SENSOR DATA SHEET



Extreme Environment

For high pressure, low temperature, and high temperature applications









(860) 632-4301
kmmprecisionmeasuring.com

KMM
PRECISION MEASURING

Extreme Environment

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Features

- For applications requiring high accuracy, high reliability, and structural integrity.
- Operating temperatures from -320°F to +1000°F (+1200°F short term).
- Displacement systems withstand pressure up to 3500 or 5000 psi.
- Dual-coil sensor design effectively minimizes radiation effects.
- Hermetically sealed and laser welded.
- Unaffected by environmental contaminants.

High Precision Sensors for Extreme Environments



KMM Precision Measuring manufactures a line of high-precision sensors and systems specifically for extreme environment applications. These include three displacement measuring systems, all able to operate at high temperatures.



The high temperature products in this catalog were initially designed for NASA and the nuclear power industry — applications requiring high reliability, accuracy, and structural integrity. The same engineering skill and technology that went into Kaman's +2000°F microphone for measuring the dB level of jet engine exhaust noise, in the exhaust, went into the design and manufacture of this superior line of high temperature products.



KMM originally developed the high temperature displacement sensor to measure steam turbine shaft runout in nuclear power plants. They are also used to measure nuclear fuel rod position/vibration, since these inductive sensors are unaffected by radiation and most other environmental contaminants.

This specialized line of high temperature sensors features precise operation at up to 1000°F continuous and +1200°F short term. They have resolution and repeatability comparable to Kaman's conventional line of high precision systems.



All of KMM's high temperature transducers are made with sealed, all laser-welded Inconel housings and use metaljacketed, mineral-insulated cable.

The displacement transducers withstand pressures:

KD-1925 greater than 5000 psi; KD-1950 and KD-1975 up to 3500 psi.

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High Temperature Displacement Sensors

Features

- Operating temperatures from -320°F to +1000°F
- Excellent linearity
- Rugged all welded construction
- Ideal for high pressure environments
- Hermetically sealed
- Small error band
- Corrosive gas or liquid environments
- KDM-8200 electronics for the KD-1925, KD-1950 and KD-1975

Typical Applications

- Nuclear reactors
- Steam and gas turbines
- Turbine and rocket engines
- Chemical processes
- Research projects
- High temperature processing

KD-1925, KD-1950 and KD-1975 Displacement Sensors

Kaman's high-temperature displacement sensors provide accurate noncontacting measurement of conductive surface motion in hostile environments. Thermal compensation techniques that maintain sensitivity and linearity with small zero shifts make these accurate high temperature measurements possible.

Kaman's sensors feature laser-welded Inconel construction, making them perfect for a variety of extreme environment applications. The sensors use the versatile KDM-8200 family of signal conditioning electronics. Single channel systems are available in the NEMA-enclosed KDM-8200 or bench-top/ rack-mountable KDM-8200. The NEMA enclosure houses an internal power supply, digital panel meter and window kit. Up to eight measuring channels are available in the rack-mountable KDM-8200. (See Kaman's KDM-8200 data sheet for a complete description and additional specifications for these electronics.)



From left to right, KD-1975, KD-1950 and KD-1925 high temperature displacement sensors

Each sensor has dual coils inside the corrosion-resistant case. In operation, an electromagnetic field generated by the active coil penetrates the front of the sensor to induce eddy currents in a conductive target within the sensor's range. Changes in target displacement result in impedance variation in the active coil. This variation is detected by the signal conditioning electronics and converted to a linear analog output signal.

The symmetrical design of the dual coils compensates for constant and slowly changing temperatures from -320°F to +77°F or from 77°F to +1000°F. Measurement quality is unaffected by most corrosive gasses and liquids and most other environmental contaminants such as oil, dirt, radiation, and stray RF and magnetic fields.

The cabling has two sections joined by a LEMO® transition connector: a high-temperature metal-sheathed, mineralinsulated section designed to the same environmental specifications as the sensor, and a flexible section of Teflon® jacketed, twisted pair, coax cable for connection to the electronics unit.

