Rider ring wear, measurement methodologies

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www.thomassen.com

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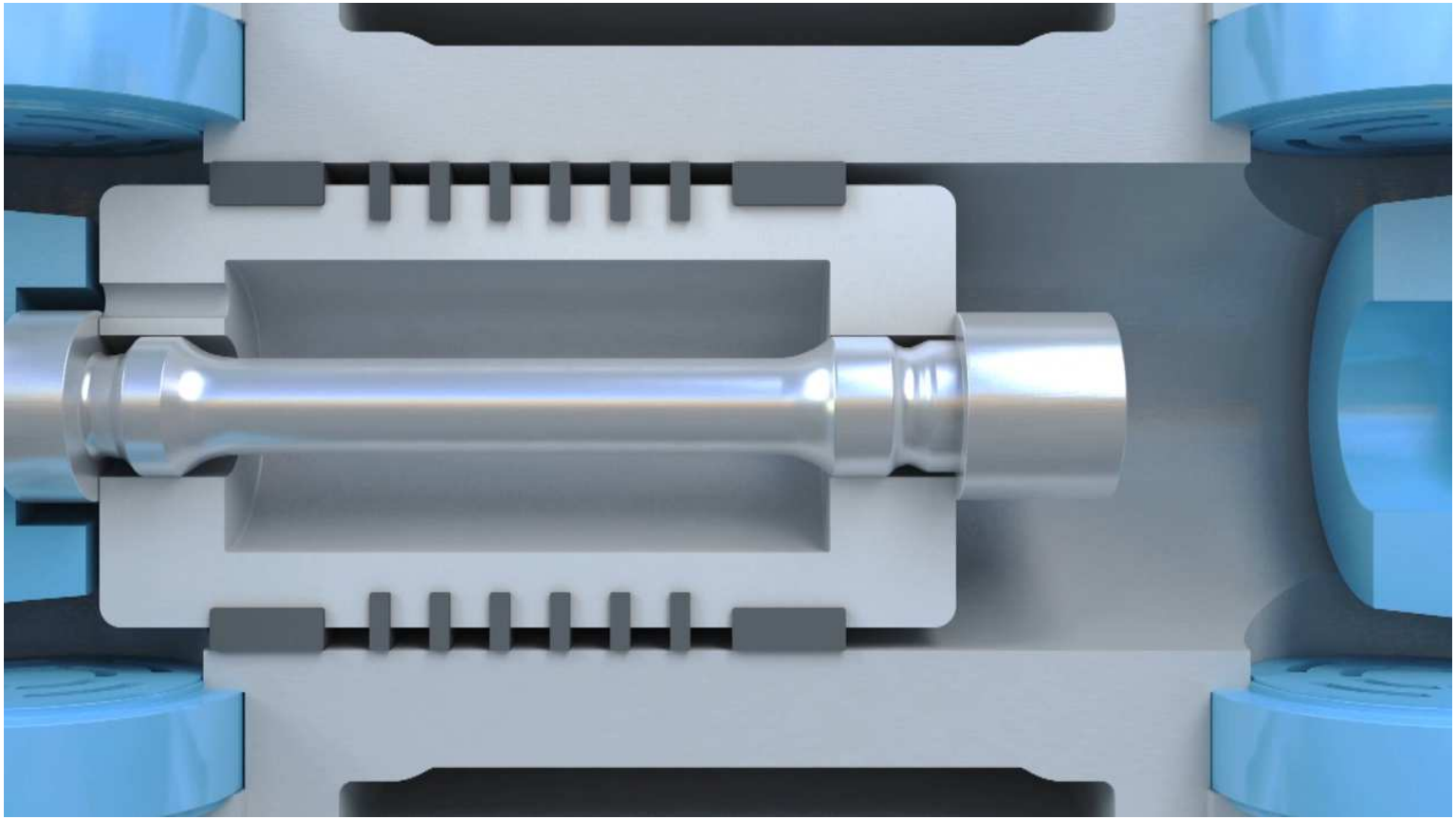
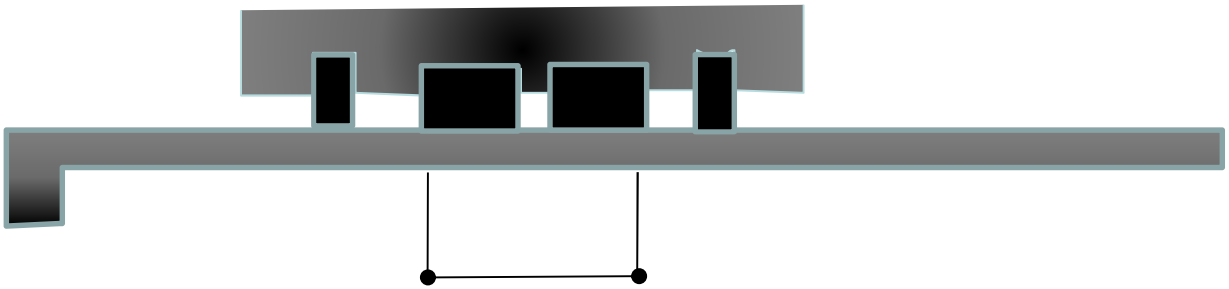
- Rod drop measuring
- Direct measurement

Rider ring wear



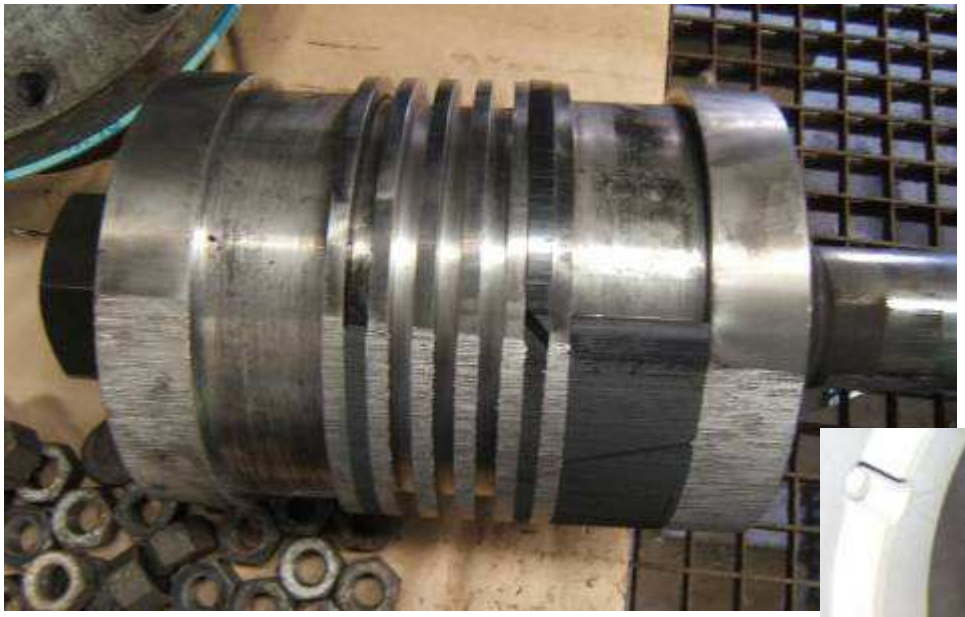
Possible reasons for rapid wear

- API 618 requires low surface pressure, resulting in large width bands, together with small strokes this could result in wide uncooled liner area's
- Abrasive particles in the process gas
- Oil solvents in the process
- Lubricator failures
- Wrong liner roughness, or liner damages
- Wrong choice of ring materials

