The TriOxmatic® series (ECDO): proved and tested...

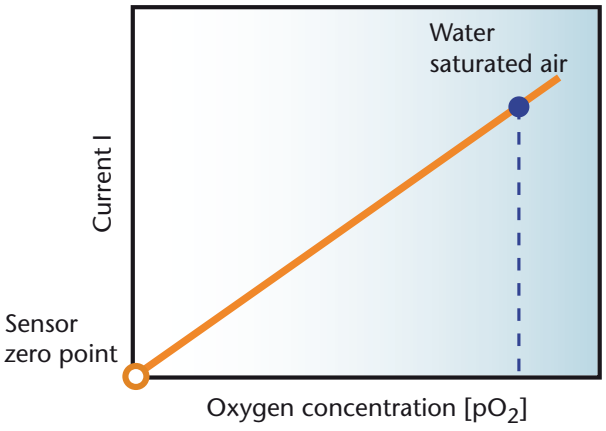
ECDO stands for Electrochemical Dissolved Oxygen Sensor. 60 years ago, Clark's cell was introduced and WTW was among the first manufacturers to advance this principle for water and wastewater applications.

The electrochemical principle

With the electrochemical method the O_2 diffuses through the membrane of the TriOxmatic® sensor. The oxygen is transformed in a chemical reaction by using an electrolyte; thereby a current can be measured. The electrical current correlates to the oxygen concentration. For delivering precise results, the sensor will require the following conditions:

- Flow
- Continuous exchange of electrolytes
- Clean membrane

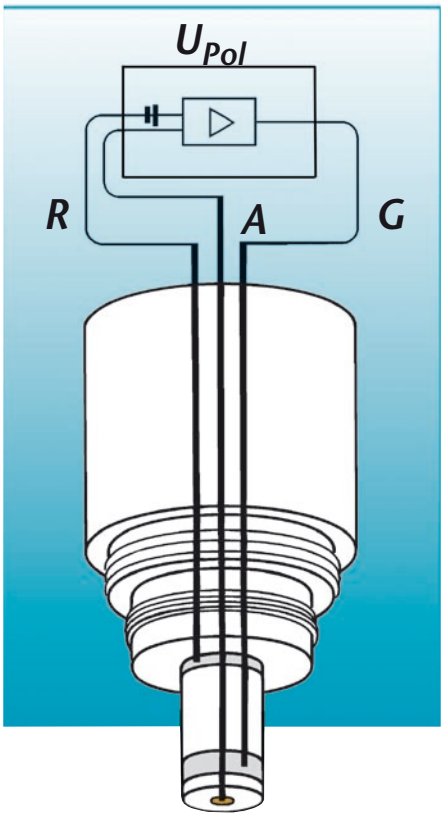
Linear dependancy of current towards the O_2 concentration



Patented Technology – 3 electrode system

In contrast to conventional membrane covered oxygen sensors equipped with 2-electrode technology, the TriOxmatic® sensor functions with a potentiostatically driven 3-electrode system. In terms of measuring technology, this means that the measuring system has two silver electrodes and a gold cathode (A). One silver functions as a non-current bearing reference electrode (R). And, the other is the live, counter electrode (G). The reference electrode thus displays significantly improved potential constancy, which in turn leads to considerably improved sensor signal stability and thus higher measuring accuracy.

The 3-electrode technology additionally allows precise monitoring of the electrolyte supply, i.e. the system displays when the electrolyte solution needs to be replaced.



Self-diagnosis system

All parts being relevant for the measurement, such as membranes are automatically monitored by the SensReg (used electrolyte)/SensLeck (leakage in the membrane) system. Any occurring incidents will be shown.

Maintenance-free due to special membrane

The membrane or the membrane cap plays a decisive role in all DO measuring techniques. Fouling or mud covering of the membrane or of the cap will affect the measurement reading. Unlike conventional membranes the teflon membranes used by WTW are highly resistent to fouling. This allows operation without the use of additional cleaning accessories in most cases.

High accuracy

WTW sensors feature extremely low maximum errors of 1% of the measured value (i.e. 0.02 mg/ml at a measured value of 2 mg/ml), regardless of whether measuring in the upper or in the lower range of the instrument.

Stable readings right from the start

All WTW ECDOs provide stable and reproducible readings right from the start:

- No break-in
- No long-term drift
- No zero point drift due WTW's patented TriOxmatic® principle.

With safety experience

WTW's TriOxmatic® has been thoroughly proven in many years of field use:
More than 20,000 installations can be found in reliable operation worldwide.

