DOC053.52.04091
Nitsch
Oktober 2003

LANGE
FOR WATER QUALITY

8810 Analyser

Industrial on-line titrator and ion selective analyser

data sheet

Features

- Microprocessor–operated
- Application–specific menu programming
- IP65 electronics
- Modular design
- Programmable concentration units
- Programmable cycle time
- Compact design suitable for panel– or wall– mounting or free–standing cabinet
- Self–diagnostics
- Titrations using preset pH or self–seeking endpoint
- Accommodates pH, ORP, precipitation or complexometric titrations
- Wide concentration range: ppm - %
- Most samples do not require filtration (sample line 10 mm Ø)
- Digital display
- High accuracy even at high concentrations
- Standard–addition technique for ion–selective electrodes
- Automatic temperature compensation
- Low reagent consumption
- Automatic calibration (optional)
- Automatic dilution (optional)

System applications

Production processes are constantly being improved to operate at faster rates with a minimum of intervention by production personnel. Concurrently, material–quality tolerances and process conditions are subjected to more severe specifications. As a result, both production efficiency and product quality are critically dependent upon continuous control of the key chemical parameters.
On-line chemical analysers capable of operating in conjunction with feedback–control systems are quickly gaining acceptance as an important tool for process control. Experience has shown that optimizing a chemical process, i.e., maximum product yield with minimum raw material and energy consumption, remains an elusive goal without
continuously monitoring the relevant key chemical parameters. Finally, chemical characterization of the process streams, including raw materials, intermediates, final product and wastes, should be standard practice and procedure to minimize product loss, maintain a high level of plant safety, and minimize the environmental impact.

The 8810 ANALYSER is designed to provide the user with the chemical information needed to operate the process on a high level of reliability and efficiency.

Advantages of on–line titrimetry

- Most standard laboratory reference methods are amenable to on–line chemical analysis.
- Titrimetric analysis is very accurate and precise, especially at high concentration levels.
- Substances for which no specific sensors exist can still be determined by titration, using specifically reacting reagents.
- The zero and slope stabilities of the electrodes are much less critical for titrations than for direct potentiometry.
- The results of the analysis are directly related to the concentration.

Operating principle (titrimetry)

The 8810 is one of a new family of automatic, chemical on–line monitors based on volumetric analysis refering to a titrimetry.
A reagent solution (titrant), whose chemical composition is tailored to the sample to be analyzed, is continuously added to a constant volume of sample solution until the ensuing chemical reaction is
completed.
This point is called the endpoint (EP); it indicates that point of the reaction where the two concentrations, i.e., the sample and the titrant, are equivalent to each other.

If: $V_s \cdot C_s = V_r \cdot C_r$

then: $C_s = \frac{V_r \cdot C_r}{V_s}$

because: V_s, C_r = Constant

The sample concentration is:

$C_s = k \cdot V_r$

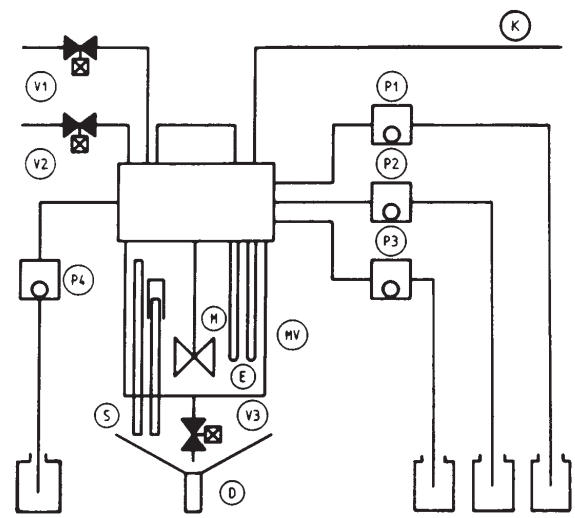
V_s = Sample volume

C_s = Sample concentration

V_r = Titrant volume

C_r = Titrant concentration

The constant **k** is obtained and updated by periodic system calibration and stored in the memory of the microprocessor.
Depending on the application, two different endpoint detection techniques are available with the 8810 ANALYSER.



