

## Analyzer

### On-line Measuring

Water and wastewater treatment still require analyzers for on-line measuring, justifying their presence next to commonly more reasonable in-situ sensor systems. Especially for utmost precise water analysis – with for i.e. effluent monitoring of wastewater plants requiring automatic calibrations and/or adaption as well as standard DIN procedures for analysis – analyzers are applied. Besides the measuring instruments also the sample preparation is of great importance. Sample preparation and measuring system should correspond to each other in order to guarantee failure-free reliable and accurate measurements. The WTW TresCon® analyzer and PurCon® sample preparation represent a perfectly matching complete system and guarantee best possible measuring results even under most difficult conditions.

#### Measuring parameters

The WTW analyzer cover a wide range of measuring parameters. Besides the nitrogen parameters ammonium, nitrate as well as nitrite also the phosphate parameters ortho-phosphate and total phosphate can be measured by the TresCon® analyzer family. Mainly photometric and potentiometric procedures are used.

#### Controlling

When the main focus is set on the control/regulation of processes, it is advisable to use in-situ sensors for fast, continuous monitoring of measuring values, whenever possible. In such cases it sometimes becomes acceptable, when measurings are less precise and do not comply with the DIN standard. Only a high process transparency enables to develop efficient controlling strategies. Reliable and

immediately accessible measuring data of all process relevant parameters are precondition for process transparency. This was well exemplarily processed during the last years regarding the optimization of nitrification and denitrification: Through ion-selective in-situ ammonium and nitrate measurings of WTW's VARION®, AmmoLyt®, and NitraLyt® and additionally the spectral in-situ nitrate measurement using NitraVis® sensor did not only improve the nitrogen elimination but also cut costs considerably.

#### Phosphate parameter

Both measuring parameters ortho-phosphate and total phosphor cannot be determined by ion-selective or spectral measurement. However, analyzer as the currently exclusive automatic measuring instruments enable the determination of both parameters.

For this reason analyzers are so far the only alternative for the total-phosphor measuring – i.e. for wastewater treatment discharge monitoring – and for ortho-phosphate elimination through controlled adding of precipitation solution.

**Special applications**

Also with special applications and process related difficult applications, analyzers can outperform in-situ measurements. Especially related to contamination problems such as for extremely grease contaminated wastewaters special cleaning liquids can be used for analyzers especially developed for this condition. In-situ measuring sensors the automatic cleaning with cleaning liquids is not given and also not

feasible unless further efforts are undertaken. Also the option to operate the analyzers with sea-water applications such as fishfarming or fishtanks enables the automatic measuring of some parameters, such as ammonium or nitrate, considering that ion-selective or spectral optical methods cannot be applied in those areas.

**Sample dilution**

Furthermore, analyzers offer the possibility to attenuate the sample using distilled or deionized water and therefore finally enable a measuring with high parameter concentrations.



General Description of Meters

Monitors

IQ\_SENSOR NET

Analyzer

Sample Preparation

Samplers

Accessories

Measuring stations

# TresCon® – Systematic On-line Analysis

## For Continuous Monitoring and Process Control

As the need for higher quality measurements in water and wastewater plants increases so does the complexity and degree of automation. Practical and maintenance-free instruments to continuously monitor these processes requires that those instruments be also rugged and efficient. The TresCon® Multi-parameter System exceeds all requirements for accurate and precise continuous measurements.



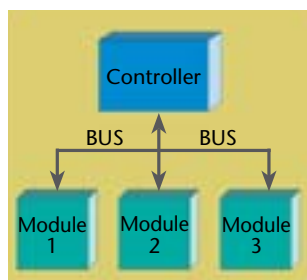
TresCon®

- Simultaneous analysis of up to three parameters
- Easily upgradeable
- Reliable & Accurate

## A Progressive Design – Modular System

The TresCon® 's individual system components, the central control unit and the self-contained analyzer modules, have their own microprocessors which can perform specific tests independently.

