Measuring
- Ammonia
- ATP (Adenosine Triphosphate)
- Bacterial DNA
- BTX
- Chloramine (Monochloramine)
- Chlorine/Free Chlorine
- COD/BOD/TOC/DOC/SAC
- Colour/Hazen
- Conductivity
- Dissolved Oxygen
- Faecal Coliform
- Hydrocarbons
- Level
- Manganese
- Microbes
- Nitrate/Nitrite
- Oil/Grease in Water
- Ortho-Phosphate
- pH/ORP (Redox)
- Sulphite
- Sludge Blanket
- Suspended Solids
- TDS
- Total Nitrogen
- Total Phosphorus
- Turbidity
- UV Transmittance

Royce Water Technologies

Product Catalogue

Innovative water & wastewater solutions

Innovative Technologies
- Algae Control in ponds and lakes
- Automatic Water & Wastewater Samplers
- Methane Potential Analysis Systems for Biomass
- Sonication - Denitrification improvement
- Sonication - Anaerobic Digestion improvement
- Sonication - Reduction of Foaming in Activated Sludge Basins
- Aeration for Lagoons
- Aeration for Bioreactors
- Aeration for Wet Wells
- Wastewater Sludge Dewatering Optimisation
- Wet Well Pump Control

www.roycewater.com.au
After over 15 years servicing the Australian water and wastewater marketplace, Royce Water Technologies has established an envied position as a quality supplier of innovative solutions.

We take great pride in offering only the best available solutions in analytical monitoring, control and process improvement in Australia’s diverse water and wastewater industry.

Royce Water Technologies has a nationwide team of dedicated water and wastewater professionals. Our team services Queensland, New South Wales and Victoria. We have an expert team of partner distributors covering Tasmania, South Australia and Western Australia.

“Our aim is to provide accurate & reliable measurements of process parameters with the lowest overall cost of ownership – which leads to improved process quality & reduced energy consumption.”

Our team has a combined application and product experience of over 100 years. We are backed by industry expertise from across the globe in our ongoing relationships with the most innovative manufacturers and commitment to professional development. Royce Water is able to deliver the best possible expert advice and solutions to our clients throughout Australia.

Royce Water Technologies Directors

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Email rod.wellings@roycewater.com.au

**Tim Curtis**  
Phone 0408 079 073  
Email timc@roycewater.com.au

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10 BDX17 Single Input Controller
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Waste Water Treatment Plant
Process Monitoring & Control

**Influent:** pH, Conductivity, Ammonia, Ortho-Phosphate, COD, TOC, DOC, BOD, SAC

**Aeration:** DO, Ammonia, TSS, pH, MLSS, Nitrate, Nitrite
**Effluent:** Ammonia, Ortho-Phosphate, Total Nitrogen, Total Phosphorus, Nitrate, pH, Conductivity, D.O., Turbidity, COD, TOC, DOC, BOD, SAC

**Chlorination:**
Total & Free Chlorine

**Sludge Processing:**
Sludge Dewatering Optimisation

**Final Setting:**
Nitrogen, Turbidity, TSS, pH, Sludge Blanket Level

**Denitrification:**
Sonication of TWAS returned to Anoxic Zone as an Internal Carbon Source for Denitrification

**Chlorination:**
Total & Free Chlorine

www.roycewater.com.au
The innovative MXD70 series of process instruments brings a new dimension to analytical process measurements with the modular design to meet ever changing process requirements.

- MXD73 Compact 96 DIN IP66 Panel mount option
- MXD75 IP66 Surface / Pipe mount version
- 3¾” QVGA Backlit LCD display provides clear indication as single or multiple measurements
- Parameters include: Contacting and Electrodeless Conductivity, pH / Redox or Dissolved Oxygen measurement, Salinity/ TDS/Turbidity/TSS
- Up to 3 measured parameters with temperature readings can be displayed together
- Accurate at zero DO
- User selectable bar graph display option
- Plug and play card detection for simple measurement and output expansion upgrades
- SD card interface allows trouble free saving of configuration and simplifies software updates
- Base models include 2 relay outputs and a single isolated 4-20mA current output
- Can be expanded up to 6 relay outputs and 6 isolated 4-20mA current outputs
- Relays are fully configurable including on/off, time or pulse proportional operation
- 8 Independent programmable digital inputs with user selectable operations
- Dedicated error page provides up to date controller status
- BS-265v or 18-32v Supply options (AC or DC)
- SD Card data logging
- Three separate live trend screens
- Add to existing MXD70 series controllers

### MXD70 Series

<table>
<thead>
<tr>
<th></th>
<th>MXD73</th>
<th>MXD75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Expansion Slots</td>
<td>3 slots, user configurable with any combination of available input add-in cards.</td>
<td>3 slots, user configurable with any combination of available input add-in cards.</td>
</tr>
<tr>
<td>Output Expansion Slots</td>
<td>1 slot, user configurable with an additional output option add-in card.</td>
<td>1 slot, user configurable with an additional output option add-in card.</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-20°C to +50°C</td>
<td>-20°C to +50°C</td>
</tr>
<tr>
<td>Current Output Adjustment</td>
<td>±0.01mA, 3 point 0/4-20 mA for remote monitor calibration.</td>
<td>±0.01mA, 3 point 0/4-20 mA for remote monitor calibration.</td>
</tr>
<tr>
<td>Buttons</td>
<td>3¾” QVGA backlit LCD module.</td>
<td>3¾” QVGA backlit LCD module.</td>
</tr>
<tr>
<td>SD Card Interface</td>
<td>Enables backing up and restoring of instrument configuration, logging of the sensor readings and instrument status (optional extra) and on-site upgrading of instrument software. SD, SDHC and SDXC-FAT32 cards supported.</td>
<td>Enables backing up and restoring of instrument configuration, logging of the sensor readings and instrument status (optional extra) and on-site upgrading of instrument software. SD, SDHC and SDXC-FAT32 cards supported.</td>
</tr>
<tr>
<td>Instrument Housing</td>
<td>UL 94-V0 PC/ABS</td>
<td>UL 94-V0 PC/ABS</td>
</tr>
<tr>
<td>Weight</td>
<td>880g</td>
<td>2.7kg</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Front - 128 x 116 x 23 mm (H, W, D) Rear - 89 x 89 x 161 mm (H, W, D)</td>
<td>331 x 242 x 110 mm (H, W, D)</td>
</tr>
</tbody>
</table>

Hundreds of installations in Australia!
MXD70 Series - SD Card Data Logging with Live Trending

The Data logging additional software function expands the capabilities of the MXD70 series by allowing the user to record over time the status of the instrument. It consists of two separate sections, Live Trending and SD Card Data Logging, which together help the user to analyse and improve the performance of their application.

The MXD70 series features optional software functions which when purchased will expand the instrument’s capabilities. These functions by default are locked. They can be unlocked by LTH or your local distributor at the time of order. Alternatively the functions may be ordered after purchase by supplying LTH or your local distributor the serial number of your instrument. In return they will supply you with an 8 digit unlock code that is unique to the instrument and the required function to be unlocked.

Live Trending provides the user with three separate live trend screens adjacent to the front screen with each showing two readings. This enables the user to instantly view the last 50 samples of each reading. The live trend screen also features a review mode where by the user can further analyse the last 200 samples of each reading, If the user finds something of note the software provides the facility to save these 200 readings to an excel compatible file on the SD card.

Further analysis is provided by optionally displaying the minimum, maximum and average value of the 200 samples. The number of readings, the source of the readings, the displayed scale and the sample interval rate are all configurable by the user.

The SD Card Data Logging enables the user to log over long periods the status of the instrument. Variables logged include: the primary sensor readings, any secondary readings, set point status, the current output readings, digital input status and any error messages. This data can be viewed either on the MXD70 series instrument or removed and viewed in Microsoft Excel on a PC. The user can configure which channels are logged and the logging interval. When logging three inputs at one sample per second a 1GB card will allow 40 days of recording.

Once removed place the SD card in a card reader connected to the PC. Open the SD card in the file explorer and browse to either the Data logging folder to view the SD card data logging or the Live Trend folder to view the live trend log saves.

Each file is limited to 65535 logs; when this limit is reached the instrument will automatically create a new file. The instrument will also automatically create a new file if the configuration of the instrument is changed whilst the data logging is active. Each file name contains the date and time of when it was created. The data is stored as a comma separated variable (csv), which can be read by Microsoft Excel.
Sensors for MXD70 Series

Conductivity Sensor
ECS 40

Galvanic Dissolved Oxygen Sensor
RWT G95A

Conductivity Sensor
ECS 20

ORP Sensor
S 400

pH Sensor
S 410

Optical Dissolved Oxygen Sensor
OD 8325

Turbidity/TSS (MLSS)
TU 8355
TU 8555

Turbidity
TU 8325
TU 8525
Sensor Mountings & Enclosures

Handrail Bracket

Jethead

Marine Grade Aluminium Enclosure
The BXD17 is a microprocessor controlled instrument range offering individual controllers for the measurement parameters Electrodeless (Inductive) and Contact Conductivity, pH/Redox and Dissolved Oxygen. To achieve this the instrument utilises a clear multifunction LCD to display the primary reading and temperature, show operational status and to provide an intuitive user interface.

As standard the instrument is simple to install with a new custom 144x144mm IP66 rated Wall-mount instrument, however with the addition of a suitable mounting kit it can either be installed as a Panel-mount or Pipe-mount instrument.

The instrument has two onboard volt-free normally open-relays with adjustable setpoint value and hysteresis. Either one can be set to activate on a High, Low or Band operation allowing the instrument to be used in a variety of dosing and or control applications. Additional setpoint functions include delayed activation and dose alarm timer, whilst the status of the relays can be seen via the main screen of the instrument. The set points relays may also be given the function as a clean initiator to provide automatic sensor cleaning, the clean duration, recovery time and interval period all programmable.

Additionally, the instrument features one industry standard, isolated, 0/4-20mA current output that features adjustable scaling and selectable on-error states, allowing the instrument to transmit the primary reading for remote monitoring purposes. Also fitted are two digital inputs operating on either closed or open contact which allow the instrument to be triggered by No Flow, Low Tank Level, Interlock or Off-line functions that forces the relays to deactivate and the current output to a pre-defined state.

Depending upon version purchased the instrument may be powered by either 85-265V AC or 12-30V DC.

**Features**
- Power supply 85-265vAC (24vDC option)
- 2 off Independent digital inputs
- Accurate at zero DO
- Measurement and Temperature input
- 2 off Programmable relay outputs
- 1 off Isolated scaleable 0/4-20mA output
- Software Upgrade via Micro(SD) Card
- Available for Galvanic Dissolved Oxygen (BGD17) and pH (BPD17)

**Technical specifications**

<table>
<thead>
<tr>
<th>Enclosure</th>
<th>Front panel: 144 x 144mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Panel cut out: 138 x 138mm</td>
</tr>
<tr>
<td></td>
<td>Depth behind panel: 77mm maximum</td>
</tr>
<tr>
<td>Cable Glands/Connectors</td>
<td>Maximum of 5, 2 x M20, 3 x M16</td>
</tr>
<tr>
<td>Material</td>
<td>ABS – Coloured Pantone 281C</td>
</tr>
<tr>
<td>Protection</td>
<td>IP66 using BS EN 60529: 1992</td>
</tr>
<tr>
<td>Equipment Safety</td>
<td>2006/95/EC using BS EN 61010-1: 2010</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20 to +55°C Relative Humidity 5% to 95%, non-condensing</td>
</tr>
<tr>
<td>Power Supply</td>
<td>85-265v, maximum 15 Watts. Low voltage option available – 12-30vDC</td>
</tr>
<tr>
<td>EMC</td>
<td>2004/108/EC using BS EN 61326-1: 2013</td>
</tr>
<tr>
<td>Modes</td>
<td>High, Low, Band, Delay, Hysteresis, Dose Alarm, Initial Charge</td>
</tr>
</tbody>
</table>
RWT G95A
Galvanic Dissolved Oxygen Sensor

The Australian made RWT G95A is the next generation in Dissolved Oxygen measurement. We have taken a sensor that was already good and made it better. Galvanic Dissolved Oxygen Sensor are part of Australia’s most proven range of Dissolved Oxygen Systems with excellent measurement at the low end of the measurement range at zero. They are the preferred choice at many wastewater treatment authorities.

The Model RWT G95A Sensor utilises proven galvanic sensing technology – without a question the most accurate and reliable Dissolved Oxygen sensing technology ever developed. The pure platinum cathode makes the sensor incapable of being poisoned by other gases often found in impure waters, such as hydrogen sulfide.

This sensor utilises the only DO sensing technology that is successful in continuous de-nitrification monitoring and control applications. It is also the only sensor design that can be used continuously in very violent pure liquid oxygen injection systems.

Features
- Accurate at zero DO
- Ground loop elimination
- 3 year warranty
- Platinum cathode, lead anode
- Automatic temperature compensation
- Easily refurbished in the field
- Jet-cleaning available
- No special tools required

Technical specifications

<table>
<thead>
<tr>
<th>Measuring principal</th>
<th>Galvanic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cathode material</td>
<td>99.5% Platinum</td>
</tr>
<tr>
<td>Anode material</td>
<td>Lead Plate</td>
</tr>
<tr>
<td>Electrolyte</td>
<td>Potassium Chloride gel</td>
</tr>
<tr>
<td>Repeatability</td>
<td>± 1% (at constant temperature)</td>
</tr>
<tr>
<td>Response time</td>
<td>Using 1 mil membrane - PPM 99% of actual, from air calibration &lt; 30 seconds</td>
</tr>
<tr>
<td>Temperature accuracy</td>
<td>± 0.2ºC</td>
</tr>
</tbody>
</table>

This sensor can be used with MXD73/75 Analyser on page 6 and BXD17 Analyser on page 10

www.roycewater.com.au
The S400 sensors have been designed for rugged service in submersion or inline process applications. The reference cell features a double junction design for extended service life in harsh applications. The high quality sensors are constructed of corrosion resistant wetted materials including Ryton®, Teflon® and glass. They can be supplied with built in temperature compensation and a solution ground connection.

**Sensor Tip Options**

- **Coaxial Teflon Reference**  
  Designed to withstand tough industrial applications. Best overall performance with rugged dome bulb.

- **Flat pH Bulb Self Cleaning**  
  Designed for obstructionless contact with the sample stream for self cleaning service and for use with a spraywash system. Features coaxial porous teflon junction.

- **Dual Ceramic Pin Junction**  
  For use in highly alkaline processes. Best choice for use at high pressures.

**Features**

- Choice of body styles
- Can be used with virtually any pH meter
- Competitive price
- Choice of temperature compensators
- Optional built in solution ground
- Sealed double junction reference
- 0.75” or 1” Male NPT threaded connection
- Wide range of mounting options
- Moulded from chemical resistant Ryton®

### Technical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>pH range</strong></td>
<td>0 - 14 pH</td>
</tr>
<tr>
<td><strong>Redox range</strong></td>
<td>± 5000 mV</td>
</tr>
<tr>
<td><strong>Temperature range</strong></td>
<td>0 - 105°C</td>
</tr>
<tr>
<td><strong>Maximum pressure</strong></td>
<td>10 bar at 100°C</td>
</tr>
<tr>
<td><strong>Glass</strong></td>
<td>HT-3 standard, HT-4 high pH available (above 13 pH)</td>
</tr>
<tr>
<td><strong>Temperature sensor</strong></td>
<td>Standard Pt1000*</td>
</tr>
<tr>
<td><strong>Wetted materials pH</strong></td>
<td>Ryton, PTFE or ceramic &amp; glass</td>
</tr>
<tr>
<td><strong>Wetted materials Redox</strong></td>
<td>Redox Ryton, PTFE or ceramic &amp; platinum</td>
</tr>
<tr>
<td><strong>Standard cable length</strong></td>
<td>6 metres with ferrule connections*</td>
</tr>
</tbody>
</table>

Note: Temperature, pressure & solution composition will influence the life expectancy of the measurement sensor.

*Other variants available. Please contact our sales department for details.

This sensor can be used with MXD73/75 Analyser on page 6 and BXD17 Analyser on page 10.
Optical Dissolved Oxygen Meter - HI98198

The HI98198 Optical Dissolved Oxygen Meter makes measuring the concentration of dissolved oxygen hassle-free. Optical DO technology doesn't require a minimum flow rate, so there is less drift in your readings. Perfect for the field or for the laboratory, the Quick Connect probe requires no membranes, no filling solution, and no warm-up time so you can measure without hesitation. Your meter comes complete in a rugged, custom carrying case for easy transportation.

Benefits
- Optical DO technology for fast and stable readings, even in tough environments
- Digital probe with Smart Cap Technology eliminates costly, tiresome membranes and solutions
- An IP67-rated waterproof, rugged body makes this portable meter ideal for field use

Hanna Multi Parameter - HI98194
pH/ORP/EC/TDS/Salinity/DO/Pressure Meter

The HI98194 is a waterproof portable logging multiparameter meter that monitors up to 12 different water quality parameters including 6 measured and 6 calculated. The microprocessor based multi-sensor probe allows for the measurement of key parameters including pH, ORP, conductivity, dissolved oxygen, and temperature. The probe transmits readings digitally to the meter, where data points can be displayed and logged. The HI98194 is supplied with all necessary accessories and packaged in a durable carrying case.

