



# U-GAGE<sup>®</sup> Chemically Resistant Ultrasonic Sensors

Teflon<sup>®</sup>-protected sensors for harsh environments



## Features

- Available option for all Banner QT50U and T30U..B models.
- Factory-installed Teflon flange and film coating bonded over the transducer provide protection from harsh environments.
- The flange is sealed to the sensor face using a Viton<sup>®</sup> o-ring; other o-ring materials may be specified (contact factory).
- Performance specifications for these models are identical to those of corresponding standard models, with the exception of reduced sensing range (see Performance Curves below).
- Sensor dimensions and mounting vary somewhat from corresponding standard models (see dimensions on reverse).

Teflon<sup>®</sup> is a registered trademark of Dupont<sup>™</sup>

Viton<sup>®</sup> is a registered trademark of Dupont Dow Elastomers

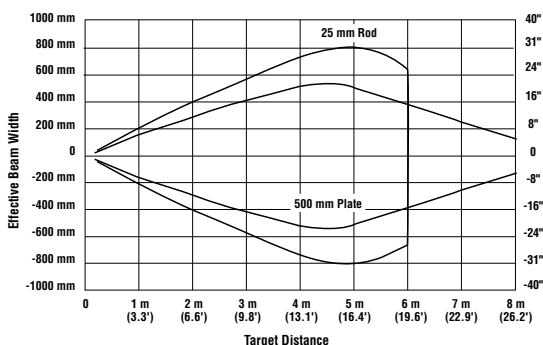
## Models

Add suffix “-CRFV” to the model number of any standard QT50U or T30U..B model sensor to get this option. For example: **QT50ULBQ6-CRFV** or **T30UINB-CRFV**. Consult factory for information on T30U..A models.

## Performance Curves

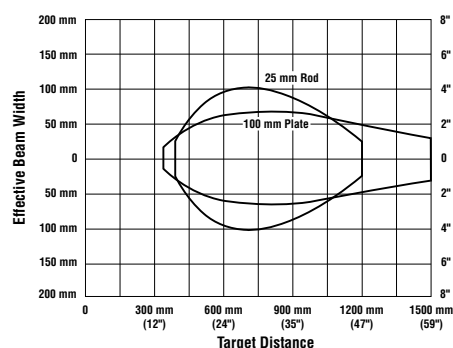
**QT50U Max. Sensing Range: 200 mm to 8 m (8" to 26')**

**QT50U Effective Beam Pattern (Typical)**



**T30U..B Max. Sensing Range: 300 mm to 1.5 m (12" to 5')**

**T30U..B Effective Beam Pattern (Typical)**



# U-GAGE® QT50U and T30U Chemically Resistant Ultrasonic Sensors

## Installation

The sensor may be threaded directly into the side of a tank (see dimensions for hole diameter and thread specifications), or into a non-threaded hole, using the included threaded nut.

For a non-threaded hole, install an o-ring onto the flange, and insert the flange completely into the hole until the sensor front surface is against the tank's exterior surface. Place the other o-ring into the groove on the Teflon nut, and thread the nut onto the flange (see Figure 1). Tighten enough to eliminate gaps between the flange and the tank surface. This will ensure that the o-rings are fully compressed.

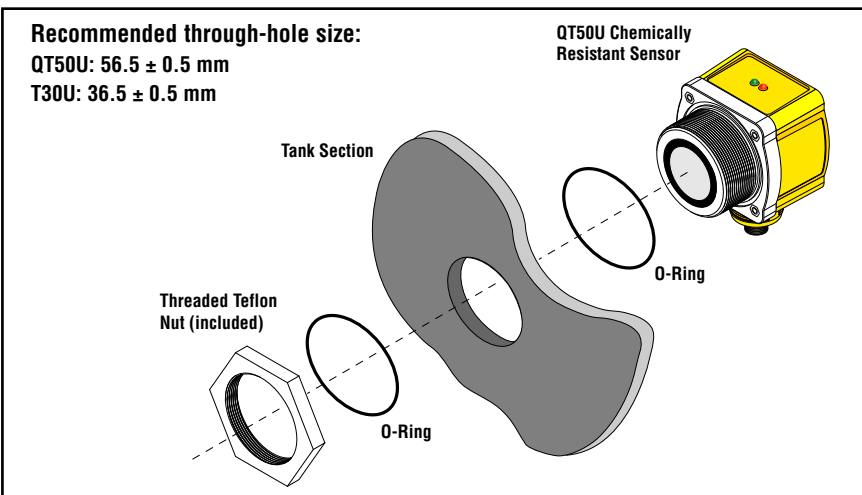
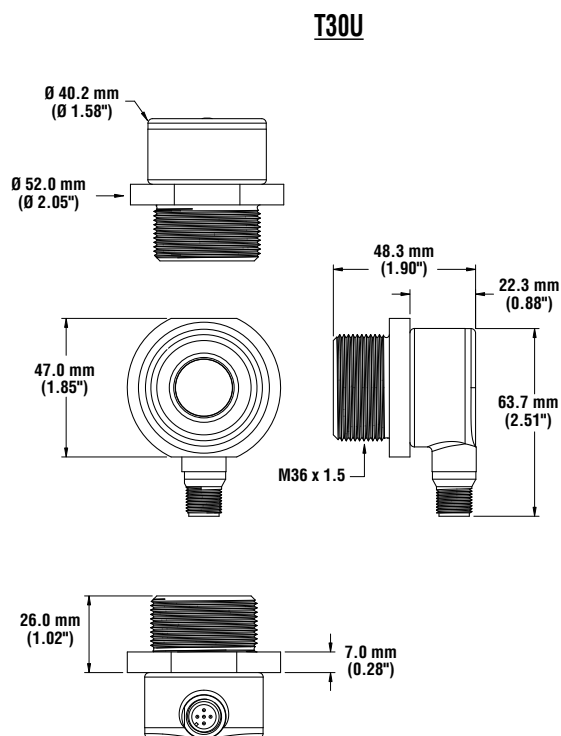
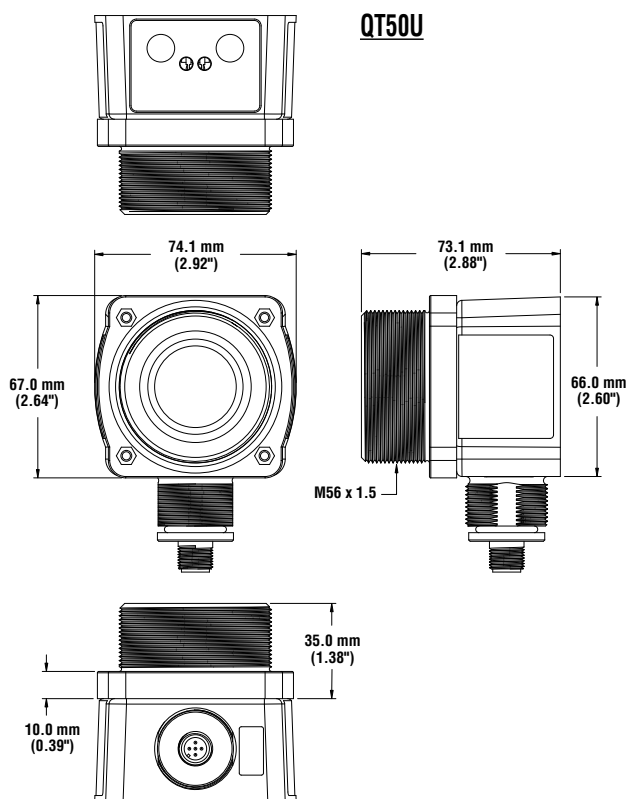


Figure 1. Installing the sensor into a non-threaded hole in a tank

## Dimensions

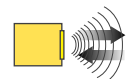
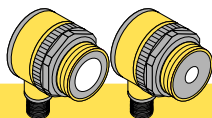


**WARRANTY:** Banner Engineering Corp. warrants its products to be free from defects for one year. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture found to be defective at the time it is returned to the factory during the warranty period. This warranty does not cover damage or liability for the improper application of Banner products. This warranty is in lieu of any other warranty either expressed or implied.

## Dual-Discrete U-GAGE T30 Series Features



- Fast, easy-to-use TEACH-mode programming; no potentiometer adjustments
- Choose to set a specific window size and position, or a set point centered within its own 10-mm window, for either or both outputs
- Program both outputs together or independently. The two outputs may be identical, independent, overlapping, or 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

## Dual-Discrete U-GAGE T30 Series Models

Models	Range and Frequency	Cable*	Supply Voltage	Discrete Output	Response Time
T30UDNA T30UDNAQ	150 mm to 1 m (5.9" to 39")	2 m (6.5') 5-pin Euro QD	12 to 24V dc	NPN (sinking)	48 milliseconds
T30UDPA T30UDPAQ	228 kHz	2 m (6.5') 5-pin Euro QD		PNP (sourcing)	
T30UDNB T30UDNBQ	300 mm to 2 m (11.8" to 79")	2 m (6.5') 5-pin Euro QD		NPN (sinking)	96 milliseconds
T30UDPB T30UDPBQ	128 kHz	2 m (6.5') 5-pin Euro QD		PNP (sourcing)	

**\*\*NOTES:**

- 9 m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., Q45UDNA W/30).
- A model with a QD connector requires an optional mating cable; see page 8.



### 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™ T30 Series with Dual Discrete Outputs

## Dual-Discrete U-GAGE T30 Series 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. Each output has the option of being set with a sensing distance set point centered within a 10-mm window.

## Dual-Discrete U-GAGE T30 Series Programming

Window limits may be taught to the sensor in several ways. The following methods describe the programming procedures using the push buttons on the back of the sensor; remote programming (remote TEACH) procedures are described on page 4.

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 below. The sensing window limits expand temporarily to full scale (max range) during PROGRAM mode.

