



**Vibration instrumentation in
paper machines** – *a unique environment*

Wilcoxon
SENSING TECHNOLOGIES

Installation considerations

- Installing the proper sensor
 - Wet section (hot, humid, corrosive)
 - Dryer section (heat, steam, ESD)
- Mounting the sensor
 - Deep groove vs. spherical bearings
 - High frequency analysis
 - Acceleration vs velocity
- Connectors and cabling
 - Materials and design
 - Shielding and routing
- Connection boxes
 - Switching
 - Location



Press and forming section

Environment: steam, water spray, corrosive chemicals

- Sensor requirements
 - Low noise for slow rolls
 - 316L stainless steel – chlorine resistant steel designed for paper industry
 - Hermetic sealing
 - Splashproof / waterproof connectors
 - Teflon® cabling
- Sensor recommendations
 - Industrial sensors: 787A, 797L, 799LF
 - Sealed connectors: R6QI (IP68), R6W (IP67)
 - J9T2A cables, shielded twisted pair



Dryer section

Environment: high temperatures, steam, ESD

- Sensor requirements
 - Long term reliability at high temperatures
 - Overload protection
 - ESD protection
 - Hermetic sealing
 - High temperature sealed connectors
 - Teflon® cabling rated to 200°C
- Sensor recommendations
 - Industrial sensors: 793-6, 797-6
 - Sealed connectors: R6QI (IP68), R6W (IP67)
 - J9T2A cables, shielded twisted pair



Dryer section

Requires high temperature performance

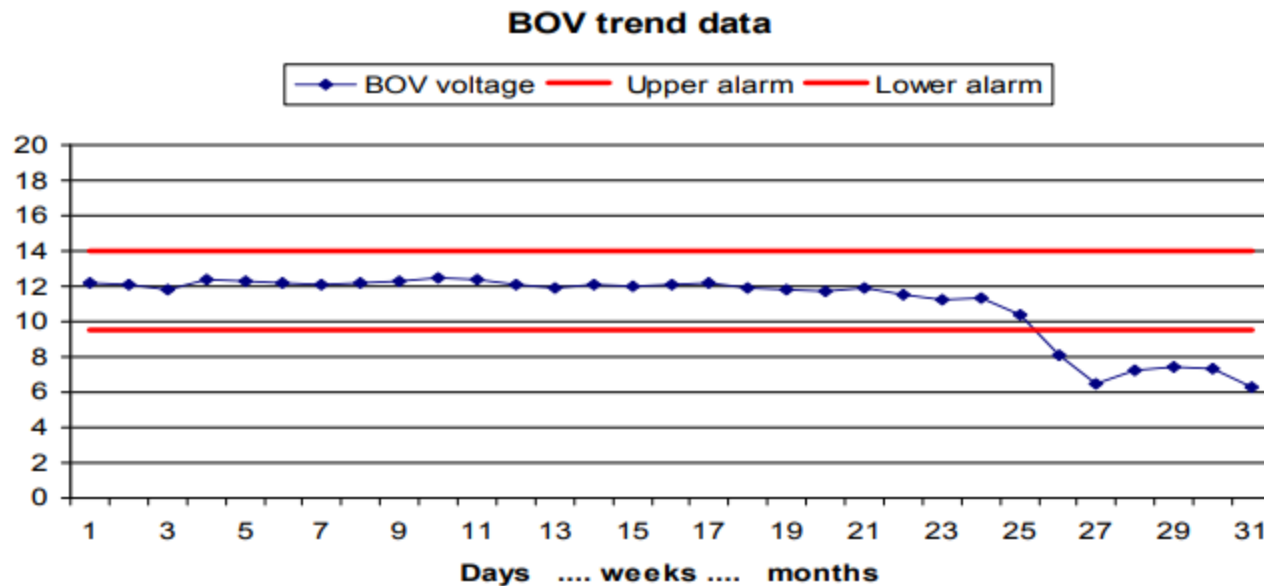
- Paper machine speeds are being increased to increase capacity. The dryer section temperatures are increased to meet faster speeds. Sensors chosen must meet these requirements!
- Temperature increases from 110 to 140° C are not uncommon
- Grease lubricated bearings are hotter than circulating oil lubricated bearings
- The top of the dryer hood is hotter than below



