



Oxi 170, pH 170, LF 170

QuadroLine® Oxi 296, pH 296, LF 296



- Built-in lightning protection
- No EMC Interference
- Galvanically isolated inputs and outputs
- IP 66 housing or 3.78 x 3.78 in. (96 x 96 mm) panel mounting



EcoLine 170



QuadroLine® 296

Outstanding price/performance ratio

State-of-the-art technology, easy of use and maximum operating safety at an attractive price were the basic design criteria for the development of the EcoLine monitors. As a result of the logical further development of the successful EMC concept, WTW has also been able to make these advantages available to customers at an attractive price.

With the EcoLine series WTW offers an economical and technically flexible and reliable system solution which is suitable for a wide range of applications water and wastewater applications.

The QuadroLine® series is an extremely powerful monitor in a compact form and at an attractive price-performance ratio. These monitors are intended to be built into control panels and fulfill all the requirements which industrial practice demands from such systems today. Based on the proven technology of the WTW monitors of the EcoLine family, the QuadroLine® instruments have the same impressive performance features such as built-in lightning/overvoltage protection, galvanic separation of the inputs and outputs and increased EMC stability. EcoLine and QuadroLine® monitors are the right choice when single point measurements require a dedicated monitor.





TetraCon[®] 700

Conductivity Cells

- 4-electrode Design
- No polarization effects
- Large measuring range with only a single cell
- Highly resistant to fouling



TetraCon[®] 700/700 IQ

The TetraCon[®] 4-electrode cell from WTW is the perfect result of an application-oriented development. Compared with conventional 2-electrode cells, this advanced design provides substantially better performance, particularly in the higher conductivity ranges.

TetraCon[®] 700 conductivity sensors are especially suitable for use in wastewater treatment plants dealing with highly loaded sewage. Due to the special measuring technique employed, severe influences from primary and secondary polarization effects are eliminated, resulting in improved accuracy of the sensor. Provided the devices are installed in accordance with the manufacturer's instructions, errors due to the distortion of the current and voltage fields are also avoided.

The special cell geometry of the TetraCon[®] 700 makes it impervious to fouling, and the abrasion resistant carbon electrodes are also easy to clean. The modern epoxy resin encapsulation technique used diminishes the likelihood of sensor breakage in harsh industrial environments.

The TetraCon[®] 700 as digital model TetraCon[®] 700 IQ is also available for connection to IQ SENSOR NET. This version is specially featured by a larger measuring range (10 μ S/cm ... 500 mS/cm).

TetraCon[®] 700 IQ

IP 68

CE

UL
CUL

1 Year
Warranty



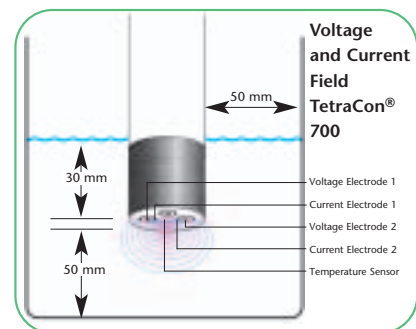
Conductivity Cells

TetraCon® 4-electrode Design

The conductivity of a given electrolyte is determined by an electro-chemical resistance measurement. In its simplest configuration, the measuring cell uses **two** electrodes to which an alternating voltage is applied. The electric current which is directly proportional to the free ions in the electrolyte is measured. The electronic instrument then calculates the conductivity of the solution, taking into account the absolute cell constant of the sensor.

With the **TetraCon® 4-electrode design**, two separate electrode pairs are used whereby the currentless voltage electrodes produce a stable and constant reference potential. The voltage drop at the current electrodes is regulated via a potentiostat circuit.

The advantage of this technique is that it eliminates measurement errors usually caused by **polarization effects** which most likely build up at higher conductivity levels. Contact resistance problems caused by contaminated electrodes is also largely avoided by this design.



