

Sensorise SmartScrew Datasheet

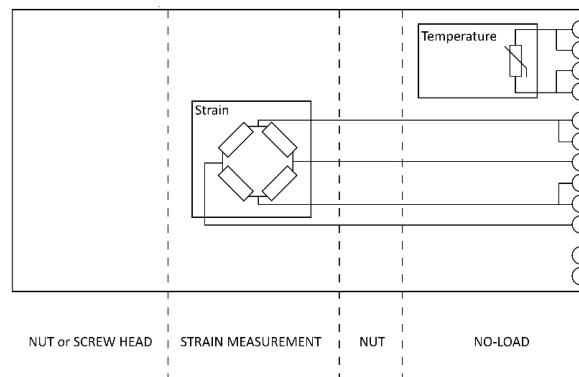
Features

- Strain measurement via bridge-circuit
- Measurement of static and dynamic loads
- Temperature measurement via RTD
- Connectivity via M8 or M12
- Measurement system resistant against humidity, oil, diluted acids and alkalis and many solvents

Applications

- Flanges
- Wind turbines
- Water turbines
- Vessel engines
- Large aggregates
- Oil and gas production
- Remote installations

Functional Block Diagram



General Discription

The Sensorise SmartScrew is a standard bolt with integrated sensors to measure static (e.g. pre-tension) and dynamic (operating) loads.

The axial load of the bolt and its temperature are provided as measurement signals via robust M8 or M12 connectors for simple installation.

The Sensorise SmartScrew has been designed for harsh environmental conditions. The system is completely passive, eliminating the risk of failed active electronic components inside the mechanical part.

SmartScrews are installed like regular bolts (torquing or stretching tools can be used) and exhibit the specified mechanical characteristics of normed bolts. This makes retrofitting of existing machines with SmartScrews as simple as exchanging a regular bolt.

Bolt and sensor elements are robust and highly integrated – the sensor becomes part of the bolt during the manufacturing process and cannot be disassembled. The sensor system is very versatile and can be adapted to custom bolt designs – contact Sensorise for your application.

Specifications

Parameter		Units	Comments
TEMPERATURE			
Type	Pt100		Pt1000 optionally available
Resistance	100	Ohm	@ 20 °C
Range	-50 .. +100	°C	
Tolerance	Class B		
STRAIN			
Type	Integrated strain gauge		
Bridge resistance	360 .. 5000	Ohm	Resistance depends on thread dimensions.
Temperature coefficient	< 10	ppm	
Bridge supply voltage	5	V DC	
Output sensitivity	0.2 .. 10	mV/V	Depending on active strain measurement length
Minimum clamping length for sensorial thread section	1 x bolt diameter		
MECHANICAL			
Connector type	M8 or M12		IP67, other connectors available upon request
Bolt types	HV Bolts Hex Bolts Stud Bolts Treaded Rods		Custom designs available upon request
Connector placement	Nut-side		Head-side optionally available
Minimum thread	M20 or G 5/8"		Custom designs available upon request
Maximum bolt length	No limit		
No-Load distance	16	mm	Recess for connectivity

Certifications*

DIN EN ISO 9001 : 2015
AD-2000/WO
Pressure Equipment Directive 2014/68/EU
KTA 1401, AVS D 100/50
KTA 3201.1 und 3211.1
DNV GL

Bureau Veritas
RINA Certification
ASME Code Section III
KSB – NCA-3800 and 100CFR21
Emerson – NCA-4250
Kobe Steel Ltd. – NCR-Regulations
*more upon request

Absolute Maximum Ratings

Parameter		Units	Comments
Storage temperature range	-65 .. +100	°C	
Operating temperature range - dry	-40 .. +85	°C	Extended range available.
Operating temperature range - wet	-40 .. +60	°C	
Bridge supply voltage	10	V	

! Bolt and mechanical construction must be properly grounded!
Take special caution when performing welding activities on the mechanical construction – avoid if possible! Sensorise SmartScrews must not be placed in the path of the welding current!

Mechanical Mounting

Although Sensorise SmartScrews are designed for harsh environments, handle the system with care. Do not drop the bolts as the connector or the thread might get damaged. Remove the protective sleeve right before mounting. The sensor inside the thread is well protected, however keep it away from sharp or abrasive objects that could reach the bottom of the thread.

! Before installing: Properly clean all inner threads (e.g. nuts) from manufacturing residue with a brush and suitable solvents (e.g. acetone)!

Do not force the bolt into its hole and avoid touching the sides of the holes, especially with tensioning bolts. Mount the SmartScrew like a regular bolt using torque wrenches or hydraulic tools. Do not exceed recommended pre-tension of the bolt as specified by the bolt manufacturer.

Electrical Connectivity

Connect the bolt with standard sensor cables to the measurement equipment. Shielded cables are recommended for cables longer than 10 m and environments with high electromagnetic interference, e.g. close to electric motors or power electronics.

Protect your measurement equipment from electromagnetic discharges, e.g. lightning strikes in outdoor applications taking appropriate measures

Signal Amplification and Data Acquisition

TEMPERATURE

Many data acquisition devices offer inputs for RTD measurement. SmartScrews use 4-wire measurement.

STRAIN

SmartScrews are compatible with most industrial strain gauge amplifiers. The recommended bridge supply voltage is 5 V DC.

To effectively filter out 50 Hz noise, a cut-off frequency of 20 Hz or lower is recommended. If you expect higher frequencies (e.g. due to machine vibration) to be present, amplifiers with higher cut off-frequencies can be used.

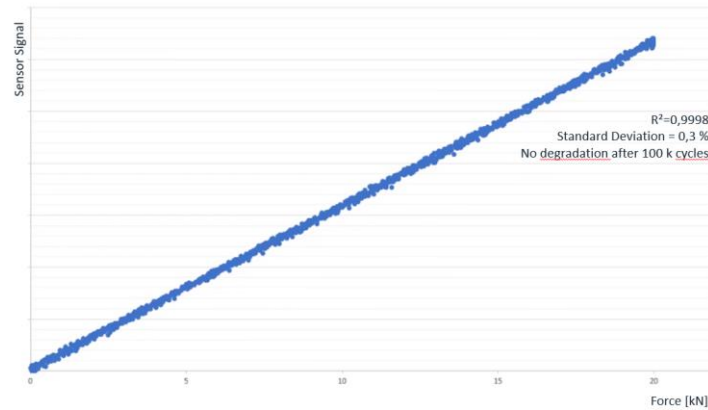
Taring to mid-range (e.g. 12 mA for a 4..20 mA output signal) is recommended for later software-temperature compensation, especially in applications with a high temperature range.

Calibration and Temperature Drift

SmartScrews are delivered non-calibrated as a standard. To detect bolt failure (lose nuts, cracked bolts), taring the amplifier after tightening and setting thresholds for a (relative) value change is sufficient.

Due to the sensor element being distributed over the lengths of the thread, temperature drift is possible and cannot be compensated completely inside the SmartScrew. It is at the user's discretion to compensate for temperature drift with the help of the temperature signal in software. The temperature dependency is a quadratic function with its minimum around 20 °C and depends on the mounting conditions.

Output Signal



Additional Products and Services

Sensorise supports your applications from sensor to cloud! Bolts, amplifiers, industrial data acquisition, cloud connectivity and storage are available as well as a seasoned team of experts to build custom data interpretation models.

Contact Information

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