Dryer section

BOV trend

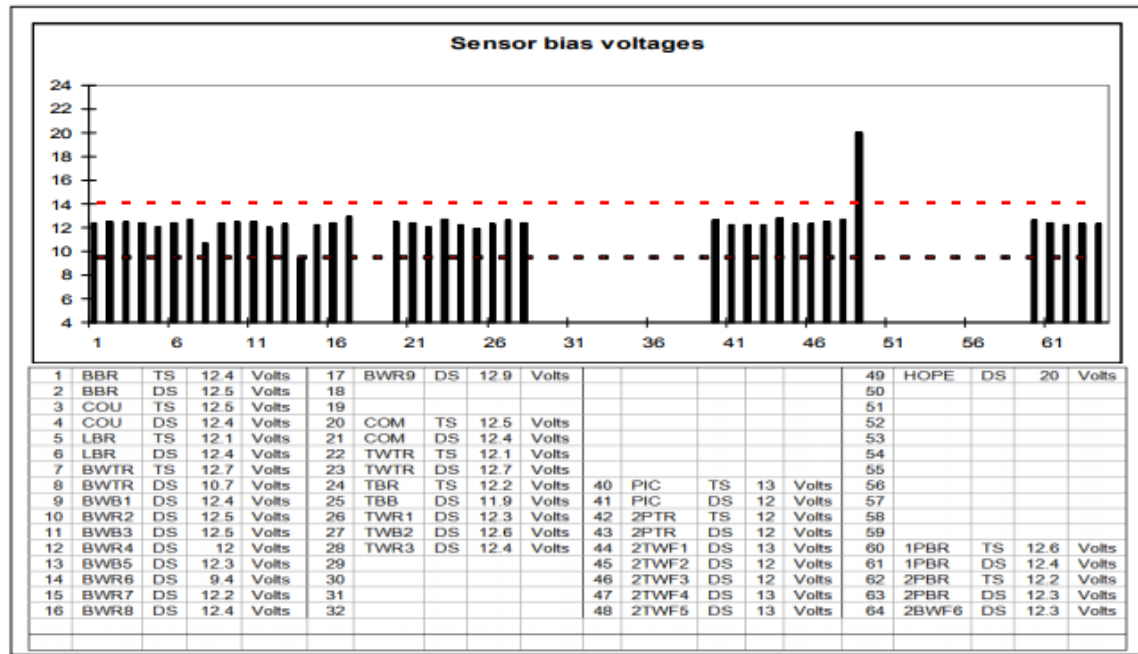
- High temperature sensor failures usually show a gradual decline in bias voltage
- Select sensors incorporating robust high temperature technology



Dryer section

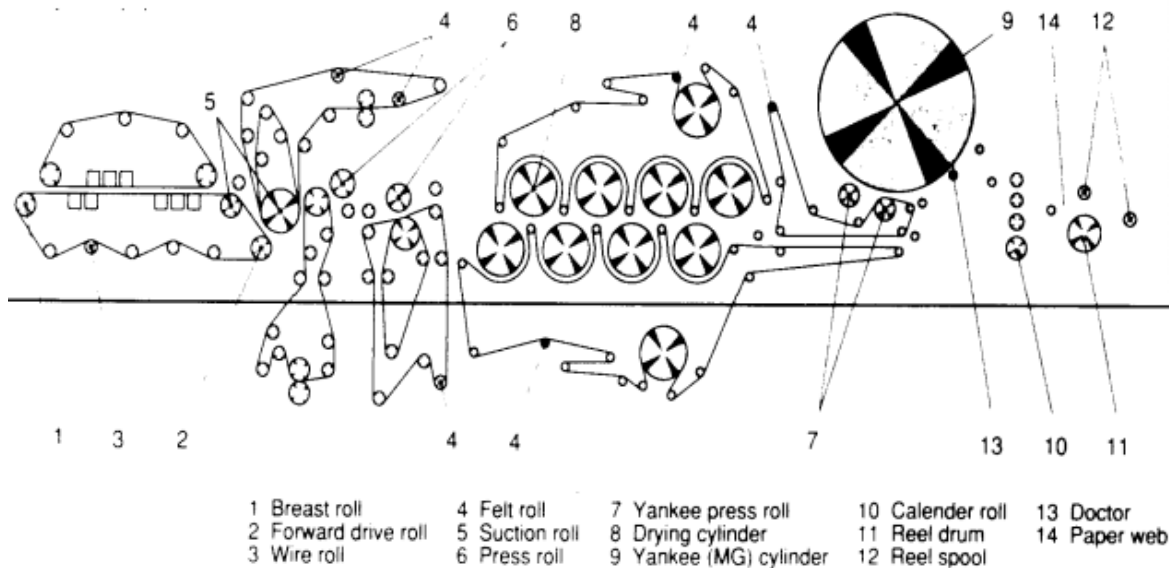
BOV trend

- Bias voltage trending can be used to diagnose connection and cabling problems



Sensor shape considerations

- Use low profile sensors where roll access is required and on external gear machines. This will ease maintenance and reduce sensor damage.

