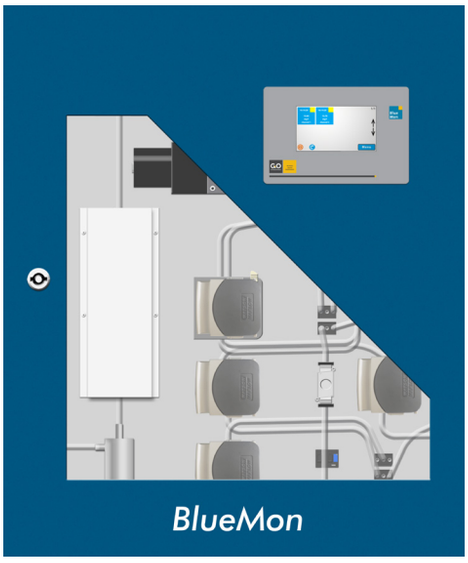
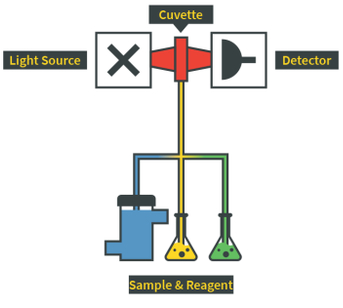
Introduction to Colorimetry

DIN Standard

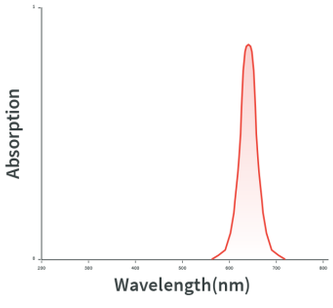


If you mix water with chemicals, different effects can occur depending on the mixture. In colorimetry, these effects are used to determine a parameter. The addition of reagents causes a color change or a change in the absorption behavior of the sample. For measurement, light of a certain wavelength is radiated onto the sample and the absorption of this light is measured in transmitted light. The concentration of the substance to be measured can then be calculated directly from the absorption.

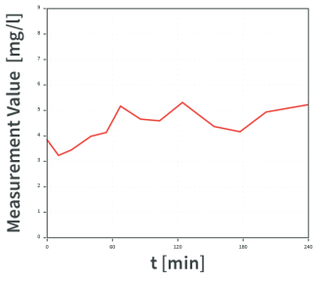
Chemical Reaction



Measurement of Absorption

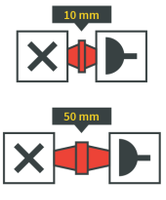


Determination of Concentration



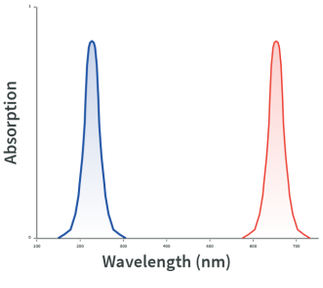
Cuvette Size

During photometric measurement, the cuvette serves as a sample container through which the light is radiated. In addition to the chemical reaction, the correct light source and the appropriate detector, the path length of the cuvette is also important. High concentrations lead to high absorption and therefore require a small path length. Low concentrations, on the other hand, require a longer path length in order to obtain ideal measurement results. By using different cuvette sizes it is possible to cover different measuring ranges.



Wavelengths

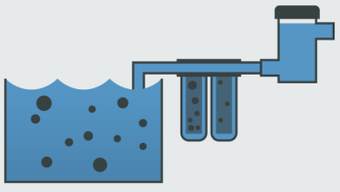
The chemical method used is parameter-specific. These differ not only in the reagents used, but also in the optical behavior of the sample after the chemical reaction. Therefore, depending on the parameter, a specific wavelength is used in the photometric measurement to determine the absorption of the sample. For example, total phosphorus is measured at 643 nm and total nitrogen at 230 nm.



Sample Preparation

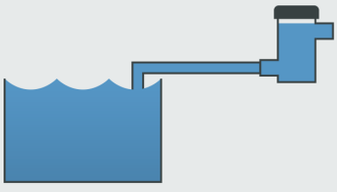
Before mixing the medium with chemicals, it is important to ensure that only particles that can be pumped through the entire flow path without causing blockages get into the BlueMon Analyser. Therefore, depending on the medium, it may be necessary to install a filtration upstream of the analyser. The required particle size depends on the respective parameter. For example, TP should not be filtered too strongly, otherwise no representative measurement is possible.

Filtration Necessary



Particle size >30 µm
For TP >100 µm

No Filtration Necessary



Particle size ≤30 µm
For TP ~100 µm

General Measurement Procedure

The sequence program of the BlueMon Analysers is specific for each parameter. The various subprograms are started and repeated cyclically. If required, the sequence of the program can be individually adapted and optimized to the local conditions. In the simplest case, the calibration and cleaning intervals can be adjusted. In addition, if several measuring channels are used, it is easy to determine when and how often each channel is measured. Even more complex adjustments such as the integration of a customer-specific program are possible without any problems.

Sequence program 1:

Sequence program 2:

Sequence program 3:

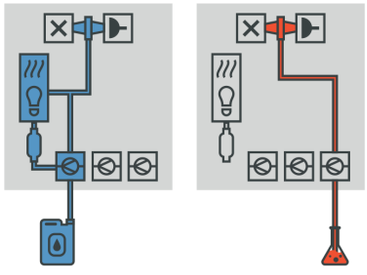
BlueMon On-line Analyser

The **BlueMon** analyser is a powerful measurement device for wet-chemical on-line analysis methods. The analyser allows for a fully automated and self-calibrating operation of up to six sample lines. Thereby it enables the on-line monitoring of parameters that previously required time-consuming and costly manual lab work. The BlueMon Analyser also features extensive control functions, as well as the possibility for remote access and control via internet and mobile networks.

