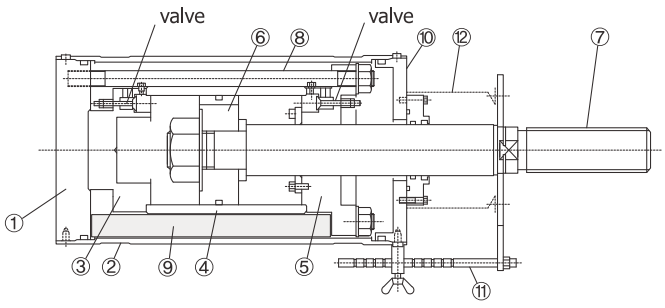
Configuration

HYDRAULIC SNUBBER

■ Hydraulic Snubber is a device developed to protect high pressure/temperature piping system in power generating plants and various types of industrial plants. They function to restrain undesirable displacement of piping system or components when they are about to oscillate due to seismic or other types of dynamic loading, while, to allow their free movement during the thermal displacement mode. Our hydraulic snubber is designed to provide such essential two-way functions by means of a sophisticated combination of hydraulic cylinder with a valve mechanism. A built-in flexible reservoir is also a dominant design feature. As an important step among entire development works, comprehensive design verifications and thorough testing were conducted to assure the highest reliability. Since they were put into service decades ago, they have been proving perfect trouble-free performance and excellent maintenanceability, and thus assuring maximum safeness for operation of various piping systems when they were subjected to occasional dynamic events.



1	Holder	5	Rod Cover	9	Accumulator
2	Casing	6	Piston	10	Casing Cover
3	Cylinder Cover	7	Piston Rod	11	Travel Indicator
4	Cylinder Tube	8	Tie-Rod	12	Canvas Cover

■ Design principle of our hydraulic snubber is a hydraulic system controlled by a valve mechanism. The magnitude of generated resistance force is a function of input velocity. Namely, $CV^n = F$ (C = constant, V = piston velocity, n = valve property, F = force generated)

① Hydraulic cylinder is fully enclosed in the outer casing and they are filled with hydraulic fluid. A piston divides the cylinder into two pressure chambers. They are hydraulically linked each other through a fluid path formed by a pair of popet valves and outer casing.

② A popet valve, being loaded by a built-in coil spring, stays open so far as the pressure in a fluid chamber is lower than the pre-determined threshold, and thus allowing reciprocal free movement of the piston during the thermal displacement mode of piping.

③ The cubic volume of lateral piston rod, penetrating one of the chambers, causes a difference in fluid volume in each chamber. An elastic accumulator, inserted between the cylinder wall and outer casing, functions as the self-adjustment means for offsetting the difference. For this design advantage, Model SNA snubber has no projection on the cylindrical body unlike conventional snubbers having outside oil reservoirs.

④ Dynamic input displacement gives a quick driving force to the piston. and then causes a rapid pressure increase inside the compressed chamber. The valve on the compressed chamber side closes and the fluid path is shut off on the spot. Complete stop of fluid flow generates the resistant force inside the cylinder to restrain the displacement.

⑤ The entire process takes place against a reverse loading, and completely suppress the dynamic loading.

⑥ The popet valve, having a fine slit on its head, keeps a minimum fluid flow even when it is in shut off position. For this design feature, the snubber unit is capable of allowing thermal displacement of the piping even during a dynamic oscillation of the piping system. This ability is defined by so-called release rate or bleed rate.

Advantages :

① Reliable hydraulic system including precise valve mechanism assures stable and symmetrical performance in both loading directions.

② Self-contained oil reservoir eliminates fluid leakage from sealed connections.

③ High durability of sealing materials assures longer service duration without frequent maintenance works.

④ Well-engineered construction simplifies disassembling and re-assembling of the unit, assuring easier maintenance works.

⑤ Installable in a limited space because of a plain cylindrical contour.

⑥ Filled with thoroughly verified genuine hydraulic fluid.

⑦ Easy-to-read stroke indicator.

Major Design Specifications :

1. Applicable Code and Standard

① JIS (Japanese Industrial Standard) Code

② MITI (Ministry of Trade and Industry) Code 501

③ ASTM (American Iron and Steel Institute) Standard

④ SSPC (Steel Structure Painting Council) Standard

2. Rated Load (Kgf)

Size No.	Rated Load
SNA 03	300
SNA 06	600
SNA 1	1,000
SNA 3	3,000
SNA 6	6,000
SNA 10	10,000

Size No.	Rated Load
SNA 16	16,000
SNA 25	25,000
SNA 40	40,000
SNA 60	60,000
SNA 100	100,000

3. Standard Strokes (mm)

100mm	160mm	250mm	Extra strokes available on request

4. Minimum Spring Rate (Kgf/mm)

Stroke mm	100	160/250
SNA-03	250	150
SNA-06	450	300
SNA-1	650	450
SNA-3	1,500	1,000

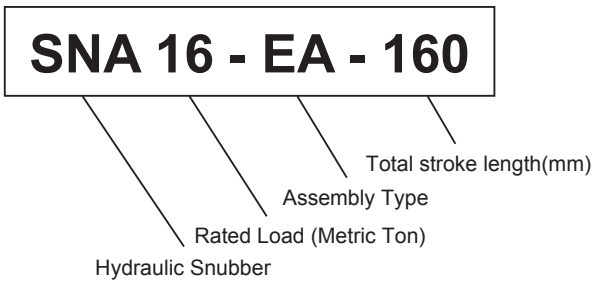
Stroke mm	100	160/250
SNA-6	3,000	2,000
SNA-10	5,000	3,000
SNA-16	7,000	4,500
SNA-25	8,000	6,500