Benefits
- Auto-sensor Recognition
- Automatic Temperature Compensation
- Standard or Quick Calibration
- Data Logging

Portable pH/ORP Meter - HI98190

Bring the performance of a benchtop pH meter with you when you use the HI98190 handheld pH meter. This professional, waterproof meter accurately measures pH, ORP and temperature. Built-in diagnostic features for the most precise measurements and logging so you never miss a measurement, the HI98190 is the perfect tool for environmental and industrial testing.

Benefits
- CAL Check™ electrode diagnostics system alerts you to potential calibration problems so that you know your results are trustworthy every time
- Everything you need for field testing in one compact, durable carrying case
- Great for environmental and industrial testing
OD 8325/8525
Optical dissolved oxygen probes

These unique probes have been designed to measure dissolved oxygen based on fluorescent technology. The probes are available for submersible and in-pipe installations. The measuring system consists of:

- optical device complete of fluorescent material
- d.oxygen and temperature measuring circuit
- 2-wire 4/20 mA analog output
- RS 485 digital output
- nozzle for the autoclean by external pressure air (OD 8325)

The measuring is provided in ppm or % of air with automatic temperature compensation. Through commands from the Personal Computer hyperterminal, the serial interface allows the d.oxygen and temperature data transmission, the ppm or % of air scale selection, the configuration of pressure, salinity and R.H compensation, the zero and sensitivity calibration.

Thanks to its 4/20 mA isolated output, the probe can be directly connected to a PLC or data logger.

The probe can be connected to B&C Electronics controller BC 6587, which provides the power, the measuring readout, 2 set-points, alarm relay and the holding function for an external cleaning cycle. The most common applications of this probe include: water quality monitoring, municipal and industrial wastewater treatment and aquaculture.

**Principle of operation**

A light beam of a specific wavelength is sent to a special fluorescent layer in contact with the sample. The absorbed light energy is partially released as a light pulse with an higher wavelength. This phenomenon is called fluorescence. If oxygen molecules are in contact with the sensing layer, the fluorescing is reduced (quenching).

By measuring the amount of quenching it is possible to determine the oxygen concentration. The advantages of this measuring method are the absence of electrolyte and membrane, the possibility to measure the oxygen concentration in water or in air, and a good sensitivity in a low oxygen concentration.

**Technical specifications**

<table>
<thead>
<tr>
<th>Scale</th>
<th>0/20 ppm - 0/200 % air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>± 0,5 % of the scale</td>
</tr>
<tr>
<td>Response time</td>
<td>95% in &lt; 60 seconds</td>
</tr>
<tr>
<td>Power supply</td>
<td>9/36 VDC</td>
</tr>
<tr>
<td>Analog output</td>
<td>4/20 mA isolated current Loop</td>
</tr>
<tr>
<td>Load</td>
<td>600 Ω max. at 24 VDC</td>
</tr>
<tr>
<td>Digital output</td>
<td>RS 485</td>
</tr>
<tr>
<td>Temperature compensation</td>
<td>Automatic</td>
</tr>
<tr>
<td>Secondary parameters</td>
<td>Pressure, salinity, RH</td>
</tr>
<tr>
<td>Room temperature</td>
<td>-5/50 °C</td>
</tr>
<tr>
<td>Max. pressure</td>
<td>1 bar at 25 °C (OD 8325); 6 bar at 25 °C (OD 8525)</td>
</tr>
<tr>
<td>Autoclean</td>
<td>By pressure air 3 bar max (OD 8325)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>OD 8325: L=165 mm total, D= 60 mm</td>
</tr>
<tr>
<td></td>
<td>OD 8525: L=143 mm total, D= 40 mm</td>
</tr>
<tr>
<td>Body</td>
<td>PVC</td>
</tr>
<tr>
<td>Cable</td>
<td>10</td>
</tr>
</tbody>
</table>

The technical specifications may be changed without notice.
The Royce Model 711 Portable Suspended Solids/Interface Level Analyser is a rugged, waterproof instrument designed for the rigors of remote sampling. The meter provides reliable operation in waste treatment plants, rivers, lakes and other aqueous systems. The meter will read in either grams per liter when in the Suspended Solids mode or relative density percentage while in the interface level mode of operation.

The Model 711 stores the calibration values for Suspended Solids and interface level in two separate nonvolatile memory locations allowing the user to switch between operational modes without having to recalibrate. The net effect is two analysers in one.

Due to the full utilisation of the microprocessor, calibration values are stored so that recalibration is not required on a daily basis. If the sensor is cleaned after use, monthly calibration is usually more than sufficient for proper operation in either mode of calibration.

The Model 711 analyser utilises the Model 71 medium range sensor. The Model 71 is a rugged, reliable sensing element that has polymer optical grade lenses. It was designed specifically to meet the rigorous demands that are a requirement for a portable sensor.

**Features & Benefits**
- Two complete analysers in one package (TSS & Interface Level)
- Microprocessor based
- Automatic ranging
- Simple, insitu calibration
- Electronic self-diagnostics
- Nine volt battery with automatic shutoff
- Waterproof, rugged housing

### Technical Specifications

<table>
<thead>
<tr>
<th>Spec</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td>.01 - 10 grams per liter (10 to 10,000 mg/l)</td>
</tr>
<tr>
<td><strong>Readout Device</strong></td>
<td>Harsh environment, 1/2&quot; LCD digital display</td>
</tr>
<tr>
<td><strong>Input Power</strong></td>
<td>Standard 9V battery</td>
</tr>
<tr>
<td><strong>Enclosure</strong></td>
<td>Waterproof</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td>7&quot; L x 3.2&quot; W x 1.5&quot; D</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>1.5 pounds (.68 kgs)</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Single Gap, Optical</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>± 5% of reading or ± 100 mg/l</td>
</tr>
<tr>
<td><strong>Repeatability</strong></td>
<td>± 1% of reading or ± 20 mg/l</td>
</tr>
<tr>
<td><strong>Operating Limits</strong></td>
<td>Temperature, 0 - 65°C. Pressure, 0 - 50 PSIG</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>Polyurethane body, Optical grade polymer lenses</td>
</tr>
</tbody>
</table>
TU 8355/8555
High Turbidity and Suspended Solids (MLSS) probes

These unique probes have been designed to measure high Turbidity and Suspended Solids based on back scattering technology. The probes are available for submersible and in-pipe installations.

The measuring system consists of:
- Infrared light source
- Detector of scattered light by suspended particles
- Detector of the clean lens status
- 2-wire 4/20 mA analog output
- RS 485 digital output
- Nozzle for the autoclean by external pressured air (TU 8355)

Through commands from the Personal Computer hyperterminal, the serial interface allows the measuring and check signals transmission, the scale selection, the analog or digital operating mode selection, the zero and sensitivity calibration.

Thanks to its 4/20 mA isolated output, the probe can be directly connected to a PLC or data logger, and configured in FTU, g/l, % or other.

The probe can be connected to B&C Electronics controller BC 6587, which provides the power, the measuring readout, 2 set-points, the alarm relay and the holding function for an external cleaning cycle.

The most common applications of this probe include: water quality monitoring, municipal and industrial wastewater treatment and aquaculture.

Principle of operation
The Turbidity and suspended solid measurement follows the back scattering method. A light beam is sent in the sample through an optical lens. The back scattered light by suspended particle is collected by the probe through a second lens, detected and converted in an electric signal proportional to the Turbidity of the sample.

The probe uses an infrared light and the measuring is not affected by the color of the sample.

Technical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale</td>
<td>0/100 - 0/1000 - 0/10000 FTU</td>
</tr>
<tr>
<td>Sensitivity NTU</td>
<td>70/130 %</td>
</tr>
<tr>
<td>Zero NTU</td>
<td>± 10 FTU all scales</td>
</tr>
<tr>
<td>Power supply</td>
<td>9/36 VDC</td>
</tr>
<tr>
<td>Analog output</td>
<td>4/20 mA isolated current Loop</td>
</tr>
<tr>
<td>Load</td>
<td>600 Ω max. at 24 VDC</td>
</tr>
<tr>
<td>Digital output</td>
<td>RS 485</td>
</tr>
<tr>
<td>Room temperature</td>
<td>5-50 °C</td>
</tr>
<tr>
<td>Max. pressure</td>
<td>1 Bar at 25 °C</td>
</tr>
<tr>
<td>Autoclean</td>
<td>by pressure air 3 bar max. (TU 8355)</td>
</tr>
<tr>
<td>Dimensions TU 8355</td>
<td>L=165 mm total, D= 60 mm</td>
</tr>
<tr>
<td>Dimensions TU 8555</td>
<td>L=143 mm total, D= 40 mm</td>
</tr>
<tr>
<td>Body</td>
<td>PVC</td>
</tr>
<tr>
<td>Cable</td>
<td>10 m (100 m max.)</td>
</tr>
<tr>
<td>Protection</td>
<td>IP 68</td>
</tr>
</tbody>
</table>

Accessories
- **BC 8701** RS485/USB converter for power supply though PC connection
- **0012.450043** Extension pipe adapter
- **0012.000624** Swivel mounting + 0012.450043
- **0012.440040** 33 m PVC tubing for pressured air
- **TU 910** Overflow cell
- **yat75m0021** Flow Tee assembly for in-pipe installation

This sensor can be used with MXD73/75 Analyser on page 6
These unique probes have been designed to measure Turbidity based on nephelometric method (ISO 7027 - EN 27027). The probes are available for submersible and in-pipe installations.

**The measuring system consists of:**
- Infrared light source
- 90 degree scattered light detector
- Detector of the clean lens status
- 2-wire 4/20 mA analog output
- RS 485 digital output
- Nozzle for the autoclean by external pressured air (TU 8325)

Through commands from the Personal Computer hyperterminal, the serial interface allows the measuring and check signals transmission, the scale selection, the analog or digital operating mode selection, the zero and sensitivity calibration.

Thanks to its 4/20 mA isolated output, the probe can be directly connected to a PLC or data logger, and configured in NTU, g/l, % or other.

The probe can be connected to B&C Electronics controller BC 6587, which provides the power, the measuring readout, 2 set-points, the alarm relay and the holding function for an external cleaning cycle.

The most common applications of this probe include: water quality monitoring, municipal and industrial water treatment and aquaculture.

**Principle of operation**

The Turbidity follows the back nephelometric method (ISO 7027 - EN 27027). A light beam is sent to the sample through an optical lens. The 90 degree scattered light by suspended particle is collected by the probe through a second lens and it is converted in an electric signal proportional to the Turbidity of the sample.

The probe uses an infrared light and the measuring is not affected by the color of the sample.

---

**Technical Specifications**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale</td>
<td>0/4,000 - 0/40,00 - 0/400,0 NTU</td>
</tr>
<tr>
<td>Sensitivity NTU</td>
<td>70/130 %</td>
</tr>
<tr>
<td>Zero NTU</td>
<td>± 0,400 NTU all scales</td>
</tr>
<tr>
<td>Power supply</td>
<td>9/36 VDC</td>
</tr>
<tr>
<td>Analog output</td>
<td>4/20 mA isolated current Loop</td>
</tr>
<tr>
<td>Load</td>
<td>600 Ω max. at 24 VDC</td>
</tr>
<tr>
<td>Digital output</td>
<td>RS 485</td>
</tr>
<tr>
<td>Room temperature</td>
<td>-5/50 °C</td>
</tr>
<tr>
<td>Max. pressure</td>
<td>1 Bar at 25 °C</td>
</tr>
<tr>
<td>Autoclean</td>
<td>by pressure air 3 bar max (TU 8325)</td>
</tr>
<tr>
<td>Dimensions TU 8325</td>
<td>L=165 mm total, D= 60 mm</td>
</tr>
<tr>
<td>Dimensions TU 8525</td>
<td>L=143 mm total, D= 40 mm</td>
</tr>
<tr>
<td>Body</td>
<td>PVC</td>
</tr>
<tr>
<td>Cable</td>
<td>10 m (100 m max.)</td>
</tr>
<tr>
<td>Protection</td>
<td>IP 68</td>
</tr>
</tbody>
</table>

**Accessories**

- **BC 8701** RS485/USB converter for power supply though PC connection

**Accessories for TU 8325**
- 0012.4500043 Extension pipe adapter
- 0012.000624 Swivel mounting + 0012.450043
- 0012.4400040 33 m PVC tubing for pressured air

**Accessories for TU 8525**
- TU 910 Overflow cell
- YAT75M0021 Flow Tee assembly for in-pipe installation

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This sensor can be used with MXD73/75 Analyser on page 6
The ECS20 Series of Electrodeless conductivity sensors have been developed and engineered to produce a very low cost sensor, without sacrificing performance or quality. This has been achieved by injection moulding the sensor in glass loaded polypropylene.

The sensor provides all of the benefits that the method of Electrodeless conductivity measurement provides. It is extremely tolerant of coating on the sensor, probably the greatest problem with conventional conductivity measurement.

The ECS20T incorporates temperature compensation and can be mounted inline, in a tank wall or large bore pipe or in an open tank using a range of adapters.

**Features**
- Low cost
- Low Maintenance
- Inline, Dip and Tank Mounting Options
- Ideal for use with the BC9 series Controllers and the MTD53 Cooling Tower Monitor
- Ideal for Cooling Tower Bleed, Rinse Water & Solution Concentration Applications

### Technical Specifications

**ECS 20T**
- Operating temp: -5 to 60°C (not freezing)
- Wetted Material: Glass filled polypropylene
- Temp Comp: 2 wire Pt1000
- Cable: Standard 5 metres 54G terminated with tag ends, extended to instrument limit, via junction box
- Connection: 0.5” BSP male
- Protection: IP67

**ECS 22T Dip Assembly**
- Material: PVC
- Operating Temp: -5 to 60°C (not freezing)
- Dip Length: 600mm or 1200mm
- Mounting: Standard bracket or flange option
- Protection: IP68

**ECS 24T In-Line Assembly**
- Material: PVC with Viton seal
- Operating Temp: -5 to 60°C (not freezing)
- Size: 1.5” plain tee with 0.5”BSP option
- Operating Pressure: Vacuum to 6.5 bar (100psi)

**ECS 27T Tank Mount/Insertion Assembly**
- Material: PVC with Viton seal
- Operating Temp: -5 to 60°C (not freezing)
- Size: 1.25” BSP
- Operating Pressure: Vacuum to 6.5 bar (100psi)

This sensor can be used with MXD73/75 Analyser on page 6 and BXD17 Analyser on page 10.
ECS-40 Series
Electrodeless conductivity sensors

The Electrodeless method of measuring conductivity has many advantages over conventional methods. In particular the sensors will operate with virtually zero maintenance and provide reliable measurements over extended periods of time.

The ECS40 series can be mounted inline, in a tank wall, large bore pipe or in an open tank using a variety of fittings. The option of several different hygienic flanges caters for the majority of applications.

The sensor is manufactured in PEEK™ a food grade material with excellent chemical resistance and high temperature performance. The construction of the sensor allows it to operate at 100°C continuously and withstand thermal shocks, commonly associated with CIP applications and can be steam sterilised up to 135°C.

The sensors are fitted with Pt1000 temperature sensors and are compatible with all LTH Electrodeless conductivity instruments. The temperature sensor is mounted in direct contact with the medium via a stainless steel jacket, an alternative PEEK jacket is available where stainless steel might be unacceptable. Connection is made via an IP67 plug which simplifies installation and maintenance.

Features
- Low Maintenance
- Hygienic inline, Dip and Tank Mounting Options
- Ideal for Process, Dairy, Brewing and Food Applications
- Conductivity and Solution Concentration Measurements
- Steam Sterilisable to 135°C, Thermal Shock Resistant
- IP67 Connection Simplifies Installation and Maintenance
- Fast Temperature Response *90 < 10 secs

Technical Specifications

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Wetted Material</th>
<th>Order Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECS 42T Dip Sensor</td>
<td>Peek, 316 stainless steel temperature pocket, 316 stainless steel stem</td>
<td>8515 600mm dip, 8516 1200mm dip</td>
</tr>
<tr>
<td>ECS 49T Hygienic Insertion Sensor</td>
<td>Peek, 316 stainless steel temperature pocket, 316 stainless steel flange, ordered separately, EPDM seal</td>
<td>8527</td>
</tr>
<tr>
<td>ECS 43T In-Line Sensor</td>
<td>Peek, 316 stainless steel temperature pocket, PVC EPDM seal</td>
<td>8523</td>
</tr>
<tr>
<td>ECS 45T In-Line Sensor</td>
<td>Peek, 316 stainless steel temperature pocket and tee, EPDM seal</td>
<td>8525</td>
</tr>
<tr>
<td>ECS 47T Insertion Sensor</td>
<td>Peek, 316 stainless steel temperature pocket and screwed fitting, EPDM seal</td>
<td>8526</td>
</tr>
<tr>
<td>ECS 48T Hygienic Insertion Sensor</td>
<td>Peek, 316 stainless steel temperature pocket, 316 stainless steel flange, ordered separately, EPDM seal</td>
<td>8528</td>
</tr>
</tbody>
</table>

Notes: Flanges for the ECS49 sensors must be ordered separately. Minimum pipe size for insertion sensors 2.5", 63.5 mm. Optional PEEK temperature pocket available. Temperature, pressure and solution composition will influence the life expectancy of the measurement sensor. Varivent® is the registered trademark of Tuchenhagen GmbH.

