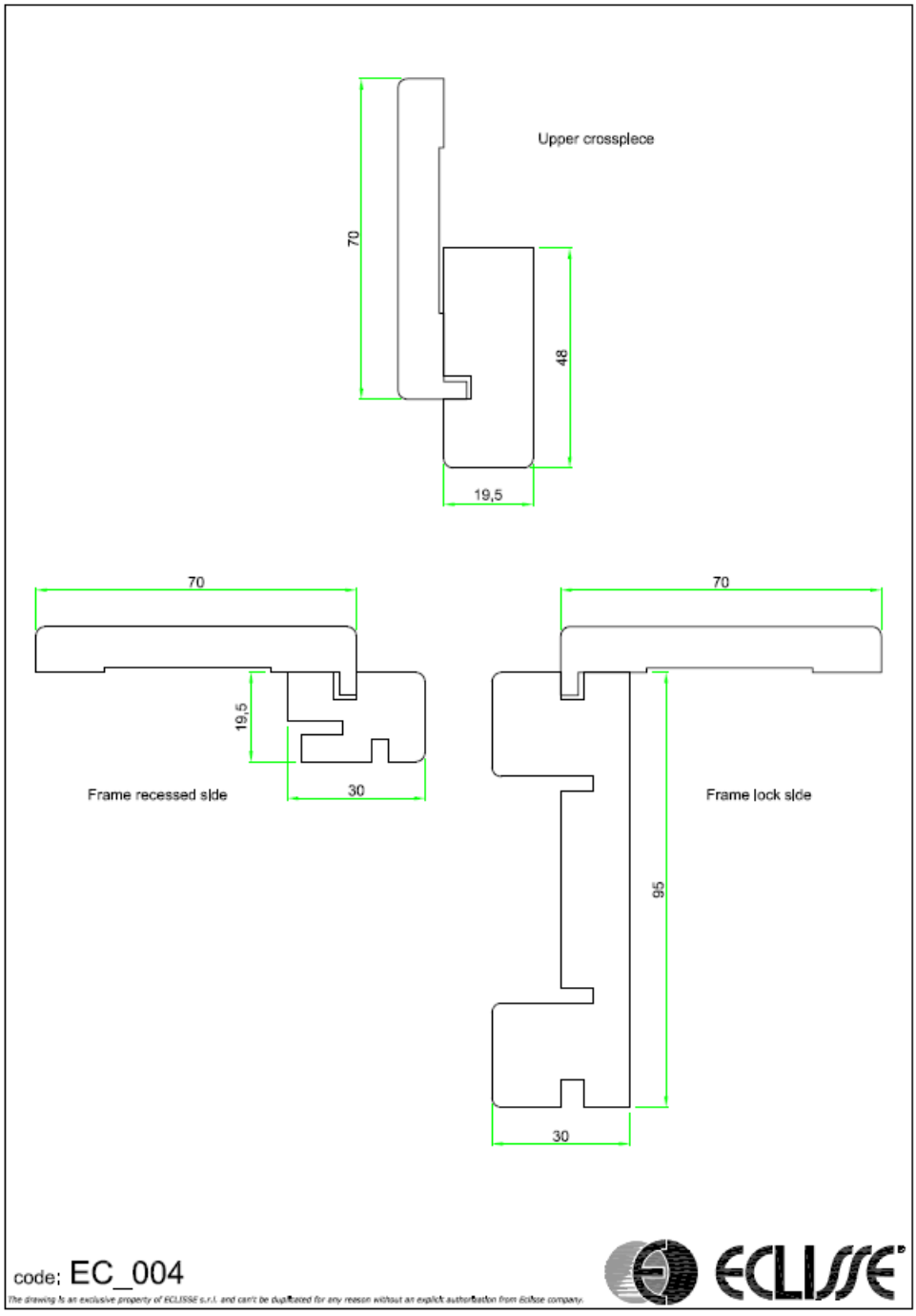

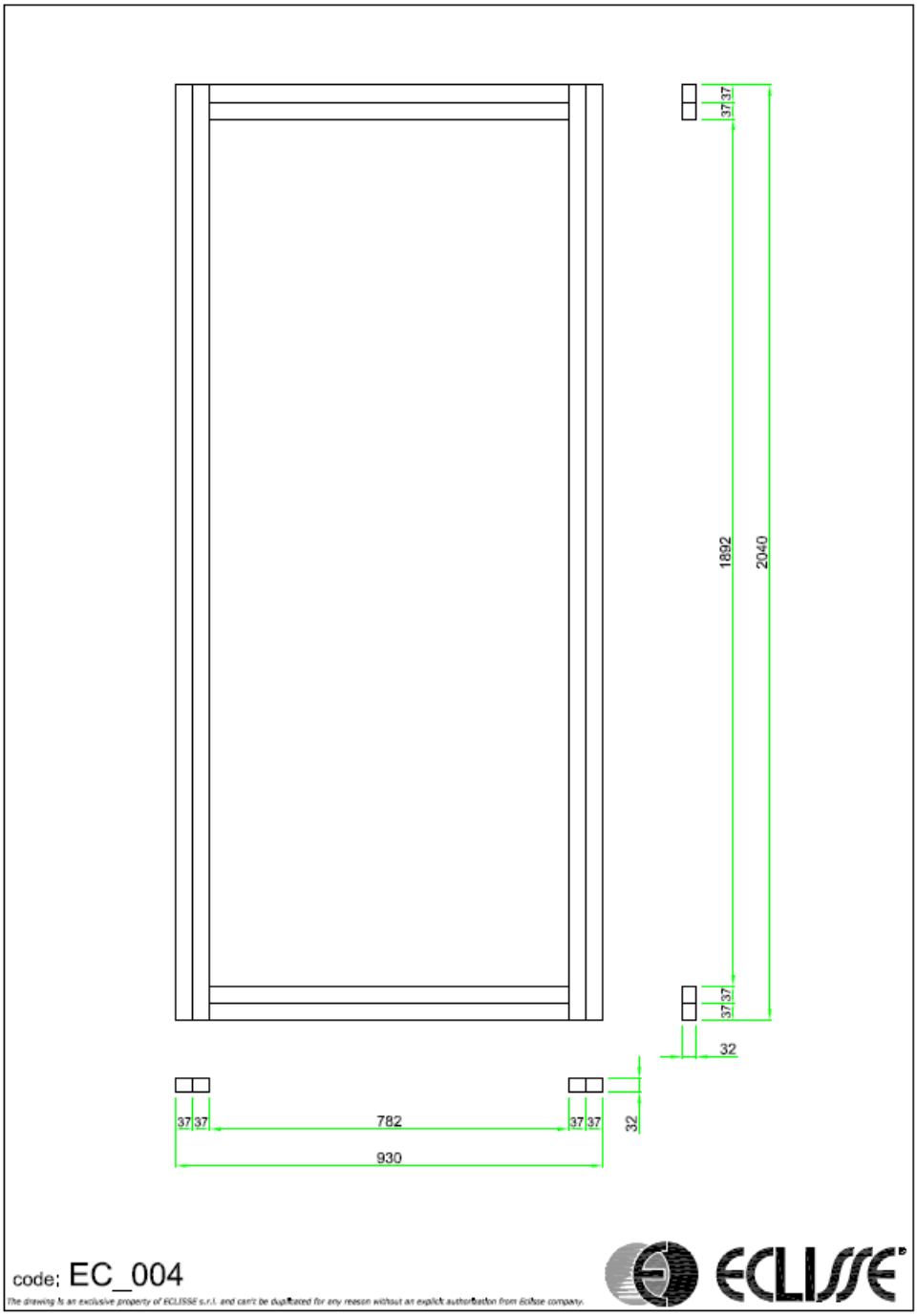

(*) nominal data provided by the sample manufacturer
(**) data measured by test element sampling

Test sample illustrations

The test has been made as soon as the sample installation was completed.

Standards references

UNI EN ISO 10140-2:2010	*Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation.*
UNI EN ISO 717-1:2013	*Acoustics – Acoustic insulation verification in buildings and in building elements* *Part 1: Airborne sound insulation.*

Test environment description

The test environment structure is made of reinforced concrete, wholly insulated from the laboratory through anti-vibration supports. In particular, this environment consists of a source room and a receiving room, both characterized by an irregularly-shaped volume, free of any parallel partition. The rooms are separated by a 100 cm thick test frame.

The dimensional data are listed below:

Average source room dimensions (L x W x H)	700 X 500 X 330 cm
Average receiving room dimensions (L x W x H)	770 X 560 X 370 cm

Test equipment and instruments

Instrument	Model	Serial number
Sound Level Meter	LARSON DAVIS L&D 2900B	1080
Microphone	G.R.A.S. 40AQ	204027
Preamplifier	LARSON DAVIS L&D PRM900C	1267
Calibrator	LARSON DAVIS L&D CAL200	3852
Omnidirectional source	LOOKLINE D301	DO900159
Termohygrometer	DELTA OHM HD2301.0	09020599
Temperature and humidity sensor	DELTA OHM HP472AC R	09028736
Tape	STANLEY POWERLOCK 33-442	13/946
Microclimate with pressure gauge	DELTA OHM HD 32.1	MSP430F4618

