

SENSOR DATA SHEET

KD-2446

Noncontact  
high-precision  
proximity  
measuring  
system



**KAMAN**  
PRECISION PRODUCTS

# KD-2446

## FEATURES

- > Outstanding precision: static resolution to 12 microinches
- > 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)
- > High speed (10 KHz) level adjustable switched output for process control
- > Very low switching hysteresis, < 1% on ferrous targets
- > RoHS compliant

Kaman Precision Product's Model KD-2446 is a noncontact proximity measuring system. This low-cost, easy -to-use system makes precision static and dynamic measurements of metal targets.

## THEORY OF OPERATION

The KD-2446 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-2446 may be used in a variety of applications using target materials such as ferrous, stainless steel or aluminum. Applications include displacement, vibration, sorting and event capture. With its excellent sensitivity to small targets and high-speed switching, the KD-2446 is ideal for RPM sensing in harsh environments. The opto-isolated switched output makes the KD-2446 ideal for interfacing to PLC inputs, counters, timers or alarm circuits.

## KD-2446 SYSTEM

The KD-2446 system consists of two sub-assemblies: the sensor, with integral cable, and the signal conditioning or electronics module. The KD-2446 electronics is housed in a DIN rail mount enclosure with terminal connections for +12 Vdc to +24 Vdc input power and the variable voltage and switched outputs. Kaman offers 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 for continuous operation up to 400°F (205°C).

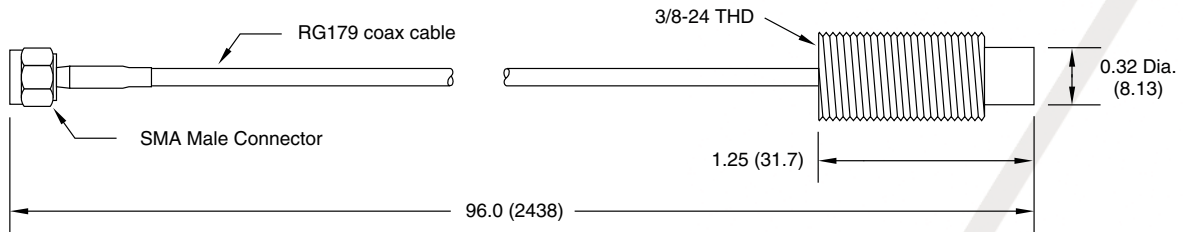
## EMI PERFORMANCE

The KD-2446 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-2446 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 for specific data or for recommended solutions to problems you are having with the KD-2446.

# KD-2446

## KD-2446 SENSORS

### 9C SENSOR AND SPECIFICATIONS



Dimensions shown are in inches (mm)

#### ORDERING INFORMATION

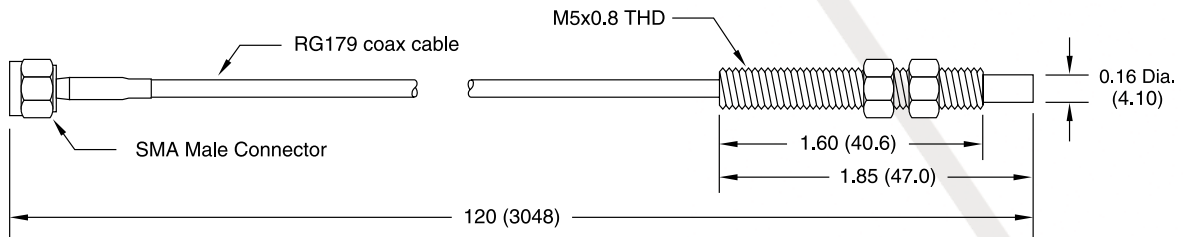
KD-2446-9C	Complete system, sensor and electronics	P/N 855776-9CMT
	Sensor only	P/N 851166-008
	Electronics only	P/N 855765-001G

#### 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)

### 5CM SENSOR AND SPECIFICATIONS



Dimensions shown are in inches (mm)

#### ORDERING INFORMATION

KD-2446-5CM	Complete system, sensor and electronics	P/N 855776-5CM
	Sensor only	P/N 851520-004
	Electronics only	P/N 855765-001G