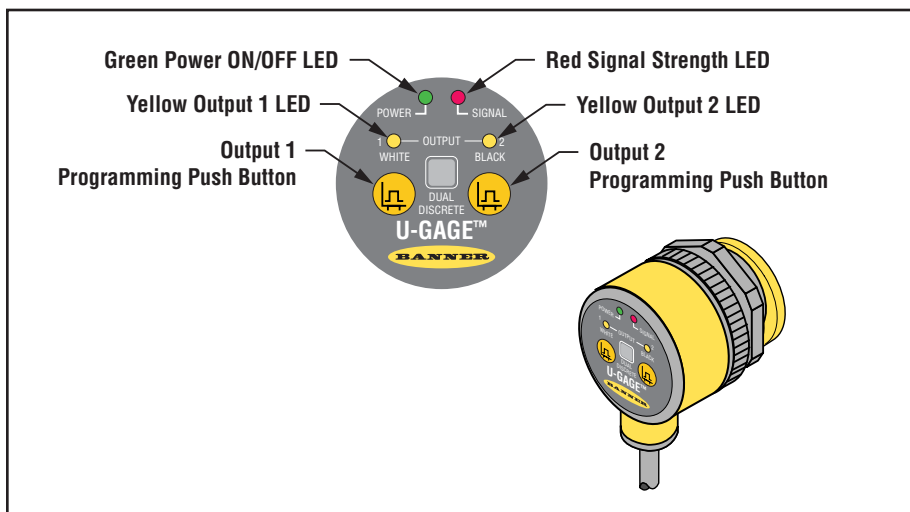


Figure 1. U-GAGE T30 Series sensor programming push buttons and indicators

Program the outputs independently to define separate sensing windows (both their size and placement) or program the outputs simultaneously for complementary or fixed-field 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  
Output 2 = Black wire

# U-GAGE™ T30 Series with Dual Discrete Outputs

## 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.
4. The sensor allows for some forgiveness in the teaching of a set point. If both near and far limits are not exactly the same (but are closer than the minimum 10-mm required to define a window), the sensor will set a 10-mm window with the center at the “average” of the two limits.

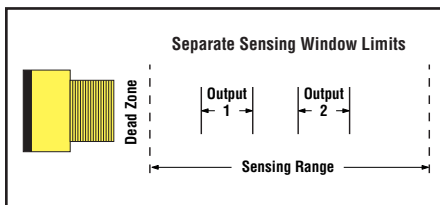


Figure 2a. Programming separate sensing window limits

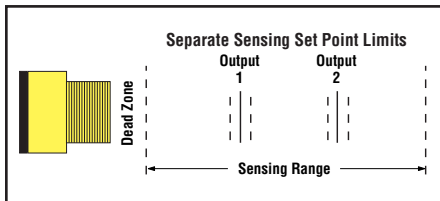


Figure 2b. Programming separate sensing set point limits

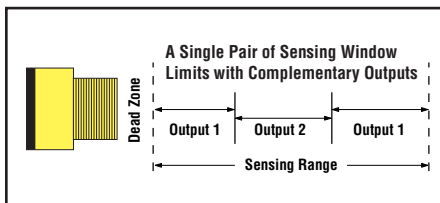


Figure 2c. Programming a single pair of sensing window limits, complementary outputs

## To Program Separate Sensing Window Limits

Each output conducts when the target is inside that output's window limits. The two sets of window limits may overlap or be completely independent. See Figure 2a.

1. Press and hold the push button for the selected output until the green Power LED goes OFF and the yellow LED for the programmed output comes ON.
2. Position the target at the first limit and click the push button. The yellow Output LED flashes.
3. Position the target at the second limit and click the push button. The green Power LED comes ON. The sensor is in RUN mode.
4. Repeat the procedure for the second output, if desired.

## To Program Separate Sensing Set Point Limits

Each output conducts when the target is inside that output's 10-mm limits (centered on the taught set point, or the average of the two limits). The window limits for the two outputs may overlap or be completely independent. See Figure 2b.

1. Press and hold the push button for the selected output until the green Power LED goes OFF and the yellow LED for the programmed output comes ON.
2. Position the target at the set point and click the push button. The yellow Output LED flashes.
3. While the target remains at the first limit (or within 10 mm), click the push button once more. The green Power LED comes ON. The sensor is in RUN mode.
4. Repeat the procedure for the second output, if desired.

## To Program A Single Pair of Sensing Window Limits, with Complementary Outputs

Output 2 conducts when inside the programmed window limits; Output 1 conducts for all other conditions. See Figure 2c.

1. Press and hold both push buttons (or press and hold one and then the other) until the green Power LED goes OFF and both yellow Output LEDs come ON.
2. Position the target at the first limit and click a push button. The yellow Output LED flashes.
3. Position the target at the second limit and click a push button. The green Power LED comes ON. The sensor is in RUN mode.

NOTE: The window limits must be  $\geq 10$  mm or the sensor will default to fixed-field style.

# U-GAGE™ T30 Series with Dual Discrete Outputs

## To Program A Single Sensing Set Point, with Complementary Outputs (Fixed-Field Style)

Output 2 conducts when inside the programmed set point; Output 1 conducts outside (away) from this point. See Figure 2d.

1. Press and hold both push buttons (or press and hold one and then the other) until the green Power LED goes OFF and both yellow Output LEDs come ON.
2. Position the target at the first limit and click a push button. The yellow Output LED flashes.
3. While the target remains at the first limit (or within 10 mm), click the push button once more. The green Power LED comes ON. The sensor is in RUN mode.

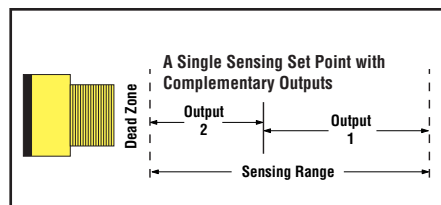


Figure 2d. Programming separate sensing set point limits, complementary outputs

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

- 1 pulse: Programs first Output 2 limit. Wait  $> 0.8 \text{ sec}$ . Next pulse programs second Output 2 limit.
- 2 pulses: Programs first Output 1 limit. Wait  $> 0.8 \text{ sec}$ . Next pulse programs second Output 1 limit.
- 3 pulses: Programs both outputs together (complementary or fixed-field mode). First 3-pulse programs the first limit; wait  $> 0.8 \text{ sec}$ . Next pulse programs second limit and determines output configuration.
- 4 pulses: Disables (locks out) or enables the keypad for security.

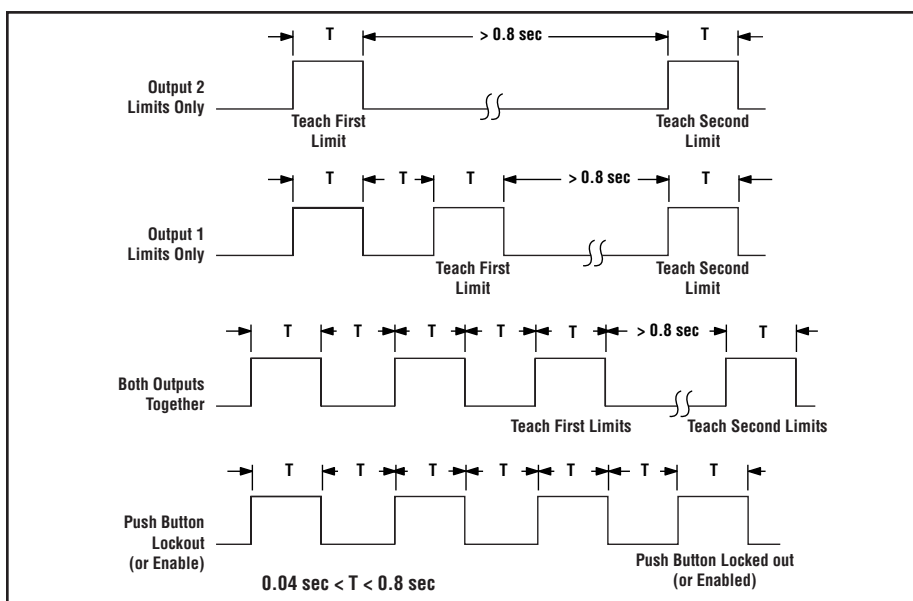


Figure 3. Timing programs for remote TEACH programming

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.

# U-GAGE™ T30 Series with Dual Discrete Outputs

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## 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 a target is sensed within the programmed window limits.

### 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.

# U-GAGE™ T30 Series with Dual Discrete Outputs

## U-GAGE T30 Series Specifications

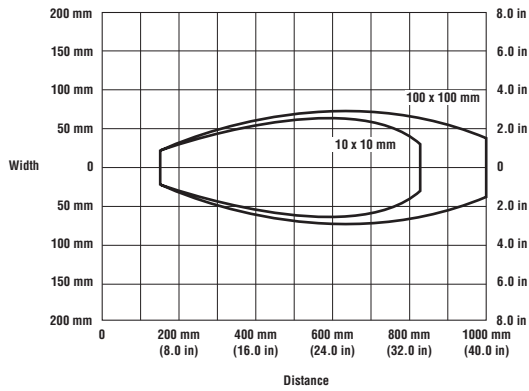
<b>Proximity Mode Range</b>	<p><b>“A” suffix models:</b> 150 mm (5.9") min. near limit; 1 m (39") max. far limit</p> <p><b>“B” suffix models:</b> 300 mm (11.8") min. near limit; 2 m (79") max. far limit</p>
<b>Supply Voltage</b>	12 to 24V dc (10% max. ripple) at 90 mA, exclusive of load
<b>Supply Protection Circuitry</b>	Protected against reverse polarity and transient voltages
<b>Output Configurations</b>	SPST solid-state switch conducts when target is sensed within sensing window; choose NPN (current sinking) or PNP (current sourcing) models
<b>Output Ratings</b>	<p><b>Dual Discrete Outputs:</b> 100 mA maximum, total – both outputs</p> <p><b>OFF-state leakage current:</b> less than 10 microamps</p> <p><b>ON-state saturation voltage:</b> less than 1V at 10 mA and less than 1.5V at 100 mA</p>
<b>Output Protection</b>	Protected against continuous overload and short-circuit; transient over-voltage; no false pulse on power-up
<b>Output Response Time</b>	<p><b>“A” suffix models:</b> 48 milliseconds</p> <p><b>“B” suffix models:</b> 96 milliseconds</p>
<b>Sensing Performance</b> (Specified using a 10 cm x 10 cm aluminum target at 25°C under fixed sensing conditions.)	<p><b>Sensing repeatability:</b> ±0.25% of distance</p> <p><b>Minimum window size:</b> 10 mm (0.4")</p> <p><b>Hysteresis of discrete output:</b> 2.5 mm (0.10")</p>
<b>Adjustments</b>	<b>Sensing window limits:</b> 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 2-4). Window limits may be programmed separately, or together.
<b>Indicators</b>	<p><b>Four status LEDs:</b></p> <p><b>In RUN mode:</b></p> <p>Green                      ON = Power ON, RUN mode</p> <p>                                    Flashing = Output is overloaded</p> <p>Red                            Flashing = Relative received signal strength</p> <p>Yellow                        ON = Output is conducting</p> <p><b>In Program mode:</b></p> <p>Green                        OFF = PROGRAM mode</p> <p>Red                            Flashing = Relative received signal strength</p> <p>Yellow                        { ON = Ready for first window limit</p> <p>                                    Flashing = Ready for second limit</p> <p>                                    OFF = Not teaching this output</p>
<b>Construction</b>	Molded reinforced thermoplastic polyester housing
<b>Environmental Rating</b>	Leakproof design is rated IEC IP67; NEMA 6P
<b>Connections</b>	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)
<b>Operating Conditions</b>	<p><b>Temperature:</b> -20° to +70° C (-4° to 158° F)</p> <p><b>Maximum relative humidity:</b> 100%</p>
<b>Vibration and Mechanical Shock</b>	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.
<b>Application Notes</b>	Objects passing inside the specified near limit will produce a false response.
<b>Certifications</b>	

