



MOTION SENSORS, INC.



Producing High Quality Solutions Since 1970

COMPANY OVERVIEW AND PRODUCT BROCHURE

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About Motion Sensors, Inc.

"About Us" is not just about Motion Sensors Inc (MSI), but includes you. We develop partnerships with our customers, priding ourselves on the ability to anticipate and adapt to customer requirements quickly and efficiently. This is possible, in part, by controlling our manufacturing processes, including CNC machining, TIG welding, and automated pick and place, with a formal MRP (material resource planning) system to minimize lead times and maximize production flexibility. The picture is completed with our people; a dedicated team ready to serve you.

MSI systems and products are world-class; from our ISO 9001:2000 registered quality system, to our intrinsically safe ATEX compliant (94/9/EC) and CSA certified products, MSI is specified globally for the most stringent hazardous locations.

MSI Facility/Equipment Overview:

- 7,500 sq. ft. of manufacturing floor space
- Haas CNC three (3)-axis milling machine
- Hardinge CNC two (2)-axis lathe machine
- Cincinnati CNC two (2)-axis lathe machine
- Daewoo CNC two (2)-axis lathe machine
- Manual milling machine, lathe and drill press
- Weld Logic automatic TIG welder
- Universal Instruments pick and place machine
- NBW Systems solder reflow oven
- Cirris Systems Automated Cable Tester (Signature 1100+)
- Environmental pressure test capability to 20,000psi
- Environmental chambers (including vacuum capability)
- Standard bench electronic test equipment



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Industries Served by Motion Sensors, Inc.

Your industry, if you need reliable, high quality sensing and electronic products for use in harsh and rugged environments. Motion Sensors (MSI) has been fulfilling our customer's application requirements for years in several demanding industries, among which are:

Rail Applications - The rail industry requires rugged, moisture resistant sensors that can withstand high levels of vibration, impact and general mechanical abuse over long periods of time. Applications include braking, speed control, propulsion, automatic train control, event recording, and head-end power. MSI also supplies cable assemblies and jumpers as well as products such as ground fault sensors, electronic thermostats and door safety interlock systems. MSI has delivered numerous custom products for rail applications and has been cited for our innovative design solutions.

Flow Metering Applications – Motion Sensors (MSI) is a market leader for sensors used in the demanding turbine flow metering industry, where high accuracy and reliability, as well as cryogenic and high temperature applications are the norm. Innovative engineering and use of materials, combined with attention to detail has allowed us to build a global reputation for quality.

Aerospace and Military – MSI has designed and manufactured numerous products for aerospace and military applications including sensors used in space programs, nuclear submarines, missile systems, various jet aircraft, army trucks and armored vehicles. We can administer and oversee qualification testing, and have the in-house facilities and capability to provide comprehensive ATP testing to meet stringent military and aerospace requirements.

Power Industry – MSI has produced variable reluctance and Hall Effect sensors for shaft speed and over/under speed control. Additionally, MSI has developed transducers and electronics for sensing turbine shaft run-out and vibration, parameters that are used in equipment health monitoring.



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Custom Sensors and Related Products

Since 1970, Motion Sensors (MSI) has developed and manufactured sensors and electronics for companies based upon their unique specifications. Innovative engineering and a commitment to customer satisfaction have enabled us to continue offering custom products at very reasonable prices. MSI has the ability to adapt to customer demands quickly and efficiently, reducing the lead times and costly non-recurring charges typically associated with the development of custom designs.

At MSI we welcome the opportunity to develop a product for your particular application or modify an existing product to suit your needs. We have designed and manufactured sensor, sensor-related, and electronic products for various markets including aerospace, flowmetering and rail, among others.

Some sensor-specific examples include:

- Aerospace turbine engine speed control
- Rail system propulsion motor speed control
- Stationary gas turbine speed control
- Automatic Train Control (ATC) applications
- Door safety interlock system for rail cars

With respect to customization possibilities for our sensor products, the list is extensive and highly dependent on specific application parameters and the sensor technology employed. If you are considering a custom sensor to fulfill your application requirements, call MSI to discuss. The following is a short-listing of the most common areas of customization:

- **Configuration**
The geometry of the product can be configured to most customer specifications within functional parameters.
- **Intrinsically Safe**
Intrinsically safe products are an increasingly popular approach for a large number of customers. MSI offers intrinsically safe versions of all our sensor types as well as selected electronic products. Intrinsically safe versions of MSI sensors are certified for use in both North America and Europe to the most stringent requirements.
- **Materials**
Housings may be constructed from any non-magnetic material, typically 300 series stainless steel.



- **Explosion Proof**
Explosion Proof sensors feature NPT/pigtail lead configurations to allow direct coupling to electrical conduit.
- **Pulsed Output**
All our sensors that produce digital output can be obtained with 0-5V, 0-10V or open-collector outputs. Other output types are available per customer requirements.
- **Hermetic Sealing**
Hermetically sealed sensors are totally water and air-tight ensuring no leakage. Hermetic sealing is typically desired when the sensor will be exposed to harsh environments, moisture, etc.
- **Threads**
5/8"-18, 11/16"-24, and 3/4"-20 are the most popular threads. Other English and Metric threads are available.
- **Electrical Connections**
Options include circular 2-pin and 3-pin connectors, pigtail leads or cables, NPT threading/pigtail lead combinations with leads in any length.
- **Gauss Strength**
Related to the functional performance of the sensor. Can be lowered to reduce drag or increased to provide greater output signal strength (variable reluctance) and/or working range (Hall Effect. Magnetoresistive).
- **Ruggedizing**
Ruggedized variable reluctance (VR) undergo a unique internal construction process that enables them to tolerate rigorous conditions that would cause other sensors to fail (e.g. excessive vibration, impact and repeated thermocycling).
- **Drag**
Drag is defined as the magnetic influence a magnet has on a free-spinning target such as a turbine flow meter. This drag can cause significant measurement errors in particular applications. Most MSI variable reluctance (VR) sensors are offered in low drag versions.
- **Dual Coils**
Dual coils allow a variable reluctance (VR) sensor to produce two outputs. This is particularly important as a redundancy method and for verification of the primary coil. This option also enables the user to specify frequency ranges for each coil.
- **Tip (Pole Piece) Dimensions**
Tip dimensions and shape of variable reluctance (VR) sensors can be varied for special requirements (i.e., cylinder shaped, cone shaped, chisel shaped, etc.).
- **Dual Coils**
Dual coils allow a variable reluctance (VR) sensor to produce two outputs. This is particularly important as a redundancy method and for verification of the primary coil. This option also enables the user to specify frequency ranges for each coil.
- **Tip (Pole Piece) Dimensions**
Tip dimensions and shape of variable reluctance (VR) sensors can be varied for special requirements (i.e., cylinder shaped, cone shaped, chisel shaped, etc.).



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Custom Cable Assemblies

Motion Sensors Inc. offers custom electrical harness assembly products, with focus on satisfying requirements for the interconnection of sensors and related electronics in high-pin content/low volume applications such as those in the flow-metering and rail industries. Capability exists to fabricate and assemble multi-conductor assemblies with or without protective/heat shrink tubing, shielding for EMI protection or molded/traditional type connectors for the harshest applications.

At Motion Sensors Inc. we welcome the opportunity to develop a custom electrical harness assembly specifically suited to your application or to modify an existing product to suit your needs. We have extensive experience in designing custom products and pride ourselves on the ability to provide high quality custom products at reasonable prices.

Some examples include:

- Aerospace turbine engine speed control
- Train communication harness (inter-car jumper)
- Locomotive engine control harness
- Passenger train car harness (inter-car jumper)



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Custom Electronics

At Motion Sensors Inc. we welcome the opportunity to develop a custom electronic product specifically suited to your application or to modify an existing product to suit your needs. We have extensive experience in designing custom electronic products used both in conjunction with our sensors or as stand-alone devices. We pride ourselves on the ability to provide high quality custom products at reasonable prices.

Some examples include:

- Miniaturized amplifier/signal conditioner for an under water flow-meter application
- Reverse engineered logic boards for HVAC system
- Electronic thermostats for commuter rail cars
- Natural gas sensing system for an intrinsically safe environment
- Ground fault detection system for commuter rail cars
- Door safety interlock system for rail cars



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Engineering Services

Motion Sensors (MSI) is focused to provide engineered custom solutions for a variety of applications and industries. We specialize in the development of products and providing technical services to meet our customers' unique requirements. We have designed and manufactured sensor, sensor-related, and electronic products for various markets including:

- Aerospace
- Flowmetering
- Rail
- Transportation

Our in-house technical capabilities include:

- Electrical and mechanical product engineering
- Reverse engineering
- Prototyping
- PCB layout (SMT and through-hole)
- Circuit simulation
- Verification/validation testing
- Project management

Technical Software includes:

- AutoCad LT 2006
- OrCad



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Sensors Overview

Hall Effect Sensors - MSI Hall Effect sensors provide zero speed sensing and are available in both oriented and non-oriented models. The target can be either ferrous, such as a gear, sprocket, etc. or magnetic (discrete or multi-pole). Standard MSI Hall Effect sensors have unique safeguards built into their circuits to prevent damage from incorrect hookup and can be obtained in models that produce the most popular digital outputs; current-sinking, current-sourcing, etc.

Variable Reluctance (VR) Sensors – MSI VR speed sensors are designed for all types of environments and user specifications. Options include hermetically sealed, cryogenic, high temperature, intrinsically safe and explosion proof. In addition to the more common VR sensors, MSI also offers inductive type sensors for applications where magnets, rather than ferrous metal, will be sensed.

Intrinsically Safe Sensors – MSI offers intrinsically safe versions of all speed sensor types; Hall Effect, VR, Magnetoresistive, RF, and Digi-Pulse. We also offer intrinsically safe versions of our PA1001A preamplifier for use with the VR and RF types when the preamplification and signal conditioning needs to be detached from the sensor because of temperature or space considerations.

RF Sensors – MSI's RF sensors offer low speed response, no drag, large air gaps and sensing characteristics which enable them to sense non-ferrous metals like aluminum or nonmagnetic stainless steel in addition to ferrous metal. Unlike their VR counterparts, RF sensors are not passive devices and require signal conditioners/preamplifiers to operate. These devices produce a digital square wave output versus the analog sine wave of the VR sensors.

Digi-Pulse Sensors - Digi-Pulse sensors combine high sensitivity amplifiers and signal conditioners with either variable reluctance or modulated carrier (RF) transducers. Unique features include near zero velocity (2 Hz) speed sensing, large air gap capability and several choices of pulse output.

Magnetoresistive Sensors – Similar to Hall Effect sensors, MR sensors are highly sensitive devices that can detect very small changes in magnetic fields caused by a passing target (ferrous or magnetic), and convert this into a digital output. Versions are available for quadrature (bi-directional) or single direction sensing.

Custom Magnetic Sensors - At MSI we welcome the opportunity to develop a product specifically suited to your application or to modify an existing product to suit your needs. We have extensive experience in designing custom products and pride ourselves on the ability to provide high quality custom products at reasonable prices.



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Variable Reluctance Sensors - Premium

For harsh environments and years of reliable service, MSI Premium sensors are your best option. They are hermetically sealed for resistance to moisture and other atmospheric contamination and can withstand repeated thermocycling in temperatures ranging from -450°F to 450°F. MSI Premium sensors are the sensors of choice for use in cryogenics for their ability to operate dependably at extremely low temperatures for long periods of time. The ruggedized version of this type undergo a unique internal construction process that enables them to better tolerate rigorous conditions that would cause other sensors to fail (e.g., excessive vibration, impact, and repeated thermocycling).

Product Specifications

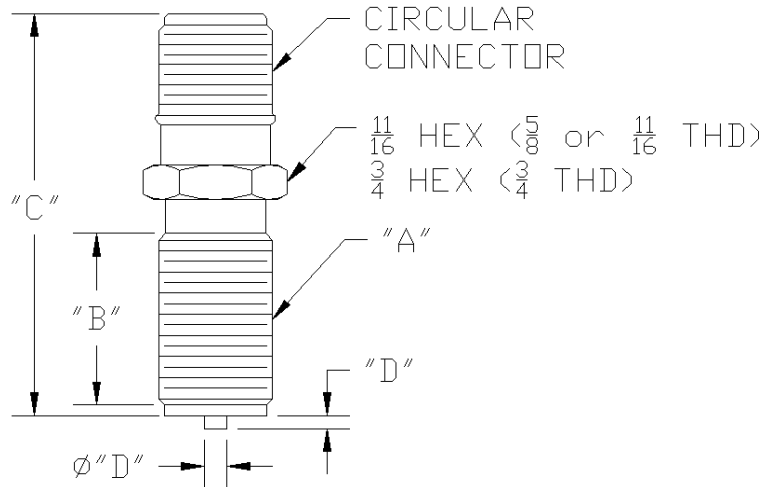
In addition to the models specified, MSI can make custom Premium series VR sensors in other lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. to satisfy special requirements. The products listed below are a sampling of our standard grade sensors, and are also available in the ruggedized grade. If you do not see a sensor that meets your needs, please contact us and we would be happy to make a product that meets your specifications.

