BELGIAN BUILDING RESEARCH INSTITUTE

INSTITUTION RECOGNIZED BY APPLICATION OF THE DECREE-LAW
OF JANUARY THE 30th, 1947
NOTIFICATION NUMBER 1136

N° 42-TEST

All tests in this report are executed according to the ISO 9001
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TEST REPORT

Laboratory	**ACOUSTICS (AC)**	**O/References**	DE631xB624 AC7612-E Page 1 / 7

Requested by	INSULCO Rue Buisson aux loups 1a B-1400 Nivelles		
Date of the order	06-06-2017	**Nr. Test element**	S2017-15-15/1
Date of the test	08-05-2017	**Receipt of the test element**	12-04-2017
Remark(s)	/	**Drafting date of the report**	01-08-2017
Test carried out	Laboratory measurement of impact sound insulation of floors and improvement of impact sound insulation of floor coverings in laboratory		
Product tested	INSULIT 4+2		
References	EN ISO 10140:2010 Acoustics – Measurement of sound insulation in buildings and of building elements - Part 1: Application rules for specific products - Part 3: Measurement of impact sound insulation - Part 5: Requirements for test facilities and equipment EN ISO 717-2:2013 Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound insulation (ISO 717-2:2013)		

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Each page of the original report has been stamped (in red) by the laboratory and initialised by the head of laboratory.
The results and findings are only valid for the tested samples.

☐ *No sample*
☐ *Sample(s) submitted to a destructive test*
☒ *Sample(s) to be removed from our laboratories 10 calendar days after sending of the report, unless a written request is received by the demander of the test*

C.S.T.C. W.T.C.B.

