CorrSen – system for real-time monitoring of corrosivity

Producer

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Product description

CorrSen is a complex system for monitoring atmospheric corrosivity. The operation of the device is based on the resistometric principle, i.e. applying a small current to a thin metal sensor exposed to a corrosive environment and measuring its electrical resistance. The thickness loss of the sensor due to corrosion and real-time corrosion rate are then calculated from the electrical resistance values. The system consists of the sensors, loggers and a gateway.

Application

CorrSen system is used to measure corrosion rate, temperature and relative humidity of indoor and outdoor atmospheres of all levels of corrosion aggressiveness. Measurement can be made in a temperature range from – 20 to + 60 °C and a relative humidity range from 0 to 100 %.

The main applications of the CorrSen system:

- Transport and storage of goods
- Museums, galleries and depositaries
- Server rooms
- Clean rooms
- Automotive industry
- Chemical industry
- Coating
- Food industry
- Aerospace industry
- Pulp and paper
- Metallurgy
- Petrochemical industry
- Research and development.

Restrictions on use

CorrSen system must not be used in explosive and flammable environments. The device must not be subjected to mechanical stress. The gateway must not be exposed to precipitation and aggressive environment.

Sensors

The sensors consist of a non-conductive substrate and a thin metal track. The metal track consists of four parts, one of which (reference) is covered during the measurement, while the other three (sensing) are exposed to the corrosive environment. Depending on the type of the sensor, the substrate is either ceramic (marked C), fiberglass (market L) or a combination of aluminium sheet and polymer interlayer (marked as A).

Overview of the CorrSen sensors:

Sensor	Material	Sensor thickness, [µm]	Sensitivity	Substrate type
Fe_250	Carbon steel	250	0,1 µm	A, L
Fe_50	Carbon steel	50	0,05 µm	A, L
SSA4-25	Stainless steel AISI 316(A4)	25	0,03 µm	A, L
SSA2-25	Stainless steel AISI 304(A2)	25	0,03 µm	A, L
Zn_250	Zinc	250	0,1 µm	A, L
Zn_50	Zinc	50	0,05 µm	A, L
Al_20	Aluminium	20	0,03 µm	A, L
Al_0.5	Aluminium	0,5	0,2 nm	C
Cu_12	Copper	12	0,02 µm	A, L
Cu_0.5	Copper	0,5	0,2 nm	C
Ag_0.5	Silver	0,5	0,2 nm	C
Pb_25	Lead	25	0,03 µm	A, L
Pb_0.4	Lead	0,4	0,2 nm	C

The sensor can be inserted directly into the logger or connected to the logger with a cable (modification /C or /O). The cable-based solution is intended for use in small or hard-to-reach spaces where the full logger cannot be placed. The standard cable length is up to 5 m, and it can be customized upon request.

Loggers

The measurement of changes in the sensor is performed by the logger. The functions of the loggers include applying current to the sensor and measuring its electrical resistance, measuring the ambient temperature and relative humidity, receiving settings from the server, storing the data and transmitting the data to the server. Receiving the settings and transmitting the data can be done in two ways, via the gateway using a radio module or via a mobile application using an NFC module. Three modifications of the loggers are intended for use in different applications depending on corrosion aggressiveness and accessibility.

CorrSen logger modifications:

Modification	Description	Applications
CorrSen-B	Logger with a thin changeable sensor with or without cable	Indoor environment with low aggressiveness
CorrSen-H	Logger with a robust unchangeable sensor and sealed contacts	Outdoor and aggressive indoor environment, degree of protection IP44
CorrSen-O	Logger in a special housing with protected connector for connecting cable-mounted sensors	Demanding or aggresive outdoor environment, degree of protection IP56

Specifications of the CorrSen loggers:

Dimensions	CorrSen-B a H: 95×82×36 mm CorrSen-O: 120x130x90 mm
Cover colour	Grey, black, red, orange
Cover material	ASA
Power supply	Primary cell alkaline or lithium, size R6 – 3 pcs
Battery life	Minimum 2 years in operation and 5 years in storage
Operating temperature	From - 20 to + 60 °C
Sensor cable durability	Flexible installation: from - 5 to + 80 °C, bending radius 52mm Firm installation: from - 40 to + 80 °C, bending radius 28mm
Sensor cable material	PVC

Measurement of electrical resistance, temperature and relative humidity:

Applied current	to 20 mA depending on sensor type
Accuracy of the sensor thickness loss measurement	1 nm to 1 µm depending on the sensor type
Temperature sensor type	Semiconductor sensor with integrated A/D converter
Temperature measurement accuracy	±0,2 °C
Temperature range	From - 20 to + 60 °C
Humidity sensor type	Semiconductor sensor with integrated A/D converter
Humidity measurement accuracy	±1,8 %RH
Humidity measurement range	0 to 100% including condensation

Receiving the settings and transmitting the data via the gateway:

Radio module type	ISM
Radio frequency	868 MHz or 915 MHz, depending on the country of installation
Maximum radio communication range	100 meters in open space without metal and concrete barriers

Receiving the settings and transmitting the data via the mobile application:

NCF	RFID standards including ISO/IEC 14443 and FeliCa.These standards are part of the ISO/IEC 18092

Gateway

The gateway is a permanently plugged device for transmitting the settings and the measured data between the logger and the server. Communication between the gateway and the logger is realized using a radio module. Communication between the gateway and the server is realized by mobile communication.

Specification of the gateway:

Dimensions	153 × 112 × 45 mm
Cover colour	Grey
Cover material	ABS
Power supply	DC 12V or AC 90 to 230V
Operating temperature	From 0 to + 60°C
Degree of protection	IP20, intended for indoor installation
Display	Colour 4,3“ TFT LCD
Radio module	ISM
Mobile communication	2G + LTE
Maximum number of connected loggers	20

Packaging

Sensor	Vacuum-packed in polymer foil with silica gel, together with the logger (CorrSen-H), soldered to the cable (CorrSen-O) or separately (CorrSen-B) and cardboard box
Logger	Vacuum-packed in polymer foil with silica gel and cardboard box
Gateway	Cardboard box

Storage

Loggers and gateway must be stored in a dry, non-aggressive environment. Sensors must be stored in the original packaging, i.e. vacuum-packed in the polymer foil with silica gel.