This sensor can be used with MXD73/75 Analyser on page 6 and BXD17 Analyser on page 10
Ultrasonic Sludge Blanket Monitoring System

The ENV100 Ultrasonic Sludge Blanket Level Meter, utilises enhanced ultrasonic technology to measure the sludge interface level in various types of clarifiers, settling tanks and thickeners with superior accuracy and reliability.

The instrument continuously provides the user with important information which includes numeric and graphic screens representing the distance to the blanket, an echo profile image to ensure correct configuration during commissioning and saved data analysis. Additional features such as ASF (Abnormal Signal Filter), allows elimination of irregular field noise which can result from moving structures intermittently obscuring the signal. The ENV100 technology additionally incorporates a compressed air cleaning system to maintain the sensor in optimum condition and guarantee maintenance-free measurement. Specially designed mounting kits are also available.

**ENV100 Features**
- Continuous and Real-time Measurement
- 4 Sensors Measurement with One Controller Enables Economic Operation
- Maximum 400 Days Data Logging and Monitoring
- Wireless Option Avoids Cabling Cost
- Automatic Sensor Cleaning Guarantee Maintenance-free Measurement
- Built-in Unique Algorithm Eliminates Stationary and Moving Structures
- Free WESSWARE Software Enables Field Data Analysis and Menu Setup

**Applications**
- Water & wastewater treatment clarifiers
- Water & wastewater gravity & DAF thickeners
- Raw water clarifiers
- Sumps, lagoons, settling ponds
- Industrial process thickeners
- Salt brine tanks
- Material inventory tanks
- Process thickeners

**Technical Specifications**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>C1-S</th>
<th>C1-M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring Principle</td>
<td>Ultrasonic echo flight time</td>
<td>Ultrasonic echo flight time</td>
</tr>
<tr>
<td>Measuring Range</td>
<td>0.35—10m</td>
<td>0.35—10m</td>
</tr>
<tr>
<td>Resolution</td>
<td>1cm</td>
<td>1cm</td>
</tr>
<tr>
<td>Measuring Pulse</td>
<td>5—25 times/sec</td>
<td>5—25 times/sec</td>
</tr>
<tr>
<td>Measuring Density</td>
<td>Heavy/ Light</td>
<td>Heavy/ Light</td>
</tr>
<tr>
<td>Accuracy</td>
<td>+/- 1% of measuring range</td>
<td>+/- 1% of measuring range</td>
</tr>
<tr>
<td>Operational Temp.</td>
<td>-20 — 10°C</td>
<td>-20 — 10°C</td>
</tr>
<tr>
<td>Sensor Control</td>
<td>1 channel</td>
<td>Multiple channel (Max. 4 channel)</td>
</tr>
<tr>
<td>Data Logging</td>
<td>Max. 400 days</td>
<td>Max. 400 days</td>
</tr>
<tr>
<td>Screen</td>
<td>Numeric, Echo Profile, Data Trend, Parameter</td>
<td>Numeric, Echo Profile, Data Trend, Parameter</td>
</tr>
<tr>
<td>Display</td>
<td>Level, Distance, Temperature, Time, Current, Echo profile, Measuring status</td>
<td>Level, Distance, Temperature, Time, Current, Echo profile</td>
</tr>
<tr>
<td>Power Supply</td>
<td>Standard: 100 — 240V AC, 50—60Hz, ≤6W Option: 20 — 30V DC</td>
<td>Standard: 100 — 240V AC, 50—60Hz, ≤6W Option: 20 — 30V DC</td>
</tr>
<tr>
<td>Enclosure Material</td>
<td>Body/Cover: Polycarbonate</td>
<td>Body / Cover: ABS Window: Polycarbonate</td>
</tr>
<tr>
<td>Weight</td>
<td>3 kg</td>
<td>3.2 kg</td>
</tr>
<tr>
<td>IP Rating</td>
<td>IP67</td>
<td>IP67</td>
</tr>
<tr>
<td>Certificate</td>
<td>CE</td>
<td>CE</td>
</tr>
</tbody>
</table>
Accurate Ammonia Measurement

Accurate ammonia measurement allows Blower Control Optimisation leading to reduced energy consumption and improved process quality.

Water & Wastewater Monitoring
Royce Water Technologies also offers the ChemScan mini for single-parameter, single-sample line analysis - parameters include: Ortho Phosphate, UV254 Percent Transmittance, Ammonia, Manganese, Chlorine, Sulfite, Monochloramine and Free Ammonia.
Min LowAm
Ammonia analyser

The single parameter in-line analyser family from ASA Analytics utilises years of ChemScan® experience and proven technology to provide reliable and accurate analysis of water and waste water. This device has been designed from the ground up to reduce maintenance requirements, includes large I.D. sample tubing to minimise plugging and only needs quarterly reagent refills.

Features
- Automatic Analysis Utilising ChemScan’s Proprietary Method
- Low Maintenance
- Proven Sample Handling with Large I.D. Flow Paths
- Simple Field Adjustable Calibration
- Sample Blank to Eliminate Background Interference
- Automatic Cleaning

Benefits
- High Reliability
- Low Capital Cost
- High Accuracy
- Low Operating Cost

Capabilities
- Automatic Analysis
- Continuous Output
- Multiple Data Communication Interface Options

Applications
- Wastewater Effluent
- Wastewater Bioreactor

Technical Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>0.1 - 10.0 mg/L (ppm)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>2% of value or 2x detection limit (whichever greater)</td>
</tr>
<tr>
<td>Cycle Time</td>
<td>10 minutes to 9999 minutes (field programmable)</td>
</tr>
<tr>
<td>Environment</td>
<td>5 - 50 degrees C (method dependent)</td>
</tr>
<tr>
<td>Power</td>
<td>100 - 240 VAC, 50 W</td>
</tr>
<tr>
<td>Enclosure</td>
<td>NEMA 4x</td>
</tr>
<tr>
<td>Safety Approval</td>
<td>CSA-US</td>
</tr>
<tr>
<td>Sample Requirements</td>
<td>0.5 - 1 Liter/analysis, pressure 2 to 10 psi, &lt;150 mg/L TSS, &lt;60 NTU</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Reagent replacement every 3 months, pump kit yearly</td>
</tr>
<tr>
<td>Relay Contacts</td>
<td>1 SPDT Concentration, 1 SPDT Programmable</td>
</tr>
<tr>
<td>Serial Interface</td>
<td>RS-232 Maintenance Port</td>
</tr>
<tr>
<td>Analog Output</td>
<td>Isolated 4-20 mA</td>
</tr>
</tbody>
</table>
The new single parameter in-line analyser family from ASA Analytics utilises years of ChemScan® experience and proven technology to provide reliable and accurate analysis of water and waste water. This device has been designed from the ground up to reduce maintenance requirements, includes large ID sample tubing to minimise plugging.

**Features**
- UV-LED Light Source
- Low Maintenance
- Automatic Zeroing and Cleaning
- Proven Sample Handling with Large I.D. Flow Paths
- Simple Field Adjustable Calibration
- Direct Photodiode Detection
- Temperature Stabilised Light
- Source and Detector
- Sealed Electronics Enclosure
- Sealed Flow Cell

**Benefits**
- High Reliability
- Low Capital Cost
- High Accuracy
- Low Operating Cost

**Capabilities**
- Continuous, Real Time Analysis of Constant Flow Sample Stream
- Isolated Analog Output
- High and Low Alarms
- Diagnostic Alarms
- LED Digital Display
- Universal AC Power Options
- Data Log

**Applications**
- Municipal Water and Wastewater
- Industrial Water and Wastewater

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**Technical Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td>1.0 - 100% T, 0.0 - 2.0 AU</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
<td>2% of value or 2x detection limit (whichever greater)</td>
</tr>
<tr>
<td><strong>Cycle Time</strong></td>
<td>Continuous</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td>5 - 50 degrees C (method dependent)</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>100 - 240 VAC, 50 W</td>
</tr>
<tr>
<td><strong>Enclosure</strong></td>
<td>NEMA 4x</td>
</tr>
<tr>
<td><strong>Safety Approval</strong></td>
<td>CSA-US</td>
</tr>
<tr>
<td><strong>Sample Requirements</strong></td>
<td>5 - 20 psi</td>
</tr>
<tr>
<td><strong>Maintenance</strong></td>
<td>Monthly replenish zero/clean solution</td>
</tr>
<tr>
<td><strong>Relay Contacts</strong></td>
<td>1 SPDT Concentration, 1 SPDT Programmable</td>
</tr>
<tr>
<td><strong>Serial Interface</strong></td>
<td>RS-232 Maintenance Port</td>
</tr>
<tr>
<td><strong>Analog Output</strong></td>
<td>Isolated 4-20 mA</td>
</tr>
</tbody>
</table>

---

www.roycewater.com.au
Mini oP
Ortho phosphate analyser

The single parameter in-line analyser family from ASA Analytics utilises years of ChemScan® experience and proven technology to provide reliable and accurate analysis of water and waste water.

This device has been designed from the ground up to reduce maintenance requirements, includes large ID sample tubing to minimise plugging and only needs quarterly reagent refills.

Features
- Automatic Analysis Utilising ChemScan’s Proven VMo Method
- Low Maintenance
- Proven Sample Handling with Large I.D. Flow Paths
- Simple Field Adjustable Calibration
- Sample Blank to Eliminate Backgound Interference
- Automatic Cleaning

Benefits
- High Reliability
- Low Capital Cost
- High Accuracy
- Low Operating Cost
- EPA Recognised Analysis Method

Capabilities
- Automatic Analysis
- Continuous Output
- Multiple Data Communication
- Interface Options

Applications
- Potable Water
- Waste Water Effluent
- Wastewater Inlet

Technical Specifications

<table>
<thead>
<tr>
<th>Range (as PO4)</th>
<th>0.09 - 9.0 mg/L (ppm) (Std), 0.3 - 18.0 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range (as PO4 - P)</td>
<td>0.03 - 3.0 mg/L (ppm) (Std), 0.1 - 6.0 ppm</td>
</tr>
<tr>
<td>Accuracy</td>
<td>2% of value or 2x detection limit (whichever greater)</td>
</tr>
<tr>
<td>Cycle Time</td>
<td>5 minutes to 9999 minutes (field programmable)</td>
</tr>
<tr>
<td>Environment</td>
<td>5 - 50 degrees C (method dependent)</td>
</tr>
<tr>
<td>Power</td>
<td>100 - 240 VAC, 50 W</td>
</tr>
<tr>
<td>Enclosure</td>
<td>NEMA 4x</td>
</tr>
<tr>
<td>Safety Approval</td>
<td>CSA-US</td>
</tr>
<tr>
<td>Sample Requirements</td>
<td>0.5 - 1 Liter/analysis, pressure 5 ft to 10 psi, &lt;150 mg/L TSS, &lt;60 NTU</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Reagent replacement every 3 months, pump kit yearly</td>
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</tr>
<tr>
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<td>Serial, RS-232 Maintenance Port</td>
</tr>
<tr>
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</tr>
</tbody>
</table>
The new single parameter in-line analyser family from ASA Analytics utilises years of ChemScan® experience and proven technology to provide reliable and accurate analysis of water and waste water. This device has been designed from the ground up to reduce maintenance requirements, includes large ID sample tubing to minimise plugging and only needs quarterly reagent refills.

**Features**
- Automatic Analysis Utilising Proven Formaldoxime Method
- Low Maintenance
- Proven Sample Handling with Large I.D. Flow Paths
- Simple Field Adjustable
- Calibration
- Sample Blank to Eliminate Background Interference
- Automatic Cleaning

**Benefits**
- High Reliability
- Low Capital Cost
- High Accuracy
- Low Operating Cost

**Capabilities**
- Automatic Analysis
- Continuous Output
- Multiple Data Communication Interface Options

**Applications**
- Potable Water
- Wastewater Effluent

**Technical Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>0.002 - 8.0 mg/L</td>
</tr>
<tr>
<td>Accuracy</td>
<td>2% of value or 2x detection limit (whichever greater)</td>
</tr>
<tr>
<td>Cycle Time</td>
<td>5 minutes to 9999 minutes (field programmable)</td>
</tr>
<tr>
<td>Environment</td>
<td>5 - 50 degrees C (method dependent)</td>
</tr>
<tr>
<td>Power</td>
<td>100 - 240 VAC, 50 W</td>
</tr>
<tr>
<td>Enclosure</td>
<td>NEMA 4x</td>
</tr>
<tr>
<td>Safety Approval</td>
<td>CSA-US</td>
</tr>
<tr>
<td>Sample Requirements</td>
<td>0.5 - 1 Liter/analysis, pressure 2 to 10 psi, &lt;150 mg/L TSS, &lt;60 NTU</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Reagent replacement every 3 months, pump kit yearly</td>
</tr>
<tr>
<td>Relay Contacts</td>
<td>1 SPDT Concentration, 1 SPDT Programmable</td>
</tr>
<tr>
<td>Serial Interface</td>
<td>RS-232 Maintenance Port</td>
</tr>
<tr>
<td>Analog Output</td>
<td>Isolated 4-20 mA</td>
</tr>
</tbody>
</table>
Mini Mono & FreeAm
Monochloramine analyser

The single parameter in-line analyser family from ASA Analytics utilises years of ChemScan® experience and proven technology to provide reliable and accurate analysis of water and waste water.

This device has been designed from the ground up to reduce maintenance requirements, includes large ID sample tubing to minimise plugging and only needs quarterly reagent refills.

**Features**
- Automatic Analysis Utilising Proven Method
- Low Maintenance
- Proven Sample Handling with Large I.D. Flow Paths
- Simple Field Adjustable Calibration
- Sample Blank to Eliminate Background Interference
- Automatic Cleaning

**Benefits**
- High Reliability
- Low Capital Cost
- High Accuracy
- Low Operating Cost

**Capabilities**
- Automatic Analysis
- Continuous Output
- Multiple Data Communication Interface Options

**Applications**
- Potable Water
- Wastewater Effluent

**Technical Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>0.02 - 10.0 mg/L (ppm)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>5% of value or 2x detection limit (whichever is greater)</td>
</tr>
<tr>
<td>Cycle Time</td>
<td>5 minutes to 9999 minutes (field programmable)</td>
</tr>
<tr>
<td>Environment</td>
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<td>RS-232 Maintenance Port</td>
</tr>
<tr>
<td>Analog Output</td>
<td>Isolated 4-20 mA</td>
</tr>
</tbody>
</table>
The ChemScan® on-line analysers provide operators and control systems with timely process chemistry measurements. This data is used to control and optimise the process; resulting in increased plant capability, reduced energy and chemical usage along with monitoring the process.

ChemScan Features
- Configured to monitor samples and/or parameters
- Real-time spectrographic chemical analysis using advanced pattern recognition techniques
- Easily interfaced to SCADA systems (4-20mA, MODBUS or Ethernet)
- Extensive internal data logging
- Self monitored diagnostics and alarms
- Internal manifold with inlets for auto zeroing, auto cleaning and calibration samples

Potable Water Monitoring
- Chloramination Monitoring
- Water Blending
- Organics Detection
- Nitrification Avoidance

Wastewater Nutrient Monitoring
- Nitrification Analysis
- De-Nitrification Control
- Chem or Bio Phosphorous Removal
- Nutrient Deficiency Analysis
- SBR End Point Detection
- Toxicity/Rapid BOD Analysis

ChemScan® Process Analysers

<table>
<thead>
<tr>
<th>Model</th>
<th>Up to</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV-2150</td>
<td>Four Sample Lines*</td>
<td>Analysis of one reagent-assisted parameter such as ammonia or phosphate</td>
</tr>
<tr>
<td>UV-3150</td>
<td>Eight Sample Lines*</td>
<td>Analysis of one non-reagent parameter such as nitrate, organics, metals or color</td>
</tr>
<tr>
<td>UV-4100</td>
<td>Two Sample Lines*</td>
<td>Analysis of up to four compatible parameters using primary and secondary analysis</td>
</tr>
<tr>
<td>UV-6101</td>
<td>Eight Sample Lines*</td>
<td>Analysis of up to eight compatible parameters using primary and secondary analysis</td>
</tr>
</tbody>
</table>

* If samples are unfiltered

The 6101 can have up to four cyclic filter sample lines, other analysers can have only two

www.roycewater.com.au
 Specialty Analysers

ChemScan® UV-2150/S Chloramination Suite
- Number of Sample Lines: 1 or 2 through Internal Manifold

Range
- Free Ammonia 0.02 - 1.00 mg/l as N
- Total Ammonia 0.02 - 2.00 mg/l as N
- Monochloramine 0.01 - 5.0 mg/l as Cl₂
- Total Chlorine 0.05 - 5.0 mg/l as Cl₂

ChemScan® UV-2150/N Ammonia & Nitrate
- Number of Sample Lines: 1 or 2 through Internal Manifold

Range
- Nitrate and Ammonia Parameter/Site Dependent

ChemScan® UV-2150/DC
Chlorination/De-Chlorination
- Designed for Chlorination and De-Chlorination measurements in Contact Tanks
- Online UV Absorbance measuring principal
- Measures Total Chlorine Residual (0.05 to 5.00 as Cl₂ Influent) and De-chlorination Agent Residual (0.005 to 0.5 as Cl₂ Effluent)
- Accuracy 2% to 5% of range
- Continuous Online Monitoring of 2 Sample Lines
- Benign, inexpensive non-proprietary reagents used

ChemScan® UV-2150/NoP
Nitrate & Ortho-Phosphate
- Number of Sample Lines: 1 or 2 through Internal Manifold

Range
- Nitrate and Ortho-Phosphate Parameter/Site Dependent

ChemScan® UV-2150/NHoP
Ammonia & Ortho-Phosphate
- Number of Sample Lines: 1 or 2 through Internal Manifold

Range
- Ammonia and Ortho-Phosphate Parameter/Site Dependent
An award-winning multi-parameter, real-time sensor platform (portable or permanent) that accurately and reliably measures BOD, COD and faecal coliforms for permanent and temporary applications.

