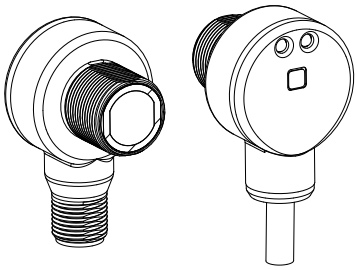
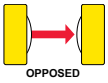
# TM18 Series Sensors

## Datasheet



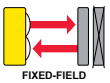
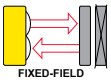
- Heavy duty metal housing with 18 mm threaded barrel mount and integral metal QD prevents sensor damage during machine assembly, transport, maintenance, and operation
- Right angle "T" mounting fits in tight places, prevents sensor damage, and avoids personnel catch points
- Models with dedicated 3-wire output NPN or PNP for OEM machine builders — designed to work with I/O block splitters for reduced wiring costs
- Models with 4-wire complementary NPN or PNP outputs available
- Featuring EZ-BEAM technology provides reliable sensing without adjustments
- Visible red LED models available in opposed, polarized retroreflective, diffuse, and fixed-field (background suppression) modes
- Infrared models available in fixed-field (background suppression) mode
- Completely epoxy encapsulated electronics to provide superior durability, especially in harsh sensing environments
- Sensors rated IP69K for resistance to intermittent high pressure washdown
- Innovative dual indicator systems takes the guess work out of sensor performance monitoring
- Enhanced immunity to fluorescent lights on fixed field and diffuse sensors
- Cross talk avoidance allows two sensors to be used in close proximity on polarized retro, diffuse, and fixed field sensors

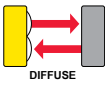
To order the 9 m (30 ft) cable models, add the suffix "W/30" to the cabled model number. For example, "TM186E W/30". To order the 4-pin Euro M12 integral QD models, add suffix Q8 (for example, TM186EQ8). To order the 4-pin Euro M12 pigtail QD models: add suffix Q5 (for example, TM186EQ5).

| Opposed Mode Sensors | | | | |
|---|---|---|---|---|
| Model Number | Mode | Range | LED | Output |
| TM186E |   | 20 m | Visible red 625 nm | None |
| TM18AP6R | | | None | PNP, LO 3-wire |
| TM18RP6R | | | | PNP, DO 3-wire |
| TM18VP6R | | | | PNP, LO/DO 4-wire |
| TM18AN6R | | | | NPN, LO 3-wire |
| TM18RN6R | | | | NPN, DO 3-wire |
| TM18VN6R | | | | NPN, LO/DO 4-wire |

| Polarized Retroreflective | | | | |
|---|---|---|---|---|
| Model Number | Mode | Range | LED | Output |
| TM18AP6LP |   | 5.5 m [1] | Visible red 624 nm | PNP, LO 3-wire |
| TM18RP6LP | | | | PNP, DO 3-wire |
| TM18VP6LP | | | | PNP, LO/DO 4-wire |
| TM18AN6LP | | | | NPN, LO 3-wire |
| TM18RN6LP | | | | NPN, DO 3-wire |
| TM18VN6LP | | | | NPN, LO/DO 4-wire |

[1] Range specified with BRT-84 reflector.

