


## 2440



High-precision  
proximity  
measuring  
system

### FEATURES

- Outstanding precision: static resolution to 12 microinches
- Easy to calibrate
- Low cost
- Excellent performance with ferrous targets
- Variable voltage input from 12 to 24 volts DC
- Compact rugged electronics, sensors
- Adjustable gain for up to 22 volts output (with 24 Vdc input)
- Temperature tolerant sensors (to 400°F)
- Level adjustable switched output to 10 KHz for process control
- Drop in replacement to Kaman's KD-2400 (with accessories kit)
- Very low switching hysteresis, < 1% on ferrous targets

## KD-2440

Kaman Instrumentation's displacement measuring system Model KD-2440 is a noncontact proximity measuring system. This low-cost, easy-to-use system makes precision static and dynamic measurements of metal targets, and thickness measurements of nonconductive material backed by metal. Its switching output will track RPM measurement to 10 KHz.

## THEORY OF OPERATION

The KD-2440 system operates on a traditional Colpitts oscillator circuit where the sensor acts as the resonating coil for the oscillator. The proximity of the target to the sensor face pulls the oscillator, changing its frequency and amplitude of modulation, and controlling a variable gain oscillator section within the electronic circuit.

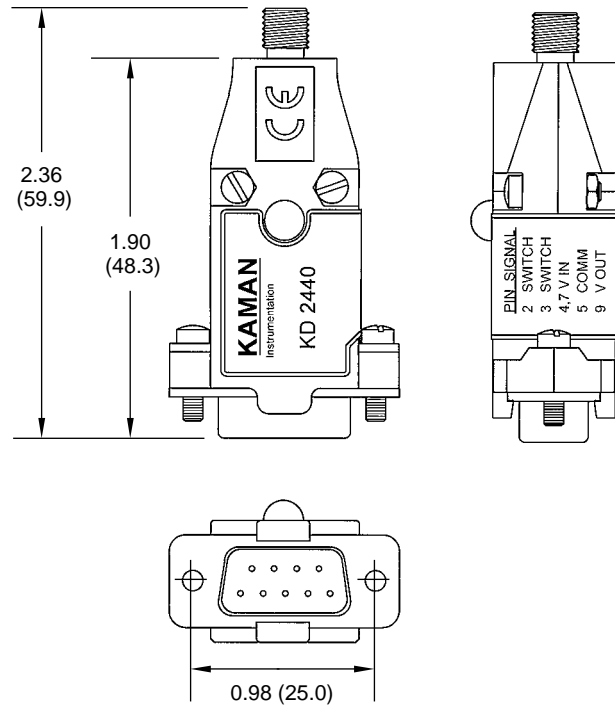
The signal is half-wave rectified and filtered to obtain an analog voltage proportional to the target position or displacement. The analog voltage output can be varied by adjustment of the gain. The input power is diode protected and regulated to provide a clean low-noise signal. The output is short-circuit current protected.

## APPLICATIONS

The KD-2440 may be used in a variety of applications using target materials such as ferrous or stainless steel or aluminum. Good sensitivity to small diameter targets lends itself to applications such as gear teeth counting or RPM measurement. The opto-isolated switched output makes the KD-2440 ideal for interfacing to PLC inputs, counters, timers or alarm circuits.

## KD-2440 SYSTEM

The KD-2440 system consists of three sub-assemblies: the sensor, with integral cable, a power and output cable, and the signal conditioning or electronics module. The KD-2440 electronics use a standard DB-9 connector to bring +12 Vdc to +24 Vdc into the electronics and provide outputs for the variable voltage and switch functions. Kaman offers



Note: All dimensions shown in inches (mm).

### ▲ KD-2440 proximity measuring electronics

either the P-3410 or P-3450 power supplies. The system comes standard with one of two production sensor configurations — the 9C or the 5CM. Both of these sensors are rated to moderate temperatures and can withstand temperatures to 400° F (205° C).

