



Load Measurement in Hostile Environments ...This is Not Your Average Load Cell

Advanced Sensors J5K Series Transducer–Class® strain gages from Micro-Measurements are utilized by Sentran, LLC in load pins for a crane / weighing system in a steel mill. In this application, temperatures can reach +400°F, leading to changes in the modulus of elasticity of the load pin element. The strain gages are specially manufactured by Micro-Measurements to compensate for the change in modulus of elasticity of the load pin, and allow for better gage matching, tighter resistance tolerance, and more repeatability through temperature.

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Company/Institute: Sentran, LLC

Industry/Application Area: Steel mill, weighing large slabs of steel

Products Used:

- [MMF017469 J5K-MC-S1448-350/DPM3](#) Transducer-Class® Gages
- [M-Bond 610 Adhesive](#)

The Challenge

Measuring heavy loads in hostile environments poses a wide range of challenges. Conventional load cells and load pins are typically designed and constructed to make measurements at temperatures that are tolerable to humans and in fairly benign environments; however, there are a variety of applications for which measurements are required in very hostile environments.

Sentran's customer needed to weigh massive slabs of steel as part of its manufacturing process. Load pins are an integral part of the scale system in an overhead crane application. The crane / weighing system must weigh slabs of steel in a finishing department that processes the slabs to meet the required finished dimensions. Loads are lifted from a location in close proximity to molten steel, which exposes the load pins to temperature up to +400 °F. These elevated temperatures pose several problems, including:

- Thermal output
- Zero drift
- Changes in the modulus of elasticity of the load pin element



The Solution

Sentran manufactures high temperature load pins designed and constructed to operate at a maximum temperature of +400 °F (standard +175 °F is also available). While the strain gages are capable of higher temperature operation, the cables and connectors selected for this application limits operation to 400°F. The pins are constructed of heat-treated alloy steel or stainless steel. Measurement is accomplished utilizing Advanced Sensors J5K Series Transducer-Class strain gages, which are specially manufactured by Micro-Measurements to compensate for the change in modulus of elasticity of the load pin. These modulus-compensated gages are carefully engineered and manufactured so the change in gage factor with temperature offsets the change in modulus of elasticity of the base metal to which they are bonded. For more information on modulus compensation, please visit <http://www.vishaypg.com/doc?11552>.



Additionally, Advanced Sensors technology allows for better gage matching, tighter resistance tolerance, and more repeatability through temperature. The modified Karma foil used to manufacture these gages is produced in-house (a Micro-Measurements exclusive) to ensure the greatest uniformity from gage to gage and maximizing output stability.



The gages are internally bonded in a honed bore with Micro-Measurements' M-Bond 610 adhesive. The internal construction method allows for excellent sealing against moisture and chemical ingress to IP67 and IP68 standards.

“The special modulus compensation, precision, stability, accuracy, and repeatability of Micro-Measurements’ gages ensure that our load pins can meet or exceed customer expectations in these demanding conditions.”

Acknowledgement:

Sentran is a recognized leader in the field of custom load and force measurement. Selection of the proper strain gages, bonding adhesive, and protective sealing materials —along with the ability to meet exacting tolerances in machined parts and gage placement — allow the company to deliver precise measurement and excellent sealing of its finished load pins to ensure accuracy and long service life.

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