Standard Features and Specifications

- Available in standard and ruggedized grades
- Variable Reluctance (VR) or inductive type (no internal magnet).
- Hermetically sealed, heli-arc welded construction
- Two (2) pin gold plated glass sealed connector (mates with: MS3106-10SL-4S)
- 300 stainless steel housing (lock-nut included)
- Magnet that resists demagnetization
- Unique potting that compensates for temperature extremes
- Focusing tip (pole piece) which allows greater air gap with no signal loss
- High signal output
- Temperature range: -450°F to +450°F (-270°C to +232°C)
- IR leakage: 100 Mohms @ 100 VDC minimum
- High Shock and Vibration resistance:
Impact: 15 G's (11 mS, 1/2 sine) min.; Vibration: 20 G's at 2,000 Hz min
- Unconditional one (1) year warranty if used within specifications



Dimension Key



Standard VR Models

Model Number	Mounting Thd (A)	Thd Length (B)	Overall Length (C)	Tip (Length/Dia.) (D)	Resistance (ohms)	Inductance (Henry)	Gauss Strength
PC51-1G	5/8x18	1.00	2.212	.031/.100	1200	.54	810
PC13-74G	11/16x24	.563	2.685	.070/.125	1800	1.3	850
PC13-70G	11/16x24	.563	1.975	.070/.125	1800	1.3	850
PC13-106G	3/4x20	1.25	2.685	flush front	1800	1.3	850

Standard Low-drag VR Models

Model Number	Mounting Thd (A)	Thd Length (B)	Overall Length (C)	Tip (Length/Dia.) (D)	Resistance (ohms)	Inductance (Henry)	Gauss Strength
PC55-2G	5/8x18	1.00	2.212	.031/.100	1650	1.4	325
PC24-45G	11/16x24	.563	2.220	.070/.125	1380	1.6	350
PC24-141G	3/4x20	1.25	2.685	flush front	1380	1.6	350

Standard Inductive Models

Model Number	Mounting Thd (A)	Thd Length (B)	Overall Length (C)	Tip (Length/Dia.) (D)	Resistance (ohms)	Inductance (Henry)	Gauss Strength
PC53-1G	5/8x18	1.00	2.212	flush front	5000	15	n/a
PC3-24G	11/16x24	.563	2.220	flush front	5000	15-20	n/a

Notes:

1. Dimensions in inches
2. Specifications +/- 10%
3. Mounting threads UNF-2A



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Variable Reluctance Sensors - Value

Motion Sensors (MSI) Value sensors feature quality design features similar to our other sensors. They are suitable for applications that do not have special environmental requirements (e.g., wide operating temperature range, hermeticity, atmospheric contamination, etc.). Therefore, they do not feature the same materials and components found in our MSI Premium series, which is more suited for severe environments. MSI's commitment to detail, quality and reliability apply to every sensor in the Value series. For example, these sensors feature metal fronts to better protect the sensors' internals as opposed to epoxy encapsulated fronts. In addition, they carry the same warranty as the MSI Premium series.

Product Specifications

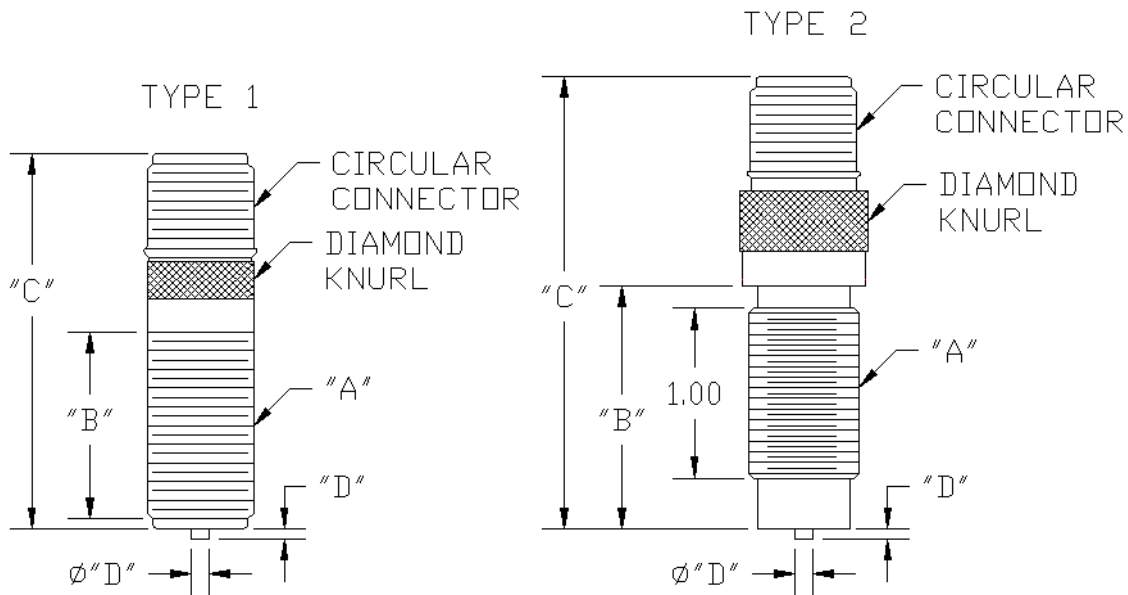
In addition to the models specified, MSI can make custom Value series sensors in other lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. to satisfy special requirements. If you do not see a sensor that meets your needs, please contact us and we would be happy to make a product that meets your specifications.

Standard Features and Specifications

- Two (2) standard body styles
- Variable reluctance (VR) type
- Epoxy encapsulation
- Two (2) pin gold plated connector (mates with: MS3106-10SL-4S)
- 300 stainless steel housing (lock-nut included)
- IR leakage: 100 Mohms @ 100 VDC minimum
- High Shock and Vibration resistance
Impact: 100 G's (6 mS, 1/2 sine) min.; Vibration: 20 G's at 2,000 Hz min
- Unconditional one (1) year warranty if used within specifications



Dimension Key



Standard Drag VR Models Type 1

Model Number	Mounting Thd (A)	Thd Length (B)	Overall Length (C)	Tip (L/Dia) (D)	R (ohms)	I (mH)	Op Temp (°C)
PC51-6E	5/8x18	1.10	2.20	.031/.100	1200	500	-55 to 120
PC24-164E	11/16x24	1.10	2.20	.075/.105	1200	500	-55 to 120
PC24-165E	11/16x24	1.10	2.20	.075/.105	2800	1200	-55 to 120

Standard Drag VR Models Type 2

Model Number	Mounting Thd (A)	Thd Length (B)	Overall Length (C)	Tip (L/Dia) (D)	R (ohms)	I (mH)	Op Temp (°C)
PC51-15E	5/8x18	1.43	2.656	.025/.100	1100	450 max.	-55 to 120
PC51-16E	5/8x18	1.13	2.356	.025/.100	1100	450 max.	-55 to 120
PC51-18E	5/8x18	1.13	2.356	.025/.100	1100	450 max.	-55 to 232
PC55-13E	5/8x18	1.43	2.656	.015/.187	120-162	85 max.	-55 to 120
PC55-15E	5/8x18	1.13	2.356	.015/.187	120-162	85 max.	-55 to 120
PC55-18E	5/8x18	1.13	2.356	.015/.187	120-162	85 max.	-55 to 232

Notes:

1. Dimensions in inches
2. Specifications +/- 10%
3. Mounting threads UNF-2A



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Variable Reluctance Sensors – High Temperature

Motion Sensors (MSI) High Temperature sensors were designed to operate reliably in high temperature environments for long periods of time. These sensors can easily withstand repeated thermocycling and feature an operating temperature range of -450°F to +850°F and +1000°F intermittently. A flexible stainless steel braided sheath that can withstand exposure to +1000°F protects signal lead wires. Special materials and construction prevent damage from physical abuse and thermal shock. In addition, all High Temperature magnetic sensors are hermetically sealed.

Product Specifications

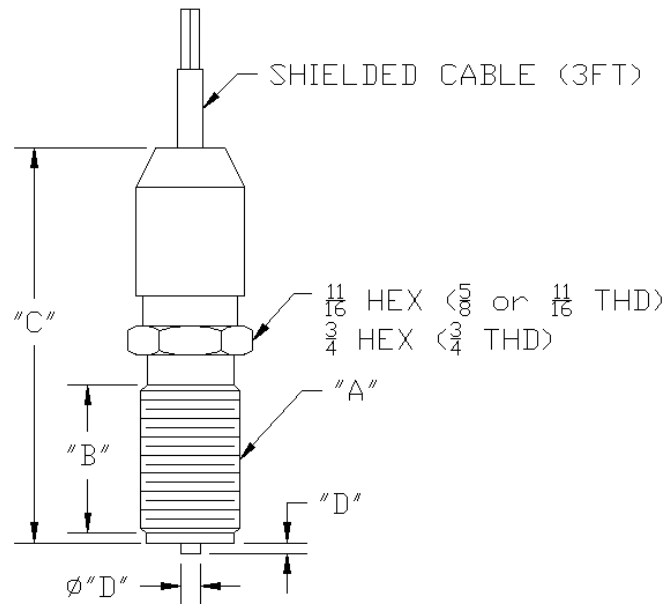
In addition to the models specified, MSI can make custom High Temperature VR sensors in other lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. to satisfy special requirements. If you do not see a sensor that meets your needs, please contact us and we would be happy to make a product that meets your specifications.

Standard Features and Specifications

- Variable Reluctance (VR) or inductive type (no internal magnet).
- Hermetically sealed, heli-arc welded construction
- Three (3) foot stainless steel overbraided lead
- 300 stainless steel housing (locknut included)
- Magnet that resists demagnetization
- Unique potting that compensates for temperature extremes
- Focusing tip (pole piece) which allows greater air gap with no signal loss
- Operating temperature range: -450°F to +850°F & +1000°F intermittently
- IR leakage: 50 Mohms @ 50 VDC minimum
- High signal output
- High Shock and Vibration resistance:
Impact: 15 G's (11 mS, 1/2 sine) min.; Vibration: 20 G's at 2,000 Hz min
- Unconditional six (6) month warranty if used within specifications



Dimension Key



Standard Drag High Temp VR Models

Model Number	Mounting Thd (A)	Thd Length (B)	Overall L (C)	Tip (L/D) (D)	R (Ohms)	I (Henry)	Gauss Strength
PC28-41G	5/8x18	.875	3.1	.031/.100	100	.09	1000
PC28-13G	11/16x24	.563	3.1	.070/.125	120	.10	1050
PC28-45G	3/4x20	1.25	3.1	.070/.125	120	.10	1050

Low-Drag High Temp VR Models

Model Number	Mounting Thd (A)	Thd Length (B)	Overall L (C)	Tip (L/D) (D)	R (Ohms)	I (Henry)	Gauss Strength
PC28-40G	5/8x18	.875	3.1	.031/.100	160	.20	180
PC28-14G	11/16x24	.563	3.1	.070/.125	180	.25	200
PC28-24G	3/4x20	1.25	3.1	.070/.125	180	.25	200

Inductive High Temp Models

Model Number	Mounting Thd (A)	Thd Length (B)	Overall L (C)	Tip (L/D) (D)	R (Ohms)	I (Henry)	Gauss Strength
PC23-16G	11/16x24	.563	3.1	flushfront	250	1.2	n/a

Notes:

1. Dimensions in inches
2. Specifications +/- 10%
3. Mounting threads UNF-2A



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Variable Reluctance Sensors - Humbucking

Humbucking sensors are special dual coil versions of the MSI Premium series and feature the same materials and construction methods. These sensors offer very high resistance to electrical interference with little or no loss in signal strength. Humbucking sensors must be used with a differential amplifier to condition and isolate the signal and eliminate unwanted electrical interference. They have the ability to cancel out most of the extraneous noise that is generated by motors, pumps, overhead lines, or other electrical devices that often create signal problems.