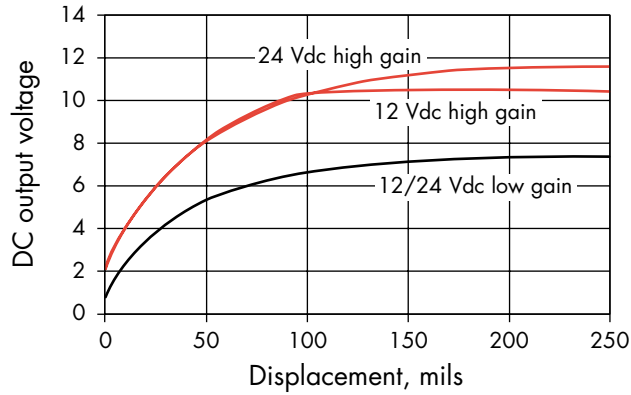
## EMI PERFORMANCE

The KD-2440 conforms with the applicable standards of Council Directive for *Generic for Light Industrial and Commercial Use*. Under some EMI environments, at specific frequencies, the KD-2440 unit may experience a change in output voltage. In general, when exposed to those environments covered by the EMC directive, the user can expect less than 5% deviation of output. As always, contact Kaman Instrumentation for specific data or for recommended solutions to problems you are having with the KD-2440.

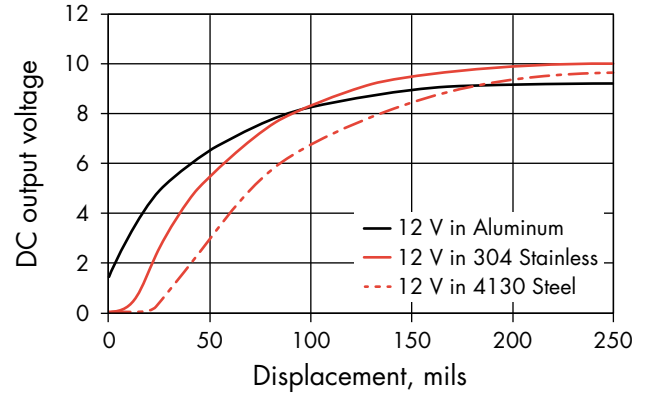
## 9C SENSOR SPECIFICATIONS AND RESPONSE DATA

Target material	9C sensor measuring range
Non-ferrous (aluminum)	0 - 0.175 in. (0 - 4.45 mm)
Non-magnetic steels (304 stainless)	0.025 - 0.200 in. (0.64 - 5.08 mm)
Magnetic steels (4130)	0.040 - 0.275 in. (1.02 - 6.99 mm)

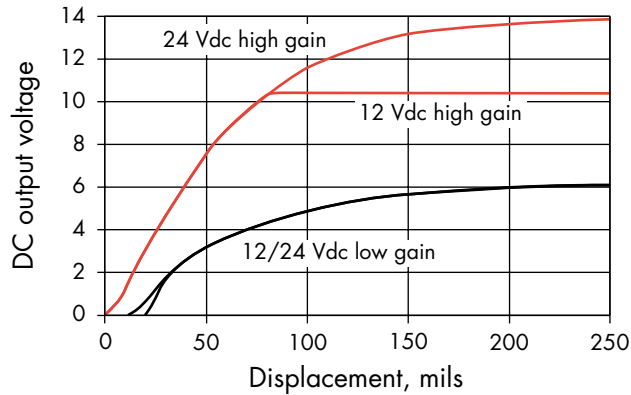
**Aluminum output for 12 and 24 volt inputs**



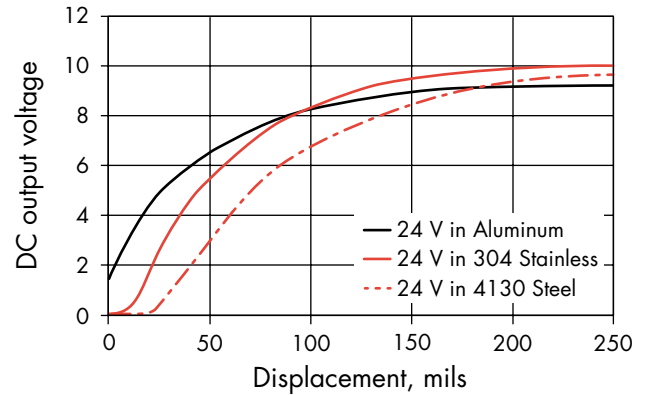
**Outputs at medium gain and 12 volt input**



