



TECTONUS
RESILIENT SEISMIC SOLUTIONS

PRODUCT CATALOGUE

CUTTING EDGE SEISMIC PROTECTION TECHNOLOGY



REVOLUTIONARY SEISMIC PROTECTION

TECTONUS

A FUTURE MORE RESILIENT

Tectonus offers next generation seismic connections that significantly improve the performance of earthquake-prone buildings. Unlike traditional systems, Tectonus focuses on providing a system that does NOT need repair or replacement following an event - providing long term structural protection.

Earthquakes pose a great threat to social and economical welfare - costing society at every event. Traditional seismic systems often require costly post event maintenance or complete replacement following a seismic event - in some cases leaving the structure at risk for aftershocks whilst awaiting maintenance.

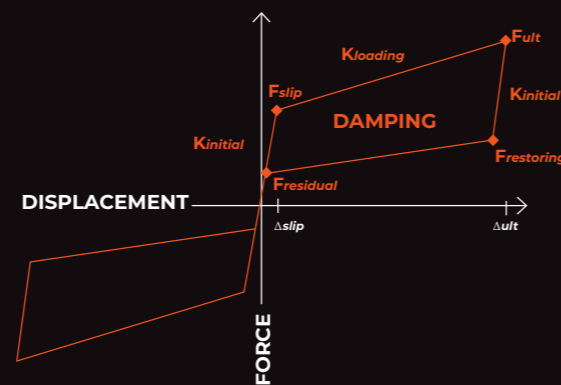
Through effective energy dissipation and self centring functionality of the Tectonus connections, structures are able to withstand earthquake sequences without replacement or structural repairs.

LIFE SAFETY | NO REPAIR OR REPLACEMENT | MINIMISE BUSINESS DISRUPTION

LIMITLESS POTENTIAL

The RSFJs compact and scalable configuration offers design freedom for any application.

The compact joint is exceptionally scalable and can be implemented in all types of projects of various materials and configurations.

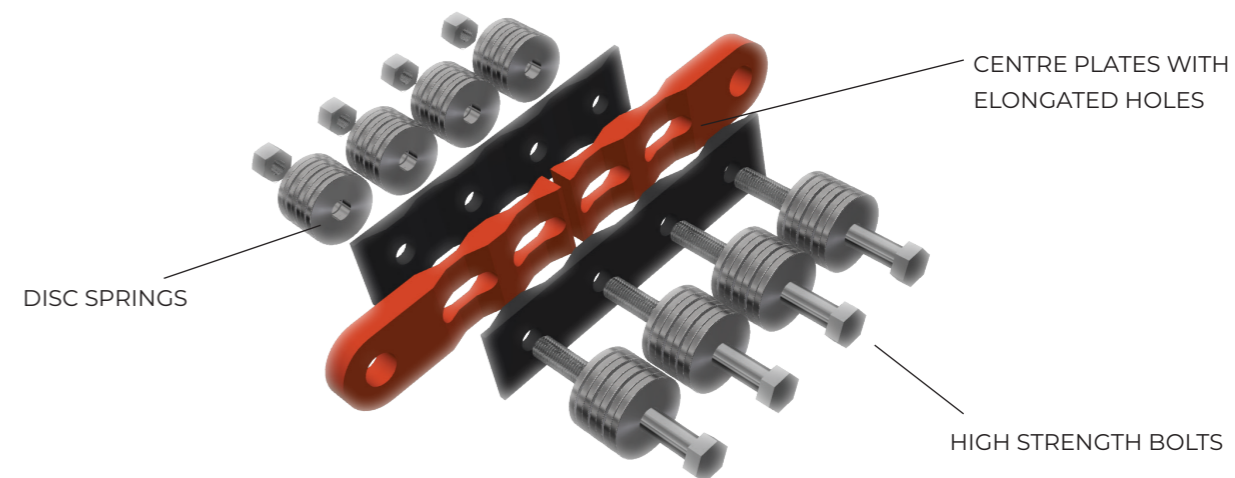


ADVANTAGES

- / EFFECTIVELY DISSIPATES ENERGY
- / SELF-CENTRING
- / CONTINUED DAMAGE AVOIDANCE
- / NO POST EVENT MAINTENANCE REQUIRED
- / APPLICABLE TO ALL TYPES OF BUILDINGS
- / COST-EFFECTIVE
- / RETROFIT
- / COMPACT
- / EASY IMPLEMENTATION
- / STRUCTURAL HEALTH MONITORING

THE RSFJ TECHNOLOGY

The Resilient Slip Friction Joint (RSFJ) consists of 2 outer plates and 2 centre plates with elongated holes. The outer cap plates and the centre slotted plates are grooved and clamped together with high strength bolts and disc springs.