The controller and the module communicate via high speed internal connections. Real-time control of the most difficult tests are easily accomplished with the TresCon® 's superior design. System can be custom designed to meet the operator's needs.



### ① System Controller Module

Equipped with a fast microprocessor, the controller includes a graphic display unit, a control panel and all the input/output interfaces. The controller inputs all application functions, calibration protocols, processing and storage of data and the display of measured results.

If modules are added or exchanged TresCon® will automatically recognize the new parameter and automatically updates the system. No operator servicing is required.

### ② Analysis Modules

The analyzer modules are microprocessor-based, self-contained system components which will operate completely independent of each other. Up to three modules, in any combination of parameters, can be integrated into a single TresCon® system. The modules can be for the same parameter from different sample sites, or for any combination of the available parameters.

- NH<sub>4</sub>-Module (Ammonium-Nitrogen)
- NO<sub>3</sub>-Module (Nitrate-Nitrogen)
- NO<sub>3</sub>/SAC-Module (Nitrate-Nitrogen and SAC)
- NO<sub>2</sub>-Module (Nitrite-Nitrogen)
- PO<sub>4</sub>-Module (Orthophosphate)
- ΣP-Module (Total Phosphorus)

Retrofitting or exchanging a module can be carried out in a few minutes. The new module is automatically recognized by the TresCon® controller and is immediately ready to use.

### ③ System Mounting

The stainless steel mounting column is an integral part of the TresCon® system. It is used for simple wall mounting and also contains the wide-range power supply for TresCon®.

### ④ Supplies Tray

A tray holds all bottles and containers for reagent, standard and cleaning solutions. The containers are color-coded so that parameters and connections can be easily connected.



Ammonium-Nitrogen

Nitrate-Nitrogen/SAC



Nitrite-Nitrogen

Orthophosphate



Total Phosphorus

 General Description  
of Meters

Monitors

IQ SENSOR NET

Analyzer

 Sample  
Preparation

Samplers

Accessories

 Measuring  
stations

# User Interface

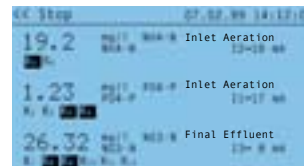
## Simple Operation

- Uniform user interface for the complete system
- Uniform operation of all analysis parameters
- Clear and logically structured system program
- Rapid and safe input by 8 function and control keys
- Quick Start Guide/ Instruction Manual



## Easy-to-read information and graphical presentation

- High-resolution backlit graphics display
- Up to 3 measuring parameters at a glance
- Clear presentation of measurement, units, individual text and assigned relays and current interfaces
- Daily or weekly trend curves for individual or several parameters in a single graph
- Status line for auxiliary information



## Auto Functions of All Modules

|                   |  |
|-------------------|--|
| AutoClean®        | An innovative method for automatic self-cleaning whose high efficiency allows measurements in slightly polluted wastewater, e.g. in sewage treatment plant effluent, without sample preparation.   |
| AutoCal           | Automatic calibration and plausibility check at predefined time intervals – resulting in a higher degree of accuracy.  |
| AutoKorr          | A correction algorithm developed by WTW for compensating background color in the sample in photometric measuring methods.  |
| AutoFlow          | Function for continuously monitoring the container filling levels and the sample/reagent flow in the module and for producing useful maintenance messages.   |
| AutoTherm         | Automatic temperature control means that ambient temperature influences on the analytical results can be disregarded.  |
| Intervall         | Software function for regular measurements at selectable intervals.  |
| Intervall-Program | Measuring program – for a period of one week the measuring intervals within two-hour sections can be defined. This allows extremely reagent-saving operation in periods where experience has shown that only slight variations in the measurements are to be expected. |

# System Inputs & Outputs

TresCon® standard features include a number of analog and digital outputs, which provide enhanced data management and control capabilities of the system. All inputs and outputs can be assigned at will to the installed analyzer modules and freely configured.