Environmental data during the test

	Source room	Receiving room
Volume	122.5 m^3	164.2 m^3
Average temperature	21 ± 1,0 °C	22 ± 1,0 °C
Average relative humidity	52 ± 2,0 %	54 ± 2,0 %
Atmospheric pressure	101.4 kPa ± 1 hPa	
Sample area	4.0 m^2	

Measurement method

The airborne sound insulation test between two rooms is based on the difference between the average sound pressure level in the source room (L_1) and the one detected in the receiving room (L_2). The acoustic source (which produces pink noise) has been operated within the source room in 3 different positions, while the microphone is located in 5 different positions, both in the source room and in the receiving room. A measurement for each source-microphone combination has been performed, for a total of 15 measurements in the source room and 15 in the receiving room. The integration time, for each measure, has been at least 15 s.

Having detected the average level of sound pressure in the receiving environment, the source is switched off, in order to allow the background noise level measurement, L_b. The spectrum corrections, L_2, which need to be calculated for each spectrum frequency component, are equal to:

$$L_2 = L_2 - 1{,}3 \text{ [dB]} \quad \text{if} \quad L_2 - L_b \leq 6 \text{ dB}$$

$$L_2 = 10 \cdot \log(10^{(L_2/10)} - 10^{(L_b/10)}) \text{ [dB]} \quad \text{if} \quad 6 < L_2 - L_b < 10 \text{ dB}$$

The reverberation time calculation, T allows to determinate the sound reduction index, R or the sound insulation for small elements $D_{n,e}$. These parameters result from the application of the following formulas:

$$R = L_1 - L_2 + 10 \cdot \log(S/A) \text{ [dB]}$$

$$D_{n,e} = L_1 - L_2 + 10 \cdot \log(A_0/A) \text{ [dB]}$$

where:
S: is the free test area opening in which the test element is installed, expressed in m^2;
A_0: reference equivalent sound absorption area, equal to 10 m^2;
A: equivalent sound absorption area in the receiving room, calculated by the Sabine equation:

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

where V is the volume of the receiving environment, in m^3.
Basing on the values calculated for each one-third octave frequency band from 100 Hz to 3150 Hz, the experimental curve has been evaluated and compared with the reference one, which is provided within the standard UNI EN ISO 717-1.
Then, the curves comparison method is applied, up to the point where the sum of the unfavorable differences between relative curves values is on the reference curve less than or equal to 32 dB. The value corresponding to the 500 Hz frequency has subsequently been evaluated: this value is the index of evaluation of the apparent sound reduction index R_w (or the normalized acoustic index for small elements $D_{n,e,w}$).

Measured values

f [Hz]	L_1 [dB]	L_2 [dB]	L_b [dB]	T [s]	R [dB]
Frequency	*Source room level*	*Receiving room level*	*Background noise*	*Reverberation time*	*Sound reduction index*
50	80.1	62.1	32.6	4.43	16.3
63	82.3	63.2	27.3	4.27	17.5
80	80.7	53.8	21.7	3.57	25.3
100	87.1	54.1	16.1	3.09	29.8
125	90.1	60.3	15.0	2.61	25.7
160	90.3	61.1	12.9	2.75	25.4
200	88.5	58.2	10.3	2.56	26.2
250	89.4	53.1	5.9	2.25	31.6
315	90.0	51.8	4.8	2.29	33.6
400	90.6	53.4	5.5	2.06	32.2
500	91.2	52.0	5.1	2.25	34.5
630	92.3	51.5	2.7	2.26	36.2
800	92.3	50.9	1.9	2.32	36.8
1000	92.0	51.1	3.1	2.21	36.2
1250	92.0	46.5	3.1	2.18	40.6
1600	93.5	45.4	2.5	2.25	43.5
2000	95.6	49.2	3.2	2.25	41.8
2500	93.5	50.5	3.7	2.13	38.1
3150	91.3	47.0	4.4	1.93	39.0
4000	94.2	46.8	5.4	1.71	41.5
5000	90.7	40.5	5.5	1.53	43.9

(**)Applied correction for background noise according to UNI EN ISO 10140-4:2010, §4.3.

