



Customized orders provide the performance you need for your application

## Seismic Isolation Module Model TGS

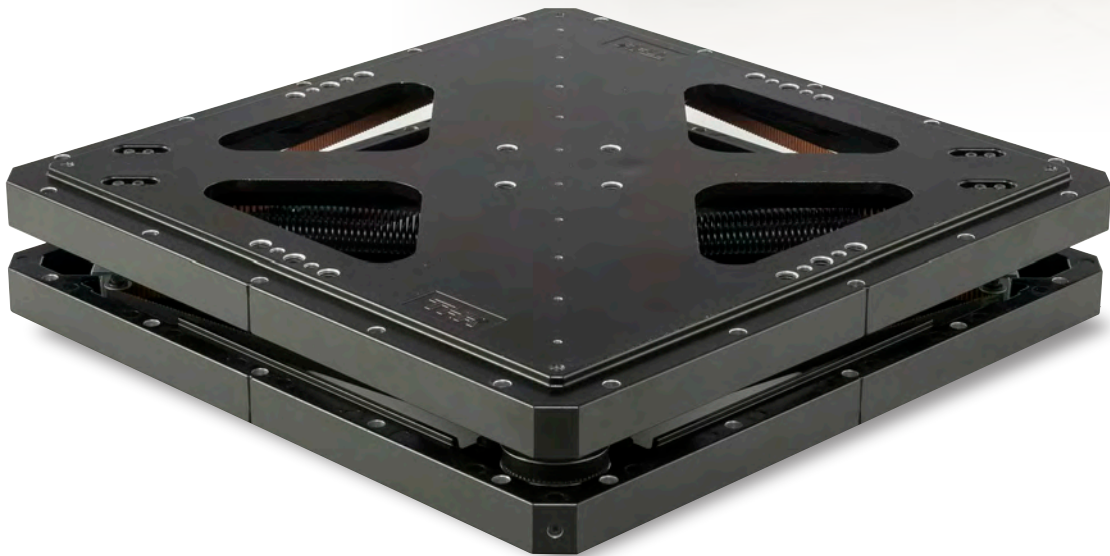
Ensure business continuity when earthquakes strike

*Peace of mind is right here.*





## *Compact seismic isolation for buildings*



### **Seismic Isolation Module Model TGS: The Culmination of THK's Seismic Isolation Technologies**

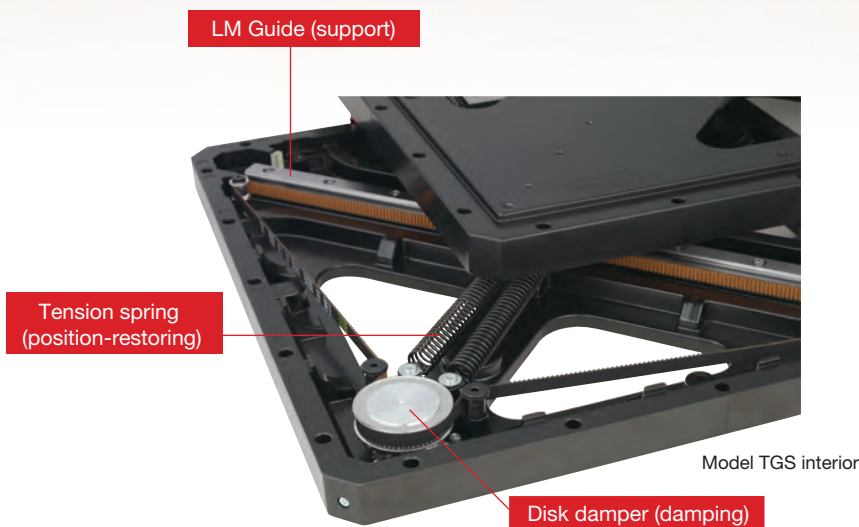
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Utilizing our vast experience in seismic isolation for all kinds of buildings from single-family homes to skyscrapers, the Seismic Isolation Module Model TGS condenses the core technologies of supporting, damping, and restoring that are essential to seismic isolation into a compact size.

Combining these compact modules allows for sectional seismic isolation suited to your application, including everything from single units for production equipment and measurement machines to total floor coverage for data centers, server rooms, and operation centers.

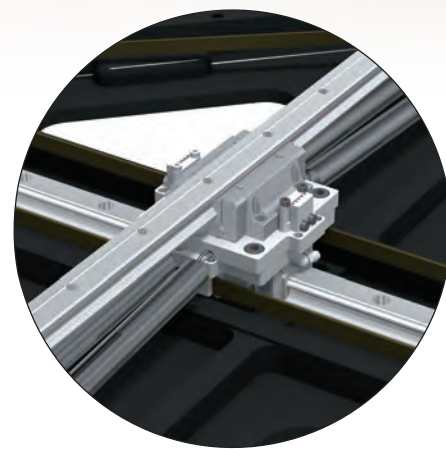


Seismic isolation system installed under THK headquarters building



### Compact Seismic Isolation

The Seismic Isolation Module Model TGS condenses the supporting, restoring, and damping functions essential to seismic isolation into a compact form.



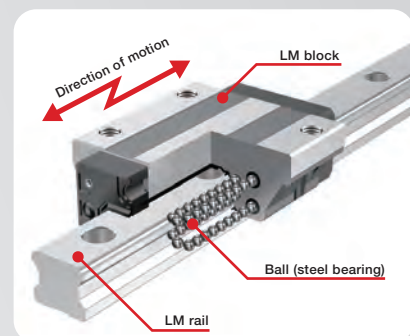
LM Guide combination

### Perpendicular LM Guide Units

Perpendicular LM Guide units provide smooth movement in every direction for a range of 360°.

### Core LM Guide Component Is Used in Industrial Machinery Worldwide

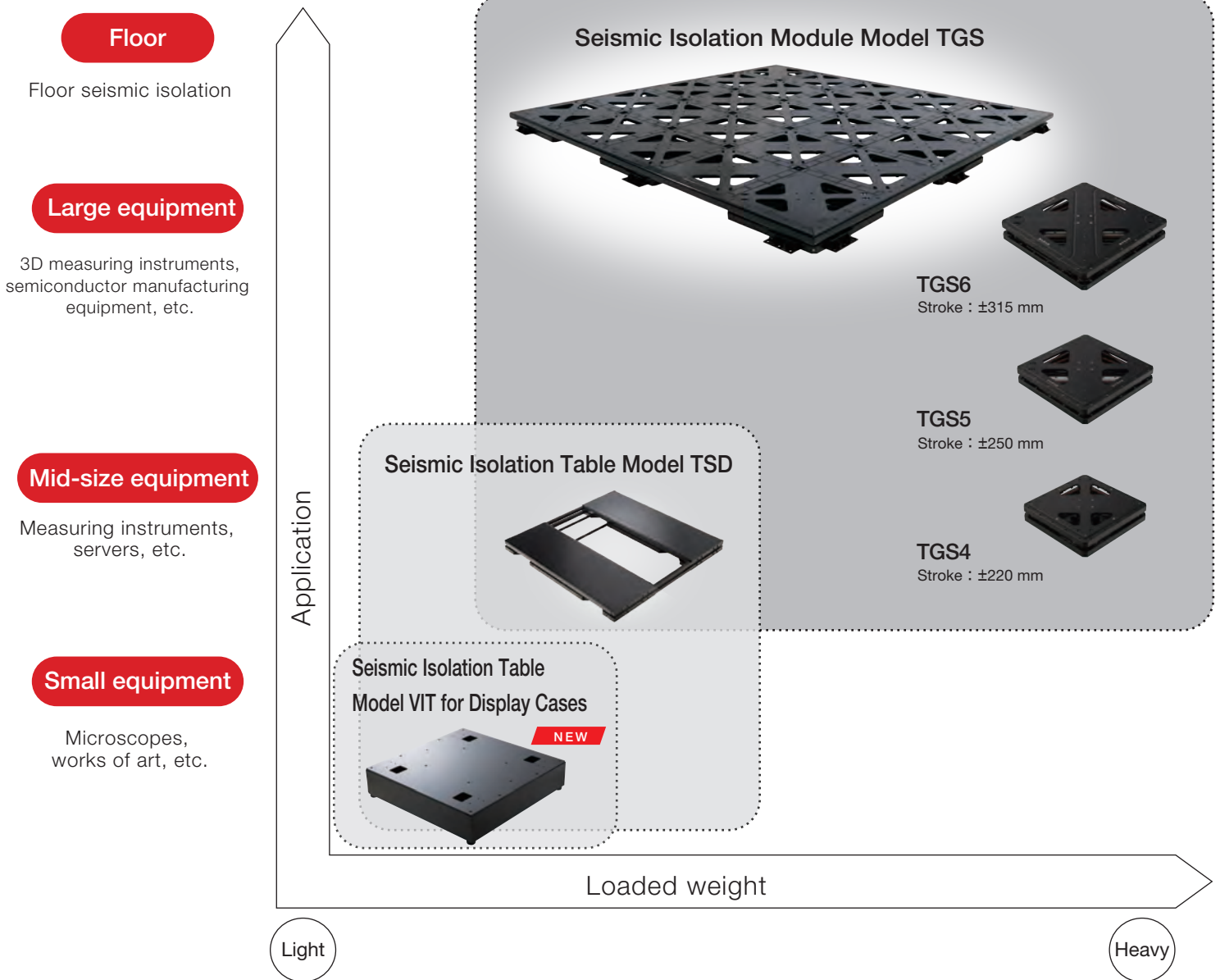
Forming the heart of the seismic isolation module, the LM Guide uses rolling motion to achieve linear motion while reducing frictional resistance to generate smooth movement that deflects seismic tremors. Since its development by THK in 1972, the LM Guide has spurred dramatic improvements in the performance of mechatronic equipment, and it is now the de facto standard for industrial equipment and machine tools around the world.



