

High Precision Resistometric Transmitter for 3-Wire and 4-Wire **Electrical Resistance Probes**

FEATURES

- High 18 bits measuring resolution achieves 1nm metal release sensitivity for a 0.5 mm thick exposed element.
- 2 Channel PSD detector for high error signal attenuation.
- Reads ER sensors from 0.7 mohm to 10 mohm.
- Reads 3 and 4 wire probes with access key in fitting or transmitter probe connector port.
- Very low temperature drift for measurement electronic. 0.002% of FS from -10°C to 70°C.
- Very low supply current. 3.6mA at 24 VDC supply voltage.
- Galvanically isolated sensor from supply and comm.
- RS485 Modbus RTU output for easy integration into SCADA systems or data loggers, radios and PLCs.
- Fully welded or O-ring sealed enclosure.
- Small size and weight make it fit on probe shafts directly. No probe cables required.
- Energy flows in and out of the device are restricted for use in hazardous areas. Explosion proof enclosure.
- Resistance ratio or thickness output. Corrosion rate output with connected logger online.

APPLICATIONS

- **Online Corrosion Monitoring with ER Probes**
- **Corrosion Monitoring with Logger or Wireless**
- **Erosion Monitoring with Cylindrical Probes**
- **Underwater Applications (depth max 500m)**
- **General Corrosion Testing/Monitoring with** Sensors on Short Cables.

ERT01 Resistometric Transmitter Power/Comm Sensor Port The ERT01's best in class precision, repeatability, very low power consumption and communication flexibility outperform competitive products and take resistometric metal release monitoring to the next level.

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DESCRIPTION

The **ERT01** transmitter is specifically designed to detect metal release (caused by corrosion) from electrical resistance probes (sensors) in three or four wire configuration.

The **ERT01** transmitter operating principal is based on the resistometric technique outlined in the copper sensor data sheet **DS FMRS06**. The three channel FMRT01 PSD detector for the FMRT01 transmitter has been reduced to 2 channels without the reference element temperature measurement and gradient detector for the two sensing elements in the sensor. A four cycle gain offset and drift compensation technique allows for stable and reproducible ratios over a large temperature range. Additionally a basic AI algorithm based on linear regression further improve accuracy and precision for the collected ratio-metric measurement samples.

The ERT01 transmitter preferably uses Solenics type cylindrical and strip shaped metal elements as reference and sensing elements (resistors). Other standard ER probes can also be used if their resistances do not exceed 10 mohm but in most cases with much lower performance.

An internal flat reference element is used for both Solenics types of sensors to compensate for the temperature dependent resistance of the element material. The wall thickness for the exposed cylinder and strip type Solenics sensors is 0.5 mm (0.02").

The TCR (Temperature Coefficient of Resistance) of the two elements (reference and exposed) is within or better than +/- 2 RRU for a 1°C change in element material temperature at 18 bits of resolution. 18 bits of resolution result in 262144 RRU (Resistance Ratio Units). The loss of half the wall thickness for the exposed cylinder or strip is a full scale reading of 262144 RRU or 254 000 nm for a 0.5mm thick cylinder or strip wall (1 RRU = ~1nm).

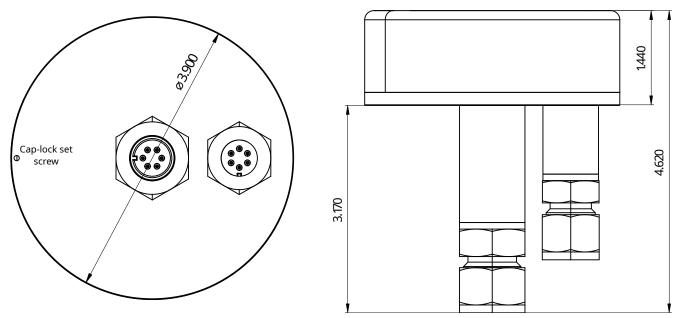
The ERT01 power and communication side is galvanically isolated from the sensing elements in the sensor (probe). Sensor output signals are proximity signal corrected for Solenics and other standard ER sensors/ probes.

ERT01 transmitters can be directly read with a rugged **Tablet PC** without an additional power supply. It can also be connected to the LSHR01 data logger (see also data sheet DS-LSHR01). The standard Modbus RTU communication protocol allows for easy integration into plant SCADA systems without dedicated additional computers.

Cell phone radios and other wireless gear can be directly connected to the ERT01 or via the LSHR01 data logger. The Tablet PC can also be used for temporary online or wireless communication.