Minimal Distance: 1.97 in. (50 mm)
Minimal Immersion Depth: 1.18 in. (30 mm)

WTW Conductivity Sensors

TetraCon® 700

Rugged conductivity sensor (4-electrode design), with integrated dual thermistor, abrasion resistant carbon electrodes and break-proof epoxy body; measuring range 10 $\mu\text{S}/\text{cm}$ to 1000 mS/cm . Submersible sensor assembly specially designed for use in wastewater treatment plants.

TetraCon® 325

4-electrode conductivity cell with graphite electrodes, integral temperature probe; measuring range 1 $\mu\text{S}/\text{cm}$ - 2000 mS/cm . Suitable for universal applications.

TetraCon® DU/T

4-electrode conductivity cell with integral flow-thru chamber (7 ml volume), built-in temperature sensor; measuring range 1 $\mu\text{S}/\text{cm}$ to 2000 mS/cm . Recommended for standard industrial applications.

TetraCon® 700 IQ

Digital 4-electrode conductivity cell (same as TetraCon® 700). In addition to the general preferences of IQ technology the TetraCon® 700 IQ offers the benefit of a larger measuring range (10 $\mu\text{S}/\text{cm}$... 500 mS/cm).



LRD 01

LRD 325

LRD 01

316 Ti stainless steel conductivity cell for installation in pipes. Built-in temperature sensor (266 °F/130 °C max.), measuring range 0.01 to 200 $\mu\text{S}/\text{cm}$, pressure resistant up to 14 bar, 1/2 inch NPT thread.

LRD 325

Conductivity measuring cell for installation in pipes. With built-in temperature sensor (up to 212 °F/100 °C). Measuring range 1 $\mu\text{S}/\text{cm}$ to 2 S/cm , pressure resistant up to 10 bar. 1/2 inch NPT thread.

LR 325/01

Low-level conductivity cell with flow-thru chamber, integrated temperature sensor; measuring range 0.001 to 300 $\mu\text{S}/\text{cm}$. For use in ultra-pure water applications; e.g., boiler feed water.

LR 325/001

Like Model LRD 325/01, but with higher resolution; measuring range 0.0001 to 30 $\mu\text{S}/\text{cm}$. Sensor is especially designed for trace measurement in both aqueous and non-aqueous or partially aqueous media.



Analog

Digital

Technical Data

Conductivity Cells	TetraCon® 700	LRD 01	LRD 325	TetraCon® 700 IQ
Sensor type	4-electrode cell	2-electrode cell	4-electrode cell	4-electrode cell
Measuring range	10 µS/cm ... 1000 mS/cm SAL: 0 ... 70	0.01 ... 200 µS/cm	1 µS/cm ... 2 S/cm	10 µS/cm ... 500 mS/cm SAL: 0 ... 70
Cell constants	K = 0.917 cm ⁻¹ , ±1.5 % (in free solution) K = 0.933 cm ⁻¹ , with EBST 700-DU/N flow-thru adapter	0.1 cm ⁻¹ , ±1.5 %	0.475 cm ⁻¹ , ±1.5 %	K = 0.917 cm ⁻¹ , ±1.5 % (in free solution) K = 0.933 cm ⁻¹ , with EBST 700-DU/N flow-thru adapter
Signal output	Analog	Analog	Analog	Digital
Sensor memory for calibration values	—	—	—	Yes
Power consumption	—	—	—	0.2 Watt
Temperature sensor	Integrated NTC	Integrated NTC	Integrated NTC	Integrated NTC
Temperature range	32...122 °F (0...+50 °C, ±0.2 K)	32...266 °F (0...+130 °C, ±0.2 K)	32...212 °F (0...100 °C, ±0.2 K)	23...140 °F (-5 °C ... +60 °C)
Maximum pressure	10 bar (at 68 °F/20 °C)	14 bar (at 68 °F/20 °C)	10 bar (at 68 °F/20 °C)	10 bar
Electrical connection	integrated PU connecting cable with fitted 7-pole screw connector (IP 65)			2-wire shielded cable with quick fastener to sensor
Certifications	CE, CUL, UL			CE, UL, CAN/CSA
Mechanical	Sensor head: PVC Body: 316 Ti stainless steel Protection rating: IP 68	Cell body: 316 Ti stainless steel Threaded 1/2 inch NPT Protection/Electrode: IP 68	Measuring cell: epoxy/graphite Thread: 316 Ti stainless steel Protection/Electrode head: IP 68	Sensor head: PVC Body: 316 Ti stainless steel Protection rating: IP 68
Dimensions	7.72 x 1.57 in. (196 x 40 mm) (length x diameter)	5.24 x 0.98 in. (133 x 25 mm) (length x diameter)	5.24 x 0.98 in. (133 x 25 mm) (length x diameter)	14.06 x 1.57 in. (357 x 40 mm) (length x diameter) incl. connection thread of sensor connection cable SACIQ
Weight	Approx. 1.46 lb (660 g)	Approx. 0.77 lb (350 g)	Approx. 0.66 lb (300 g)	Approx. 1.46 lb (660 g, without cable)

