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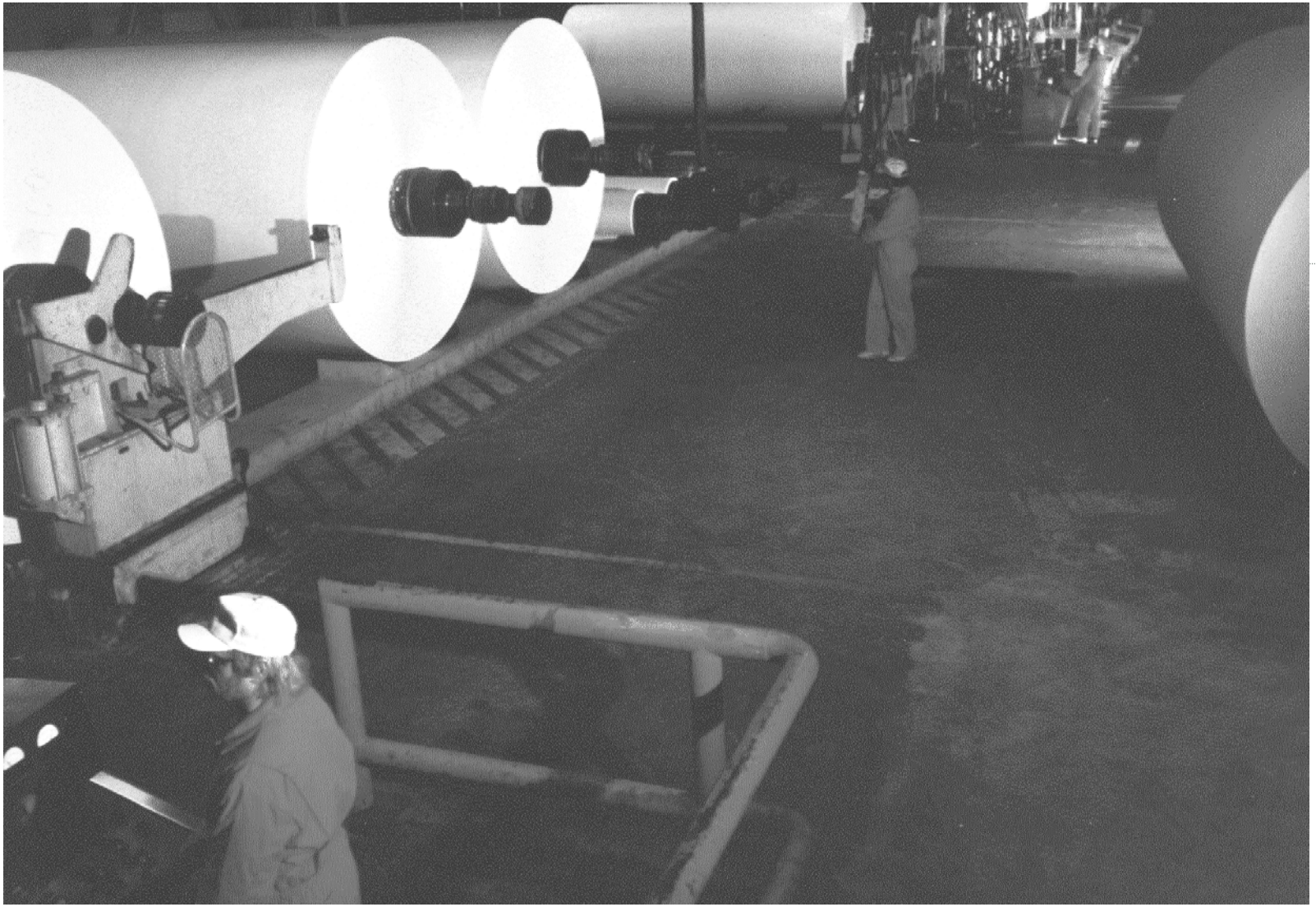


