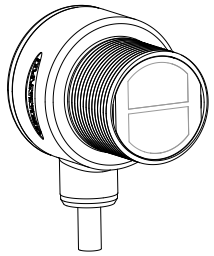
T30AD9 NAMUR Series Fixed-Field Sensor

Datasheet

No revision without agency approval.



- Designed for use with approved amplifiers and intrinsically safe barriers in explosive environments
- NAMUR compliant sensor featuring EZ-BEAM® technology; the specially designed optics and electronics provide reliable sensing without the need for adjustments
- "T" style plastic housing with 30 mm threaded lens
- Completely epoxy-encapsulated to provide superior durability, even in harsh sensing environments; Banner tested to IP69K
- Innovative dual-indicator system takes the guesswork out of sensor performance monitoring
- Advanced diagnostics to warn of marginal sensing conditions or output overload
- 5 to 30 V dc; constant current output; ≤ 1.2 mA in the "dark" condition and ≥ 2.1 mA in the "light" condition

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	Connection	Far-Limit Cutoff	LED	Output Type
T30AD9FF150	2 m (6.5 ft) unterminated PVC-jacketed cable	150 mm (5.9 in)	Infrared, 880 nm	Constant current ≤ 1.2 mA dark ≥ 2.1 mA light
T30AD9FF150Q	Integral 4-pin M12/Euro-style male quick disconnect (QD)			

Overview

T30AD9FF150 NAMUR Series Sensor is a self-contained fixed-field sensors are small, powerful, infrared diffuse mode sensors with far-limit cutoff (a type of background suppression). The sensor is designed for use with certified intrinsically safe switching amplifiers and barriers (Approved Apparatus) with intrinsically safe circuits. The T30AD9FF150 NAMUR Series Sensor is designed in accordance with DIN 19234 (IEC/EN 60947-5-6) for operation via two-wire connection to an Approved Apparatus controlled by the variable internal resistance of the sensor.

Their high excess gain and fixed-field technology allow detection of objects of low reflectivity, while ignoring background surfaces. The cutoff distance is fixed. Backgrounds and background objects must always be placed beyond the cutoff distance.

Models are available with either a 2 m (6.5 ft) long attached PVC-covered cable or a 4-pin M12/Euro-style quick disconnect (QD) connector. Quick disconnect models (with "Q" in the model number suffix) use MQD9-4.. mating cable (either straight or right angle connector; see *Accessories* on page 6). Contact Banner Engineering for availability of sensor models with 9 m (30 ft) long attached cable.

Fixed-Field Sensing – Theory of Operation

The T30AD9FF150 NAMUR Series Sensor compares the reflections of its emitted light beam (E) from an object back to the sensor's two differently aimed detectors, R1 and R2. See *Figure 1* on page 2. If the near detector's (R1) light signal is stronger than the far detector's (R2) light signal (see object A in the Figure below, closer than the cutoff distance), the sensor responds to the object. If the far detector's (R2) light signal is stronger than the near detector's (R1) light signal (see object B in the Figure below, beyond the cutoff distance), the sensor ignores the object.

The cutoff distance for the T30AD9 is fixed at 150 mm (5.9 in). Objects lying beyond the cutoff distance are usually ignored, even if they are highly reflective. However, under certain conditions, it is possible to falsely detect a background object (see *Background Reflectivity and Placement* on page 3).

