



Water Quality Monitor

Q46H/83 Potassium Permanganate

OVERVIEW

Potassium Permanganate (KMnO_4) is a strong oxidizer used in the water industry for reduction of organics in raw water. It is also used for control of zebra mussel problems at raw water intake structures. Continuous monitoring of low permanganate concentrations allows operators to adjust chemical feed rates and achieve target values. Chemical feed problems that result in either too little or too much residual can be quickly identified and corrected.

The Badger Meter Q46H/83 Potassium Permanganate monitor is an on-line monitoring system designed for continuous measurement of potassium permanganate in water. The full-scale operating range of the system can be selected for 0–2,000 or 0–20.00 ppm and operates on water streams with temperatures from 32 to 122 °F (0 to 50 °C).

The monitor consists of two main components: a chemistry module and an electronic display unit. The chemistry module contains sample and reagent pumps, sample handling systems and the gas sensor that provides the final measurement. An inlet overflow assembly attached to the bottom of the chemistry module is where the inlet sample line and drain line are connected. Sample inlet flows of 250–100 mL/min are recommended to keep system response time to a minimum. Reagent bottle holders are supplied so that reagents can be wall mounted below the chemistry system.

The electronics module can be mounted near the chemistry unit or up to 100 feet away depending on installation requirements. Permanganate concentration is displayed on a large format back-lit LCD with a second alpha-numeric line below to indicate other operating parameters. Three SPDT alarm relays and two 4–20 mA outputs are provided, and digital communications are available.



FEATURES

- **Gas Phase Sensing.** Measurement is made without contact between sample and sensor, eliminating the potential for sensor fouling.
- **Standard Method.** Potassium permanganate is measured using iodometric measurement after reaction of the sample with buffer and potassium iodide.
- **Analog Output Options.** Two isolated 4–20 mA outputs are standard. One output is programmable for PID function.
- **Chemistry Module Power Options.** Power options include universal 115 or 230V AC, 50/60 Hz.
- **Three Control Relays.** Relays are programmable for setpoint, deadband and time delay.
- **Clear Display.** Backlit large LCD display provides clear visibility in any lighting condition. A scrolling second line on the display provides additional information and programming prompts.
- **Digital Communications.** Available in Profibus DP, Modbus RTU, Modbus TCP/IP, Ethernet/IP or Datalogger.



THEORY OF OPERATION

The Q46H/83 monitor uses the Badger Meter Auto-Chem chemistry module to provide chemical treatment of the sample, air stripping of the released iodine, gas sample conditioning and iodine gas measurement. In operation, a small amount of sample is pumped from an overflow assembly into the chemistry system and mixed with pH 4 buffer and potassium iodide (KI) solution. At pH 4, permanganate compounds in solution react as follows:



The treated sample flows into an air-stripping chamber where a controlled amount of air removes the iodine from the water sample. The air coming from the top of the stripping chamber is directed to a gas conditioning module which removes any excess water and then to a flow cell containing the iodine gas sensor.

The iodine gas sensor is an amperometric membraned sensor that generates current in proportion to the amount of iodine in the gas stream. Since the gas sensor is only in contact with clean air containing iodine, sensor fouling due to contaminants in the sample is eliminated.

INSTALLATION

The Q46H/83 monitor two main components (Auto-Chem chemistry module and 46H electronic unit) require AC power. A 25 foot interconnecting sensor cable is supplied. The two components can be separated by up to 100 feet, if desired.

The monitors provide a large format concentration display with a second alpha-numeric lower line for secondary information. The monitor provides two standard 4-20 mA analog outputs and three SPDT relays. If desired, one analog output can be configured for PID control use. In addition, the monitor provides options for digital communications including Profibus DP, Modbus RTU, Modbus TCP/IP, Ethernet/IP or Datalogger.

Auto-Chem chemistry systems include peristaltic pumps for sample and reagents, air supply for the stripping system, and gas conditioning components. All components are easily accessible from the front of the unit making service quick and easy. Attached to the bottom of the enclosure is an inlet overflow chamber where sample and drain connections are made. A sample flow rate of 5–20 gallons per hour (300–1200 mL/min.) is recommended.

