

## Transportation Variable Reluctance Speed Sensors Thrumold Series

**32303003**  
Issue A

Datasheet



### DESCRIPTION

The Thrumold Series VRS (Variable Reluctance Speed) sensors are designed to detect engine timing and transmission speed by determining the speed and position of rotating shafts in heavy-duty, off-road, and construction vehicles, providing information to help improve engine combustion process efficiency. These passive VRS sensors are simple, rugged devices that do not require an external voltage source for operation. A permanent magnet in the sensor establishes a fixed magnetic field. The approach and passing of a ferrous metal target near the sensor's pole piece (sensing area) changes the flux of the magnetic field, dynamically changing its strength. This change in magnetic field strength induces a current into a coil winding which is attached to the output terminals. The output signal of a VRS sensor is an ac voltage that varies in amplitude and frequency as the speed of the monitored device changes, and is usually expressed in peak to peak voltage (Vp-p). One complete cycle occurs as each tooth passes the sensor's pole piece. If a standard gear were used as a target, this output signal would resemble a sine wave if viewed on an oscilloscope.

### VALUE TO CUSTOMERS

- Cost-effective: Self-powered operation, energy efficiency, and simple design help to reduce costs
- Manufacturing excellence: Honeywell has more than 100 years of manufacturing and engineering expertise
- Fast Request for Quotes (RFQs): Responding quickly to RFQs and product sample requests are Honeywell hallmarks
- Reliable supply chain: Honeywell's effective inventory management and dependable supply chain are available throughout the customer's development cycle
- Designed to Six Sigma standards: Provides the highest level of product quality, performance, consistency and confidence that the sensor will perform to specification
- Dedicated teams and efficient manufacturing processes allow samples to be shipped quickly to support the customer's product development cycle

### FEATURES

- Configurable diameters, materials, and output voltages: A variety of package styles, housing diameters, materials and output voltages
- Compensated operating temperature range: -40 °C to 150 °C [-40 °F to 302 °F]
- Energy efficient: When used in engine camshaft and crankshaft applications, can provide a precise engine timing signal to optimize the combustion process
- No moving parts or wear mechanisms (unlike mechanical switches)
- Self-powered operation: Can be used in applications where no external power is available
- Direct conversion of actuator speed to output frequency: Simplifies the customer's electronic control interface because each output signal correlates to each tooth on the actuator
- Simple installation: Screw-in mount sensor requires no special tools
- Designed for use over a wide range of speeds: Allows for potential use in engines and transmissions which often require a wide range of rotational speed measurement
- Durable: 300 Series stainless steel housing material allows for use in harsh environments
- Environmentally tough:
  - Chemical compatibility: Engine oil, diesel fuel, water, engine coolant, salt spray and trisodium phosphate cleaning solution (oils containing extreme pressure additives are not suitable for use with this sensor)
  - Front end sealed to 5 psi
- Sensor reach options: Sensor reach is the distance from a sensor's mounting surface to its sensing tip:
  - Adjustable: The sensor, with its threaded housing, is screwed into the application until it makes contact with the target, and then is backed off one-half to one turn; a user-provided jam nut is then used to fix the sensor in place
  - Fixed (also called non-adjustable): The sensor is screwed into the application until the sensor's mounting surface makes contact with the application's mounting surface

### POTENTIAL TRANSPORTATION APPLICATIONS

- Engine timing for heavy duty, off-road, construction vehicles (i.e., tractors and dump trucks)
- Transmission speed for heavy duty, off-road, construction vehicles (i.e., tractors and dump trucks)

**Note: Not recommended for potential use in Aerospace/Defense applications.**

### PORTFOLIO

In addition to the Thrumold Series for Transportation applications, Honeywell offers Industrial variable reluctance sensors which provide electrical compatibility to most control system interfaces: [VRS General Purpose Series](#), [VRS Hazardous Location Series](#), [VRS High Output Series](#), [VRS High Resolution Series](#), [VRS High Temperature Series](#) and [VRS Power Output Series](#).