# We offer the optimal seismic isolation for your application, from single unit servers to total floor coverage for operation centers.

We have a varied lineup of seismic isolation systems in different sizes. Choose the optimal system based on the fundamental period that would be expected for the building structure, the application (equipment located on the floor), and where it will be installed.

## Guidelines for Selecting a THK Seismic Isolation System





***Our original mechanisms handle even the types of tremors seen from recent major earthquakes.***

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During the 2011 Tohoku earthquake and tsunami (Great East Japan Earthquake) and the 2016 Kumamoto Earthquakes, tremors that exceed the specifications (displacement) of conventional seismic isolation units were recorded, and tremors of the same kind are expected for the Nankai Trough earthquake that is predicted to occur in the future.

THK has combined the LM Guide, which has a proven track record in industrial machinery, with a damper using an original mechanism to develop the Seismic Isolation Module Model TGS.

With a combined high-displacement module and damper, we offer the optimal customized seismic isolation performance.

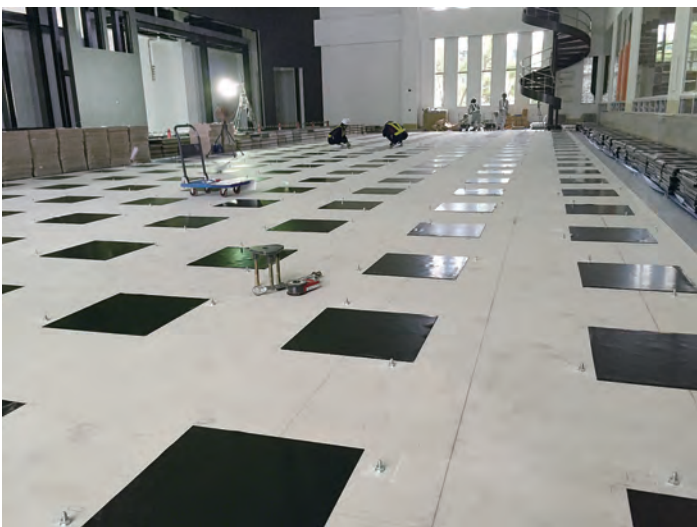


# Installation Examples: Flooring



Traffic control center (281 m<sup>2</sup> surface)

## Installation process



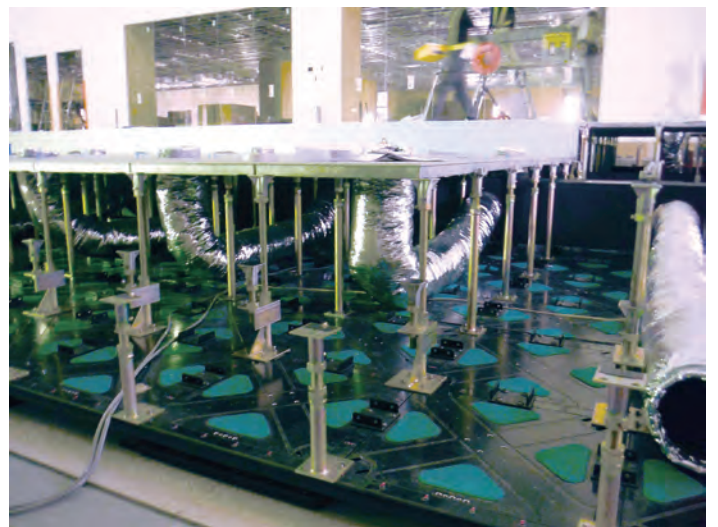
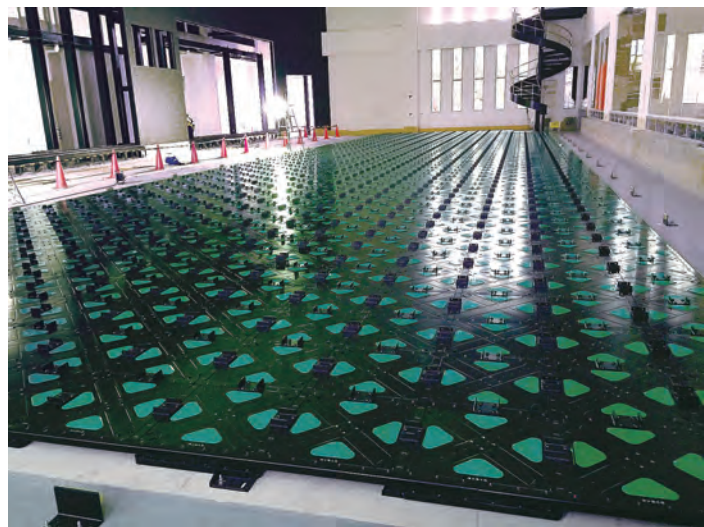
## Summary

The seismic isolation modules can be installed directly onto the floor, so steel frames to cover the entirety of the floor like those used with conventional seismic isolation devices for flooring are unnecessary.

Module sizes are offered in the same specifications (450 mm<sup>2</sup>, 500 mm<sup>2</sup>, and 600 mm<sup>2</sup>) as raised access flooring (raised flooring), so construction is simple. Moreover, the top surface of the modules are a planar construction, so wiring and piping can be run freely between the raised access flooring.



Underfloor wiring



# Installation Examples: Servers



Toyohashi Cable Network inc: Data center



Installation of Seismic Isolation Module Model TGS



Underfloor wiring

## Summary

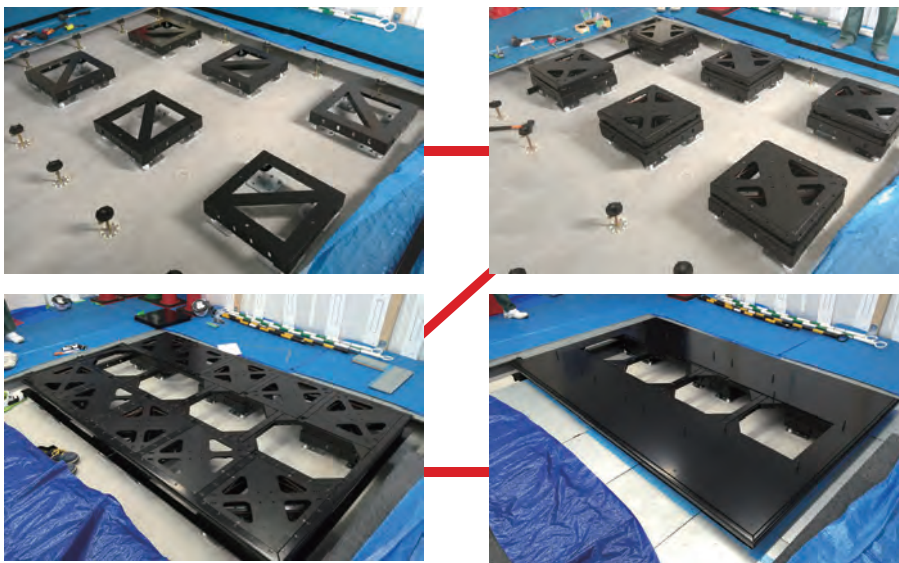
Because the seismic isolation module is thin, a large amount of space is available between the raised access flooring (raised flooring) and the bottom of the flooring, which easily secures space for wiring and piping. In addition, steel frames and raised access flooring can be used together, just the same as with conventional installation methods for server racks.





