



# Hydrophil Z 1701-40 Series A

## Operating Instructions

GA 990301



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# 1 System description

## 1.1 Function and applications



### *Function*

HYGROPHILZ 1701-40 is a probe for measuring the level of humidity in gases. The monitoring and control of gas humidity is essential in many processes in order to ensure products of consistently high quality, the economical use of energy, and compliance with permissible emission values.

The measuring principle is based on a special zirconium oxide sensor notable for its exceptional long-term stability and accuracy. The sensor delivers reliable measurement results, even under dust and dirt charged conditions and is suitable for gas temperatures up to 300°C.

Using a dual element sensor it is possible to eliminate the influence of strange gases.

Beside of measuring the humidity the probe can optionally determine the content of oxygen in the process air. In many applications there is no need, therefore, to provide an additional instrument for this purpose.

### *Applications*

As there is no need of any maintenance the process hygrometer HYGROPHIL Z 1701-40 is suitable for continuous duty in industrial processes.

Application examples:

- Textile tenter dryers
- Baking ovens
- Drying hoods
- Hot air tunnels
- Ceramics dryers
- Smoking chambers
- The food industry
- Animal feed dryers
- Roasting plants
- Calcining furnaces
- Plasterboard dryers
- Rotary kilns and the like

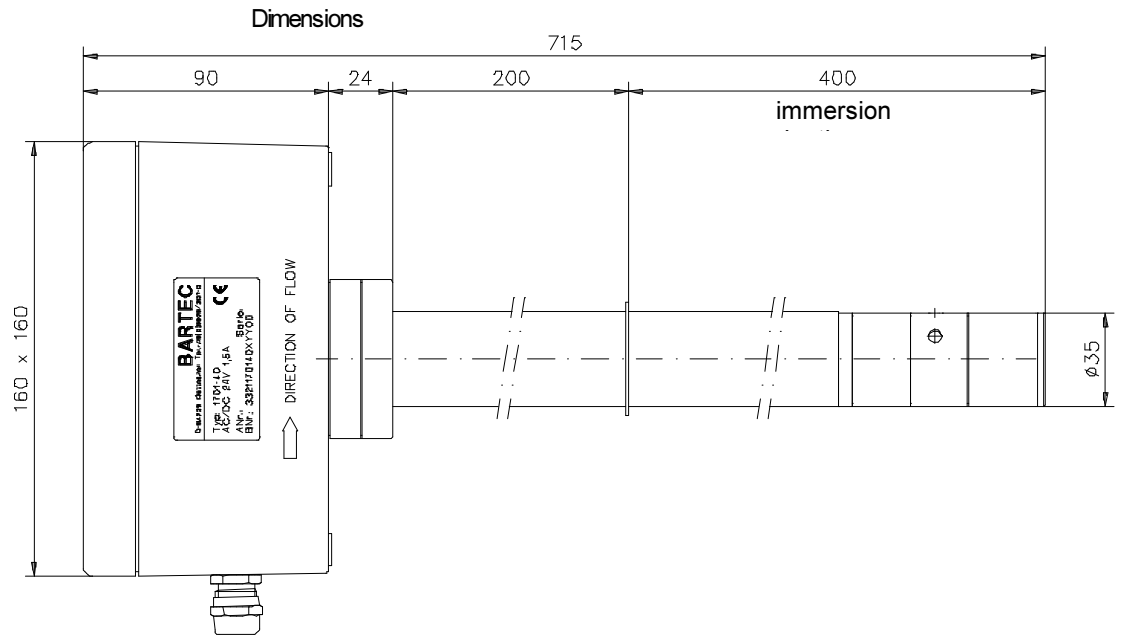


### **Instruction of corrosive gas**

SO<sub>x</sub>, H<sub>2</sub>S and vapor of silicone and adhesives will damage the performance of the sensor.

