



ORP-1400 ORP analyser with automatic cleaning of the electrodes

## Technical data

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Contents	What is ORP-1400
	Dimension drawings
	Electrical connections
	Specifications





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## ORP-1400

ORP-1400 is an automatic on-line REDOX analyser with an advanced system for cleaning of the electrodes. The pH value of the solution is measured discontinuously. Since the cycle time is very short, the measurement can be used as a continuous measurement. The analyser is a complete working unit for sampling, measuring and cleaning of the electrodes. The analyser has 4-20 mA output, alarm output and a Modbus RTU computer interface.

### Function

The instrument sucks a sample from the process, to a measuring cell, where the ORP 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 electrodes are sprayed with this solution from a powerful spray nozzle underneath, and afterwards the electrodes is sprayed with water from the same nozzle. Then the cycle repeats itself.

### Proven technology

The ORP-1400 pH analyser is the result of 40 years of experience with design, construction, servicing and sale of pH and ORP analysers to the industry.

The Norzink/Halland analysers have been sold to zinc plants world-wide for 40 years. The first model was developed at the Norzink zinc plant in Odda 1971. In the early 1980's Norzink developed a new model, it was called "SLURpH" this model replaced the first generation and many zinc plants bought this analyser. In 1998 the business was handed over to Halland Instruments AS. In 1999 the third generation of pH analysers were developed, the model PH-13. Hindustan zinc bought many analysers for the three new zinc plants they build in 2004, 2006 and 2008. The experiences we got from commissioning and servicing these plants in Rajasthan in India, with ambient temperatures of 50 degrees centigrade, were the reasons to develop a new analyser, the model PH-1300. The analyser has been developed even further and is today our product the ORP-1400 REDOX analyser.

### 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. The suction height is maximum 6 meters water column. Generally, we recommend that the suction tube should be less than 10 meters long or as short as practically possible. In the zinc industry we have well-functioning installations in the neutral leach and in the jaraosite iron precipitation stage with suction tubes that are more than 25 meters long.



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The analyser is designed for harsh environments.

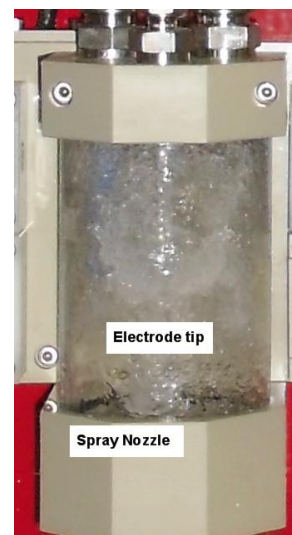
The analyser is designed for the harsh environment in chemical industries with high ambient temperatures, acid, dust and gasses. The analyser can be mounted outdoors or indoors. The analyser cabinet is made of stainless steel. The analyser is also available in a glass fibre reinforced polyester cabinet for installation in environments where for instance chlorine is a problem. The analyser is designed to tolerate the electrical noise and the fluctuations in the supply voltage which often occurs in the industries.

Unique patented system for cleaning of the wetted parts

Reliable and patented system for sampling. The mechanical unit is kept clean by a unique patented system. The suction circuit; vacuum-pump, valve and connections are cleaned automatically.

Automatic cleaning system for the electrodes

Only clean sensors can provide accurate and reliable measurements. With our system the electrodes are kept clean automatically. The spray nozzle is spraying the electrodes from below and cleans the sensor surface mechanically. The instrument has a system for dosing and cleaning of the electrodes with an acid to prevent build-up of physical or chemical coating. The analyser is designed for using cold or hot water for spraying of the electrodes. To prevent the reference electrode from being poisoned by the process solution we use a flowing type of reference electrode with overpressure. The analyser is equipped with a KCl reservoir for the reference electrode.



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

The analyser is designed for measuring the ORP of slurries with very high temperatures

The analyser is designed for measuring the pH of solutions with high temperatures, up to 100 degrees centigrade, high solid content and high ionic strength.



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## Modes of operation

- Normal: The instrument is running continuously.
- For batch processes: A Modbus start command or a 24 volt signal starts the analysers and the analyser runs continuously until a stop command or a 0 volt signal is received, then the current cycle is finished, and the analyser stops.
- Fixed intervals; the instrument executes one cycle for instance every 10 minutes.