The Proteus is the world’s first scientifically proven real-time sensor for measuring BOD that can measure a wide range of applications. A multiprobe that measures your choice of parameter, all in one package, that can deliver data in the toughest field conditions. The Proteus has been designed for its ease of use, reliable data and economical operation.

Applications
- BOD Loading to Wastewater Treatment Works (WWTWs)
- Combined Sewage Overflow (CSO) event monitoring
- Point Source Pollution monitoring
- Faecal Coliform monitoring
- Efficiencies of Wastewater Treatment Works
- Diffuse Pollution Monitoring
- Groundwater Water Quality Monitoring
- Survey tool combined with Bluetooth®

Technical Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Proteus 30</th>
<th>Proteus 35</th>
<th>Proteus 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>75 mm</td>
<td>89 mm</td>
<td>102 mm</td>
</tr>
<tr>
<td>Length</td>
<td>483 mm</td>
<td>483 mm</td>
<td>483 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>2.3 kg</td>
<td>4.1 kg</td>
<td>4.5 kg</td>
</tr>
<tr>
<td>Number of sensors</td>
<td>Up to 7</td>
<td>Up to 11</td>
<td>Up to 13</td>
</tr>
<tr>
<td>Battery Pack</td>
<td>8 “C” cells</td>
<td>8 “C” cells</td>
<td>8 “C” cells</td>
</tr>
<tr>
<td>Internal Power Battery Life</td>
<td>1 to 24 month depending on sensors / logging rates</td>
<td>1 to 24 month depending on sensors / logging rates</td>
<td>1 to 24 month depending on sensors / logging rates</td>
</tr>
<tr>
<td>Sample Rate</td>
<td>1 Hz</td>
<td>1 Hz</td>
<td>1 Hz</td>
</tr>
<tr>
<td>External Power</td>
<td>5-30 vdc</td>
<td>5-30 vdc</td>
<td>5-30 vdc</td>
</tr>
<tr>
<td>Data Memory</td>
<td>&gt;1,000,000 logged readings</td>
<td>&gt;1,000,000 logged readings</td>
<td>&gt;1,000,000 logged readings</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-5 to 50 °C</td>
<td>-5 to 50 °C</td>
<td>-5 to 50 °C</td>
</tr>
<tr>
<td>Logging Rates</td>
<td>1 second to 1 day</td>
<td>1 second to 1 day</td>
<td>1 second to 1 day</td>
</tr>
<tr>
<td>Depth Rating</td>
<td>200 m</td>
<td>200 m</td>
<td>200 m</td>
</tr>
<tr>
<td>Warranty</td>
<td>2 years*</td>
<td>2 years*</td>
<td>2 years*</td>
</tr>
<tr>
<td>Communications</td>
<td>RS-232, SDI-12, USB or Bluetooth</td>
<td>RS-232, SDI-12, USB or Bluetooth</td>
<td>RS-232, SDI-12, USB or Bluetooth</td>
</tr>
</tbody>
</table>

*All sensors included except ISE’s (Ammonia/nitrate/chloride)
The intelligent spectral analyser ISA provides the simultaneous acquisition of multiple parameters with only one sensor in a small form factor. This compact UV/VIS sensor provides both standard water quality parameters and additional substances and water properties applying modern chemometrical methods.

The detection is not limited to a few bands, instead the whole spectrum from ultraviolet to near-infrared (200-720nm) is detected and analysed. Solutes, suspended matter and other water properties can be characterized thoroughly. This is not limited to common values like e.g. nitrate, organic carbon (TOC) or chemical and biological oxygen demand (COD, BOD) since modern chemometrical methods are permitting the assay of various other components.

The calibration monitoring feature based on a spectral quality index (SQI) is a new technology introduced to absorption spectroscopy by Go-Systemelektronik. This allows an automatic adaptation to water matrix variances. With this there is a significant increase in measurement reliability and with this a lower risk of false alerts in water monitoring systems.

Another unique feature is the possibility to quickly mechanically adjust the optical path length, without special tools.

**Features & Benefits**
- One Sensor - Wide range of parameters
- Simplest calibration
- Measurement path length 0.5 - 20 mm continuously adjustable
- Deployable up to +110 °C
- Automatic cleaning
- ATEX Category 3 [Category 2 optional]
- Ready for network based data processing and control technology [BlueGate]
- Monitoring function
- Calibration monitoring (SQI)
- ATEX Certified
- Intelligent event handling
- Cloud data service
- Adjustable optical path length
- Quality control
- Alarm systems
- Analysis of trends
- Early detection of disposal (fingerprint) Process water applications
- Process monitoring in industrial facilities
- Control of water treatment
BlueTrace
Fluorescence Sensor for Refined Oils/BTEX

When light of a certain wavelength hits an oil particle, the oil emits light of a different wavelength shortly after excitation. This effect is called fluorescence.

Fluorescence occurs not only in oils, but also in other substances. The BlueTrace oil in water sensor uses this effect to determine the concentration of refined oils in water.

A transmitter installed in the sensor emits light at around 280 nm. The oil particles in the water absorb this energy and then emit light in a range from 300 to 400 nm. This light is measured by a detector.

The Jablonski diagram shows the fluorescence effect in detail. The oil particle absorbs the energy of the light, changes to a higher, unstable energy level and then falls back to the lower energy level. Part of the energy is released by the fluorescence effect. The intensity of the fluorescence is directly dependent on the concentration (see equation). By measuring the intensity at the detector, the concentration of the oil in the water can be determined.

Fluorescence spectral data
There is no universal fluorescence spectrum for all oils. Rather, the spectrum depends on the composition of the oil. Refined oils consist mainly of aromatic hydrocarbons, which in solution in water are often indicated in the BTEX collection parameter. There is a graph available that shows examples for typical fluorescence spectra of some refined oils. The BlueTrace oil in water sensor is suitable for the measurement of refined oils, BTEX and aromatic hydrocarbons.

Features & Benefits
- **Easy calibration**: The BlueTrace can easily be optimally calibrated to the specific application. All you have to do is hold the sensor in the prepared samples and then perform a multi-point calibration.
- **Selectable Measuring Range**: The sensitivity of the receiver can easily be changed either directly on the controllers of GO Systemelektronik, or with the help of the freely available PC program.
- **Modbus Interface**: The BlueTrace features a Modbus RTU interface. This means that the sensor can not only be connected to a GO Systemelektronik controller, but can also be integrated into third-party controllers or directly to a PLC.
- **Robust Design**: Settings or calibrations are stored directly on the sensor and can be adapted with the freely available PC program.

Applications
- **Wastewater**: Influent of WWTP, Monitoring of wastewater of industrial plants
- **Drinking Water**: Influent of drinking water plants, Influent to desalination plants
- **Environmental Monitoring**: Detection of contamination, Maritime applications
- **Process Monitoring**: Cooling water, Leakage detection
BlueMon Total Nitrogen & Total Phosphorus

Measuring: Total Nitrogen/Total Phosphorus

Fully automatic on-line analyser for measuring concentrations of mediums in fluids according to wet-chemical methods. The photometer total nitrogen and total phosphorus version of the BlueMon system comprises of the following equipment: analyser unit and control and measurement electronics in a powder-coated cabinet.

**MEASURING**
- Measuring cell: photometer (wavelength and measuring gap is dependent on the method)
- Method: reaction of NH3 at a pH value of 12 to indophenol blue
- Wavelength: 643 nm
- Measuring range: selectable option

**NUMBER OF SAMPLE CHANNELS: SELECTABLE OPTION**
- Number of free valves: dependent on procedure e.g. use as dilution channel (e.g. H2O)
- Number of peristaltic pumps: dependent on procedure
- Number of process valves: dependent on procedure

**TECHNICAL DETAILS**
- Protection classification: IP54 (optional IP65)
- Dimensions: (LxWxH): 600 mm x 300 mm x 700 mm
- Cabinet material: aluminium (powder-coated)
- Colour: blue (RAL 5010)
- Sample pressure: 0 bar (max 0.05 bar overpressure)
- Sample temperature: 10 °C ... 35 °C
- Sample flow rate: 2 ... 10 l/h, no suspended solids

**EXTERNAL POWER SUPPLY UNIT**
- Input voltage range: 85...265V AC
- Output: 230 V/50 Hz (power supply included)

**MEASUREMENT, CONTROL INPUTS AND OUTPUTS INTERFACES**
- 1x Ethernet (incl. Modbus)
- 1x RS-232 or RS-485 (incl. Modbus)
- 1x CAN bus (for connecting further BlueBox System modules for sensors and actuators)
- 2x current output 4 - 20mA

**ADDITIONAL INTERFACES: SELECTABLE OPTION**
- 1x connector for pH glass electrode
- 1x connector for temperature (PT1000) 0 - 80 °C
- 1x connector redox electrode
- 1x current input 4 - 20mA
- 6x digital in
- 1x connector for leakage sensor
- 6x connector bubble detector for sample reagent

**ACTUATORS**
- 1x output for digester with temperature, heating (0-150 °C) and UV monitoring
- 1x control stirrer
- 1x motor control forward/backward and pulse counter
- 2x motor control - (direction jumper selectable)
- 6x relays for valves, limit and interference signals

**MEASURING METHOD**
- Wet Chemical

**IMPLEMENTATION**
- Flow-through Measurement

**BLUEMON MEASUREMENT METHOD**
- Photometric

**PARAMETERS**
- Ammonium
BlueMon
Ammonia & Orthophosphate
Measuring: Ammonia/Orthophosphate

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.

Functions & Features
- Monitoring Function
- Control Function (PLC)
- Automated Calibration
- Up to 6 Measuring Channels
- Intelligent Event Handling
- Cloud Data Service
- Configurable Measurement Procedure
- Automated Cleaning

Parameters
- Ammonia
- Chlorine
- Orthophosphate
- Total phosphorus (TP)
- Total nitrogen (TN)

Application Areas

Drinking Water
- Quality control
- Alarm systems

Wastewater
- Effluent monitoring
- Trend analysis

Process Measurement & Control Technology
- Process monitoring in industrial facilities
- Control of process water treatment
- Process optimisation

Environmental Monitoring
- River water
- Surface water
Technical Specifications

Power supply  230 VAC (90 - 260 V)
Power consumption  42 W
Dimensions (wxhxd)  Art. no. 488 1xx  45 x 48 x 26 cm
                  Art. no. 488 2xx  60 x 70 x 30 cm
IP protection class  IP 54 / IP 65 [optional]
Measuring channels  2 / up to 6 [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
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
4x Digital-Out
6x Relay with a switching capacity of 24 V AC/DC; 0.5 A

Orthophosphate
Measuring principle  photometric
Measuring range  0.0 - 0.5 / 2.0 / 6.0 / 25 / 50 mg/l
Art. no.  488 1FP0

Total nitrogen
Measuring principle  photometric
Measuring range  0.0 - 0.5 / 10 mg/l
Art. no.  488 2FN1

Ammonia
Measuring principle  photometric
Measuring range  0.0 - 0.5 / 4.0 / 8.0 / 20 / 100 mg/l
Art. no.  488 1FA0

Orthophosphate & Total Phosphorus
Measuring principle  photometric
Measuring range  0.0 - 0.1 / 0.5 / 6.0 / 100 mg/l
Art. no.  488 2FP1

Chlorine
Measuring principle  photometric
Measuring range  Free, combined & residual chlorine
                0.0 - 0.2 / 1.0 / 3.0 mg/l
Art. no.  488 1FC0

Further parameters on request
BlueSense Transducer
Measuring: Nitrate / Ammonia

The BlueSense transducer facilitates the processing and calculation of measurement values of physical and chemical sensors. In addition, the transducer features a full controller function that can cover all process-oriented tasks. The BlueSense transducer is compatible with analogue and digital sensors and actuators of all manufacturers.

Sensor
ION-SELECTIVE ELECTRODE (ISE) Nitrate / Ammonia
- Plastic shaft
- Slope $57 \pm 2 \text{ mV/p NH}_4^+$
- Flexible ammonium selective membrane
- Organic ion exchanger in a special solvent, homogeneously distributed in PVC

Functions & Features
- Cloud Data Service
- SD Card Data Logger
- Modular & Expandable
- Monitoring Function PID-Controller Function
- Intelligent Event Handling CAN bus, Modbus & Profibus

Parameters
- Blue-green algae
- Chlorine
- Chlorine dioxide
- Chlorophyll a
- Conductivity
- Dissolved organics
- Dissolved oxygen
- ISE
- Level
- Oil in water
- Ozone
- pH
- Redox (ORP)
- Salinity
- Temperature
- Turbidity

Application Areas
- Drinking Water
  - Quality control
  - Alarm systems
- Wastewater
  - Effluent monitoring
  - Trend analysis
  - Early detection of discharge
- Process Measurement & Control Technology
  - Process monitoring in industrial facilities
  - Control of process water treatment
  - Process optimization
- Environmental Monitoring
  - River water
  - Surface water

The ISE sensors can be used with the Handrail Bracket enclosure on page 9
Introduction to UV/Vis

Measurement Principle

From Raw to Absorbance Spectra

Clear Water Raw Spectrum = Detected light in clear water, saved as reference

Current Raw Spectrum = Actual detected light

Absorbance = log10 (Current Raw Spectrum / Clear Water Raw Spectrum)

From Absorbance to the Parameter

Sample | COD | No3
--- | --- | ---
Sample 1 | 1250 ppm | 75 ppm
Sample 2 | 975 ppm | 40 ppm
Sample 3 | 835 ppm | 32 ppm

Chemometric Modelling

COD = -5.05 + 388.44 * Absorbance (282 nm)
- 6123.48 * Absorbance (436 nm)
+ 5564.12 * Absorbance (448 nm)

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Krypton® Multi
Reagentless Free and Total Chlorine Measurement with pH Compensation

Controlled and reliable measurements driven by Kuntze Krypton® systems. The measuring system includes all customers need for disinfectant measurement: instrument, sensors, assembly and cables. The Krypton® Multi is a measuring system for disinfectant, pH and temperature - optional ORP and 5th measuring input (Cl₂, TCl or conductivity).

Kuntze Krypton® Multi are delivered fully assembled and ready to use.

All Kuntze products are made in Germany.

StabiFlow®
StabiFlow® is an assembly for precise measurement of disinfectants. Values are:

- Constant flow of approx. 30 l/h
- Stable, precise and reliable measurements
- Increased life expectancy of the electrodes

Cloud Connect®
Controlled water measurement process at any time, from any place, on any device. The solution is Kuntze Cloud Connect® service.