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**Table 1. Electrical Specifications**

Characteristic	High Voltage Output Versions						Low Voltage Output Versions			
	TM-HAADA	TM-HBADA	TM-HBADA-001	TM-HBCDA	TM-HCBDF	TM-HCDDF	TM-LAADA	TM-LBADA	TM-LCBDA	TM-LDADA
<b>Input</b>										
Coil resistance: at 25 °C [77 °F] over temp.	1450 Ohm ±180 Ohm 1450 Ohm ±70 Ohm						140 Ohm to 230 Ohm 105 Ohm to 260 Ohm			
Inductance (at 1 kHz, ±2%)	706 mH ±41 mH					580 mH ±35 mH	84 mH ±9 mH			
Operating frequency, max.	15 kHz typ.						40 kHz typ.	15 kHz typ.		40 kHz typ.
<b>Output</b>										
Output voltage, min.	39 Vp-p ±9 Vp-p					34.5 Vp-p ±6.9 Vp-p	28 Vp-p ±7 Vp-p			
Optimum actuator	8 DP									
Gear pitch range	8 mm									
Surfacespeed, min.	5.9 IPS (0.15 m/s) typ.									

**Table 2. Mechanical Specifications**

Characteristic	High Voltage Output Versions						Low Voltage Output Versions			
	TM-HAADA	TM-HBADA	TM-HBADA-001	TM-HBCDA	TM-HCBDF	TM-HCDDF	TM-LAADA	TM-LBADA	TM-LCBDA	TM-LDADA
Housing material	stainless steel				aluminum	anodized aluminum	stainless steel			stainless steel
Mounting thread	M18x1.5 6G	5/8-18 UNF-2A			3/4-16 UNF-2A		M18x1.5 6G	5/8-18 UNF-2A		M16x1.5 6G
Termination	Deutsch DT04 connector									
Chemical compatibility	Engine oil, diesel fuel, water, engine coolant, salt spray, and trisodium phosphate cleaning solution. (Note: do not use oils containing extreme pressure additives (high sulfur content).)									
Weight	72 g [2.54 oz] approx.									

**Table 3. Environmental Specifications**

Characteristic	High Voltage Output Versions						Low Voltage Output Versions			
	TM-HAADA	TM-HBADA	TM-HBADA-001	TM-HBCDA	TM-HCBDF	TM-HCDDF	TM-LAADA	TM-LBADA	TM-LCBDA	TM-LDADA
Operating temp.	-40 °C to 120 °C [-40 °F to 248 °F]									
Storage temp.	-55 °C to 150 °C [-67 °F to 302 °F]									
Vibration	20 G RMS from 24 Hz to 2000 Hz >50 MOhm									

**Table 4. High Output Versions Only: Test Condition Specifications**

Characteristic	TM-HAADA	TM-HBADA	TM-HBADA-001	TM-HBCDA	TM-HCBDF	TM-HCDDF
Surface speed	5.9 IPS typ.					
Gear	8 DP					
Air gap	0,889 mm ±0,381 mm [0.035 in ±0.015 in]					
Load resistance	4.8 kOhm					
Free air condition	no ferrous metals within 38,1 mm [1.5 in] of sensor face					

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Figure 1. Nomenclature

For example, a **TM-HAADA** catalog listing number defines a TM Series VRS sensor with high output, M18 x 1.5 6G thread size, 82,68 mm [3.265 in] housing length, a Deutsch connector, adjustable sensor reach, no protective sleeve.