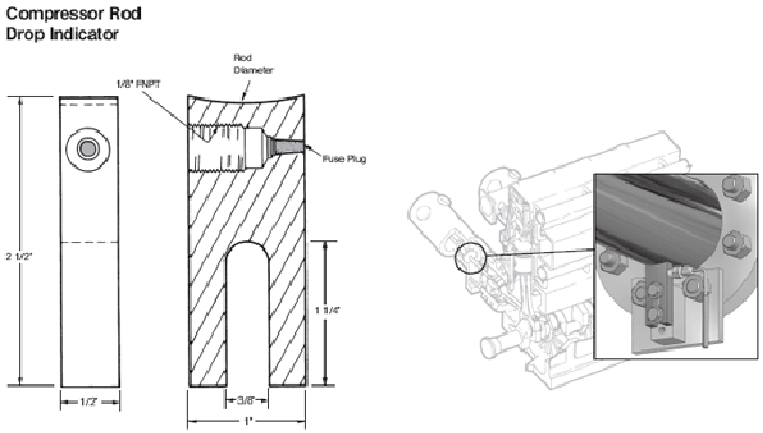


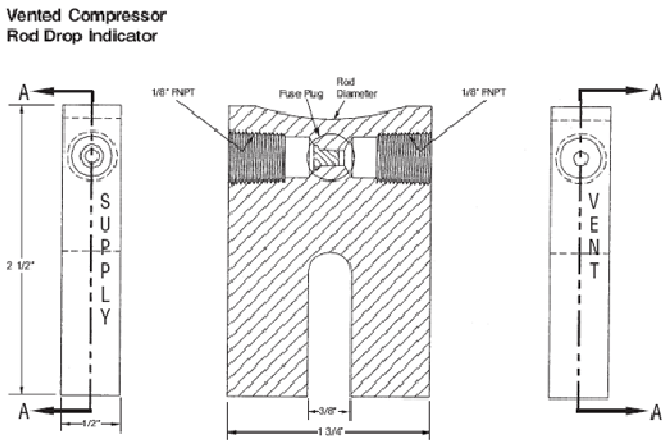
Masked area

Rider ring wear detection; too late

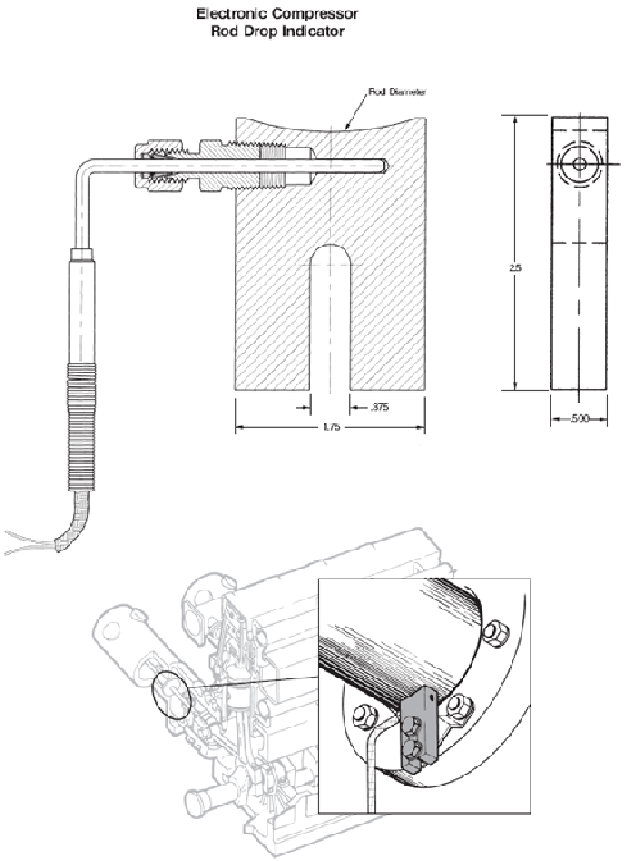


Detection; contact probes

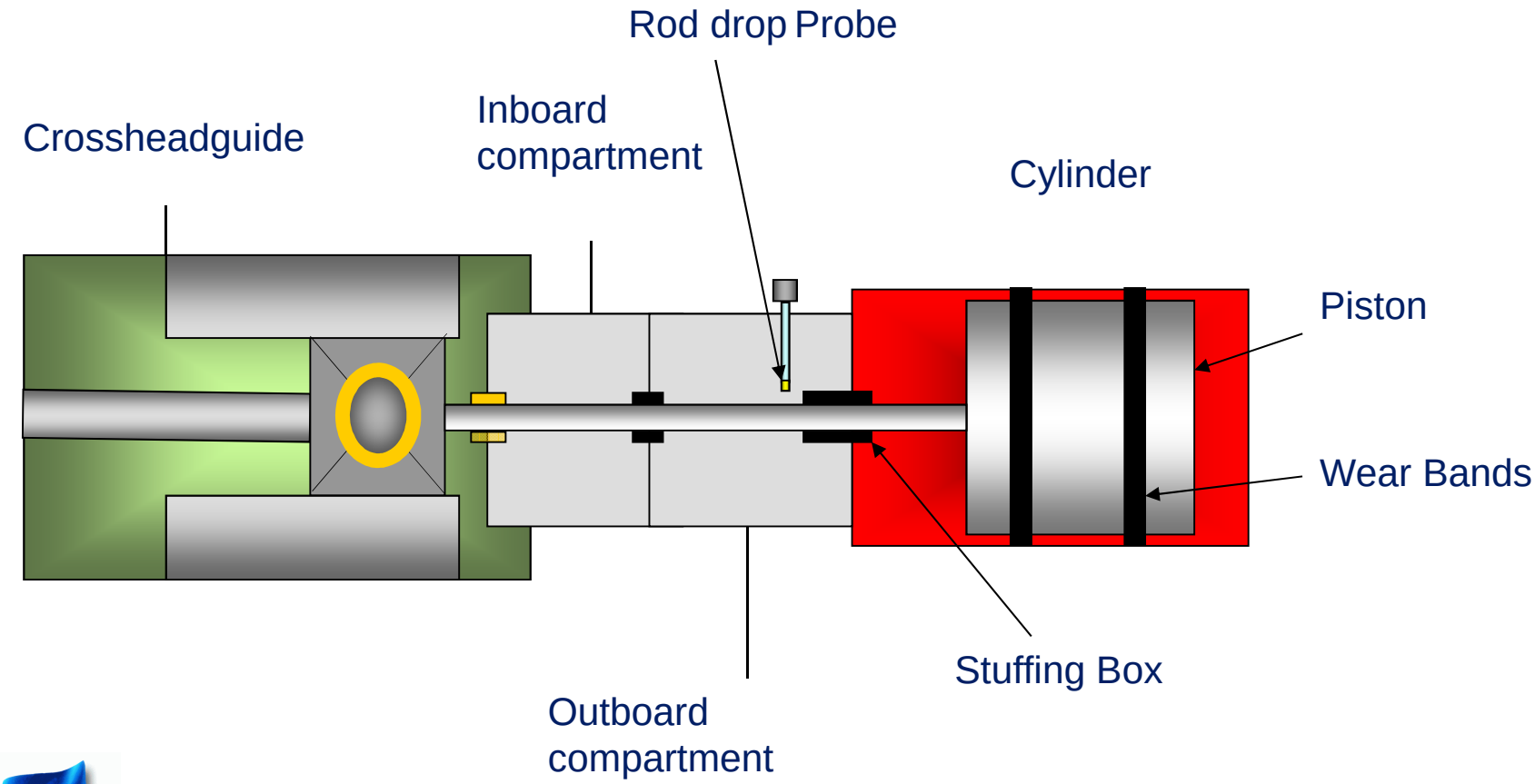




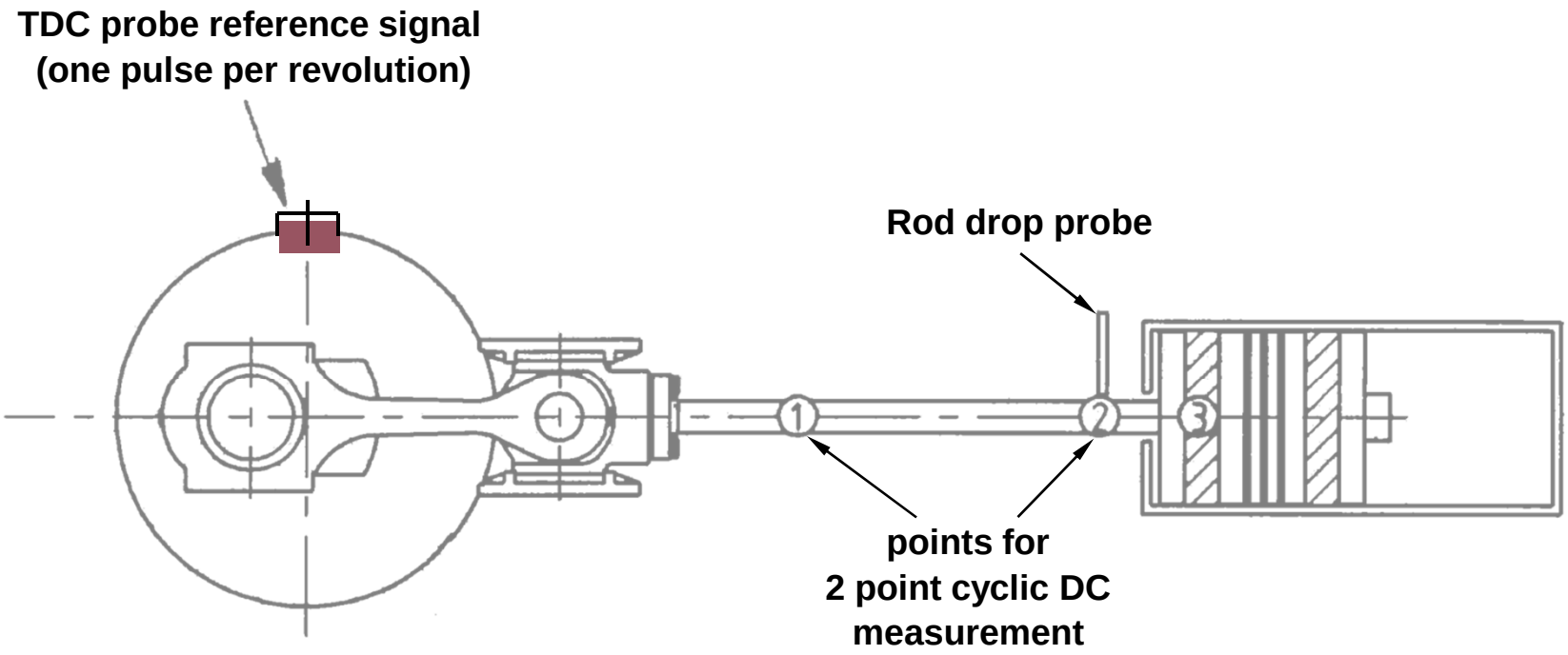
Detection; Switches



