Advantage Series™ Two-Wire pH/ORP/pIon Transmitter

Specification

Type TB82

Features

■ *Simple menu programming (patent pending).*

■ *On-line continuous sensor diagnostics.*

■ *Fully programmable isolated output.*

■ *Three standard modes of automatic temperature compensation:* Manual Nernstian, standard automatic Nernstian, and automatic Nernstian with solution compensation coefficient.

■ *Platinum 100 and 3-kΩ Balco RTD compatibility.*

■ *Local and remote diagnostic alarming (patent pending).*

■ *Adjustable damping.*

■ *Hold output function.*

■ *Programmable security codes and configuration lockout.*

■ *HART communications (consult factory).*

■ *NEMA 4X/IP65 housing:* Cast aluminum with corrosion resistant polyurethane powder coat finish.

■ *CE97 Mark.* Complies with all applicable European Community product requirements, specifically those required to display the CE97 marking on the product nameplate.

■ *Intrinsically safe and nonincendive design (certifications pending).*

TC00795B

The TBI-Bailey Type TB82 Advantage™ pH/ORP/pIon Transmitter is an advanced microprocessor-based instrument. Smart keys on the front panel provide for local programming of all transmitter functions. Easy-to-follow instructions appear above each smart key. A unique secondary display clearly defines each menu option when programming the transmitter. During normal operation, the secondary display shows process temperature, sensor reference impedance, loop current and other parameters. This innovative, user-friendly interface provides for straightforward transmitter configuration and calibration. Remote programming is available via any HART® (Highway Addressable Remote Transducer) compatible hand-held terminal.

The intrinsically safe and nonincendive Type TB82 transmitter also meets current CE97, NEMA 4X and IP67 requirements. It is compatible with original TBI-Bailey Solid State pH/ORP sensors as well as the new Next Step™ reference and Next Step Advantage™ pH/ORP sensor with solution ground. This new sensor enables the Type TB82 transmitter to perform several diagnostic checks. It is also compatible with diagnostic capable instruments from other manufacturers. The transmitter has adjustable asymmetry and isopotential points to ensure flexibility and compatibility with all types of sensors having nonglass electrodes.

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Calibration

Smart key programming makes transmitter calibration accurate and efficient. One or two-point calibration routines automatically calculate the slope and offset of the sensor. The transmitter comes from the factory calibrated to 100-percent efficiency and with no offset. Selecting the proper choice from the calibration menu allows the return of the transmitter to its factory calibrated state in the event of an improper calibration or the installation of a new sensor. Analysis of calibration information by the transmitter helps ensure correct calibration.

Programmable Security Code

The transmitter has a single three-digit security code. Menu-selectable choices allow the security code to be applied to none of or any combination of the following choices: Calibrate, output/hold and configure.

Basic or Advanced Programming

The basic or advanced programming mode can be chosen at the time of purchase. The advanced mode has an expanded set of functions intended for complex applications. Separating the basic and advanced modes simplifies setup and calibration activities. The advanced configuration choices are:

- Adjustable asymmetry and isopotential points for compatibility with sensors with non-glass electrodes.
- Nonlinear output function generator.
- User-entered, solution specific, temperature compensation coefficient.
- Analog pulse diagnostic output.
- Adjustable reference impedance alarming.
- Specific ion (pIon) concentration.

Adjustable Damping

Damping is helpful in process environments where noise is present. It is added as a capacitive type lag where reaction to any signal change is slowed according to the entered time constant. For example, the response to a step input change reaches approximately 63 percent of its final value in five seconds for five seconds of damping. The damping time is adjustable from 0.00 to 99.9 seconds.

Diagnostics

The Type TB82 transmitter constantly monitors both the sensor and the transmitter. This helps to ensure reliability and accuracy. Upon detection of a diagnostic condition, the transmitter provides diagnostic notification by flashing a FAULT icon on the display and supplying a pulse on the analog output (if activated). Pressing the FAULT info smart key stops the icon from flashing and provides, on the secondary display, a short description and fault code. The FAULT icon remains on until resolution of the problem. Sensor faults that activate the diagnostic notification are:

- Broken glass electrode.
- High reference impedance.
- Shorted cable.
- Open cable.
- Sensor out of solution.
- Shorted or open temperature compensator.
- Ground loop detection (patent pending).