| Fixed-Field Background Suppression | | | | |
|---|---|---|---|---|
| Model Number | Mode | Range | LED | Output |
| TM18AP6FF25 |  | 25 mm | Visible red 660 nm | PNP, LO 3-wire |
| TM18VP6FF25 | | | | PNP, LO/DO 4-wire |
| TM18AN6FF25 | | | | NPN, LO 3-wire |
| TM18VN6FF25 | | | | NPN, LO/DO 4-wire |
| TM18AP6FF50 | | 50 mm | | PNP, LO 3-wire |
| TM18VP6FF50 | | | | PNP, LO/DO 4-wire |
| TM18AN6FF50 | | | | NPN, LO 3-wire |
| TM18VN6FF50 | | | | NPN, LO/DO 4-wire |
| TM18AP6FF100 | | 100 mm | | PNP, LO 3-wire |
| TM18VP6FF100 | | | | PNP, LO/DO 4-wire |
| TM18AN6FF100 | | | | NPN, LO 3-wire |
| TM18VN6FF100 | | | | NPN, LO/DO 4-wire |
| TM18AP6FF25IR |  | 25 mm | Infrared, 880 nm | PNP, LO 3-wire |
| TM18VP6FF25IR | | | | PNP, LO/DO 4-wire |
| TM18AN6FF25IR | | | | NPN, LO 3-wire |
| TM18VN6FF25IR | | | | NPN, LO/DO 4-wire |
| TM18AP6FF50IR | | 50 mm | | PNP, LO 3-wire |
| TM18VP6FF50IR | | | | PNP, LO/DO 4-wire |
| TM18AN6FF50IR | | | | NPN, LO 3-wire |
| TM18VN6FF50IR | | | | NPN, LO/DO 4-wire |
| TM18AP6FF100IR | | 100 mm | | PNP, LO 3-wire |
| TM18VP6FF100IR | | | | PNP, LO/DO 4-wire |
| TM18AN6FF100IR | | | | NPN, LO 3-wire |
| TM18VN6FF100IR | | | | NPN, LO/DO 4-wire |

| Diffuse Visible Mode | | | | |
|---|---|---|---|---|
| Model Number | Mode | Range | LED | Output |
| TM18AP6DV |  | 500 mm | Visible red 660 nm | PNP, LO 3-wire |
| TM18RP6DV | | | | PNP, DO 3-wire |
| TM18VP6DV | | | | PNP, LO/DO 4-wire |
| TM18AN6DV | | | | NPN, LO 3-wire |
| TM18RN6DV | | | | NPN, DO 3-wire |
| TM18VN6DV | | | | NPN, LO/DO 4-wire |

**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.

# Specifications

Supply Voltage and Current - Class 2
10 to 30 V dc (10% max. ripple within specified limits); supply current (exclusive of load current):
Emitters: 25 mA
Receivers: 20 mA
Polarized Retroreflective: 20 mA
Diffuse and Fixed-Field: 35 mA

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Effective Beam
13 mm for opposed mode sensors

Output Configuration
NPN (current sinking) or PNP (current sourcing), depending on model
Light Operate: Output conducts when sensor receives its own (or the emitter's) modulated light
Dark Operate: Output conducts when sensor does not receive it own (or the emitter fts) modulated light

Connections
2 m (6.5 ft) or 9 m (30 ft) PVC attached cable
Integral 4-pin M12/Euro-style quick disconnect
4-pin M12/Euro-style PVC pigtail quick disconnect

Construction
Housing: Zinc die cast with nickel plating
Lens: PMMA or PC (opposed mode only)
Black Cover: PBT polyester housing

Adjustments
Diffuse models only: single turn rear panel sensitivity control

Indicators
Two LEDs (green and amber)

| Complementary (4-Wire) Models | |
|---|---|
| Indicator | Description |
| Green ON | Power ON |
| Green Flashing* | Output is overloaded |
| Amber ON | N.O. Output is conducting |
| Amber Flashing* | Marginal excess gain (1 to 1.5x) |

* Not valid for Diffuse or Fixed Field Models.

| Single Output (3-Wire) Models | |
|---|---|
| Indicator | Description |
| Green ON | Power ON |
| Green Flashing | N.A. |
| Amber ON | Output is conducting |
| Amber Flashing | N.A. |

Output Protection Circuitry
Protected against false pulse on power-up and continuous overload or short circuit of outputs

Output Rating
150 mA maximum each output at 25 °C, derated to 100 mA at 70 °C (derate about 1 mA per °C)
OFF-state leakage current: < 1 microamp at 30 V dc
ON-state saturation voltage: < 1 V at 10 mA dc; < 1.5 V at 150 mA dc

Environmental Rating
IEC IP67; quick disconnect models are IEC IP69K when mated with a washdown rated (IEC IP69K) cordset

Operating Conditions
−40 °C to +70 °C (−40 °F to +158 °F)
90% at +50 °C maximum relative humidity (non-condensing)

Vibration and Mechanical Shock
All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06 in acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for
non-operation)

Output Response Time (TM18)
Opposed mode: 1.5 ms ON, 0.75 ms OFF
Retro: 3 ms ON and OFF
Diffuse and Fixed Field: 3 ms ON, 1.5 ms OFF
Note: 100 ms delay on power-up; outputs do not conduct during this time.