Saiseikai Kumamoto Hospital: Server rack

Installation process From base frame installation to upper plate installation



### Summary


The seismic isolation modules can be customized with added steel frame bases or upper plates depending on the wiring method (top surface wiring or underfloor wiring), installation location, and application. (The pictures show examples of access panels for underfloor wiring.)

# Installation Examples: Precision Equipment

3D Measuring Instruments, Semiconductor Manufacturing Equipment, and Analyzers




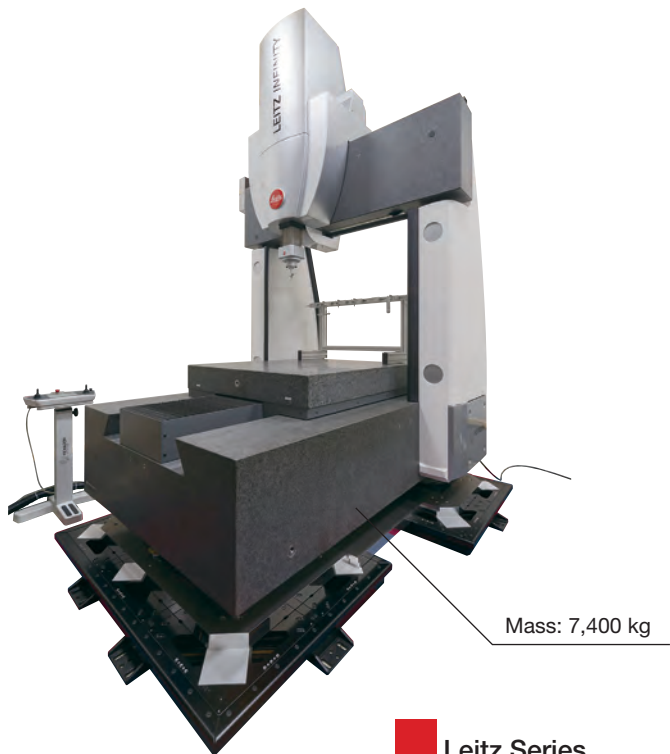
Mass: 2,700 kg

 TOKYO SEIMITSU CO., LTD., Carl Zeiss Series



Mass 3,085 kg

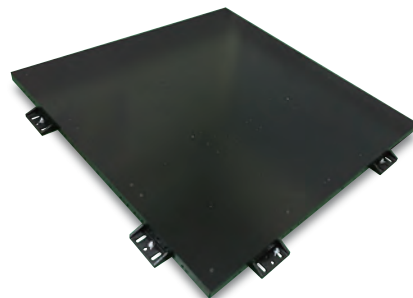
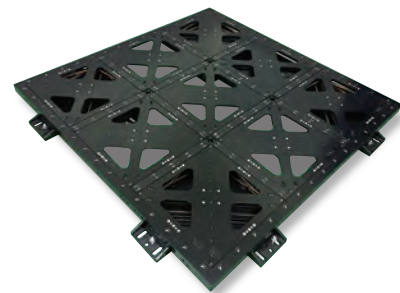
 Mitutoyo Corporation



Mass: 7,400 kg

 Leitz Series

## Installation Process



### Summary

Because the seismic isolation module has high rigidity, even precision equipment with significant weight can be loaded onto it. Also, because it is thin, it doesn't impact the operability of the equipment.



**Kosaka Laboratory Ltd.: Automatic roundness and cylindricity measurement equipment**



**Semiconductor manufacturing equipment (diffusion furnace)**



**Thermo Fisher Scientific Inc.: High resolution ICP mass spectrometry**



Oita University Hospital: Biochemistry analyzer



Oita University Hospital: Biochemistry analyzer



Oita University Hospital: Blood testing equipment

**Summary** The modules can be installed in the optimal location for the loaded object, and heavy automatic analyzing machines can even be loaded in groups.



Nippon Becton Dickinson Company, Ltd.: Blood culture system



Nuclear power research facility

### Summary

The seismic isolation modules can be linked freely to accommodate the shape of the room they're installed in.



Photo by Roberto Mascaroni

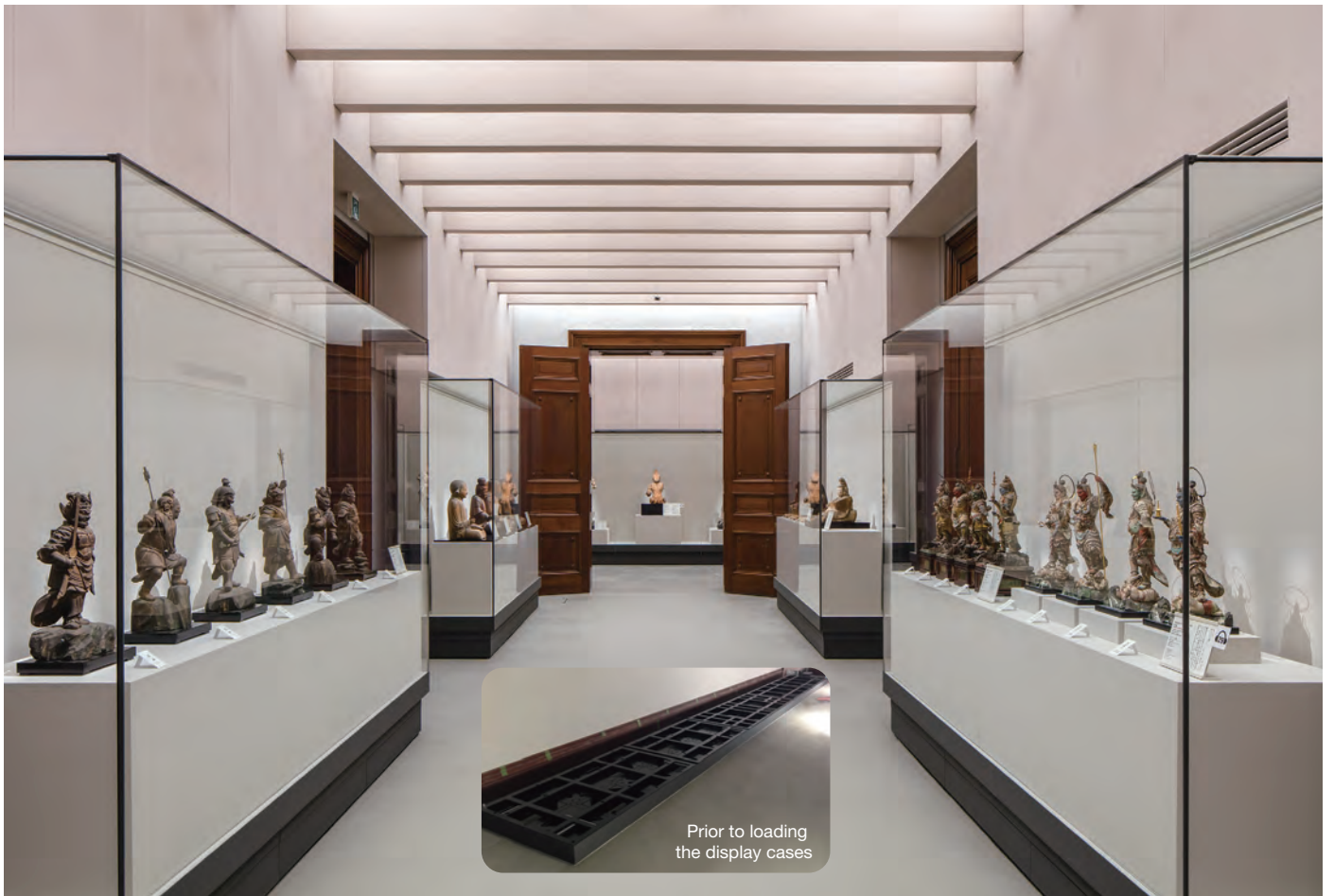
**Michelangelo's Rondanini Pietà (Sforza Castle in Milan)**



**Toshodaiji Temple**

## Summary

Whether it will be used for display cases, inside display cases, or for individual objects, the optimal seismic isolation module can be installed for each application.



