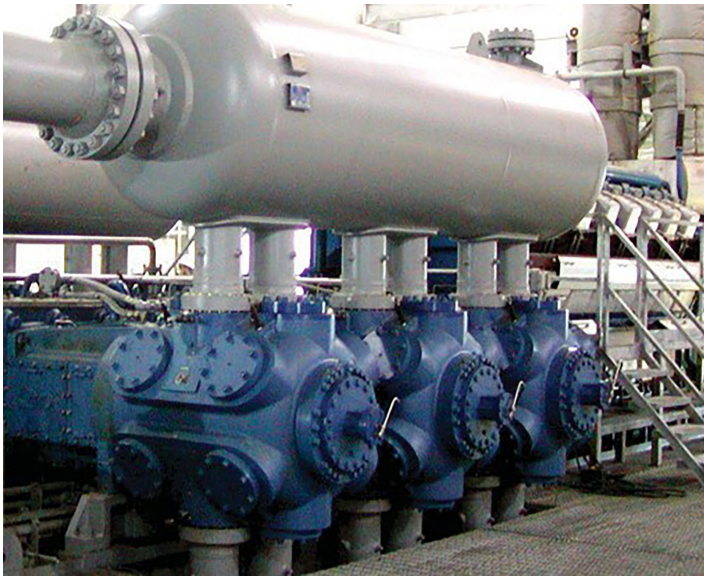
RECIPROCATING COMPRESSOR MONITORING

Why choose Metrix for monitoring your reciprocating compressors? The answer is simple: better value.

1. Scalability
Metrix is the only provider to offer monitoring solutions easily scalable to the various sizes of reciprocating compressors (recips), namely packaged/skid-mounted up to API 618 machines. In contrast to their much larger API 618 counterparts, packaged recips are typically smaller in size, but can still occupy a prominent role in the plant. While a complex measurement suite and accompanying diagnostic software may not be appropriate, Metrix provides affordable and comprehensive solutions for this smaller – but no less important – class of machines.

Metrix is now able to offer a focused solution for recips including shutdown and alarm for frame vibration, impact severity, rod drop, and crosshead acceleration. Large or small, Metrix truly delivers a scalable solution.

2. Simplicity
Our approach to reciprocating compressor monitoring is to simplify it without sacrificing effectiveness. Accordingly, we have designed our offerings to use simple measurement concepts focused on key areas in which reciprocating compressors are most prone to mechanical problems. Metrix is the only company offering 4-20mA transmitter-based solutions as well as transducer-based solutions leveraging our 5580 Smart Signal Conditioner and SW5580 Switch. Our solutions focus on simplifying the user experience for installing, maintaining, and using the instrumentation, while delivering outstanding results and excellent value for your money.