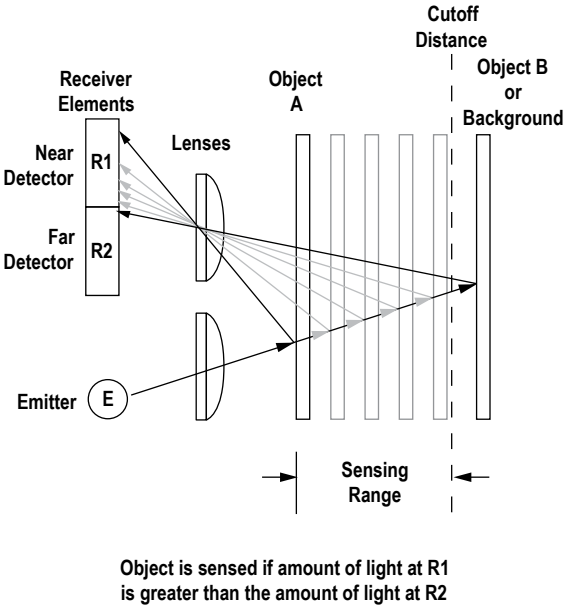


Figure 1. Fixed-Field Concept

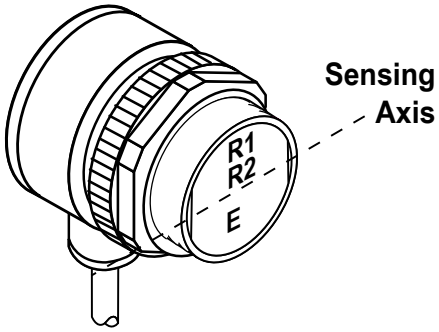


Figure 2. Fixed-Field Sensing Axis

In the drawings and information provided in this document, the letters E, R1, and R2 identify how the sensor's three optical elements (Emitter "E", Near Detector "R1", and Far Detector "R2") line up across the face of the sensor. The location of these elements defines the sensing axis, see *Figure 2* on page 2. The sensing axis becomes important in certain situations, such as those illustrated in *Figure 5* on page 4 and *Figure 6* on page 4.

Installation Instructions

Ex/HazLoc Applications

WARNING:
- **Explosive Atmospheres/Hazardous Locations**
- The user has the responsibility to ensure that all local, state, and national laws, rules, codes, or regulations relating to the installation and use of this Banner device in any particular application are satisfied. This Banner device must be installed by Qualified Persons, in accordance with this document and applicable regulations.
- A Qualified Person is a person who, by possession of a recognized degree or certificate of professional training, or who, by extensive knowledge, training and experience, has successfully demonstrated the ability to solve problems relating to the subject matter and work.

WARNING:
- **Explosion Hazard**
- Do not disconnect equipment unless the power has been switched off or the area is known to be non-hazardous.

CAUTION: Electrostatic Discharge (ESD)

Special Conditions for Safe Use. Parts of the enclosure are non-conducting and may generate an ignition-capable level of ESD. Cleaning of the equipment shall be done only with a damp cloth.

General Notes and Conditions for Safe Use:
- See Specifications and Wiring Diagrams for important information concerning entity parameters, permissible locations, electrical connections and certifications.
- In addition to the warning above concerning user responsibility, the installation must comply with the following:
  - All installations must comply with all manufacturer's instructions.
  - U.S. Installations: The relevant requirements of the National Electrical Code® (ANSI/NFPA-70 (NEC®) and when appropriate ANSI/ISA-RP12.06.01 Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations.
  - Canadian Installations: The relevant requirements of the Canadian Electrical Code (CSA C22.1).
  - ATEX and IECEx Installations: The relevant requirements of EN 60079-14 and applicable National regulations.
- Do not attempt any repairs to this Banner device; it contains no field-replaceable parts or components. Tampering and/or replacement with non-factory components may adversely affect the safe use of the system.

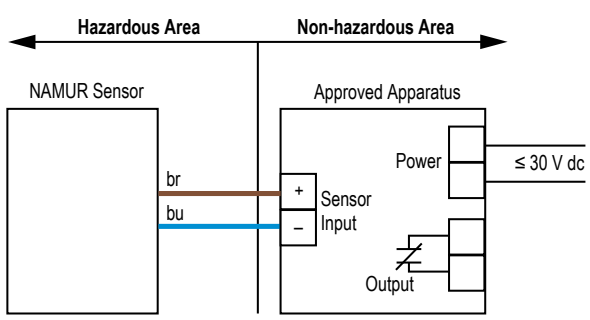
- Approved Apparatus entity parameters must meet the following requirements:
  - o V_{oc} or $V_t \leq V_{max}$
  - o $C_a \geq C_i + C_{cable}$
  - o I_{sc} or $I_t \leq I_{max}$
  - o $La \geq L_i + L_{cable}$
- Sensor Entity Parameters:
  - V_{max} (Ui) ≤ 30 V dc
  - I_{max} (Ii) ≤ 35 mA
  - C_i = 0 µF
  - L_i = 0 mH
- Cable Entity Parameters (if unknown):
  - C_{cable} = 60 pF/ft
  - L_{cable} = 0.2 µH/ft
- The ambient operating temperature range of the Sensors is –40 °C to +70 °C (–40 °F to +158 °F).
- For intrinsically safe installations, sensors must be used with certified intrinsically safe switching amplifiers and barriers (Approved Apparatus) with intrinsically safe circuits that limit supply voltage and current in the event of failures.
- Maximum non-hazardous area voltage that the Approved Apparatus (intrinsically safe circuit) is connected to must not exceed 250V.
- Intrinsic safety ground, if required for the Associated Apparatus, shall be less than 1 ohm.
- Maximum connector torque: 6 ft-lbs.

