



Water Quality Monitor

Q46/R pH/ORP Monitor

OVERVIEW

Measurement and control of pH is important in a wide variety of industries. Water and wastewater, boiler feed water, high purity water, food processing wash water, chemical plant cooling water, and many other aqueous systems require reliable pH monitoring. The Model Q46P pH Monitor provides the combination of durability, accuracy and versatility required for virtually any pH monitoring or control application.

The Model Q46R provides the same reliable monitoring for Oxidation-Reduction Potential (ORP) applications.

The Q46 platform represents our latest generation of monitoring and control systems. Control features have been expanded to include an optional 3rd analog output or an additional bank of low power relays. Digital communication options include Profibus DP, Modbus RTU, Modbus TCP/IP or Ethernet IP.

FEATURES

Sensor Options. Choice of either “differential” or “conventional” pH sensors. Differential sensors provide reliable, long lasting service in demanding applications while conventional sensors provide a lower cost alternative for clean water applications.

Calibration. Automatic buffer recognition simplifies calibration.

Auto-Cleaning. Automatic “air blast” sensor cleaning system available for reducing maintenance in applications where sensor fouling is a problem.

AC or DC Power Options. Power options include universal 100...240V AC $\pm 10\%$ or 12...24V DC.

Analog Output Options. Two isolated 4...20 mA outputs are standard, with an option for a third output if required. Default setting provides analog outputs for pH/ORP and temperature.

PID Output. Standard PID control function assignable to one analog output.

Digital Communications. Profibus-DP, Modbus-RTU, Modbus-TCP/IP, Ethernet-IP

Relay Outputs. Three SPDT relays are standard, with relay functions programmable for alarm, control, or trouble indication. An additional three internal low power relays provide control of the automatic sensor cleaning function.

Flexible Mounting. NEMA 4X (IP66) enclosure is suitable for wall, pipe, or panel mounting.

Clear Display. Backlit large LCD display provides clear visibility in any lighting conditions. A scrolling second line on the display provides additional information and programming prompts.



Badger Meter

ATI-DS-05135-EN-01 (June 2025)



AUTOMATIC SENSOR CLEANING

Accurate pH (or ORP) measurement requires that sensing surfaces are clean. The surface of a pH glass element covered with biological or chemical coatings do not provide reliable measurements and the coatings must be removed, either automatically or manually. Sensor fouling is rarely an issue in potable water or high purity water applications, but wastewater treatment, raw water monitoring and many industrial water monitoring applications demand regular sensor cleaning. With operations and maintenance personnel often in short supply, sometimes simple yet critical cleaning functions can be overlooked until inaccurate measurements cause other problems.

Q-BLAST OPTION

Our Q-Blast option provides the ideal answer for automatic pH or ORP sensor cleaning. Employing a unique “air-blast” cleaning method, sensors can be cleaned as often as necessary without operator attention. Pulses of pressurized air delivered through a nozzle at the tip of the sensor remove accumulated solids from critical sensing surfaces, resulting in accurate and reliable measurements.

The Q-Blast Auto-Clean assembly is housed in a NEMA 4X enclosure suitable for indoor or outdoor use. The system includes an integral compressor and air-pulse control components, with a power supply for the entire air supply system incorporated into the design. A simple connection to the Q46P or Q46R monitor provides the sequencing for the system and allows the operator to select cleaning frequencies as often as once every hour, to as little as once every 999 hours. For performance in extremely cold conditions, a thermostatically controlled heater is included in the assembly, allowing operation down to -40°C .

Product Data Sheet



CONVENTIONAL SENSORS

There is no single pH sensor that fits every application. Sensors designed for harsh environments do not necessarily work as well in high purity water. Understanding the difference between various sensor types will help you choose the best sensor for your application.

The most widely used pH sensors contain a hydrogen ion sensitive glass measuring electrode and a silver/silver chloride reference element. The reference element is sealed inside the sensor body filled with an electrolyte and electrically connected to the outside solution through one or more porous reference junctions. The glass electrode is in direct contact with the measured solution.