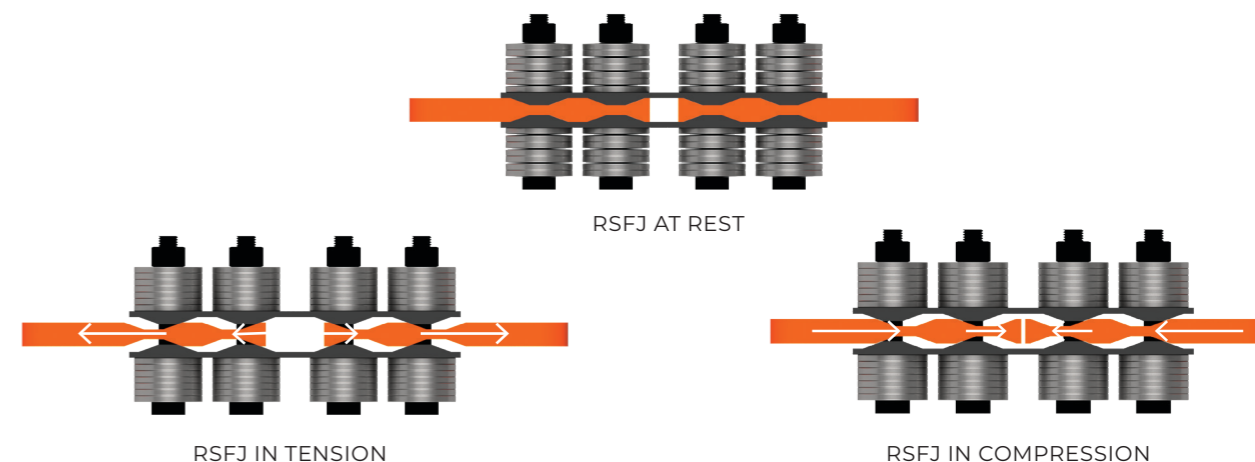
KEY CHARACTERISTICS OF THE RSFJ

- / Bolts only work in tension
- / Cap plate can't "jump" the ridge
- / At F_{ult} , disc springs are fully flattened
- / Gap in centre allows for compression deformation
- / All parts remain within their elastic range up to F_{ult}
- / RSFJ returns to its original "rest" position every time

HOW IT WORKS

When the applied joint force overcomes the frictional resistance between the sloped bearing surfaces, the centre slotted plates start to slide and energy will be dissipated through friction during cycles of sliding.

The patented shape of the plate ridges along with the use of disc springs and high strength bolts provide the desirable self-centring characteristic. The angle of the grooves is designed such that at the time of unloading, the reversing force induced by the elastically compacted disc springs is larger than the friction force acting between the facing surfaces. Therefore, the system is recentred upon unloading.



DESIGN WITH EASE

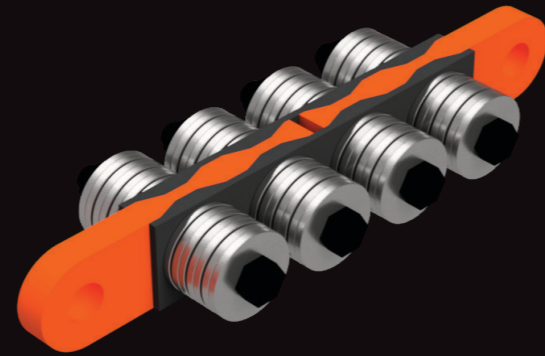
The RSFJ can be easily integrated in the structural analysis and design softwares ETABS or SAP2000. It allows the designer to accurately calibrate the parameters according to the requirements of the project. In ETABS or SAP2000, the RSFJ load displacement behaviour can be easily modelled by choosing the "Damper-Friction Spring" type link element.

Refer to the RSFJ Structural Modelling Guide for more information.