## Serial Interfaces

Two serial input/output interfaces which can be operated independently are standard equipment in the analyzer. While the RS 232, for example, is linked to a local device for data recording – such as a printer –, the RS 485 interface allows for remote control of the unit.

If a telephone connection is available then TresCon® can be accessed and controlled by a remote computer via the RS 232 interface and a modem. The RS 485 interface also allows TresCon® to be coupled to PROFIBUS-DP by using a gateway.

## PID Control

As an alternative to outputting the measured values, the analog outputs of TresCon® can also be used as PID controllers for control and feedback control purposes.

## Proportional Control (PW/PF)

As well as being used for report or limit contacts, each relay can also be programmed as an impulse or frequency controller. Depending on the control function, in I/F control either the impulse length (I-control) or the impulse frequency (F-control) of the output signal is varied.

# TC/PU 1 Two-Channel Permeate Switcher

By means of the TC/PU 1 Two-Channel Permeate Switcher TresCon® can analyze samples from two different sampling locations in sequence. As the two analyzer samples, e.g. the permeate flows from two PurCon® systems, are directly in contact with the switching valve, any alteration in concentration of either of the permeate flows can be registered within minutes. Up to three TresCon® modules can be con-

nected to the TC/ PU 1 Two-Channel Permeate Switcher. It is available as an accessory and can be mounted on the side of the TresCon® stand in a space-saving manner. Control is via the TresCon® terminal. The mA outputs and relays can be parametrized accordingly so that no additional external reporting units are necessary.

## Technical Data TresCon®

|                               |  |
|-------------------------------|--|
| <b>Sample preparation</b>     | TresCon® analyzer modules require continuous sample input with a low solids content; typical sample preparation with PurCon® (see Sample Preparation Section).   |
| <b>Sample delivery</b>        | Sample presented for analysis in overflow vessels supplied; up to three analyzer modules can be connected to one overflow vessel. Operation with up to three overflow vessels is also possible (parallel analysis of different samples). |
| <b>Interfaces</b>             | 3 freely configurable galvanically separated 0/4-20 mA outputs, 12 potential-free relays, freely configurable, RS 232, RS 485.   |
| <b>Electrical connections</b> | 230 VAC ± 10%, 50 Hz / 115 VAC ± 10%, 50 – 60 Hz   |
| <b>Ambient conditions</b>     | Storage temperature – 77 ... 140 °F (25 ... 60 °C), operating temperature 32 ... 104 °F (0 ... 40 °C), climate class 4, VDI/VDE 3540 Bl. 2   |
| <b>Test marks</b>             | CE, DIN-GOST   |
| <b>Instrument protection</b>  | Safety class I according to IEC 1010-1/EN 61010-1  |
| <b>Weight</b>                 | Empty housing: 59.5 lb (27 kg); each module: 22 lb (10 kg); mounting column: 55 lb (25 kg)   |
| <b>Guaranty</b>               | 2 years for defects of quality   |

## Ordering Information

|  |  |                  |
|--|--|------------------|
| <b>Ein TresCon® basic instrument (without module) consisting of:</b> | TresCon® terminal, mounting column, reagent tray, overflow vessels for max. three modules, terminal operating instructions (German)<br>If operating instructions in English are required these must be ordered separately. | <b>Order No.</b> |
|--|--|------------------|

