



fill level



water level



pressure



temperature



flow



visualization



signal converter



sensoric



Technical manual

BA 0114

Hydrolog 3000

Water level sensor with data memory

for autonomous measuring and storing
of water levels and temperatures in liquids



- High accuracy and long term stable water level measurement
- Ceramic highly overload resp. pressure blow resistive membrane
- Food- and drinking water suitable materials
- Integrated temperature measurement
- Integrated battery for minimum 2 million measurements resp.
10 years operation at a measuring interval of 3 minutes
- Measuring rates from 1x per second up to 1x per 100 days
- Data memory for up to 216 000 measurement values
- Interface head up to 3m water column flood protected
- Installation in water level tubes 1 1/4" and wider

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1. Application

The water level sensor with data memory is a battery powered system for autonomous measurement of water levels from 1 m to 100m water column and temperatures in liquids, also in explosive hazardous areas, at environmental temperatures from - 25°C to +70°C.

The preferential application fields are water supply and distribution e.g. for measurement tubes, control levels, wells, containers and outstanding waters like lakes and rivers.

The excellent characteristics like highest strength against pressure and pressure blows, high resistance against chemicals and corrosion, very good insensitiveness against temperature shocks and EM interference, highest accuracy and long term stability as well as low influence of temperature makes it possible to use the sensor in various fields with liquids like water, waste water, solvents, oil, sludge, grease, cleaning agents, etc., where levels and temperatures combined with date and time should be surveillanced without having any auxiliary power at the place of installation.

For applications, where food or drink water suitability is necessary, a corresponding variant can be ordered where only suitable materials are used.

Because of many possibilities of adjustment a highest flexibility in the application for control level and especially for pumping test or long term surveillance is given.

2. Function

The liquid contacts directly the ceramic membrane and causes there a deflection of the membrane because of the hydrostatic pressure of the liquid.

At the maximum deflection the membrane contacts a robust ceramic carrier and because of this, the membrane come through over pressure of e.g. 40-times of nominal load at a sensor with a pressure range of 0...1 m water column without damage.

The water level proportional hydrostatic pressure signal of the ceramic membrane and also the measuring signal of an optional integrated temperature sensor is measured by the integrated high-resolution digital electronic according to the adjusted measurement rate and is stored loss protected.

Because of an intelligent store management the internal data memory with a size of 64kB resp. 128kB allows a recording of up to 107.00 resp. 216 000 measurement data sets.

An highly efficient lithium battery, which is integrated in the interface head, ensures the power supply of the device. The battery life time is conceived for minimum 2.000.000 measurements. This equals a run time of minimum 10 years at a measurement rate of 1x per 3 minutes.

Integrated over voltage protection modules prevents the destruction of the water level sensor caused by atmospheric influences like e.g. thunder strike.

The setting of the operation parameter, e.g. measurement place name, measuring unit, measuring rate or control value and the data retrieval from the water level sensor is operated in combination with the operation software alternatively directly per cable or wireless per GSM/GPRS remote data transmission (RDT) (only data retrieval) to a PC resp. FTP server.

The software allows a comfortable and flexible adaption to the various requirements of the respective measurement place.

At a directly per cable connected PC resp. handheld-PC a real time view of the measuring values of the water level sensor with a measuring rate of 1x per second is possible.

For the more comfortable wireless remote data transmission a battery powered GSM RDT can be used to configure the water level sensor resp. to read out the measuring values without the need to go to the place of installation.

By this the configuration resp. measuring values can be transmitted directly per GSM network between the RDT module and the PC.

Alternatively, the measuring **values can be transmitted by GPRS to an FTP server, to make the data's worldwide available per internet.**

When using the RDT module the active use of an alarm function is possible that informs immediately and continuously by SMS messages about the actual measuring values if the measuring value exceeds a freely adjustable limit measuring value.

The **settings of the water level sensor are protected against unauthorized changing's and can only be changed after the input of the valid password.**



3. Safety notes

Each person that is engaged with inauguration and operation of this device, must have read and understood this technical manual and especially the safety notes.

Installation, electrical connection, inauguration and operation of the device must be made by a qualified employee according to the informations in this technical manual and the relevant standards and rules.