#### TARGET MATERIAL

#### 5CM SENSOR MEASURING RANGE

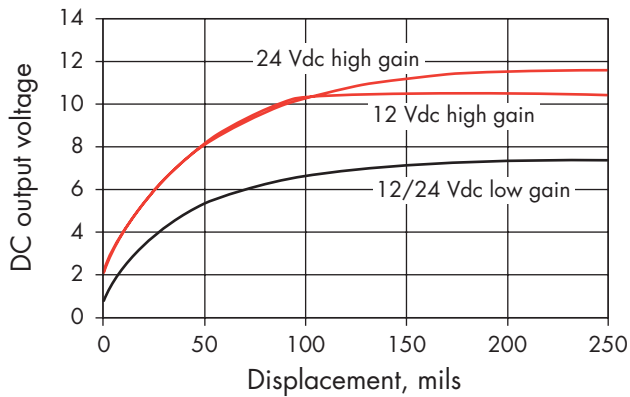
Non-ferrous (aluminum)	0 - 0.100 in. (0 - 2.54 mm)
Non-magnetic steels (304 stainless)	0.010 - 0.125 in. (0.254 - 3.18 mm)
Magnetic steels (4130)	0.015 - 0.150 in. (0.38 - 3.81 mm)

# KD-2446

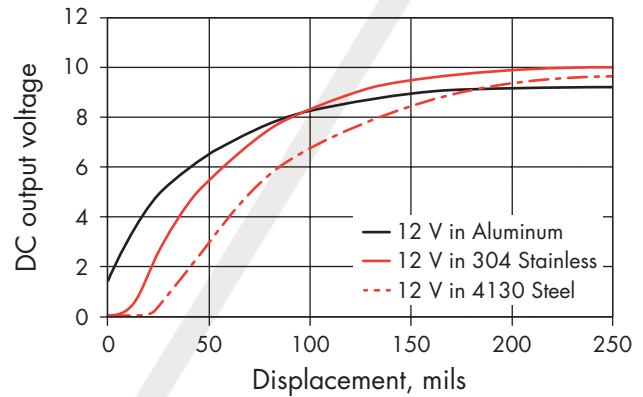
## KD-2446 SENSORS

### 9C SENSOR RESPONSE DATA

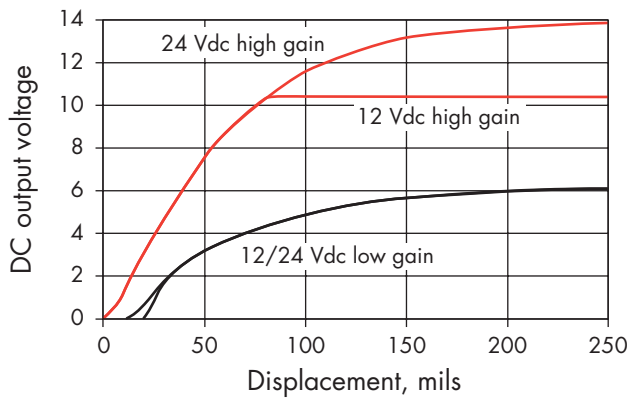
**Aluminum output for 12 and 24 volt inputs**



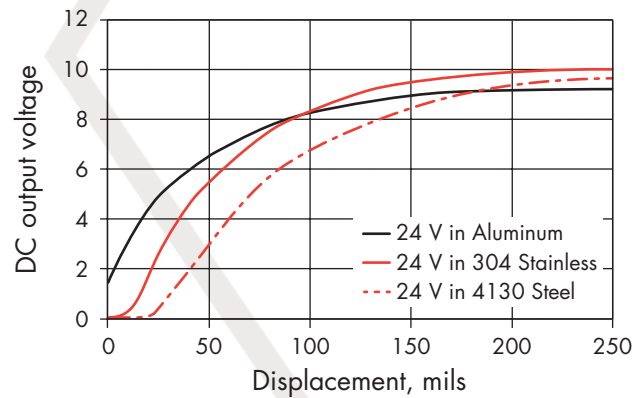
**Outputs at medium gain and 12 volt input**



