

## Ultrasonic Sensor Selection Guide



Ultrasonic Sensors Barrels			
Housing	18 mm	30 mm	47 mm
Sensing Range	20 - 100 mm	30 - 100 mm	300 mm
Pages	H9 - H11	H11	H13

**Ultrasonic Sensor Selection Guide**



Ultrasonic Sensors Barrels and Rectangular			
Housing	65 mm	30 mm	40 mm
Sensing Range	600 MM	30 - 100 mm	100 mm
Pages	H13	H15	H15

**Ultrasonic**

# Ultrasonic Sensors

## Ultrasonic Sensor Part Number Key

**RUC 130 - M 30 - 2 A P 8 X** *Wiring Options*

### Mounting

RU(C) = Ultrasonic Sensor  
 RUN = Ultrasonic Sensor  
 RUR = Ultrasonic Sensor

### Rated Operating Distance (cm)

### Housing Style

#### Barrel - Metal

M = Partial Threading, Chrome Plated Brass

#### Rectangular

Q = Metal or Plastic, Various Rectangular Styles

#### Limit Switch

CP = *combiprox*<sup>®</sup>, Plastic Housing, Terminal Chamber Base with Removable Sensor

### Number of LEDs

Examples:

Blank = No LEDs  
 X2 = 2 LEDs

### Voltage Range

#### DC:

6 = 10-30 VDC, Polarity Protected, Pulsed SCP  
 8 = 20-30 VDC, Polarity Protected, Pulsed SCP  
 LI = 20-30 VDC  
 LIU = 15-30 VDC  
 LU = 18-30 VDC

### Output

N = NPN Transistor (Current Sinking)  
 P = PNP Transistor (Current Sourcing)

### Output Function

A = Normally Open (N.O.)  
 LI(LU) = Linear Analog Output Current (LI) or Voltage (LU)  
 LIU = Linear Analog Output (Current and Voltage)  
 LFX = Analog Frequency Output

### Number of Switch Points

### Secondary Barrel Modifier

K = Short Barrel Length  
 S = Side Sensing

### Housing Diameter/Height (mm)

## Wiring Options

### A) Connectorized Sensor

RUC 130-M30-2AP8X-**H1** **1** **5** **1**

**Connector Family**

H1 = *eurofast*<sup>®</sup>, Metal or Plastic, Male

**Number of LEDs**

Example:  
1 = Standard

**Number of Pins**

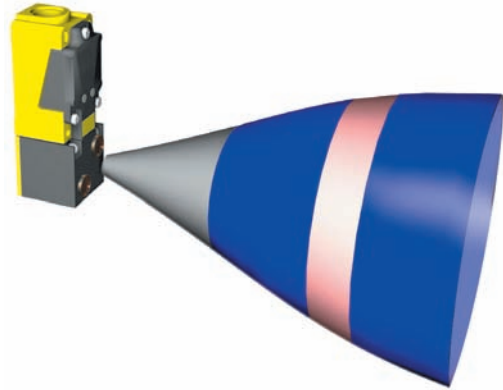
**Connector / Sensor Transition**

1 = Straight

# Ultrasonic Sensors

## Principle of Operation

The sensor emits an ultrasonic pulse that reflects back from any object entering the sonic cone. Because sound has a constant velocity at a given temperature and humidity, the time taken for this echo to return to the sensor is directly proportional to the distance of the object. The sensor's output status is dependent on the comparison of this time with the setting of the detection zone.



## Medium

TURCK ultrasonic transducers are calibrated for use in air. The sensors can also be used in other gaseous media with a corresponding change in sensing range.

## Targets

Solid, fluid, granular and powdery targets can be detected by TURCK ultrasonic sensors.

The **variations** of an "ideal" target should not exceed 0.15 mm (.006 in). Larger surface variations allow for larger alignment variations but may reduce sensing range.

Target **temperature** affects the sensing range in that hot surfaces reflect sonic waves less than cold ones.

The ultrasonic reflectivity of **liquid surfaces** is the same as that of solid, flat objects. Correct alignment should be observed.

Textiles, foams, wool, etc. absorb sonic waves, thereby reducing the sensing range.