Vibration instrumentation in paper machines

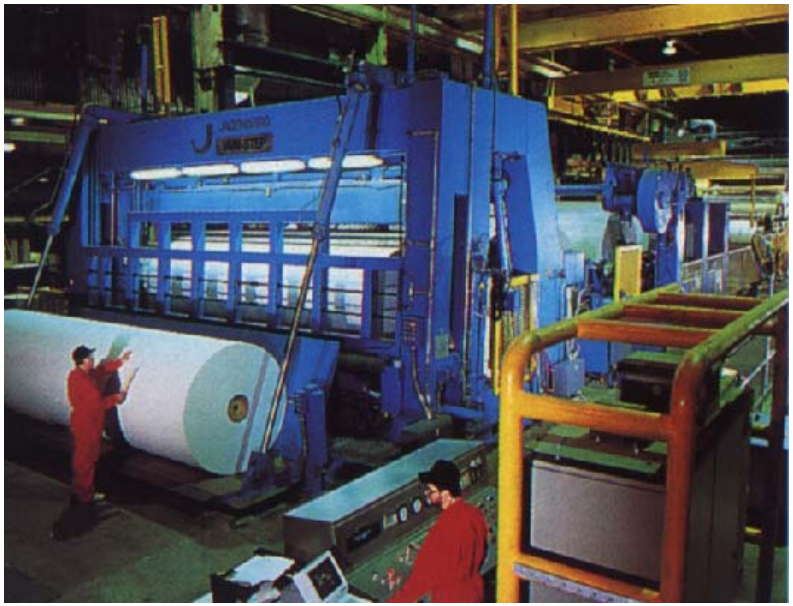
A unique environment

May 2012

MEGGITT

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

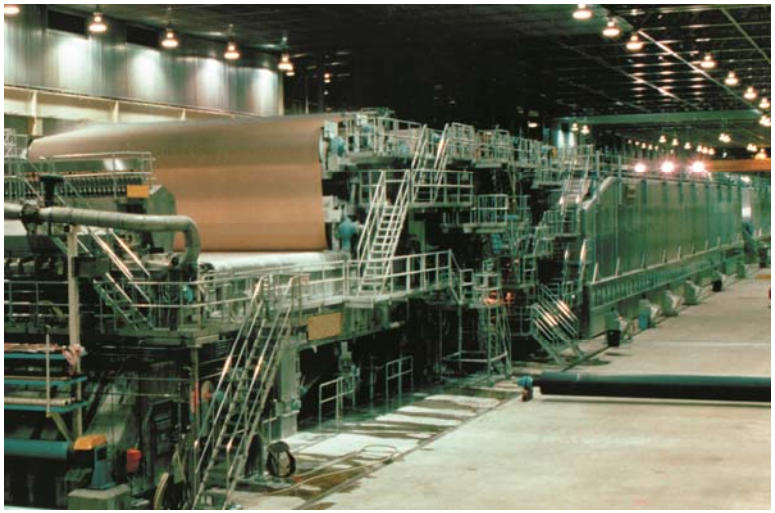
Environment: High temperatures, steam, and ESD

