SENSONICS

Keeping Industry Turning

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Welcome to our latest quarterly newsletter, which aims to keep customers and partners up to date with new developments and provide case studies and measurement techniques for protecting your critical rotating plant.

Accelerometers - cabling and the ATEX directive

ICP-type accelerometers are used extensively throughout industry for providing valuable machine vibration data for machinery protection and condition monitoring applications. However, to ensure the measurement criteria can be met, it is vital to consider the overall system implementation. One limitation, usually only considered for ATEX applications, is the effect of cable length on the overall vibration measurement.

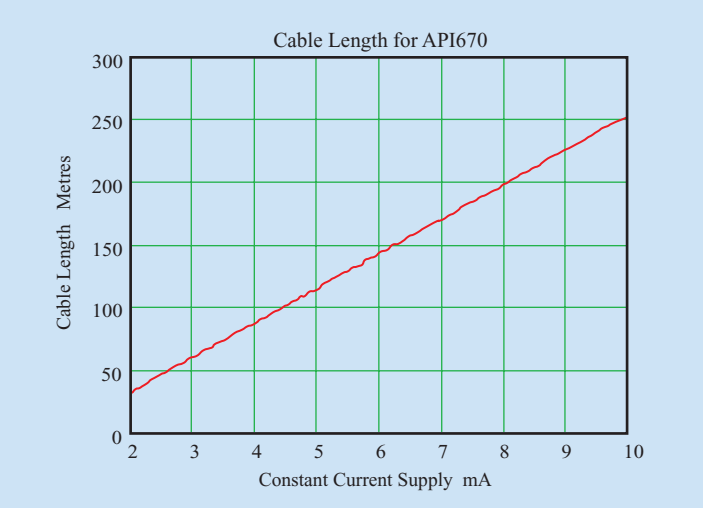
Accelerometers operate on a current loop principle, typically modulating a 2-10mA current source with the vibration signal derived from a piezo-electric element. The current source range limits the capacitance that can be driven at a particular frequency. This is expressed by the equation:-

$$\text{Cable length (m)} = \frac{(I_c - I_a)10^9}{2\pi C v_m f}$$

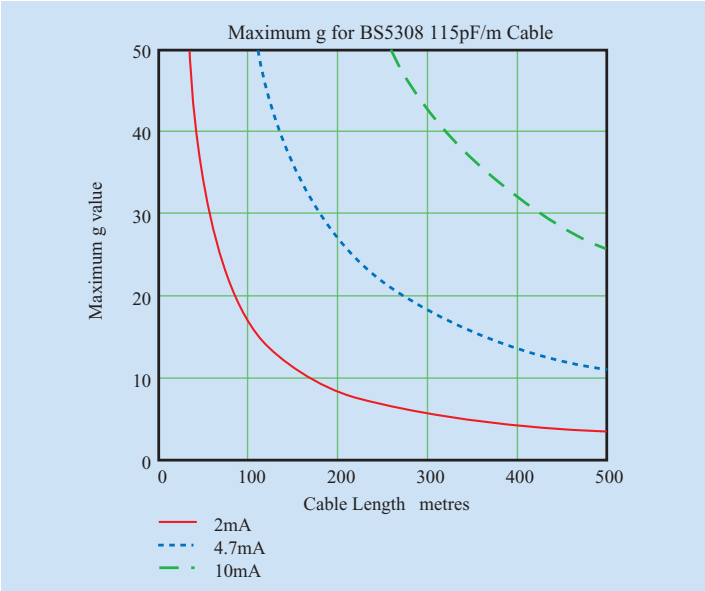
where

- I_c is the constant current supply in mA
- I_a is the operational bias current in mA
- C is the cable capacitance per metre in pF
- v_m is the voltage corresponding to the max g in volts
- f is the frequency of the acceleration signal in Hz

The API 670 standard recommends a vibration acceleration measurement bandwidth of up to 10 kHz; other applications, such as harmonic analysis, demand even higher bandwidths. The graph below indicates the maximum permissible cable length at 10 kHz against available current. Standard BS 5308 shielded twisted pair cable has been assumed (capacitance 115pf/m).

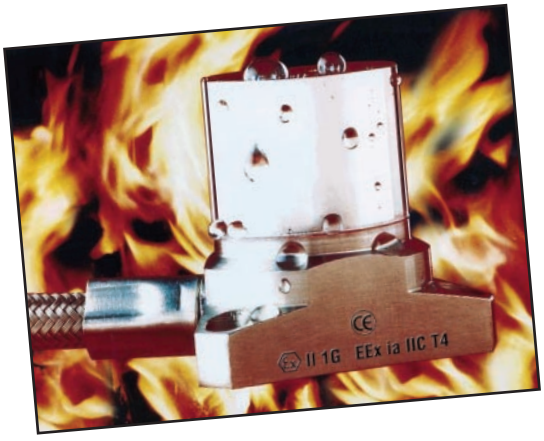


If we translate this into acceleration and look at the effect of different value current loops (diodes), the potential limitations in the dynamic range of the measurement system can be seen.



ATEX applications with accelerometers mounted within a hazardous area are limited by the overall circuit capacitance seen by the safety barrier at the interface between the safe and hazardous areas.

