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PAI-Colorimetric-Analyzer

- Flexibel configuration
- Up to 8 sample streams
- Very robust
- Automatic calibration / validation
- Automatic cleaning

Process Colorimetric Analyser (PCA)



The reliable control of several critical parameters is required in many industrial processes. Also environmental regulations become a more and more important issue in waste water treatment and discharge. For a large number of inorganic as well as organic substances discharge limits are introduced and enforced by environmental authorities. To be able to satisfy the growing demand for reliable automatic analytical instruments we developed the Process Colorimetric Analyser (PCA)! The PCA is designed as a very flexible instrument that can be customized easily for almost any colorimetric or photometric analysis.

Since online instruments are performing their job 24/7 they have to be very robust. But it's not only the robustness of the hardware! The analytical method should be robust as well against changes in the sample matrix. Colour, turbidity, temperature variations and chemical interferences may have an important impact on the measurement results. Also ambient conditions (dust, dirt, moisture, temperature etc.) should be taken into account. Therefore, each instrument is carefully designed in order to get a maximum in reliability and robustness which means a maximum in environmental protection.

Automatic temperature compensation

Many reactions are temperature dependant therefore sample and air temperature are measured and the temperature influence is taken into account automatically.

Automatic turbidity compensation

Since any photometric measurement is affected by turbidity measures have to be taken to overcome this problem.

One possibility is to use a sophisticated filtration system which means additional investment and maintenance.

The PAI-Colorimetric Analyzer offers the possibility to compensate turbidity effects! There are two options depending on the application:

- Running a blank on the sample during each measurement, or
- Measuring the absorbance at a second wavelength and compensate the influence mathematically.

Applications

Due to its flexible design the instrument can be adapted to almost every colorimetric method. The following list gives just some examples:

Parameter	Range*	Unit	Detection limit*
Aluminium	0 - 300	µg/l Al	< 10 µg/l
Ammonium	0 - 1	mg/l N	< 5 µg/l
Calcium	0 - 1	mg/l Ca	< 5 µg/l
Chlorine	0 - 2,5	mg/l Cl ₂	< 10 µg/l
Chromate (VI)	0 - 500	µg/l Cr (VI)	< 10µg/l
Copper	0 - 5	mg/l Cu	< 5 µg/l
Cyanide (free)	0 - 200	µg/l CN	< 5 µg/l
Cyanide (total)	0 - 200	µg/l CN	< 10 µg/l
Formaldehyde	0 - 10	mg/l CHO	< 0,1 mg/l
Total hardness	0 - 100	µg/l Ca	< 1 µg/l
	0 - 1	mg/l Ca	
Glycols	0 – 5	mg/l Glycols	< 1 mg/l
Hydrazine	0 - 500	µg/l N ₂ H ₄	< 1 µg/l
Iron	0 - 1	mg/l Fe	< 5 µg/l
Lead	0 – 3	mg/l Pb	< 20µg/l
Magnesium	0 – 1	mg/l Mg	< 5µg/l
Manganese	0 - 2	mg/l Mn	< 100µg/l
Nickel	0 - 3	mg/l Ni	< 5 µg/l
Nitrate	0 - 200	µg/l N	< 2 µg/l
Nitrite	0 - 200	µg/l N	< 2 µg/l
Phenols	0 - 5	mg/l C ₆ H ₅ OH	< 5 µg/l
Phosphate	0 - 1	mg/l P	< 1 µg/l
Phosphate	0 - 7,5	mg/l P	< 10 µg/l
Silicate	0 - 1	mg/l Si	< 1 µg/l
	0 - 100	µg/l Si	
Total Nitrogen	0 – 200	µg/l N	< 2 µg/l
Total Phosphorus	0 - 1	mg/l P	< 10µg/l
Zinc	0 - 1	mg/l Zn	< 10 µg/l
Chlorine dioxide	0 - 1	mg/l ClO ₂	< 0,10 mg/l
Urea	0 - 500	mg/l Urea	< 8 mg/l
Hydrogen peroxide	0 - 20	mg/l H ₂ O ₂	<0,02mg/l

* 30mm optical path

Measuring ranges

To adjust the measurement range of the PAI-Colorimetric Analyzer we have the choice between different measuring cells with a light path ranging from 1mm to 3cm! Extremely high concentrations can be measured by using automatic dilutions with dilution factors of up to 1/1.000!

2-Wavelength Photometer

The instrument can be equipped with 2 LED's which offers the possibility to measure 2 different parameters with one instrument! The second wavelength can be used for turbidity compensation as well.

Reliability and robustness

During development we took considerable care to implement only robust parts to minimize maintenance and obtain a maximum in reliability and robustness!

Electronics and chemical processing are installed in two completely separated housings (IP65).

Main features are:

- **High precision pumps for precise reagent dosage.**
- **Automatic calibration / validation.**
- **Automatic cleaning function.**

Result storage and transmission

The PAI-Colorimetric Analyzer stores up to 10.000 results in its memory together with date and time.

For each measurement channel a separated analog-output (4 – 20mA) is available.

Operation

The instrument is controlled by a user-friendly menu. The results are presented numerical and by an adjustable graph to show the historical results.

Multichannel instruments show the results for each channel separately.

A status line indicates the action performed during analysis. For each channel separate sequence tables can be configured for blank, standard, measurement and cleaning. In any sequence all build-in modules (pumps, valves, stirrers etc.) can be used to offer highest flexibility.

Automatic calibration

To ensure reliable results the PAI-Colorimetric Analyzer can perform an automatic calibration in user settable intervals.

During each calibration sequence a blank and standard ("span") is measured. The divergence between calibrations is controlled. If a pre-set threshold is exceeded or undercut the system alarm is triggered. The instrument keeps running using the previous calibration data.