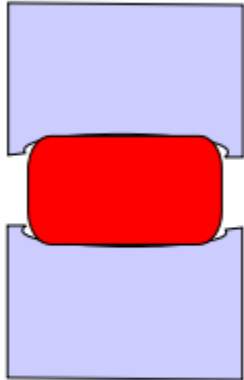


Through-bolted accelerometers

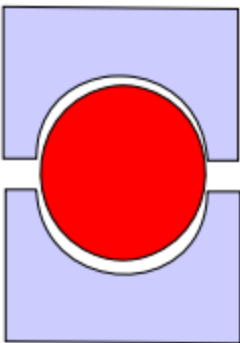
- Captive bolt won't fall into machine
- Captive bolt allows 360° cable orientation
- Low profile reduces sensor damage during maintenance and operation
- Exposed bolt removable with channel locks



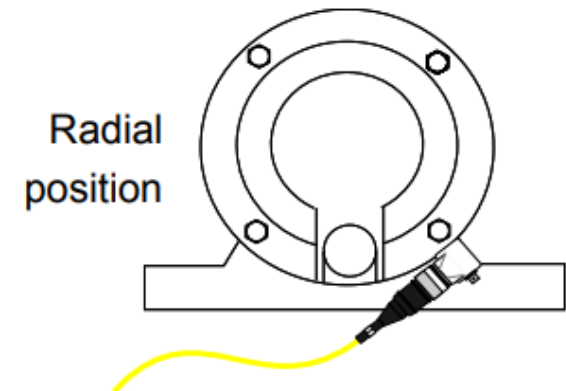
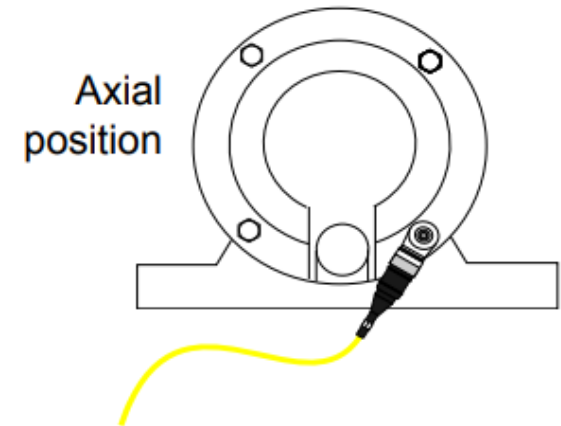
Installation location considerations