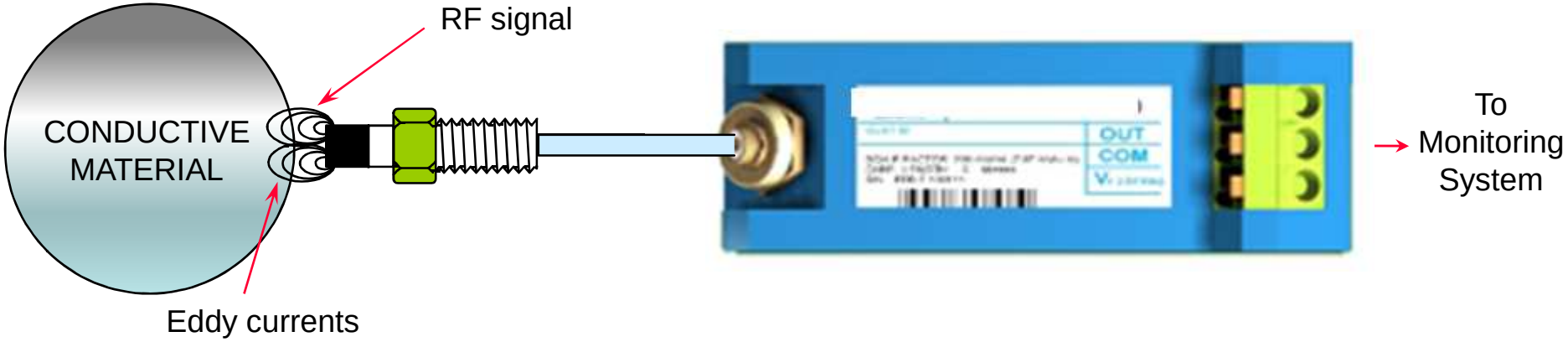
Detection: Rod drop measurement

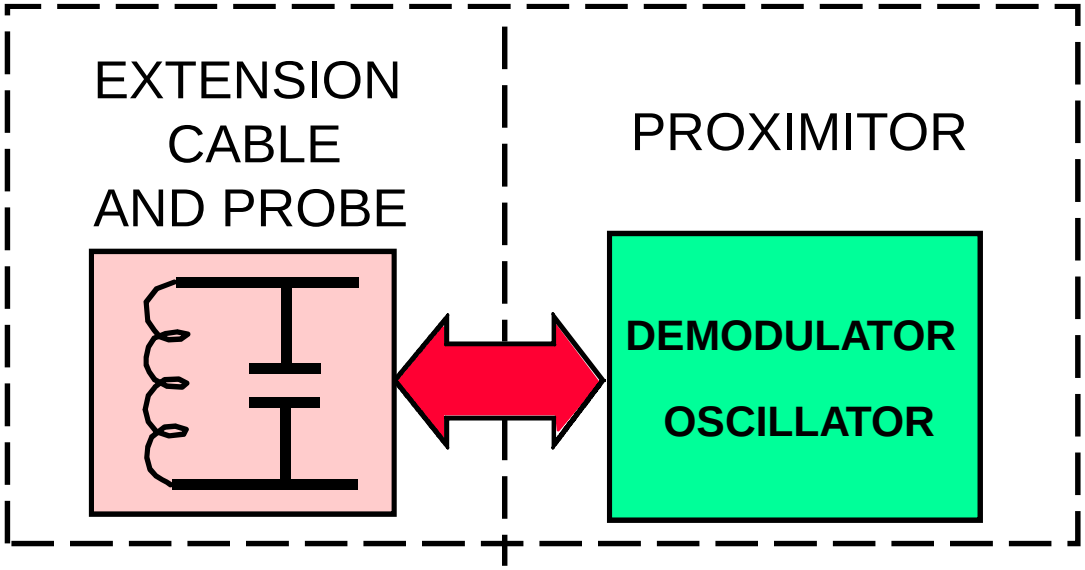


Rod drop measurement: set up

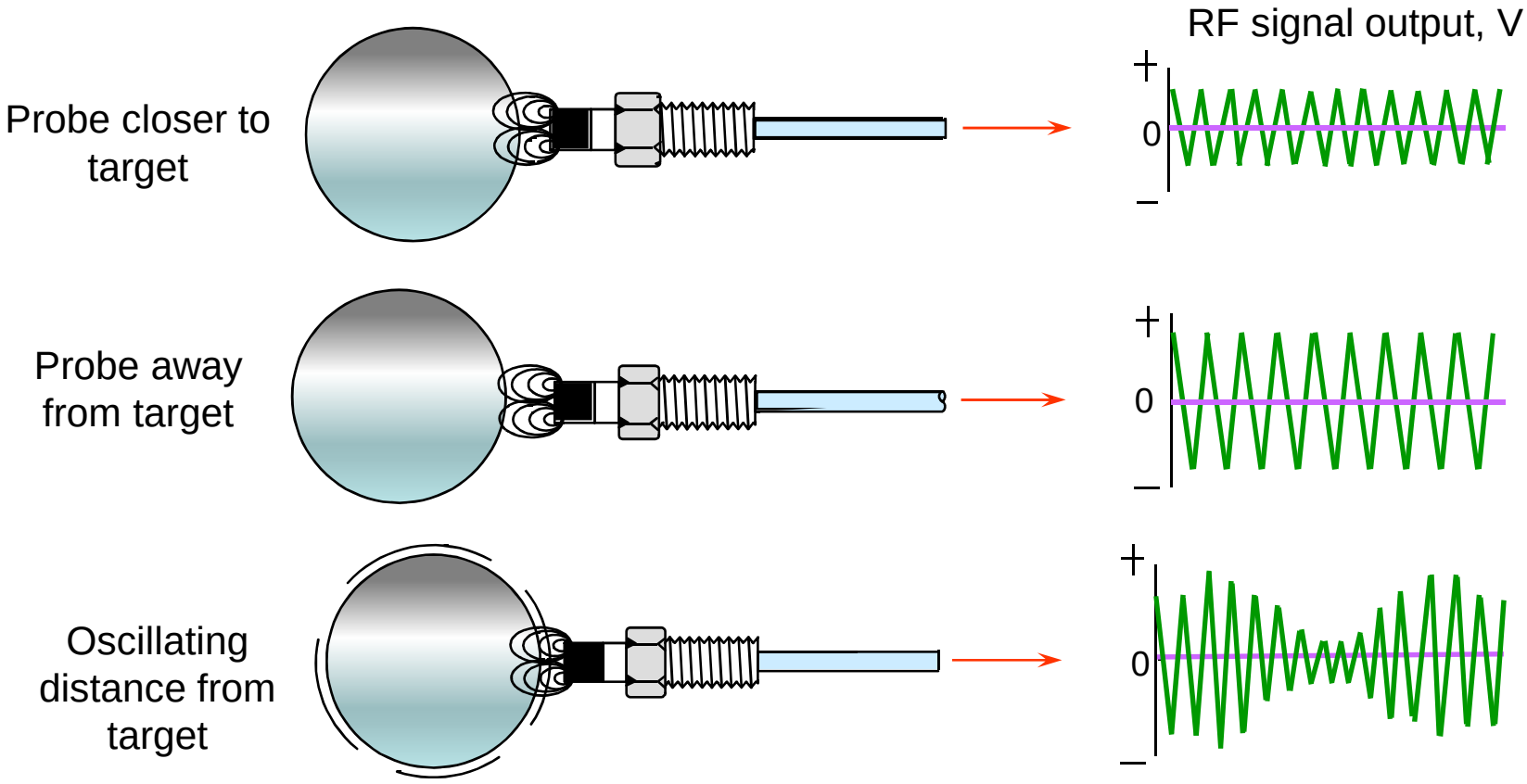


Proximity Transducer System





Observed vibration



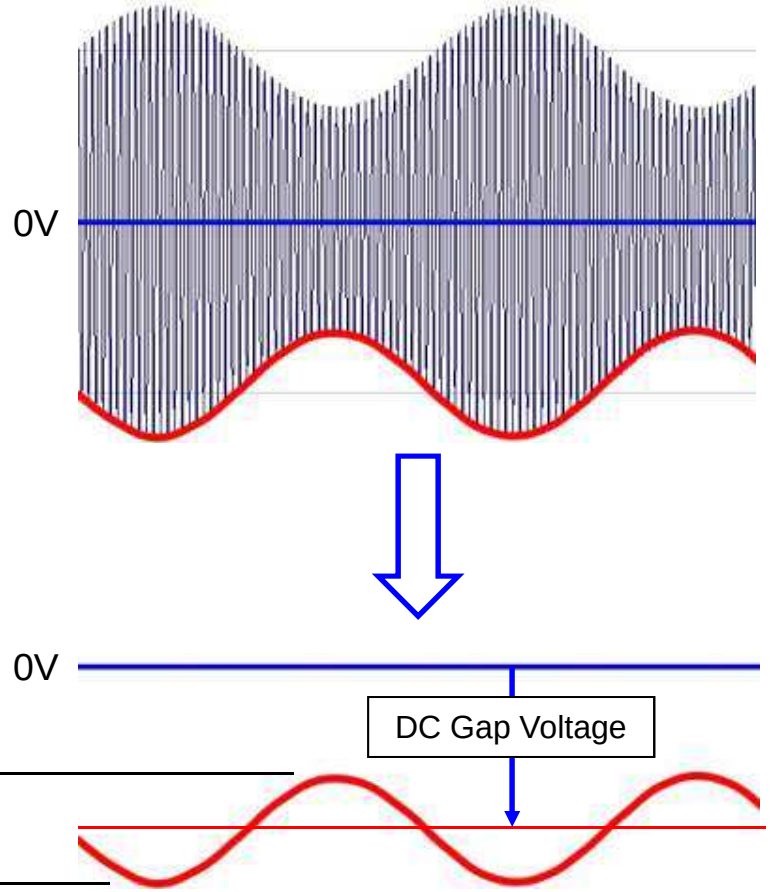
