FACT SHEET FOR
THE RAY PRESSURE SNUBBER

Purpose of the Ray Pressure Snubber.

The purpose of the Ray Pressure Snubber is to improve the readability and reliability of an instrument and/or reduce the effect of pressure surges on the instrument. They also limit the leakage of the system fluid, if there were a system rupture downstream of the snubber. The Ray Pressure Snubber protects costly instrumentation while ensuring optimum system accuracy.

Common Snubber Terminology.

- **Response time** - the time required for a change in system pressure to be shown by the instrument.
- **Surge** - a sudden rise or drop in system pressure.
- **Pulsation** - a periodic surge
- **Fluctuation** - a non-periodic surge
- **Spike** - a short duration, high amplitude surge
- **Snubber** - a surge dampening device which is designed to reduce the effect of pressure spikes and surges on instruments while allowing changes in system pressure, and low frequency pulsations transmitted to the instrument.
- **Rate of pressure change** - pressure change per time
- **Amplitude** - the maximum departure of the pressure from the average pressure

Types of Ray Pressure Snubbers.

Piston Type Snubber. This device consists of a movable piston within an orifice. The clearance between the piston and the orifice determines the amount of dampening. It is furnished with multiple pistons. Changing pistons can precisely control the amount of snubbing. The Ray Snubber piston type snubbers are self-cleaning because of the action of the piston, ensuring trouble-free service after installation.

Porous Metal Type Snubber. This nonadjustable device consists of a porous metal element, available in several porosities, installed within a fitting. The porous snubber is primarily used in non-critical and HVAC applications.

Selection Criterion for the Ray Pressure Snubber.

The following system parameters should be considered by the user for each application of the snubber. The effect of these parameters may vary depending on the instrument used.

Viscosity. A fluid with a high viscosity requires less snubbing than a fluid with a low viscosity. For example, a high viscosity fluid such as 10 weight oil will require less snubbing than a thinner fluid, such as air.

Pressure. The higher the pressure the greater the amount of dampening that is required. For example, a system operating at 3,000 PSI would require more dampening than a system operating at 100 PSI.

Rate of Pressure Change. The higher the maximum rate of pressure change the greater the amount of dampening that is required. For example, a pressure change from 0 to 3,000 PSI in 100 milliseconds will require more dampening than the same pressure change in 500 milliseconds.

Amplitude of Pressure Change. The higher the amplitude of pressure change the greater the amount of dampening that is required. For example, a pressure change from 0 to 5,000 PSI requires more dampening than a pressure change from 0 to 100 PSI.

Volumetric Displacement of the Instrument. The greater the volumetric displacement of the gauge the less dampening that is required.

Piston selection for the Ray Pressure Snubber.

The Ray Pressure Snubber is shipped with 3 pistons that will satisfy 90% of customer requirements. The Pressure vs. Viscosity Graph (PV-1) is used for piston selection for more demanding applications. (See Figure 1).

The piston recommended by this chart would protect the instrument from the most severe surges; one piston number lower is usually recommended. Bear in mind, any piston will operate over a wide range of pressures and viscosities.

For air or gas above 10 psi use the number 2 or 3 piston. For pressures below 10 psi, criterions that were not important at higher pressures, become very important such as the volume of the gauge and the volume between the snubber and the gauge. Some experimentation at these pressures may be necessary.

The following are recommended starting points:

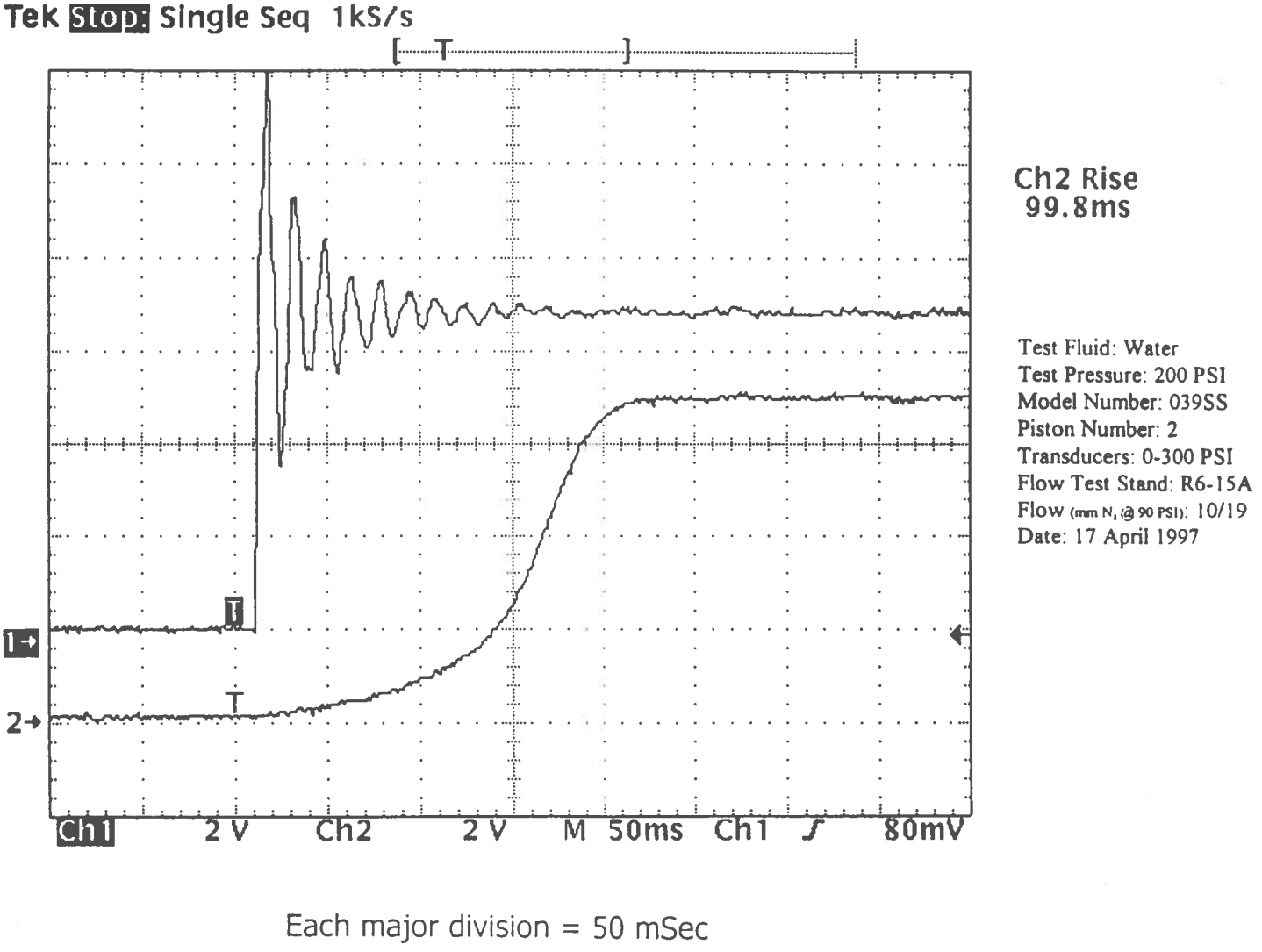
2 psi to 8 psi:	Number 1 Piston
.2 inch of water to 2 psi:	Number 02 Piston
.002 inch of water to .2 inches of water:	Number 002 Piston

1 psi = 2.31" H20	1' H20 = 0.433 psi
1 psi = 2.041" Hg	1" Hg = 0.490 psi
1 psi = .070307 Kg/cm2	1 kg/cm2 = 14.22 psi
1 psi = 27.712" H20	1" H20 = .0361 psi
1 psi = 6.894 kpa	1 kpa = 0.1451 psi
1 psi = .068948 Bar	14.5 psi = 1 Bar

Typical Pressure: Time Curves Without a Snubber vs. Time Curve With Snubber

In the following graph (Figure 2) Line Number **1** is a typical pressure surge without a snubber. First notice the rapid (instantaneous) increase in pressure. This initial pressure overshoot can cause failure to pressure sensing devices due to exceeding the rated maximum pressure. Next, notice the unstable reading occurring after the system comes up to pressure. This can cause premature failure of the pressure sensing instrument due to cyclic stresses.