## Air pressure

Normal atmospheric pressure changes of  $\pm 5\%$  (at a fixed reference point) can cause a  $\pm 6\%$  deviation in sensing range.

## Air temperature and humidity

Both air temperature and humidity influence the sonic pulse duration. An air temperature increase of 20°C (68°F) results in a +3.5% change in sensing distance for M18, M30 or Q30 styles and +8% for CP40s.

An increase in humidity results in an increased sound speed (max. 2%) compared with dry air.

## Air streams

Air streams affect the echo propagation time, but the effects of air flow speeds of up to 10 m/s are negligible. The use of ultrasonic sensors is not recommended in turbulent areas such as above glowing metal because the sonic waves become distorted, making the echos difficult to evaluate.

## Dewing

Normal concentrations of rain or snow falling in front of the sensor do not affect sensor operation.

CP40 transducers are not protected against wetting. All other ultrasonic sensors are not damaged by water, but correct functionality may be impaired when wet. Therefore, the transducers should not be subjected to direct wetting during use.

## Sensor styles

**M18, M30 & Q30:** these sensor styles have one transducer that functions both as emitter and receiver, which results in a larger blind zone. They have a narrow sonic cone (6°) and are especially suited for detection of small objects in a small area at a long distance.

**CP40** - these sensor styles have two transducers - one emitter and one receiver, which results in a smaller blind zone. They have a wide sonic cone (60°). The wide cone angle allows for a greater angle of inclination for the target. CP40 style sensors are especially suited for detecting objects in a large area.



## Simultaneous operation of several sensors

When several ultrasonic sensors are used, mutual interference of the sonic cones may arise. To eliminate this problem, some of the sensors have synchronization and multiplexing features. For those sensors without these features, maintaining a minimum distance between sensors will also solve this problem.

## Synchronization

Synchronization of ultrasonic sensors causes the sensors to emit their sonic pulses simultaneously. Using RUC...M30, RU...Q30 or RU...M18 sensors, up to six sensors may be synchronized by tying their X1 lines.

## Multiplexing

Multiplexing the sensors causes them to emit their pulses at pre-defined intervals, independent of one another. This eliminates the possibility of mutual interference and of sensors seeing targets that are actually in front of other sensors. The more sensors that are operated alternately, the lower the switching frequency.

The X1 line of sensors RUC...M30, RU...Q30 and RU...M18 can be used as an enable input for multiplexing purposes. An X1 input of +24 V enables the sensor while an X1 input of 0 V disables it. Multiplexing via the X1 line instead of by powering down the sensors has the advantage that only the response time has to be considered and not the time delay before availability.

# Ultrasonic Sensors

## Range adjustments

M30 and CP40 style sensors have two potentiometers to enable both foreground and background suppression. Q30 and discrete M18 style sensors have one potentiometer to enable background suppression only.

Analog M18 sensors have a fixed range.

Sensing ranges given are at nominal conditions, i.e.  $T_u = +20^{\circ}\text{C}$  ( $68^{\circ}\text{F}$ ) using a standard target, vertically aligned, with reflective surface (metal, 1 mm thick).

## Sensors with two switch points

**RUC...2AP8X** - the potentiometers on these sensors set the far limits of each detection zone. Potentiometer S1 sets the far limit of Zone 1, which begins at the end of the blind zone.

Potentiometer S2 sets the far limit of Zone 2, which begins at the far limit of Zone 1 (Figure 1).

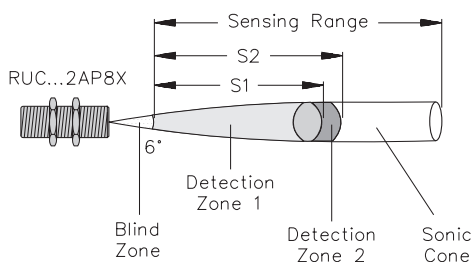


Figure 1

## Sensors with one switch point

**CP40** - potentiometer S1 sets the near limit while potentiometer S2 sets the depth of the detection zone. This allows both foreground and background suppression. Changes to S1 will cause the far limit to follow (Figure 2).