|   |  | 1 <sup>st</sup> Module | 2 <sup>nd</sup> Module              | 3 <sup>rd</sup> Module   |
|---|--|------------------------|-------------------------------------|--------------------------|
| <b>TresCon® basic instrument (with first analyzer module)</b>             |  |                        |                                     |                          |
| <b>TresCon® Ammonia, A111</b>   | Basic instrument with ON 110 module for Ammonium-Nitrogen                                    | 8A-1                   | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>TresCon® Nitrate, N211</b>   | Basic instrument with ON 210 module for Nitrite-Nitrogen                                     | 8A-2                   | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>TresCon® Nitrite, N511</b>   | Basic instrument with ON 510 module for Nitrite-Nitrogen                                     | 8A-3                   | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>TresCon® Orthophosphate, P211/MB 1</b>                                 | Basic instrument with OP 210/MB1 module for Orthophosphate (measuring range 1)               | 8A-4                   | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>TresCon® Orthophosphate, P211/MB 2</b>                                 | Basic instrument with OP 210/MB2 module for Orthophosphate (measuring range 2)               | 8A-5                   | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>TresCon® Orthophosphate, P211/MB 3</b>                                 | Basic instrument with OP 210/MB3 module for Orthophosphate (measuring range 3)               | 8A-6                   | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>TresCon® Nitrate/SAC, S211</b>   | Basic instrument with OS 210 module for Nitrate-Nitrogen and SAC                             | 8A-7                   | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>TresCon® Total Phosphorus, P511</b>                                    | Basic instrument with OP 510 module for Total Phosphorus (requires two module places)        | 8A-8                   | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| <b>Ordering options for additional analyzer modules (2nd/3rd modules)</b> |  |                        |                                     |                          |
|   | <b>Without additional analyzer module</b>  |                        | <input type="checkbox"/>            | <input type="checkbox"/> |
|   | <b>NH<sub>4</sub> analyzer module (Ammonia-Nitrogen), OA110</b>                              |                        | <input type="checkbox"/>            | <input type="checkbox"/> |
|   | <b>NO<sub>3</sub> analyzer module (Nitrate-Nitrogen), ON210</b>                              |                        | <input type="checkbox"/>            | <input type="checkbox"/> |
|   | <b>NO<sub>2</sub> analyzer module (Nitrite-Nitrogen), ON510</b>                              |                        | <input type="checkbox"/>            | <input type="checkbox"/> |
|   | <b>PO<sub>4</sub> analyzer module (Orthophosphate), OP 210/MB1</b>                           |                        | <input type="checkbox"/>            | <input type="checkbox"/> |
|   | <b>PO<sub>4</sub> analyzer module (Orthophosphate), OP 210/MB2</b>                           |                        | <input type="checkbox"/>            | <input type="checkbox"/> |
|   | <b>PO<sub>4</sub> analyzer module (Orthophosphate), OP 210/MB3</b>                           |                        | <input type="checkbox"/>            | <input type="checkbox"/> |
|   | <b>NO<sub>3</sub>/SAC analyzer module (Nitrate-Nitrogen and SAC), OS 210</b>                 |                        | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>Other ordering options</b>   |  |                        |                                     |                          |
|   | <b>Without feet (wall mounting with mounting stand)</b>                                      |                        |                                     | <input type="checkbox"/> |
|   | <b>With feet (free-standing arrangement)</b>   |                        |                                     | <input type="checkbox"/> |
| Please complete the ordering number by entering the required versions:    |  |                        | <input type="checkbox"/>            | <input type="checkbox"/> |
| <b>Ordering example:</b>  | TresCon® Ammonium A111 with additional nitrate module, for wall mounting with mounting stand | 8A-1                   | <input type="checkbox"/>            | <input type="checkbox"/> |



The technical data of the analyzer modules can be found on pages 48 to 57.



## TresCon® Uno

- Compact dimensions
- Economical
- Easy to Use

### Online-Analysis – reliable · compact · economical

The new TresCon® Uno uses a single channel version of our popular multi channel TresCon® Analyzer. The TresCon® Uno instruments are designed for control and monitoring at waste water treatment plants. The compact size of TresCon® Uno at a reasonable price offers to the user a good price-performance-ratio for the measurement of nutrient parameters.

#### System Description:

TresCon® Uno consists of a basic unit ①, an analyzer-module ②, and a reagent tray ③. System can be wall mounted.

#### Operation safe and Service friendly:

Many automatic diagnosis functions help the user with operation and maintenance. The modular design allows for the quick and easy exchange or replacement of modules.