# U-GAGE™ T30 Series with Dual Discrete Outputs

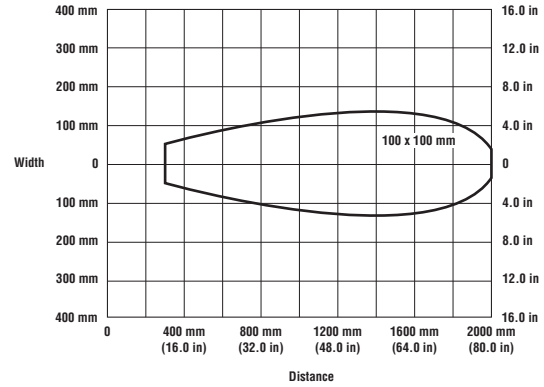
## U-GAGE T30 Series Performance Curves

### With Plate Target (Typical)

#### 1-Meter Models

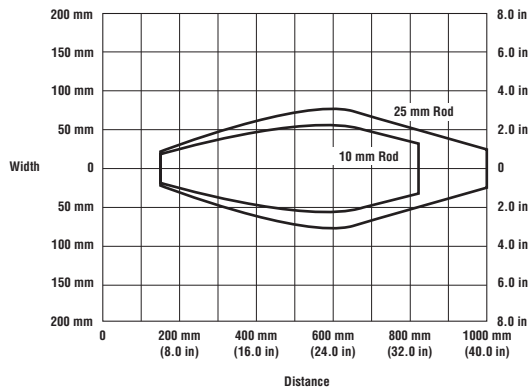


#### 2-Meter Models

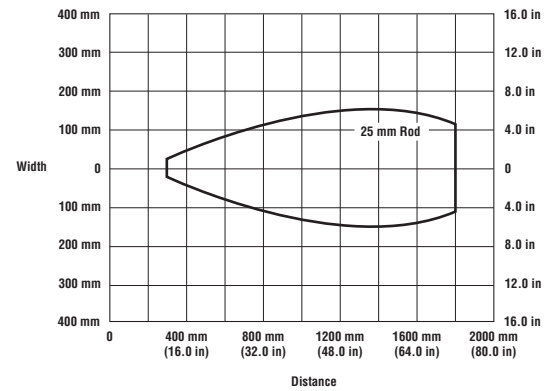


### With Rod Target (Typical)

#### 1-Meter Models

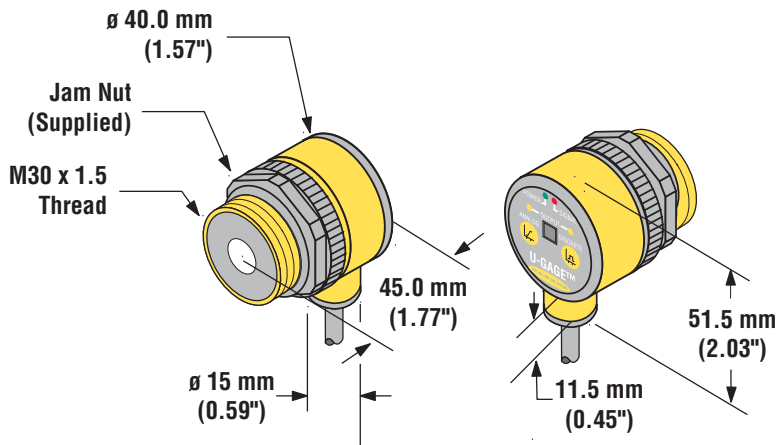


#### 2-Meter Models

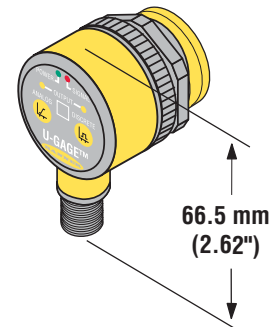


## Dual-Discrete U-GAGE T30 Series Dimensions

### Cabled Models



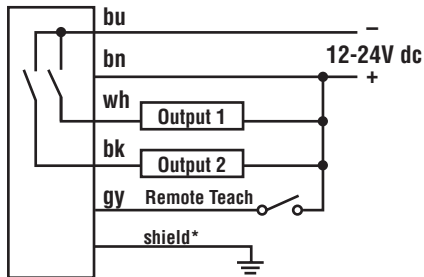
### Quick-Disconnect Models



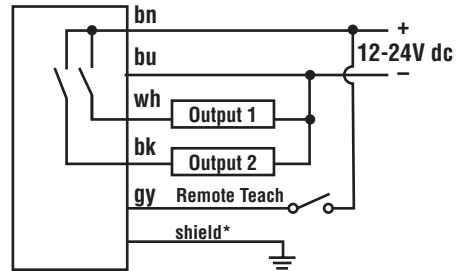
# U-GAGE™ T30 Series with Dual Discrete Outputs

## Dual-Discrete U-GAGE T30 Series Hookups

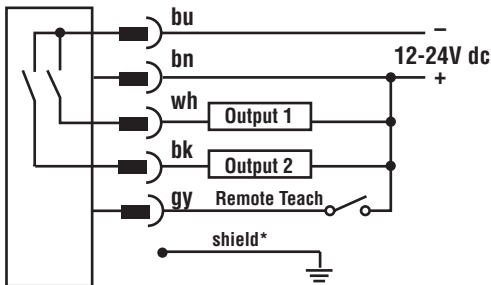
### Cabled NPN



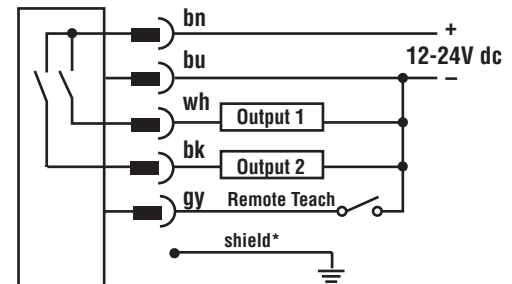
### Cabled PNP



### Quick-Disconnect NPN



### Quick-Disconnect PNP



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


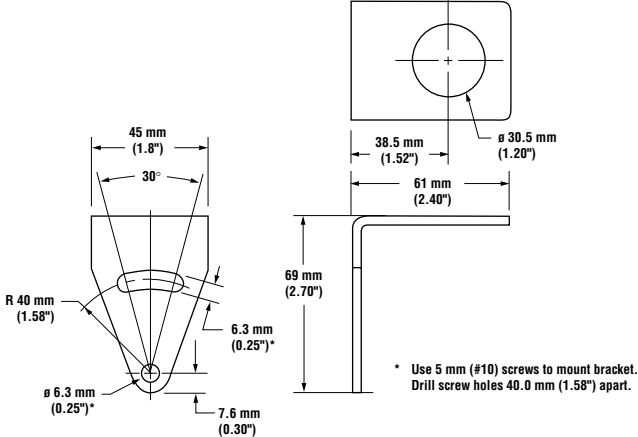

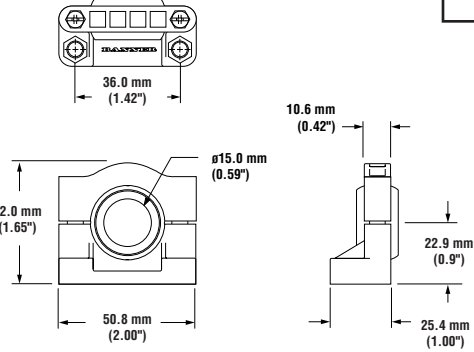

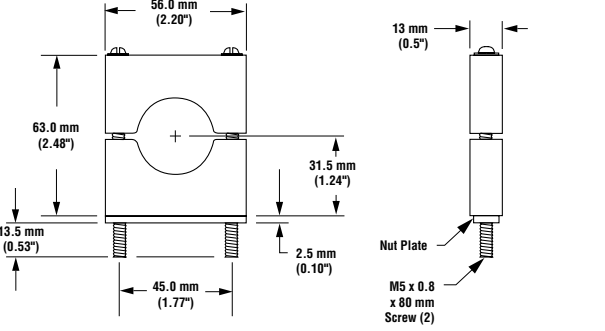

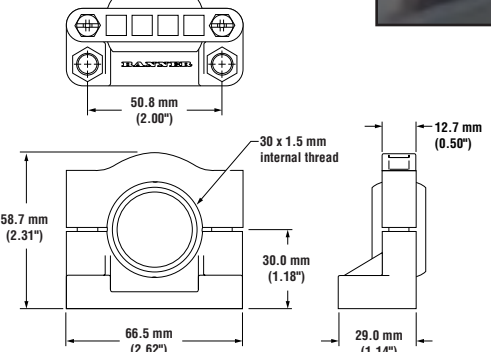
## Accessories

### 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')	<p>44 mm max. (1.7") ø 15 mm (0.6") M12 x 1</p>	<p>White Wire Blue Wire Gray Wire Black Wire Brown Wire</p>
5-Pin Euro-style Right-angle with shield	MQDEC2-506RA MQDEC2-515RA MQDEC2-530RA	2 m (6.5') 5 m (15') 9 m (30')	<p>38 mm max. (1.5") 38 mm max. (1.5") M12 x 1 ø 15 mm (0.6")</p>	

# U-GAGE™ T30 Series with Dual Discrete Outputs

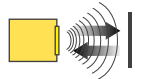
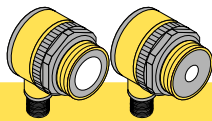
## Mounting Brackets