Target vibration causes the oscillator signal amplitude to be modulated at the same frequency as the vibration.

Output values

Demodulator extracts the signal from the RF signal

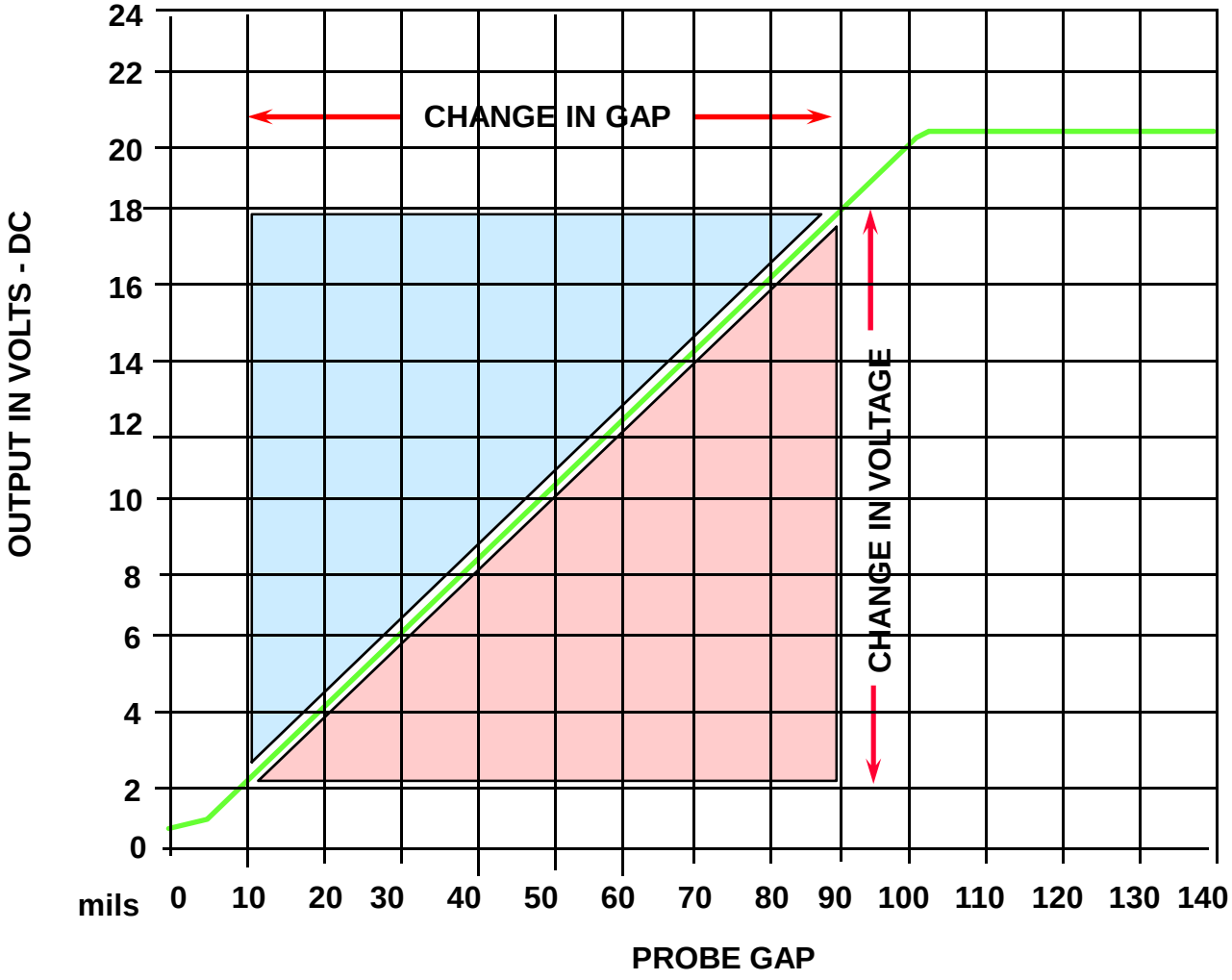
Transducer output:

- Time-varying (AC) value: vibration signal.
- Average (DC) value: gap voltage.