- 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

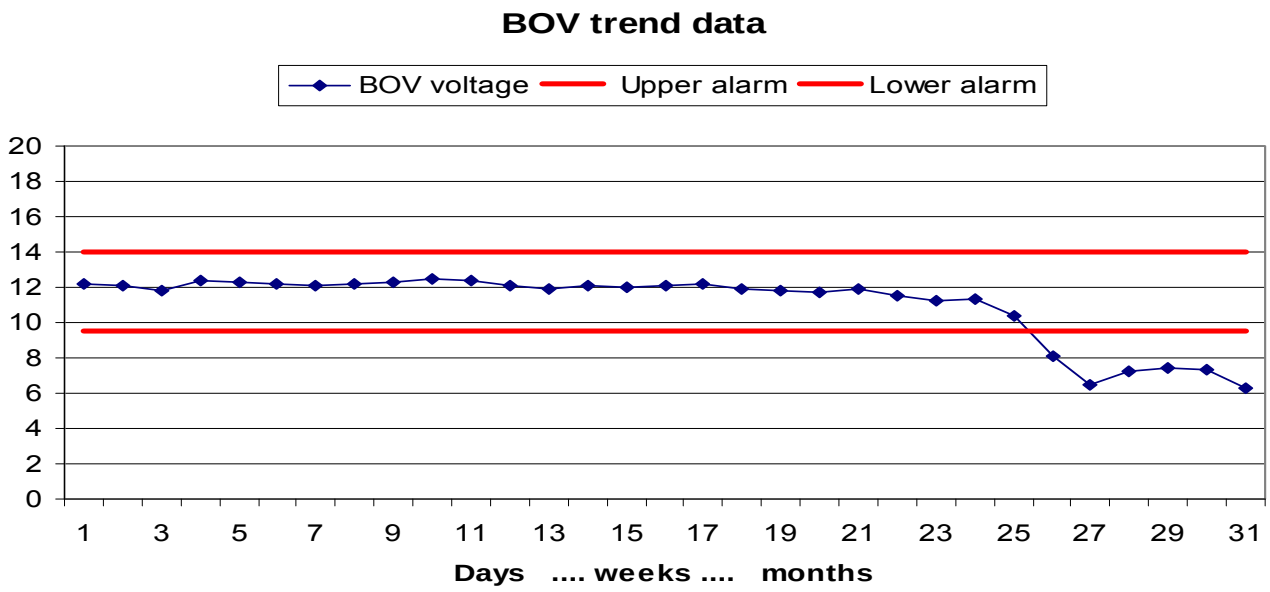
Requires high temperature performance

- 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 the bias voltage

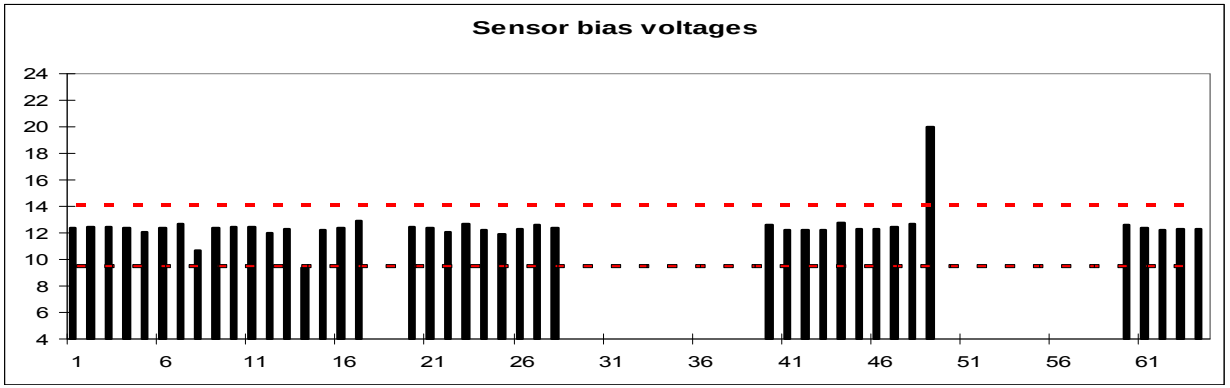


- Select sensors incorporating robust high temperature technology!

