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# Process Colorimetric Analyser - PCA

- Flexibel configuration
- Up to 4 sample streams
- Very robust

## 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 PCA 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
Chlorine	0 - 2,5	mg/l Cl <sub>2</sub>	< 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
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 – 5ppm	mg/l Glycols	< 1 mg/l
Hydrazine	0 - 500	µg/l N <sub>2</sub> H <sub>4</sub>	< 1 µg/l
Iron	0 - 1	mg/l Fe	< 5 µg/l
Manganese	0 - 25	µg/l Mn	
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 <sub>6</sub> H <sub>5</sub> 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	
Zinc	0 - 1	mg/l Zn	< 10 µg/l
Chlorine dioxide	0 - 1	mg/l ClO <sub>2</sub>	< 0,10 mg/l
Urea	0 - 500	mg/l Urea	< 8 mg/l
Hydrogen peroxide	0 - 600	mg/l H <sub>2</sub> O <sub>2</sub>	<10mg/l

\* 30mm optical path

## Measuring ranges

To adjust the measurement range of the PCA 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 (IP55).

Main features are:

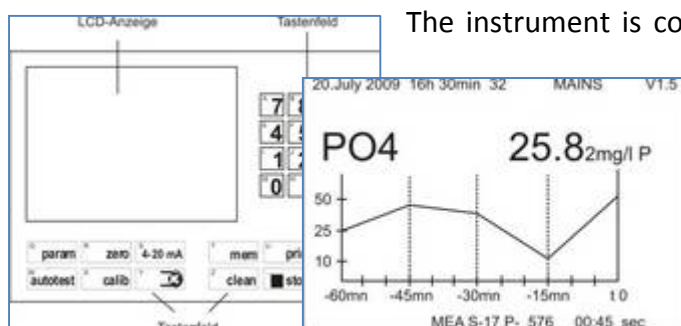
- **High precision pumps for precise reagent dosage.**
- **Automatic calibration.**
- **Automatic cleaning function.**

## Result storage and transmission

The PCA stores up to 1000 results in its memory together with date and time. These results can be downloaded via the integrated RS232-port.

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 PCA 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 preset 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 PCA offers different automatic cleaning options:

### **Cleaning after each measurement:**

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

### **Cleaning in preset 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.

## 4-Channel multiplexer

The PCA offers the possibility to measure up to 4 channels with one instrument! This can be 4 different sample streams or different parameters (Nitrite and Nitrate etc.).

For each channel separate calibration, measurement and cleaning sequences can be defined!

For each channel a separate analog output is available.

## External modules

If necessary external modules can be controlled by the PCA as well:

- **Extraction modules**
- **Digestion modules**
- **Dilution modules**
- **etc.**

### 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.

### Sample filtration

If necessary, we offer self-cleaning filtration modules controlled by the analyser. These modules are nearly maintenance free. We offer filter units with 125 $\mu$  or 1000 $\mu$  bores.

The picture shows a typical installation of a PCA equipped with a filtration system left to the analyser.



### 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 - 60 ml/minute
	<i>Temperature:</i>	5 - 60 °C (sample cooler available)
Optical system:		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. 4; 4 – 20mA, galvanically isolated, max. 500 Ohm
Digital inputs:		Remote control
Environmental cond.:		In-house installation
	<i>Rel. humidity:</i>	5 – 95% (not condensing)
	<i>Temperature:</i>	10 – 40 °C
Housing:		Wall mounting, steel powder coated; IP55 (electronics); plastic (hydraulics)
Dimensions:		Width: ±400 mm x depth: ±250 mm x heights: ±800 mm
Weight:		±30 kg
Infrastructure:	<i>Mains:</i>	220/240 VAC, 50/60 Hz, 110/120 VAC
	<i>Instrument air</i>	Dry oil free (ISA-S7.0.01-1996) (optional)
	<i>Waste:</i>	Atmospherically open with vent.

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

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