BANNER®

more sensors, more solutions

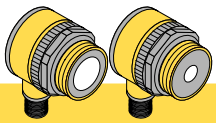
U-GAGE® T30U Series – Pump-In/Pump-Out

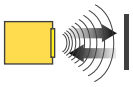
Ultrasonic Sensors with Pump-In/Pump-Out Switching Logic

CE

Features

- Fast, easy-to-use TEACH-mode programming; no potentiometer adjustments
- Program both outputs together or independently. The two outputs may be independent, overlapping, or identical (complementary).
- Remote TEACH input for security and convenience
- Choose models with 150 mm to 1 m range (5.9" to 39.4") or 300 mm to 2 m range (11.8" to 78.7")
- Wide operating temperature range of -20° to +70°C (-13° to +158°F)
- Choose models with either NPN or PNP dual discrete outputs
- LED indicators for Power ON/OFF; Signal Strength; and Discrete Outputs Conducting
- Choose 2 m (6.5') or 9 m (30') integral unterminated cable or 5-pin Euro-style QD connector
- Compact, self-contained sensor package
- Rugged design for use in demanding sensing environments; rated IEC IP67, NEMA 6P





Ultrasonic, 228 or 128 kHz

Models

Models	Range and Frequency	Cable*	Supply Voltage	Discrete Output	Response Time
T30UHNA **T30UHNAQ**	150 mm to 1 m (5.9" to 39") 228 kHz	2 m (6.5') 5-pin Euro QD	12 to 24V dc	NPN (sinking)	48 milliseconds
T30UHPA **T30UHPAQ**				PNP (sourcing)	
T30UHNB **T30UHNBQ**	300 mm to 2 m (11.8" to 79") 128 kHz			NPN (sinking)	96 milliseconds
T30UHPB **T30UHPBQ**				PNP (sourcing)	

* 9 m (30') cables are available by adding suffix **"W/30"** to the model number o f any cabled sensor (e.g., **T30UHNA W/30**).
A model with a QD connector requires an optional mating cable; see page 10.

WARNING . . . Not To Be Used for Personnel Protection

Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death.

These sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition. Consult your current Banner Safety Products catalog for safety products which meet OSHA, ANSI and IEC standards for personnel protection.

U-GAGE® T30U Series with Pump-In/Pump-Out Switching Logic

Overview

The U-GAGE is an easy-to-use ultrasonic sensor, ideal for demanding environments. Simple push-button programming provides flexibility for a variety of applications. Excellent for gauging applications such as sensing of liquid levels in a tank or for sensing most clear materials.

Each sensor includes two discrete outputs, which may be programmed independently with different window limits or together with identical limits.

Pump-In/Pump-Out Switching Function

Pump-in/pump-out operation provides the switching logic required for fill-level control, web tensioning control, and similar applications. In this mode, Output 2 energizes when the target reaches the farthest sensing window limit, and stays energized until the target moves to the nearest limit. Output 1 de-energizes at the farthest limit and does not re-energize until the target moves to the nearest limit. Figure 2 shows how pumping action might be controlled directly by the sensor in a fill-level-control application.