Hold Output

The transmitter has a hold output state that ensures plant safety and process integrity during maintenance and calibration. When activated, the hold output state causes a HOLD icon to appear at the top of the display. Upon release of the hold state, the HOLD icon disappears. During a two-point calibration the hold output state activates automatically.

Analog Output and Diagnostic Pulse

The analog output is fully scalable over any pH/ORP or pIon range. The advanced programming mode allows pulsing of the analog output during a diagnostic condition. This is done by allowing a 0.16 to 16-milliamp pulse to be programmed into the transmitter. If the transmitter detects an error, this pulse is impressed upon the four to 20-milliamp output for one second out of a six-second repeating cycle. If the actual transmitter output is below 12 milliamps, the pulse adds current. If it is above 12 milliamps, the pulse subtracts current. This provides notification of a problem.

Temperature Compensation

The Type TB82 transmitter is compatible with either a Platinum (Pt) 100 or a three-kilohm Balco resistive temperature device (RTD). The automatic temperature compensation options are: Manual Nernstian, standard automatic Nernstian, and automatic Nernstian with solution compensation coefficient.

HART Communications

HART communication protocol can be ordered at the time of purchase or added on as a field upgrade. This provides remote programming via any HART compatible hand-held terminal. Consult the factory for availability.

pH/ORP/pIon Sensor Compatibility

The Type TB82 transmitter operates with original TBI-Bailey Solid State pH/ORP sensors as well as the new Next Step reference and Next Step Advantage pH/ORP sensor with solution ground. Adjustable asymmetry and isopotential points ensure compatibility with nonglass pH sensor electrodes such as those that are Iridium Oxide based.

Specifications

Property	Characteristic/Value
Type	2-wire pH/ORP/pIon transmitter

Input Range
   pH
   ORP/pIon
	0 to 14 pH (with -2 to 16 pH overrange)
	±1999 mV

Display resolution
   pH
   ORP/pIon
   Temperature
	0.01 pH
	1 mV
	1°C (1°F)

Temperature compensation mode
   pH
 	
   ORP/pIon
	Manual Nernstian, standard automatic Nernstian, automatic Nernstian with solution compensation coefficient
	Manual (none), solution compensation coefficient

Temperature compensation types	Pt 100, 3-kΩ Balco RTD

Property	Characteristic/Value

Output
  pH
  ORP/pIon
	
	Isolated 4 to 20 mA, linear and nonlinear, configurable across full pH range
	Isolated 4 to 20 mA, linear and nonlinear, configurable across full range

Load	550Ω at 24 VDC, 1350Ω at 40 VDC

Minimum span
  pH
  ORP/pIon
	
	1 pH unit
	100 mV

Maximum span
  pH
  ORP/pIon
	
	14 pH
	3,998 mV

Nonlinearity and repeatability[1]
  pH
  ORP/pIon
	
	Display: ±0.01 pH, Output: ±0.02 mA
	Display: ±1.0 mV, Output: ±0.02 mA

Environmental[2]
  Operating temperature range
  Storage temperature range
  Humidity
	
	-20°C to 60°C (-4°F to 140°F)
	-40°C to 70°C (-40°F to 158°F)
	Will meet specifications up to 95% RH

Power requirements	13 to 53 VDC (13 to 42 VDC for certified applications)
Power supply effect	±0.005% of full scale per volt
Housing	NEMA 4X and IP65, aluminum alloy with polyurethane powder coating
Conduit connection	2 each, 0.875-inch holes in enclosure accept ½-inch hubs

Size (h x w x l)
  Minimum panel depth
  Maximum panel cutout
	½ DIN, 144.0 mm x 144.0 mm x 171.0 mm (5.67 in. x 5.67 in. x 6.73 in.)
	144.8 mm (5.70 in.)
	138.0 mm x 138.0 mm (5.43 in. x 5.43 in.)

