

# FA 510

The **CS dew point sensor FA 510** with 3-wire technology 4...20 mA and RS 485 Modbus output enables a reliable and long-term stable monitoring of the dew point in industrial applications such as in

- compressed air plants (refrigerating/adsorption dryers)
- granulate dryers
- medical gases
- non-corrosive gases, e. g. nitrogen



	Page
Introduction	11
Notes of safety	12
Description	12
Technical data	13
Diagram of instrument / Dimensions of instrument	14
Installation	15
Modbus Interface	16
Calibration/Adjustment	18
Warranty	18
Ordering details	18
Contact	20

---

**INTRODUCTION**


---

Dear CS customer,

You have made the right decision by choosing a measuring instrument of CS Instruments GmbH. Thousands of customers buy our high standard products every year. There are a few good reasons for doing so:

- Cost-performance ratio. Reliable quality at a fair price.
- We have the ideal solutions for your measuring tasks based on our expert experience gained over 20 years.
- Our high quality standard.
- Of course, our instruments carry the CE symbol required by the EU.
- Calibration certificates, trainings, consultation and calibration on location.
- Our after sales-service, we do not leave you out in the cold.

Our service guarantees fast help.

 Measuring instrument conforms with **DIN EN 61326-1**

**Please read prior to operation!**



**Warning:** Do not exceed a pressure range of > 50 bar with standard version. With special versions up to 350 bar.

Observe measuring ranges of sensor! The probes are damaged if they are overheated.

Observe max. storage and transport temperature as well as max. operating temperature (e. g. protect measuring instrument from direct sunlight).

Warranty claims no longer apply if the instrument is opened, in the case of inexpert handling or use of force.

Adjustments or calibrations should be carried out by qualified measurement and control engineering staff only.

Important: Before installation briefly bleed the compressed air in order to remove condensate and particles. This prevents soiling of FA 510. Standing air leads to long measuring times.

## DESCRIPTION

The FA 510 dew point sensor enables a reliable and long-term stable monitoring of the dew point in industrial applications from -80 to +20 °C dew point. The FA 510 features improved stability.

When mounting FA 510 into compressed air systems the pressure dew point (dew point under pressure) up to 50 bar (in the special version up to 350 bar) is measured directly. When mounting FA 510 in atmospheric conditions (ambient pressure) or in the flow off sector (relaxed air) of compressed air systems the atmospheric dew point is measured.

### Advantages:

- Dew point sensor for very low dew points down to -80 °Ctd
- Extremely long-term stable due to internal automatic calibration
- IP 65 housing grants a reliable protection in extreme industrial conditions
- Very fast response time
- Installable in the dryer by means of G 1/2" thread, optional UNF 5/8" or NPT 1/2"
- High accuracy of  $\pm 2$  °Ctd
- Calibration on location and testing with CS control and calibration set (PC connection set)

### Programming via Software.

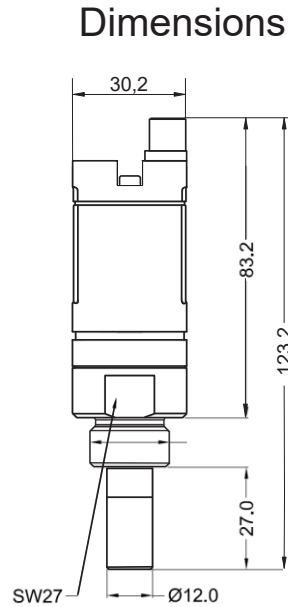
With the CS Service Software incl. USB / Modbus Adapter the Modbus settings, the scaling of the Analogue output and the assignment of the measurement values could be set.