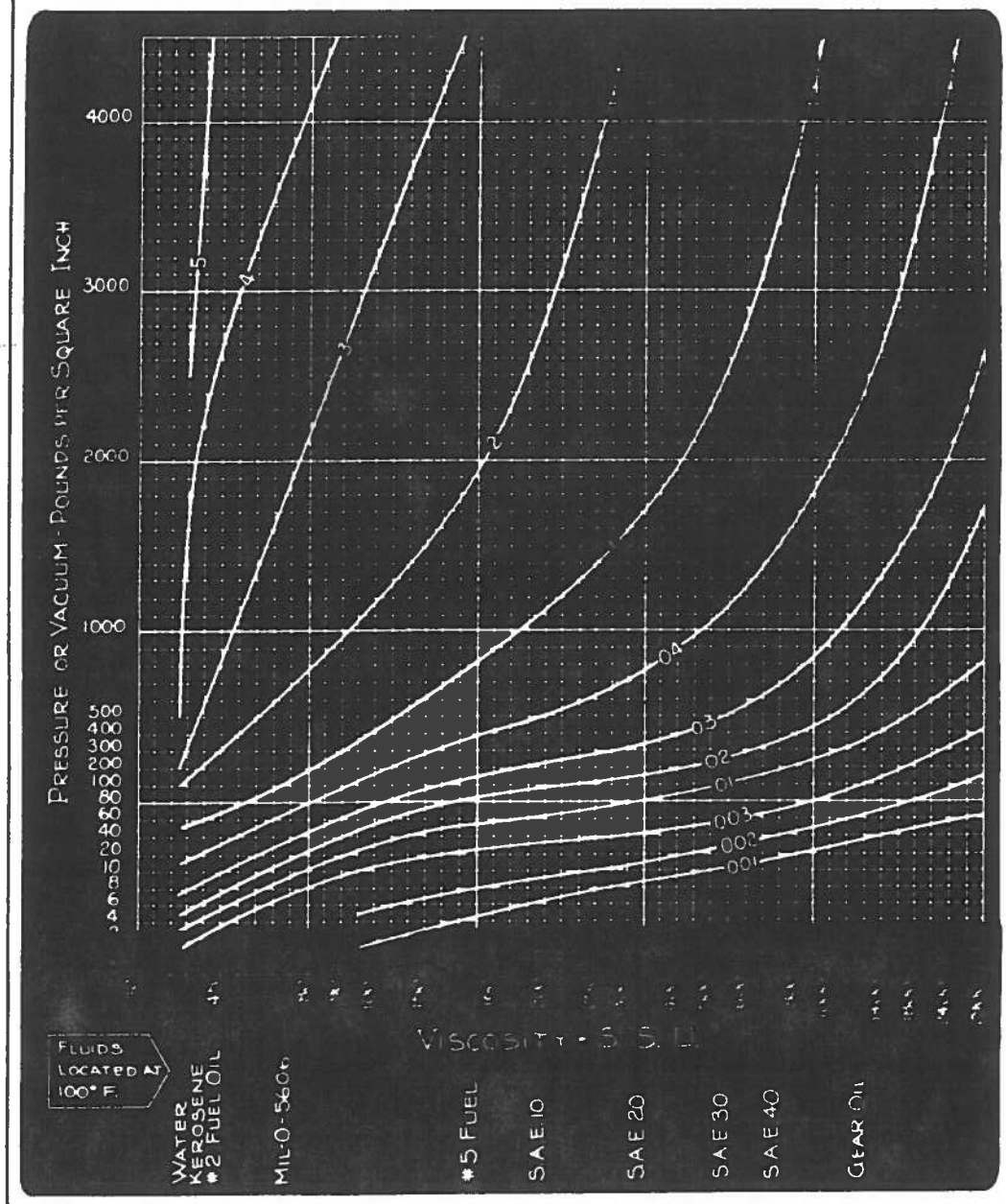
Line number **2** measures the same pressure surge with a snubber. Notice the slower rate of pressure rise. This is the ideal pressure transient to reduce the pressure shock to the sensing element.



For Your Engineering File

Pressure-Viscosity—A Supplement To Brochure CG-16

Use this graph in conjunction with Brochure CG-16 and order snubbers by model number followed by a piston number from this graph. The lines 001 through 5 on this graph represent the various pistons that can be used in any of the Ray Pressure Snubbers listed on Brochure CG-16. The 001 piston gives the least snubbing and the 5 the most. Three different pistons are shipped with each unit. By selecting the proper piston, any type of instrument action may be obtained.



HOW TO USE GRAPH

Step One

Select the operating pressure in the left column. Project a horizontal line.

Step Two

Select the approximate viscosity of the fluid from the bottom of the graph. Project a vertical line. The curved line nearest to the intersection of these lines represents the piston number to be added to the model number.

For all gases above 2 psi use -2, below 2 psi use -04.

NOTE:

The column entitled "Gas or liquid in pipe line" on CG-16 is not restricted to the uses indicated.

EXAMPLE

Problem	Facts	Solution
To eliminate the surges and pulsations from your instrument readings.	A ¼" pipe line containing oil (approx. 500 SSU viscosity) 600 psi operating pressure.	A model 2-03 snubber. Model number from CG-16 chart based on pipe size, material, pressure range, approx. fluid. Piston number from the PV-1 graph based on operating pressure and fluid viscosity. (For gases see step two above.)

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DRAWING GRAPH PV-1