Nara National Museum

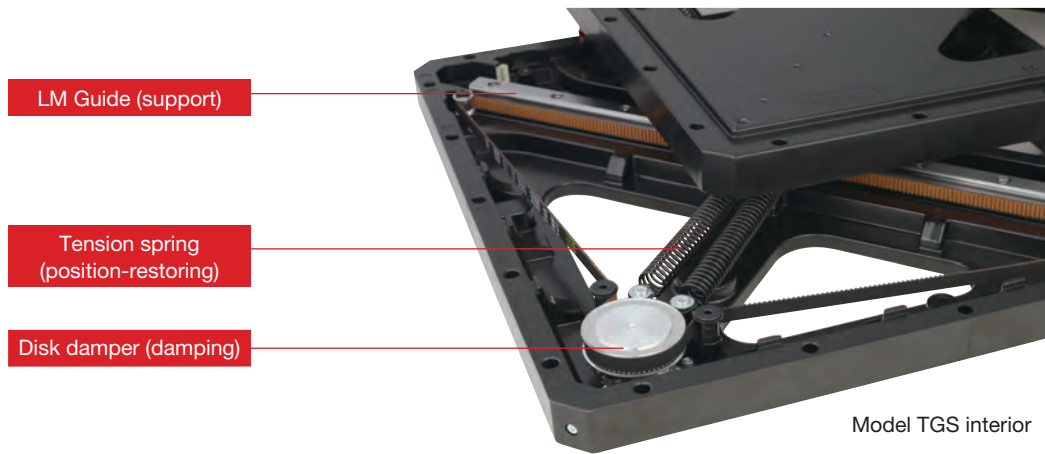


Important cultural asset: Eleven-headed Kannon (Ryuhonji Temple)

# Seismic Isolation Module Model TGS features

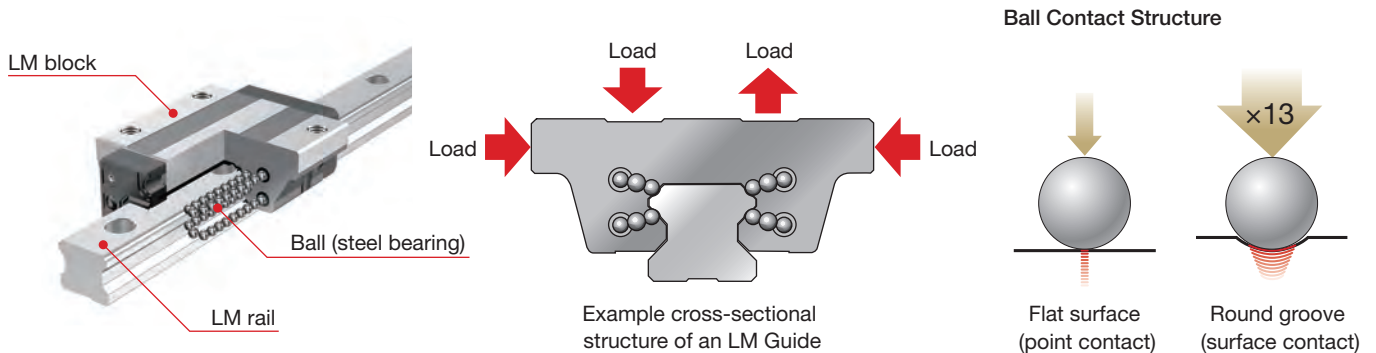
## Seismic Isolation in a Compact Package

- The TGS provides the support, restoring, and damping functions required for effective seismic isolation, delivered in a compact module.

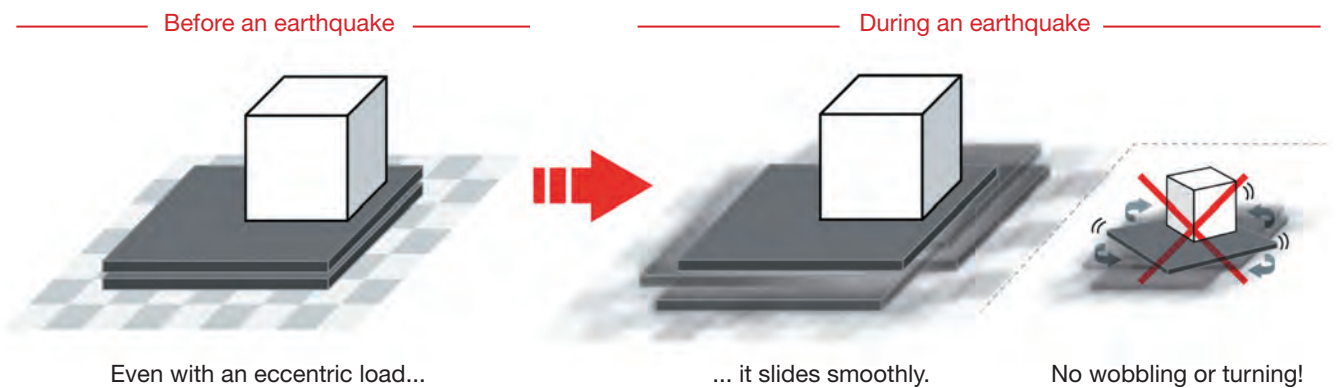


## Benefits from the LM Guide

- Because the balls limit the movement of the rail and blocks in the LM Guide to four directions (up, down, left, and right), loads from any direction are received evenly, and the device will not separate even if a load exceeds the maximum displacement.



- Because the LM Guide has balls that roll through the grooves in the rail, it is highly stable and can withstand up to approximately 13 times the load that conventional flat surface contact types can. The system moves smoothly and seismic isolation performance is unaffected even if the loaded weight changes or objects are placed off-center.



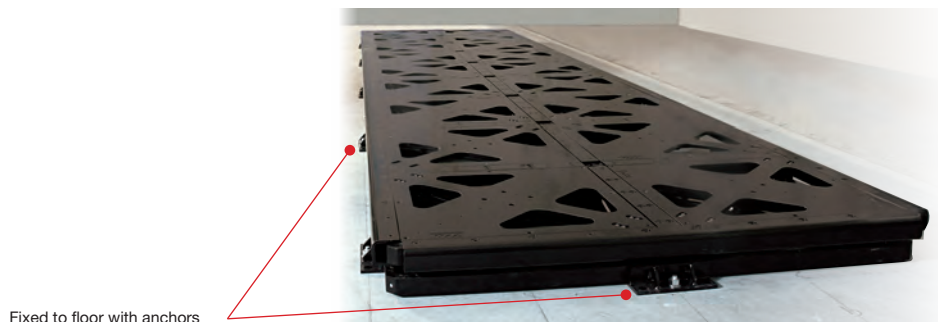


## Structural Benefits

- At 100 mm to 112 mm high, the device is low and compact.
- The module is die-cast aluminum, making it lightweight.
- Compatible with a variety of devices, with a load capacity of 750 kgf/m<sup>2</sup> to 3000 kgf/m<sup>2</sup>.

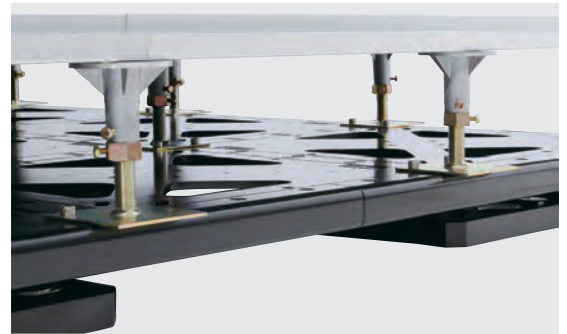


- Can be linked freely according to the shape of the object to be loaded, making construction simple.
- The minimum configuration is 2x2 modules, and modules can be added with no upper limit.  
Displacement and floating due to earthquakes are prevented because the module is secured to the floor using anchor bolts.