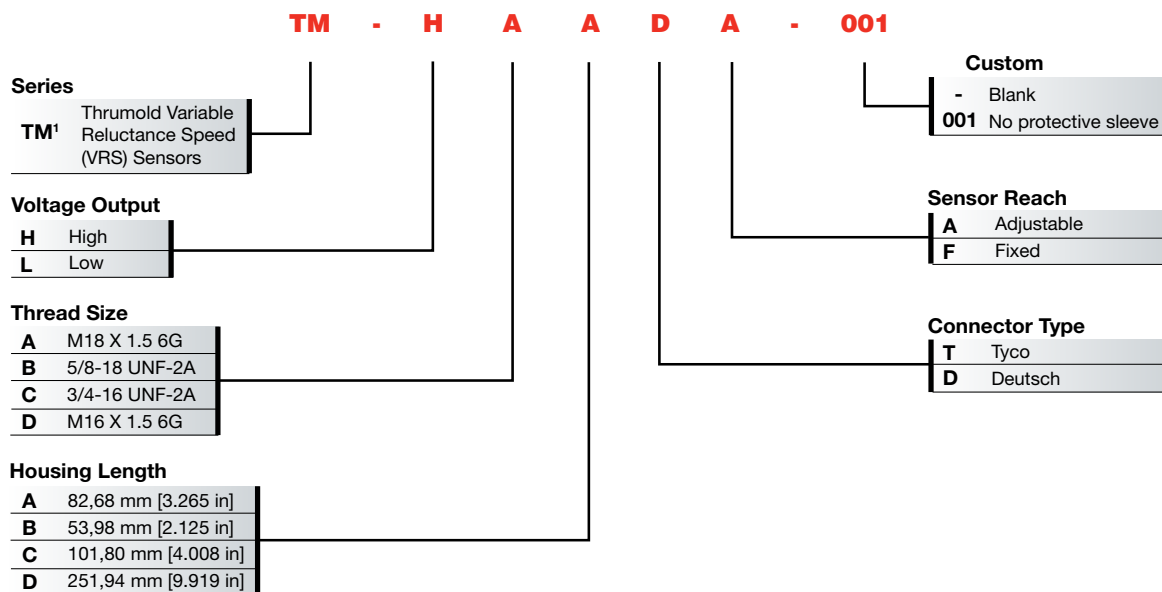


Table 5. Order Guide

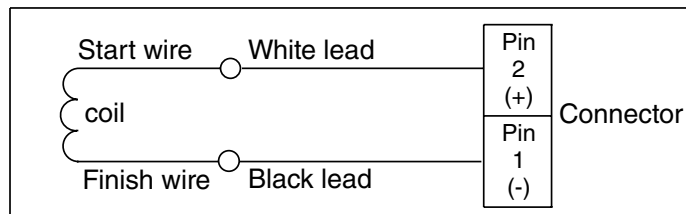
Catalog Listing	Description
TM-HAADA	Thrumold Series transportation variable reluctance speed sensor, high output, M18X1.5 6G thread size, 82,68 mm [3.265 in] housing length, Deutsch connector, adjustable sensor reach
TM-HBADA	Thrumold Series transportation variable reluctance speed sensor, high output, 5/8-18 UNF-2A thread size, 82,68 mm [3.265 in] housing length, Deutsch connector, adjustable sensor reach
TM-HBADA-001	Thrumold Series transportation variable reluctance speed sensor, high output, 5/8-18 UNF-2A thread size, 82,68 mm [3.265 in] housing length, Deutsch connector, adjustable sensor reach, no protective sleeve
TM-HBCDA	Thrumold Series transportation variable reluctance speed sensor, high output, 5/8-18 UNF-2A thread size, 101,80 mm [4.008 in] housing length, Deutsch connector, adjustable sensor reach
TM-HCBDF	Thrumold Series transportation variable reluctance speed sensor, high output, 3/4-16 UNF-2A thread size, 53,98 mm [2.125 in] housing length, Deutsch connector, fixed sensor reach
TM-HCDDF	Thrumold Series transportation variable reluctance speed sensor, high output, 3/4-16 UNF-2A thread size, 251,94 mm [9.919 in] housing length, Deutsch connector, fixed sensor reach
TM-LAADA	Thrumold Series transportation variable reluctance speed sensor, low output, M18X1.5 6G thread size, 82,68 mm [3.265 in] housing length, Deutsch connector, adjustable sensor reach
TM-LBADA	Thrumold Series transportation variable reluctance speed sensor, low output, 5/8-18 UNF-2A thread size, 82,68 mm [3.265 in] housing length, Deutsch connector, adjustable sensor reach
TM-LBCDA	Thrumold Series transportation variable reluctance speed sensor, low output, 5/8-18 UNF-2A thread size, 101,80 mm [4.008 in] housing length, Deutsch connector, adjustable sensor reach
TM-LDADA	Thrumold Series transportation variable reluctance speed sensor, low output, M16X1.5 6G thread size, 82,68 mm [3.265 in] housing length, Deutsch connector, adjustable sensor reach

# Transportation Variable Reluctance Speed Sensors, Thrumold Series

Figure 2. All Available External Configurations

High Voltage Output Versions	Low Voltage Output Versions
<b>TM-HAADA</b> 	<b>TM-LAADA</b> 
<b>TM-HBADA</b> 	<b>TM-LBADA</b> 
<b>TM-HBADA-001</b> 	<b>TM-LBCDA</b> 
<b>TM-HBCDA</b> 	<b>TM-LDADA</b> 
<b>TM-HCBDF</b> 	
<b>TM-HCDDF</b> 	