The device may only be used within the permitted operation limits that are listed in this technical manual. Every use besides these limits as agreed can lead to serious dangers.

The materials of the device must be chosen resp. checked for compatibility with the respective application requirements (contacting materials, process temperature)

An unsuitable material can lead to damage, abnormal behavior or destruction of the device and to the resulting dangers.

The device meets the legal requirements of all relevant EC directives. 

4. Installation

The water level sensor can be mounted into water level tubes wider than 1 1/4".

The installation in wider water level tubes than 2" is made by using adapter rings.

In water level tubes wider than 2" a control plumbing with a cable light plumbline without deinstalling the sensor is possible.

The stabile carrying cable with steel axis for strain relief that is necessary to ensure the length stability of the cable, with shield for EMC protection and pressure balancing capillary for compensation the environmental air pressure guarantees an interference-free operation of the water level sensor.

The probe of the water level sensor is put into the medium by the carrying cable.

The carrying cable may not be folded and the cable sheath may not be damaged.

The cut of the carrying cable may only be made by the manufacturer.

A holding ring at the interface head fixes the water level sensor in the filler cap.

The construction of the interface head allows those damage protected flooding up to 3m water column.

Avoid faulting the pressure compensation openings resp. damaging pressure compensation membrane inside it at the bottom side of the interface head.

The hindrance of the air pressure compensation can lead to faulty measurement results. At a damaging of the pressure compensation membrane the flood protection of the interface head is no more longer ensured.

The correct function of the device within the specific technical data can only be guaranteed, if the permitted environmental and process temperatures will not be exceeded.

5. Electrical connection

The electrical connection of the device must be carried out according to the respective country specific standards. Incorrect installation or adjustment could cause applicationally conditioned risks.

Auxiliary power supply

The connection of a separate auxiliary power supply is not necessary, because the device is powered by an integrated lithium battery. **Information to the battery exchange are noted in the chapter „maintenance“.**

Communication interface

For the communication with other devices, the water level sensor is equipped with a RS485 interface.

For the direct communication by cable to the RS232 interface (COM port) resp. USB interface of the PC a special interface cable is used.

To connect the interface cable, at first the protection cap, that protects and seals the socket, must be removed from the interface socket.

The plug of the interface cable can only be plugged in the correct orientation.

A red mark at the plug and at the socket shows the correct orientation.

The plug must be fully inserted into the socket.

To ensure the tightness of the interface socket at removed plug, the protection cap must be fully inserted into the socket.

6. Operation

Detailed informations to the operation parameter and the operation can be found in the technical manual of the operation software.

7. Maintenance

The device is free of maintenance.

Special substances can lead to solid coatings on the membrane.

Such depositions can lead to faulty measurement results of the pressure sensor.

In the case of coat forming liquids the membrane must be regularly cleaned e.g. with clear water.

Don't use sharp tools or aggressive chemicals for cleaning.

Battery exchange

A battery exchange can only be made by the manufacturer.

The attempt of the user, to change the battery resp. to open the probe housing, the device can be damaged resp. destroyed. This leads to the expiration of all rights to claim under guarantee.

8. Repair

A repair may only be carried out by the manufacturer.

If the device must be sent back for repair, the following informations must be enclosed:

- An exact description of the application.
- The chemical and physical characteristics of the product.
- A short description of the occurred error.

Before returning the device for repair, the following measures must be proceeded:

- All stick product residues must be removed. This is especially important, if the product is unhealthily, e.g. caustic, toxic, carcinogenic, radioactive etc.
- A returning must be refrained, if it is not possible by 100% to remove the unhealthily product completely, because e.g. it is penetrate into cracks or is diffused through plastic.