Weight	1.9 kg (4.2 lbs), 3.4 kg (7.5 lbs) with pipe mount

Agency certifications[3]
  Nonincendive (nonsparking)
    CSA
 	
    FM
 	
    SAA
	
	Class I; Division 2; Groups A, B, C and D
	Class II; Division 2; Groups E, F and G
	Class III; Division 2
	Class I; Division 2; Groups A, B, C and D
	Class II; Division 2; Groups F and G
	Class III; Division 2
	Ex n, Zone 2; Group IIC, T6

Intrinsic safety
    CENELEC
    CSA
 	
    FM
 	
    SAA
	
	Ex ia IIC T6
	Class I; Division 1; Groups A, B, C and D
	Class II; Division 1; Groups E, F and G
	Class III; Division 1
	Class I; Division 1; Groups A, B, C and D
	Class II; Division 1; Groups E, F and G
	Class III; Division 1
	Ex ia, Zone 0; Group IIC, T6

NOTES:
1. Repeatability is defined as the closeness of agreement among a number of consecutive measurements of the output for the same value of input under the same operating conditions, approaching from the same direction, for full-range traverse.
2. The lower temperature limitation for the LCD is -20°C (-4°F).
3. Agency approvals pending. Consult factory for status.

Installation Drawings

Figures 1, 2, 3 and 4 show the installation drawings for the various types of mounting hardware. Figure 5 is the wiring diagram for Next Step sensors and Figure 6 is the wiring diagram for sensors with BNC connectors.

Installation Accessories

Kit Number	Description
4TB9515-0123	Panel mounting kit
4TB9515-0124	Pipe mounting kit
4TB9515-0125	Hinge mounting kit
4TB9515-0156	Wall mounting kit
4TB9515-0166	BNC/TC to pin TB82 adapter with conduit fitting

Nomenclature

Position	1	2	3	4	5	6	7	8	9	10	11	12	13	
Type	T	B	8	2	☐	☐	☐	☐	☐	☐	☐	☐	☐	**Advantage Series Transmitter**

Input[1]
P H	pH/ORP/pIon

Programming Mode
1	Basic
2	Advanced

Digital Communications
0	None
1	HART[2]

