









Resonance Systems Lenz

Condition and Performance Analyzer

-  Safe
-  Modular
-  Expandable
-  Backward Compatible
-  IOT Enabled
-  Open
-  Easy
-  Affordable



It is hard to overstate how important machinery has become to our lives. Modern day life is dependent on the complex infrastructure which is supported by machines that run around the clock to keep utilities available, products delivered, and services provided. These machines are critical to our lives. Optimizing the care of these machines has now become a science. Too little preventive maintenance and unexpected failures occur. However, too much preventive maintenance often results in increased safety risks, unnecessary maintenance costs, and often maintenance induced. In addition, maintenance departments are being asked to do more with less thus teams need diagnostic capabilities that focus resources based on a clear understanding of the machine condition and performance.

The revolutionary platform allows you to collaborate in real time with your colleagues as the data is effortlessly loaded onto the secure Rmonix™ cloud database where the data is there for you to analyze and share. Additionally, the data is open and flexible, you can create KPI's to share with management in Rmonix™ or ask for an API to transfer data into a platform of your choice. It is your data we let you do what you want with it.

Evolution of the Analyzer

The condition monitoring and predictive maintenance sciences have been in development for several decades now. Technology has allowed industry and analysts to apply these sciences more safely, quicker and with better results. In the 1990's data collection and analysis saw dramatic improvements that have carried that basic platform through the 2010's. The Lenz is the next step in the evolution. The Resonance Systems Lenz Condition and Performance Analyzer is the most advanced modular hardware that gives you the

power to collect and analyze your data your own way. The Lenz gives you flexibility to allow you to collect route-based portable data as well as the freedom to leave it on your machine and collect continuous data. All this flexibility leverages modern day phones and tablets for data collection, and it is tied together with the Resonance Systems Rmonix™ software platform and secured cloud-based data storage. The Lenz is the next generation in condition and performance monitoring from simple pumps and motors to complex multi-stage integral compressors. The Resonance Systems Lenz equips you with the tools needed to analyze the condition and performance of your machines.

Evolution of the analyzer



Six-Channels

The Lenz is built to be versatile. When developing the user requirements for the Lenz it was determined that a three-connector

solution that allows for six channels would be optimum for our users. This allows for a simple three connector portable route or our channel adapters can be used to allow for 6 sensors of data to be collected in either portable routes or in continuous mode.

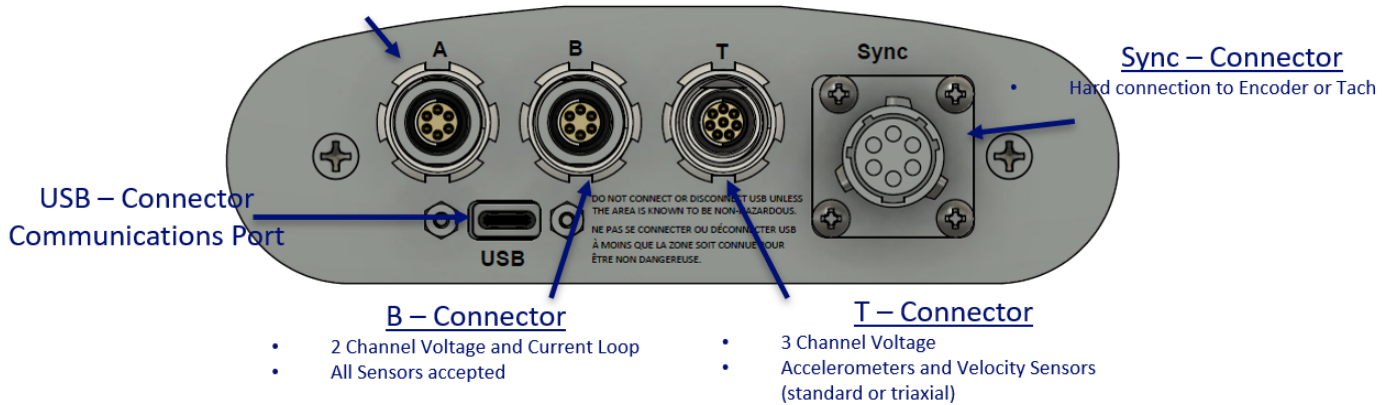
Lenz Configurations

Connector Channel	A		B		T			Sync
	1	2	1	2	1	2	3	1
	P	T	P	T	A	A	A	Ta
	U	4-20	U	4-20	V	V	V	
	T		T		Sp	Sp	Sp	
	A		A		U	U	U	
	V		V					
	Sp		Sp					
	D		D					
	4-20		4-20					