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High Temperature Displacement Sensors

Signal Conditioning Electronics



KDM-8200 3U/84 HP



KDM-8200 3U/42 HP



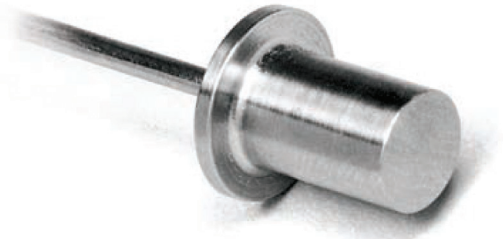
KDM-8200 NEMA enclosure

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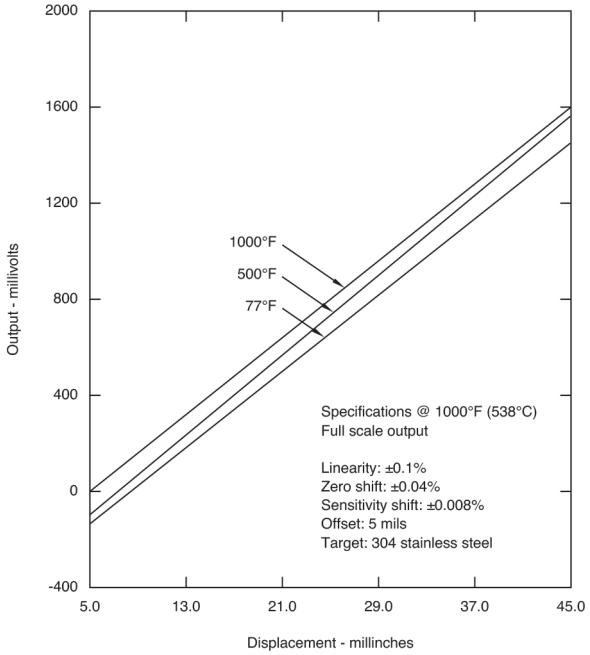
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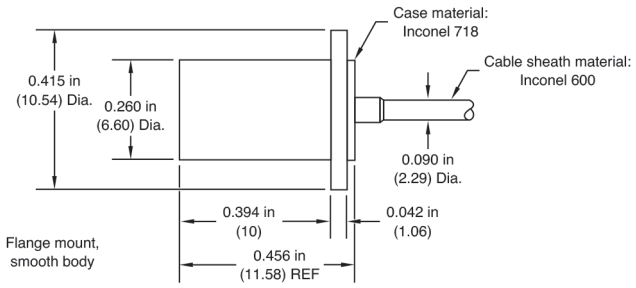
High Temperature Displacement Sensors

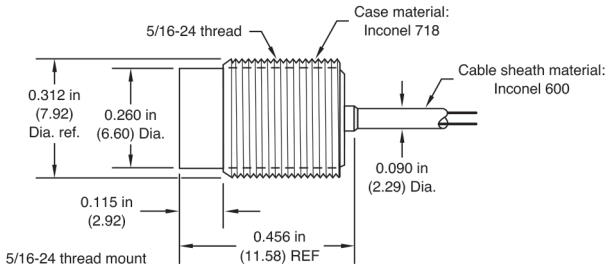
KD-1925 Displacement Sensor



Flange mount, smooth body







Specifications

Measuring range* (maximum mechanical offset 0.001 inch)	
KD-1925	0.050 inch (1.27 mm)
KD-1925M**	0.035 inch (0.9 mm)
Electronics	KDM-8200
Power input	(120 Vac)
Output (electrical zero offset up to 50% of measuring range)	
KD-1925	0-2 Vdc nominal (50 mV/mil)
KD-1925M**	0-1.75 Vdc nominal (50 mV/mil)
Resolution (at mid range)	
Static	30 µinch (0.00003 inch) [0.00076 mm]
Dynamic	50 µinch (0.00005 inch) [0.0013 mm]
Repeatability	30 µinch at mid range
Operating temp. range	-320°F TO +77°F or +77°F to +1000°F (+538°C)
Nonlinearity	Within ±1.5% FSO at customer selected calibration temp.
Typical temperature coefficients (over maximum specified thermal range)	
Zero shift	0.03%/°F FSO (0.054%/°C FSO)
Sensitivity shift	0.03%/°F FSO (0.054%/°C FSO)
Frequency response	0-10 kHz (3 dB) 30 kHz available on request
Sensor material	Corrosion resistant high temp. nickel chrome alloy (Inconel 718) welded and hermetically sealed
Cable material	Nickel chrome alloy (Inconel 600) sheathed, mineral insulated
Standard cable lengths	
Hardline	10 feet
Softline	5 feet
Target material	Conductors - nonmagnetic and magnetic
Operating pressure range	To 5000 psi
Standard mounting configurations	1. 5/16-24 thread mount 2. Flange mount, smooth body