## 1.2 Technical data

Auxiliary energy	AC/DC 24V +10%,-15%, 35 VA; PG 9, screw-type terminals (Top/Top)
Output	Isolated analog output, 0/4...20 mA; 12 bit resolution; load max. 500 Ω; PG 9, screw-type terminals (Top/Top)
Operating temperature	Electronics: -10...+50 °C (climatic category JWE according to DIN 40040) Sensor tip: 0 °C to 300 °C
Storage temperature	Electronics section: -20...+70 °C ; sensor tip: 0...+70 °C, no condensation
Sensor calibration temperature	100 °C, 200 °C, 300 °C
Useful measurement ranges (sensor)	0.2...25 Vol% O <sub>2</sub> ; 0...98 °C DT*; 0.2...95 Vol% H <sub>2</sub> O; 1...1000 g/kg MH *additional computing error for DT: 20 °C < DT < 50 °C: ±2 °C DT; 50 °C < DT < 100 °C: ±0.5 °C DT
Programming via plug-in jumpers	Output: 0/4...20 mA Measurement ranges: [0...25 % O <sub>2</sub> ] 0...100 °C DT, 0...25% H <sub>2</sub> O; 0...50% H <sub>2</sub> O; 0...100% H <sub>2</sub> O; 0...250 g/kg MH; 0...500 g/kg MH; 0...1000 g/kg MH after request specific measurement ranges too
Reproducibility	±0.2 Vol% H <sub>2</sub> O
Measurement error limits	1 Vol% H <sub>2</sub> O
Temperature effect of electronics	max. 0.025%/K
Case	Die-cast aluminium case, 160 x 160 x 91 mm Protection type: IP 65
Sensor	Installation diameter: 35 mm Standard length: approx. 715 mm with 400 mm immersion depth Material: Stainless steel (material No.: 1.4305)
Response time	t <sub>63</sub> =5s
Warm-up time	approx. 10 min after a cold start and a power failure
Accessories	Mounting flange
Weight	3.12 kg
Order data	<u>Humidity sensor Type 1701-40</u> Order No.: 332 1 170 140 x yy z x: operating temperature; 0 =100°C, 1 =200°C, 2 =300°C yy: mounting length in dm (e.g. 04 = 4 dm = 0.4m), z: customer-specific programming (serial No.) <u>Mounting flange (accessory)</u> Order No.: 332 1 170 0106







## 2 Safety precautions

### 2.1 General information

These systems are built with due consideration to the regulations currently in force. They leave the factory in perfect condition after undergoing thorough inspection.

- Have the installation and maintenance of these systems carried out by qualified specialists only.
- Make sure that the data and operating conditions specified by BARTEC are observed.
- Study the operating instructions before installing and starting up the system. If you have questions concerning any particular aspects, contact our Customer Service for expert advice.
- Instruct your operating and maintenance personnel thoroughly and provide them with all essential information.
- The system's internal error messages are no replacement for safety devices in the larger facility in which the system is integrated.
- It is imperative to observe all the regulations which govern the operation of your facility.

### 2.2 Handling the humidity sensor

The life expectancy of the  $ZrO_2$  sensor can be increased if you observe the following mounting and operating instructions:

- If condensation should form on the sensor as the result of a temperature shock (condensate on the shaft, etc.), you must keep the sensor in storage under ambient conditions until the condensation has dried. Storage in a dry, warm place (e.g. near a radiator) accelerates the drying process.
- The sensor must be warmed up before you bring it into contact with the moist atmosphere at the point of measurement.

When using the sensor for the first time, wait for the "WARM-UP" phase to end (analog output current approx. 10min at error level; see also 4.3), before you mount the sensor at the point of measurement. During operation it is also important to make sure that moist gas ( $DT > 15\text{ °C}$ ) does not come in touch with the sensor until the sensor is warm.

The sensor should be switched on before all other parts of the facility.

- The sensor's life expectancy can be increased if it is switched on and off as rarely as possible. Ideally, the sensor should remain activated throughout its working life.
- The sensor has an operating temperature of up to  $300\text{ °C}$ ; contaminants are vaporized, therefore, provided the sensor does not come into contact with condensing substances (resins and the like) when cool.

Clean the sensor only when it is dry. Remove dust or soot deposits with a brush or compressed air up to 3 bar.



The internal temperature of the sensor may reach local peaks of up to  $500\text{ °C}$  during operation.

Never touch the sensor with your bare hands!

Never bring the sensor into contact with inflammable or liquescent materials!

## 2.3 Mounting instructions

- Mount the equipment so that the stipulated climatic values and temperatures are not exceeded.
- If at all possible, mount the equipment where it is unaffected by shocks and vibrations.
- Install a separate power supply line for the equipment.
- Avoid influences caused by electromagnetic fields, e.g. from motors, transformers and the like.
- If at all possible, keep the humidity transmitter away from contactor circuits. Where inductive consumers such as contactors, solenoid valves, large heaters etc. are installed in the vicinity, the contactor coil should be interference-suppressed with an RC element. All manufacturers of such devices are familiar with the problem and can supply suitable RC elements.