Repeatability (TM18)
Opposed mode: 190 µs
Retro: 585 µs
Diffuse and Fixed Field: 185 µs

Certifications

c UL us LISTED Class 2 supply Required; CE

Required Overcurrent Protection

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

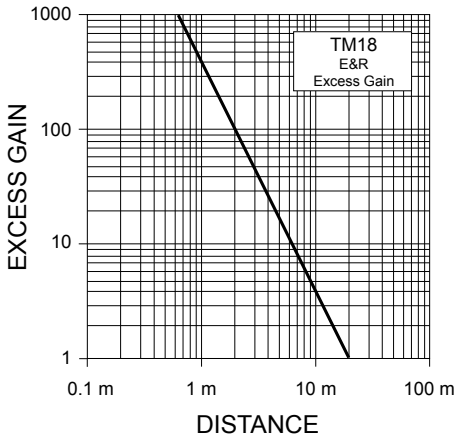
Overcurrent protection is required to be provided by end product application per the supplied table.
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.
Supply wiring leads < 24 AWG shall not be spliced.
For additional product support, go to *http://www.bannerengineering.com*.

| 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 |

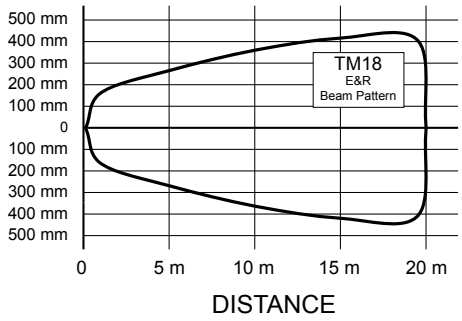
## Performance Curves

### Opposed Mode Sensors

#### Excess Gain

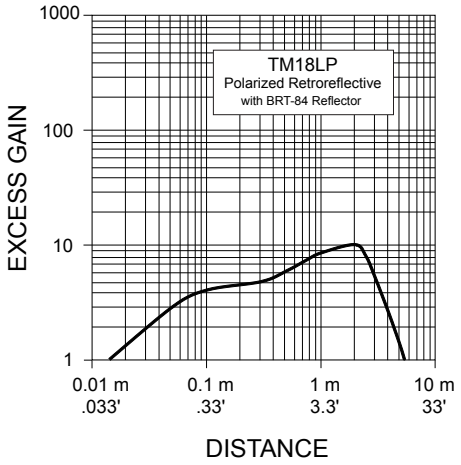