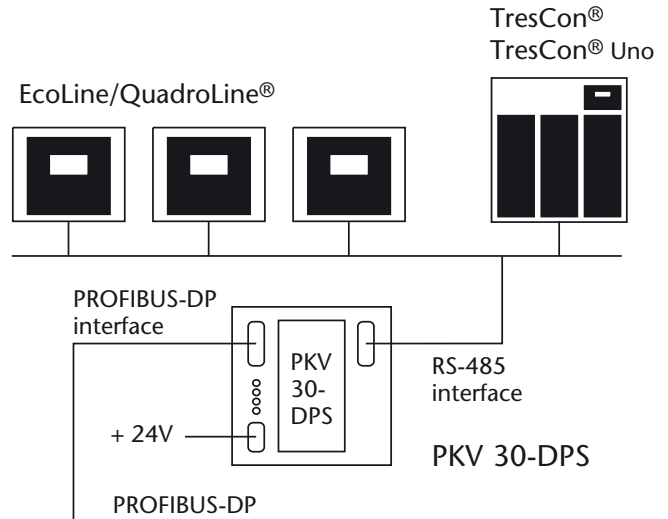


#### Maintenance and Service

TresCon® systems are service-friendly requiring little or no maintenance. The numerous useful system functions are easily accessed and changed. The operator is also prompted as to service intervals automatically. It has also been designed for easy access and maintenance.

**The Instruments include:**

- big graphical display
- three 0/4-20 mA outputs
- 12 relay interfaces
- RS 232 interfaces
- RS 485 interfaces
- different controller functions (PID, pulse-width, frequency)



Connection to PROFIBUS-DP via Protocol Converter

**Technical Data TresCon® Uno**

| TresCon® Uno  |   |  |                                  |
|---|---|--|----------------------------------|
| <b>Measuring ranges</b><br><i>Detailed technical data: see TresCon® modules in parameter section*</i> | Ammonium:   | 0.05 ... 1000 mg/l NH <sub>4</sub> -N                              | <i>*See also OA 110, page 48</i> |
|   | Nitrate:  | 0.10 ... 60 mg/l NO <sub>3</sub> -N                                | <i>*See also ON 210, page 52</i> |
|   | Nitrite:  | 0.05 ... 1,200 mg/l NO <sub>2</sub> -N                             | <i>*See also ON 510, page 53</i> |
|   | Orthophosphate Range 1:   | 0.05 ... 3,00 mg/l PO <sub>4</sub> -P                              | <i>*See also OP 210, page 56</i> |
|   | Orthophosphate Range 2:   | 0.10 ... 10,0 mg/l PO <sub>4</sub> -P                              | <i>*See also OP 210, page 56</i> |
|   | Orthophosphate Range 3:   | 0.10 ... 25,0 mg/l PO <sub>4</sub> -P                              | <i>*See also OP 210, page 56</i> |
|   | Nitrate/SAC:  | 0.10 ... 60 mg/l NO <sub>3</sub> -N / 0.10 ... 200 m <sup>-1</sup> | <i>*See also OS 210, page 52</i> |
| <b>Calibration</b>  | Automatic 2-point-calibration (works calibration for N211 and S211)   |  |                                  |
| <b>Measurement intervals</b>  | Cont., 5, 10, 15, 20, 25, 30 min to be set depending on the parameter |  |                                  |
| <b>Sample preparation</b>   | Depending on the application: none, PurCon® or PurCon® IS             |  |                                  |
| <b>Mains</b>  | 230 VAC ± 10%; 50 Hz / 115 VAC ± 10%; 50/60 Hz                        |  |                                  |
| <b>Operation temperature</b>  | 32 ... 104 °F (0 ... 40 °C)   |  |                                  |
| <b>Dimensions, Weight</b><br>(W x H x D, lb/kg)   | Analyzer:   | 24.1 x 30.5 x 13 in. (612 x 775 x 329 mm), approx. 77.2 lb/35 kg   |                                  |
|   | Reagent tray:   | 23.2 x 2 x 14.2 in. (590 x 50 x 360 mm), approx. 37.5 lb/17 kg     |                                  |
| <b>Guaranty</b>   | 2 years for defects of quality  |  |                                  |

