# DP 110

The **dew point sensor DP 110** with 2-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,

You have made the right decision by choosing this measuring instrument. 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, and consultation
- Our after sales-service, we do not leave you out in the cold.

Our service guarantees fast help.

CE 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.

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.

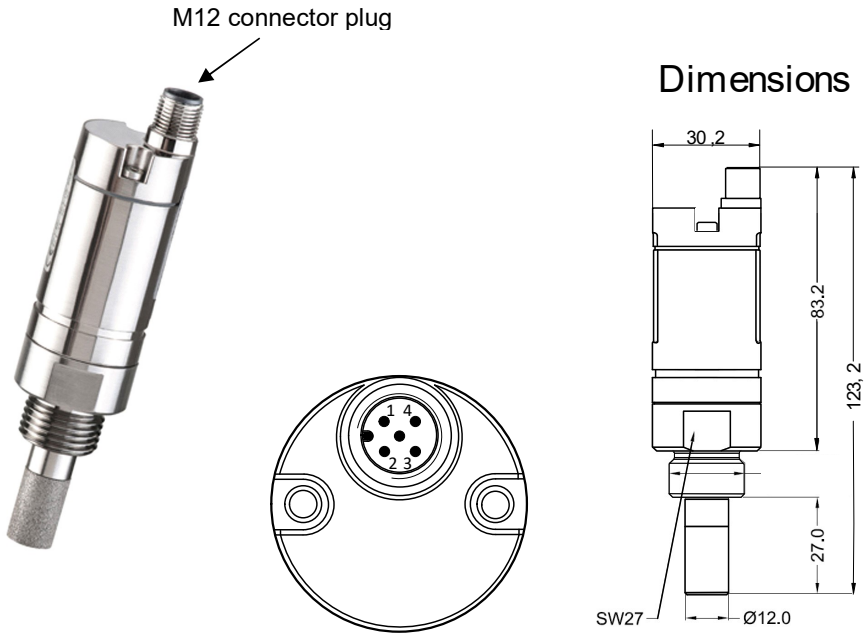
The DP 110 dew point sensor enables a reliable and long-term stable monitoring of the dew point in industrial applications. The DP 110 features improved stability.

**Advantages**:

- **Extremely long-term stable**
- **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**
- **High accuracy of ± 1…2 °Ctd**

| | |
|---|---|
| Measuring range | -80…50 °Ctd pressure dew point resp. dew point in °Ctd |
| | 0…100 % RH |
| | -20…70 °C |
| Type 0699.0515, DP 110 | -80…20 °Ctd ≙ 4…20 mA |
| Type 0699.0517, DP 110 | -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 2-wire technology** |
| | RS 485 Modbus ** |
| Protection class: | IP 65 |
| EMV: | DIN EN 61326-1 |
| 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 |
| Response time t95: | < 30 seconds (descending) |
| | < 10 seconds (ascending) |

** **Remark:** The DP 110 comes standard with a 4...20mA output in 2-wire technique




| | | Pin 1 | Pin 2** | Pin 3 | Pin 4** | Pin 5 |
|---|---|---|---|---|---|---|
| DP 110 | **Connector plug** | +VB | NC | -VB | NC | NC |
| | | | | | | |

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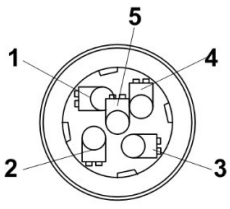
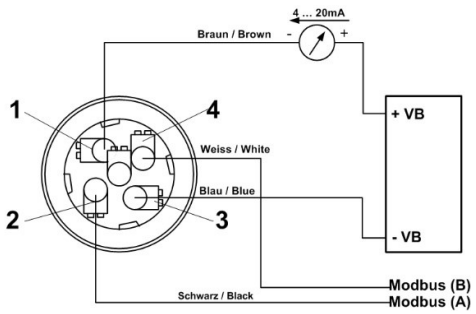
|---|---|
| +VB | Positive supply voltage 24VDC (10...30 VDC) smoothed |
| -VB | Negative supply voltage |
| NC | Not connected |

**M12 connector plug** **Wiring diagram**

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.

Connector plug



**Remark**: The sensor must be connected in strainless 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.

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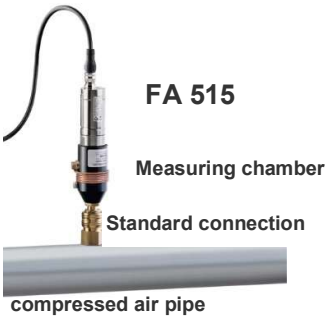
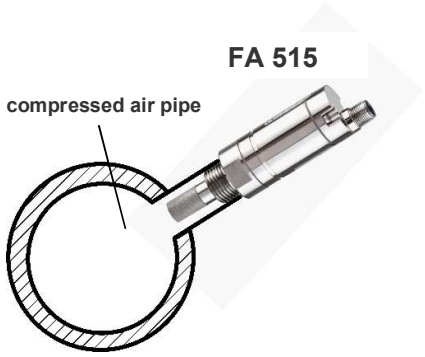
|  | **Indirectly in the compressed air system**<br><br>Connect probe with measuring chamber to the compressed air pipe by means of a quick coupling. In case of compressed air containing oil and dirt particles a pre-filter should be installed in front of the measuring chamber. Compressed air flows continuously (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. |
|  | **Directly in the compressed air system**<br><br>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. |

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|  **FA 515** | **Measurable gases**<br><br>In general, humidity can be measured in all non-corrosive gases. In case of measurements in<br><br>corrosive gases please consult CS Instruments GmbH. |

The FA515 comes standard with a 4...20mA output in 2-wire technique and an RS 485 Modbus output. But it can only be used either the analogue output 4...20 mA or RS 485 Modbus output. Both outputs can not be used at the same time due to the 4...20 mA 2-wire technology (low power).

**Change from 2 wire technolgy to Modbus and back requires the CS Instruments service software. (Order.No.: 0554 2007)**

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 Type 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<br>1 = 2400<br>2 = 4800<br>3 = 9600<br>4 = 19200<br>5 = 38400 |
| 2003 | 2002 | 2 | UInt16 | Parity | 1 | R/W | 0 = none<br>1 = even<br>2 = odd |
| 2004 | 2003 | 2 | UInt16 | Number of Stopbits | | R/W | 0 = 1 Stop Bit<br>1 = 2 Stop Bit |
| 2005 | 2004 | 2 | UInt16 | Word Order | 0xABCD | R/W | 0xABCD = Big Endian<br>0xCDAB = Middle Endian |
| 2006 | 2005 | 2 | UInt16 | Modbus Enabled | FA510: 1<br>FA515: 0 | R/W | 0 = Modbus disabled<br>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<br>1 = Temperature [°C]<br>2 = Temperature [°F]<br>3 = relative Humidity [%]<br>4 = DewPoint [°C]<br>5 = DewPoint [°F]<br>6 = Absolute Humidity [g/m3]<br>7 = Absolute Humidity [mg/m3]<br>8 = Humidity Grade [g/kg]<br>9 = Vapor Ratio [ppm]<br>10 = Saturation Vapor Pressur [hPa]<br>11 = Partial Vapor Pressure [hPa]<br>12 = Atmospheric DewPoint [°C]<br>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"**

## CALIBRAITON/ADJUSTMENT

### 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 DP 110 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 DP 110 is 12 months for the instruments 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.

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