Figure 3. Electrical Schematic

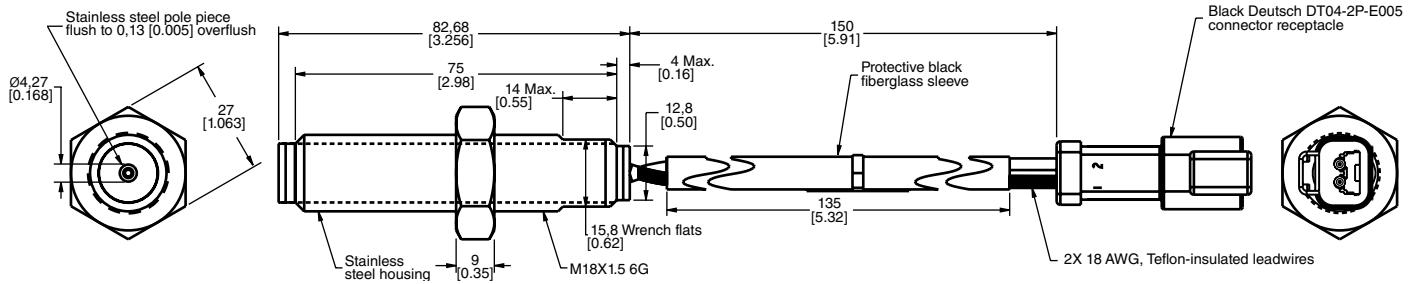


As ferrous material approaches the pole piece, the white lead goes positive with respect to the black lead.

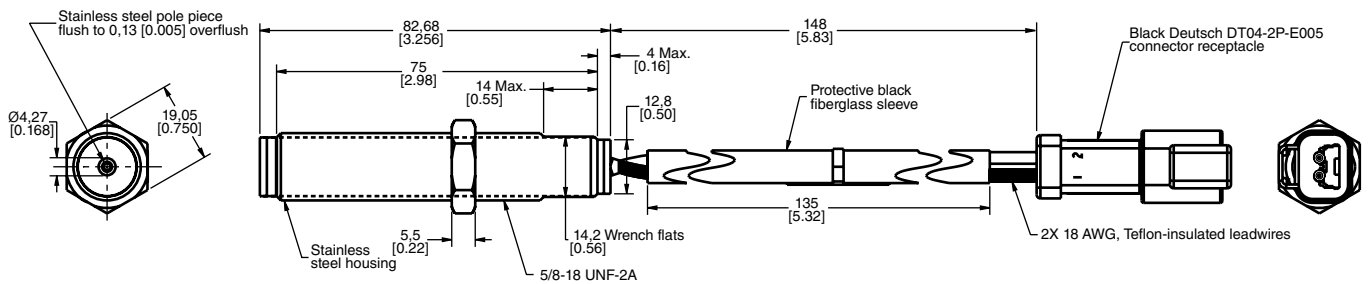
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Figure 4. High Output Versions Dimensional Drawings (For reference only: mm [in].)