<b>SMB30A</b> <ul style="list-style-type: none"> <li>• Angled-mount bracket</li> <li>• Stainless steel</li> </ul>	<b>SMB1815SF</b> <ul style="list-style-type: none"> <li>• Compact 30 mm split clamp with swivel, black reinforced thermoplastic polyester</li> <li>• Stainless steel hardware included</li> </ul>
  <p>* Use 5 mm (#10) screws to mount bracket. Drill screw holes 40.0 mm (1.58\" data-bbox="348 488 498 504"/&gt; </p>	<p>The 15 mm diameter hub of the T30 is mounted into the swivel using two set screws.</p>  
<b>SMB30C</b> <ul style="list-style-type: none"> <li>• 30 mm split clamp, black reinforced thermoplastic polyester</li> <li>• Stainless steel hardware included</li> </ul>	<b>SMB30SC</b> <ul style="list-style-type: none"> <li>• 30 mm split clamp with swivel, black reinforced thermoplastic polyester</li> <li>• Stainless steel hardware included</li> </ul>
  <p>Nut Plate</p> <p>M5 x 0.8 x 80 mm Screw (2)</p>	  <p>30 x 1.5 mm internal thread</p>

## U-GAGE T30 Series Features



- Fast, easy-to-use TEACH-mode programming; no potentiometer adjustments
- Program both outputs together or independently, with either an upward or a downward analog output slope
- Remote TEACH input for security and convenience
- Choose models with 150 mm to 1 m range (7.9" 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 NPN or PNP discrete output, plus 0 to 10V dc or 4 to 20 mA sourcing analog output
- LED indicators for Power ON/OFF; Signal Strength; and Analog/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

## U-GAGE T30 Series Proximity Mode Models

Models	Range and Frequency	Cable*	Supply Voltage	Discrete Output	Analog Output	Response Time
T30UINA T30UINAQ	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)	4 to 20 mA Sourcing	48 milliseconds
T30UIPA T30UIPAQ		2 m (6.5') 5-pin Euro QD		PNP (sourcing)		
T30UUNA T30UUNAQ		2 m (6.5') 5-pin Euro QD	15 to 24V dc	NPN (sinking)	0 to 10V dc Sourcing	
T30UUPA T30UUPAQ		2 m (6.5') 5-pin Euro QD		PNP (sourcing)		
T30UINB T30UINBQ	300 mm to 2 m (11.8" to 79")  128 kHz	2 m (6.5') 5-pin Euro QD	12 to 24V dc	NPN (sinking)	4 to 20 mA Sourcing	96 milliseconds
T30UIPB T30UIPBQ		2 m (6.5') 5-pin Euro QD		PNP (sourcing)		
T30UUNB T30UUNBQ		2 m (6.5') 5-pin Euro QD	15 to 24V dc	NPN (sinking)	0 to 10V dc Sourcing	
T30UUPB T30UUPBQ		2 m (6.5') 5-pin Euro QD		PNP (sourcing)		

\*NOTES:

- 9 m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., T30UINA/30).
- A model with a QD connector requires an optional mating cable, see page 9.

# U-GAGE™ T30 Series with Analog and Discrete Outputs

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## U-GAGE T30 Series 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 measurement applications such as sensing of liquid levels in a tank or, for example, determining box heights for sorting purposes.

Each sensor includes both an analog and a discrete output, which may be programmed independently with different window limits or together with identical limits. Each output has the option of being set with a sensing distance set point centered within a 10-mm window.

## U-GAGE T30 Series Programming

### Window Limits

Window limits may be taught to the sensor in several ways. The following methods describe the programming procedures using the push buttons on the back of the sensor; remote programming (remote TEACH) procedures are described on page 4.

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 below. The sensing window limits expand temporarily to full scale (max range) during PROGRAM mode.

### Teaching Limits for Either Analog or Discrete Output

1. Choose the output for the first set of window limits (analog or discrete) and push and hold the corresponding button until the green Power LED goes OFF and the appropriate yellow Output LED turns ON (solid). This indicates the sensor is waiting for the first limit.
2. Position the target for the first limit and briefly “click” the same button. This will teach the sensor the first limit. The yellow Output LED will flash to acknowledge receiving the first window limit; it is now waiting for the second limit.
3. Position the target for the second limit and “click” the button again. This will teach the sensor the second limit. The yellow Output LED turns OFF and the green Power LED comes ON; the sensor is now in normal RUN mode.
4. Repeat for the other output (analog or discrete) if a second output is desired.

NOTE: Press and hold the same 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.

### Teaching Analog or Discrete Limits Using the Auto-Zero Feature

For some applications, a sensing distance set point centered within a minimum sensing window may be required. The TEACH procedure for this application is simple: teaching the same limit twice causes the sensor to program a 10-mm window centered on the position taught (position  $\pm 5$  mm).

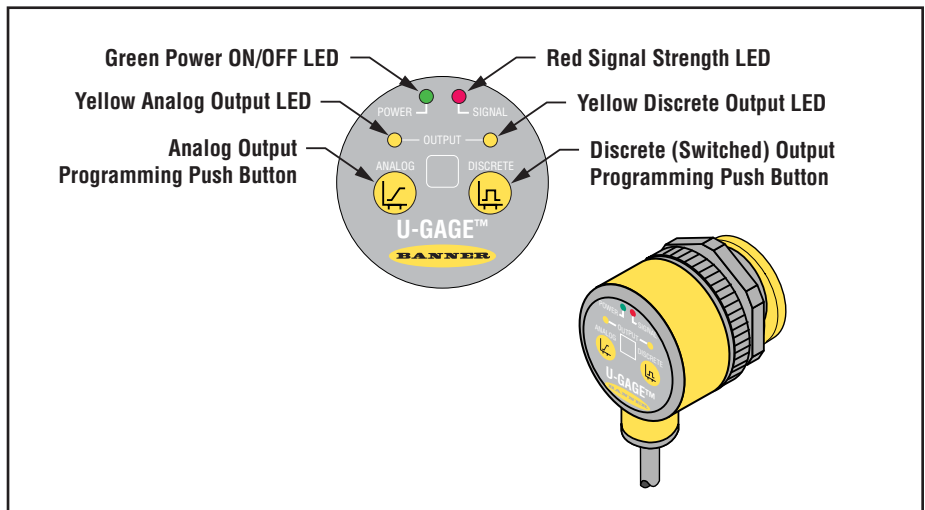
NOTE: The sensor allows for some forgiveness in this procedure. If the two limits are not exactly the same (but closer than the minimum 10-mm window required), the sensor will put the set point at the “average” of the two limits.

# U-GAGE™ T30 Series with Analog and Discrete Outputs

## Teaching Identical Limits for Both Analog and Discrete Outputs Simultaneously

To set both the analog and the discrete outputs at exactly the same limits, both may be set simultaneously.

1. Push and hold either the Analog or the Discrete programming push button until the yellow Output LED turns ON. Push and hold the other push button until its yellow Output LED turns ON. The sensor is waiting for the first limit.
2. Position the target for the first limit and “click” either programming push button. Both yellow LEDs will flash to acknowledge receiving the first window limit; the sensor is now waiting for the second limit.
3. Position the target for the second limit and “click” either button again to teach the sensor the second limit.
4. The green Power LED will come ON to indicate that the sensor will now function in normal RUN mode; both yellow Output LEDs will remain ON if the outputs are conducting within the window limits.



**Figure 1. U-GAGE T30 Series sensor programming push buttons and indicators**

## 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.

# U-GAGE™ T30 Series with Analog and Discrete Outputs

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

- 1 pulse: Programs first discrete limit. Wait  $> 0.8 \text{ sec}$ . Next pulse programs second discrete limit.
- 2 pulses: Programs first analog limit. Wait  $> 0.8 \text{ sec}$ . Next pulse programs second analog limit.
- 3 pulses: Programs first analog and discrete limit. Wait  $> 0.8 \text{ sec}$ . Next pulse programs second analog and discrete limit.
- 4 pulses: Disables (locks out) or enables the keypad for security.

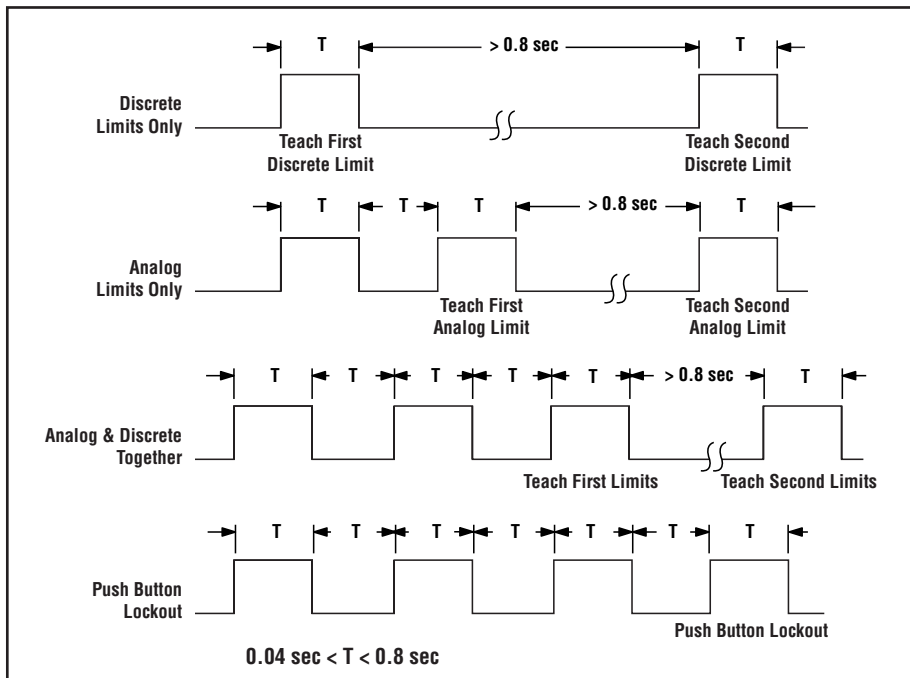


Figure 2. Timing programs for remote TEACH programming

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

# U-GAGE™ T30 Series with Analog and Discrete Outputs

## 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

### Output LEDs

Each yellow Output LED lights when a target is sensed within the programmed window limits.