Product Specifications

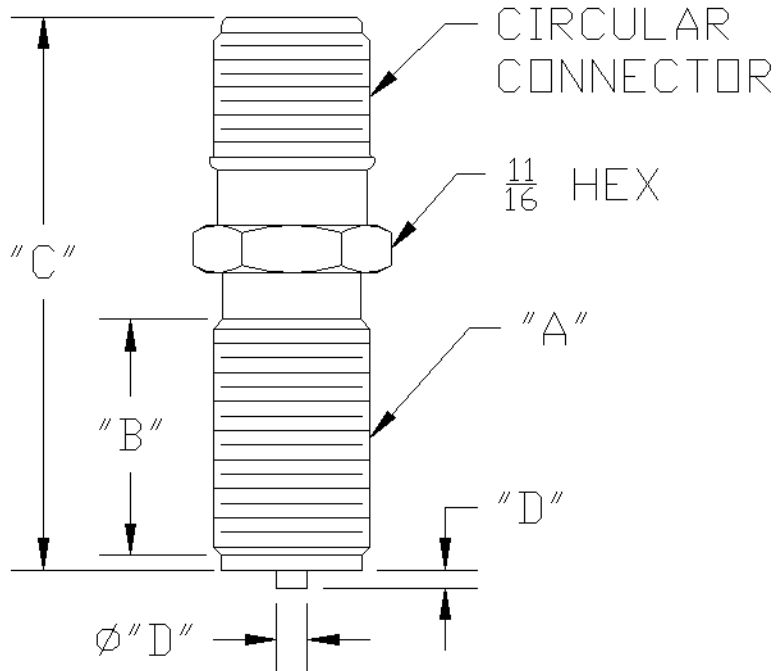
In addition to the models specified, MSI can make custom Humbucking sensors in other lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. to satisfy special requirements. If you do not see a sensor that meets your needs, please contact us and we would be happy to make a product that meets your specifications.

Standard Features and Specifications

- Available in standard and low drag versions
- Variable reluctance (VR) type
- Hermetically sealed, heli-arc welded construction
- Two (2) pin gold plated glass sealed connector (mates with: MS3106-10SL-4S)
- 300 stainless steel housing (locknut included)
- Magnet that resists demagnetization
- Unique potting that compensates for temperature extremes
- Focusing tip (pole piece) which allows greater air gap with no signal loss
- Wide temperature range: -450°F to +450°F (-270°C to +232°C)
- IR leakage: 100 Mohms @ 100 VDC minimum
- High signal output
- High Shock and Vibration resistance - Impact: 15 G's (11 mS, 1/2 sine) min.; Vibration: 20 G's at 2,000 Hz min
- Unconditional one (1) year warranty if used within specifications



Dimension Key



Standard Humbucking Models

Model Number	Mounting Thread (A)	Thread Length (B)	Overall Length (C)	Tip (L/D) (D)	R (Ohms)	I (Henry)	Gauss Strength
PC24-128G (Std. Drag)	11/16x24	1.125	3.370	.070/.125	3600 (each winding 1800)	2.25	850
PC24-85G (Low Drag)	11/16x24	1.135	3.363	.070/.125	2800 (each winding 1400)	3	350

Notes:

1. Dimensions in inches
2. Specifications +/- 10%
3. Mounting threads UNF-2A



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Variable Reluctance Sensors - Intrinsically Safe

Intrinsic safety has become an increasingly popular approach for handling sensing requirements in hazardous locations. These sensors are intrinsically safe versions of Motion Sensors (MSI) Premium or Value variable reluctance (VR) sensors. CSA (with NRTL/C) and LCIE to ATEX (94/9/EC) certify them. Intrinsically safe models feature high quality construction and materials.



Product Specifications

In addition to the models specified, MSI can make custom Intrinsically Safe VR sensors in other lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. to satisfy special requirements. Our certifications permit us to make intrinsically safe versions of almost any MSI sensor, or to customize a sensor to suit a particular application or customer need. The customization process for Intrinsically Safe products at MSI is straightforward, quick, offers more choice, and is less costly than our competitors. Just tell us what you want and we will provide a fully certified CUSTOM INTRINSICALLY SAFE PRODUCT IN WEEKS, NOT MONTHS, made to your specifications, even if you only need one piece! This ability to provide rapid development of custom certified product WITHOUT THE NORMAL CERTIFICATION COSTS AND LEADTIMES is due to our unique "modular" certification scheme with CSA and ATEX. Please contact us to learn how Motion Sensors can provide a customized Intrinsically Safe VR sensor for your application.

Features and Specifications

Type:

Variable reluctance (VR) or inductive type

Physical Features:

Body material: 300 series stainless steel (locknut included)

Encapsulation: hermetically sealed, heli-arc welded construction (standard) or epoxy encapsulation

Magnet that resists demagnetization

Focusing tip (pole piece) which allows greater air gap with no signal loss

IR leakage: 100 Mohms @ 100 VDC min.

High signal output

High Shock and Vibration resistance: Impact: 15 G's (11 mS, 1/2 sine) min.; Vibration: 20 G's at 2,000 Hz min

Warranty:

Unconditional one (1) year warranty if used within specifications

Approvals:

Intrinsic safety to CSA (with NRTL/C) and LCIE to ATEX (94/9/EC).

Temperature Range:

-54°F to 346°F (-65°C to 175°C)

Interconnection Options:

Two (2) pin gold plated glass sealed connector (mates with: MS3106-10SL-4S)

Pigtail with wires or cable

NPT threaded body with wire or cable pigtail for explosion proof environments

Entity Parameters:

Group IIC:

Vmax/Ui = 30 VDC

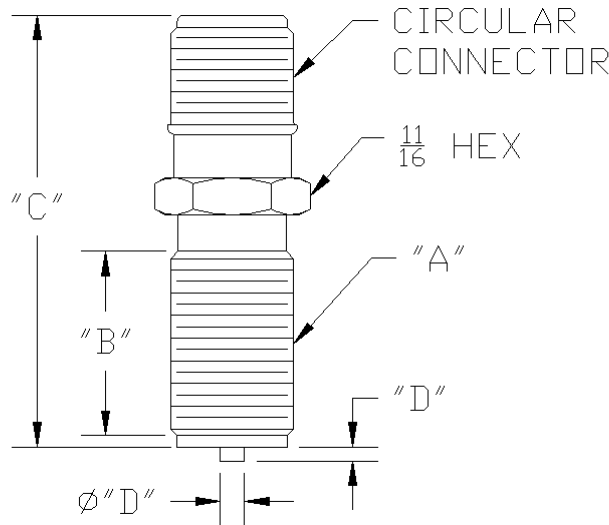
Imax/li = 300 mA

Ci/Ci = 0 uF

Li/Li = 0 mH



Dimension Key



Hazardous Location: Class I, Div. I, Group A,B,C,D; Class II, Div. I, Group E,F,G; Class III and coal dust (If equipped with NPT/pigtail lead combinations, below units are also suitable for Class I, Div. I, Group A,B,C,D; Class II, Div. I, Group E,F,G; and Class III)

Standard Drag Intrinsically Safe Models

Model Number	Mounting Thd (A)	Thd Length (B)	Overall Length (C)	Tip (L/D) (D)	Resistance (Ohms)	Gauss Strength	MSI Premium Equivalent
PC45-7	5/8x18	.875	2.685	.031/.100	1200	810	PC51-1G
PC45-1	11/16x24	.563	2.685	.070/.125	1800	850	PC13-74G

Low Drag Intrinsically Safe Models

Model Number	Mounting Thd (A)	Thd Length (B)	Overall Length (C)	Tip (L/D) (D)	Resistance (Ohms)	Gauss Strength	MSI Premium Equivalent
PC45-9	5/8x18	.875	2.685	.031/.100	1650	325	PC55-2G
PC45-5	11/16x24	.563	2.685	.070/.125	1380	350	PC24-45G

Inductive Intrinsically Safe Models

Model Number	Mounting Thd (A)	Thd Length (B)	Overall Length (C)	Tip (L/D) (D)	Resistance (Ohms)	Gauss Strength	MSI Premium Equivalent
PC45-2	11/16x24	.563	2.685	flushfront	5000	n/a	PC3-24G

Notes:

1. Dimensions in inches
2. Specifications +/- 10%
3. Mounting threads UNF-2A



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Hall Effect Sensors - H Type (oriented)

The Motion Sensors (MSI) H series of sensors is based on Hall Effect sensor technology, which can sense a change in target motion from true zero to 20 KHz. These sensors incorporate a magnet within the sensor, enabling them to sense ferrous metal as well as magnet targets and can be optimized to detect fine as well as large pitch targets. These sensors integrate a preamplifier/signal conditioner within the sensor housing that provides excellent noise immunity and greater transmission capability. They also have a unique circuit design that offers complete protection in the event of connection mis-wiring. The output frequency of these sensors has a square pulse waveform (digital) that directly relates to the number of turbine blades, gear teeth, etc. that have been sensed. These pulses, in turn, can be correlated to determine flow rate, RPM, or velocity.

Product Specifications

In addition to the models specified, MSI can make custom H type Hall Effect sensors in other lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. to satisfy special requirements. In addition, for lower cost, high volume applications, MSI manufactures Hall Effect sensors that contain only the Hall Effect element, without special circuitry to guard against incorrect hook-up. These sensors are available with an open collector output and contain reverse polarity protection. If you do not see a sensor that meets your needs, please contact us and we would be happy to make a product that meets your specifications.

Features and Specifications

Input Power:

4.7 to 24 VDC regulated, 15 mA maximum @ no-load

Reverse polarity protected

Pin Connections:

Pin A (Red): Input Power (+)

Pin B (White): Pulse Output (+)

Pin C (Black): Common (-)

Pulse Output Options:

1. TTL/CMOS:
Fan-out of 5 TTL/CMOS loads
2. Open collector:
Maximum OFF state voltage 24 VDC, maximum ON current 50 mA
3. Supply tracking:
logic 0: 0.4 VDC
logic 1: $(V_s - 0.2) \times R_L / (R_L + 2200)$



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Physical Features:

Operating temperature:

-40°C to +125°C with connector

-40°C to +105°C with pigtail

NOTE: +150°C also available

Storage temperature:

-40°C to +150°C with connector

-40°C to +105°C with pigtail

Body material:

300 series stainless steel

Encapsulation:

Epoxy potting or hermetically sealed, welded construction

High Shock and Vibration resistance:

Impact: 100 G's (6 mS, 1/2 sine) min.

Vibration: 20 G's at 2,000 Hz min

Airgap:

Up to 0.100" dependent on target geometry and sensor construction

Orientation:

Alignment of the sensor to target rotation is required for optimal performance, ensuring proper orientation of the Hall Effect element to the magnetic field.

Interconnection Options:

1. Three (3) pin MIL-C-5015 type connector with gold plated pins, mates with MS3106-10SL-3S
2. Other connectors available upon request
3. Pigtail with wires or cable
4. NPT threaded body with wire or cable pigtail for explosion proof environments

Approvals:

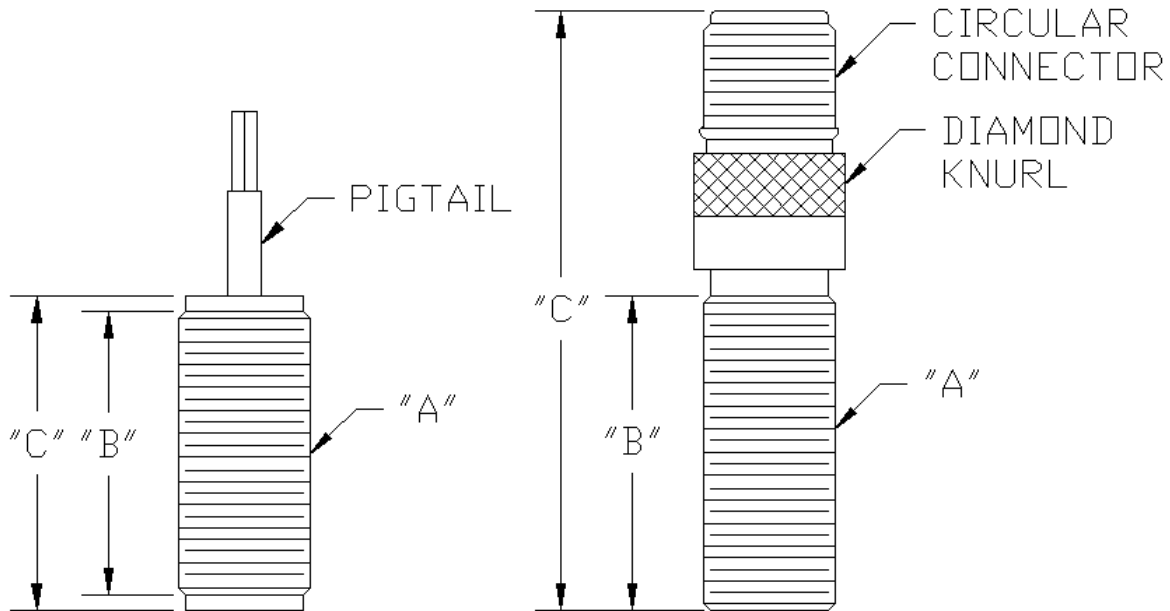
CE compliant to EMC Directive 89/336/EEC for use in residential, commercial, light industrial and heavy industrial environments