TriOxmatic® and FDO® in comparison

Analog (electrochemical)

	TriOxmatic® 700 / 690 / 701
Measuring principle	Electrochemical
Membrane exchange	Yes – exchange of membrane and electrolyte
Calibration	Yes – rarely
Drift behavior	Yes
Sulfide and ionogenic substances	Influence
Measuring range	Up to 60 mg/l
Self-diagnosis system	Yes
Trace sensor	Yes
Investment costs	Reduced
Calibration data storage	No
Signal output	Analog
Integrated lightning protection	Yes

Digital (electrochemical/optical)

TriOxmatic® 700 IQ / 701 IQ / 702 IQ	FDO® 700 IQ
Electrochemical	Optical
Yes – exchange of membrane and electrolyte	Yes – exchange cap – self-recognition of cap via IQMC technology
Yes – rarely	No
Yes	No
Influence	No influence
Up to 60 mg/l	Up to 20 mg/l
Yes	No
Yes	No
Reduced	Higher
Yes	Yes (IQMC technology)
Digital	Digital
Yes	Yes

TriOxmatic® 700/700 IN

The standard Model TriOxmatic® 700 is a rugged dissolved oxygen sensor with a very durable 50 micron thick hydrophobic membrane, a minimal flow rate of 0.5 cm/sec and a medium response time of less than 180 sec. With these features, this membrane sensor is ideally suited for any D.O measurement in biological purification stages of municipal waste water treatment plants; e.g. control of the oxygenation. The response of the sensor prevents signal disturbances due to rising air bubbles thus eliminating false readings and improved stability. This is specially important for measurements in aeration tanks.

TriOxmatic® 690

This cost-effective D.O. sensor offers the same specifications and features as the Model TriOxmatic® 700, except it does not have the sensor monitoring function. This unit is primarily designed for conventional D.O. measurements, where a continuous membrane check is not needed; e.g. general applications in water quality analysis.

TriOxmatic® 701

Equipped with a special 25 micron thick membrane, the Model TriOxmatic® 701 features an enhanced resolution and a faster response time. This sensor is ideally suited for low level concentration applications; e.g. measurements of residual oxygen in the denitrification of biological sewerage treatment.

FDO® 700 IQ

Optical working D.O. sensor for the measuring and control of oxygen concentration in the biological cleaning process of wastewater plants, no flow required and H_2S insensitive. Digital sensor for connecting to the IQ Sensor Net.

TriOxmatic® 700 IQ

Universal oxygen sensor for measuring and controlling oxygen input in biological sewage treatment processes in wastewater treatment plants. Membrane, flow rate and response times equivalent to TriOxmatic® 700, however as digital sensor with calibration value memory for connection to IQ Sensor Net.

TriOxmatic® 701 IQ

O_2 sensor with increased resolution and improved response times. Technical specifications equivalent to TriOxmatic® 701, however as digital sensor with calibration value memory for connection to IQ Sensor Net.

TriOxmatic® 702 IQ

Providing similar performance data as the TriOxmatic® 701, the 702 IQ model is specifically designed for trace level measurements in the ppb range. This sensor is ideally suited for use in ultra-pure water applications; e.g. monitoring of boiler feed water or drinking water purification. The applied digital technology permits integrated storage of calibration values and simple connection to IQ Sensor Net.