Sample Sequence for the Measurement of TP & OP

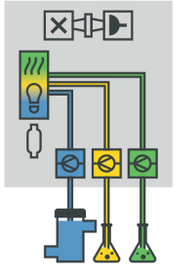
Calibration and Cleaning

The calibration of the BlueMon is an automated process. To ensure the measurement accuracy, the calibration is continuously monitored. Should the calibration fail for example due to contamination, it is repeated. If this happens several times in a row, the operator is alerted. In addition, the BlueMon Analyser has an automated cleaning cycle that can be adapted according to the application. Thus negative effects of contamination or carry-over can be eliminated.



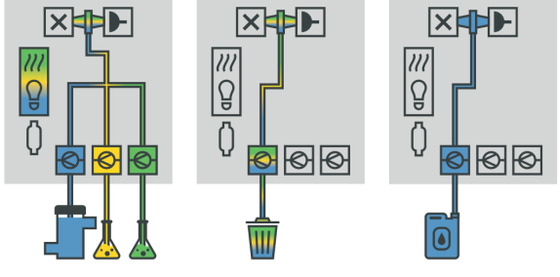
Digestion of Total Phosphorus

First, the sample is pumped together with the necessary reagents into a digestion vessel. In this container, the mixture is irradiated with UV light and heated during this process. This converts the free and bound phosphorus into orthophosphate (OP). The mixture is then pumped into a sample container where it cools down.



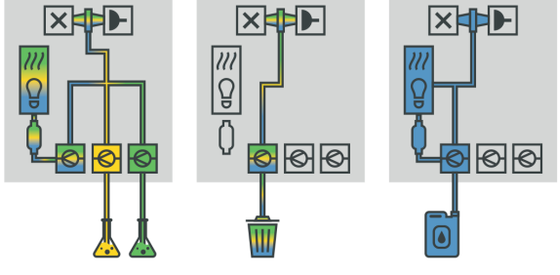
Measurement of Orthophosphate

During the sample digestion the measurement of orthophosphate is carried out. For this purpose, a water sample with the corresponding reagents is pumped directly into the cuvette. The water reacts with the reagents, causing the mixture to change color. In the photometer, the intensity of this color is measured and the concentration of orthophosphate is calculated. The sample is then pumped into the drain and the BlueMon Analyser is cleaned.



Measurement of Total Phosphorus

The prepared sample is pumped from the sample vessel into the photometer and mixed with additional reagent. Again the color change is measured, the concentration calculated and the sample discarded. The BlueMon Analyser is finally cleaned and ready for the next measuring cycle of total phosphorus and orthophosphate.



Functions & Features

- MONITORING FUNCTION
- AUTOMATED CLEANING
- AUTOMATED CALIBRATION
- CONFIGURABLE MEASUREMENT PROCEDURE
- INTELLIGENT EVENT HANDLING
- CLOUD DATA SERVICE
- CONTROL FUNCTION (PLC)
- UP TO 6 MEASURING CHANNELS

Technical Data

Power supply	230 VAC (90 - 260 V)
Power consumption (typical)	42 W
Dimensions (wxhxd)	60 x 70 x 30 cm
IP protection class	IP 54 / IP 65 [optional]
Number of measuring channels	2 / up to 4 [optional]
Sample pressure	0 bar (max. 0.05 bar overpressure)
Sample temperature	+10 to +40 °C
Ambient temperature	+15 to +35 °C

Interfaces

1x RS-232, RS-485, var. protocols e.g. Modbus

1x CAN bus for connection of additional modules, sensors & actuators

1x Ethernet [TCP/IP], Modbus [TCP/IP]

Profibus [optional]

GPRS / UMTS / LTE modem [optional]

Inputs

1x Current input 4-20 mA (Example: Turbidity Sensor TU 8xxx)

4x Digital-In (static) potential-free contacts

1x Connection for pH glass electrode

1x Connection for temperature (PT1000) 0-80 °C

1x Connection for Redox/ORP electrode

1x Connection for leakage sensor

Outputs

2x Current output 4-20 mA expandable to 6x 4-20 mA

4x Digital-Out

6x Relay with a switching capacity of 24 V AC/DC; 0,5 A

Total Nitrogen

Measuring principle	spectrophotometric
Measuring range	0.0 - 6.0 / 20.0 / 100(d) mg/l
Measuring accuracy	± 5 %

Total Phosphorus

Measuring principle	spectrophotometric
Measuring range	0.0 - 2.0 / 10.0 / 100(d) mg/l
Measuring accuracy	± 3 %

Ammonium

Measuring principle	photometric
Measuring range	0.0 - 1.0 / 8.0 / 20 / 100(d) mg/l
Measuring accuracy	± 3 %

NO_3

Measuring principle	spectrophotometric
Measuring range	0.0 - 1.0 / 20.0 / 100(d) mg/l
Measuring accuracy	± 5 %

Chlorine

Measuring principle	photometric
Measuring range	0.0 - 0.2 / 1.0 / 3.0 mg/l
Art. no.	488 1FC0

Ortho-phosphate

Measuring principle	photometric
Measuring range	0.0 - 0.5 / 2.0 / 6.0 / 50(d) mg/l
Art. no.	488 1FP0

Silica

Measuring principle	photometric
Measuring range	0.0 - 0.02 / 2.0 mg/l
Art. no.	488 1FS0

Application Areas

Drinking Water

Quality control

Alarm systems

Wastewater

Trend analysis

Effluent Monitoring

Process Measurement & Control Technology

Process monitoring in industrial facilities

Control of process water treatment

Process optimisation

Environmental Monitoring

River water

Surface water