Warranty:

Unconditional one (1) year warranty if used within specifications



Dimension Key



Model Number	Mounting Thread (A)	Thread Length (B)	Overall Length (C)	Connection Type	Output (Pulse Range)
H-1	5/8x18	1.43	2.86	connector	open collector
H-2	5/8x18	1.43	2.86	connector	0-5 VDC
H-3	5/8x18	.85	1.00	pigtail	open collector
H-4	5/8x18	.85	1.00	pigtail	0-5 VDC
H-5	5/8x18	1.35	1.50	pigtail	open collector
H-6	5/8x18	1.35	1.50	pigtail	0-5 VDC

Notes:

1. Dimensions in inches
2. Specifications +/- 10%
3. Mounting threads UNF-2A



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Hall Effect Sensors - HN Type (non-oriented)

The Motion Sensors (MSI) HN series of sensors is based on Hall Effect sensor technology, which can sense a change in target motion from true zero to 20 KHz. These sensors incorporate a magnet within the sensor, enabling them to sense ferrous metal as well as magnet targets. Maximum air gap sensing distances are typically 0.100". These sensors are optimized to provide extremely accurate tooth edge detection when used with larger pitch targets, and offer the unique advantage of not requiring orientation to the target. HN sensors integrate a preamplifier/signal conditioner within the sensor housing that provides excellent noise immunity and greater transmission capability. They also have a unique circuit design that offers complete protection in the event of connection mis-wiring, not only reverse polarity. The output frequency of these sensors has a square pulse waveform (digital) that directly relates to the number of turbine blades, gear teeth, etc. that have been sensed. These pulses, in turn, can be correlated to determine flow rate, RPM, or velocity.

Product Specifications

In addition to the models specified, MSI can make custom HN type Hall Effect sensors in other lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. to satisfy special requirements. In addition, for lower cost, high volume applications, MSI manufactures Hall Effect sensors that contain only the Hall Effect element, without special circuitry to guard against incorrect hook-up. These sensors are available with an open collector output and contain reverse polarity protection. If you do not see a sensor that meets your needs, please contact us and we would be happy to make a product that meets your specifications.

Features and Specifications

Input Power:

4.7 to 24 VDC regulated, 15 mA maximum @ no-load

Reverse polarity protected

Pin Connections:

Pin A (Red): Input Power (+)

Pin B (White): Pulse Output (+)

Pin C (Black): Common (-)

Pulse Output Options:

1. TTL/CMOS:
Fan-out of 5 TTL/CMOS loads
2. Open collector:
Maximum OFF state voltage 24 VDC, maximum ON current 50 mA
3. Supply tracking:
logic 0: 0.4 VDC
logic 1: $(V_S - 0.2) \times R_L / (R_L + 2200)$



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Physical Features:

Operating temperature:

-40°C to +125°C with connector

-40°C to +105°C with pigtail

NOTE: +150°C also available

Storage temperature:

-40°C to +150°C with connector

-40°C to +105°C with pigtail

Body material:

300 series stainless steel

Encapsulation:

Epoxy potting or hermetically sealed, welded construction

High Shock and Vibration resistance:

Impact: 100 G's (6 mS, 1/2 sine) min.

Vibration: 20 G's at 2,000 Hz min

Airgap:

Up to 0.100" dependent on target geometry and sensor construction

Orientation:

Non-oriented operation, allowing for ease of installation

Interconnection Options:

1. Three (3) pin MIL-C-5015 type connector with gold plated pins, mates with MS3106-10SL-3S
2. Other connectors available upon request
3. Pigtail with wires or cable
4. NPT threaded body with wire or cable pigtail for explosion proof environments

Approvals:

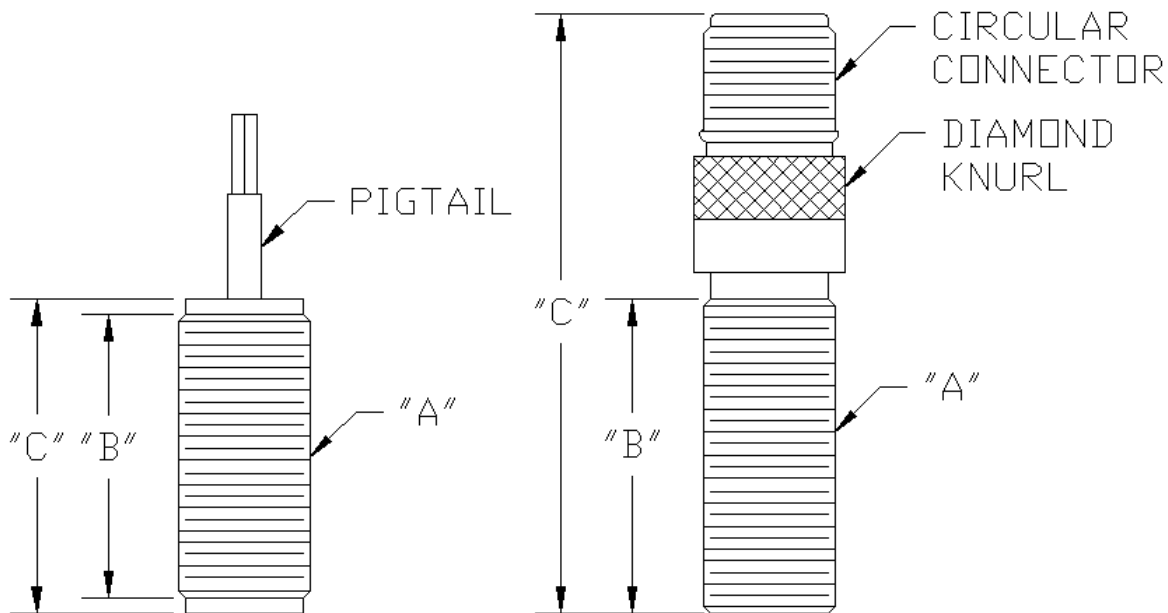
CE compliant to EMC Directive 89/336/EEC for use in residential, commercial, light industrial and heavy industrial environments

Warranty:

Unconditional one (1) year warranty if used within specifications



Dimension Key



Model Number	Mounting Thread (A)	Thread Length (B)	Overall Length (C)	Connection Type	Output (Pulse Range)
HN-10	5/8x18	1.43	2.86	connector	open collector
HN-5	5/8x18	1.43	2.86	connector	0-5 VDC
HN-16	5/8x18	.85	1.00	pigtail	open collector
HN-13	5/8x18	.85	1.00	pigtail	0-5 VDC
HN-15	5/8x18	1.35	1.50	pigtail	open collector
HN-14	5/8x18	1.35	1.50	pigtail	0-5 VDC

Notes:

1. Dimensions in inches
2. Specifications +/- 10%
3. Mounting threads UNF-2A



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Hall Effect - HD Type (dual channel)

The Motion Sensors (MSI) HD series of sensors is based on Hall Effect sensor technology, which can sense a change in target motion from true zero to 20 KHz. These sensors are dual channel versions of our H series or HM series of sensors and offer two channels of output.

HD sensors based on the HM series require that the target be a magnet, such as magnets embedded in gear teeth, blade tips, or around a disc. They must be oriented to the direction of the target movement and can be set to sense both north and south oriented magnets or only north or south respectively. Air gap distances can be as much as 0.200" to 0.250" away, depending on target shape and magnetic field strength.

HD sensors based on the H series incorporate a magnet within the sensor, enabling them to sense ferrous metal as well as magnet targets. Maximum air gap sensing distances are typically 0.100" and these sensors can be optimized to detect fine as well as large pitch targets. As with sensors based upon the HM series, they must be oriented to the direction of target movement to work effectively. The output frequency of HD sensors has a square pulse waveform (digital) that directly relates to the number of turbine blades, gear teeth, etc. that have been sensed. These pulses, in turn, can be correlated to determine flow rate, RPM, or velocity.

Product Specifications

HD series Hall Effect sensors are manufactured on a custom basis to meet the specifications and requirements of a particular application. MSI can make custom dual channel Hall Effect sensors in customer-specified lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. Please contact us and we would be happy to make a product that meets your specifications.

Features and Specifications

Input Power:

4.7 to 24 VDC regulated, 15 mA maximum @ no-load

Reverse polarity protected

Pin Connections:

Pin A (Red): Input Power (+)

Pin B (White): Pulse Output (+)

Pin C (Black): Common (-)

Pulse Output Options:

1. TTL/CMOS:
Fan-out of 5 TTL/CMOS loads
2. Open collector:
Maximum OFF state voltage 24 VDC,
maximum ON current 50 mA
3. Supply tracking:
logic 0: 0.4 VDC
logic 1: $(V_S - 0.2) \times R_L / (R_L + 2200)$



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Physical Features:

Operating temperature:

-40°C to +105°C

NOTE: +150°C also available

Storage temperature:

-40°C to +150°C

Body material:

300 series stainless steel

Encapsulation:

Epoxy potting or hermetically sealed, welded construction

High Shock and Vibration resistance:

Impact: 100 G's (6 mS, 1/2 sine) min.

Vibration: 20 G's at 2,000 Hz min

Airgap:

Up to 0.250" dependent on target geometry, magnet construction and sensor construction (for those sensors based on the HM series)

Up to 0.100" dependent on target geometry, magnet construction and sensor construction (for those based on the H series)

Orientation:

Alignment of the sensor to target rotation is required for optimal performance, ensuring proper orientation of the Hall Effect element to the magnetic field.

Interconnection Options:

1. Pigtail with wires or cable
2. NPT threaded body with wire or cable pigtail for explosion proof environments
3. Connector per customer specifications

Approvals:

CE compliant to EMC Directive 89/336/EEC for use in residential, commercial, light industrial and heavy industrial environments

Warranty:

Unconditional one (1) year warranty if used within specifications



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Hall Effect Sensors - HM Type (external magnet)

The HM series of sensors is based on Hall Effect sensor technology, which can sense a change in target motion from true zero to 20 KHz. These sensors require that the target be a magnet, such as magnets embedded in gear teeth, blade tips, or ring magnets. They also must be oriented to the direction of target movement. The advantage of this series, versus other Hall Effect types, is that they can sense longer air gap distances, thereby enabling the sensor to effectively sense targets as much as 0.200" to 0.250" away, depending on target geometry and magnetic field strength. These sensors integrate a preamplifier/signal conditioner within the sensor housing that provides excellent noise immunity and greater transmission capability. They also have a unique circuit design that offers complete protection in the event of connection mis-wiring. The output frequency of these sensors has a square pulse waveform (digital) that directly relates to the number of turbine blades, gear teeth, etc. that have been sensed. These pulses, in turn, can be correlated to determine flow rate, RPM, or velocity.

Product Specifications

HM series Hall Effect sensors are manufactured on a custom basis to meet the specifications and requirements of a particular application. MSI can make custom Hall Effect sensors in customer-specified lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. In addition, for lower cost, high volume applications, MSI manufactures Hall Effect sensors that contain only the Hall Effect element, without special circuitry to guard against incorrect hook-up. Please contact us and we would be happy to make a product that meets your specifications.

Features and Specifications

Input Power:

4.7 to 24 VDC regulated, 15 mA maximum
@ no-load

Reverse polarity protected

Pin Connections:

Pin A (Red): Input Power (+)

Pin B (White): Pulse Output (+)

Pin C (Black): Common (-)

Pulse Output Options:

1. TTL/CMOS:
Fan-out of 5 TTL/CMOS loads
2. Open collector:
Maximum OFF state voltage 24 VDC, maximum ON current 50 mA
3. Supply tracking:
logic 0: 0.4 VDC
logic 1: $(V_S - 0.2) \times R_L / (R_L + 2200)$



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Physical Features:

Operating temperature:

-40°C to +125°C with connector

-40°C to +105°C with pigtail

NOTE: +150°C also available

Storage temperature:

-40°C to +150°C with connector

-40°C to +105°C with pigtail

Body material:

300 series stainless steel

Encapsulation:

Epoxy potting or hermetically sealed,
welded construction

High Shock and Vibration resistance:

Impact: 100 G's (6 mS, 1/2 sine) min.

Vibration: 20 G's at 2,000 Hz min

Airgap:

Up to 0.250" dependent on target geometry
and sensor construction

Orientation:

Alignment of the sensor to target rotation is required for optimal performance, ensuring proper orientation of the Hall Effect element to the magnetic field.