Lightning Suppressor
0	None
1	Included

Housing Type
0	Anodized aluminum, powder coat polyurethane

Mounting hardware
0	None
1	Pipe
2	Hinge
3	Panel
4	Wall

Agency Approval[3]
0	None
1	FM
2	CSA
3	CENELEC
4	SAA

Identification Tags
0	None
1	Stainless steel
2	Mylar®

NOTES:
1. The features of the Type TB82 transmitter are best suited for use with TBI-Bailey Advantage sensors. The transmitter is, however, compatible with all TBI-Bailey pH/ORP/pIon sensors. Refer to Figure 6 to connect existing sensors with BNC connectors to the Type TB82 transmitter.
2. Consult factory for availability.
3. Agency approvals pending. Consult factory for status.
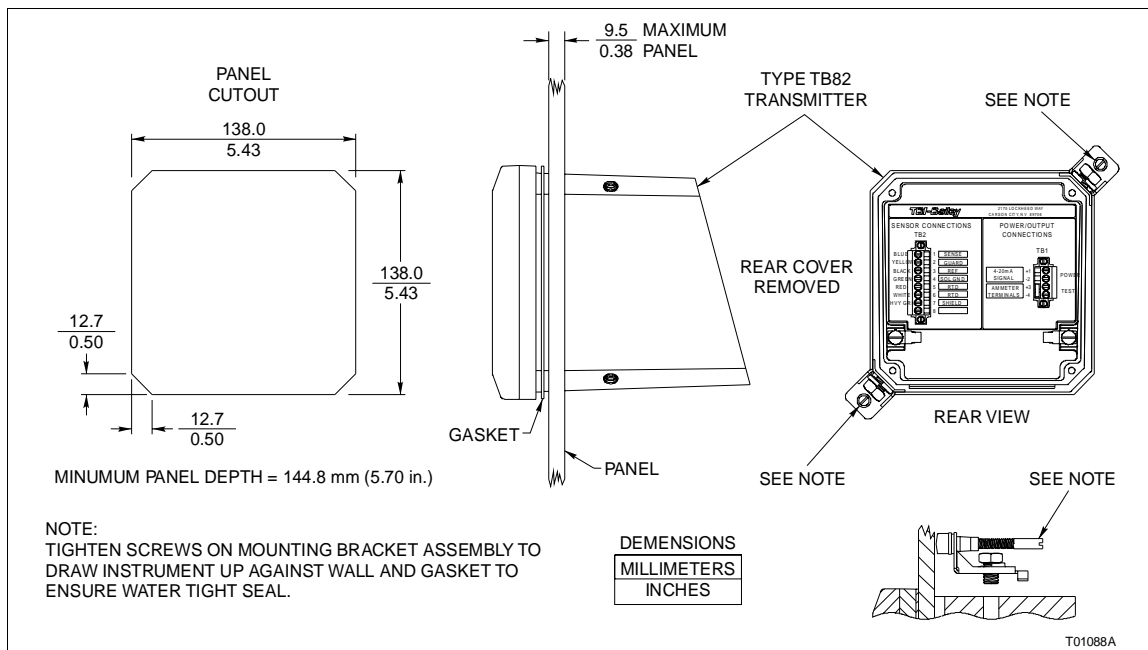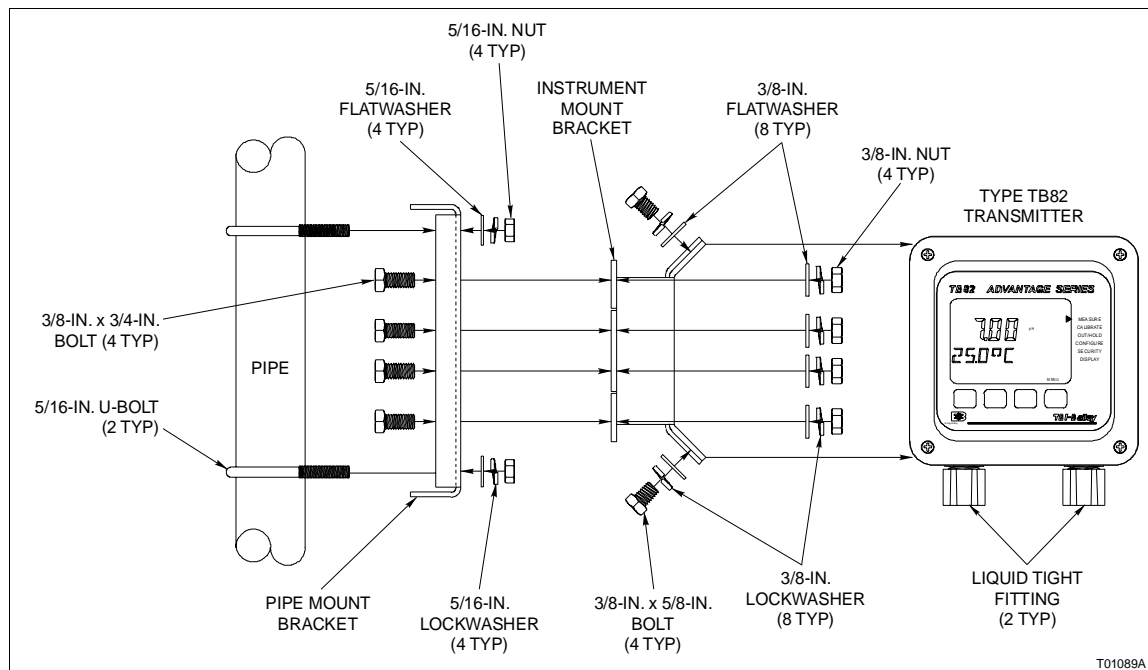
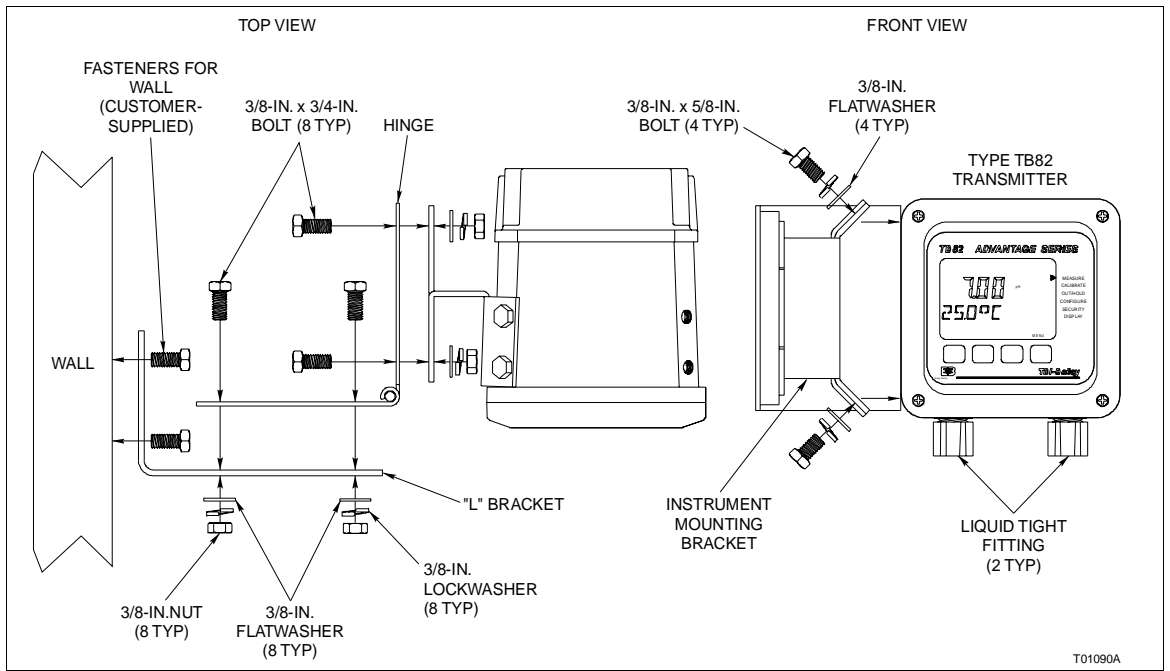**Figure 1.** Panel Mounting