Dryer section

Bias voltage trend

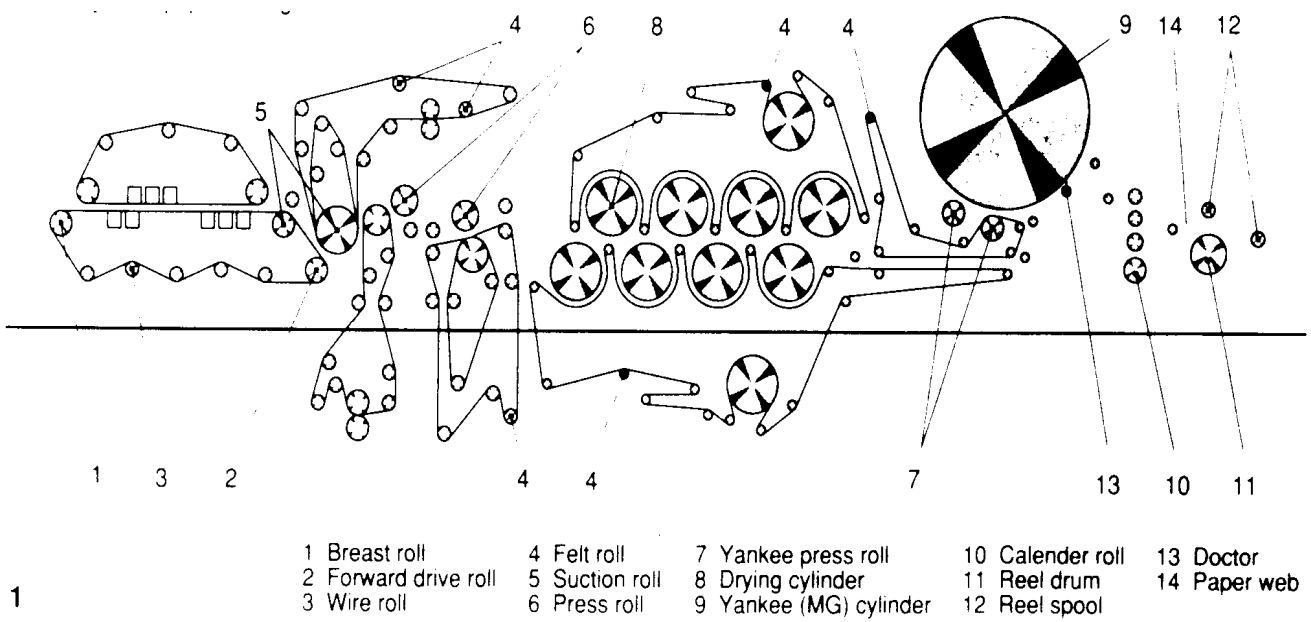
- Bias voltage trending can be used to diagnose connection and cabling problems



1	BBR	TS	12.4	Volts	17	BWR9	DS	12.9	Volts						49	HOPE	DS	20	Volts
2	BBR	DS	12.5	Volts	18										50				
3	COU	TS	12.5	Volts	19										51				
4	COU	DS	12.4	Volts	20	COM	TS	12.5	Volts						52				
5	LBR	TS	12.1	Volts	21	COM	DS	12.4	Volts						53				
6	LBR	DS	12.4	Volts	22	TWTR	TS	12.1	Volts						54				
7	BWTR	TS	12.7	Volts	23	TWTR	DS	12.7	Volts						55				
8	BWTR	DS	10.7	Volts	24	TBR	TS	12.2	Volts	40	PIC	TS	13	Volts	56				
9	BWB1	DS	12.4	Volts	25	TBB	DS	11.9	Volts	41	PIC	DS	12	Volts	57				
10	BWR2	DS	12.5	Volts	26	TWR1	DS	12.3	Volts	42	2PTR	TS	12	Volts	58				
11	BWB3	DS	12.5	Volts	27	TWB2	DS	12.6	Volts	43	2PTR	DS	12	Volts	59				
12	BWR4	DS	12	Volts	28	TWR3	DS	12.4	Volts	44	2TWF1	DS	13	Volts	60	1PBR	TS	12.6	Volts
13	BWB5	DS	12.3	Volts	29					45	2TWF2	DS	12	Volts	61	1PBR	DS	12.4	Volts
14	BWR6	DS	9.4	Volts	30					46	2TWF3	DS	12	Volts	62	2PBR	TS	12.2	Volts
15	BWR7	DS	12.2	Volts	31					47	2TWF4	DS	13	Volts	63	2PBR	DS	12.3	Volts
16	BWR8	DS	12.4	Volts	32					48	2TWF5	DS	13	Volts	64	2BWF6	DS	12.3	Volts

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.