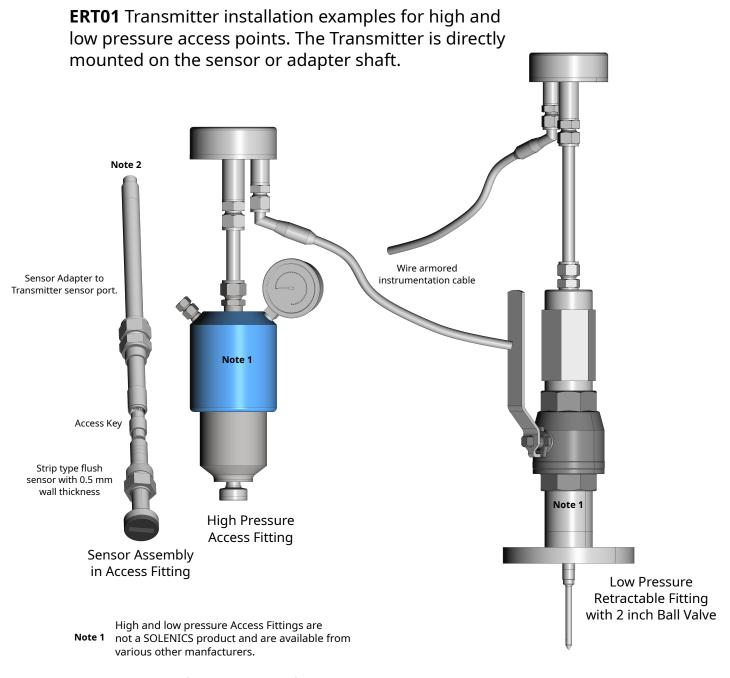
ERT-01 Transmitter Specifications

Enclosure	Stainless Steel with Swagelok Port entries.	For other enclosure options please contact SOLENICS		
Connectors/Cables	6 pin glass sealed connector ports/over-molded wire armored instrumentation cables	For custom connections and cables please contact Solenics		
Measurement Method	Ratio-metric Electrical Resistance	Modified Wheatstone Bridge		
Signal Conditioning	2 Channel PSD	Phase Sensitive Demodulation		
Resolution	18 bits	262144 points FS		
Sensor Resistance Range	0.7 mohm to 10 mohm	Transmitter can be adapted to other resistance ranges.		
Channels	2			
Power Supply	6 to 24 VDC			
Current Consumption	3.6 mA at 24 VDC			
Communication	RS485 Solenics or Modbus RTU	For other Comm options please contact SOLENICS		
Output Values	2			
Value 1	Sensor Ratio 0 to 262144 RRU	RRU = Resistance Ratio Units		
Value2	Transmitter PCB temperature -40 to 80 °C.	Circuit board body Temperature		
Sensor Element Material	C1010 Low Carbon Steel	For other materials please contact SOLENICS		
Sensitivity to thickness loss	1nm for 0.5 mm wall thickness			
Precision	+/- 5 RRU for 0.7 mohm SR better for higher resistances	Depends also on the rate of temperature change in the exposed environment.		
Transmitter Temperature Drift	0.002% of FS from -10 to 70 °C			
Permanent Operating Temperature Range	-20 to 70 °C			
Excitation Output	28 Hz Sinusoidal			
Max Excitation Current	100mA			
Max Excitation Output Amplitude	40 mVpp	Terminal voltage for a disconnected sensor		



Dimensions are in inches

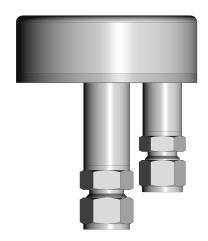
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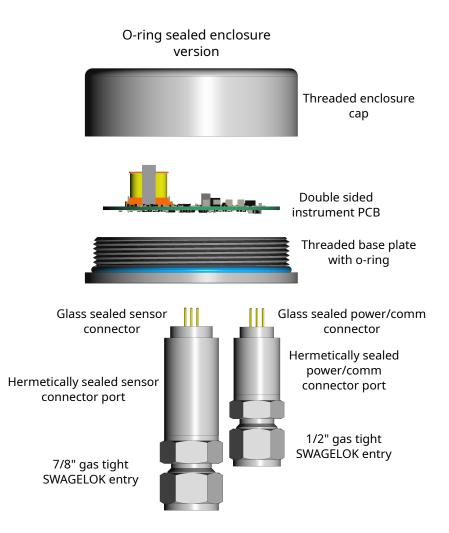
Note 2 Transmitter, Adapter, Access Key and Sensor are Solenics owned designs.

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Fully welded hermetically sealed enclosure version



ERT01 Transmitter enclosure composition for fully welded and o-ring sealed version.