TENSION ONLY BRACES

RSFJ-TBRACE



SELF CENTRING | NO POST EVENT MAINTENANCE | LONG TERM PROTECTION

ADVANTAGES

- / Self-centring & NO post event maintenance
- / Can be installed in parallel to increase the capacity
- / Arrives on site ready for installation
- / Installation can be carried out by a 2 person team
- / Length of diagonal brace can be adjusted for site imperfections
- / NO out of plane buckling

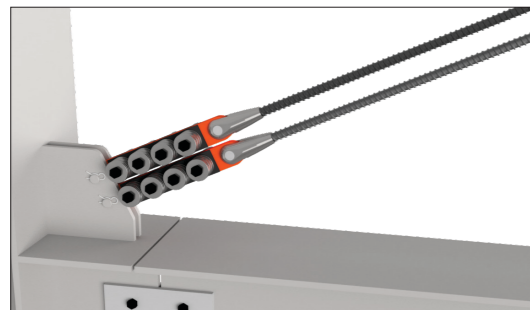
APPLICATIONS

New and retrofit projects, and can be implemented to all types of buildings;

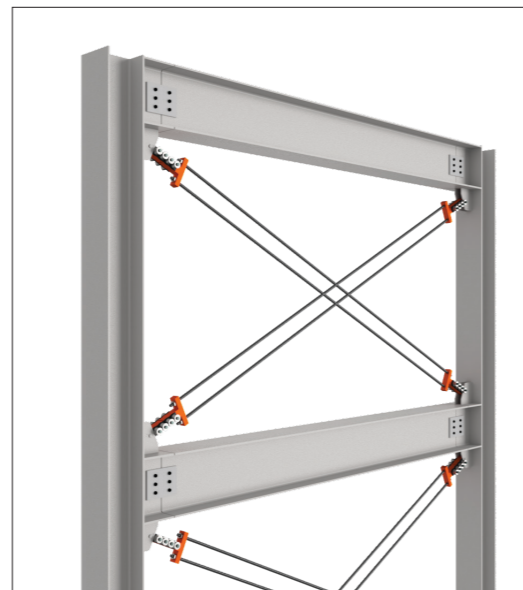
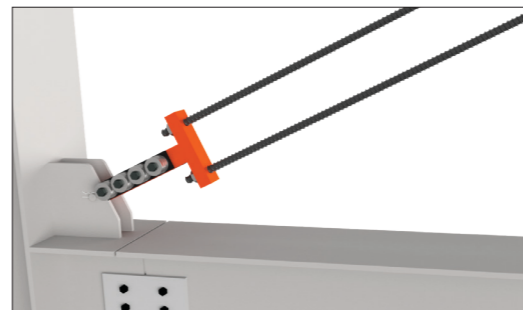
Steel, timber, concrete, or a hybrid of any.

- / Multi story
- / Industrial applications
- / Industrial pallet racks

PIN END



T - END



DESIGN SPECIFICATIONS

Designing for capacities 500kN & higher

Tectonus units can be designed to meet any targeted capacity and deflection. The standard range units can also be applied in multiples in a modular pattern to achieve larger capacities.

Structural Modelling & Design with Tectonus units

Please refer to the Structural Modelling & Design Guide for the recommended design procedure.

Project support

Tectonus offers support for engineering design, detailed design and analysis with a range of options to suit.

Standard Product Range

PRODUCT CODE	F _{ult} (comparable to ULS) [kN]	F _{slip} [kN]	F _{restoring} [kN]	F _{residual} [kN]	Deflection Limit	Δ _{ult} (comparable to ULS) [mm]	
CATEGORY A 15% TO 20 % HYSTERESIS DAMPING							
RSFJ-TH4-200	200	100	34	17	S, M, L, X	S (up to 25mm) M (25mm to 50mm) L (50mm to 75mm) X (75mm to 100mm)	
RSFJ-TH4-250	250	125	77	38	S, M, L		
RSFJ-TH4-300	300	150	117	58	S, M		
RSFJ-TH6-350	350	175	94	47	S, M, L, X		
RSFJ-TH6-400	400	200	136	68	S, M, L		
RSFJ-TH6-450	450	225	176	88	S, M		
Units above 450kN are easily achievable. Installing units in multiples can also achieve desired larger capacity.							
CATEGORY B 10% TO 15 % HYSTERESIS DAMPING							
RSFJ-TH2-200	200	100	96	48	S, M, L		
RSFJ-TH2-250	250	125	131	66	S, M		
RSFJ-TH2-300	300	150	163	82	S		
RSFJ-TH4-350	350	175	156	78	S, M, L		
RSFJ-TH4-400	400	200	193	97	S, M		
RSFJ-TH4-450	450	225	228	114	S		
Units above 450kN are easily achievable. Installing units in multiples can also achieve desired larger capacity.							

