# FL 510

The **CS INSTRUMENTS moisture transmitter FL 510** with two analog outputs for different measured variables and RS 485 Modbus interface as standard, enables reliable and long-term stable measurement.

# Inhalt

# 1 Foreword

Dear Customer,

Thank you for purchasing the FL 510. Please read these installation and operating instructions carefully before installation and commissioning and follow our instructions. The FL 510 will only function properly and operate safely if the instructions and notes described are strictly observed.

# 2 Intended use

The FL510 is intended for measuring moisture in technical oils.

A check whether the device is suitable for the selected application must be carried out by the user. It must be ensured that the medium is compatible with the wetted parts. The technical data listed in the data sheet are binding.

Improper handling or operation outside the technical specifications is not permitted. Claims of any kind due to improper use are excluded.

# 3 Safety instructions

**Before installing the FL 510, read these operating instructions carefully. Failure to follow the instructions in this manual, in particular the safety instructions, may result in danger to personnel, equipment, and installations.**

- The product may only be used and applied in accordance with its intended use.
- Installation of the moisture in oil sensor) and maintenance work may only be carried out by trained personnel.
- Installation and service work must be carried out in a de-energized state.
- The applicable safety regulations must be observed!
- Attention: max. pressure range 300 bar must not be exceeded.
- Observe the measuring ranges of the sensor!
  Overheating will destroy the sensors.
- Observe the permissible storage and transport temperature as well as the permissible operating temperature (e.g. protect the measuring device from direct sunlight).
- Opening the device, improper handling or use of force will void the warranty!

# 4 Description

The FL 510 humidity and temperature transmitter is a reliable measuring device that can be used in various applications.

It is a microprocessor-controlled device that enables moisture measurement in the form of relative humidity.

The analog interfaces with two current outputs can be freely configured, while a digital output (RS-485) is also available.

Connection options (ISO and NPT 1/2).

In addition, the FL 510 enables precise temperature measurement and is designed as an easy-to-install online probe.

## Special advantages of the FL 510 moisture sensor

- Measured variables: Relative humidity (%rH) and temperature (t)
- Fast Response time
- Two freely configurable analog outputs as well as Modbus-RTU (RS 485) interface available)

The FL 510 is used to measure the moisture content in gases using relative humidity (%rh).

The relative humidity is measured on a scale from 0 to 100% rH, where 0 % rH stands for completely water-free and 100% rH indicates that the gas is completely saturated.

If the relative saturation exceeds 90 % rH, there is a risk of segregation in the system, especially at falling temperatures.

The relative humidity serves as critical parameters to indicate risks of free water in the system, especially when they reach values of >90 %rH.

The FL 510 transmitter enables continuous online measurements.

**Programming by software.**

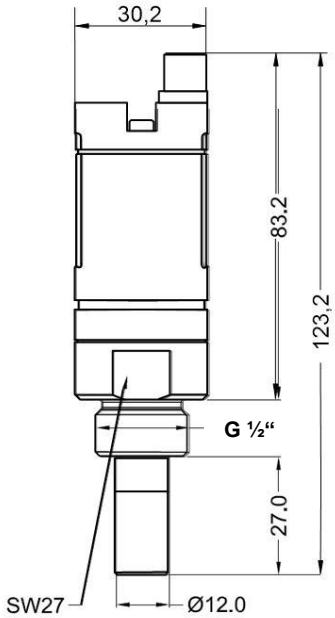
With the CS Service Software incl. USB / Modbus adapter settings like Modbus settings can be changed, analog output can be rescaled, and measured values can be assigned to adapt these oil specific parameters for different oil types.

## 5 Technical data

| | |
|---|---|
| Measuring range relative humidity: | 0...100% rH |
| Accuracy (0...100% rH): | ± 1.8% Accuracy at 23°C |
| Accuracy (90...100% rH): | typically, ± 3% rH at 23°C |
| Measuring range temperature: | 0...125°C |
| Accuracy temperature: | ±0.3°C |
| Permitted temperature: | -20...125°C |
| Permitted ambient temperature: | -20...70°C |
| Storage temperature: | -40…80 °C |
| Pressure range: | up to 300 bar |
| Power supply: | 24VDC (10...30 VDC) |
| Output: | 2x 4...20 mA (3-wire-Technology) |
| | RS 485 (Modbus RTU) |
| Protection class: | IP 66 |
| Load for analogue output: | < 500 Ohm |
| Screw in thread: | G 1/2" |
| Optional: | NPT ½ “ |
| Material case: | Zinc die casting |
| Wetted parts: | Sensor protection Perforated cap 1.4301 |
| | (SS304) |
| Process connection (screw-in thread): | 1.4404 (SS 316L) |
| Electr. connection: | M12, 8-pin, A-Coding |
| EMC: | DIN EN 61326-1 |

## 6 Dimension / elektr. Connection


**Dimension**

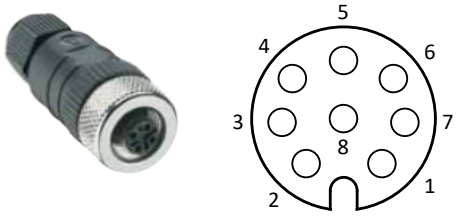



| Pin 1 | Pin 2 | Pin 3 | Pin 4 | Pin 5 | Pin 6 | Pin 7 | Pin 8 |
|---|---|---|---|---|---|---|---|
| NC | RS485 (B) | RS485 (A) | +I output | +I output | -VB | NC | +VB |