**Ordering Information**

| TresCon® Uno |                                       |                          | Order No. |
|--------------|---------------------------------------|--------------------------|-----------|
| TCU/A111     | TresCon® Uno – Ammonium               | NH <sub>4</sub> -N       | 820 101   |
| TCU/N211     | TresCon® Uno – Nitrate                | NO <sub>3</sub> -N       | 820 102   |
| TCU/N511     | TresCon® Uno – Nitrite                | NO <sub>2</sub> -N       | 820 103   |
| TCU/P211-MB1 | TresCon® Uno – Orthophosphate Range 1 | PO <sub>4</sub> -P/MB1   | 820 104   |
| TCU/P211-MB2 | TresCon® Uno – Orthophosphate Range 2 | PO <sub>4</sub> -P/MB2   | 820 105   |
| TCU/P211-MB3 | TresCon® Uno – Orthophosphate Range 3 | PO <sub>4</sub> -P/MB3   | 820 106   |
| TCU/S211     | TresCon® Uno – Nitrate/SAC            | NO <sub>3</sub> -N / SAC | 820 107   |







## Phosphate

### Phosphate Measurements

Phosphorus compounds – in particular ortho-phosphate  $\text{PO}_4^{3-}$  – are considered to be the limiting nutrients in most stagnant and flowing waters. An increase in their concentration caused by higher input (wastewater, avulsion etc.) results directly in increasing eutrophication of the water with known effects such as increased growth of algae, oxygen depletion as far as anoxia in the deeper regions, etc.

#### Measuring Methods

##### Molybdenum blue method

In an acidic medium, ortho-phosphates bond with ammonium molybdate to form molybdenic phosphoric acid. With the aid of a reducing agent this forms phosphorus molybdenum blue compound. Photometrical measurement of dye intensity can be performed at 880 nm.

##### Vanadate/molybdate method (yellow method)

In acids, ortho-phosphate ions react with ammonium molybdate and ammonium vanadate to form yellow ammonium phosphoric vanadomolybdate. This can be photometrically analyzed at 380 nm.

#### Phosphorus Compounds in Water

Phosphorus occurs in 3 compounds in natural waters:

- inorganic, dissolved ortho-phosphate
- dissolved organic phosphorus compounds
- particulate phosphorus (bound in biomass or attached to particles),

which add up to the total of phosphorus content  $P_{\text{Total}}$ , an important parameter in monitoring wastewater treatment plant effluents.

**Measuring Methods and Digestion**

There are two methods available for determining phosphate or phosphorus concentrations:

- Molybdenum blue method
- Vanadate/molybdate method (yellow method)

Both techniques are based on the measurement of ortho-phosphate. Digestion of both dissolved organic as well as particulate phosphorus compounds is therefore mandatory for determining the total P content. In addition, an unfiltered sample must be acquired in order to include all solid matters in the digestion process. Digestion is usually performed by heating the sample with peroxodisulfate and sulfuric acid.

**Elimination of Phosphates in Wastewater**

To meet the required limits of P concentration in the effluent, the modern wastewater treatment facility has two methods available:

- Biological elimination of phosphates “Bio-P”: incorporation of phosphate in microbial biomass (usually in combination with a preliminary anaerobic stage to stimulate luxury consumption of phosphate and intracellular storage as polyphosphate)
- Chemical-physical elimination of phosphates: Chemical precipitation of ortho-phosphates using metallic salts (usually Fe<sup>3+</sup> or Al<sup>3+</sup>). The use of ortho-phosphate analyzers for effective control and regulation of precipitations results in considerable savings.