#### Beam Pattern

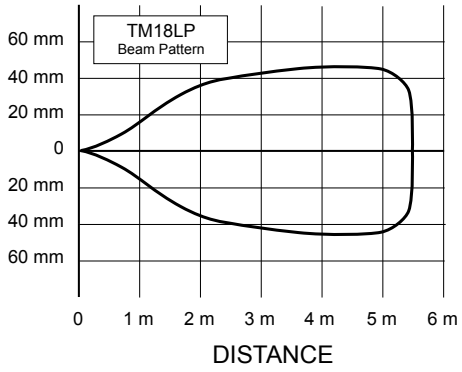



### Polarized Retroreflective

#### Excess Gain

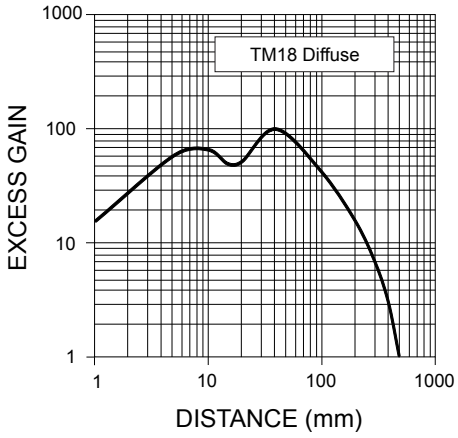



#### Beam Pattern

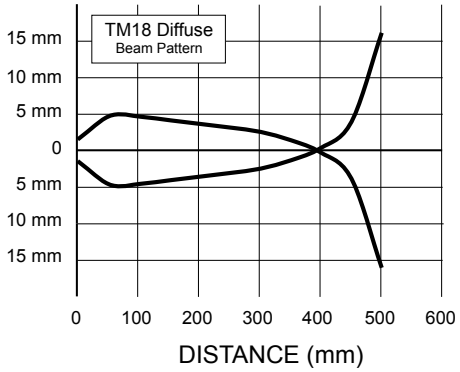


## Diffuse

### Excess Gain



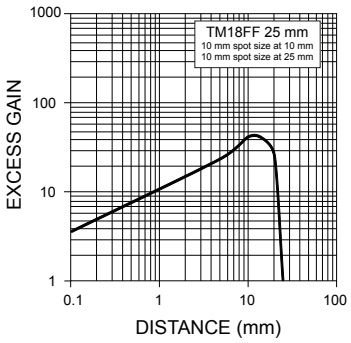

### Beam Pattern




## Fixed Field (Visible Red and Infrared)

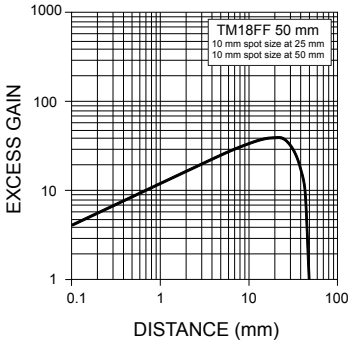
### Excess Gain

#### 25 mm



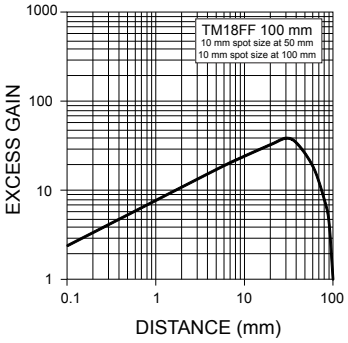

- Using 18% gray test card: Cutoff distance will be 95% of value shown.
- Using 6% black test card: Cutoff distance will be 90% of value shown.

#### 50 mm




- Using 18% gray test card: Cutoff distance will be 90% of value shown.
- Using 6% black test card: Cutoff distance will be 85% of value shown.

