ISE-Analyser/Titrator

- Determination of: Br^-, Cl^-, F^-, S^{2-}, NH_4^+, CN^-, SO_4^{2-} etc.
- Direct-potentiometry
- Standard-addition
- Titration
- Up to 8 sample streams
- Automatic Calibration (optional)
- Automatic Cleaning (optional)

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Measurement & Control

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Potentiometric-ISE-Analyser/Titrator

Many ionic substances are easily measured by means of potentiometry using ion-selective electrodes (ISE). The potential between the ISE and a suitable reference electrode depends on the concentration of the ion-species to be measured. The most common ion-specific electrode is the pH-electrode.

This versatile measuring principle is used in the ISE-Analyser/Titrator to measure a variety of different parameters like:

- **Ammonia - NH_4^+**
- **Bromide – Br^-**
- **Chloride - Cl^-**
- **Cyanide - CN^-**
- **Fluoride - F^-**
- **Iodide – I^-**
- **Nitrate – NO_3^{2-}**
- **Potassium – K^+**
- **Sulphide – S^{2-}**
- **Sulphate – SO_4^{2-}**
- **Alkalinity, acidity (m/p-value)**
- **etc.**

Analytical Methods

Depending on matrix interferences, measuring range, detection limit etc. three different analytical methods can be applied:

Direct Potentiometry

The simplest mode is to measure the difference of the potential between an ion-selective electrode “ISE” and a suitable reference electrode and calculate the concentration based on the Nernst-equation. This method can be applied in samples where interferences from other ions or compounds like complexing agents are absent.

Standard Addition

The method of standard addition is applied in samples where an excess of an interfering compound is present that reacts with the analyte to be measured. Since the interference reacts with the sample in the same manner as on the standard-additions the real concentration is calculated be means of linear regression.

Titration

In this analytical method the change of the potential of a suitable electrode is used to detect the inflection point during titrations. For some applications a photometer is used to detect the change in absorbance at a suitable wavelength during titrations.

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Applications

	Direct potent.	Standard addition	Titration
Acidity ("-p/-m-value")			X
Alkalinity ("p/m-value")			X
Fluoride (F^-)	X	X	X
Chloride (Cl^-)	X	X	X
Bromide (Br^-)	X	X	X
Iodide (I^-)	X	X	X
Cyanide (CN^-)	X	X	X
Sulphate (SO_4^{2-})			X
Sulphide (S^{2-})	X	X	X
Nitrate (NO_3^-)	X	X	
Ammonium (NH_4^+)	X	X	
Potassium (K^+)	X	X	
Silver (Ag^+)	X	X	X

Temperature compensation

All potentials of the measurement chain are temperature-dependent. Therefore it is necessary take temperature effects into account. A temperature sensor and mathematical temperature compensations are implemented in the instrument.

Options

Depending on the users requirements the following options are available:

- **Automatic cell and line cleaning**
- **Automatic filtration and filter cleaning**
- **Automatic calibration and/or validation**
- **Up to 8-channel multiplexer**

Setup

The ISE-Analyser consists of two separated housings to protect the electronics from any hazardous vapours and liquids. The upper part containing all electronic parts made of powder coated steel. Whereas the lower part is made out of plastic.

To maintain a maximum of reliability all parts are carefully chosen and thoroughly tested.

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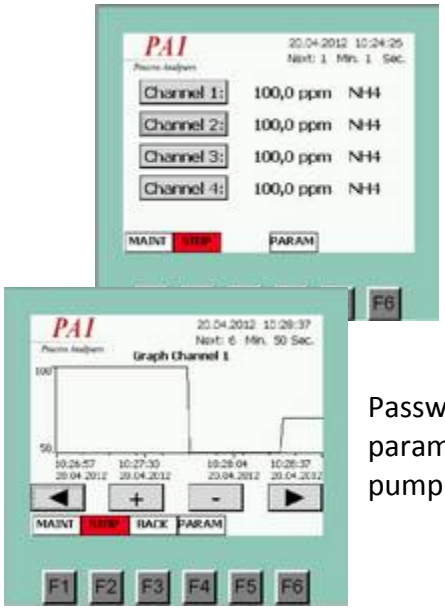
Operation



The instrument has an inbuild touch screen with functional keys that allows the configuration and manual control of the ISE-Analyzer. The results are displayed in numerical values for each channel or as a graph for a selected channel. Touch keys allow movement in the graph and zooming. In an additional window a table of the historical results is presented.

