



## 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 pressures 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



Kaman Precision Products 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.



Kaman 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 Kaman's high temperature transducers are made with sealed, all laser-welded Inconel housings and use metal-jacketed, mineral-insulated cable.

The displacement transducers withstand pressures:

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

## 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-



*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,

**High Temperature Displacement Sensors**

**Signal Conditioning Electronics**



*KDM-8200 3U/84 HP*



*KDM-8200 3U/42 HP*



*KDM-8200 NEMA enclosure*

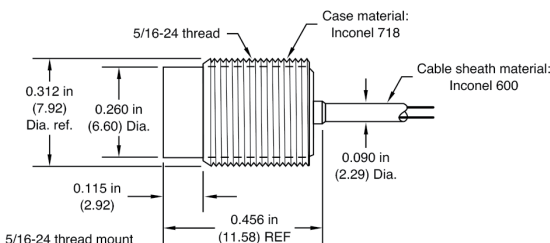
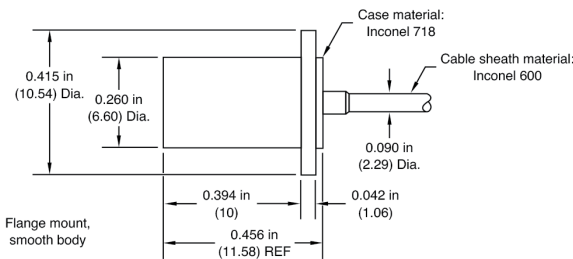
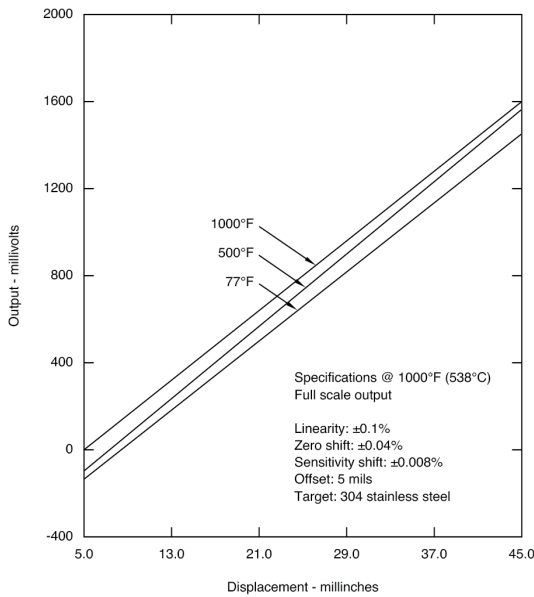


**High Temperature Displacement Sensors**

**KD-1925 Displacement Sensor**



Flange mount, smooth body



**Specifications**

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

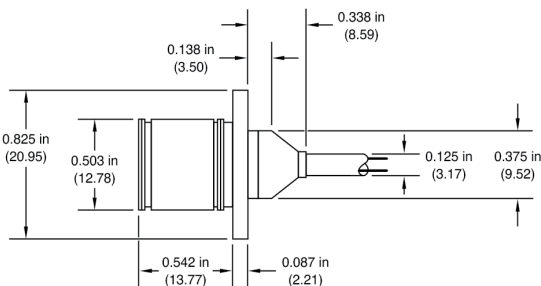
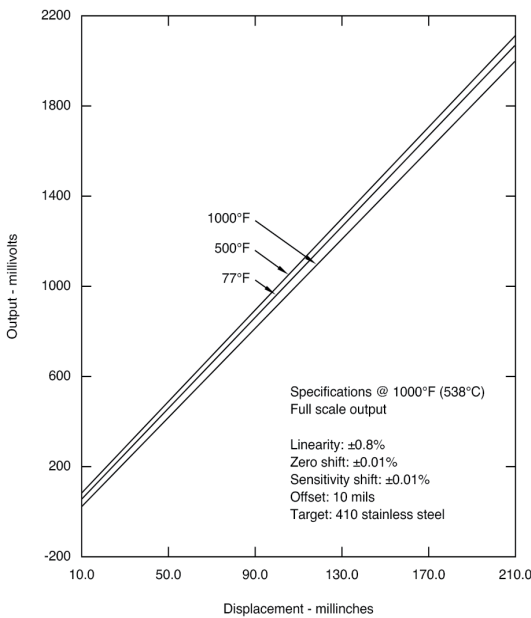
\*Change from standard may degrade specifications.