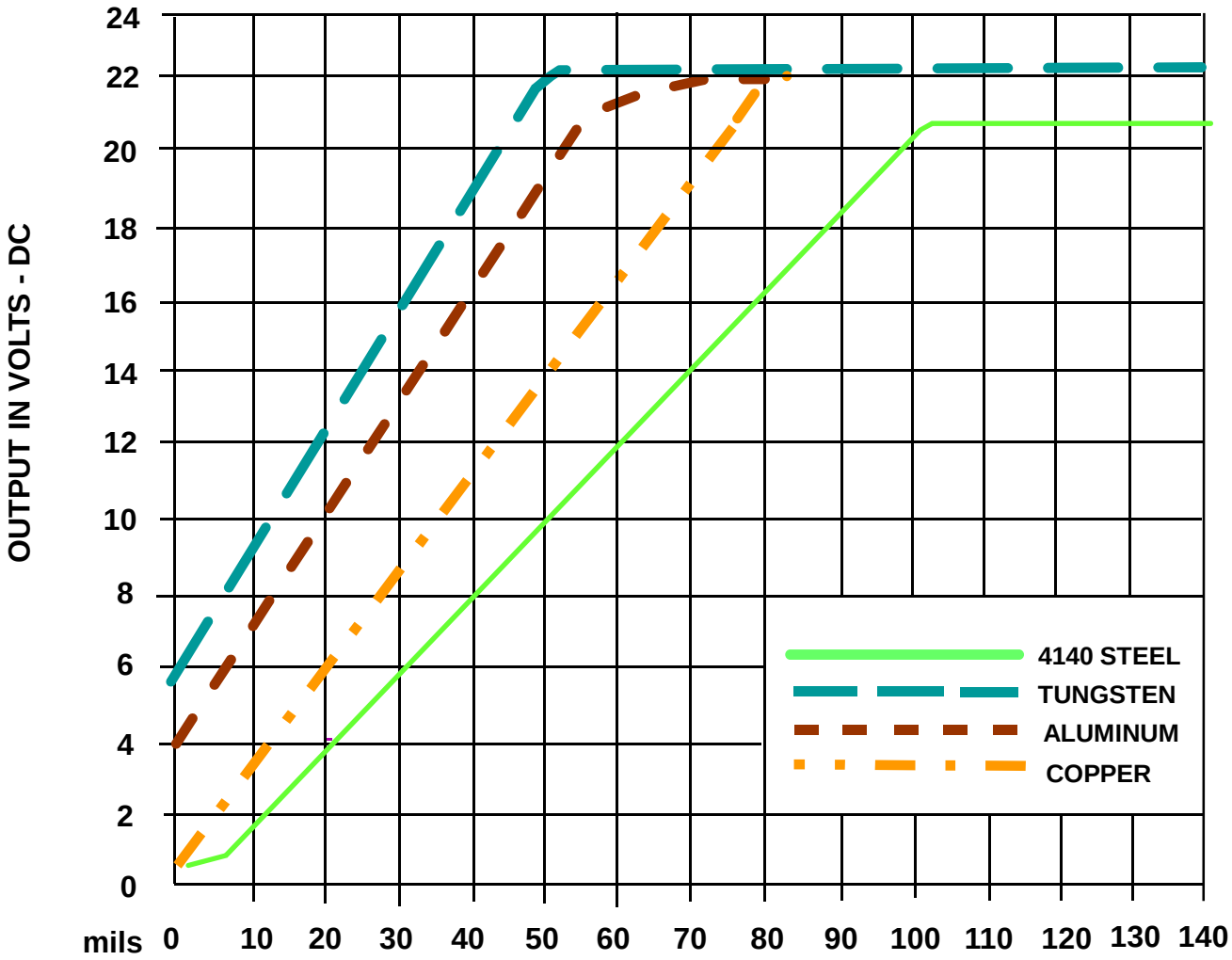


Probe Response Curve

Operational Verification

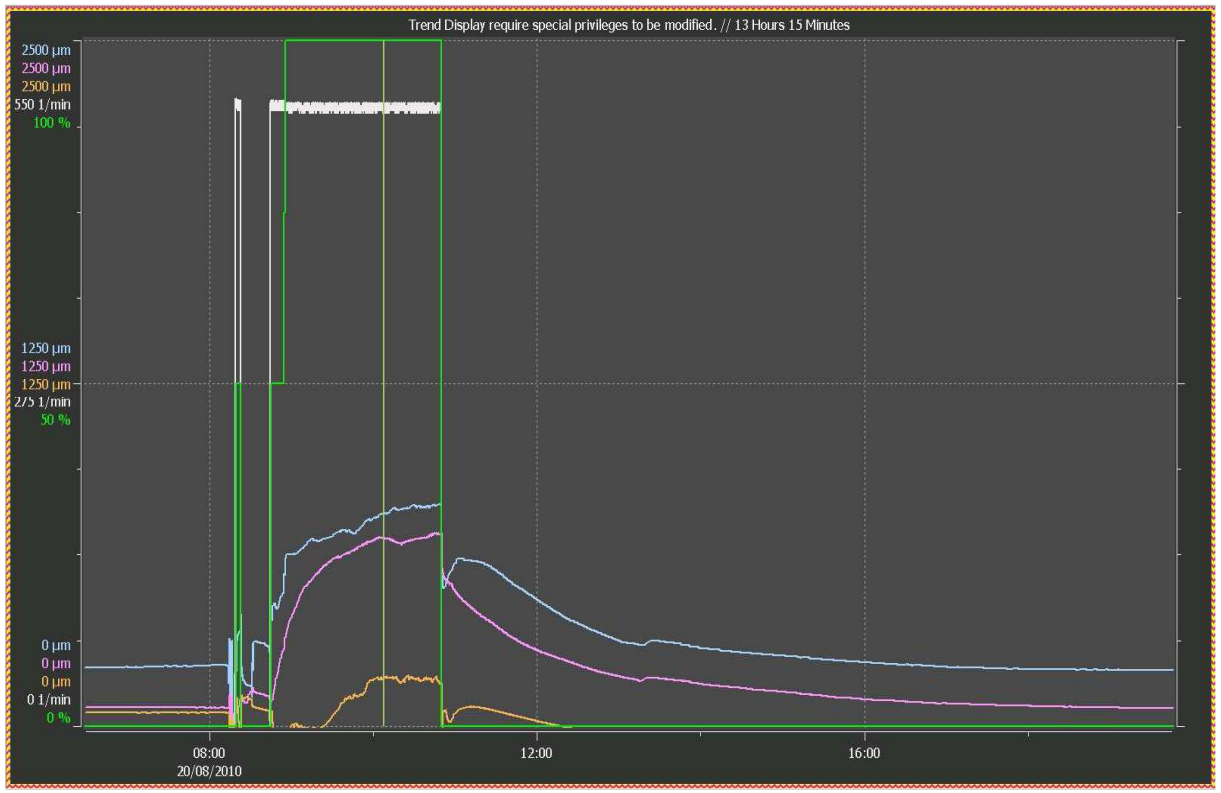


Shaft Surface Material



The vertical the piston rod displacement; what do we measure

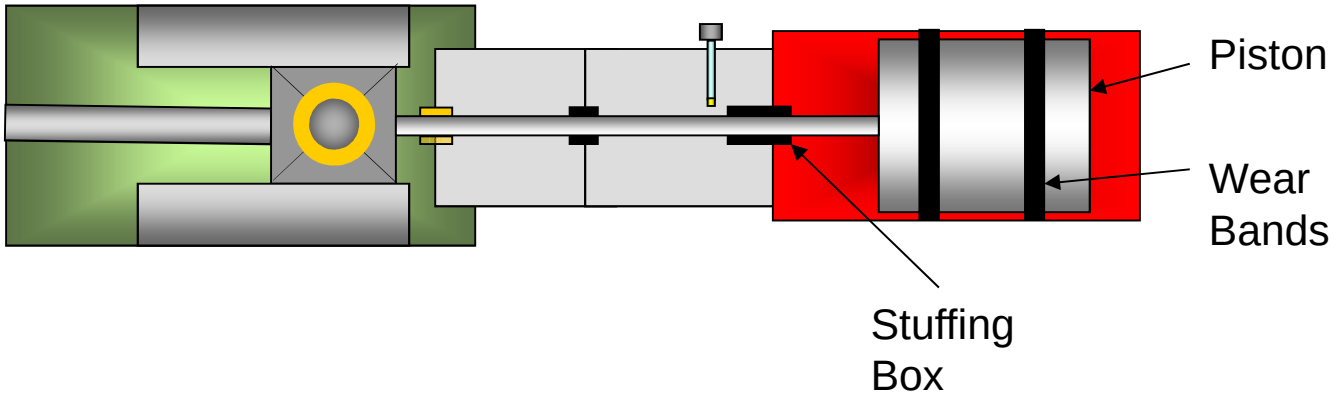
Thermal expansion of the piston relative to the cylinder for a 3-stage compressor



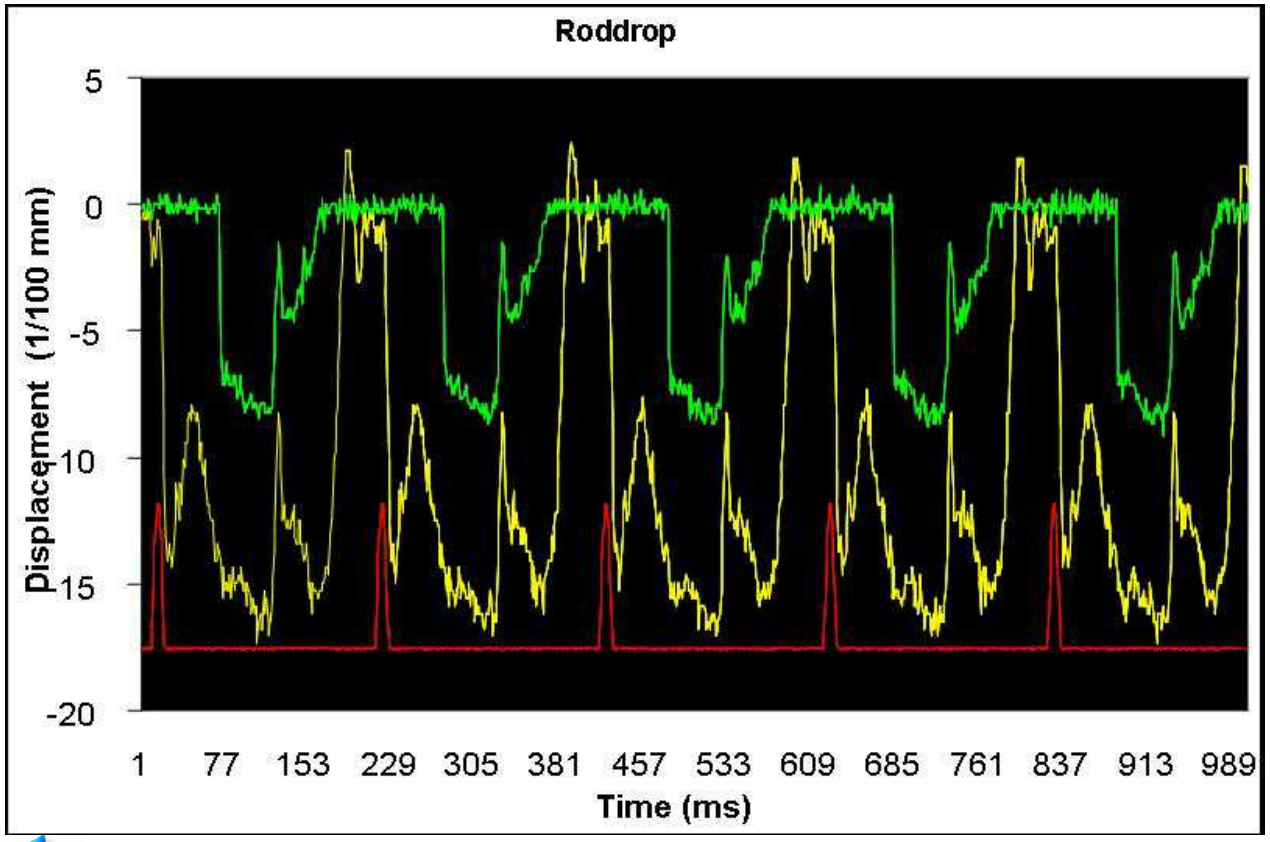
blue 1st stage,
cyan 2nd stage,
yellow 3rd stage

The vertical the piston rod displacement; what do we measure