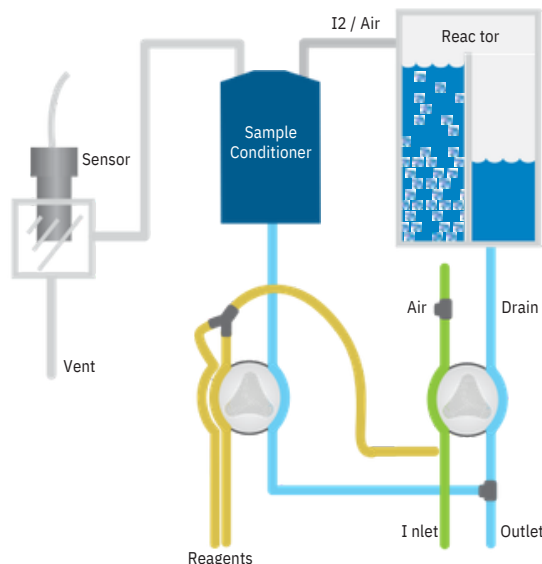


Figure 1: Permanganate measurement

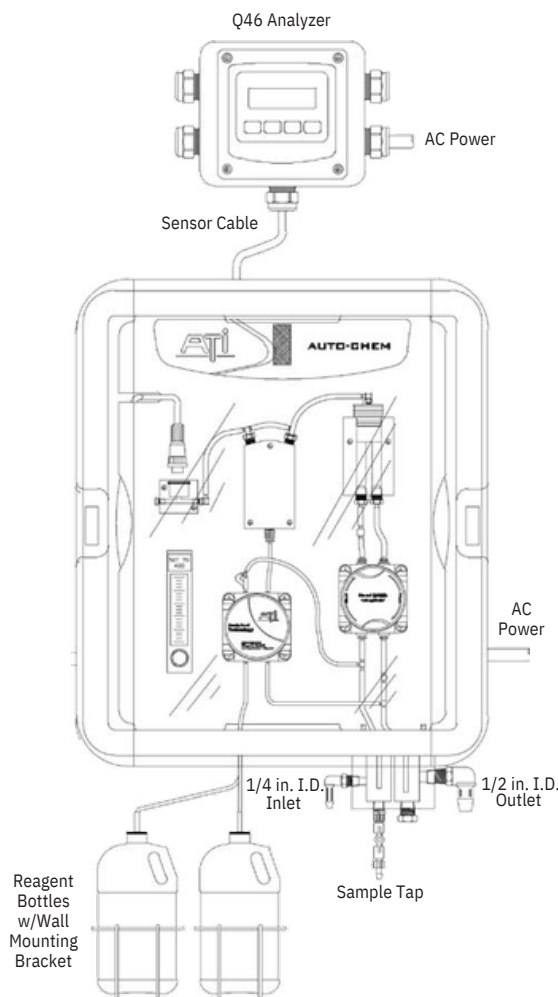


Figure 2: Installation overview



SPECIFICATIONS

Electronic Monitor

DisplayRange	0–2.000 or 0–20.00 ppm
Accuracy	± 0.005 ppm
Repeatability	± 0.002 ppm
Linearity	0.5% of F.S.
Zero Drift	< 0.005 ppm/month
Power	100–240V AC ± 10%, 50/60 Hz
Analog Outputs	Two isolated 4–20 mA, 500 Ω load max.
Relays	Three SPDT, 6A @250V AC, 5A @ 240V DC
Display	4-digit, 0.75 in. numeric LCD with 12-digital second line, LED backlight
Enclosure	NEMA 4X (IP66) Polycarbonate
Operating Conditions	32 to 122 °F (0 to 50 °C)
Weight	2.5 lb (1.1 kg)
Digital Output	Profibus DP, Modbus RTU, Modbus TCP/IP, Ethernet/IP, Datalogger

Chemistry Module

Sensor Type	Membraned Iodine Gas Sensor
Sensor Cable	25 ft (7.5 m) standard, 100 ft (30.5 m) max.
Response Time	95% in 3 minutes
Sample Pump	Internal tubing pump, 7 cc/min
Acid Pump	Internal tubing pump, 0.1 cc/min
Air Supply	Diaphragm air pump with precision flow control
Air-Stripping Chamber	Teflon™
Inlet Sample Flow Rate	5–20 gph at inlet overflow assembly
Sample Inlet	1/4 in. I.D. hose barb
Sample Drain	1/2 in. I.D. hose barb
Power	115 or 230V AC (customer specified)
Operating Temperature	36 to 122 °F (2 to 50 °C)
Enclosure	Kydex with acrylic cover, V-0 flammability
Weight	15 lb (6.8 kg)



ORDERING INFORMATION

QA-A-B Permanganate Monitor

Suffix A - Power	
8	115V AC, 50/60 Hz
9	230V AC, 50/60 Hz
Suffix B - Digital Output	
1	None
2	Profibus DP
3	Modbus RTU
4	Ethernet/IP
5	Modbus TCP/IP
6	Datalogger

ACCESSORIES

31-0038	7-c sensor interconnect cable, max. 100 ft
05-0094	Panel mount bracket kit
47-0005	2 in. U-bolt, 304 SS

NOTES:

1. All systems are supplied with one package of membranes, one 120 cc bottle of electrolyte, one 50 gram container of KI, two reagent bottles with reagent pickup assemblies and 2 reagent bottle brackets.



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