Figure 2. Pipe Mounting

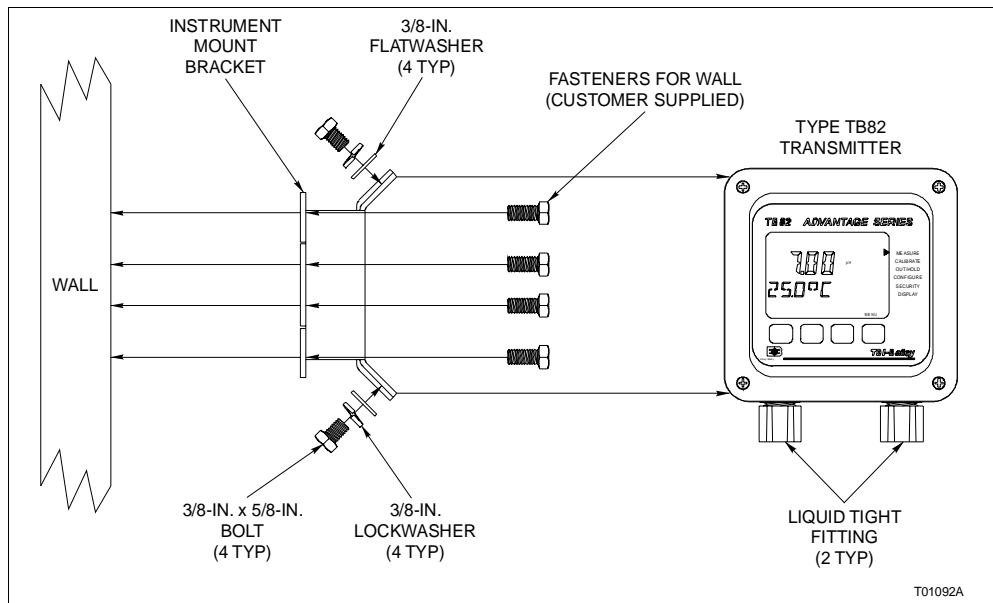**Figure 3.** Hinge Mounting

Figure 4. Wall Mounting

® HART is a registered trademark of HART Communication Foundation.
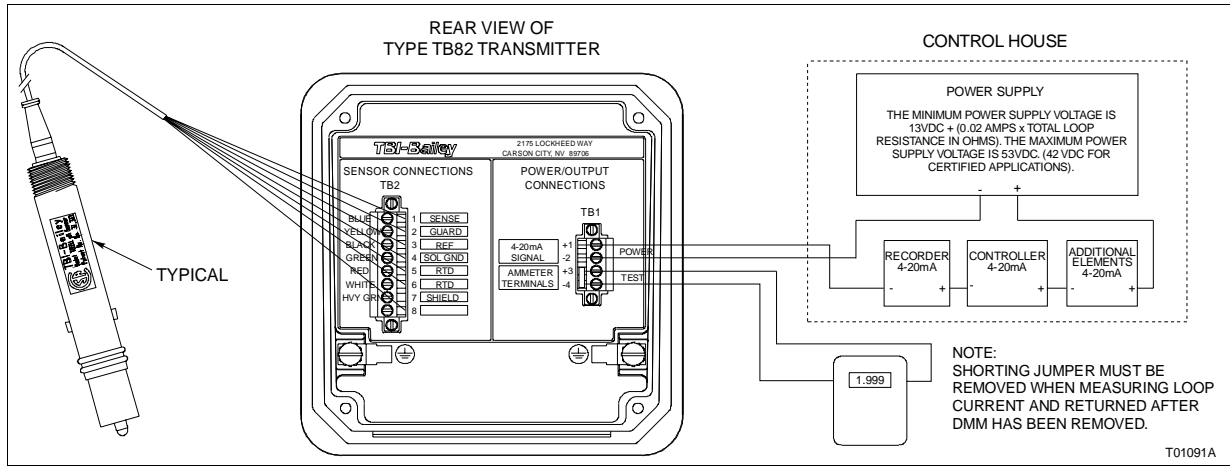
Figure 5. Wiring Diagram for Next Step Sensors
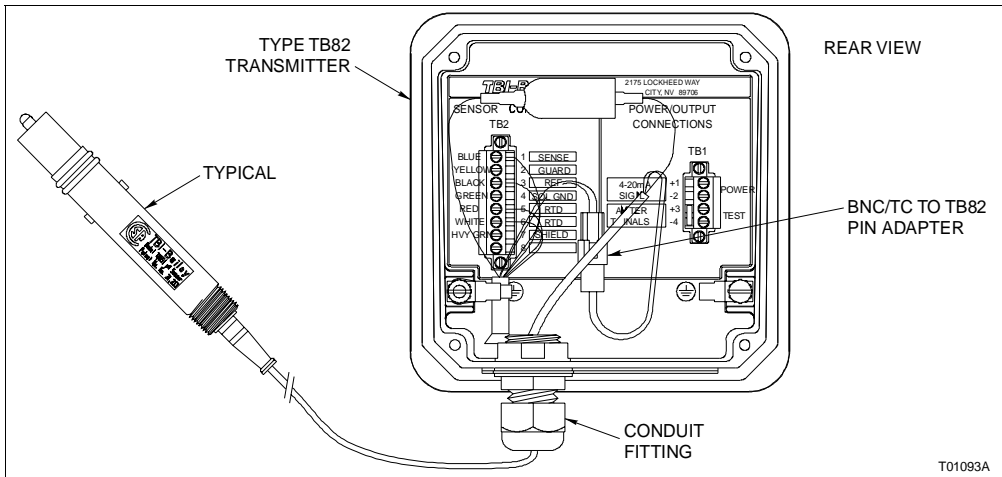

Figure 6. Wiring Diagram for Sensors with BNC Connectors

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