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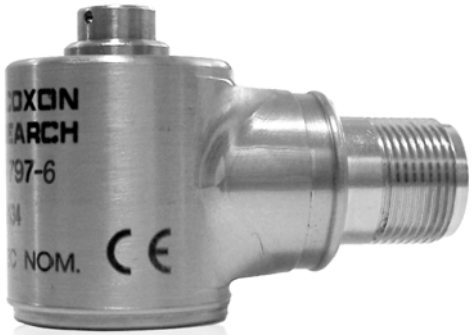
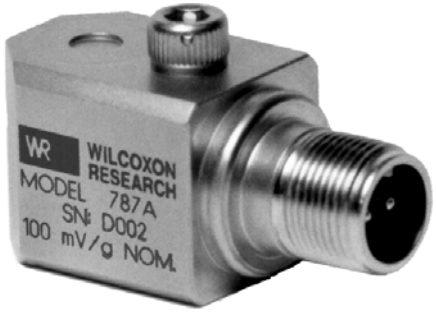
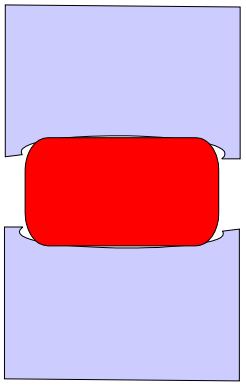
Through-bolted accelerometers