### 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)

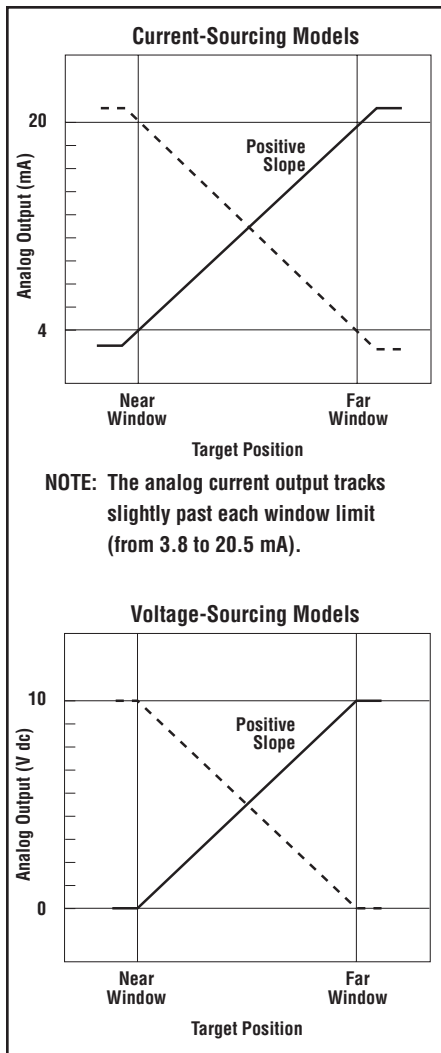


Figure 3. Output current as a function of target position

## Analog Output

The U-GAGE T30 Series sensor may be programmed for either a positive or a negative output slope, based on which condition is taught first (see Figure 3). If the near limit is taught first, the slope will be positive; if the far limit is taught first, the slope will be negative. Banner's scalable analog output automatically distributes the output signal over the width of the programmed sensing window.

The U-GAGE T30 also features a 2-second hold upon loss of the analog signal, which is useful for harsh and unstable applications. In the event of analog signal loss for longer than 2 seconds, the analog output goes to 3.6 mA or 0V dc, which may be used to trigger an alarm.

## 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.


# U-GAGE™ T30 Series with Analog and Discrete Outputs

## U-GAGE T30 Series Specifications

<b>Proximity Mode Range</b>	<p>“A” suffix models: 150 mm (5.9") min. near limit; 1 m (39") max. far limit</p> <p>“B” suffix models: 300 mm (11.8") min. near limit; 2 m (79") max. far limit</p>																																							
<b>Supply Voltage</b>	<p><b>Current-sourcing analog output models:</b> 12 to 24V dc (10% max. ripple) at 90 mA, exclusive of load</p> <p><b>Voltage-sourcing analog output models:</b> 15 to 24V dc (10% max. ripple) at 90 mA, exclusive of load</p>																																							
<b>Supply Protection Circuitry</b>	Protected against reverse polarity and transient voltages																																							
<b>Output Configurations</b>	<p><b>Discrete (switched) output:</b> SPST solid-state switch conducts when target is sensed within sensing window; choose NPN (current sinking) or PNP (current sourcing) models</p> <p><b>Analog output:</b> Choose 0 to 10V dc sourcing or 4 to 20 mA sourcing output models; output slope may be selected via TEACH sequence (see Window Limit Programming on pages 2-4)</p>																																							
<b>Output Ratings</b>	<p><b>Discrete (switched) output:</b> 100 mA maximum</p> <p><b>Off-state leakage current:</b> less than 5 microamps</p> <p><b>On-state saturation voltage:</b> less than 1V at 10 mA and less than 1.5V at 100 mA</p> <p><b>Analog output:</b></p> <p><b>Voltage sourcing:</b> 0 to 10V dc (at 1K ohm minimum resistance)</p> <p><b>Current sourcing:</b> 4 to 20 mA, 1 ohm to Rmax</p> $R_{max} = \frac{V_{supply} - 7V}{20 \text{ mA}}$																																							
<b>Output Protection</b>	Protected against continuous overload and short-circuit; transient over-voltage; no false pulse on power-up																																							
<b>Output Response Time</b>	<p><b>Discrete output:</b></p> <p>“A” suffix models: 48 milliseconds</p> <p>“B” suffix models: 96 milliseconds</p> <p><b>Analog output:</b></p> <p>“A” suffix models: 48 milliseconds average, 16-millisecond update</p> <p>“B” suffix models: 96 milliseconds average, 32-millisecond update</p>																																							
<b>Sensing Performance</b> (Specified using a 10 cm x 10 cm aluminum target at 25°C under fixed sensing conditions.)	<p><b>Analog sensing resolution:</b> ±0.25% of measured distance</p> <p><b>Analog linearity:</b> ±0.5% of full-scale sensing range</p> <p><b>Sensing repeatability:</b> ±0.25% of distance</p> <p><b>Minimum window size:</b> 10 mm (0.4")</p> <p><b>Hysteresis of discrete output:</b> 2.5 mm (0.10")</p>																																							
<b>Adjustments</b>	<p><b>Sensing window limits (analog or discrete):</b> 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 2-4). Discrete and analog window limits may be programmed separately, or together.</p> <p><b>Analog output slope:</b> the first limit taught is assigned to the minimum output value (4 mA or 0V)</p>																																							
<b>Indicators</b>	<p><b>Four status LEDs:</b></p> <p><b>In RUN mode:</b></p> <table style="border: none;"> <tr> <td style="padding-right: 10px;">Green</td> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 10px;">ON = Power ON, RUN mode</td> </tr> <tr> <td></td> <td></td> <td style="padding-left: 10px;">Flashing = Discrete output is overloaded</td> </tr> <tr> <td>Red</td> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 10px;">Flashing = Relative received signal strength</td> </tr> <tr> <td>Yellow analog</td> <td></td> <td style="padding-left: 10px;">ON = Target is inside window limits</td> </tr> <tr> <td>Yellow discrete</td> <td></td> <td style="padding-left: 10px;">ON = Output conducting</td> </tr> </table> <p><b>In Program mode:</b></p> <table style="border: none;"> <tr> <td style="padding-right: 10px;">Green</td> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 10px;">OFF = PROGRAM mode</td> </tr> <tr> <td>Red</td> <td></td> <td style="padding-left: 10px;">Flashing = Relative received signal strength</td> </tr> <tr> <td>Yellow analog</td> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 10px;">ON = Ready for first window limit</td> </tr> <tr> <td></td> <td></td> <td style="padding-left: 10px;">Flashing = Ready for second limit</td> </tr> <tr> <td></td> <td></td> <td style="padding-left: 10px;">OFF = Not teaching analog limits</td> </tr> <tr> <td>Yellow discrete</td> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 10px;">ON = Ready for first window limit</td> </tr> <tr> <td></td> <td></td> <td style="padding-left: 10px;">Flashing = Ready for second limit</td> </tr> <tr> <td></td> <td></td> <td style="padding-left: 10px;">OFF = Not teaching discrete limits</td> </tr> </table>	Green	{	ON = Power ON, RUN mode			Flashing = Discrete output is overloaded	Red	{	Flashing = Relative received signal strength	Yellow analog		ON = Target is inside window limits	Yellow discrete		ON = Output conducting	Green	{	OFF = PROGRAM mode	Red		Flashing = Relative received signal strength	Yellow analog	{	ON = Ready for first window limit			Flashing = Ready for second limit			OFF = Not teaching analog limits	Yellow discrete	{	ON = Ready for first window limit			Flashing = Ready for second limit			OFF = Not teaching discrete limits
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		Flashing = Ready for second limit																																						
		OFF = Not teaching discrete limits																																						

# U-GAGE™ T30 Series with Analog and Discrete Outputs

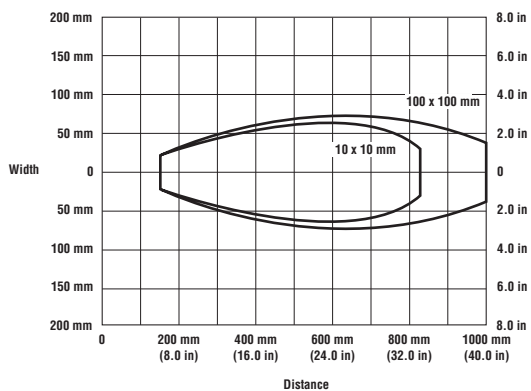
## U-GAGE T30 Series Specifications (continued)

<b>Construction</b>	Molded reinforced thermoplastic polyester housing
<b>Environmental Rating</b>	Leakproof design is rated IEC IP67; NEMA 6P
<b>Connections</b>	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)
<b>Operating Conditions</b>	<b>Temperature:</b> -20° to +70° C (-4° to 158° F) <b>Maximum relative humidity:</b> 100%
<b>Vibration and Mechanical Shock</b>	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.
<b>Application Notes</b>	Objects passing inside the specified near limit will produce a false response. NOTE: For more information about out-of-range and signal loss response of the analog output, see page 5.
<b>Certifications</b>	

