

# 1.5 Lb Rohr Damper Data Sheet

## Description

The 1.5 Lb Rohr damper series is a damped tuned vibration absorber that has been optimized for maximum vibration damping using a clamp on device that is intended to target vibration reduction on small bore piping. Small bore piping is described to be smaller pipe up to 2" Nominal Pipe Size.

The damper model numbers are as follows:

R1.5 – XXX

The R1.5 designates that it is a Rohr line with 1.5 Lb internal mass. The XXX as stamped on the nameplate is the target frequency for the device.



## Application

The devices are intended to be bolted on to a vibrating pipe section that is resonant. Resonance occurs when the pipe mechanical natural frequency is near to an exciting frequency. When an exciting force is in the vicinity of the mechanical natural frequency, the vibration on the pipe will be amplified by a factor as high as 100 times compared to a pipe layout without the resonance condition.

When the dampers are properly applied, vibration damping as high as 13% can be achieved which can result in a reduction in vibration as much as 90% or more.

The 1.5 Lb damper is intended for use on a resonant system with about 10 Lb modal ("moving") mass. Examples of pipe runs that will have a 10 Lb modal mass will include:

- Cantilever vent or drain line with about 8 Lb valve
- Maximum straight pipe with the approximate length per damper:
  - ½" nominal pipe size – 20 ft/damper
  - ¾" nominal pipe size – 14 ft/damper
  - 1" nominal pipe size – 9.5 ft/damper
  - 1 ½" nominal pipe size – 5.5 ft/damper
  - 2" nominal pipe size – 3.5 ft/damper
- Shorter pipe run that detailed above if lumped masses are present (valves, flanges, etc.)

## Identifying the Dampers Required

The location and selection of damper target frequency is completed using a general review of the pipe layout as well as vibration measurements on the piping. The following procedure is recommended for piping with operating vibration (system cannot be shut down for bump testing):

1. Using a vibration analyzer (i.e. CSI-2140 data collector or similar), measure vibration velocity on the offending pipe starting from one support and progressing down the pipe to the next support.
  - a. An initial scan can be done using overall vibration velocity so that the location with the highest vibration can be identified.
2. Using a vibration velocity spectrum (FFT plot), identify the peak on the plot with the highest velocity for the location along the pipe with the highest overall velocity.
3. Select a Rohr damper model with the target frequency closest to the frequency for the highest vibration velocity.
  - a. Identify the number of dampers needed based on the pipe layout
    - i. Consider 50% of the pipe weight between supports
    - ii. Add weight of valves, flanges, etc. that are near the middle of the span
    - iii. Using the estimate of total “moving mass”, multiply the mass estimate by 15% to get a required total damper mass required.
    - iv. Divide the total damper mass required by 1.5 to determine the number of required dampers.
4. Locate the damper(s) near the location(s) of highest vibration velocity.
5. In some cases it may be necessary to use two or more dampers with different target frequencies in the event of multiple resonant frequencies on the same pipe section.

If the system can be shut down (to eliminate the excessive vibration), the piping section can be testing using a “bump” test to measure the natural frequency on the piping. Once the natural frequency is known, compare that to the operating vibration frequency. If the operating vibration frequency is near the natural frequency, the pipe is confirmed to be resonant and is then an excellent candidate for a vibration damper.

Once the resonant system is confirmed, use the same method described above to identify the number of required dampers and general locations.

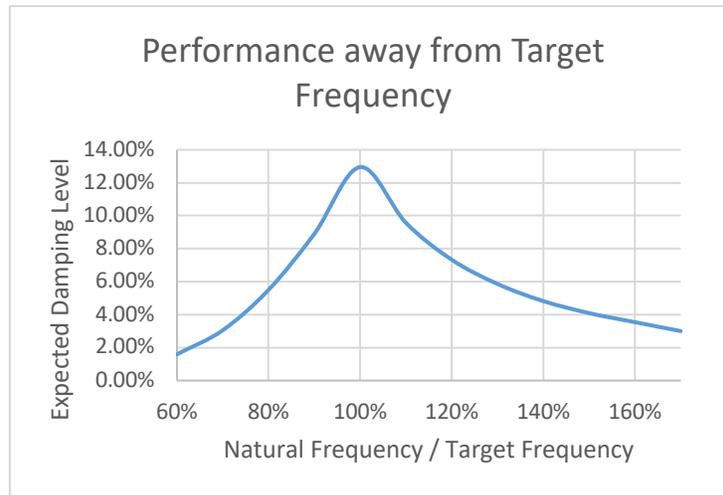
## Performance

The dampers will provide 13% damping when applied as follows:

- The pipe is resonant at the target frequency on the damper
- The modal (“moving”) mass on the system is at 10 Lb (or enough dampers are installed so that there is one damper for each 10 Lb)
- Dampers are attached near the location of maximum vibration

When the pipe resonant frequency is not right on the target frequency, the performance drops off as shown below. One thing to keep in mind is that if the original system has 1% damping and the

damper(s) will increase the damping to 4%, the expected vibration at resonance will decrease by a factor of 4!



## Small Bore Pipe Test Kit

ZetaQuest Technologies, LLC offers a test kit for small bore piping vibration mitigation that includes 1.5 Lb dampers that are ideal for small bore pipe and covers a range of applications from 15 Hz – 290 Hz. The kit can be used to identify necessary damping hardware needed for a specific pipe run.



### What's Included

We have two options including the starter kit that has the 21.2 Hz, 30 Hz, 60 Hz, and 120 Hz dampers that are likely the most common with fixed speed equipment. The complete kit includes all 8 models to cover the full range of resonant frequencies up to 290 Hz.

The kit is designed to allow connection to any tubing or piping from a ½" tube (0.5" OD) up to 2" pipe (2.375" OD) using a variety of mounting plates.

The dampers housings are hard anodized for corrosion resistance and can be mounted in any orientation. The sizing of these dampers are ideal for pipe runs with total pipe weight between spans of about 60 Lb or 30 lb modal mass or less.

Target Frequency, Hz	21.2	30.0	42.4	60.0
Min Freq, Hz	18.10	25.60	36.21	36.21
Max Freq, Hz	25.60	36.21	51.21	72.42

Target Frequency, Hz	84.9	120.0	169.7	240.0
Min Freq, Hz	72.42	102.41	144.84	204.83
Max Freq, Hz	102.41	144.84	204.83	289.67