

## Datasheet

### Ultrasonic Opposed Mode Sensor Pairs with Dual Sensing Ranges



- Dual range/dual resolution opposed mode ultrasonic sensors; ideal for reliable sensing of clear objects or materials
- Rugged design for use in demanding environments: rated NEMA 6P (IEC IP67), wide-operating temperature range of -40 °C to +70 °C (-40 °F to +158 °F)
- Alignment indicator flashes at a rate proportional to the received signal strength
- Highly immune to ambient sonic and electrical noise
- Popular T-style right-angle sensor package with 18 mm threaded mounting hub; cabled or quick disconnect models
- 12 to 30 V dc operation; choose receivers with either NPN (sinking) or PNP (sourcing) output; outputs are short-circuit protected



#### WARNING: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel **protection**. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

## Models

Model <sup>1</sup>	Range <sup>2</sup>	Output	Response Time
T186UE	-	-	-
T18VN6UR	Normal Resolution: 600 mm (24 in)	NPN (sinking)	Normal Resolution: 2 ms
T18VP6UR	High Resolution: 300 mm (12 in)	PNP (sourcing)	High Resolution: 1 ms

## Overview

U-GAGE<sup>®</sup> T18U Series Sensor is an opposed mode ultrasonic emitter/receiver pair. It uses an advanced built-in microprocessor to analyze the received ultrasonic signal and control an indicator LED located on the back of the receiver. The receiver LED flashes at a rate proportional to the received sonic signal strength. This indicator greatly simplifies sensor alignment and alerts personnel to marginal sensing conditions because of gradual misalignment or environmental factors. The receiver is precisely tuned to the ultrasonic emitter, making this sensor pair highly immune to both sonic and electrical ambient noise.

T18U receivers may be wired for either of two resolution modes: NORMAL or HIGH. The modes are selected by the polarity of the supply voltage.

- The NORMAL resolution mode offers a sensing range of 600 mm (24 in) and maximizes sensing energy, as is required in demanding environments.
- The HIGH resolution mode yields a sensing range of up to 300 mm (12 in) and maximizes sensing response, as is needed in high-speed counting applications.

Opposed mode ultrasonics are very useful for highly reliable sensing of clear materials, which is always a challenge for photoelectric modes. T18U Series ultrasonic sensors are designed for demanding sensing environments. Housings are tough, NEMA 6P-rated PBT. Electronics are epoxy encapsulated. The acoustic face of both emitter and receiver are epoxy-reinforced for extreme durability and moisture resistance.

<sup>1</sup> The standard 2 m (6.5 ft) cable models are listed. To order a 4-Pin M12/Euro-style integral QD model, add suffix "Q" to the model number (e.g., T18VN6URQ). To order the 9 m (30 ft) cable model, add suffix "W/30" to the model number (e.g., T18VN6UR W/30). Models with a QD connector require a mating cable.

<sup>2</sup> T18U receivers may be wired for either of two resolution modes: Normal or High.



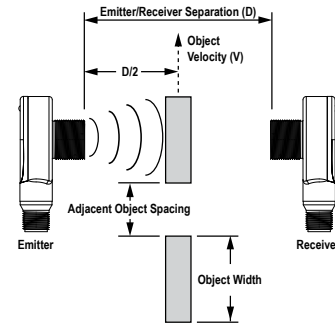
## Installation Instructions

### Object Detection

These figures reflect the following assumptions:

- Objects have square (not radiused) corners,
- Sensors are optimally aligned,
- Objects pass through the sensing area midway between the emitter and receiver (i.e. at  $D/2$ ),<sup>3</sup>
- Operating conditions are stable, with minimal air turbulence.