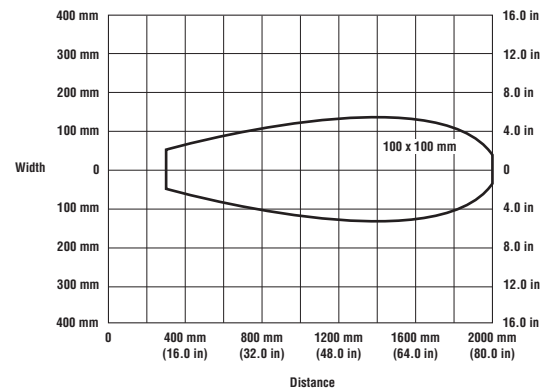
## U-GAGE T30 Series Performance Curves

### U-GAGE T30 Effective Beam with Plate Target (Typical)

#### 1-Meter Models

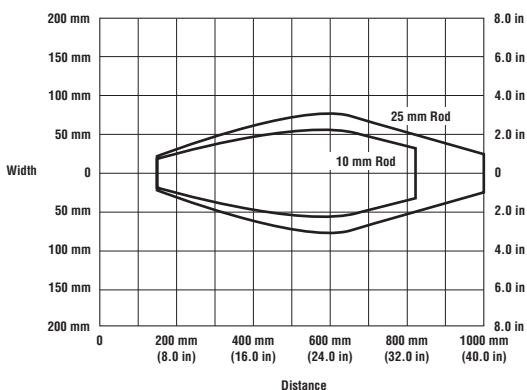


#### 2-Meter Models

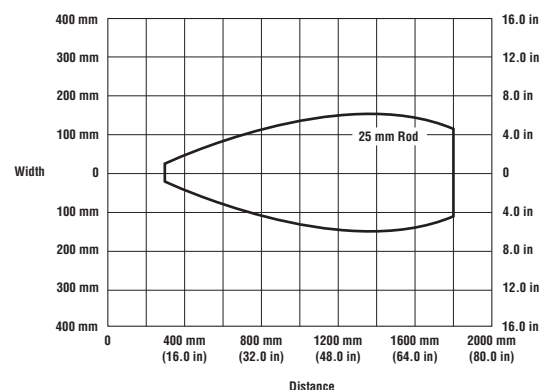


### U-GAGE T30 Effective Beam with Rod Target (Typical)

#### 1-Meter Models



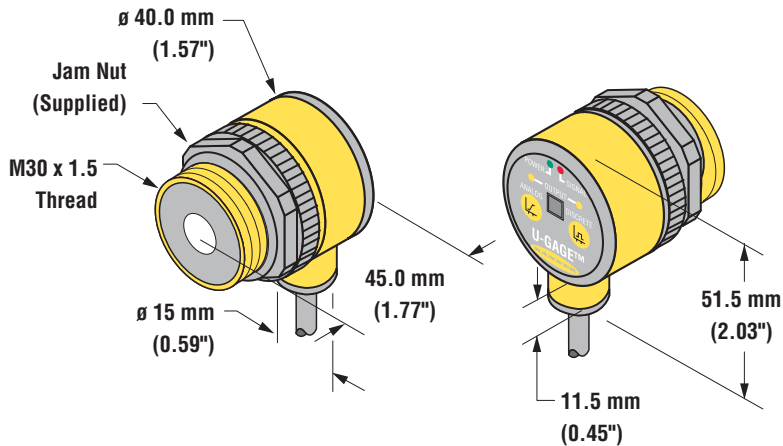
#### 2-Meter Models



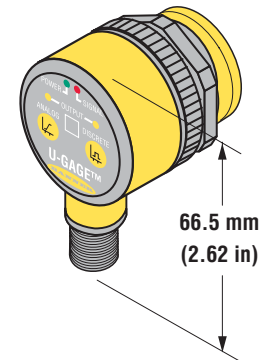
# U-GAGE™ T30 Series with Analog and Discrete Outputs

## U-GAGE T30 Series Dimensions

### Cabled Models

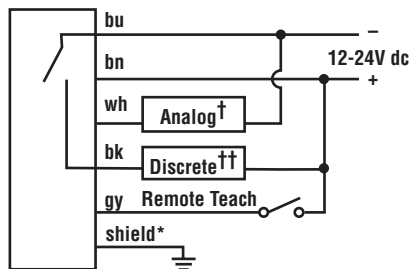


### Quick-Disconnect Models

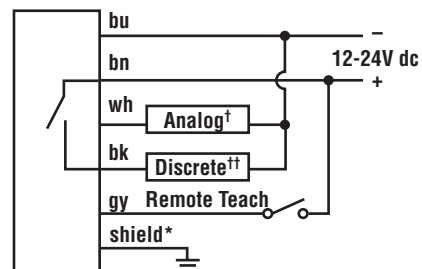


## U-GAGE T30 Series Hookups

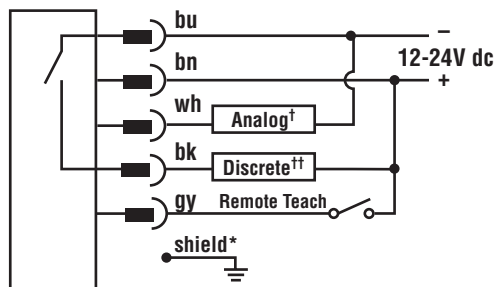
### Cabled NPN



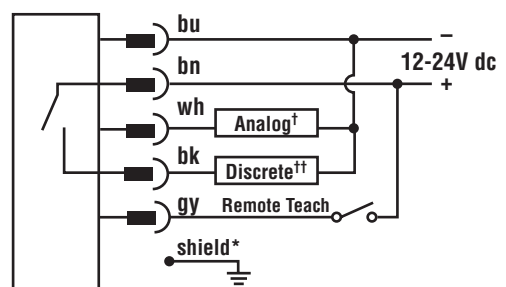
### Cabled PNP



### Quick-Disconnect NPN



### Quick-Disconnect PNP



† 4-20 mA or 0-10V dc

†† 100 mA maximum

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



# U-GAGE™ T30 Series with Analog and Discrete Outputs

## Accessories

### Quick-Disconnect (QD) Cables



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

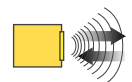
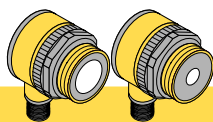
### Mounting Brackets

<b>SMB30A</b>	<ul style="list-style-type: none"> <li>• Angled-mount bracket</li> <li>• Stainless steel</li> </ul>	<b>SMB1815SF</b>	<ul style="list-style-type: none"> <li>• Compact 30 mm split clamp with swivel, black reinforced thermoplastic polyester</li> <li>• Stainless steel hardware included</li> </ul>
 <p>* Use 5 mm (#10) screws to mount bracket. Drill screw holes 40.0 mm (1.58\") apart.</p>			

# U-GAGE™ T30 Series with Analog and Discrete Outputs

## Mounting Brackets

<b>SMB30C</b> <ul style="list-style-type: none"> <li>• 30 mm split clamp, black reinforced thermoplastic polyester</li> <li>• Stainless steel hardware included</li> </ul>	<b>SMB30SC</b> <ul style="list-style-type: none"> <li>• 30 mm split clamp with swivel, black reinforced thermoplastic polyester</li> <li>• Stainless steel hardware included</li> </ul>
 <p>             13 mm (0.51")              63.0 mm (2.48")              56.0 mm (2.20")              31.5 mm (1.24")              2.5 mm (0.10")              45.0 mm (1.77")              13 mm (0.51")              Nut Plate              M5 x 0.8 x 80 mm Screw (2)         </p>	 <p>             50.8 mm (2.00")              58.7 mm (2.31")              30 x 1.5 mm internal thread              30.0 mm (1.18")              66.5 mm (2.62")              29.0 mm (1.14")              12.7 mm (0.50")         </p>



Ultrasonic, 228 or 128 kHz

## 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

## Models

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

\* 9 m (30') cables are available by adding suffix "W/30" to the model number of 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.

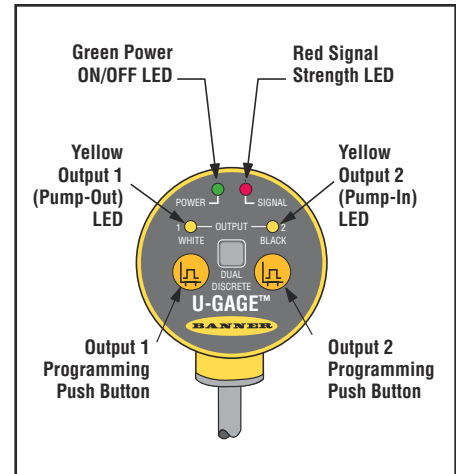


Figure 1. Sensor features

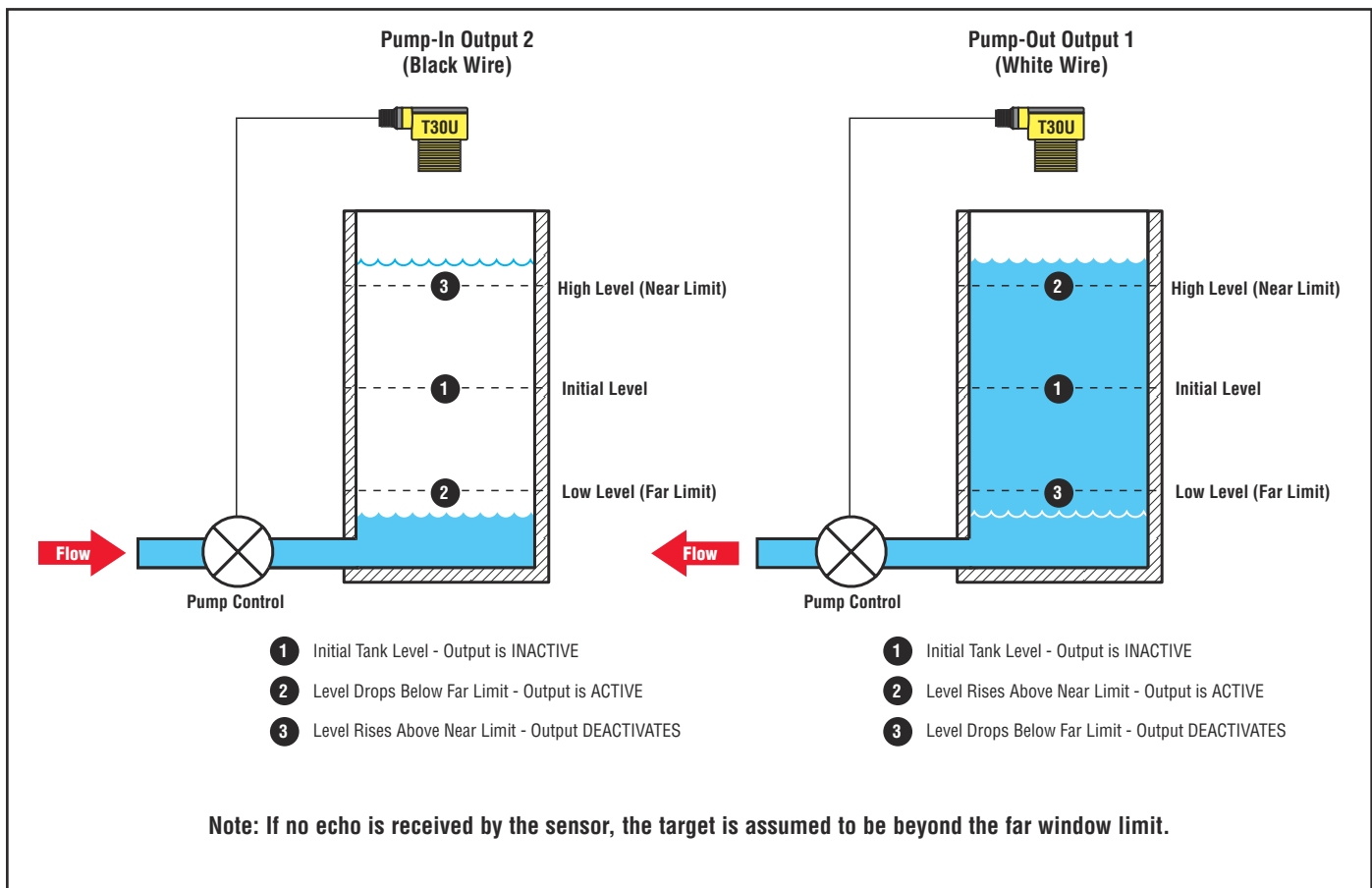


Figure 2. Fill-level-control application

## 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 k $\Omega$ .

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.