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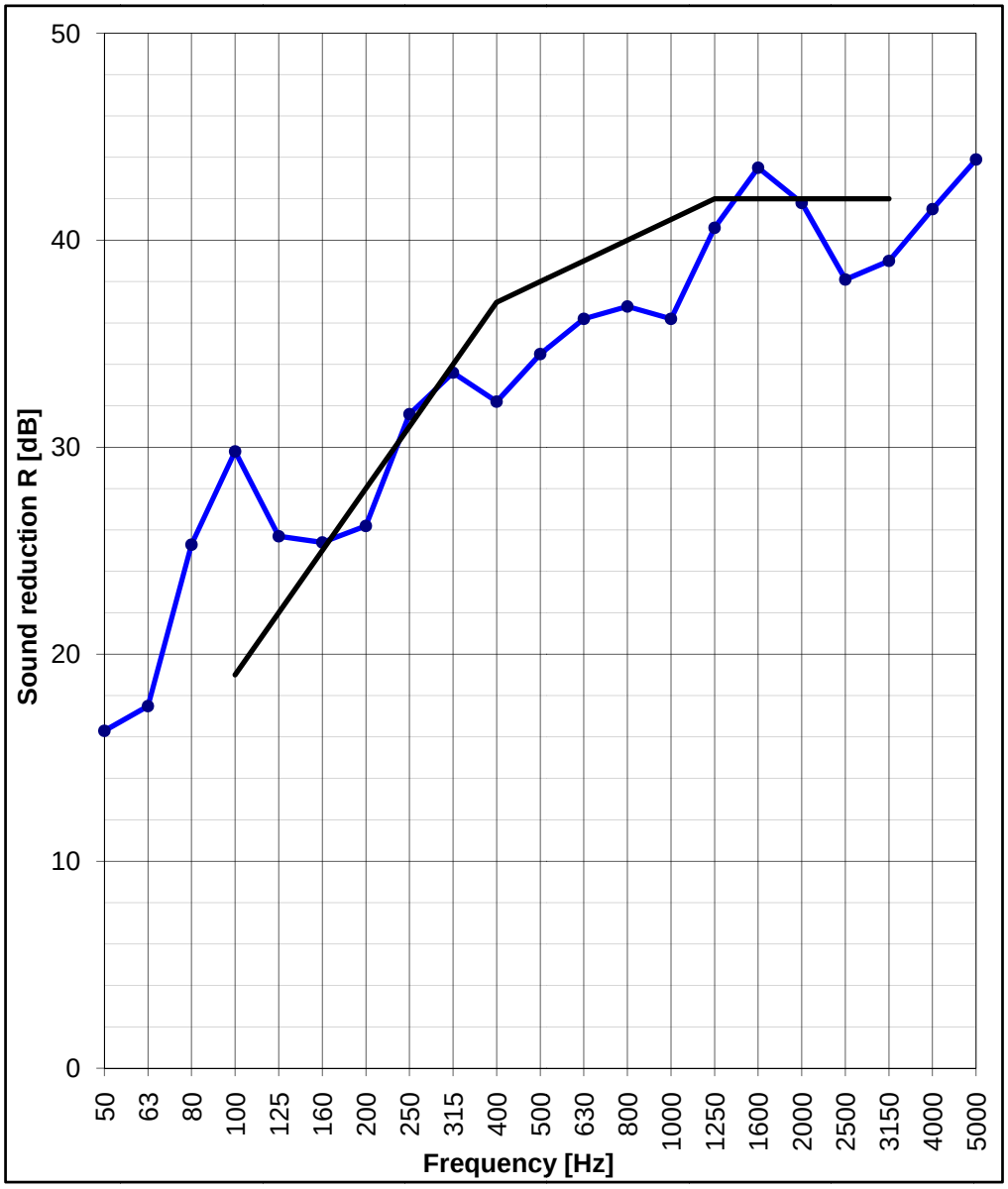
Sound reduction index R, according to UNI EN ISO 10140-2:2010 and UNI EN ISO 717-1:2013

Sample description: Sliding door EC_004

Specimen area: 4.0 m^2

Rooms volume: Emitting 122.5 m^3 Receiving 164.2 m^3

f	R
[Hz]	[dB]
50	16.3
63	17.5
80	25.3
100	29.8
125	25.7
160	25.4
200	26.2
250	31.6
315	33.6
400	32.2
500	34.5
630	36.2
800	36.8
1000	36.2
1250	40.6
1600	43.5
2000	41.8
2500	38.1
3150	39.0
4000	41.5
5000	43.9



Evaluation of conformity according to ISO 717-1

$R_w (C;C_{tr})$ = 38 (-1 ; -3) dB $C_{50\text{-}3150}$ = -1 dB; $C_{50\text{-}5000}$ = -1 dB; $C_{100\text{-}5000}$ = -1 dB

Evaluation based on laboratory measurement results by means of a technical method.

$C_{tr,50\text{-}3150}$ = -5 dB; $C_{tr,50\text{-}5000}$ = -5 dB; $C_{tr,100\text{-}5000}$ = -3 dB

Laboratory Manager Ing. Antonio Scofano