V1	Rinse valve	D	Drain pipe
V2	Sample valve	E	Sensors
V3	Drain valve	M	Stirrer
P1	Titration pump	K	Electrode cable
P2	Reagent pump 1	S	Siphon
P3	Reagent pump 2	MV	Reactor
P4	Calibration pump		

(1) Titration preset endpoint

This technique is preferred for those reactions which are fast, reproducible and not susceptible to interference from other ions.

For such reactions, the endpoint potential (pH or mV) is preset.

The reagent pump then adds titrant at a fast rate until the sample/reagent mix reaches a pH which is ahead of the actual setpoint (for example, 0.5 units).

At this point, the titrant addition slows down until the final endpoint setting is reached and the reading remains stable within a “dead zone” for a defined length of time.

(2) Self–seeking endpoint

This technique is used for those titrations which are unstable, irreproducible and subject to interference (for instance, pH–dependent ORP titrations).

For these reactions, the 8810 ANALYSER is programmed to determine the endpoint mathematically by calculating the point of inflexion on the titration curve at the end of every analysis cycle.

This means that the system is capable of titrating to one or more endpoints without any knowledge of the actual location of these points.

The endpoints are simply identified as inflection points on the titration curve.

Upon receiving a signal from the electronic control, the analysis cycle starts by opening the drain valve (V3).

With the drain valve open, the rinse valve (V1) opens, allowing rinse water to simultaneously clean and drain the reactor (MV) for a programmed length of time.

After rinse valve closes (V1), the sample valve (V2) opens while the drain valve (V3) stays open a few seconds longer in order to flush any remaining rinse–water droplets with fresh sample solution.

The drain valve (V3) closes and the sample volume is accurately adjusted with the built–in siphon (S).

The reactor vessel is now charged with a defined volume of sample solution for titration.

The titration pump (P1) is activated and the titration starts with the addition of titrant solution until the endpoint is reached.

The microprocessor calculates the concentration using the function $C_s = k \cdot V_r$.

■ System description

The 8810 ANALYSER is a modular system designed for a wide spectrum of industrial on–line applications.

The analyser automatically takes on–line samples, adds the appropriate reagents, buffers, masking agents, etc., and carries out the desired analysis.

The system is rugged and designed for heavy–duty, industrial on–line applications.

The panel–mounted model is standard. A wall–mounted, polyester cabinet and a free–standing cabinet to house the analyser with the required reagents are also available.

The analyser requires front access only.

Liquid–handling modules are mounted below the electronic–controls unit for protection, easy access and rapid service.

The hinged panel may be tilted forward to gain access to the rear.

The built–in microprocessor controls all functions of the analyser.

Self–diagnostic programs alert the operator to possible instrument malfunctions; maintenance personnel receive pertinent information as to the probable source of failures.

Optional automatic calibration at preset time intervals minimizes system drift and maintains high accuracy.

The 8810 ANALYSER can routinely address a large number of monitoring and control applications.

Typical applications

Industry	**Where?**	**What?**
Electric–power generation	Feedwater Water treatment Cooling water	m–, p–value, hardness m–, p–value, hardness Hardness
Metal–surface treatments	Degreasing Phosphatizing Electroplating Pickling and etching Passivating	Free and total alkalinity Total free acid, accelerator, zinc Alkali, acid, metals Ferrous iron, free acidity Chromium VI, nitric acid
Chemical industries	Fertilizers Chlorine/alkali production Base chemicals	Ammonia, nitrate Chlorine, caustic, calcium Intermediates, finished products
Textile industries	Bleaching Dyeing Mercerization	Hypochlorite, peroxide Hydrosulfite, caustic, indigo Caustic, carbonates
Pulp and paper industries	Pulping (kraft, sulfite process) papermaking	Caustic, sulfides, carbonates Chlorine, acidity in pulp bleaching, alum, pH
Foods and beverages industries	Soft drinks	Citric acid, CO_2
Potable water, wastewater	Ground water and municipal wastewater	Hardness, nitrate, ammonia, phosphate, fluoride alkalinity
Environmental monitoring	Rivers/lakes Industrial wastewater	Nitrate, ammonia, phosphate Sulfide, phosphate, hardness, chloride, fluoride, ammonia, nitrate
Mining	Gold mining	Free cyanide in gold leachates