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

## 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.

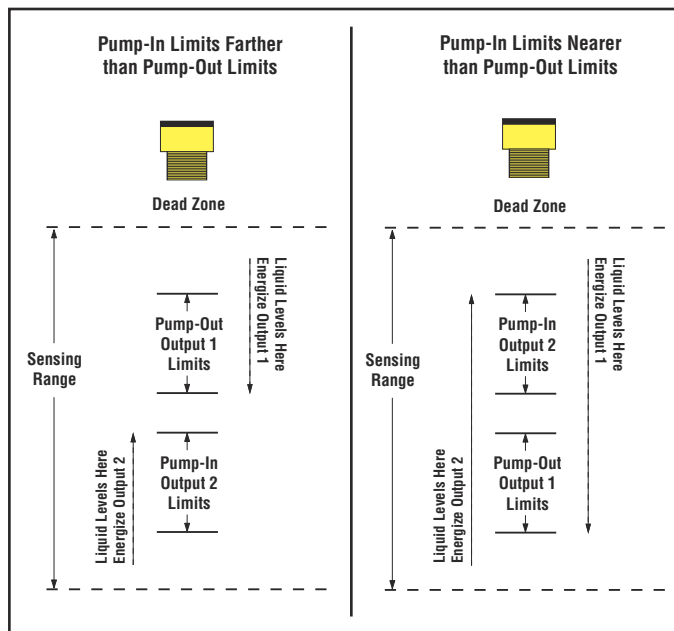
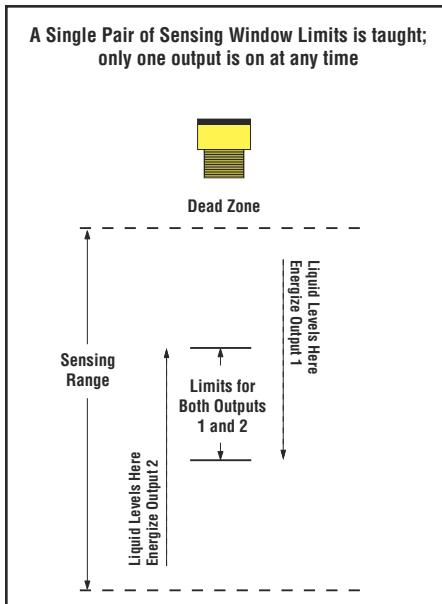


Figure 3. Programming separate sensing window limits for each output

	Push Button		Remote Wire 0.04 sec. < T < 0.8 sec.			
	Procedure	Result	Procedure	Result		
<b>Programming Mode</b>	<ul style="list-style-type: none"> <li>Push and hold push button for selected output*</li> </ul> <p>&gt; 2 sec.</p>	<ul style="list-style-type: none"> <li>Green Power LED goes OFF</li> <li>Corresponding Output LED turns ON Yellow</li> <li>Sensor is waiting for first limit</li> </ul>	No action required			
<b>Teach First Limit</b>	<ul style="list-style-type: none"> <li>Position the target for the first limit</li> <li>"Click" the same push button</li> </ul>	<ul style="list-style-type: none"> <li>After a short delay, the Yellow LED will flash</li> <li>Sensor learns first limit and waits for second limit</li> </ul>	<ul style="list-style-type: none"> <li>Position the target for the first limit</li> </ul> <table border="1"> <tr> <td> <b>Output 1 (Pump-Out)</b> <ul style="list-style-type: none"> <li>Double-pulse the remote line</li> </ul> </td> <td> <b>Output 2 (Pump-In)</b> <ul style="list-style-type: none"> <li>Single-pulse the remote line</li> </ul> </td> </tr> </table>	<b>Output 1 (Pump-Out)</b> <ul style="list-style-type: none"> <li>Double-pulse the remote line</li> </ul>	<b>Output 2 (Pump-In)</b> <ul style="list-style-type: none"> <li>Single-pulse the remote line</li> </ul>	<ul style="list-style-type: none"> <li>Green Power LED goes OFF</li> <li>Corresponding Output LED turns ON Yellow</li> <li>After a short delay, the Yellow LED will flash</li> </ul>
<b>Output 1 (Pump-Out)</b> <ul style="list-style-type: none"> <li>Double-pulse the remote line</li> </ul>	<b>Output 2 (Pump-In)</b> <ul style="list-style-type: none"> <li>Single-pulse the remote line</li> </ul>					
<b>Teach Second Limit</b>	<ul style="list-style-type: none"> <li>Position the target for the second limit</li> <li>"Click" the same push button</li> </ul>	<ul style="list-style-type: none"> <li>After a short delay, the Green Power LED will go ON</li> <li>Sensor learns second limit and returns automatically to RUN mode</li> </ul>	<ul style="list-style-type: none"> <li>Position the target for the second limit</li> <li>Single-pulse the remote line</li> </ul>	<ul style="list-style-type: none"> <li>After a short delay, the Green Power LED will go ON</li> <li>Sensor learns second limit and returns automatically to RUN mode</li> </ul>		
<b>Program Second Output</b>	Repeat as needed for other output.					

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

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



## 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.


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

	Push Button		Remote Wire 0.04 sec. < T < 0.8 sec.	
	Procedure	Result	Procedure	Result
<b>Programming Mode</b>	<ul style="list-style-type: none"> <li>Push and hold both push buttons (or press and hold one and then the other)*</li> </ul> <p>&gt; 2 sec.</p>	<ul style="list-style-type: none"> <li>Green Power LED goes OFF</li> <li>Both Output LEDs turn ON Yellow</li> <li>Sensor is waiting for first limit</li> </ul>	No action required	
<b>Teach First Limit</b>	<ul style="list-style-type: none"> <li>Position the target for the first limit</li> <li>"Click" either push button</li> </ul>	<ul style="list-style-type: none"> <li>After a short delay, the Yellow LEDs will flash</li> <li>Sensor learns first limit and waits for second limit</li> </ul>	<ul style="list-style-type: none"> <li>Position the target for the first limit</li> <li>Triple-pulse the remote line</li> </ul>	<ul style="list-style-type: none"> <li>Green Power LED goes OFF</li> <li>Both Output LEDs turn ON Yellow</li> <li>After a short delay, the Yellow LEDs will flash</li> </ul>
<b>Teach Second Limit</b>	<ul style="list-style-type: none"> <li>Position the target for the second limit</li> <li>"Click" either push button</li> </ul>	<ul style="list-style-type: none"> <li>After a short delay, the Green Power LED will go ON</li> <li>Sensor learns second limit and returns automatically to RUN mode</li> </ul>	<ul style="list-style-type: none"> <li>Position the target for the second limit</li> <li>Single-pulse the remote line</li> </ul>	<ul style="list-style-type: none"> <li>After a short delay, the Green Power LED will go ON</li> <li>Sensor learns second limit and returns automatically to RUN mode</li> </ul>

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

# U-GAGE<sup>®</sup> T30U Series with Pump-In/Pump-Out Switching Logic

## 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	<ul style="list-style-type: none"> <li>Four-pulse the remote line</li> </ul> 	<ul style="list-style-type: none"> <li>Push buttons are either enabled or disabled, depending on previous condition.</li> </ul>

## 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.

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

## Specifications

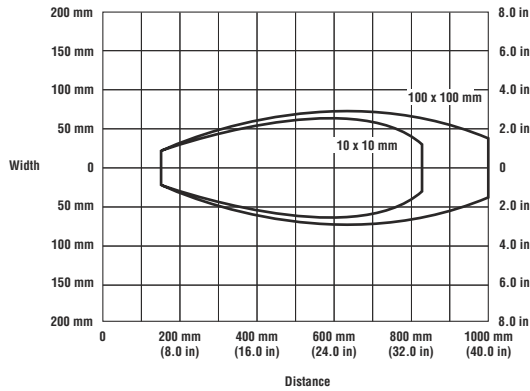
<b>Proximity Mode Range</b>	<b>"A" suffix models:</b> 150 mm (5.9") min. near limit; 1 m (39") max. far limit <b>"B" suffix models:</b> 300 mm (11.8") min. near limit; 2 m (79") max. far limit														
<b>Supply Voltage</b>	12 to 24V dc (10% max. ripple) at 90 mA, exclusive of load														
<b>Supply Protection Circuitry</b>	Protected against reverse polarity and transient voltages														
<b>Output Configurations</b>	SPST solid-state switch; choose NPN (current sinking) or PNP (current sourcing) models														
<b>Output Ratings</b>	<b>Dual Discrete Outputs:</b> 100 mA maximum, total – both outputs <b>OFF-state leakage current:</b> less than 10 microamps <b>ON-state saturation voltage:</b> less than 1V at 10 mA and less than 1.5V at 100 mA														
<b>Output Protection</b>	Protected against continuous overload and short-circuit; transient over-voltage; no false pulse on power-up														
<b>Output Response Time</b>	<b>"A" suffix models:</b> 48 milliseconds <b>"B" suffix models:</b> 96 milliseconds														
<b>Sensing Performance</b> (Specified using a 10 cm x 10 cm aluminum target at 25°C under fixed sensing conditions.)	<b>Sensing repeatability:</b> ±0.25% of distance <b>Minimum window size:</b> 10 mm (0.4") <b>Hysteresis of discrete output:</b> 2.5 mm (0.10")														
<b>Adjustments</b>	<b>Sensing window limits:</b> 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.														
<b>Indicators</b>	<table border="1"> <thead> <tr> <th>Four Status LEDs:</th> <th>RUN Mode</th> <th>PROGRAM Mode</th> </tr> </thead> <tbody> <tr> <td>Green</td> <td><b>ON</b> – Power ON, RUN mode <b>Flashing</b> – Output is overloaded</td> <td><b>OFF</b> – PROGRAM Mode</td> </tr> <tr> <td>Red</td> <td><b>Flashing</b> – Relative received signal strength</td> <td><b>Flashing</b> – Relative received signal strength</td> </tr> <tr> <td>Yellow (2)</td> <td><b>ON</b> – Output energized (conducting)</td> <td><b>ON</b> – Ready for first window limit <b>Flashing</b> – Ready for second limit <b>OFF</b> – Not teaching this output</td> </tr> </tbody> </table>			Four Status LEDs:	RUN Mode	PROGRAM Mode	Green	<b>ON</b> – Power ON, RUN mode <b>Flashing</b> – Output is overloaded	<b>OFF</b> – PROGRAM Mode	Red	<b>Flashing</b> – Relative received signal strength	<b>Flashing</b> – Relative received signal strength	Yellow (2)	<b>ON</b> – Output energized (conducting)	<b>ON</b> – Ready for first window limit <b>Flashing</b> – Ready for second limit <b>OFF</b> – Not teaching this output
Four Status LEDs:	RUN Mode	PROGRAM Mode													
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Yellow (2)	<b>ON</b> – Output energized (conducting)	<b>ON</b> – Ready for first window limit <b>Flashing</b> – Ready for second limit <b>OFF</b> – Not teaching this output													
<b>Construction</b>	Molded reinforced thermoplastic polyester housing														
<b>Environmental Rating</b>	Leakproof design is rated IEC IP67; NEMA 6P														
<b>Connections</b>	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)														
<b>Operating Conditions</b>	<b>Temperature:</b> -20° to +70° C (-4° to 158° F) <b>Maximum relative humidity:</b> 100%														
<b>Vibration and Mechanical Shock</b>	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.														
<b>Application Notes</b>	Objects passing inside the specified near limit will produce a false response.														
<b>Certifications</b>															