Metallic surfaces which can be touched (flange ,probe shaft) must not exceed a temperature of 55 °C!

The fitter is responsible for keeping this instruction by using adequate safety measures (sheet metal shields, cover plates).

## 2.4 Electrical installation instructions

- Before connecting the auxiliary power, make sure that the equipment's operating voltage (24V, see the rating plate) matches the actual supply voltage.
- Have trained specialists do the wiring work.
- The wiring of the mains connections and the choice of conductor material must comply with the regulations laid down in VDE 0100 or with your local regulations as well as with the specifications listed in the Technical Data.
- All sensor and signal lines have to be laid away from control and mains voltage lines (separate, independent cable ducts).
- Shielded measurement and signal lines provided by the customer are to be earthed at one end only on the equipment.

## 2.5 Operating instructions

- Voltage fluctuations are permitted only within the specified tolerances.
- After a power failure the transmitter will start automatically with a "warm up" phase. Measurements are then available again after approx. 10 min.
- If there are reasons for suspecting that the equipment can no longer be operated safely (e.g. due to visible damage), shut down the equipment and secure it against being restarted.



### Combustible gases

Use of the zirconium oxide sensor in explosive gases is prohibited. Temperatures inside the sensor can rise as high as 500 °C!

### Pollution gases

The sensor's life expectancy may be shortened if sulphur oxides, hydrogen sulphides or halogens get into the measurement gas!

### Dust and oil

Remove dust and oil deposits from the filters from time to time according to the degree of soiling.

#### Water

Drip water and hose water can destroy the sensor. Use filters or guard plates to protect the sensor from water. Ask us for advice if necessary.

## 2.6 Maintenance and repair instructions

- Live parts are uncovered when the humidity transmitter is opened. Be sure to disconnect the equipment from the voltage supply before you open any of these parts, e.g. for wiring or repair purposes.
- All repair or calibration work which requires the equipment to be open and the supply voltage to be activated must be performed only by specialists who are acquainted with the hazards involved.

#### *Exclusion of liability*

BARTEC accepts no liability for any damage resulting from non-observance of the safety regulations or from non-compliance with the operating instructions or operating conditions. This applies likewise to consequential damage in the facility as a whole.

## 2.7 Inspection and recalibration



Since the zirconium-sensors can be subjected to a drift depending on demand, we recommend an annual inspection and/or recalibration.



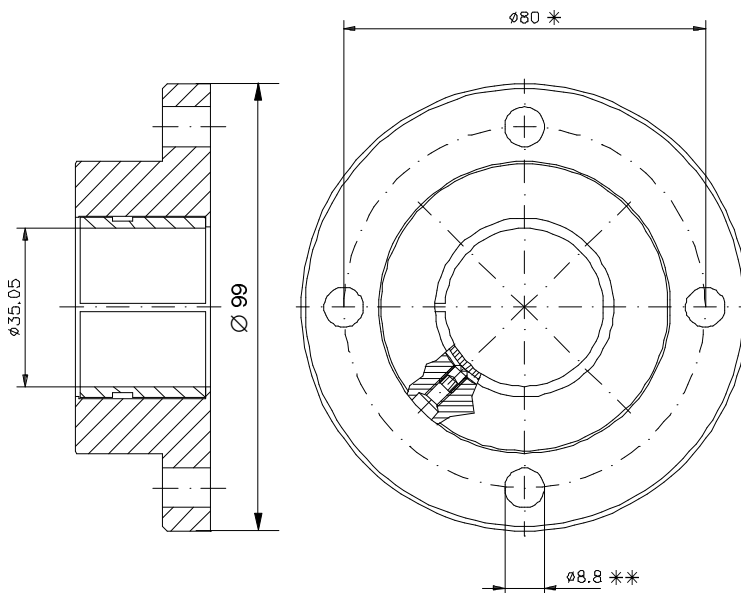
### 3 Installation

The humidity sensor can be mounted in any position according to the direction of flow.