Product list

Pos.	Item	Model	Item No.	Drawing No.
	8810 pH Titrator, Single–Channel			
1	Basic panel–mounted unit 220 VAC, 50 Hz	8810.1	368 810,10220	1,2
2	Basic panel–mounted unit 240 VAC, 50 Hz	8810.1	368 810,10240	1,2
3	Basic panel–mounted unit 110 VAC, 60 Hz	8810.1	368 810,10116	1,2
4	Basic panel–mounted unit 110 VAC, 50 Hz	8810.1	368 810,10115	1,2
	8810 ORP Titrator, Single–Channel			
5	Basic panel–mounted unit 220 VAC, 50 Hz	8810.2	368 810,20220	1,2
6	Basic panel–mounted unit 240 VAC, 50 Hz	8810.2	368 810,20240	1,2
7	Basic panel–mounted unit 110 VAC, 60 Hz	8810.2	368 810,20116	1,2
8	Basic panel–mounted unit 110 VAC, 50 Hz	8810.2	368 810,20115	1,2
	8810 ISE , Single–Channel			
9	Basic panel–mounted unit 220 VAC, 50 Hz	8810.3	368 810,30220	1,2
10	Basic panel–mounted unit 240 VAC, 50 Hz	8810.3	368 810,30240	1,2
11	Basic panel–mounted unit 110 VAC, 60 Hz	8810.3	368 810,30116	1,2
12	Basic panel–mounted unit 110 VAC, 50 Hz	8810.3	368 810,30115	1,2

Accessories

13	Fiberglass cabinet for wall–mounting	368 810,40000	4
14	Self–contained, free–standing cabinet	368 810,45000	3
15	Automatic sample dilution	08810=A=5300	–
16	Chemical cleaning	368 810,56000	–
17	Automatic system calibration (8810 pH/ORP)	368 810,60000	–
18	Additional peristaltic pump	368 810,700xx	–
19	Additional piston pump or autocal for ISE	368 810,72000	–
20	Spare parts kit for 2 years	368 810,9xxxx	–
	Consumables: Pump tubing, 1 set of 12 pcs./year:		
21	with XX (00=OR-GR-OR) (06=WH-YE) (10=WH-BL) (15=GR-GR) (20=GRE-GRE) (21=PI-PI)	359 090,700XX	–
22	Inches connectors kit for 8810 panel mounted	08810=A=0301	–
23	Inches connectors kit for 8810 in wall mounted cabinet	08810=A=0302	–
24	Inches connectors kit for 8810 in free standing cabinet	08810=A=0303	–

Standard accessories

• Startup kit	368 810,90000	–
• Instruction manual in English		–
• Instruction manual in French		–

Notes to product list

Pos. 1-12: The basic units are single–channel systems, fully equipped (including electrodes) and operable upon installation.

Pos. 15: An add–on for automatically diluting highly concentrated samples.