## Industries

- Zinc production
- Electroplating industry
- Wastewater treatment
- Cobalt production

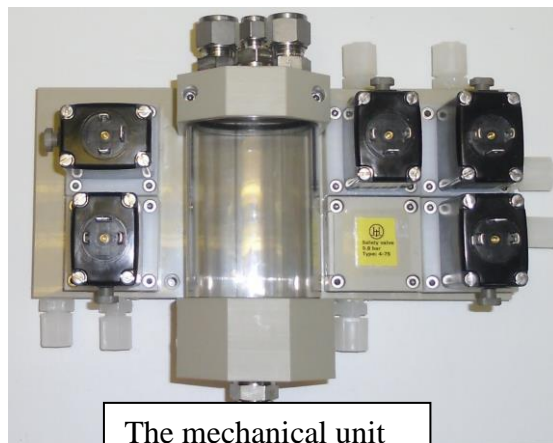


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The analyser is design for easy maintenance

No special skills are needed for the maintenance and the calibration of the instrument. The analyser has one mechanical unit, all the valves and the mechanical components, except the air pressure regulators and the ejector, are mounted on a manifold with the same type of O-ring sealing as used on hydraulic manifolds. The advantage is that the valves and the other components can be replaced for repair without disconnecting any tube fittings. It is also very fast and easy to replace the complete unit for instance for preventive maintenance after a lengthy period of operation. The internal tubing is made of high quality plastic materials, Teflon tubing and Kynar (pvdf) fittings.

The analyser has one proprietary electronic unit with one electronic circuit board. This advanced design eliminates many possible causes for errors, since the alternative is a much more complicated design with a PLC, advanced pH transmitter, electronics for dosing acid, level control, user communication unit and wiring. It is easy to replace the unit if needed.



The mechanical unit



The electronic unit

Summary: Advantages and earnings

- Automatic cleaning of the electrodes by spraying the electrodes from below cleans the sensor surface mechanically and cleaning with chemicals prevents build-up of physical or chemical coating. This results in stable measurements.
- Cleaning of the electrode gives long electrode life. And 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.
- Very high short-term and long-term accuracy. This makes accurate process control possible.
- Very long life-time of the electrodes, many months or even years even in very difficult solutions for ORP measurement. It is not possible to get high long-term accuracy without long electrode life. The low consumption of electrodes by it selves does, in many cases, the procurement of the instrument cost saving.
- The electrode system is designed in such a way that the reference electrode can never be poisoned.
- The electrodes are in controlled pressure conditions. The electrodes are protected against mechanical strains - no risk of broken electrodes.



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- Other systems require calibration daily or even several times daily to provide high accuracy. Our analyser gives high accuracy even with weeks' or even months' interval between calibrations.
- It is fast and easy to calibrate the analyser, there is no sample head which must be dismantled for calibration. No special skills are needed for the calibration and maintenance of the instrument and it is only necessary to stop the analyser few minutes for calibration. It is also fast and easy to replace the electrodes.
- Easy to operate, logical menu structure. Easy-to-use one- or two point-calibration procedures with ORP buffer solutions or millivolt source. It is also very easy to change the times, for instance for emptying, spraying and measuring, and to set the measurement range etc.
- The analyser can use a wide 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 be mounted where it is easy to access it for calibration and maintenance.
- Reliable and patented system for sampling. Suction circuit; vacuum-pump, valves and connections are cleaned automatically.
- Most reliable, infrequent error with the analyser, very low-maintenance. 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 and it is designed in such a way that it is easy to carry out the maintenance.
- The built-in Modbus RTU interface makes it very straightforward to communicate with a process control computer or PLC. The ORP measurement, the temperature, the step number in operation and the error warnings are available over 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 analyser is designed for the harsh environment in the industry with high temperatures, acid, dust and gasses. The analyser is designed to tolerate electrical noise and fluctuations in the supply voltage.



