A Badger Meter® Brand

Water Quality Monitor

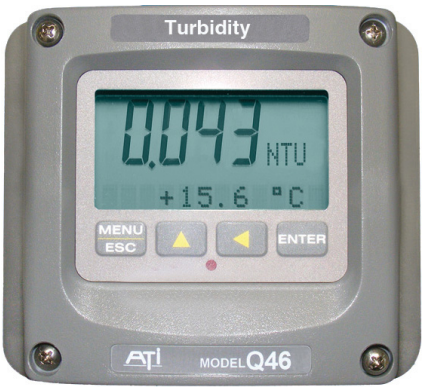
Q46/76 Turbidity

SIMTECH

OVERVIEW

Turbidity is a general indicator of the optical clarity of water and is defined as the amount of light scattered by particles in solution. In practice, a light beam is directed into a water sample and a photo detector measures the light scattered at 90-degrees to the incident light beam. While other scatter angles are possible, the 90-degree measurement angle has become the standard for turbidity measurement in most water systems. It is used as a relative indicator of the amount of turbidity in a solution, and is measured in virtually all drinking water systems. It is also used in industrial water treatment systems as an indicator of product water quality.

The Q46/76 Turbidity Monitor is designed to meet the needs of both municipal drinking water systems and industrial water treatment for reliable, low-range turbidity measurement.



FEATURES

- **Flexibility.** Wide range capability with selectable ranges of 0…4, 0…40 or 0…400 NTU provide maximum application flexibility.
- **AC or DC Power Options.** Power options include universal 100…240V AC ±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 turbidity and temperature.
- **Relay Contacts.** Three SPDT relays are standard, with relay functions programmable for alarm, control or trouble indication. Three additional low power relays available as an option.
- **Extra Outputs/Relays.** Expansion board to add a third 4…20 mA analog output or to add three additional non-isolated low power relays.
- **PID Output.** Standard PID control function assignable to one analog output.
- **Digital Communications.** Available in Profibus DP, Modbus RTU, Modbus TCP/IP, Ethernet/IP or Datalogger.
- **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.
- **Sensor Diagnostics.** System automatically checks for sensor fouling, "dry cell" and external light interference.

APPLICATIONS

- Potable Water Filter Outlets
- Raw Water Inlets
- Wastewater Effluent

TURBIDITY SENSOR

The turbidity sensor used in the Q46/76 monitor is a planer sensor with the light source and photo detector mounted on a flat face. Lenses in front of the light source direct the beam of light at a 45-degree angle into the sample. Another lens in front of the photo detector collects the 90-degree scattered light and directs it to the detector. The signal generated by the detector is amplified inside the sensor for transmission to the display unit. Periodic pulsing of the light source allows the sensor zero to be adjusted automatically for improved stability in low-range applications. Turbidity sensors are available for measurement in a pressurized flow cell or for direct submersion in open tanks. A 1-1/2 in. flow tee assembly is also available for direct in-line measurements. The flow cell is required for very low measurements (0…4 NTU), while the submersion unit may be used for higher turbidity applications such as wastewater effluent or raw water.

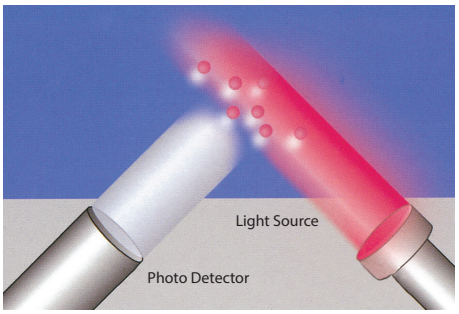


Figure 1: Turbidity sensor cross-section

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Product Data Sheet

SENSOR FLOW CELL

The flow cell used with the turbidity system is designed to eliminate ambient light effects and to maintain sample pressure inside the flow cell. This minimizes air bubble formation, which is a common problem in many turbidity systems, and can cause measurement errors.

There is also a modified flow cell for raw water applications that allows for higher amounts of suspended particles to pass through without creating clogging or settling issues.

TURBIDITY MONITOR

The turbidity electronics unit is an AC or DC powered instrument providing an LCD display of turbidity value, as well as indication of alarm status and instrument diagnostics. The NEMA 4X housing can be wall, pipe or handrail mounted using the universal mounting kit included with each system.

The monitor provides display of turbidity over a variety of operating ranges. The minimum display range of 0…4 NTU provides resolution down to 0.001 NTU and is suitable for almost any final filter monitoring application. Ranges of 0…40 or 0…400 NTU are available for raw water or clarifier effluent monitoring. The Q46/76 provides three programmable SPDT alarm relays, as well as two isolated 4…20 mA outputs. The analog outputs may be programmed for full-scale outputs as low as 0…0.2 NTU and can be inverted if desired.