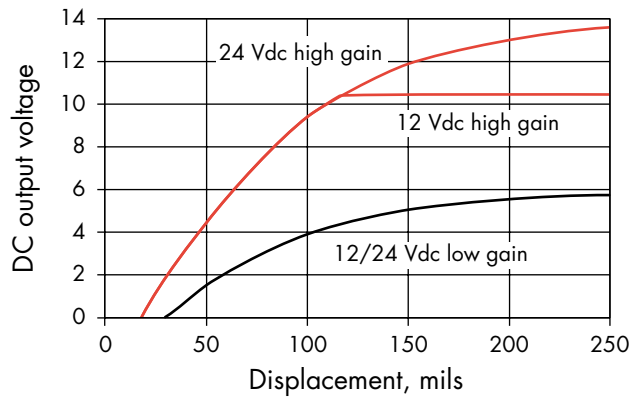
**304 SS output for 12 and 24 volt inputs**



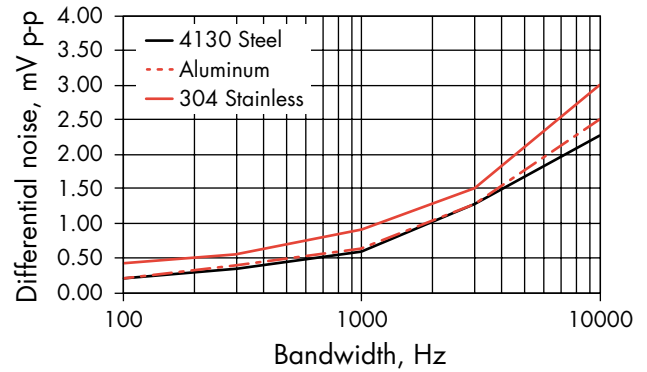
**Outputs at medium gain and 24 volt input**



**4130 steel output for 12 and 24 volt inputs**



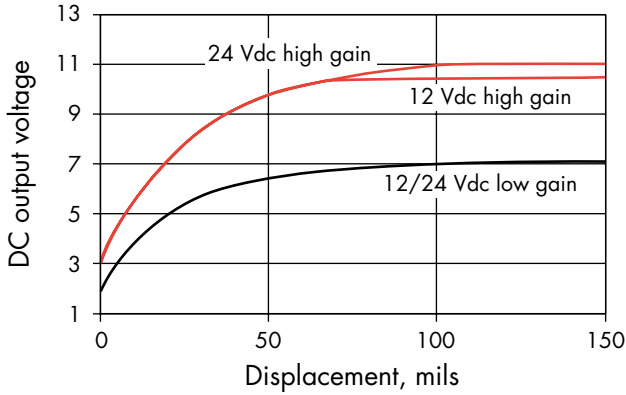
**Example output noise @ 12 Vdc input, mid gain, medium displacement**



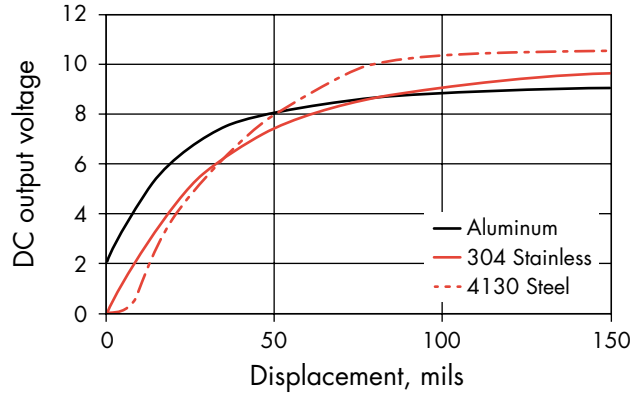
## 5CM SENSOR SPECIFICATIONS AND RESPONSE DATA

