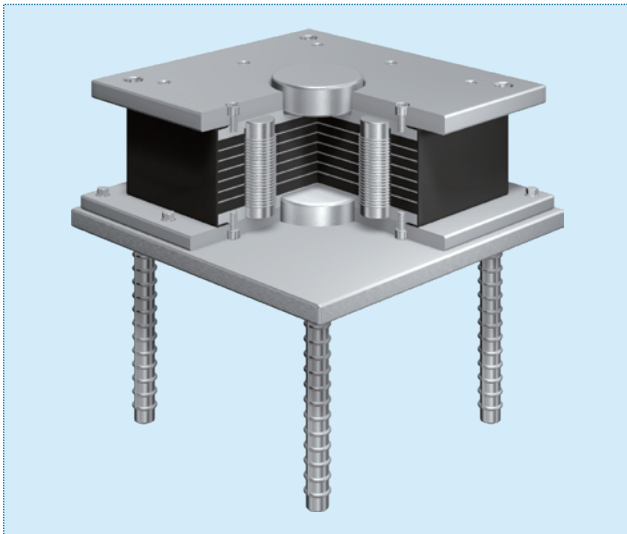


# SPR-S

## Super Spring Confined Pb Rubber Bearing



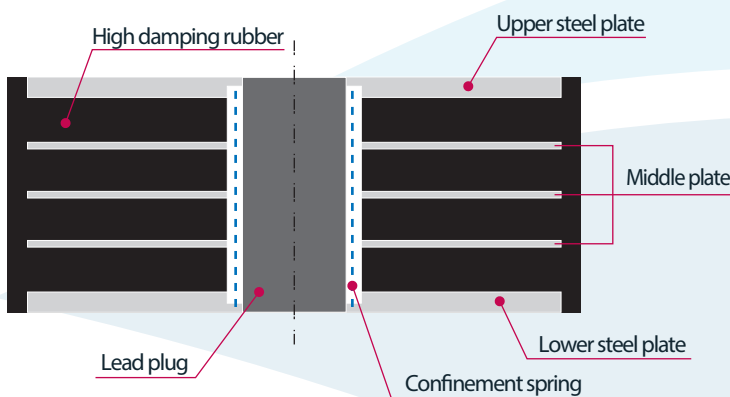
**Compared to conventional bearings, the damping performance of SPR-S is greatly enhanced!**  
 The bearing's dimensions are reduced and optimized to achieve cost reduction of an entire bridge project.



SPR-S is a new seismic isolation bearing consisting of laminated high damping rubber with lead plugs confined by springs. The SPR-S laminated structure transfers the shear deformations to the lead plugs that, in combination with the high damping rubber, dissipate energy from the earthquake.

The confinement springs are vulcanized to the rubber layers to improve durability against repeated loading and stabilize the damping. SPR-S can be used for concrete or steel bridges and new or retrofit projects.

### Structure



<p><b>Material Specification</b></p>	<ul style="list-style-type: none"> <li>• Inner rubber : High damping rubber</li> <li>• Covering rubber : Integrated with Inner rubber</li> <li>• Middle steel plate : SS400</li> <li>• Upper and lower plate : SM490</li> <li>• Lead plug : Purity 99.99%</li> </ul>
<p><b>Physical Property of Inner Rubber</b></p>	<ul style="list-style-type: none"> <li>• Shear modulus : G12</li> <li>• Elongation at break : over 550%</li> <li>• Tensile strength : over 12 N/mm<sup>2</sup></li> </ul>