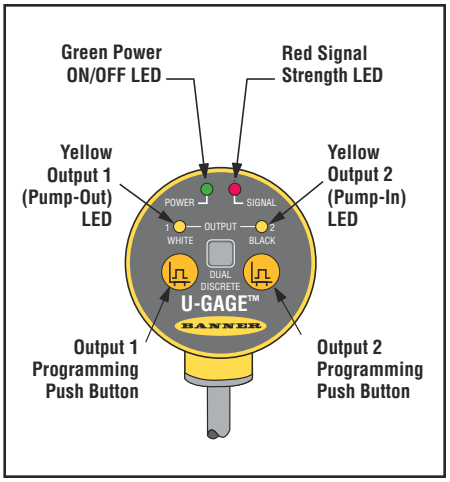


Figure 1. Sensor features

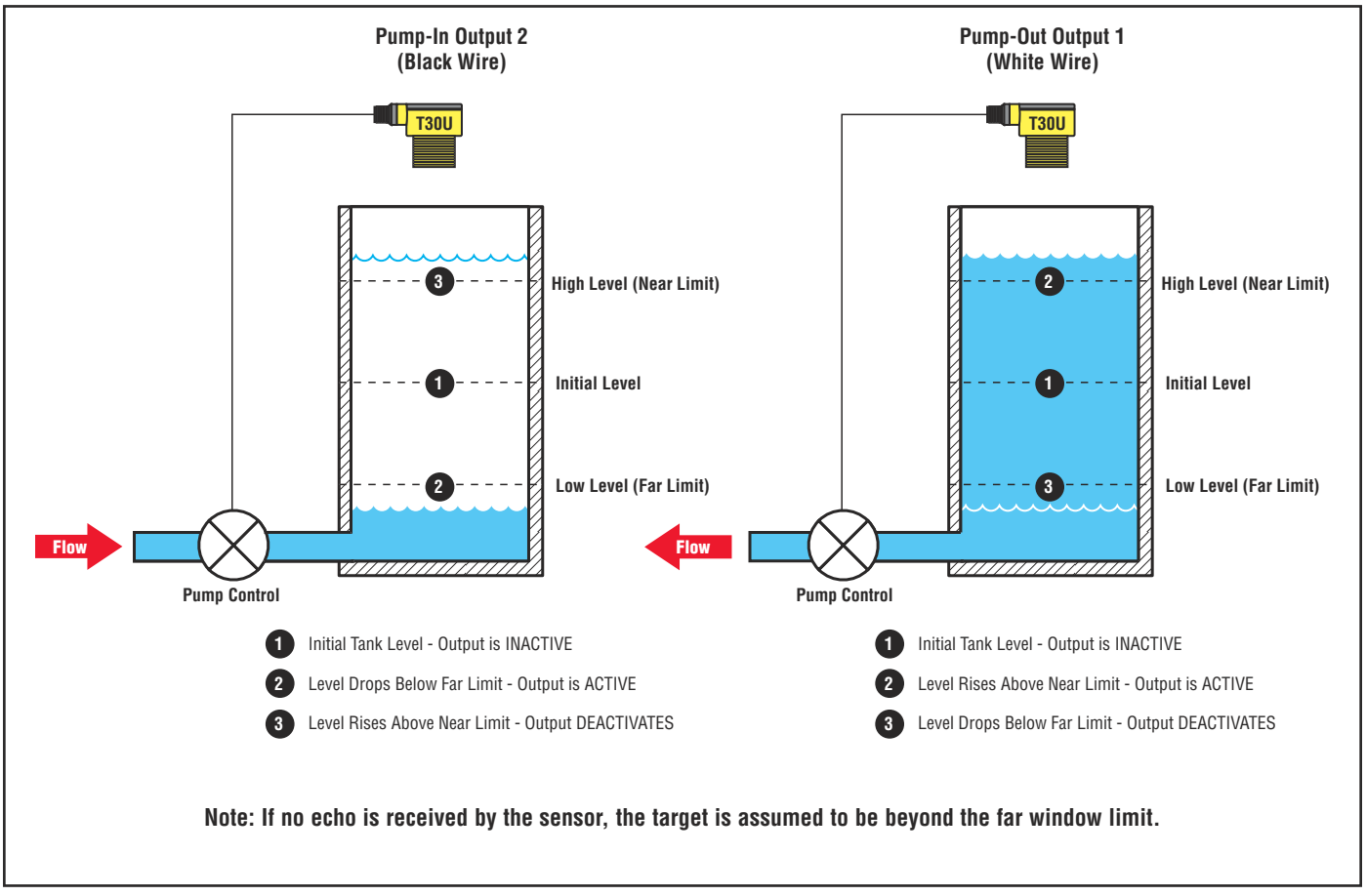


Figure 2. Fill-level-control application

Sensor Programming

Window limits may be taught to the sensor in several ways. Programming procedures using the push buttons on the back of the sensor, as well as remote programming (remote TEACH) procedures are described below and on the following pages.