In titration mode titration curves and the 1. derivative can be visualized.

Password protected menus allow the setting of various parameters like measuring intervals, cleaning intervals, pumping times, channel selection, thresholds etc.

Communication

To transmit the results to process control systems analog outputs ((0)4 – 20mA) are available.

Communication via RJ45 is also possible to control the analyzer and to down load measurement data from the memory.

Alarms

System fault: in case of system failure the alarm contact is triggered.

Threshold alarm (optional): relays for threshold alarm are available.

Systems for hazardous samples

If hazardous samples like concentrated acids need to be measured special measures have to be taken to protect human health and property. For those samples a special designed ISE-Analyser is available.

The whole instrument is made of plastic where possible. A special cabinet contains the sampling system that ensures a maximum of protection against any leakage. During sampling the sample is confined in a loop completely made of Teflon and other inert materials in the sampling unit. From here the sample is transferred to the analytical unit.

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Maintenance

Action	Daily	Weekly	Monthly	Quarterly	Yearly
Check for leakage and alarms	X				
Fill up reagents		(X)	X		
Check calibrations		(X)	(X)	(X)	X
Fill up electrolyte (ISE) (if installed)		(X)	X		
Replace sensor of ISE or ISE (if installed)				(X)	X
Clean tubing (if necessary)		(X)	X		
Replace pump tubing (if necessary)				X	
Replace all tubing					X
Replace reference electrode (if installed)					X
Check photometer (if installed)			X		

Intervals and tasks may change due to application.

Sample pre-treatment

Since turbity does not effect potentiometric measurements filtration is only necessary to keep out large particles. Therefore we provide a simple automatic filtration unit for applications clogging my cause trouble.

The implemented automatic back flush system keeps the filterelement clean and ensures almost maintenance free operation.

The back flushing is either controlled by the analyser or by seperated controller.

All wetted parts are made of PVC and stainless steel.

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Specifications

Analytical method:		Potentiometry, Photometry
		Standard addition
		Titration
Range:		Application dependent
Meas. interval:		5 - 30 Min. (typical)
Max. num. channels:		Up to 8
Sample:	*Pressure:*	0 bar with sample pump. Higher pressures on demand.
	Flow rate:	10 - 500 ml/minute
	Temperature:	>0 - 100 °C (application dependant)
Measurement system:		Ion-selective electrode pH-electrode
		Redox-electrode
		Reference electrode
		T-probe (PT1000 Teflon-coated) (optional)
		Photometer
Alarms:	*Threshold*	potential free, NC/NO
	Fault	potential free, NC/NO
Status signal:		For remote start/stop (potential free, optional)
Outputs:		Max. 8; (0)4 – 20mA, max. 500 Ohms
Digital input:		Start/stop, others
Calibration/Validation:		Manual/automatic (optional)
Environmental conditions.:		Indoor mounting
	Rel. humidity:	5 – 95% (not condensing)
	Temperature:	10 – 50 °C
Housing:		Wall mounting, stainless steel and plastic
	Dimensions:	Width: ±400 mm x depth: ±270 mm x highth: ±910 mm
	Weight:	Approx. 30 kg
Infrastructure:	*Mains:*	220/240 VAC, 50/60 Hz, 110/120 VAC
	Instrument air:	Dry and oil free ISA-S7.0.01-1996 (optional for air purge)
	Waste:	Atmospheric open sink

Errors and omissions accepted! Technical data are subject to change!

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