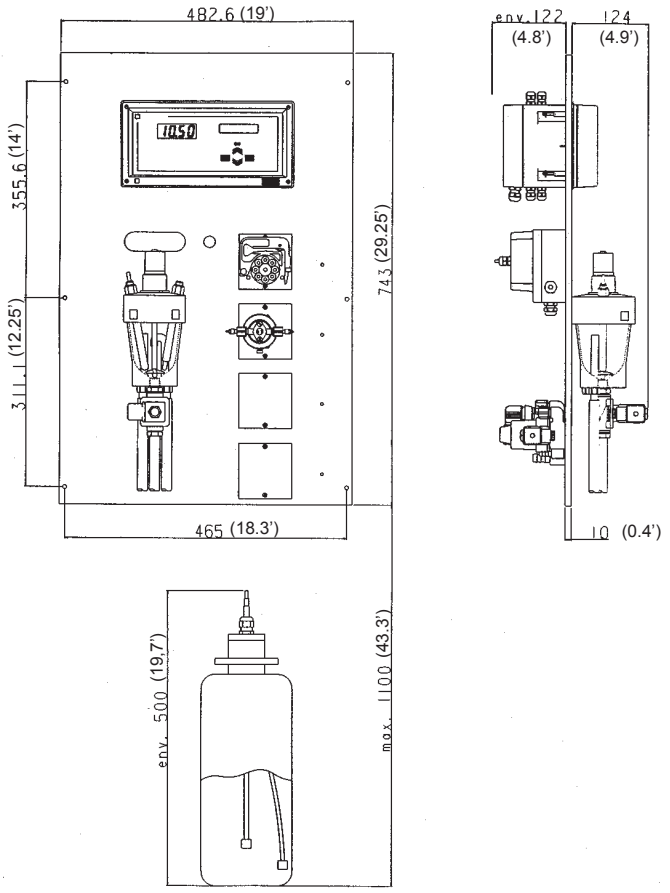
Pos. 16: An add–on for spray cleaning the electrodes with suitable cleaning fluids.

Pos. 17: An add–on for fully automatic system calibration.

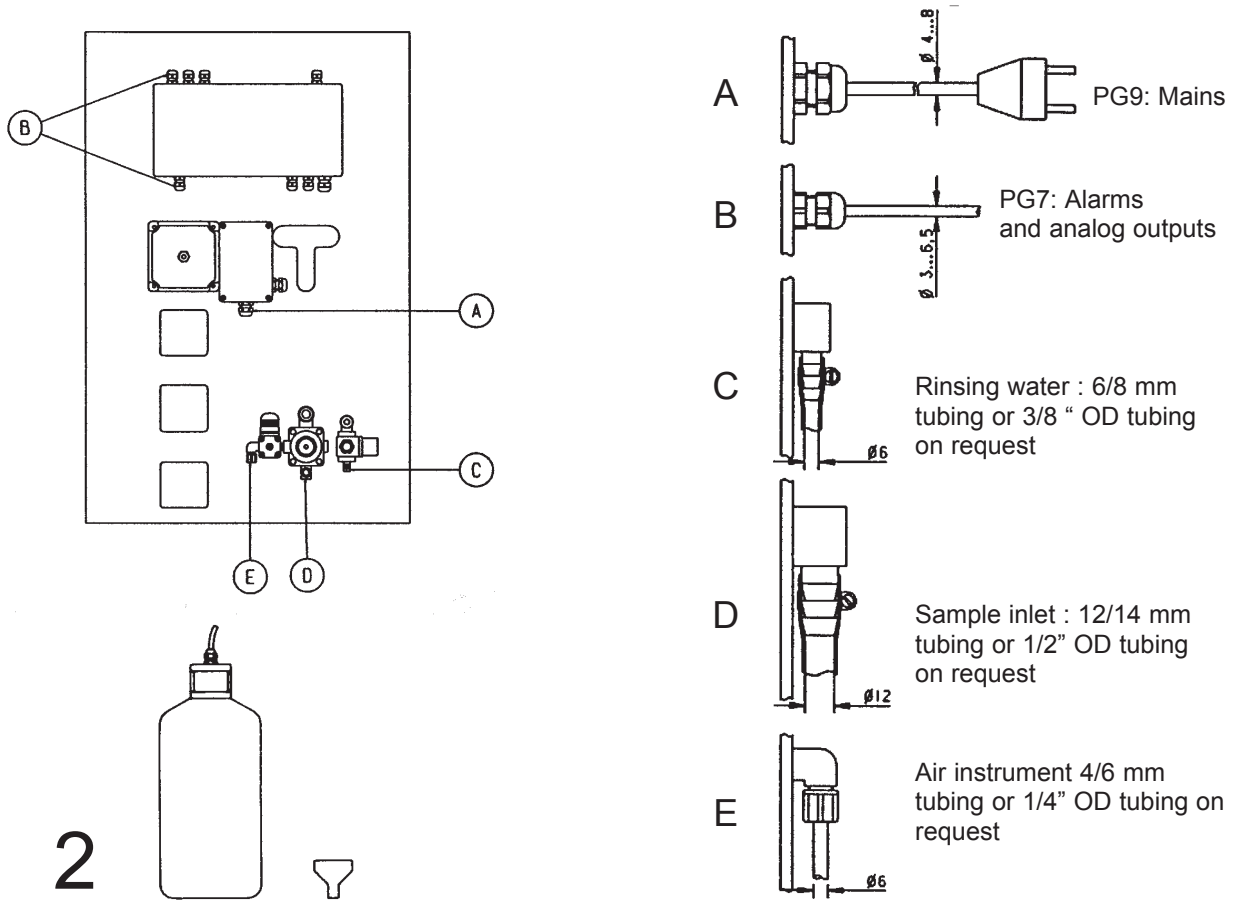
Pos. 20: This spare parts kit contains parts common to all three basic versions (nipples, Tygon tubing, fittings, tube weights, stirrer, hardware, etc...).