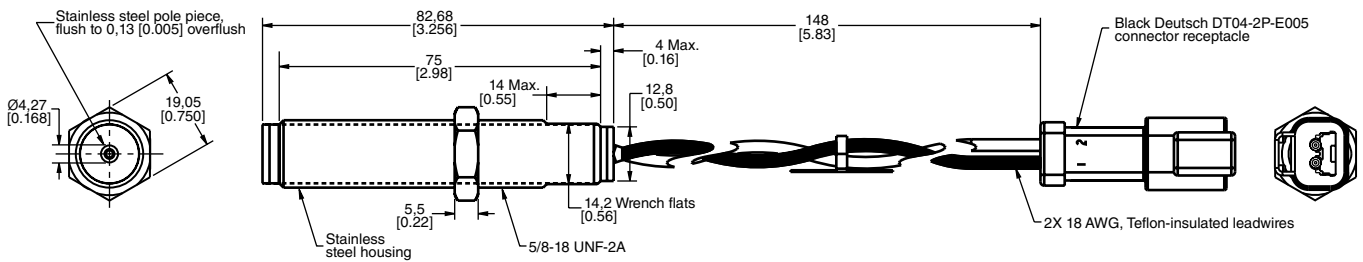
## TM-HAADA



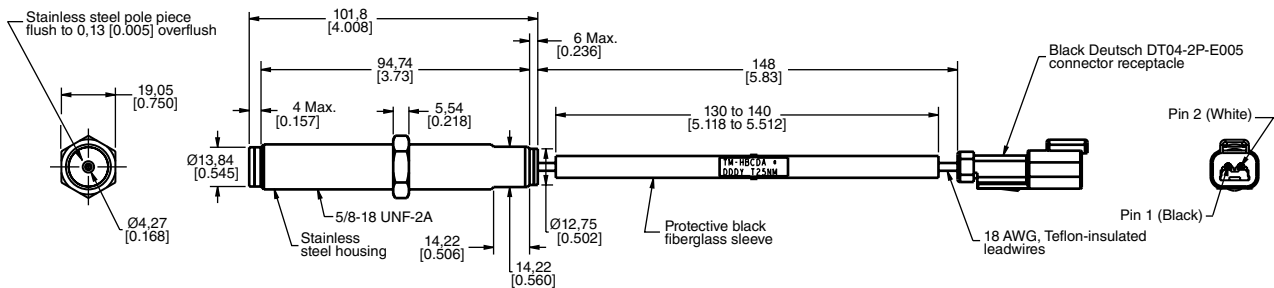
## TM-HBADA



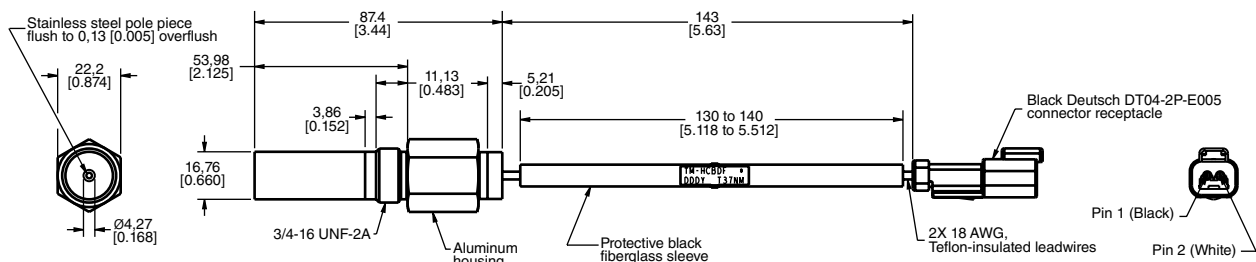
## TM-HBADA-001



## TM-HBCDA



## TM-HBCDF



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Figure 4. High Output Versions Dimensional Drawings (continued)

## TM-HCDDF

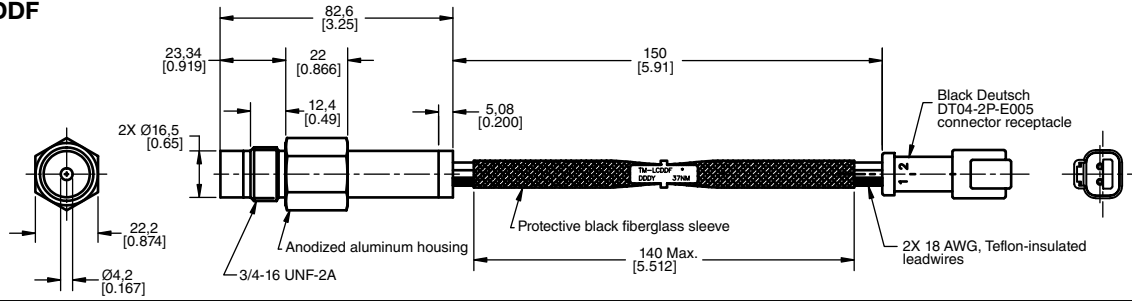
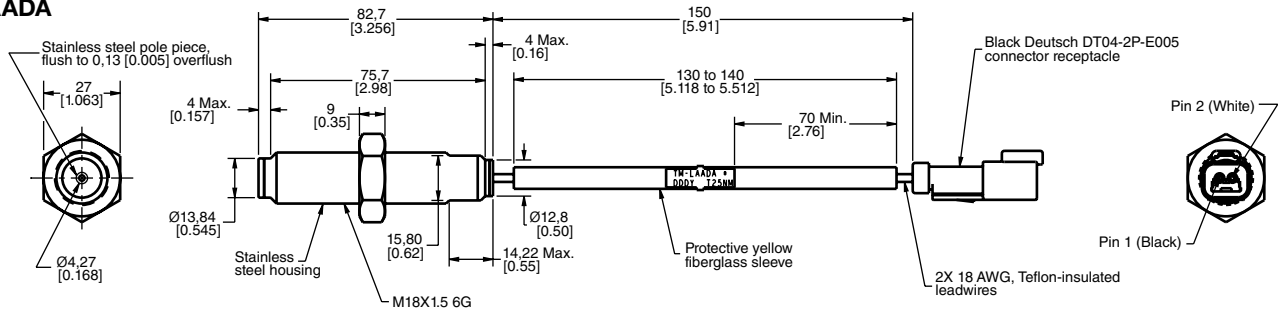
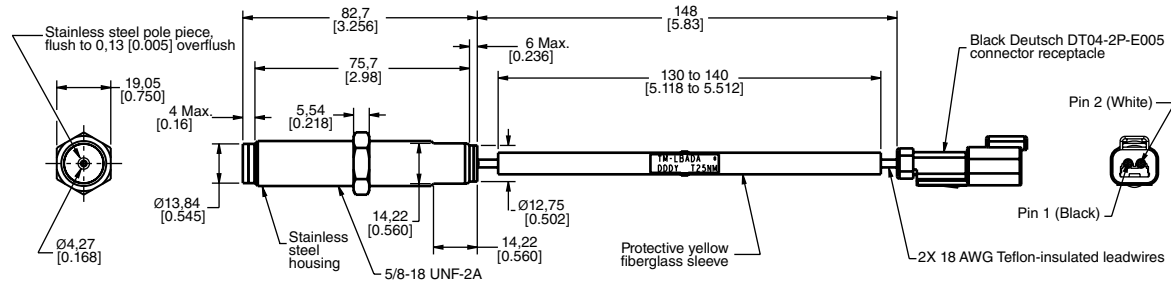