For example, Sensonics accelerometers are certified with an internal capacitance of 31nF and the EN50020:2002 Standard (Electrical Apparatus for Potentially Explosive Atmospheres - Intrinsic Safety) certifies a maximum capacitance of 78nF for 28.5V circuits in a class IIC environment (Hydrogen Gas Group). Thus the maximum allowable cable capacitance is 47nF; with 115pf/metre cable, the maximum permissible cable length between the accelerometer and the safety barrier is 408 metres.



Axial displacement measurements at 200°C

Our range of established high temperature LVDT displacement transducers has recently been extended to cater for direct contact with rotating plant. The specific application which triggered the design involved measuring the axial displacement on a large rotating kiln.

Kiln with support and drive structure

Non-contact methods (proximity probes) are usually preferred for measuring movement or vibration on rotating plant. However, this was not possible for this application due to the large axial movement of up to 50mm. The challenge was to provide a robust, reliable displacement transducer in permanent contact with a hot, rotating metal surface. A standard ball end extension would wear rapidly in such an environment and so a guided rod (to prevent rotation) and wheel arrangement was implemented.

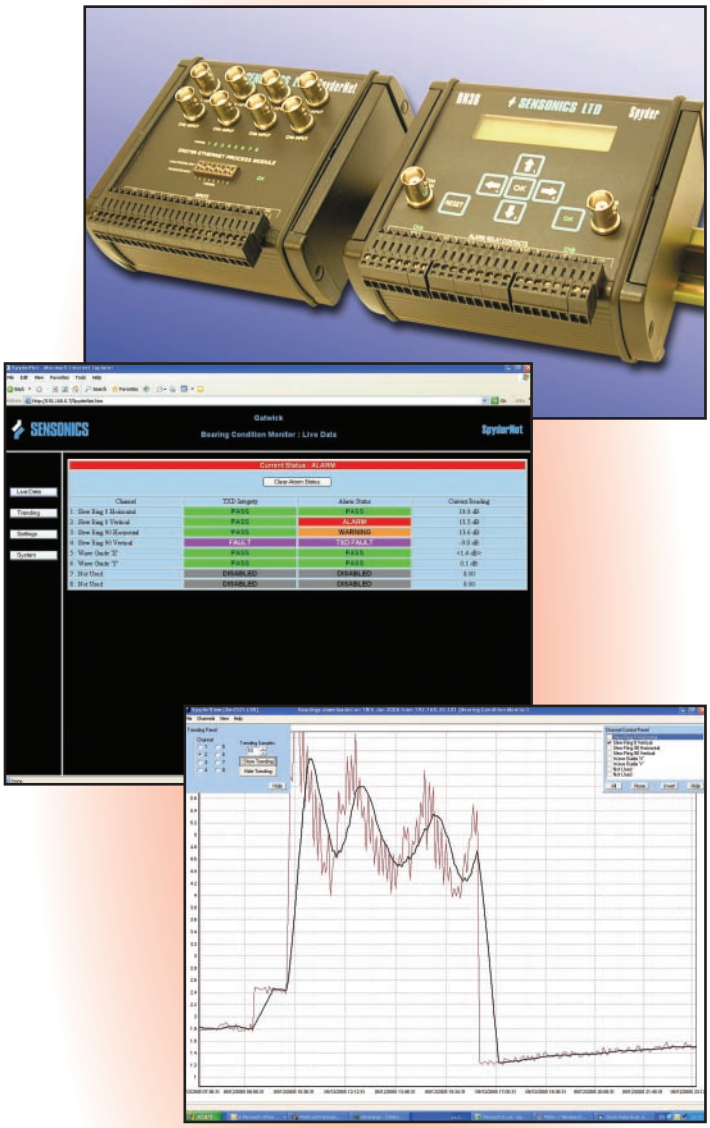
The instrument was supplied with an LVDT driver unit configured to provide a 4-20mA signal for direct integration with the site DCS system for alarming and trending.

Recent contract award highlights

- Turbine Vibration Monitoring system with on-line test facilities. *Location:* United Kingdom.
- Volume ATEX accelerometer supply for offshore oil and gas application. *Location:* North Sea.
- Shaft eccentricity and bearing vibration monitoring systems for various power station plant. *Location:* Poland

Product Focus - SpyderNet Vibration Trending

During recent months we have seen a rise in interest in our SpyderNet remote vibration monitoring unit. Offering eight vibration trending channels in a compact DIN-rail mount design, the product complements the existing DN26 range of protection monitors by providing smart access to historical data. Designed to offer cost-effective 24/7 monitoring, it is a viable alternative to offline portable regimes.



SpyderNet modules with homepage and typical trending plot

The unit contains a powerful webserver which provides remote access using standard Ethernet protocol with connection via RJ45 cabling or wireless networks. Customer-configured with a unique IP address, once the unit is connected into the local network, standard web browser tools can be used to give desktop access to the alarm status and vibration/process levels.

With a programmable interface to ICP-type accelerometers or 4-20mA circuits, Spydernet offers a wealth of measurement facilities coupled with low integration costs.

Sensonics are a leading supplier of turbine supervisory and high integrity protection equipment to industry. With 30 years experience in providing vibration, displacement and speed instrumentation solutions in demanding environments, not only do they supply a full range of sensors and API 670 compliant measuring and protection equipment, but also offer design through to installation and commissioning services.

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