NOTE: When the sensor changes state between PROGRAM and RUN modes, all of the LED indicators turn OFF momentarily, before the appropriate LEDs come ON as described on pages 4 and 5. The sensing window limits expand temporarily to full scale (max range) during PROGRAM mode.

Program the outputs independently to define separate sensing windows (both their size and placement) or program the outputs simultaneously for complementary operation.

Sensing windows may be as large as 0.85 m for 1-m range models, and as large as 1.7 m for 2-m range models. Use the procedures as described, or combine them for specialized applications.

NOTE: Output 1 = White wire (Pump-Out)
Output 2 = Black wire (Pump-In)

General Notes on Programming:

1. The sensor will return to RUN mode if the first TEACH condition is not registered within 120 seconds.
2. After the first limit is taught, the sensor will remain in PROGRAM mode until the TEACH sequence is finished.
3. Press and hold the programming push button > 2 seconds (before teaching the second limit) to exit PROGRAM mode without saving any changes. The sensor will revert to the last saved program.

Remote Programming

To program the sensor remotely or to disable the keypad, the Remote Programming function may be used. Disabling the keypad prevents anyone on the production floor from adjusting any of the programming settings. Connect the gray wire of the sensor to +12 to 24V dc, with a remote programming switch connected between them.

NOTE: The impedance of the remote teach input is 55 kΩ.

Programming is accomplished by following the sequence of input pulses. The duration of each pulse (corresponding to a push button “click”), and the period between multiple pulses, are defined as:

$$0.04 \text{ seconds} < T < 0.8 \text{ seconds}.$$

NOTE: Hold the Remote line high > 2 seconds (before teaching the second limit) to exit PROGRAM mode without saving any changes. The sensor will revert to the last saved program.

Teaching Separate Window Limits for Each Output

Each output conducts in its respective manner (either pump-in or pump-out) independently, in response to the target distance. The two outputs may overlap or may be completely independent. For fill-level applications, set the window limits for Output 2 (pump-in) farther from the sensor than for Output 1 (pump-out); see Figure 3.

The distance between the taught near and far limits for each output MUST be at least 10 mm.

To readjust window limits for either output, follow the teach procedure for that output only.