\*\*For magnetic targets.

800-552-6267 | kamansensors.com | measuring@kaman.com

**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

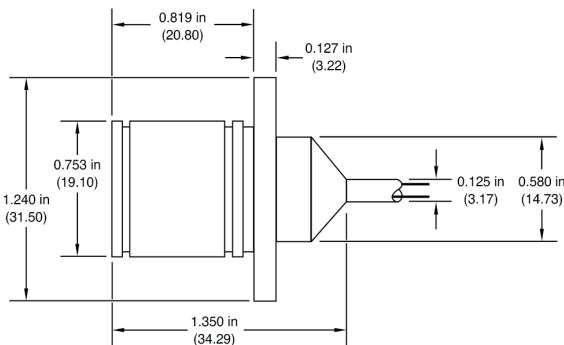
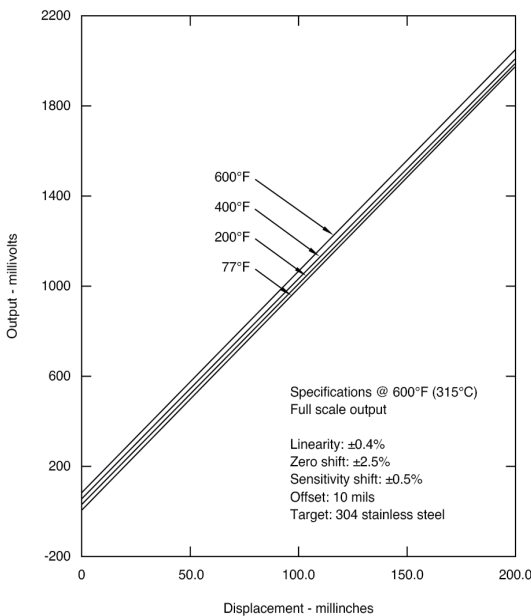
**Standard mounting configurations** Flange mount, smooth body

\*Change from standard may degrade specifications.

\*\*For magnetic targets.

**High Temperature Displacement Sensors**

**KD-1975 Displacement Sensor**



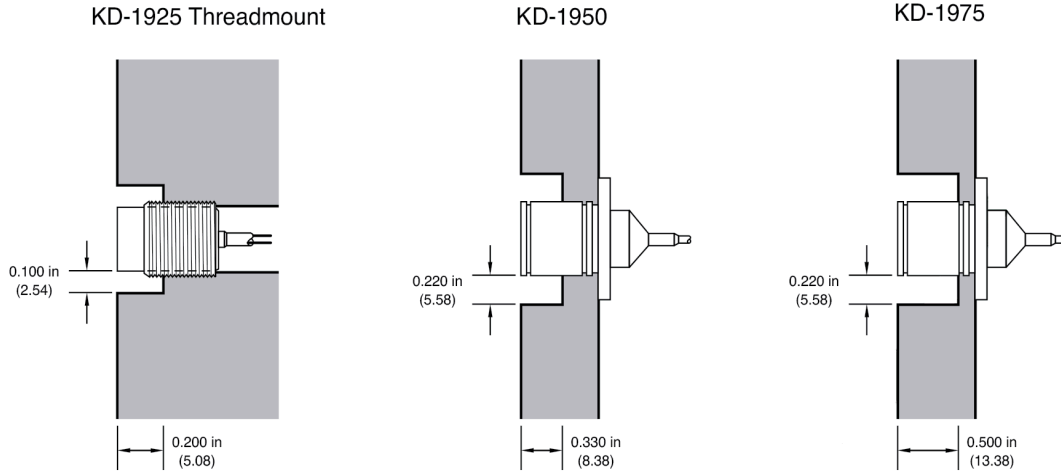
**Specifications**

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

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

**High Temperature Displacement Sensors**

**Mounting Considerations**



Customer supplied sideload ring and target