Interconnection Options:

1. Three (3) pin MIL-C-5015 type connector with gold plated pins, mates with MS3106-10SL-3S
2. Other connectors available upon request
3. Pigtail with wires or cable
4. NPT threaded body with wire or cable pigtail for explosion proof environments

Approvals:

CE compliant to EMC Directive 89/336/EEC for use in residential, commercial, light industrial and heavy industrial environments

Warranty:

Unconditional one (1) year warranty if used within specifications



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Hall Effect Sensors - Intrinsically Safe

The Motion Sensors (MSI) Intrinsically Safe Hall Effect sensors feature the same high quality construction and materials as our standard Hall Effect units. They are designed and developed for each specific customer application. These sensors are certified to CSA (with NRTL/C) and LCIE to ATEX (94/9/EC) for Class 1, Zone 0, IIC and II 1 G EEx ia IIC T4, or Class 1, Zone 0, IIA and II 1 G EEx ia IIA T4 hazardous locations.

Product Specifications

Intrinsically Safe Hall Effect sensors are manufactured on a custom basis to meet the specifications and requirements of a particular application. MSI can make custom Intrinsically Safe Hall Effect sensors in customer-specified lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. Our certifications permit us to make intrinsically safe versions of almost any MSI sensor, or to customize a sensor to suit a particular application or customer need. The customization process for Intrinsically Safe products at MSI is straightforward, quick, offers more choice, and is less costly than our competitors. Just tell us what you want and we will provide a fully certified CUSTOM INTRINSICALLY SAFE PRODUCT IN WEEKS, NOT MONTHS, made to your specifications, even if you only need one piece! This ability to provide rapid development of custom certified product WITHOUT THE NORMAL CERTIFICATION COSTS AND LEADTIMES is due to our unique "modular" certification scheme with CSA and ATEX. Please contact us to learn how Motion Sensors can provide a customized Intrinsically Safe Hall Effect sensor for your application.



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Features and Specifications

Type:

Intrinsically safe versions of the H, HN, HD and HM Hall Effect sensors are available

Input Power:

13 to 30 VDC, 35 mA @24 VDC
(Class I, Zone 0, IIC models)

7.5 to 30 VDC, 10 mA @ ≤10 VDC
(Class I, Zone 0, IIA models)

Reverse polarity protected

Pulse Output Options:

TTL/CMOS; fan-out of 5 TTL/CMOS loads

Open collector; maximum OFF voltage 30 VDC, maximum ON current 400mA

Physical Features:

Operating temperature:

-40°C to +85°C

Storage temperature:

-65°C to +125°C

Body material:

300 series stainless steel

Encapsulation:

Epoxy potting or hermetically sealed, welded construction

High Shock and Vibration resistance:

Impact: 100 G's (6 mS, 1/2 sine) min.

Vibration: 20 G's at 2,000 Hz min

Warranty:

Unconditional one (1) year warranty if used within specifications

Orientation:

Alignment of the sensor to target rotation is required for optimal performance, ensuring proper orientation of the Hall Effect element to the magnetic field.

Interconnection Options:

1. Pigtail with wires or cable
2. NPT threaded body with wire or cable pigtail for explosion proof environments
3. Connector per customer specifications

Approvals:

Intrinsic Safety to CSA (with NRTL/C) and LCIE to ATEX (94/9/EC)

CE compliant to EMC Directive 89/336/EEC for use in residential, commercial, light industrial and heavy industrial environments

Entity Parameters:

Group IIA:

$V_{max}/U_i = 30$ VDC

$I_{max}/I_i = 190$ mA

$C_i/C_i = 0.0$ uF

$L_i/L_i = 0.50$ mH

Group IIC:

$V_{max}/U_i = 30$ VDC

$I_{max}/I_i = 200$ mA

$C_i/C_i = 0.0$ uF

$L_i/L_i = 0.50$ mH



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RF Sensors - Standard

Motion Sensors (MSI) modulated carrier (RF) sensors require coupling with our PA1001A or PA2001 series preamplifiers or other modulated carrier amplifiers.

When used with the PA1001A or PA2001 preamplifiers, they offer square wave (digital) output, low speed response, no drag, and large air gaps. They also have the ability to sense non-ferrous metals like aluminum and stainless steel, in addition to ferrous metals. RF sensors are becoming increasingly popular in applications such as turbine flowmetering where it is important to sense small, free spinning devices without inducing drag on the movement of the rotor.

Product Specifications

In addition to the models specified, MSI can make custom RF sensors in other lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. to satisfy special requirements. The products below are only a sampling of our product line; if you do not see a sensor that meets your needs, please contact us and we would be happy to manufacture a product to your specifications.

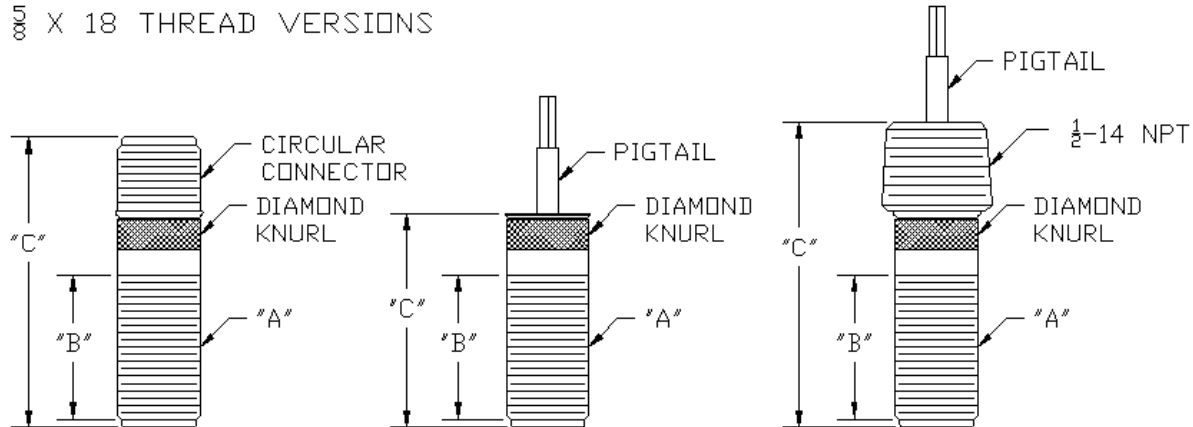
Standard Features and Specifications

- Modulated carrier (RF) type
- Epoxy encapsulation
- Open front construction (closed fronts and hermetically sealed versions are also available)
- 300 series stainless steel enclosure
- Two (2) pin gold plated connector (mates with: MS3106-10SL-4S) or pigtail leads
- Inductance: 1 mH +/- 10%
- DC resistance: 10.5 ohms +/- 10%
- Temperature range: -100°F to +400°F (-74°C to +204°C)
- IR leakage: minimum of 50 Mohms @ 50 VDC
- High Shock and Vibration resistance - Impact: 100 G's (6 mS, 1/2 sine) min.; Vibration: 20 G's at 2,000 Hz min
- Unconditional one (1) year warranty if used within specifications

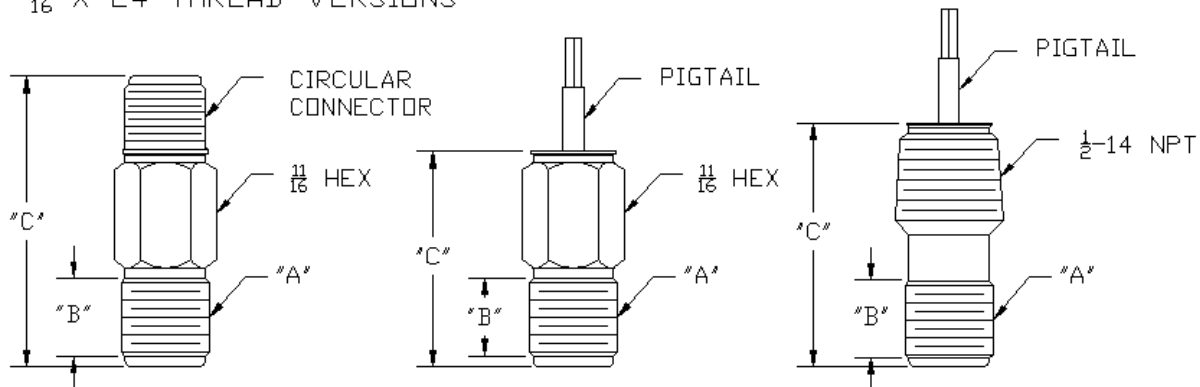


Dimension Keys

5/16" X 18 THREAD VERSIONS



11/16" X 24 THREAD VERSIONS



Standard RF Models

Model Number	Mounting Thd (A)	Thd Length (B)	Overall L (C)	Connection	Additional Features
RF-1	11/16x24	.580	2.24	2 pin	
RF-1PT	11/16x24	.580	1.66	pigtail	
RF-1EX	11/16x24	.630	1.88	NPT/pigtail	explosion proof
RF-3**	5/8x18	1.10	2.20	2 pin	
RF-3PT**	5/8x18	1.10	1.625	pigtail	
RF-3EX**	5/8x18	1.10	2.27	NPT/pigtail	explosion proof

Notes:

1. Dimensions in inches
2. Specifications +/- 10%
3. Mounting threads UNF-2A



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RF Sensors – High Temperature

Motion Sensors (MSI) High Temperature RF (modulated carrier) sensors are built to operate in temperature ranges beyond that of our Standard RF Sensors. These sensors operate in a broad temperature range of -100° to +750°F (-74° to +400°C). High Temperature RF sensors come with either a standard two (2) pin connector or a three (3) foot stainless steel shielded cable to allow interconnection without the need for expensive mating connectors. The explosion proof version features NPT threading and lead-wires shielded with glass tubing potted with special high temperature cement.

Product Specifications

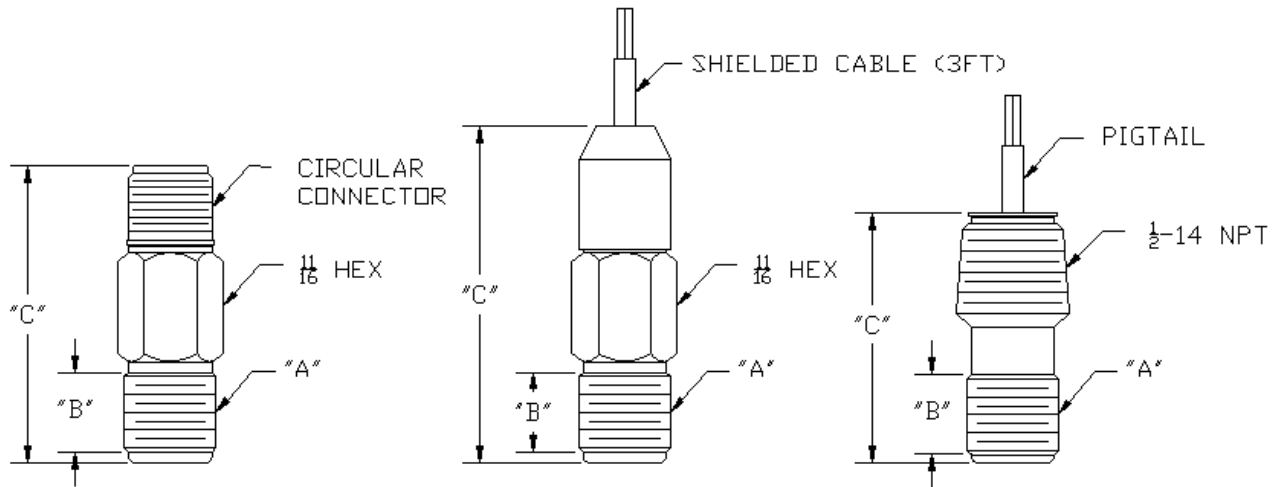
In addition to the models specified, MSI can make custom RF sensors in other lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. to satisfy special requirements. The products below are only a sampling of our product line; if you do not see a sensor that meets your needs, please contact us and we would be happy to manufacture a product to your specifications.