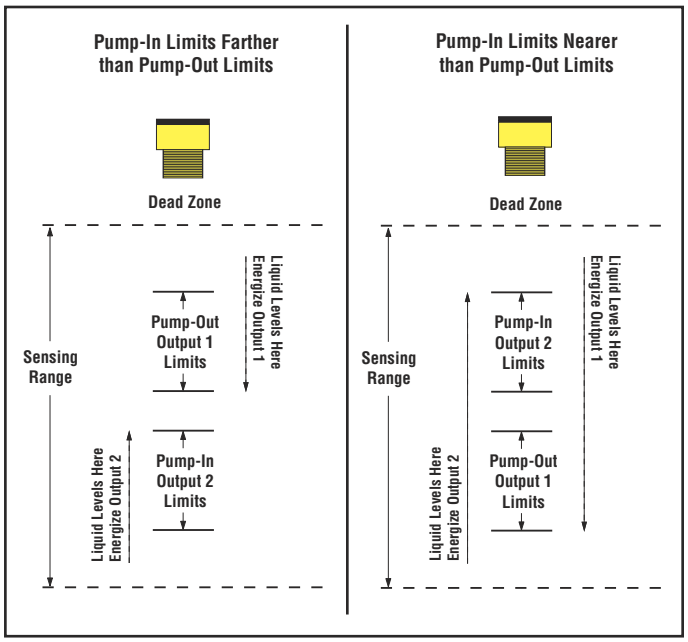


Figure 3. Programming separate sensing window limits for each output

	Push Button		Remote Wire 0.04 sec. < T < 0.8 sec.	
	Procedure	**Result**	**Procedure**	**Result**
Programming Mode	• Push and hold push button for selected output* > 2 sec.	• Green Power LED goes OFF • Corresponding Output LED turns ON Yellow • Sensor is waiting for first limit	No action required	
Teach First Limit	• Position the target for the first limit • "Click" the same push button	• After a short delay, the Yellow LED will flash • Sensor learns first limit and waits for second limit	• Position the target for the first limit **Output 1 (Pump-Out)** • Double-pulse the remote line (T T T) **Output 2 (Pump-In)** • Single-pulse the remote line (T)	• Green Power LED goes OFF • Corresponding Output LED turns ON Yellow • After a short delay, the Yellow LED will flash
Teach Second Limit	• Position the target for the second limit • "Click" the same push button	• After a short delay, the Green Power LED will go ON • Sensor learns second limit and returns automatically to RUN mode	• Position the target for the second limit • Single-pulse the remote line (T)	• After a short delay, the Green Power LED will go ON • Sensor learns second limit and returns automatically to RUN mode
Program Second Output	Repeat as needed for other output.			

* Sensor will return to RUN mode if first TEACH condition is not registered within 120 seconds.

Banner Engineering Corp. • Minneapolis, MN U.S.A.
www.bannerengineering.com • Tel: 763.544.3164

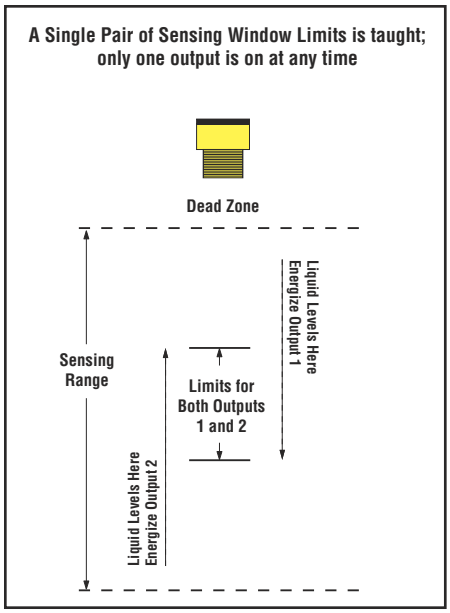


Figure 4. Programming one pair of sensing window limits, complementary outputs

Teaching Identical (Complementary) Window Limits for Both Outputs

Only one output conducts at any time in response to the target distance. Under no conditions will both outputs conduct at the same time; see page 2 and Figure 4.

The distance between the taught near and far limits MUST be at least 10 mm in this complementary mode for proper sensor operation.

	Push Button		Remote Wire 0.04 sec. < T < 0.8 sec.	
	Procedure	**Result**	**Procedure**	**Result**
Programming Mode	• Push and hold both push buttons (or press and hold one and then the other)* > 2 sec.	• Green Power LED goes OFF • Both Output LEDs turn ON Yellow • Sensor is waiting for first limit	No action required	
Teach First Limit	• Position the target for the first limit • "Click" either push button	• After a short delay, the Yellow LEDs will flash • Sensor learns first limit and waits for second limit	• Position the target for the first limit • Triple-pulse the remote line	• Green Power LED goes OFF • Both Output LEDs turn ON Yellow • After a short delay, the Yellow LEDs will flash
Teach Second Limit	• Position the target for the second limit • "Click" either push button	• After a short delay, the Green Power LED will go ON • Sensor learns second limit and returns automatically to RUN mode	• Position the target for the second limit • Single-pulse the remote line	• After a short delay, the Green Power LED will go ON • Sensor learns second limit and returns automatically to RUN mode

* Sensor will return to RUN mode if first TEACH condition is not registered within 120 seconds.