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

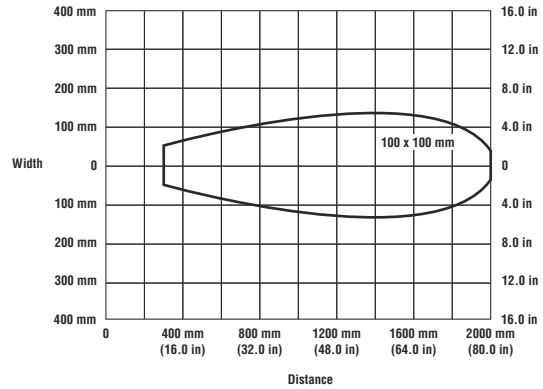
## Performance Curves

With Plate Target (Typical)

1-Meter Models

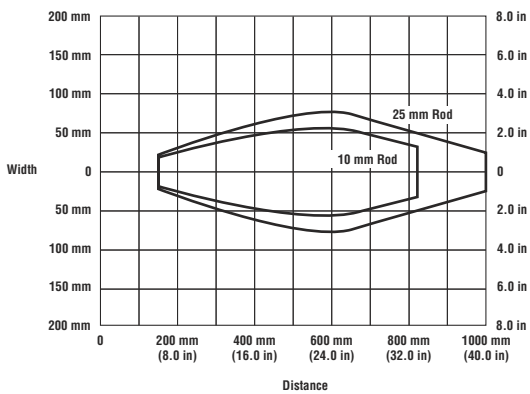


2-Meter Models

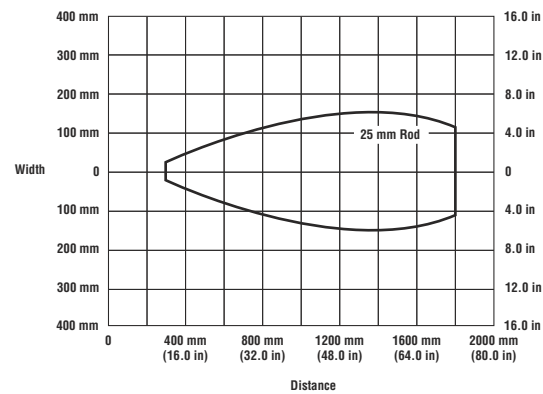


With Rod Target (Typical)

1-Meter Models



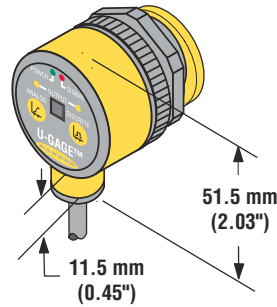
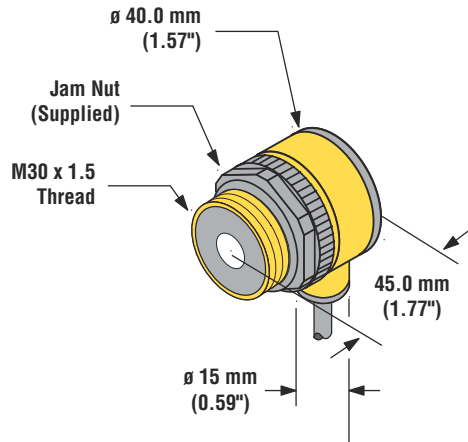
2-Meter Models



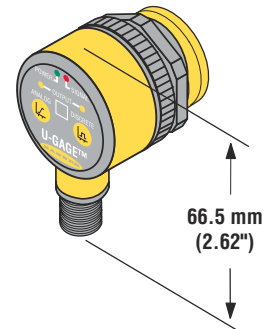
# U-GAGE® T30U Series with Pump-In/Pump-Out Switching Logic

## Dimensions

### Cabled Models

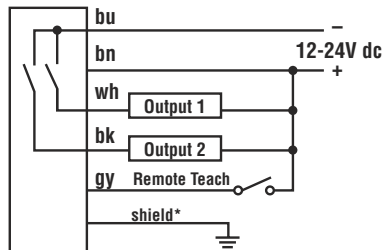


### Quick-Disconnect Models

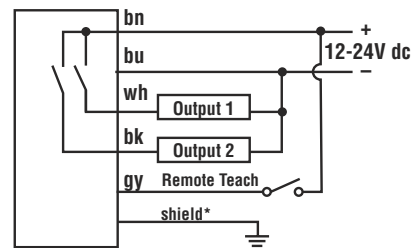


## Hookups

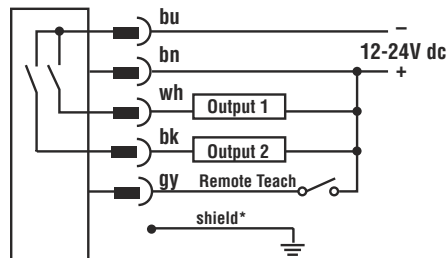
### Cabled NPN



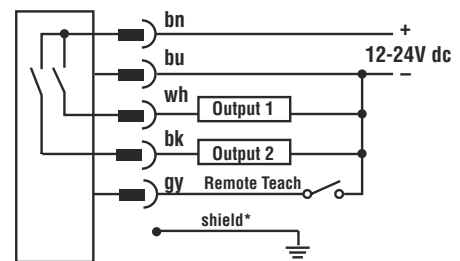
### Cabled PNP



### Quick-Disconnect NPN



### Quick-Disconnect PNP



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

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


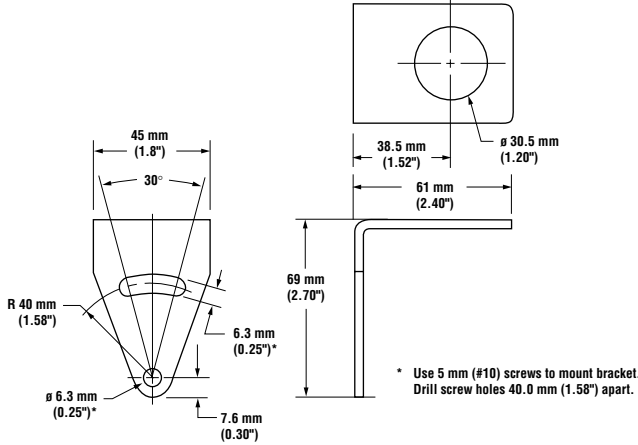

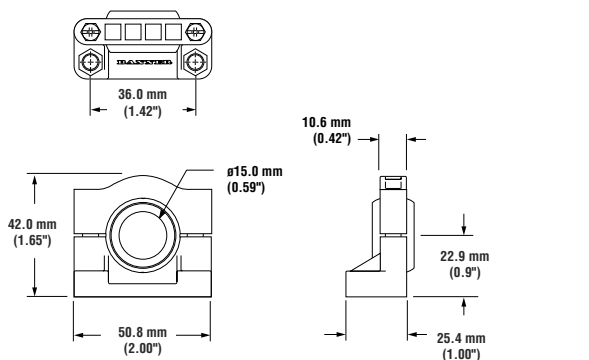

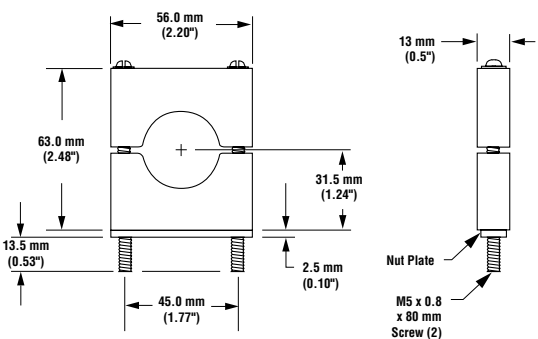

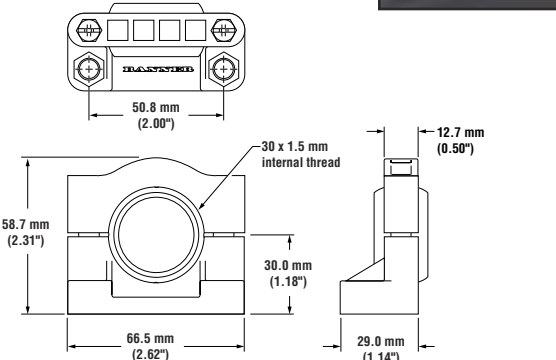
## Accessories

### Quick-Disconnect (QD) Cables

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

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

## Mounting Brackets

<p><b>SMB30A</b></p>	<ul style="list-style-type: none"> <li>• Angled-mount bracket</li> <li>• Stainless steel</li> </ul>	<p><b>SMB1815SF</b></p>	<ul style="list-style-type: none"> <li>• Compact 15 mm split clamp with swivel, black reinforced thermoplastic polyester</li> <li>• Stainless steel hardware included</li> </ul>
  <p>* Use 5 mm (#10) screws to mount bracket. Drill screw holes 40.0 mm (1.58\"</p>		<p>The 15 mm diameter hub of the T30 is mounted into the swivel using two set screws.</p>  	
<p><b>SMB30C</b></p>	<ul style="list-style-type: none"> <li>• 30 mm split clamp, black reinforced thermoplastic polyester</li> <li>• Stainless steel hardware included</li> </ul>	<p><b>SMB30SC</b></p>	<ul style="list-style-type: none"> <li>• 30 mm split clamp with swivel, black reinforced thermoplastic polyester</li> <li>• Stainless steel hardware included</li> </ul>
  <p>Nut Plate M5 x 0.8 x 80 mm Screw (2)</p>		  <p>30 x 1.5 mm internal thread</p>	