- Analogue output 4...20 mA scalable
- Switching between °Ctd, °Ftd, % RH, °C, °F, g/m<sup>3</sup>, mg/m<sup>3</sup>, g/kg, ppm, and so on
- Calibration and adjustment
- Sensor diagnosis
- Read-out of service data

Measuring range	-80...20 °Ctd pressure dew point resp. dew point in °Ctd 0...100 % RH -20...70 °C
Type 0699.0510, FA 510	-80...20 °Ctd $\triangleq$ 4...20 mA
Type 0699.0512, FA 510	-20...50 °Ctd $\triangleq$ 4...20 mA Other scales on request, for example, -60 ... 30 ° Ctd $\triangleq$ 4 ... 20 mA
Accuracy:	typical $\pm 1$ °Ctd von 20...-20 °Ctd $\pm 2$ °Ctd von -50...-20 °Ctd $\pm 3$ °Ctd von -50...-80 °Ctd
Pressure range:	-1...50 bar standard
Power supply:	24V VDC (10..30 VDC)
Output:	4...20 mA 3-wire technology** RS 485 (Modbus RTU) **
Protection class:	IP 65
EMV:	DIN EN 61326
Operating temperature:	-20...70 °C (ideal 0...50 °C)
Storage temperature:	-40...80 °C
Load for analogue output:	< 500 Ohm
Screw-in thread:	G 1/2" stainless steel Optional: UNF 5/8" or NPT 1/2"
Material of housing:	zinc alloy, PC, ABS
Sensor protection:	sinter filter 50 $\mu$ m stainless steel
Connection:	M12, 5-pole
Response time t95:	< 30 seconds (descending) < 10 seconds (ascending)

**\*\* Remark:** Parallel use of analogue 4...20mA and RS 485 Modbus output is possible

**DIAGRAM OF INSTRUMENT**



		Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
FA 510	<b>Connector plug</b>	+VB	RS485 A	-VB	RS485 B	+I Current output
	<b>Connection cable</b> 0554.0104 (5 m) 0554.0105 (10 m)	brown	white	blue	black	grey

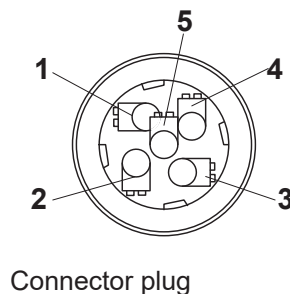
+VB	Positive supply voltage 24VDC (10...30 VDC) smoothed
RS485 A	Modbus A (+)
-VB	Negative supply voltage
RS485 B	Modbus B (-)
+I	Positive 4...20 mA signal **

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

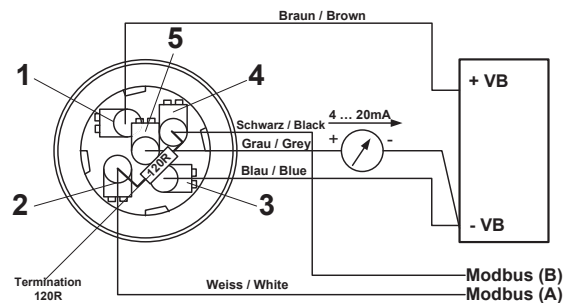
If no connection cable (0553.0104, 0553.0105) is ordered, the sensor will be supplied with a M12 connector plug. The user can connect the supply and signal cables as indicated in the connection diagram.



**M12 connector plug**



**Wiring diagram**




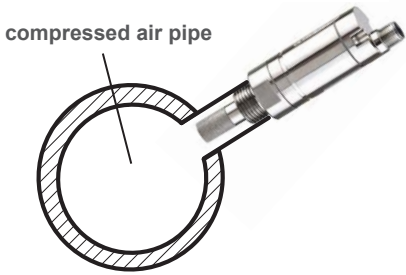
**Remark:** The sensor must be connected in stainless state only




- 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 a NPT 1/2" thread. Appropriate PTFE sealing tape or sealant should be used instead

**Please note: CS recommends the indirect installation with measuring chamber**

**Advantage:** Easy mounting and dismounting of the probe without interruption of the line. Quick response time due to quick coupling. Optimum sensor protection.