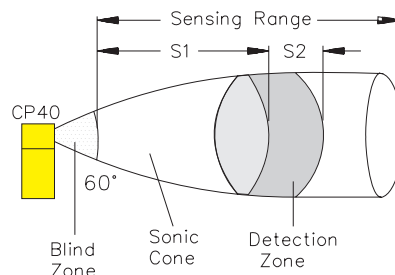


Figure 2

**Q30 and discrete M18** - one potentiometer sets the far limit of the detection zone. The near limit is not adjustable, and is determined by the blind zone. This allows for background suppression only (Figure 3).

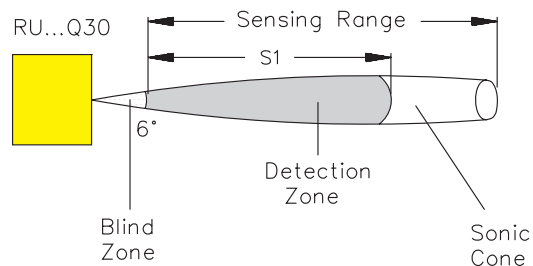


Figure 3

**M30** - potentiometers S1 and S2 set the near and far limits of the detection zone. This allows for foreground and background suppression. The pots are independent of each other (Figure 4).

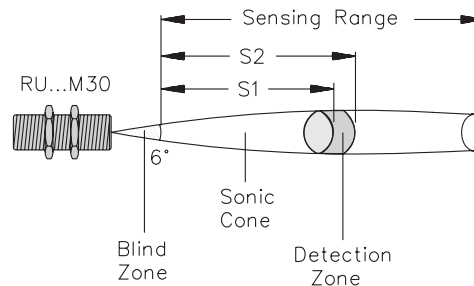
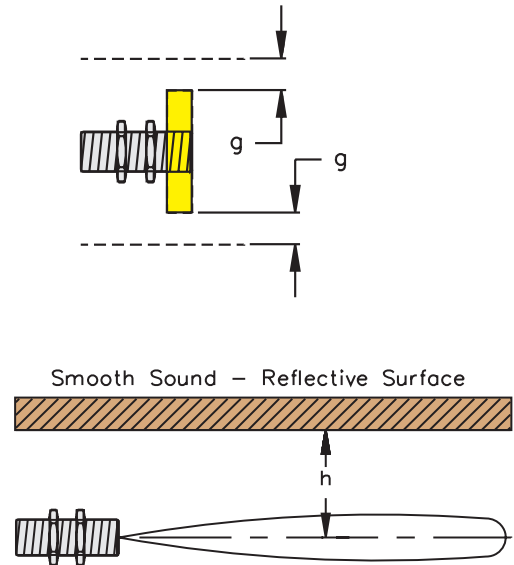
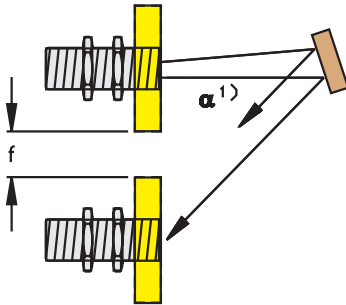
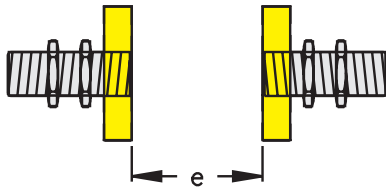