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



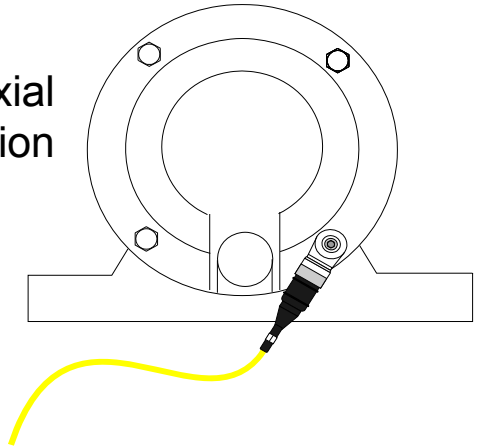


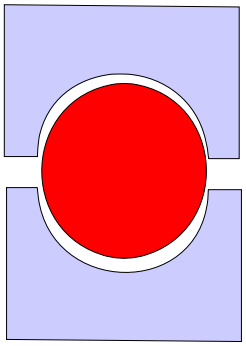
Installation location considerations



Spherical roller bearings:
Mount axially

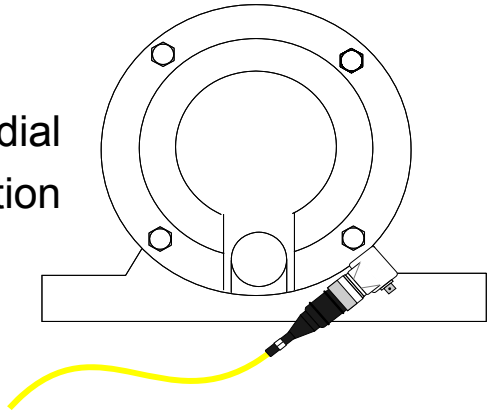
Axial position





Deep groove roller bearings:
Mount radially near the load zone

Radial position

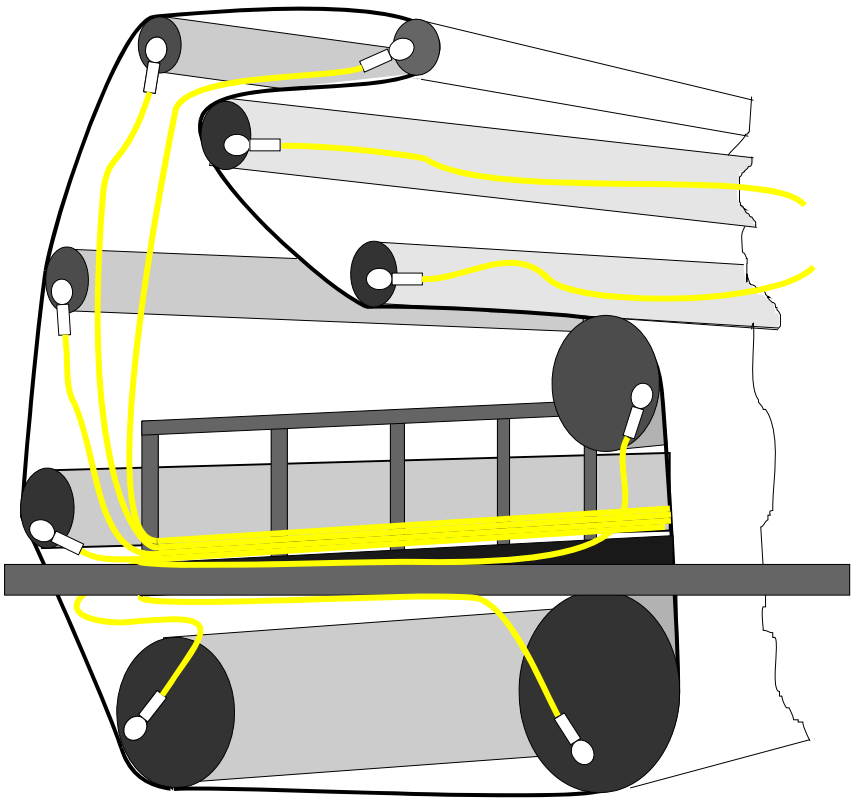


Installation location considerations

- Tending side velocity measurements will detect drive side bearing faults
- The 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

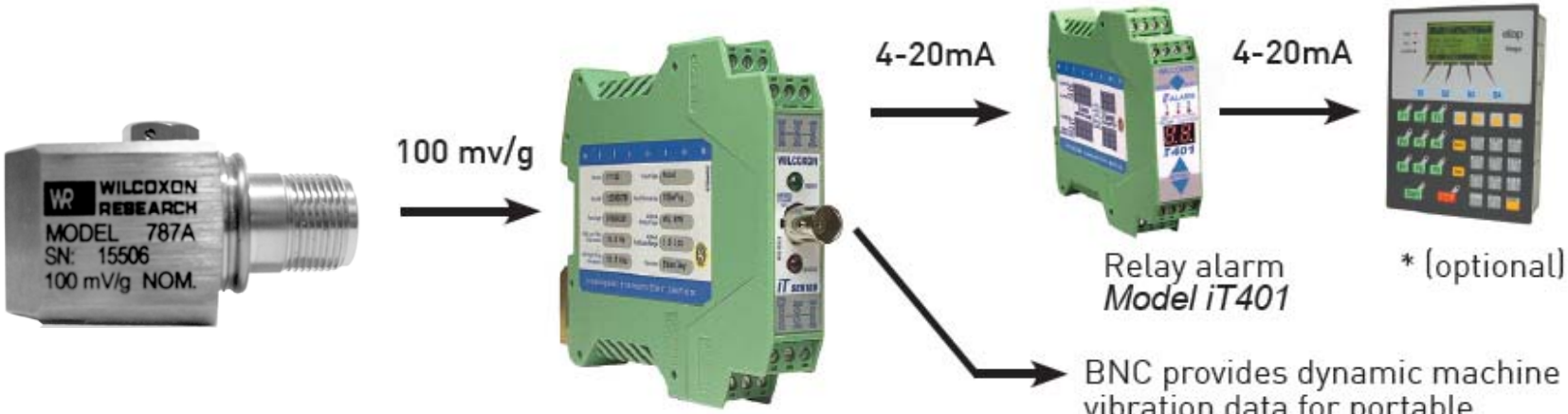


Intelligent Transmitters (iT), iT Alarm, and iT Communications module

- 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 or 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

