



PH-1300A pH analyser for zinc plants with automatic cleaning of the electrodes

Technical data

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PH-1300A

PH-1300 is an automatic on-line pH measuring instrument with cleaning of the electrodes. The pH value of the solution is measured discontinuously.

The instrument is a complete working unit for sampling, measuring and washing of the electrodes. It has 4-20 mA output and Modbus RTU computer interface. Since the cycle time is very short, the measurement can be used as a continuous measurement.

Proven technology

The instrument is built on 40 years of experience with design, construction and sale of pH analysers to zinc plants.

The instruments have been sold to zinc plants world-wide. The first model was developed at the Norzink zinc plant in Odda 1971. In the early 1980's Arve Halland, (owner and managing director of Halland Instruments AS) then employed by Norzink developed a new model, it was called "SLURpH" this model replaced the first generation and many zinc plants bought this analyser. In 1998 Norzink decided to focus on core business, zinc production, and the instrument business was handed over to Arve Halland, this was the start of Halland Instruments AS. In 1999 the third generation of PH analysers were developed, the model PH-13. These analysers were sold to several zinc plants. For instance Hindustan zinc bought analysers for the three new zinc plants they build in 2004, 2006 and 2008. The experiences we got from commissioning and servicing these new plants in Rajasthan in India (with ambient temperatures up to 50 degrees centigrade) was one of the reasons for us to develop a new analyser, the model PH-1300A. The PH-1300A analyser has been sold to the "Norzink" zinc plant (ca 20 analysers) in Odda, to Votorantim in Brazil (Juiz de Fora, 19 analysers), Glencore in Italy and Argentina, Met.Mex Penoles in Mexico and Teck in Canada.

Every new design has been based on the knowledge experience gathered from the older designs. The knowledge is not from one zinc plant or one person but from many zinc plants and many persons who has been dedicated to measuring the pH in the plants as accurate and reliable as possible.

Automatic cleaning system for the electrodes

Only a clean pH sensor can provide accurate and reliable measurements. With our system the electrode is kept clean automatically. The instrument has a system for dosing and cleaning the electrodes with an acid or other suitable detergent. To prevent the reference electrode from being poisoned by the process solution we use a flowing type electrode with overpressure. The analyser is equipped with a KCl reservoir with safety valve.





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Regular sensor cleaning ensures:

- Increased process safety due to accurate, reliable measurement
- Defined and consistent product quality
- A greater reproducibility of measurements for better process control
- Replacement/maintenance costs savings due to an extended lifetime of electrode

Function

The instrument sucks a sample from the process, to a measuring cell, where the pH is measured. Then the sample is returned to the process. The instrument then sucks up 4 ml of a suitable **detergent**, for instance acid, from a detergent container. The frequency of washing with detergent is programmable. The dose is measured and the instrument gives a warning if no detergent (acid) is available. The dose can be adjusted. The pH electrode is sprayed with this solution from a powerful spray nozzle underneath, and afterwards the pH electrode is sprayed with water from the same nozzle. Then the nozzle sprays water against the suction circuit, and at the same time the vacuum ejector (pump) is started. Water is sucked into the suction circuit (tube, valve and water ejector) and it is cleaned. Then the cycle repeats itself.

Modes of operation

- Normal: The instrument is running continuously.
- Modbus batch process mode: A Modbus start command starts the analysers, when the instrument receives a stop command the current cycle is finished and the instrument stops.
- Fixed intervals; the instrument executes one cycle for instance every 10 minutes.
- On demand: The instrument executes one cycle when it receives a Modbus start command followed by a stop command.

Some typical applications in zinc plants

- Neutral leach, automatic control.
- Jarosite precipitation stages, automatic control.
- Gypsum removal, automatic control of acid flow.
- Purification stages
- Wastewater treatment, automatic control.