Conductivity Cells for Special Purposes

	TetraCon® 325	TetraCon® DU/T	LR 325/01	LR 325/001
Sensor Type	4-electrode cell		2-electrode cell	
Electrode	Carbon	Carbon	316 Ti stainless steel	316 Ti stainless steel
Measuring Ranges	1 µS/cm ... 2 S/cm	1 µS/cm ... 2 S/cm	0.001 µS/cm ... 300 µS/cm	0.0001 µS/cm ... 30 µS/cm
Cell Constant	K = 0.475 cm ⁻¹	K = 0.778 cm ⁻¹	K = 0.1 cm ⁻¹	K = 0.01 cm ⁻¹
Temperature Sensor	Integrated	Integrated	Integrated	Integrated
Flow-thru Measurement	No	Yes	Yes, with additional flow chamber D01/T	Yes, with integrated flow chamber
Length	4.72 in. (120 mm)	6.10 in. (155 mm)	4.72 in. (120 mm)	4.72 in. (120 mm)

Ordering Information – Conductivity Cells

		Order No
TetraCon® 700-7	Submersible conductivity sensor for water/wastewater, cable length 7.66 yds (7.0 m)	302 316
LRD 01-7	Submersible conductivity sensor for boiler feed water/ion exchanger, cable length 7.66 yds (7.0 m)	302 222
LRD 325-7	Submersible conductivity sensor for water/wastewater, cable length 7.66 yds (7.0 m)	302 229
TetraCon® 700 IQ	Submersible conductivity sensor for water/wastewater	302 500
SACIQ-7,0	Sensor connection cable for all IQ sensors, cable length 7.66 yds (7.0 m)	480 042
Further cable length and accessories see brochure "Product Details"		