**Regulation according to P Concentration**

With a continuous monitor PO<sub>4</sub> analyzer, the operator of water treatment plants can realize significant cost savings.

*(cf. Application Report PO4 1609 2003 01e)*



## TresCon® OP 210

- Yellow method
- Continuous background compensation
- Continuous/Discontinuous operation selectable

### On-line orthophosphate measurement

- Control or feedback control of chemical phosphate precipitation, e.g. precipitating agent addition with simultaneous precipitation
- Monitoring biological phosphate elimination
- Measuring the phosphate pollution in natural waters
- Monitoring the phosphate concentration in the drinking water



### Measuring Principle

The PO<sub>4</sub> module uses the vanadate/molybdate method (yellow method) for determining the orthophosphate content. A reagent reacts with phosphate in the sample to color the sample solution yellow. The intensity of this color is recorded photometrically and evaluated as a measure of the phosphate content.

### Technical Data OP 210

|                                     |   |   |   |
|-------------------------------------|---|---|---|
| Measuring Ranges                    | Measuring range 1:  | PO <sub>4</sub> -P<br>0.05 - 3.00 mg/l; 1.5 - 100 µmol/l        | PO <sub>4</sub><br>0.15 - 9.00 mg/l; 1.5 - 100 µmol/l |
|                                     | Measuring range 2:  | 0.1 - 10.0 mg/l; 3 - 320 µmol/l                                 | 0.3 - 30.0 mg/l; 3 - 320 µmol/l                       |
|                                     | Measuring range 3:  | 0.1 - 25.0 mg/l; 3 - 800 µmol/l                                 | 0.3 - 80.0 mg/l; 3 - 800 µmol/l                       |
| Resolution (Display)                | Measuring range 1:  | 0.01 mg/l or µmol/l   |   |
|                                     | Measuring range 2:  | 0.1 mg/l or µmol/l  |   |
|                                     | Measuring range 3:  | 0.1 mg/l or µmol/l  |   |
| Accuracy                            | ±2% of the measured value ±0.01 mg/l PO <sub>4</sub> -P (Measuring range 1)<br>±2% of the measured value ±0.1 mg/l PO <sub>4</sub> -P (Measuring range 2 and 3) |   |   |
| Coefficient of Variation for Method | 2% (for all measuring ranges)   |   |   |
| Response Time                       | <4 min to measured value (after alteration in concentration at module input)  |   |   |
| Measuring Interval                  | Quasi-continuous measurement, 5, 10, 15, 20, 25 or 30 min settings  |   |   |
| Calibration                         | Automatic 2-point calibration (time and interval selectable)  |   |   |
| Background Correction               | Continuous background compensation based on new WTW algorithm   |   |   |
| Sample Input                        | Approx. 0.06 l/h, solid content < 50 mg/l (e.g. sewage treatment plant effluent)  |   |   |
| Consumption                         | Reagent, 10 l:  | 60/155/310/465 days with cont./10/20/30 min measuring intervals |   |
|                                     | Standard B 1.5 l:   | 90 days with 24 h calibration interval                          |   |
|                                     | Cleaning solution, 1.5 l:   | 45 days with 24 h cleaning interval                             |   |
| Maintenance Interval                | Every 6 months  |   |   |
| Guaranty                            | 2 years for defects of quality  |   |   |