**Change from standard may degrade specifications.*
***For magnetic targets.*

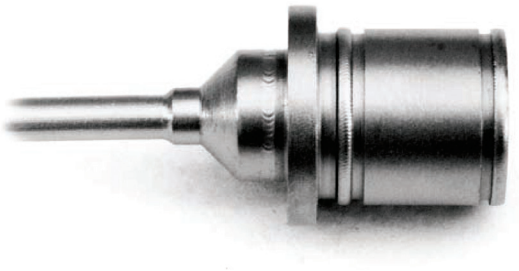
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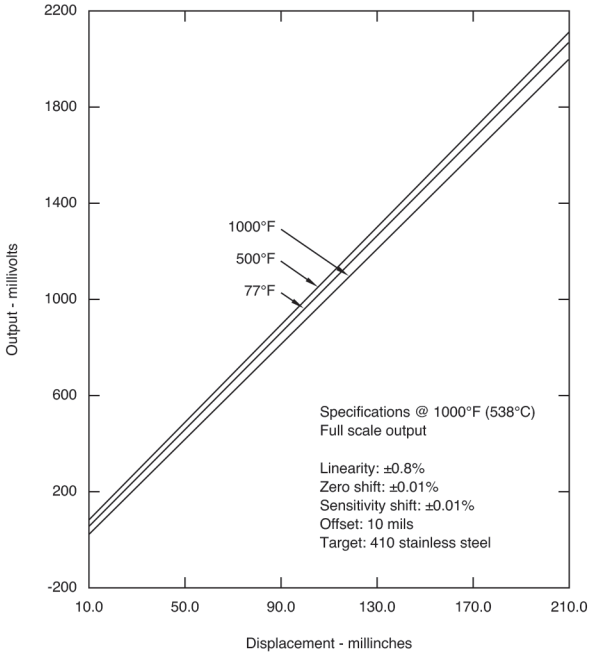
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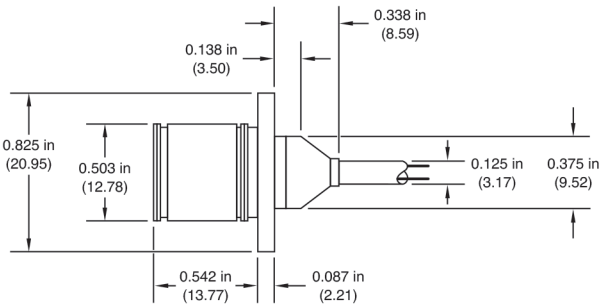
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High Temperature Displacement Sensors

KD-1950 Displacement Sensor







Specifications

Measuring range* (maximum mechanical offset 0.005 inch)	
KD-1950	0.150 inch (3.81 mm)
KD-1950M**	0.100 inch (2.54 mm)
Electronics	KDM-8200 with internal power supply
Power input	(120 Vac)
Output (electrical zero offset up to 50% of measuring range)	
KD-1950	0-1.5 Vdc nominal
KD-1950M**	0-1.0 Vdc nominal
Resolution (at mid range)	
Static	50 µinch (0.00005 inch) [0.0013 mm]
Dynamic	100 µinch (0.0001 inch) [0.0025 mm]
Repeatability	100 µinch at mid range
Operating temp. range	-320°F to +77°F or +77°F to +1000°F (+538°C)
Nonlinearity	Within ±1% FSO at customer selected calibration temp.
Typical temp. coefficients (over maximum specified thermal range)	
Zero shift	0.02%/°F FSO (0.036%/°C)
Sensitivity shift	0.02%/°F FSO (0.036%/°C)
Frequency response	0-10 kHz (3 dB)
Sensor material	Corrosion resistant high temp. nickel chrome alloy (Inconel 625) welded and hermetically sealed
Cable material	Nickel chrome alloy (Inconel 600) sheathed, mineral insulated
Standard cable lengths	
Hardline	10 feet
Softline	5 feet
Optional lengths	Available upon request
Target material	Conductors - nonmagnetic and magnetic
Operating pressure range	To 3500 psi
Standard mounting configurations	Flange mount, smooth body