/ Joints are designed to provide deflection with self-centring even beyond Δ_{ult} (as a secondary fuse) with Δ_{max} = 1.5 Δ_{ult} and F_{max} = 1.25F_{ult}.

/ Given the slight non linearity at the joint slip stage, the F_{slip} is determined as the intersect of the straight lines matching the initial and second stiffness of the flag-shaped curve.

/ Δ_{slip} (comparable to SLS) is kept to be about 1mm, 1.5mm and 2mm for 2-bolt, 4-bolt and 6-bolt RSFJs, respectively (excluding the deflection resulting from the attachments such as pins, brackets and anchor bolts).

DIMENSIONS

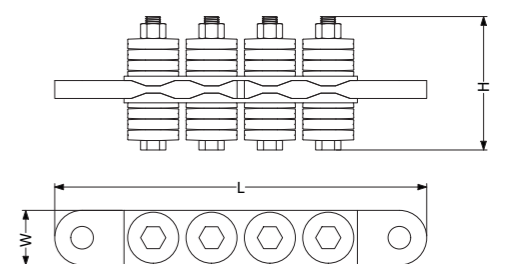
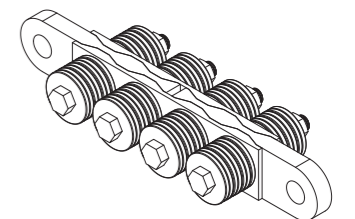
The dimensions of the RSFJ units depend on the demand deflection. To support the application of RSFJs in a wide range of brace sizes, the units are provided up to 4 different ranges of deflections:

- S = up to 25mm
- M = 25mm to 50mm
- L = 50mm to 75mm
- X = 75mm to 100mm

The table indicates the approximate dimensions of units:

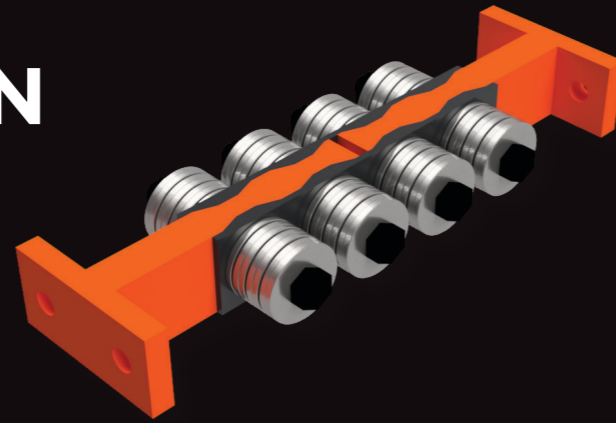
PRODUCT CODE	NO. OF BOLTS (N _b)	L (MM)	W (MM)	H [MM]
RSFJ-TH2	2			
RSFJ-TH4	4	2N _b ℓ+200	100mm	4ℓ + 150
RSFJ-TH6	6			

Note: For S, M, L and X Categories of deflection, ℓ equals 25 mm, 50mm, 75mm, and 100mm respectively.



TENSION & COMPRESSION BRACE

RSFJ-BRACE



SELF-CENTRING | NO POST-EVENT MAINTENANCE | LONG-TERM PROTECTION

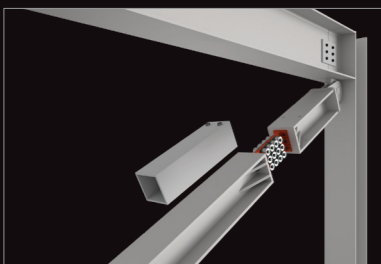
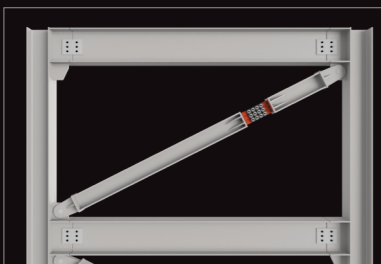
ADVANTAGES

- / Self-centring
- / No post-event maintenance
- / Can be installed in parallel to increase the capacity
- / Arrives on site ready for installation (no secondary steps required)
- / Length of diagonal brace can be adjusted for site imperfections