- Optimised asset utilisation
- Increased productivity
- Reduced maintenance costs
- Simple usability and precise control

ASR®
ASR® is their patented automatic sensor cleaning process:

- It keeps the electrode surfaces clean and reduces maintenance efforts automatically
- ASR® is available for measurement of free chlorine, chlorine dioxide, ozone and hydrogen peroxide

Cost reduction due to less maintenance:

- No manual cleaning
- No refill of chemical or physical agents
- Strongly reduced calibration demand

Technical Specifications

<table>
<thead>
<tr>
<th>Disinfectants</th>
<th>Free chlorine, chlorine dioxide: 0.. 5.00 / 10.00 / 20.00 mg/l</th>
<th>Ozone: 0.. 5.00 / 10.00 mg/l</th>
<th>Hydrogen peroxide: 0.. 30.00 mg/l</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>0-14.00 pH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>0.. 50.0 °C / 32.0.. 122 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ORP (optional)</td>
<td>-1500.. +1500 mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5th measuring</td>
<td>Total Chlorine: 0.. 10.00 mg/l, or Conductivity: 0 - 100,0 mS/cm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>input (optional)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Digital Inputs

- Flow control
- External controller stop
- 2x level control, activation
- 2nd or 3rd control parameter set

Sensors

Zirkon® DIS Total
TOTAL CHLORINE - Zirkon® DIS Total is an open potentiostatic sensor for measuring chlorine compounds

- No exchange of membrane
- No exchange of electrolyte
- No delicate plastic membrane
- Immune to air bubbles

Zirkon® DIS
FREE CHLORINE - Zirkon® DIS is a potentiostatic sensor for measuring Free Chlorine

- Low maintenance and robust
- Stable zero point
- Reliable measuring values
- Long operating life due to auto sensor cleaning by ASR®
Krypton® DIS
Free Chlorine Monitoring System without pH Compensation

Controlled and reliable measurements driven by Kuntze Krypton® systems. The measuring system includes all customer needs for disinfectant measurement: instrument, sensors, assembly and cables. The Kuntze Krypton® DIS is used to measure free chlorine, chlorine dioxide, ozone or hydrogen peroxide, and temperature. Measuring parameter and range can be chosen via menu.

Kuntze Krypton® DIS are delivered fully assembled and ready to use.

All Kuntze products are Made in Germany.

StabiFlow®
StabiFlow® is an assembly for precise measurement of disinfectants. Values are:
- Constant flow of approx. 30 l/h
- Stable, precise and reliable measurements
- Increased life expectancy of the electrodes

Cloud Connect®
Controlled water measurement process at any time, from any place, on any device. The solution is Kuntze Cloud Connect® service.
- Optimised asset utilisation
- Increased productivity
- Reduced maintenance costs
- Simple usability and precise control

ASR®
ASR® is their patented automatic sensor cleaning process:
- It keeps the electrode surfaces clean and reduces maintenance efforts automatically
- ASR® is available for measurement of free chlorine, chlorine dioxide, ozone and hydrogen peroxide

Cost reduction due to less maintenance:
- No manual cleaning
- No refill of chemical or physical agents
- Strongly reduced calibration demand

Technical Specifications

| Disinfectants                  | Free Chlorine/Chlorine dioxide/Total Chlorine: Up to 1000μg/l, up to 5.00 / 10.00 / 20.00 mg/l Cl₂ or ClO₂
| Ozone: Up to 1000μg/l, up to 5.00 / 10.00 mg/l O₃
| Hydrogen peroxide: Up to 30.00 mg/l H₂O₂ |
| Temperature                   | -30°C to +140°C (-22°F to +284°F) |
| Digital Inputs                | For external controller stop, low-water indication, or level monitoring
| Display text can be selected according to intended function
| Input can be set to N/O or N/C contact via menu |

Total Chlorine Measurement now available
The instrument is used when there is a need to add display functions, control, alarm, and/or automatic cleaning of the sensor to a transmitter capable of performing any type of measurement.

**The instrument provides**
- ABS watertight enclosure, with Polycarbonate front panel
- Measuring display in the selectable range from -9999 to 9999, corresponding to the 0-20 mA or 4-20 mA input
- VDC power to power the 4-20 mA loop of the transmitter
- Automatic measurement control function
- Alarm from the low/high measurement, the set point overtime operation and the logic input
- Programmable dual analog output for recording and acquisition of the measurement values or PID regulation
- Hold/alarm function activated by two external volt free contacts
- Automatic/manual autoclean function

This unit allows a differential measurement, by using two 0-20 mA or 4-20 mA transmitters featuring the same measurement scale.

**Turbidity Sensors**
- TU 8355: High Turbidity and Suspended Solids probe
- TU 8325: Turbidity probe, submersible with autoclean
- TU 8555: High Turbidity and Suspended Solids probe
- TU 8525: Turbidity probe

**Aquameta Sensors with universal controller**
- CR420-0.5NPU: Hydrostatic water level sensor
- CR420-x.xVFA: Hydrostatic diesel level sensor
- CR420-0.5VPU: Hydrostatic level sensor for salt and chlorinated water

---

**Technical Specifications**

<table>
<thead>
<tr>
<th><strong>Display</strong></th>
<th>Multi-line graphic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input from</strong></td>
<td>0-20 or 4-20 mA single or differential</td>
</tr>
<tr>
<td><strong>Scale</strong></td>
<td>-9999/+9999 with selectable decimal point</td>
</tr>
<tr>
<td><strong>Measuring unit</strong></td>
<td>Electable and 4 digit configurable 2 set-point with min/max function, hysteresis and delay time programmable</td>
</tr>
<tr>
<td><strong>Analog output</strong></td>
<td>0-20 or 4-20 mA isolated for PID regulation or measure transmission Min/max alarm relay, activate/deactivate function selectable Parameters configuration on two levels with access code selected by the operator Two logic digital input for hold or alarm function, selectable</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>85/264 Vac - 50/60 Hz, 5 VA</td>
</tr>
<tr>
<td><strong>Protection</strong></td>
<td>IP 65</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>256x230x89 mm</td>
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<tr>
<td><strong>Registered design</strong></td>
<td>002564666-002</td>
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<tr>
<td><strong>Options</strong></td>
<td>091428 Power supply 9/36 VDC - 24 Vac</td>
</tr>
</tbody>
</table>
PH 3436
4-20mA 2 wire Loop pH/ORP microprocessor transmitter

This transmitter powered with a dc voltage between 9 and 36 volt provides an isolated 4-20 mA “current loop”, a RS485 and Modbus (function 03) outputs.

The instrument uses a pH/ORP sensor and RTD Pt100 temperature sensors. If the Pt100 is connected the transmitter makes automatic temperature compensation (pH only). In these conditions it is possible to visualise the temperature readout on the display.

Its modularity, small dimensions and built-in technology make it suitable for measurements of pH/ORP in various process applications.

The transmitter can be configured for the measurement of pH or ORP and it can also work with the antimony pH electrodes. The measured values, along with support and instruction messages, are also visualised on an alphanumeric display. The transmitter displays the temperature value measured by a Pt100 and performs the manual/automatic compensation (pH only).

The extractable terminal blocks and DIN rail mounting make easy the maintenance and the installation in the field.

Analog mode
The transmitter can be connected to a PLC or instruments BC 6587 and MXD73/75 which provide the VDC power supply, measuring values, two set point and the alarm. The digital input can place the current loop on hold.

Digital mode
When in digital mode, the transmitter is a slave device interrogated by a master device with protocol B&C (ASCII) or Modbus (function 03). The analogue and digital modes can be used simultaneously.
Networked Analyser

2020 XT

Improve operational efficiency with continuous data. With an easily scalable solution, the 2020 XT allows for the connection of up to 20 sensors. Add sensors at any time and at any location or change them out with ease. This completely modular plug-and-play system allows you to monitor and control the water quality in your wastewater facility continuously and accurately.

Features
- Up to 20 digital sensors, any combination
- Easy, intuitive system expansion
- Centralised power supply along entire network
- Numerous relays and outputs may be selected
- Communications via modem, Bluetooth, radio transmission, PROFIBUS, MODBUS, RS-232
- LED status update
- Integrates into existing systems
- Change or move parameters at any time with ease

181/282/284

The new controller DIQ/S 282/284 is available as 2- (DIQ/S 282) or 4-channel-version (DIQ/S 284). Besides the reagent-free measurement of COD, all other parameters needed for a wastewater treatment plant can be measured. By the combination of multi-parameter sensors, up to 20 parameters can be measured and displayed simultaneously. All versions include an USB-interface and an internal data logger by default. Thereby, your valuable data and system configurations can be stored quick and easy. Stay up-to-date with our software updates free of charge and improve your controller for upcoming measurement tasks.

Features
- Connect 1-4 digital sensors for a variety of parameters
- 2-wire cable provides power and communications
- Ultrasonic cleaning on some sensors
- System-wide lightning protection
- Analog or digital outputs; relays
- USB-interface and internal data logger by default
- Convenient and available anytime via internet and Ethernet-interface
- Easy replacements

Technical Specifications

Certifications
- ETL, cETL (conforms with relevant UL and Canadian standards), CE

Integrated Lightning Protection
- EN 61326 enhanced over voltage protection for entire system

Electrical
- Directly via IQ SensorNet when coupled to an MIQ module

Datalogging
- 525,600 data sets

Display
- Graphic; 128 x 64 pixels; backlit

Warranty
- 3 years

Operating Temperature
- -4 to 131°F (-20 to 55°C)

Measuring Parameters:
- Temperature
- pH/ORP (Redox)
- Conductivity
- Salinity
- TDS
- Dissolved Oxygen
- Turbidity
- Suspended Solids (TSS)
- Ammonium
- Nitrate
- Potassium
- COD, TOC, DOC, BOD, SAC
- Sludge Blanket Level
- Ortho-Phosphate

Technical Specifications

Certifications
- ETL, cETL (conforms with relevant UL and Canadian standards), CE

Integrated Lightning Protection
- EN 61326 enhanced over voltage protection for entire system

Electrical
- Directly via IQ SensorNet when coupled to an MIQ module

Display
- Graphic; 320 x 240 pixels; backlit

Warranty
- 3 years

Operating Temperature
- -4 to 131°F (-20 to 55°C)

Measuring Parameters:
- Temperature
- pH
- ORP (Redox)
- Conductivity
- Salinity
- TDS
- Dissolved Oxygen
- Turbidity
- Suspended Solids (TSS)
- Ammonium
- Nitrate
- Potassium
- COD, TOC, DOC, BOD, SAC
## Sensorlyt® 700 IQ
**pH/ORP Sensor Systems**

The Sensorlyt® 700 IQ is perfect for continuous pH/ORP measurement, especially under the difficult conditions very often found in sewage treatment facilities, very high demands are made concerning the reliability and operating safety of the systems employed.

### UV/VIS Spectrometric Probes

- Optical spectral measurement
- Factory calibrated
- Ultrasonic cleaning with UltraClean technology; prevents initial biofouling
- Operating Temperature: 32 to 113°F (0 to 45°C)
- Accuracy: ± 3% of measured value ± 0.5 mg/L
- pH Range: 4 to 9 pH units
- 2-year warranty

<table>
<thead>
<tr>
<th>NitraVis®</th>
<th>CarboVis®</th>
<th>NiCaVis®</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nitrate/TSS</strong></td>
<td><strong>COD/TOC/DOC/BOD/SAC/TSS</strong></td>
<td><strong>Nitrate/COD/TOC/DOC/BOD/SAC</strong></td>
</tr>
<tr>
<td>- Optical spectral measurement</td>
<td>- Optical spectral measurement</td>
<td>- Optical spectral measurement</td>
</tr>
<tr>
<td>- Factory calibrated</td>
<td>- Ultrasonic cleaning with UltraClean technology; prevents initial biofouling</td>
<td>- Continuous real-time values; no sample transport or sample preparation needed</td>
</tr>
<tr>
<td>- Ultrasonic cleaning with UltraClean technology; prevents initial biofouling</td>
<td>- Continuous real-time values; no sample transport or sample preparation needed</td>
<td>- Compensates for interferences and Turbidity</td>
</tr>
<tr>
<td>- Operating Temperature: 32 to 113°F (0 to 45°C)</td>
<td>- Compensates for interferences and Turbidity</td>
<td>- Compressed air cleaning available</td>
</tr>
<tr>
<td>- Accuracy: ± 3% of measured value ± 0.5 mg/L</td>
<td>- Compressed air cleaning available</td>
<td>- Operating Temperature: 32 to 113°F (0 to 45°C)</td>
</tr>
<tr>
<td>- pH Range: 4 to 9 pH units</td>
<td>- 2-year warranty</td>
<td>- pH Range: 4 to 12 pH units</td>
</tr>
<tr>
<td>- 2-year warranty</td>
<td>- 2-year warranty</td>
<td>- 2-year warranty</td>
</tr>
</tbody>
</table>

## IQ Sensor Net Sensors

### Sensorlyt® 700 IQ

**Optical Dissolved Oxygen Sensor**

The right choice of measuring technology for D.O. is of essential importance for the performance of the wastewater plant. WTW offers well proven electrochemical and innovative optical D.O. sensors.

### VisoTurb® & ViSolid® 700 IQ Sensors

New sensors for Turbidity and Suspended Solids measurement

With the VisoTurb® 700 IQ and ViSolid® 700 IQ sensors, WTW presents a family of optical sensors for Turbidity and Suspended Solids measurement. These sensors incorporate a ultrasound cleaning system that guarantees low maintenance and long-term reliability of the sensors.

### FDO® 700 IQ

**Ammonium & Nitrate**

For measurement, simply insert correct electrodes into Sensor (plug and play). The display will show values for Ammonium and Nitrate. The potassium compensation value for Ammonium (Chloride for Nitrate) can be displayed separately if required. All values can be re-transmitted via 4-20mA, PROFIBUS, Modbus (or Ethernet on 2020XT Instrument).

### VARiON®

**Ammonium & Nitrate**

The right choice of measuring technology for D.O. is of essential importance for the performance of the wastewater plant. WTW offers well proven electrochemical and innovative optical D.O. sensors.

www.roycewater.com.au
Accessories & Mountings

Flow Through Adapter
EBST 700-DU/N / EBST 700-DU/ND

Sensor Extensions
UA 55 / UA 130 / UA-SO

Retractable Armature
WA70010

Sensor Holder
EHU170

Sensor Float
S 200

Weld-in Stainless Steel Socket
ESS700VA10 / ADA DF11

Sensor Connection Cable
SACIQ-XX / SACIQ-SW

PROTECTIVE CAP
SCREWABLE PLUG
SACIQ-PLUG
The CR420 series of 4-20mA pressure transducers are a cost effective and robust solution designed for continuous water level measurement where a 4-20mA output is required. It may be used with other liquids that are compatible with its wetting materials which are UPVC, Nitrile and Aluminum Oxide. Different choice of seals is available for other applications. The CR420-0.5NPU is suitable for pressure application of 0.5 bar (5.1m H2O). A 1 bar option is available. The sensor includes temperature and barometric pressure compensation.

**Transducer Construction**

This state of the art pressure sensor uses a flush Aluminum Oxide Ceramic diaphragm in conjunction with on-board signal conditioning to measure pressures. Pressure and temperature calibration is done electronically with the internal applicationspecific integrated circuit (ASIC). When pressures and temperatures change, the electronics provide an offset and span correction. It also includes aging detection and compensation. This new method guarantees good precision and long term stability. The sensor is encapsulated in a UPVC body that is filled with an epoxy. The sensor cable is molded into the transducer eliminating problems associated with threaded plugs. This design ensures a very high level of reliability.

**Output Signals**

The CR420 transducer uses a two wire 4-20mA output signal. The signal is linear with pressure. The sensor will operate with a supply voltage that can range from 9V to 30V DC. The Aquameta Junction box may be used to extend the transducer cable with any other cable. The vented junction box has a Gortex covered opening that allows venting to atmosphere to take place whilst restricting the ingress of moisture.

**Features**

- 4-20mA output
- Power Supply 9 to 30V DC
- Temperature compensated
- Barometric pressure compensation via vented cable
- High linearity and low hysteresis values
- EMI Certified
- Excellent resistance to corrosion and abrasion
- Automated offset and span correction
- Age compensation

**Applications**

- Dams
- Reservoirs
- Storage Tanks
Wastewater Sludge Dewatering Optimisation

Reliable management of wastewater solids by reducing Centrifuge Energy, lowering Polymer Consumption and producing Dryer Cake!

For more than ten years Valmet’s microwavebased solid content transmitters have been used in the process industry for highly demanding applications. Valmet TS has been developed from third generation microwave solids transmitters, combining cost-efficiency with the extreme accuracy of microwave technology. The new transmitter meets the needs of wastewater treatment plants – with no compromises in accuracy. The 500 references in global waste water industry speak for the excellence.

Applications

Sludge pumping from primary & secondary sedimentations / Feed to Thickening: Sludge pumping control based on reliable total solids measurement, and thus optimising sludge quality early on in the process, is vital for the whole sludge handling procedure.

Digester feed: Maintaining a high, optimised total solids content in the sludge entering the digesters helps to achieve better process control and significant savings. Sludge digestion time can be increased to produce more biogas.

Dewatering: Significant savings can be achieved through better dewatering control: a reliable total solids measurement helps to optimise polymer dosing and thus reduce polymer costs.

Dry Cake: The Valmet TS can be installed in the feed line to the incinerator, immediately after the sludge cake pump.