Configuration example: 2x9 modules

- Because the upper surface of the module is a flat plane, the loaded object can be fastened to it, and space for wires and air conditioning can be secured.



## Proposals for the Optimal Seismic Isolation Performance

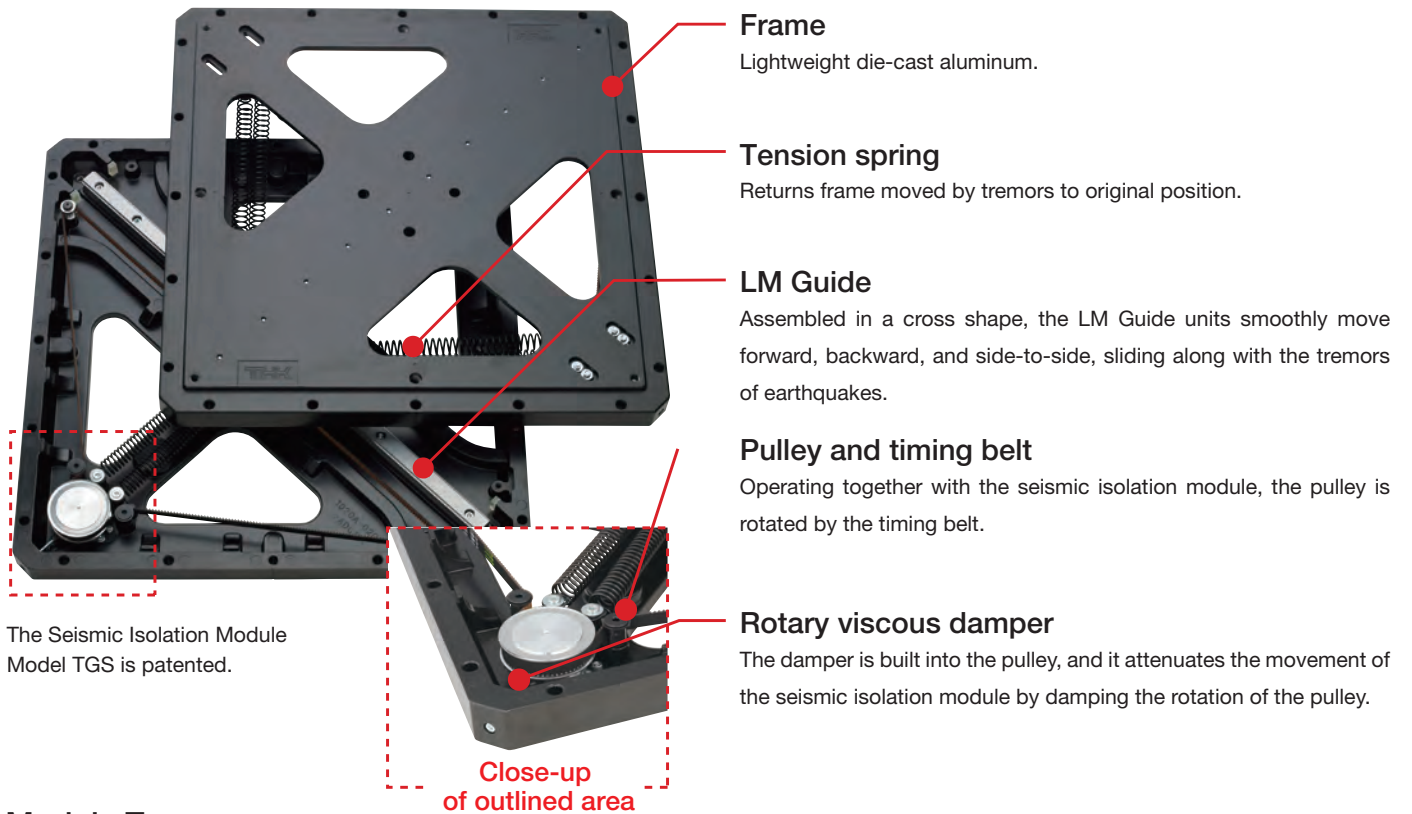
For the Seismic Isolation Module Model TGS, we can use earthquake response analysis to propose the optimal seismic isolation performance (equipment tuning) for you based on criteria such as installation location, weight of the loaded object, and expected earthquake motion.

(For details, refer to p.19)



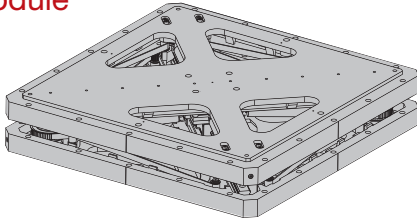
# Seismic Isolation Module Model TGS Product Specifications

## Module Structure



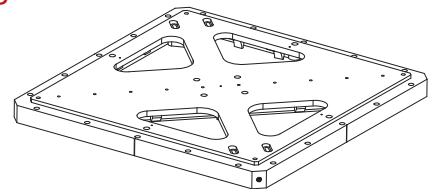
## Module Types

### Support module



- Module to support weight.
- Adjusts restoring force and damping force depending on loaded object weight and installation location.

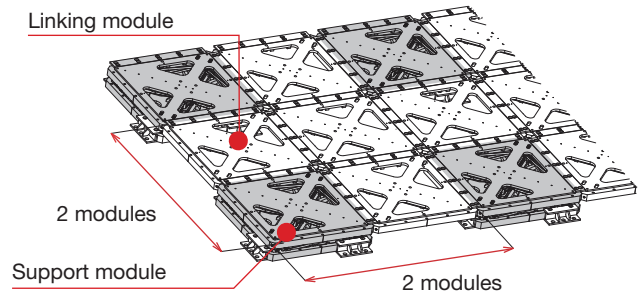
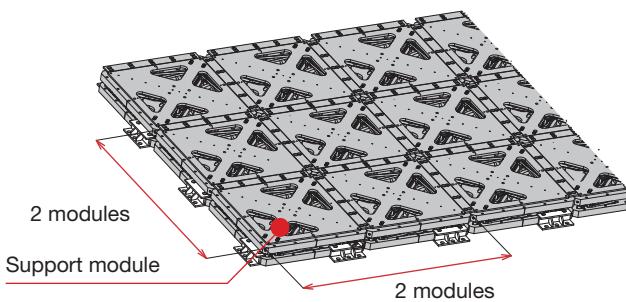
### Linking module



- Module to connect support modules.

## Module Configuration Example

The minimum configuration for the Seismic Isolation Module Model TGS is 2x2 modules, and there is no maximum limit.

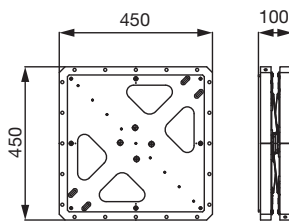
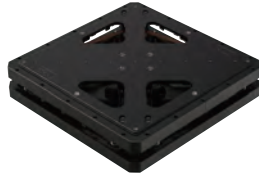


Reference: Permissible Load When Using the Minimum 2x2 Module Configuration

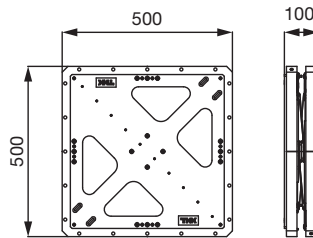
Module classification	Module combination			
Support module	4 units	3 units	2 units	1 unit
Linking module		1 unit	2 units	3 units
Maximum permissible capacity	3000 kgf	2250 kgf	1500 kgf	750 kgf