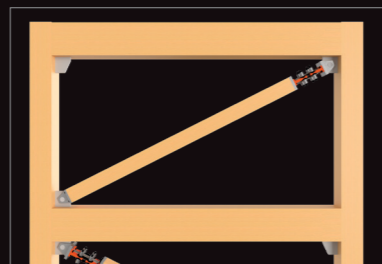
APPLICATIONS

- New and retrofit projects, and can be implemented to all types of buildings;
- Steel, timber, concrete, or a hybrid of any.
- / Multi-story
 - / Industrial applications
 - / Industrial pallet racks

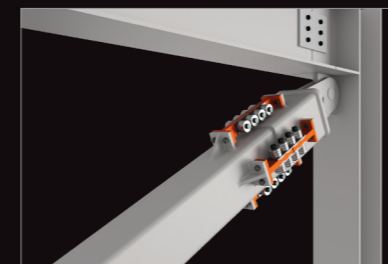
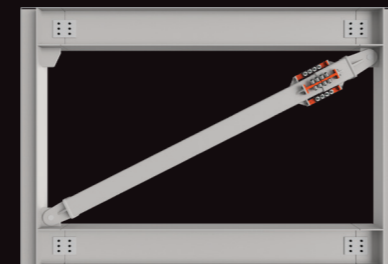
VERSION 1



VERSION 2



VERSION 3



DESIGN SPECIFICATIONS

Designing for capacities 500kN & higher

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Structural Modelling & Design with Tectonus units

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Project support

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CATEGORY A 15% TO 20 % HYSTERESIS DAMPING						
RSFJ-BH4-200	200	100	34	17	S, M, L, X	S (up to 25mm) M (25mm to 50mm) L (50mm to 75mm) X (75mm to 100mm)
RSFJ-BH4-250	250	125	77	38	S, M, L	
RSFJ-BH4-300	300	150	117	58	S, M	
RSFJ-BH6-350	350	175	94	47	S, M, L, X	
RSFJ-BH6-400	400	200	136	68	S, M, L	
RSFJ-BH6-450	450	225	176	88	S, M	
Units above 450kN are easily achievable. Installing units in multiples can also achieve desired larger capacity.						
CATEGORY B 10% TO 15 % HYSTERESIS DAMPING						
RSFJ-BH2-200	200	100	96	48	S, M, L	S (up to 25mm) M (25mm to 50mm) L (50mm to 75mm) X (75mm to 100mm)
RSFJ-BH2-250	250	125	131	66	S, M	
RSFJ-BH2-300	300	150	163	82	S	
RSFJ-BH4-350	350	175	156	78	S, M, L	
RSFJ-BH4-400	400	200	193	97	S, M	
RSFJ-BH4-450	450	225	228	114	S	
Units above 450kN are easily achievable. Installing units in multiples can also achieve desired larger capacity.						

/ Joints are designed to provide deflection with self-centring even beyond Δ_{ult} (as a secondary fuse) with Δ_{max} = 1.5 Δ_{ult} and F_{max} = 1.25F_{ult}.

/ Given the slight non-linearity at the joint slip stage, the F_{slip} is determined as the intersect of the straight lines matching the initial and second stiffness of the flag-shaped curve.

/ Δ_{slip} (comparable to SLS) is kept to be about 1mm, 1.5mm and 2mm for 2-bolt, 4-bolt and 6-bolt RSFJs, respectively (excluding the deflection resulting from the attachments such as pins, brackets and anchor bolts).