Q46/76 monitors also provide sensor diagnostic functions to warn of conditions that cause inaccurate or invalid readings. The sensor is continuously monitored for optical fouling and displays an alarm message should the sensor require cleaning. In addition, the sensor detects the lack of water in the flow cell and provides a "dry cell" when an air interface is detected. These alarm conditions cause a third alarm relay to activate, which can be used to indicate these conditions remotely.

OPTIONAL Q-BLAST AUTO-CLEAN ASSEMBLY

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 Q46/76 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. To insure performance in extreme cold conditions, a thermostatically controlled heater is included in the assembly, allowing operation down to –40°C.

The Q-Blast option provides the ideal answer for submersible turbidity applications such as wastewater effluent. 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.

Figure 2: Q-Blast Auto-clean assembly

SPECIFICATIONS

Electronic Monitor

Display Range	0…4.000, 0…40.00 or 0…400.0 NTU
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 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-digital second line, LED backlight
Enclosure	NEMA 4X Polycarbonate V-0 Flammability
Operating Conditions	–4…140° F (–20…60° C)
Weight	6 lb (2.7 kg) with sensor, flow cell and accessories
Sensitivity	0.05% of span or 0.01 mS
Digital Output	Profibus DP, Modbus RTU, Modbus TCP/IP, Ethernet/IP, Datalogger
Mounting	Wall mounting kit standard, panel mount bracket and pipe U-bolts available
Size	5.6 in. W × 4.9 in. H × 6.4 in. D (142.2 mm × 124.5 mm × 162.6 mm)

Sensor

Sensor Type	Tungsten White Light or IR Source (680 mm)
Materials	PVC body, Acrylic optical windows
Cable Length	20 ft (6 m) standard, 200 ft (61 m) max. with junction box
Temperature Limits	0…105° C, 0…80° C with flow cell
Pressure Limit	100 psig max.
Connection	3/4 in. MNPT rear thread
Flow Cell	2 in. CPVC with alignment key
Temperature Element	Pt1000 RTD

ORDERING INFORMATION

QU-A-B-C-D-E-F Turbidity Monitor

Suffix A - Light Source	
N	None
1	Tungsten White Light (EPA Compliant)
2	IR Source (ISO-7027, EN 27027 Compliant)
3	IR Sensor in Kynar Body
Suffix B - Power	
1	100…240V AC, ±10%, 50/60 Hz
2	12…24V DC (requires 300 mA)
3	100…240V, ±10%, 50/60 Hz with Q-Blast Auto-Clean Assembly
4	12…24V VDC with Q-Blast Auto-Clean Assmelby (requires 1.0 A)
Suffix C - Sensor Type	
WW	None
1T	Flow Sensor with 30 ft (10 m) Cable and Standard Flow Cell
2T	Flow Sensor with 30 ft (10 m) Cable and 1-1/2 in. Flow Tee
3T	Submersible Sensor with 30 ft (10 m) Cable
4T	Flow Sensor with 30 ft (10 m) Cable and Raw Water Flow Cell
5T	Submersible Sensor with Auto-Clean Nozzle, 30 ft (10 m) Cable
6T	Flow Sensor, 30 ft Cable, No Flow Cell
7T	Flow Sensor, Flow Cell on Calibration Panel

Suffix D - Digital Output	
1	None
2	Profibus DP
3	Modbus RTU
4	Ethernet/IP
5	Modbus TCP/IP
6	Datalogger
Suffix E - Optional Output	
A	None
B	One additional 4…20 mA output
C	Three additional low power relays (SPST, 0.5 A max.)
Suffix F - System Assembly	
X	None
6	Q-Blast Mounting Plate - VAC
7	Q-Blast Mounting Plate - VDC

ACCESSORIES

00-1637	Q-Blast system plate assembly with power junction box
00-1690	Submersion mounting bracket kit for standard sensors
00-1689	1 in. mounting adapter for standard sensor
07-0100	Universal junction box, NEMA 4X
31-0001	5 conductor sensor interconnect cable (max. 1000 ft)
00-0624	Mounting bracket kit for Auto-clean sensor
45-0043	Pipe adapter for Auto-clean sensor
05-0094	Panel mount bracket kit
47-0005	2 in. U-bolt, 304 SS
00-0930	Auto-clean monitor mounting bracket

NOTE: Pipe mount requires two 2 in. U-bolts (47-0005).