Conventional sensors are a good alternative for clean water applications with conductivity above about 50 microsiemens (μS). They typically provide an operating life of 1...3 years depending on the application and are relatively inexpensive. They are available in submersible or inline versions and a clear flow cell is also available. Maximum cable length is 25 feet (7.7 m) for this type of sensor. A preamplifier in a NEMA 4X enclosure is available for applications requiring longer distances between the sensor and monitor.



Figure 1: Submersible sensor



Figure 2: Twist-lock sensor (with and without pipe adapter)



Figure 3: Sealed acrylic flow cell

High Purity Water Sensor

For simpler applications such as filtered potable water, high purity boiler feed water, pharmaceutical grade water or very cold clean water applications, conventional sensors can be a better choice. In clean applications where there is little to attack the reference system, this type of sensor provides a much lower impedance sensor that can be used without an internal preamplifier, making the cost of the sensor significantly less. In addition, special versions of this sensor are available that provide high flow reference systems allowing better stability in very low conductivity water applications.

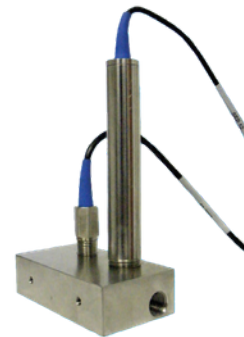


Figure 4: High purity water sensor & flow cell

DIFFERENTIAL SENSORS

In this type of sensor, the silver/silver chloride reference element has been replaced by a pH sensitive glass electrode identical to the measuring electrode. This second glass electrode is housed in a chamber filled with pH 7 buffer, which provides a stable reference. A high surface area reference junction electrically connects this reference system to the pH measuring element. The result is that pH is measured by the voltage difference between the two pH sensitive glass elements.

Differential pH sensors are the best choice for demanding applications such as wastewater, plating baths, aggressive industrial process water or higher temperature applications. They are especially good in applications containing sulfur compounds that tend to poison the silver/silver chloride reference element found in conventional sensors. Because they are designed with replaceable reference junctions and have internal preamplifiers, these sensors tend to significantly outlast conventional sensors.



Figure 5: Differential sensors



SENSOR MOUNTING OPTIONS

Convertible-style sensors may also be used with a modified 1 inch flow tee (*Figure 6*) that accommodates the pipe thread on the front of the sensor. Sample flows directly toward the face of the sensor to prevent buildup of solids. When using this sensor for submersion application, hardware is available for mounting the sensor to standard handrails, facilitating sensor removal for cleaning and calibrating.

The 1-1/2 or 2 inch union mount systems (*Figure 7*) can be used with pipe sizes up to 2 inches. The union mount hardware allows for easy removal of the sensor from the hardware without twisting the sensor cable.

Special insertion mounting hardware is available for applications requiring the removal of the sensor from a process line or tank without shutting off the sample flow in the line. This hardware is available in 316 SS or CPVC construction.



Figure 6: 1 inch flow tee



Figure 7: Union mount

SPECIFICATIONS

Electronic Monitor

Display Range	[pH] 0...14 [ORP] -1000...2000 mV
Accuracy	0.5% of selected range
Repeatability	0.3% of selected range
Non-Linearity	0.1% of selected range
Temperature Drift	0.01% of span/°C
Power	100...240V AC ±10%, 50/60 Hz, 10 VA max.; 12...24V DC, 500 mA max.
Analog Outputs	Two isolated 4...20 mA, 500 Ω load max. (3rd output optional)

Relays	Three SPDT, 6A @250V AC, 5A @24V DC (3 additional SPST non-isolated, 1A @30V DC optional)
Display	4-digit, 0.75 in. numeric LCD with 12-digit second line, LED backlight
Enclosure	NEMA 4X (IP66) polycarbonate, V-0 flammability
Weight	6 lb (2.7 kg) with sensor, flow cell and accessories
Digital Output	Options for Profibus-DP, Modbus-RTU, Modbus-TCP/IP, Ethernet-IP
Operating Conditions	-20 to 60°C (-4 to 140°F)

Sensor

Measuring Range	0...14 pH, -1000 ...2000 mV
Sensitivity	0.002 pH; 0.2 mV
Stability	0.02 pH; 2 mV (per 24 hours, non-cumulative)
Wetted Materials	PEEK, ceramic, titanium, glass, Viton, EPDM, platinum or gold (ORP only), 316 SS with Sanitary or Insertion body styles
Temperature Compensation	Pt1000 RTD
Sensor Cable	6 conductor plus 2 shields, HDPE jacket