Legend	
P	Pressure
U	Ultrasonic
T	Temperature
A	Accelerometer
V	Velocity
Sp	Spark
D	Displacement/Eddie Current Sensor
4-20	4-20 ma
Ta	Tachometer/Once per turn

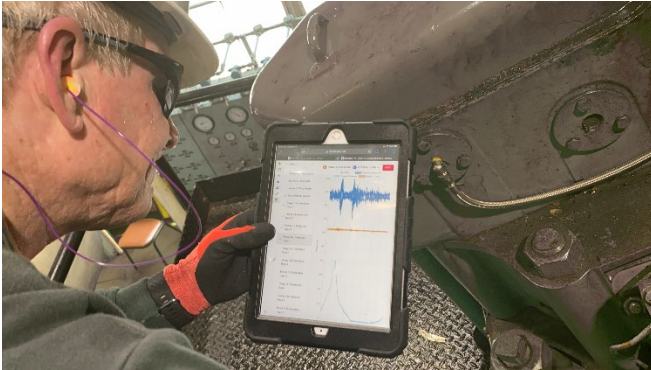
A – Connector

- 2 Channels Voltage and Current Loop



- B – Connector**
- 2 Channel Voltage and Current Loop
 - All Sensors accepted

- T – Connector**
- 3 Channel Voltage
 - Accelerometers and Velocity Sensors (standard or triaxial)



The Resonance Systems Lenz uses your tablet or phone as the user interface to collect data.

Features

Small Footprint and Lightweight. Much Safer, less weight, compact design

No Neck Straps. Belt, Holster, Pocket, or magnet mount. Wireless user interface allows for team data collection in potentially hazardous locations. No need for dangerous straps.

Safe Data. Redundant data storage locally during collection. Secure cloud storage of data in Rmonix™ database.

Only One Analyzer Needed. With advanced vibration capabilities built in one analyzer can handle all your reciprocating and rotating performance and condition monitoring needs.

Transport Case. 1 small 19.20 x 15.20 x 7.30 in case. Full kit less than 20 lbs. Everything is smaller and lighter.

Modular Design. Lenz Units are Modular so they can be paired with each other to collect more channels as a system. If you want to collect more than six channels of data on your route or in continuous mode, you can pair additional Lenz devices to meet most any data collection need.

Built in Bluetooth and Wi-Fi. Operates like a true IoT device. System components pair and communicate to each other, your intranet, the internet, and any Wi-Fi or Bluetooth device desired.

Bluetooth and Wi-Fi Sensor ready. In addition to the five hard channels the Lenz is capable of tracking and trending additional sensor points via Bluetooth and/or Wi-Fi.



Magnetically mount the Lenz on your machine and continuously collect data.

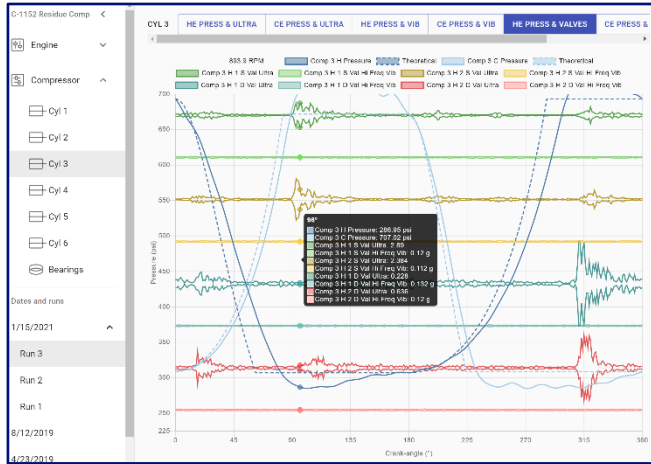
Continuous Data Collection Mode. Collect continuous data like a DVR. Use this function to troubleshoot, analyze parameter changes, or continuously monitor the condition.

Hazardous Area Rating. Class 1 Division 2, Groups A-D, T4A, IP65.