Configuration Guide

		1. Measuring range 2. Cell constant 3. Probe type 4. Temperature compensation 5. Temperature range 6. Pressure range 7. Protection rating	LF 170 Field Monitor	LF 296 Panel mount Monitor	IQ SENSOR NET
Analog	TetraCon® 700	1.: 10 µS/cm..1000 mS/cm 2.: K=0.917 cm ⁻¹ 3.: 4-electrode cell 4.: NTC 5.: 32...122 °F (0...50 °C) 6.: 10 bar 7.: IP 68 (electrode)	Water / Wastewater Usable Measuring Range: 0,0..199,0 µS/cm 0,000..1,999 mS/cm 0,00..19,99 mS/cm 0,0..199,9 mS/cm 32...122 °F (0...50 °C)		—
	LRD 01	1.: 0,01...200 µS/cm 2.: K=0.1 cm ⁻¹ 3.: 2-electrode cell 4.: NTC 5.: 32...266 °F (0...130 °C) 6.: 14 bar (68 °F/20 °C) 7.: IP 68 (electrode)	Boiler Feed Water/Ion Exchanger; In-Line Measurements/ Pipework Mounting 1/2" NPT Thread Usable Measuring Range: 0,00..19,99 µS/cm 0,0..199,9 µS/cm 32...266 °F (0..130 °C); 14 bar (68 °F/20 °C)		—
	LRD 325	1.: 1 µS/cm..2 S/cm 2.: K=0.475 cm ⁻¹ 3.: 4-electrode cell 4.: NTC 5.: 32...212 °F (0..100 °C) 6.: 10 bar 7.: IP 68 (electrode)	Large Usable Measuring Range; In-Line Measurements/ Pipework Mounting 1/2" (3/4" Adapter) NPT Thread 0,0..199,0 µS/cm 0..1999 µS/cm 0,00..19,99 mS/cm 0,0..199,9 mS/cm (MR: 0,0..199,9 mS/cm to 110,0 mS/cm at 122 °F/50 °C) 32...212 °F (0..100 °C); 10 bar at 68 °F (20 °C)		—
	LR 325/01	1.: 0.001...300 µS/cm 2.: K=0.1 cm ⁻¹ 3.: 2-electrode cell 4.: NTC 5.: 32...212 °F (0...100 °C) 6.: 2 bar 7.: IP 68 (electrode)	Boiler Feed Water/Ion Exchanger; Conductivity Cell with Flow-thru Chamber; Usable Measuring Range: 0,00..19,99 µS/cm 0,0..199,9 µS/cm 0,000..0,300 mS/cm 32...122 °F (0..50 °C)		—
	LR 325/001	1.: 0.0001..30 µS/cm 2.: K=0.01 cm ⁻¹ 3.: 2-electrode cell 4.: NTC 5.: 32...212 °F (0...100 °C) 6.: 2 bar 7.: IP 68 (electrode)	Boiler Feed Water/Ion Exchanger; Conductivity Cell with Flow-thru Chamber, Trace Measurements Usable Measuring Range: 0.000..1.999 µS/cm 0.00..19.99 µS/cm 32...122 °F (0..50 °C)		—
	TetraCon® 325	1.: 1 µS/cm..2 S/cm 2.: K=0.475 cm ⁻¹ 3.: 4-electrode cell 4.: NTC 5.: 32...212 °F (0...100 °C) 6.: 2 bar 7.: IP 68 (electrode)	General Application/Water; Large Measuring Range 0.00..19.99 µS/cm 0.0..199.9 µS/cm 0.000..1.999 mS/cm 0.00..19.99 mS/cm 0.0..199.9 mS/cm (32...77 °F/0..25 °C) 32...122 °F (0..50 °C) (MR: 0.0..199.9 mS/cm up to 110.0 mS/cm at 122 °F/50 °C)		—
	TetraCon® DU/T	1.: 1 µS/cm..2 S/cm 2.: K=0.778 cm ⁻¹ 3.: 4-electrode cell 4.: NTC 5.: 32...140 °F (0...60 °C) 6.: 2 bar 7.: IP 65	Flow-thru cell Usable Measuring Range: 0.00..19.99 µS/cm 0.0..199.9 µS/cm 0.000..1.999 mS/cm 0.00..19.99 mS/cm 0.0..199.9 mS/cm 32...122 °F (0..50 °C)		—
Digital	TetraCon® 700 IQ	1.: 10 µS/cm..500 mS/cm 2.: K=0.917 cm ⁻¹ 3.: 4-electrode cell 4.: NTC 5.: 32...140 °F (0...60 °C) 6.: 10 bar 7.: IP 68 (electrode)	—	—	Water/Wastewater; Usable Measuring Range: 0.00...20.00 µS/cm 0.0...200.0 µS/cm 0.000...2.000 mS/cm 0.00...20.00 mS/cm 0.0...200.0 mS/cm 0...500 mS/cm