Push Button Lockout

	Push Button		Remote Wire 0.04 sec. < T < 0.8 sec.	
	Procedure	Result	Procedure	Result
Push Button Lockout	Not available via push button	Not applicable	• Four-pulse the remote line 	• Push buttons are either enabled or disabled, depending on previous condition.

RUN Mode

NOTE: All LED indicators momentarily go OFF when sensor changes state between PROGRAM and RUN modes.

Signal LED

The Red Signal LED indicates the strength and condition of the sensor's incoming signal.

Signal LED Status	Indicates
OFF	No signal is received, or the target is beyond the range limitations of the sensor (with some tolerance beyond the recommended minimum and maximum sensing distance)
Flashing	Relative received signal strength; the faster the LED flashes, the stronger the signal

Output LEDs

Each Yellow Output LED lights when the corresponding output (pump-in or pump-out) is energized.

Power ON/OFF LED

The Green Power ON/OFF LED indicates the operating status of the sensor.

Power ON/OFF LED	Indicates
OFF	Power is OFF (or in PROGRAM mode, if other LEDs are ON)
ON Solid	Sensor is operating normally (power is ON, RUN mode)
Flashing	Discrete output is overloaded (RUN mode)

Self-Diagnostic Error Mode

In the unlikely event of a microprocessor memory error, all of the LEDs will flash in sequence. If this occurs, the setup parameters have been lost and the sensor may be corrupt. Contact your Banner representative for further information.

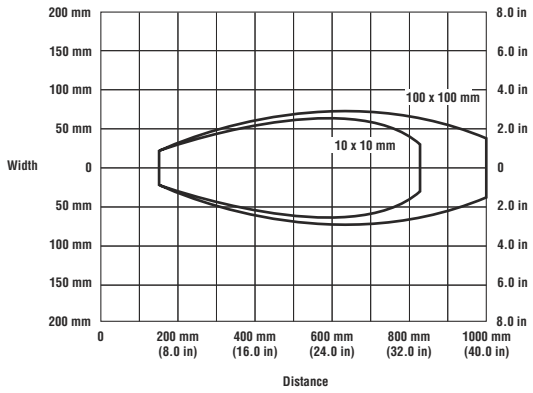
Specifications

Proximity Mode Range	**"A" suffix models:** 150 mm (5.9") min. near limit; 1 m (39") max. far limit **"B" suffix models:** 300 mm (11.8") min. near limit; 2 m (79") max. far limit
Supply Voltage	12 to 24V dc (10% max. ripple) at 90 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configurations	SPST solid-state switch; choose NPN (current sinking) or PNP (current sourcing) models
Output Ratings	**Dual Discrete Outputs:** 100 mA maximum, total – both outputs **OFF-state leakage current:** less than 10 microamps **ON-state saturation voltage:** less than 1V at 10 mA and less than 1.5V at 100 mA
Output Protection	Protected against continuous overload and short-circuit; transient over-voltage; no false pulse on power-up
Output Response Time	**"A" suffix models:** 48 milliseconds **"B" suffix models:** 96 milliseconds
Sensing Performance (Specified using a 10 cm x 10 cm aluminum target at 25ºC under fixed sensing conditions.)	**Sensing repeatability:** ±0.25% of distance **Minimum window size:** 10 mm (0.4") **Hysteresis of discrete output:** 2.5 mm (0.10")
Adjustments	**Sensing window limits:** TEACH-mode programming of near and far window limits may be set using membrane push buttons on sensor or remotely via TEACH input (see pages 3-5). Window limits may be programmed separately, or together.
Indicators	<table><tr><th>Four Status LEDs:</th><th>RUN Mode</th><th>PROGRAM Mode</th></tr><tr><td>Green</td><td>**ON** – Power ON, RUN mode **Flashing** – Output is overloaded</td><td>**OFF** – PROGRAM Mode</td></tr><tr><td>Red</td><td>**Flashing** – Relative received signal strength</td><td>**Flashing** – Relative received signal strength</td></tr><tr><td>Yellow (2)</td><td>**ON** – Output energized (conducting)</td><td>**ON** – Ready for first window limit **Flashing** – Ready for second limit **OFF** – Not teaching this output</td></tr></table>
Construction	Molded reinforced thermoplastic polyester housing
Environmental Rating	Leakproof design is rated IEC IP67; NEMA 6P
Connections	2 m (6.5') or 9 m (30') 5-conductor PVC-covered attached cable, or 5-pin Euro-style quick-disconnect fitting (see page 9 for optional quick-disconnect cables)
Operating Conditions	**Temperature:** -20° to +70° C (-4° to 158° F) **Maximum relative humidity:** 100%
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration: 10 to 60Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G, 11 ms duration, half sine wave.
Application Notes	Objects passing inside the specified near limit will produce a false response.
Certifications	CE