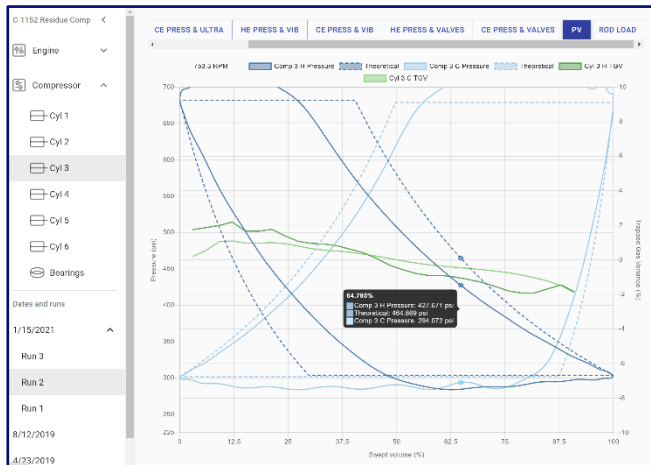
Certifications and Approvals. ISA-12.12.01; CAN/CSA C22.2 No 213-15, Class 1 Division2, UL 61010-1, FCC.

Rmonix™

Rmonix™ is a user driven feature basis software platform that is built with the analyst in mind when it comes to ease of operation and with management in mind when it comes to easy access to data and key performance indicators.



Cloud Native. Rmonix™ is true cloud-native software, so it is automatically maintained, automatically kept up to date, and accessible from anywhere. Of course, if you prefer an on-premise version, we can help with that too.



Access from anywhere. PC, Mac, Android, iPhone. If you have a modern web browser or mobile device, you can access Rmonix™.

Seamless collaboration with other analysts. Any data that you take can automatically be shared with others in your organization and with Resonance Systems' expert analysts. No need to manually zip and email around machine databases or use complicated network drive setups; no need for expensive per-user or per-device license fees.

Easy, attractive reports. You can view and print clean, modern-

Compressor performance

Cyl	RPM	Valve Loss (%)	Top Press. (psi)	Temp. (°F)	Comp. Ratio	Flow Balance	Theo. Dis. Temp Delta (°F)	Red Load (°)	Red Reversal (°)					
Cyl 1 H	372.0	4.4	4.5	316.8	637.7	76.9	196.4	2.15	1.65	-33.46	79.2	87.4	159.0	C
Cyl 1 C	544.4	5.2	7.9	312.2	658.6	76.9	196.4	2.09	1.65	-39.54				
Cyl 2 H	200.0	3.6	5.0	445.9	1650.1	87.3	155.4	1.62	1.62	-19.49				
Cyl 2 C	225.1	3.5	5.9	445.1	1615.2	87.3	155.4	1.61	1.69	-20.24	40.6	52.3	156.0	T
Cyl 3 H	351.6	4.6	5.0	307.1	693.1	79.2	196.1	2.20	1.69	-32.59	61.2	62.4	164.0	C
Cyl 3 C	549.2	5.6	7.9	307.7	671.9	79.2	196.1	2.10	1.65	-36.72				
Cyl 4 H	196.6	4.6	5.1	446.8	1633.9	87.1	150.9	1.61	1.75	-20.77	41.2	52.3	157.0	T
Cyl 4 C	228.1	4.6	5.6	445.5	1651.4	87.1	150.9	1.61	1.71	-21.16				
Cyl 5 H	351.2	4.5	4.0	308.1	692.6	79.2	196.8	2.19	1.70	-31.87	61.3	62.2	161.0	C
Cyl 5 C	552.3	5.1	7.9	312.2	675.2	79.2	196.8	2.11	1.69	-36.26				
Cyl 6 H	193.1	2.4	5.0	442.1	1644.2	86.3	150.7	1.61	1.64	-22.22	40.4	51.7	157.0	T
Cyl 6 C	325.9	2.5	5.0	442.8	1644.5	86.3	150.7	1.61	1.65	-22.31				

