

**AUTOMATED BOLT PRELOAD MONITORING**

The Load Monitoring Fastener+® (LMF+) is a wireless system capable of automatically monitoring bolt preload during extended periods of operation.

Once fitted, the LMF+ will wake for brief periods to transmit bolt preload. If the preload drops below a pre-determined level, a report will be automatically sent via email or SMS to key stakeholders detailing the bolt ID, location, and its current tension. This ensures maintenance is only conducted on bolts requiring attention, and allows immediate action to be taken on problematic bolts installed in mission critical applications.

The integrated battery typically allows for 3 to 5 years of monitoring, at a temperature range of -20°C to 85°C.



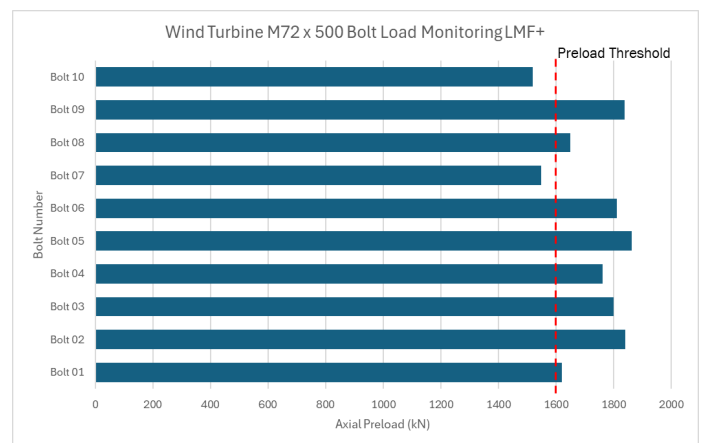
The LMF+ can be installed in bolts and studs ranging from M16 to M80+ in size, with a minimum length of 40mm. The LMF+ is installed by drilling a 2mm diameter hole through the head of the bolt into the shank and applying a strain gauge at the base of the hole. An insert containing a small amplifier and memory chip PCB to store a unique ID and calibration data is then pressed into a recess in the bolt head and connected to the strain gauge. The LMF+ cap with integrated battery and transmitter electronics is then screwed into place.

Data from the LMF+ is transferred wirelessly via Bluetooth to a nearby powered transceiver. The transceiver then transfers the data to the Global Data Network (GDN).



System applications include:

- Rail
- Highways
- Offshore
- Power Generation
- Mining
- Grinding Mills
- Bridges
- Constructions
- Pressure Vessels
- Cranes
- Pumps



The graph shows the monitoring of an individual bolt over time showing a reduction which eventually exceeds the predetermined preload threshold.

The system is able to monitor preload simultaneously on any number of bolts, thereby reducing the requirement and cost of timely maintenance to check each bolt individually. It can also operate on rotating machinery due to its wireless capability.