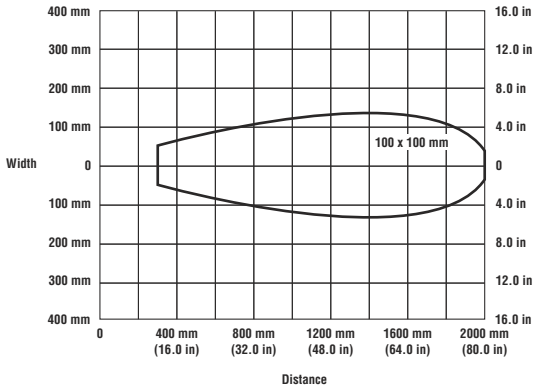
Performance Curves

With Plate Target (Typical)

1-Meter Models

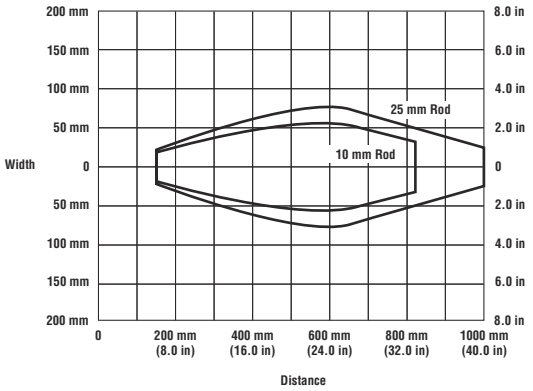


2-Meter Models

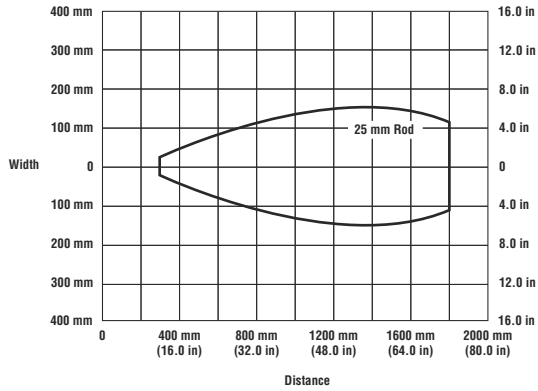


With Rod Target (Typical)