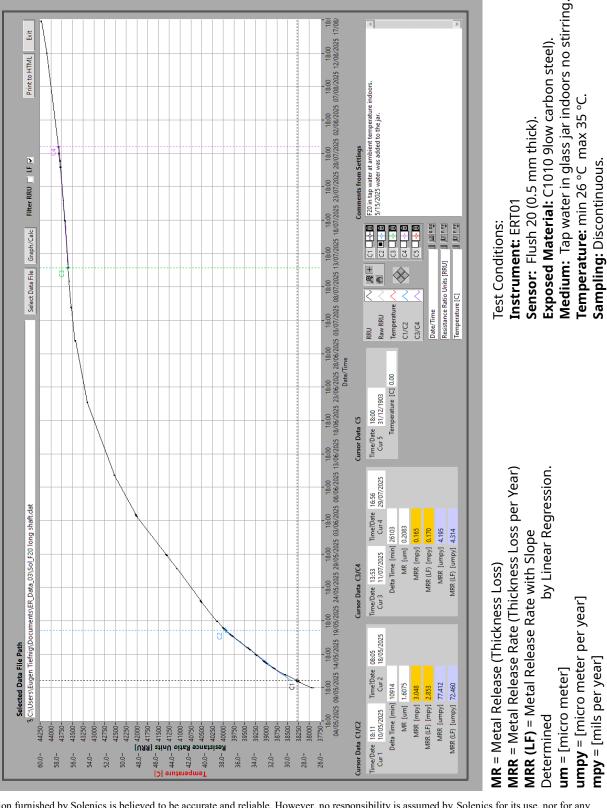


ERT01 Transmitter Serial Interface Modbus RTU Mapping for 32 bit Floating Point numbers

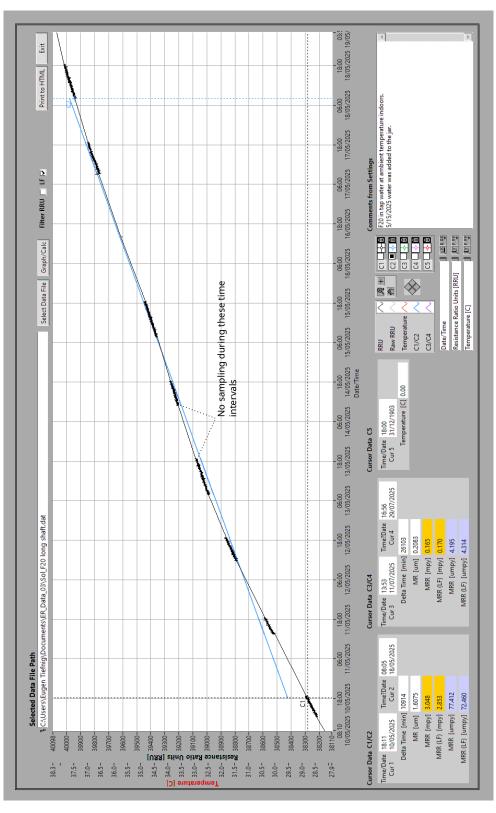
			Protocol:	RS485					
Serial Interface IO Mapping		Comm Protocol	Modbus RTU (Master)						
		PLC Address:							
		Baud Rate:	1200						
			Start Bit:	1					
Project:			Stop Bit:	1					
End User:			Parity:	None					
Doc No:			PLC Data Type:	Holding Register					
Rev. No / Date:									
	Serial Device	e Type:							
Remote IO	IO Card Slot				Remote	PLC to DCS			
Device Address	Number	Ch. No.	Field Tag Name	Description	Register Address	Register Address	Access Type	Data Type	Remark
1		CH1	ER 0001	ER Corrosion Sensor	40001	40001	Read	IEEE Floating Point	32 Bit Floating Point Number (DCBA)
2		CH2	FR 0002	FR Corrosion Sensor	40001	40003	Read	IEEE Floating Point	32 Bit Floating Point Number (DCBA)

Duration: 90 days.

Metal Release Test in Tap Water.



Metal Release Test in Tap Water.



Instrument: ERT01 **Fest Conditions:**

MRR = Metal Release Rate (Thickness Loss per Year)

MR = Metal Release (Thickness Loss)

MRR (LF) = Metal Release Rate with Slope

umpy = [micro meter per year]

um = [micro meter]

Determined

mpy = [mils per year]

by Linear Regression.

Sensor: Flush 20 (0.5 mm thick).

Medium: Tap water in glass jar indoors no stirring. Exposed Material: C1010 (low carbon steel). Temperature: min 26 °C max 35 °C.

Sampling: Discontinuous. Duration: 90 days.