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ULTRASONIC MEASUREMENT ENSURES MECHANICAL JOINT INTEGRITY

Although measurement of the torque applied to a bolt or other threaded fastener during tightening provides sufficient feedback in most applications, there are more specialised tasks where measurement of the fastener tension is essential to ensure the integrity of the mechanical joint. To address this requirement, Norbar has introduced the USM-3 ultrasonic bolt meter – a compact, lightweight, field-portable unit that gives precise measurement of elongation and load in threaded fasteners.

Traditionally, ultrasonic measurement has been a highly skilled task, requiring extensive knowledge of material properties to determine the correct transducer diameter, the correct transducer frequency, and to interpret the results. The USM-3 overcomes all of these challenges, and gives the operator a highly accurate yet easy-to-use tool for determining the tension in a fastener. Real-time, precise bolt measurement can be accomplished in fasteners of any metal from 1 inch to over 50 feet long.

Ultrasonic measurement is based on the time-of-flight principle. In use, a small transducer placed against the head or stud end of the fastener sends an ultrasonic sound wave through the length of the bolt. When the echo signal returns, the microprocessor in the USM-3 converts the transit time to a precise length, using constants based on the bolt material, and digital signal.

Processors perform the calculations to derive a precise elongation or load measurement, taking into account the effects of stress and temperature variations on the sound velocity to give an accuracy that exceeds that of strain gauges. The USM-3's ¼VGA backlit LCD display provides easy to interpret results of load, elongation data and waveform. Norbar's exclusive five-point DSP algorithm also provides an evaluation of signal quality.

USM-3 can provide a 0-10V analogue output to precisely shut off torque tools when a predetermined bolt stretch or load has been attained. In addition, the onboard flash memory can store measurements on up to 80 bolts, with up to five measurements of load and elongation for each bolt. An RS232 interface allows these results to be uploaded to a PC where Norbar's Windows-based Sonic Bolt software can perform theoretical load to stretch calculations for long-term mechanical joint integrity analysis. The software can also provide Excel-formatted reports.

The USM-3 is an evolution of Norbar's popular USM-2, with significant improvements in both utility and performance. The new model offers eight times more memory and twice the processor speed as the previous model, for increased capacity and faster response. In addition, the 1/4VGA display is significantly larger than that of the USM-2, allowing more data to be presented and in a more user-friendly fashion.