Standard Features and Specifications

- Modulated carrier (RF) type
- Encapsulation: high temperature cement
- Hermetically sealed
- 300 series stainless steel enclosure
- Two (2) pin gold plated connector (mates with: MS3106-10SL-4S), stainless steel shielded cable or pigtail leads (explosion-proof version)
- Operating temperature range: -100°F to +750°F (-74°C to +400°C)
- High Shock and Vibration resistance:
Impact: 15 G's (11 mS, 1/2 sine) min.; Vibration: 20 G's at 2,000 Hz min
- Unconditional one (1) year warranty if used within specifications



Dimension Keys



Model Number	Mounting Thd (A)	Thd Length (B)	Overall Length (C)	R (Ohms)	I (mH)	Connection	Additional Features
RF-5	11/16x24	.580	2.62	28	2.0	3' cable	
RF-10	11/16x24	.630	1.78	28	2.0	NPT/pigtail	Explosion Proof
RF-11	11/16x24	.580	2.22	28	2.0	2 pin	

Notes:

1. Dimensions in inches
2. Specifications +/- 10%
3. Mounting threads UNF-2A



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RF Sensors - Intrinsically Safe



Motion Sensors (MSI) CSA and ATEX certified intrinsically safe RF (modulated carrier) models feature the same high quality construction, specifications, and features as our Standard RF Sensors. They are certified to CSA (with NRTL/C) and LCIE to ATEX (94/9/EC) for the hazardous locations listed below.

Product Specifications

In addition to the Standard RF sensors specified, MSI can make Intrinsically Safe RF sensors in other lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. to satisfy special requirements. Our certifications permit us to make intrinsically safe versions of almost any MSI sensor, or to customize a sensor to suit a particular application or customer need. The customization process for Intrinsically Safe products at MSI is straightforward, quick, offers more choice, and is less costly than our competitors. Just tell us what you want and we will provide a fully certified CUSTOM INTRINSICALLY SAFE PRODUCT IN WEEKS, NOT MONTHS, made to your specifications, even if you only need one piece! This ability to provide rapid development of custom certified product WITHOUT THE NORMAL CERTIFICATION COSTS AND LEADTIMES is due to our unique "modular" certification scheme with CSA and ATEX. If you do not see a sensor that meets your needs please contact us to learn how Motion Sensors can provide a customized Intrinsically Safe RF sensor for your application.

Product Features & Specifications

Entity Parameters	Hazardous Locations (with Connector)	Hazardous Locations (with Pigtail Leads)
<u>II 1 G EEx ia IIC T6:</u> Vmax/Ui=30 Vdc Imax/li=160 mA Ci/Ci=0 uF Li/Li=1.2 mH <u>II 1 G EEx ia IIB T6:</u> Vmax/Ui=30 VDC Imax/li=300 mA Ci/Ci=0 uF Li/Li=1.2 mH	Class I, Div. 1, Group A,B,C,D Class II, Div. 1, Group G Class III Coal dust	Class I, Div. 1, Group A,B,C,D Class II, Div. 1, Group E,F,G Class III



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Digi-Pulse Sensors – Magnetic (Variable Reluctance or Inductive) and RF

Digi-Pulse sensors with digital output offer a low cost solution for interfacing directly to data acquisition systems. These sensors integrate a preamplifier/signal conditioner within the sensor housing and offer the advantages of excellent noise immunity and greater transmission capability. Input power supply requirements cover the most popular ranges for both commercial and industrial use. The output frequency of these sensors has a square pulse waveform (digital) that directly relates to the number of turbine blades, gear teeth, etc. that have been sensed. These pulses, in turn, can be correlated to determine flow rate, RPM, or velocity.

Product Specifications

In addition to the models specified, MSI can make custom Digi-Pulse sensors in other lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. to satisfy special requirements. If you do not see a sensor that meets your needs, please contact us and we would be happy to make a product that meets your specifications.

Features and Specifications

Type:

Magnetic (inductive or variable reluctance)
or RF (modulated carrier)

Input Power:

8 to 30 VDC, 10 mA maximum @ no-load

Reverse polarity protected

Pin Connections:

Pin A (Red): Input Power (+)

Pin B (Black): Common (-)

Pin C (White): Pulse Output (+)

Airgap:

Up to 0.140" dependent on target geometry and sensor construction

Pulse Output Options:

1. TTL/CMOS:
Fan-out of 5 TTL/CMOS loads
2. Open collector:
Maximum OFF state voltage 30 VDC,
maximum ON current 400 mA
3. 0-10 VDC square-wave:
Requires 15-30 VDC input

Interconnection Options:

1. Three (3) pin MIL-C-5015 type connector with gold plated pins, mates with MS3106-10SL-3S; other connector types upon request
2. Pigtail with wires or cable
3. NPT threaded body with wire or cable pigtail for explosion proof environments

Physical Features:



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Operating temperature:

-40°C to +85°C

NOTE: +125°C also available

Storage temperature:

-65°C to +125°C

Body material:

300 series stainless steel

Encapsulation:

Epoxy potting or hermetically sealed, welded construction

High Shock and Vibration resistance:

Impact: 100 G's (6 mS, 1/2 sine) min.

Vibration: 20 G's at 2,000 Hz min

Approvals:

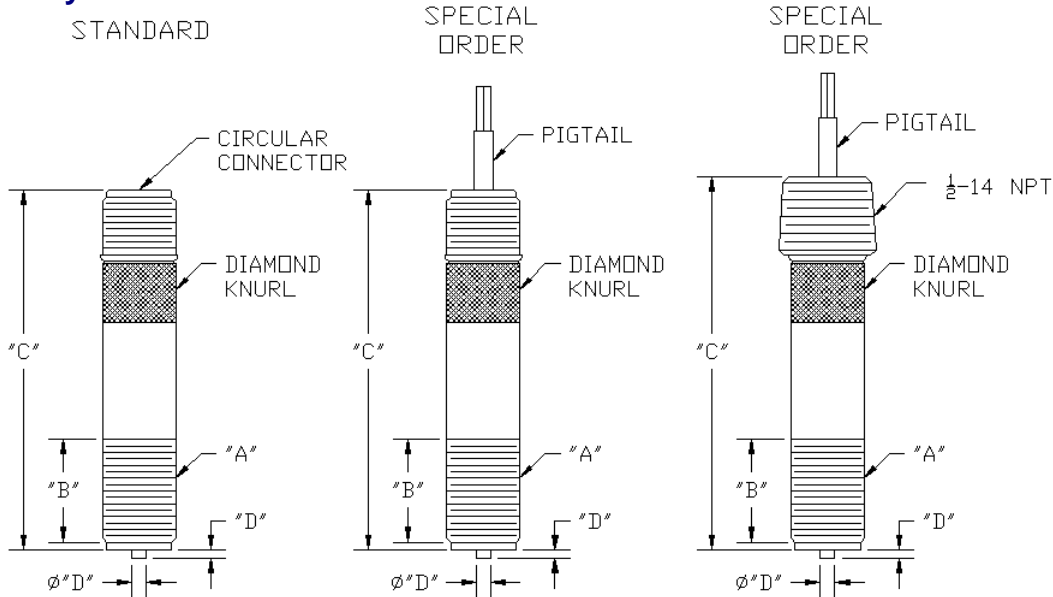
CE compliant to EMC Directive 89/336/EEC for use in residential, commercial, light industrial and heavy industrial environments

Warranty:

Unconditional one (1) year warranty if used within specifications



Dimension Key



VR Digi-Pulse Sensors

Model Number	Mounting Thread (A)	Thread Length (B)	Overall Length (C)	Tip (Length/Dia.) (D)	Output (Pulse Range)
DM-010	5/8x18	.875	3.07	.031/.100	Open collector
DM-002	5/8x18	.875	3.07	.031/.100	0-5 VDC
DM-011	5/8x18	.875	3.07	.031/.100	0-10 VDC
DM-013	11/16x24	.875	3.07	.075/.105	Open collector
DM-001	11/16x24	.875	3.07	.075/.105	0-5 VDC
DM-012	11/16x24	.875	3.07	.075/.105	0-10 VDC

RF Digi-Pulse Sensors

Model Number	Mounting Thread (A)	Thread Length (B)	Overall Length (C)	Tip (Length/Dia.) (D)	Output (Pulse Range)
DR-014	5/8x18	.875	3.45	flush front	Open collector
DR-002	5/8x18	.875	3.45	flush front	0-5 VDC
DR-013	5/8x18	.875	3.45	flush front	0-10 VDC
DR-007	11/16x24	.875	3.45	flush front	Open collector
DR-001	11/16x24	.875	3.45	flush front	0-5 VDC
DR-003	11/16x24	.875	3.45	flush front	0-10 VDC

Notes:

1. Dimensions in inches
2. Specifications +/- 10%
3. Mounting threads UNF-2A



Digi-Pulse Sensors – Intrinsically Safe

Motion Sensors (MSI) intrinsically safe Digi-pulse sensors feature the same high quality construction and materials as our standard Digi-pulse models. They are certified by CSA (with NRTL/C) and LCIE to ATEX (94/9/EC) for Class I, Zone 0, IIC and II 1 G EEx ia IIC T4, or Class I, Zone 0, IIA and II 1 G EEx ia IIA T4 hazardous locations.

Product Specifications

In addition to the models specified, MSI can make custom intrinsically safe Digi-Pulse sensors in other lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. to satisfy special requirements. Our certifications permit us to make intrinsically safe versions of almost any MSI sensor, or to customize a sensor to suit a particular application or customer need. The customization process for Intrinsically Safe products at MSI is straightforward, quick, offers more choice, and is less costly than our competitors. Just tell us what you want and we will provide a fully certified CUSTOM INTRINSICALLY SAFE PRODUCT IN WEEKS, NOT MONTHS, made to your specifications, even if you only need one piece! This ability to provide rapid development of custom certified product WITHOUT THE NORMAL CERTIFICATION COSTS AND LEADTIMES is due to our unique "modular" certification scheme with CSA and ATEX. If you do not see a sensor that meets your needs please contact us to learn how Motion Sensors can provide a customized Intrinsically Safe Digi-Pulse sensor for your application.

Features and Specifications

Type:

Magnetic (inductive or variable reluctance)
or RF (modulated carrier)

Input Power:

13 to 30 VDC, 10 mA @ 24 VDC
(Class I, Zone 0, IIC Models)

7.5 to 30 VDC, 10 mA @ <10 VDC
(Class I, Zone 0, IIA Models)

Reverse polarity protected

Airgap:

Up to 0.140" dependent on target geometry
and sensor construction

Pin Connections:

Pin A (Red): Input Power (+)

Pin B (Black): Common (-)

Pin C (White): Pulse Output (+)

Pulse Output Options:

- TTL/CMOS:
Fan-out of 5 TTL/CMOS loads
- Open collector:
Maximum OFF state voltage 30 VDC,
maximum ON current 400 mA



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Interconnection Options:

1. Three (3) pin MIL-C-5015 type connector with gold plated pins, mates with MS3106-10SL-3S; other connector types upon request
2. Pigtail with wires or cable
3. NPT threaded body with wire or cable pigtail for explosion proof environments

Warranty:

Unconditional one (1) year warranty if used within specifications

Physical Features:

Operating temperature:

-40°C to +85°C

Storage temperature:

-65°C to +125°C

Body material:

300 series stainless steel

Encapsulation:

Epoxy potting or hermetically sealed, welded construction

High Shock and Vibration resistance:

Impact: 100 G's (6 mS, 1/2 sine) min.