Advantages and earnings

- Automatic washing prevents dirtying, deposits and contamination of the electrodes. This results in stable measurements, and makes it possible to optimize the process.
- Cleaning of the electrode gives long electrode life. The electrode is only in contact with the solution in a limited time, the measurement cycle, which also gives long electrode life. The low consumption of electrodes does, in many cases, the procurement of the instrument cost saving.
- High measuring accuracy. This makes accurate process control possible
- It is very easy to calibrate the instrument. It is only necessary to stop the instrument few minutes for calibration. Simple procedure – push-button calibration. No special skills are needed for the calibration and maintenance of the instrument.
- The electrode is protected against mechanical strains - no risk of broken electrodes.
- It is very easy to replace the electrodes.
- PH-1300A can use a large selection of chemicals in addition to water spraying for cleaning of the electrodes.
- It is easy to install the instrument; normally no encroachment in the process equipment is required. The instrument can for instance take the sample from a tank or a launder.
- Reliable and patented system for sampling. Suction circuit; vacuum-pump, valve and connections are cleaned automatically.
- Uncomplicated mechanical design, with few parts, gives reliable operation and little maintenance. It is designed in such a way that it is easy to carry out the maintenance.
- It is very easy to change the times, for instance for emptying, spraying and measuring, and to set the measurement range etc.
- The built-in Modbus RTU interface makes it very straightforward to communicate with a process control computer or PLC. The temperature is also available through the Modbus line.
- It is possible to start and stop the analyser via the Modbus line.
- Sophisticated intelligent monitoring; of measured value and electrode response. The instrument gives warning with the alarm relay and message on the Modbus line if the electrode response is abnormal or if the measurement is abnormal. These functions can be switched off if they are not needed.
- The instrument can be mounted where it is easy to access it for calibration and maintenance.

Is designed for measuring of the pH of slurries with high temperatures

The instrument can be used to measure the pH in solutions with temperatures over 100 degrees centigrade. It can be used to measure the pH of slurries with particle sizes up to 5 mm in diameter. The instrument can be used to measure the pH of most chemical solutions.

Maintenance

The instrument is design for easy maintenance. No special skills are needed for the maintenance and the calibration of the instrument.



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Patented

Norwegian patent no. 322 522. International priority application no. PCT/NO2006/000011

Installation

It is easy to install the instrument. Normally no encroachment in the process equipment is needed for taking the sample. The cabinet should be mounted in normal working height for easy access. Mount the instrument close to or on tank, basin or launder. Can be mounted maximum 4 meters over the sampling point, the length of the suction tube should anyway be no more than 10 meters.

Electrical connections

RK1 terminal No.	Description
26	4-20 mA output, +10-24 volts for feeding the mA loop.
12	4-20 mA output, return 4-20 mA, connect load from here to 0 (-10-24V)
9/23	+ for RS485/MODBUS
10/24	- for RS485/MODBUS
11/25	Screen RS485/MODBUS Cable
8	Alarm signal output +, normal operation +24 VDC, alarm 0 VDC. Wire terminals 8/22 to alarm relay or galvanic isolated digital input on process control computer or warning system.
22	Alarm signal output - (0 VDC)
3	Digital input for remote start/stop signal. Wire terminals 3/17 to external contact for remote start/stop (relay contact or switch).
17	Digital input for remote start/stop signal
RK3 terminal No.	
1	230 VAC
2	230 VAC
3	Earth, preferably local earth