— Not Applicable



EcoLine/QuadroLine®

General
Description of
Meters

Monitors

IQ SENSOR NET

Analyzers

Sample
Preparation

Samplers

Accessories

Measuring
stations

Technical Data EcoLine Oxi 170/QuadroLine® Oxi 296

		D.O. Measurement
Measuring Ranges		0.0 ... 60.0 mg/l or 0 ... 600 % saturation, user-selectable
Resolution		0.1 mg/l or 0.01 mg/l; 1 % or 0.1 % (depending upon the sensor)
Accuracy		±1 % of value, ±1 digit
Signal Input		Low-impedance, isolated from output
Temperature Measurement		NTC resistor (integrated in the sensor), 23 °F ... 122 °F (-5 °C ... +50 °C); 0,1 K resolution
Temperature Compensation		Range: 23 °F ... 122 °F (-5 °C ... +50 °C)
Atmospheric Pressure Correction		Range: 500 ... 1100 mbar; manual parameter input
Salinity Correction		2.0 ... 70.0
Relay Outputs		1 Sensor alarm relay (SensReg/SensLeck function) 2 programmable relays (setpoints, delay, hysteresis), ①+② Relays are form C rated 5A at 230 VAC, max. 5A @ 30 VDC resistive
Analog Outputs		Two isolated 0/4 - 20 mA outputs for D.O. and ①+② temperature, max. load 600 Ω, basic accuracy 0.1%; Output span and recorder damping adjustable by software
Digital Interface		RS 485 interface; bus operation possible with up to 31 units ②
Ambient Conditions		Operating temperature: -13 °F ... 131 °F (-25 °C ... +55 °C); Storage temperature: -13 °F ... 149 °F (-25 °C ... +65 °C); Clima class 4 (VDI/VDE 3540)
Electrical Connections	Oxi 170	Sensor input: quick disconnect 7-pole receptacle Outputs, mains supply: via plug-in terminal strips
	Oxi 296	Sensor input, signal inputs and outputs, mains supply: via plug-in terminal strips; accessible from rear
Input Power		115/230 VAC (-15/+10 %), 48 ... 62 Hz (18 VA max.), 24 VAC (-15/+10 %), 24 VDC (-30/+20 %)
Integrated Lightning Protection		Coarse and fine protection, surpasses EN 61326 requirements
EMI/RFI Conformance		EN 61 326 Class B, FCC Class A
Certifications		CE, CUL, UL (pending)
Housing	Oxi 170	Watertight housing (PC/GF20) with threaded receptacle and four cable feed-through connections (PG compression fittings, 10-14 mm dia.); Protection rating IP66 (exceeds NEMA 4X).
	Oxi 296	Fiberglass-reinforced Noryl housing with membrane keypad (Polyester); Protection rating IP 54 (front panel)
Dimensions (W x H x D)	Oxi 170	8.74 x 7.95 x 4.13 in. (222 x 202 x 105 mm)
	Oxi 296	3.78 x 3.78 x 7.32 in. (96 x 96 x 186 mm)
Weight	Oxi 170	Approx. 7.7 lb (3.5 kg)
	Oxi 296	Approx. 2.2 lb (1 kg)
		① R-T-version ② R-T-RS-version

Ordering Information EcoLine Oxi 170/QuadroLine® Oxi 296

EcoLine Oxi 170		Order No.
Oxi 170, 230 VAC	D.O. field monitor, 230 VAC 50/60 Hz; standard model	281 112
Oxi 170 RT, 230 VAC	Same as standard model, with 2 programmable relays and second analog output for temperature	282 212
Oxi 170 RT RS, 230 VAC	Same as standard model, with 2 programmable relays and second analog output for temperature and RS 485 interface	282 222
QuadroLine® Oxi 296		Order No.
Oxi 296, 230 VAC	D.O. panel mount monitor, 230 VAC 50/60 Hz; standard model	291 112
Oxi 296 RT, 230 VAC	Same as standard model, with 2 programmable relays and second analog output for temperature	292 212
Oxi 296 RT RS, 230 VAC	Same as standard model, with 2 programmable relays and second analog output for temperature and RS 485 interface	292 222
Other power supplies see brochure "Product Details"		



