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

INTRODUCTION

Dear Customer,

thank you for choosing the FA 510. Please read these installation and operating instructions carefully before installation and commissioning and follow our instructions. The proper functioning of the FA 510 and safe operation can only be ensured if the regulations and instructions described are strictly observed.

Intended Use

The dew point sensor is intended for measuring the dew point or the pressure dew point in clean, dry and oil-free gases and compressed air.

The user must check whether the instrument is suitable for the selected application. It must be ensured that the medium is compatible with the wetted parts. The technical data listed in the data sheet are obligatory.

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

⚠️ **Read these operating instructions carefully before installing the FA 510. Failure to observe the instructions contained herein, in particular the safety instructions, may result in hazards to personnel, equipment and systems..**

- The product may only be used in accordance with its intended purpose.
- Installation of the dew point 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!
- All work on the compressed air network must only be carried out in a depressurized state.
- Attention: Do not exceed the pressure range > 50 bar for the standard version.
- 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 instrument from direct sunlight).
- Opening the instrument, improper handling or use of force will void all warranty claims!

- **Important:** Before installation, briefly allow compressed air to flow off to remove condensate and particles, this will prevent soiling of the 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. 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 ½"
- High accuracy of ± 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/m³, mg/m³, g/kg, ppm, and so on
- Calibration and adjustment
- Sensor diagnosis
- Read-out of service data

Measuring range	-80…50 °Ctd pressure dew point resp. dew point in °Ctd 0…100 % RH -20…70 °C
Type 0699.0510, FA 510	-80…20 °Ctd ≙ 4…20 mA
Type 0699.0512, FA 510	-20…50 °Ctd ≙ 4…20 mA
	Other scales on request, for example, -60 ... 30 ° Ctd ≙ 4 ... 20 mA

Accuracy:	typical ± 1 °Ctd von 20…-20 °Ctd
	     ± 2 °Ctd von -50…-20 °Ctd
	     ± 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 ½"
Material of housing:	zinc alloy
Sensor protection:	sinter filter 50 μm stainless steel
Connection:	M12, 5-pole

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

Dimensions

M12 Connector plug

SW27 Ø12.0
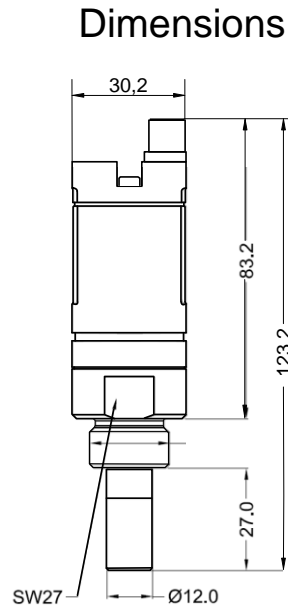
		Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
FA 510	**Connector plug**	+VB	RS485 A	-VB	RS485 B	+I Current output
	Connection cable 0554.0104 (5 m) 0554.0105 (10 m)	brown	white	blue	black	grey

+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.
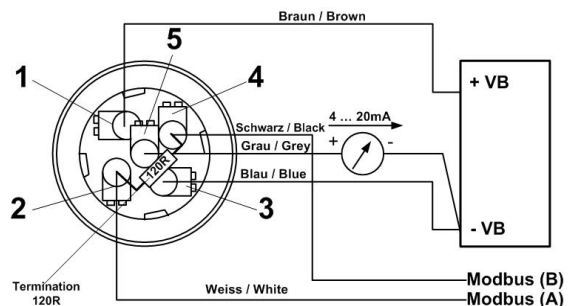
M12 connector plug
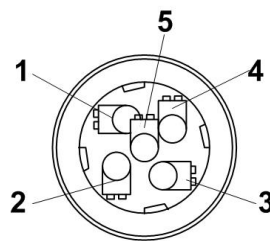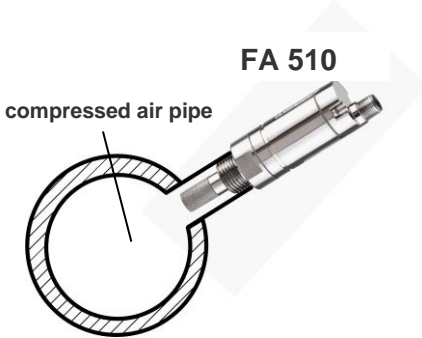
Connector plug

Wiring diagram

Braun / Brown
+ VB
4 … 20mA
Schwarz / Black
Grau / Grey
Blau / Blue
- VB
Termination 120R
Weiss / White
Modbus (B)
Modbus (A)

Remark: The sensor must be connected in strain less state only

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⚠️
- 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.

FA 510 Measuring chamber Standard connection compressed air pipe	**Indirectly in the compressed air system** 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.
FA 510 compressed air pipe	**Directly in the compressed air system** 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.
FA 510	**Measurable gases** In general, humidity can be measured in all non-corrosive gases. In case of measurements in corrosive gases please consult CS Instruments GmbH.

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/m³]
1013	1012	4	Float	Absolute Humidity		R	[mg/m³]
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"

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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"**

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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

Order no.	Description
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/m³, ppm (V/V), g/m³
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 & Co.KG
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 Electromagntic 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**

Anbringungssjahr der CE Kennzeichnung: 15

Year of first marking with CE Label: 15

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

Harrislee, den 19.04.2016

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Wolfgang Blessing Geschäftsführer

CS INSTRUMENTS GmbH & Co.KG

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

Geschäftsstelle Nord / Sales Office North

Gewerbehof 14
D-24955 Harrislee

Tel.: +49 (0) 461 807 150 0
Fax: +49 (0) 461 807 150 15

Mail: info@cs-instruments.com
Web: http://www.cs-instruments.com

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