Temperature Range	-5... 95° C (23...203° F)
Pressure Range	0...100 PSIG
Sensor Body Options	1 in. NPT Convertible 1-1/4 in. Insertion 1-1/2 or 2 in. Sanitary-style
Max. Sensor to Analyzer Distance	3,000 ft (914 m)
Max. Flow Rate	10 ft (3 m) per second





Q46P/R ORDERING INFORMATION

Model QL-A-B-C-D-E-F-G pH/ORP Monitor, Auto-Clean

Suffix A - Power	
1	100...240V $\pm 10\%$ 50/60 Hz
2	12...24V DC (requires 300 mA)
Suffix B - Parameter	
1P	pH
1R	ORP
Suffix C - Cable Length	
AF	30
AN	ft
WW	None
Suffix D - Cleaning System	
1	No cleaning system
2	Automatic sensor air-blast cleaner, 100...240V AC
3	Automatic sensor air-blast cleaner, 12...24V DC
Suffix E - Digital Output	
1	None
2	Profibus DP
3	Modbus RTU
4	Ethernet IP
5	Modbus TCP/IP
6	Datalogger
Suffix F - Optional Output	
C	Three additional low power relays
Suffix G - System Assembly	
6	Q-Blast mounting plate – VAC
7	Q-Blast mounting plate – VDC
x	N/A

Accessories

05-0094	Panel mount bracket kit
47-0005	2 in. U-bolt, 304 SS

Notes

- Pipe mount requires two 2 in. U-bolts (47-0005).
- Auto-Clean sensors supplied with 30 (or 60) ft of 1/4 in. ID PVC tubing, depending on sensor cable.

Sensor Options

07-0100	Sensor junction box, NEMA 4X
31-0057	Sensor interconnect cable
00-0624	Submersion mounting hardware for Auto-Clean sensor
00-0628	Submersion mounting hardware for standard sensor
07-0209	1 in. NPT tee, CPVC
07-0221	1-1/2 in. NPT union/tee mount, CPVC, no tee
44-0219	1-1/2 in. NPT tee, schedule 80, CPVC
07-0210	2 in. NPT union/tee mount, CPVC, no tee
44-0233	2 in. NPT tee, schedule 80, CPVC
00-1391	External preamp for conventional sensors, NEMA 4X
00-1527	Sealed flow cell for 63-0013 or 63-0008 sensors
63-0017	3/4 in. flow tee adapter for 63-0008 or 63-0013 sensors
63-0021	1 in. flow tee adapter for 63-0008 or 63-0013 sensors

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Model QR-A-B-C-D-E-F-G QR Q Series pH/ORP Monitor

Suffix A - Power	
1	100...240V $\pm 10\%$ 50/60 Hz
2	12...24V DC
N	None
Suffix B - Parameter	
1P	pH
1R	ORP
Suffix C - Electrode Type	
Industrial	glass
Municipal	glass
R1	Platinum metal
R2	Gold metal
WW	None
Suffix D - Sensor Type	
C1	Convertible, PEEK body
C2	Insertion, 316 SS body
C3	Sanitary-style, 1-1/2 in. 316 SS body
C4	Sanitary-style, 2 in. 316 SS body
C5	Convertible, PEEK body
WW	None
Suffix E - Cable Length	
AF	30
AN	ft
WW	None
Suffix F - Digital Output	
1	None
2	Profibus DP
3	Modbus RTU
4	Ethernet IP
5	Modbus TCP/IP
6	Datalogger
Suffix G - Optional Output	
A	None
B	One additional 4...20 mA output
C	Three (3) additional low power relays

Notes

- Sensor with integral connector is not waterproof. Used for indoor applications only.
- Suffix D, Option C5 requires 03-0029 cable

Calibration Accessories

09-0034	pH 4 buffer, 1000 mL
09-0035	pH 7 buffer, 1000 mL
09-0036	pH 10 buffer, 1000 mL
05-0056	Quinhydrone powder, 5 g
09-0042	200 mV ORP solution, 500 mL
09-0043	600 mV ORP solution, 500 mL