- Spherical roller bearings: Mount axially

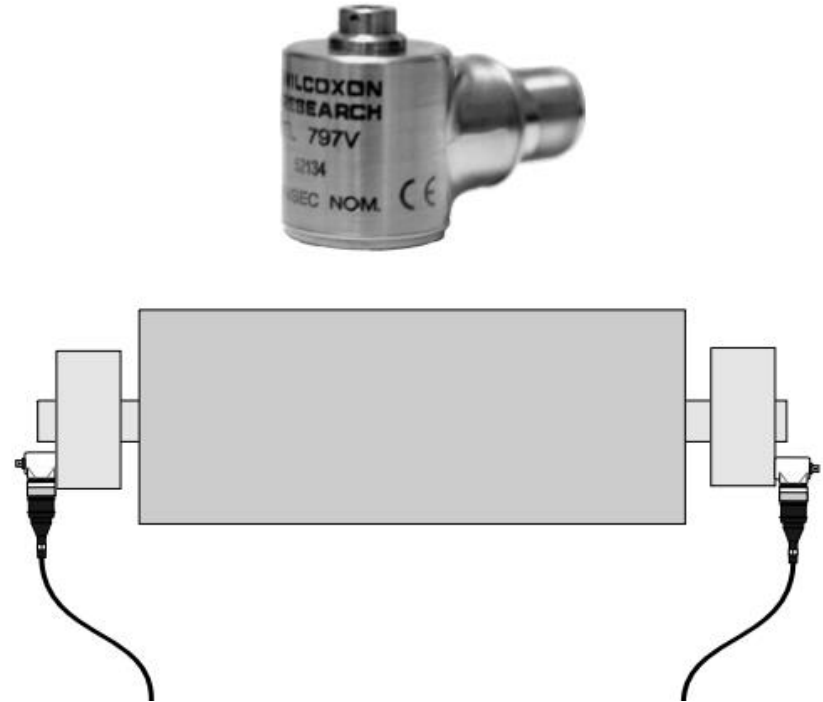


- Deep groove roller bearings: Mount radially near the load zone



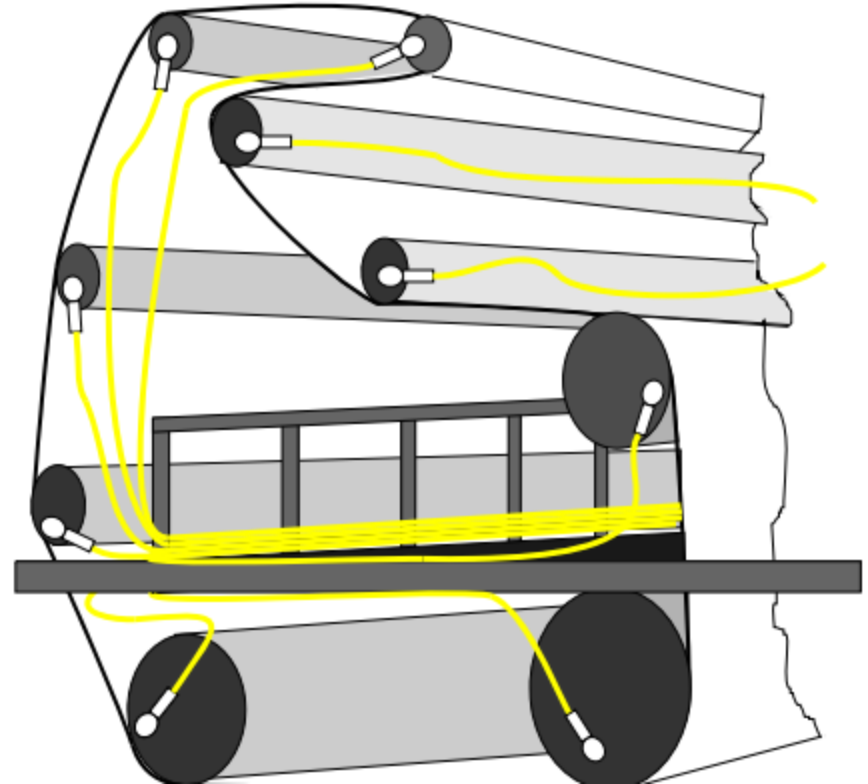
Installation location considerations

- Tending side velocity measurements will detect drive side bearing faults
- 793V sensor is a convenient way to get velocity directly out of the sensor, mV/in/sec, without the need for external integration



Cable routing considerations

- Never allow cables to cross a felt line on the tending side of the machine
- Route cables from front side (tending side) sensors through felt to the back side (drive side). This will ease felt removal
- Route cables inside of felt for inner rolls/ outside of felt for outer rolls



Intelligent Transmitters (iT), iT Alarm, iT communications module

- Intelligent Transmitter
 - Powers the IEPE dynamic sensor
 - Single integration of the signal
 - Converts the overall level to a 4-20 mA signal
 - Outputs a 4-20 mA proportional to acceleration, velocity or displacement
 - Output is RMS, peak, true peak or true peak to peak
 - Front panel BNC to monitor the raw AC signal or feed to an online system
 - DIN rail mountable
- iT Alarm module
 - 3 alarm relays
 - User programs settings
 - Local alarming



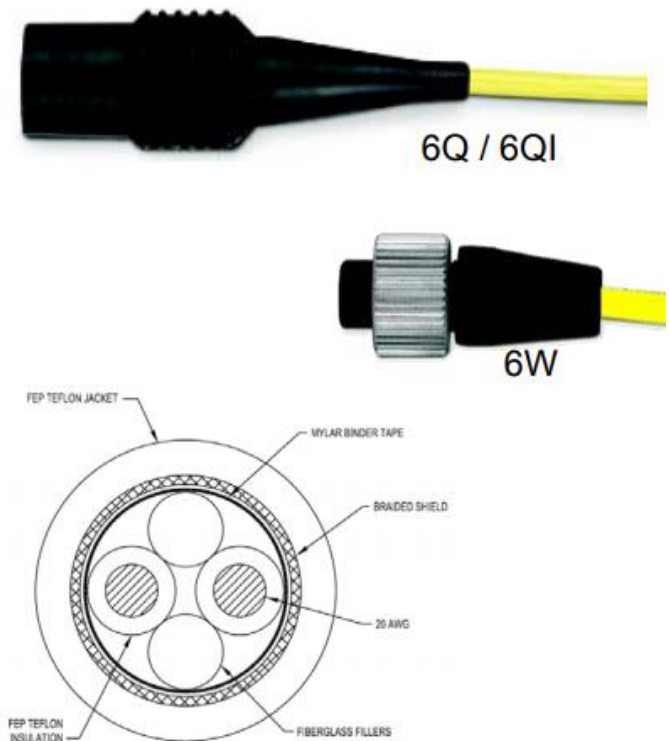
Intelligent Transmitters increase the value of your sensors