DIMENSIONS

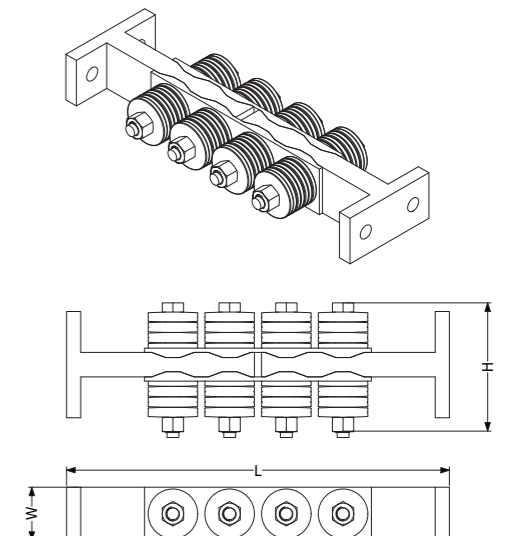
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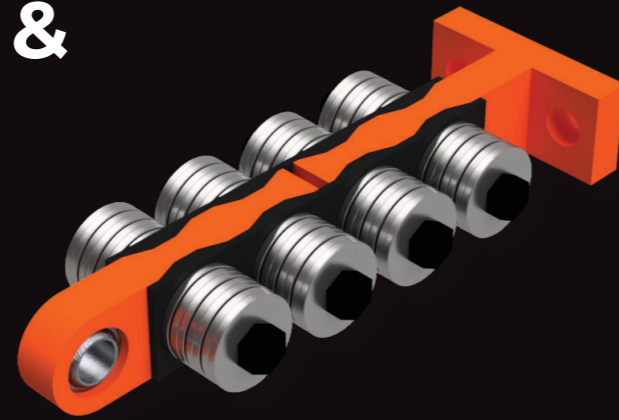
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RSFJ-BH4	4	2N _b ℓ+200	100mm	4ℓ+150
RSFJ-BH6	6			

Note: For S, M, L and X Categories of deflection, ℓ equals 25 mm, 50mm, 75mm, and 100mm respectively.

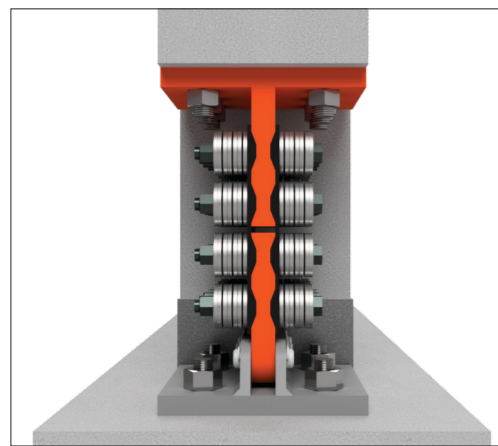


SHEARWALLS & COLUMNS

RSFJ – SHEARWALL



SELF CENTRING | NO POST EVENT MAINTENANCE | LONG TERM PROTECTION



The RSFJ-Shearwall connections acts as a hold down for shearwalls and columns, allowing displacements both in plane and out of plane.

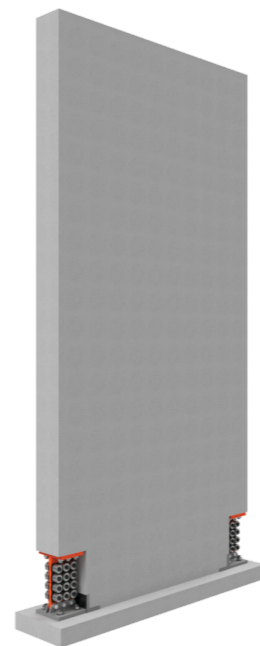
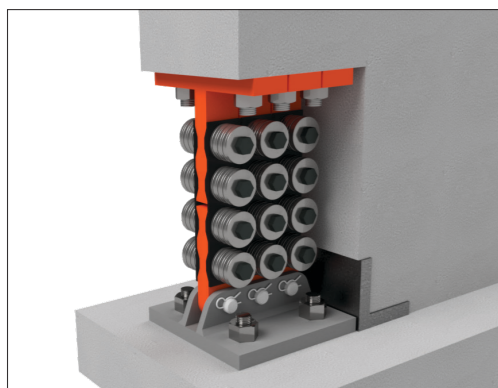
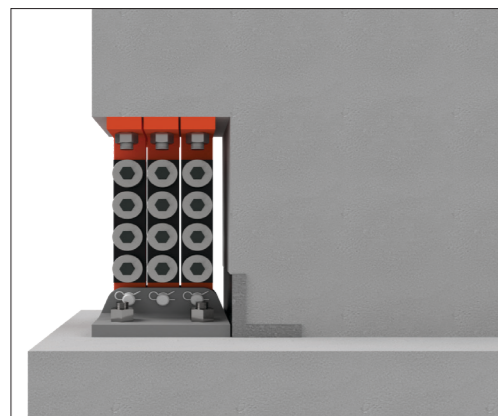
ADVANTAGES

- / Self-centring
- / No post event maintenance: Reduced costs when considering earthquake sequences
- / Scalability: can be installed in groups to increase the capacity
- / Arrives on site ready for installation (no secondary steps required)
- / The pin and swivel bearing allow for +/- 5% rotation

APPLICATIONS

New and retrofit projects, and can be implemented to all types of buildings; steel, timber, concrete, or a hybrid of any.