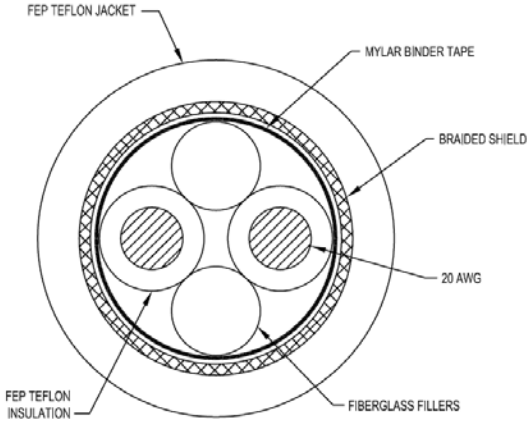


Cable and connection considerations

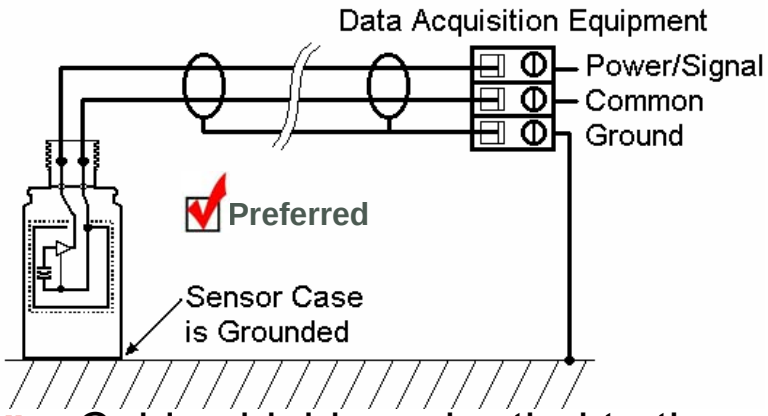
- Use sealed connectors - not integral cables
- Use IP68 rated connectors
- Use appropriate materials - Teflon® and Viton in dryer section
- Use 2 conductor shielded cable
- Bright cable colors are easier to identify

6Q / 6QI

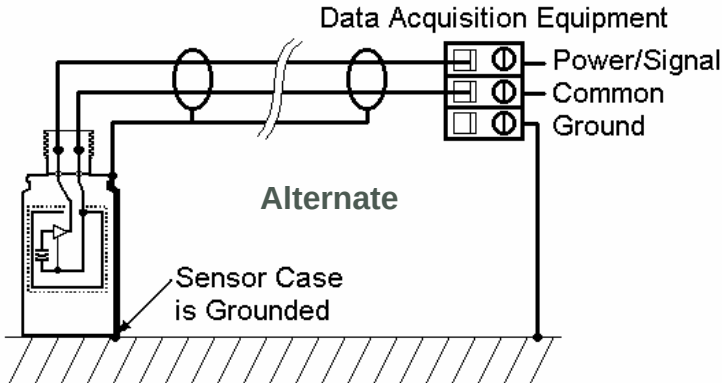
6W



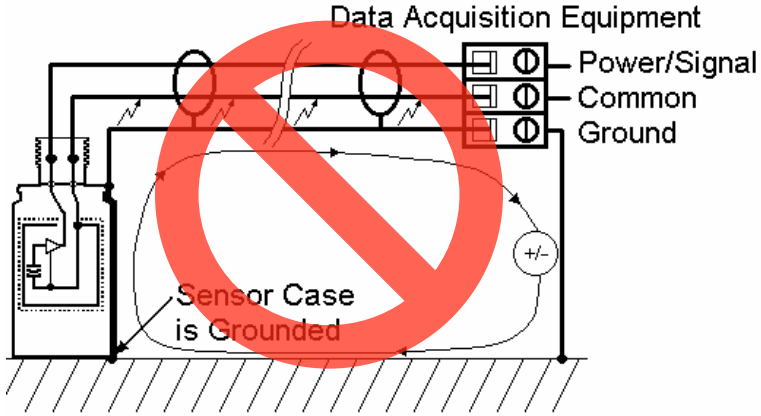
Cable shield grounding considerations



- 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

Wilcoxon Research

Building quality sensors for over 50 years

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