1-Meter Models

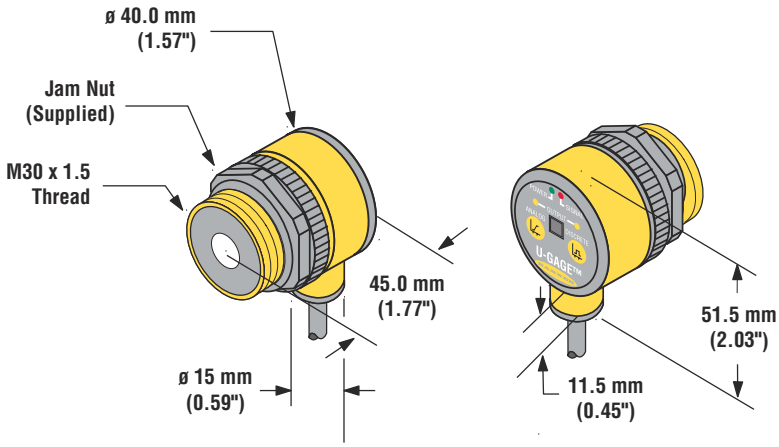


2-Meter Models

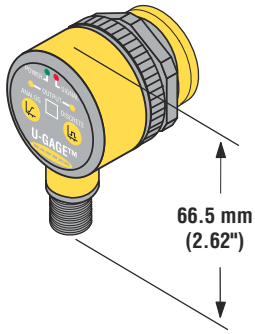


Dimensions

Cabled Models

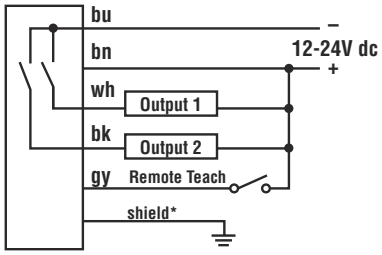


Quick-Disconnect Models

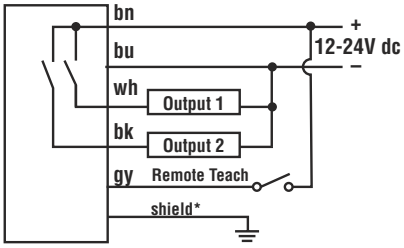


Hookups

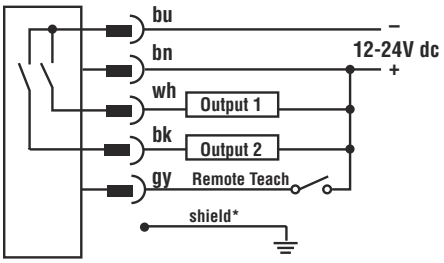
Cabled NPN



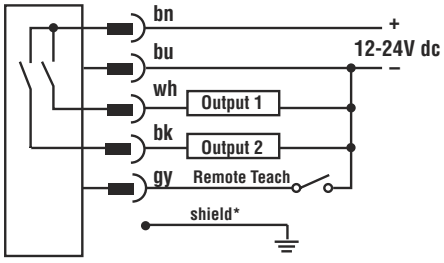
Cabled PNP



Quick-Disconnect NPN



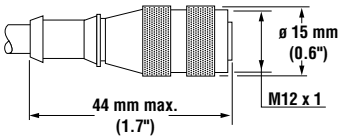
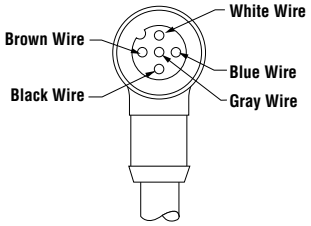
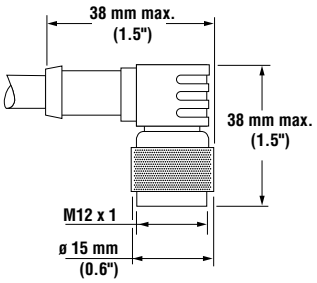
Quick-Disconnect PNP



* It is recommended that the shield wire be connected to earth ground or dc common.