### Ordering Information

|  |  |            |
|--|--|------------|
| Separate TresCon® analyzer module for Orthophosphate for extension of an existing TresCon® system (requires 1 measuring place) |  | Order. No. |
| OP 210/ MB 1   | Module for Orthophosphate: Measuring range 1       | 820 004    |
| OP 210/ MB 2   | Module for Orthophosphate: Measuring range 2       | 820 005    |
| OP 210/ MB 3   | Module for Orthophosphate: Measuring range 3       | 820 006    |
| TresCon®-basic instrument with analysis module OP 210 for ortho-phosphate (wall mounting, space for 2 further modules)         |  | Order. No. |
| TresCon® P 211/MB1   | Orthophosphate, Measuring range 1                  | 8A-40030   |
| TresCon® P 211/MB2   | Orthophosphate, Measuring range 2                  | 8A-50030   |
| TresCon® P 211/MB3   | Orthophosphate, Measuring range 3                  | 8A-60030   |
| TresCon® Uno single parameter system ortho-phosphate with analysis module OP 210   |  | Order. No. |
| TCU/P211-MB1   | TresCon® Uno for Orthophosphate: Measuring range 1 | 820 104    |
| TCU/P211-MB2   | TresCon® Uno for Orthophosphate: Measuring range 2 | 820 105    |
| TCU/P211-MB3   | TresCon® Uno for Orthophosphate: Measuring range 3 | 820 106    |



Accessories and Consumables see brochure "Product Details"

**TresCon® OP 510**

- 2-point calibration – high degree of accuracy
- Automatic Monitoring
- “Blue” method



Parameter section

Dissolved Oxygen

pH/ORP

Conductivity

Turbidity/Suspended Solids

Nitrogen

Phosphate

Carbon: COD/TOC/DOC/BOD/SAC

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**On-line P<sub>Total</sub> measurement**

- Monitoring the effluent from wastewater treatment plant for P<sub>Total</sub>
- Monitoring phosphorus pollution in natural waters

**Measuring Principle**

The P<sub>Total</sub> module consists of two units: in the first unit (digestion unit) the sample undergoes a chemical-thermal digestion; in the second unit the total phosphorus content is determined.

During the digestion all the phosphorus compounds contained in the sample are converted to orthophosphate; this can be determined photometrically. The phosphorus compounds are oxidized by peroxodisulfate under acidic conditions.

This process is accelerated by overpressure and an increased temperature so that very short digestion times are achieved.

The subsequent analysis is by the molybdenum blue method. The sample is mixed with a molybdate reagent which reacts with phosphate via an intermediate chemical step to form a blue coloration. The intensity of this coloration is a measure of the original concentration of the phosphate ions. It is measured photometrically and evaluated.

**Technical Data OP 510**

|                                     |  |
|-------------------------------------|--|
| Measuring Ranges                    | P <sub>Total</sub> : 0.01 ... 3.00/6.00*; 0.3 ... 100/200*   |
| Resolution (Display)                | Range: 0.01 ... 3.00 mg/l : 0.01 mg/l<br>0.30 ... 100 µmol/l : 0.1 µmol/l  |
| Accuracy                            | ±3% of the measured value ±0.05 mg/l P <sub>Total</sub>  |
| Measuring Principle                 | Photometric reference beam method after digestion  |
| Measuring Method                    | Molybdenum blue methode  |
| Coefficient of Variation for Method | 1.5%   |
| Measuring Interval                  | 10, 15, 20, 25, 30 or 60 min can be set (DIN EN measurement with 30 min digestion at approx. 248 °F/120 °C)  |
| Calibration                         | Fully automatic 2-point calibration  |
| Consumption                         | Reagents A, B, C, D: 10/15/20/30/60 days with 10/15/20/30/60 min measuring intervals<br>Standard, 1.5 l: 70 days with 24 h calibration interval<br>Cleaning solution, 1.5 l: 60 days with 24 h cleaning interval |
| Maintenance Interval                | Every 3 months   |
| Guaranty                            | 2 years for defects of quality   |

**Ordering Information**

|                |  | Order. No. |
|----------------|--|------------|
| OP 510         | Separate TresCon® analyzer module for total phosphorus for extension of an existing TresCon® system (requires 2 TresCon® measuring places) | 820 011    |
| TresCon® P 511 | TresCon®-basic instrument with analysis module OP 510 for total phosphorus (wall mounting, space for 1 further module)                     | 8A-8X030   |



Accessories and Consumables see brochure “Product Details”  
Homogenizer available on demand (see brochure “Product Details”)  
\* by continuous sample dilution in a 1:1 ratio