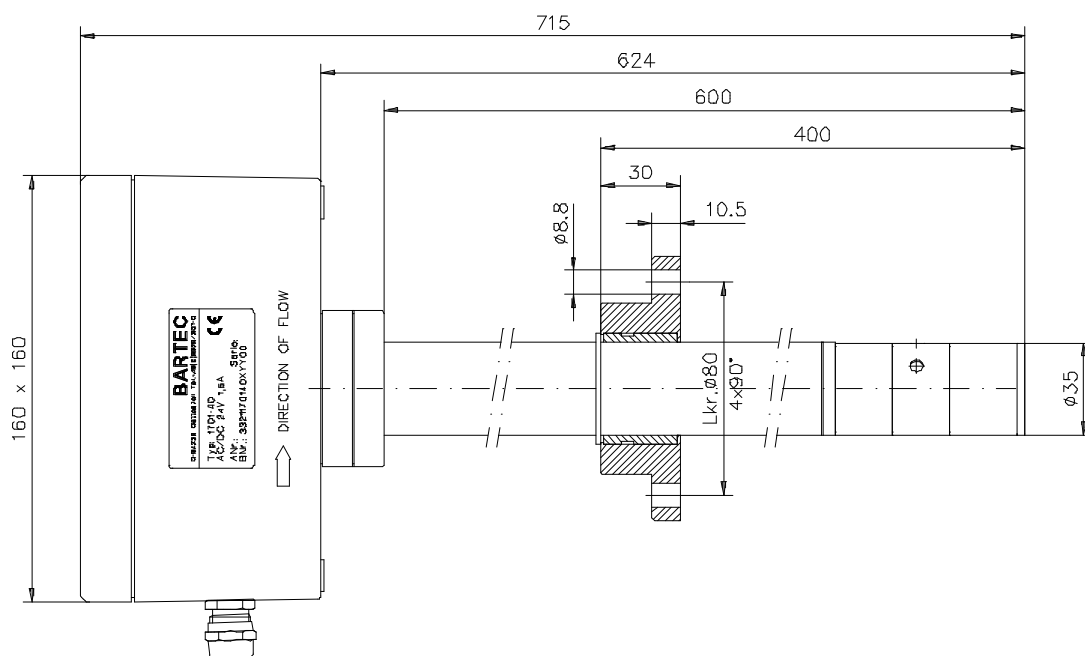
The following description is based on mounting the sensor with the flange available as an accessory.

If a different solution is used, proceed accordingly.

Flange Type 1700-107:  
 \*:  $\varnothing 110$   
 \*\*:  $\varnothing 18$

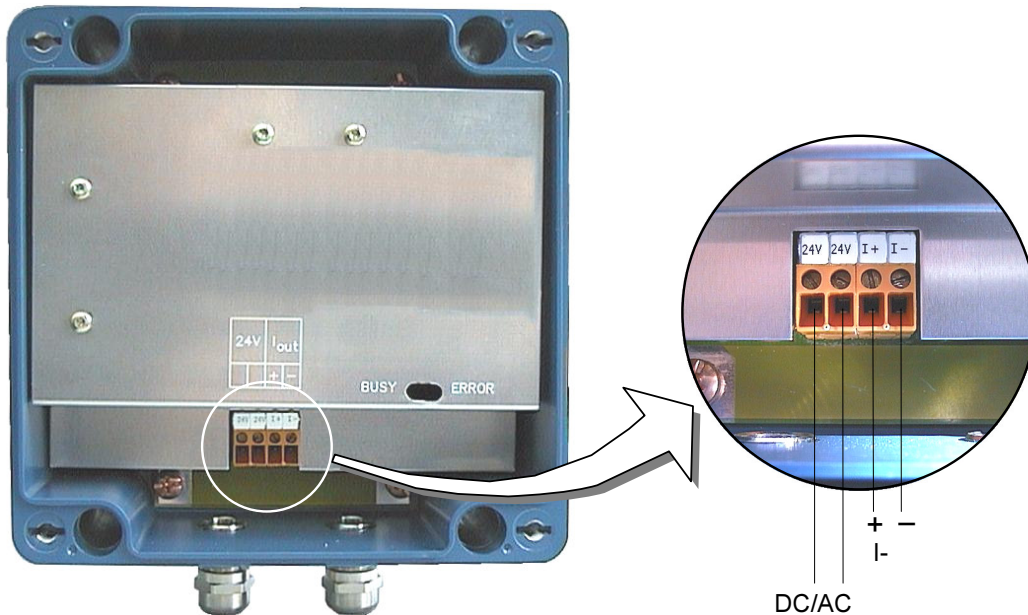


Mounting flange, Type 1700-106



Sensor with mounting flange

- Mount the flange for the humidity sensor at the point of measurement.
- Undo the four screws in the case lid and take off the lid.
- Make the electrical connections as indicated on the cover in the case. Wire up the connections of the auxiliary energy and the analog output.
- Refit the lid and screw in place.