Wiring Connections

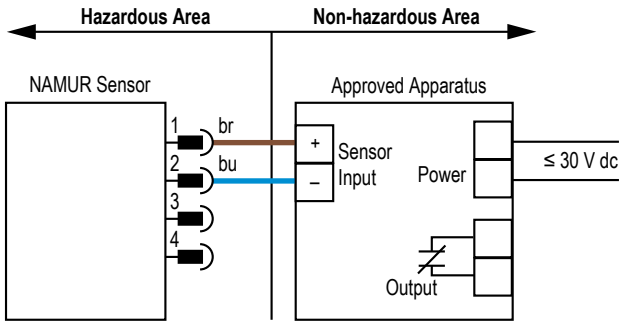
The T30AD9FF150 NAMUR Series Sensor is intrinsically safe ONLY when used with certified intrinsically safe switching amplifiers and barriers (Approved Apparatus) with intrinsically safe circuits. Banner does not manufacture such devices; however, our applications engineers can refer you to suppliers of certified devices that will interface with Banner sensors.

The user is responsible for proper installation and maintenance of this equipment, and must conform with the certification requirements relating to barriers and to maximum allowable capacitance and inductance of the field wiring. If in doubt about these requirements, our applications engineers can refer you to the appropriate authority.

Cabled Models



Quick-Disconnect Models



Configuration Instructions

Sensing Reliability

For highest sensitivity, position the target for sensing at or near the point of maximum excess gain. Maximum excess gain for all models occurs at a lens-to-object distance of about 40 mm (1.5 in). Sensing at or near this distance makes the maximum use of each sensor's available sensing power. The background must be placed beyond the cutoff distance. Note that the reflectivity of the background surface also may affect the cutoff distance. Following these guidelines improves sensing reliability.

Background Reflectivity and Placement

Avoid mirror-like backgrounds that produce specular reflections. A false sensor response occurs if a background surface reflects the sensor's light more to the near detector (R1) than to the far detector (R2). The result is a false ON condition (*Figure 3* on page 4). Correct this problem by using a diffusely reflective (matte) background, or angling either the sensor or the background (in any plane) so the background does not reflect light back to the sensor (*Figure 4* on page 4). Position the background as far beyond the cutoff distance as possible.

An object beyond the cutoff distance, either stationary (and when positioned as shown in *Figure 5* on page 4), or moving past the face of the sensor in a direction perpendicular to the sensing axis, may cause unwanted triggering of the sensor if more light is reflected to the near detector than to the far detector. Correct the problem by rotating the sensor 90° (*Figure 6* on page 4). The object then reflects the R1 and R2 fields equally, resulting in no false triggering. A better solution, if possible, may be to reposition the object or the sensor.

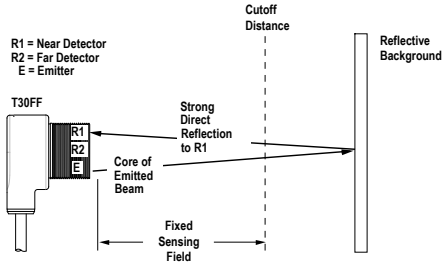


Figure 3. Reflective Background - Problem

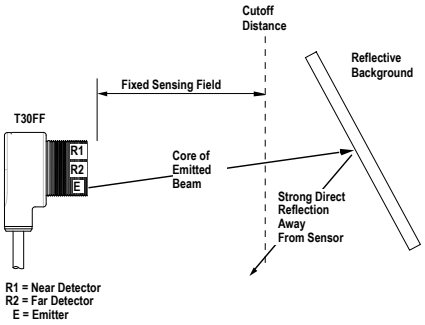
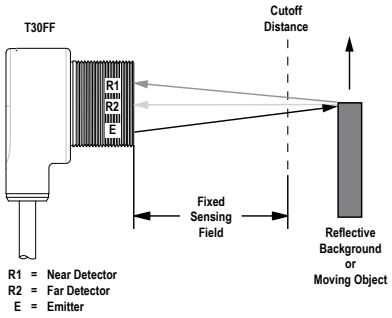
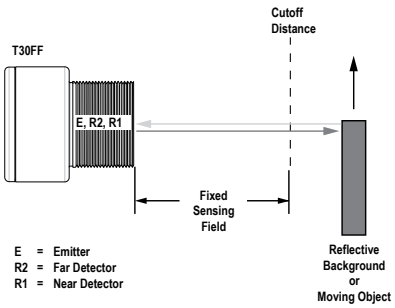


Figure 4. Reflective Background - Solution



A reflective background object in this position or moving across the sensor face in this axis and direction may cause a false sensor response.