Target material	5CM sensor measuring range
Non-ferrous (aluminum)	0 - 0.100 in. (0 - 2.54 mm)
Non-magnetic steels (304 stainless)	0.010 - 0.125 in. (0.254 - 3.18 mm)
Magnetic steels (4130)	0.015 - 0.150 in. (0.38 - 3.81 mm)

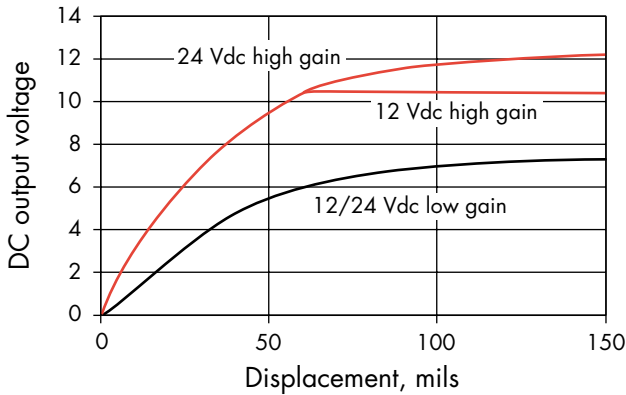
**Aluminum output for 12 and 24 volt inputs**



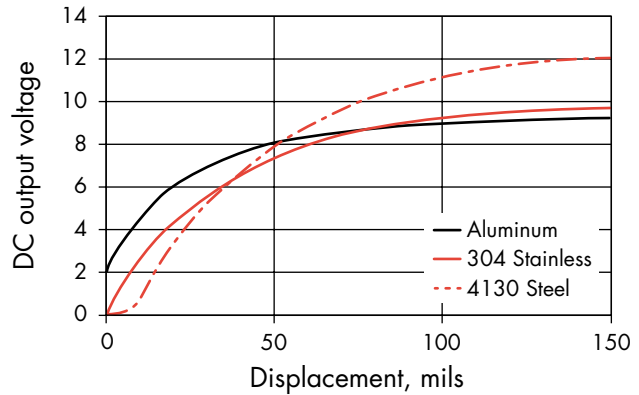
**Outputs at medium gain and 12 volt input**



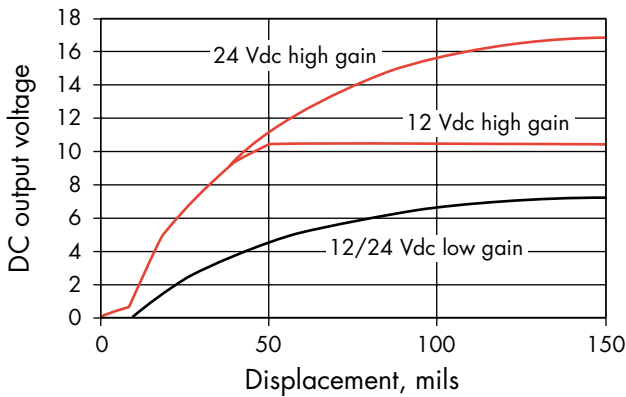
**304 SS output for 12 and 24 volt inputs**



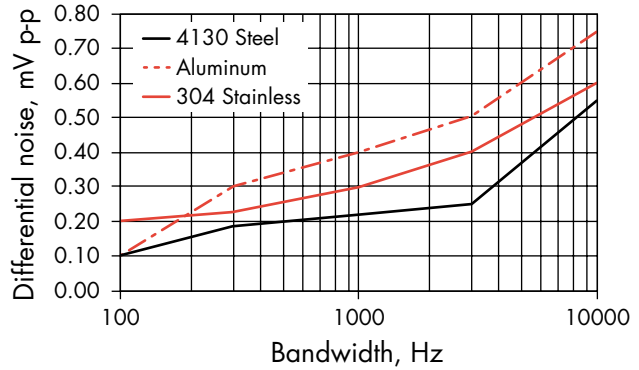
**Outputs at medium gain and 24 volt input**