Before you install the sensor, make sure that its rated temperature is suitable for the measurement gas temperature in question. The quoted level of accuracy and a satisfactory life span are only possible if the temperature of the measurement gas does not exceed the permissible sensor temperature.



- Observe the instructions set out in the Section "Safety precautions" when installing the sensor!
- The sensor can be mounted in any position provided you observe the direction of flow.
- Protect the measuring cell area from drip water and hose water, e.g. by using guard plates.
- If you install a baffle plate, be sure to allow for the direction of gas flow!

Under no circumstances is the sensor to be struck by drip water or hose water.

- Do not install the sensor at the point of measurement until the warm-up phase is over. A cold, unwarmed sensor may be installed only if it is certain that no condensation will form.
- If any filters, guard plates or air current reducers are required, fit them before you install the sensor. Use the arrow on the transmitter case to check the position of installation. The arrow indicates the "DIRECTION OF FLOW".
- Insert the sensor far enough into the flange for the actual measuring cell (the first 20 cm at the front) to be sufficiently immersed in the measurement gas. Be sure to keep a minimum distance of 100 mm from the chamber wall.

- Use the mark "DIRECTION OF FLOW" on the side of the case to check the position of installation.
- Fasten the sensor in the flange by tightening the screw of the clamping bush.

If the measurements drift away slowly or adopt implausible values (under otherwise constant gas conditions), the reason is a poor level of air exchange. Remove any filters that may be present.





## 4 Operation

### 4.1 Startup

To start up the measurement system, switch on the auxiliary power. Please remember to control the overall facility so that the sensor reaches its operating temperature before coming into contact with the moist measurement gas.



Never allow the humidity sensor to come into contact with the measurement gas until the warm-up phase is over.

When you start up the equipment for the first time, do not install the humidity sensor at the point of measurement until the sensor is warm or make sure that no moist measurement gas comes into contact with the sensor until the warm-up phase is over.



Never touch the hot sensor with your bare hands!  
Never bring the sensor into contact with inflammable or liquescent materials!

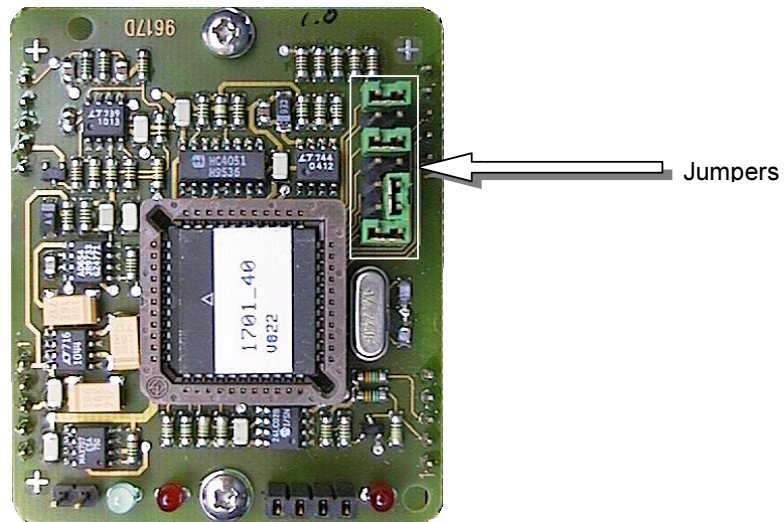
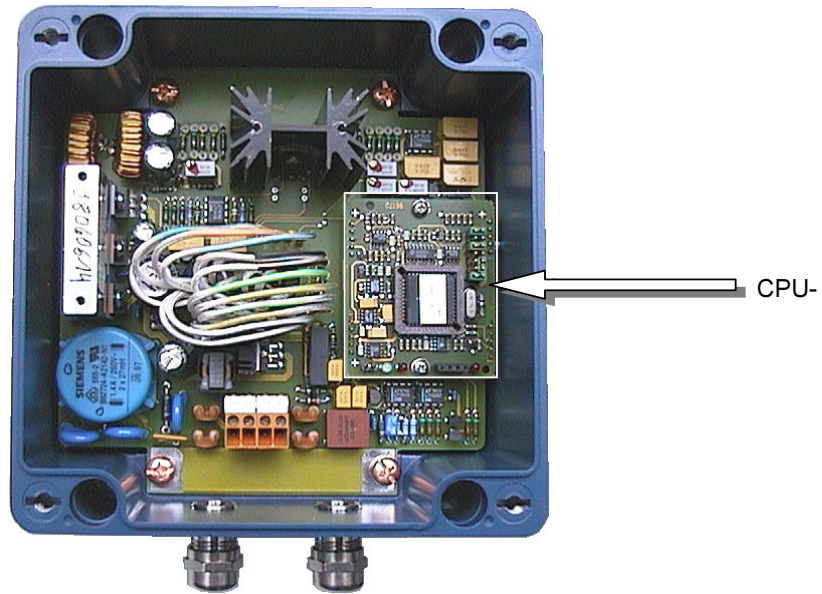


