# Mechanical Protection for Cylinder Pressure Transducers

Cylinder pressure measurements provide critical information about the condition of reciprocating compressors. Such transducers provide the all-important pressure-volume (PV) measurements needed to assess mechanical and thermodynamic performance of the cylinder and other parts of the machine. For reciprocating compressors, the internal cylinder gas pressure generates forces on the piston rod and these forces are typically larger than combined effects from inertia loads, rotating imbalance, etc. Accurate information about the cylinder gas compression cycle provides critical insight into the machine's running condition and the operating stresses experienced by the various compressor components.

Although data provided by these transducers can be used to greatly improve machine safety and reliability, it is imperative that the installation provides adequate structural bracing of the transducers and associated isolation valves. Failure to install such bracing introduces a very serious safety hazard because if a transducer or valve were to break due to improper installation or physical abuse (see Figure 1), gas would be vented directly to the atmosphere. Indeed, the suction valves in the cylinder will allow all available gas in the bottles, coolers, and piping to vent to the atmosphere even if Operations were to immediately isolate the compression system at the instant the breakage occurs. When hazardous or flammable gases are used, as is often the case with reciprocating compressors, the consequences are even more serious.

**Figure 1 – Broken cylinder pressure transducer due to Inadvertent contact with an overhead crane hook.**

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Adequate structural bracing safeguards against this in two ways:

1. It provides additional stiffness that helps reduce effects of vibratory resonance and the potential for fatigue-induced failures.
2. It provides an additional layer of mechanical protection, guarding the pressure transducer and isolation valve from the accidental impact of an overhead crane hook, dropped tools/parts, a worker's boot stepping in the wrong place, or similar scenarios.

Figure 1 shows the damage that resulted from an overhead crane hook contacting a cylinder pressure transducer. Fortunately, the primary diaphragm remained in the valve so no release of gas occurred. Further, the bracing extended to the isolation valve so it remained in place and allowed plant personnel to immediately isolate the damaged diaphragm from the internal cylinder pressure.

Figure 2 shows a design for an adequately braced cylinder pressure transducer. At a minimum, the bracket should be designed to have a first mode resonance above 100X running speed. This usually requires the plate be 0.50" [12mm] thickness or greater. Substantial bolts (½" nominal size or larger) should be used to secure the bracket to the cylinder body. For a detailed design specific to your application, contact your local GE sales professional specializing in Bently Nevada* asset condition monitoring products and services.



**Figure 2 – CAD rendering showing design for an adequately braced cylinder pressure transducer**
**(bracing in blue, isolation valves in orange, tranducers in green).**