Vibration: 20 G's at 2,000 Hz min

Approvals:

Intrinsic Safety to CSA (with NRTL/C) and LCIE to ATEX (94/9/EC)

CE compliant to EMC Directive 89/336/EEC for use in residential, commercial, light industrial and heavy industrial environments

Entity Parameters:

Group IIA:

$V_{max}/U_i = 30$ VDC

$I_{max}/I_i = 190$ mA

$C_i/C_i = 0.0$ uF

$L_i/L_i = 0.50$ mH

Group IIC:

$V_{max}/U_i = 30$ VDC

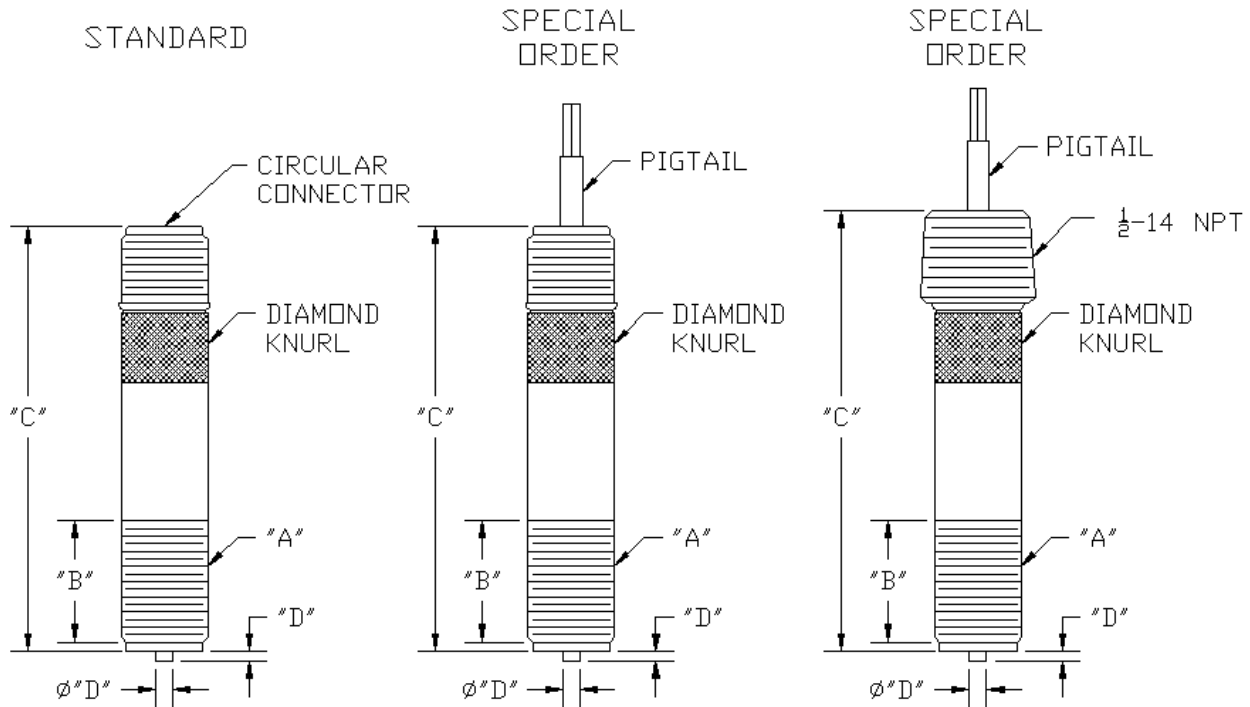
$I_{max}/I_i = 200$ mA

$C_i/C_i = 0.0$ uF

$L_i/L_i = 0.50$ mH



Dimension Key



Tables 1 & 2

Hazardous Location: Class I, Zone 0, IIC; Class I, Div. I, Group A,B,C,D and Class II, Div. I, Group G, Class III and coal dust (If equipped with NPT/pigtail lead combinations, below units are also suitable for Class II, Div. 1, Group E,F,G, Class III)

Tables 3 & 4

Hazardous Location: Class I, Zone 0, IIA; Class I, Div. I, Group D and Class II, Div. I, Group G, Class III and coal dust (If equipped with NPT/pigtail lead combinations, below units are also suitable for Class II, Div. 1, Group E,F,G, Class III)



Table 1 VR Intrinsicly Safe Digi-Pulse Sensors

Model Number	Mounting Thread (A)	Thread Length (B)	Overall Length (C)	Tip (Length/Dia.) (D)	Output (Pulse Range)
DMX-002-1	5/8x18	.875	4.5	.031/.100	open collector
DMX-002-2	5/8x18	.875	4.5	.031/.100	0-5 VDC
DMX-001-1	11/16x24	.875	4.5	.075/.105	open collector
DMX-001-2	11/16x24	.875	4.5	.075/.105	0-5 VDC

Table 2 RF Intrinsicly Safe Digi-Pulse Sensors

Model Number	Mounting Thread (A)	Thread Length (B)	Overall Length (C)	Tip (Length/Dia.) (D)	Output (Pulse Range)
DRX-002-1	5/8x18	.875	4.7	flush front	open collector
DRX-002-2	5/8x18	.875	4.7	flush front	0-5 VDC
DRX-001-1	11/16x24	.875	4.7	flush front	open collector
DRX-001-2	11/16x24	.875	4.7	flush front	0-5 VDC

Table 3 VR Intrinsicly Safe Digi-Pulse Sensors

Model Number	Mounting Thread (A)	Thread Length (B)	Overall Length (C)	Tip (Length/Dia.) (D)	Output (Pulse Range)
DMX-002-3	5/8x18	.875	4.5	.031/.100	open collector
DMX-002-4	5/8x18	.875	4.5	.031/.100	0-5 VDC
DMX-001-3	11/16x24	.875	4.5	.075/.105	open collector
DMX-001-4	11/16 x 24	.875	4.5	.075/.105	0-5 VDC

Table 4 RF Intrinsicly Safe Digi-Pulse Sensors

Model Number	Mounting Thread (A)	Thread Length (B)	Overall Length (C)	Tip (Length/Dia.) (D)	Output (Pulse Range)
DRX-004-3	5/8x18	.875	4.7	flush front	open collector
DRX-002-4	5/8x18	.875	4.7	flush front	0-5 VDC
DRX-003-3	11/16x24	.875	4.7	flush front	open collector
DRX-001-4	11/16x24	.875	4.7	flush front	0-5 VDC

Notes:

1. Dimensions in inches
2. Specifications +/- 10%
3. Mounting threads UNF-2A



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Magneto-resistive Sensors

The Motion Sensor (MSI) MR series of Magneto-resistive zero speed sensors integrate within the sensor body the Magneto-resistive elements and all amplification and signal-conditioning electronics necessary to produce digital square-wave output with excellent noise immunity and transmission capability.

The MR series sensors can sense ferrous metal (e.g., gears) and magnet targets at airgaps up to .200" to .250", depending on target geometry and sensor construction. Units can be configured for single or (dual) bi-directional sensing. Our units also include a unique circuit design that offers complete protection in the event of any connection mis-wiring, not only reverse polarity. The output frequency of these sensors has a square pulse waveform that directly relates to the number of turbine blades, gear teeth, etc. that have been sensed. These pulses, in turn, can be correlated to determine flow rate, RPM, or velocity.

Product Specifications

MR series sensors are manufactured on a custom basis to meet the specifications and requirements of a particular application. MSI can make custom MR sensors in customer-specified lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. Please contact us and we would be happy to make a product that meets your specifications.

Features and Specifications

Input Power:

8 to 30 VDC, 10 mA @ no-load

Reverse polarity protected

Pulse Output Options:

1. TTL/CMOS:
Fan-out of 5 TTL/CMOS loads
2. Open collector:
Maximum OFF state voltage 30 VDC,
maximum ON current 400 mA
3. 0 to 10 VDC square wave:
Requires 15 to 30 VDC input power

Airgap:

Up to 0.250" dependent on target geometry and sensor construction

Temperature Range:

Operating: -40°C to +85°C

Storage: -65°C to +125°C

Warranty:

Unconditional one (1) year warranty if used within specifications



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Physical Features:

Body material:

300 series stainless steel

Encapsulation:

Epoxy potting or hermetically sealed,
welded construction

Overall Length:

Approximately 3.0" to 3.5"

High Shock and Vibration resistance:

Impact: 100 G's (6 mS, 1/2 sine) min.

Vibration: 20 G's at 2,000 Hz min

Approvals:

CE compliant to EMC Directive 89/336/EEC
for use in residential, commercial, light
industrial and heavy industrial environments

Output Types and Specifications

Output Type	Interconnection Options	Pin/Pigtail Connections	Direction Output Logic
Single	Three (3) pin MIL-C-5015 type connector with gold plated pins; mates with MS3106-10SL-3S Pigtail with wires or cable NPT threaded body with wire or cable pigtail for explosion proof environments.	Pin A (Red): Input Power (+) Pin B (Black): Common (-) Pin C (White): Pulse Output (+)	
Dual/Bi-directional	Four (4) pin DTIH-8-4PN type connector with gold plated pins; mates with MS3116-116F-8-4S Pigtail with wires or cable NPT threaded body with wire or cable pigtail for explosion proof environments.	Pin A (Red): Input Power (+) Pin B (Black): Common (-) Pin C (White): Pulse A Output (+) Pin D (Orange): Pulse B Output (+)	
Bi-directional with Direction Output (0-5V)	Pigtail with wires or cable NPT threaded body with wire or cable pigtail for explosion proof environments	Red: Input Power (+) Black: Common (-) White: Pulse A Output (+) Orange: Pulse B Output (+) Green: Direction Output Logic (+) Braid: Shield (non-terminated at sensor)	TTL/CMOS (Std); fan-out of one (1) TTL/CMOS



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Magneto-resistive Sensors –Intrinsically Safe

The Motion Sensor (MSI) Intrinsically Safe versions of Magneto-resistive (MR) sensors feature the same high quality construction and materials as our standard Magneto-resistive units and are custom designed and developed for each customer application.

They are certified to CSA (with NRTL/C) and LCIE to ATEX (94/9/EC) for Class I, Zone 0, IIC and II 1 G EEx ia IIC T4, or Class I, Zone 0, IIA and II 1 G EEx ia IIA T4 hazardous locations.

Product Specifications

Intrinsically Safe MR sensors are manufactured on a custom basis to meet the specifications and requirements of a particular application. MSI can make custom Intrinsically Safe MR sensors in customer-specified lengths, diameters, configurations, mounting threads (e.g., metric) as well as with different operating specifications and options like pigtail leads, NPT threads for explosion proof applications, etc. Our certifications permit us to make intrinsically safe versions of almost any MSI sensor, or to customize a sensor to suit a particular application or customer need. The customization process for Intrinsically Safe products at MSI is straightforward, quick, offers more choice, and is less costly than our competitors. Just tell us what you want and we will provide a fully certified CUSTOM INTRINSICALLY SAFE PRODUCT IN WEEKS, NOT MONTHS, made to your specifications, even if you only need one piece! This ability to provide rapid development of custom certified product WITHOUT THE NORMAL CERTIFICATION COSTS AND LEADTIMES is due to our unique "modular" certification scheme with CSA and ATEX. Please contact us to learn how Motion Sensors can provide a customized Intrinsically Safe MR sensor for your application.

Features and Specifications

Type:

Intrinsically Safe versions of both single and dual channel Magneto-resistive sensors are available

Warranty:

Unconditional one (1) year warranty if used within specifications

Approvals:

Intrinsic Safety to CSA (with NRTL/C) and LCIE to ATEX (94/9/EC)

CE compliant to EMC Directive 89/336/EEC for use in residential, commercial, light industrial and heavy industrial environments

Entity Parameters:

Group IIA:

$V_{max}/U_i = 30$ VDC

$I_{max}/I_i = 190$ mA

$C_i/C_i = 0.0$ uF

$L_i/L_i = 0.50$ mH

Group IIC:

$V_{max}/U_i = 30$ VDC

$I_{max}/I_i = 200$ mA

$C_i/C_i = 0.0$ uF

$L_i/L_i = 0.50$ mH



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Electronics Overview

PA1001A Series of Preamplifiers: These preamplifiers are offered in configurations that provide the capability to work with VR, RF or a combination of both types of sensors. Some of their noteworthy features are: near zero sensing capability, ability to sense very low signal levels, rejection of unwanted noise and spurious signals, user-definable pulse outputs, and optional features such as analog output, pulse scaling and linearization.

PA2001 Series of Preamplifiers: These preamplifiers combine many of the fine features of the PA1001A series in a low cost, compact unit intended for mounting in an elbow conduit box such as Crouse Hinds Model LBY15. Versions are available in either combination VR/RF or VR only units

PCA121S Digital to Analog Converter: A convenient and low cost device that will provide current and/or voltage based analog output from pulsed signals when these are needed to drive plotters, recorders, printers and other data acquisition equipment. Its intended use is with MSI – or other company's - sensors, preamplifiers and other devices that produce digital, pulsed output, when analog output is desired. It can be used, for example with our Digi-Pulse, hall effect and Magnetoresistive sensors, and our PA2001 preamplifier. It can also be used with our intrinsically safe products when it is mounted on the "safe" side of the barrier.

PMX (VR) and PRX (RF) Intrinsically Safe Preamplifiers: These preamplifiers offer features similar to our PA1001A preamplifier/signal conditioners except they are intrinsically safe, allowing them to be used in hazardous environments with VR or RF speed sensors. Unlike our PA1001A preamplifiers, pulse outputs are factory installed and must be indicated when ordering. These preamplifiers are certified to CSA (with NRTL/C) and ATEX (94/9/EC).

Custom Electronics: We welcome the opportunity to develop a product specifically suited to your application or to modify an existing product to suit your needs. We have extensive experience in designing custom products and pride ourselves on the ability to provide high quality custom products at reasonable prices. Please contact us if you would like additional information.



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PA1001A Pre-Amplifier



The Motion Sensors (MSI) PA1001A series preamplifiers allow convenient interfacing with process measuring devices and digital electronics. This series of preamplifiers/signal conditioners is available in variable reluctance (VR) and RF sensor configurations as well as a combination unit that provides user selection of either VR or RF sensor input. Optional features include factory installed pulse scaling and field or factory installed analog output modules. The analog output module provides both current and voltage outputs proportional to RPM, flow-rate, etc.