**4130 steel output for 12 and 24 volt inputs**



**Example output noise @ 12 Vdc input, mid gain, medium displacement**



**SPECIFICATIONS**

**Electrical**

**Input:**

*Voltage:* Regulated 12 Vdc to 24 Vdc  
*Current:* Fuse limit input current from power source to 11 mA, .28W maximum at full load

**Analog output:**

*Current (full load):* 4.2 mA maximum  
*Impedance:* 50 ohms  
*Voltage:* 0-22 Vdc minimum with 24 Vdc input;  
 0-10 Vdc minimum with 12 Vdc input  
*Frequency response:* 0-10 KHz ( $\pm$  3db)

**Switched output:**

*Load current:* 100 mA maximum AC or DC  
*Load voltage:* 30 V r.m.s., 42.4 V peak, or 60 Vdc  
*On resistance:* 30 ohms minimum / 50 ohms maximum

*Switch point hysteresis:* 0.56% of full scale for 9C sensor, and 0.97% of full scale for 5CM sensor using 24 Vdc input on 4130 steel

*Frequency response:* 3.3 KHz

**Resolution:** Less than .008% of measuring range using a 5CM sensor on a 4130 steel target at mid scale, mid gain, and 12 Vdc input

**Environmental**

**Operating temperature range:**

*Sensor and cable:* 0°F to +400°F (-18°C to +205°C)  
*Electronics:* +32°F to +150°F (0°C to +66°C)

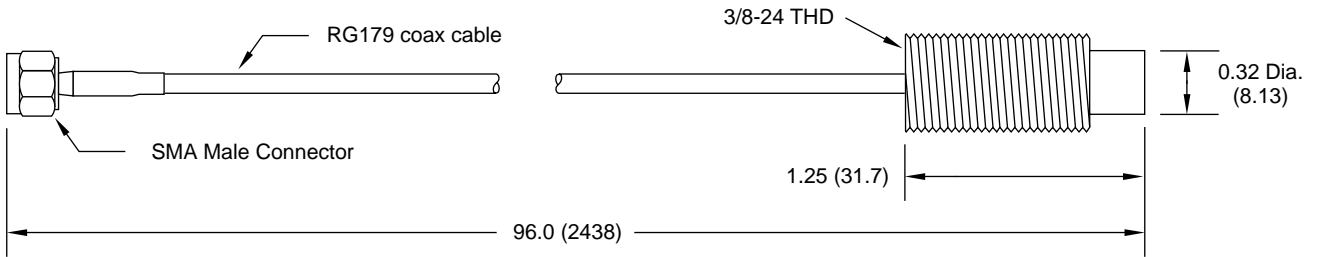
**Storage temperature range:**

*Sensor and cable:* -60°F to +400°F (-52°C to +205°C)  
*Electronics:* -58°F to +212°F (-50°C to +100°C)

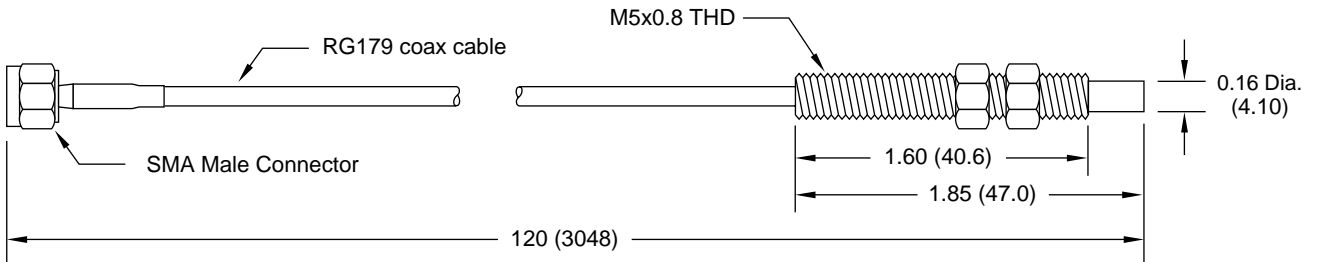
**Thermal drift:** Less than 0.22% per °C of full scale for sensor, electronics or system.