## Module Dimensions

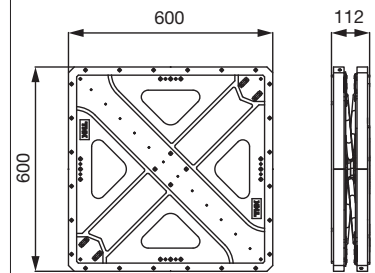
### TGS4



### TGS5



### TGS6



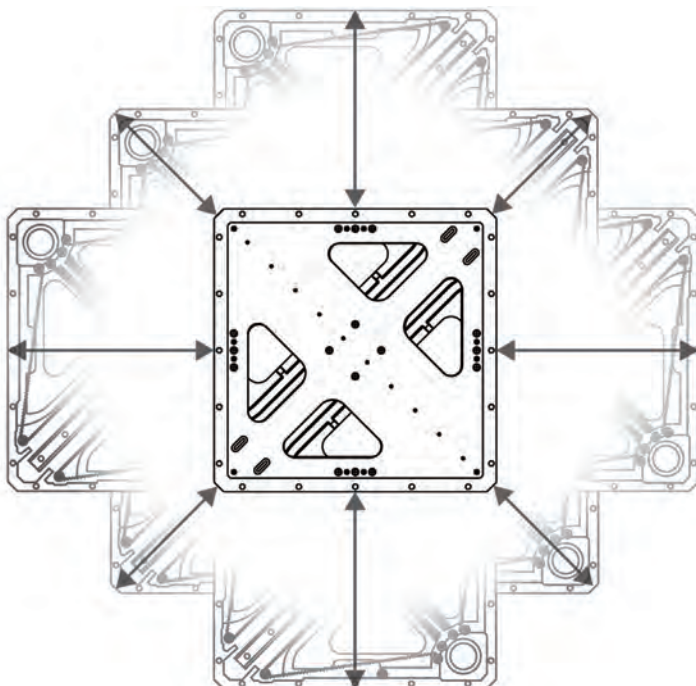
Module weight <sup>1</sup>	Approx. 20 kg	Approx. 24 kg	Approx. 35 kg
Permissible load <sup>1, 2</sup>	750 kgf		
Maximum displacement (45° direction)	±220 mm	±250 mm	±315 mm
Maximum displacement (0°, 90° direction)	±311 mm	±354 mm	±445 mm

<sup>1</sup> The weight and permissible load values are the values for one support module.

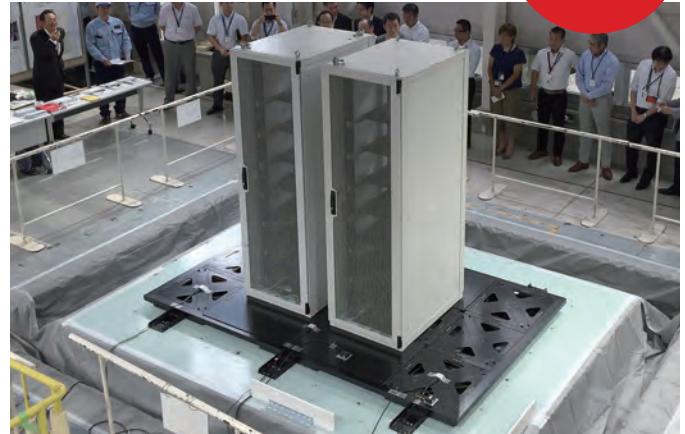
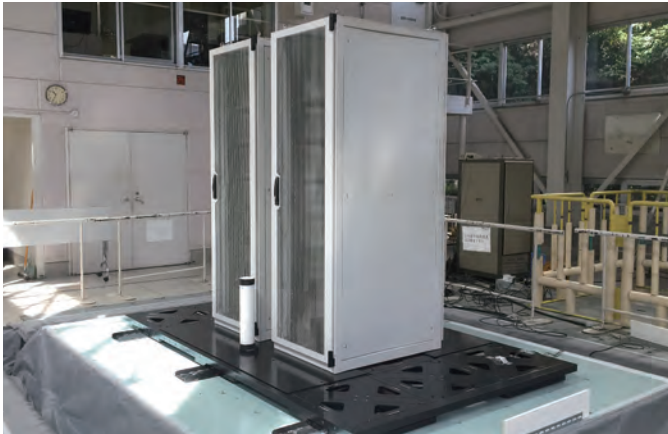
<sup>2</sup> The Model TGS cannot be used as a single module.

The minimum configuration unit is a 2x2 configuration, including at least one support module.

## Range of Motion



During an earthquake, TGS modules move within the range indicated in the diagram to the left. It is therefore necessary to ensure enough space is available in the planned area of usage. Also, be sure not to leave any obstructions within the stroke range.



## Overview

Seismic isolation performance validation testing is conducted by placing two server racks on the Seismic Isolation Module Model TGS and simultaneously applying tremors to the three axes. The test results as well as the previous response analysis\* are both validated.

\* The performance can be estimated using time history response analysis for the Seismic Isolation Module Model TGS, just like with designs for buildings with seismic isolation.

## Test Date

October 4, 2016

## Test Location

Urban Renaissance Agency (UR) Technology Research Institute Vibration Laboratory

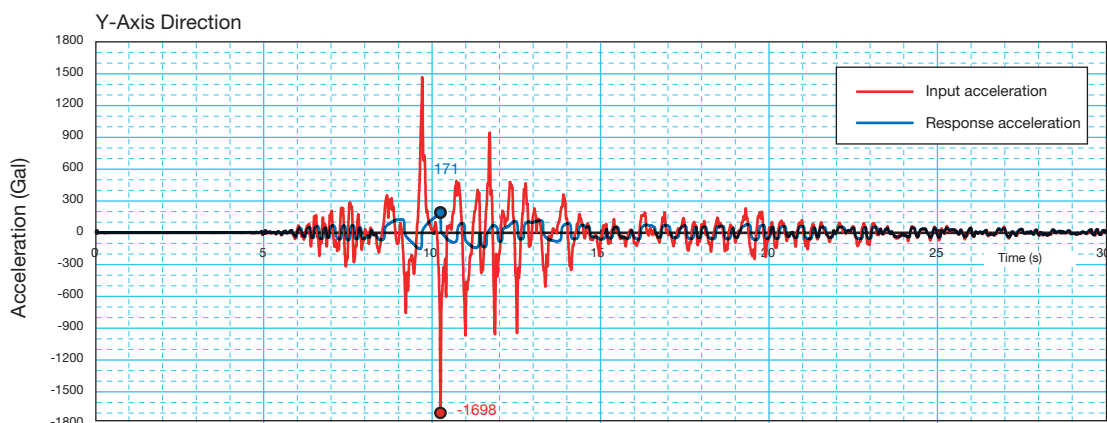
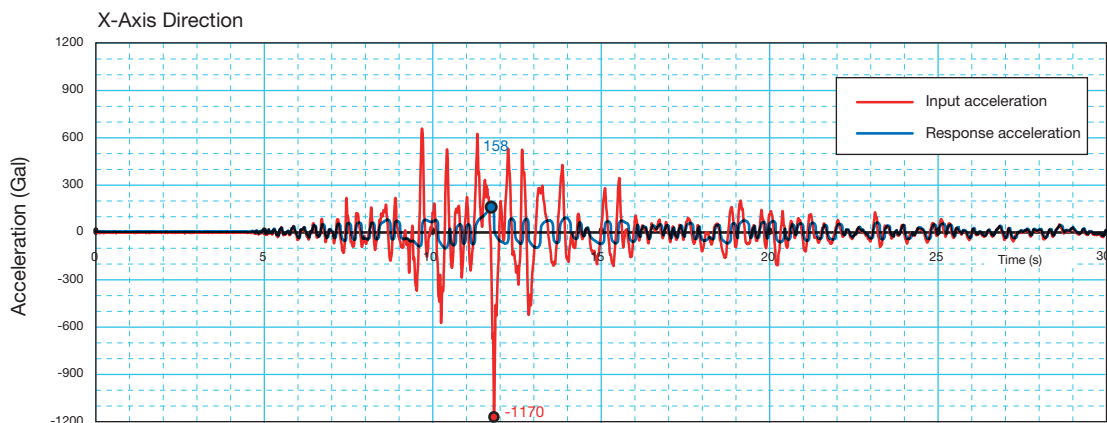
## Test Object Specifications

- Seismic Isolation Module Model TGS6 dimensions: 3000 mm × 1800 mm, with maximum displacement of ±315 mm
- Mounted load: 1000 kgf (500 kgf × 2 racks)