Figure 5. Object Beyond Cutoff - Problem



A reflective background object in this position or moving across the sensor face in this axis is ignored.

Figure 6. Object Beyond Cutoff - Solution

Color Sensitivity

The effects of object reflectivity on cutoff distance, though small, may be important for some applications. It is expected that at any given cutoff setting, the actual cutoff distance for lower reflectance targets is slightly shorter than for higher reflectance targets. This behavior is known as color sensitivity.

For example, an excess gain of 1 for an object that reflects 1/10 as much light as the 90% white card is represented by the horizontal graph line at excess gain = 10. An object of this reflectivity results in a far limit cutoff of approximately 130 mm (5.1 in) cutoff model, for example; and 130 mm represents the cutoff for this sensor and target.

These excess gain curves were generated using a white test card of 90% reflectance. Objects with reflectivity of less than 90% reflect less light back to the sensor, and thus require proportionately more excess gain in order to be sensed with the same reliability as more reflective objects. When sensing an object of very low reflectivity, it may be especially important to sense it at or near the distance of maximum excess gain.

Specifications

Supply Voltage and Current
5 to 30 V dc (provided by the amplifier to which the sensor is connected)

Output
Constant current output; ≤1.2 mA in the dark condition and ≥2.1 mA in the light condition

Output Response Time
10 ms on/off (does not include amplifier response)

Sensing Beam
Infrared (880 nm)

Cutoff Distance
150 mm (5.9 in), referenced to a 90% reflectance white test card. See excess gain curve.

Indicators
Red indicator LED on rear panel turns on when the sensor sees a light condition.

Operating Conditions
Temperature: –40 °C to +70 °C (–40 °F to +158 °F)

Application Note
Special Conditions for Safe Use: Parts of the enclosure are non-conducting and may generate an ignition-capable level of ESD. Cleaning of the equipment must be done only with a damp cloth.

Construction
Yellow PBT enclosure, PBT rear cover. Acrylic lens. M30xl,5 threaded lens housing with two mounting nuts supplied. Banner tested to NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 6P, 12, and 13. IEC IP67.

Connections
2 m (6.5 ft) attached PVC covered cable or 4-pin M12/Euro-style quick-disconnect (QD) fitting, depending on model. QD cable must be purchased separately.

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

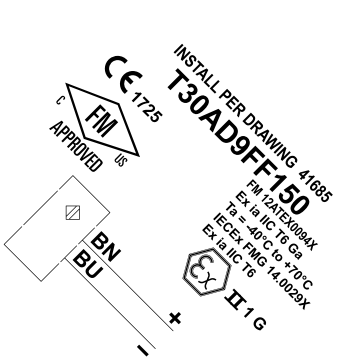
Certifications

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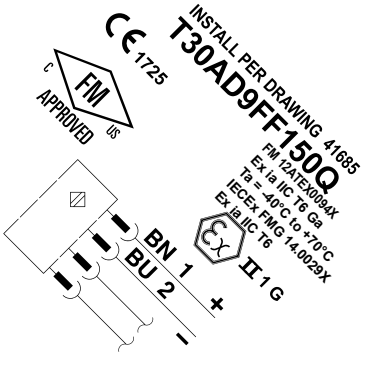
IEC IECEx FMG 14.0029X
ATEX FM12ATEX0094X
FM CoC 0003046293 (US)
FM CoC 0003046293C (CAN)

Design Standards	
ATEX (European)	EN 60079-0, EN 60079-11 and EN 60079-26
Canada	CAN/CSA C22.2: No.0-M91, No.142-M1987, No.157-92, No.213-M1987, No.1010.1, E60079-0 and E60079-11
United States	FM Class 3600, 3610, and 3810; ANSI/ISA 61010-1 (82.02.01), 60079-0 and 60079-11
IECEx	IEC 60079-0, IEC 60079-11

Approvals	
T30AD9FF150, T30AD9FF150Q	
ATEX (European)	II 1 G Ex ia IIC T6 Ga Ta = –40°C to 70°C - 41685; Entity Entity Parameters: U_i = 30 V dc, I_i = 35 mA, C_i = 0 µF, L_i = 0 mH.
Canadian	IS / I,II,III / 1 / ABCDEFG / T6 Ta = –40°C to 70°C - 41685; Entity I / 0 / Ex ia / IIC / T6 Ta = –40°C to 70° C - 41685; Entity Entity Parameters: V_{Max} = 30 V dc, I_{Max} = 35 mA, C_i = 0 µF, L_i = 0 mH
United States	IS / I,II,III / 1 / ABCDEFG / T6 Ta = –40°C to 70°C - 41685; Entity I / 0 / AEx ia / IIC / T6 Ta = –40°C to 70°C - 41685; Entity Entity Parameters: V_{Max} = 30 V dc, I_{Max} = 35 mA, C_i = 0 µF, L_i = 0 mH
IECEx	Ex ia IIC T6 Ta= –40 °C to +70 °C - 41685; Entity Entity Parameters: U_i = 30 V dc, I_i = 35 mA, C_i = 0 µF, L_i = 0 mH.