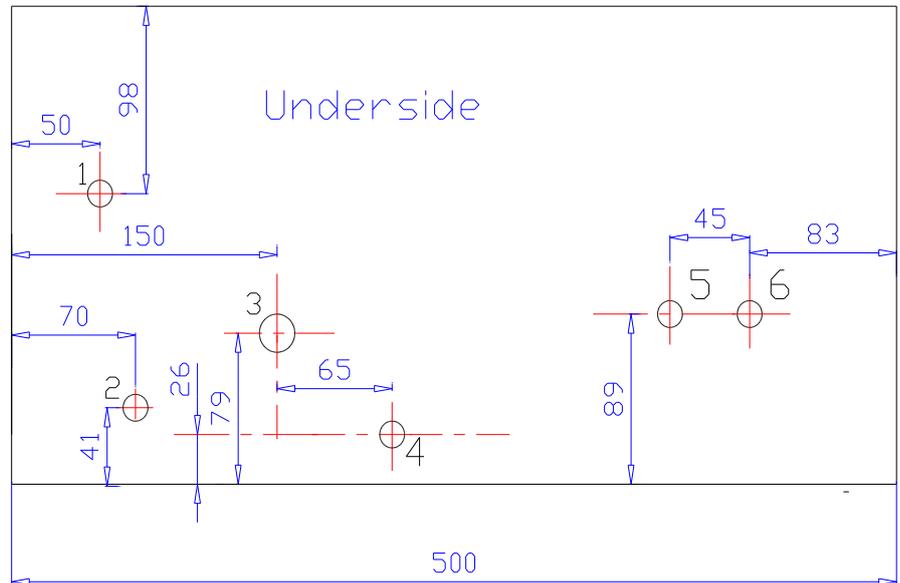
The pH measurement, the temperature, the step number in operation and the warnings are available over the Modbus line.



Electronic unit

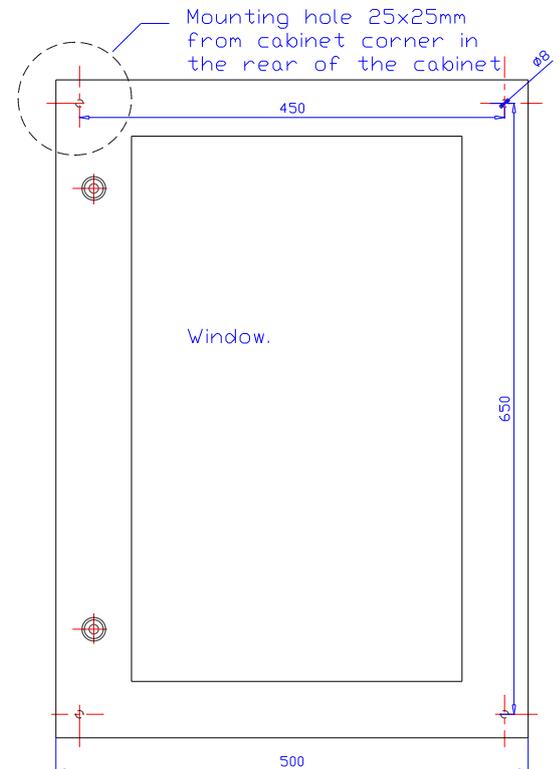


Mechanical dimensions



Connections from left to right:

1. Pressurized air in (8 mm or 5/16" tube)
2. Washing water in, hot or cold (8 mm or 5/16" tube)
3. Acid in (8 mm or 5/16" tube)
4. Process solution in/out (12 mm tube)
5. Safety valve exhaust (8 mm or 5/16" tube)
6. Ejector exhaust (8 mm or 5/16" tube)





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Specifications

Water pressure.....3-7 bar.

Air pressure.....4-7 bar

Detergent consumption (washing freq. is programmable)...4-20 ml per wash.

Suction height (from vessel, duct etc to cabinet).....6 meter water column.

pH range.....0 to 14 pH.....Span....1-14 pH.

Temperature.....0-100 °C.

Accuracy, transmitter.....0.01 pH.

Power supply.....110 or 230 volt AC.

Power consumption.....35 Watt.

Internal tubing.....Teflon .

Electronic enclosure.....IP 65.

Cabinet (Stainless steel with glass window).....IP 65.

Outer dimensions.....500x700x250 mm.

Weight ca.....27.5 kg.

Outputs:

4-20 mA loop powered, maximum load 950 Ω at 24V dc, linearity and offset error max 0.1 %.

Alarm signal: 24 VDC, 0.5 A. RS485 (Modbus RTU) computer interface (1 start bit, 8 data bits, 2 stop bits, 9600 baud). All outputs are galvanic isolated from the measuring circuits and from each other.