- Thermal expansion of the piston relative to the cylinder
- Clearance of the crosshead
- Bending of the rod caused by the piston tilting
- Stuffing box packing rings “clamp” the rod



The vertical the piston rod displacement; what do we measure

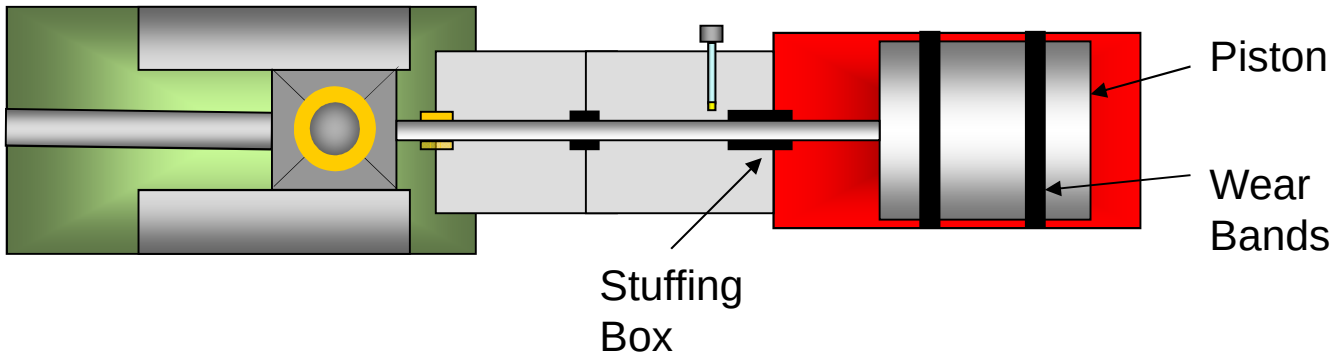


Piston rod vibration;
green: horizontal,
yellow: vertical,
red: trigger TDC

The vertical the piston rod displacement; what do we measure

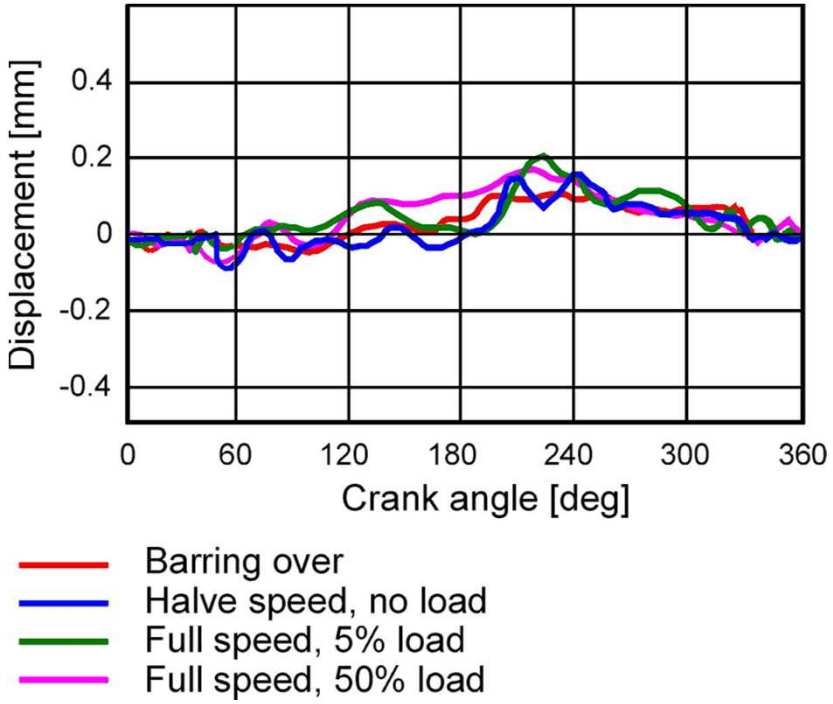
Thermal expansion of the piston relative to the cylinder