 <p>FA 510 Measuring chamber Standard connection compressed air pipe</p>	<p><b>Indirectly in the compressed air system</b></p> <p>Connect probe with measuring chamber to the compressed air pipe by means of a quick coupling. In case of compressed air containing oil and dirt particles a pre-filter should be installed in front of the measuring chamber. Compressed air flows continuously (at 7 bar approx. 1 l/min expanded) in the capillary pipe of the measuring chamber. The reaction times for the humidity reading are shorter than in case of a direct mounting.</p>
 <p>FA 510 compressed air pipe</p>	<p><b>Directly in the compressed air system</b></p> <p>Screw in probe with G 1/2" thread pressure-tight in the center or at the top of the compressed air pipe. Take care that measurement is effected close to the compressed air flow. U-bend pipes or non-flowing compressed air, result in very slow reaction times for the moisture reading.</p>

 <p>FA 510</p>	<p><b>Measurable gases</b></p> <p>In general, humidity can be measured in all non-corrosive gases. In case of measurements in corrosive gases please consult CS Instruments GmbH.</p>
-------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

The dew point sensor FA 510 comes with a Modbus RTU Interface.  
Before commissioning of the sensor the communication parameters

Modbus ID, Baudrate, Parity und Stop bit

must be set in order to ensure the communication with the Modbus master.

The adjustment can be done either with the CS Instruments PC service software, DS 400, DS 500 and the hand-held instrument PI 500 done.

Modbus communication default values:

- Modbus ID : 1 (1 -247)
- Baudrate: 19200 bps (1200,2400, 4800, 9600, 19200, 38400 bps)
- Parity: even (none, even, odd)
- Stoppbit: 1 (1,2)

Supported are following functioncodes:

- Function code 03: Read Holding Register
- Function code 16: Write multiple Register

**Register Mapping measuring values:**

Modbus Register	Modbus Address	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	[%]
1007	1006	4	Float	Dew Point		R	[°Ctd]
1009	1008	4	Float	Dew Point		R	[°Ftd]
1011	1010	4	Float	Absolute Humidity		R	[g/m <sup>3</sup> ]
1013	1012	4	Float	Absolute Humidity		R	[mg/m <sup>3</sup> ]
1015	1014	4	Float	Humidity Grade		R	[g/kg]
1017	1016	4	Float	Vapor Ratio (Volume)		R	[ppm]
1019	1018	4	Float	Saturation vapor pressure		R	[hPa]
1021	1020	4	Float	Partial Vapor Pressure		R	[hPa]
1023	1022	4	Float	Atmospheric DewPoint		R	[°Ctd]
1025	1024	4	Float	Atmospheric DewPoint		R	[°Ftd]

**Remark for DS400 / DS 500 / Handheld devices - Modbus Sensor Datatyp:**

„Data Typ R4-32“ match with „Data Type Float“



**Modbus Settings (2001...2006)**

Modbus Register	Modbus Address	No.of Byte	Data Type	Description	Default Setting	Read Write	Unit /Comment
2001	2000	2	UInt16	Modbus ID	1	R/W	Modbus ID 1...247
2002	2001	2	UInt16	Baudrate	4	R/W	0 = 1200 1 = 2400 2 = 4800 3 = 9600 4 = 19200 5 = 38400
2003	2002	2	UInt16	Parity	1	R/W	0 = none 1 = even 2 = odd
2004	2003	2	UInt16	Number of Stopbits		R/W	0 = 1 Stop Bit 1 = 2 Stop Bit
2005	2004	2	UInt16	Word Order	0xABCD	R/W	0xABCD = Big Endian 0xCDAB = Middle Endian
2006	2005	2	UInt16	Modbus Enabled	FA510: 1 FA515: 0	R/W	0 = Modbus disabled 1 = Modbus Enabled

**Analog Scaling Settings (2007...2011)**

Modbus Register	Modbus Address	No.of Byte	Data Type	Description	Default Setting	Read Write	Unit /Comment
2007	2006	4	UInt32	Output Value	4	R/W	0 = 4-20mA disabled 1 = Temperature [°C] 2 = Temperature [°F] 3 = relative Humidity [%] 4 = DewPoint [°C] 5 = DewPoint [°F] 6 = Absolute Humidity [g/m3] 7 = Absolute Humidity [mg/m3] 8 = Humidity Grade [g/kg] 9 = Vapor Ratio [ppm] 10 = Saturation Vapor Pressur [hPa] 11 = Partial Vapor Pressure [hPa] 12 = Atmospheric DewPoint [°C] 13 = Atmospheric DewPoint [°F]
2009	2008	4	float	4mA Scale Low	-80	R/W	
2011	2010	4	float	20mA Scale High	20	R/W	