Dimensions in mm (in) and connections

1

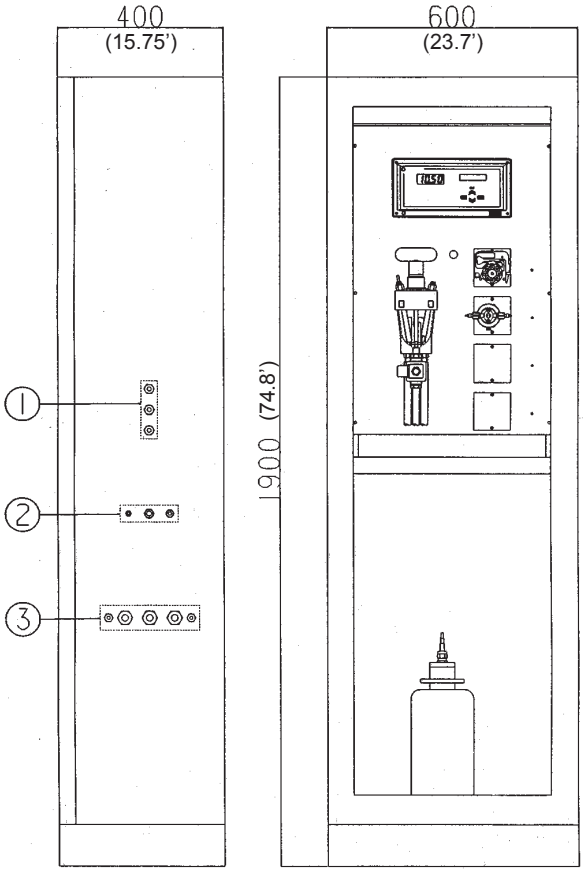


2



Dimensions in mm (in) and connections

3

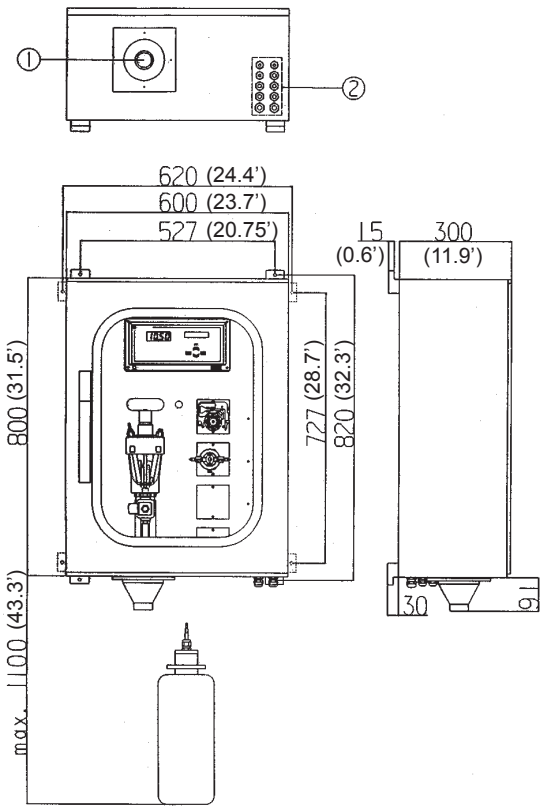


1 – Mains - 3 cable glands PG11

2 – Sample inlet (DN10/12 mm or 1/2” OD)
Rinsing water (DN6/8 mm or 3/8” OD)
Air instrument (DN4/6 mm or 1/4” OD)

3 – Drain (3 PG21 and 2 PG9)

4



1 – Drain

2 – Mains/Sample inlet/Rinsing water/
Air instrument

Specifications

Sample	**No. of sample streams**	1
	No. of reagent pumps	1, 2 or 3 max.
	Sampling mode	Fixed or loop
	Sampling time	Application–specific, programmable
	Sample temperature	0–50°C (32–122°F)
	Sample pressure	0.5–6 bar (7.2– 87 psi)
	Sample flowrate	40–300l/h (10-80 GPH)
	Sample volume/titration	80-200 ml, adjustable
	Sample volume/cycle	200–1000 ml
	Suspended solids	Generally no filtration required, screening only
	Rinse–water pressure	1–6 bar (14.5–87 psi), consumption :< 5 liters/analysis
	Rinse–water flowrate	50–300l/h (20-80 GPH)
	Sample dilution	Programmable
Installation	**Power supply**	110/220/240 VAC, –15 % to –10 %, 50/60 Hz
	Power consumption	~ 100 VA
	Drain	3 tubes of 12 mm (1/2" OD) for panel version or central funnel of 50 mm (2" OD) for wall mounted and free standing enclosure
	Instrument air	4–7 bars (58–101 psi), filtered and lubricated, consumption < 10 l/h
	Mounting	Panel– or wall–mounted unit, or free–standing cabinet
	Weight	Panel : Approx. 25 kg (55 lbs), Wall : Approx. 50 kg (110 lbs), Free–standing: < 100 kg
	Dimensions	See attached drawings
	Fittings	See attached drawings
Analysis	**Exchangeable sensors**	pH, ORP, ion–selective electrodes