Technical Data EcoLine pH 170/QuadroLine® pH 296

	pH Measurement	ORP Measurement	Temperature Measurement
Measuring Range	0.00 ... 14.00 pH	-1000 mV ... +1000 mV	NTC: 23 ... 212 °F (-5 ... 100 °C) Pt 100/Pt 1000: -4...266 °F (-20...130 °C)
Resolution	0.01 pH	1 mV	0.1 K
Accuracy (± 1 Digit)	±0.01 pH	± 2 mV	NTC: ±0.2 K; Pt 100/Pt 1000: ±0.1 K fine adjustment ± 0.5 K
Signal Input	Low impedance or high impedance	Low impedance or high impedance	2-conductor (NTC); 3-conductor (Pt 100/Pt 1000)
Temperature Measurement	NTC thermistor, integrated in SensoLyt® sensor assembly; or separate NTC/Pt 100/ Pt 1000		
Temperature Compensation	NTC: 23 °F ... 212 °F (-5 °C ... 100 °C); Pt 100/Pt 1000: -4 °F ... 266 °F (-20 °C ... 130 °C)		
Calibration	AutoCal1: Automatic calibration with technical buffer solutions AutoCal2: Automatic calibration with technical buffer solutions and subsequent analog output of buffers used in calibration ConCal®: Manual calibration with any buffer solutions		
Calibration Range	Slope range: -62 mV/pH ≤ S ≤ -50 mV/pH Asymmetry potential: -45 mV ≤ U _{asy} ≤ +45 m		
Display	Dual numeric LCD-readout, 3 1/2 digits for values and display of units; Graphic symbols for auxiliary information and operator guidance		
Relay Outputs	1 Sensor alarm relay (sensor failure); 2 programmable relays (setpoints, delay, hysteresis, control function), ①+② ; Relays are form C rated 5A at 230 VAC, max. 5A @ 30 VDC resistive		
Analog Outputs	Two isolated 0/4 - 20 mA -outputs for pH/ORP and temperature, ①+② ; max. load 600 W, basic accuracy 0.1%; Output span and recorder damping adjustable by software		
Serial Interface	RS 485 interface, bus operation with up to 31 instruments possible ②		
Ambient Conditions	Operating temperature: -13...131 °F (-25...+55 °C); Storage temperature: -13...149 °F (-25 ...+65 °C); Clima class 4 (VDI/VDE 3540)		
Electrical Connections	pH 170	Sensor input: quick disconnect 7-pole receptacle; Signal inputs and outputs, mains supply: via plug-in terminal strips	
	pH 296	Sensor input, signal inputs and outputs, mains supply: via plug-in terminal strips; accessible from rear	
Input Power	115/230 VAC (-15/+10 %), 48-62 Hz (18 VA max.); 24 VAC (-15/+10 %), 24 VDC (-30/+20 %)		
Integrated Lightning Protection	Coarse and fine protection, surpasses EN 61326 requirements		
EMI/RFI Conformance	EN 61 326 Class B, FCC class A		
Certifications	CE, CUL, UL (pending)		
Housing	pH 170	Watertight housing (PC/GF20) with threaded receptacle and four cable feed-through connections (PG compression fittings, 10-14 mm dia.); Protection rating: IP66 (exceeds NEMA 4X).	
	pH 296	Fiberglass-reinforced Noryl housing with membrane keypad (Polyester); Protection rating: IP54 (front panel)	
Dimensions (W x H x D)	pH 170	8.74 x 7.95 x 4.13 in. (222 x 202 x 105 mm)	
	pH 296	3.78 x 3.78 x 7.32 in. (96 x 96 x 186 mm)	
Weight	pH 170	Approx. 7.7 lb (3.5 kg)	
	pH 296	Approx. 2.2 lb (1 kg)	
	① R-T-version	② R-T-RS-version	

Ordering Information EcoLine pH 170/QuadroLine® pH 296

EcoLine pH 170		Order No.
pH 170, 230 VAC	pH/ORP field monitor, 230 VAC 50/60 Hz; standard model	181 112
pH 170 RT, 230 VAC	Same as standard model, with 2 programmable relays and second analog output for temperature	182 212
pH 170 RT RS, 230 VAC	Same as standard model, with 2 programmable relays and second analog output for temperature and RS 485 interface	182 222
QuadroLine® pH 296		Order No.
pH 296, 230 VAC	pH/ORP panel mount monitor, 230 VAC 50/60 Hz; standard model	191 112
pH 296 RT, 230 VAC	Same as standard model, with 2 programmable relays and second analog output for temperature	192 212
pH 296 RT RS, 230 VAC	Same as standard model, with 2 programmable relays and second analog output for temperature and RS 485 interface	192 222
Other power supplies see brochure "Product Details"		

