

Application

The TrafoStick™ TS G2 (RTU Advanced) sensor was specifically designed for online field use and is exclusively used for the precise, repeatable measurement of:

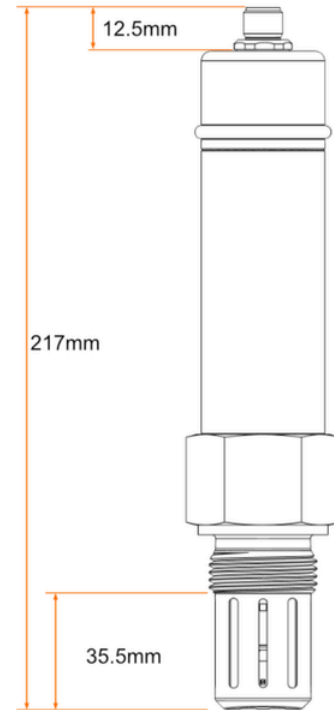
- Breakdown voltage,
- Oil pressure,
- Humidity (relative saturation),
- Water content,
- Temperature,
- Dissolved gases in transformer oil: H2 (hydrogen),
- Partial discharge (PD) indication.

Description

The TrafoStick™ TS G2 (RTU Advanced) sensor is housed in a rugged, stainless steel 1.4571 enclosure, engineered for extreme environments, including offshore applications, in compliance with DIN EN ISO 12944-9:2018-06. The measurement zone, made from mineral oil-resistant and chemically stable reinforced plastic, features precision-drilled holes that facilitate the direct filling of internal sensor chamber with mineral transformer oil.

Equipped with a G1" EN ISO 228-1 connector, the TrafoStick™ TS G2 integrates seamlessly into your target system—screwing directly into the transformer's threaded flange or tap changer. A mechanical seal with a hydraulic sealing ring (NBR or FKM insert) ensures a leak proof fit, eliminating the need for additional sealing materials.

The sensor's installation is flexible, though optimal performance requires unobstructed oil flow within the measuring zone. The device features a top-mounted cable socket, facilitating easy integration with your system. Communication with the Modbus RTU master is streamlined via a standard (or custom) RS485 twisted-pair cable and the provided Amphenol/CONEC connector. The cable connection is a standard M12 5-pin connector. For optimal data exchange, the device operates at a baud rate of 115200 bps with 8 data bits and 1 stop bit — ensuring fast, reliable communication with your PC or Modbus RTU master.



Physical Address

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Contact

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A Eberle Africa (Pty) Ltd

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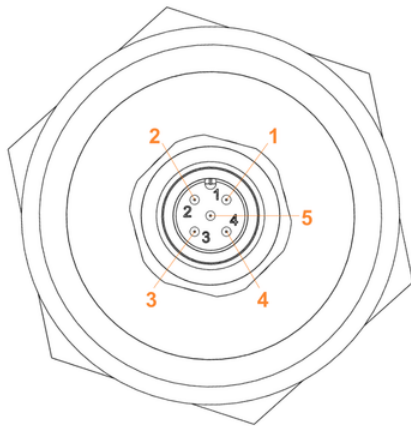
Directors

BE Howarth, T Sybel,
N Ramlutchman-Nel

Maintenance Procedure

TrafoStick™ TS G2 sensor is designed as a maintenance-free analog/digital measuring system that, thanks to the use of piezo ceramic technology, does not require any consumable or wear parts that need to be replaced within the service life of more than 40,000 operating hours (5 years). In addition, the device is designed in such a way that it remains functional for significantly longer if the absolute maximum values are observed. If a connection cable has to be replaced, e.g. due to environmental or other influences, this can be done on site thanks to the modular design of the TrafoStick™ TS G2 system. This is usually the Modbus RTU connection cable or, in rare cases, the ground connection.

Electrical connector



M12 A Coded 5 Pin

Pin quantity : 5 pin

Coding : A Coded

Coupling : thread

Gender : male

Contact material : gold plated copper

IP Rating : IP68

Rated voltage : AC/DC 60V

Rated current : 4A

Conductor size : 24AWG 0.25mm²

Durability : 1500 cycles

Standard : IEC 61076-2-101

TrafoStick M12 5-pin A-coded Modbus RTU Pinout

Pin	Function	Description
1	V+ / U_B	Power Supply +12V or +24V DC
2	RS485 A+	Data Signal A / D+ (Positive)
3	RS485 B-	Data Signal B / D- (Negative)
4	GND	Ground (0V) for Data/Supply
5	n.c. [not connected]	Not connected optional Functional Earth/Shielding

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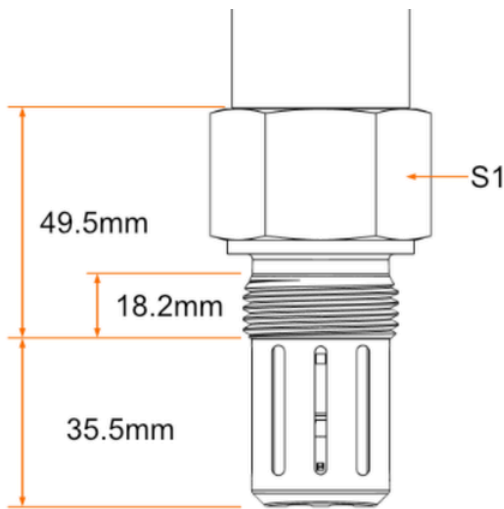
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Mechanical connector