The engineer in charge of the test,
ir. D. Wuyts

Technical responsable,
F. Corbugy

Head of the Laboratory,
ir. D. Wuyts

Technical Assistant: /

NORMALIZED IMPACT SOUND PRESSURE LEVEL

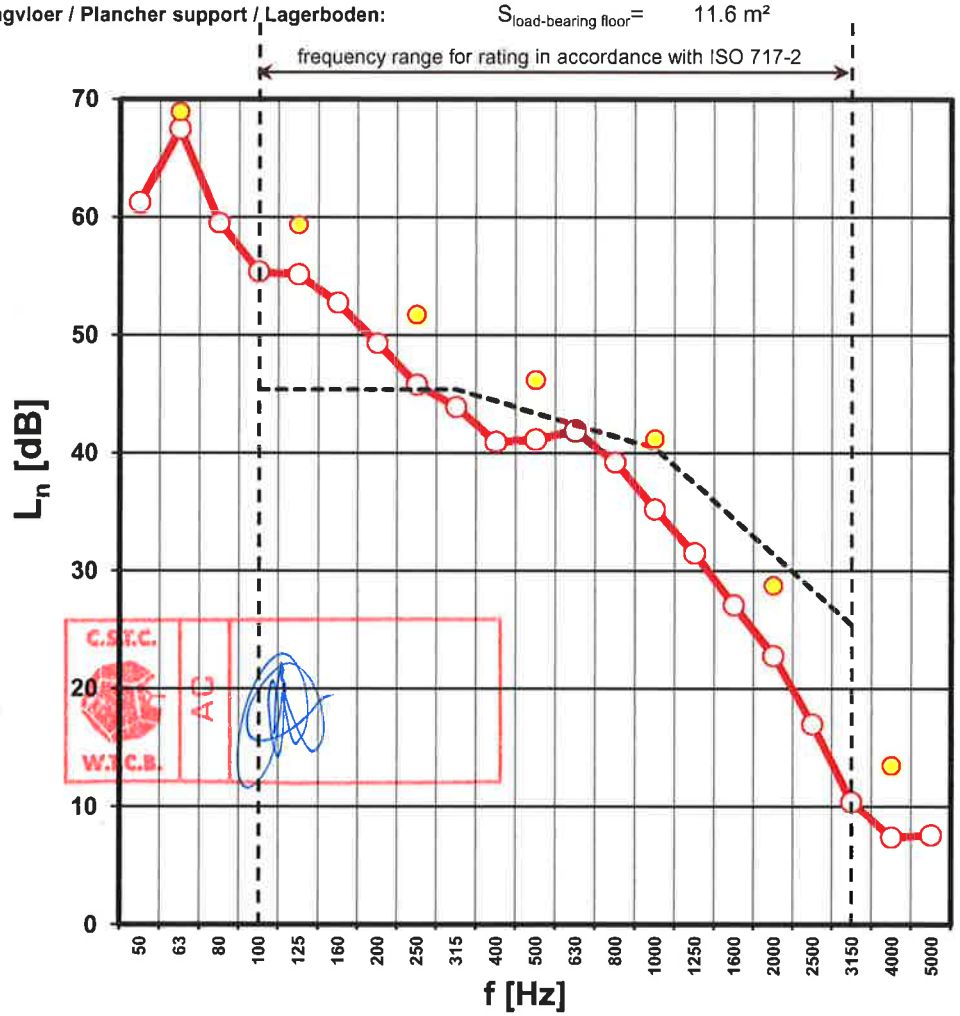
NIVEAU DU BRUIT DE CHOC NORMALISÉ / GENORMALISEERD CONTACTGELUIDNIVEAU

EN ISO 10140-3:2010 Acoustics – Measurement of sound insulation in buildings and of building elements – Part 3: Measurement of impact sound insulation
EN ISO 717-2:2013 Acoustics – Rating of sound insulation in buildings and of building elements – Part 2: Impact sound insulation

Date of Test / Testdatum / Date d'essais / Prüfdatum:	08/05/2017
Source room / Zendruimte / Salle d'émission / Senderaum:	K2 % H2O = 38.8 % T = 21.2 °C
Receiving room / Ontvangstruimte / Salle de réception / Empfangsraum:	E2 V = 103,22 m³ % H2O = 57,3 % T = 18,8 °C
Test sample / Testelement / Elément de l'essai / Testelement:	$S_{testelement}$= 10.6 m²
Load-bearing floor / Draagvloer / Plancher support / Lagerboden:	$S_{load\text{-}bearing\ floor}$= 11.6 m²

f (Hz)	L_n (dB)
1/3 octaves	
50	61.2
63	67.5
80	59.5
100	55.4
125	55.1
160	52.7
200	49.3
250	45.8
315	43.9
400	41.0
500	41.2
630	41.9
800	39.2
1000	35.2
1250	31.5
1600	27.1
2000	22.8
2500	17.0
3150	10.4
4000	7.4
5000	7.6

octaves ○	
63	68.9
125	59.3
250	51.7
500	46.2
1000	41.2
2000	28.8
4000	13.5



$L_{n,w}$ = 43 dB	C_I = 2 dB	$C_{I,50\text{-}2500}$ = 11 dB	cat = I a
$L_{n,r,w}$ = 43 dB	$C_{I,r}$ = 2 dB		
ΔL_w = 35 dB	$C_{I,\Delta}$ = -13 dB		ΔL_{lin} = 22 dB

Description by the producer - Beschrijving door de fabrikant - Description par le fabriquant
Floating screed of 60 mm on a resilient underlayer "insulit 4+2" on a Betonsulit LD200 leveling screed of 50 mm.

Characteristics of the basic test floor - Beschrijving van basistestvloer - Description du plancher d'essai de base
Reinforced concrete slab of uniform thickness 140 mm over a surface of 260 cm x 442 cm, with 160 mm high elevated borders that simulate the surrounding walls of an actual floor slab.