Benefits

- Lower energy consumption in dewatering, better utilisation rate in energy production
- Higher pumping capacity means higher water processing volumes and helps to postpone investments
- Better utilisation of solids transportation capacity
- Lower polymer consumption
- Highly efficient use of dewatering centrifuges
- Less laboratory analysis
- Provides higher solids content in sludge

Technical Specifications

- Measuring range: 0 – 40 % TS, if more than 16 % TS
- Repeatability: ±0.01 %Cs
- Sensitivity: 0.001 %Cs
- Damping: 1 to 99 s
- Ambient temperature: -20...+70 °C (-4...+158 °F), protect from direct heat radiation
- Sensor sizes: PN16 DN50, 80, 100, 150, 200, 250, 300 PN 100 DN100, 150
- ATEX Certificate: No. VTT 12 ATEX 058X, II 3G Ex nR IIC T6 Gc
- Options: Glass-lined versions available
- Enclosure class: IP 65 (NEMA 4)
- Operating voltage: 90...260 VAC / 0.1 A
- Wetted materials: WFT sensors AISI 316, AISI 316L, Ceramic gasket EPDM, Simrit 483
- Current output: Total solids 4 – 20 mA + HART® 18 to 35 VDC
- Secondary output: Process temperature/Conductivity 4 – 20 mA 18 – 35 VDC
- Binary inputs: 2 inputs, isolated 12 – 48 VDC
- Communication: PC-connection RS-232 PROFIBUS PA Support for Valmet FieldCare
- pH-range: 2.5 – 11.5
- Process temperature: 0...+100 °C (+32...+212 °F)
- Operating pressure: Recommended minimum process pressure >1.5 bar (22 psi), No entrained air. If less than 1.5 bar (22 psi), please consult Royce Water Technologies.
- Vibration max.: 20 m/s², 10 – 200 Hz
- Pressure rating: PN16 bar (232 psi) standard. PN100 bar (1440 psi) option for FT100/150/200 (4”/6”/8”) sensors
**Effective Management of Sludge Reduces Capital & Operating Costs**

**Notable savings in energy**

Microwave transmitters have given excellent results in the total solids measurement of wastewater plants. The achieved energy savings alone are enough to ensure a short investment payback period, ranging from a few weeks to a few months according to the size of the plant.
Portable Samplers
P2-COMPACT / P2-COOLBOX / P2-MULTIFORM

Aquamatic’s range of three Portable Wastewater Samplers gives complete sampling flexibility. Like all the models in Aquamatic’s Aquacell Sampler range, the tiny P2-COMPACT, the versatile P2-MULTIFORM and the temperature controlled P2-COOLBOX all feature the unique, high-performance Aquacell Module. All can be powered by mains electricity or via an integrated battery that can provide up to 350 samples on a full charge.

The air pump vacuum sampling system featured within every Aquacell Module provides for a reliable, representative and repeatable sample without the weaknesses that can be associated with alternative sampling techniques. Programming set-up is simplicity itself, with sample volumes from 50 - 500ml (and above, using multiple shots/sample events) and sample intervals from 1 minute to almost 100 hours. Sample extraction frequency can be time based or triggered by external sources such as flow meters, level sensors, pH meters, PLC’s etc. ALL Aquacell Sampler models are certified to the UK Environment Agency’s MCERTs standard for Automatic Wastewater Sampling Equipment and also the International Standard for Wastewater Samplers ISO 5667-10.

All Aquamatic portable Samplers can extract samples from a pressurised effluent source, when specified with a Pressurised Pipeline Interface - Standard.

**P2-COMPACT**
Ideal when samplers are transported between sites, the Aquacell P2-COMPACT takes up minimal space and yet offers all the benefits of the high-performance Aquacell module. Supplied complete with with a compact, low profile 5 litre HDPE Sample Collection Vessel.

**P2-COOLBOX**
Designed for sampling biologically active wastewater, the Aquacell P2-COOLBOX features a high-performance passive Sample Temperature Control System that maintains samples at an optimal temperature of 0 - 5ºC for up to five days. The passive temperature control system requires no power, therefore maximising on-board battery life. Sample temperatures can be measured and logged for subsequent download. Supplied complete with 5 litre Sample Collection Vessel and Cooling Elements.

**P2-MULTIFORM**
Combining the convenience and reliability of a portable Aquacell Sampler with the versatility of single or multiple bottle Sample Collection Vessels, the P2-MULTIFORM Sampler features a simple ‘lift-off’ design for access to easily visible Sample Collection Vessels. Like all Aquacell Samplers, the P2-MULTIFORM can be connected to and controlled by external equipment such as flow meters, pH meters or PLC’s etc.

**Technical Specifications**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>COMPACT</th>
<th>COOLBOX</th>
<th>MULTIFORM</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCERTS Certified</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sample temperature control</td>
<td>No</td>
<td>Passive</td>
<td>No</td>
</tr>
<tr>
<td>Sample frost protection</td>
<td>No</td>
<td>Passive</td>
<td>No</td>
</tr>
<tr>
<td>Suitable for outdoor use</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H430</td>
<td>H835</td>
<td>H780</td>
<td></td>
</tr>
<tr>
<td>W220</td>
<td>W430</td>
<td>W445</td>
<td></td>
</tr>
<tr>
<td>D375</td>
<td>D430</td>
<td>D445</td>
<td></td>
</tr>
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<td>50</td>
<td>50</td>
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<tr>
<td>5 litre container</td>
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<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>25 litre container</td>
<td>No</td>
<td>No</td>
<td>Opt</td>
</tr>
<tr>
<td>12 x 1 litre PET Bottler</td>
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<td>12 x 1 litre glass Bottler</td>
<td>No</td>
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<tr>
<td>24 x 1 litre HDPE Bottler</td>
<td>No</td>
<td>No</td>
<td>Opt</td>
</tr>
<tr>
<td>Ancillary Signal Connection (for flowmeters, pH meters, PLC’s etc)</td>
<td>Opt</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>Bottler Connection</td>
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<td>Data Download Connection</td>
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<tr>
<td>Sample Temperature Monitoring</td>
<td>Opt</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>Transportation Truck</td>
<td>Opt</td>
<td>Opt</td>
<td>Opt</td>
</tr>
</tbody>
</table>
Stationary Samplers

S200 / S320 / S320H

The Aquamatic range of stationary, refrigerated wastewater samplers consists of three Aquacell models, the S200, the secure S320 and the rugged outdoor S320H. At the heart of each is the well proven Aquacell sampling module, a robust and reliable unit proven in thousands of applications worldwide and trusted by users as diverse as food manufacturers, water companies and the Environment Agencies.

The air pump vacuum sampling system featured within every Aquacell Module provides for a reliable, representative and repeatable sample without the weaknesses that can be associated with alternative sampling techniques. Programming set-up is simplicity itself, with sample volumes from 50 - 500ml (and above) and sample intervals from 1 minute to almost 100 hours. Sample extraction can be time based or triggered by external sources such as flow meters, level sensors, pH meters, PLC’s etc. All Aquacell Sampler models are certified to the UK Environment Agency’s MCERTs standard for Automatic Wastewater Sampling Equipment and also the International Standard for Wastewater Samplers ISO 5667-10. Aquacell S200, S320 and S320H Samplers can extract samples from both non-pressurised and pressurised (when specified with a Pressurised Pipeline Interface) effluent sources.

### Technical Specifications

<table>
<thead>
<tr>
<th>MODEL</th>
<th>S200</th>
<th>S320</th>
<th>S320H</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCERTS Certified</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sample temperature control</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sample frost protection</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Suitable for outdoor use</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>H1250 W500 D600</td>
<td>H1470 W770 D765</td>
<td>H1470 W770 D900</td>
</tr>
<tr>
<td>Weight (kg) excluding container and options</td>
<td>46</td>
<td>118</td>
<td>120</td>
</tr>
<tr>
<td>POWER OPTIONS</td>
<td>Mains 10/220/230 VAC 50Hz</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Float charged backup battery (12VDC 7Ah)</td>
<td>Opt</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>POWER CONSUMPTION (VA)</td>
<td>@110VAC (max. inrush current (A) in brackets)</td>
<td>380 (24)</td>
<td>665 (24)</td>
</tr>
<tr>
<td></td>
<td>@220VAC (max. inrush current (A) in brackets)</td>
<td>295 (9)</td>
<td>570 (9)</td>
</tr>
<tr>
<td></td>
<td>@230VAC (max. inrush current (A) in brackets)</td>
<td>315 (9)</td>
<td>615 (9)</td>
</tr>
<tr>
<td>ENVIRONMENTAL</td>
<td>IP Rating</td>
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<td>50</td>
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<tr>
<td></td>
<td>Minimum ambient working temperature °C</td>
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<tr>
<td></td>
<td>Maximum ambient working temperature °C</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>SAMPLE COLLECTION VESSELS</td>
<td>2.5, 5, 10 litre HDPE Container</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td></td>
<td>25 litre MDPE Container</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td></td>
<td>2 x 4.5 litre Self-Emptying Polypropylene Bottler with/without optional cleaning</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td></td>
<td>2 x 5 litre HDPE Bottler</td>
<td>No</td>
<td>Opt</td>
</tr>
<tr>
<td></td>
<td>4 x 5 litre Glass Bottler</td>
<td>No</td>
<td>Opt</td>
</tr>
<tr>
<td></td>
<td>4 x 2.27 litre Glass Bottler</td>
<td>Opt</td>
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</tr>
<tr>
<td></td>
<td>4 x 5 litre HDPE Bottler</td>
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<td></td>
<td>4 x 10 litre HDPE Bottler</td>
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<td></td>
<td>12 x 1 litre HDPE Bottler</td>
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<td>Opt</td>
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<tr>
<td></td>
<td>12 x 1 litre PET Bottler</td>
<td>Opt</td>
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<td></td>
<td>12 x 0.75 litre Glass Bottler</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td></td>
<td>24 x 1 litre HDPE Bottler</td>
<td>Opt</td>
<td>Opt</td>
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</table>

### Optional Equipment

<table>
<thead>
<tr>
<th>MODEL</th>
<th>S200</th>
<th>S320</th>
<th>S320H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ancillary Signal Connection (for flowmeters, pH meters, PLC’s etc)</td>
<td>Opt</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>Beacon</td>
<td>No</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>Bottler Connection</td>
<td>Opt</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>Data Download Connection</td>
<td>Opt</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>Sample Temperature Monitoring Connection</td>
<td>No</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>Transportation Castors</td>
<td>No</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>Auxiliary Equipment Enclosure</td>
<td>No</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>Lift-Up Protection Cover</td>
<td>No</td>
<td>Opt</td>
<td>Yes</td>
</tr>
<tr>
<td>Pull Out Tray (standard with Integral Bottlers)</td>
<td>No</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>Sampler Inspection Window (for Lift-Up Cover)</td>
<td>No</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>Wastewater Drain</td>
<td>Opt</td>
<td>Opt</td>
<td>Opt</td>
</tr>
</tbody>
</table>
Royce Lagoon Aerator

Water-moving aerator

What is this aerator doing that no others can do?

ANSWER

Moving from 2 to 5 acres of water with only 1.5kW of energy, and adding 7kg of DO per hour with only 1.5 more kW of energy use!

The Lagoon Aerator Water-Moving Aeration System is not just an aerator, but it is a water-mover with the ability to deliver large amounts of dissolved oxygen (DO) using a minimum of energy. When compared to standard paddlewheel, vortex, hose diffusion, spray (fountain), or aspirating aerators, the Lagoon Aerator is more efficient, less costly to operate, and requires less maintenance.

The Lagoon Aerator is a two-stage system which utilises two 1.5kW regenerative blowers. Stage 1, using one of the blowers, is the de-stratification phase, continuously pushing every drop of water within 2 to 5 acres (depending upon water depth) of a pond or lagoon. Stage 2 is a second 1.5kW blower that can run continuously, or be initiated manually or automatically, to provide DO at a rate that is comparable to other aerators designed for shallow water ponds or lagoons.

The use of this new aeration system will (1) provide better overall water quality, (2) eliminate the zero-oxygen dead-zone on the lagoon bottom, (3) provide constantly moving water to assist in sludge organic breakdown, and (4) provide dissolved oxygen at a controlled rate in order to save energy and oxidize waste gases. One 2.4 meter Lagoon Aerator will move over 34,100 cubic meters of water in a 24 hour period.

Finally, a lagoon or pond aerator that is designed for function rather than power. The Lagoon Aerator Water-Moving Aerator provides the ability to re-habilitate waste lagoons by providing a cost effective way to break-down sludge naturally, using minimal energy, and putting aeration throughout the water column - where it is required. Algae blooms are reduced and DO is continuously provided to the bottom sludge to enhance natural organic digestion.

Features

- Only 3 kW at maximum energy use
- No propellers or shafts to foul
- No belts or gearboxes to break or require maintenance
- Non-corrosive materials of construction - Anodized aluminum, HDPE, Stainless Steel

Benefits

- Continuously moves the lagoon or pond water via vertical mixing, for complete destratification, algae bloom reduction, and natural sludge digestion.
- Delivers more dissolved oxygen to the water per hour
- Lowers energy costs by up to 80%
- Practically maintenance free for years
- Eliminates trapped nitrogen and ammonia gases, and improves BOD/COD counts
How the Lagoon Aerator is different from other surface aerators

Quiescent water forces turbulent surface flowing water to fall until it hits the sludge on the bottom. This turbulence on the bottom begins sludge fluidisation. Fine bubble, unable to rise above turbulence of coarse bubble flow, finally breaking the surface.

Opposite shores turns water back toward the intake of the model Lagoon Aerator, which pulls 34,100 cubic meters of water through itself per day. This flowing water completes the fluidisation of the sludge.

Advantages

- Less energy usage on an annual basis - per area covered
- Over 34,100 cubic meters of water movement in a 24 hour period
- Guarantees continual water turnover and de-stratification throughout the lagoon - mixes algae and eliminates blue-green algae stratification
- Moves ALL the lagoon’s sludge in a slow, non-violent manner - allowing for sludge turnover for continual degradation by the indigenous bacteria
- No annual motor maintenance - oil changes, belt changes, etc. The only maintenance on a Lagoon Aerator is to clean or replace two inexpensive filters annually
- The addition of up to 6.8kg of dissolved oxygen per hour
- If used in a fish grow-out or recreation lake, the fish in the pond face less stress, more grazing space throughout the pond, more evenly distributed dissolved oxygen, and a constant flow into which to swim

In the water, the Lagoon Aerator provides a low profile. Notice that there is very little white water in front of the unit. An unspoken rule never heard from other aerator manufacturers is that “white water is wasted energy and oxygen.” This lack of white water speaks volumes of the efficiency of this lagoon water moving and aeration system.

The Lagoon Aerator out of the water, ready for installation. Weighing less than 408 kg, it is simple to install because it floats in less than 1.2m of water depth. It can be tethered to the bank or out in the lagoon, whichever is preferred.

Blower intake filters are stainless steel and only require cleaning once or twice per year, not replaced.

Can also be used with Kuh Kai Water Aerator on page 53

www.roycewater.com.au
Assists in removing FATS, OILS, GREASES and odour from wet wells and pump lift stations.

Kuh Kai Wet Well FOG Blitzer

Water Aerator

- Helps Dissolve FOG within hours
- Helps Eliminates odours
- Simple to Install

Utilising both coarse and fine Aeration bubbles through the patented Kuh Kai Aerator, the coarse bubbles assist in breaking up the FOG “scum” in the well.

The fine micro bubbles activate aerobic bacteria to form a healthy colony of bacteria that enable biodegradation of organic matter and thus also eliminating odours.

The Kuh Kai Wet Well FOG Blitzer is easy to install by a suspension chain and air hose.

A low energy Blower can also be supplied to compliment the System Package.
Kuh Kai Water Aerator

The World’s First Pentagon-Shaped Diffuser

KUH KAI is an innovative product that collides, stirs and breaks down sludge and air into fine particles in a pentagonal cylinder 65cm in length, to accelerate the purification of waste water. Air jetted from a pentagonal cylinder diffuses and radiates outward while eddying in a non-conventional approach.

**Features**

- Applicable when the water is 1m or deeper
  - Applicable to existing or new equipment as long as the water tank or lagoon pond is 1m or deeper.
- No clogging (Pentagonal tube opening 80mm × 130mm)
  - No need to worry about clogging due to the large-diameter opening particularly with intermittent processes during denitrification.
- Power cost reduction (20% to 40%)
  - With a small pressure loss between the air in-take and discharge, power costs can be substantially reduced.
- No sludge flocculation on the tank bottom and the oxygen transfer rate is high due to its “air lift effects”.
  - Sludge on the tank bottom is drawn into the pentagonal cylinder and the sludge and air are broken down into fine particles which increases the oxygen transfer rate while colliding, being stirred, and rotating. This how the KUH KAI effectively purifies the water.
- Easy maintenance and management due to its simple structure
  - The main body is made of stainless steel and the inside is made of molded resin = Virtually maintenance free. Also, the main body material and the installation method can be changed according to needs.