## Test Wave

100% of 2016 Kumamoto Earthquake response measured at KiK-net Mashiki

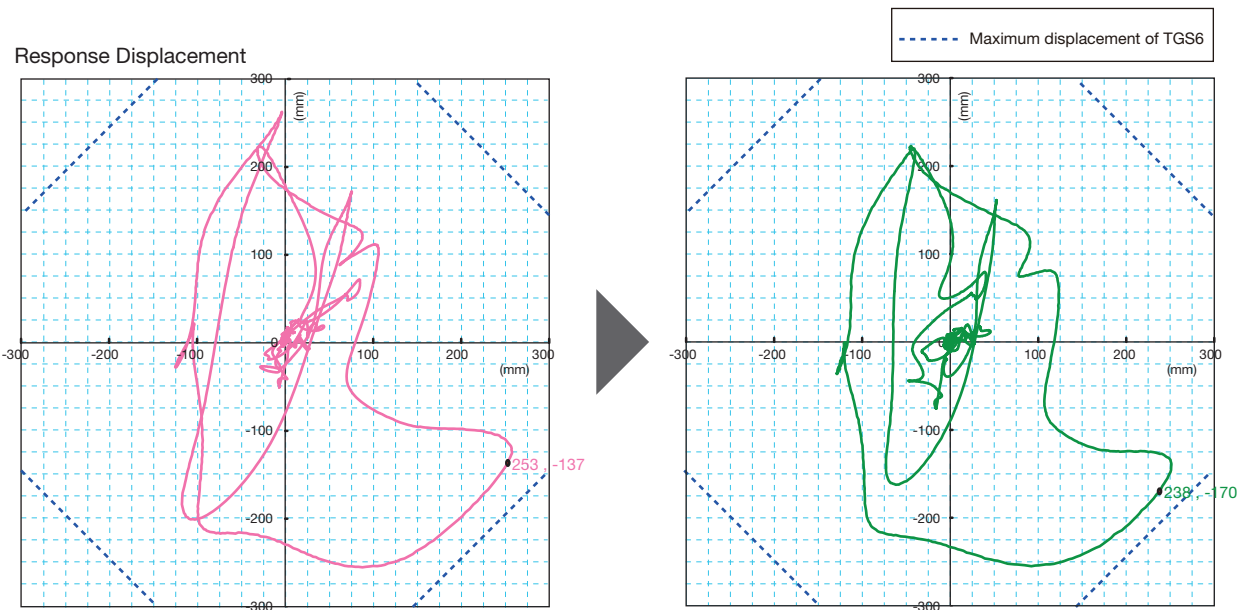
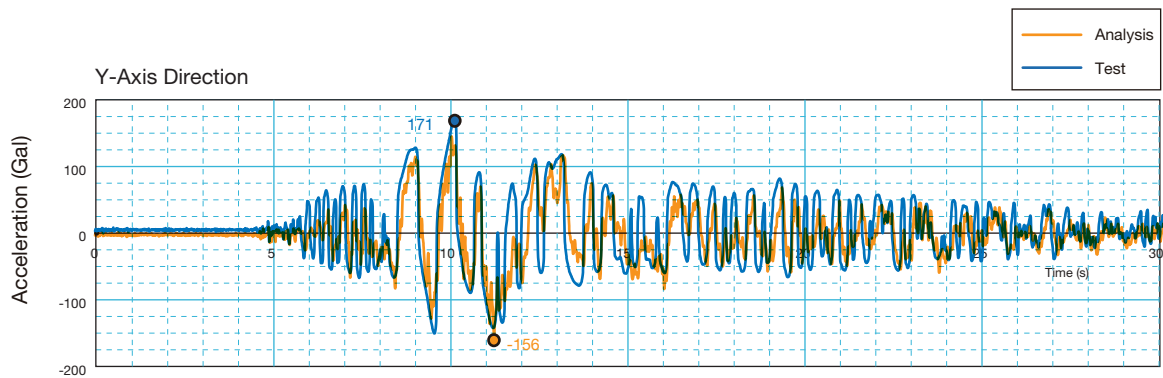
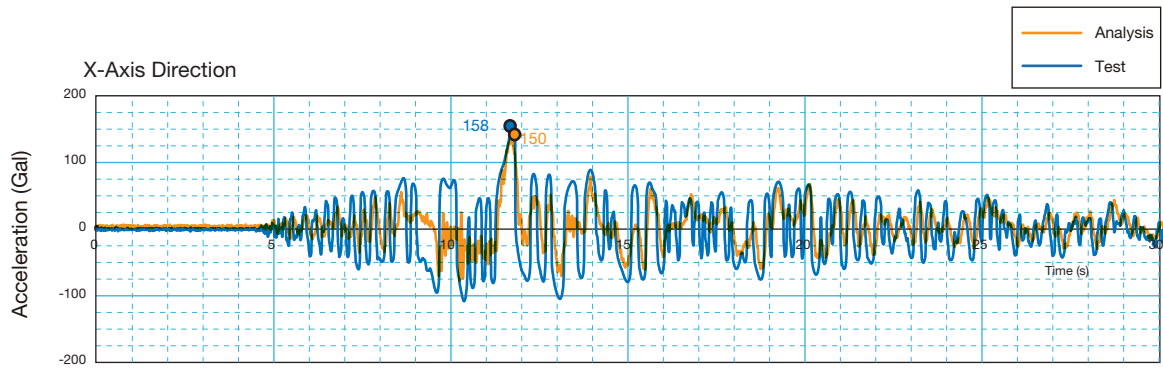
## Test Data



Information used for the vibration testing was provided by the National Research Institute for Earth Science and Disaster Prevention.

# Analysis

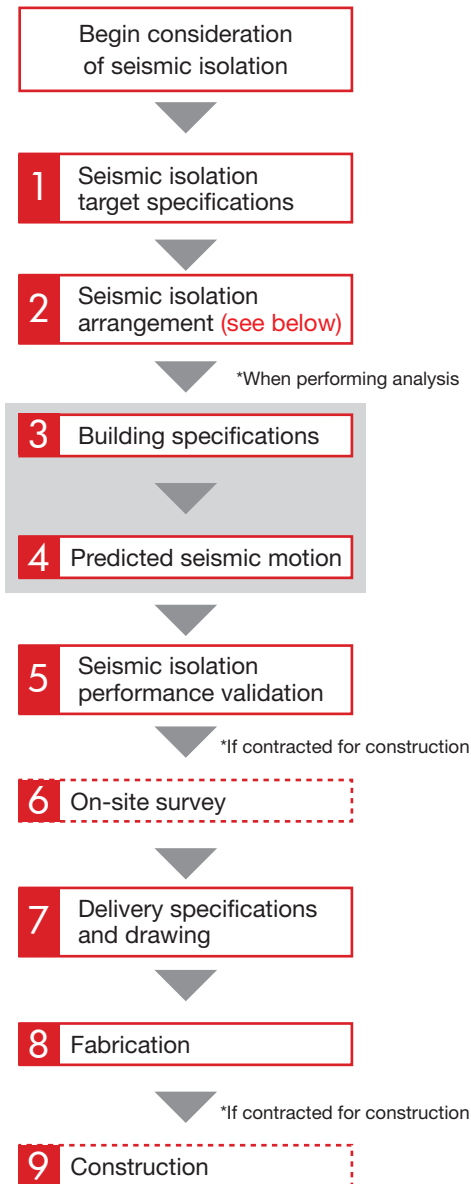
The test results on the left page (p. 19) are virtually identical to the previous response analysis results, and they validate that the test and analysis results match.



# Validation Results

The optimal seismic isolation performance tuning is possible using conditions such as installation location, loaded object, and predicted seismic motion.