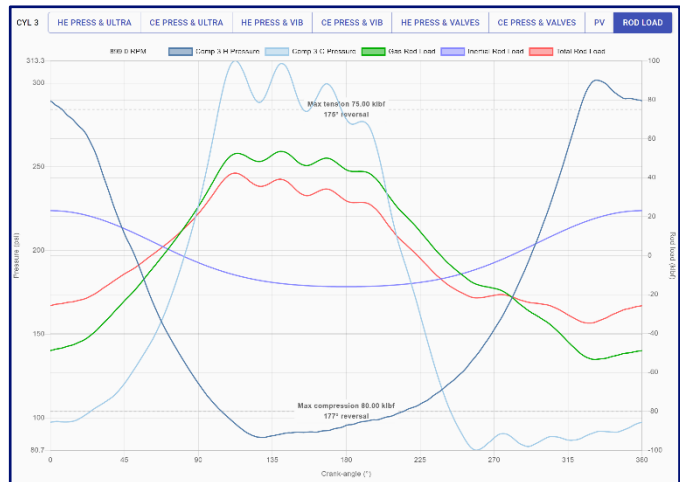
Total RPM: 4332.7
Compressor speed: 901.5 (RPM)

Stages
Stage Flow (MMSCFD)
Stage 1: 37.244
Stage 2: 34.945

Performance details
Cyl: VS (%), Clearance (%), Max (MMSCFD), Z, k, TDV (psi)

looking reports from your web browser, and you can easily drill down from reports to view analysis plots of interest.

A full reciprocating analysis suite. The Rmonix™ platform provides the analysis functionality is needed to monitor your machines thus eliminating the need for tiered licenses; multiple products or



platforms; or "AI" features that may confuse your results.

Advanced thermodynamics calculations. Rmonix™ uses the latest scientific research in its gas property calculations, giving you the most advanced theoretical plots and flow calculations possible.



Advanced vibration analysis. Not only the strongest offering for advanced reciprocating analysis.

Specifications

Dimensions	6.3" x 5" x 1.6"
Weight	1.5 lbs.
Display	Up to 2048 x 2732, customer device dependent
LCD Display	Up to 2048 x 2732, customer
RF	Wi-Fi /Bluetooth 2.4 GHz, 900 MHz proprietary receiver
Operating Temperature	-20°C to +50°C (-4°F to 120°F)
Long-term Storage Temperature	-40°C to +85°C (-40°F to 185°F)
Environmental Rating	Sealed enclosure, IP-65 rated
Battery	10,000 mA-hr. Li-ion 3.7V
Power input	5V-14V DC, up to 3.5A depending upon charger
Hazardous Area	Class 1 Division 2, Groups A-D, T4A, IP65
Certifications and Approvals	ISA-12.12.01; CAN/CSA C22.2 No 213-15, Class 1 Division2, UL 61010-1, FCC.

Performance

A/D Converter	24 bits of precision
Processor Speed (MHz)	4 to 5 GHz
Channels	5 Hard wired Unlimited Wireless
Memory	16 GB
Samples per revolution	1024
Screen Type (Resolution)	Up to 2048 x 2732. Smart Phone or Tablet.
Software Selectable Wireless Channels	100
Angular Velocity Continuous Mode capabilities	Yes
TDC Resolution	0.15
Ultrasonic & IR Sensors	Integrated
Remote Trigger on ULT/IR Sensor	Yes
Encoder & Wireless Transmitter	Integrated
Strobe Connectivity	Pulse, Connected to the Pulse timing control module. More reliable and clean data and more convenient usage
Analyzer User Interface	HTML, iOS, Android, and Windows
Barometer	Barometric Pressure readings are gathered directly from the UI and pulled into the software. More accurate and more direct theoretical model calculations and corrections.
GPS	GPS coordinates are gathered directly from the UI and pulled into the software. Integrates with your asset management systems
Camera	Take Pictures and Videos using the UI and enter directly into Rmonix™.
Audio Capture	Record the while on your route.
Transient Data Capture	Full Transient data recapture capability
Ultrasonic Gain Level	Configurable and Recordable Scale
Viewable (Real-Time) Multi-Sample Data Collection	Yes
Storage of Crank-Angle Samples	Unlimited
Pressure Spike Removal	Yes
Vibration Resolution at All Speeds	Up to 50 samples/deg
Sampling Rate (kHz)	100
FFT Fmax (kHz)	50
FFT Lines of Resolution	Unlimited
ADC Resolution	24-bit, Analog to digital resolution, 256 times the precision of the data

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