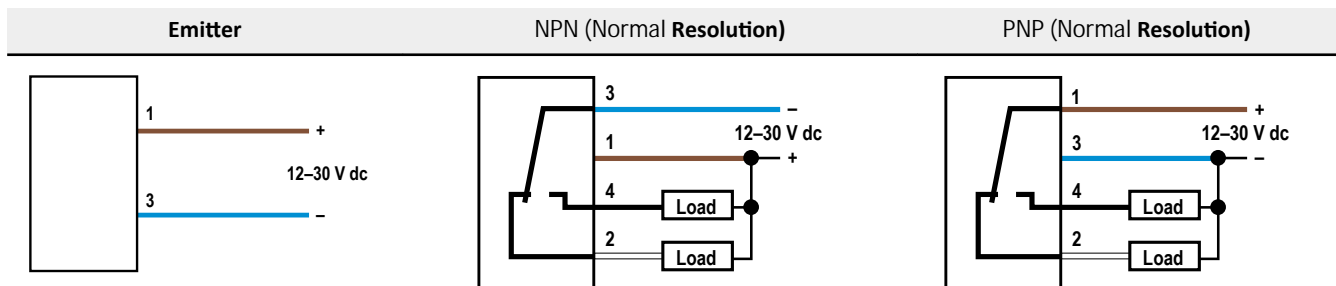
Individual results may differ based on ambient operating conditions, alignment, and the geometry of the objects to be detected.



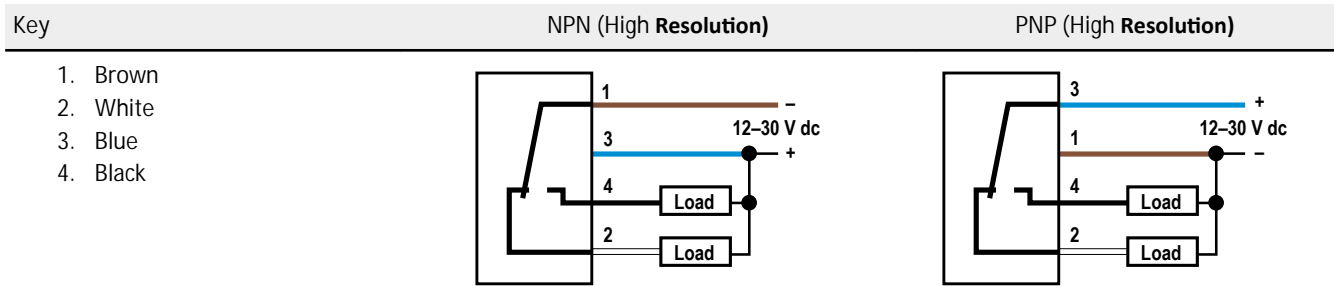
Resolution Mode	Emitter/Receiver Separation (D)	Velocity = 0 mm/sec (0 in/sec)	Velocity = 1270 mm/sec (50 in/sec)	Velocity = 2540 mm/sec (100 in/sec)
Normal	150 mm (6 in)	25.4 mm (1 in)	35.6 mm (1.40 in)	38.1 mm (1.5 in)
	300 mm (12 in)	31.8 mm (1.25 in)	50.8 mm (2 in)	50.8 mm (2 in)
	600 mm (24 in)	25.4 mm (1 in)	44.5 mm (1.75 in)	44.5 mm (1.75 in)
High	150 mm (6 in)	15.2 mm (0.60 in)	19.1 mm (0.75 in)	20.3 mm (0.80 in)
	300 mm (12 in)	12.7 mm (0.50 in)	19.1 mm (0.75 in)	25.4 mm (1 in)

Resolution Mode	Emitter/Receiver Separation (D)	Velocity = 0 mm/sec (0 in/sec)	Velocity = 1270 mm/sec (50 in/sec)	Velocity = 2540 mm/sec (100 in/sec)
Normal	150 mm (6 in)	0.8 mm (0.03 in)	1 mm (0.04 in)	1.3 mm (0.05 in)
	300 mm (12 in)	2.5 mm (0.1 in)	3.8 mm (0.15 in)	5.1 mm (0.2 in)
	600 mm (24 in)	8.9 mm (0.35 in)	10.2 mm (0.4 in)	12.7 mm (0.5 in)
High	150 mm (6 in)	3.3 mm (0.13 in)	3.8 mm (0.15 in)	4.3 mm (0.17 in)
	300 mm (12 in)	10.2 mm (0.4 in)	11.4 mm (0.45 in)	11.4 mm (0.45 in)

### Wiring Diagrams



<sup>3</sup> In general, the minimum object width and minimum object spacing will decrease if the object (or space) to be detected is passed closer to the emitter or the receiver.