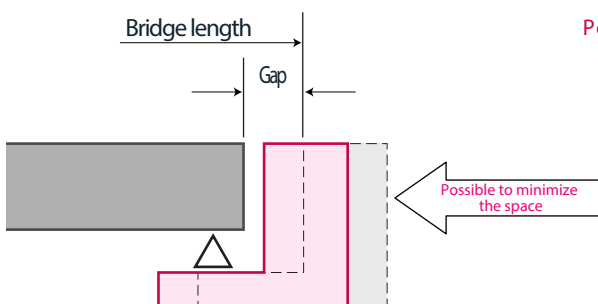
### Characteristics

#### Gap reduction

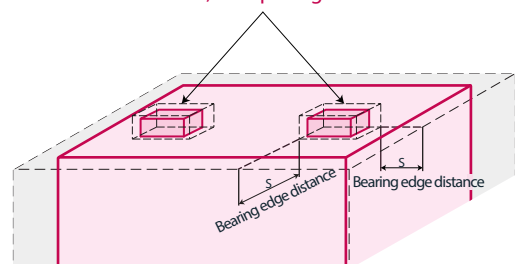
Because of the higher damping performances of the SPR-S, the superstructure's horizontal displacement during an earthquake will be reduced. Therefore the expansion joint and gap dimensions can be minimized, achieving cost reduction.

#### Smaller section of substructure

Due to smaller seismic displacements, the dimensions of the bearing can be reduced compared to conventional isolators. This will affect the design of the substructure and the edge distance, reducing the sizes and achieving good cost performance.

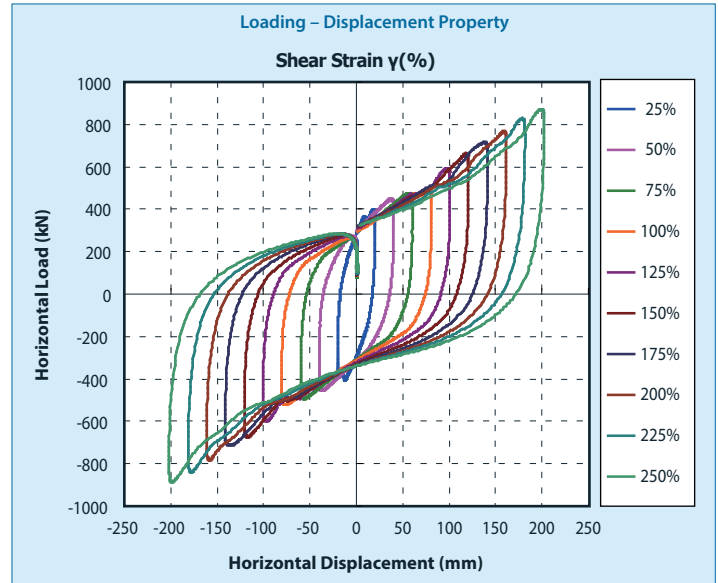
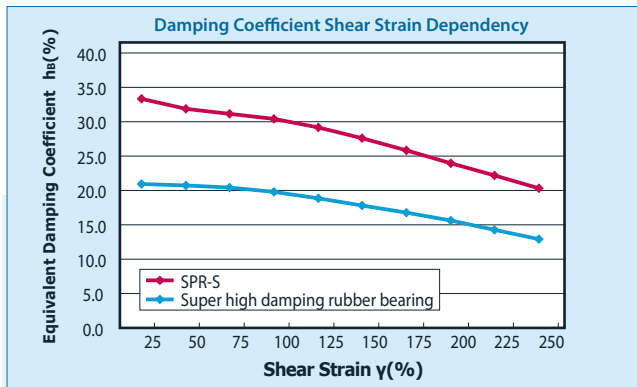
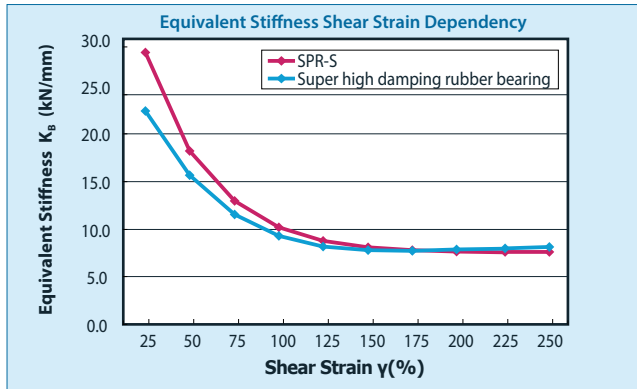