**IP rating:**

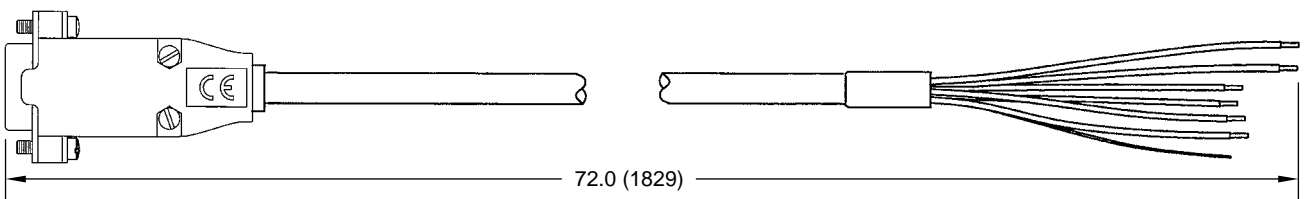
*Sensor:* IP67  
*Electronics:* IP40



▲ 9C sensor Note: All dimensions shown in inches (mm).

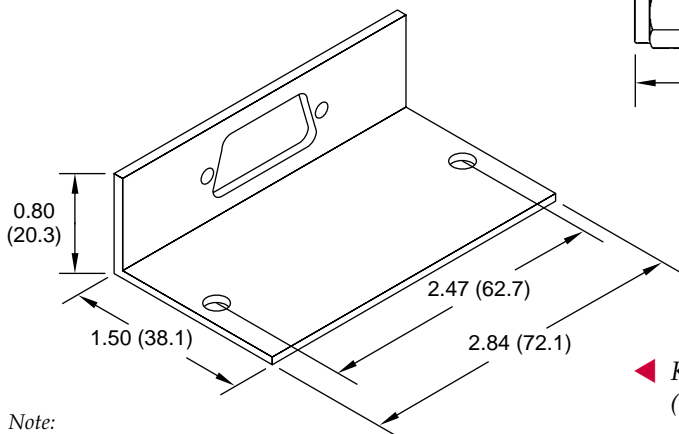


▲ 5CM sensor Note: All dimensions shown in inches (mm).

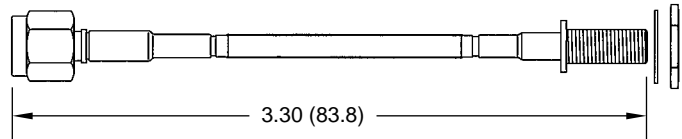


Note: All dimensions shown in inches (mm).

▲ KD-2440 power/output cable (order number 854981-072)



Note:  
All dimensions shown in inches (mm).



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KD-2400 to KD-2440 sensor adapter cable  
(order number 854993-001)

◀ KD-2400 to KD-2440 adapter mounting bracket  
(order number 815945-001)

## MOUNTING OPTION: DIN MOUNT INTERFACE MODULE



### FEATURES

- Easy retrofit into existing equipment and electronics enclosures.
- DB9 connector mates directly to the KD-2440.
- Terminal strip connections for power input, analog voltage output and switched output.

### ORDERING INFORMATION

- KD-2440-5CM-DIN part number: 854980-003. Complete system including electronics, 5CM sensor and DIN interface module.
- KD-2440-9C-DIN part number: 854979-003. Complete system including electronics, 9C sensor and DIN interface module.
- Interface module only part number: 826721-005.

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**PM INSTRUMENTATION**, 59 rue Emile Deschanel, 92400 Courbevoie, France  
Tel : 01 46 91 93 30, Fax : 01 46 91 93 39, Web : [www.pm-instrumentation.com](http://www.pm-instrumentation.com)