Honeywell

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 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.

Transportation Variable Reluctance Speed Sensors, Thrumold Series

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
Input										
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.
Output										
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									
Surface speed, 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.

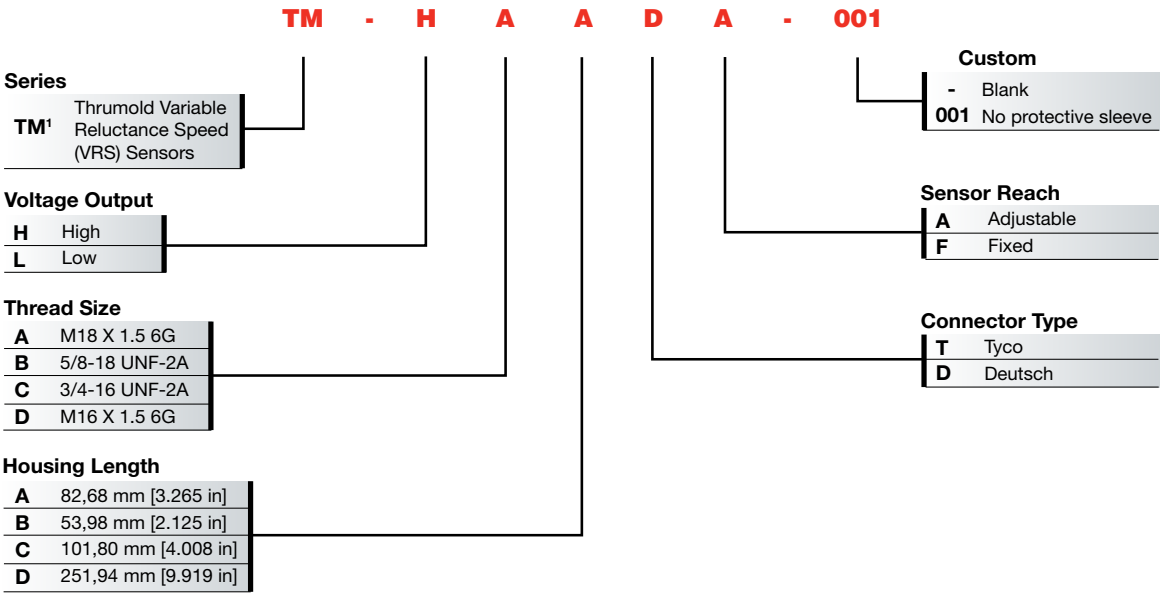

Table 5. Order Guide

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

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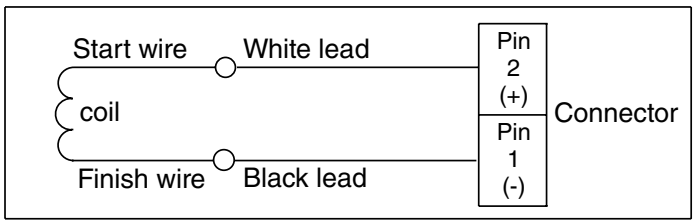
Figure 2. All Available External Configurations

High Voltage Output Versions	Low Voltage Output Versions
TM-HAADA 	**TM-LAADA** 
TM-HBADA 	**TM-LBADA** 
TM-HBADA-001 	
TM-HBCDA 	**TM-LBCDA** 
TM-HCBDF 	**TM-LDADA** 
TM-HCDDF 	

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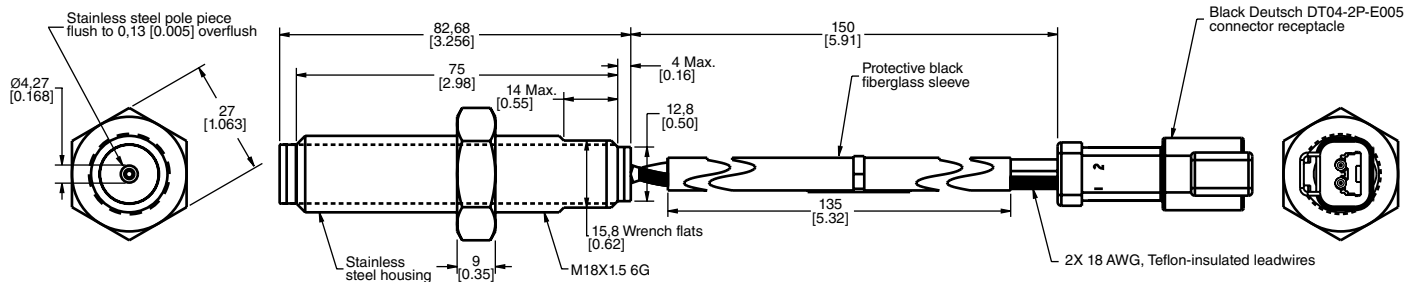
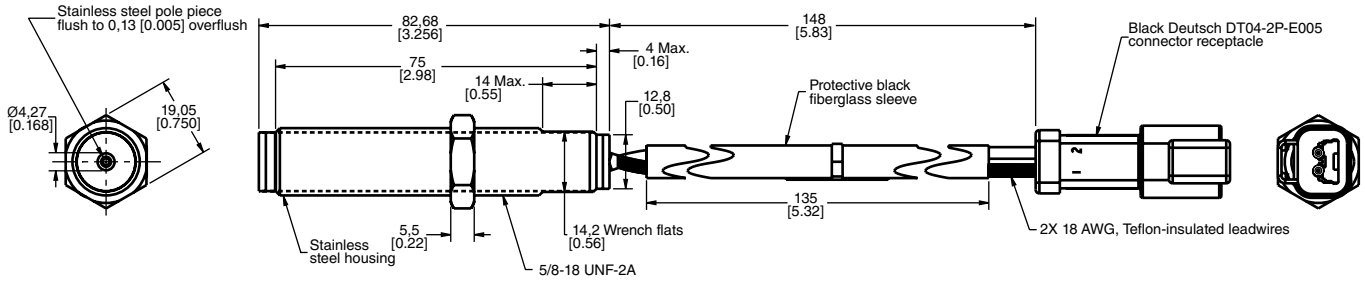
Figure 4. High Output Versions Dimensional Drawings (For reference only: mm [in].)