9. Technical Data

Auxiliary power supply

Supply voltage:	Integrated lithium battery, exchangeable only by manufacturer
Battery run time:	$\geq 2.000.000$ measurements resp. ≥ 10 years at a measuring interval of 1x each 3 minutes

Input water level

Measuring range:	1m water column up to 100m water column
Measuring units:	mWs / cmWs / bar / mbar / mNN / mAbsenkung
Measuring range resolution:	$\leq 0,01\%$ FS ²⁾
Characteristic deviation ^{3) 5) 12)} :	$\leq 0,1\%$ resp. 0,25% FS ²⁾
Temperature deviation ¹²⁾ :	T _k ⁴⁾ Zero $\leq \pm 0,15\%$ FS ²⁾ / 10 K, max. 0,75K T _k ⁴⁾ Span $\leq \pm 0,15\%$ FS ²⁾ / 10 K, max. 0,5K
Long term drift ¹²⁾ :	$\leq \pm 0,15\%$ FS ²⁾ / year not cumulative

Input temperature

Measuring range:	-25°C ... +70°C
Accuracy:	$\leq \pm 0,3$ Kelvin
Measuring range resolution:	$\leq 0,1$ Kelvin
Long term drift:	$\leq \pm 0,2$ Kelvin / 1000 hours

Clock

Type:	Real time clock
Cycle accuracy:	$\leq \pm 1$ minute / month

Datenspeicher

Memory capacity:	64kB > 10 700 ... 107 000 data records > 8 000 ... 80 000 data records	water level water level / temperature
	128kB > 21 600 ... 216 000 data records > 16 200 ... 162 000 data records	water level water level / temperature
Storage method:	Intelligent memory management. Measuring values are only stored at a exceeding of a minimum deviation, but always at a minimum of every 10 th measuring cycle	
Memory organization:	Circle memory active > at overflow overwriting of the oldest data records Circle memory inactive > memory is written only once	
Measuring rate:	one measuring per 1 second up to one measuring per 100 days	
Operation / data retrieval:	Operation software or RDT module	
Data processing:	Graphic data evaluation resp. data export as excel-, ASCII-, Hydras3- or Wiski-file resp. real time evaluation with measuring rate 1x per second and graphical evaluation by operation software	
Alarm management:	Surveillance of the measurement signals on exceeding the preset limit values with alarm message per SMS message by RDT module and separately adjustable alarm measuring rate	

Interface

Type:	RS485 - full-duplex
Transmission rate:	9600 Baud

²⁾ Referring to nominal measuring span resp. full scale (FS)

³⁾ Nonlinearity + Hysteresis + Reproducibility

⁴⁾ Tk = Temperature coefficient

⁵⁾ Limit value adjustment

¹²⁾ Higher values for special measuring range

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Materials

Membrane:	Ceramic AL ₂ O ₃	96%
(medium contact)		
Sensor housing:	Steel 1.4404 (AISI 316L) / 1.4571 (AISI 316Ti)	
(medium contact)		
Carrying cable:	PE polyethylene	
(medium contact)		
Interface head:	CrNi-steel	
Holding ring:	Aluminum	
Socket / cap:	Socket brass nickel plated / chrome plated, insert PBT/PUR, contacts gold plated	
Pressure compens. element:	Filter membrane PES	
Gaskets:	medium contact	> FPM – fluorelastomere (Viton®) EPDM – ethylene-propylene-dienmonomere
	others	> FPM – fluorelastomere (Viton®)

Environmental conditions

Environmental temperature: - 25°C...+70°C, ice-free

Measuring range: 0...1mWs to 0...100 mWs

Overload resistance:

Measuring range	Overload / Burst pressure
0...1 mWs	+5 bar _{rel}
0...2 mWs	+5 bar _{rel}
0...4 mWs	+6 bar _{rel}
0...5 mWs	+10 bar _{rel}
0...6 mWs	+10 bar _{rel}
0...10 mWs	+10 bar _{rel}
0...20 mWs	+15 bar _{rel}
0...40 mWs	+25 bar _{rel}
0...50 mWs	+40 bar _{rel}
0...100 mWs	+40 bar _{rel}

Vacuum resistance: 0 mbar_{abs}

Weight: 0,55 kg + (Sensor length L in meter x 0,035 kg)

Protection classification: Sensor IP68 DIN EN 60529
Interface head IP68 up to 3 mWs DIN EN 60529

Climatic classification: 4K4H EN/IEC 60721-3-4

Shock classification: 50 g EN/IEC 60068-2-27 (11 ms)