- / Multi story
- / Industrial applications



DESIGN SPECIFICATIONS

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RSFJ-SH4-250	250	125	77	38	S, M, L		
RSFJ-SH4-300	300	150	117	58	S, M		
RSFJ-SH6-350	350	175	94	47	S, M, L, X		
RSFJ-SH6-400	400	200	136	68	S, M, L		
RSFJ-SH6-450	450	225	176	88	S, M		
Units above 450kN are easily achievable. Installing units in multiples can also achieve desired larger capacity.							
CATEGORY B 10% TO 15 % HYSTERESIS DAMPING							
RSFJ-SH2-200	200	100	96	48	S, M, L		
RSFJ-SH2-250	250	125	131	66	S, M		
RSFJ-SH2-300	300	150	163	82	S		
RSFJ-SH4-350	350	175	156	78	S, M, L		
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/ Joints are designed to provide deflection with self-centring even beyond Δ_{ult} (as a secondary fuse) with Δ_{max} = 1.5 Δ_{ult} and F_{max} = 1.25F_{ult}.

/ Given the slight non linearity at the joint slip stage, the F_{slip} is determined as the intersect of the straight lines matching the initial and second stiffness of the flag-shaped curve.

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DIMENSIONS

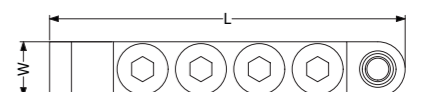
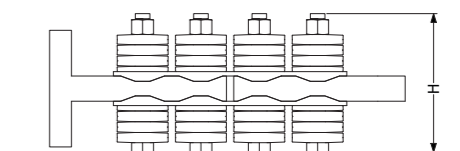
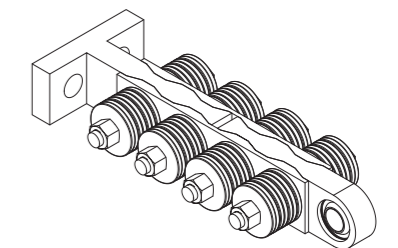
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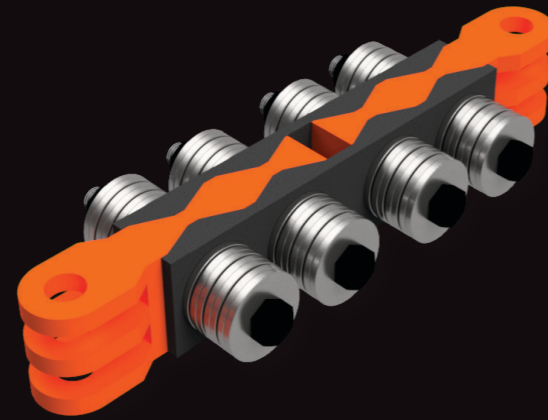
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RSFJ-SH4	4	2N _b ℓ+200	100mm	4ℓ + 150
RSFJ-SH6	6			

Note: For S, M, L and X Categories of deflection, ℓ equals 25 mm, 50mm, 75mm, and 100mm respectively.