REDUCTION OF IMPACT SOUND PRESSURE LEVEL

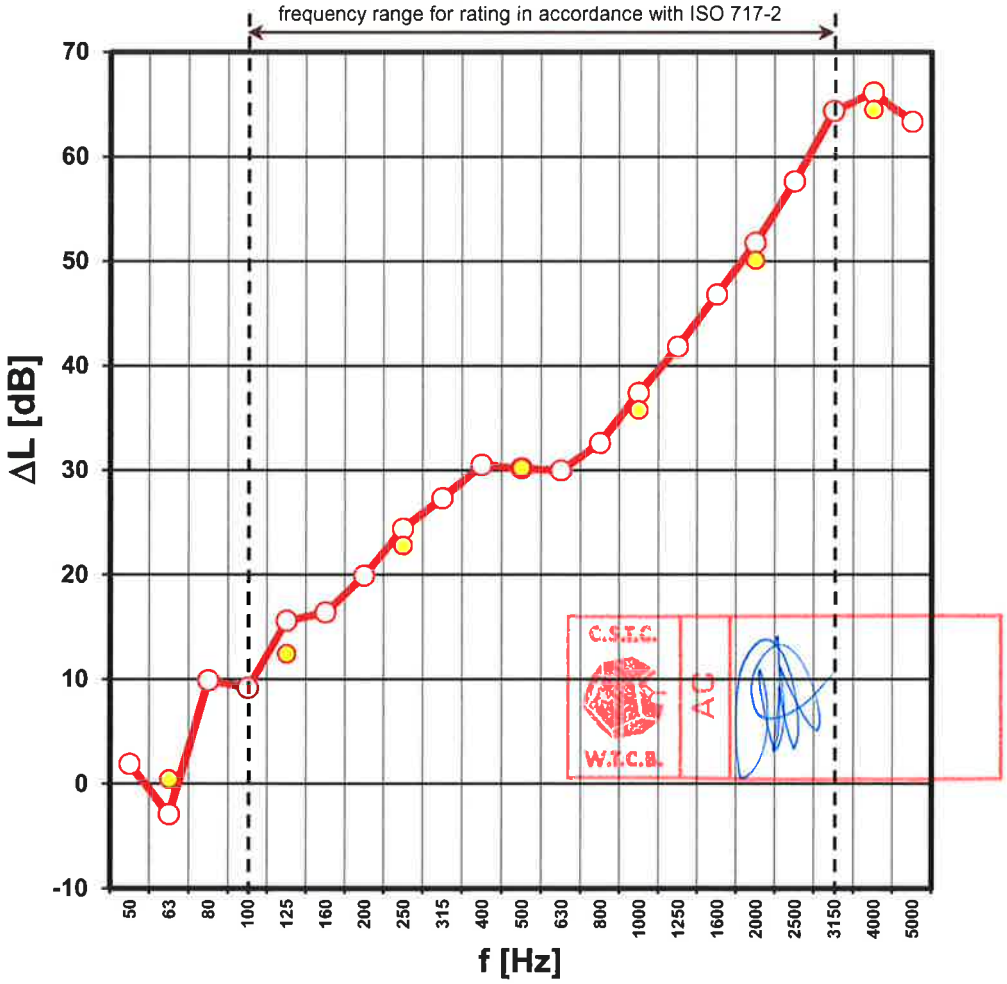
AFFAIBLISSEMENT ACOUSTIQUE BRUT / CONTACTGELUIDNIVEAUREDUCTIE

EN ISO 10140-3:2010 Acoustics – Measurement of sound insulation in buildings and of building elements – Part 3: Measurement of impact sound insulation
EN ISO 717-2:2013 Acoustics – Rating of sound insulation in buildings and of building elements – Part 2: Impact sound insulation

Date of Test / Testdatum / Date d'essais / Prüfdatum:	08/05/2017			
Source room / Zendruimte / Salle d'émission / Senderaum:	K2		% H2O = 38.8 %	T = 21.2 °C
Receiving room / Ontvangstruimte / Salle de réception / Empfangsraum:	E2	V = 103,22 m³	% H2O = 57,3 %	T = 18,8 °C
Test sample / Testelement / Elément de l'essai / Testelement:	$S_{testelement}$=	10.6 m²		
Load-bearing floor / Draagvloer / Plancher support / Lagerboden:	$S_{load\text{-}bearing\ floor}$=	11.6 m²		

f (Hz)	ΔL (dB)
1/3 octaves	
50	1.9
63	-2.9
80	9.9
100	9.2
125	15.6
160	16.4
200	19.9
250	24.4
315	27.3
400	30.5
500	30.2
630	30.0
800	32.6
1000	37.4
1250	41.8
1600	46.8
2000	51.8
2500	57.6
3150	64.4
4000	66.1
5000	63.3

octaves	
63	0.5
125	12.4
250	22.8
500	30.2
1000	35.8
2000	50.1
4000	64.5



$L_{n,w}$ = 43 dB	C_I = 2 dB	$C_{I,50\text{-}2500}$ = 11 dB	cat = I a
$L_{n,r,w}$ = 43 dB	$C_{I,r}$ = 2 dB		
ΔL_w = 35 dB	$C_{I,\Delta}$ = -13 dB		ΔL_{lin} = 22 dB

Description by the producer - Beschrijving door de fabrikant - Description par le fabriquant
Floating screed of 60 mm on a resilient underlayer "insulit 4+2" on a Betonsulit LD200 leveling screed of 50 mm.