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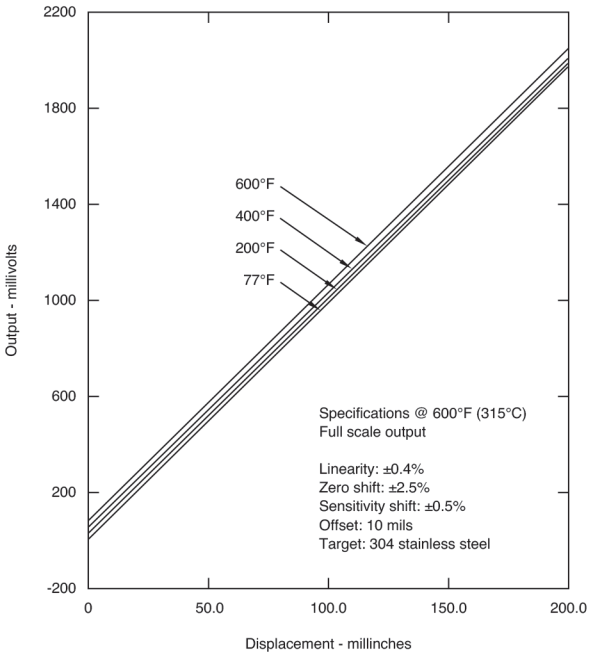
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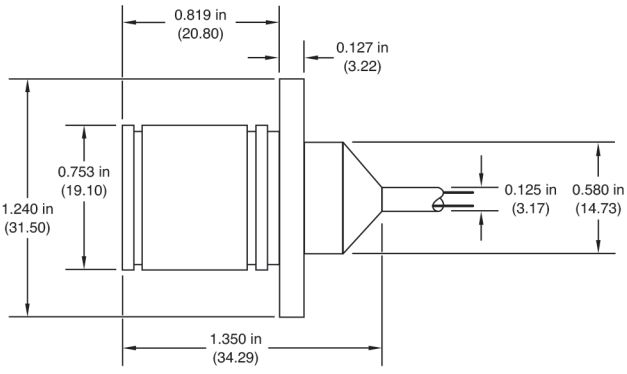
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High Temperature Displacement Sensors

KD-1975 Displacement Sensor







Specifications

Measuring range* (maximum mechanical offset 0.010 inch)	
KD-1975	0.200 inch (5 mm)
KD-1975M**	0.100 inch (2.5 mm)
Electronics	KDM-8200 with internal power supply
Power input	(120 Vac)
Output (electrical zero offset up to 50% of measuring range)	
KD-1975	0-2 Vdc nominal
KD-1975M**	0-1 Vdc nominal
Resolution (at mid range)	
Static	100 µinch (0.0001 inch) [0.0025 mm]
Dynamic	100 µinch (0.0001 inch) [0.0025 mm]
Repeatability	100 µinch at mid range
Operating temp. range	-320°F to +77°F or +77°F to +1000°F (+538°C)
Nonlinearity	Within ±1% FSO at customer selected calibration temp.
Typical temperature coefficients (over maximum specified thermal range)	
Zero shift	0.01%/°F FSO (0.018%/°C)
Sensitivity shift	0.01%/°F FSO (0.018%/°C)
Frequency response	0-2.5 kHz (3 dB). Higher frequency response available
Sensor material	Corrosion resistant high temp. nickel chrome alloy (Inconel 625) welded and hermetically sealed
Cable material	Nickel chrome alloy (Inconel 600) sheathed, mineral insulated
Standard cable lengths	
Hardline	10 feet
Softline	5 feet
Optional lengths	Available on request
Target material	Conductors - Nonmagnetic and magnetic
Operating pressure range	To 3500 psi
Standard mounting configurations	Flange mount, smooth body

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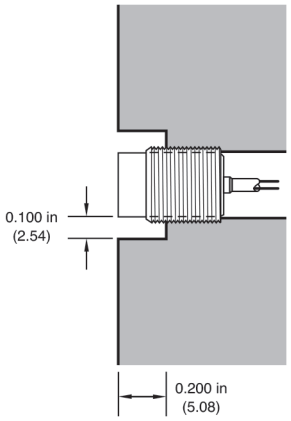
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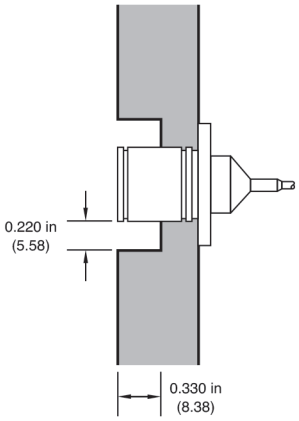
High Temperature Displacement Sensors

Mounting Considerations

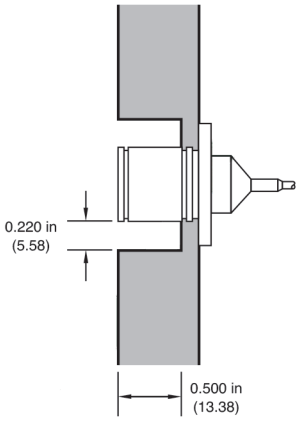
KD-1925 Threadmount



KD-1950



KD-1975



Customer supplied sideloading ring and target