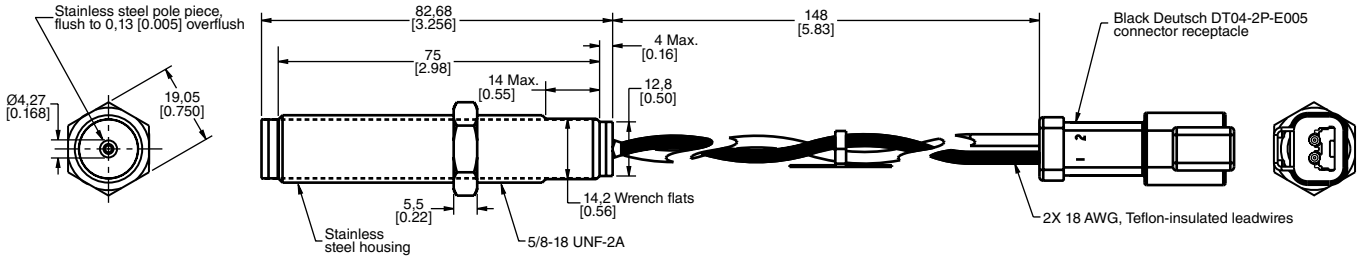
TM-HAADA



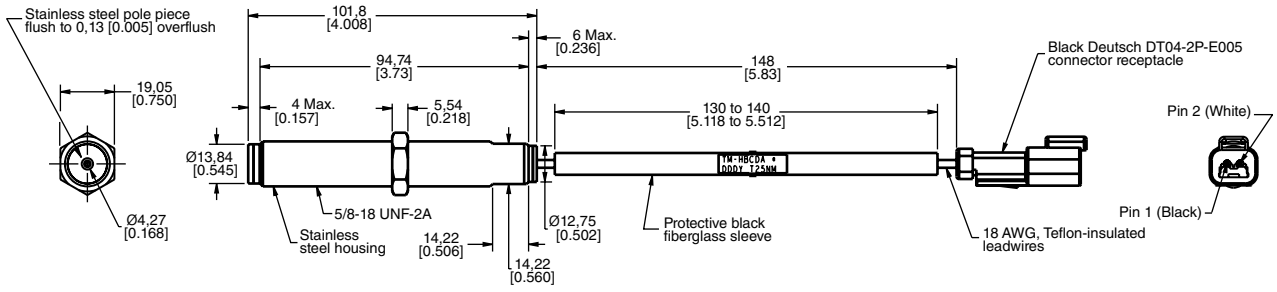
TM-HBADA



TM-HBADA-001



TM-HBCDA



TM-HBCDF

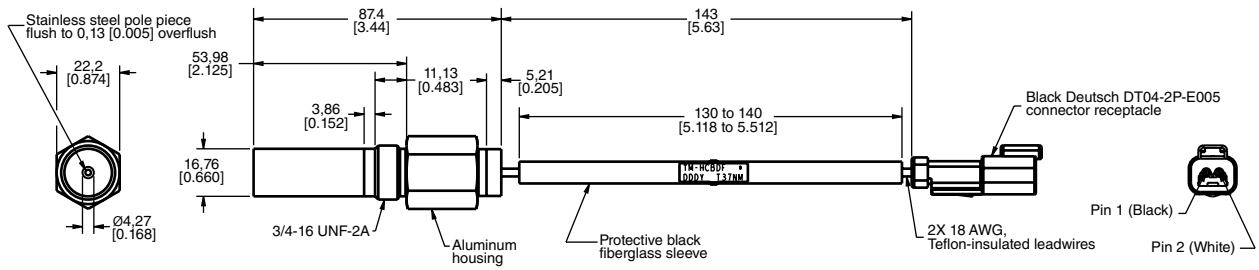


Figure 4. High Output Versions Dimensional Drawings (continued)