G1" EN ISO 228-1 connector with a single-ended screw-in stud in inch size (ISO 1179)

External thread: G 1 A

Material: Stainless steel (1.4571)

Wrench size: S1 / 41 mm

RS-485 bus connection and termination guidelines

- TrafoStick works with an RS-485 bus, which can be implemented as a "2-wire" or "4-wire" system (TrafoStick only supports the 2-wire option).
- The RS-485 bus must have only two ends and must be terminated with terminators (120 Ω resistors) to avoid reflections and reduce impedance (this reduces sensitivity to interference). TrafoStick does not have a bus end terminator - there is an option to make TrafoStick with a 120 Ω bus terminator, but it must be clearly indicated in the order.
- Both data lines should be aligned to +5V and GND potentials to avoid "floating" potential. This ensures safe operation and reduces sensitivity to interference when no node is powering the line or the bus is damaged/short-circuited.

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Technical specifications

Performance

Breakdown voltage (BDV)	10kV ÷ 120kV (± 2.5%)
Water Content (WC)	2 ppm ÷ 180 ppm (± 2%)
Temperature (Temp)	-40°C ÷ +120°C (± 0.2°C typical) -40°F ÷ +248°F (± 0.36°F)
Oil Pressure (P)	20kPa ÷ 410kPa (± 0.1kPa) 0.2bar ÷ 4.1bar (± 0.01bar) 2.9PSI ÷ 60PSI (± 0.14PSI)
Hydrogen (H2)	0ppm ÷ 18000ppm (± 10%)*
Internal measurement interval	0.1s
External data output interval	1s

(* on the measured value)

Operating environment

Ambient temperature range	-20°C ÷ +70°C
Oil temperature range	-20°C ÷ +85°C -4°F ÷ +185°F
Operating pressure	up to 700kPa (7bar ; 100PSI)

Inputs and outputs

Power supply	5V DC ÷ 28V DC Preferable 12V DC or 24V DC regarding the system supply voltage
Power consumption	1.3W - 1.5W / Typically 1.35W
Digital output	Digital protocol - Modbus RTU
PC interface	USB Modbus RTU Adapter
Internal data logging capacity	dynamic latch buffer cache chains (64-512-8192)

General

Modbus	Modbus RTU, baud rate 9600 - 115200 bps, 8 data bits, 1 stop bit
Housing material	Stainless steel 1.4571

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Performance

Mechanical connection	G1" EN ISO 228-1 (Parker RI1EDX3/471-like) connector
Measuring zone material	reinforced chemically stable plastic
Housing classification when assembled	IP68
Control software (Windows 8 or later)	Ver. 2.0

Absolute maximum ratings

Maximum operating voltage	28.0V DC
Operating temperature	-40°C ÷ +100°C -40°F ÷ +212°F
Maximum pressure (never exceed)	900kPa (9bar ; 130PSI)
Storage temperature (without Modbus cable)	-65°C ÷ +150°C (excluding external cable) -85°F ÷ +302°F



Stress above values listed in "Absolute maximum ratings" section may cause permanent damage to the device.

Following power supply systems compliant with EU directives are recommended:

- Wago Kontakttechnik GmbH & Co. KG 2787-2144,
- Mean-Well Enterprises Co., Ltd. – HDR-30-24 or HDR-15-24.

Accreditations

The TrafoStick™ TS G2 has undergone rigorous testing by an accredited body in accordance with EN61326- 1, classed as a Class A measuring instrument, certifying its full compliance with the following regulatory standards:

- EN 61000-4-2:2011,
- EN 61000-4-3:2014,
- EN 61000-4-4:2013,
- EN 61000-4-5:2014,
- EN 61000-4-6:2014,
- EN 61000-4-11:2007,
- EN 50216-1:2002,
- EN 50216-3:2002 + A2:2006,
- CISPR11:2015 + AMD1:2016,
- EN 55011:2016 + A1:2017,
- EN 55011:2016 + A1:2017-06,
- EN 60950-1:2007 + A11:2009 + A1:2011 + A12:2011.

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Patents

A. Eberle Africa's TrafoStick™ system and devices are covered by one or more of the following patents:

- WO002018050499A,
- WO002018050500A,
- US020190204289,
- US020190277805,
- EP000003513154,
- EP000003513155,
- CN000109844469.

Breakdown voltage accuracy vs. temperature

Following table shows the Breakdown Voltage measurement range accuracy depending on the oil temperature.

[kV]											
100			+/- 4%						+/- 5%		>5%
90											
80			+/- 2%								
70											
60											
50			+/- 1%						+/- 3%		
40											
30											
20											
10											
	10	20	30	40	50	60	70	80	90	100	[°C]

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