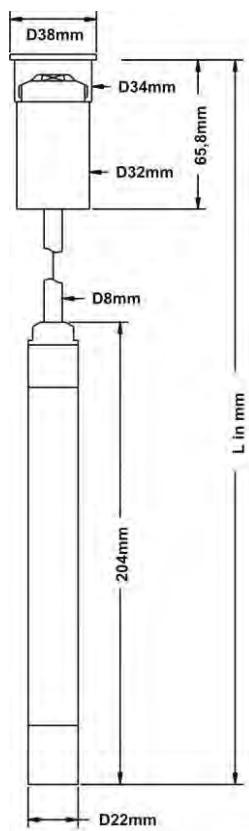
Vibration classification: 20 g EN/IEC 60068-2-6 (10 - 2000 Hz)

EM – compatibility: emission DIN EN 61326-1 operation device class B
immunity DIN EN 61326-1 industrial range

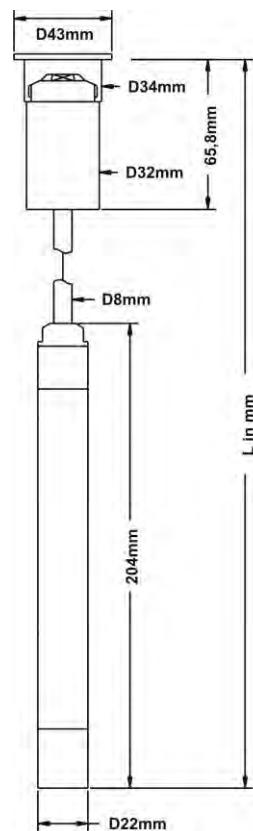
Reference conditions: EN/IEC 60770-1 resp. EN/IEC 61003-1
T = 25 °C, rel. humidity 45...75 %, environm. air pressure 860...1060 kPa

10. Dimension drawings

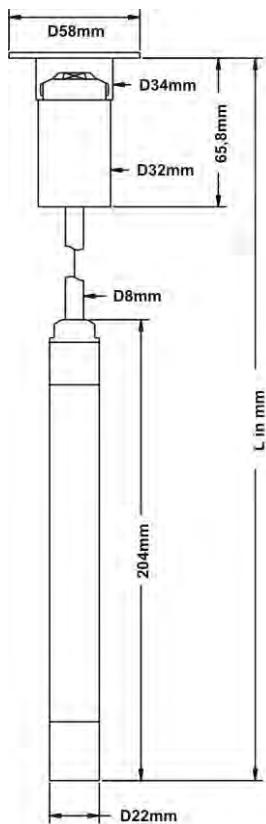
Process connection 14



Process connection 12



Process connection 20



11. Order code overview

Type:

- O Standard
T Certificate for food and drink water suitability of all liquid contacting materials

Process connection:

- 14 Mounting into 1 ¼" water level tube control measurement without removal not possible
12 Mounting into 1 ½" water level tube control measurement without removal not possible
20 Mounting into 2" water level tube control measurement without removal possible

Measuring signals:

- S Water level
T Water level and temperature

Accuracy meas. system *) – material meas. membrane (medium contact):

O 0,25%	ceramic AL ₂ O ₃	96%
K 0,1% linearization protocol	ceramic AL ₂ O ₃	96%

Measuring range:

- A 0...1 m water column (mWs)
B 0...2 m water column (mWs)
C 0...4 m water column (mWs)
M 0...5 m water column (mWs)
D 0...6 m water column (mWs)
E 0...10 m water column (mWs)
F 0...20 m water column (mWs)
G 0...40 m water column (mWs)
J 0...50 m water column (mWs)
H 0...100 m water column (mWs)
Y special measuring range separate spec. necessary

Memory capacity:

- 0 64 kB max. 107 000 data records water level
max. 80 000 data records water level and temperature
1 128 kB max. 216 000 data records water level
max. 162 000 data records water level and temperature

Material sensor (medium contact):

- 1 Stahl 1.4404 (AISI 316L) / 1.4571 (AISI 316 Ti)

Material gaskets (medium contact):

- 1 FPM fluorelastomere (Viton®)
3 EPDM ethylene-propylene-dienmonomere

Material carrying cable (medium contact):

- A PE polyethylene

Sensor length L (see dimension drawings):

Measure in mm

Hydrolog 3000 _ _ _ _ _ 1 1 _ A _

Installation material and connection cable are not enclosed in the delivery contents.

*) Higher values at special measuring range



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