Characteristics of the basic test floor - Beschrijving van basistestvloer - Description du plancher d'essai de base
Reinforced concrete slab of uniform thickness 140 mm over a surface of 260 cm x 442 cm, with 160 mm high elevated borders that simulate the surrounding walls of an actual floor slab.

1. Measurement and calculation methods

A detailed description of the mounting and measuring procedures can be respectively found in EN 10140-1&5:2010 and EN ISO 10140-3:2010 (see page 1). In simple terms, the determination principle can be summarized as follows : The impact sound is generated by the standardized tapping machine (with steel-headed hammers) which is set successively at various positions on the test floor. For each position, sound pressure measurements are carried out with the help of 2 continuously rotating microphones in the measuring cell located beneath the floor. Measurements are done during at least one complete rotation and different planes of rotation. One thus obtains an integration over time and space of the sound pressure level spectrum, which results in an average sound pressure level. The reverberation time in the receiving room is measured, which permits one to calculate the correction term to be integrated into the formula for calculating the normalized impact sound pressure level:

$$L_n = L_{pm} + 10 \lg (A / A_0)$$

with: L_{pm} = the average sound pressure level in the receiving room, in dB (reference 20 Micro Pa);
A_0 = the reference equivalent absorption area 10 m²;
A = the equivalent absorption area of the receiving room in m².

Successively, the following normalised impact sound pressure level spectra are obtained for:

- $L_{n,0}$ ⇨ (a) measured 1/3d octave band values for the bare load-bearing floor described in EN ISO 10140-1:2010
- L_n ⇨ (b) measured 1/3d octave band values for the total test floor (load-bearing floor + eventually a topping and/or a suspended ceiling)
- ΔL ⇨ (a)-(b) calculated reduction of impact sound pressure level due to the topping and/or suspended ceiling
- $L_{n,r,0}$ ⇨ (c) given 1/3d octave band values for a fictuous reference load bearing floor (EN ISO 10140-5:2010)
- $L_{n,r}$ ⇨ (c)-(a)+(b) calculation of the normalized impact sound pressure level of a reference lightweight floor with the floating floor (covering) and/or suspended ceiling

The single-number values (given by the index "w") and spectrum adaptation terms are described in the standard EN ISO 717-2:2013 (see page 1). Calculation modules and more information about the single-number value (and about acoustical standardisation in general) can be found on the website of the Acoustics laboratory, i.e.: http://www.bbri.be/antenne_norm/

	(a)	(b)	(a)-(b)	(c)	(c)-(a)+(b)
f (Hz)	$L_{n,0}$ (dB)	L_n (dB)	ΔL (dB)	$L_{n,r,0}$ (dB)	$L_{n,r}$ (dB)
50	63.1	61.2	1.9	/	/
63	64.6	67.5	-2.9	/	/
80	69.4	59.5	9.9	/	/
100	64.6	55.4	9.2	67.0	57.8
125	70.7	55.1	15.6	67.5	51.9
160	69.1	52.7	16.4	68.0	51.6
200	69.2	49.3	19.9	68.5	48.6
250	70.2	45.8	24.4	69.0	44.6
315	71.2	43.9	27.3	69.5	42.2
400	71.5	41.0	30.5	70.0	39.5
500	71.4	41.2	30.2	70.5	40.3
630	71.9	41.9	30.0	71.0	41.0
800	71.8	39.2	32.6	71.5	38.9
1000	72.6	35.2	37.4	72.0	34.6
1250	73.3	31.5	41.8	72.0	30.2
1600	73.9	27.1	46.8	72.0	25.2
2000	74.6	22.8	51.8	72.0	20.2
2500	74.6	17.0	57.6	72.0	14.4
3150	74.8	10.4	64.4	72.0	7.6
4000	73.5	7.4	66.1	/	0.0
5000	70.9	7.6	63.3	/	0.0