If there is a risk of condensed water forming when the facility is switched off, we recommend supplying the measurement system with auxiliary power and to keep it switched on all the time independently of the facility as a whole.

## 4.2 Programming

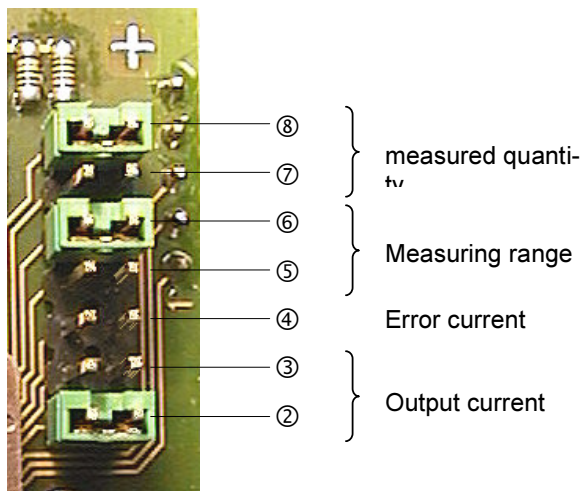
Where necessary, carry out the programming prior to starting up the system for the first time. The following settings are possible using plug-in jumpers:

- Select the measurement variable
  - Fix the measurement range for the selected measurement variable
  - Fix the error current level
  - Fix the output current range
1. Disconnect the equipment from the voltage source.
  2. Undo the four screws in the case lid and take off the lid.
  3. Undo the four holding screws in the cover plate and take off the cover plate.
  4. You will find the plug-in jumpers for the programming on the CPU board. Using tweezers or small pliers, carefully place the jumpers in position to match the required programming (see page 4-3).



*CPUboard*

Jumper numbers



Use jumpers 7 and 8 to select the measured quantity presented at the analog output.

Selecting the measured quantity	
Measured quantity	Jumper No.
Vol % O <sub>2</sub>	⑧
MH	⑦
DT	⑦ and ⑧
Vol % H <sub>2</sub> O	No jumper at ⑦ and ⑧ *

The measurement range is fixed with the jumpers 5 and 6 for the selected measured quantity.

Selecting the measurement range		
measured quantity	Measurement range	Jumper No.
H <sub>2</sub> O	0...25%	⑥
	0...50%	⑤
	0...100%	⑤ and ⑥
MH	0...250 g/kg	⑥
	0...500 g/kg	⑤
	0...1000 g/kg	⑤ and ⑥
DT	0...100 °C	⑤ and ⑥
Vol % O <sub>2</sub>	0...25%	⑥

The current output level when occurs an error is fixed with the jumper 4 (the LEDs „ERROR“ and „WAIT“ will be switched on at the same time)

Fixing the error current level	
Output current	Jumper No.
0 mA	④ not inserted
21 mA	④ inserted

The output signal from the analog output is fixed with the jumpers 2 and 3.

Fixing the output signal from the analog output	
Output signal	Jumper No.

0...20 mA	②
4...20 mA	③

If no jumpers are inserted, the default setting is used.  
 This means 0...100 Vol % H<sub>2</sub>O/ 0...20 mA output signal/ 0 mA error current!