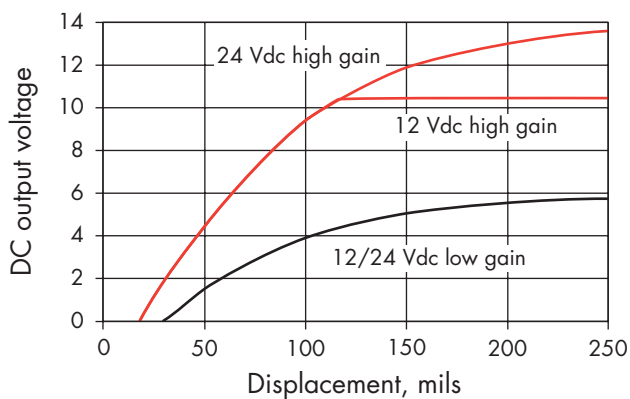
**304 SS output for 12 and 24 volt inputs**



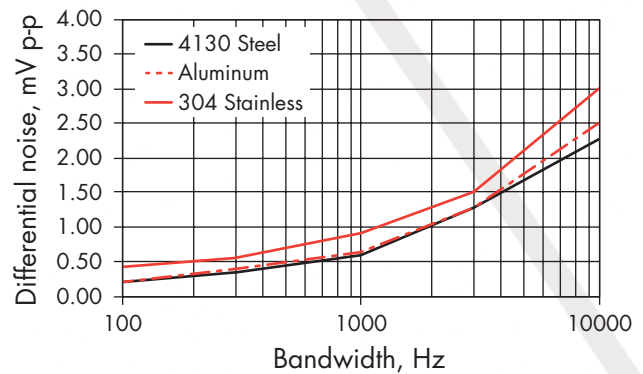
**Outputs at medium gain and 24 volt input**



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



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

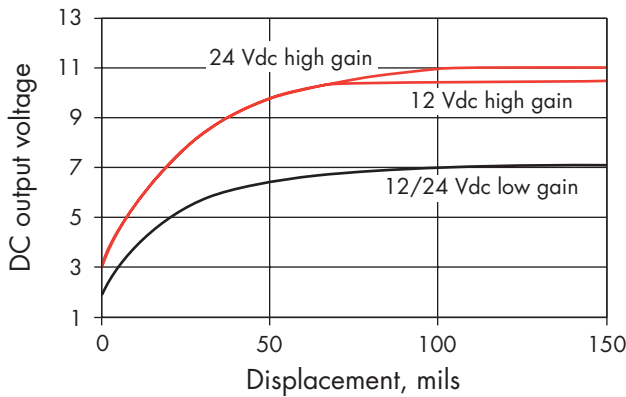


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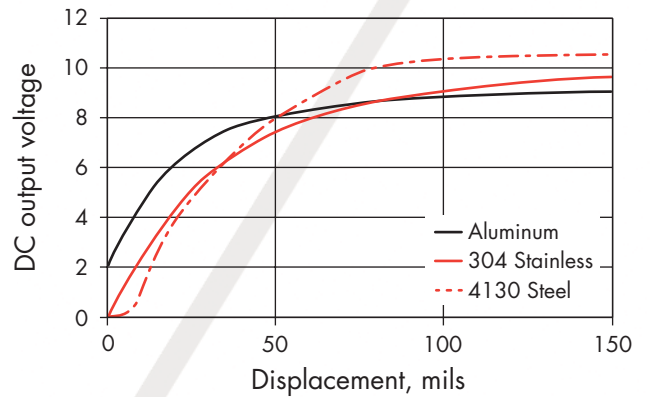
## KD-2446 SENSORS