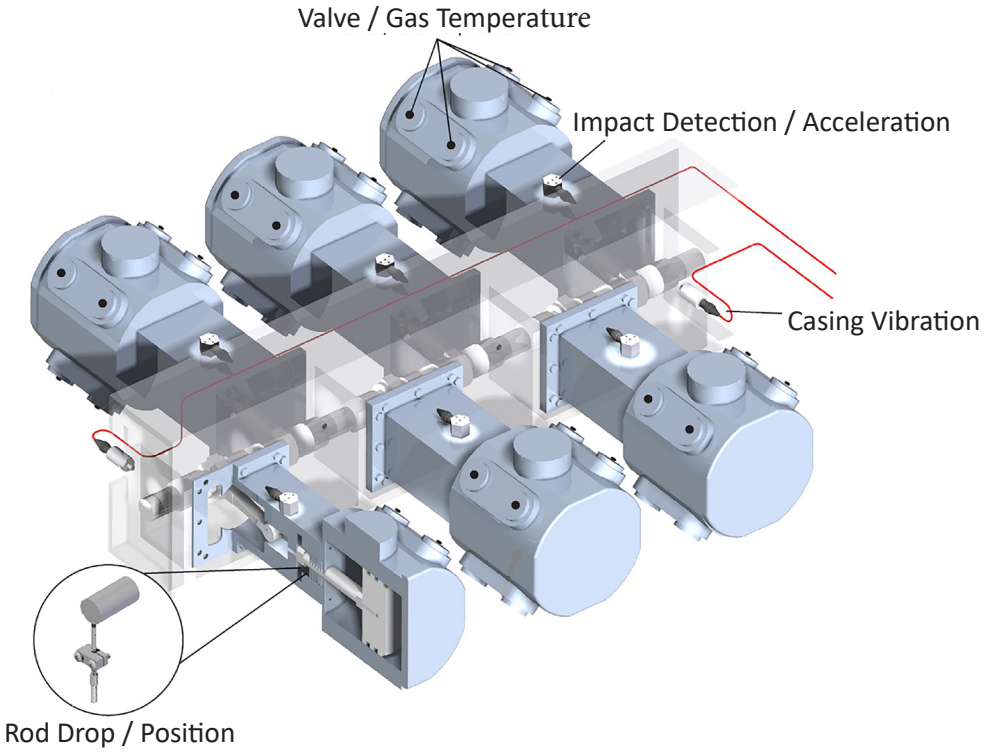


3. Experience
Metrix monitors an estimated 3,800 reciprocating compressors around the world – more than any other provider. Our solutions have been proven in use for more than two decades and are purchased by OEMs and end-users alike. We also maintain open communication with our customers, ensuring reliable feedback and subsequent improvement for our products. The 5580 and SW5580 products are good examples of that feedback.

4. Innovation
More than twenty years, Metrix became a leader in the industry and has remained as such with our patented impact measurement technology. We developed this technology because we recognized hard workers like you needed a reliable yet simple way to detect problems in your reciprocating machines, such as looseness in crosshead shoes, wrist pins, connecting rods/nuts, and other components. We also pioneered the first commercially available 4-20 mA seismic vibration transmitter in the 1980s. For the past ten years, we have continued to be an innovative

leader in the reciprocating compressor monitoring equipment industry with the world's first field configurable proximity system. We have extended that digital technology to our 5580 and SW5580 Smart Signal Conditioners, which provide the ability to extend the dynamic vibration signal while providing a 4-20 mA output to a control system. With the 5580 technology, one can look at acceleration and impact with an accelerometer on the crosshead, and rod position and rod drop with a proximity sensor near the piston cylinder packing box. Our DATAWATCH IX monitoring system builds on this configurable theme by offering a flexible monitoring module – a 4 or 8-channel system configurable for virtually any vibration or position transmitter measurement. Because our equipment can be configured for your needs, we are a one-stop shop for all reciprocating compressors in your business.

Machine Area	Measurement	Metrix Solution	
		Transmitter-Based	5580-Based
Crank, Frame and Bearings	Seismic Vibration Monitoring	ST5484E into PLC	SV6300 into 5580
Running Gear	Impact Monitoring	IT681X into PLC	SA6200A into 5580
Rider Bands	Rod Drop Monitoring	MX2034 into PLC	MX2033 into 5580
Valves	Temperature Monitoring	RTD or TC into PLC	RTD or TC into PLC



Transmitter Solution

- Simple Architecture and Cost Effective
- Direct Connection to PLC or SCADA
- Local Configuration and Setup
- Remote Indication of Real-Time Values

5580 Smart Signal Conditioner Solution

- Simple Configuration and Cost Effective
- Direct Conne ction to Local Monitor and PLC or SCADA
- Field configurable full-scale range, input type and bandpass filtering
- Local and Remote Indication of Real-Time Values

Impact Monitoring

The impact measurement was originally developed as a reliable means of protecting reciprocating compressors. Mechanical conditions such as loose bolts or rod nuts, excessive slipper clearance, worn pins, and liquid in the process are routinely detected on recips using the impact measurement. Prior to this type of monitoring, extremely skilled technicians were required if there was any hope of detecting major issues before they arose.

The IT681X Impact Transmitter outputs a current level based on the registered number of events above a user-set threshold level that occurred within a configurable time window. Metrix calls this measurement of "impact severity" – Impact. We can also provide the same impact functionality with our SA6200A accelerometer monitored on the crosshead connected to our 5580 or SW5580 Smart Signal Conditioner. Using the 5580 technology we can provide both impact and acceleration using a single sensor. An output of 4 mA indicates no impact events occurred over the threshold level within the set time window. An output of 6 mA indicates 2 impact events, 8 mA indicates 4 impact events, etc., up to 20 mA for 16 impact events. If the transmitter is set up correctly, the events should equal the number of impacts due to looseness.