### Aerator Performance Comparison

<table>
<thead>
<tr>
<th>Category</th>
<th>Item</th>
<th>Air Bubble Type</th>
<th>Mechanical Type</th>
<th>Kuh Kai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen transfer rate</td>
<td>No clogging of porous diffusers in intermittent processes during settling (denitrification)</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Complete mixing of water column of solids, liquids and air</td>
<td>×</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>No sludge flocculation on the tank bottom</td>
<td>×</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Efficient uptake by micro-organisms by using full biomass available</td>
<td>×</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Power saving (small pressure loss)</td>
<td>×</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Facility Cost savings (easy installation and piping)</td>
<td>×</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Easy Operation and Maintenance (parts replacement)</td>
<td>×</td>
<td>×</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Proven Long Life Durability</td>
<td>×</td>
<td>×</td>
<td>✓</td>
</tr>
</tbody>
</table>

Can also be used with Lagoon Aerator on page 51
Large Bubble Air Mixing

Cleans wet wells, mixes water storage reservoirs (aiding DBP reduction) and increases Dissolved Oxygen concentration in wastewater aerobic tanks by causing water column inversion thus lengthening diffuser air contact time.

Pulsed Hydraulics is a proven mixing technology for water and wastewater, cutting the energy used for mixing by 50% over traditional mechanical mixing equipment. The PHi mixing system is designed for use in:

- Anoxic and Aeration Basins
- Water Storage Reservoirs
- Sludge Holding Tanks
- Chemical Mixing
- Polymer and Alum Mixing
- Lift Stations
- Distilled Spirits
- EQ Basins
- Belt Press Sludge
- Backwash Basins

Pulsed Hydraulics, Inc. provides water and wastewater plant operations with a totally unique “Hydro-Pulse” system that mixes without in-basin moving parts, is infinitely adjustable, yet simple to install, operate and maintain. The result is significant power savings over traditional mixers.

Our patented process mixes the entire contents of the tank. The PHi mixing process is non-shear and does not entrain oxygen into tank contents. There are no moving parts within the tank, which keeps the system’s reliability high and maintenance costs low.

Pulsed Hydraulics’ mixing technology is well accepted in the petroleum, chemical, food, wine and other industries. There are thousands of installations worldwide. This proven mixing solution, is finding wide acceptance for potable water mixing and multiple applications in the wastewater industry.

Benefits
- No Moving Parts in Basin or Tank
- Power Savings over Traditional Mixers
- 100% Online Standby
- Greatly Reduces Costs
- Variable Speed and Intensity Mixing
- Complete Tank Mixing
- Scalable to Any Size Basin or Tank
- Significantly Less Sediment Buildup
- SCADA Interface
- Eliminates FOG, Ragging and Odors in Lift Stations
- Enhances Aeration Efficiency
- Eliminates Temperature Stratification in Potable Water Tanks
- Prevents Ice Build-up
- NSF-61 Approved

How it works: PHi Hydro-Pulse Mixing Technology

Pulsed Hydraulics’ mixing technology Hydro-Pulses compressed air through 316 stainless steel forming plates on the bottom of the tank, forming very large bubbles that rise at 1.5 metres per second to the surface. As they rise, they drag tank contents with them. When the bubbles break the surface and exit to the atmosphere, the tank contents move horizontally until they meet a tank wall, or meet a wave of contents coming from another forming plate bubble. The contents move down until they hit the tank bottom, where they move sideways to the forming plate which results in a circular mixing action in the tank.

The PHi mixing system is not like diffuser or coarse-air mixers, which use a continuous stream of air. The Hydro-Pulses are released 2-4 times per minute depending on the mixing application. Each pulse is approximately 1 cubic metre in size. Both the pulse times and sizes are adjustable. This allows PHi to use the minimum amount of energy necessary to keep solids in suspension.
Replace your floats in a half day or less - with no rewiring of your control system.

**Keep it simple with FOGRod®**

Wastewater level sensor

- 10% of the maintenance of floats
- 10x easier than ultrasonics
- Unbreakable - 10 year warranty

This failsafe lift station level device is almost as simple as floats, but with much less maintenance; way simpler than ultrasonics; and can’t fail like pressure transducers.

**Why not free up some of your valuable time with the FOGRod®?**

- No moving parts, sensors or electronics in the wetwell
- Failsafe
- Simple and quick to install
- No rewiring of your control system
- No configuration or calibration
- As easy to understand as floats
- Class I Division 2 with no barrier, Division 1 with barrier

The FOGRod comes in three lengths - 7.5 ft, 5ft and a special 3ft (with only 6 contacts, 6” apart). If you need a 10ft FOGRod we supply 2x 5ft FOGRods (and 1 LIT). Each FOGRod has the option of two cable lengths - 50 ft or 100 ft. If you don’t already have D.C power in the panel (e.g. powering a PLC or telemetry supply) you will need a mains to D.C. power supply.

**Benefits**

The Level Device that keeps on working as well as much lower maintenance, the FOGRod has a number of additional benefits that you don’t get with floats.

- More reliable solution - there is a failsafe feature where faults in the FOGRod or the cable cause an alert (unlike floats)
- Better cleaning of the well - the FOGRod can be positioned much lower in the well than a float - which allows a much lower pump stop point
- Safety - you can see the well level on the unit without opening the well cover, making a much safer working environment
- Remote monitoring of level and faults - the well level is indicated and communicated in 10 steps - allowing your PLC or RTU to communicate the level to your SCADA/telemetry system

**Technical Specifications**

<table>
<thead>
<tr>
<th>Construction</th>
<th>CPVC (a stronger and more corrosion resistant form of PVC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal contacts</td>
<td>AL6XN (super-austenitic steel for very high corrosion resistance)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>Diameter: 35mm FOG-5 - Length 5ft (1525mm), Separation between contacts 6 in (152mm) FOG-7.5 - Length 7ft 3in (2217mm), Separation between contacts 9 in (229mm)</td>
</tr>
<tr>
<td>Weight</td>
<td>FOG-5: 5.5 lbs (2.5kg), excluding cable FOG-7.5: 7.7 lbs (3.5kg), excluding cable</td>
</tr>
<tr>
<td>Rating</td>
<td>Nema 6P / IP68</td>
</tr>
<tr>
<td>Temperature rating</td>
<td>Operating: -40°F to 158°F (-40°C to +70°C) Storage: -40°F to 185°F (-40°C to +85°C)</td>
</tr>
<tr>
<td>Cable</td>
<td>Custom 11-core cable with braided shield PVC insulation &amp; outer jacket Conductor size 20 AWG or greater</td>
</tr>
<tr>
<td>Mounting bracket</td>
<td>Aluminum (powder coated) with polyurethane cleaning pad (anchors, S-hook and cable tie included)</td>
</tr>
</tbody>
</table>

You can’t afford the time to clean floats, or to work out why transducers are giving false readings.

www.roycewater.com.au
The principle
Ultrasound is sound with frequencies beyond audible sound, i.e. from 20 kHz up to the megahertz range. In aqueous media ultrasound waves cause periodic compression and extension of the water phase. High-intensity ultrasound is necessary to tear apart water molecules during the rarefaction phase, which results in the formation of microscopically small voids in the liquid. These voids become bubbles filled with water vapour or gas. They grow in extension phases and shrink in compression phases until they implode.

This event is called cavitation, a process under extreme (adiabatic) conditions. On a micro scale, pressures of 500 bar and a temperature of 5,000°C are produced. Particularly large cavitation bubbles are produced within the frequency range from 20 to 100 kHz; when these bubbles collapse they cause extreme mechanical shear forces. These forces produced by ultrasound are capable of destroying even the most robust surfaces.

How it works
Extensive empirical studies have led to the development of a patented high-power ultrasound system, which is optimally tuned to the disintegration of biomass. Our ultrasound reactors operate as a plug flow system. Ultrasound within the lower frequency range (20 and 35 kHz) and high intensity is applied. Our ultrasound systems can be used for volumetric flow rates of up to 2 m³/h, which means that the resulting sonicaton time for the medium is very short viz. only one minute. It is not necessary to recirculate the medium. The flow rate can even be higher for less concentrated suspensions.

Sludge treatment
Degradation of the organic sludge fraction by conventional anaerobic sludge stabilisation is limited by the rate-determining hydrolysis step. Degrees of volatile solids degradation of 50% are rarely achieved. The cause of this lies in the difficult to access and degrade bacterial biomass of the waste activated (excess) sludge. By applying the high-power Ultrasound ultrasound technology this limiting hydrolysis step is overcome. Therefore the sonicated excess sludge biomass is more readily available for the subsequent biological enzymatic degradation process.

Ultrasound causes disintegration of the sludge floc structure and release of exo-enzymes even with small energy inputs. This also creates more interface between the solid and liquid phase and therefore facilitates the enzymatic attack of the active micro-organisms. A higher energy input results in the breakdown of bacteria cells, causing the cell contents and endo-enzymes to be released. These enzymes further accelerate the degradation process. The entire digestion process is intensified and the organic fraction is further degraded. An important advantage from this is a significantly increased production of biogas and reduction in the quantity of residual sludge to be disposed of. As a result of the smaller quantity of residual organic matter, the dewaterability of the digested sludge is also facilitated (less flocculent addition) and increased (higher degree of dewatering).

This disintegration of the sludge reduces its viscosity.
This is important for practical operation, as this facilitates mixing the fermenter content, which in turn results in noticeable energy savings. With the help of ultrasound technology, digesters which are at the limit of their capacity can easily continue to be operated long-term. In new installations the digesters can be designed with a shorter retention period.

**Bulking sludge and foam**

Seasonal bulking sludge problems often occur in wastewater treatment plants. These are usually caused by filamentous organisms. Foaming in digester tanks is also a familiar occurrence and can cause substantial operational problems.

Sonication of a small quantity of the return activated sludge or returned excess sludge exposes this bacterial biomass to permanent stress through cavitation and fluctuating pressure in the liquid medium. Ultrawaves has proven that this process causes filamentous micro-organisms to particularly suffer and therefore forces them to be permanently eliminated. Use of high-power ultrasound can therefore prevent the formation of bulking sludge and stable wastewater treatment plant operation is maintained again.

**Wastewater Treatment**

Nitrogen degradation: The biological nitrogen degradation takes place through nitrification and denitrification. A successful degradation process requires an additional carbon supply to be provided for the denitrification stage. Normally, methanol or another external carbon source is bought in and added to the process for this purpose.

Sonication of the excess sludge with ultrasound breaks down the biomass. This releases the cell contents - i.e. ideal carbon carriers - which are then available as an internal source of carbon in the denitrification stage. Biological nitrogen degradation in the wastewater treatment plant can therefore be maintained or even intensified. If part of the sonicated sludge is returned to the biological phase, the quantity of sludge to be disposed of is automatically reduced. Use of ultrasound for the degradation of nitrogen was successfully tested in practice and, for example, has been in operation in Bünde municipal wastewater treatment plant since 2006.

**Reduction in greenhouse gas emissions - Positive CO₂ balance due to ultrasound**

Electricity produced from biogas is climate-neutral, which is particularly positive for the greenhouse gas balance. Therefore, by using the Ultrawaves ultrasound systems, the CO₂-neutral energy production can be further increased.

The mathematical model drawn up by Ultrawaves calculates the emission reduction achieved by using ultrasound, as the following example shows:

In a wastewater treatment plant with 100,000 p.e. ultrasound achieves a 10% relative increase in anaerobic sludge degradation. As a further consequence the dewaterability of the digested sludge is increased by 4% (relative). These effects result in a reduction in the annual greenhouse gas emissions by 1.5 kg CO₂ equivalents per p.e. This corresponds to a reduction of around 150 tonnes CO₂ equivalents per year for this wastewater treatment plant.

Further and more detailed descriptions of case studies as well as our reference list are presented on our website.

**Royce Water Technologies Pilot Plant used for Trials**

Royce Water Technologies has placed a significant investment into a Pilot Plant to introduce this technology to the Australian Wastewater market and invites progressive engineers and stakeholders at waste water facilities to partner us in this endeavor.
CASE STUDY

Ultrasound System For Improvement Of Anaerobic Digestion On Wastewater Treatment Plants
Bamberg WWTP, Germany

**Brief Snapshot of the Plant**
- Design capacity 230,000 PE
- Actual loading 280,000 PE
- Sludge treatment: Primary sludge (PS) and thickened waste activated sludge (TWAS)
- Separate WAS thickening: Centrifuge
- Anaerobic sludge stabilisation: 3 digesters (2 x 2,000 m³, 1 x 1,000 m³)
- Hydraulic retention time: 18 days (2003)
- Sludge disposal: Incineration after dewatering

**Objective of the ultrasound application**
- Intensification of anaerobic digestion process
- Reduction of volatile solids concentration
- Increase of biogas production

**Installation of the Ultrawaves ultrasound system**
- Installation of 2 Ultrawaves ultrasound systems (2 x 5 kW) for test in May 2002
- 30% of total TWAS flow treated with ultrasound

**Results of ultrasound treatment**
- Construction of a new digester (est. investment costs: 2.5 million euros) was avoided
- Intensification of sludge digestion: degradation of VS increased from 34% to 58% (see figure 2)
- Quality of digested sludge: reduction of the VS (as per cent of DS) from 60% to 54%
- Biogas production: increase of 29%

**Full-scale installation**
Two Ultrawaves ultrasound systems (2 x 5 kW) are in operation since August 2004. In the beginning the recommended stream (30% of the total TWAS flow) was treated during 8 hours a day. The thickening process was automated to operate 24 hours a day. Today the treated stream amounts to 80% of the total TWAS flow.

**FIGURE 1**
Sludge flow sheet of Bamberg WWTP and integration of ultrasound system (US)

**FIGURE 2**
Biogas production and degradation of volatile solids
CASE STUDY

Ultrasound Sludge Disintegration Of Sewage Sludge Used As Internal Carbon Source For Denitrification

Bünde WWTP, Germany

Brief snapshot of the plant
- Design capacity: 40,000 PE
- Actual loading: 54,000 PE
- Biological wastewater treatment
  - P-elimination
  - Alternating nitrification and denitrification at a sludge age of about 22 days
  - Addition of methanol as external carbon source
  - Secondary clarifier
- Sludge treatment
  - No primary sludge
  - Thickened waste activated sludge
- Separate waste activated sludge thickening
  - Belt press (operating 24 hours)
- Anaerobic sludge stabilisation
  - 2 digester, mesophilic
  - HRT: 40 days
- Digested sludge dewatering: Centrifuge
- Sludge disposal: Incineration

Objective of the ultrasound sludge disintegration
- Use of disintegrated TWAS as an internal carbon source for the improvement of the denitrification process.

Preliminary trial of the ultrasound disintegration system
- Test phase of four months (March 2006 - June 2006)
- 50% of the total TWAS flow were treated with 1 ULTRAWAVES US unit 5 kW, operating 24 hours per day and feed in denitrification basin (Fig. 1)

Results
- A significant reduction of the nitrogen concentration in the effluent (N < 3 mg/L)
- Avoid of methanol as external carbon source
- Waste activated sludge: Reduction of the sludge mass by 13%
- Reduction of the organic fractions
- Improvements in dewaterability of the sludge by 2%
- No foaming or bulking sludge in the activated sludge tank

Payback time
Immediately, because of reimbursement in form of reduced public sewage fees as a result of decreased nitrogen concentrations in the effluent of the plant and cost savings of avoided methanol.

Full-scale installation
In September 2006 the ULTRAWAVES ultrasound system was implemented on WWTP Bünde. And since is in operation 24 hours per day. WWTP Bünde bought a second ULTRAWAVES ultrasound system for the improvement of anaerobic digestion in 2007.

Figures:
- FIGURE 1: Scheme of sludge treatment on WWTP Bünde and Ultrasound system with thickener
Increase the revenue from your waste & sludge

Bioprocess Control offer unique instruments which also study the dynamics of the degradation process, so that you can more easily find ways to maximise digestion. Our smart testing equipment minimises workloads by turning testing into an efficient and simple routine procedure that removes the most common human errors associated with more traditional approaches.

**AMPTS II**
Methane potential analysis made easier

The Automatic Methane Potential Test System (AMPTS) II allows users to determine the true biochemical methane potential and dynamic degradation profile of any biomass substrate. This in turn will allow users to more easily determine the optimal retention time and mix of substrates for co-digesting, screen proper pre-treatment methods, and evaluate the need for additives.

**Features & Benefits**
- Determine the true bio-methane potential
- Significantly reduce your labour demands
- Standardise and compare results
- Get access to highly precise & accurate data

**CSTR Bioreactors**
Simulate with a continuous stirred tank reactors

Bioprocess Control has developed a series of continuous stirred tank reactors (CSTR) especially designed for scientists and process engineers to simulate full scale fermentation processes in laboratory- or small pilot-scale. Today, the company offers 2 size options (5 and 10 liters) and 3 different configurations. The CSTR bioreactors are well engineered to meet the needs of the most demanding biogas labs.

**Features & Benefits**
- High quality & robust
- A series of CSTR bioreactors
- Easy to run and maintain
- Offering a flexible and modular design
**BioReactor Simulator**
*A simulation platform in the cloud*

The BioReactor Simulator is a universal platform for simulating at laboratory scale anaerobic fermentation processes in a continuous mode of operation. The system is controlled by a web-based software running on an efficient cloud computing solution accessible from any computer or mobile device with an internet connection.