- Permanently mounted dynamic sensor is continuously monitored
- Overall value to true peak value can be sent as 4-20 mA signal
- Local control panel or plant-wide DCS can include vibration signal
- Raw AC signal is available for spectral analysis monitoring

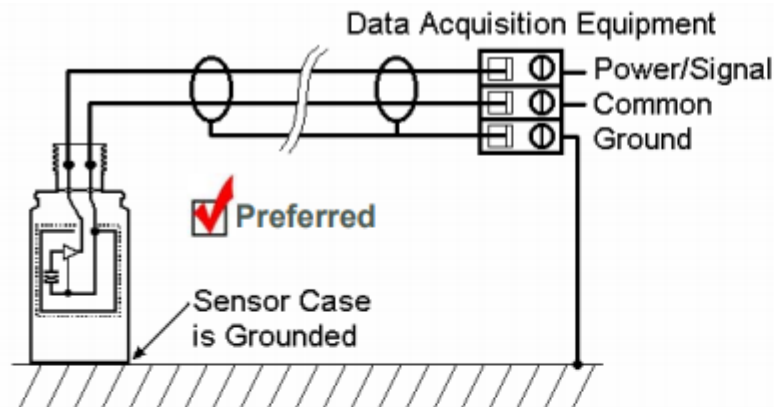


Cable and connection considerations

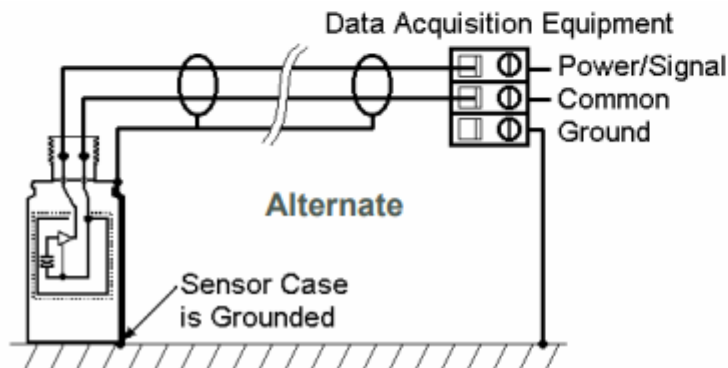
- Use sealed connectors – not integral cables
- Use IP68 rated connectors
- Use appropriate materials Teflon® and Viton in dryer section
- Use 2 conductor shielded cable
- Bright cable colors are easier to identify



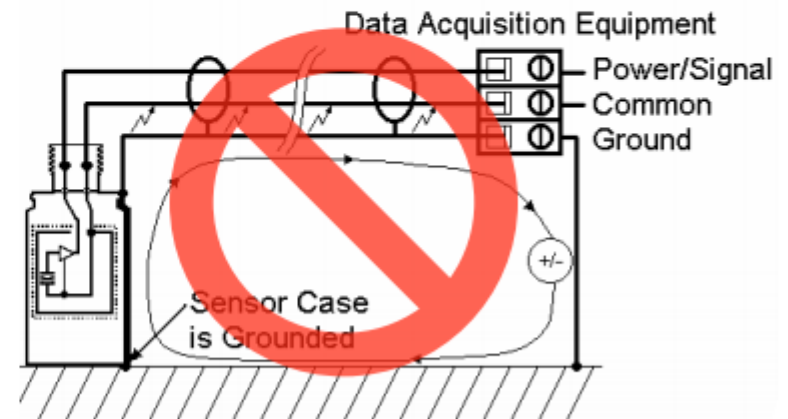
Cable shield grounding considerations



» Cable shield can be tied to the sensor case or the monitor - not both



- » Prevent ground loops!
- » Never ground both ends of a shield



Connection boxes

- Sensor turn-on time is important when using multiplexing and manual switch boxes
- Junction boxes should incorporate ferrite bead protection of BNC termination
- NEMA 4X rated boxes should be used for best wiring protection
- Termination boxes and switched output boxes maximize your permanent mount sensor utilization




High performance sensors tailored for your environment

- Low frequency, low noise sensors for clean measurements signals
- Dependable high temperature sensors for increased reliability in extreme environments
- Multiple output configurations to fit in any location
- Industry standard cable assemblies that last in extreme conditions
- High quality, long lasting connectors
- Proven performance



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