Basic test floor:
[based on spectrum (a)]
$L_{n,0,w}$ = 80 dB $C_{I,0}$ = -11 dB

Basic floor + linings:
[based on spectrum (b)]
$L_{n,w}$ = 43 dB C_I = 2 dB

Reference load-bearing floor:
(c) given 1/3d octave band values for a fictuous reference load bearing floor (EN ISO 10140-5:2010)
$L_{n,r,0,w}$ = 78 dB $C_{I,r,0}$ = -11 dB

Reference floor + linings:
[calculated (c)-(a)+(b)]
$L_{n,r,w}$ = 43 dB $C_{I,r}$ = 2 dB

Reduction of impact sound pressure level
$\Delta L_w = L_{n,r,0,w} - L_{n,r,w}$ = 35 dB
$C_{I\Delta} = C_{I,r,0} - C_{I,r}$ = -13 dB
$\Delta L_{lin} = \Delta L_w + C_{I\Delta}$ = 22 dB

⇧ ***TABLE 1: calculation of the single ratings as to EN ISO 717-2:2013***
⇦ ***TABLE 2: 1/3 octave band measured and calculated spectral values***

2. Test equipment

TEST EQUIPMENT	BRANDMARK
2 microphones 1/2"	Brüel & Kjær type 4190
2 pre-amplifiers for microphone	Brüel & Kjær type 2669-L
One power supply for microphones	Brüel & Kjær type 2829
One rotating microphone set-up	Norsonic Nor265
Acquisition system	Norsonic Nor850 Distributed Multichannel System
Measurement software	Norsonic Nor850 Building Acoustic Software
One calibration source pistonphone	Brüel & Kjær type 4228
One standardized tapping machine	Brüel & Kjær type 3207

3. The precision of the measurement results

The standard measurement uncertainties as given in the standard ISO 12999-1 (table 4 and 5) apply.

4. Description of the test element

This description is given by the producer of the test element and is not guaranteed by the laboratory. The equivalence between the tested product in this report and the commercialised product is the sole responsability of the producer.

GENERAL DESCRIPTION

Floating screed of 60 mm on a resilient underlayer "insulit 4+2" on a Betonsulit LD200 leveling screed of 50 mm.

COMPOSITION OF THE TESTELEMENT

Only parts of the table below can be made unreadable in copies of this report, e.g. if some data are confidential.

layer	thickness [mm]	density [kg/m³]	surface mass [kg/m²]	description
+7				
+6				
+5				
+4				
+3	60 mm	1800 kg/m³	108.0 kg/m²	Screed
+2	6 mm	40 kg/m³	0.24 kg/m²	INSULIT 4+2
+1	50 mm	200 kg/m³	10.0 kg/m²	Betosulit LD 200
BASIC FLOOR	140 mm	-	-	Reinforced concrete slab
-1				
-2				
-3				
-4				

C.S.T.C. W.T.C.B. AC

Total thickness of the layers on top of the basic floor = 116 mm (calculated value)
Total surface mass on top of the basic floor = 118.24 kg/m² (calculated value)

REMARKS

/

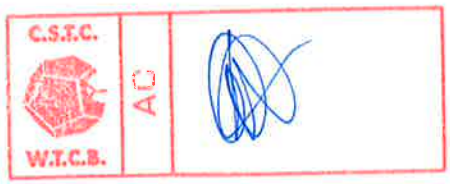
5. Description of the test set-up

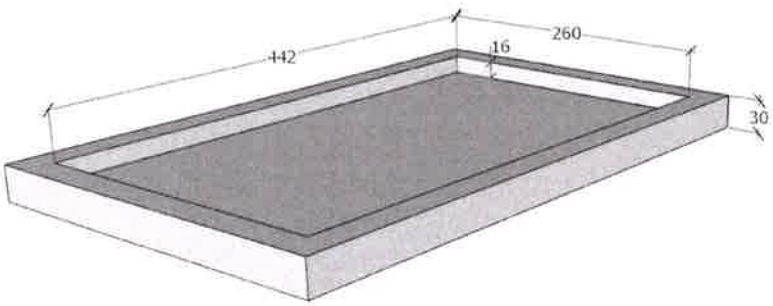
The acoustic laboratory disposes of 6 transmission rooms : A, B, C, D, E and F. Each one is provided with a 30 mc thick concrete floor slab, placed on resilient pads placed on the foundation beams. The transmission rooms are separated from each other as well as from the environment by means of a 5 cm large cavity filled with mineral wool.