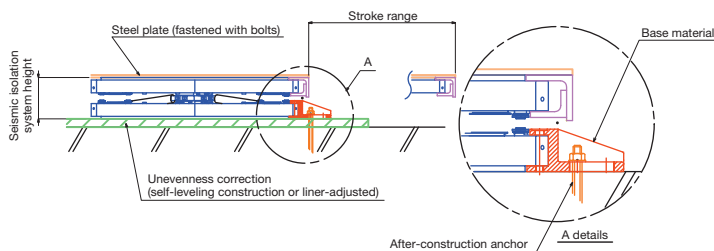
# Model TGS Implementation Process



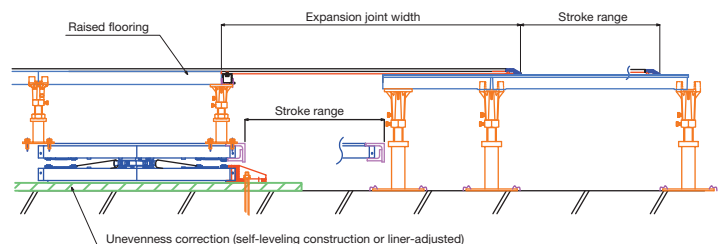
Customer	THK
Weight, shape, footprint, installation level, etc.	Consideration of device arrangement General model number calculations Reference drawings Rough estimate of costs
Customer and THK Confirmation	
Approval	(Time history response analysis) Model confirmation
Approval	Site confirmation and measurements Submit delivery specifications Submit delivery specifications drawing
Work contract or sale of materials	
	Construction or supervision

## Standard Construction Patterns

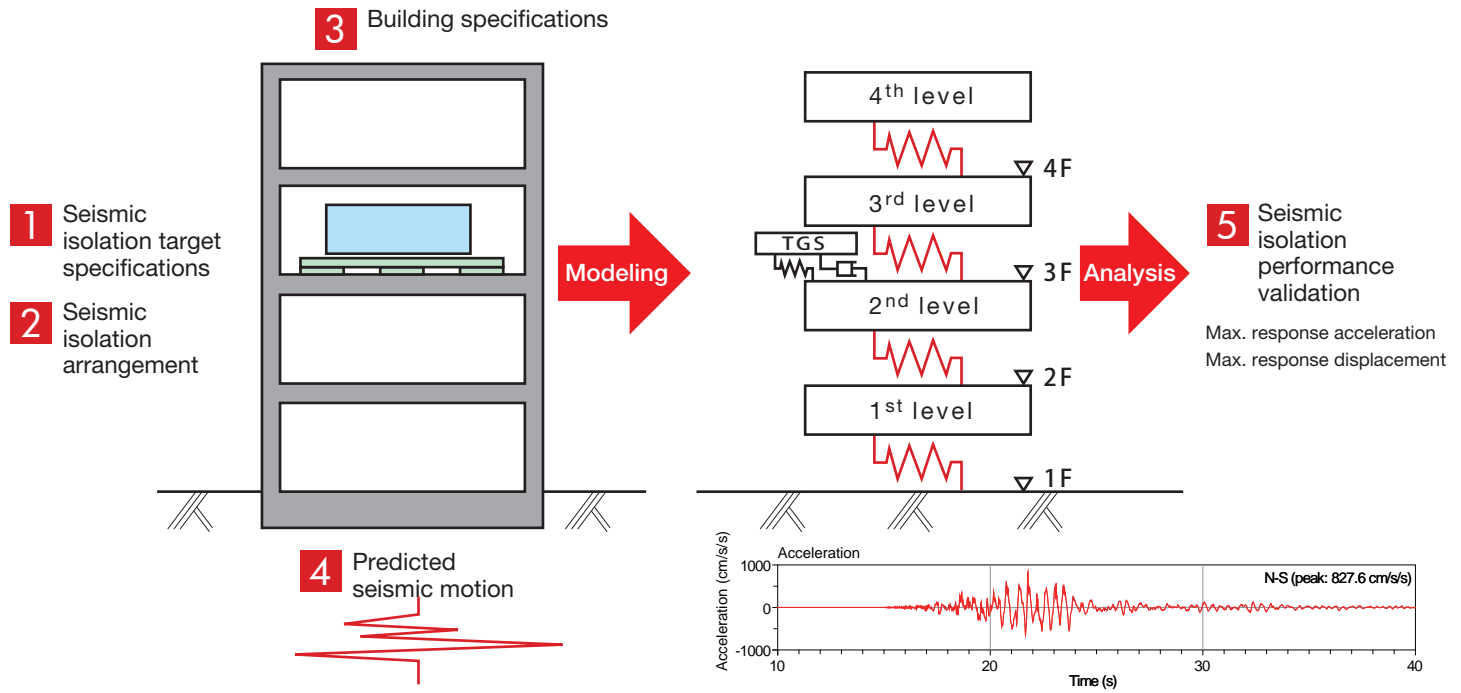
### 1 OA flooring



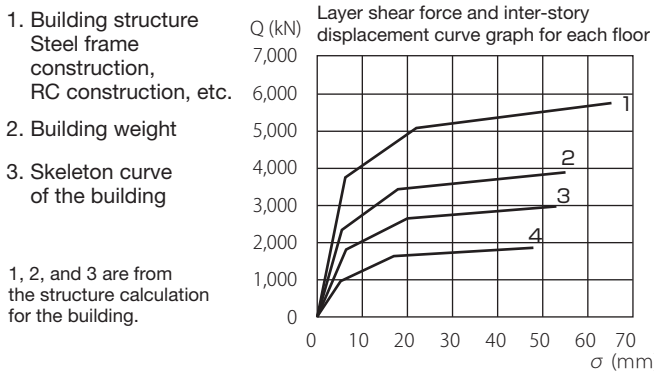
### 2 Raised flooring



# When Performing Analysis



## 3 Building Specifications



## 4 Predicted Seismic Motion (a unless otherwise specified)

### a) Standard waves (observed waves)

To serve as representative observed seismic waves in the past, waves whose maximum velocity amplitude is standardized to 50 cm/s are set as extremely rare seismic waves. 1940 El Centro NS, 1952 Taft EW, 1968 Hachinohe NS, etc.

### b) Regulated waves

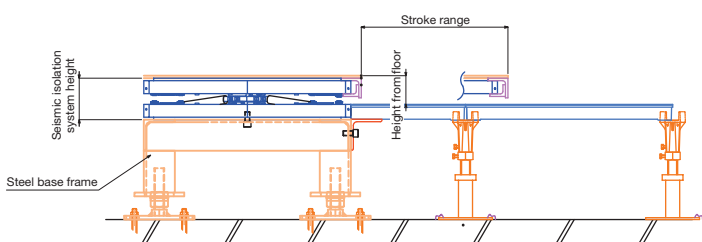
These mock seismic waves are created taking proper consideration of the amplification from construction subsurface layers, with the acceleration response spectrum from an isolated engineering bedrock, as specified in the Ministry of Construction's Notification No. 1461.

### c) Site waves

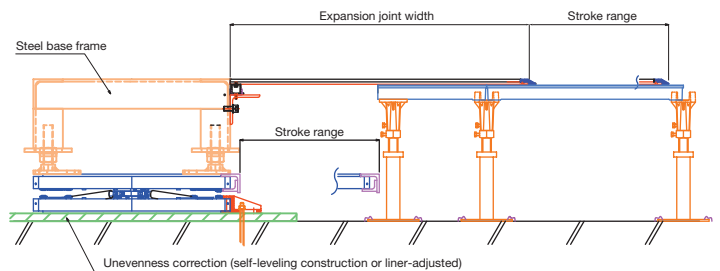
These are mock seismic waves for the construction site, based on active fault distribution, fault damage models, past seismic activity, and bedrock structure surrounding the construction site.

\*If the floor response (historical acceleration data) from when the building was designed is available, **3** and **4** are not needed.

## 3 Base frame installation (top)



## 4 Base frame installation (bottom)



# THK Seismic Isolation Module Model TGS

## Precautions on Use

- Injuries may occur if people enter or objects are placed within the seismic isolation table's range of motion (the maximum displacement given in the catalog) and the seismic isolation table activates during an earthquake.
- This product is designed to attenuate horizontal seismic motion; it is not intended to be effective against vertical seismic motion. This product does not guarantee that the object will not move or topple.
- In the event of seismic motion stronger than this product is designed to absorb, the modules can be expected to strike the stopper, exerting an impact on any object loaded onto them.

- LM Guide and "Caged Ball" are registered trademarks of THK CO., LTD.
- Discrepancies may exist between photographic representations of products and the products themselves.
- Modifications may be made, without prior notice, to a product's appearance and specifications; please consult THK before using the product.
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See our seismic isolation website for more details.

[www.menshin.biz/?q=eng](http://www.menshin.biz/?q=eng)

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