Technical Data

Type	Analog		Digital			
	TriOxmatic® 690/ 700 (SW*)/700 IN	TriOxmatic® 701	TriOxmatic® 700 IQ (SW*)	TriOxmatic® 701 IQ	TriOxmatic® 702 IQ	FDO® 700 IQ (SW*)
Measuring method	Electrochemical	Electrochemical	Electrochemical	Electrochemical	Electrochemical	Optical
Measuring range (25 °C)						
O_2 concentration	0.0 ... 60.0 mg/l	0.00 ... 20.00 mg/l 0.0 ... 60.0 mg/l	0.0 ... 60.0 mg/l	0.00 ... 20.00 mg/l 0.0 ... 60.0 mg/l	0 ... 2000 µg/l 0.00 ... 10.00 mg/l	0 ... 20.00 mg/l (0 ... 20.00 ppm)
O_2 saturation	0 ... 600%	0.0 ... 200.0% 0 ... 600%	0 ... 600 %	0.0 ... 200.0 % 0 ... 600 %	0 ... 110 %	0 ... 200.0 %
	(depending upon the selected monitor model)					
Resolution						
O_2 concentration	0.1 mg/l	0.01 mg/l 0.1 mg/l	0.1 mg/l	0.01 mg/l 0.1 mg/l	0.001 mg/l 0.01 mg/l	0.01 mg/l (0.01 ppm)
O_2 saturation	1%	0.1 % 1%	1%	0.1% 1 %	0.1%	0.1 %
Response time at 25 °C	t_{90}: 180 s	t_{90}: 30 s t_{99}: 90 s	t_{90}: 180 s	t_{90}: 30 s t_{99}: 90 s	t_{90}: 30 s t_{99}: 110 s	t_{90}: < 150 s t_{95}: < 200 s
Minimum flow rate	0.05 m/s	0.23 m/s	0.05 m/s	0.23 m/s	0.3 m/s	No drift required
SensCheck	SensLeck (700/700 IN) SensReg (700/700 SW)	SensLeck SensReg	SensLeck (700 IQ) SensReg (700 IQ/ 700 IQ SW)	SensLeck SensReg	– SensReg	Monitoring of membrane function
Signal output	Analog	Analog	Digital	Digital	Digital	Digital
Sensor memory for calibration values	–	–	Yes	Yes	Yes	Yes (factory calibrated)
Power consumption	–	–	0.2 Watt	0.2 Watt	0.2 Watt	0.7 Watt
Temp. measurement	Integrated NTC, 23 ... 122 °F (-5 °C ... +50 °C)		Integrated NTC, 23 ... 140 °F (-5 °C ... +60 °C)			
Temp. compensation	32 ... 122 °F (0 °C ... +50 °C)		32 ... 140 °F (0 °C ... +60 °C)			23 ... 122 °F (-5 °C ... +50° C)
Maximum pressure	10 bar		10 bar (incl. sensor connection cable)			
Ambient conditions	Operating temperature: 32 ... 122 °F (0 °C ... +50 °C) Storage temperature: 32 ... 122 °F (0 °C ... +50 °C)		Operating temperature: 32 ... 140 °F (0 °C ... +60 °C) Storage temperature: 32 ... 149 °F (0 °C ... +65 °C)			23 ... 122 °F (-5 °C ... +50 °C) -13 ... 122 °F (-25 °C ... +50 °C)
Electrical connections	Integrated PU connection cable with fitted 7-pole screw connector (IP65)		2-wire shield cable with quick fastener to sensor			
Input power	Powerd by WTW D.O. monitor		Powered by IQ Sensor Net			
Translet voltag protection	Yes		Yes			
EMI/RFI Conformance	EN 61326 Class B, FCC Class A		EN 61326, Class B, FCC Class A; Intended for indispensable operation			
Certifications	CUL, UL		CE, cETLus			
Mechanical	Membrane head assembly, locking cap: POM Sensor body: 316 Ti stainless steel Protection rating: IP 68		Membrane head assembly, locking cap: POM Sensor body: 316 Ti stainless steel Protection rating: IP 68			Sensor cap, fixation: POM, PVC, silicone, PMMA housing shaft: VA steel 1.4571 protection type IP 68
Dimensions (length x diameter)	7.83 x 1.57 in. (199 x 40 mm) SW: 8.90 x 2.34 in. (226 x 59.5 mm)		14.17 x 1.57 in. (360 x 40 mm); SW: 14.17 x 2.34 in. (360 x 59.5 mm)			15.75 x 1.57 in. (400 x 40 mm) SW: 15.75 x 2.34 in. (400 x 59.5 mm)
			incl. connection thread of SACIQ sensor connection cable			
Weight (Approx.)	1.46 lb (660 g); SW: 1.90 lb (860 g)		1.46 lb (660 g, without sensor connection cable); SW: 2.58 lb (1,170 g)			1.98 lb (900 g) SW: 3.31 lb (1.5 kg)
Guaranty	2 years for sensor acc. § 10 AGB		2 years for sensor acc. § 10 AGB			

Ordering Information

Dissolved Oxygen Sensors		Order No.
TriOxmatic® 700-7	D.O. sensor for water/wastewater; oxygenation determination; cable length 23 ft. (7.0 m)	201 670
TriOxmatic® 690-7	Same as model 700-7, but without SensCheck function; cable length 23 ft. (7.0 m)	201 690
TriOxmatic® 701-7	D.O. sensor for water/wastewater; oxygenation/residual oxygen determination; cable length 23 ft. (7.0 m)	201 678
TriOxmatic® 700 IN-7	D.O. sensor for highly polluted industrial wastewater; cable length 23 ft. (7.0 m)	201 695
TriOxmatic® 700 IQ	D.O. sensor for water/wastewater; oxygenation determination	201 640
TriOxmatic® 701 IQ	D.O. sensor for water/wastewater; oxygenation/residual oxygen determination	201 644
TriOxmatic® 702 IQ	D.O. sensor, ppb measuring range; ultrapure water/boiler feedwater	201 646
FDO® 700 IQ	Digital calibration-free optical O_2 sensor for water/wastewater, determination of oxygen concentration	201 650
FDO® 700 IQ SW	Digital calibration-free optical O_2 sensor for water/wastewater, determination of oxygen concentration in sea water	201 652
SACIQ-7,0	Sensor connection cable for all IQ sensors, cable length 23 ft. (7.0 m)	480 042

IP 68 | UL CUL | 2 Year Warranty

Further cable lengths and special seawater/brackwater designs see brochure "Product Details"

** SW: Sensor in sea water design (with plastic armouring (POM))*