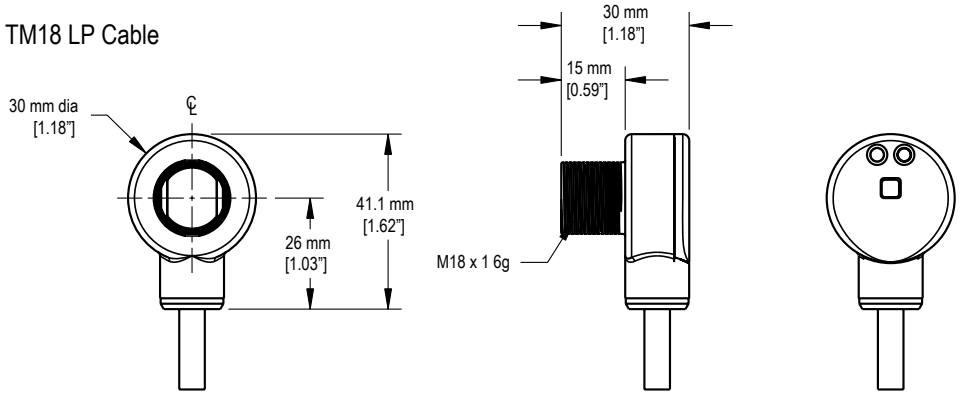
#### 100 mm



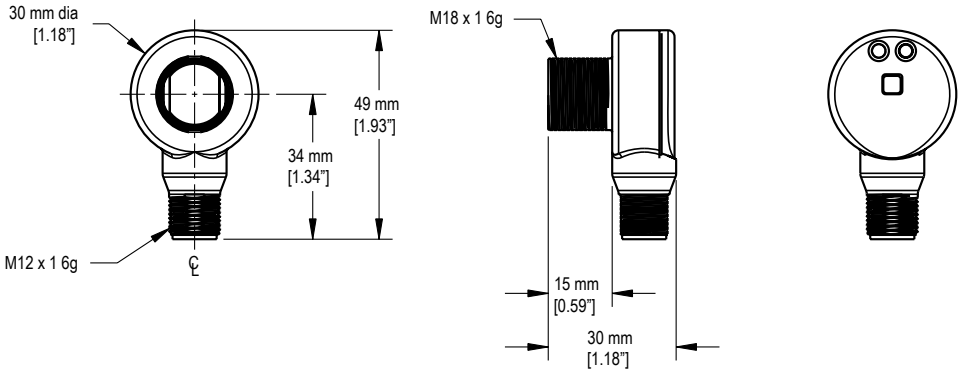

- Using 18% gray test card: Cutoff distance will be 85% of value shown.
- Using 6% black test card: Cutoff distance will be 75% of value shown.

## Dimensions

TM18 LP Cable



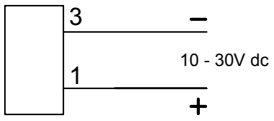

TM18 LP QD



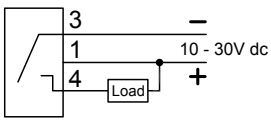

Maximum Torque specification: 5.6 nm or 50 in-lbs. Lockwasher and M18 nut included.

## Wiring

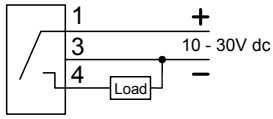
Emitter



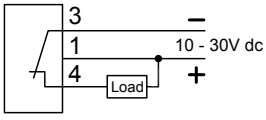

NPN L.O. 3-Wire



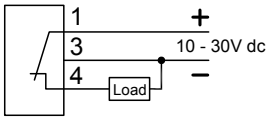

PNP L.O. 3-Wire




NPN D.O. 3-Wire




PNP D.O. 3-Wire

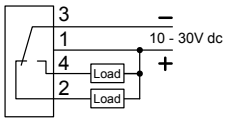



Wiring Key

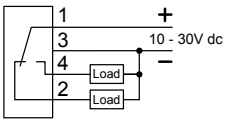
1 = Brown
2 = White
3 = Blue
4 = Black

QD and cabled emitter wiring functionality is identical; black and white wires have no connection when not shown.

NPN L.O./D.O. 4-Wire

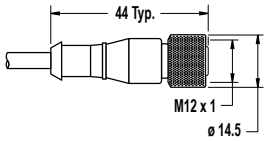
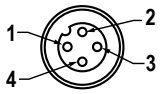
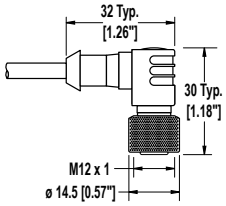



PNP L.O./D.O. 4-Wire




## Accessories

### Cordsets

| 4-Pin Threaded M12/Euro-Style Cordsets | | | | |
|---|---|---|---|---|
| Model | Length | Style | Dimensions | Pinout (Female) |
| MQDC-406 | 1.83 m (6 ft) | Straight |   |   1 = Brown<br>2 = White<br>3 = Blue<br>4 = Black |
| MQDC-415 | 4.57 m (15 ft) | | | |
| MQDC-430 | 9.14 m (30 ft) | | | |
| MQDC-450 | 15.2 m (50 ft) | | | |
| MQDC-406RA | 1.83 m (6 ft) | Right-Angle |   | |
| MQDC-415RA | 4.57 m (15 ft) | | | |
| MQDC-430RA | 9.14 m (30 ft) | | | |
| MQDC-450RA | 15.2 m (50 ft) | | | |

### Apertures

**AP18SCN**

Kit includes round apertures of 0.5 mm (0.02 in), 1.0 mm (0.04 in), and 2.5 mm (0.10 in) diameter.

Used with T18, TM18 models.

**AP18SRN**

Kit includes rectangular apertures of 0.5 mm (0.02 in), 1.0 mm (0.04 in), and 2.5 mm (0.10 in) wide. Each kit also includes a thread-on housing, Teflon® FEP® lens, and o-ring.

Used with T18, TM18

**APG18S**

Kit with glass lens to protect plastic sensor lens from chemical environments and weld splatter damage.

Used with S18, M18, T18, TM18, and Q4X

## Banner Engineering Corp. Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

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