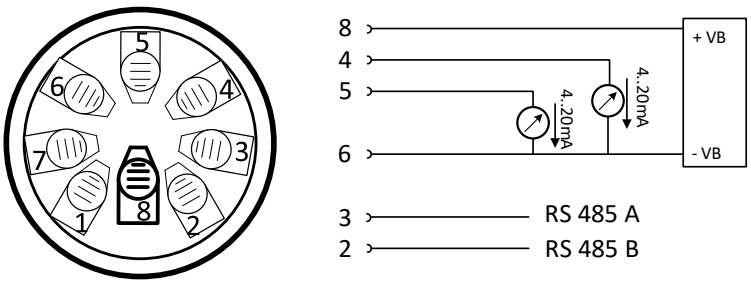
| | |
|---|---|
| +VB | Positive supply voltage 24VDC (10...30 VDC) smoothed |
| RS485 (A) | Modbus A (+) |
| -VB | Negative supply voltage |
| RS 485 (B) | Modbus B (-) |
| +I | Positive 4...20 mA Signal ** |
| NC | not connected |

** Measuring value assignment for 4-20mA signal selectable

**M12 Connector**




**Connection diagram**




**Note:** The sensor may only be connected in a de-energized state.

# 7 Installation instructions

- The direct installation of the sensor is only allowed in the unpressurized state of the system.
- The sensor must be tightened with a torque of 25 - 30 Nm.
- Tightness of the connection must be checked and ensured.
- It is not permitted to use a sealing ring with an NPT 1/2“. Instead, use a suitable PTFE sealing tape or sealant.

# 8 Modbus

The moisture in oil sensor FL 510 comes with a Modbus RTU Interface.

Before commissioning of the sensor, the communication parameters Modbus ID, Baud rate, Parity und Stop bit must be set to ensure the communication with the Modbus master.

The adjustment can be done either with the CS Instruments PC service software.

Modbus communication default values:

- Modbus ID: 1 (1 -247)
- Baud rate: 19200 bps (1200,2400, 4800, 9600, 19200, 38400 bps)
- Parity: even (none, even, odd)
- Stop bit: 1 (1,2)

Supported are following function codes:

- Funktionscode 03: Read Holding Register
- Funktionscode 16: Write multiple Register

## 8.1 Register Mapping measuring values:

| Modbus Register | Modbus Adresse | No.of Byte | Data Type | Description | Default Setting | Read Write | Unit /Comment |
|---|---|---|---|---|---|---|---|
| 1001 | 1000 | 4 | Float | Temperature | | R | [°C] |
| 1003 | 1002 | 4 | Float | Temperature | | R | [°F] |
| 1005 | 1004 | 4 | Float | relative Humidity | | R | [%rH] |

**for DS400 / DS 500 / Handheld devices - Modbus Sensor Datatyp:**
„Data Type R4-32“match with „Data Type Float“

# 9 Calibration / Adjustment

**At the manufacturer**
Within the scope of DIN ISO certification, we recommend having the measuring instruments calibrated and, if necessary, adjusted by the manufacturer at regular intervals. The calibration cycles should be based on your internal specifications. Within the scope of DIN ISO certification, we recommend a calibration cycle of one year for the FL 510.

# 10 Warranty

Defects which are demonstrably due to a factory defect will of course be repaired free of charge. The prerequisite is that you report this defect immediately upon discovery and within the warranty period granted by us. Damage caused by improper use or by non-observance of the operating instructions is excluded from this warranty.

The warranty is also void if the sensor has been opened - unless this is expressly described in the operating instructions for maintenance purposes - or if serial numbers in the device have been changed, damaged, or removed.

The warranty period for FL 510 is 12 months. Unless otherwise defined, 6 months apply to accessories. Warranty services do not cause an extension of the warranty period.

If in addition to the warranty service necessary repairs, adjustments or similar are carried out, the warranty services are free of charge but there is a charge for other services such as transport and packing costs. Other claims, especially those for damage occurring outside the instrument are not included unless responsibility is legally binding.

**After-sales service after the warranty time has elapsed**
Of course, we are also there for you after the warranty period has expired. In case of malfunctions, please send us your measuring device with a short description of the error. Please also include your telephone number for any queries.

# KONFORMITÄTSERKLÄRUNG

DECLARATION OF CONFORMITY

Wir
We

CS Instruments GmbH & Co.KG
Gewerbehof 14, 24955 Harrislee

Erklären in alleiniger Verantwortung, dass das Produkt
Declare under our sole responsibility that the product

Ölfeuchte-Sensor FL 510
Moisture in oil sensor FL 510

den Anforderungen folgender Richtlinien entsprechen:
We hereby declare that above mentioned components comply with requirements of the following EU directives:

| | |
|---|---|
| Elektromagnetische Verträglichkeit<br>Electromagntic compatibility | 2014/30/EUG<br>2014/30/EC |
| RoHS (Restriction of certain Hazardous Substances) | 2011/65/EC |

Angewandte harmonisierte Normen:
Harmonised standards applied:

| | |
|---|---|
| EMV-Anforderungen<br>EMC requirements | **EN EN 55011:2016 + A1:2017 + A11:2020 + A2:2021**<br>**EN 61326-1: 2021** |

Das Produkt ist mit dem abgebildeten Zeichen gekennzeichnet.
The product is labelled with the indicated mark.

CE

Harrislee, den 14.12.2023

Wolfgang Blessing Geschäftsführer

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