Accessories

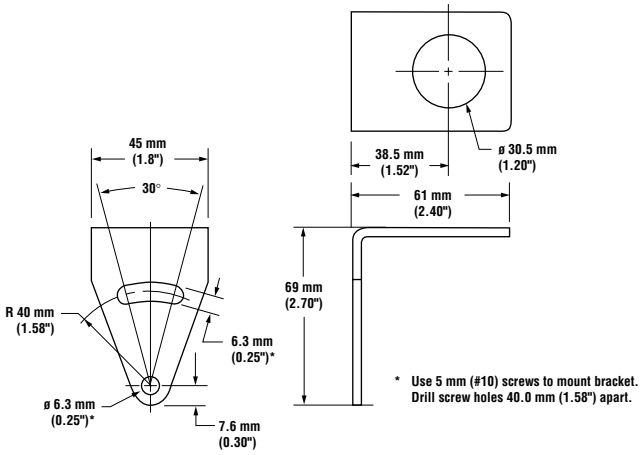
Quick-Disconnect (QD) Cables

Style	Model	Length	Connector	Pin-Out
5-Pin Euro-style Straight with shield	**MQDEC2-506** **MQDEC2-515** **MQDEC2-530**	2 m (6.5') 5 m (15') 9 m (30')		
5-Pin Euro-style Right-angle with shield	**MQDEC2-506RA** **MQDEC2-515RA** **MQDEC2-530RA**	2 m (6.5') 5 m (15') 9 m (30')		

Mounting Brackets

SMB30A

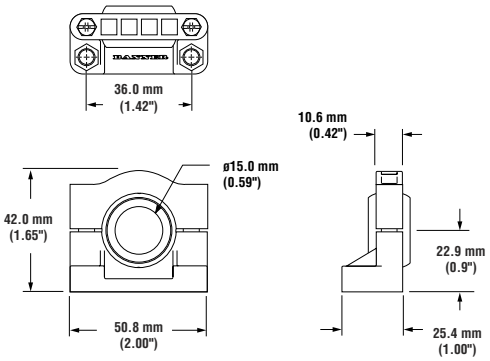
- Angled-mount bracket
- Stainless steel



SMB1815SF

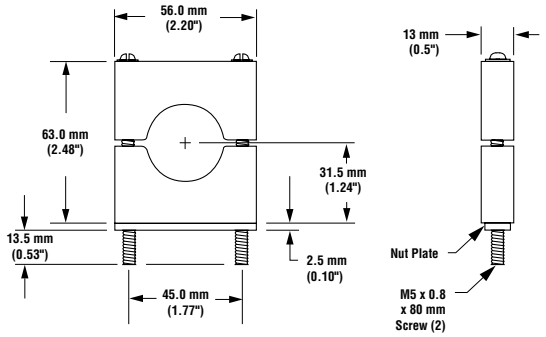
- Compact 15 mm split clamp with swivel, black reinforced thermoplastic polyester
- Stainless steel hardware included

The 15 mm diameter hub of the T30 is mounted into the swivel using two set screws.



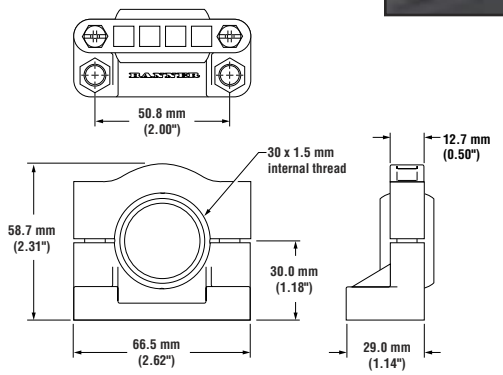
SMB30C

- 30 mm split clamp, black reinforced thermoplastic polyester
- Stainless steel hardware included



SMB30SC

- 30 mm split clamp with swivel, black reinforced thermoplastic polyester
- Stainless steel hardware included



U-GAGE® T30U Series with Pump-In/Pump-Out Switching Logic

more sensors, more solutions

P/N 63974 Rev. B

Banner Engineering Corp., 9714 Tenth Ave. No., Mpls, MN 55441 • Ph: 612.544.3164 • www.bannerengineering.com • Email: sensors@bannerengineering.com