Figure 4

Mounting Considerations



Sensor Type	e (cm)	f (cm)	g (cm)	h (cm)
RU20-M18K-	80	6	3	1.5
RU70-M18K-	280	18	10	5.0
RUN20-M18K	80	6	3	1.5
RUN70-M18K-	280	18	10	5.0
RUR20-M18K-	80	6	3	1.5
RUR70-M18K-	280	18	10	5.0
RU20-M18KS-	80	6	3	1.5
RU70-M18KS-	280	18	10	5.0
RUN20-M18KS-	80	6	3	1.5
RUN70-M18KS-	280	18	10	5.0
RUR20-M18KS-	80	6	3	1.5
RUR70-M18KS-	280	18	10	5.0
RU 30-M18-	≥120	≥15	≥6	≥3
RU100-M18-	≥400	≥60	≥30	≥15
RU 30-M30-	≥120	≥15	≥6	≥3
RU100-M30-	≥400	≥60	≥30	≥15
RU600-M3065-	≥2500	≥250	≥80	≥40
RUC 30-M30-	≥120	≥15	≥6	≥3
RUC130-M30-	≥400	≥60	≥30	≥15
RUC300-M3047-	≥1200	≥150	≥60	≥30
RUC600-M3065-	≥2500	≥250	≥80	≥40
RU 30-Q30	≥120	≥15	≥6	≥3
RU100-Q30	≥400	≥60	≥30	≥15
RU100-CP40-AP6X2	≥600	≥100	≥120	≥60
RU100-CP40-LIUX	≥600	≥100	≥120	≥60

<sup>1)</sup> The greater the angle  $\alpha$ , the larger the distance f. The minimum f values in the table refer to  $\alpha = 0^\circ$ .

Ultrasonic

# Ultrasonic Sensors



Housing Style	Part Number	ID Number	Sensor Operating Mode	Rated Oper. Distance(cm)	Adjustment Method	Sonic Cone Angle	Output
<b>18 mm - Embeddable, Barrel Style eurofast® Connection</b> 	RUN20-M18K-AP8X-H1141	M1830034	D	5-20	Teach Input	6°	4-Wire DC PNP
	RUN70-M18K-AP8X-H1141	M1830035	D	15-70	Teach Input	6°	
	RUR20-M18K-AP8X-H1141	M1830036	R	7-20	Teach Input	6°	
	RUR70-M18K-AP8X-H1141	M1830037	R	20-70	Teach Input	6°	
	RU20-M18K-LFX-H1141	M1830030	D	5-20	Teach Input	6°	4-Wire DC 200-800 Hz 400-1600 Hz Frequency Output
	RU70-M18K-LFX-H1141	M1830031	D	15-70	Teach Input	6°	4-Wire DC 150-700 Hz 300-1400 Hz Frequency Output
	<b>18 mm - Embeddable, Side Sensing, Barrel Style eurofast connection</b> 	RUN20-M18KS-AP8X-H1141	M1830038	D	5-20	Teach Input	6°
RUN70-M18KS-AP8X-H1141		M1830039	D	15-70	Teach Input	6°	
RUR20-M18KS-AP8X-H1141		M1830040	R	7-20	Teach Input	6°	
RUR70-M18KS-AP8X-H1141		M1830041	R	20-70	Teach Input	6°	
RU20-M18KS-LFX-H1141		M1830032	D	5-20	Teach Input	6°	4-Wire DC 200-800 Hz 400-1600 Hz Frequency Output
RU70-M18KS-LFX-H1141		M1830033	D	15-70	Teach Input	6°	4-Wire DC 150-700 Hz 300-1400 Hz Frequency Output

**Sensor operating mode:**

D = Diffused

R = Retro-reflective

**Adjustment method:**

Pot. = Potentiometer

\* 4-wire DC sensors can be programmed with a VB2-SP2 programming kit.

For detailed Sensor Specifications see Section M.  
Normally Closed Versions available upon request, consult factory.



Voltage	Switching Freq. (Hz)	Continuous Load Current (mA)	Operating Temp. (°C)	Protection	Housing	Transducer	Power LED	Output LED	Mating Cordset	Wiring Diagram #	Wiring Diagrams
20-30 VDC	10	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	1	<p><b>Diagram 1</b></p> <p>Teach Input</p> <p><b>Diagram 2</b></p> <p>Frequency Input</p>
	5	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	1	
	10	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	1	
	5	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	1	
20-30 VDC	N/A	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	2	
20-30 VDC	N/A	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	2	
20-30 VDC	10	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	1	
	5	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	1	
	10	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	1	
	5	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	1	
20-30 VDC	N/A	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	2	
20-30 VDC	N/A	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	2	

\* Length in meters.

For material descriptions see page M22.