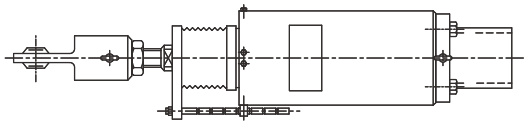
5. Design Parameters

Design Parameters	Criteria
Drag Force (Frictional Resistance)	2% of the rated load, or 50Kgf. Whichever is greater.
Bleed Rate (Release Capacity)	0.5mm/Sec.
Lock-up Rate	0.1 ~ 0.4cm/sec.
Frequency Range	1 Hz ~ 33 Hz
Pressure Capacity	1.5 times of the rated laod.
Loading Capacity (under rated load)	20,000 loading cycles.
Temperature Capacity Radiation Limit	-15℃ ~ 60℃
Recommended	1 x 10^8 (TEKOHR 200 Fluid)
Maintenance	Once every 10 years.
Angular Offset	Max. 15 °

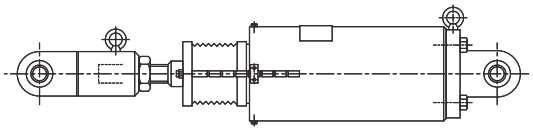
Ordering

■ Designation of Size No.





Type EA



Type FA

■ Size Selection Guideline

Selection of the proper snubber assembly shall be made based on the following design elements :

(1) Design dynamic load.
(2) Amount of thermal displacement (actual travel) and its direction.
(3) Overall installation length allotted for the snubber assembly.
(4) Details of end conditions (Bracket or pipe clamp).
(5) Radiation level to select the type of fluid.

① Rated Load

Snubber unit having a rated load nearest to but greater than the design load(calculated dynamic load).

For example, when the calculated design load is 4500 Kgf, size SNA 6 (rated load = 6000 Kgf) is the proper size to be selected.

② Assembly Type

Type EA : With extension attachments, for a longer installation length.

Type FA : With the shortest attachments, for a limited installation length.

③ Stroke

(1) The rated stroke of the snubber unit selected must be sufficiently greater than the calculated travel so as to provide a safety margin for the extra movement not counted in at the designing stage of the piping system.

Combination of total (rated) stroke and design displacement

Design Stroke(mm) (Displacement)	Total(Rated) Stroke(mm)		
	100	160	250
50 and less	○	△	△
51 - 110	X	○	△
111 - 200	X	X	○

○ Optimum
△ Usable
X Not usable

(2) Each snubber unit is pre-set it stroke position at factory to provide the ready-to-install length of the assembly based on the designated amount and direction of the stroke

■ **Special Design**

In addition to the standard size series, for non-standard, rated load, stroke length and/or installation length, special design of snubber assemblies are available on request. Testing facilities having loading capacity of Max. 500,000 Kgf is available at our factory. For details, contact our Engineering Department.

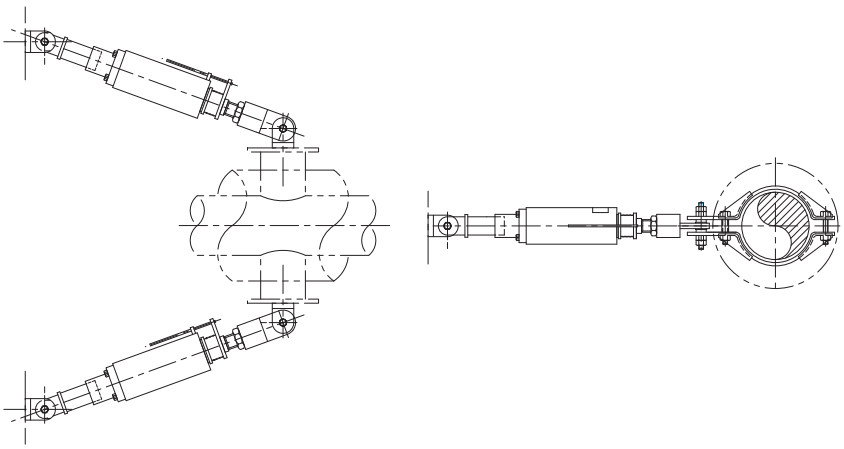
■ **Storage Guide**

(1) For lifting the snubber unit, use the sling bolt provided, and do not drag it on the ground or floor or smash to hard objects.

(2) Place the components in a space covered with a roof, and keep them away from dust, sunbeam, moisture and high humidity.

(3) Cover them with proper protective sheet when welding spatters may fall down on them.

■ Typical Installation Plan



■ Installation Guide

(1) Installation works at site must be curried out in close reference to the relevant installation drawing to be provided for each individual snubber location.

(2) Exact alignment of the entire snubber assembly is critically important for the snubber assembly to assure the required performance, and the alignment must be carefully observed throughout the installation works, especially when welding the connecting tube with the adapter of the main unit.

(3) When connecting the assembly to the bracket(s), it is required to confirm that the name plate affixed on the cylindrical snubber unit comes to the upward surface.

(4) When the required installation works have been completed in exact compliance with the installation manual and the relevant installation drawing, the pre-set pin must be completely removed as the final step.

■ Mobile Type Snubber Operability Test Equipment

To meet the needs for periodic or on-demand checking at site of snubber operability, a compact mobile type testing equipment is available. For details, please contact our Engineering Department.

■ Quality Assurance

Supply of our Hydraulic Snubber products, including sales activities, designing, manufacturing, testing, inspection and after-sale services, is performed in strict compliance with our ISO-9001 quality system.