Modbus installation, Modbus settings and further information refer to the manual CS Instruments **"Modbus Installation and Operating Instructions FA 5xx sensors"**

**From the manufacturer**

According to DIN ISO certification of the measuring instruments we recommend regular calibration and, if necessary, adjustment of the instrument by the manufacturer. The calibration cycles should fit your internal scheme. In the course of the DIN ISO certification, we recommend for FA 510 a calibration cycle of one year. If requested we can carry out the calibration on your premises.

**WARRANTY**

If you have reason for complaint, we will of course repair any faults free of charge if it can be proven that they are manufacturing faults. The fault should be reported immediately after it has been found and within the warranty time guaranteed by us. Excluded from this warranty is damage caused by improper use and non-adherence to the instruction manual.

The warranty is also cancelled once the measuring instrument has been opened provided this is not described in the instruction manual for maintenance purposes. This is also the case if the serial number has been changed, damaged or removed.

The warranty time for FA 510 is 12 months for the instrument and 6 months for accessories if no other terms are agreed upon. Warranty services do not extend the warranty time.

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**

We are, of course, there for you after the warranty time has elapsed. In the case of function faults please send us your measuring instrument with a brief description of the defect. Please also indicate your telephone number so that we can contact you if necessary.

**ORDERING DETAILS**

<i>Order no.</i>	<i>Description</i>
0699.0510	FA 510 dew point sensor (-80...20 °Ctd)
0699.0512	FA 510 dew point sensor (-20...50 °Ctd)
0553.0104	Connection cable, length: 5 m
0553.0105	Connection cable, length:10 m
0699.3390	Standard measuring chamber for compressed air up to 16 bar
0699.3590	High-pressure measuring chamber up to 350 bar *
0699.3690	Measuring chamber for atmospheric dew point
0699.3790	Measuring chamber for respiratory air bottles up to 350 bar *
0699.4004	Special scaling, output in g/kg, % RH, mg/m <sup>3</sup> , ppm (V/V), g/m <sup>3</sup>
0699.3396	Precision calibration at -40 °Ctd or 3° Ctd incl. ISO certificate
3200.0003	Precision calibration at 0 °Ctd and 10 °Ctd incl. ISO certificate
	CS Service Software for FA/VA sensors incl. PC connection set, USB connection and interface adapter to the sensor

## KONFORMITÄTSERKLÄRUNG

DECLARATION OF CONFORMITY

Wir CS Instruments GmbH  
 We Am Oxer 28c, 24955 Harrislee

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

Feuchtesensoren FA 510 / FA 515  
 Dew point sensors FA 510 / FA 515

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

Elektromagnetische Verträglichkeit Electromagnetic compatibility	2014/30/EUG 2014/30/EC
RoHS (Restriction of certain Hazardous Substances)	2011/65/EC

Angewandte harmonisierte Normen:

Harmonised standards applied:

EMV-Anforderungen EMC requirements	EN 55011: 2011-04 EN 61326-1: 2013-07
---------------------------------------	------------------------------------------

Anbringungsjahr der CE Kennzeichnung: 15

Year of first marking with CE Label: 15

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



Harrislee, den 19.04.2016



Wolfgang Blessing Geschäftsführer

**Geschäftsstelle Süd / Sales Office South /**

Zindelsteiner Str. 15  
D-78052 VS-Tannheim

Tel.: +49 (0) 7705 978 99 0

Fax: +49 (0) 7705 978 99 20

Mail: [info@cs-instruments.com](mailto:info@cs-instruments.com)

Web: <http://www.cs-instruments.com>

**Geschäftsstelle Nord / Sales Office North**

Am Ozer 28c  
D-24955 Harrislee

Tel.: +49 (0) 461 700 20 25

Fax: +49 (0) 461 700 20 26

Mail: [info@cs-instruments.com](mailto:info@cs-instruments.com)

Web: <http://www.cs-instruments.com>