# Ultrasonic Sensors



Housing Style	Part Number	ID Number	Sensor Operating Mode	Rated Oper. Distance(cm)	Adjustment Method	Sonic Cone Angle	Output	
<b>18 mm - Embeddable, eurofast® Connection</b> 	RU30-M18-AP8X-H1141	M1810000	D	5-30	Pot.	6°	4-Wire DC PNP	
	RU100-M18-AP8X-H1141	M1810200	D	15-100	Pot.	6°		
	RU30-M18-LIX-H1141	M1810005	D	5-30	Pot.	6°	4-Wire DC Analog 4-20 mA Current	
	RU100-M18-LIX-H1141	M1810205	D	15-100	Pot.	6°		
	<b>30 mm - Embeddable, eurofast Connection</b> 	RU30-M30-AP8X-H1141	M1830000	D	6-30	Pot.	6°	3-Wire DC PNP
		RU100-M30-AP8X-H1141	M1830200	D	20-130	Pot.	6°	
RUC130-M30-LIAP8X-H1151		M1840230	D	20-130	Pot.	6°	5-Wire DC PNP Analog 4-20 mA	
RUC30-M30-AN8X-H1141		M1840001	D	6-30	Pot.	6°	4-Wire DC NPN	
RUC30-M30-2AP8X-H1151		M1840020	D	6-30	Pot.	6°	5-Wire DC PNP	
RUC130-M30-2AP8X-H1151		M1840220	D	20-130	Pot.	6°		

**Sensor operating mode:**

D = Diffused

R = Retro-reflective

**Adjustment method:**

Pot. = Potentiometer

4-wire DC sensors can be programmed with a RU-DPI programming kit.

For detailed Sensor Specifications see Section M.

Normally Closed Versions available upon request, consult factory.



Voltage	Switching Freq. (Hz)	Continuous Load Current (mA)	Operating Temp. (°C)	Protection	Housing	Transducer	Power LED	Output LED	Mating Cordset	Wiring Diagram #	Wiring Diagrams
20-30 VDC	5	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	1	<b>Diagram 1</b> 
	4	≤150	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	1	
20-30 VDC	N/A	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	2	<b>Diagram 2</b> 
	N/A	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RK 4.4T-*	2	
20-30 VDC	8	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RKK 4.4T-*	1	<b>Diagram 3</b> 
	4	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RKK 4.4T-*	1	
20-30 VDC	4	≤300	-25 to +70	IP 65	CPB	E/PU/PBT	GN	YE	RKK 4.5T-*	5	<b>Diagram 4</b> 
20-30 VDC	8	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RKK 4.4T-*	3	<b>Diagram 5</b> 
	4	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RKK 4.4T-*	3	
20-30 VDC	8	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RKK 4.5T-*	4	<b>Diagram 5</b> 
	4	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RKK 4.5T-*	4	

\* Length in meters.

For material descriptions see page M22.

# Ultrasonic Sensors



Housing Style	Part Number	ID Number	Sensor Operating Mode	Rated Oper. Distance(cm)	Adjustment Method	Sonic Cone Angle	Output
<b>47 mm - Embeddable, eurofast® Connection</b> 	RUC300-M3047-AP8X-H1141	M1840400	D	40-300	Pot.	6°	4-Wire DC PNP
	RUC300-M3047-2AP8X-H1151	M1840420	D	40-300	Pot.	6°	5-Wire DC PNP
<b>65 mm - Embeddable, eurofast Connection</b> 	RU600-M3065-AP8X-H1141	M1830400	D	60-600	Pot.	6°	3-Wire DC PNP
	RUC600-M3065-AP8X-H1141	M1840600	D	60-600	Pot.	6°	4-Wire DC PNP
	RUC600-M3065-2AP8X-H1151	M1840620	D	60-600	Pot.	6°	5-Wire DC PNP

### Sensor operating mode:

D = Diffused

R = Retro-reflective

### Adjustment method:

Pot. = Potentiometer

4-wire DC sensors can be programmed with a RU-PDI programming kit.

For detailed Sensor Specifications see Section M.

Normally Closed Versions available upon request, consult factory.