**Features & Benefits**
- Simulate continuous processes
- Obtain deeper knowledge and experience
- Standardise and compare results
- Significantly reduce your labour demands

**Gas Endeavour**
*Low gas volume and flow analysis*

The Biogas Endeavour allows users to determine the biogas potential and dynamic degradation profile of any biomass substrate. This in turn will facilitate for users to select and price a substrate according to its true energy content of biomass, thus helping to ensure a good control of substrate economy for biogas plants.

**Features & Benefits**
- Determine a substrates true energy content
- Explore the potential of available substrates
- Compare your results and reports
- Take control of selecting and pricing substrates

**μFlow**
*Low gas flow measurements made easy*

The μFlow is a compact and elegant instrument for measuring ultra-low gas flows with high precision. The μFlow has been designed for the on-line, real-time monitoring of all inert and slightly aggressive gases, over a wide detection range and for most indoor laboratory scale applications. Suitable applications include biogas process studies, ethanol fermentation, dark fermentation for bio-hydrogen, and leak rate detection.

**Features & Benefits**
- A compact and elegant solution
- A low gas flow meter with zero labour requirements
- An entirely new level of precision
- Normalisation of key measurements

**www.roycewater.com.au**

Product Catalogue Royce Water Technologies 61
The LuminUltra Solution
Rapid Microbial Monitoring

Regardless of the situation, LuminUltra’s advanced 2nd Generation ATP technology provides fast, complete, and accurate insight into microbiological activity. Both portable and easy to use, our test kits provide an interference-free indication of total microbial quantity within minutes of sample collection allowing you to save valuable time, help you better manage risk and reduce operating costs.

What is ATP?
ATP or Adenosine Triphosphate, is the main energy carrying molecule for all forms of life. This makes the measurement of ATP a direct indication of total microorganisms!

How is it Measured?
If you have seen a firefly at night, then you have seen the ATP measurement process in action. Simply put, ATP recovered from microorganisms is mixed with the enzyme Luciferase to produce light which is measured in a luminometer. More microorganisms = more ATP = more light!

What can ATP testing do for me?
The measurement of ATP detects all living microorganisms, rather than just a fraction of the total population. As well, ATP testing is extremely fast - it provides results in minutes instead of days. These two critical advantages over traditional counting techniques can help you save time, manage risk, and reduce cost!

The LuminUltra Difference:
What makes LuminUltra’s 2nd Generation products different from traditional plate counts and other ATP test kit suppliers? LuminUltra’s technology is…

- **Rapid**: Provides results in minutes rather than hours, days or weeks.
- **Accurate**: LuminUltra’s 2nd Generation ATP test kits are designed specifically for water, organic, and wastewater samples.
- **Complete**: Achieves total recovery of all microorganisms in the sample rather than a small fraction.
- **Quantitative**: Includes a built-in standard to normalise results for valid historical and site-to-site comparisons.
- **Reliable**: LuminUltra’s products meet the highest of quality standards and our expert staff provides unparalleled support for all applications.
 PhotonMaster™
Luminometer

The world’s first USB-operated luminometer has become even more versatile! LuminUltra’s PhotonMaster is now coupled with the PhotonMaster Bluetooth Module (PBM), meaning that data can not only be generated independently from a computer, but also collected and analysed in real-time when paired via Bluetooth with our LuminUltra Cloud™ mobile app. Our goal was to reduce equipment costs for our customers, but we didn’t stop there. As the world’s first USB-powered and operated commercial-grade luminometer, the PhotonMaster has been designed to shield against the elements and potential interferences while working in typical field conditions. No need to worry about batteries or power cords; the PhotonMaster uses as little power as a typical computer mouse. While the PhotonMaster excels in its simplicity, the true power comes from combining our luminometer together with its control software, LuminUltra Cloud™. The PhotonMaster detects light emitted from the bioluminescent reaction of our test kits using a photomultiplier tube. It then reports back in Relative Light Units (RLU) to our LumiCalc data analysis software which does the remaining work of calculating and interpreting the results for you.

LuminUltra Cloud™
Software & Decision Making Platform

**Easily bring all of your data together:** LuminUltra Cloud allows you to input data of any type through Bluetooth connection, spreadsheet import, or simply typing on your phone. Organize your data according to specific sites, complete with GPS-tagged sample locations and set up scheduled workflows to share with your colleagues.

**View, edit and analyse data directly from your phone, tablet or PC:** When you’re in control of your data, you’re in control of your next decision. LuminUltra Cloud allows you to easily view and manipulate your data in convenient on-screen tables, as well as to manage alarms and decision support systems that identify when action is required. And when you want to take a closer look, quickly export data into a spreadsheet.

**Save time generating reports:** Our easy-to-use reporting module allows you to automatically email PDF reports to your colleagues on the schedule of your choosing. All you need to do is set up the report content, schedule, and recipient list, and we take care of the rest. Select from a wide array of report templates or request your own custom template!

**Secure, instantaneous sharing:** LuminUltra Cloud is built upon best-in-class cloud database systems using secure storage and encrypted data transfer. This means that not only is your data safe, but collaboration with your colleagues is also real-time. Share sites along with your sampling programs, data, analytics and notes with colleagues of your choosing by simply entering their email address.
Portable & Complete Microbial Detection
Measure, react & confirm in 5 minutes

For use in multiple markets – including drinking water, wastewater, industrial manufacturing and oil & gas – LuminUltra’s 2nd Generation ATP-based operator-friendly solutions enable you to take the microbiology laboratory into the field to achieve same-shift problem solving.

### Side-by-Side Comparison

<table>
<thead>
<tr>
<th>Method</th>
<th>2nd Generation ATP</th>
<th>Culture Tests</th>
<th>Microscopic Examination</th>
<th>Molecular Biology Methods</th>
<th>Particulate Analysis</th>
<th>Respirometry</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is detected?</td>
<td>Total Microorganisms</td>
<td>Culturable Microorganisms</td>
<td>Total or Specific Microorganisms</td>
<td>Specific Microorganisms</td>
<td>Suspended Solids</td>
<td>Metabolic Activity</td>
</tr>
<tr>
<td>Interferences in detecting total living biomass</td>
<td>None</td>
<td>UNABLE TO MEASURE</td>
<td>Dead biomass; non-biological particles</td>
<td>UNABLE TO MEASURE</td>
<td>Dead biomass; non-biological particles</td>
<td>Respiration Type</td>
</tr>
<tr>
<td>How long to get results?</td>
<td>Minutes</td>
<td>Days to Weeks</td>
<td>Minutes to Hours</td>
<td>Minutes to Days</td>
<td>Minutes to Hours</td>
<td>Minutes to Hours</td>
</tr>
<tr>
<td>Can give results onsite?</td>
<td>Yes</td>
<td>No</td>
<td>Yes (but difficult)</td>
<td>Yes (in some cases)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>What types of samples can be tested?</td>
<td>Fluids &amp; Solids</td>
<td>Fluids, Re-suspended Solids</td>
<td>Fluids &amp; Solids</td>
<td>Fluids, Re-suspended Solids</td>
<td>Fluids only</td>
<td>Fluids only</td>
</tr>
<tr>
<td>How much skill is required?</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Moderate to High</td>
<td>Low</td>
<td>Moderate</td>
</tr>
<tr>
<td>What is the capital cost?</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Moderate to High</td>
<td>Low</td>
<td>Moderate to High</td>
</tr>
<tr>
<td>What is the cost per test?</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Low</td>
<td>Moderate to High</td>
<td>Low to Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>What is its best use?</td>
<td>Total microbiological concentration</td>
<td>Specific microbiological concentration</td>
<td>Population diversity</td>
<td>Population diversity &amp; specific concentration</td>
<td>Total particles</td>
<td>Specific metabolic activity</td>
</tr>
</tbody>
</table>

**DRINKING WATER**
Are you in control of microorganisms in your drinking water system?

**WASTEWATER**
It’s the most fundamental aspect of biological wastewater treatment. Are you monitoring the Biomass?

**INDUSTRIAL WATER**
Quantify microbial content in any industrial process water application.
Now we can identify which microbes are in your sample and their impact on your process with our new DNA tools – qPCR and NGS.

Why DNA?
LuminUltra’s 2nd Generation ATP® test kits were a revolutionary step up from traditional tools – delivering a rapid and accurate quantification of the total microbial population in a sample. Now we can offer insight on which microbes make up that population, with two new DNA services: qPCR and NGS.*

Quantitative Polymerase Chain Reaction (qPCR) provides users the ability to rapidly screen for specific microbes or groups of microbes that are known to be significant in their process. Next Generation Sequencing (NGS) provides users the ability to see what is happening inside their process by identifying nearly all of the types of microbes present along with insight into what good or harm they may be causing.

A DNA testing program can keep your process running optimally by helping you to:
- Understand the cause and effect relationships certain microbes have on your process – positive or negative.
- See trends and understand future triggers for proactive versus reactive decision making.
- Apply more targeted treatment.

Why use LuminUltra’s NGS service?
- Faster results – 2 weeks from receipt of sample versus 4-6 weeks or more from the competition.
- Easy to follow sample preservation techniques giving confidence in results.
- Convenient. No freezers or refrigerated transport required.
- Reporting includes results and analysis from an in-house DNA expert.
- Extremely competitive pricing with no hidden costs.

How do I get my sample tested?
The process is simple…..
1. Collect your sample.
2. Send it to us hassle-free.
3. Get your report.
4. Make better decisions based on feedback.

More data on the microbes in your process means faster, better decision-making, for greater efficiencies.

Case Scenario: Identifying the cause of bulking in a bioreactor using NGS
A WWTP is having persistent problems with filamentous bulking and sludge carryover in the secondary clarifier. Traditionally operators used a microscope to try and identify filamentous organisms, however they switched to NGS to reduce organism misidentification. With NGS, they receive standardized, quantitative results that are easy to interpret with no additional training.

NGS also gives the added benefit of identifying all organisms, not just filamentous. This allows the plant to understand other processes including: biological nutrient removal, viscous bulking, foaming and aeration performance. Through LuminUltra’s NGS report, the WWTP identified the significant filamentous bulking organisms leading up to a severe bulking event on August 20:

<table>
<thead>
<tr>
<th>Microbe</th>
<th>Relative Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>23-Jul</td>
</tr>
<tr>
<td>Caldilinea</td>
<td>0.23</td>
</tr>
<tr>
<td>Cause: Low F:M</td>
<td></td>
</tr>
<tr>
<td>Kouleothrix</td>
<td>0.04</td>
</tr>
<tr>
<td>Type 1831</td>
<td></td>
</tr>
<tr>
<td>Cause: Low F:M</td>
<td></td>
</tr>
<tr>
<td>Gordonia</td>
<td>0.45</td>
</tr>
<tr>
<td>Cause: FOG</td>
<td></td>
</tr>
</tbody>
</table>

Based on the NGS results, the bulking event was caused by Caldilinea and Kouleothrix, both of which are associated with low F:M. Gordonia was also found to be present, but its relative abundance did not change during the bulking event. If a microscope was exclusively used for identification, the bulking event may have been misidentified as Gordonia related, which is caused by high fats, oils and grease (FOG) not low F:M.

The WWTP corrected the F:M by attributing the microorganism portion to active biomass using LuminUltra’s 2nd Generation ATP, as opposed to total or volatile solids. The new F:M corrected the filamentous bulking issue.

* Both services complement 2nd Generation ATP
D umo Algacleaner
Algae removal with ultrasounds

Algae mitigation and growth inhibition using ultrasound, avoids the use of chemicals and does not generate waste. Therefore it is a clean technology that meet the legislative requirements of environmental policy.

**Algae growth inhibition by ultrasound**
The propagation of sound in a medium such as water is carried out by a continuous transition of pressure waves. In the case of ultrasound, alternating between increasing and decreasing pressure in relation to a normal pressure is produced at a rate higher than 20,000 times per second (20kHz).

DUMO Algacleaner emits ultrasonic pulses that causes damage to the internal structure of cells. Under the effect of ultrasound, the vacuoles - that provide buoyancy to algae - breaks, in addition of further damages in the pores of the cell wall, which makes the acquisition of vital nutrients to the algae.

DUMO system emits different frequencies that generate different wave fronts effective against algae. This covers a wide range of applications over various species, by the combination of frequency, power and pulse sequence.

Depending on environmental conditions, nutrients in water, the effects of destruction and inhibition as well as the type and characteristics of existing algae populations, the effect of DUMO Algacleaner begins to be felt from fourth to eighth week from its application.

**The most effective and environmentally friendly way to eliminate algae**
Now it is possible to alleviate algae blooms in your irrigation reservoir, pond, lake, fountain, etc, without the need for chemicals.

Our ultrasonic system will ensure algae control with the most sustainable method. Installation is simple and easy. All you need to do is place the device in the water and connected it to the power or energy source.

**Advantages**
- Ecological
- Non-toxic: It does not cause harm to people, animals or plants.
- Clean: No need for chemical products
- Minimal maintenance
- Easy to install
- 24/7
- Low power consumption

**Specifications**
- Ultrasonic waves generator: multifrequency digital generator with automatic sequence programs.
- Alarm output for emission fault: relay output (3A, 250V).
- Protections: overload, overheating and breakage of the transmitter cable.
- Pilot lights: ultrasound emission, power ON.
At a sewage treatment plant naturally occurring micro-organisms - bacteria and protozoa - convert many of the substances found in sewage into forms that do not harm the environment. There are millions of micro-organisms of a thousand or more different species in the reactor tank.

### Biological Nutrient Reduction

The micro-organisms are responsible for several chemical transformations:
- **Heterotrophic bacteria** convert molecules containing carbon into carbon dioxide and water: \( \text{CHO} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} \)
- **Phosphorus accumulating bacteria** have the ability to take up phosphorus.
- **Nitrifying bacteria** turn ammonia into nitrates and water: \( \text{NH}_3 + \text{O}_2 \rightarrow \text{NO}_3 + \text{H}_2\text{O} \)
- **Denitrifying bacteria** turn nitrates into nitrogen, carbon dioxide and water: \( \text{NO}_3 + \text{CHO} \rightarrow N_2 + \text{CO}_2 + \text{H}_2\text{O} \)

In the reactor tank, the sewage passes through a series of zones in which different conditions are provided so as to promote the activities of the various species.

- **Anaerobic**: No oxygen present, either dissolved in the water or combined with other molecules.
- **Anoxic**: No oxygen dissolved in water but it is present combined with other molecules (eg. nitrate - NO₃).
- **Aerobic**: An abundance of oxygen present, dissolved in water and combined with other molecules.

### REACTOR TANK

- **N1**: No activity
- **P1**: Bacteria release phosphorus & take up carbon compounds
- **P2**: No activity
- **P3**: Bacteria take in oxygen & phosphates, use up stored carbon and give out carbon dioxide
- **N2**: Denitrifying bacteria take in carbon & nitrogen, give out nitrogen and Carbon Dioxide
- **N3**: Nitrifying Bacteria: Take in Oxygen & Ammonia & give out Nitrites
- **C1**: No activity
- **C2**: No activity
- **C3**: No activity

### ZONES

- **C**: Compounds containing carbon are food for heterotrophic bacteria. Bacteria, in turn, become food for protozoa. The carbon-containing compounds are converted to carbon dioxide that escapes into the air. The microorganisms need oxygen in order to be able to do this, so activity takes place only in the aerobic zone, C3.

- **P**: Specialised phosphorus accumulating bacteria are responsible for depositing phosphorus compounds in the sludge. They have to have the right conditions to do this efficiently. In the anaerobic zone, P1, they are starved of oxygen but there is an abundance of small carbon containing molecules. The bacteria are stressed in these conditions. They release any phosphorus they have already absorbed and take in carbon. The bacteria pass through the anoxic zone, P2, to the aerobic zone, P3. Here they use oxygen and some of the carbon they have stored as energy, and take in lavish amounts of phosphorus. These form long chains that stick together so the bacteria become heavy and, in the clarifier, sink into the sludge, taking the phosphorus with them.

### KEY

- **Oxygen O₂**: Compounds containing oxygen as nitrate nitrogen
- **Carbon Dioxide CO₂**: Compounds containing nitrogen as nitrate NO₃
- **Nitrogen gas N₂**: Compounds containing nitrogen as nitrous NO₂
- **Compounds containing carbon (CHO)**: some large and complex, others small and simple
- **Phosphate (PO₄)**: Compounds containing phosphorus mostly as phosphate

### INCOMING SEWAGE

<table>
<thead>
<tr>
<th>RAS - Returned Activated Sludge</th>
<th>WAS - Waste Activated Sludge</th>
</tr>
</thead>
<tbody>
<tr>
<td>The main part of the sludge is recycled back to the reactor tank. This ensures that a high concentration of active micro-organisms stays in the system. The sewage is recycled through the system many times.</td>
<td>The smaller stream of sludge receives further treatment to stabilise the phosphorus compounds in it and thicken it before disposal or re-use.</td>
</tr>
</tbody>
</table>

### CLARIFIER

The heavier particles settle to the bottom as sludge that contains millions of bacteria and protozoa, both alive and dead.

### EFFLUENT

The water at the top of the clarifier is clear and usually disinfected before it is discharged.
Royce Water Technologies, proudly offering global knowledge with local support to Australia’s water and wastewater market.