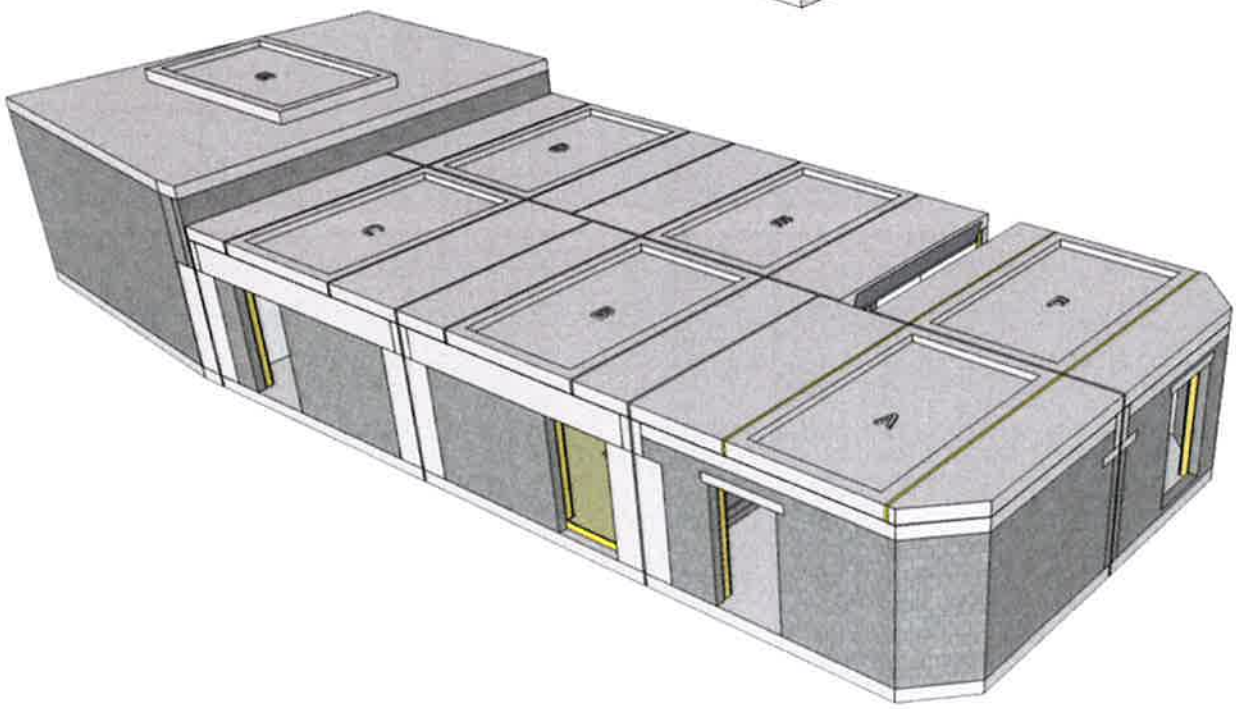
The ceiling slab of each transmission room consists of three parts being supported from the exterior wall to the central axis : two 30 cm thick external concrete slabs and one central 14 cm thick concrete "tub" (250 cm x 442 cm) with a 25 cm large and 30 cm thick edge. All ceiling slabs can be removed with the roller bridge. They are attached to each other as well to the walls of the underlying rooms by a mortar joint. To avoid flanking transmission, an elastical interlayer is put between the ceiling slabs and the beams above the vertical test openings in rooms B and D. The 30 cm thick ceiling parts are lined with a heavy, removeable false ceiling construction to avoid flanking transmission of impact sound.

The laboratory construction meets the requirements for impact sound insulation measurements as mentionned in the standard EN ISO 10140-3.

As basic test floor one of the reinforced concrete slabs (A, B, C, D, E or F) of uniform thickness 140 mm over a surface of 260 cm x 442 cm, with 160 mm high elevated borders simulating the surrounding walls of an actual floor slab, is used.







6. Mounting of the test element

The test element is mounted according to the NBN EN ISO 10140-3, in a similar manner to the actual construction. (See also "4. Description of the test element"). The mounting details are illustrated below.