Valve Temperature

Valve and gas temperatures are a proven method for detecting valve problems. Failed valves are a common cause of inefficiency for reciprocating compressors according to industry studies. Metrix offers the ability to supplement temperature monitoring that may already be in place for the majority of recips and correlate with additional mechanical faults using vibration and position measurements.

Rod Drop Measurement

An indicator used to determine rider band wear is rod drop. Using a proximity probe to trend band wear helps to avoid piston-to-cylinder liner contact and associated downtime for unexpected repairs. The average position or an instantaneous position of the piston can be provided to the user with a rod drop measurement, allowing for early detection and prevention of any likely contact. The MX2034 Proximity Transmitter can be used for rod drop or rod position measurements with a 4-20 mA output to your control system, PLC or SCADA system. Using the 5580 or SW5580 Smart Signal Conditioner, with an MX2033 Proximity Driver, one can get both rod drop and rod position measurements. The SW5580 provides alert and danger relays that can be useful for early warning and shutdown.

"When using the Impact Measurement with a 5580 Smart Signal Conditioner or SW5580 Switch, the configuration of the threshold level and time window are easily performed within the 5580 software and not at the machine."

Frame Vibration

While operational, the vibration output of machines will provide a significant amount of valuable information pertaining to the running speed and any forces acting on the machine. With an impact transmitter or an accelerometer, malfunctions associated with low-frequency and high-frequency events can be reliably detected. Metrix recommends the use of the ST5484E Velocity Transmitter for frame vibration measurements or the SA6200A accelerometer integrated to velocity using the 5580 or SW5580 Smart Signal Conditioner.

Failure Mode	Piston Rider Band Wear	Piston Rod Bow	Crosshead Shoe Vibration	Piston Rod Nut Looseness	Connecting Rod Looseness	Loose Crosshead Guide Shims	Main Bearing Failure	Liquid in Cylinder	Overloading
Rod Drop	X								
XY Rod Drop	X	X		X					
Crosshead Impact / Accel			X	X	X	X		X	X
Crankcase Velocity							X		

COMPETITIVE COMPARISON

Provider Comparison	Metrix Transmitters or 5580	Bently Nevada 3500 / System 1	Prognost SILver / NT
Target Machine Class	Packaged/API 618	API 618	API 618
Cost per throw (USD)1	$3K - $10K	$25K – $150K	$25K – $150K
Frame Vibration	•	•	•
Crosshead/Cylinder Impact	•		
Crosshead/Cylinder Acceleration	•	•	•
Machine Speed / Phase	•	•	•
Bearing Temperature	•[2]	•	•
Valve Temperature	•[2]	•	•
Rod Drop	•	•	•
Rod Position	•	•	•
Dynamic Cylinder Pressure		•	•
Condition Monitoring	•	•	•
Advantages	- Simple - Cost-effective - Solutions for rotating and recip machines - Impact measurements available - Simplified spares - Comprehensive measurements including raw signal output for diagnostics	- Comprehensive measurements - Cylinder performance (PV curves) - Automated diagnostics - Solutions for rotating and recip machines	- Comprehensive measurements - Cylinder performance (PV curves) - Automated diagnostics - Excellent data visualization
Disadvantages	- No dynamic pressure measurements - Diagnostics performed via third party condition monitoring software	- Complex - Expensive - Not cost effective for packaged recips - Numerous installation pitfalls Impact measurements not available	- Complex - Expensive - Not cost effective for packaged recips - Numerous installation pitfalls - Solutions only for recip machines - Impact measurements not available

Note 1: Approximate cost to instrument a 4-throw, 8-valve-per-cylinder compressor with all bulleted measurements
Note 2: Temperature (TC or RTD) inputs to PLC directly for correlation with Metrix Transmitter or 5580 data passed to PLC

5580 / SW5580 Features:

- Two channel module, one or two channels enabled
- Provides sensor excitation
- Drives dynamic signals over long distances (300 m or 1000 ft)
- Alpha-numeric LCD display for both dynamic input and 4-20 mA output signals
- LED for OK / Not OK indication and alarm levels
- SW5580 - optional solid state or dry contact relays are available



SW5580 **5580**

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AMETEK

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