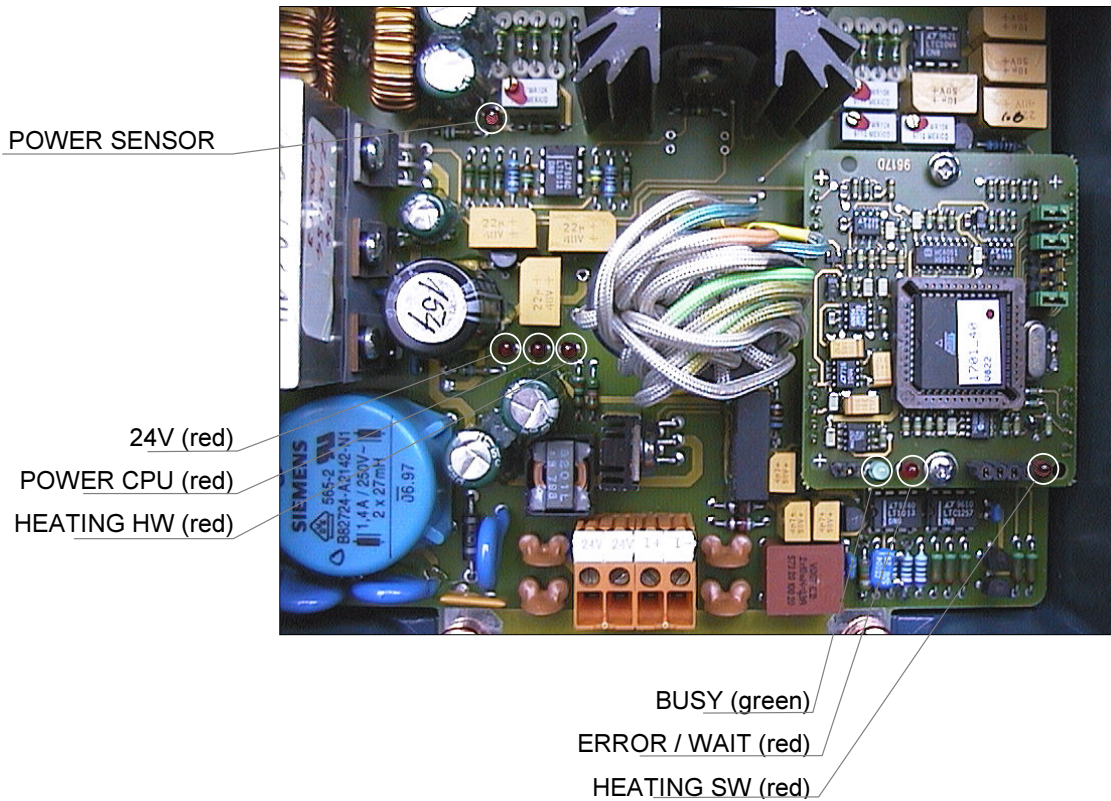
\* If there is present a customer-specific programming it will be used instead of the default settings.

### 4.3 Status messages

Various system statuses are indicated by LEDs on the motherboard and on the CPU board. The case lid has to be opened to check the LEDs. The printed circuit-boards are to be found underneath the cover plate. The LED "BUSY" and the LED "ERROR" are visible through a hole in the cover plate. For checking the other LEDs you must remove the cover plate.



Never operate the equipment for lengthy periods without the cover plate. The cover plate performs a cooling function. Components may be damaged during operation without the cover plate.





LED Designation	Status	Meaning
24V (red)	OFF	No supply voltage activated or the reversible fuse has blown
	ON	Supply voltage activated
POWER CPU (red)	OFF	The 5V supply is faulty
	ON	The 5V supply is OK
POWER SENSOR (red)	OFF	- During the "warm up" phase (for approx. 10 min) - When there is a sensor fault (after expiry of the fault-tolerant period (approx. 10 min))
	Shines with increasing intensity	When warming up the sensor elements (for approx. 10 min)
	ON	When the warming up is over
HEATING HW	Flashes together in rhythm with the regulator	Sensor heating OK, is being regulated to the right temperature
HEATING SW (red)	Both OFF	Heating is not activated
	Both ON	Heating with full power
	SW ON HW OFF	Defect in the heating system, do not carry on using the sensor in moisture!
	SW OFF HW ON	Defect in the heating control system, risk of overheating. Switch off immediately!
ERROR / WAIT (red)	OFF	No error, measuring mode
	ON	Error persists after the fault-tolerant period
	Flashes	Off or warm-up phase
BUSY (green)	OFF	- Fault-tolerant period (approx. 10 min) has expired - CPU does not start up
	Flashes	The program running as normal
	ON	CPU not running

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