TM-HCDDF

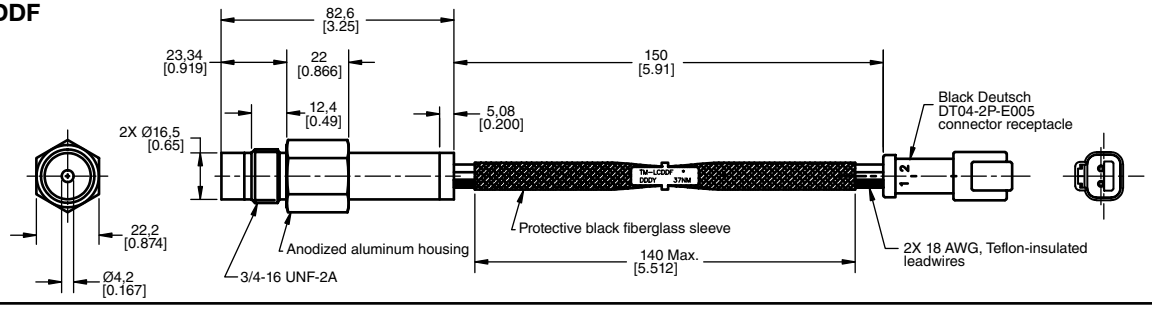
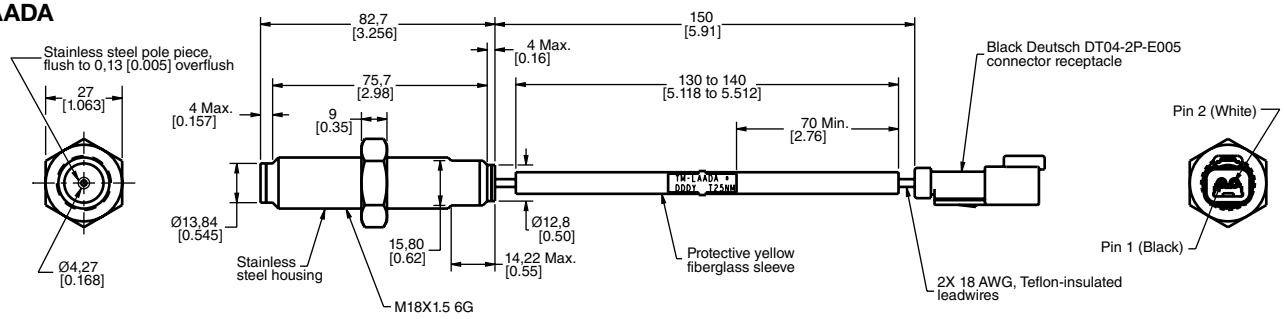
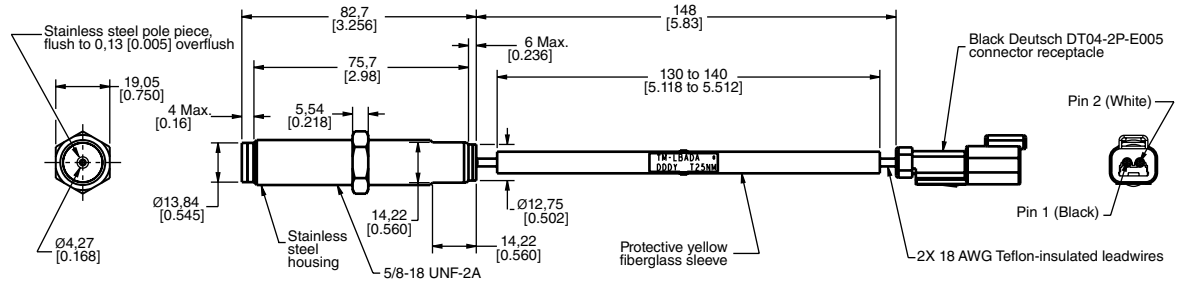


Figure 5. Low Output Versions Dimensional Drawings (For reference only: mm [in].)

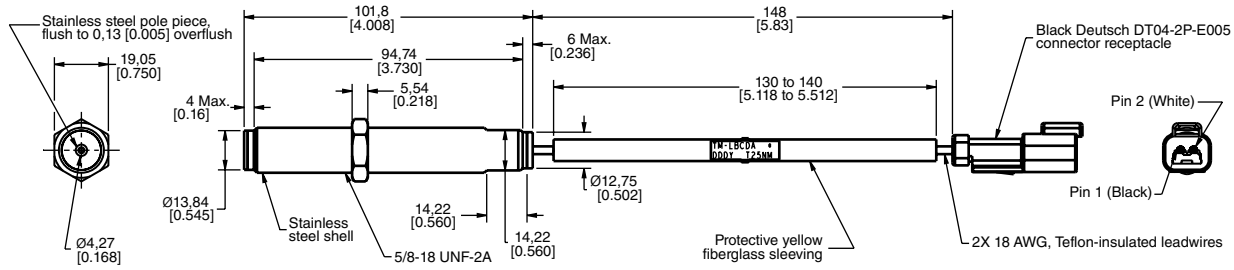
TM-LAADA



TM-LBADA



TM-LCBDA



TM-LDADA