Figure 5. Low Output Versions Dimensional Drawings (For reference only: mm [in.])

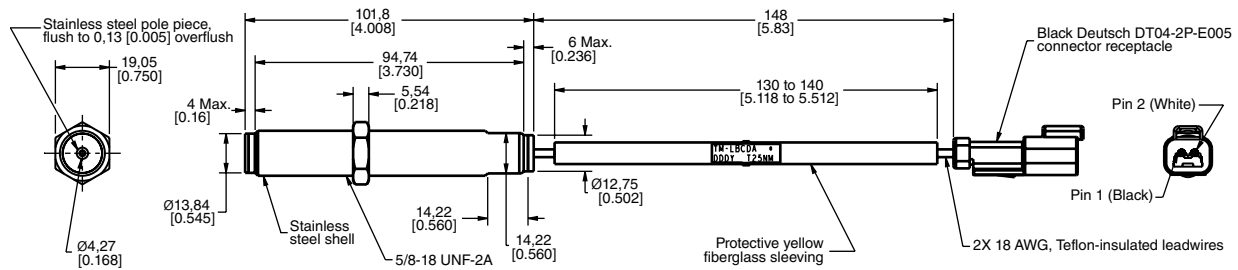
## TM-LAADA



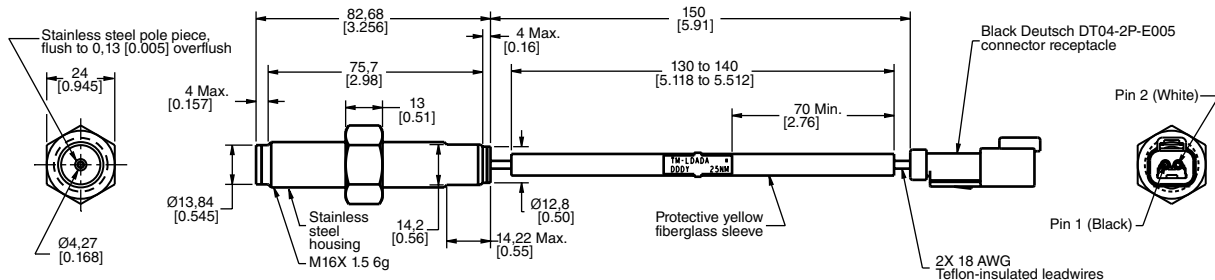
## TM-LBADA



## TM-LCBDA



## TM-LDADA



**⚠ WARNING**  
**PERSONAL INJURY**

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

**Failure to comply with these instructions could result in death or serious injury.**

**⚠ WARNING**  
**MISUSE OF DOCUMENTATION**

- The information presented in this datasheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

**Failure to comply with these instructions could result in death or serious injury.**

**Warranty/Remedy**

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