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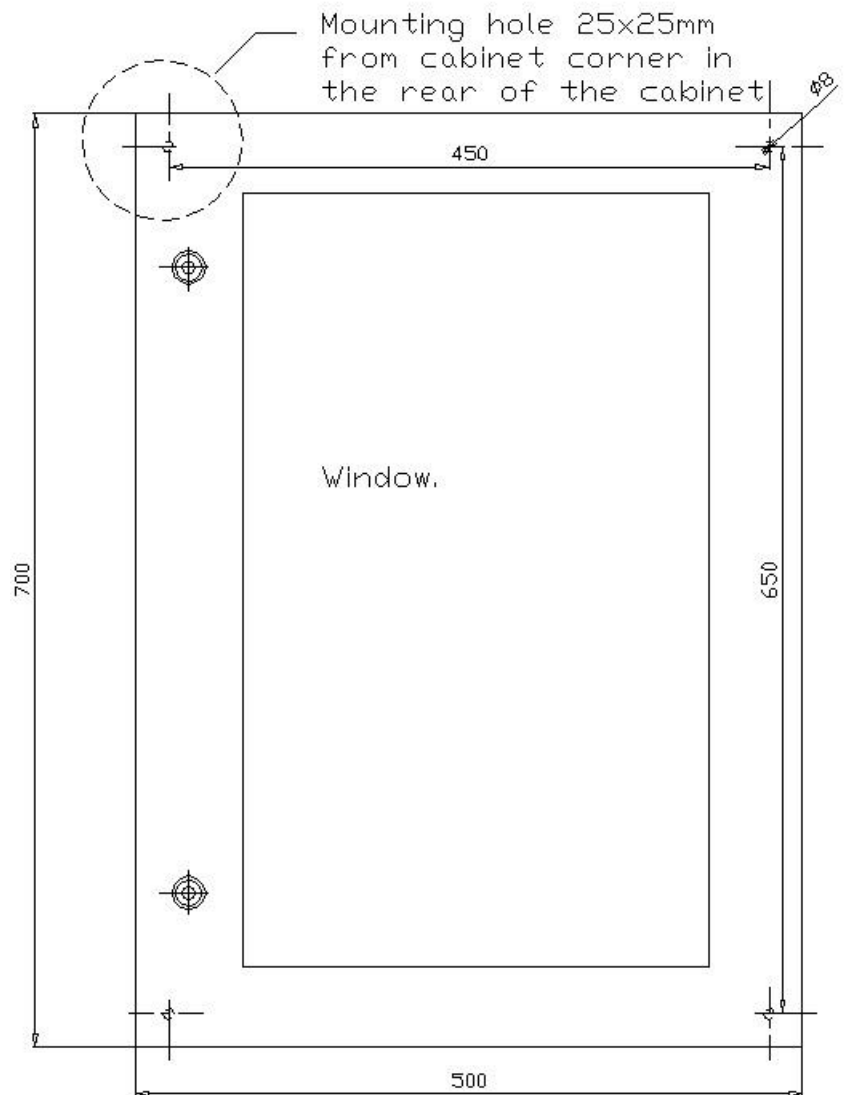
## Electrical connections

RK1 terminal No.	Description
26	4-20 mA output, connect to external power +10-24 VDC for feeding the mA loop.
12	4-20 mA output, return 4-20 mA, connect load from here to –external power.
9/23	+ for RS485/MODBUS or 0 VDC for start stop
10/24	- for RS485/MODBUS
11/25	Screen RS485/MODBUS Cable or +24 VDC for remote start stop
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)
RK3 terminal No.	
1	Power, 230 VAC, we deliver for 110 or 115 VAC supply too.
2	Power, 230 VAC, we deliver for 110 or 115 VAC supply too.
3	Earth, preferably local earth



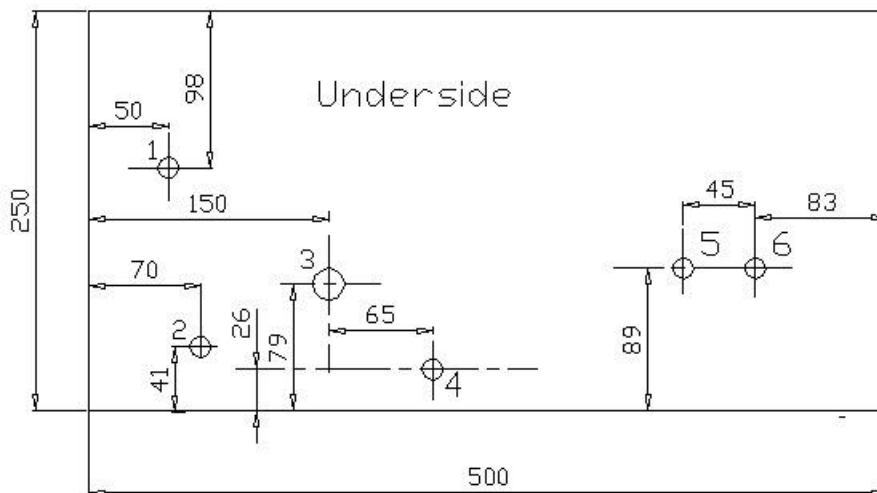


## Mechanical dimensions



### Connections on the underside:

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)







## Specifications

Water pressure.....	3-7 bar.
Air pressure.....	4-7 bar
Detergent consumption, adjustable .....	4-10 ml/wash
The acid washing frequency is programmable	
Suction height .....	6 meter water column.
ORP range.....	-1500 to +1500
Temperature.....	0-100 °C.
Accuracy, transmitter.....	0.1 mV
Power supply.....	110, 115 or 230 volt AC.
Power consumption.....	35 Watt.
Internal tubing.....	Teflon .
Electronic enclosure.....	IP 65.
Cabinet (Stainless steel with glass window).....	IP 65.
Alternative: Glass-fibre reinforced polyester cabinet	
Outer dimensions.....	500x700x250 mm.
Weight ca.....	27.5 kg.

### *Outputs:*

4-20 mA loop powered, maximum load 950  $\Omega$  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.

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