MOMENT RESISTING FRAMES

RSFJ-MRF



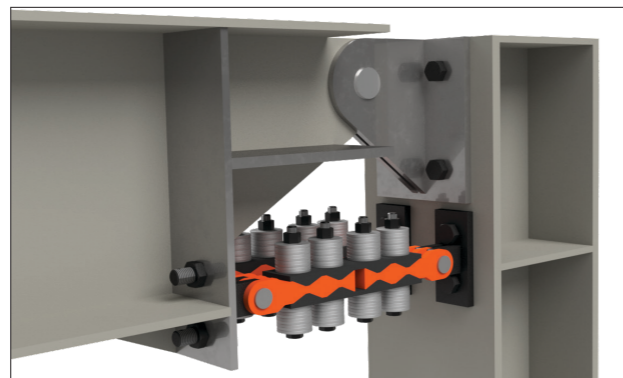
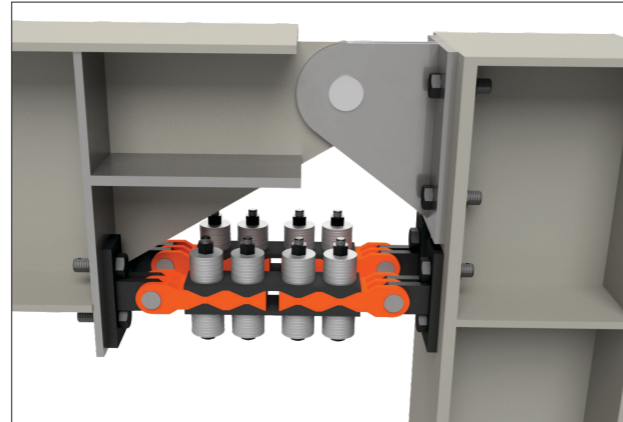
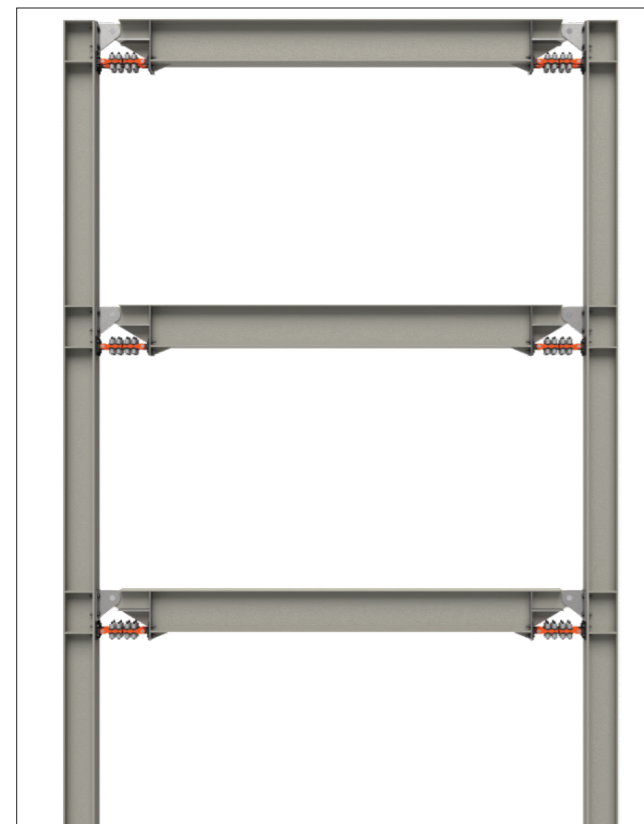
SELF CENTRING | NO POST EVENT MAINTENANCE | LONG TERM PROTECTION

ADVANTAGES

- / Self-centring
- / No post event maintenance: Reduced costs when considering earthquake sequences
- / Scalability: Can be installed as single unit or combined with others to increase the capacity
- / Arrives on site ready for installation

APPLICATIONS

- New and retrofit projects, and can be implemented to all types of buildings; steel, timber, concrete, or a hybrid of any.
- / Multi story
 - / Portal frames



DESIGN SPECIFICATIONS

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DIMENSIONS

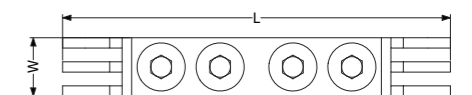
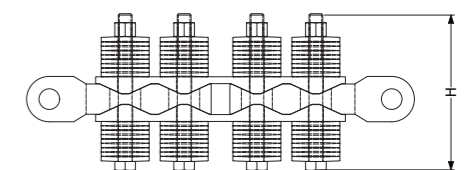
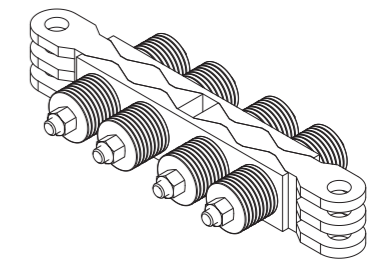
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RSFJ-MH4	4	2N _b ℓ+200	100mm	4ℓ+150
RSFJ-MH6	6			

Note: For S,M,L and X Categories of deflection, ℓ equals 25 mm, 50mm, 75mm, and 100mm respectively.



CONTACT US

TECHNICAL SUPPORT SERVICES & PROJECT ESTIMATES

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The experienced engineering team at Tectonus is available to provide more details and assistance for RSFJ structural modelling upon request.



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