## Specification

**Supply Voltage**  
12 to 30 V dc (10% maximum ripple)

**Supply Current**  
Emitters: 50 mA  
Receivers: 35 mA, exclusive of output load

**Output Protection Circuitry**  
Protected against overload and short circuit conditions. No false pulse upon receiver power-up.

**Delay at Power-up**  
100 milliseconds

**Beam Angle (-3dB full angle)**  
15 ± 2°

**Output Rating**  
150 mA max. (each output) at 25°C, derated to 100 mA at 70°C (derate ≈ 1 mA per °C). Both outputs may be used simultaneously.  
ON-state saturation voltage: < 1.5 V at 10 mA; < 2.0 V at 150 mA  
OFF-state leakage current: < 1 microamp at 30 V dc

**Rep Rate**  
Normal Resolution Mode: 125 Hz maximum  
High Resolution Mode: 200 Hz maximum

**Indicators**  
Emitters have a Green LED for Power ON.  
Receivers have one Green Power LED and one Yellow Signal LED.  
Green Power LED: ON indicates power on; Flashing indicates output overload  
Yellow Signal LED: sonic signal received (flash rate is proportional to received signal strength; flash is from full to half intensity)

**Environmental Rating**  
NEMA 6P; IEC IP67

**Operating Conditions**  
-40 °C to +70 °C (-40 °F to +158 °F)

**Vibration and Mechanical Shock**  
All models meet Mil Std. 202F requirements. Method 201A (vibration: 10 Hz to 60 Hz max., double amplitude 0.06 inch, maximum acceleration 10G). Also meets IEC 947-5-2 requirements: 30G 11 ms duration, half sine wave.  
Method 213B conditions H&I.  
Shock: 75G with unit operating; 100G for non-operation

**Certifications**



**Sensing Range**  
Normal Resolution: 600 mm (24 in)  
High Resolution: 300 mm (12 in)

**Ultrasonic Frequency**  
230 kHz

**Minimum Spacing (adjacent pairs)**  
50 mm for emitter-to-receiver separations of up to 150 mm  
Add 10 mm of adjacent pair spacing for every 100 mm of emitter-to-receiver spacing beyond 150 mm

**Receiver Output Configuration**  
NPN (sinking) or PNP (sourcing), depending on model: Normally Open (NO) or Normally Closed (NC) (complementary)

**Output Response Time**  
Normal Resolution Mode: 2 milliseconds ON and OFF  
High Resolution Mode: 1 millisecond ON and OFF

**Mechanical Sensing Repeatability at 300 mm (12 in) Range**  
Normal Resolution Mode: < 2 mm (< 0.08 in)  
High Resolution Mode: < 1 mm (< 0.04 in)

**Construction**  
Patented T-style yellow PBT housing with black PBT back cover. Transducer housing is threaded M18 x 1. Mating jam nut is supplied for mounting. Acoustic face is epoxy reinforced. Circuitry is epoxy encapsulated.

**Construction**  
Emitter: 2 m (6.5 ft) attached PVC-covered 2-wire cable or 4-pin Euro-Style quick disconnect fitting  
Receiver: 2 m (6.5 ft) attached PVC-covered 4-wire cable or 4-pin Euro-Style quick disconnect fitting  
9 m (30 ft) cables available by request.  
A model with a QD connector requires a mating cable

**Required Overcurrent Protection**



**WARNING:** Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.  
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.  
Supply wiring leads < 24 AWG shall not be spliced.  
For additional product support, go to [www.bannerengineering.com](http://www.bannerengineering.com).

Supply Wiring (AWG)	Required Overcurrent Protection (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5