Of course, manual calibration is possible also.

Automatic cleaning

The PAI-Colorimetric Analyzer offers different automatic cleaning options:

Cleaning after each measurement:

The cleaning steps are programmed at the end the analysis sequence table.

Cleaning in pre-set intervals:

Additionally, a dedicated cleaning sequence can be programmed which will be performed in intervals defined by the user.

Cleaning of filtration modules:

If a filtration module is installed the cleaning (back flashing etc.) can be controlled by the analyser as well.

Maintenance

All maintenance works can be performed by the user. A regular service by your supplier is not necessary!

The following table gives an overview of the regular maintenance to be done.

Task	daily	weekly	monthly	quarterly	yearly
Check for leakages	X				
Check for alarms	X				
Refill reagents		(X)	X		
Check calibration		(X)	(X)	(X)	X
Cleaning if necessary		(X)	X		
Replace peristaltic tubing				X	
Replace all tubing					X

Depending on the application maintenance steps and intervals may vary.

Outputs

Analog outputs

4 to 20 mA (0 to 20 mA) for concentration.

System fault relay

The **ProcessColorimeter** is equipped with a self-monitoring system that recognizes faults within the analyser and will trigger an alarm contact in case of any malfunction.

Maintenance request relay

To maintain a reliable function, the levels of the sodium hydroxide solution, of the cleaning solution, the DI-water and the capacity of the ion exchanger is controlled.

Options

- Multiplexer for up to 8 sample lines
- Digital in- and outputs (ready signal, remote start/stop)
- Sm@rt Server
- Audit trail
- Modbus TCP
- Profibus

Sample pre-treatment

Although filtration is not necessary for most applications we provide a simple automatic filtration unit for applications clogging may 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 separated controller.

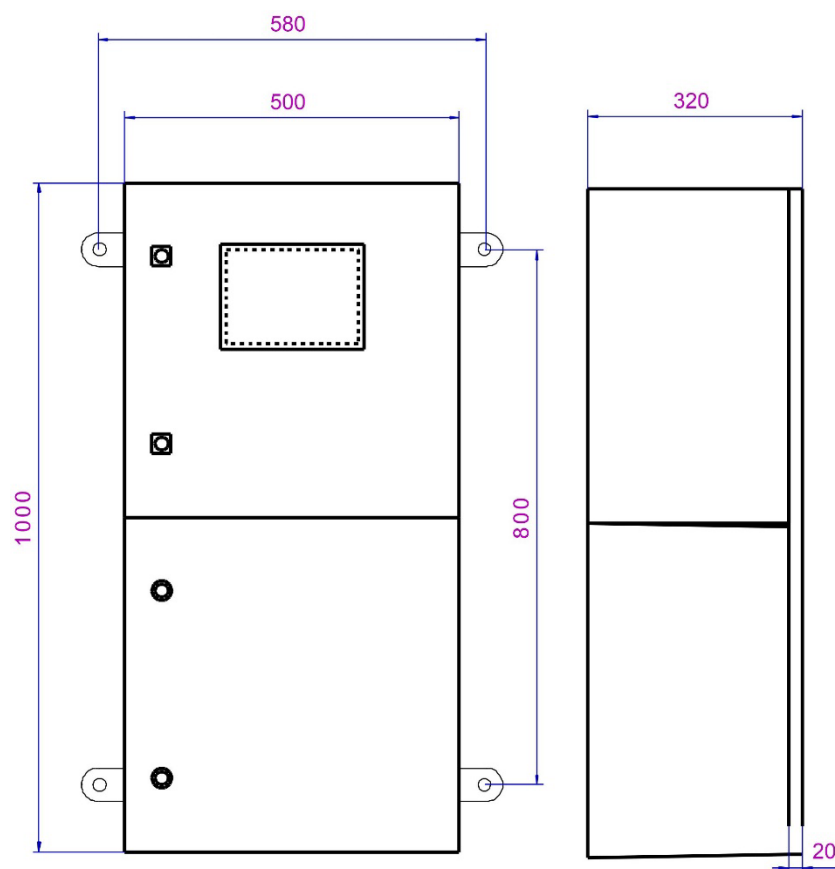
All wetted parts are made of PVC and stainless steel.



Specifications

Analytical method:		Colorimetric, photometric
Ranges:		Configuration dependent
Measuring interval:		15-30Min. application dependent
Sample:	<i>Pressure:</i>	0 bar with sample pump. Up to 4 bars with sampling valve
	<i>Flow rate:</i>	10 - 120 ml/minute
	<i>Temperature:</i>	5 - 60 °C (sample cooler available)
Optical system:		1 / 2-Wavelength Photometer
Alarms:		Threshold (potential free, NC/NO) System fault (potential free, NC/NO)
Status signal:		For remote control (potential free)
Analog outputs:		Max. 8; 4 – 20mA, galvanically isolated, max. 500 Ohm
Digital inputs:		Remote control etc.
Environmental cond.:		In-house installation
	<i>Rel. humidity:</i>	5 – 95% (not condensing)
	<i>Temperature:</i>	10 – 50 °C
Housing:		Wall mounting, steel powder coated; IP65 (electronics); plastic IP56 (hydraulics) with window.
Dimensions:		1000x500x350mm (HxWxD) (standard) 1225x600x350mm (HxWxD) (heated version; total-P, total-N, total-CN)
Weight:		±50 kg
Infrastructure:	<i>Mains:</i>	85-264 VAC, 45/65 Hz, 120W
	<i>Instrument air</i>	Dry oil free (ISA-S7.0.01-1996) (optional)
	<i>Waste:</i>	Atmospherically open with vent.

Dimensions:



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

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