Features and Specifications

Input Power:

Voltage: 8 to 30 VDC

Current draw: 125 mA @ 24 VDC
(all options equipped)

Reverse polarity protected

RF Sensor Input:

Modulation carrier frequency: 25 KHz

Input frequency: 2 Hz to 5 KHz, user-adjustable
trigger level to eliminate false pulsing

Carrier adjustment to allow precise tuning of
carrier signal to physical environment
(e.g., air gap, wall thickness)

Maximum air gap: 0.160"

Preferred coil inductance: 1.0 mH +/- 10%

Max. distance from sensor to preamp: 100'

Temperature Range:

Operating:

-40°F to +185°F
(-40°C to +85°C)

Storage:

-40°F to +302°F
(-40°C to +150°C)

Warranty:

Unconditional one (1) year warranty if used
within specifications

VR Sensor Input:

Input protected, RF and band pass filtered

Input frequency: 0 to 10 KHz, user-adjustable
trigger level to eliminate false pulsing (higher
frequencies also available)

Trigger sensitivity: 4 mV RMS min (note: at 4
mV frequency range 10 Hz to 3 KHz)

Input impedance: 40K ohms (nominal)

Max. input signal: 600 volts RMS

Max. distance from sensor to preamp: 100'

Pulse Output Options:

All output options are user selectable

Open collector Vmos transistor, maximum OFF
voltage 30 VDC, maximum ON state current
400 mA

TTL/CMOS fanout of 5 TTL/CMOS loads

0 to 10 VDC square wave

Square wave tied to input voltage

Optional Features:

Pulse Scaling - Divisions of 2, 4, 8, 16, 32, 64
or 128 (user selectable)



Analog Output Module:

Current Output

Accuracy +/- 0.05% of full-scale & +/-200 PPM/°C
Available range 4-20 mA
Output suitable for driving, floating, or grounded loads
Maximum loop impedance 500 ohms
Response time 3 seconds for 10% to 90%

Voltage Output

Accuracy +/- 0.05% of full-scale & +/-200 PPM/°C
Available range: 0-5 VDC or 0-10 VDC, user selectable
Impedance:<10 ohms
Response time: 3 seconds for 10% to 90%

Approvals:

CE compliant to EMC Directive 89/336/EEC for use in residential, commercial, light industrial and heavy industrial environments

Enclosures:

Unit is intended for mounting in a conduit box and comes with 2" and 2.5" center mounting holes. Enclosure is not required but recommended to protect unit from moisture, dirt, etc.
Optional explosion proof box available upon request
Enclosure requirements: GUAx16, 26, 36 or equivalent

Physical Dimensions:

Board diameter: 2.75"
Center mounting holes: 2" and 2.5"
Height (standard): 0.625"

NOTE: with analog output opt add 1.325" (may change with different connector type)

Product Features

VR and RF

Model Number	Description	Enclosure Cover Type
PA1001A-1	standard	standard lid
PA1001A-1PS	with pulse scaling	standard lid
PA1001A-1A	with analog module	2" dome lid

For Use with RF Sensor Only

Model Number	Description	Enclosure Cover Type
PA1001A-2	standard	standard lid
PA1001A-2PS	with pulse scaling	standard lid
PA1001A-2A	with analog module	2" dome lid

For Use with VR Sensor Only

Model Number	Description	Enclosure Cover Type
PA1001A-3	standard	standard lid
PA1001A-3PS	with pulse scaling	standard lid
PA1001A-3A	with analog module	2" dome lid



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PA2001 Pre-Amplifier

The Motion Sensors (MSI) PA2001 series preamplifiers allow convenient interfacing with process measuring devices and digital electronics. This series of preamplifiers/signal conditioners is available in either a combination version that provides user selection of either variable reluctance (VR) or RF sensor input, or a VR input only version. When used with VR sensors they will accept low-level signals and provide hysteresis to eliminate unwanted noise and interference. Operating range is 4 to 10,000 Hz. When used with RF sensors, they provide false pulsing safeguards, air gaps up to 0.150", a frequency range of 2 to 5,000 Hz, as well as a precisely tuned carrier signal to allow for maximum signal reliability.

Features and Specifications

Input Power:

Voltage: 8 to 30 VDC

Current draw: 25 mA @ 24 VDC

Reverse polarity protected

RF Sensor Input:

Modulation carrier frequency: 25 KHz

Input frequency: 2 Hz to 5 KHz

Maximum air gap: 0.150"

Preferred coil inductance: 1.0 mH +/- 10%

Max. distance from sensor to preamp: 100'

VR Sensor Input:

Input protected, RF and band pass filtered

Input frequency: 0 to 10 KHz

Trigger sensitivity: 4 mV RMS minimum
(NOTE: at 4 mV frequency range 10 Hz to 3 KHz)

Input impedance: 40K ohms (nominal)

Maximum input signal: 600 volts RMS

Max. distance from sensor to preamp: 100'

Pulse Output Options:

All output options are user selectable

Open collector Vmos transistor, maximum OFF state voltage 30 VDC; maximum ON current 400 mA

TTL/CMOS; fanout of 5 TTL/CMOS loads

0 to 10 VDC square wave

Square wave tied to input voltage

Physical Dimensions:

Board diameter: 1.10"

Height: 0.85"

Temperature Range:

Operating: -40°F to +185°F
(-40°C to +85°C)

Storage: -40°F to +302°F
(-40°C to +150°C)

Approvals:

CE compliant to EMC Directive 89/336/EEC for use in residential, commercial, light industrial and heavy industrial environments



MOTION SENSORS, INC.

Producing High Quality Solutions Since 1970

786 Pitts Chapel Rd.
Elizabeth City, NC 27909
Phone: 252-331-2080
Fax: 252-331-1666
info@motionsensors.com



Warranty:

Unconditional one (1) year warranty if used within specifications

Enclosures:

Unit is intended for mounting in an elbow conduit box such as Crouse-Hinds Model LBY15

Optional explosion proof box available upon request

Product Features

Model Number	Description	Pulse Output
PA2001-1	Combo VR/RF	Equipped with all options
PA2001-1A	Combo VR/RF	TTL/CMOS and open collector only
PA2001-2	VR only	Equipped with all options
PA2001-2A	VR only	TTL/CMOS and open collector only



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PCA121S Digital to Analog Converter

The Motion Sensors (MSI) PCA121S Digital to Analog Converter is a convenient and low cost device that will provide current and/or voltage based analog output from pulsed signals when these are needed to drive plotters, recorders, printers, and other data acquisition equipment. Its intended use is with sensors, preamplifiers, and other devices that produce digital, pulsed output when analog output is also desired. The PCA121S can be used, for example, with our Digi-Pulse (DP), Hall Effect (HE) and Magneto-resistive (MR) sensors, as well as our PA1001A and PA2001 series of preamplifiers. The PCA121S can also be used with our Intrinsically Safe products when it is mounted on the "safe" side of the barrier.

Features and Specifications

Input Power:

Voltage: 8 to 30 VDC

Reverse polarity protected

Pulse Input:

Frequency range: 0 to 12.8 KHz

Pulse type: 0 to 5 TTL/CMOS (other types of pulse input also available; contact factory for details)

Max. distance from sensor to preamp: 100'

Voltage Output:

Accuracy: +/- 0.05% of full-scale +/- 200 PPM

Available range: 0 to 5 VDC or 0 to 10 VDC, user selectable

Impedance: <10 ohms

Response time: 3 seconds for 10% to 90%

Current Output:

Accuracy: +/- 0.05% of full-scale +/- 200 PPM

Available range: 4-20 mA

Output suitable for driving, floating or grounding loads

Maximum loop impedance: 500 ohms

Response time: 3 seconds for 10% to 90%

Enclosures:

Unit is intended for mounting in a conduit box.
Custom configuration for other housings available.
Enclosure is not required but is recommended to protect unit from moisture, dirt, etc.

Terminal Connections and Type:

Input Pulse and Power: (Terminal Block 2)

Pulse (+): terminal 1

Common (-): terminal 2

Power (+): terminal 3

Analog output: (Terminal Block 1)

Voltage (+): terminal 1

Common (-): terminal 2

4 to 20 mA (+): terminal 3

Type

Screw-down (optional Phoenix type with mating connector also available)

Temperature Range:

Operating: -40°F to +185°F
(-40°C to +85°C)

Storage: -40°F to +302°F
(-40°C to +150°C)

Approvals:

CE compliant to EMC Directive 89/336/EEC for use in residential, commercial, light industrial and heavy industrial environments

Physical Dimensions:

2.58" x 1.5" x 0.41"

Warranty:

Unconditional one (1) year warranty if used within specifications



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PMX (Variable Reluctance) and PRX (RF) Intrinsically Safe Pre-Amplifiers

Motion Sensors (MSI) PMX (variable reluctance) and PRX (RF) intrinsically safe preamplifiers offer features similar to our PA1001A preamplifiers/signal conditioners and can be used in hazardous environments with intrinsically safe variable reluctance (VR) or RF sensors (e.g., PC45-X or RF10-X, respectively).

Unlike our PA1001A preamplifiers, pulse outputs are factory installed and must be indicated when ordering. These preamplifiers are certified to CSA (with NRTL/C) and LCIE to ATEX (94/9/EC). They are available for Class I, Zone 0, IIC and II 1 G EEx ia IIC T4 or Class I, Zone 0, IIA and II 1 G EEx ia IIA T4 hazardous locations.

Features and Specifications

Input Power:

13 to 30 VDC, 35 mA @24 VDC
(Class I, Zone 0, IIC models)

7.5 to 30 VDC, 10 mA @ ≤10 VDC
(Class I, Zone 0, IIA models)

Reverse polarity protected

RF Sensor Input:

Modulation carrier frequency: 20 KHz

Input frequency: 2 Hz to 5 KHz, adjustable trigger level

Carrier adjustment: to allow precise tuning of carrier signal to physical environment (e.g., air gap, wall thickness)

Max. air gap: 0.160"

Preferred coil inductance: 1.0 mH +/- 10%

Max. distance from sensor to preamp: 100'

VR Sensor Input:

Input protected, RF and band pass filtered

Input frequency: 0 to 10 KHz, adjustable trigger level

Trigger sensitivity: 10 mV RMS min. (note: at 10 mV frequency range 10 Hz to 3 KHz)

Input impedance: 40K ohms (nominal)

Max. input signal: 600 volts RMS

Max. distance from sensor to preamp: 100'

Pulse Output Options:

All output options must be factory installed

Open collector Vmos transistor, maximum OFF voltage 30 VDC; maximum ON current

TTL/CMOS (standard) fanout of 5
TTL/CMOS loads



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Temperature Range:

Operating: -40 ° F to +185 ° F
(-40 ° C to +85 ° C)

Storage: -40 ° F to +302 ° F
(-40 ° C to +150 ° C)

Enclosures:

Unit is intended for mounting in a conduit box. Enclosure is not required (unless using in Class II and III locations in which must be enclosed in an approved Class II/III enclosure) but recommended to protect unit from moisture, dirt, etc.

Optional explosion proof box available upon request

Approvals:

Intrinsically safe to CSA (with NRTL/C) and LCIE to ATEX (94/9/EC).

CE compliant to EMC Directive 89/336/EEC for use in residential, commercial, light industrial and heavy industrial environments

Entity Parameters:

Group IIC

To barrier:

$V_{max}/U_i = 30$ VDC, $I_{max}/I_i = 200$ mA

$C_i/C_i = 0.0uF$, $L_i/L_i = 0.50$ mH

To sensor:

$V_{oc}/U_o = 5.9$ VDC, $I_{sc}/I_o = 64$ mA

$C_a/C_o = 1$ uF, $L_a/L_i = 3.5$ mH

Warranty:

Unconditional one (1) year warranty if used within specifications

Physical Dimensions:

Board diameter: 2.75"

Center mounting holes: 2" and 2.5"

Product Features

Hazardous location: Class I, Zone 0, Group IIC and Class 1, Div. 1 Group A,B,C,D

Model Number	Description	Output (Pulse Range)	Enclosure Cover Type
PMX-0001-1	for use with VR sensor	open collector	standard lid
PMX-0001-2	for use with VR sensor	0-5 VDC	standard lid
PRX-0002-1	for use with RF sensor	open collector	standard lid
PRX-0002-2	for use with RF sensor	0-5 VDC	standard lid

Hazardous location: Class 1, Zone 0 Group IIA and Class 1, Div. 1, Group D

Model Number	Description	Output (Pulse Range)	Enclosure Cover Type
PMX-0001-3	for use with VR sensor	open collector	standard lid
PMX-0001-4	for use with VR sensor	0-5 VDC	standard lid
PRX-0002-3	for use with RF sensor	open collector	standard lid
PRX-0002-4	for use with RF sensor	0-5 VDC	standard lid