	Temperature compensation	Pt100 temperature sensor
	Ambient temperature	5– 55 °C (41–131°F)
	Reagent consumption	Application–specific (typically 3–6 ml/cycle)
	Analysis (titration) time	Application–specific (typically 3–6 minutes)
	Cycle time	Programmable, 999 minutes max.
	Units of concentration	mg/l, ppm, g/l, %, p–value, m–value, 2 p–m or user programmable
	Concentration range	Application–specific, programmable
	Accuracy	< ± 2–4 % depending on the application
	Reproducibility	< ± 2–4 % depending on the application
	Drift	Negligible
	Protection	Electronic unit: IP65
	LCD indication	Numeric: 4 digits illuminated, 17.8 mm height Alphanumeric: 2 lines at 16 characters, 5.86 mm height
	Type of titration	pH, ORP, precipitation, ion–selective, complexing
	Endpoint detection	Preset potential or self–seeking inflexion point
	Calibration	Manual system calibration Auto–assist electrode calibration Auto–system calibration (optional) Ion–selective electrode: Standard addition auto calibration (optional)
	Programming	Menu–operated
	Electrode-cleaning system	Application–specific
Outputs	**Analog outputs**	2 x 0/4 – 20 mA, 700 V max., galvanically separated
	Alarms	3 relays: 1 system alarm, 2 high or low limits, programmable
	Controls	1 sample/diluent–level detector 1 reagent–level detector 1 calibration solution–level detector
Maintenance	**Service**	Monthly: • Change pump tubing. • Replenish titrant and/or reagents.
E.M.C.: This instrument conforms to European Directive 89/336/EEC concerning electromagnetic compatibility.		

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