RION

Impact Sound Generator for Architectural Acoustics Measurement and Impact Force Measurement system

● **Light Floor Impact Sound Generator**
<Tapping Machine>
FI-01A

● **Heavy Floor Impact Source**
<Bang Machine>
FI-02

● **Heavy Floor Impact Source**
<Impact Ball>
YI-01

● **Impact Force Measurement system**
<Impact Force Sensor>
PF-10

For testing the performance of floor surface finishing materials in terms of sound insulating performance in the mid to high frequency range

Light Floor Impact Sound Generator <Tapping Machine>

FI-01A ISO 10140-5, ISO 16283-2

The FI-01A is a light and hard impact source for measuring the sound level of floor impacts. It simulates a sound source such as a person walking with shoes on. It is primarily used for testing the performance of floor surface finishing materials in terms of their sound insulating performance in the mid to high frequency range.

● Specifications

Applicable standards	ISO 10140-5, ISO 16283-2, JIS A 1418-1
Hammers number and Spacing	5 hammers are arrayed at 100 mm intervals in a straight line
Hammer surface curvature	500 mm
Hammer diameter/weight	Diameter: 30 mm, Weight: 500 g
Average floor impact time interval	100 ms ±5 ms
Floor impact velocity	88.5 cm/s (equivalent to free-fall of a hammer from a height of 40 mm)
Interface	RS-232C
Power requirements	AC power supply 100 V to 240 V Built-in rechargeable lithium ion battery (Under continuous operation approx. 45 minutes)
Dimensions, weight	Approx. 230 (H) × 265 (W) × 557 (D) mm, approx. 10 kg
Accessories	AC power cable × 1, 13 mm wrench × 1, height adjustment gauge × 1

The 5 hammer heads on the underside hit the floor in succession, generating impact sounds.

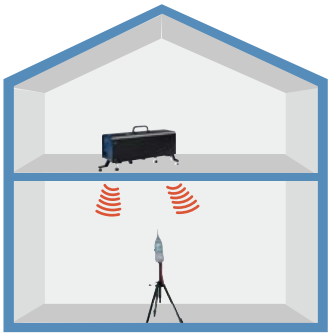


Image illustrating measurement of the performance for insulating floor impact sounds between upstairs and downstairs rooms in a building.

Measures the impact force of a bang machine or impact ball

Impact Force Measurement system

<Impact Force Sensor>

PF-10

The force pickup PF-10 is used for measuring the impact force of the standard heavy impact source specified in JIS A 1418-2: 2019. It is used in conjunction with a charge amplifier and octave band frequency analyzer to measure the impact force exposure level of each octave band.

For testing acoustic performance of floor structures in terms of their sound insulating performance in the mid to low frequency range

Heavy Floor Impact Source <Bang Machine>

FI-02

FI-02 JIS A 1418-2: 2019 Standard Heavy Impact Source (Impact Force Characteristics 1)

The FI-02 is a heavy and soft impact source which is designed for floor impact sound level measurement.
It simulates a sound such as children jumping up and down.
It is mainly used for testing acoustic performance of floor structures in terms of sound insulating performance in the mid to low frequency range.

● Octave band impact force exposure levels and tolerances of impact force properties (1)

Octave band center frequency Hz	Octave band impact force exposure levels dB	Tolerances dB
31.5	47.0	±1.0
63	40.0	±1.5
125	22.0	±1.5
250	11.5	±2.0
500	5.5	±2.0

● Impact force exposure level L_{FE}

Excerpt from Japan Industrial Standards (JIS) Unit: Decibel (dB)

$$L_{FE} = 10 \log_{10} \left[\frac{1}{T_0} \int_{t_1}^{t_2} \frac{F^2(t)}{F_0^2} dt \right]$$

Here, $F(t)$: impact force (N)
F_0 : standard force (1 N)
$t_2 - t_1$: time includes impact time of impact source (s)
T_0 : reference time (1 s)