Possible to down-size rubber volume, comparing with conventional bearings

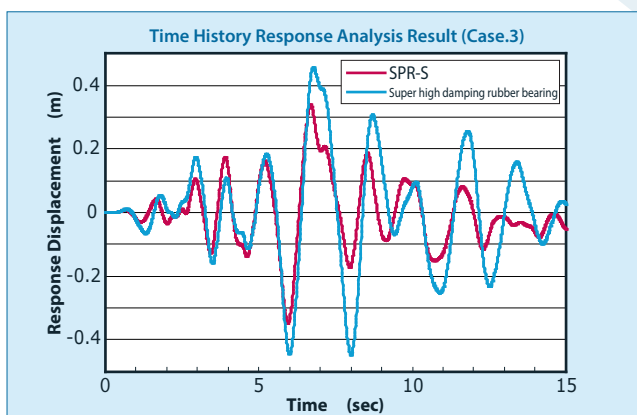
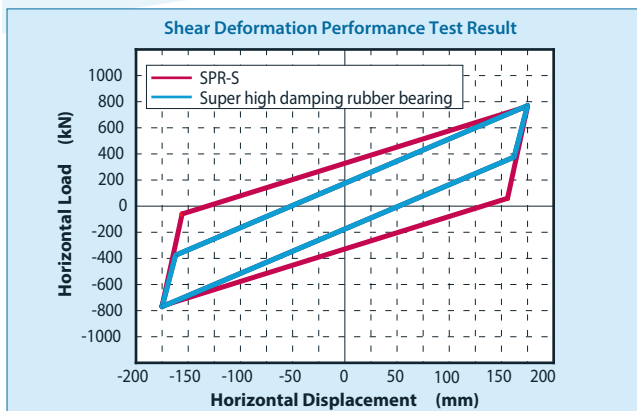


## Performance Verification

The quality has been ensured by numerous performance tests and rigorous durability tests .



### Comparison with conventional isolators(1)



### Comparison with conventional isolators(2)

Trial design results are shown as below. (In-house comparison)

			Displacement ratio with super high damping	Volume ratio with super high damping
Case.1 2-span continuous PC bridge	Super high damping rubber bearing	A1	1.00	1.00
		P1	1.00	1.00
		A2	1.00	1.00
	SPR-S	A1	0.78	0.83
		P1	0.54	0.75
		A2	0.77	0.81
Case.2 2-span continuous steel girder bridge	Super high damping rubber bearing	A1	1.00	1.00
		P1	1.00	1.00
		A2	1.00	1.00
	SPR-S	A1	0.79	0.80
		P1	0.69	0.81
		A2	0.80	0.80
Case.3 7-span continuous PC bridge	Super high damping rubber bearing	A1	1.00	1.00
		P1	1.00	1.00
		P2	1.00	1.00
		P3	1.00	1.00
		P4	1.00	1.00
		P5	1.00	1.00
	SPR-S	A2	1.00	1.00
		A1	0.81	0.96
		P1	0.79	0.82
		P2	0.74	0.83
		P3	0.74	0.83
		P4	0.74	0.83
	P5	0.80	0.84	
	P6	0.80	0.84	
	A2	0.81	0.96	

\*Compared to super high damping rubber bearings, 25 % of the response displacement, and 15 % of the rubber volume can be reduced.

\*The results of the 2 cases above are not applicable to all bridges.



Kawakin Core-Tech Co., Ltd.

Head Office : 2-2-7, Kawaguchi, Kawaguchi-city, Saitama, 332-0015, JAPAN

TEL: +81-48-259-1117 FAX: +81-48-259-1137

Email: info@kawakinkk.co.jp

Branch/Plant : Ibaraki / Tokyo / Osaka / Sendai / Sapporo / Vietnam

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