- Clearance of the crosshead
- Bending of the rod caused by tilting of the piston
- Stuffing box packing rings “clamp” the rod
- Misalignment
- Wear of the rod in the stuffing box running section
- Unequal calibration Eddy-current sensor over the stroke length
- Wear of the rider rings

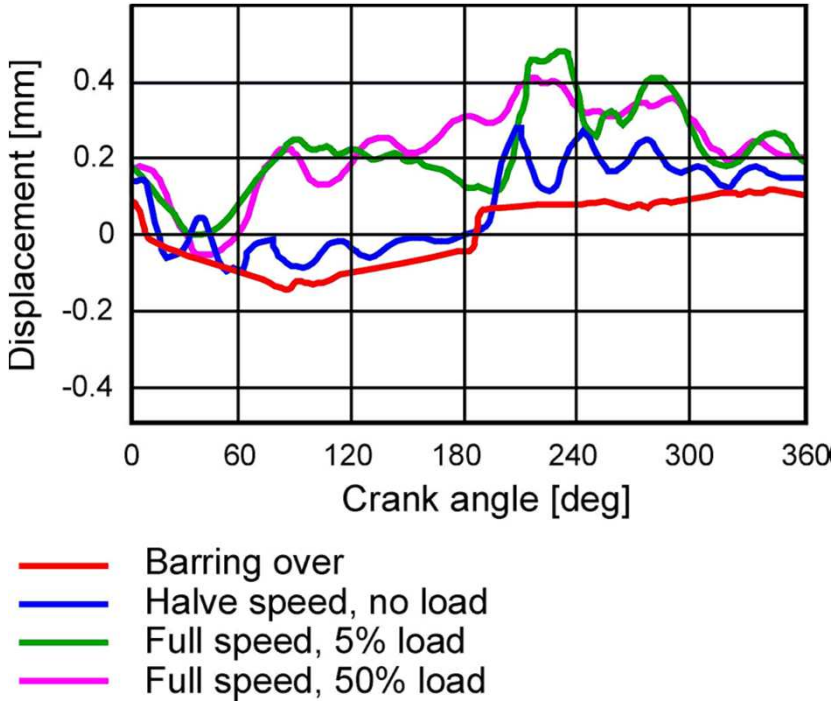


The vertical the piston rod displacement; what do we measure

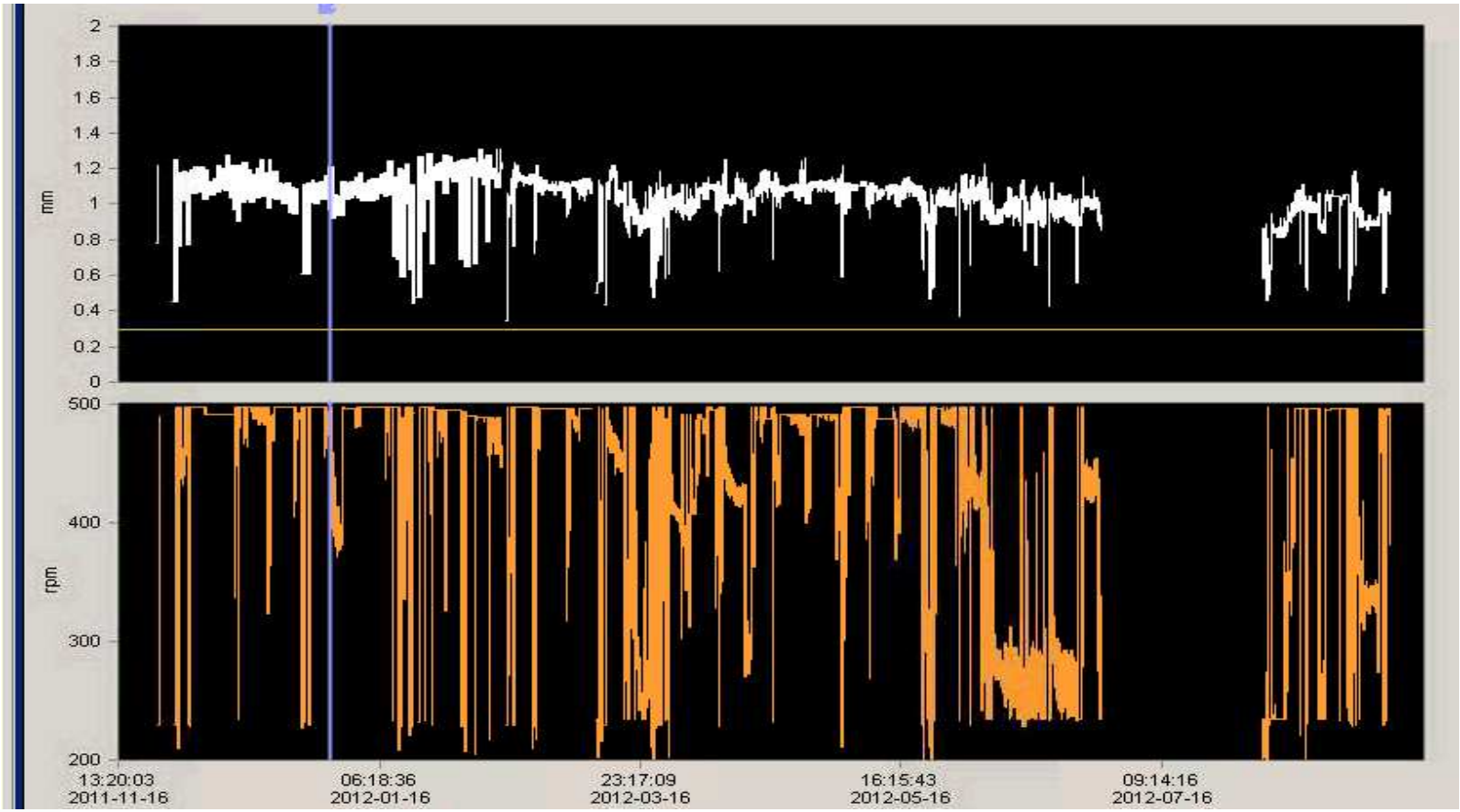
piston



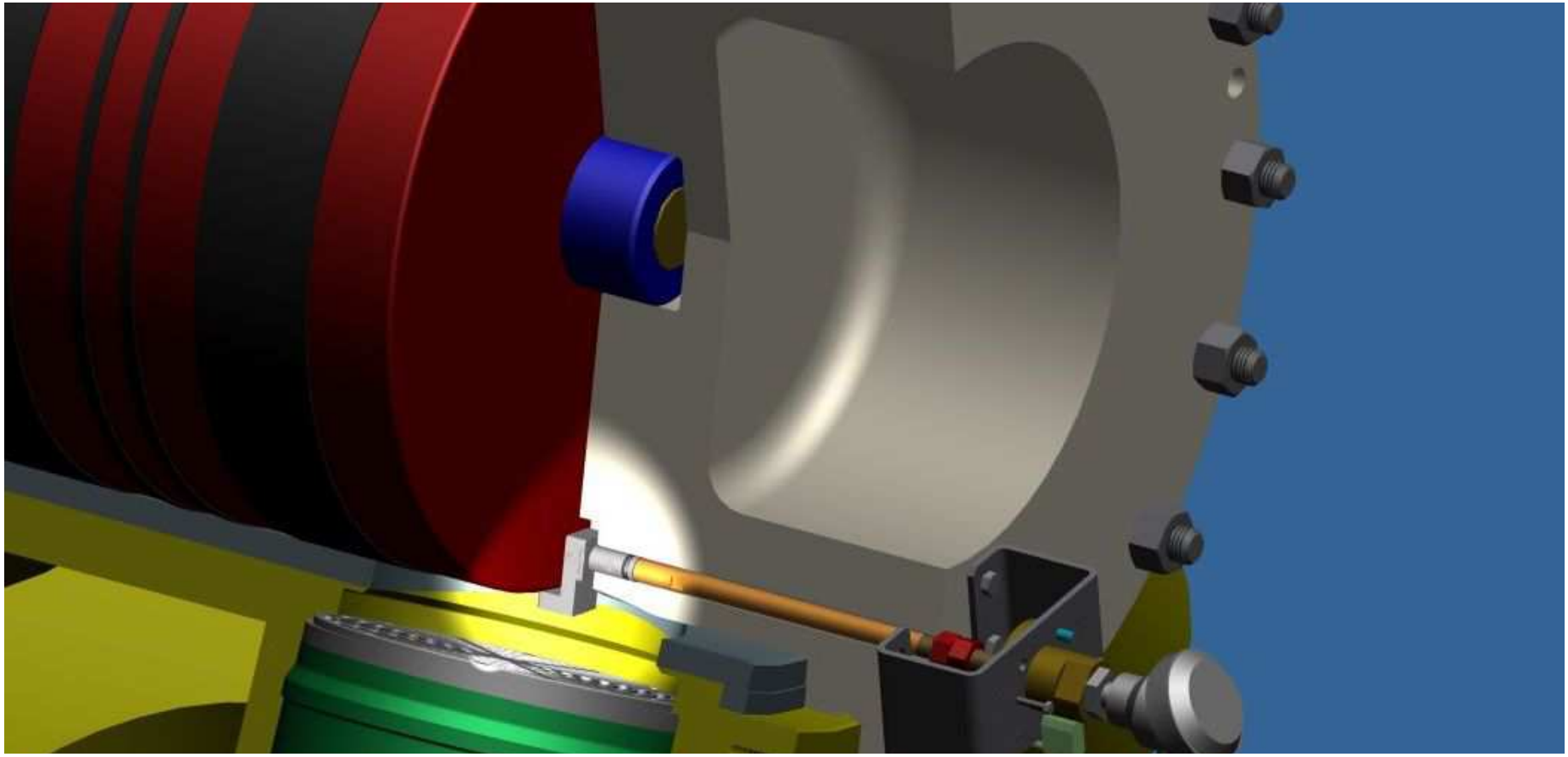
piston rod



Rod drop measurement, site data

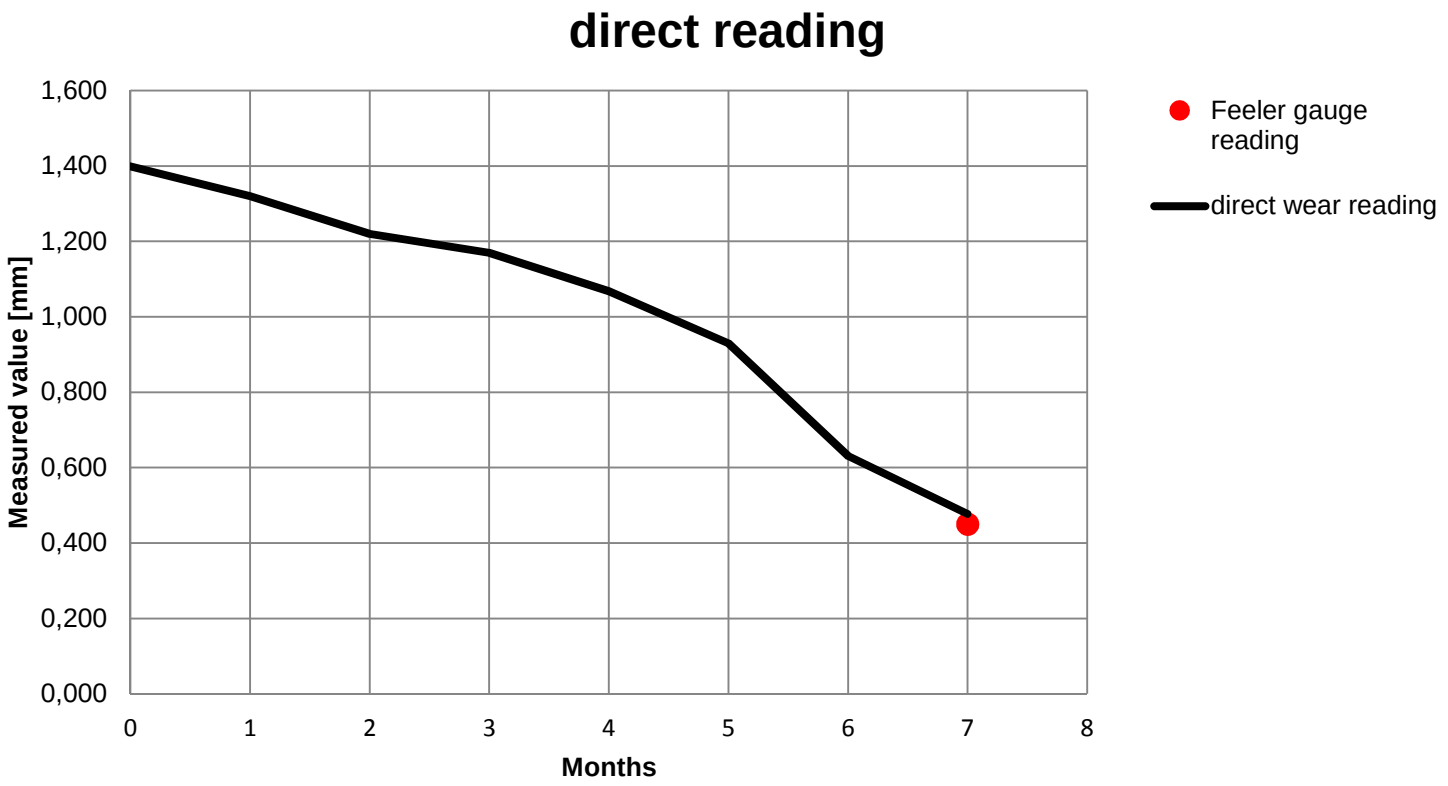


Direct rider ring measurement



Rider ring wear sensor

Direct detection; site data



Detection of Rider ring wear: summary

Switch only:

- Not sufficient in particular for non-lubricated cylinders
- Can make scratches on the rod
- It is not used in continuous condition monitoring

Detection of Rider ring wear: summary

Rod drop measurement:

- Relative easy to install
- Not in pressurized area
- Requires extensive calibration of the sensor on the specific rod
- Read out is influenced by expansion and vibrations, and compressor operating conditions
- Cannot be used for short period detection; trending over longer periods is required.
- The wear is a derivative of the sensor read out. A magnification (geometry) factor is applied for the conversion of sensor read out and wear.
- Generally a key phasor is required
- Can be used in a condition monitoring system

Detection of Rider ring wear: summary

Direct measurement

- Cylinder head mounting, subjected to the cylinder pressure
- Direct and accurate reading
- Calibration on the piston material
- Measures only when the piston is in top dead centre
- Measures the actual gap between piston and liner
- No key phasor
- Very reliable results
- Can be used in a condition monitoring system