### 5CM SENSOR RESPONSE DATA

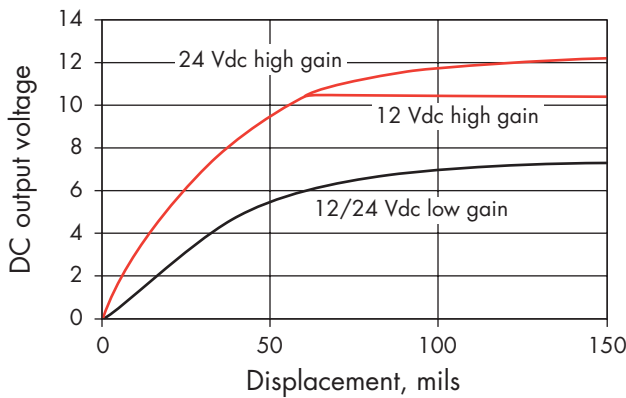
**Aluminum output for 12 and 24 volt inputs**



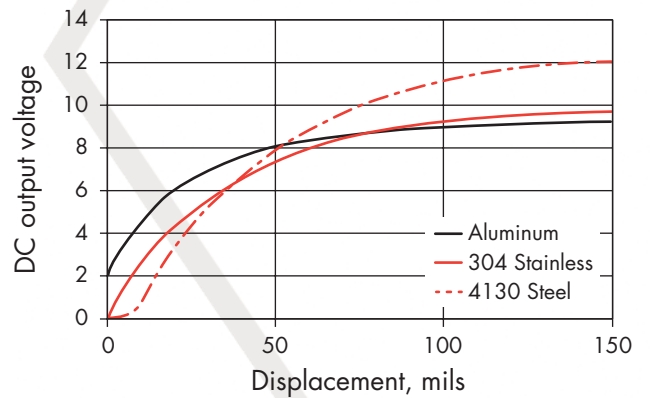
**Outputs at medium gain and 12 volt input**



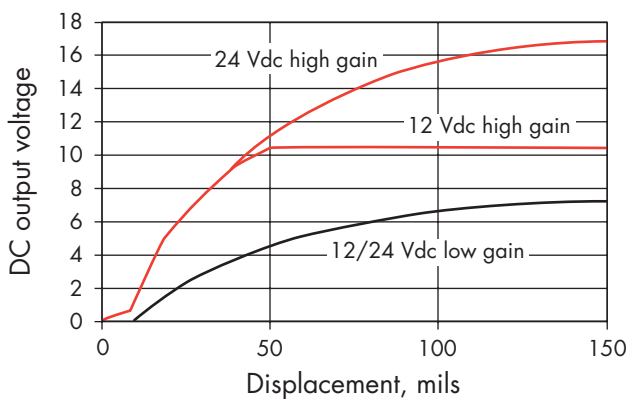
**304 SS output for 12 and 24 volt inputs**



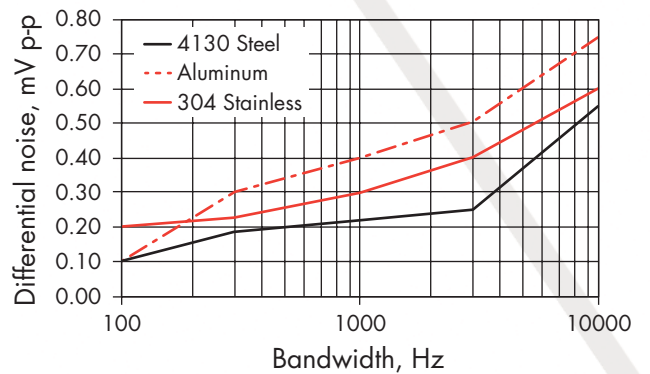
**Outputs at medium gain and 24 volt input**



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



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



# KD-2446

## SPECIFICATIONS

### ELECTRICAL

#### INPUT

Voltage Regulated 12 Vdc to 24 Vdc.  
Fuse limit input current from power source to 11 mA, 0.28 W maximum at full load.

#### ANALOG OUTPUT

Voltage 0-22 Vdc with 24 Vdc input; 0-10 Vdc with 12 Vdc input. The 0-22 Vdc and 0-10 Vdc are maximum voltages with the defined input voltage.

Current (full load) 4.2 mA maximum  
Impedance 50 ohms  
Frequency response 0-10 KHz ( $\pm 3$ db)

#### 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