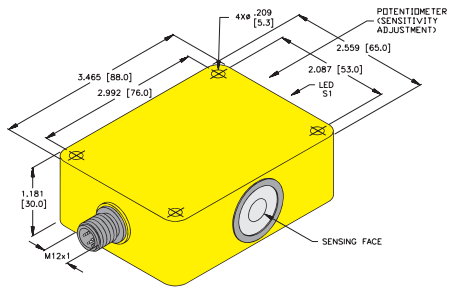
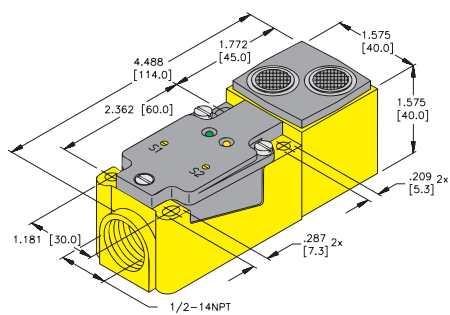
Voltage	Switching Freq. (Hz)	Continuous Load Current (mA)	Operating Temp. (°C)	Protection	Housing	Transducer	Power LED	Output LED	Mating Cordset	Wiring Diagram #	Wiring Diagrams
20-30 VDC	2	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RKK 4.4T-*	2	<p><b>Diagram 1</b></p>
20-30 VDC	2	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RKK 4.5T-*	3	<p><b>Diagram 2</b></p>
20-30 VDC	1	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RKK 4T-*	4	<p><b>Diagram 3</b></p>
20-30 VDC	1	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RKK 4.4T-*	2	<p><b>Diagram 4</b></p>
20-30 VDC	1	≤300	-25 to +70	IP 67	CPB	E/PU/PBT	N/A	YE	RKK 4.5T-*	5	<p><b>Diagram 5</b></p>

\* Length in meters.

For material descriptions see page M22.

# Ultrasonic Sensors



Housing Style	Part Number	ID Number	Sensor Operating Mode	Rated Oper. Distance(cm)	Adjustment Method	Sonic Cone Angle	Output
<b>30 mm - Embeddable, Rectangular</b> <b>euromast® Quick Disconnect</b> 	RU30-Q30-AP8X-H1141	M1820000	D	6-30	Pot.	6°	4-Wire DC PNP
	RU100-Q30-AP8X-H1141	M1820200	D	20-100	Pot.	6°	
<b>40 mm - Embeddable, Rectangular, Terminal Chamber</b> 	RU100-CP40-AP6X2 W/ESD	M1610200	D	5-180	Pot.	60°	3-Wire DC PNP
	RU100-CP40-LIUX W/ESD	M1534800	D	5-180	Pot.	60°	4-Wire Analog 0-10 V 0-20 mA Current and Voltage

**Sensor operating mode:**

D = Diffused  
 R = Retro-reflective

For detailed Sensor Specifications see Section M.  
 Normally Closed Versions available upon request, consult factory.



Voltage	Switching Freq. (Hz)	Continuous Load Current (mA)	Operating Temp. (°C)	Protection	Housing	Transducer	Power LED	Output LED	Mating Cordset	Wiring Diagram #	Wiring Diagrams
18-35 VDC	8	≤100	-25 to +70	IP 67	Crastin	EPR	N/A	YE	RKK 4.4T-*	1	<b>Diagram 1</b> 
	5	≤100	-25 to +70	IP 67	Crastin	EPR	N/A	YE	RKK 4.4T-*	1	
18-35 VDC	N/A	≤100	-25 to +70	IP 67	Crastin	EPR	N/A	YE	RKK 4.4T-*	2	<b>Diagram 2</b> 
	N/A	≤100	-25 to +70	IP 67	Crastin	EPR	N/A	YE	RKK 4.4T-*	2	
10-30 VDC	3	≤200	-25 to +70	IP 67	PBT	EPR	GN	YE	- - - -	3	<b>Diagram 3</b> 
15-30 VDC	N/A	≤100	-25 to +70	IP 67	PBT	EPR	N/A	YE	- - - -	4	<b>Diagram 4</b> 

\* Length in meters.

For material descriptions see page M22.