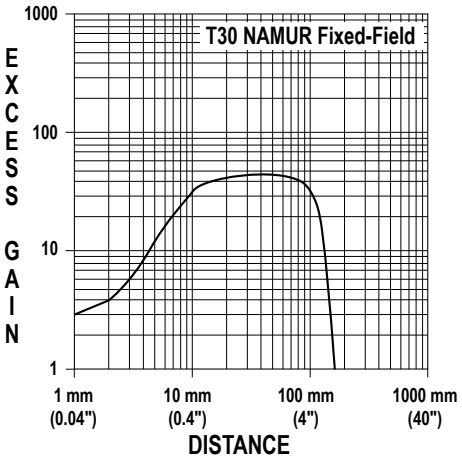


41246H



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Performance



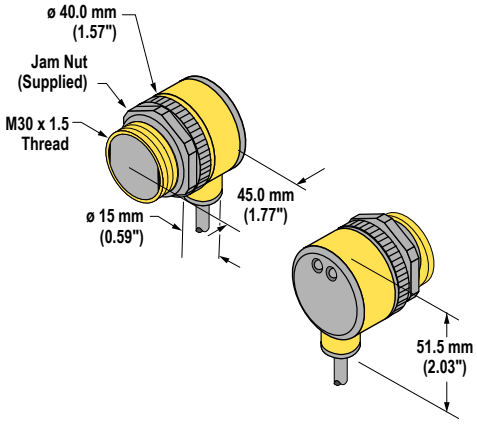
Performance is based on the use of a 90% reflectance white test card.

Using 18% gray test card: cutoff distance is 95% of the value shown.

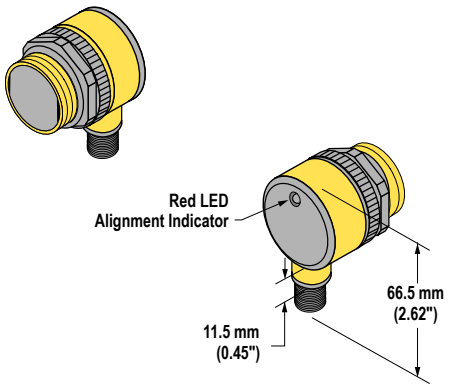
Using 6% black test card: cutoff distance is 90% of the value shown.

Dimensions

Cabled Models

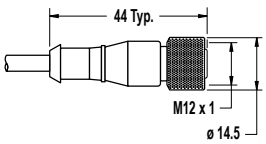
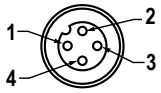


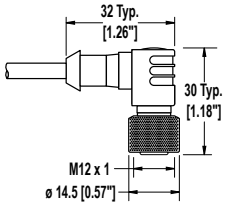
QD Models



Accessories

Cordsets

4-Pin Threaded M12/Euro-Style Cordsets (for use with NAMUR sensors)				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MQD9-406	1.83 m (6 ft)	Straight		 1 = Brown 2 = Blue
MQD9-415	4.57 m (15 ft)			
MQD9-430	9.14 m (30 ft)			

4-Pin Threaded M12/Euro-Style Cordsets (for use with NAMUR sensors)				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MQD9-406RA	1.83 m (6 ft)	Right-Angle		
MQD9-415RA	4.57 m (15 ft)			
MQD9-430RA	9.14 m (30 ft)			

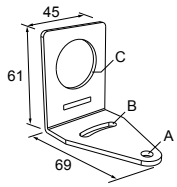
Brackets

T30 Series sensors may also be mounted in a 30 mm clearance hole up to 15 mm (0.6 in) deep, using the supplied jam nut(s).

All measurements are in mm

SMB30A

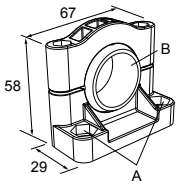
- Right-angle bracket with curved slot for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor
- 12-ga. stainless steel



Hole center spacing: A to B=40
Hole size: A=ø 6.3, B= 27.1 x 6.3, C=ø 30.5

SMB30SC

- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included



Hole center spacing: A=ø 50.8
Hole size: A=ø 7.0, B=ø 30.0

Repairs and Translations

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