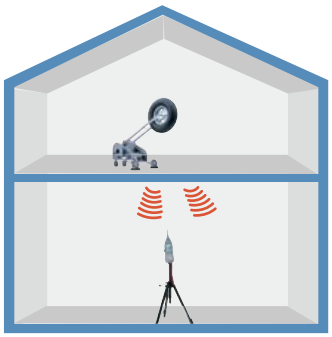
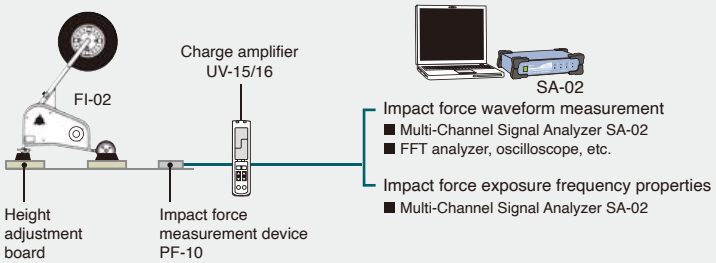


Image illustrating measurement of the performance for insulating floor impact sounds between upstairs and downstairs rooms in a building.

● Configuration example for measuring impact force characteristics of a bang machine
(Height adjustment board optional)



● Equipment Configuration

Impact force measuring sensor

Impact Force Sensor	PF-10
Sensitivity	approx. 4 pC N
Measurement range	5 000 N
Dimensions	220 mm ϕ (upper board) × 260 mm ϕ (lower plate) × 45 mm (height)

Charge amplifier

Vibration Meter Unit	UV-15
2-Channel Charge Amplifier	UV-16
Frequency properties	0.5 Hz to 30 kHz ± 10 %

Frequency analyzer

Multi-Channel Signal Analyzer	SA-02
Applicable standard	Octave-band and fractional-octave band filters : IEC 61260-1 : 2014

● Example of bang machine impact force measurement

Measures floor impact sound insulation properties of building materials

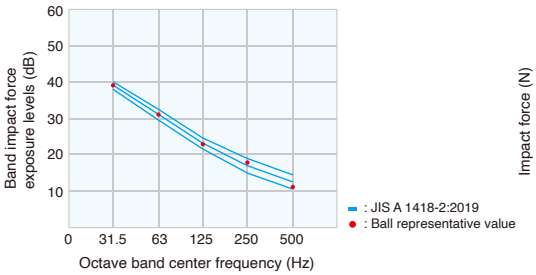
Heavy Floor Impact Source <Impact Ball>

YI-01

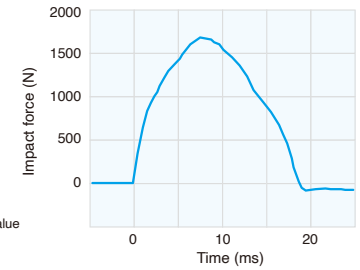
GREEN

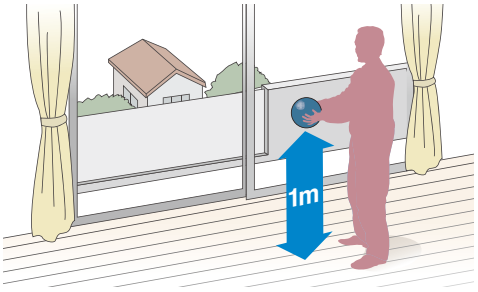
YI-01 conforms the rubber ball impact source defined in ISO 10140-3: 2010 and JIS A 1418-2: 2019.
This is used when the impact force of a standard impact source (bang machine) with impact force properties (1) is excessive for a building with a lightweight structure.
Easy to carry, weighing just 2.5 kg. A consistent impact force is achieved by free-dropping from a height of 1 m.

● Impact force exposure level frequency properties



● Impact force waveform (example)





● Specifications

Major rubber compound	Silicone rubber
Shape	Hollow sphere with diameter of approx. 178 mm and wall thickness of 32 mm
Equivalent mass	2.5 kg ± 0.1 kg
Rebound coefficient	0.8 ± 0.1
Hardness of rubber	40 °± 5 °

● Octave band impact force exposure levels and tolerances of impact force properties (2)

Octave band center frequency Hz	Octave band impact force exposure levels dB	Tolerances dB
31.5	39.0	±1.0
63	31.0	±1.5
125	23.0	±1.5
250	17.0	±2.0
500	12.5	±2.0

ilac-MRA IA Japan Accredited Calibration JCSS JCSS 0197

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ISO 14001 TÜV SÜD ISO 9001

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Distributed by:

RION CO., LTD.
https://rion-sv.com/

3-20-41, Higashimotomachi, Kokubunji, Tokyo 185-8533, Japan
Tel: +81-42-359-7888 Fax: +81-42-359-7442

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